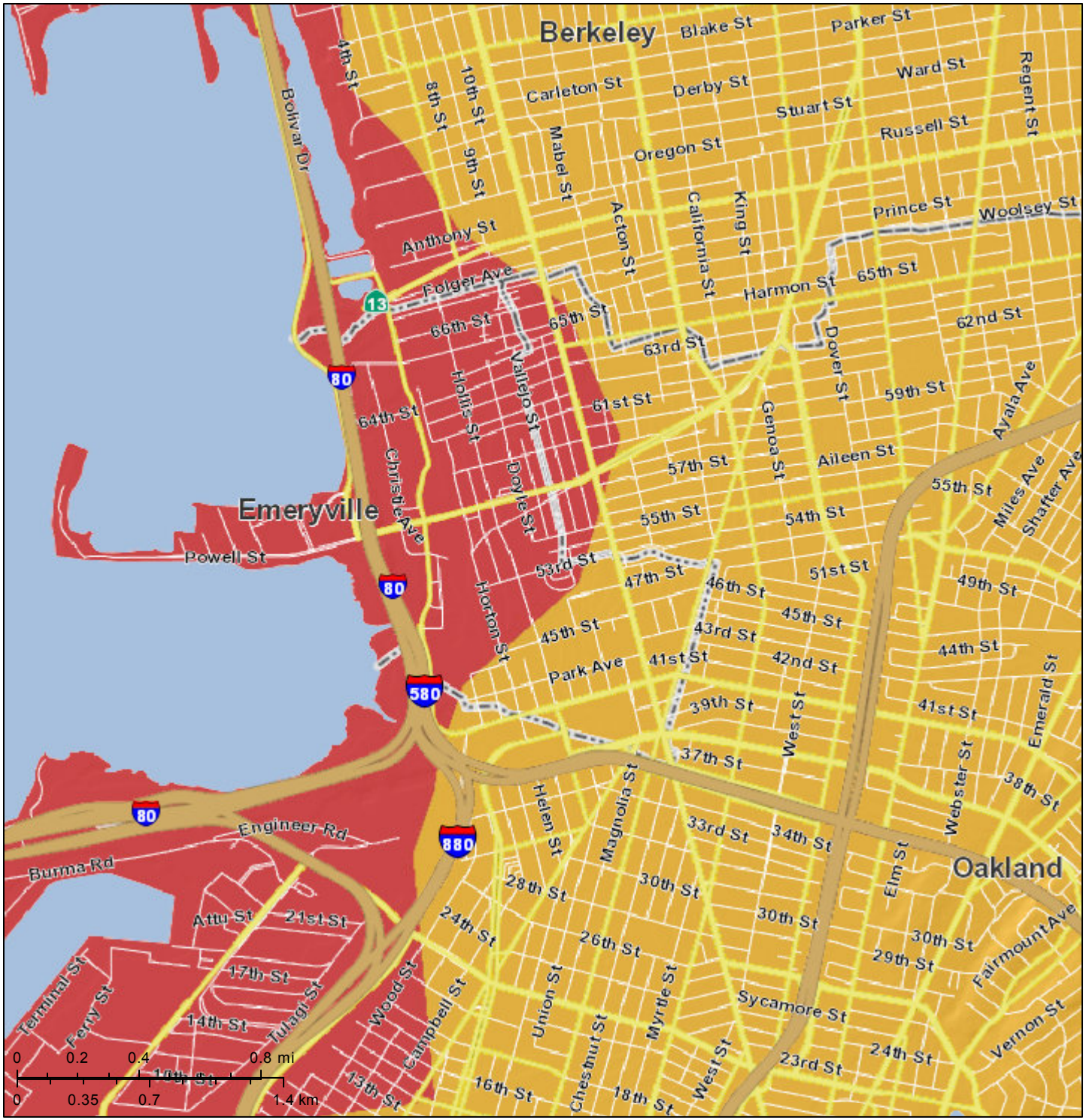
San Francisco Bay Area Hazards

Legend

- Light - MMI 5
- Moderate - MMI 6
- Strong - MMI 7
- Very Strong - MMI 8
- Violent - MMI 9
- Very Violent - MMI 10



This map is intended for planning only and is not intended to be site specific. Rather, it depicts the general risk within neighborhoods and the relative risk from community to community.

ASSOCIATION OF BAY AREA GOVERNMENTS
RESILIENCE PROGRAM

November 2, 2015

ABAG GIS







Visions for
Priority Development Areas

Jobs-Housing Connection Strategy

May 2012

Plan BayArea

ASSOCIATION OF BAY AREA GOVERNMENTS

METROPOLITAN
TRANSPORTATION
COMMISSION

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Visions for Priority Development Areas

The Jobs-Housing Connection Strategy builds upon a rich legacy of integrated planning in the Bay Area. For over a decade, the region and its local governments have been working together to encourage growth of jobs and housing production in areas supported by amenities and infrastructure. In 2008, ABAG and MTC created a regional initiative to support these local efforts called FOCUS. Through FOCUS, local governments identified Priority Development Areas (PDAs) and Priority Conservation Areas (PCAs). These Priority Development and Conservation Areas are the implementation framework for the Jobs-Housing Connection Land Use Strategy.

In PDAs, new development would support the needs of residents and contribute to a pedestrian and-transit friendly environment. While PDAs were originally established to address housing needs in urban settings, they were later broadened to address employment centers and rural settings. Local jurisdictions have defined the character of their PDAs according to existing conditions and future expectations as regional centers, city centers, suburban centers, transit town centers or rural centers, among other place types. PCAs are regionally significant open spaces for which there exists a broad consensus for long-term protection. PDAs and PCAs complement one another because promoting compact development within PDAs takes development pressure off the region's open space and agricultural lands.

The planning processes for these key infill, transit-oriented neighborhoods are local efforts informed by a range of community members that involve hard work to address a unique and complex range of local goals and issues. The Jobs-Housing Connection Strategy is designed to connect these efforts and advance dialogue around a sustainable regional growth pattern that recognizes local aspirations and the distinctive characteristics of our region's neighborhoods and communities. This is not a simple compilation of local proposals; rather it is the result of an ongoing dialogue on enhancing community and regional qualities for future generations.

The following narratives provide a brief description of Priority Development Areas in the future as envisioned by local jurisdictions through their specific plans. They are organized by county and place-type.

ALAMEDA COUNTY

Located just across the bay from San Francisco, Alameda County is the most centrally located county in the region. Its location provides good access to jobs and a diverse array of natural amenities make it an attractive choice for residents and business. The University of California, Berkeley, Lawrence Livermore Laboratory, and Disney Pixar Studio are some notable employers located within its boundaries.

Alameda County is home to the City of Oakland, the third largest city in the region, the Port of Oakland, one of the country's busiest container ports, nineteen BART stations, and an enviable park system. Alameda County has long been a major hub of economic activity in the Bay Area and is projected to grow significantly by taking on 23% of total regional household growth, or 154,000 additional units, and 21% of total regional job growth or 253,000 jobs. The Jobs-Housing Connection Strategy envisions these new homes and jobs primarily in neighborhoods along major transportation corridors in Oakland, Emeryville, Dublin, and Fremont, where they will be served by rapid bus, Bus Rapid Transit (BRT) and BART.

REGIONAL CENTER

Oakland - Downtown & Jack London Square

Downtown and Jack London Square constitute premier central districts of the East Bay. Broadway, the main street of Oakland and downtown gateway to Jack London Square, is a critical corridor in downtown, as well as other adjacent residential neighborhoods and the "Pill Hill" medical campuses. This transit rich environment is served by two BART stations, bus routes and shuttle services. Oakland endeavors to make downtown and Jack London Square centers of culture, night life, business, innovation, shopping and civic life. It is envisioned that transit oriented development paired with a retail strategy will connect developments along Broadway. Development projects tied to key Oakland BART stations along the Broadway corridor will create a mix of housing, commercial uses and open space designed to encourage compact infill and efficient use of land capacity within the existing communities. Infrastructure improvements will include utility services, access





improvements and amenities for pedestrians, bicycles, and buses making it an ideal location to live, work and play.

CITY CENTER



Berkeley - Downtown Berkeley

The Downtown Berkeley Priority Development Area is centered on the Downtown Berkeley BART station in the heart of the city immediately adjacent to the campus of UC Berkeley

The vision for the downtown is to build on the area's cultural, educational, and historic assets to ensure that downtown is truly healthy, livable, and economically vital. The plans call for adding new higher-intensity, mixed-use development in the core area near BART and the AC Transit hub in ways that respect the area's existing historic character.

To foster this sense of downtown as a complete neighborhood, the downtown land use pattern will encourage more residential development, promote a wide variety of restaurants, small shops, and business to create a thriving and diverse retail environment as well as add more open spaces and landscaping and streetscape improvements throughout the downtown core. Over time, the addition of more residents, promotion of a vibrant mix of uses, and improvements to the public realm will help to create a vital and appealing neighborhood that make streets more safe and comfortable to encourage walking, bicycling, and transit use as alternatives to driving.

Emeryville - Mixed Use Core



The goals for this area include the creation of an urban, diverse and inclusive city that offers distinctive districts and livable neighborhoods; an enhanced and connected open space network and green streets; a walkable, fine-grained street network that emphasizes pedestrians; a diversity of transportation modes and choices; and sustainability and innovation, with respect for the past.

Emeryville is planning to continue to expand housing options over the next 20 years. The highest intensity uses will primarily be around the Amtrak station and the nearby Powell/Christie core area. Development of new homes in mixed-use areas will provide residents with easy access to nearby shops, services, and jobs. To

complement this new development, the City is working to develop new parks and greenways and a Center for Community Life, which will combine social, education, and recreation resources in a single location.

Fremont - Central Business District



The vision for the Central Business District and Fremont BART Station PDA is a core area of vibrant commercial and office uses integrated with residential mixed-use development. The core area is surrounded by high- and medium-density residential developments that take advantage of existing infrastructure, including the Fremont BART Station and bus connections. The Fremont BART Station acts as a public-use anchor for the north end of the PDA, which has the greatest concentration of housing. Commercial retail development with the potential for residential units on the floors above will anchor the south end of the PDA. Between these two anchors, the City envisions a public realm that encourages pedestrian activity and safely and conveniently connects the major destinations and gateways in the PDA.

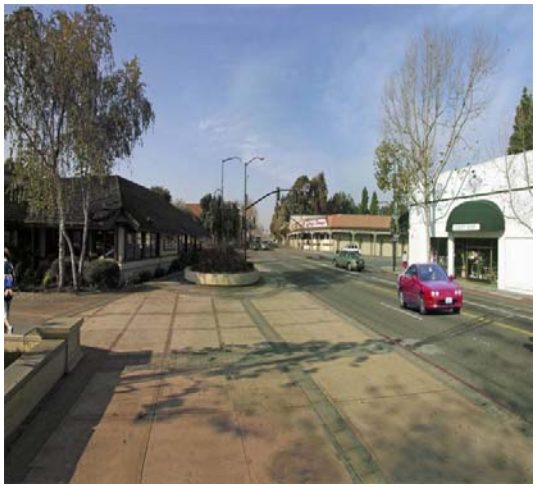
The plan for the Central Business District envisions a complete downtown center in Fremont, with a mix of housing, retail, medical, and office uses. The plan creates a central, urban environment within the City of Fremont that helps to accommodate regional housing needs, supports transit ridership and retail tenants, reduces automobile dependence and vehicle miles traveled, and provides for livable neighborhoods that also serve as an asset to the community at large.

Hayward - Downtown



The downtown plan calls for new housing clustered around an easily accessible transit hub for BART and buses, revitalized retail connecting directly to the transit center and housing, and civic buildings re-assuming their traditional stature as monuments within the town fabric. Hayward envisions an additional new housing units and jobs through future downtown development. Plans for Downtown Hayward envision the transformation of the area into a focal point for the Hayward community. This neighborhood offers a wide range of housing choices, including affordable housing options, stores and services in close proximity to BART and other public transit services.

San Leandro - Downtown



In the future, retail mixed-use development, with pedestrian-oriented retail on the ground floor and housing above, will rise around San Leandro's existing retail downtown core along East 14th Street and Washington Avenue. Residential densities in these areas range from a medium to high with a minimum height of two stories for buildings along East 14th Street. The growth calls for mixed-use office development near Davis Street and San Leandro Boulevard to complement existing office buildings in the area. Transit-oriented development is particularly encouraged in the areas around BART and between the BART station and downtown core. Development to the east of the BART station, closest to downtown, will include a mix of uses with residential densities.

Union City - Intermodal Station District

Union City's vision is to transform this underutilized area into community focal point that would take advantage of the numerous transit services available. The city envisions a dynamic pedestrian-and transit-oriented neighborhood with housing, jobs, shopping, and community facilities surrounding a regional transit hub and a mixed-use district that will create a neighborhood for people to live and work. Retail and childcare will also be available. To encourage people to choose transit, the plan establishes a new development pattern that incorporates more intensive land uses and reduces dependence on automobile access. It will provide easy pedestrian access to the station as well as connections to surrounding residential areas and community amenities.

SUBURBAN CENTER

Dublin - Dublin Transit Center

Plans for the Dublin Transit Center call for the creation of a vibrant, pedestrian-friendly and high-density mix of office, residential, and retail uses within easy walking distance of the BART station. The area accommodates office buildings up to ten stories high. The plan also includes ancillary retail located in the ground floors of the buildings along Iron Horse Parkway and locates a village green at the center of the residential areas, at the western end of Digital Drive.

Dublin - Town Center

The Dublin Town Center Priority includes a mix of housing types—including single-family detached, town homes, condominiums, and apartments. It is intended to become a visually distinctive central business district and

community center. The city envisions the Town Center as a walkable area with locally-serving businesses within walking distance or a short ride from residential neighborhoods, conveniently served by transit. Mixed-use development with retail and service uses on the ground level and office or residential uses above is encouraged in existing commercial areas. Landscaped parkways provide attractive, tree canopied sidewalks to enhance the pedestrian experience and encourage greater pedestrian activity. These will be complemented by the addition of two elementary schools, a local trail, four neighborhood parks, and a community park all within walking distance of residential neighborhoods. The City is also planning for community uses, with the potential for a performing arts center, library, community center, or post office, and a public plaza.

Dublin - West Dublin BART Station Area

The plan for this area promotes a mix of uses, including high-density residential, mid-rise office buildings, specialty retail uses, and lodging around the future BART station. This development pattern would be supported by a variety of infrastructure improvements and creation of a cohesive pedestrian- and bicycle-oriented network. The plan calls for buildings up to eight stories tall. According to the plan, retail/office uses will be to the east of Golden Gate Drive, while Amador Plaza Road would be lined by commercial uses. Housing would be located adjacent to the BART station, with a hotel to the south of the housing. Land along Interstate 580 is designated for mixed-use, office, commercial, and lodging while there would be commercial and office uses along the south side of Dublin Boulevard. The plan calls for a bike lane along Dublin Boulevard to link the BART station to downtown Dublin and other employment and recreation areas throughout the city.

Livermore - Downtown

Plans for Downtown Livermore envision a mixed-use district that includes affordable infill housing, streetscape and pathway enhancements, improved bicycle and pedestrian connections to transit, significant live-work opportunities, employment, shopping, and a variety of cultural and entertainment venues. More specifically, the vision involves the creation of an arts and cultural district with a well-defined retail core and additional housing within the core and gateway districts. The plan involves substantial increases in moderate-to high-density housing, as well as commercial, office, and performing arts square footage. Plans also include a pedestrian link between the downtown core and the transit center, a public plaza, and improved signage and wayfinding.



Livermore - Vasco Road

This area is next to a major employment center in the city, the National Laboratories, as well as an existing regional transit connection, the ACE rail station. The overall vision for the area integrates a revitalized research and technology center, accessible by both the regional transportation corridor and local transit with affordable housing of varied types and commercial services close by serving both the daytime population and the residential community. A proposed BART extension, along the I-580 corridor eastward to the proposed PDA, provides a complete transit corridor connection for regional commuters and local residents. The i-GATE/i-Hub designation, along with the proposed BART to Livermore extension, broadens the vision to establish this area as a growing research center generating new technology, services and jobs accessible by both ACE and BART.

Livermore - Isabel Avenue/BART Station

The vision for this area is a transit oriented, neighborhood scale community with a mix of housing types in close proximity to transit and multi-use trail connections, and existing and expanding employment center, including a major employer and a regional educational institution. Bus transit will provide local and regional transit connections for residents, commuters, college students and faculty. This area will serve commuters, new residential development, and the college while minimizing traffic, noise and other impacts on centrally located neighborhoods.

Pleasanton - Hacienda

In this area, several vacant and underutilized parcels are planned for mixed-use development to enhance the connectivity between jobs, housing, and transit in the area immediately adjacent to and to the south of the Dublin/Pleasanton BART station. Improvements envisioned include replacement parking structures for BART, intermodal facilities, BART station pedestrian improvements, station area pedestrian improvements, and placemaking/plaza and wayfinding improvements.



TRANSIT TOWN CENTER

Alameda - Alameda Naval Air Station

This area includes substantial acres of underutilized land. The overall vision for the redevelopment of the Alameda's former Naval Air Station lands and Fleet Industrial Supply Center is to create a transit-oriented, mixed-use, sustainable development that provides homes for a variety of family sizes and income levels, jobs for the region to replace those lost by the closure of the base, as well as parks and open spaces for conservation and regional recreation.

Fremont - Irvington District

The overall vision for the Irvington area is for a walkable neighborhood of residential uses mixed with shopping and dining opportunities centered around Five Corners. As a result of its historic character, commercial activity, existing bus transit, future BART station and pedestrian scale, the Irvington District offers immediate room for infill housing within a traditional/historic neighborhood area. With the large amount of infill housing planned around the future BART station, new commercial development in Irvington will include unique shops and restaurants offering a range of choices to the existing and future residents of the area and the city. The proximity of these new homes to existing stores and services, along with the complementary streetscape and connectivity improvements, will make it easier for people to take care of their daily needs by walking or bicycling, rather than driving.

Newark - Dumbarton Rail Station Area

The vision for the Newark Dumbarton Rail station area is an urban village with transit access to thousands of jobs that embraces the natural beauty of the Bay a few footsteps away. It is intended as a pedestrian area by design that incorporates green building and sustainable living. The project area includes property that is of high habitat value that could be conserved as an element of the project. The area will provide housing, access to new rail transit, connections to open space, and possibly community amenities such as a performing arts facility. As planned, it will attract a variety of residents and retail and has the potential to become a new destination within Newark that will draw visitors from within the city, neighboring communities, and across the Bay.

Oakland - Coliseum BART Station

The Coliseum area is home to a sports arena, industrial, commercial, and residential uses. The vision for the area includes creating a Coliseum Transit Village comprised of mixed-use development that capitalizes on proximity to BART, Amtrak, and AC Transit services. The area will include mixed income housing, new streets, a city park and restoration of a portion of Lion Creek. The BART parking lot will be replaced with housing and neighborhood serving retail. The plan calls for improved streets and pedestrian linkages between transit areas, schools and activity centers, parks and libraries.

Oakland - West Oakland

Known for its rich history and importance to immigrant populations at the turn of the century, West Oakland is regaining significance in the region. The vision for this area includes replacing the BART parking lot with a mixed-use residential development complemented by streetscape improvements along 7th Street to make the area more pedestrian-friendly and to help revitalize the retail district by reconfiguring traffic



lanes to calm truck and vehicle traffic. The 7th Street Streetscape Improvement Plan also calls for new pedestrian and bicycle amenities for this historic thoroughfare, improved transit stops, and enhanced connections from the local neighborhood to the main BART entry and the Seventh Street commercial historic district.

San Leandro - Bay Fair BART Station Area



Plans for the area include creating a place that is attractive and safe; improving connections to jobs, services, and transit; providing a range of housing options; fostering fiscal and economic growth that favors the creation of a higher-density; and mixed-use district that promotes walking, biking, and transit use. Strategies to achieve these urban design goals include; circulation and access for pedestrians, bicyclists, drivers, and transit users; parking management; market and financial feasibility; and design guidelines for higher-density development and ensuring appropriate transitions to existing neighborhoods. In particular, these strategies focus on adding more housing in the area while improving the circulation network between the BART site, Bayfair Center, and surrounding areas.

URBAN NEIGHBORHOOD

Hayward - South Hayward BART Station

The city is looking to create a vibrant, livable neighborhood by encouraging the highest-intensity residential uses and essential community services to be located within walking distance to BART. Plans for the area around the South Hayward BART station include conversion of older commercial uses that are no longer economically feasible into a state-of-the-art, urban-scale residential neighborhood. Mobility improvements include: a pedestrian and bicycle bridge over Tennyson Road to improve access to BART from the north; pedestrian and bicycle improvements in the vicinity of the South Hayward BART Station including a pedestrian plaza, improved bus transfer facility, bike routes, bike lanes, and signage; and improvements to the Valle Vista Community Center and adjacent park.

Oakland - Fruitvale & Dimond Area



This area lies between the Lake Merritt and Coliseum areas and is currently largely residential with local serving commercial and retail. Fruitvale Village, one of the nation's earliest and best examples of successful transit-oriented development, includes a health clinic, community resource center and library. This area is envisioned to become a bustling community with abundant housing choices, offices, restaurants, and more local serving commercial and retail. The new structures will feature state-of-the-art green building and energy savings systems

Oakland - MacArthur Transit Village

Located near "Pill Hill" medical campuses and a BART station, this site is well poised to become one of Oakland's premier transit villages. Planned improvements include attractive streetscapes, abundant housing choices, ground floor neighborhood serving retail, a new public place adjacent to retail, community space, a new BART plaza, and improved shuttle service. The planned improvements will result in a vibrant hub of transit, housing, shopping and recreation that reduces dependency vehicles by placing new residents near both transit and employment opportunities. This transit village aims to be a regional model of a complete community.

TRANSIT NEIGHBORHOOD

Alameda County - Castro Valley BART

The vision for the development of the area surrounding the Castro Valley BART station is well established as the County has long recognized the area's redevelopment potential. The county believes that promoting compact, mixed residential and commercial development near the Castro Valley BART station will help to create an activity center that will support anticipated growth in unincorporated Alameda County. In support of this project, street infrastructure will be improved in a manner that supports and promotes pedestrian activity, multi-modal transit options, and a reduced reliance on private motor vehicles.

Alameda County - East 14th and Mission Street

These major commercial corridors have the potential to be thriving centers for economic development, but are currently an underutilized resource. Alameda County envisions this area as one of the most livable communities in the region – with accessible and flexible transportation options and housing opportunities within walking distance to transit stations transforming these corridors from features that divide the community into areas that bring people together, featuring shops, housing and offices. The area will be an attractive and vibrant place, enhanced by the creation of lively districts where residents can live, shop, walk, eat, gather, and play with housing choices

that fit the needs of all residents and investment in the economic development of the community to revitalize underutilized districts and transportation corridors.

Alameda County - Hesperian Boulevard

The vision for the area supports the economic, commercial and cultural heart of San Lorenzo. A diversity of small and large shops and retail services in an attractive landscaped setting will provide essential household and specialty shopping needs for residents and adjoining communities. Integral to the planned vision of the community will be a revitalized community center featuring a renovated library, meeting spaces, childcare center, and accommodations for social, recreational, and educational programs for people of all ages. New housing options will also be available throughout the corridor. The arrangement of distinct, high quality buildings will create well-proportioned public spaces for a thriving commercial and community oriented environment.

Alameda - Northern Waterfront

The City of Alameda envisions this area being redeveloped as a series of mixed use, waterfront and transit oriented neighborhoods that will provide a mix of jobs and transit oriented housing types to serve the next generation of Alameda residents. The plans propose that a mix of uses are developed on former industrial and auto-oriented lands and preserve former railroad right of way for future bus rapid transit or light rail improvements. The Clement Avenue corridor through the Northern Waterfront is a designated transit priority right of way. The plans emphasize the importance of a mix of uses and a diversity of housing types for all income and household types**.**

Alameda County - Meekland Avenue Corridor

The vision for the Meekland Avenue Corridor is a revitalized community that will assist in making the Eden Area a livable community where people will want to live, shop, work, and gather. This project envisions creating a more walkable community with access to services, parks, schools, and employment and shopping sectors, and to increasing access to alternative modes of transportation. A critical component of the plan is the development of its corridors. The Meekland Avenue corridor will feature transit oriented development comprised of commercial, mixed-use, residential and civic land uses compatible with existing land uses and linked to established public transportation served by Amtrak, BART, and bus transit.

Fremont - Centerville

The vision for the Centerville Priority Development Area is to create a vibrant, mixed-use, traditional-style downtown centered around the historic train station. Fremont envisions redevelopment of most of the existing commercial property in the area with a mix of uses at higher densities. The vision also calls for the relinquishing

of Peralta and Fremont Boulevards by Caltrans so the streets can be redesigned to facilitate local usage rather than regional traffic. Improvement priorities include: a second platform for the train depot to accommodate more riders, construction of a community park, and improving streetscapes and pedestrian connections. The vision for Centerville will provide a dense, urban core to support community-serving retail uses.

Hayward - The Cannery

The Cannery Priority Development Area is moving forward in its transformation from an outdated industrial area into a complete community, with a range of housing and transportation choices. The proposed residential communities are walkable neighborhoods, inclusive of affordable and market-rate units, and clustered around open spaces. These new communities also have direct ties to surrounding residential areas, a new elementary school, and public transit. In addition, the Cannery area is within a half mile of the downtown area where residents of the Cannery will have access to services such as grocery stores, the post office, restaurants, and entertainment.

Newark - Old Town

The vision for the area includes reinvigorating the district by improving its appearance, encouraging a mix of uses, and transforming it into a vibrant, pedestrian-friendly, mixed-use neighborhood that provides residents with a range of housing and transportation choices. Proposed revitalization strategies include new streetscape improvements to make the area more walkable; an emphasis on neighborhood-serving and specialty retail; and increasing the range of housing types available in the area, including affordable options.

MIXED-USE CORRIDOR

Albany - San Pablo/Solano



The overall vision for this area is to implement functional infill development projects that maintain traditional residential character of the city, expand the city's housing stock, include affordable units, capture sustainable economic development opportunities, and improve neighborhood-serving businesses. This area will accommodate a wide range of commercial retail and related services both to the adjacent neighborhoods and the surrounding communities, within an attractive pedestrian-oriented shopping environment. It also provides opportunities for office development and residential serving a citywide or larger market in a boulevard environment.

Berkeley - Adeline Street



The vision for this community is to build on its strengths and achieve a renaissance – to realize appropriate scale of development for the area, to make Adeline Street a more appealing and pedestrian-friendly connector within the neighborhood, and to manage the commercial revitalization in a way that retains its historic role for both the community as a whole and for the African-American community in particular which has deep roots in the area.

Berkeley - San Pablo Avenue

The vision for San Pablo Avenue is a great boulevard – a vibrant corridor that links residential areas and commercial clusters that meet the needs of surrounding neighborhoods. Projected landscape and improved streetscape designs will reduce the emphasis on automobile traffic and make the street safer and more attractive for pedestrians and bicyclists. The City expects to add new homes along San Pablo Avenue over the next few decades. The addition of more residents along San Pablo Avenue will help to support a diverse range of stores, restaurants, and services and add vitality to the corridor's commercial nodes and significant investments in streetscape design and improvements.

Berkeley - South Shattuck

This area is planned to become "a thriving and dynamic neighborhood, home to a diversified business environment, serving the needs of the local and regional community, and to new residents living along Shattuck Avenue." The plan calls for economic revitalization and enhancement, primarily through mixed-use residential development that provides predominantly neighborhood-serving uses. Streetscape improvements, in particular, could help spur additional development activity and help make the corridor more pedestrian/bicycle-friendly and the construction of new homes that will help provide new residents to support a diverse range of stores, restaurants, and services that meet people's everyday needs.

Berkeley – Telegraph Avenue



The vision for Telegraph Avenue includes continued mix of commercial, residential, and mixed use land uses. Improved landscape and streetscapes and replacing underutilized commercial space with new residential and mixed-use development will add vitality to the corridor and help support activity nodes that provide surrounding neighborhoods with the stores, services, and amenities

to meet their daily needs. The City of Berkeley anticipates the corridor will be transformed from its current status as a largely underutilized strip to a great boulevard lined by mid-rise (four- to five-story) mixed-use buildings and serviced by Bus Rapid Transit.

Berkeley - University Avenue



The University Avenue Strategic Plan envisions the transformation of University Avenue from an underutilized commercial strip to a boulevard lined by mid-rise (four-story) mixed-use buildings, with somewhat higher-intensity (five-story) commercial "nodes" at key intersections. New retail activity and small-scale offices will be concentrated in the high-density, mixed-use, pedestrian-oriented nodes, rather than spread throughout the corridor. Commercial development in these areas will be accompanied by housing with ground-floor retail or office space between commercial nodes to replace low-density, underutilized commercial space. Residents along University Avenue will have easy walking access to transit and convenient local-serving shopping. New homes along the corridor will provide additional consumers to support a diverse range of stores, restaurants, and services.

Hayward - Mission Boulevard

The overall vision for the Mission Boulevard Corridor along the northern portion of Mission Boulevard, from Harder Road to the northern City limit is to transform the existing commercial corridor to a mixed-use corridor that has a variety of commercial functions, a mix of housing types and a transportation network that facilitates non-automobile modes of travel.

Oakland - Transit Oriented Development Corridors

The City of Oakland will capitalize on its excellent transit service and encourage an efficient use of land by promoting compact, infill development in broad range of transit-rich areas. Encouraging development of healthy communities with a diversity of housing, jobs, activities, services, and transit will help spur economic development and promote transit ridership.

The areas adjacent to BART stations will be transformed into transit-oriented villages, with a mix of housing, commercial uses, open space, and community amenities. All of the stations serve as transit hubs that bring together BART, AC transit, and shuttle services. It is envisioned that each transit-oriented district will connect with others by way of common transportation corridors, including San Pablo Avenue, Telegraph Avenue, and International Boulevard, that will be developed with higher-density, commercial, residential, and mixed-use projects. New development along these corridors would be supported by infrastructure improvements, such as enhanced utility services, access improvements, and amenities for pedestrians, bicycles, and buses.

San Leandro - East 14th Street

Future plans include pedestrian, sidewalk, and streetscape improvements and transformation of what currently exists as a relatively unbroken strip of commercial land uses into a series of mixed-use districts, each with a different character and focus. These districts will include a mix of local-serving retail, restaurants, and services, and will be linked by residential areas with high-quality, multi-family housing

The changes envisioned for the East 14th Street corridor would transform a major transportation route in San Leandro from an auto-oriented commercial strip into an attractive boulevard, lined with higher-density housing between activity nodes that offer a mix of uses, including shops, restaurants, offices, and services. These proposed changes, when accompanied by planned streetscape improvements, would make the corridor more pedestrian-, bicycle-, and transit-friendly. As a result, residents will have a wider range of housing choices and will be able to take care of their daily needs without relying on a car.

CONTRA COSTA COUNTY

Located across from San Francisco and Marin County, Contra Costa has grown over the last few decades to be the third most populous county in the Bay Area region, surpassing San Francisco. The county's natural beauty and its strategic location between the San Francisco Bay and California's Central Valley have long attracted residents and businesses, as has the relative affordability of housing. Auto-oriented growth spurts during the 1940s and then again from the 1980s through early 2000 pushed development eastward. Over one-third of Contra Costa County's most recent population growth took place in the eastern portion of the county.

The Jobs–Housing Connection recognizes these areas and the need for increased employment near new homes, while also encouraging growth along the county's major transit thoroughfares and BART. The new eBART line will connect city centers, employment centers, transit neighborhoods, and transit town centers to regional employment hubs and affordable housing options. From 2010 to 2040, Contra Costa County is projected to experience 12% of the total regional housing growth, or an estimated 93,390 additional households . The County will also take 11% of the region's job growth, or 70,300 new jobs, the majority of which will be in PDAs. Both job and housing growth will cluster along San Pablo Avenue in the western part of the County, including Richmond, as well as in the suburbs of Antioch, Pittsburgh, Walnut Creek, and San Ramon. The most transformative growth will occur at the former Concord Naval Weapons station, where a new Regional Center with over 17,000 jobs and 12,000 homes will rise near BART.

REGIONAL CENTER

Concord - Community Reuse Area

The Concord Community Reuse Project is an extremely unique Priority Development Area due to its setting in the Inland Area of the Concord Naval Weapons Station (CNWS). The size of the site leaves an abundance of space to accommodate development as well as a significant amount of parks and open space.



The recently adopted plan for the Concord Community Reuse Project represents a broad range of interests that share the goal of creating an exceptional place that fosters a vibrant and diverse community, economy, and environment, and embraces principles of smart growth, transit-oriented development and sustainability. The plan centers around the desire for transit-oriented development around the North Concord BART Station, which is adjacent to the northwestern portion of the site. Transit villages around the

BART Station will incorporate retail uses that will benefit long-time residents of neighboring communities, transit riders, and new residents and employees of the area. A cluster of transit villages throughout the CNWS has been embraced as a means to facilitate accessibility among live-work uses, transportation networks, recreation, and open spaces in the area.

CITY CENTER



Concord - Downtown

The vision for the area focuses on both new and revived developments within walking distance of the Downtown BART station including affordable housing, pedestrian–oriented development and flexible parking requirements to support use of mass transit. This includes providing a stronger connection between Downtown BART and Todos Santos Plaza, three blocks north of BART.



Richmond - Central Richmond

The goals for the area include economic development and neighborhood revitalization that will make this district a significant commercial and business hub for the East Bay. The focal point of this revitalization is the Richmond Transit Village – a pedestrian-friendly urban village located at the Intermodal Transit Station which unites BART, Capitol Corridor, and bus transit under one roof. The City hopes to capitalize on the wealth of transportation options at the station, expand home-ownership opportunities and increase transit ridership by creating a vibrant, walkable neighborhood with high-density housing, neighborhood serving-retail, and office uses around the station. Changes at the station include a parking garage to replace the surface parking, a new transit station building, and elevated walkways to improve access to the station.

SUBURBAN CENTER

Antioch - Hillcrest BART Station Area

The City of Antioch envisions the Hillcrest Station Area as a high-quality development, with a mix of uses and amenities that will make it a signature area of Antioch. It will be a place easily accessible by BART, with many jobs and residential units within walking distance of the station. The City plans to capitalize on the future eBART by building a transit village with an assortment of high-density housing options, a business district with high-density office space to generate jobs, and a mix of retail uses to attract employers and residents to the area. The

future transit connection will provide a key alternative to mitigate the long commute times that have been exacerbated by recent population growth in the area. A pedestrian-oriented streetscape with restaurants, shops, and entertainment will create a desirable place for people to live and visit and generate the eBART ridership necessary to support public investment in the system. The PDA will incorporate the vital attributes of a complete community, creating a residential mixed-use pattern of development that can be effectively served by transit, advantageously located in the center of Antioch

Oakley - Employment Focus

The Employment Focus Priority Development Area is envisioned to be a significant source of employment and community identify for the City of Oakley and Eastern Contra Costa County. The idea is to redevelop the neighborhood to support the City's economic development goals, generate employment opportunities, encourage private investment, create quality affordable housing, and provide enhanced access to the Delta. This will create a better jobs/housing balance for the community, in line with the City's General Plan goals. Additionally, improved pedestrian and bicycle circulation, enhanced streetscaping, and the addition of public plazas in the area will serve to encourage non-vehicular travel to neighborhood retail services.

San Ramon - City Center

Future development within the City Center Mixed Use District will provide new residential units, including workforce housing. These new homes will be in the core of the proposed lifestyle center that will include retail space, flex office space, hotel space, as well as three Bishop Ranch Class A office buildings. The District will also see the addition of a new City Hall/Civic Center with new City offices, Council Chamber and a new library.

Walnut Creek – Downtown



The Walnut Creek Core Area Priority Development Area includes a walkable downtown that is a thriving shopping, restaurant, and entertainment destination. The transit-oriented vision for the Walnut Creek Core Area encourages housing and commercial mixed-use development near the Walnut Creek BART station, seeks to reduce traffic congestion, permits multi-family housing in almost all commercial districts, and requires that new office development in the Walnut Creek BART station area include housing. Four key locations within the area have been designated for additional housing. The vision for the Core Area also includes park and placemaking components, including a linear park and a pocket park along the pedestrian/bicycle path from the BART station to Mt. Diablo Boulevard.

TRANSIT TOWN CENTER

Antioch - Rivertown Waterfront

The vision of Rivertown Waterfront is to restore downtown as a vibrant community gathering place and to reestablish the key physical and economic link between the waterfront and the downtown. With the San Joaquin River as the visual centerpiece, the Rivertown Waterfront provides the city with a fitting setting to offer higher-density housing, and encourage mixed uses with an array of retail, services, and restaurants. To establish the strong connection with downtown, the City will ensure the land use strategy draws a critical mass of restaurants, retail, services, recreation, and other attractions to support residents and visitors. With attractive features such as views of the San Joaquin River and a great number of parks, it is expected that the natural benefits and character of the waterfront will play a major role in attracting the residents and businesses necessary to establish a complete downtown community.

Contra Costa County - Pittsburg/Bay Point BART Station

Redevelopment of the area is focused on transforming the end of the BART Concord line into a sustainable and cohesive transit-oriented community built around the premise of supporting the region's short- and long-term growth through neighborhood balance, energy efficiency, and the reduction of greenhouse gases The goal is to stimulate revitalization through a mix of residential, office and commercial uses, which will link jobs and housing, provide vital community services and encourage the use of transit and other non-automotive forms of transportation. Ultimately, the redevelopment of the Station Area will enhance the livability of residents and establish Pittsburg/Bay Point's sense of place and identity within the region.

Hercules - Waterfront District

The overall vision for Hercules is for a series of pedestrian-friendly, mixed-use districts with higher-density housing, employment, retail, and civic uses on an interconnected grid of streets, arranged around transit terminals, restored wetlands and creeks. A range of housing options will support wide choices for household needs and incomes. Whether a third-story apartment above a retail-lined street with easy access to shops, a single-family townhome with space to raise a family, or a quiet unit for live-work space, the housing options in the Waterfront District will provide a range of affordability, form, and density choices. Additional uses in the Waterfront District will include office and retail. In addition to transit access to many Bay Area destinations, Waterfront District residents will live in a complete community with high-quality public plazas, vibrant streets, parks and schools, and access to neighborhood services and local and regional job centers. Across the railroad and directly on the shoreline, Hercules Point will undergo further environmental cleanup to allow for future recreational use.

Layfayette - Downtown

Layfayette strives to establish the Downtown Core as the center of commercial and cultural life, with a mix of retail, office, commercial, and residential uses to meet all needs of the community and visitors. The city's goal for the 290-acre area is to encourage infill suburban development to stimulate an already active city center. The Downtown Core will have a mix of multi-family residential, retail, office, and public uses, including the new Library and Lifelong Learning Center. The East and West End Districts will be largely focused on office and retail uses, with some multi-family housing allowed as well. The plan encourages growth and a new direction for the Downtown and Redevelopment Area, while preserving and enhancing the center of Lafayette as a place where residents, employees, and visitors can congregate, take part in civic activities, and enjoy the ambiance of small town life. To ensure a vibrant Downtown that is the community's commercial, civic, and cultural center, the city encourages a mix of uses, creating a pedestrian-oriented environment, improving the appearance and function of the commercial areas, promoting multi-family residential uses and mixed use development, and preserving historic sites and structures. Lafayette strives to establish the Downtown Core as the center of commercial and cultural life, with a mix of retail, office, commercial, and residential uses to meet all needs of the community and visitors.

Moraga – Moraga Center

The area is currently underutilized and approximately 50 percent is vacant land. The vision for Moraga Center is that of a mixed-use, walkable "Town Center" that serves as a hub for local services and a link to regional transit. Moraga Center will consist of a community-serving commercial core that is supported and enhanced by new and existing residential development. New residential areas surrounding the core will be realized at various densities and types, providing a range of housing options for residents. The complementary retail and residential land uses to be developed in the central part of the Priority Development Area will create an attractive, pedestrian-friendly, village-like environment. As envisioned, Moraga Center will enhance non-vehicular circulation in order to facilitate bicycle and pedestrian use in the town for transportation and recreation, and to encourage alternatives to single-occupancy motor vehicles on roadways leading to Highway 24 and BART.

Oakley - Downtown Oakley Focus Area

As envisioned, Downtown Oakley will consist of a mix of neighborhood-serving uses and high-density residential development. Attractive streets, public spaces, and civic facilities will encourage residents and visitors to leave their cars behind and walk to destinations throughout the district. Street improvements will create an attractive and memorable Downtown character, and complement the retail businesses, cafes, and restaurants that will contribute to a vibrant street life. Development of curbs and streetwall guidelines, as well as shared parking and rear-parking standards will help establish consistency and a pedestrian-scale within the Downtown. Seven

important capital improvement projects will make the Downtown more pedestrian- and bicycle-friendly, including streetscape improvements, gateway signage, utility enhancements, and the addition of bike lanes on key streets.

Orinda - Downtown

The City's vision for the area is a downtown with a vibrant mix of transit-oriented retail, residential, office and entertainment uses. Mixed-use development that combines housing and shopping near the BART station is increasingly popular as Orinda's population ages and as growing families move into the area seeking more local shopping options and alternatives to large-lot single-family homes. Significant opportunity exists for redeveloping existing underutilized properties to create higher-density infill developments with street-front retail and upper-story multi-family residential or commercial office uses.

Pinole - Old Town



Creating a clear sense of place for the community that will serve as a gateway to a revitalized cultural, civic, and historic heart of the city is the vision for Old Town. The plan calls for a transition in use and character from a small-scale network of specialty stores and services along the edges, to a mixed-use district with diverse residential and employment opportunities at its core. The goal is a diversified mix of uses that complement and support one another and effectively cater to the needs of local residents and visitors. Land uses that have been identified for Old Town include residential, specialty retail, restaurants, arts and cultural services and entertainment businesses, as well as live-work and commercial office uses.

San Pablo Avenue will serve as a hub for a system of well-maintained streets, sidewalks, walking paths, and bicycle trails that connect with San Pablo Bay, public transportation, surrounding neighborhoods, and other area parks, landmarks, and attractions. The circulation system is intended to encourage significant pedestrian and bicycle use. High-quality streetscape improvements and clearly defined walkways within the area are intended to identify Old Town as a regional destination.

Pittsburg - Railroad Avenue eBART Station

The City of Pittsburg envisions the Railroad Avenue eBART Station Area as a mixed-use, pedestrian-oriented village with a variety of amenities and neighborhood-serving retail uses. Its strategic setting around the transit station will facilitate development of a vibrant activity center with improved linkages to the adjacent downtown and surrounding neighborhoods of Pittsburg. An appropriate mix of open space will create recreation opportunities within the community for residents and workers in the area. As a whole, the Station Area will

comprise a complete community which meets the needs of residents and connects the city and greater region via a safe, efficient, and accessible transportation network that embraces pedestrians, bicyclists, buses, autos, and eBART.

San Ramon - North Camino Ramon

The North Camino Ramon Plan Area is proposed as a pedestrian- and bicycle-friendly, mixed-use, transit-oriented neighborhood. A new transit center is proposed in the City Center Mixed Use Priority Development Area and the existing transit center on Executive Parkway will be relocated approximately three-quarters of a mile north to the North Camino Ramon area. This proposed location, along Crow Canyon Road and the Iron Horse Trail, relates directly to the North Camino Ramon Plan Area and will encourage transit ridership and ensure greater connectivity to planned and existing BART stations in the region. A future pedestrian over-crossing at Crow Canyon Road and the Iron Horse Trail will increase pedestrian and bicycle connectivity to the relocated transit center, and to the increased carpooling opportunities made possible by the construction of the planned Norris Canyon Road/Interstate 680 High Occupancy Vehicle on/off ramps.

TRANSIT NEIGHBORHOOD

Contra Costa County - North Richmond

The vision for this community located within both the City of Richmond and unincorporated Contra Costa County, includes development of a neighborhood commercial district, new parks and open space, expanded community facilities, infill housing development, and improved streetscapes (including pedestrian and bicycle connections)that will reinforce residential neighborhoods in the southern portion of the PDA. Light industrial infrastructure improvements and land use changes in the northern portion will strengthen the economic base of North Richmond and create new commercial and industrial jobs for local as well as regional residents. Upgrading the deteriorated housing stock in the area will stimulate the construction of new affordable housing, and initiating a commercial/retail development program for specific sites will provide for needed neighborhood services.

Hercules - Central Hercules

The Central Hercules Priority Development Area is comprised of two future urban districts; the New Town Center District and the Hilltown District located astride the regional crossroads of Interstate 80 and State Route 4. Central Hercules is to become a transit-oriented urban center in a suburban sub-region. The overall vision is of a series of pedestrian-friendly, mixed-use districts. In the two PDA districts, housing, employment, retail, and civic uses are envisioned for multi-story buildings on an interconnected grid of streets, arranged around transit terminals, restored wetlands and creeks. The physical character will be defined by a network of walkable streets

with attractive public spaces, organized around a regional transit facility, and the interior thoroughfares will be designed for very low automobile speeds and high pedestrian amenity.

Martinez - Downtown Martinez Intermodal Station District

The Downtown Martinez plan encourages mixed-use development as a way to revitalize and strengthen the commercial core of Martinez into a town-center destination that will attract residents and visitors to shop, eat, and recreate. To encourage retail growth and draw residents and visitors downtown, the plan calls for new high-density housing close to transit, new cultural resources, and development of the Martinez Marina. The downtown core will allow for the highest densities and a mix of uses, including retail, office, multi-family residential, entertainment and cultural uses, as well as visitor-serving uses. The goal for the downtown core is to create a concentration of uses that generate activity during evenings and weekends as well as on weekdays. The retail uses in this area are intended to serve many of the daily shopping needs of downtown residents and employees, as well as the specialty shopping needs of citywide residents, regional shoppers, and tourists.

Oakley - Potential PDA

The Oakley Potential Planning Area Priority Development Area consists of 235 acres along the eastern portion of Highway 4/Main Street, in the vicinity of Main Street and Delta Road in Eastern Contra Costa County. The Potential Planning Area is characterized primarily by low-density uses and underutilized property with significant potential for infill development. The area is envisioned to have a mix of commercial and residential uses that would create a commercial core with increased housing opportunities within the southern part of the city along a major residential corridor and existing transit route.

Pittsburg - Downtown

Pittsburg's vision for redevelopment of its downtown is to transform the underutilized district at the center of the city into a vibrant mixed-use core with an array of amenities that support the continued revival of the community. A wide spectrum of housing options will be offered to create an inclusive, safe, and sustainable environment for residents of all incomes to live, work, shop, and recreate. The revitalized district will be tied together by a multi-modal transportation network that capitalizes on the valuable connections provided by regional transit arteries, and will feature a dynamic streetscape with planned landscaping improvements, widened sidewalks, traffic calming, and improved bicycle access.

Pleasant Hill - Diablo Valley College Area

The overall vision for the PDA is to create a small-scale transit village centered on the future Transit Center that provides neighborhood commercial services and greater housing opportunities to local employees, residents, and students while encouraging non-vehicular modes of travel within and around the area. The Contra Costa Transportation Authority has committed to establishing a state-of-the-art bus transit and commute alternatives center at the Pleasant Hill campus of Diablo Valley College. The new transit center would include much-improved passenger waiting areas, lighted loading islands, better access for persons with disabilities, and separation of buses and personal vehicles at access and egress. The transit center would also contain a "commute store" where students, faculty, and employees of the college may purchase bus and BART passes, sign up for carpool partners, and explore alternative ways to get to school and work. In addition to the transit center, the project will improve access and stops for paratransit vehicles serving students with disabilities.

Richmond - South Richmond

The primary focus of this 1,350-acre redevelopment area is on the shoreline at Marina Bay. The vision includes mixed-use revitalization of a former Kaiser Shipyard on Richmond's southern shoreline and attracting business to the area, especially retail and commercial uses to serve the growing population. Redevelopment of older, light industrial buildings, will yield mixed-use development incorporating both commercial and residential uses. An example will be transforming the Nystrom Village housing project to a transit-oriented district with a mix of uses. Future investments include additional public transit in the area and enhancements of street level pedestrian/bicycle access to allow greater mobility among residents, and to create better connections to services and amenities in and around South Richmond.

MIXED USE CORRIDOR

Contra Costa County - Contra Costa Centre Transit Village

Contra Costa Centre Transit Village is a planned development situated adjacent to the Pleasant Hill BART station on a small unincorporated portion of Contra Costa County between the cities of Pleasant Hill and Walnut Creek. The key component of the vision is to transform the area into a vibrant, active, and accessible community that is an asset to its surrounding neighbors. The transit village will provide economic growth, new jobs, and affordable housing, while also expanding transportation options. Development will include office space, hotel rooms, and multi-family residential units and will be tied together by a well-designed streetscape, scaled to fit the needs of pedestrians and bicyclists. Additional street-level activity will bring life and energy to the transit village. The result of the design and development process will be a walkable mixed-use community where workers and residents have easy access to vital retail services and parks and recreation opportunities immediately within the district including the Iron-Horse Trail. People in the area currently enjoy a high level of regional mobility, and the new

development proposed in the area will reaffirm and strengthen the Contra Costa Centre's role as a residential and employment center in the heart of Contra Costa County.

Contra Costa County - Downtown El Sobrante

Downtown El Sobrante Priority Development Area is a district in western Contra Costa County near San Pablo Dam Road has a vision to create a mix of retail, commercial and residential uses along a four-block section of San Pablo Dam Road between El Portal Drive and Appian Way. This will enhance the economic vitality of the area and better accommodate bus transit, pedestrian use, and bicycle travel. The proposed new mixed-use land use designations in Downtown El Sobrante would allow for multi-family units and commercial space for restaurants, cafes, neighborhood retail, entertainment centers, and offices.

A key focus of future revitalization efforts is to establish a new Village Center along San Pablo Dam Road which would become the pedestrian core of the community including retail businesses, services, a public plaza or park, as well as some housing. These areas will promote pedestrian activity and create a transition between outlying residential areas and the downtown business district.

El Cerrito - San Pablo

The overall vision for the entire San Pablo Avenue corridor is to develop an attractive, thriving, vibrant, mixed-use transportation corridor with nodes of medium- to high-density residential uses supported by a complete spectrum of local and regional civic and cultural opportunities and professional, retail, and services jobs. In all, the El Cerrito PDA is anticipated to result in new housing units at all levels of affordability, as well as new jobs (through the provision of new office and commercial space) along the corridor within El Cerrito alone.

Pleasant Hill - Buskirk Avenue Corridor

The overall vision for this area identifies higher-density and mixed-use development in appropriate locations within the city such as along transit corridors. Given its close proximity to active local and regional transit corridors and the Pleasant Hill BART station, the Buskirk Avenue Corridor PDA represents a significant opportunity for focused growth that encourages transit use and other forms of alternative transportation and creates a better local and regional jobs/housing balance. The overall goal for the area is to encourage infill development and redevelopment where appropriate, and to incorporate a mix of uses at greater intensities along a corridor that has traditionally been characterized by low-density commercial and single-family residential development. Infrastructure improvements such as streetscaping and development of pedestrian and bicycle paths will help to establish the corridor as a walkable and complete community

MARIN COUNTY

Located north of San Francisco and south of Sonoma County, Marin County is recognized for its natural and agricultural landscapes, which support local farming and ranching, tourism, recreation, wildlife habitat, and water supply. More than 50 percent of the county is protected open space and the Marin Agricultural Land Trust and the Marin County Department of Parks and Open Space have worked for decades to protect and preserve the county's iconic landscapes. Plan Bay Area will support continued protection of the many Priority Conservation Areas in Marin County.

The Jobs-Housing Connection Strategy recognizes Marin County's relatively limited role in the region's growth and focuses Marin's growth along the already urbanized Highway 101 corridor. Marin County takes one percent of the regional housing growth by 2040, or 7,510 homes, and two percent of the region's job growth, with 18,390 jobs. Growth will be managed through city-centric policies around Golden Gate Transit bus service along Highway 101, future Sonoma-Marin Area Rail Transit (SMART) stations such as Novato and San Rafael, and in ferry-served locations like Larkspur and Sausalito.

CITY CENTER



San Rafael - Downtown City of San Rafael

The San Rafael Transit Center PDA is the heart of downtown and provides shopping; residential, commercial and mixed use neighborhoods, as well as numerous public facilities. The area is served by both local and regional bus service. SMART service is also planned.

This area provides a healthy economic center, a wonderful place to live, and a flourishing social, cultural, recreational and entertainment center, among many others uses. Street and utility improvements will be made in addition to improvements to park facilities and community amenities.

TRANSIT TOWN CENTER

San Rafael - City of San Rafael Civic Center / North San Rafael Town Center

The Civic Center/North San Rafael Town Center PDA is a half-mile radius area around the proposed Civic Center SMART rail station. The area is home to the Marin County Civic Center, a state and National Historic Landmark, and government and corporate offices, shopping centers, a hotel, condominiums,



apartments, single-family homes, a post office and a lagoon park. The County's weekly Farmer's Market and annual Marin County Fair also take place on Civic Center grounds. The Marin Center complex offers a broad range of programs, including performance art, educational and cultural events.

Large retail shopping stores, schools and services and a wide variety of businesses are also in this area. The Center will be a livable and walkable mixed-use neighborhood near transit and services. The area also provides an excellent opportunity construct approximately 200 affordable units.
San Rafael's Civic Center station will bring the SMART train to within walking distance of one of Marin County's largest employers – the County of Marin – and several other large office buildings. Other transportation improvements include a new landscaped multi-modal path that links to other bike paths.

TRANSIT NEIGHBORHOOD

Marin County - Marin County Unincorporated 101 Corridor

The highly urbanized and commercial 101 Corridor Priority Development Area is transforming into a mixed-use, sustainable corridor with connections to transportation hubs and recreational opportunities. The corridor includes Marin County land within a half mile of US Highway 101. When complete, this area will provide a mix of housing, offer a range of jobs, focus intensive developments in nodes, enhance existing commercial and industrial areas, and expand workforce housing.

The corridor is served by a variety of transit services including Golden Gate Transit regional connections and local bus service, and local shuttles. Sonoma Marin Area Rail Transit (SMART) service is also planned for the area, with a connection linking to the Larkspur Ferry Terminal. Both commercial and residential development are encouraged on commercially zoned sites, which will generate fewer commercial vehicle trips and allow residents to live close to jobs. Affordable housing is also encouraged; the county grant and loan funds support high levels of affordable housing development and related infrastructure. Transforming the commercial corridor is projected to increase pedestrian connections as well.

NAPA COUNTY

Napa County is internationally acclaimed for its winemaking, and the picturesque Napa Valley wine region is a major draw for San Francisco Bay Area visitors. The valley is bounded by mountains, and the Napa River empties into San Pablo Bay through the narrow Mare Island Strait. Napa County has strong policies to prioritize agricultural uses and to protect farmlands, watersheds, and open space. Consequently, more than 90 percent of unincorporated county land falls within those designations. The County seeks to continue to protect these lands and encourage recreation through its ten Priority Conservation Areas. Most non-agricultural development is clustered in the four cities and one town connected by Highway 29, which parallels the Napa River in the western part of the county.

The Jobs-Housing Connection Strategy recognizes the focus on agricultural and watershed protection in the County by allocating only one percent of the region's housing growth, with just over 6000 homes, and two percent of the region's job growth, or 18,880 jobs. The Cities of Napa and American Canyon assume most of the County's household growth, while the City of Napa and unincorporated Napa County assume most of the job growth in the County.

MIXED-USE CORRIDOR



American Canyon - Highway 29 Corridor, City of American Canyon
The corridor is a thriving retail service and residential hub for the community, with new open space and gathering places, and well-integrated circulation for pedestrians, bicyclists and vehicles.

There are opportunities for new and unique businesses and catalyst projects. With traffic calming measures and an increase in pedestrian and cycling opportunities and safety, this corridor can serve as primary north/south automobile route for residents and commuters. It can also provide well-integrated travel lanes and pathways for pedestrians and cyclists.

There is a significant amount of vacant and underutilized property which, when combined with mixed-use zoning and its proximity to the East Bay and Solano County, provides an opportunity for mixed-use and higher density residential projects. These developments could also boost transit ridership to East Bay BART stations, the Vallejo Ferry to San Francisco, and transit to local Wine Country jobs.

SAN FRANCISCO COUNTY

San Francisco is one of California's largest cities and home to many of the region's landmarks. Like many port cities, the convergence of cultures in one location has resulted in a diverse population, and over time the city has emerged as a major financial and cultural center, as well as a primary tourist destination in North America. In recent years San Francisco has also emerged as a leading center for innovative companies and enterprises. Surrounded by water, San Francisco's population and employment growth over the decades was accommodated with more intense development throughout the city's varied neighborhoods. As a result, the city has the highest residential and commercial densities in the region. Demand to live in the city continues to be high.

San Francisco is one of the region's largest employment hubs, and accommodates nearly one half million commuters each day, many of whom travel using the region's most extensive public transit system. The concentration of jobs and transit make it a leader in regional sustainability and a key location to focus growth. From 2010 to 2040 housing and jobs projection, San Francisco is estimated to absorb 92,410 additional households, or 14% of the total regional household growth. In terms of employment, the projections estimate an increase of 190,740 additional jobs, or 17% of total regional growth. This growth will cluster in PDAs with adopted plans on the Eastern side of the City, as well as in Downtown and along future BRT lines on Van Ness Avenue and Geary Street. Both the new Transbay Terminal and a new Intermodal station at the southern border of the city will greatly improve transit commutes for current and future residents.

REGIONAL CENTER

San Francisco, Transbay Terminal Area

The Transbay Terminal Area houses the Transbay Terminal, a modern regional transit hub currently under construction. This site includes office, high density housing, and hotel uses within short walking distance of San Francisco's Financial District.

When completed, the Terminal will be a dynamic regional transportation hub that finally unites the 11 different transit systems in the area and accommodates 45 million passengers annually. The area will be a center of activity with shopping, restaurants, and retail services. It will also offer a new public park, new pedestrian-oriented alleyways, and widened sidewalks.

Downtown and Transit Rich Corridors

The large, very urban San Francisco downtown and transit-rich corridors include many evolving and interconnected neighborhoods



that are well-covered by rail, bus and ferry service. This area also includes the new Transbay Terminal and the Central Subway.
The former industrial zones surrounding downtown will convert to mixed residential, neighborhood commercial, and light industrial uses. Housing development is expected along new rapid bus corridors on Geary Boulevard and Van Ness Avenue.

Transit service will continually expand and improve to keep pace with the growing population, and to make transit a primary driver of location choice. Housing in the area consists of apartments, condominiums and residential hotels. When complete, these areas will include substantial new housing, including planned affordable housing.

The area will continue to be a regional and local job center, with several million square feet of additional office space. In addition to yielding enormous benefits to the region's economy, the downtown area will also have environmental and equity benefits. Seventy-seven percent of commuters to downtown San Francisco take transit, and new jobs are expected to provide opportunities at all skill and wage levels.

TRANSIT TOWN CENTER

19th Avenue Corridor

Neighborhood transportation improvements in this area are closely linked with new development, to both accommodate future residents and improve pedestrian safety. The existing neighborhood along the corridor crosses from San Francisco County into San Mateo County, and includes a regional retail shopping center, San Francisco State University (SFSU) and Park Merced, a large multi-family residential development. When complete, new residential development at Brotherhood Way, Park Merced and Chumasero Drive, and new development around the Daly City BART Station will increase the diversity of housing, both in terms of affordability and housing type. The SFSU campus expansion will include new education and residential buildings, while a rebuilt Stonestown Shopping Center will offer new retail. The 19th Avenue Corridor will add to the mix of housing and transit, benefiting both the city and the region.

Treasure Island

Treasure Island, once a Naval and Coast Guard base, is located in San Francisco Bay and is a "Ferry-Oriented Development." When complete, it will offer new, dense housing and commercial development centered on a ferry connection to downtown San Francisco. The development is planned as the most environmentally sustainable large development project in U.S. history. It includes planning for jobs, housing, food production, transit access, water treatment, energy conservation and production, schools and open space.

A few of the naval buildings are historic and are re-used for commercial, office and cultural purposes. New "neighborhood tower" homes are clustered around the ferry terminal, surrounded by open space, and townhomes are planned for the outer edges of the community and on adjacent Yerba Buena Island.

The housing will include below-market affordable rates, specifically units for formerly homeless individuals and families. Eighty percent of all residences will be within a 12-minute walk of the Ferry terminal. An elementary school will serve the areas youth. In addition, a residential job-training program will be included on a portion of the Island and include construction, culinary training and an urban farm. The transportation infrastructure is designed to encourage residents to use public transit as a primary mode of travel.

San Francisco /San Mateo Bi-County Watershed Area

The Joint San Francisco / San Mateo Bi-County Watershed Area PDA includes the San Francisco neighborhoods of Visitacion Valley, Little Hollywood, Executive Park, Sunnydale, the former industrial Schlage Lock site, and the Brisbane Baylands. This plan calls for the development of a mixed-use, transit-orient development with residential and neighborhood-serving commercial uses, accompanied by open space and pedestrian-oriented street designs. The concept plan also calls for the revitalization of Leland Avenue, which has historically served as the neighborhood commercial street for Visitacion Valley, and the west side of Bayshore Boulevard.

Development on currently vacant lands will reinvigorate the neighborhood with over a thousand new housing units, new open spaces and a street network integrated into the fabric of the neighborhood. Nearby, Executive Park will transform into San Francisco's newest residential neighborhood. The plan envisions a mixed-used residential neighborhood with a street and open space system that knits all the various neighborhood components together. Little Hollywood is not expected to undergo significant growth, but its addition makes the PDA a contiguous land area and a coherent set of neighborhoods

URBAN NEIGHBORHOOD

Bayview - Hunters Point

The Bayview – Hunters Point neighborhood (including Candlestick Point and Hunters Point Shipyard) is a large urban area with housing, commercial and industrial uses served by several transit agencies (MUNI, Caltrain and SamTrans) that provide connections throughout the city and the region.

When complete, the Bayview neighborhood will have new housing and public improvements including lighting, landscaping and rehabilitation of existing single-family homes. The existing commercial Third Street corridor will

have additional commercial and other infill development. Industrial uses will continue around Highway 280 and within the South Basin area.

The more comprehensive change will occur at Hungers Point Shipyard, with housing especially affordable housing, and job creation. Candlestick Point, with a diverse mix of industrial, residential and other uses, can also accommodate new green technology uses. The new housing will be complemented by new community facilities, a teen center, commercial space and parks.

Eastern Neighborhoods



This area encompasses the Mission, East South of Market (SOMA), Showplace Square, Potrero Hill, and the Central Waterfront neighborhoods of San Francisco. These communities are diverse in both population and business types. While home to substantial residential areas and vibrant commercial streets with neighborhood-serving retail, the area also contains much of the city's industrial land. Transit service in the area is excellent, with BART stations, Muni, and Caltrain stops.

Key changes to the neighborhood include transit improvements for better connections to downtown and Mission Bay. Infrastructure improvements include street repaving, sidewalk, signal, and lighting for several streets in the area. The development of multimodal streets also preserves current and supports the growth of new homes and affordable rentals.

When complete, these areas will be more transit-, bicycle-, and pedestrian-friendly. They will also contain denser development near transit corridors and vibrant neighborhood-serving commercial areas; ensure neighborhood livability; and increase both the supply and variety of housing for residents, including both affordable and middle-income housing opportunities.

Market-Octavia



When complete, this area will add attractive high-density housing opportunities in transit-oriented neighborhoods and a new residential center in the SOMA West/South Van Ness area. The neighborhood's existing fabric allows residents to access most of their needs by foot. Changes to street circulation, including area-wide streetscape and traffic calming improvements,

continue to restore the urban fabric that a now demolished freeway had previously disrupted. The neighborhood provides attractive high-density housing opportunities in transit-oriented neighborhoods, accommodating people of many different lifestyles, ages and ethnicities.

Mission Bay

Mission Bay is a new, large-scale, mixed-use redevelopment on the city's central Bay waterfront. When complete, the Mission Bay community will include jobs, housing, schools, a supermarket, and police and fire stations. The jobs created in this area are easily accessible to residents along San Francisco's Third Street corridor and beyond Additional private office/life science/technology commercial space is planned. A new specialty hospital in Mission Bay South will serve women, children, and cancer patients. The area will also include city-and neighborhood-serving retail space, and a hotel that includes retail and entertainment uses all enhanced by street, lighting, sidewalk improvements and additional transit. At completion, Mission Bay could include significant new housing units with more than 30 percent affordable for households with moderate, low, and very low incomes.

TRANSIT NEIGHBORHOOD

Balboa Park

The classic, 1950s-style suburban area of Balboa Park will have additional housing in character with the surrounding neighborhoods, along the main streets of Geneva, Ocean and San Jose Avenues as well as in the area by the Balboa Park BART station. A dramatic re-do of the streets, transit systems, and open spaces will create a network that is comfortable for people, not just for cars and transit storage. When complete, there will be more rental and affordable housing units, commercial space and improved public uses. This will revitalize main streets, and provide new neighborhoods and a new center. The large investments in transit will improve the transit service connection to the whole city.

MIXED-USE CORRIDOR

Port of San Francisco

The historic waterfront is a maritime, cultural and recreational area for the city of San Francisco that continues to support fishing and other water dependent uses. When complete, this area will a mix of uses that respect and enhance its maritime character. There will be a special emphasis on creating more open spaces and recreational. This area can provide urban mixed-use development, and industrial integrated with mixed use and open space with rehabilitated nationally-important historic buildings to house 21st-century industry and technology.



San Mateo County

San Mateo County is strategically located between San Francisco and Silicon Valley. The Coast Range divides the county into two distinct parts: the bayside and coast. Ninety percent of development in the county is located on the bayside. The communities along the bayside of the Peninsula are home to Fortune 500 headquarters, globally significant firms and research entities, as well as many charming town centers and residential neighborhoods. The downtowns of many of the county's cities, including South San Francisco, San Bruno, Millbrae, Burlingame, San Mateo, Belmont, San Carlos, Redwood City, and Menlo Park, are clustered near a Caltrain station, often encompassing or bordering El Camino Real. The coast is primarily agricultural and open space.

The downtown areas and transit-served neighborhoods will continue to be the primary focus for incremental growth in San Mateo County. Local governments along El Camino Real are working together to transform the corridor from an auto-oriented commercial strip into a walkable Grand Boulevard that includes a mix of homes, stores, parks, and services. Frequent bus service links the transit town centers and city center nodes along its length. The Jobs-Housing Connection Strategy projects 55,700 additional housing units in San Mateo County through 2040, or 8% of the total regional housing unit growth. The County is expected to add just over 100,000 jobs, or 9% of the total employment growth for the region. Importantly, 60% of these jobs will be in transit-served PDAs. San Mateo and Redwood City are expected to house the largest concentration of jobs and housing in the County, and nearly 70% of the new housing will be in PDAs along El Camino. Focused growth in these bayside communities will reduce development pressures on the hills, coast and mountains, including many lower density residential neighborhoods and Priority Conservation Areas.

CITY CENTER

Redwood City - Downtown

This vibrant urban PDA has a mix of activity centers and building styles from different decades. It will become an entertainment capital, a dense residential neighborhood, a destination for shopping and dining, a cultural center, a major transit hub, and a dynamic workplace district. The downtown supports small, independent businesses and encourages both civic interaction and entertainment. Public transportation is provided by the Caltrain station and bus service with SamTrans.



This area can accommodate substantial new housing and retail development. Housing will make transit more viable by placing large numbers of potential riders in close proximity to the station. The addition of housing will also help to support existing businesses and attract new oned by putting more people on the sidewalks.

The downtown streets are pedestrian-friendly and attractive, and function as public gathering spots, including small piazzas for concerts and outdoor dining, and grand spaces like Courthouse Square. As the civic heart of the area, Courthouse Square features fountains, pavilions, tree-shaded seating areas, and a large central plaza with a custom-designed concrete pattern. Plans for a grand boulevard along El Camino Real and an elevated transit corridor for Caltrain will complete the critical integration of transit and land use planning. By creating a walkable environment, great public spaces, new housing options, and entertainment destinations, Downtown Redwood City will continue to serve as a model of well-designed urban growth.

San Mateo - Downtown

New development in downtown San Mateo will focus on high-intensity commercial projects and transit-oriented development near the renovated train incorporating multi-family housing into mixed-use developments.



Served by both SamTrans and Caltrain, the area a prime housing opportunity given its proximity to the train station, commercial uses, services, and a growing employment center. Improved walkability and lighting, street trees, pedestrian connections, and streetscapes will visually enhance the area and provide safe and easy access for visitors and residents. In addition, improved pedestrian access will make city amenities such as recreational activities at Central Park more accessible to residents. New development will help to create a livable community while ensuring safe and easy access to Downtown San Mateo from the train station.

TRANSIT TOWN CENTER

Burlingame El Camino Real

Already a vibrant and pedestrian-friendly community, Burlingame has several neighborhoods where new infill development and additional improvements are on the horizon. The Burlingame Downtown area is anchored by the historic Burlingame Train station, which is served by Caltrain. The Burlingame Downtown Specific Plan proposes to increase higher density residential development and mixed use to create a more vibrant downtown. El Camino Real will continue to evolve as part of a Grand Boulevard through San Mateo County. In addition, new development is also planned for California Drive, which is

also a primary Samtrans transit corridor with two Caltrain stations and access to the Millbrae Intermodal station. The North Burlingame/Rollins Road Specific Plan encourages higher density residential and mixed use opportunities in those areas closest to the Millbrae station.

Daly City - Bayshore Neighborhood

This area will have higher residential densities in close proximity to existing public transportation, which will help to increase pedestrian activity along Geneva Avenue. New housing will be built primarily on smaller infill sites, with the possibility of a large-scale development at the Cow Palace. An innovative and creative re-use of the Cow Palace site could provide a large number of additional dwelling units in an area where the potential for large additions to the housing stock are rare or non-existent. There is also an opportunity to increase the number of jobs in the area. These changes will help to reinvigorate the community by providing new housing, shops, and services. Residents in the area will also be able to take advantage of expanded housing and transportation choices.

East Palo Alto - Ravenswood Business District

The vision for development in this area is to provide jobs for both local residents and the regional labor market, along with housing at a range of affordability levels, increased parks and access to the Bay shoreline, and a positive net effect on the City's general fund, so that the City can continue to provide services for all residents. Improved transit services along the Dumbarton Rail corridor, along with buses and shuttles, will enhance accessibility for current and future residents.

Menlo Park - El Camino Real Corridor and Downtown

New mixed-use projects along El Camino Real will house residents with minimal impact on the existing single-family residential neighborhoods. Senior and certain underserved sections of the city's working population will have new housing opportunities. Development of a vibrant, mixed-use area will benefit the independent businesses in downtown by building a consumer base and supporting evening activities and public outdoor events. Locating new housing near the downtown, in close proximity to transit options, will also reduce the city's per capita auto use and climate impact. New development will make Caltrain and local buses a convenient option for more workers and residents.

San Carlos - Railroad Area Corridor

The Railroad Corridor development can stimulate San Carlos' local, neighborhood-oriented economy; provide much-needed new housing for the city and county; and improve walking conditions around the transit station. This area will promote transit-oriented development and will include landscape and traffic improvements.

Including housing throughout the downtown core will enable transit-oriented living and provide more people to shop in the downtown, supporting both the local economy and regional goals. Development can also help to bridge the communities on the east and west side of the tracks and create a unified corridor.

TRANSIT NEIGHBORHOOD

San Mateo - Rail Corridor

The Rail Corridor PDA, bounded by the Hayward Park and the Hillsdale Caltrain stations, includes land along El Camino Real and the Caltrain tracks that run parallel to it, between Hillsdale Boulevard and State Route 92, and between El Camino Real and US Highway 101. This area is largely commercial in nature and includes the Hillsdale Shopping Center, restaurants, large specialty stores, personal service centers, grocery stores, financial institutions, and small "mom and pop" businesses. Most of these businesses rely heavily on automobile traffic along El Camino Real.

Higher density, mixed-use development will help to revitalize underutilized land within walking distance of the transit stations and will increase housing opportunities, reduce dependence on single occupancy vehicles, and promote transit ridership. New transit-oriented development will be located on the site of the former Bay Meadows Racetrack. Substantial infrastructure improvements, including three grade-separated crossings of the Caltrain line and an upgraded sewer line, will also help to support new development and improve walkability in the area.

MIXED-USE CORRIDOR

El Camino Corridor

This multi-city PDA encompasses a quarter-mile buffer along El Camino Real (State Highway 82) through San Mateo County, including the cities of Menlo Park, Redwood City, San Carlos, Belmont, San Mateo, Burlingame, Millbrae, San Bruno, South San Francisco, Colma, Daly City, and neighborhoods in unincorporated San Mateo County. El Camino Real crosses through and connects areas around the downtowns and commercial streets in Menlo Park, Redwood City, San Mateo, Millbrae, San Bruno, and Daly City. Though narrow, the total area covers approximately ten square miles.

The El Camino Corridor will be transformed into denser, mixed-use neighborhoods, where new residents will reinvigorate the commercial areas and civic spaces can replace parking lots. BART and Caltrain stations are within walking distance from El Camino Real and the San Mateo County Transit District (SamTrans) provides bus service along the corridor San Francisco to Menlo Park. Each city will have a bicycle- and pedestrian-friendly connection between mixed-use communities with shopping centers and downtowns while maintaining the

elements that give each area its sense of place. New homes and retail along the corridor will be able to use Caltrain and bus transit service, which in turn, will also justify increased frequency. The new streetscape and retail will encourage walking.

With denser housing, retail, and a more inviting streetscape, the highway corridor will become a series of neighborhoods, or a "grand boulevard of meaningful destinations." A re -design of El Camino Real to a walkable urban boulevard will make this possible.

Daly City - Mission Street Corridor

The convergence of Muni and SamTrans bus lines make easy access to transit a draw for new development and redevelopment. Development around the Colma BART station will provide a mix of moderate and high density housing, local and community shopping, and offices. The Mission Street commercial corridor will meet the community's retail needs, create employment opportunities, and increase the customer base by creating more housing in mixed-use developments. Infrastructure improvements will support new development. New residential development will include housing that is affordable for moderate, low, and very low income households. The increased job opportunities and services along the corridor will also benefit residents and reduce their transportation costs. An improved pedestrian environment and new buildings near the BART stations will greatly improve the on-the-ground walking experience for all.

Belmont - Villages of Belmont



The Belmont PDA is located near the Belmont Caltrain station along the El Camino Real corridor. New development will transform traditional modes of transportation and revitalize Downtown Belmont to stimulate economic development and enhance livability for residents, workers, and visitors. Belmont will become a sustainable community that is walkable and transit-oriented with a safe, efficient multi-modal transportation network. New development will be energy-efficient and focused on clean, renewable forms of energy; affordable and desirable for a variety of household types; and a key component in increasing the supply and improving the balance of employment and housing opportunities.

Millbrae - Transit Station Area

When complete, the Millbrae Station Area will expand the vibrant, pedestrian-friendly nature of Downtown and integrate such diverse uses as single-family residential and mixed-use residential of the surrounding communities. There will be a mix of office and retail between the transit station and US Highway 101, and hotels, theaters, and mixed-use residential buildings are planned along El Camino Real and close to downtown. High-density housing near transit will enhance housing and transportation options, while providing local consumers to support the area's stores and services. New parks will provide improved recreational opportunities. Residents will continue to enjoy a high level of transit access, with BART, Caltrain, and SamTrans bus service at the station. Walking will be encouraged with a variety of streetscape improvements.

Redwood City - Broadway/Veterans Boulevard Corridor

The Broadway/Veterans Boulevard Corridor is home to four of Redwood City's largest employers in Redwood City and is planned for further job growth.This PDA will be a diverse, multifunctional growth area in central Redwood City. There are several land use components, including high density mixed use areas, walkable workplace areas, light industrial incubator area, and healthcare workplace area. Pedestrian-friendly design with buildings facing public streets will help to make the area a pleasant place to walk.

San Bruno - Transit Corridors

Development around the station area will provide transit-oriented housing and services, and a grade separation will enhance pedestrian safety. Along El Camino Real and San Bruno Avenue, new housing in the commercial districts will dramatically change the area. Downtown will see more retail and existing residential neighborhoods will remain the same or add a few more homes. New development may occur at the Tanforan and the Towne Center shopping centers or on smaller parcels in redevelopment areas. Transit, pedestrian, and bicycle connections, particularly to and from the BART and Caltrain stations and surrounding residential neighborhoods, will be improved and enhanced, as will several traffic intersections. A new baseball diamond and other public parks will make the area a more pleasant place to play. Residents will be able to take advantage of a range of housing and transportation choices located in a reinvigorated Downtown and along major corridors. The creation of a distinctive, transit-oriented development district will not only promote walking and access to downtown, but will also boost a sense of community.

San Mateo - El Camino Real

Most of the land along the corridor is devoted to commercial uses, including Hillsdale Shopping Center, financial institutions, goods and services centers, other small businesses, and restaurants. Improvements to public and private spaces along the corridor will include improved lighting, design guidelines for public and private spaces fronting the corridor, natural streetscape designs, and improved pedestrian connections to rail stations. These

enhancements will spur redevelopment of private properties along the corridor with mixed-use projects that include residential uses above first-floor commercial uses. The improvements will enhance the corridor for pedestrians, businesses, and residents. Pedestrians will have a safe, accessible, and visually appealing area to walk while shopping and patronizing the businesses along the corridor. New residents will add vitality to the corridor, while helping to support local businesses and increase transit ridership. Transit riders will also benefit from improved bike and pedestrian connections to rail stations.

South San Francisco - South San Francisco Downtown

The South San Francisco Downtown PDA is a unique commercial center that is home to the oldest commercial and residential areas of the city. Almost all non-residential areas are built to the street, resulting in a pedestrian-friendly scale. There is also a wide range of housing types, from single-family detached to three-story apartment buildings with tuck under parking. This area is a regional employment center with a biotechnology cluster and is served by BART, Caltrain, SamTrans and the San Francisco Airport. As Downtown grows, the unique character of the established and vibrant downtown will be maintained as the pedestrian scale, character, and broad mix of uses are expanded to the entire PDA. The historic street pattern also lends itself to creating more walkable neighborhoods, which will make the area more appealing to pedestrians.

SANTA CLARA COUNTY

Santa Clara County is the home of Santa Clara Valley, known to the world as Silicon Valley, the birthplace and now global capital of the high-technology revolution. Today, with over 1.8 million residents and 900,000 jobs, Santa Clara County is the most populous and job-rich county in the San Francisco Bay Area. The communities within Santa Clara County represent the full spectrum of urban to rural places found around the Bay Area, including both the region's largest city, San Jose, and the highest number of Priority Conservation Areas of any county.

Over the past decade, there has been an increased emphasis on transit-supportive land use planning and infrastructure improvements to keep pace with the new economy and protect open space. Many communities in the county have looked to future growth near Caltrain stations, VTA light rail stations, and along the El Camino Real corridor. Communities and businesses have also looked at reinvesting in office parks along the Highway 101 corridor, providing a wider range of services and amenities, and improving transit, bicycle, and pedestrian connections to these areas. The Jobs-Housing Connection Strategy supports these efforts and prioritizes growth in the County into existing downtowns, employment centers, town centers, and major mixed-use transit corridors.

The County has experienced explosive growth in the last 40 years and is projected to lead the region in both new jobs and housing. From 2010 to 2040 Santa Clara is expected to account for 32% of the total regional household growth in the Bay Area, or 211,190 additional housing units, and 27% of the total employment, or 303,530 new jobs. While historically jobs in Santa Clara County have been in suburban areas, 71% of the new growth will be in transit-served PDAs. The City of San Jose will have the largest share of both jobs and housing, followed by PDAs in Milpitas, Santa Clara, and Sunnyvale.

REGIONAL CENTER

San Jose - Greater Downtown San Jose

The downtown area has recently undergone significant improvements but the ultimate vision is to transform downtown into an even more vibrant area. When complete the area will include new office space, abundant choices of urban residential, retail, and four hotels. Plans include attractive streetscape and addressing traffic barriers to allow better mobility, encourage high density infill development and not detract from the pedestrian experience in the area.



San Jose - North San Jose

The vision for North San Jose includes new residential units, retail development, and the creation of new jobs with leading technology industries. Key components include establishing an Industrial Core Area along the Guadalupe light rail corridor by reserving development capacity and enabling transit-oriented development along an existing light rail corridor by increasing maximum building heights to allow 12-story buildings with structured parking for projects providing enhanced transit and pedestrian facilities. Included in the vision are direct industrial-to-residential conversions to appropriate sites and new neighborhoods that incorporate residential amenities, including at least 35 acres of new neighborhood-serving parks.

SUBURBAN CENTER

Milpitas - Transit Area

The Milpitas Transit Area has high-density residential, mixed-use, and transit oriented land uses that provide housing, employment and transportation options. This development helps to promote a compact urban form by allowing increased heights, mixes of uses, and growth focused on infill and redevelopment opportunities. The new higher density housing will be in close proximity to employment centers and transit hubs, which promotes increased transit use and intermodal commuting options. To further establish the Transit Area as a walkable, transit-supportive community, pedestrian, bicycle and transit systems will be supported with pedestrian amenities, wider sidewalks, traffic calming, streetscape improvements, pedestrian routes to transit stations, and improvements to the city-wide trail network.

San Jose - Cottle Transit Village and Shopping Center

The Cottle Transit Village is planned for a mix of new residential market rate units and is intended to link residents to a strong pedestrian circulation system with new sidewalks and substantial landscaping near transit rail station. The mixed-use housing area will include row houses, stacked townhouses, flats, and lofts. Commercial space is planned around the Blossom Hill Caltrain Station, the Cottle Road Light Rail Transit Station and the Hitachi campus. The transit village will take advantage of multiple transit opportunities.

TRANSIT TOWN CENTER

Gilroy - Downtown Specific Plan

The City of Gilroy's PDA will unite the unique scale and architecture of Downtown Gilroy with urban design that embraces mixed-use and transit-oriented development to create the foundation for a specialty retail district

distinct from other modern shopping centers. The area will have compact urban residential and commercial development within close walking distance of the Caltrain multi-modal station. Pedestrian-scale treatments in the area will include outdoor dining, public plazas, lower vehicle speeds, midblock crosswalks, diagonal parking, and wide sidewalks with shade street trees, benches, and public art work will enhance and emphasize downtown Gilroy. Mixed-use development, incorporating residential and/or office uses above retail shops, will create a 24-hour atmosphere and will inject new life into Downtown to help solidify Downtown Gilroy as the civic, commercial, urban residential and cultural central focal point of the city.

As Downtown grows, the unique character of the established and vibrant downtown will be maintained as the pedestrian scale, character, and broad mix of uses are expanded to the entire PDA. The historic street pattern also lends itself to creating more walkable neighborhoods, which will make the area more appealing to pedestrians.

Morgan Hill - Downtown

The focus of this effort is to strengthen Downtown, making it the social and activity heart of Morgan Hill – a place where residents from all segments of the community can live, work, meet, shop, participate in public celebrations and share in the richness of Morgan Hill's community life. Downtown is a place like nowhere else – a place with its own scale, character and uses. Development in the city center will create new residential, retail, restaurant, office and entertainment uses supported by pedestrian-friendly landscaping and infrastructure improvements. Downtown Morgan Hill will be a distinct, attractive community with a strong sense of place: a walkable neighborhood connecting residents, employees and visitors to a wide variety of retail, commercial and entertainment uses.

San Jose – Communications Hill, Evergreen

When complete, the area will incorporate residential amenities, such as new neighborhood-serving parks and calls for housing units in a very urban form near the Curtner Light Rail Station. Transit and transportation improvements including Amtrak, ACE, and VTA service, streetscape improvements, recycled water, parks, community centers, libraries, life-safety facilities, and other public facilities will also be expanded in the area. New office space, housing, retail, and hotel space will be developed and new jobs are anticipated.

Sunnyvale - Downtown & Caltrain Station Area

The downtown core of Sunnyvale is a hub of activity with a number of large, mixed-use redevelopment projects currently underway. These projects include significant increase in office space, retail, one-bedroom and two-bedroom condominium units and townhomes, a hotel. Development focuses on enhancing the traditional downtown district to provide the community with a variety of destinations in a pedestrian-friendly environment. There will be an increase in the total number of residential units with emphasis on reconnection to the Town Center area, and a sense of arrival along Mathilda Avenue with wider sidewalks and taller buildings will be

achieved. When completed, the revitalization will take advantage of the multimodal transit station that consists of Caltrain, Santa Clara Valley Transportation Authority (VTA) buses and area shuttles. The station incorporates a parking structure, a Caltrain ticket office, surface parking and a shuttle plaza. The station provides a gateway to Sunnyvale's shopping and entertainment center, as well as providing important commuter access to Santa Clara County and the peninsula**.**

TRANSIT NEIGHBORHOOD

Campbell - Central Redevelopment Area

The City of Campbell's Priority Development Area (PDA) centers on areas adjacent to Campbell's three Valley Transit Authority (VTA) light rail stations and historic downtown. In recent years, new residential homes, mixed-use projects, and a new public parking facility have been built in Downtown Campbell, and numerous public works and related capital improvement projects have also been completed.



The Central Redevelopment Area will be walkable, with mixed-use design, affordable housing, and transit accessibility. The community will retain and respect Campbell's heritage of small-town connectedness that gives the city its charm while promoting smart growth planning and encouraging additional housing. The existing development standards and reconfiguration of the street layout will support and inform future development to create a pedestrian-friendly, mixed use environment.

Mountain View - Whisman Station Area

Formerly an industrial, office, and research site, this area has undergone significant change, with high-quality development and a new mix of uses including a multi-family development next to the light rail station. A variety of housing types, a new public park, and neighborhood retail uses will help shape the area into as a compact, sustainable community. New public streets and pedestrian/bicycle pathways will connect new and existing residential areas. Housing will be small-lot single-family and multi-family residential uses with a variety of densities and a ground-floor retail component will provide services to local residents.



Palo Alto - California Avenue Pedestrian Transit Oriented Development Combining District

When complete, the area will serve as a vibrant, pedestrian-oriented neighborhood with a diversity of uses that supports the economic vitality of California Avenue and nearby businesses while encouraging the use of public transportation and other non-vehicular transportation modes. A mix of local jobs and services are envisioned including will include expansion of retail, personal services, neighborhood office, and public open space and help create a self-supporting, transit-oriented community and reduce the need for cars. Three housing opportunity sites with multiple parcels within the California Avenue area have been identified. The development strategy supports the vision of the Grand Boulevard Initiative, which focuses on the corridor's potential for housing and retail development, balancing the need for cars and parking with viable options for transit, walking, and biking.

MIXED-USE CORRIDOR

Sunnyvale - El Camino Real Corridor

The El Camino Real Corridor in Sunnyvale builds on the long range Grand Boulevard Initiative that links 19 cities in San Mateo and Santa Clara Counties along the El Camino Real Corridor to create more urban, pedestrian friendly areas. The area will serve as a local street and main retail corridor with the Grand Boulevard Initiative's guiding principles to encourage housing and job growth, compact high quality design mixed-use developments, pedestrian-oriented environments and improved streetscapes. The area encompasses has been identified for intense mixed-use projects. It is located at the city's four busiest intersections along El Camino Real, where bus lines, pedestrians, and commercial and recreational opportunities converge. When complete, the area will feature expansive housing within walking distance of neighborhood restaurants, an organic fruit stand, coffee shops and a bookstore, all of which were absent in the area before. Enhancement of the public streetscape to improve the visual quality of El Camino Real and the pedestrian experience are planned**.**

Sunnyvale - Lawrence Station Transit Village

The Lawrence Station Transit Village is a core station area and corridor where future residential and employment growth will be focused. When completed, the area will provide major transit corridors and station areas with proximity to Valley Transportation Authority, Light Rail Transit, Caltrain, and future BART stations where future residential and employment will be focused. The emphasis of development will be on improved transit service, a concentration of residential growth in the area, and additional neighborhood services including parks and local grocery stores. Infrastructure improvements to the overall transportation experience within the surrounding neighborhoods are also planned. Plans include improvements such as adding transit queue jump lanes on

highways, improving traffic circulation on arterial streets, enhancing transit service frequency as demand increases, and creating direct pedestrian and bicycle paths from local neighborhoods and the transit facility. The vision is to redevelop the Lawrence Station area as a compact and walkable neighborhood with continuous wide sidewalks, bike lanes, neighborhood parks, grocery stores, retail establishments, and high density housing.

Valley Transportation Authority – Santa Clara County

Cores, Corridors & Station Areas

The Cores, Corridors & Station Areas in Santa Clara County include transit-rich areas within the cities of Campbell, Cupertino, Gilroy, Los Altos, Los Gatos, Milpitas, Morgan Hill, Mountain View, Palo Alto, San Jose, Santa Clara, Saratoga, Sunnyvale, and in unincorporated Santa Clara County. Within these cities, a mix of housing and job growth is planned. Core areas within the county that contain concentrations of residential areas, employment sites, and other destinations such as retail and cultural facilities will also expand. These areas have urban characteristics, including residential and commercial land uses and/or downtown center attractions combined with transit connectivity. Corridors will include transit service that functions as the "transit spine" of the surrounding community. When complete, these communities will have expansive Station Areas adjacent to VTA light rail, Caltrain, and future BRT stations that will serve as focal points for new and future residential and employment infill.

The Cores, Corridors, and Station Areas present tremendous opportunities to meet Silicon Valley's housing needs while providing viable transit alternatives. The areas support the vision for pedestrian- and transit-oriented development. Encouraging residential, commercial, and recreational development in these key areas of the county meets the smart growth practice of increasing the live-work-play balance within walking distance or within walking distance of a transit route that connects these land use types together.

SOLANO COUNTY

Solano County has the distinction of containing nearly half the San Francisco Bay Area's important farmland and more than half the region's wetlands, according to the State Farmland Mapping and Monitoring Program. The Sacramento River flows along the southeastern portion of Solano County, emptying into the Sacramento-San Joaquin River Delta, the largest estuary on the U.S.'s West Coast, and into the Suisun Bay. Five Priority Conservation Areas have been identified in the county to protect important natural resources across all eight cities.

The Jobs-Housing Connection Strategy for Solano County recognizes Suburban and Town Centers, focusing the majority of household and job growth in the cities of Fairfield, Vacaville, and Vallejo. These cities, connected via the Capitol Corridor train to Sacramento and Bay Area job locations, will remain the most populous in the County. The Strategy also recognizes existing greenfield development capacity within urban growth boundaries in a few communities, including Fairfield. Solano County takes 5% of the region's housing growth, or 22,820 homes, and 5% of the region's job growth, or 47,560 jobs. The PDAs in Solano County jurisdictions help focus 43% of the County's household growth and a third of the job growth.

SUBURBAN CENTER

Fairfield - Downtown South, Jefferson Street/Union Avenue

A new multimodal train station will serve residents of eastern Fairfield as well as Vacaville, provide a hub for regional and local bus services to and from Fairfield-Suisun and Vacaville, and support higher-density development in the area. The train station is planned as part of Amtrak's Capitol Corridor route, an intercity passenger train system.

The area is currently characterized by industrial and commercial uses such as auto dismantlers, rock crushing operations, concrete batch plants, and workshops. The proposed development will take advantage of the planned transportation facility with a transit-oriented, pedestrian-friendly, mixed-use community.

When complete, the area will have a mix of residential, commercial, and office uses. New homes in the area would range from small-lot single-family to apartments with podium parking. Commercial and office uses would include a neighborhood-serving retail center with offices across the street from the station and retail on the station site itself.

Vacaville - Allison Policy Plan Area

The area is bordered by Interstate 80 and in the vicinity of Allison Drive and served by several transit options but currently, there are no jobs or housing in the area. Commercial, residential, and public uses and the use of alternative modes of transportation are envisioned for the future. The Ulatis Creek corridor will be used as a natural open space linear park to encourage bicycle and pedestrian use. A planned regional and intermodal transit facility will provide transit for existing and future residents of high density housing. The facility will include a bus terminal that will accommodate multiple buses at one time, a park and ride area with surface parking for over two hundred cars, bicycle lockers, and a van pool. When complete, Vacaville's City Coach, which serves the Solano Mall, Solano Community College, and Solano Express routes will be accessible from the new intermodal transit facility. Signal light improvements and street improvements are also envisioned. An additional multi-level parking structure is envisioned after the initial intermodal transit facility is completed.

Vallejo - Waterfront & Downtown

When complete, the waterfront area will have a mixed-use development with new high density homes. Land near the existing ferry terminal and planned bus transfer station will be used for higher-density residential, commercial, and open space development. The intended result is to provide a high-density, mixed-use environment within walking distance of multiple transit opportunities, waterfront open space, and the historic downtown. The overall vision of the Downtown Vallejo Specific Plan is to significantly intensify development in the historic downtown area within walking distance to the existing Vallejo ferry terminal and planned bus transfer station while retaining the historic character of the downtown.

TRANSIT TOWN CENTER

Fairfield - Fairfield-Vacaville Train Station



Much of the area is characterized by industrial and service commercial uses such as auto dismantlers, rock crushing operations, concrete batch plants, and workshops incompatible with regional transportation nodes like a train station.

The proposed development vision will, by contrast, take advantage of the planned transportation facility.

The Fairfield-Vacaville Train Station is envisioned as an example of a transit-oriented, pedestrian-friendly, mixed-use community. The plan proposes a mix of residential, commercial, and office uses. New homes in the area would range in medium to high density. There will also be new commercial and office uses would total - this includes a neighborhood-serving retail center with offices across the street from the station and retail on the station site itself.

Suisun City - Downtown Waterfront District



The goal is to reduce the number of vehicle trips within the City, while implementing the downtown waterfront vision. The vision includes waterfront recreation, retail uses, dining and entertainment and expansion of existing transit opportunities and bicycle path systems. The revitalized downtown would feature a modern transit center with connections to completed bicycle/pedestrian paths, cultural and business gathering spaces, and high-density, compact housing. A multi-family and mixed use residential community is envisioned within a quarter-mile of transit. Preserved open space is another element of the vision, with natural and cultural activity sites, such as a downtown promenade, plazas, and public parks. A connection to county and regional trails is also envisioned**.**

Vacaville - Downtown



Downtown Vacaville's Town Square includes a library, two privately owned and developed commercial buildings with a restaurant, retail, office space, parking, and a pedestrian plaza. The area is envisioned for mixed use residential and retail projects in the downtown and includes goals for improving linkages and connections to transportation sites. Major roadway improvement projects are envisioned. Projects include a capital improvement project to one of the Gateways to Downtown Vacaville and widening the traffic intersection and the Ulatis Creek Bridge to accommodate projected increases in traffic. Improved parking is also envisioned in the downtown area. Improvements to walkability in the downtown area would include the addition of a playground and public restroom facilities at the existing Ulatis Creek Walk. These improvements will be made while maintaining the historic downtown features.

TRANSIT NEIGHBORHOOD

Benicia - Downtown

Downtown Benicia is envisioned as a walkable transit town center that will serve a mix of uses, including a wide range of housing types, retail and professional offices, along with churches, libraries, public spaces, and recreation opportunities. New growth and development should be in walkable areas accessible by bus. First Street pedestrian safety improvements are planned as is the addition of parking facilities. Bus usage would expand with a park and ride at Military and First Street.

MIXED USE CORRIDOR

Fairfield - North Texas Street Core

The area, when complete, will highlight successful redevelopment focused around infill, mixed used development with moderate density housing with access to a major transportation alternatives and to public. Under consideration is the creation of a new street, providing better visibility and access to businesses. The city also envisions preserving the two neighborhood serving retail clusters. A portion of North Texas Street, north of East Tabor Avenue to Air Base Parkway, could be a mixed-use corridor with some residential development and compatible commercial and office uses filled in on vacant or underutilized sites. This portion of the corridor will also retain a neighborhood serving retail cluster. A new park and streetscape improvements, such as planting street trees, widening sidewalks, and landscaping will be completed. A new Central Transfer Facility will also provide enhanced transit access to regional transit and the core Bay Area.

Fairfield - West Texas Street Gateway

This area encompasses a portion of the one-mile West Texas Street corridor that serves as a gateway to downtown Fairfield at Interstate 80. The area includes a variety of land uses with new shopping centers, a regional transportation center, and new higher density housing near I-80. Much of the corridor, however, is aging, with small commercial structures, vacant rear parcels, mobile home parks, and older motels. This area is served by local, inter-city, and regional bus connections.

SONOMA COUNTY

Sonoma County is the largest, northernmost county in the San Francisco Bay Area and contains coastal areas, redwood forests, wetlands, and small farms. Urban development in Sonoma County is concentrated within cities along the U.S. 101 corridor, which has been supported by voter-approved urban growth boundaries and other policies that encourage separation between cities and scenic landscapes. The existing bus service in the county will be enhanced by the introduction of Sonoma-Marin Area Rail Transit (SMART). The stations planned in Cloverdale, Healdsburg, Windsor, Santa Rosa, Rohnert Park, Cotati, and Petaluma are largely located within Priority Development Areas and will provide improved connections among the cities in the county and to employment opportunities in San Francisco.

The Jobs-Housing Connection Strategy for Sonoma County recognizes growth along the proposed transit corridor, focusing the majority of household and job growth in the central cities. Sonoma County assumes 6% of regional housing unit growth by 2040, or 31,870 homes, and 6% percent of the total regional job growth, or 65,430 jobs. Household and job growth are focused in Santa Rosa, the largest jurisdiction in the county, and other jurisdictions along the SMART corridor, with about half the growth located in PDAs.

CITY CENTER

Santa Rosa - Downtown Station Area

This area is centered on a proposed SMART station site in downtown Santa Rosa. Existing transit includes Santa Rosa City Bus, Sonoma County Transit, and Golden Gate Transit bus lines. There are also primary dedicated pedestrian and bicycle paths in the area. The area's existing land uses are retail and office in the core, with residential and industrial along the edges.

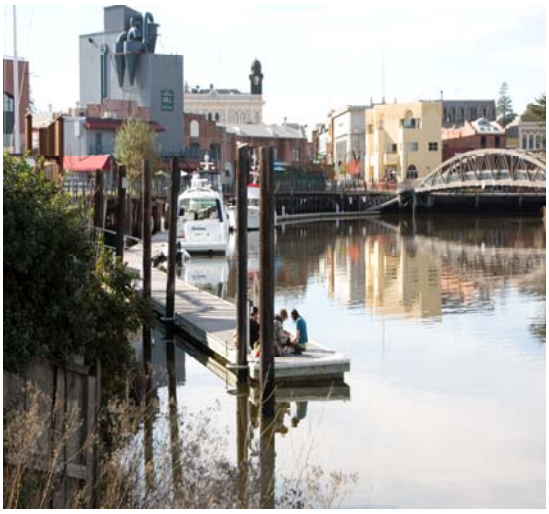


A new framework for development downtown is a healthy, vibrant regional center with a mix of shopping and jobs, new higher-density housing, parks and open space—with opportunities for bicyclists, pedestrians, transit users, and drivers to travel on an attractive, safe network of streets.
Diverse development will include a variety of types and sizes of streets, heights and densities of development, and ages of structures, all adding to the area's visual character. Industrial areas near the rail right-of-way are opportunity sites for development, with new housing units concentrated in the Railroad Square, Railroad Corridor, and Courthouse Square sub-areas.

Other key changes and investments are planned to improve easy circulation for automobiles, bicycles, and pedestrians in the area. Additional new community amenities include a new civic center and performing arts center, and the daylighting of Santa Rosa Creek. With these changes and investments, the new mix of land uses and travel choices can create a vibrant community.

SUBURBAN CENTER

Petaluma - Central Petaluma



Development in this area seeks to reinvigorate the city's historic downtown core in underutilized land and redirects development away from the city's fringes to the central core. The area also provides for a greater diversity, affordability and intensity of development. The mix of uses and activities within this area will give it identity and interest. Golden Gate Transit, Sonoma County Transit and Petaluma Transit provide bus service to the area, and SMART rail is planned. There are opportunities for transportation options, including a station site on the SMART corridor and the City's bus transit mall. The area is near the Petaluma River and the plan focuses on reconnecting the city to and along the river, to promote walkability and access to open space.

Rohnert Park - Sonoma Mountain Village

The area will be transformed from an office park to a community centered on a village square with amenities for people to eat, gather, stroll, and enjoy other activities. Residences will be available in a variety of densities to appeal to a wide range of homebuyers and renters, with some of the units being affordable by design. Densities would be highest in the mixed-use core and would decrease appropriately as one travels away from the center toward the existing neighborhoods in the vicinity and the city's edge. Recreational opportunities, located throughout the community, are easily accessible to all residents and visitors. This new community aims to set the pace for sustainable development in the Bay Area—it will become a benchmark for conservation and environmentally sensitive standards for years to come.

Windsor - Redevelopment Project Area

This area is planned as a city-centered, high-density, transit-oriented, culture hub of town. The Sonoma County Transit intermodal rail station will also accommodate SMART, providing the area with regular commuter rail service between Cloverdale and Larkspur, with a bus link to San Francisco and the greater Bay Area. Surrounding the new intermodal station is planned mixed use, high-density housing and commercial uses. The area can provide residents with a variety of diverse housing and transportation choices, and create an environment that is walkable with access to parks and other amenities. Other projects are underway to continue advancing the vision for the area.



TRANSIT TOWN CENTER

Cloverdale - Downtown/SMART Transit Area

When complete, transit connections will be improved and provide an active, livable downtown where residents, employees and visitors can take advantage of rail and bus service. The major objectives are to initiate SMART passenger rail and to provide bicycle and pedestrian access from the downtown to the transit station. There are opportunities at Citrus Fair for mixed-use housing, transit-oriented development (TOD) projects and also in downtown east of the freeway, where there are a few available sites for high-density housing. There are also opportunities for job creation in the existing industrial area east of the freeway. Collectively, these changes can contribute to an increased quality of life for residents in this community by providing housing and transportation choices and proximity to local services.

Cotati - Downtown & Cotati Depot

The downtown and the Cotati Depot are planned for a SMART station. The development in the northern section of Old Redwood Highway will results in a denser, pedestrian "small-town" downtown with commercial and housing. This development will be multifamily housing, either on top of commercial or on the residentially designated streets, along with new commercial uses. The future downtown development is pedestrian-oriented, enhances vehicle and pedestrian connectivity and strengthens the local economy with environmentally responsible development. The plan calls for high-density mixed-use, transit-oriented development such as multi-family housing units, commercial spaces, and a new transit station and park and ride lot.

Sebastapol - Nexus Area

New development in the Northeast envisions a wide variety of high-density residential, commercial, and civic uses in a lively downtown district. Sebastopol's core would be strengthened, circulation improved, facilitate alternatives transportation, expand goods and services for the community, improve open space access, and support the concepts of sustainable development and a sustainable local economy. Supportive projects include infrastructure, park, housing, circulation, and streetscape improvements. Implementation of the plan will also include ensuring green building techniques, housing affordability, and environmental sustainability.

MIXED-USE CORRIDOR

Santa Rosa - Mendocino – Santa Rosa Corridor

The intent is to develop "gateways" into the downtown, create a "sense of place," and connect Santa Rosa Junior College in a substantial way to downtown. The routes served by the bus project should also be considered for transit-oriented development, which could spur commercial infill and reduce the number of auto trips. Improvements to the street include improved safety and functionality, providing a pedestrian friendly environment, and addressing aesthetic issues.

Santa Rosa - Sebastopol Road Corridor

This area is a planned Rapid Bus Corridor and future SMART station. The goal is to create a unique, pedestrian-oriented street, including a revitalized neighborhood center. New development envisioned includes small businesses, affordable housing and parks, all oriented toward the street. The eastern part of Sebastopol Road, within a half mile of the future downtown SMART station, is currently designated for transit-supportive land uses. The bus project routes may also be considered for transit-oriented development, which could also spur commercial infill and reduce the number of auto trips.



Plan BayArea

Strategy for A Sustainable Region

Adopted July 18, 2013

Association of Bay Area Governments

Metropolitan Transportation Commission

Metropolitan Transportation Commission

Amy Rein Worth, Chair
Cities of Contra Costa County

Dave Cortese, Vice Chair
Santa Clara County

Alicia C. Aguirre
Cities of San Mateo County

Tom Azumbrado
U.S. Department of Housing and Urban Development

Tom Bates
Cities of Alameda County

David Campos
City and County of San Francisco

Bill Dodd
Napa County and Cities

Dorene M. Giacopini
U.S. Department of Transportation

Federal D. Glover
Contra Costa County

Scott Haggerty
Alameda County

Anne W. Halsted
San Francisco Bay Conservation and Development Commission

Steve Kinsey
Marin County and Cities

Sam Liccardo
San Jose Mayor's Appointee

Mark Luce
Association of Bay Area Governments

Jake Mackenzie
Sonoma County and Cities

Joe Pirzynski
Cities of Santa Clara County

Jean Quan
Oakland Mayor's Appointee

Bijan Sartipi
State Business, Transportation and Housing Agency

James P. Spering
Solano County and Cities

Adrienne J. Tissier
San Mateo County

Scott Wiener
San Francisco Mayor's Appointee

Association of Bay Area Governments

Supervisor Mark Luce
ABAG President
County of Napa

Mayor Julie Pierce
ABAG Vice President
City of Clayton

Representatives From Each County

Supervisor Richard Valle
Alameda

Supervisor Scott Haggerty
Alameda

Supervisor Karen Mitchoff
Contra Costa

Supervisor John Gioia
Contra Costa

Supervisor Katie Rice
Marin

Supervisor Mark Luce
Napa

Supervisor Eric Mar
San Francisco

Supervisor Jane Kim
San Francisco

Supervisor Warren Slocum
San Mateo

Supervisor Dave Pine
San Mateo

Supervisor Mike Wasserman
Santa Clara

Supervisor Dave Cortese
Santa Clara

Supervisor Linda Seifert
Solano

Supervisor David Rabbitt
Sonoma

Representatives From Cities in Each County

Mayor Bill Harrison
City of Fremont / Alameda

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City of Pleasanton / Alameda

Mayor Julie Pierce
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City of San Ramon / Contra Costa

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Mayor Edwin Lee
City and County of San Francisco

Jason Elliott, Director, Legislative/Government Affairs, Office of the Mayor
City and County of San Francisco

Joaquin Torres, Deputy Director, Economic and Workforce Development, Office of the Mayor
City and County of San Francisco

Mayor Pedro Gonzalez
City of South San Francisco / San Mateo

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Mayor Jean Quan
City of Oakland

Councilmember Libby Schaaf
City of Oakland

Councilmember Desley Brooks
City of Oakland

Councilmember Sam Liccardo
City of San Jose

Councilmember Kansen Chu
City of San Jose

Councilmember Ash Kalra
City of San Jose

Advisory Members

William Kissinger
Regional Water Quality Control Board

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Plan BayArea

Regional Transportation Plan and Sustainable Communities Strategy for the San Francisco Bay Area 2013–2040

Adopted July 18, 2013

Association of Bay Area Governments

Metropolitan Transportation Commission

Welcome to Plan Bay Area

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Urbanized Area
Publicly Owned Parks and Open Space
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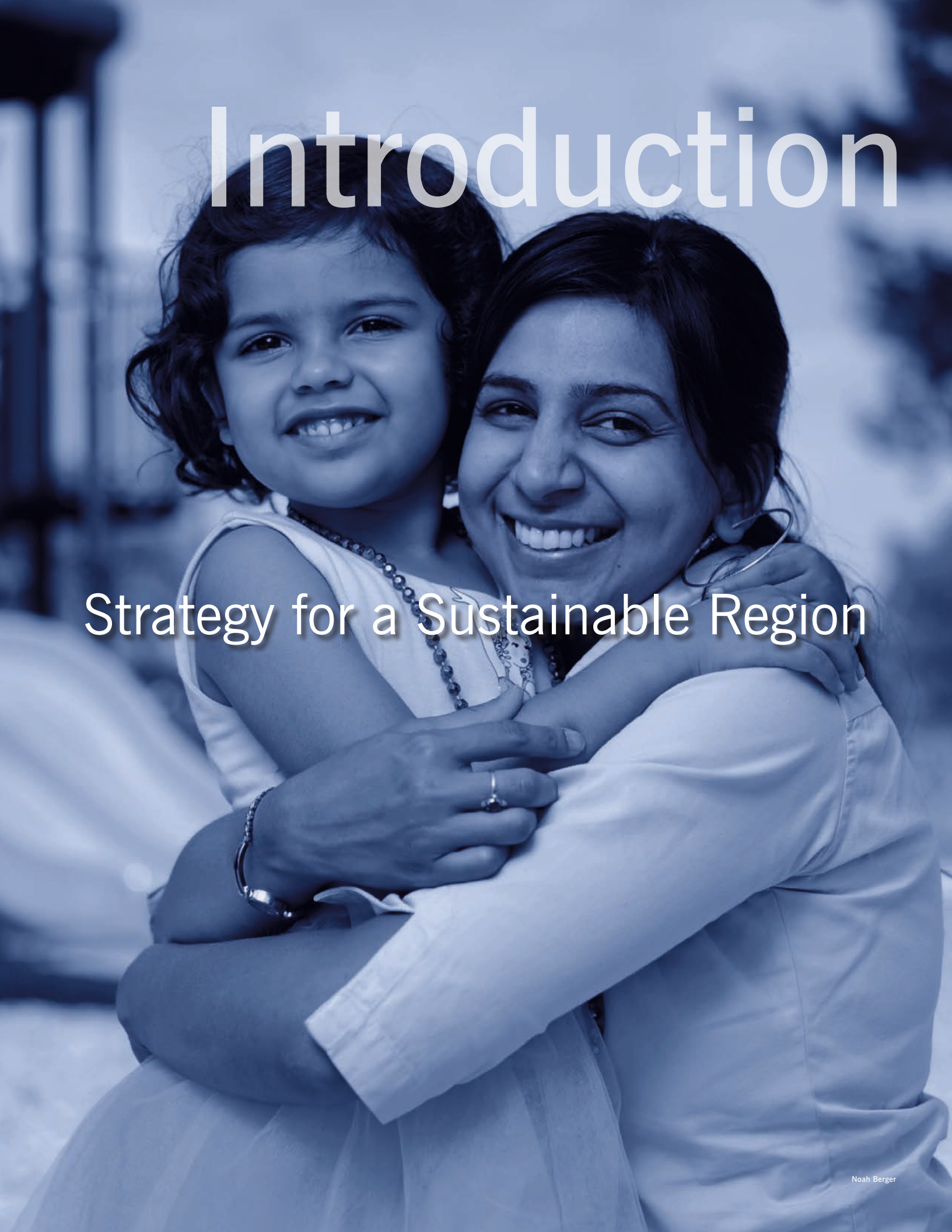
Priority Development Area (PDA) — Potential
Priority Conservation Area (PCA)
ROADS
Freeway
Major Road
RAIL SYSTEM
Altamont Corridor Express
Amtrak
BART
Caltrain
Light Rail (Muni & VTA)
Cable Car (Muni)
2010 POPULATION
Oakland > 350,000
Novato 50,000–350,000
Pacifica <50,000
0 10 20 30 Miles
0 10 20 30 40 Kilometers
Map is for general information. For more information on local zoning or designations for a particular site or parcel, please contact your city or county.
Sonoma
Napa
Solano
Marin
Contra Costa
Alameda
San Mateo
Santa Clara
San Francisco
Oakland
San Jose
Cloverdale
Healdsburg
Windsor
Santa Rosa
Sebastopol
Rohnert Park
Cotati
Petaluma
Calistoga
Yountville
Napa
Sonoma
American Canyon
Vallejo
Benicia
Novato
Fairfax
San Anselmo
San Rafael
Ross
Larkspur
Corte Madera
Mill Valley
Belvedere
Tiburon
Sausalito
Hercules
Pinole
Martinez
San Pablo
Richmond
El Cerrito
Albany
Berkeley
Emeryville
Piedmont
Alameda
Vacaville
Fairfield
Suisun City
Dixon
Rio Vista
Pittsburg
Antioch
Oakley
Concord
Pleasant Hill
Clayton
Brentwood
Lafayette
Orinda
Walnut Creek
Moraga
Danville
San Ramon
Dublin
Pleasanton
Livermore
Daly City
Colma
Brisbane
South San Francisco
San Bruno
Pacifica
Millbrae
Burlingame
San Mateo
Foster City
Hillsborough
Belmont
San Carlos
Redwood City
Menlo Park
Hayward
San Leandro
Union City
Newark
Fremont
East Palo Alto
Half Moon Bay
Woodside
Atherton
Palo Alto
Mountain View
Los Altos
Los Altos Hills
Portola Valley
Sunnyvale
Santa Clara
Milpitas
Cupertino
Campbell
Saratoga
Monte Sereno
Los Gatos
Morgan Hill

Introduction

Strategy for a Sustainable Region



Noah Berger



Simon Marcus, Corbis Images

Introducing Plan Bay Area

Strategy for a Sustainable Region

Most of us living in the nine counties that touch San Francisco Bay are accustomed to saying we live in "the Bay Area."

This simple phrase speaks volumes — and underscores a shared regional identity. The 7 million of us who call the nine-county San Francisco Bay Area home have a strong interest in protecting the wealth of features that make our region a magnet for people and businesses from around the globe.

The Bay Area is, after all, the world's 21st-largest economy. The natural beauty of San Francisco Bay and the communities surrounding it, our Mediterranean climate, extensive system of interconnected parks and open space, advanced mass transit system, top-notch educational institutions and rich cultural heritage continue to draw people who seek better opportunities. Yet we cannot take for granted that we will be able to sustain and improve our quality of life for current and future generations.

With our region's population projected to swell to some 9 million people by 2040, Plan Bay Area charts a course for accommodating this growth while fostering an innovative, prosperous and competitive economy; preserving a healthy and safe environment; and allowing all Bay Area residents to share the benefits of vibrant, sustainable communities connected by an efficient and well-maintained transportation network.

A Legacy of Leadership

Plan Bay Area, while comprehensive and forward-reaching, is an evolutionary document. The Bay Area has made farsighted regional planning a top priority for decades. Previous generations recognized the need for a mass transit system, including regional systems such as BART and Caltrain that have helped make our region the envy of other metropolitan areas. Our transbay bridges add cohesion to the regional transportation system by connecting communities across the bay. Likewise, we owe our system of parks and open space to past generations of leaders who realized that a balance between urbanized areas and open space was essential to a healthy environment and vibrant communities.

Plan Bay Area extends this legacy of leadership, doing more of what we've done well while also mapping new strategies to face new challenges. Among the new challenges are the requirements of California's landmark 2008 climate law (SB 375, Steinberg): to decrease greenhouse gas emissions from cars and light trucks, and to accommodate all needed housing growth within our nine counties. By coordinating future land uses with our long-term transportation investments, Plan Bay Area meets these challenges head on — without compromising local control of land use decisions. Each of the Bay Area's nine counties and 101 cities must decide what is best for their citizens and their communities.



San Francisco-Oakland Bay Bridge

Caltrans

Building Upon Local Plans and Strategies

For over a decade, local governments and regional agencies have been working together to encourage the growth of jobs and production of housing in areas supported by amenities and infrastructure. In 2008, the Association of Bay Area Governments (ABAG) and the Metropolitan Transportation Commission (MTC) created a regional initiative to support these local efforts called FOCUS. In recent years, this initiative has helped to link local community development aspirations with regional land use and transportation planning objectives. Local governments have identified Priority Development Areas (PDAs) and Priority Conservation Areas (PCAs), and these form the implementing framework for Plan Bay Area.

PDAs are areas where new development will support the day-to-day needs of residents and workers in a pedestrian-friendly environment served by transit. While PDAs were originally established to address housing needs in infill communities, they have been broadened to advance focused employment growth. Local jurisdictions have defined the character of their PDAs according to existing conditions and future expectations as regional centers, city centers, suburban centers or transit town centers, among other place types. PCAs are regionally significant open spaces for which there exists broad consensus for long-term protection but nearer-term development pressure. PDAs and PCAs complement one another because promoting development within PDAs takes development pressure off the region's open space and agricultural lands.

Building upon the collaborative approach established through FOCUS, local input has driven the set of alternative scenarios that preceded and informed the development of Plan Bay Area. The non-profit and business communities also played a key role in shaping the plan. Business groups highlighted the need for more affordable workforce housing, removing regulatory barriers to infill development, and addressing infrastructure needs at rapidly growing employment centers. Environmental organizations emphasized the need to improve transit access, retain open space, provide an adequate supply of housing to limit the number of people commuting into the region from nearby counties, and direct discretionary transportation funding to communities building housing in PDAs. Equity organizations focused on increasing access to housing and employment for residents of all income categories throughout the region, and establishing policies to limit the displacement of existing residents as PDAs grow and evolve. All of these diverse voices strengthened this plan.

Preserving Local Land Use Control

Adoption of Plan Bay Area does not mandate any changes to local zoning, general plans or project review. The region's cities, towns and counties maintain control of all decisions to adopt plans and permit or deny development projects. Similarly, Plan Bay Area's forecasted job and housing numbers do not act as a direct or indirect cap on development locations in the region. The forecasts are required by SB 375 and reflect the intent of regional and local collaboration that is the foundation of Plan Bay Area.

The plan assists jurisdictions seeking to implement the plan at the local level by providing funding for PDA planning and transportation projects. Plan Bay Area also provides jurisdictions with the option of increasing the efficiency of the development process for projects consistent with the plan and other criteria included in SB 375.



Sergio Ruiz

California Senate Bill 375: Linking Regional Plans to State Greenhouse Gas Reduction Goals

Plan Bay Area grew out of "The California Sustainable Communities and Climate Protection Act of 2008" (California Senate Bill 375, Steinberg), which requires each of the state's 18 metropolitan areas — including the Bay Area — to reduce greenhouse gas emissions from cars and light trucks. Signed by former Gov. Arnold Schwarzenegger, the law requires that the Sustainable Communities Strategy (SCS) promote compact, mixed-use commercial and residential development. To meet the goals of SB 375, Plan Bay Area directs more future development in areas that are or will be walkable and bikable and close to public transit, jobs, schools, shopping, parks, recreation and other amenities. Key elements of SB 375 include the following.

- The law requires that the Bay Area and other California regions develop a Sustainable Communities Strategy (SCS) — a new element of the regional transportation plan (RTP) — to strive to reach the greenhouse gas (GHG) reduction target established for each region by the California Air Resources Board. The Bay Area's target is a 7 percent per capita reduction by 2020 and a 15 percent per capita reduction by 2035. Plan Bay Area is the region's first RTP subject to SB 375.
- In the Bay Area, the Association of Bay Area Governments (ABAG) is responsible for the land use and housing assumptions for the SCS, which adds three new elements to the RTP: (1) a land use component that identifies how the region could house the region's entire population over the next 25 years; (2) a discussion of resource and farmland areas; and (3) a demonstration of how the development pattern and the transportation network can work together to reduce GHG emissions.
- Extensive outreach with local government officials is required, as well as a public participation plan that includes a minimum number of workshops in each county as well as three public hearings on the draft SCS prior to adoption of a final plan.
- The law synchronizes the regional housing need allocation (RHNA) process — adopted in the 1980s — with the regional transportation planning process.
- Finally, SB 375 streamlines the California Environmental Quality Act (CEQA) for housing and mixed-use projects that are consistent with the SCS and meet specified criteria, such as proximity to public transportation.

Plan Bay Area is one element of a broader California effort to reduce greenhouse gas emissions. While Plan Bay Area focuses on where the region is expected to grow and what transportation investments will support that growth, Assembly Bill 32 (2006) creates a comprehensive framework to cut greenhouse gases with new, cleaner fuels, more efficient cars and trucks, lower carbon building codes, cleaner power generation, as well as coordinated regional planning. In addition, Caltrans will lead efforts consistent with Senate Bill 391 (2009) to reduce greenhouse gases statewide from the transportation sector, including freight. These strategies are outlined in the California Air Resources Board's (CARB) 2008 Scoping Plan, which demonstrates there is no single way to reduce greenhouse gases. Every sector must contribute if the state is to achieve its goals today and for tomorrow's generations.



Noah Berger

Setting Our Sights

Developing a long-range land use and transportation plan for California's second-largest metropolitan region, covering about 7,000 square miles across nine Bay Area counties, is no simple task. We set our sights on this challenge by emphasizing an open, inclusive public outreach process and adopting objective performance standards based on federal and state requirements to measure our progress during the planning process.

Reaching Out

We reached out to the people who matter most — the 7 million people who live in the region. Thousands of people participated in stakeholder sessions, public workshops, telephone and internet surveys, and more. Befitting the Bay Area, the public outreach process was boisterous and contentious. Key stakeholders also included the region's 101 cities and nine counties; our fellow regional agencies, the Bay Conservation and Development Commission and the Bay Area Air Quality Management District; community-based organizations and advocacy groups, and some three dozen regional transportation partners. In addition, there were multiple rounds of engagement with the Bay Area's Native American tribes, as detailed in the tribal consultation report. (See "Plan Bay Area Prompts Robust Dialogue on Transportation and Housing," in Chapter 1.)

Establishing Performance Targets

Before proposing a land use distribution approach or recommending a transportation investment strategy, planners must formulate in concrete terms the hoped-for outcomes. For Plan Bay Area, performance targets are an essential means of informing and allowing for a discussion of quantitative metrics. After months of discussion and debate, ABAG and MTC adopted 10 targets in January 2011, reflecting input from the broad range of stakeholders engaged in the process.

Two of the targets are not only ambitious — they also are mandated by state law. The first mandatory target addresses climate protection by requiring the Bay Area to reduce its per-capita CO_2 emissions from cars and light-duty trucks by 15 percent by 2040. The second mandatory target addresses adequate housing by requiring the region to house 100 percent of its projected population growth by income level. Plan Bay Area achieves both these major milestones.

Taking Equity Into Account

About one-fifth of the Bay Area's total population lives in areas with large numbers of low-income and minority populations. Promoting these people's access to housing, jobs and transportation not only advances Plan Bay Area's objective to advance equity in the region; it also increases our chances of meeting the other performance targets. MTC and ABAG adopted five Equity Analysis measures to evaluate equity concerns: housing and transportation affordability, potential for displacement, healthy communities, access to jobs, and equitable mobility. (See Chapter 1, Table 5: "Plan Bay Area Equity Performance Measures.")



Noah Berger

The eight voluntary targets seek to promote healthy and safe communities by reducing premature deaths from air pollution, reducing injuries and fatalities from collisions, increasing the amount of time people walk or cycle for transportation, and protecting open space and agricultural lands. Other targets address equity concerns, economic vitality and transportation system effectiveness. Plan Bay Area meets some, but not all, of the voluntary targets. (See Chapter 1, Table 4 for a summary of all the Plan Bay Area performance targets.)

Planning Scenarios Take Aim at Performance Targets

Taken together, the Plan Bay Area performance targets outline a framework that allows us to better understand how different projects and policies might affect the region's future. With the targets clearly identified, MTC and ABAG formulated possible scenarios — combinations of land use patterns and transportation investments — that could be evaluated together to see if (and by how much) they achieved (or fell short of) the performance targets. An iterative process of scenario-testing begun in 2010 yielded preferred alternatives, both for transportation investments and a land use strategy. Adopted by the boards of MTC and ABAG in May 2012, they form this Plan Bay Area.

Looking Toward the Future

ABAG and MTC track and forecast the region's demographics and economic trends to inform and guide Plan Bay Area investments and policy decisions. The forecasts reflect the best picture we have of what the Bay Area may look like in 2040, so that today's decisions may align with tomorrow's expected transportation and housing needs. These forecasts form the basis for developing the regional land use plan for Plan Bay Area's Sustainable Communities Strategy (SCS) and, in turn, the region's transportation investment strategy.



Joyce Benna

Projections in three main areas informed development of the plan: population, employment and housing. Here are some highlights of each.

- **Population:** By 2040 the San Francisco Bay Area is projected to add 2.1 million people, increasing total regional population from 7.2 million to 9.3 million, an increase of 30 percent or roughly 1 percent per year. This growth means the Bay Area will continue to be California's second-largest population and economic center.
- **Employment:** The number of jobs is expected to grow by 1.1 million between 2010 and 2040, an increase of 33 percent. This is a slower rate of job growth than previous forecasts.
- **Housing:** During this same time period the number of households is expected to increase by 27 percent to 700,000, and the number of housing units is expected to increase by 24 percent to 660,000.

The demographic implications of these topline numbers are far-reaching, and some trends in particular weighed heavily in the development of Plan Bay Area. These are touched on below and examined in greater detail in Chapter 2.

Aging Baby Boomers Expected to Change Travel and Development Patterns

The U.S. Census Bureau defines baby boomers as people who were born between 1946 and 1964 during the post-World War II baby boom. By 2040 the oldest baby boomers will be in their 90s and the youngest will be in their 70s. Today, people who are 65 and over represent 12 percent of the Bay Area's total population, but by 2040 the number of seniors will increase to 22 percent. That's more than 1 in 5 people in our region. It is expected that many of these seniors will relocate to smaller homes in more urban locations to have easier access to essential services and amenities and the Bay Area's extensive transit system.

Mobility will be a special challenge for seniors who lose their ability to drive. MTC's Lifeline Transportation Program supports projects that address mobility and accessibility needs of low-income and disabled people throughout the region. Between 2006 and 2012, roughly $172 million was invested to support about 220 projects. Closely related are MTC programs that provide funding to sustain and improve mobility for elderly and disabled persons in accordance with and even beyond the requirements

By 2040 the San Francisco Bay Area is projected to add 2.1 million people.

of the Americans with Disabilities Act (ADA). These types of projects have included travel training, sidewalk and bus stop improvements, supportive ride programs and other community initiatives. Plan Bay Area reaffirms the importance of Lifeline and Elderly & Disabled programs by adding over $800 million in discretionary funding for the Lifeline program, and almost $240 million for the Elderly & Disabled programs over the 28-year period of the plan.

Racial and Ethnic Diversity Expected to Increase

The Bay Area and California are at the forefront of one of the greatest demographic changes in our nation's history: growth in the Latino population. In January 2013 the California Department of Finance projected that the state's Hispanic population will equal the non-Hispanic white population by mid-2013. By early 2014 it expects that California's Hispanic population will have become a plurality for the first time in state history.

This state forecast aligns with Plan Bay Area's projection that by 2040 the Bay Area population will become substantially more racially and ethnically diverse. Latinos will emerge as the largest ethnic group, increasing from 23 percent to 35 percent of the total population. The number of Asians also will increase, growing from 21 percent to about 24 percent of the population.



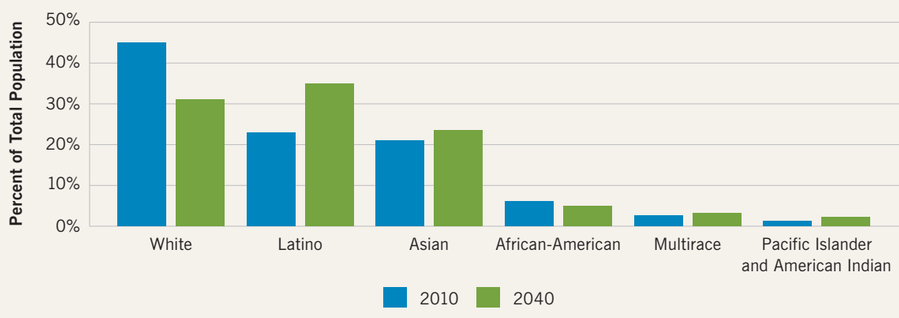
Noah Berger

Demand for Multi-Unit Housing in Urban Areas Close to Transit Expected to Increase

Single-family homes represent the majority of housing production in recent decades, but recent trends suggest that cities once again are becoming centers of population growth. Construction of multifamily housing in urban locations in the Bay Area increased from an average of 35 percent of total housing construction in the 1990s to nearly 50 percent in the 2000s. In 2010 it represented 65 percent of all housing construction.

As discussed above, demand for multifamily housing is projected to increase as seniors downsize and seek homes in more urban locations. Population growth of those aged 34 and younger is expected to have a similar effect, as this demographic group also demonstrates a greater preference for multifamily housing. All told, the number of people per Bay Area household is expected to increase from 2.69 in 2010 to 2.75 in 2040. Market demand for new homes will tilt toward townhomes, condominiums and apartments in developed areas near transit, shops and services.

FIGURE 1: Share of Population by Race and Ethnicity, 2010 and 2040



Sources: 2010 Census, California Department of Finance, ABAG

Project-Level Performance Assessment of Transportation Projects

By developing the preferred land use and transportation investment strategies, ABAG and MTC were able to answer many big-picture questions about the Bay Area's future. For example, should the region focus on expanding the transportation system or on maintaining what we have already built? And should the Bay Area invest more in transit for future generations or emphasize highway projects to improve the commutes of today's drivers? And how should our transportation investments support future growth in employment and housing?

Plan Bay Area also is based on a commitment to evaluate individual transportation projects to make sure dollars are being allocated to the most cost-effective projects. In order to take a closer look at major transportation projects, MTC performed a project performance assessment, examining billions of dollars of potential transportation projects to identify the highest-performing investments across the region. This enabled funding prioritization for the highest-performing projects. Most of them focused on leveraging existing assets and improving their efficiency, while supporting future development. Notable projects include BART Metro, which will increase service frequencies on the highest-demand segment of the BART system, and San Francisco's congestion pricing initiatives. (See Chapter 5 for a list of high-performing projects.)



Ron Finger

Building a Development Pattern That Aligns With Where We Live and Work

Plan Bay Area provides a vision for how to retain and enhance the qualities that make the Bay Area a great place to live, work and play. It builds on the legacy of leadership left to us by previous generations. In fact, many of the attributes that make the Bay Area special — a strong economy, protected natural resources, a network of diverse neighborhoods — would not have been possible without our predecessors' forward-thinking actions.

Looking ahead to the growth expected in the Bay Area over the next several decades, we face many similar problems as past generations, while also confronting new challenges that threaten the region's economic vitality and quality of life. Our economy is still recovering from the Great Recession of 2007–2009, which has resulted in uneven job growth throughout the region, increased income disparity, and high foreclosure rates. At the same time, housing costs have risen for renters and, to a lesser degree, for home buyers close to the region's job centers. Finally, Bay Area communities face these challenges at a time when there are fewer public resources available than in past decades for investments in infrastructure, public transit, affordable housing, schools and parks.

A More Focused Future

The planning scenarios and the land use and transportation investment strategies developed during the Plan Bay Area process seek to address the needs and aspirations of each Bay Area jurisdiction, as identified in locally adopted general plans and zoning ordinances. They also aim to meet the Plan Bay Area performance targets and equity performance standards. The framework for developing these scenarios consisted largely of the Priority Development Areas (PDAs) and Priority Conservation Areas (PCAs) recommended by local governments. The preferred land use scenario identified in Chapter 3 is a flexible blueprint for accommodating growth over the long term. Pairing this development pattern with the transportation investments described in Chapter 4 is what makes Plan Bay Area the first truly integrated land use/transportation plan for the region's anticipated growth.



Peter Beeler

TABLE 1: Bay Area Job Growth 2010–2040, Top 15 Cities

		Jobs		2010–2040 Job Growth	
Rank	Jurisdiction	2010	2040	Growth	Percentage Growth
1	San Francisco	568,720	759,500	190,780	34%
2	San Jose	377,140	524,510	147,380	39%
3	Oakland	190,490	275,760	85,260	45%
4	Santa Clara	112,890	146,180	33,290	29%
5	Fremont	90,010	120,000	29,990	33%
6	Palo Alto	89,690	119,470	29,780	33%
7	Santa Rosa	75,460	103,940	28,470	38%
8	Berkeley	77,110	99,330	22,220	29%
9	Concord	47,640	69,450	21,810	46%
10	Sunnyvale	74,810	95,600	20,790	28%
11	San Mateo	52,540	72,950	20,410	39%
12	Hayward	68,140	87,820	19,680	29%
13	Redwood City	58,080	77,480	19,400	33%
14	Walnut Creek	41,720	57,380	15,660	38%
15	Mountain View	47,950	63,590	15,640	33%

Source: ABAG, 2013

2040 Employment Distribution Highlights

Plan Bay Area's distribution of jobs throughout the region is informed by changing trends in the locational preferences of the wide range of industry sectors and business place types in the Bay Area. These trends capture ongoing geographic changes, as well as changes in the labor force composition and workers' preferences. The employment distribution directs job growth toward the region's larger cities and Priority Development Areas with a strong existing employment base and communities with stronger opportunities for knowledge-sector jobs.

Almost 40 percent of the jobs added from 2010 to 2040 will be in the region's three largest cities — San Jose, San Francisco and Oakland — which accounted for about one-third of the region's jobs in 2010. Two-thirds of the overall job growth is anticipated to be in PDAs throughout the region. Due to the strength of the knowledge sector, nine of the 15 cities expected to experience the greatest job growth are in the western and southern part of the region surrounding Silicon Valley. The remaining communities expecting high levels of job growth are in the East Bay and North Bay, owing to their strong roles in the current economy, diverse employment base, and their proximity to a large base of workers. The 15 cities expected to experience the most job growth will account for roughly 700,000 jobs, or just over 60 percent of the new jobs added in the region by 2040. (See Table 1 above.)

2040 Housing Distribution Highlights

The Plan Bay Area housing distribution is guided by the policy direction of the ABAG Executive Board, which voted in July 2011 to support equitable and sustainable development by "maximizing the regional transit network and reducing GHG emissions by providing convenient access to employment for people of all incomes." This was accomplished by distributing total housing growth numbers to: 1) job-rich cities that have PDAs or additional areas that are PDA-like; 2) areas connected to the existing transit infrastructure; and 3) areas that lack sufficient affordable housing to accommodate low-income commuters. The housing distribution directs growth to locations where the transit system can be utilized more efficiently, where workers can be better connected to jobs, and where residents can access high-quality services.

Substantial housing production is expected on the Peninsula and in the South Bay, where eight of the top 15 cities expected to experience the most housing growth are located. Two-thirds of the region's overall housing production is directed to these 15 cities, leaving the more than 90 remaining jurisdictions in the region to absorb only limited growth. This development pattern preserves the character of more than 95 percent of the region by focusing growth on less than 5 percent of the land. (See Table 2 below.)

TABLE 2: Bay Area Housing Unit Growth 2010–2040, Top 15 Cities

		Housing Units		2010–2040 Housing Unit Growth	
Rank	Jurisdiction	2010	2040	Growth	Percentage Growth
1	San Jose	314,040	443,320	129,280	41%
2	San Francisco	376,940	469,430	92,480	25%
3	Oakland	169,710	221,160	51,450	30%
4	Sunnyvale	55,790	74,820	19,030	34%
5	Concord	47,130	65,200	18,070	38%
6	Fremont	73,990	91,620	17,630	24%
7	Santa Rosa	67,400	83,430	16,030	24%
8	Santa Clara	45,150	58,930	13,780	31%
9	Milpitas	19,810	32,430	12,620	64%
10	Hayward	48,300	60,610	12,320	26%
11	Fairfield	37,180	48,300	11,120	30%
12	San Mateo	40,010	50,200	10,180	25%
13	Livermore	30,340	40,040	9,700	32%
14	Richmond	39,330	49,020	9,690	25%
15	Mountain View	33,880	43,280	9,400	28%

Source: ABAG, 2013

Transportation Investments

Plan Bay Area structures an infrastructure investment plan in a systematic way to support the region's long-term land use strategy, relying on a performance assessment of scenarios and individual projects. The plan makes investments in the region's transportation network that support job growth and new homes in existing communities by focusing the lion's share of investment on maintaining and boosting the efficiency of the existing transit and road system. Plan Bay Area also takes a bold step with strategic investments that provide support for focused growth in Priority Development Areas, including the new OneBayArea Grant program.

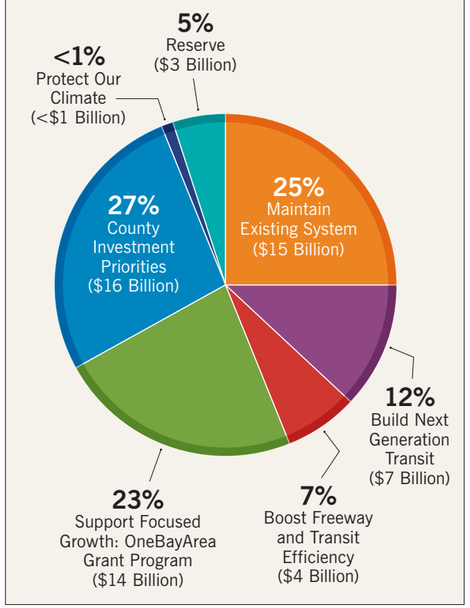


Tom Tracy

Plan Bay Area transportation revenue forecasts total $292 billion over the 28-year period. Over two-thirds (68 percent) of these funds are from regional and local sources, primarily dedicated sales tax programs and bridge tolls. Making up the remainder of the pie are state and federal revenues (mainly derived from fuel taxes). Of the total revenues, $60 billion are "discretionary," or available for assignment to projects and programs through Plan Bay Area.

The plan invests those discretionary funds via six key investment strategies, as shown in Figure 2 and presented in greater detail in Chapter 4. (See Table 3 for a look at the "big-ticket" plan investments, overall.) The first two discretionary strategies merit special mention.

FIGURE 2: Plan Bay Area — Discretionary Investment Summary ($60 billion in year of expenditure $)



Maintain Our Existing System

Though its fund sources are many and varied, Plan Bay Area's overriding priority in investing those funds can be stated quite simply: "Fix It First." First and foremost, this plan should help to maintain the Bay Area's transportation system in a state of good repair. Plan Bay Area's focus on "fix it first" ensures

"Top 10" Plan Bay Area Investments, by Project

(includes Committed and Discretionary funds)

TABLE 3: 10 Largest Plan Bay Area Investments

Rank	Project	Investment (YOE* Millions $)
1	BART to Warm Springs, San Jose and Santa Clara	$8,341
2	MTC Regional Express Lane Network	$6,057
3	Transbay Transit Center/Caltrain Downtown Extension (Phases 1 and 2)	$4,185
4	Integrated Freeway Performance Initiative (FPI)	$2,729
5	Presidio Parkway/Doyle Drive US 101 seismic replacement	$2,053
6	Caltrain Electrification and Operational/Service Frequency Improvements	$1,843
7	SF MUNI Central Subway: King Street to Chinatown	$1,578
8	Valley Transportation Authority (VTA) Express Lane Network	$1,458
9	San Jose International Airport Connector	$753
10	Hunters Point and Candlestick Point: New Local Roads	$722

*YOE = Year of Expenditure

that we maintain existing transportation assets, primarily concentrated in the region's core, which reinforces the plan's focused growth strategy.

In total, Plan Bay Area dedicates 87 percent of all available funding (committed and discretionary) to sustaining the existing transportation network. Given the age of many major assets — BART turned 40 last year and San Francisco Muni turned 100 — this should come as no surprise.

Support Focused Growth — OneBayArea Grant Program

The OneBayArea Grant (OBAG) program is a new funding approach that better integrates the region's transportation funding program with SB 375 and the land use pattern outlined in Chapter 3. The OBAG program rewards jurisdictions that focus housing growth in Priority Development Areas (PDAs) through their planning and zoning policies, and actual production of housing units. The OBAG program allows flexibility to invest in a community's transportation infrastructure by providing funding for Transportation for Livable Communities, bicycle and pedestrian improvements, local streets and roads preservation, and planning activities, while also providing specific funding opportunities for Safe Routes to Schools projects and Priority Conservation Areas.

Plan Bay Area Achieves Key Performance Targets

As described earlier, Plan Bay Area was developed within a framework of objective performance standards, both mandatory and voluntary or aspirational. As has been the case in past long-term transportation plans, no single strategy is able to achieve all the plan's performance targets. An analysis of the 10 main targets and five sub-targets (for a total of 15 performance measures) clearly bears this out. Specifically, the plan meets or exceeds six targets, including the statutory greenhouse gas emissions and housing targets, narrowly misses three targets, falls well short of two targets and unfortunately moves in the wrong direction on four of the targets. In other words, the draft plan makes great progress on nine of 15 performance measures, which represents a solid first effort. The region will need to focus future attention on conceptualizing breakthrough strategies to achieve the four targets where we are falling behind.

For a more detailed discussion of the plan's performance as measured against each individual target, please see Chapter 5.

A Plan To Build On

Plan Bay Area is a work in progress that will be updated every four years to reflect new initiatives and priorities. It builds upon the work of previous initiatives, complements ongoing work and lays the groundwork for closer examination of certain critical issues that can further prepare the region to meet the future head-on. The plan highlights the relationship between transportation investments and land use planning, and represents the region's newest effort to position itself to make the most of what the future will bring.

No single level of government can be expected to address all the critical components needed to create a stronger and more resilient Bay Area. It will take a coordinated effort among diverse partners to promote regional economic development, adapt to climate change, prepare for natural disasters, get creative about how to provide affordable housing for all Bay Area residents, ensure clean and healthy air for our communities, and prepare for emerging technologies that will change the way people work and get around. Further steps will be needed to fully realize the Plan Bay Area vision and implement some of its forward-looking plans and policies. (See Chapter 6 for a discussion of some needed "next steps.")

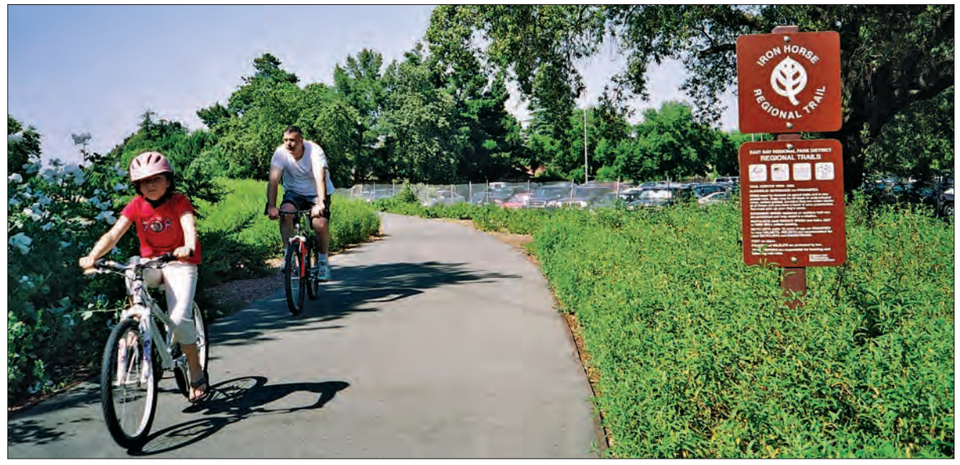
But we have made a strong start. Look closely at Plan Bay Area, and you will see a plan that takes great strides toward:

Tackling Problems That Cross Boundaries and Require Regional Solutions

Housing, air quality, traffic, jobs, economic development, open space preservation — the list is a long one.

Embodying Local Visions

Priority Development Areas were recommended by local governments, and land use and transportation strategies are linked to local input and priorities; different kinds of investments and development are envisioned for different parts of the region.



Arlene Finger

Helping To Ensure a Vibrant and Healthy Region for Our Children and Grandchildren

Cleaner air, fewer greenhouse gas emissions, more housing options, improved infrastructure, better access to jobs, and access to open space and recreation — these are the building blocks of a better future.

Making Bay Area Businesses More Competitive

A well-constructed, sustainable regional plan can help us attract private sector investment and compete for federal and state funding.

Providing a Range of Housing and Transportation Choices

A greater variety of multifamily and single-family housing will be available in places with better transit access, and improved walking conditions and local services.

Stretching Tax Revenues Through Smart Investments

By making the most of existing infrastructure, using a performance-based approach to transportation investments and coordinating the location of future housing and jobs with major transportation investments, we can get more bang for our buck in public expenditures.

Preserving Open Spaces, Natural Resources, Agriculture and Farmland

By developing in existing downtowns, main streets and neighborhoods, we don't need to develop on open spaces or in places that over-utilize our water supply, energy resources and road capacity.



Jay Jones

Helping To Create Healthy Communities

More people will be able to live in neighborhoods where they can walk to shops, transit and local parks because of the groundwork laid in this plan.

Plan Bay Area cannot guarantee these outcomes, of course, but we believe it can greatly boost the region's odds of achieving them. For surely we must work together as a region to promote sustainability, and to leave a better Bay Area for our children and grandchildren. By helping to harmonize local decision-making and regional goals, by better integrating transportation investment and land use planning, by more closely aligning our policies with our vision — in short, by creating a strategy for a sustainable region — Plan Bay Area gives us a chance to do that.

1

Setting Our Sights



Noah Berger



Caldecott Tunnel

Karl Nielsen

Chapter 1

Setting Our Sights

Crafting a plan to meet the challenges and opportunities of the coming quarter-century is a big job. MTC and ABAG tackled this assignment with enthusiasm, emphasizing both an open, inclusive attitude and a commitment to analytical rigor.

We reached out to thousands of people from around the region, through stakeholder sessions, public workshops, telephone and internet surveys, and countless other means to involve a wide swath of the public in the development of the plan. The region's 101 cities and nine counties also participated in the development of the plan, as did our fellow regional agencies, the Bay Conservation and Development Commission and the Bay Area Air Quality Management District. Community-based organizations and advocacy groups representing the diverse interests of the Bay Area played their part, as did some three dozen regional transportation partners. The plan's outreach effort was both broad-based and deep.

At the same time, wanting to hew to strict objective standards of progress, MTC and ABAG adopted 10 specific targets against which to measure the success of the plan in achieving genuine regional benefits and required statutory goals. This chapter traces the overall development of Plan Bay Area, with special attention to the public process followed, and to the setting, adjusting and assessment of key performance objectives.

Establishing a Performance Framework

What are we aiming for in Plan Bay Area, and how can we measure our success in achieving it? New mandates answer those questions to some degree. California Senate Bill 375, enacted in 2008, requires that we plan for future housing needs and complementary land uses, which in turn must be supported by a transportation investment strategy. And we must do this in a way that reduces emissions of greenhouse gases from cars and light-duty trucks. A fully integrated land use and transportation planning approach is needed to meet these requirements, and Plan Bay Area embraces and embodies such an approach.

Combining these mandated objectives with a careful assessment of the long-range needs of the Bay Area and an understanding of the desires and aspirations of its residents — communicated loudly and diversely through the many avenues provided for public participation (see sidebar on page 28) — we can begin to structure a serious plan for the region. But before proposing a land use distribution approach or recommending a transportation investment strategy, planners must formulate in concrete terms the hoped-for outcomes we seek. For Plan Bay Area, performance targets are an essential element of this regional planning process, allowing for rational discussion of quantitative metrics. Establishing targets allows for various alternative strategies to be assessed and compared using a consistent set of metrics.

Collaborative Process

MTC and ABAG engaged a broad spectrum of regional stakeholders in order to make the targets as meaningful as possible in measuring the plan's success. This collaborative process in the latter half of 2010 involved reviewing nearly 100 possible performance targets, which were critically examined using a set of evaluation criteria. These criteria emphasized targets that could be forecasted by modeling tools and potentially influenced by policies and investments in the future plan. After six months of discussion and debate reflecting input from local stakeholders, equity, environment and business advocates, and concerned members of the public, a list of the preferred targets took shape. These targets went beyond traditional transportation concerns, such as metrics for regional mobility, and instead embraced broader regional concerns, including land use, environmental quality and economic vitality.



Noah Berger

The Plan Bay Area targets, adopted in January 2011, reflect this plan's emphasis on sustainability. Sustainability encapsulates a broad spectrum of concerns, including environmental impacts from greenfield development and vehicle emissions, equity impacts from displacement and low-income household affordability, and economic impacts from regional competitiveness. By integrating these three E's — environment, equity and economy — throughout the targets, Plan Bay Area truly aims to measure the success of creating sustainable communities. We paid special attention to the equity component of the three E's triad, as detailed later in this chapter.

Of course, adopting these voluntary targets is not the same as achieving them. Many are extremely ambitious. But two of the targets are not only ambitious, but also mandatory and vitally important. Plan Bay Area must reduce greenhouse gas emissions by specified amounts, and it must plan for housing in a quantity sufficient for the region's population. These targets are critical to achieving state and regional goals in combating climate change — and the plan meets those major milestones.

The Plan Bay Area targets adopted by MTC and ABAG are displayed in Table 4; information on how the plan performs against the targets can be found in Chapter 5, "Performance."

TABLE 4: Adopted Plan Bay Area Performance Targets*

Goal/Outcome		Performance Target
Required		
Climate Protection	1	Reduce per-capita CO_2 emissions from cars and light-duty trucks by 15 percent (Statutory requirement is for year 2035, per SB 375)
Adequate Housing	2	House 100 percent of the region's projected growth (from a 2010 baseline year) by income level (very-low, low, moderate, above-moderate) without displacing current low-income residents (Statutory requirement, per SB 375)
Voluntary		
Healthy and Safe Communities	3	Reduce premature deaths from exposure to particulate emissions: • Reduce premature deaths from exposure to fine particulates ($PM_{2.5}$) by 10 percent • Reduce coarse particulate emissions (PM_{10}) by 30 percent • Achieve greater reductions in highly impacted areas
	4	Reduce by 50 percent the number of injuries and fatalities from all collisions (including bike and pedestrian)
	5	Increase the average daily time walking or biking per person for transportation by 70 percent (for an average of 15 minutes per person per day)
Open Space and Agricultural Preservation	6	Direct all non-agricultural development within the urban footprint (existing urban development and urban growth boundaries) (Note: Baseline year is 2010.)
Equitable Access	7	Decrease by 10 percentage points (to 56 percent, from 66 percent) the share of low-income and lower-middle income residents' household income consumed by transportation and housing
Economic Vitality	8	Increase gross regional product (GRP) by 110 percent — an average annual growth rate of approximately 2 percent (in current dollars)
Transportation System Effectiveness	9	• Increase non-auto mode share by 10 percentage points (to 26 percent of trips) • Decrease automobile vehicle miles traveled per capita by 10 percent
	10	Maintain the transportation system in a state of good repair: • Increase local road pavement condition index (PCI) to 75 or better • Decrease distressed lane-miles of state highways to less than 10 percent of total lane-miles • Reduce share of transit assets past their useful life to 0 percent (Note: Baseline year is 2012.)

*Unless noted, the Performance Target increases or reductions are for 2040 compared to a year 2005 baseline.

Taking Equity Into Account

In addition to assessing Plan Bay Area's impact on the 10 adopted targets, which collectively cover a wide range of issues and policies, MTC and ABAG also made a special effort to gauge the effects of Plan Bay Area on the region's low-income and minority populations. Indeed, a commitment to achieving equity in the long-range planning process is a key element of Plan Bay Area's performance-based approach. MTC and ABAG staff prepared an Equity Analysis to evaluate quantitative measures of equity concerns. Aspects of this analysis serve both to satisfy MTC's federal requirements with respect to the metropolitan planning process, as well as Plan Bay Area's objective to advance equity in the region.

The Equity Analysis identifies "communities of concern" in the region with concentrations of socioeconomically disadvantaged or vulnerable populations. MTC developed the definition of communities of concern in concert with key regional equity stakeholders, public agency staff, and community representatives, who also prioritized the equity measures based on what stakeholders believed were the region's most significant equity-related issues today and in the context of future growth: affordability, equitable growth, healthy communities, access to jobs, and equitable mobility for all system users. Guided by these priorities, MTC staff developed the set of five equity performance measures displayed in Table 5.



Noah Berger

TABLE 5: Plan Bay Area Equity Performance Measures

	Equity Issue	Performance Measure
1	**Housing and Transportation Affordability**	% of income spent on housing and transportation by low-income households
2	**Potential for Displacement**	% of rent-burdened households in high-growth areas
3	**Healthy Communities**	Average daily vehicle miles traveled per populated square mile within 1,000 feet of heavily used roadways
4	**Access to Jobs**	Average travel time in minutes for commute trips
5	**Equitable Mobility**	Average travel time in minutes for non-work-based trips

Scenarios Take Aim at Targets

Taken together, the Plan Bay Area performance targets outline a framework that allows us to better understand how different projects and policies might affect the region's future. We can compare conditions over the lifespan of the plan by measuring changes in the performance target metrics between 2005 and 2040. Because many of the targets are aspirational in nature, ABAG and MTC understood and made clear through the scenario-development process (described below) that some targets might not be achievable through Plan Bay Area. Also, and importantly, the targets were crafted to focus on desirable regional outcomes that did not preordain a specific land use pattern, transportation mode or investment strategy to reach that goal.

With the targets clearly identified, MTC and ABAG formulated possible "visioning" scenarios — combinations of land use patterns and transportation investments — that could be evaluated together to see if (and by how much) they achieved (or fell short of) the performance targets. In simplified terms, if the targets delineate the plan's aspirations, the scenarios represent possible ways to realize them. Obviously, the goal is to identify the most promising scenario, especially with respect to the attainment of the statutory requirements for greenhouse gas emission reductions and for the provision of an adequate amount of housing.

> Plan Bay Area performance targets outline a framework that allows us to better understand how different projects and policies might affect the region's future.

See the full Performance Assessment Report *(listed in Appendix 1) for detailed information on the scenario evaluation process.*



Noah Berger

MTC and ABAG staff developed a second set of scenarios, relying on input from the public, cities and counties, and transportation agencies.

Visioning Scenarios

The transportation and land use alternative included in this Plan Bay Area resulted from three rounds of scenario analyses. (For a helpful flow-chart graphic of this process, see pages 24–25.) In early 2011, two potential land use patterns were developed by ABAG staff: "Current Regional Plans," which reflected cities' current general plans and visions for growth; and an "Initial Vision Scenario," a hypothetical growth pattern put forward by ABAG staff with input from local governments and county congestion management agencies. As depicted in Table 6, each land use pattern was paired with the transportation network contained in the Transportation 2035 Plan (adopted in 2009) and tested to yield a set of both target and equity performance results. These scenario results provided a starting point for a first round of visioning conversations with local governments and Bay Area residents about where new development should occur, and how new long-term transportation investments might serve this new growth.

TABLE 6: Visioning Scenarios

Land Use Patterns	Transportation Network
Current Regional Plans • Generally reflects cities' current general plans for lower amounts of growth. • Growth includes 634,000 new housing units and 1.1 million new jobs.	**Transportation 2035 Plan Network (T-2035)** • Network is the multimodal investment strategy in the Transportation 2035 Plan. • Contains significant funding for operations and maintenance of the existing system; limited expansions of highway and transit networks.
Initial Vision Scenario • Growth pattern developed with input from local governments and county congestion management agencies. • Land uses based on Priority Development Areas and Growth Opportunity Areas. • Growth includes 902,000 new housing units and 1.2 million new jobs.	

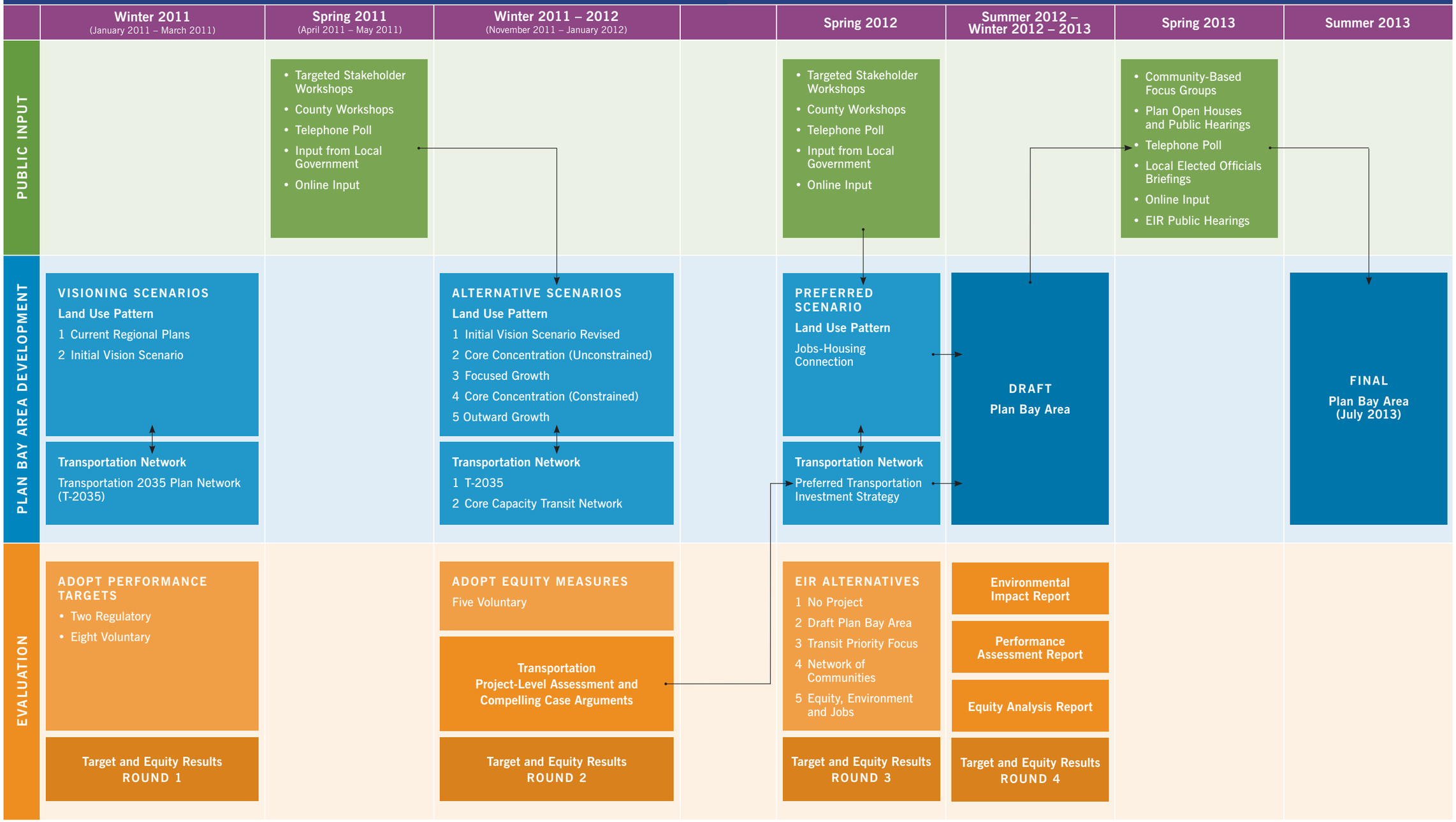
Alternatives to the Visioning Scenarios

Over the winter of 2011–12, MTC and ABAG staff developed a second set of scenarios, relying on input from the public, cities and counties, and transportation agencies. These scenarios included a wider range of alternative land use patterns as the basis for expanding the regional dialogue on the type of development, planning strategies and investments that would be best for Plan Bay Area. Five land use patterns were identified, and each was matched with one of two proposed transportation networks — the Transportation 2035 Network (i.e., the 2009 long-range plan) or a Core Capacity Transit Network — based on which best supported the pattern of development. These combinations were then separately evaluated against the performance targets, and against the five social equity measures discussed elsewhere in this chapter. See Table 7 for the specific scenario pairings.

TABLE 7: Alternatives to the Visioning Scenarios

Land Use Patterns	Transportation Networks
Initial Vision Scenario Revised • Concentrates housing and job growth in Priority Development Areas (PDAs).	**Transportation 2035 (T-2035) Plan Network** • Network is the multimodal investment strategy in the Transportation 2035 Plan. • Contains significant funding for operations and maintenance of existing system; limited expansions of highway and transit networks.
Core Concentration (Unconstrained) • Concentrates housing and job growth in locations served by frequent transit service, and/or in core Bay Area locations within a 45-minute transit commute area of downtown San Francisco, downtown Oakland or downtown San Jose. • Scenario is "unconstrained" due to the high levels of population and job growth that were assumed.	**Core Capacity Transit Network** • Significantly increases transit service frequencies along core transit network. • Keeps T-2035 investment levels for maintenance and bike/pedestrian projects; reduces T-2035 roadway expansion investments. • Requires additional capital and operating funds to pay for major expansion of transit services.
Core Concentration (Constrained) • Similar to unconstrained version above; housing and job growth is distributed to selected PDAs in the inner Bay Area, focusing on major downtowns and areas along the region's core transit network. • Scenario is "constrained" with lower levels of population and job growth relative to Initial Vision Scenario (Revised) and Core Concentration (Unconstrained).	
Focused Growth • Growth is distributed more evenly along transit corridors and job centers, with emphasis on development in PDAs and Growth Opportunity Areas (potential locations for focused growth outside already established PDAs).	
Outward Growth • Distributes greater amounts of growth to the inland Bay Area, with some emphasis on focused growth near suburban transit hubs. Scenario is closer to historical trends than the other land use options considered.	**T-2035 Network** See description above.

FIGURE 3: Plan Bay Area Development Process





Noah Berger

Preferred Scenario

In the spring of 2012, after conducting a second round of outreach to the public, local transportation agencies, cities and counties, and other stakeholders, ABAG and MTC developed the Jobs-Housing Connection Strategy. This land use scenario placed 78 percent of residential growth and 62 percent of job growth in Priority Development Areas throughout the region.

Drawing on the same outreach process and the results of a project-level transportation performance assessment (see Chapter 5), the two agencies also developed the Preferred Transportation Investment Strategy. The Jobs-Housing Connection Strategy and the Preferred Transportation Investment Strategy (displayed in Table 8) combined to form the draft Plan Bay Area, which was released in March 2013. The final Plan Bay Area was adopted by MTC and ABAG in July 2013. The main components of the plan are described in detail in chapters 3 and 4. The Plan Bay Area performance results are presented in Chapter 5.

TABLE 8: Preferred Scenario (Plan Bay Area)

Land Use Pattern	Transportation Network
Jobs-Housing Connection Strategy • Focuses 78 percent of new housing and 62 percent of new jobs in Priority Development Areas. • Reduces greenhouse gas emissions, limits growth outside of the region's core, and preserves natural resources and open space.	**Preferred Transportation Investment Strategy** • Devotes 87 percent of funding to operate and maintain existing transportation network. • Directs remaining funding to next-generation transit projects and other high-performing projects; to programs aimed at supporting focused growth and reducing GHG emissions; and to county-level agencies for locally designated priorities.



Karl Nielsen

Plan Bay Area Prompts Robust Dialogue on Transportation and Housing

Developing a multibillion dollar, long-range plan for the nine-county San Francisco Bay region is not a simple task. It is a three-year process involving four regional agencies, nine counties, 101 towns and cities, elected officials, planners, community-based organizations, the public and other stakeholders. The many moving parts include statutory and voluntary requirements, goal-setting, financial projections, calls for projects, project evaluation, forecasting, measuring, methodologies and more. Despite all this complexity, public participation is critical to ensure an open, democratic process, in which all interested residents have the opportunity to offer input and share their vision for what a vibrant, livable Bay Area will look like decades from now.

Early on in the development of Plan Bay Area, MTC and ABAG set benchmarks for involving a broad cross-section of the public. With hundreds of meetings completed and thousands of comments logged, the agencies can point to a number of indicators that show an active process. Full details are included in supplementary reports, *Plan Bay Area Public Outreach and Participation Program* (multiple volumes, listed in Appendix 1) and *Government to Government Consultation with Native American Tribes*.

- Three statistically valid telephone polls conducted in 2011, 2012 and 2013 reached out to some 5,200 Bay Area residents from all nine counties.
- Twenty-nine well-attended public workshops or hearings (at least three in each Bay Area county) attracted over 3,000 residents. A vocal contingent of participants at the public meetings expressed strong opposition to regional planning in general and to Plan Bay Area in particular.
- Eight public hearings were held in 2012 and 2013 in conjunction with development and review of the companion Plan Bay Area Draft Environmental Impact Report (DEIR) and drew another 400 participants.
- MTC and ABAG developed partnerships with community organizations in low-income communities and communities of color to conduct community surveys (1,600 completed surveys in spring 2011; 10 focus groups with 150 participants in winter 2012; and an additional 12 focus groups conducted in the spring of 2013 with 180 participants).
- Throughout the planning process, ABAG and MTC hosted meetings with local elected officials, local planning directors and officials from congestion management and transit agencies.
- An active web and social media presence resulted in some 356,000 page views by 66,000 unique visitors to the OneBayArea.org website since its launch in April 2010, and some 1,300 individuals participated in a January 2012 “virtual public workshop.” Another 90 comments were submitted on the draft plan via an interactive online comment forum.
- Release of the draft plan and DEIR drew 1,250 residents to county-based meetings that included an “open house” where participants could view displays and ask questions, followed by a public hearing. A total of 385 people spoke, and another 140 completed comment forms provided at the public hearings.
- A total of 587 letters and emails were submitted on the draft plan and DEIR. All correspondence, public hearing transcripts and comment forms can be viewed at **OneBayArea.org**.

2

The Bay Area in 2040



Noah Berger



Noah Berger

Chapter 2

The Bay Area in 2040

The Association of Bay Area Governments and the Metropolitan Transportation Commission track and forecast the region's demographics and economic trends to inform and guide Plan Bay Area investments and policy decisions.

The forecasts highlighted in this chapter reflect the best picture we have of what the Bay Area may look like in 2040, so that today's decisions align with tomorrow's expected transportation and housing needs. These forecasts form the basis for developing the regional land use plan and transportation investment strategy for Plan Bay Area.

This chapter explains the process used to develop the Plan Bay Area growth forecasts, and it describes the most recent planning assumptions used to develop the forecasts, including local general plans and other factors. It also looks at three main demographic categories that informed development of the plan: employment, population and housing.



Transbay Joint Powers Authority

What the Forecasts Tell Us:

- Between 2010 and 2040, the nine-county San Francisco Bay Area is projected to add 1.1 million jobs, 2.1 million people and 660,000 homes, for a total of 4.5 million jobs, 9.3 million people and 3.4 million homes.
- Substantial shifts in housing preferences are expected as the Bay Area population ages and becomes more diverse.
- As the Bay Area continues to recover from the lingering effects of the Great Recession, certain economic trends and indicators will likely rebound. For example, strong job growth is expected in the professional services, health and education, and leisure and hospitality sectors. Early indicators also suggest that the regional housing market is showing signs of recovery.

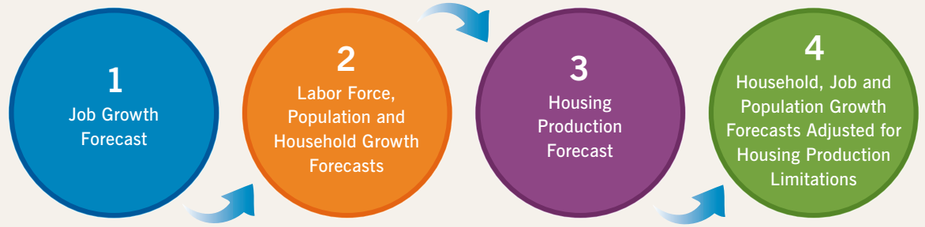
Forecasting the Region's Population, Employment and Housing

The Association of Bay Area Governments employed the Center for Continuing Study of the California Economy (CCSCE) to provide national, state and regional employment and population forecasts. The agency also hired Karen Chapple of the University of California, Berkeley, to provide a housing analysis and estimates as inputs to the ABAG housing forecast. The Metropolitan Transportation Commission employed the consulting firm Strategic Economics to provide industry-sector locational preferences, which were used as inputs to the ABAG land use forecast and Sustainable Communities Strategy.



Noah Berger

FIGURE 4: Four-Step Process for Developing Bay Area Demographic Forecasts



A Four-Step Process

The Association of Bay Area Governments developed the demographic forecasts by following four steps (Figure 4):

1 **Potential Job Growth:** Job growth by 2040 for the Bay Area was estimated as a share of the U.S. Bureau of Labor Statistics' national growth projections, reflecting the difference in 2010 between national and regional labor force participation in various economic sectors, such as the professional services and retail sectors. This analysis was performed by the Center for Continuing Study of the California Economy.

2 **Potential Population and Household Growth:** The job growth forecast determines the population and number of households, as well as household income levels. ABAG, in consultation with CCSCE, translated the Bay Area job growth projection into labor force, total population and household forecasts. These forecasts were based on labor force participation rates and the number of persons per household by age and race cohorts.

3 **Housing Production:** ABAG, in consultation with Prof. Karen Chapple at UC Berkeley, estimated regional housing production by 2040 based on past housing production levels, projected household income, and new policies and programs to support housing production in Priority Development Areas (PDAs).

4 **Feasible Job, Population and Household Growth:** ABAG adjusted for housing production limitations by 2040 that influence the number of workforce households that can be accommodated in the region. These housing production limitations, in turn, limit job growth in the region and reduce total population growth.

Assumptions

The overall regional growth forecast for Plan Bay Area relies on the following main assumptions:

- The Bay Area and national economies will be healthy, with an average unemployment rate of 5 percent or less and reasonably sufficient housing production for the workforce.
- A stronger link will be made between jobs and housing in locations sought by the workforce.
- Adjustments to the job growth forecast are needed to account for the region's expected level of housing production given historic trends and the constraints of an infill growth development pattern.
- The region will continue to receive historical levels of public funding for housing production.

For additional technical information on the regional forecasting methodology and distribution, see the Forecast of Jobs, Population and Housing, *listed in Appendix 1.*

Snapshot of the Bay Area, 2010–2040

By 2040 the San Francisco Bay Area is projected to add 2.1 million people, increasing total regional population from 7.2 million to 9.3 million, an increase of 30 percent or roughly 1 percent per year. This growth means the Bay Area will continue to be California's second-largest population and economic center. Two major demographic changes shape the forecast of household and job growth: the increase in the senior population and the increase in the Latino and Asian populations. The number of jobs is expected to grow by 1.1 million between 2010 and 2040, an increase of 33 percent. During this same time period the number of households is expected to increase by 27 percent to 700,000, and the number of housing units is expected to increase by 24 percent to 660,000. (See Table 9.) While robust, this projected rate of growth is actually slower than other metropolitan regions in California and also is slower than the Bay Area's pace of growth in the 1970s and 1980s.



Karl Nielsen

Population Forecast

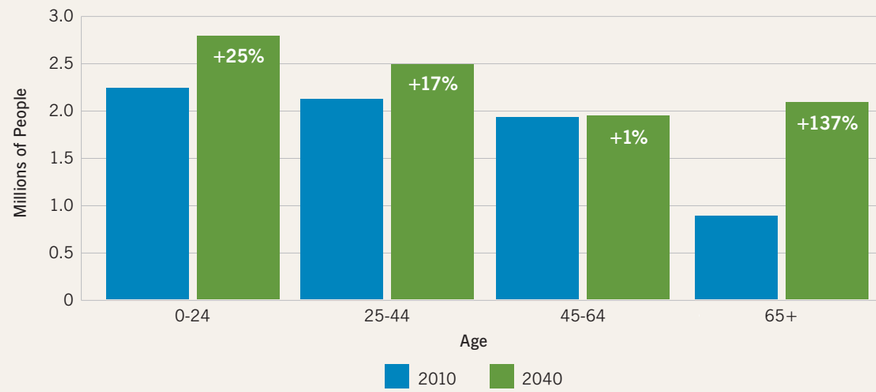
The population forecast was derived from ABAG's job growth forecast. (See "Employment Forecast," page 34.) It also analyzed the existing population and its labor force participation rates by age cohort and race. Beyond births and deaths, it was assumed that the rate of in-migration to the region will remain the same from 2010 to 2040. Incentives to produce housing close to job centers will result in some increases in the number of households and total population. (For population growth by county, see Table 12, page 40.)

TABLE 9: Bay Area Population, Employment and Housing Projections, 2010–2040

Category	2010	2040	Growth 2010–2040	Percent Change 2010–2040
Population	7,150,740	9,299,150	2,148,410	+30%
Jobs	3,385,300	4,505,220	1,119,920	+33%
Households	2,608,020	3,308,110	700,090	+27%
Housing Units	2,785,950	3,445,950*	660,000	+24%

*2010 and 2040 values include seasonal housing units.
Source: ABAG, 2013

FIGURE 5: Bay Area Population by Age, 2010 and 2040



Sources: 2010 Census, California Department of Finance, ABAG

Aging Baby Boomers

Between 2010 and 2040 the Bay Area's population is expected to grow significantly older. Today, people who are 65 and over represent 12 percent of the total population, but by 2040 the share will increase to 22 percent. Put another way, the number of seniors will more than double from under 900,000 today to nearly 2.1 million by 2040. (See Figure 5.) By contrast, the segment of population aged 45–64 will grow by less than 1 percent, and will shrink from 27 percent of the total population today to 21 percent by 2040. The projected increase in the senior population will cause the overall labor force participation rate to fall, even as more people work beyond the age of 65. By 2040, 50 people out of every 100 in the Bay Area are projected to be in the labor force, compared to 52 people out of 100 in 2010.

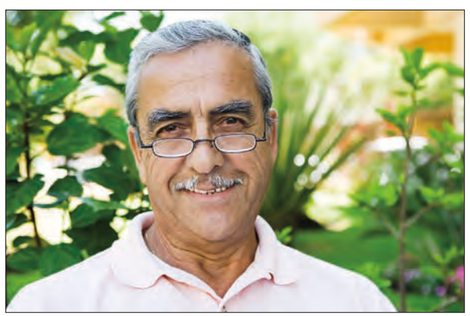


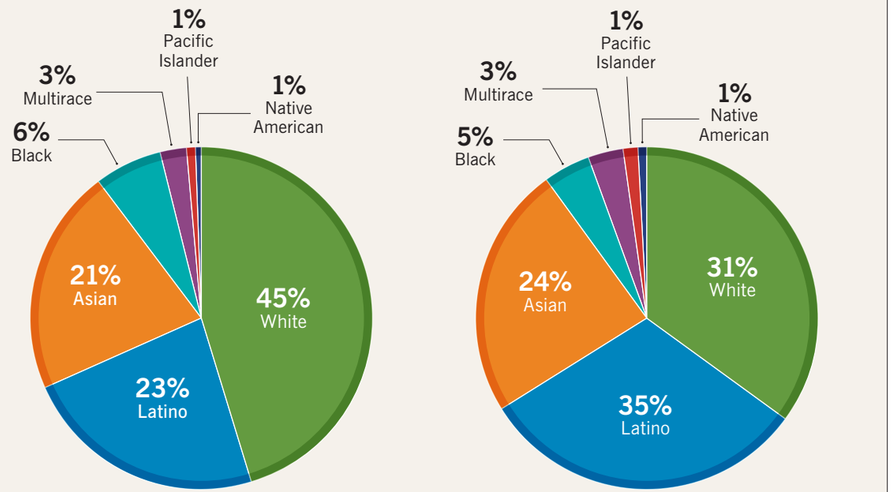
Image Source

Younger-age segments of the population will increase in size substantially, but will represent a slightly smaller share of total population in the future due to the large number of aging baby boomers. The number of people aged 25–44 will increase by 17 percent or nearly 370,000, while the number of people aged 24 and younger will increase by 25 percent or over 550,000.

Increased Racial and Ethnic Diversity

By 2040 the population will become substantially more racially and ethnically diverse. (See Figure 6). Latinos will emerge as the largest ethnic group, increasing from 23 percent to 35 percent of the total population. The number of Asians also will increase, growing from 21 percent to about 24 percent of the population. According to the California Department of Finance, the Latino and Asian populations also form multigenerational households at a higher rate than the general population. (See "Housing Forecast," page 38.)

FIGURE 6: Bay Area Population by Race/Ethnicity, 2010 and 2040



Sources: 2010 Census, California Department of Finance, ABAG

In contrast, the share of non-Hispanic whites will drop sharply from approximately 45 percent of today's population, to about 31 percent in 2040. The African-American segment of the population also is expected to decline slightly, dropping from 6 percent to 5 percent, while other demographic groups are expected to maintain a similar share of the population in the future as they do today.

Employment Forecast

The Association of Bay Area Governments forecasted regional employment by industry sector utilizing an analysis of the Bay Area's competitiveness by industry in relation to the state and national growth forecast conducted by CCSCE. The analysis took into account the Bay Area's concentration of knowledge-based industries, research centers and universities; the presence of a highly educated and international labor force; expanding international networks serving the global economy; and the overall diversity of the regional economy.



Lawrence Migdale

These fundamental assets underpinning the Bay Area economy still are strong. While it is true that the region has not recovered all jobs lost since the "dot-com bubble" popped in 2000, the so-called "jobless growth" of the last decade was a national phenomenon not limited to the Bay Area. Furthermore, various parts of the regional economy are on the mend. For example, the Bay Area led California job growth in 2012 with 91,400 new jobs, a nearly 3 percent increase from 2011 and more than twice the nationwide average, according to Bloomberg News ("Google, Facebook lead Bay Area jobs," Jan. 27, 2013). Based on the above factors and strong fundamentals, Bay Area employment is forecast to grow at a slightly faster rate than that of the nation as a whole.

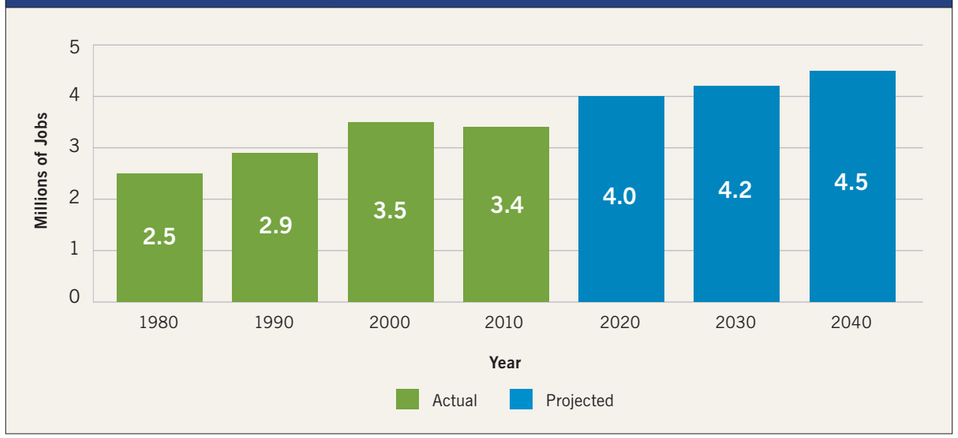
Substantial numbers of jobs are expected to be created between 2010 and 2040 (Figure 7). More than half of the projected 1.1 million new jobs are expected to be created between 2010 and 2020, which includes the recovery of close to 300,000 jobs lost during the Great Recession that began in 2007. The gain of 1.1 million jobs does not translate directly into new office, commercial or industrial construction. About one-third of these jobs could potentially be accommodated within existing offices and facilities, given current vacancy rates. Many of these jobs are expected to be filled by currently unemployed or underemployed individuals. From 2020 to 2040, the rate of job growth is forecast to slow in comparison to the 2010–2020 period.

The job growth forecast was adjusted based on the difficulties in supplying sufficient housing in the Bay Area to meet the need for workforce housing within reasonable commute times. The historic imbalances in the Bay Area housing market have resulted in excessively high housing prices in locations close to job centers. Employers have consistently cited these imbalances as the most difficult aspect of recruiting and retaining high-quality employees in the region.

Employment Growth Highest in Professional Services, Health and Education, and Leisure and Hospitality Economic Sectors

Major industry job trends in the Bay Area over the next 30 years are expected to largely mirror national trends. Nearly 73 percent of total employment growth is projected to be in the professional services,

FIGURE 7: Total Regional Employment, 1980–2040



Sources: 1980 Census, California Department of Finance (1990–2000), ABAG (2010–2040)

The Bay Area led California job growth in 2012 with 91,400 new jobs, a nearly 3 percent increase from 2011.

health and education, and leisure and hospitality sectors. The national trends of slower growth in retail and finance are also expected in the Bay Area. Construction jobs are expected to almost regain pre-recession levels by 2020 and to increase by 2040. Although this is a substantial gain compared to 2010, it is driven primarily by a slow return to more normal construction levels in the region. Manufacturing jobs are projected to remain more or less stable through 2040. (See Table 10.)

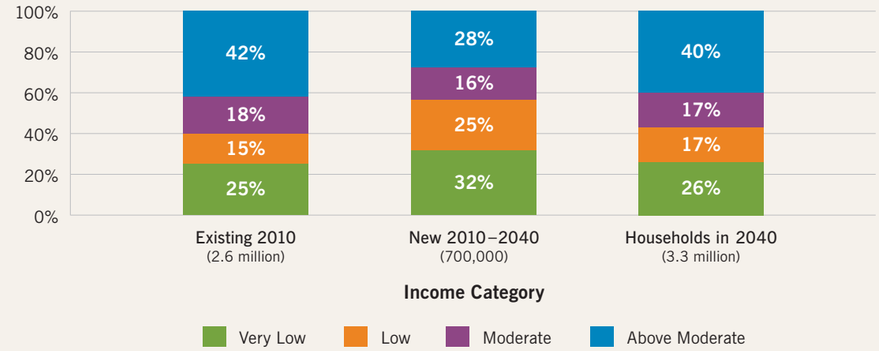
Industry sectors contain a wide spectrum of wages, which correspond to the skill levels and training needed for different occupations. This is especially true for the two sectors with the highest projected growth: professional services and health and education. For example, fewer than half the jobs in professional services require the higher levels of education and specialization that one might consider typical for this sector. The construction, manufacturing and wholesale sectors have significant numbers of jobs in middle-income occupations, while the leisure and hospitality (which includes hotels) and retail sectors have higher shares of low-income jobs. While there are substantial opportunities in fast-growing sectors with large numbers of high-income jobs, these sectors also will create middle- and low-income jobs. For example, the professional services sector will create both high-income jobs, such as a vice president of sales, and lower-income jobs, such as a file clerk.

TABLE 10: Bay Area Employment by Sector, 2010–2040, Ranked by Job Growth

Sector	2010	2040	Growth (Loss) 2010–2040	Percent Change 2010–2040
Professional Services	596,700	973,600	376,900	+63%
Health and Education	447,700	698,600	250,900	+56%
Leisure and Hospitality	472,900	660,600	187,600	+40%
Construction	142,300	225,300	82,900	+58%
Government	499,000	565,400	66,400	+13%
Retail	335,900	384,400	48,500	+14%
Finance	186,100	233,800	47,700	+26%
Information	121,100	157,300	36,300	+30%
Transportation and Utilities	98,700	127,400	28,600	+29%
Manufacturing and Wholesale	460,200	456,100	(4,100)	-1%
Agriculture and Natural Resources	24,600	22,700	(1,900)	-8%
All Jobs	**3,385,300**	**4,505,200**	**1,119,900**	**+33%**

Sources: California Center for Continuing Study of the California Economy, ABAG

FIGURE 8: Bay Area Households by Income Category, 2010–2040



Sources: U.S. Census; Karen Chapple and Jacob Wegmann, *Evaluating the Effects of Projected Job Growth on Housing Demand*, 2012

Household Income Forecast

The household income forecast was based on projected jobs by sector, associated occupations and wages, and trends in the geographic distribution of households by income level over the past several decades. Wages were calculated based on the occupations within each industry group. Other income, such as capital gains from stock market investments, was estimated from state and national forecasts as well as from past regional trends. The geographic distribution of households by income was estimated from the U.S. Census.

Today, about 40 percent of the existing 2.6 million households in the Bay Area (or just over 1 million) fall into the very-low and low-income groups, according to U.S. Census figures. Due to the growth in leisure and hospitality, retail and other low-income jobs (see Table 10), the number of people in very-low and low-income groups is projected to increase from 40 percent of households to 43 percent of households by 2040, while those in the moderate and above-moderate categories will decrease from 60 percent to 57 percent of households (see Figure 8).



Noah Berger



Noah Berger

Housing Forecast

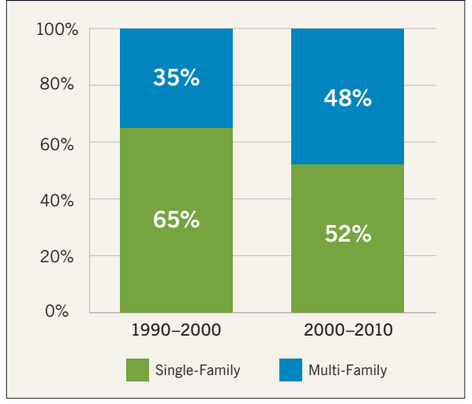
The Association of Bay Area Governments based its housing production forecast on expected household income and demand, past housing production trends, and local plans (including planned zoning changes). It also assumed the following:

- Existing policies and programs to produce housing will be retained and enhanced.
- A replacement mechanism will be found to fund and implement many of the functions that were performed by California redevelopment agencies before Gov. Jerry Brown signed legislation abolishing those agencies in June 2011.
- Some aging baby boomers will move to residential care facilities or other group housing.
- An estimated 40,000 vacant or foreclosed homes will be reabsorbed into the region's housing supply.

Demand for Multi-Unit Housing in Urban Areas Close to Transit Expected to Increase

The Bay Area has produced an average of just over 23,000 housing units annually since the 1980s. Single-family homes represent the majority of housing production in recent decades. Most of these homes were built on undeveloped land in suburban locations that provided housing for the post-war baby boom generation and their families. However, according to the Urban Land Institute's *What's Next? Real Estate in the New Economy* (2011), recent trends suggest that cities once again are becoming centers of population growth, including in the Bay Area. On average, construction of multifamily housing in urban locations in the Bay

FIGURE 9: Bay Area Housing Construction By Type, 1990–2010



Source: U.S. Census

Bay Area Housing Market Appreciation

In January 2013 the real estate information service Zillow analyzed 30 metropolitan housing markets nationwide. It predicted that the San Francisco and San Jose metro areas will be among the top markets experiencing home value appreciation in 2013. Zillow ranked the San Francisco metro area (including San Francisco, Marin, San Mateo, Alameda and Contra Costa counties) number four in the country for potential home value appreciation and predicted that median home prices will rise by 7 percent in 2013. Zillow ranked the San Jose metro area number seven and predicted that median home prices will also rise by 7 percent. Although these predicted growth rates are slower than housing market appreciation in 2012, they suggest that Bay Area homeowners will continue to benefit — and Bay Area homebuyers will continue to struggle — due to high housing costs.

TABLE 11: Top U.S. Markets for 2013 Home Value Appreciation

Metro area	Median home value December 2012	Change from December 2011	2013 appreciation forecast
Riverside	$197,400	9.3%	12.5%
Sacramento	225,200	11.7%	11.9%
Phoenix	157,800	22.5%	8.5%
San Francisco*	526,200	14.0%	7.3%
Los Angeles	414,900	7.9%	7.3%
San Diego	373,400	10.0%	6.7%
San Jose	630,800	15.4%	6.6%
Seattle	270,500	6.5%	4.6%
Nationwide	**$157,400**	**5.9%**	**3.3%**

*Includes San Francisco, Marin, San Mateo, Alameda and Contra Costa counties.
Source: *San Francisco Chronicle*, "Zillow expects home values in San Francisco to grow but also slow," January 22, 2013.

Area increased from 35 percent of total housing construction in the 1990s to nearly 50 percent in the 2000s (see Figure 9), and in the year 2010 it represented 65 percent of all housing construction.

Based upon the emerging demographic changes and employment growth forecasts previously discussed, an annual average of approximately 22,000 units or 660,000 new homes are forecast to be constructed by 2040. Demand for multifamily housing is projected to increase as seniors downsize and seek the greater access to shops and services that urban locations provide. Market demand for new homes will tilt toward townhomes, condominiums and apartments in developed areas. These homes are typically closer to transit, shops and services than are homes in the single-family developments of earlier decades.

Market demand for housing near transit also is expected to increase. According to the University of Southern California Population Dynamics Research Group's *The 2010 Census Benchmark for California's Growing and Changing Population* (2011), people aged 55 and over are more likely to prioritize public transportation, walking, access to shops and services, and multifamily housing than do other age groups. Young singles prefer similar locations

TABLE 12: Population Growth by County, 2010–2040			
County	**2010**	**2040**	**Percent**
Alameda	1,510,270	1,987,950	32%
Contra Costa	1,049,030	1,338,440	28%
Marin	252,410	285,400	13%
Napa	136,480	163,680	20%
San Francisco	805,240	1,085,730	35%
San Mateo	718,450	904,430	26%
Santa Clara	1,781,640	2,423,470	36%
Solano	413,340	511,600	24%
Sonoma	483,880	598,460	24%
Total*	**7,150,740**	**9,299,150**	**30%**

*Sum of county totals may not match regional totals due to rounding.
Source: ABAG, 2013

with urban amenities, and they prioritize short commutes. These demographic changes represent substantial shifts that are expected to contribute to the Bay Area's recovery from the Great Recession. For example, the regional real estate market already is showing signs of recovery. (See "Bay Area Housing Market Appreciation" sidebar for more detail.)

The current single-family housing stock provides a large supply relative to future demand, and an oversupply is projected by 2040. This oversupply is expected to dampen production of multifamily housing, as some households opt instead for single-family homes that are made more affordable due to the excess supply. Despite lower demand for newly constructed single-family homes, some production will occur as the Bay Area housing market gradually adjusts to these changing demographics.

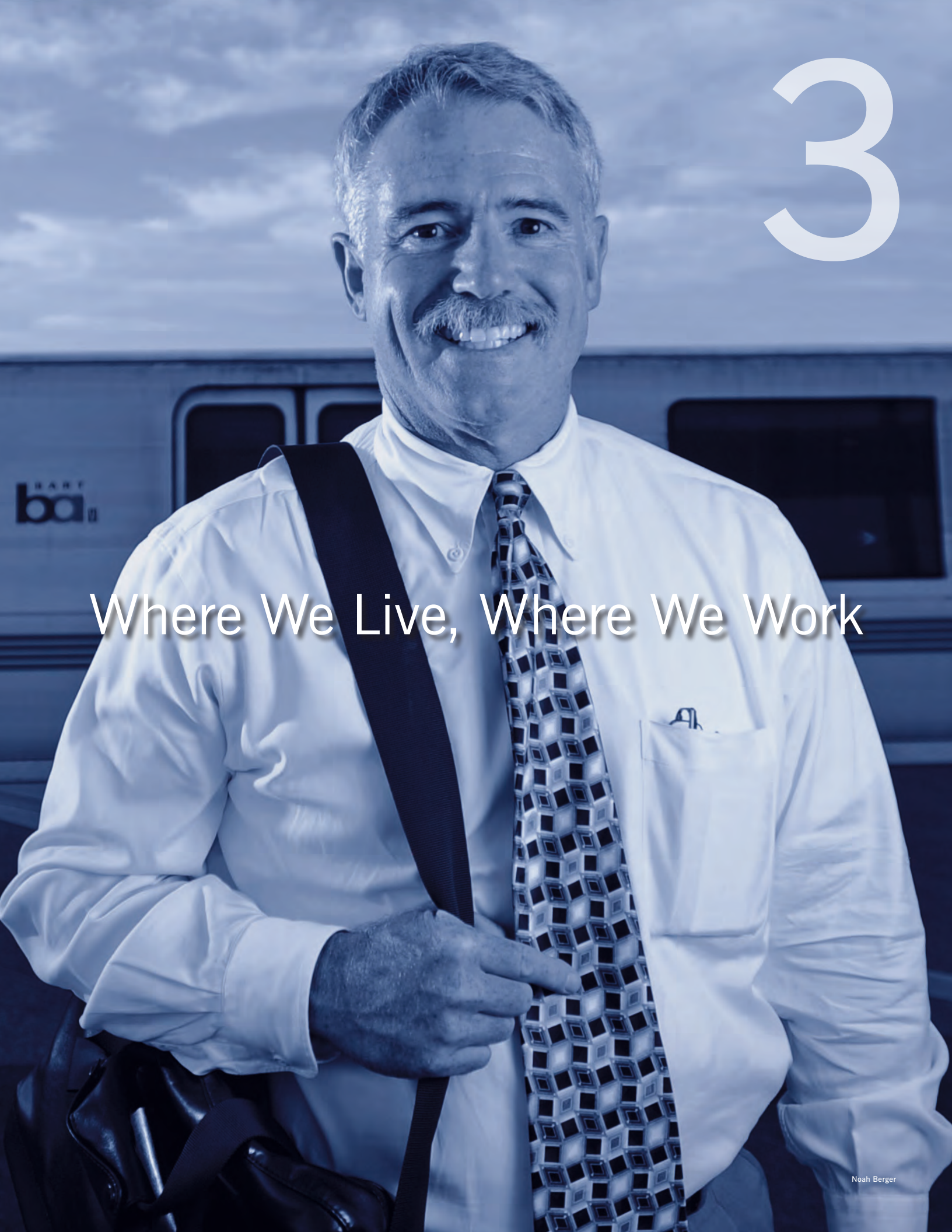


Billy Hustace

Looking Ahead at Providing Housing and Mobility for Our Workforce

The demographic forecasts summarized in this chapter were used to develop the land use distribution discussed in Chapter 3. The population, employment and housing forecasts provide information to help determine how the region will house its new residents looking forward to 2040. It should be noted that Plan Bay Area and its related forecasts will be updated every four years.

The forecasts and future land use distribution also will affect Bay Area travel patterns. These patterns include who is traveling, where travelers are going, and when people are using the region's transportation system. All these factors influence how the region will house its workforce and provide transportation choices that will increase access to people's homes and jobs.



3

Where We Live, Where We Work

Noah Berger



Noah Berger

Chapter 3

Where We Live, Where We Work

ABAG and MTC developed a variety of land use and transportation scenarios that distributed the total amount of growth forecasted for the region to specific locations.

These scenarios sought to address the needs and aspirations of each Bay Area jurisdiction, as identified in locally adopted general plans and zoning ordinances, while meeting Plan Bay Area performance targets adopted by the agencies to guide and gauge the region's future growth.

The framework for developing these scenarios consisted of Priority Development Areas (PDAs) and Priority Conservation Areas (PCAs) recommended by local governments. ABAG and MTC created the scenarios through a transparent, deliberative process, during which public input was sought at every step along the way. After further modeling, analysis and public engagement, the five initial scenarios were narrowed down to a single preferred land use scenario. This scenario and resulting development pattern represent the Sustainable Communities Strategy (SCS) that Plan Bay Area must include in the Regional Transportation Plan, as mandated by Senate Bill 375.

The preferred land use scenario is a flexible blueprint for accommodating growth over the long term. Pairing this development pattern with the transportation investments and policies described in Chapter 4 is what makes Plan Bay Area the first truly integrated land use and transportation plan for the region's anticipated growth.



ABAG Archives

A More Focused Future

As required by SB 375, the land use distribution in Plan Bay Area identifies the locations that can accommodate future growth, including the scale and type of growth most appropriate for different types of locations. In order to meet the Bay Area's greenhouse gas (GHG) emissions reduction and housing targets, and to make progress toward meeting the other adopted performance targets, the plan encourages future job and population growth in established communities with access to existing or planned transportation investments. The land use pattern seeks to achieve four comprehensive objectives:

1 **Create a Network of Complete Communities** — Building on the PDA framework of complete communities that increase housing and transportation choices, the plan envisions neighborhoods where transit, jobs, schools, services and recreation are conveniently located near people's homes.

2 **Increase the Accessibility, Affordability and Diversity of Housing** — The distribution of housing in the Bay Area is critical, given its importance to individuals, communities and the region as a whole. The Bay Area needs sufficient housing options to attract the businesses and talented workforce needed for a robust future economy.

3 **Create Jobs to Maintain and Expand a Prosperous and Equitable Regional Economy** — The plan seeks to reinforce the Bay Area's role as one of the most dynamic regional economies in the United States. It focuses on expanding the existing concentration of knowledge-based and technology industries in the region, which is a key to the Bay Area's economic competitiveness.

4 **Protect the Region's Unique Natural Environment** — The Bay Area's greenbelt of agricultural, natural resource and open space lands is a treasured asset that contributes to residents' quality of life and supports regional economic development.

Land Use Distribution Approach

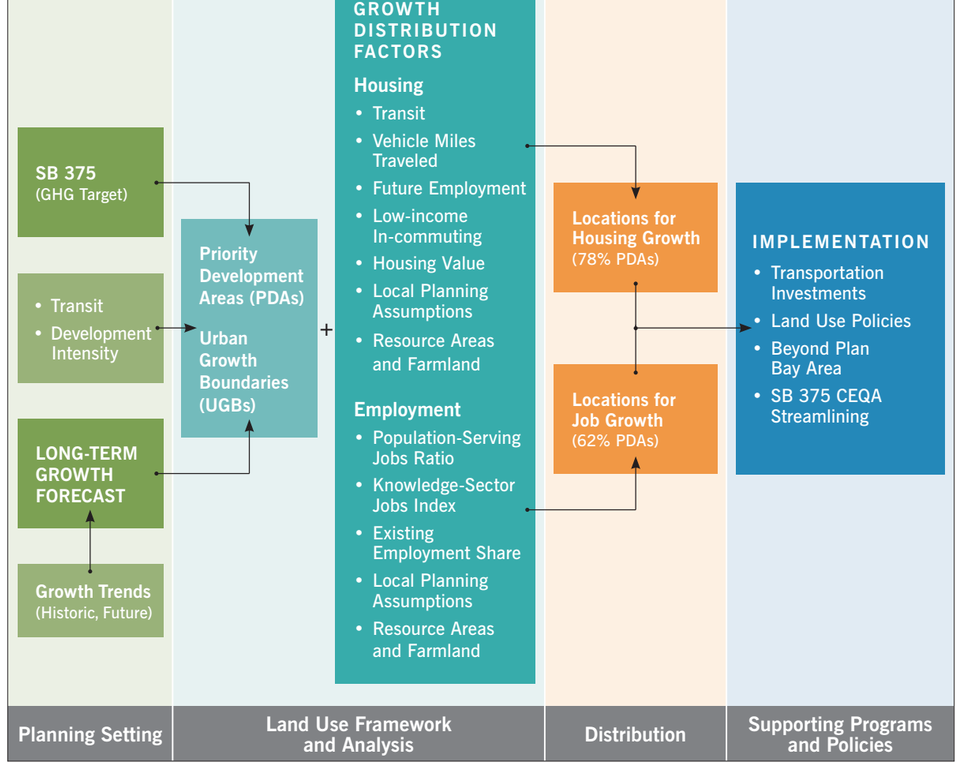
There are two main inputs for the Plan Bay Area land use distribution process (Figure 10). The first input is California Senate Bill SB 375, under which the Bay Area is required to identify a land use pattern that will:

1 **Help the Region Achieve Its GHG Emissions Reduction Target** of reducing per-capita CO_2 emissions from cars and light-duty trucks by 7 percent by 2020 and by 15 percent by 2035; and

2 **House 100 Percent of the Region's Projected 25-year Population Growth** by income level (very-low, low, moderate, above-moderate) without displacing current low-income residents.

The second input is the long-term growth forecast developed using historic and future demographic trends, as described in Chapter 2. In addition to these inputs, the land use distribution emphasizes growth in nearly 200 locally identified Priority Development Areas (PDAs) along the region's core transit network, and accommodates 100 percent of new growth within existing urban growth boundaries

FIGURE 10: Plan Bay Area Land Use Distribution Process



MAP 2

Open Space and Williamson Act Lands

Priority Conservation Areas

Publicly Owned Parks and Open Space

Riparian Corridors, Hillside Areas, Greenbelt Reserves and Floodplains

Williamson Act Lands
Some Williamson Act contracts are set to expire and be decommissioned during the plan period.

Not Categorized
Includes land that may be designated as Urban and Built-up as defined by the Farmland Mapping and Monitoring Program in 2010. These lands include areas occupied by structures with a building density of at least 1 unit to 1.5 acres, or approximately 6 structures to a 10-acre parcel. This land is used for residential, industrial, commercial, construction, institutional, public administration, railroad and other transportation yards, cemeteries, airports, golf courses, sanitary landfills, sewage treatment, water control structures and other developed purposes. Also may include areas within Urban Growth Boundaries/Urban Limit Lines, Urban Service Areas and Spheres of Influence. This category may also include undeveloped lands classified as Farmland, Critical Habitat and Grazing Lands. See "Resource Lands" map for the location of these areas.

2010 POPULATION

Oakland	> 350,000
Novato	50,000–350,000
Pacifica	<50,000

ROADS

Freeway

Major Road

0 10 20 30 Miles

0 10 20 30 40 Kilometers

Map is for general information. For more information on local zoning or designations for a particular site or parcel, please contact your city or county.

Greater detail can be found in the sub-regional maps in Appendix 2. Additional legend information can be found at the end of the appendix.

and urban limit lines. It also emphasizes protection for the region's agricultural, scenic and natural resources areas, including Priority Conservation Areas.

The nearly 200 adopted PDAs are existing neighborhoods nominated by local jurisdictions as appropriate places to concentrate future growth that will support the day-to-day needs of residents and workers in a pedestrian-friendly environment served by transit. Emphasizing higher levels of growth in these locations means that many neighborhoods, particularly established single-family home neighborhoods, will see minimal future change. A key part of the PDA strategy is to move away from an unplanned "project-by-project" approach to growth, toward the creation of complete communities that meet the needs of existing and new residents and workers.

Priority Conservation Areas (PCAs) comprise over 100 regionally significant open spaces about which there exists broad consensus for long-term protection, but which face nearer-term development pressures. They are a mechanism for implementing Plan Bay Area — particularly in the North Bay, where they are central to the character and economy of many communities, and they ensure that Plan Bay Area considers farmland and resource areas in keeping with Senate Bill 375. The PCAs and PDAs complement one another: Promoting compact development within PDAs takes development pressure off the region's open space and agricultural lands.

In contrast to past trends that saw the outward expansion of urban growth in the region and spillover growth in surrounding regions, Plan Bay Area directs new growth within locally adopted urban growth boundaries to existing communities along major transit corridors. For decades communities throughout the Bay Area have protected farmland, open space and natural resources using urban growth boundaries and other policies and investment strategies. Because urban growth boundaries and related growth controls constrain the amount of geography available for development, they not only protect valuable open space, they also help ensure that future development will assume a more compact pattern than in past decades. (See "Open Space and Williamson Act Lands" map on page 44 and "Resource Lands" map on page 46.)



ABAG Archives

MAP 3

Resource Lands

Farmland

Critical Habitat

Grazing Lands

Not Categorized

Includes land that may be designated as Urban and Built-up as defined by the Farmland Mapping and Monitoring Program in 2010. These lands include areas occupied by structures with a building density of at least 1 unit to 1.5 acres, or approximately 6 structures to a 10-acre parcel. This land is used for residential, industrial, commercial, construction, institutional, public administration, railroad and other transportation yards, cemeteries, airports, golf courses, sanitary landfills, sewage treatment, water control structures and other developed purposes. Also may include areas within Urban Growth Boundaries/Urban Limit Lines, Urban Service Areas and Spheres of Influence. These areas may also include Open Space/Parks, Riparian Corridors, Hillside Areas, Greenbelt Reserves, Floodplains and Williamson Act Lands. See "Open Space and Williamson Act Lands" map for the location of these areas.

2010 POPULATION

Oakland	> 350,000
Novato	50,000–350,000
Pacifica	<50,000

ROADS

Freeway

Major Road

0 10 20 30 Miles

0 10 20 30 40 Kilometers

Map is for general information. For more information on local zoning or designations for a particular site or parcel, please contact your city or county.

Greater detail can be found in the sub-regional maps in Appendix 2. Additional legend information can be found at the end of the appendix.

San Francisco Bay Area Job Growth

2040 Employment Distribution Approach and Methodology

Responding to Business Location Trends

Plan Bay Area's distribution of the forecasted jobs throughout the region is informed by changing trends in the locational preferences of the wide range of industry sectors and business place types in the Bay Area. These trends capture ongoing geographic changes, as well as changes in the labor force composition and workers' preferences. Overall, the changing needs of businesses suggest a transition toward a more focused employment growth pattern for the Bay Area. This focused growth takes a variety of forms across the various employment centers throughout the region, as summarized below. The plan's long-range employment forecast is developed for planning purposes only, and it is not intended to pre-determine subsequent transportation funding allocation decisions.

- **Knowledge-Based Jobs, Culture and Entertainment at Regional Centers**
  The growth of the professional services sector is expected to result in more jobs in downtown San Francisco, downtown Oakland and downtown San Jose — assuming an appropriate provision of infrastructure, transit and access to affordable housing. These downtown areas also have attracted international business and leisure travelers, as well as artists and entertainers, fueling the rise of leisure and cultural activities. Similar to the growth of San Francisco's financial district in the 1970s, and Silicon Valley in the 1990s, the Bay Area is attracting new businesses and workers seeking to locate near related firms, services and amenities. These businesses and professionals seek flexible building spaces and require less office space per worker compared to traditional office space expansion in downtown areas.



ABAG Archives

- **Multiple Activities and Transit at Office Parks**
  Office parks are expected to continue to accommodate a growing number of employees. However, given the limited land available for new office parks, available vacant office space, and the preference for walkable, transit-served neighborhoods by growing numbers of employers, office parks are expected to grow at a slower pace than in past decades. Many existing office parks are changing to use less space per worker, provide direct transit access, and even offer housing, services and other amenities. Growing numbers of businesses, particularly in San Mateo and Santa Clara counties, are providing private shuttle services to help their employees commute to work. Increasing and improving transit access to office parks will lessen, but not fully mitigate, increased traffic congestion related to employment growth.
- **Downtown Areas and Transit Corridors Serving Residents**
  Over the last decade, medium and small cities throughout the region have been expanding the range of services and jobs provided in their downtown areas. As described in Chapter 2, the increase in the senior population, combined with the region's changing ethnic profile, is expected to increase the demand for local

services, housing and transportation choices across the region, including in many of these medium and small downtown areas. Many of these locations have been identified as PDAs and have shown increased concentrations of knowledge-based jobs in the arts, recreation, health and education sectors.

- **New Vitality of Industrial Lands**
  Manufacturing and wholesale distribution have experienced declining employment in many of the region's key industrial areas. However, in recent years a different and very diverse mix of businesses has relocated to some of these Bay Area locations. In addition to basic services such as shuttle operations and refuse collection, or traditional uses such as concrete plants, industrial lands are now occupied by food processing, high-tech product development, car repair, graphic design and recycling businesses, among others. The building and space needs of these businesses make traditional industrial lands attractive. These new businesses provide jobs, and also provide essential support to other sectors of the economy and vital services to nearby residents. It is in the region's best interest to ensure that new businesses have access to industrial lands, so that the jobs they create remain in the Bay Area.

Employment Distribution Methodology

The distribution of forecasted employment growth considers job growth by sector and is linked to input from local residents and planning departments. Employment growth is organized under three major groups: knowledge-sector jobs, population-serving jobs and all other jobs. The number of knowledge-sector jobs — such as jobs in information technology companies, legal or engineering offices, or biotechnology firms — is expected to grow based on the current concentrations of these jobs, the specialized skills and experience required to perform these jobs, and past growth in the sector. The number of population-serving jobs, such as those in retail stores or restaurants, is expected to grow in a manner reflecting the distribution of future household growth. The number of jobs in all other sectors, including the government, agriculture and manufacturing sectors is expected to grow according to the existing distribution of jobs in each of these sectors. Finally, the employment growth distribution also is linked to access to transit service, which continues to be a major draw for both employers and employees.

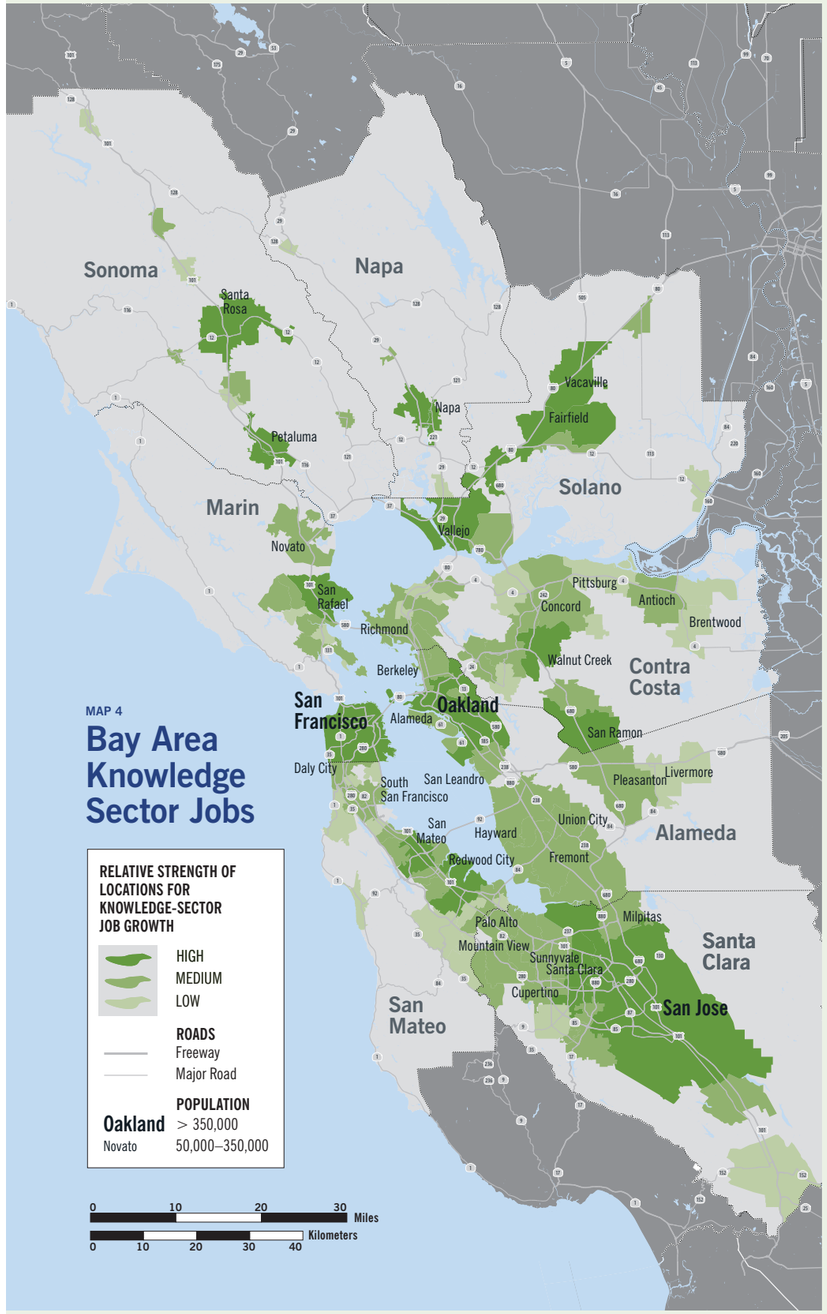
Employment by Economic Sector and County

The first step in the employment distribution was to determine the composition of employment in 2040 by different industry sectors for the region as a whole. This was derived from the Center for Continuing Study of the California Economy's *Bay Area Job Growth to 2040: Projections and Analysis* (February 2012). The next step was to distribute 2040 job numbers among the nine counties for each industry sector based upon county shares of regional employment, as reported in Caltrans' California County-Level Economic Forecast: 2011–2040 (August 2011).

Employment by Jurisdiction and Priority Development Area

The distribution of employment by jurisdiction and Priority Development Area was calculated using five growth distribution factors. The first three distribution factors are based upon the type of job. The fourth and fifth distribution factors are local planning assumptions, and the locations of resource areas and farmlands.

1 **Knowledge-Sector Jobs Index:** For jobs in the professional and business services, information and finance sectors, a "knowledge strength index" was used to weight the distribution of jobs within each county at the jurisdiction level. The index reflects the tendency of these jobs to be located in areas with already high concentrations of similar companies and a shared labor pool. (See "Knowledge-Based Jobs Expected to Lead Bay Area Employment Growth to 2040" on facing page.)



Map is for general information. For more information on local zoning or designations for a particular site or parcel, please contact your city or county.

Knowledge-Based Jobs Expected to Lead Bay Area Employment Growth to 2040

Knowledge-based jobs in the Bay Area include jobs in the professional services, information and finance sectors, as well as some occupations with relatively high educational requirements in the health and education sectors. Many companies in these sectors are expected to continue the historical trend of specializing in the design and development of new products and information. Robust growth in the amount of knowledge-based employment is supported by a highly educated labor pool and provides many high-wage jobs. The map at left shows the weighted knowledge strength index used to distribute knowledge sector jobs within each county.

Compared with other regions, the Bay Area's labor force has the highest share of college graduates (44 percent) in the country and is anchored by educational and research institutions that can continue to deliver high-quality talent. These leading sectors have represented and will continue to represent a high share of the total regional job growth. Although the knowledge-based sectors help define the overall pace of growth for the region, their success is advanced by a very diverse regional economy.



Noah Berger

2 **Population-Serving Jobs Ratio:** For jobs that provide services to households, employment location is dependent upon where people live. As a result, growth of these jobs was distributed based upon the geographic distribution of household growth in the region. Residential construction jobs also were included in this category, as they will be located where new housing is built.

3 **Existing Employment Share for All Other Jobs:** For the remaining sectors, employment growth was distributed based upon the existing distribution in 2010, using data from the National Establishment Times-Series (NETS) database, which provides employment information by location of business establishments.

4 **Local Planning Assumptions:** This information, including locally adopted general plans and neighborhood plans, was supplied by local planning departments.

5 **Resource Areas and Farmland:** This information was derived from farmland and resource lands, the locations of Priority Conservation Areas, and the urban growth boundaries.

TABLE 13: Bay Area Job Growth 2010–2040, Top 15 Cities

		Jobs		2010–2040 Job Growth	
Rank	Jurisdiction	2010	2040	Growth	Percentage Growth
1	San Francisco	568,720	759,500	190,780	34%
2	San Jose	377,140	524,510	147,380	39%
3	Oakland	190,490	275,760	85,260	45%
4	Santa Clara	112,890	146,180	33,290	29%
5	Fremont	90,010	120,000	29,990	33%
6	Palo Alto	89,690	119,470	29,780	33%
7	Santa Rosa	75,460	103,940	28,470	38%
8	Berkeley	77,110	99,330	22,220	29%
9	Concord	47,640	69,450	21,810	46%
10	Sunnyvale	74,810	95,600	20,790	28%
11	San Mateo	52,540	72,950	20,410	39%
12	Hayward	68,140	87,820	19,680	29%
13	Redwood City	58,080	77,480	19,400	33%
14	Walnut Creek	41,720	57,380	15,660	38%
15	Mountain View	47,950	63,590	15,640	33%

MAP 5

Change in Jobs per Acre: 2010–2040

Very Low 1 – 50
Low 50 – 1,000
Medium 1,000 – 5,000
Med. High 5,000 – 10,000
High 10,000 – 20,000
Very High Greater than 20,000

Urbanized Areas
Urban Boundary Zones

PRIORITY DEVELOPMENT AREAS (PDAs)

Planned: Has a formally adopted plan, as determined by a local jurisdiction.

Potential: Requires more local planning, review and action before it can become a Planned PDA.

ROADS AND RAILROADS

Rail Line
Freeway
Major Road

2010 POPULATION

Oakland > 350,000
Novato 50,000–350,000
Pacifica <50,000

Urbanized Areas: Includes land designated as Urban and Built-up as defined by the Farmland Mapping and Monitoring Program in 2010. These lands include areas occupied by structures with a building density of at least 1 unit to 1.5 acres or approximately 6 structures to a 10-acre parcel. This land is used for residential, industrial,commercial, construction, institutional, public administration, railroad and other transportation yards, cemeteries, airports, golf courses, sanitary landfills, sewage treatment, water control structures and other developed purposes.

Urban Boundary Zones: Includes areas within Urban Growth Boundaries/ Urban Limit Lines, Urban Service Areas and Spheres of Influence.

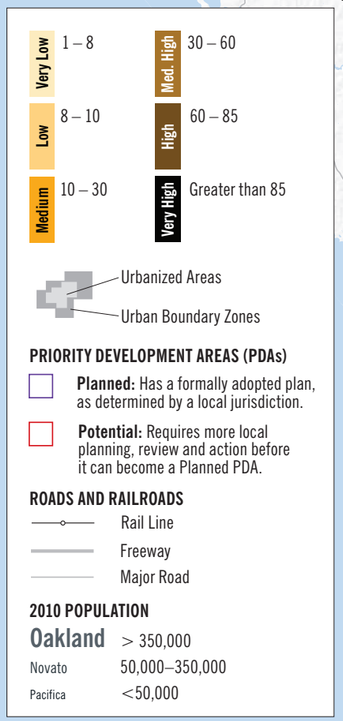
0 10 20 30 Miles
0 10 20 30 40 Kilometers

Map is for general information. For more information on local zoning or designations for a particular site or parcel, please contact your city or county.
Greater detail can be found in the sub-regional maps in Appendix 2.

Cloverdale
Healdsburg
Calistoga
Sonoma
Windsor
Napa
St. Helena
Santa Rosa
Sebastopol
Yountville
Rohnert Park
Cotati
Petaluma
Vacaville
Dixon
Fairfield
Suisun City
Solano
Rio Vista
American Canyon
Vallejo
Benicia
Marin
Novato
Hercules
Pinole
Martinez
Pittsburg
Antioch
Oakley
Fairfax
San Anselmo
Ross
San Rafael
San Pablo
Concord
Pleasant Hill
Clayton
Brentwood
Larkspur
Mill Valley
Corte Madera
Richmond
El Cerrito
Lafayette
Walnut Creek
Contra Costa
Belvedere
Tiburon
Sausalito
Albany
Berkeley
Emeryville
Orinda
Piedmont
Oakland
Moraga
Danville
San Francisco
Alameda
San Ramon
Dublin
Pleasanton
Livermore
Daly City
Colma
Brisbane
San Leandro
South San Francisco
San Bruno
Pacifica
Millbrae
Burlingame
San Mateo
Hayward
Union City
Alameda
Foster City
Hillsborough
Newark
Redwood City
Belmont
San Carlos
Menlo Park
Fremont
East Palo Alto
Half Moon Bay
Atherton
Woodside
Palo Alto
Milpitas
Mountain View
Los Altos
Los Altos Hills
Portola Valley
Sunnyvale
Santa Clara
Cupertino
San Jose
Santa Clara
San Mateo
Campbell
Saratoga
Monte Sereno
Los Gatos
Morgan Hill
Gilroy

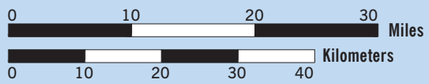
MAP 6

Change in Households per Acre: 2010–2040



Urbanized Areas: Includes land designated as Urban and Built-up as defined by the Farmland Mapping and Monitoring Program in 2010. These lands include areas occupied by structures with a building density of at least 1 unit to 1.5 acres or approximately 6 structures to a 10-acre parcel. This land is used for residential, industrial,commercial, construction, institutional, public administration, railroad and other transportation yards, cemeteries, airports, golf courses, sanitary landfills, sewage treatment, water control structures and other developed purposes.

Urban Boundary Zones: Includes areas within Urban Growth Boundaries/ Urban Limit Lines, Urban Service Areas and Spheres of Influence.



Map is for general information. For more information on local zoning or designations for a particular site or parcel, please contact your city or county.
Greater detail can be found in the sub-regional maps in Appendix 2.

2040 Employment Distribution Highlights

The combined effect of the growth distribution factors directs job growth toward the region's larger cities and Priority Development Areas with a strong existing employment base and communities with stronger opportunities for knowledge-sector jobs. As a result, almost 40 percent of the jobs added from 2010 to 2040 will be in the region's three largest cities — San Jose, San Francisco and Oakland — which accounted for about one-third of the region's jobs in 2010. Two-thirds of the overall job growth is anticipated to be in PDAs throughout the region. The map on page 51 shows where the region is expected to add jobs during this time period.

Due to the strength of the knowledge sector, nine of the 15 cities expected to experience the greatest job growth are in the western and southern part of the region surrounding Silicon Valley (see Table 13, page 50). The remaining communities expecting high levels of job growth are in the East Bay and North Bay, owing to their strong roles in the current economy, diverse employment base, and their proximity to a large base of workers.

In sum, the 15 cities expected to experience the most job growth will account for roughly 700,000 jobs, or just over 60 percent of the new jobs forecasted in the region by 2040. Through local general plans, communities may aspire to and plan for additional jobs beyond the forecast contained in Plan Bay Area.

Almost 40 percent of the jobs added from 2010 to 2040 will be in the region's three largest cities — San Jose, San Francisco and Oakland.

Additional information on employment distribution by location can be found in Forecast of Jobs, Population and Housing *listed in Appendix 1.*



Noah Berger

San Francisco Bay Area Housing Growth

2040 Housing Distribution Approach and Methodology

Supporting Equitable and Sustainable Development

The Plan Bay Area housing distribution is guided by the policy direction of the ABAG Executive Board, which voted in July 2011 to support equitable and sustainable development by "maximizing the regional transit network and reducing GHG emissions by providing convenient access to employment for people of all incomes." This was accomplished by distributing total housing growth numbers to: 1) job-rich cities that have PDAs or additional areas that are PDA-like; 2) areas connected to the existing transit infrastructure; and 3) areas that lack sufficient affordable housing to accommodate low-income in-commuters.

Housing Distribution Methodology

As with the 2040 employment distribution, the methodology for distributing new housing throughout the Bay Area involves the use of growth distribution factors (see Figure 10, page 43).

- **Level of Transit Service:** The highest level of transit service in an area was used to group each area into one of three regional transit tiers. Places with high levels of transit service were assigned more growth, with the goal of utilizing the existing transit infrastructure more efficiently and leveraging the region's emphasis on operating and maintaining the current transit system.
- **Vehicle Miles Traveled (VMT) per Household:** Housing growth was directed to locations expected to result in the lowest greenhouse gas emissions. This adjustment was based on a measure of the use of Bay Area freeways and roads called "vehicle miles traveled" (VMT). One vehicle (regardless of the number of passengers) traveling one mile constitutes one "vehicle mile." The number of vehicle miles traveled is highly correlated with greenhouse gas emissions. VMT data was derived from MTC's Regional Travel Demand Model.
- **Employment by 2040:** To link housing growth more closely to job centers, the initial housing distribution was adjusted by an employment factor for each area, based on the total 2040 employment for each jurisdiction.

Places with high levels of transit service and jobs were assigned more growth.



Arlene Finger

- **Low-Wage Workers In-Commuting From Outside the Bay Area:** This factor shifts housing growth to places that are importing many low-income workers. "Longitudinal employment and household dynamics" data from the U.S. Census Bureau was used to determine the number of workers commuting to and from a jurisdiction by income category in 2009 and previous years.
- **Housing Values:** To recognize places with high-quality services (schools, parks, infrastructure, etc.), the initial housing distribution was adjusted by a housing value factor, based on a jurisdiction's median home value in 2010. The 2010 U.S. Census was a data source for this analysis.
- **Local Planning Assumptions:** This information, including locally adopted general plans and neighborhood plans, was supplied by local planning departments.
- **Resource Areas and Farmland:** This information was derived from farmland and resource lands, the locations of Priority Conservation Areas, and the urban growth boundaries.

2040 Housing Distribution Highlights

While housing growth is closely linked to local plans, as a result of these growth distribution factors more housing is directed to locations where the transit system can be utilized more efficiently, where workers can be better connected to jobs, and where residents can access high-quality services.

By emphasizing communities with transportation options and strong employment growth, the factors direct substantial housing production to the Peninsula and South Bay, where eight of 15 cities expected to experience the most housing growth are located (Table 14). In total, two-thirds of the region's overall housing production is directed to these 15 cities. This development pattern preserves the character of more than 95 percent of the region by focusing growth on less than five percent of the land. The map on page 52 shows where housing growth is expected to take place.



Santa Clara Valley Transportation Authority

Additional information is available in Forecast of Jobs, Population and Housing, *listed in Appendix 1.*

TABLE 14: Bay Area Housing Unit Growth 2010–2040, Top 15 Cities

		Housing Units		2010–2040 Housing Unit Growth	
Rank	Jurisdiction	2010	2040	Growth	Percentage Growth
1	San Jose	314,040	443,320	129,280	41%
2	San Francisco	376,940	469,430	92,480	25%
3	Oakland	169,710	221,160	51,450	30%
4	Sunnyvale	55,790	74,820	19,030	34%
5	Concord	47,130	65,200	18,070	38%
6	Fremont	73,990	91,620	17,630	24%
7	Santa Rosa	67,400	83,430	16,030	24%
8	Santa Clara	45,150	58,930	13,780	31%
9	Milpitas	19,810	32,430	12,620	64%
10	Hayward	48,300	60,610	12,320	26%
11	Fairfield	37,180	48,300	11,120	30%
12	San Mateo	40,010	50,200	10,180	25%
13	Livermore	30,340	40,040	9,700	32%
14	Richmond	39,330	49,020	9,690	25%
15	Mountain View	33,880	43,280	9,400	28%



ABAG Archives

Summary of Jobs and Housing Distribution (2010–2040)

Reflecting the distribution growth factors' emphasis on the existing transit network and connecting homes and jobs, San Francisco, San Mateo, Santa Clara and Alameda counties account for the majority of housing growth (77 percent) and job growth (76 percent). (See Table 15.) Within these counties, the Bay Area's three regional centers — San Francisco, San Jose, and Oakland — will accommodate 42 percent of housing growth and 38 percent of total job growth by 2040. Corridors in the inner Bay Area, including El Camino Real/The Grand Boulevard, San Pablo Corridor, and East 14th–International Boulevard, also represent a major share of both housing and job growth, accommodating 19 percent of regional housing and 11 percent of regional job growth.

Contra Costa County accounts for 11 percent of the region's new jobs and 12 percent of its new homes. Concord, Richmond, Pittsburg and Walnut Creek — all with PDAs centered on BART stations — take on the largest shares of the county's housing growth, with 22 percent, 12 percent, 9 percent, and 9 percent respectively. PDAs in the county will take on 64 percent of the housing growth and 57 percent of the job growth.

Major suburban employment centers in Alameda and Contra Costa counties, including Concord, Walnut Creek, and the Tri-Valley communities of Dublin, Pleasanton, Livermore, and San Ramon, account for over 8 percent of the Bay Area's new jobs and nearly 9 percent of its new homes.

With more limited transit access and fewer PDAs, North Bay counties — Marin, Napa, Solano and Sonoma — are expected to take on a much smaller share of regional growth, accounting for 10 percent of new households and 13 percent of new jobs. Much of this growth will be focused in PDAs, such as downtown Santa Rosa, Petaluma, Fairfield and Vallejo. In Marin, 22 percent of new jobs and 38 percent of new housing are expected to be located in PDAs, while the share is 18 percent and 41 percent in Napa County, 33 percent and 63 percent in Solano County, and 45 percent and 62 percent in Sonoma County. By concentrating growth in the inner Bay Area and communities with frequent transit service, this growth strategy will help North Bay communities maintain their rural and small-town character. While accommodating a very limited amount of new growth, rural centers and corridors will enhance the pedestrian environment and access to local services in the traditional downtowns of many of these communities.

Overall, well over two-thirds of all regional growth by 2040 is allocated within Priority Development Areas. PDAs are expected to accommodate 78 percent (or over 509,000 units) of new housing and 62 percent (or nearly 690,000) of new jobs. As a result, small cities, single-family neighborhoods and rural areas throughout the Bay Area are expected to retain their scale and character.

Plan Bay Area outlines a growth strategy that makes efficient use of available infrastructure while protecting the region's natural resources and open space. However, this is only half the picture. The second half consists of the transportation investments and policies developed along with this land use pattern to support and complement the region's housing and employment growth. (See Chapter 4.) Both an efficient land use pattern and a sound transportation investment package are needed to have a fully integrated long-term land use development and transportation plan. The performance results of this overall strategy are presented in Chapter 5.

TABLE 15: Bay Area County Housing and Job Growth, 2010–2040

	Employment				Housing Units				Households			
			2010–2040 Growth				2010–2040 Growth				2010–2040 Growth	
County	2010	2040	Total	%	2010	2040	Total	%	2010	2040	Total	%
Alameda	694,450	947,650	253,200	36%	582,550	730,540	147,990	25%	545,140	705,330	160,190	29%
Contra Costa	344,920	467,390	122,470	36%	400,260	481,590	81,330	20%	375,360	464,150	88,790	24%
Marin	110,730	129,140	18,400	17%	111,210	118,740	7,530	7%	103,210	112,050	8,840	9%
Napa	70,650	89,540	18,890	27%	54,760	60,830	6,070	11%	48,880	56,310	7,430	15%
San Francisco	568,720	759,500	190,780	34%	376,940	469,430	92,480	25%	345,810	447,350	101,530	29%
San Mateo	345,200	445,080	99,880	29%	271,030	326,070	55,040	20%	257,840	315,090	57,250	22%
Santa Clara	926,260	1,229,530	303,270	33%	631,920	842,350	210,430	33%	604,200	818,390	214,190	35%
Solano	132,350	179,930	47,580	36%	152,700	175,570	22,870	15%	141,760	168,700	26,950	19%
Sonoma	192,010	257,460	65,450	34%	204,570	236,480	31,910	16%	185,830	220,740	34,910	19%
Region*	**3,385,300**	**4,505,220**	**1,119,920**	**33%**	**2,785,950**	**3,445,950†**	**660,000**	**24%**	**2,608,020**	**3,308,110**	**700,090**	**27%**

*Sum of county totals may not match regional totals due to rounding.
†Regional 2040 Housing Units include 4,350 seasonal units that were not distributed by county.
Source: ABAG, 2013



Noah Berger

Accommodating the 8-Year Regional Housing Need Allocation

California Housing Element law (Article 10.6 of the California Government Code) requires each jurisdiction to plan for housing at all income levels by ensuring that local zoning and planning support the production of a diverse range of new housing. The Regional Housing Need Allocation (RHNA) is the state-mandated process to identify the share of the state's housing need for which each jurisdiction must plan over an 8-year period. The California Department of Housing and Community Development (HCD) determined that the Bay Area's regional housing need between 2014 and 2022 is 187,990 units.

To develop the RHNA for 2014–2022, ABAG and MTC convened a Housing Methodology Committee comprised of local elected officials, staff and diverse stakeholders from throughout the region, who provided guidance through a series of workshops that began in January 2011. The Association of Bay Area Governments' Executive Board adopted the final RHNA methodology and released draft allocations on July 19, 2012.

California Senate Bill 375 (SB 375) creates an additional overlay by requiring consistency with the Sustainable Communities Strategy in Plan Bay Area. (See "California Senate Bill 375: Linking Regional Plans to State Greenhouse Gas Reduction Goals," in the introduction to this plan.) Both the plan and final RHNA methodology address the overlapping objectives of SB 375 and the California Housing Element law. These objectives include increasing the supply, diversity and affordability of housing; promoting infill development and a more efficient land use pattern; protecting environmental resources; and promoting socioeconomic equity.

TABLE 16: Regional Housing Need Allocation (Housing Units) by Household Income, 2014–2022

County	Very Low 0–50%	Low 51–80%	Moderate 81–120%	Above Moderate 120%+	Total Housing Units
Alameda	9,912	6,604	7,924	19,596	44,036
Contra Costa	5,264	3,086	3,496	8,784	20,630
Marin	618	367	423	890	2,298
Napa	370	199	243	670	1,482
San Francisco	6,234	4,639	5,460	12,536	28,869
San Mateo	4,595	2,507	2,830	6,486	16,418
Santa Clara	16,158	9,542	10,636	22,500	58,836
Solano	1,711	902	1,053	3,311	6,977
Sonoma	1,818	1,094	1,355	4,177	8,444
Region	**46,680**	**28,940**	**33,420**	**78,950**	**187,990**

Note: Percentages are of the region's area median income.
Source: http://www.abag.ca.gov/planning/housingneeds/pdfs/Final RHNA (2014–2022).pdf



Noah Berger

The Three Primary Elements of the RHNA Methodology Are:

- **The Sustainability Component** – This element advances the goals of SB 375 and is based on Plan Bay Area's proportional allocation of new housing into Priority Development Areas (PDAs). Seventy percent of the region's housing need is allocated to jurisdictions planning for growth in PDAs, with the remaining 30 percent allocated based on non-PDA growth.
- **The Fair Share Component** – This element is designed to ensure that jurisdictions with PDAs are not asked to shoulder more than their fair share of the Bay Area's total housing need. More housing was allocated to jurisdictions with strong transit networks, many jobs, or poor permitting performance in the 1999–2006 RHNA cycle for very-low and low income units. The methodology also set a minimum threshold for a jurisdiction's allocation based on its expected future growth.
- **The Income Allocation Factor** – This element aims to ensure that each jurisdiction plans for housing at all income levels. The income allocation factor is determined by the difference between the regional proportion of households in an income category and each jurisdiction's proportion for that same category. This shifts the distribution of housing allocated to each jurisdiction across income categories so that jurisdictions that already supply a large amount of affordable housing receive lower affordable housing allocations. It also promotes the state objective to increase the mix of housing types among cities and counties equitably.

To encourage even greater policy alignment, the OneBayArea Grant (OBAG) program criteria account for past RHNA performance, specifically housing production for low- and very-low income households, as well as a jurisdiction's current RHNA allocation. (See Chapter 4.)

*For further details on the RHNA methodology and process, see: **www.abag.ca.gov/planning/housingneeds/index.html***



Noah Berger

Plan Bay Area: Benefits for Project Development

Adoption of Plan Bay Area will not require any changes to local land use policies or environmental review processes. In concert with Senate Bill 375, the plan provides some jurisdictions with the opportunity to reduce the scope of environmental analysis required under CEQA for certain projects that are consistent with the plan. Agencies that find these "CEQA streamlining provisions" helpful have the opportunity, but are not obligated, to align their local planning decisions with the adopted Plan Bay Area. Projects that use the provisions will still need to obtain discretionary permits or other approvals from the lead and responsible agencies. (See "California Senate Bill 375: Linking Regional Plans to State Greenhouse Gas Reduction Goals," in the introduction to this plan.)

Plan Bay Area outlines a growth strategy that makes efficient use of available infrastructure while protecting the region's natural resources and open space.

A project may qualify for CEQA relief under SB 375 if it is: 1) consistent with the approved Plan Bay Area Sustainable Communities Strategy (SCS), including all land use designations, employment distribution densities, building space intensities and applicable policies; or 2) considered a residential/mixed-use residential project or a transit priority project (TPP).

On the facing page is a map of Transit Priority Project-eligible areas, where certain projects subject to the conditions outlined above may qualify for CEQA relief under SB 375.

MAP 7

Transit Priority Project (TPP) CEQA Streamlining

Approximate areas projected to meet residential and mixed-use densities
TPPs with residential densities >20 units/acre and with floor area ratios greater than 0.75

Approximate areas projected to meet residential densities
TPPs with residential densities >20 units/acre

Approximate areas not projected to meet residential or mixed-use densities
TPPs without sufficient densities

ROADS AND RAIL LINES
Rail Line
Freeway
Major Road

2010 POPULATION
Oakland > 350,000
Novato 50,000–350,000
Pacifica <50,000

0 10 20 30 Miles
0 10 20 30 40 Kilometers

Map is for general information. For more information on local zoning or designations for a particular site or parcel, please contact your city or county.



Greg Nelson

SB 375 defines TPP-eligible areas as places within one-half mile of a major transit stop or a high-quality transit corridor. To qualify as a residential/mixed use residential project, at least 75 percent of the total building square footage must be dedicated to residential use. To quality as a TPP, the project must also:

- Contain at least 50 percent residential use, based on total building square footage, and if the project contains between 26 percent and 50 percent nonresidential uses, then the floor area ratio (defined as the ratio of building square footage to the parcel square footage) must be 0.75 or more;
- Provide a minimum net density of at least 20 dwelling units per acre; and
- Be located within one-half mile of a major transit stop or high-quality transit corridor included in Plan Bay Area.

TPP-eligible areas were not identified until after the passage of SB 375 in 2008, and they should not be confused with the pre-existing Priority Development Areas (PDAs). Most TPP-eligible areas are within PDAs, while others are within close proximity to transit but are not identified as PDAs.

NOTE: Appendix 2 includes a set of 18 detailed maps of the region showing key resource lands, job and housing growth (2010–2040), and total future housing and job intensities for 2040. For each topic, three close-up maps of different parts of the Bay Area region are included.

4

Investments



Noah Berger



San Francisco-Oakland Bay Bridge, East Span

Barrie Rokeach ©2013

Chapter 4

Investments

In crafting an investment program for Plan Bay Area, MTC and ABAG had to grapple with a number of important, but often competing, questions.

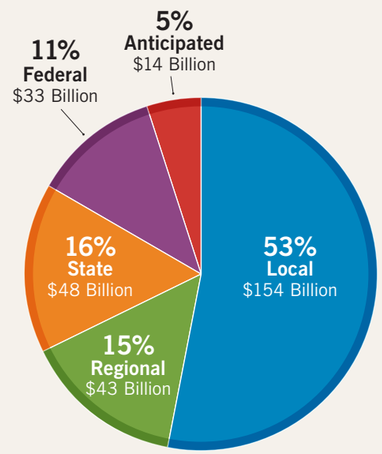
How to best support the expected growth in jobs and housing over the next quarter-century? How much do we invest to maintain, expand and improve the efficiency of our regional transportation system, when the needs exceed available revenue? How should we weigh specific project performance characteristics in assembling a package of investments to address the plan's economic, environmental and equity goals?

Plan Bay Area structures an investment plan in a systematic way to support the region's long-term land use strategy, relying on a performance assessment of scenarios and individual projects. The plan makes investments in the region's transportation network that support job growth and new homes in existing communities by focusing the lion's share of investment on maintaining and boosting the efficiency of the existing transit and road system. Plan Bay Area also takes a bold step with strategic investments that provide support for focused growth in Priority Development Areas, including major new transit projects and the OneBayArea Grant program.

Gauging Our Financial Resources

The Plan Bay Area investment strategy is based on an estimate of available funding through 2040. Although the region continues to feel the impact of a slow recovery on revenues for transportation in the short term, total revenues over the 28-year life of the plan are expected to exceed the long-term revenue estimates prepared for the preceding regional transportation plan, Transportation 2035, which was adopted in April 2009 when various transportation revenues were in decline.

FIGURE 11 Revenue Forecast $292 Billion (YOE $)*



*YOE = Year of Expenditure

For Plan Bay Area, MTC worked with partner agencies and used financial models to forecast how much revenue will be available for transportation purposes over the 28-year duration of the plan. These forecasts are used to plan investments that fit within the "financially constrained" envelope of revenues that are reasonably expected to be available.

Plan Bay Area revenue forecasts total $292 billion over the 28-year period, reckoned in year of expenditure (YOE) dollars. As shown in Figure 11, over two-thirds (68 percent) of these funds are from regional and local sources, primarily transit fares, dedicated sales tax programs, and bridge tolls.

Making up the remainder of the pie are state and federal revenues (mainly derived from fuel taxes), and "Anticipated" revenues, which are unspecified revenues that reasonably can be expected to become available within the plan horizon. Although federal and state funding for transportation is critical, it is insufficient to cover growing needs. Annual revenues from local sources dwarf the revenues local jurisdictions receive in state transportation infrastructure funding.

The Great Recession also had a severe impact on the budgets of state and local jurisdictions in California. Bay Area communities seeking to support focused growth and increase the amount of affordable housing were particularly hard hit by the elimination of redevelopment agencies and related funding in 2010. In the Bay Area, these agencies generated $1 billion annually before they were dissolved by the Legislature and the funding programs eliminated.

Financial Assumptions

The complete financial assumptions and amounts for the financially constrained Plan Bay Area are provided in *Plan Bay Area Financial Assumptions,* listed in Appendix 1. The estimated revenues in Plan Bay Area assume an inflation rate of 2.2 percent and are reported in year of expenditure dollars. Key highlights are as follows:

- The federal highway and transit programs are assumed to continue in their current form and grow at a rate of 3 percent annually. Base year revenue is set at the nationally authorized level for fiscal year (FY) 2009–10, and the Bay Area is projected to receive its historically proportionate share of these programs.
- The state funding sources — primarily fuel tax-based — are assumed to maintain their structure and distribution formulas over the 28-year period, starting from FY 2009–10 base levels. Assumptions concerning fuel price and consumption growth assume that state gasoline consumption will decline at an increasing rate until 2020 and then grow slowly at a constant long-term rate. For the 2006 voter-approved Proposition 1B, the revenue forecast includes the Bay Area's remaining share beyond FY 2011–12.
- Regional bridge toll revenues are based on projected travel demand on the region's seven state-owned toll bridges. Further, it was assumed that in FY 2018–19, there would be a $1 increase in the non-carpool vehicle toll on all state-owned bridges. The Regional Express Lane Network revenues included in the financially constrained plan represent projected gross toll revenue for express lanes including toll revenues from express lanes in Santa Clara County.
- Local revenues, sales taxes such as Transportation Development Act (TDA) and Assembly Bill 1107 (1977) are assumed to grow at rates that take into account demographic and economic factors such as median income, regional employment and population growth.
- County and transit district transportation sales tax revenues in Alameda, Contra Costa, Napa, Marin, San Francisco, San Mateo, Santa Clara and Sonoma counties are based on estimates provided by the respective sales tax authorities in those counties. Measures that are set to expire within the 28-year period are assumed to be renewed and/or augmented.
- Transit operator-specific revenue projections including transit fares, tolls, property and parcel taxes, and other sources have been provided by the respective operators. Projections of local streets and roads revenue are based on information provided to MTC by local agencies.
- Revenues forecasted to become available for high-speed rail include approximately $1.5 billion from California's Proposition 1A (2008), the Safe, Reliable High-Speed Passenger Train Bond Act. It was also assumed that the region would receive 12.5 percent, or $1.5 billion, of federal revenues that are expected to become available to finance the project.



Karl Nielsen

- Plan Bay Area assumes $3.1 billion dollars in Cap and Trade revenue. These funds represent the Bay Area's share of funds that are expected to be administered by the state's metropolitan planning organizations.
- The inclusion of "Anticipated" revenues in the financially constrained plan strikes a balance between the past practice of only including specific revenue sources currently in existence or statutorily authorized, and the more flexible federal requirement of revenues that are "reasonably expected to be available" within the plan period.

MTC performed a retrospective analysis of projections for previous long-range plans, including a review of unexpected revenues that had come to the region but had not been anticipated or included in those projections. Over a 15-year analysis period, the San Francisco Bay Area received an annualized amount of roughly $400 million (in 2011 dollars) from these "unanticipated" fund sources. MTC generated an estimate of these anticipated revenues by projecting the $400 million figure forward at a 3 percent annual growth rate. These revenues are not assumed in the first five years of the plan.

Plan Bay Area Investments—Committed and Discretionary Funds

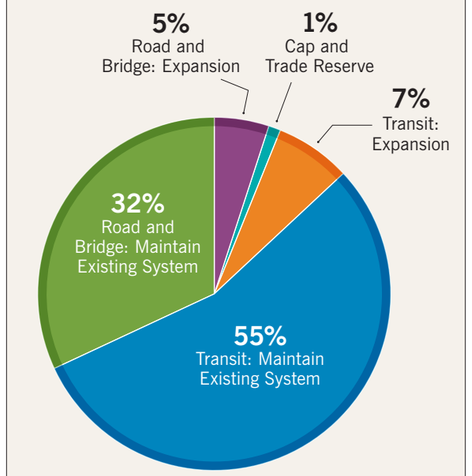
Revenues for Plan Bay Area are either committed to existing purposes or considered discretionary and available for new projects and programs. Committed funds may be designated by law for a specific purpose or are reserved by action of a governing board (such as MTC, a transit agency, a congestion management agency, etc.). Discretionary revenues are those that are available for assignment to projects or programs through the plan. In spring 2011, MTC determined that if any transportation project/program met one of the following criteria, the project would be considered "Committed" for Plan Bay Area (consistent with Senate Bill 375):

- Project is under construction with a full funding plan, or a regional program that is currently under contract.
- Project is funded with dollars designated by statute for a specific purpose, or dollars are locally generated and locally administered.

Additional funding was deemed committed to transit operating and maintenance in Spring 2012. Based on these conditions, $60 billion of the $292 billion in total revenue forecasted for Plan Bay Area is available for discretionary investments.

As summarized in Table 17, the investment strategy totals $292 billion in committed and discretionary funds. This combined investment strategy focuses 87 percent of the funding over the life of the plan on taking care of our existing transportation system. (See Figure 12.) The remaining 13 percent funds key transit and road expansion projects. Bicycle and pedestrian projects and programs are included with road maintenance and expansion due to the region's policies to ensure roads are built or modified to be accessible for all users, so-called "complete streets."

FIGURE 12 Total Investments* by Function $292 Billion (YOE $)



*Committed and discretionary

TABLE 17: Plan Bay Area Investments by Function (in billions of YOE $)

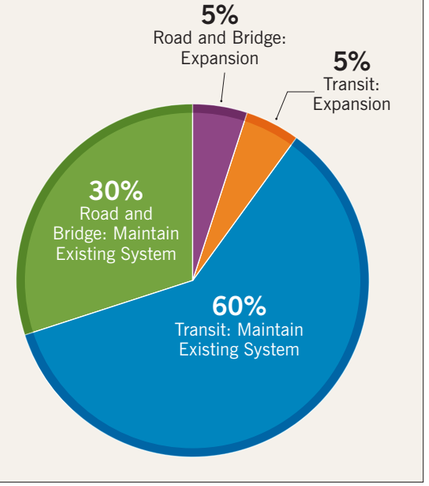
Function	Committed	Discretionary	Total
Transit: Maintain Existing System	$139	$20	$159
Road and Bridge: Maintain Existing System	$69	$25	$94
Transit: Expansion	$13	$8	$21
Road and Bridge: Expansion	$11	$4	$15
Cap and Trade Reserve	$0	$3	$3
Total	**$232**	**$60**	**$292**

Committed Revenues

Seventy-nine percent ($232 billion) of all the revenues forecast for Plan Bay Area are deemed "Committed." Examples of committed funds include existing sales tax measure revenues, which have been assigned through a voter-approved expenditure plan, and State Transportation Improvement Program (STIP) funds that have already been designated for specific projects by the California Transportation Commission. Figure 13 provides a breakdown by functional category of how committed funds will be expended over the course of the plan.

Funding for "Committed" projects is included in Plan Bay Area in order to provide a complete picture of the regional investments and so that these critical efforts can continue to advance. Included in this group are several large projects that are under construction, such as the new eastern span of the San Francisco-Oakland Bay Bridge; the Bay Area Rapid Transit (BART) extensions to Warm Springs and Eastern Contra Costa County (eBART); the BART Airport Connector to Oakland International Airport; the San Francisco Municipal Railway Central Subway; the Sonoma-Marin Area Rail Transit (SMART) Initial Operating Segment from Santa Rosa to San Rafael; and the Caldecott Tunnel Fourth Bore project.

FIGURE 13 Committed Investments $232 Billion (YOE $)





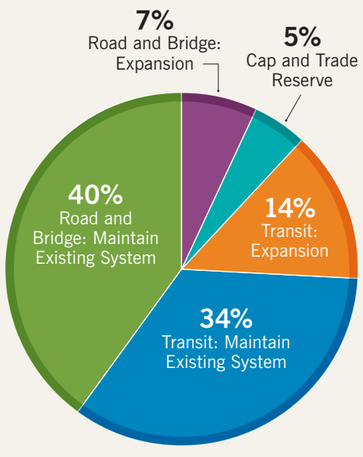
Noah Berger

The allocation of committed funds supports growth in our established rural, suburban and urban communities by directing 90 percent of these funds to the region's existing transit and road systems as shown in Figure 13. These investments, totaling more than $200 billion of the committed funds, ensure that the buses and trains can serve today's and tomorrow's passengers, and that our roads and sidewalks can carry current and future residents on their way to work or school. More detailed information on the committed investments can be found in the Online Project Database, listed in Appendix 1.

Discretionary Revenues

The 21 percent of Plan Bay Area revenues that are discretionary ($60 billion) are assigned to projects or programs to support the plan's land use and transportation investment strategy. While the funds may be discretionary in that they have not yet been assigned to a project or program, they may be subject to rules associated with how they can be spent. For example, federal New Starts funds are discretionary because they have not been assigned to a particular project; however, those funds can only be used for new transit projects. Surface Transportation Program funds can be used across different modes of transportation, but they can only be used for capital improvements and not for operating purposes. Figure 14 provides a breakdown by functional category of how discretionary revenues will be invested through Plan Bay Area.

FIGURE 14 Discretionary Investments $60 Billion (YOE $)



Cap and Trade Revenues

This investment strategy is complemented by a $3.1 billion dollar reserve from future Cap and Trade funding included in the plan. The expected eligible uses include but are not limited to transit operating and capital rehabilitation/replacement, local street and road rehabilitation, goods movement, and transit-oriented affordable housing — consistent with the focused land use strategy outlined in Plan Bay Area. The share of funds reserved for these purposes, the specific project sponsors and investment requirements will be subject to further deliberation with partner agencies and public input following adoption of Plan Bay Area.

Cap and Trade revenues will be allocated to specific programs through a transparent and inclusive regional public process. That process will specifically ensure that at least 25 percent of these revenues will be spent to benefit disadvantaged communities in the Bay Area, and to achieve the goals of Plan Bay Area.

Investment Strategies

The discretionary funds provide the opportunity to address six key investment strategies to support both the future land use pattern outlined in the previous chapter and the performance targets adopted for the plan as discussed in Chapter 1. The following section details the region's six primary investment strategies to address the key issues identified during the Plan Bay Area process.

At the end of this chapter, key road and transit projects are highlighted in a series of maps. Additional detail on the proposed Plan Bay Area-funded projects and programs is available in the Online Project Database, listed in Appendix 1.



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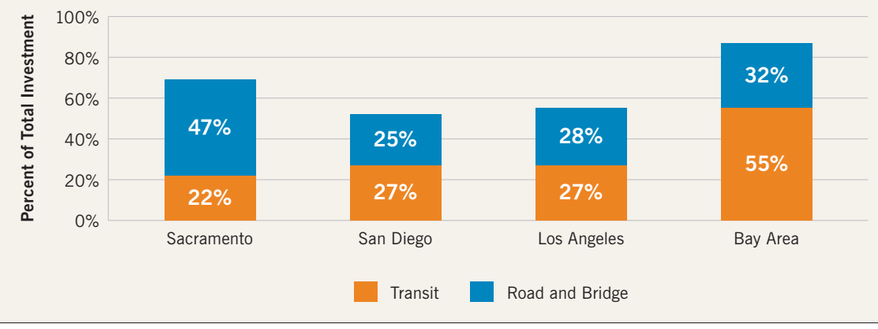
Investment Strategy 1
Maintain the Existing Transportation System

Plan Bay Area continues to support the "fix it first" emphasis from 2009's Transportation 2035 Plan to ensure that the region directs a majority of funding to maintain existing transportation assets, while also supporting focused growth in areas served by the transportation system over the life of the plan. A well-maintained multimodal transportation system is fundamental to the success of the more compact future land use outlined in Chapter 3. Plan Bay Area fully funds operating needs for existing transit services and timely transit vehicle replacement while funding 76 percent of remaining high-priority transit capital needs. Furthermore, this investment strategy invests scarce resources in state bridge rehabilitation and retrofit.

Plan Bay Area dedicates 87 percent of all available funds to keeping the current transportation network in working order as shown in Figure 12. Roughly three-quarters of the draft plan's discretionary funds and 90 percent of the committed funds are dedicated to funding transit operations, maintaining transit

FIGURE 15: System Maintenance and Management Share of Total Investment: California's Largest Regions' Long-Range Plans





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capital assets, repairing and replacing bridges, and maintaining complete streets. This includes complementary funding in the OneBayArea Grant investment strategy (see page 77) and County Investment Priorities strategy (see page 86).

Plan Bay Area makes a greater financial commitment to system maintenance and management than do the plans of California's other large metropolitan regions. Approximately 87 percent of total Plan Bay Area funding goes toward sustaining the existing system, while other metropolitan regions in the state dedicate substantially smaller shares of funding for this purpose (see Figure 15). There are several reasons for the difference in priorities:

- The Bay Area has some of the oldest transportation systems in the state (and even in the country) — and old infrastructure requires more funding to maintain, renovate and replace than newer systems. San Francisco's Municipal Railroad recently celebrated its 100th anniversary, and BART operates the oldest railcar fleet in the country.
- Our region's greater reliance on rail services results in higher costs to maintain these capital-intensive modes. Plan Bay Area includes nearly $3 billion for replacing BART's and Caltrain's aging fleets over the next decade.
- The Bay Area is relatively built-out compared to other newer, faster-growing urban areas, and our transportation system is correspondingly more fully developed. That means there is relatively less need to invest in new highways and transit lines, and relatively more existing infrastructure to maintain here than in other areas. Even so, all four of California's major metropolitan areas devote more than 50 percent of their future transportation budgets to upkeep of their current road and transit networks.

Investment in the Transit System

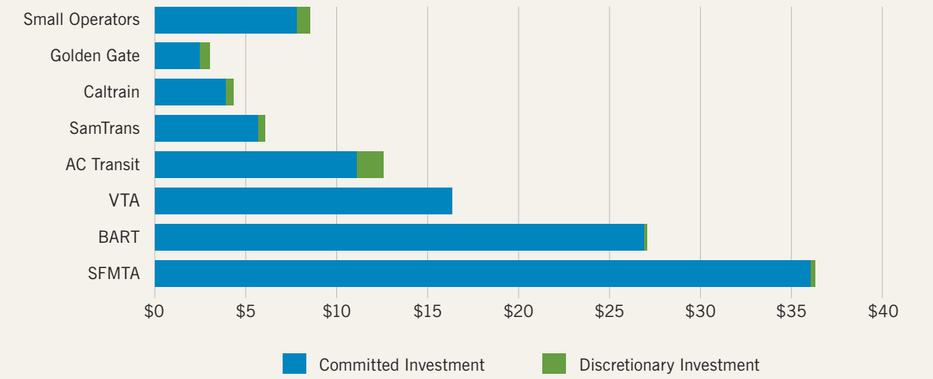
Operating and Maintaining Transit: A Key Challenge

Buses, trains, ferries, light-rail vehicles, cable cars and streetcars not only provide mobility for people without cars — including those who are low-income, elderly, disabled or too young to drive — they also provide a viable alternative to driving for hundreds of thousands of area residents who do own cars. By reducing the number of vehicles on the roads, public transit helps to fight congestion and curb greenhouse gas emissions. It is also the essential transportation complement to Plan Bay Area's distribution of housing and employment in key locations throughout the region.

TABLE 18: Plan Bay Area Transit Investment Strategy (in billions of YOE $)

	Total Need 2013–2040	Committed Investment	Discretionary Investment	Remaining Need
Transit Operations	$114	$110	$4	$0
Transit Capital	$47	$21	$9	$17
Total	**$161**	**$131**	**$13**	**$17**

FIGURE 16: Transit Operating Funding by Operator, 2013–2040 (in billions of YOE $)



Yet despite the importance of transit to the Bay Area and its economy, maintaining and sustaining the network is an ongoing challenge. The cost of buying the fuel and paying the drivers, mechanics, dispatchers and other workers needed to operate a transit system — and paying for the replacement of buses, train cars, tracks, fare machines and other capital equipment — can outpace available funds. Delayed maintenance of the transit system leads to even costlier rehabilitation down the road. Plan Bay Area thus places a high priority on funding for transit operations and equipment.

Over the next 28 years, operating and capital replacement costs for Bay Area transit providers are projected to total $161 billion. This includes $114 billion in operating costs plus $47 billion for capital replacement to achieve an optimal state of repair. Committed revenues over the same period are expected to total only $131 billion ($110 billion for operations and $21 billion for capital). The result is $30 billion in initial unfunded needs, approximately $26 billion of which is needed to bring our capital assets up to an optimal state of repair.

To address transit operating and capital needs, Plan Bay Area invests a total of $13 billion in discretionary revenues. This includes more than $2 billion in discretionary revenue plus almost $2 billion in revenues that are expected to come from a future extension of the transportation sales tax in Alameda County to eliminate the $4 billion forecasted operating shortfall over the plan period. Another $9 billion in discretionary revenue will be invested in transit capital, leaving unfunded capital needs of $17 billion to achieve a state of optimal repair that the region must take into account when pursuing new funding resources, as discussed in Chapter 6.

As illustrated in Figure 16, some transit agencies have operating needs that exceed the forecasted level of committed revenue — such as AC Transit, Golden Gate Transit, SamTrans, Caltrain and the small operators. The variability of the operating needs across the region results from the uniqueness of each system's forecasted cost growth and revenue availability. For example, on the revenue side, some transit operators have access to permanent sales taxes or are supported by general fund contributions, while others are not and are more reliant on fare revenues. As part of the investment strategy, MTC shored up the operating funding plan so that operations for existing services for all transit operators are fully funded through committed and discretionary revenues over the plan period.

Transit Sustainability Project Helps Bend Operating Cost Curve

The region's operating cost projections assume a continuation of existing levels of service and also take into account the increased operating costs associated with committed transit expansion projects. Plan Bay Area reflects the recommendations of MTC's Transit Sustainability Project (TSP), a series of actions to complement recent individual transit agency efforts to control costs, improve service and attract new riders. By establishing performance metrics and targets, new investment and incentive programs, and additional focused efforts related to cost, service and institutional arrangements, the recommendations set a course toward a more sustainable transit system. The operating cost projections associated with implementing the Transit Sustainability Project recommendations assume a five percent drop in operating costs by 2018, then indexing those costs to inflation. Over the life of the plan, this results in billions of dollars of savings.

More information on the TSP can be found in Investment Strategy 4, "Boost Freeway and Transit Efficiency."

Lifeline Transportation Program Improves Mobility and Accessibility

Plan Bay Area reaffirms the importance of addressing the mobility and accessibility needs of seniors, persons with disabilities, and residents in low-income communities throughout the region. The plan adds approximately $800 million in discretionary funding for MTC's Lifeline Transportation Program over the 28-year period of the plan. In addition to continuing the types of projects that are currently being funded, an area of possible focus for the future is "mobility management," a strategic approach to connecting people to transportation resources within a community including services provided by human services agencies and other community sponsors. This strategy is especially key to the region's ability to address growth in the Bay Area's senior population and persons with disabilities. Through partnerships with many transportation service providers, mobility management enables communities to monitor transportation needs and links individuals to travel options that meet their specific needs, are appropriate for their situation and trip, and are cost efficient. The Lifeline program, which implements locally crafted Community Based Transportation Plans funded by MTC, has already invested over $170 million in a diverse mix of projects to support high-need travelers. (See Figure 17.) In addition to mobility management projects, Lifeline has invested in additional fixed-route transit, shuttles, and non-motorized safety and access improvements.



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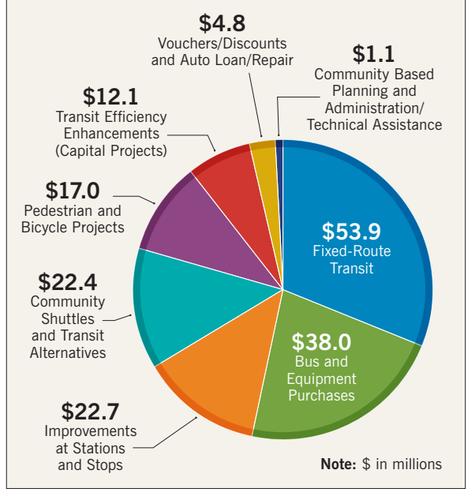
FIGURE 17 Lifeline Transportation Program Project Types, 2006–2012 $172 Million



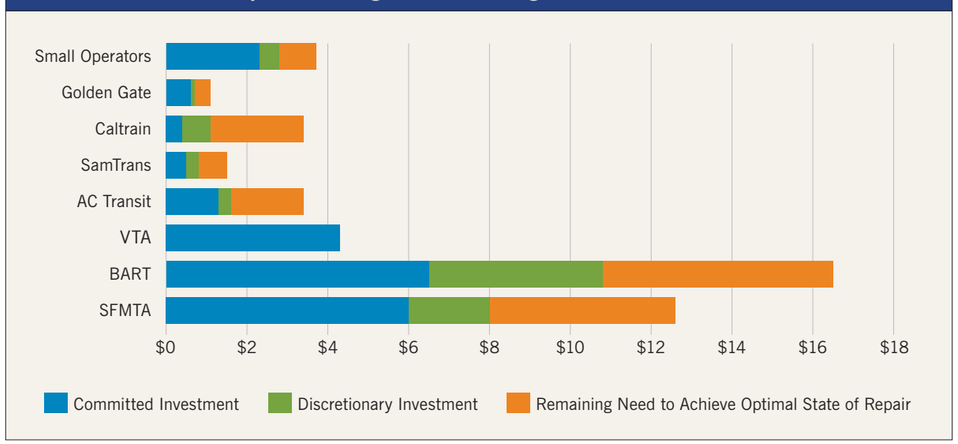
Transit Capital Replacement and Rehabilitation: A Big Hole to Fill

On the capital side, Plan Bay Area assures that all vehicles are replaced at the end of their useful lives and receive all required rehabilitation on schedule, though large capital needs remain for other assets such as maintenance facilities and station upgrades to ensure the long-term health of the region's transit operations. (See Figure 18.) In particular, a robust and efficient public transit network, anchored by expanded local service, is a linchpin of Plan Bay Area's land use strategy to promote future development around existing and planned transit nodes. The plan falls short in achieving two voluntary performance targets that are key indicators of a sustainable transit system: fully funded maintenance and state of good repair of existing capital assets; and transit operating funding necessary to meet the projected growth in non-auto mode share to 26 percent of all trips.

Consistent with MTC's Transit Capital Priorities Policy, high-priority transit capital investments include revenue vehicles (buses, railcars and ferries) — which are Plan Bay Area's first priority for transit capital funds — as well as "fixed guideway" infrastructure (track, bridges, tunnels and power systems) and communications equipment to ensure the safe, reliable, and timely delivery of transit service throughout the region.

Nearly $20 billion of the projected transit capital replacement and rehabilitation needs of the Bay Area's transit systems through 2040 are unfunded under the plan. Plan Bay Area will dedicate a significant portion of the revenue generated from Cap and Trade to these unmet transit needs. In addition, promptly after adoption of the plan, MTC will work with the region's operators and other stakeholders to develop a plan to address the gap in funding for transit capital replacement and rehabilitation needs, and to expand the funding available to support future increases in transit service.

FIGURE 18: Transit Capital Funding and Remaining Needs, 2013–2040 (in billions of YOE $)



Plan Bay Area's total capital investment of $30 billion in committed and discretionary revenues will be sufficient to fund all revenue vehicle replacements and 76 percent of fixed guideway and other high-priority needs, a substantial improvement over the 60 percent funded in the Transportation 2035 Plan. Chapter 6 outlines priorities for the region to cover the remaining capital needs, totaling $17 billion, to achieve our performance target.

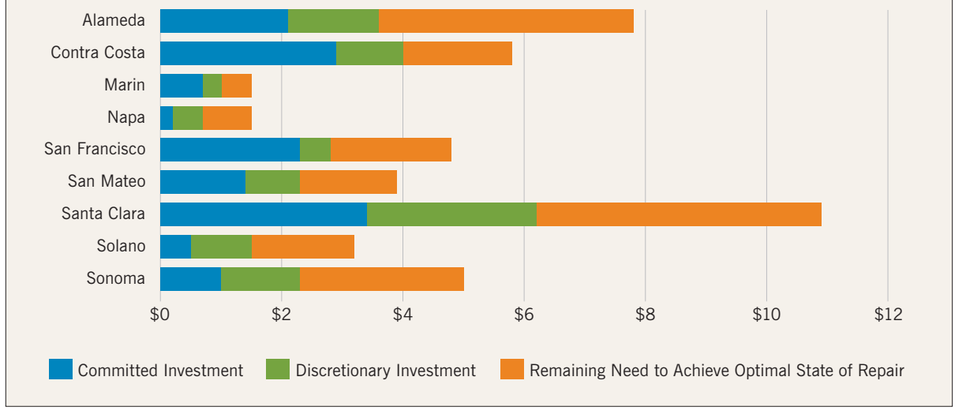
Investment in Local Streets and Roads

A critical component of the OneBayArea Grant (OBAG) investment strategy discussed later in this chapter is the investment of discretionary funds for the purpose of preserving the existing local street and road network. While congestion management agencies have the flexibility to spend their OBAG county shares on any eligible OBAG programs, Plan Bay Area provides sufficient funding within the program to reaffirm the commitment to maintain the region's pavement conditions at existing levels.

The 42,000 lane-miles of local streets and roads interconnect in a way that knits the region together, and they form the foundation of the region's transportation system. They are the conduits to the highways, ports and farmlands that are vital to the economic vitality and sustainability of the San Francisco Bay Area. All trips begin and end on a local street and road, and all modes of surface travel rely on the local street and road infrastructure. In addition to pavement, the local street and road system includes all of the safety and accessibility infrastructure that makes a functioning network possible — sidewalks, curbs and gutters, storm drains, signs and signals, and so forth.

The typical life cycle of a pavement is about 20 years. Over the first three-quarters of its life, the pavement will deteriorate slowly, resulting in a 40 percent drop in condition. Past that point, pavement will begin to deteriorate rapidly. It costs five to ten times more to rehabilitate or reconstruct a roadway that has been allowed to deteriorate, than it costs to

FIGURE 19: Local Streets and Roads Investments and Remaining Needs by County, 2013–2040 (in billions of YOE $)





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maintain that roadway in good condition. Through the OneBayArea Grant program, Plan Bay Area invests $10 billion in discretionary funding to maintain the region's existing pavement condition, currently at a regional average of 66 on a pavement condition index (PCI) scale of 0 to 100. Even with an infusion of discretionary funds, sizable funding gaps remain in each county to bring pavement up to a state of good repair, as shown in Figure 19.

The total amount of funding needed for the Bay Area to achieve a PCI of 75 (the plan's adopted performance target, as discussed in Chapter 5) over the Plan Bay Area period is $45 billion. Committed revenues over the same period of time are expected to cover $15 billion, or about one-third of the need. Add in the $10 billion in discretionary funds, and the region still falls $20 billion short of the revenue needed to achieve the plan's performance target, with the biggest shortfalls occurring in the region's largest counties, as shown in Figure 19. Chapter 6 discusses ways to pursue the revenues that will allow the region to meet its targets for roadway preservation.

Funding Active Transportation

Plan Bay Area makes a significant commitment to increase the convenience and safety of walking and bicycling by delivering complete streets for all users. State Transportation Development Act (TDA) and local sales tax funds committed to bicycle and pedestrian improvements total $4.6 billion during the plan period. In addition, the OneBayArea Grant program discussed in the next section includes $14.6 billion over the life of the plan. These funds may be used for complete streets projects, including stand-alone bicycle and pedestrian paths, bicycle lanes, pedestrian bulb-outs, lighting, new sidewalks, and Safe Routes to Transit and Safe Routes to Schools projects that will improve bicycle and pedestrian safety and travel.

Investment in State Bridges

The bridges that span San Francisco Bay are critical transportation links for the region. It is vital to the economic health of the region and quality of life of its residents that these essential structures be kept in a state of good repair. Currently, existing toll revenues are used to strengthen, reinforce and maintain bridge structures and roadways on all of the seven state-owned Bay Area bridges; this includes replacing the eastern span of the San Francisco-Oakland Bay Bridge.

Plan Bay Area assumes a single one-dollar toll increase on all state-owned bridges, beginning in the year 2019. These new bridge tolls are considered a source of regional discretionary funds and total $2.7 billion over the course of the plan.

Due to the important role that our toll bridges play in the ability of the region's transportation network to function smoothly, Plan Bay Area assumes that approximately $1 billion, or about one third of the $2.7 billion in estimated new bridge toll funds, will be needed for additional maintenance or unforeseen repairs to the Bay Area's bridges.

Investment in State Highways

California's 50,000 lane-mile state highway system is an essential contributor to the state's economic vitality, linking people and goods with intermodal

"MTC's new OneBayArea Grant program is an innovative way to use transportation funding to promote coordinated and environmentally responsible regional planning for jobs and housing. All Californians will benefit from such efforts to put SB 375's sustainability principles into practice."

— Senator Darrell Steinberg, President Pro Tempore, California Senate

transportation facilities, growing metropolitan centers, and major international airports and ports. The value of this important transportation resource is reckoned at more than $300 billion. Of the total mileage, 6,500 lane-miles are within the nine-county Bay Area, giving residents a network of interstate, freeway, highway and arterial routes maintained and managed by Caltrans. These lane-miles carry more than one-third of our region's vehicle miles traveled.

State law requires Caltrans to prepare a 10-year plan for the State Highway Operation and Protection Program (SHOPP). The SHOPP identifies the various needs for all state-owned highways and bridges. Bay Area highway maintenance needs over the 28-year life of this plan are forecasted to total about $22 billion. Projected revenues over the same period are expected to cover only $14 billion. Plan Bay Area has not yet identified any new funding sources for the $8 billion in unfunded needs, despite its heavy emphasis on maintaining our current transportation system. The magnitude of the Bay Area's highway rehabilitation needs and lack of available funding suggests that maintenance will have to be delayed or deferred on some highways. New state funding, as discussed later in Chapter 6, will need to be secured in order to ensure the long-term health of today's system.

Investment Strategy 2
Support Focused Growth

To encourage more development near high-quality transit and reward jurisdictions that produce housing and jobs, Plan Bay Area proposes to target transportation investments in Priority Development Areas (PDAs), support planning efforts for transit-oriented development in PDAs, and support Priority Conservation Areas.

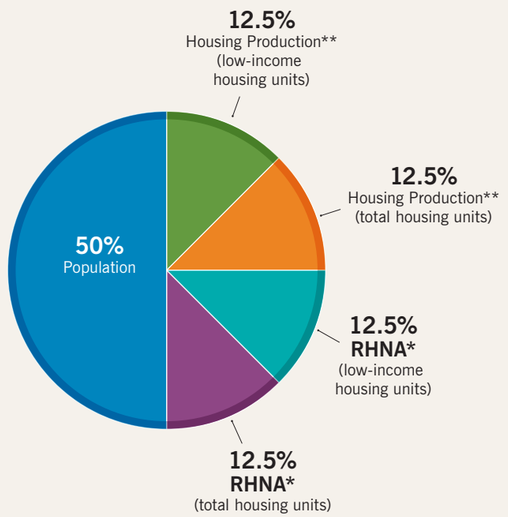
In May 2012, MTC approved a new funding approach that directs specific federal funds to support more focused growth in the Bay Area. The OneBayArea Grant (OBAG) program commits $320 million over the next four years ($14.6 billion over the life of the plan), from federal surface transportation legislation currently known as MAP-21 (Moving Ahead for Progress in the 21st Century). OBAG is designed to support jurisdictions that focus housing growth in Priority Development Areas through their planning and zoning policies, and the production of housing units. Specifically the program rewards jurisdictions that accept housing allocations through the Regional Housing Need Allocation (RHNA) process. The distribution of OBAG funds to counties is based on the following factors: population, past housing production and future housing commitments, and efforts to produce low-income housing.

Focus on Priority Development Areas

As outlined in Chapter 3, Priority Development Areas (PDAs) are transit-oriented, infill development opportunity areas within existing communities that are expected to host the majority of future development. The OBAG program allows communities flexibility to invest in transportation infrastructure that supports infill development by providing funding for bicycle and pedestrian improvements, local street repair, and planning activities, while also providing specific funding opportunities for Safe Routes to Schools projects and Priority Conservation Areas. By promoting transportation investments in PDAs, the OBAG program supports the Sustainable Communities Strategy for the Bay Area.

Per OBAG requirements, congestion management agencies (CMAs) will develop a PDA Investment and Growth Strategy for their respective counties; this will be used to guide future transportation investments that are supportive of PDA-focused development. The growth strategy also will consider strategies and plans to increase the production of affordable housing in PDAs, as well as ways to preserve existing affordable housing opportunities. The CMAs in larger counties (Alameda, Contra Costa, San Mateo, San Francisco and Santa Clara) must direct at least 70 percent of their OBAG investments to the PDAs. For North Bay counties (Marin, Napa, Solano and Sonoma) the requirement is 50 percent.

FIGURE 20: OneBayArea Grant Distribution Formula: FY 2012–13 through FY 2015–16



OBAG County Fund Distribution
(millions $, rounded)

County	Total Funds
Alameda	$63
Contra Costa	$45
Marin	$10
Napa	$6
San Francisco	$38
San Mateo	$26
Santa Clara	$88
Solano	$18
Sonoma	$23
Total	**$320**

*RHNA 2014–2022
**Housing Production Report 1996–2006, ABAG

The OneBayArea Grant distribution formula is based on the following factors: population, past housing production and future housing commitments. This includes weighting to acknowledge jurisdiction efforts to produce low-income housing. The county congestion management agencies (CMA) are responsible for local project solicitation, evaluation and selection.



Renee Goodard

A project lying outside the limits of a PDA may count toward the minimum provided that it directly connects to or provides proximate access to a PDA. A zoomable map of PDAs in the Bay Area is available at http://geocommons.com/maps/141979. The counties are expected to conduct an open decision process to justify projects that geographically fall outside of a PDA but are considered directly connected to (or provide proximate access to) a PDA.

To complement these locally administered funds, OBAG also directs additional funds to support the region's Priority Conservation Areas and Priority Development Areas. The first round of OBAG funding directs an additional $10 million to the Bay Area's Transit Oriented Affordable Housing (TOAH) Fund. These funds will see TOAH grow from a $50 million pool today to at least a $90 million pool by 2014. TOAH will help finance affordable housing projects in transit-rich locations and target neighborhood-stabilization investments, including housing acquisition and rehabilitation, small-site acquisition and land banking in the region's PDAs. OBAG also includes $30 million for the PDA Planning Program to assist cities and counties planning for employment and housing growth in their city centers and transit-served corridors. In addition, these funds will continue to facilitate the entitlement of affordable housing. Finally, the first round of OBAG commits $10 million to support the Priority Conservation Areas with funding for planning, farm-to-market projects, and to support strategic partnerships that seek to purchase conservation lands for long-term protection and use by Bay Area residents.

The OneBayArea Grant Program will provide a solid platform to advance Priority Development Areas as walkable, amenity-rich "complete communities," and to protect our Priority Conservation Areas for future generations. However, as outlined in Chapter 6, realizing the plan's full potential will require a concerted, collaborative effort on the part of federal and state agencies.

Performance and Accountability Policies

In addition to providing funding to support Priority Development Areas, OBAG requires each jurisdiction to adopt policies to support complete streets and planning and zoning policies that are adequate to provide housing at various income levels, as required by the Regional Housing Need Allocation (RHNA) process. These requirements must be met before a jurisdiction is eligible for OBAG funding:

- **Complete Streets Policy Resolution:** In addition to meeting MTC's 2005 complete streets requirements, a jurisdiction will now need to adopt a complete streets resolution. A jurisdiction can also meet this requirement by having a general plan that complies with the California Complete Streets Act of 2008. All jurisdictions seeking future rounds of OBAG funding will be required to have the updated general plan language adopted.
- **RHNA-Compliant General Plan:** A jurisdiction is required to have its general plan housing element adopted and certified by the State Department of Housing and Community Development (HCD) to be eligible for OBAG funding.

Investment Strategy 3 Build Next-Generation Transit

As discussed in Chapter 5, Plan Bay Area relied on a transportation Project Performance Assessment, which, together with public involvement, helped identify priorities for the next generation of transit investments. These include improvements to the region's core transit systems, new bus rapid transit lines in San Francisco and Oakland, rail extensions that support and rely on high levels of future housing and employment growth, and an early investment strategy for high-speed rail in the Peninsula corridor. MTC's Resolution 3434, a 2001 framework that identified regional priorities for transit expansion projects, has served the region well.

TABLE 19: MTC Resolution 3434 Project Status

Project	Project Cost* (in millions of YOE $)	Status
Caltrain Express: Baby Bullet	$128	Open for Service
Regional Express Bus	102	
BART to Warm Springs	890	In Construction
East Contra Costa BART Extension (eBART)	493	
Transbay Transit Center: Phase 1	1,589	
BART/Oakland Airport Connector	484	
Sonoma-Marin Rail Initial Operating Segment	360	
Expanded Ferry Service to South San Francisco (Berkeley, Alameda/ Oakland/Harbor Bay, Hercules and Richmond, and other improvements)	180	
MUNI Third Street Light Rail Transit Project – Central Subway	1,578	
BART: Warm Springs to Berryessa	2,330	
BART: Berryessa to San Jose/Santa Clara	3,962	Environmental Docs Approved
Transbay Transit Center/Caltrain Downtown Extension: Phase 2	2,596	
AC Transit Berkeley/Oakland/San Leandro Bus Rapid Transit	218	
Downtown to East Valley; Light Rail & Bus Rapid Transit Phases 1 & 2	559	
Caltrain Electrification	785	Environmental Docs in Process
Caltrain Express: Phase 2	427	
Van Ness Avenue Bus Rapid Transit	126	
Tri-Valley Transit Access Improvements to/from BART	168	
AC Transit Enhanced Bus: Grand-MacArthur corridor	41	
Dumbarton Rail	701	
ACE Right-of-Way Acquisition for Service Expansion	150	
Capitol Corridor: Phase 2 Enhancements	254	
Total	**$18,121**	

*Full project cost may not be included in Plan Bay Area.

TABLE 20: New Starts and Small Starts – Plan Bay Area "Next Generation" Projects
(in millions of YOE $)

Project	Cost	Previously Committed Funding	New Starts/ Small Starts	Other Funding from Plan Bay Area
BART: Berryessa to San Jose/ Santa Clara	$3,962	$1,355	$1,100	$1,507
Transbay Transit Center/Caltrain Downtown Extension: Phase 2	2,596	639	650	1,307
AC Transit Enhanced Bus/BRT: Grand-MacArthur corridor	41	0	30	11
Van Ness Avenue Bus Rapid Transit Project	126	66	30	30
AC Transit Berkeley/Oakland/ San Leandro Bus Rapid Transit	218	179	28	11
New Starts and Small Starts Reserve	660	—	660	—
Total	**$7,603**	**$2,239**	**$2,498**	**$2,866**

Roughly half of the projects are in service or under construction. Many of the others are reconfirmed as priorities for continued funding, or are included in the plan for early phases of work as the projects are being developed.

Resolution 3434 established the region's priority projects for federal New Starts and Small Starts funds (see Table 19), creating a unified regional strategy to secure commitments from this highly competitive national funding source. In 2012, the Bay Area secured commitments for nearly $2 billion in federal funding for its two most recent New Start projects — San Francisco's Central Subway and the extension of BART to Berryessa in Santa Clara County. These successes pave the way for a new generation of projects that can leverage current and future development patterns to create financially stable transit service in these corridors.

Plan Bay Area assumes that the region can attract approximately $2.5 billion in additional federal New Starts and Small Starts funding through 2040. Building on the successful delivery of Resolution 3434, and the results of the Performance Assessment and transit-specific project evaluation, Plan Bay Area's priorities for the next generation of federal New Starts and Small Starts funding include major rail and bus rapid transit (BRT) investments, as summarized in Table 20. Along with identifying these significant future transit investments, Plan Bay Area also retains $660 million in financial capacity for projects that are in the planning stages. The $660 million New and Small Starts reserve, or a regional investment equivalent, is proposed to support transit projects that are located in or enhance transit service in the East and North Bay counties, subject to future assessments of feasible alternatives, evaluation for cost-effectiveness, and for performance against MTC's Transit-Oriented Development Policy.

Reference maps of key local and regional transit projects are included at the end of this chapter.

Investment Strategy 4
Boost Freeway and Transit Efficiency

The Bay Area consistently ranks as one of the most congested metropolitan areas in the nation. In the Texas A&M Transportation Institute's 2012 Urban Mobility Report (http://mobility.tamu.edu/ums/report/), San Francisco Bay Area ranked as the third most congested region in hours of delay caused by congestion. The same report estimated that congestion cost our region's peak-commute drivers an average of more than $1,200 per year. A decade or two ago, the response to congestion might have been simply to add additional roadway capacity. With today's mature system of roadways and increased demands on available financial resources, it is no longer possible to build our way out of congestion. Instead, the region must find ways to operate our existing highway and transit networks more efficiently, and target expansion projects that will provide long-term and sustainable congestion relief.



Bill Hall, Caltrans

Plan Bay Area includes a discretionary funding commitment of $3.9 billion over the next 28 years to support projects and programs that will boost system efficiency. These include the Freeway Performance Initiative (FPI) and the Transit Performance Initiative (TPI) that aim to use low-cost technology upgrades to dramatically improve the speed and reliability of roadways and transit service. In addition, efforts like San Francisco's cordon pricing program and the Regional Express Lane Network will leverage revenues generated from pricing to improve the efficiency of the existing system while expanding travel choice.

TABLE 21: Freeway Performance Initiative

Program Elements	Description & Benefits
Ramp Metering	Activate 300 additional ramp-metering locations on freeways.
Intelligent Transportation Systems Infrastructure	Install and maintain traffic cameras, changeable message signs, speed sensors and other related infrastructure to improve travel-time reliability on freeways.
Arterial Operations	Implement traffic signal coordination, transit-priority timing and incident/emergency clearance plans on regionally significant routes.
Incident and Emergency Management	Maintain the Freeway Service Patrol and Call Box programs, and enhance transportation agencies' and first responders' capabilities to clear traffic incidents and respond to major emergencies through integrated corridor management.
Traveler Information/511	Collect, consolidate and distribute accurate regional traffic, transit and parking data for trip-planning and real-time traveler information.
Operations & Maintenance	Maintain existing and future arterial and freeway technology improvements.

Freeway Performance Initiative

Plan Bay Area supports MTC's Freeway Performance Initiative (FPI), which is designed to maximize the efficiency and improve the operations and safety of the existing freeway, highway and arterial network.

Owing to investments made through the Transportation 2035 Plan, FPI expanded the number of metered ramps throughout the Bay Area, directly resulting in reduced travel times and improved safety on major freeway corridors while managing the impact on local arterial operations. FPI investments also support the Program for Arterial System Synchronization (PASS), through which an average of 500 traffic signals are re-timed each year to improve coordination across jurisdictions, and provide priority signal timing for transit vehicles.

FPI funding for the Freeway Service Patrol and call boxes has enhanced the region's ability to quickly identify and respond to planned and unplanned freeway incidents. Currently, FSP includes 78 tow trucks that cover 552 miles of Bay Area freeways and respond to an average of 130,000 incidents per year. The 2,200 call boxes in place along the region's freeways and bridges receive an average of 22,000 calls per year.

Plan Bay Area calls for an investment of approximately $2.7 billion in discretionary regional funds over the next 28 years to implement the FPI.



Noah Berger

Transit Performance Initiative

The Transit Performance Initiative (TPI) makes a regional investment in supportive infrastructure to achieve performance improvements in major transit corridors where current and future land use supports high-quality transit. The TPI also provides incentives to reward agencies that achieve improvements in ridership and service productivity. Plan Bay Area dedicates $500 million over the plan period to support this initiative, which is expected to result in reduced emissions and vehicle miles traveled, as well as an increase in the non-auto mode share of all trips.

MTC approved the first round of capital investment projects in the spring of 2012, providing over $27 million to reduce travel times and enhance the passenger experience on major corridors served by AC Transit, San Francisco Municipal Transportation Agency (SFMTA), and Santa Clara Valley Transportation Authority (VTA). (See Table 22.) These busy routes offer the potential to improve service quality, speed, and reliability, ultimately reducing travel times and increasing ridership.

TABLE 22: Transit Performance Initiative Investments – Spring 2012

Sponsor	Project	Investment (millions $)
AC Transit	Line 51 Corridor Speed Protection and Restoration	$10.1
SFMTA	Mission Customer First	$7.0
SFMTA	N-Judah Customer First	$3.7
SFMTA	Bus Stop Consolidation and Roadway Modifications	$4.1
VTA	Light Rail Transit Signal Priority Improvements	$1.6
VTA	Stevens Creek – Limited 323 Transit Signal Priority	$0.7

MTC has also created an incentive program to reward transit agencies that achieve ridership increases and productivity improvements, and will allocate funds on the basis of performance, thereby encouraging all of the region's transit operators to continuously improve their service and attract more riders. In winter 2013, the first round of funding for the TPI Incentive program awarded over $13 million to eight projects focused on increasing ridership and/or productivity, including youth and low-income pass programs.

Regional Express Lane Network

Express lanes, otherwise known as high-occupancy toll (HOT) lanes, are carpool lanes that give solo drivers the option of paying a fee to use the uncongested carpool lane, while carpools and buses may use the express lane free of charge. Express lanes make better use of carpool lanes that often sit empty while solo drivers are stuck in traffic. Opening up the express lane to solo drivers has been proven effective across the nation in moving cars out of traffic. Fewer cars in general-purpose lanes reduce traffic even for those who do not choose to use the express lane.

Express lane tolls vary based on levels of congestion. They are priced low enough to attract drivers out of slow traffic in the regular lanes, but high enough to ensure a free flow of cars in the express lane at all times. Drivers pay based on distance traveled in the express lane. Tolls are collected through the FasTrak® electronic toll collection system.

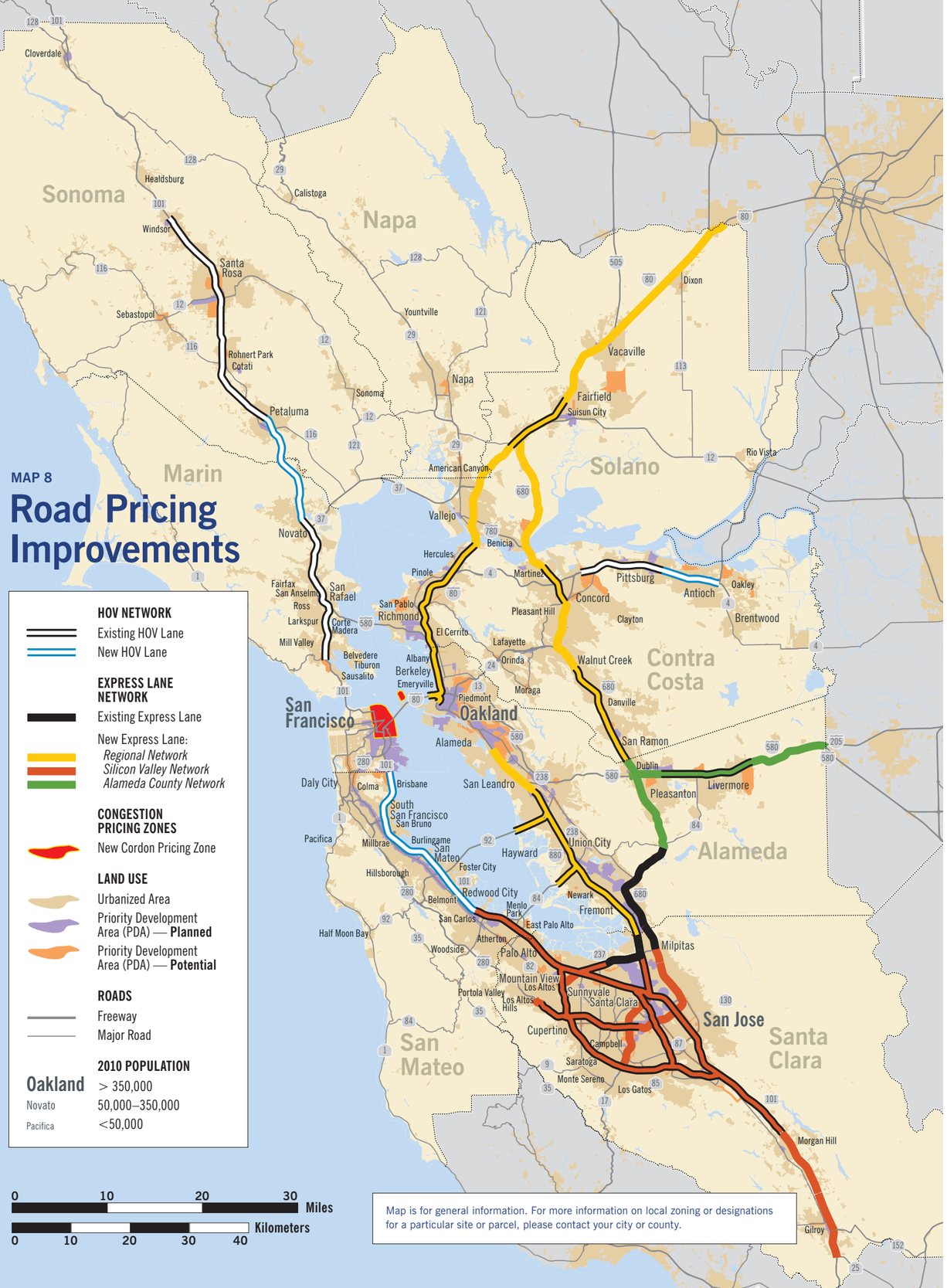


Noah Berger

In October 2011, the California Transportation Commission (CTC) approved MTC's plan to add 270 miles of express lanes on I-80 in Solano, Contra Costa and Alameda counties, I-880 in Alameda County, I-680 in Solano and Contra Costa counties, and the approaches to the Bay Bridge, San Mateo-Hayward Bridge and the Dumbarton Bridge. These will be operated by MTC in tandem with express lanes operated by county agencies on I-580 and I-680 in Alameda County and throughout Santa Clara County to form a seamless system of express lanes throughout the region. Of the proposed network, 150 miles would involve converting existing carpool lanes, or high-occupancy vehicle (HOV) lanes, to express lanes, and 120 miles would involve widening freeways to create new HOV/express lanes in both directions to close gaps in and extend the existing HOV system.

MAP 8

Road Pricing Improvements



Map is for general information. For more information on local zoning or designations for a particular site or parcel, please contact your city or county.

The goals of the Regional Express Lane system remain the same as they were in the Transportation 2035 Plan:

- **Connectivity** – Use express lane toll revenue to close gaps within the HOV lane system and to increase travel-time savings for carpools and buses. Without express lane toll revenue, the region's HOV system will remain fragmented for the foreseeable future.
- **Efficiency** – Optimize throughput on freeway corridors to better meet current and future traffic demands, using excess capacity in the existing HOV system to reduce travel time for all travelers.
- **Reliability** – Provide a reliable, congestion-free transportation option.

Express lane toll revenue will be used first and foremost to fund the operations and maintenance of the express lanes. Plan Bay Area invests $600 million in discretionary revenue in order to complete the financing package for construction of the Regional Express Lane Network in Solano, Contra Costa and Alameda counties. Conversions of existing HOV lanes will be built first. Revenues from those early express lanes will be used to bond-finance the gap closures first, and, eventually, the extensions. Express lanes in Santa Clara County will be financed by bonds that are fully supported by committed express lane toll revenue.

All project-level environmental clearances will comply with applicable requirements for environmental justice, and focused outreach will be conducted with low-income communities as part of the express lane network development and implementation. Furthermore, MTC will study the potential benefits and impacts of converting general purpose lanes to express lanes in order to inform implementation of the express lane network.

A map of other critical roadway improvements proposed in the Plan Bay Area investment strategy is included at the end of this chapter.



Proposed congestion pricing locations in downtown San Francisco and Treasure Island.

San Francisco Congestion Pricing

Congestion pricing involves charging drivers a fee to drive in congested areas, and using the revenue generated to fund transportation improvements — such as better transit service, signal coordination, and bicycle and pedestrian projects — that improve travel options and traffic flow. Congestion pricing is being advanced in San Francisco through a demonstration project as a part of the Treasure Island development project, and through ongoing planning for congestion pricing in downtown San Francisco.

Treasure Island

In June 2011, the city of San Francisco approved development plans for Treasure Island (a Priority Development Area), including 8,000 residential units, along with retail and commercial uses. The Treasure Island Transportation Implementation Plan, adopted as part of the development project's approval, calls for an integrated approach to managing traffic and improving mobility management, including a congestion fee to be assessed for residents traveling by private automobile on or off the island during peak hours. The congestion fee, in combination with parking charges and a pre-paid transit voucher for each household, will help fund a comprehensive suite of transportation services including new ferry service to San Francisco and enhanced East Bay bus services.



London congestion pricing

The Guardian UK

Downtown San Francisco

During rush hours, congestion in the greater downtown area results in average bus transit and automobile speeds below 10 miles per hour. Congestion is already a problem, and the city has ambitious growth plans for the future. Unless bold measures are taken, downtown San Francisco streets will be unable to accommodate expected levels of housing and job growth, and gridlocked conditions will threaten the city's and region's economic development plans. A recent study found congestion pricing in downtown San Francisco to be a feasible and potentially effective way to manage and grow the transportation system while supporting new businesses and residents. The mobility and pricing program could result in:

- 12 percent fewer peak-period vehicle trips and a 21 percent reduction in vehicle hours of delay
- 5 percent reduction in greenhouse gases citywide
- $60–80 million in annual net revenue for mobility improvements
- 20–25 percent transit speed improvement and 12 percent reduction in pedestrian incidents

Plan Bay Area supports the implementation of these congestion pricing projects in San Francisco with a $150 million investment over the plan period.

Investment Strategy 5
County Investment Priorities

The county congestion management agencies have identified key local transportation priorities during the development of their county transportation plans. This process resulted in $29 billion in discretionary funding requests, which is nearly twice the $16 billion that is expected to be available over the life of the plan. Overall, the county funding priorities are closely aligned with the investment strategy, including an investment of 66 percent of these funds dedicated to maintaining and sustaining current transportation systems. Their priorities complement a number of the regional discretionary investment strategies including the OneBayArea Grant, Build Next Generation Transit, and Freeway and Transit Efficiency strategies. The county programs also include complete streets programs that will deliver substantial bicycle and pedestrian improvements. Figure 21 summarizes the counties' investment priorities; more details can be found in the Online Project Database, listed in Appendix 1.

FIGURE 21: County Investment Priorities $16 Billion (YOE $)

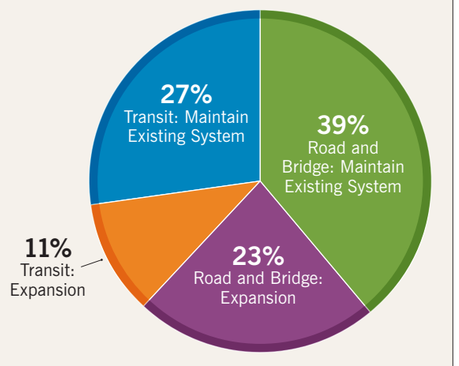


TABLE 23: Summary of Climate Initiatives Program

Policy Initiative (from most to least cost-effective)	Cost (in millions of YOE $)	Per Capita CO_2 Emissions Reductions in 2035
Commuter Benefit Ordinance	$0	–0.3%
Car Sharing	$13	–2.6%
Vanpool Incentives	$6	–0.4%
Clean Vehicles Feebate Program	$25	–0.7%
Smart Driving Strategy	$160	–1.5%
Vehicle Buy-Back & Plug-in or Electric Vehicle Purchase Incentive	$120	–0.5%
Regional Electric Vehicle Charger Network	$80	–0.3%
Climate Initiatives Innovative Grants	$226	TBD
Total	**$630**	**–6.3%**

Investment Strategy 6
Protect Our Climate

Pursuant to SB 375, the California Air Resources Board in 2011 assigned the Bay Area a per capita greenhouse gas (GHG) emissions reduction target of 7 percent by 2020 and 15 percent by 2035. These are aggressive targets that we are determined to meet and possibly exceed. In terms of its development, the Bay Area is a relatively mature region, with a well-established transportation system and a large population already in place. While it can focus the pattern of future growth, Plan Bay Area does not significantly rearrange the development pattern that already exists. So in harmony with our multimodal transportation network and focused land use plan, we have to invest in technology advancements and provide incentives for travel options to help meet these emissions targets. The Plan Bay Area climate initiative invests $630 million in the eight programs highlighted in Table 23.

Commuter Benefit Ordinance

Senate Bill 1339 authorizes the Bay Area Air Quality Management District (BAAQMD) and MTC to jointly adopt a regional commuter benefit ordinance as a means to reduce GHG emissions and to improve air quality. Commuter benefits would include pre-tax benefit programs, employer-provided subsidies, free shuttles or vanpools, or an employer-chosen alternative that would provide an equal or greater benefit in terms of reducing GHG emissions. The agencies are required to report to the Legislature in 2016 on the results of the program, including vehicle miles reduced and greenhouse gases reduced.

Car-Sharing

Car-sharing services have been available in the Bay Area since 2001, and in that time the number of vehicles available and the number of subscribers has grown. Bay Area wide, there were an estimated 60,500 members in 2012 and fleets with hundreds of cars to serve those customers. Car-sharing allows people to rent cars by the hour, for as short a time as 30 minutes up to a full weekend. Car-sharing saves families and individuals hundreds of dollars every month in car payments, insurance, gas, registration and repairs. This investment strategy proposes to invest $13 million to expand car-sharing services to ensure vehicles are available at high-demand locations, and to expand services in suburban communities.



Noah Berger

Vanpool Incentives

The Bay Area has had an organized vanpool program since 1981. Currently managed by local, county and regional partners including MTC's 511 program, the region's vanpool service helps people with long commutes that are not well-served by transit. This strategy will enhance the appeal of vanpooling by dedicating $6 million to reduce the cost of van rentals. Encouraging more people to participate in the vanpool program can help to remove personal cars from crowded freeways and reduce overall emissions.

Clean Vehicles Feebate Program

A "feebate" charges a fee to one user, and that fee is used to provide a discount to another user. The feebate program in Plan Bay Area would charge a one-time, point-of-purchase fee on new vehicles with low miles-per-gallon ratings to help purchase fuel-efficient vehicles that emit much less pollution.

Although the fees and subsidies from the program are revenue-neutral, this strategy still includes $25 million to pay for the administrative costs of the program over the period of the plan.

Smart Driving Strategy

Despite Plan Bay Area's targeted efforts to incentivize the purchase of fuel-efficient vehicles, many of the cars currently on the road fall short of current and future emission or fuel-efficiency standards, yet they work well and are not ready to be retired. Smart driving tactics are easy-to-implement actions (e.g., change in driving style, more-frequent vehicle maintenance, etc.) that any driver can do to save gas and reduce emissions. Plan Bay Area provides a total of $160 million to develop a public education campaign for the region's drivers and to provide rebates for in-vehicle, real-time fuel efficiency gauges.

Vehicle Buy-Back/Purchase Incentive Program for Plug-ins or Electric Vehicles

While the federal government and the state are offering incentives for the purchase of electric vehicles, most EVs still cost more than many gas vehicles at the time of purchase. Typically when consumers buy new cars, their older, less-efficient vehicles are re-sold rather than being removed from the fleet. As long as older vehicles are still on the road polluting, it is hard to significantly reduce emissions. Plan Bay Area sets aside a total of $120 million for a voluntary incentive program to accelerate the removal of low-mpg vehicles from the region's roads. In return for trading in their car, which is retired from service, people can receive a cash incentive towards the purchase of a new plug-in hybrid or electric vehicle.

Regional Electric Vehicle Charger Network

BAAQMD, in partnership with regional and local partners, and auto manufacturers and service providers, is charting the Bay Area path for electric vehicle use in the Bay Area. The Electric Vehicle (EV) Readiness Plan, completed in late 2012, sets forth short-term strategies to increase EV usage. A long-term strategy is currently under development. Plan Bay Area supports this initiative with supportive strategies to help clean our air and cut the region's GHGs.

The Bay Area is expected to be a successful clean-vehicle market, but due to the limited range of today's all-electric vehicles (EVs) it is projected that many EV purchases will be plug-in hybrid electric vehicles (PHEVs) that can switch over to a gasoline engine once they have used up the energy in their batteries. Plan Bay Area allocates $80 million to install more EV chargers at Bay Area workplaces. The proposed investment will allow vehicles to be charged during the day, ready to make the drive back home without using the gasoline engine.



Peter Beeler



Noah Berger

Climate Initiatives Innovative Grants

With the adoption of the Transportation 2035 Plan, MTC created a new Climate Initiatives Innovative Grant program and invested $33 million in innovative and creative pilot grants to reduce greenhouse gas (GHG) emissions from the transportation sector. The grant categories included: Safe Routes to Schools, which encourages children to bike and walk to school; Parking Pricing; Transportation Demand Management, which includes strategies to reduce travel demand or shift demand in order to relieve congestion; and Showcase Projects, for creative ideas that did not fit neatly into the other categories. These grants are still being implemented and evaluated, but many of the pilot projects show promise in their potential to reduce GHG emissions. Plan Bay Area sets aside $226 million to invest in the expansion of the most successful strategies identified in the innovative grants program.

Key Transit and Road Improvements

The following maps show priority transit and road projects from the Plan Bay Area investment strategy. These projects reflect a mix of committed and discretionary investments, with local, state and federal investments all in support. The maps show key road and highway improvements, local transit projects, and regional transit projects. More details on these and other Plan Bay Area-funded projects and programs are available in the Online Project Database, listed in Appendix 1.



Caltrain

Peter Beeler

Regional Transit System Improvements*

BART Projects

1. BART Extension to San Jose/Santa Clara

Commuter Rail Projects

2. Caltrain Electrification & Frequency Improvements
3. Caltrain Downtown Extension (4th & King to Transbay Transit Center)
4. eBART to Antioch
5. SMART Commuter Rail (Larkspur to Windsor)

Infill Stations & Bus Terminals

6. Transbay Transit Center
7. Irvington BART Station
8. Union City Commuter Rail Station
9. Hercules Commuter Rail Station

Ferry

10. New Ferry Routes: Treasure Island, Berkeley, Richmond, Hercules, Redwood City

* For clarity, only major expansion projects or operational improvements with costs exceeding $50 million are depicted.

MAP 9

Regional Transit System Improvements

BART
BART (Existing)
New BART Line

COMMUTER RAIL
Commuter Rail (Existing)
Improved Commuter Rail Frequencies
New Commuter Rail Line

LIGHT RAIL
Light Rail (Muni & VTA)

FERRIES
Existing Ferry Route
New Ferry Route

OTHER PROJECTS
Infill Rail Station/ New Bus Terminal

ROADS
Freeway
Major Road

LAND USE
Urbanized Area
Priority Development Area (PDA) — **Planned**
Priority Development Area (PDA) — **Potential**

2010 POPULATION
Oakland > 350,000
Novato 50,000–350,000
Pacifica <50,000

0 10 20 30 Miles
0 10 20 30 40 Kilometers

Map is for general information. For more information on local zoning or designations for a particular site or parcel, please contact your city or county.

Local Transit Improvements*

Bus Rapid Transit (BRT) Projects

1. Van Ness BRT
2. Geary BRT
3. Geneva-Harney BRT
4. East Bay BRT
5. Grand-MacArthur BRT
6. Alameda-Oakland BRT
7. El Camino BRT
8. Santa Clara-Alum Rock BRT
9. Stevens Creek BRT
10. King Road Rapid

Light Rail (LRT) Projects

11. Central Subway (Chinatown to Caltrain)
12. Embarcadero Streetcar (Fort Mason to Caltrain)
13. Parkmerced Light Rail Extension
14. Bayshore Light Rail Extension
15. Oakland Airport Connector
16. San Jose Airport People Mover
17. Vasona Light Rail Extension
18. Capitol Expressway Light Rail Extension

Other Projects

19. Transit Effectiveness Project
20. Dumbarton Express Bus Frequency Improvements

* For clarity, only major expansion projects or operational improvements with costs exceeding $50 million are depicted.



Future Oakland Airport Connector

BART

MAP 10

Local Transit Improvements

LIGHT RAIL
- Light Rail (Existing)
- New Light Rail Line

BUS
- Improved Bus Service
- New Bus Rapid Transit Line

RAIL SYSTEM
- BART (Existing)
- Caltrain (Existing)

LAND USE
- Urbanized Area
- Priority Development Area (PDA) — **Planned**
- Priority Development Area (PDA) — **Potential**

ROADS
- Freeway
- Major Road

2010 POPULATION
- Oakland > 350,000
- Novato 50,000–350,000
- Pacifica <50,000

0 10 20 Miles
0 10 20 30 Kilometers

Map is for general information. For more information on local zoning or designations for a particular site or parcel, please contact your city or county.

Highway System Improvements*

US-101 Corridor

1. Widening from Story Road to Yerba Buena Road
2. Operational Improvements along Presidio Parkway/Doyle Drive and in the Twin Cities/ Greenbrae Corridor
3. New Auxiliary Lanes from Oyster Point to San Francisco county line and from Marsh Road to Embarcadero Road
4. Interchange Improvements at: Petaluma Boulevard, Greenbrae, Candlestick Point, Produce Avenue, Broadway, SR-92, Woodside Road, Willow Road and Oregon Expressway
5. New Interchanges at: Zanker Road/Skyport Drive and Mabury Road/Taylor Street

I-80 Corridor

6. Widening from I-680 to Airbase Parkway
7. Integrated Corridor Management (Emeryville to Crockett)
8. Interchange Improvements at: I-680/SR-12, San Pablo Dam Road, Ashby Avenue, and Yerba Buena Island

I-280 Corridor

9. Interchange Improvements at: SR-85 and Senter Road

I-580 Corridor

10. Widening from Greenville Road to North Flynn Road
11. Interchange Improvements at: Vasco Road and Greenville Road

I-680 Corridor

12. Interchange Improvements at: SR-84 and SR-4
13. New Interchange at: Norris Canyon Road

I-880 Corridor

14. Interchange Improvements at: Jackson Street, 23rd Avenue, 29th Avenue, A Street, Industrial Parkway, Whipple Road, and SR-262

SR-4 Corridor

15. Widening from Somersville Road to SR-160 and from Lone Tree Way to Balfour Road
16. Interchange Improvements at: SR-160/ Phillips Lane

SR-12 Corridor

17. Jameson Canyon Widening
18. New Interchange at: Fulton Road

Other Projects

19. Willow Road Expressway (SR-84 to US-101)
20. SR-84 Widening (I-680 to Jack London Boulevard)
21. SR-262 Widening (I-680 to I-880)
22. SR-1 Widening (Fassler Avenue to Westport Drive)
23. Redwood Parkway/Fairground Drive Widening
24. SR-238 & SR-185 Operational Improvements
25. SR-85/SR-237 Interchange Improvements
26. SR-92/Clawiter Road/Whitesell Street Interchange Improvements

* For clarity, only major expansion projects or operational improvements with costs exceeding $50 million are depicted.

MAP 11

Highway System Improvements

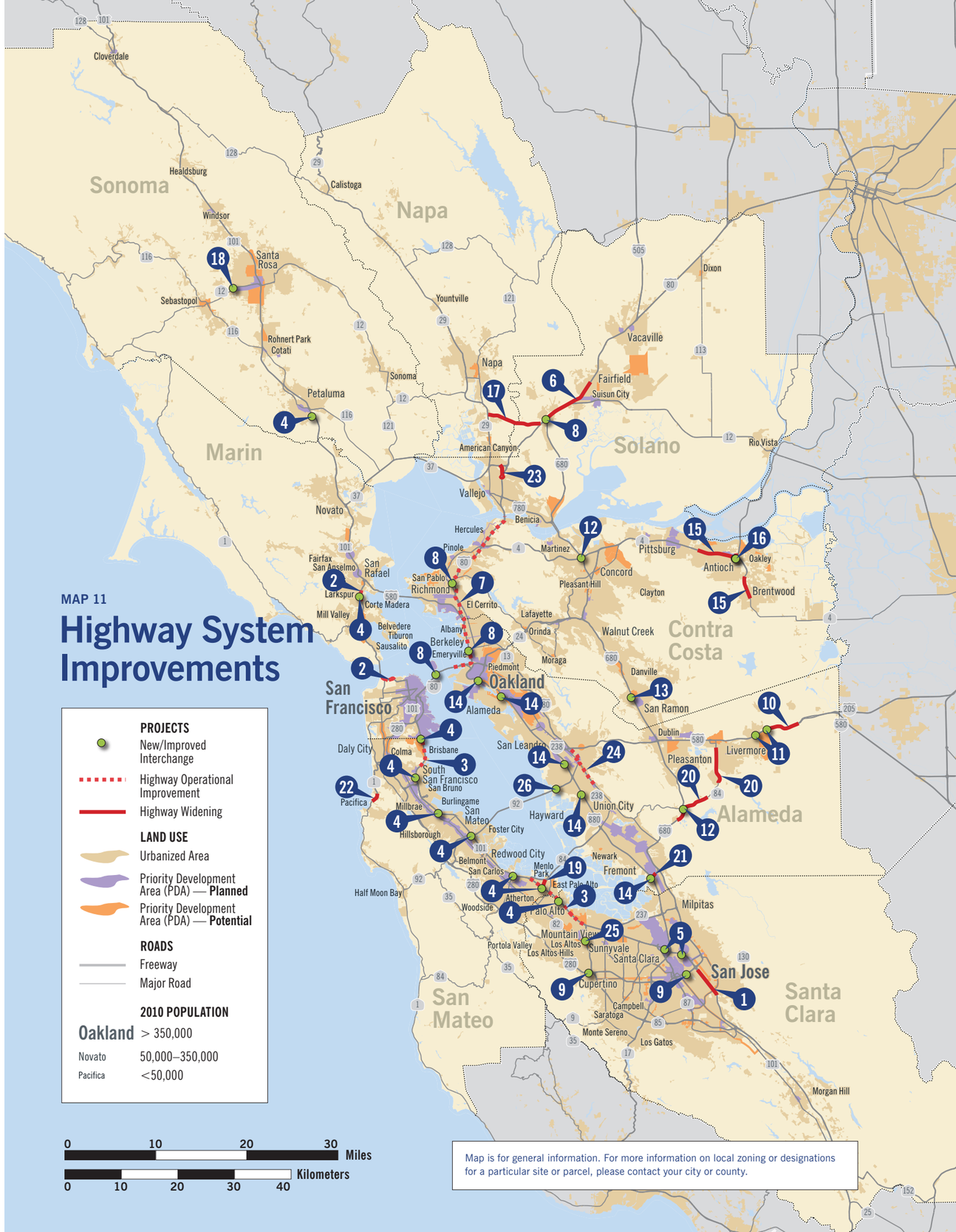


TABLE 24: Plan Bay Area Investment Strategy Summary – Discretionary Revenues (in billions of YOE $)		
Strategy	**Investment**	**% of Total**
1 Maintain Our Existing System	$15	25%
2 Build Next Generation Transit*	$7	12%
3 Boost Freeway and Transit Efficiency	$4	7%
4 Support Focused Growth – OBAG	$14	23%
5 County Investment Priorities	$16	27%
6 Protect Our Climate	< $1	1%
7 Reserve	$3	5%
Total	**$60**	**100%**

*Includes $2 billion in funds retained for future New/Small Starts and High-Speed Rail projects.

Summary

The investment strategies for the $60 billion in discretionary revenue support key priorities that will help our region to surpass our per-capita greenhouse gas target, deliver the long-term land use strategy, maintain the infrastructure investments made by past generations, and provide for future economic growth. Table 24 above summarizes the investment strategies and their respective funding levels of discretionary revenue in Plan Bay Area.

Plan Bay Area also sets a path for the region to participate in and inform the California Transportation Plan (CTP 2040). This plan, scheduled for completion by the end of 2015, will integrate regional planning efforts from around the state into a comprehensive plan. CTP 2040 will address the state's mobility, reduce greenhouse gas emissions from the transportation sector, and define performance-based goals, policies and strategies to plan, enhance and sustain California's statewide, integrated, multimodal transportation system.



Vallejo Transit Center

Karl Nielsen

5

Performance



Noah Berger



Noah Berger

Chapter 5

Performance

At both the scenario and project levels, Plan Bay Area has been tested against rigorous performance targets.

Because of this, MTC and ABAG have been able to craft a plan that emphasizes the most effective strategies to achieve regional objectives. Even so, some targets remain stubbornly out of reach.

Plan Bay Area achieves the greenhouse gas emissions reduction target required by state law through a more efficient land use pattern, key transportation investments and initiatives such as accelerated electric vehicle deployment. It also achieves the housing target required by state law to provide housing for all of the region's population over the next three decades, relying on local communities' support for policies that direct the lion's share of housing growth into Priority Development Areas.

At the same time, Plan Bay Area struggles to achieve many of the region's ambitious voluntary targets. Thanks to investments in transportation alternatives, the plan moves in the right direction when it comes to increasing active transportation and reducing the number of automobile miles driven per capita, though it falls short of the "aspirational" goals set in these areas. While the plan allocates funds and introduces policies to address them, roadway safety, transportation and housing for low-income persons, and the transportation system's state of good repair remain vexing problems that the region must redouble our efforts to confront.

How Does Plan Bay Area Perform?

As has been the case in past long-term transportation plans, no single strategy is able to achieve all the plan's performance targets, and Plan Bay Area clearly bears this out. Some targets — including the key greenhouse gas emissions and housing targets — are met or even exceeded. In other cases, the plan makes progress toward achieving a target, but falls short of full attainment. And in other cases, the plan actually loses ground against some metrics.

Here is a target-by-target breakdown of how well Plan Bay Area performs. (See Chapter 1 for background on the performance targets.) Given the plan's 2040 horizon year, target results reflect year 2040 performance in comparison to year 2005 baseline conditions, unless noted.

Additional analysis of target performance can be found in the Performance Assessment Report, *listed in Appendix 1.*

Required Performance Targets

Climate Protection

Target #1:
Reduce per-capita CO_2 emissions from cars and light-duty trucks by 15 percent.

Plan meets and exceeds target; reduces per-capita emissions of CO_2 by 18 percent (by 2040).



Reducing the transportation sector's emission of greenhouse gases responds to the threat of climate change and helps to address the threat to the region from sea level rise.

Through combinations of denser land use patterns focused in Priority Development Areas, increased investments in the region's public transit infrastructure, and enhanced funding of climate initiatives such as electric vehicle adoption incentives, Plan Bay Area not only meets but exceeds its greenhouse gas (GHG) emissions reduction target. By 2040, the typical Bay Area resident is expected to reduce his or her daily transportation CO_2 emissions by 18 percent compared to 2005 conditions.



Kit Morris

Senate Bill 375 mandates per-capita GHG target achievements for years 2020 and 2035 as established by the California Air Resources Board. For 2035, the plan leads to a 16 percent per-capita reduction (surpassing the 15 percent target), and for 2020, the plan leads to a 10 percent per-capita reduction (also surpassing an interim 7 percent target).

While MTC has considered the effects of transportation investments on GHG emissions in prior regional transportation plans, Plan Bay Area is the first regional effort with an aggressive and achievable emission reduction goal. By accelerating efforts to emphasize infill growth and to boost funding for public transit, this plan represents a bold step for the region in this era of climate change.

Adequate Housing

Target #2:
House 100 percent of the region's projected population growth by income level (very-low, low, moderate, above-moderate) without displacing current low-income residents.

Plan meets target; houses 100 percent of population growth.



It's no secret that the Bay Area is one of the most expensive places to live in the United States. For decades this has caused an ever-increasing number



MTC Archives

of people who work in the Bay Area to look for more affordable housing in the Central Valley or other surrounding regions. The resulting longer-distance commutes increase emissions while also raising transportation costs for the residents who must venture so far afield in search of more affordable housing. This places a greater burden on lower-income residents and further increases the divide between the region's more-affluent and less-affluent residents. The region's businesses also suffer, since the dispersal of workers tends to constrain the supply of labor they can draw on.

SB 375 requires regions to plan for housing that can accommodate all projected population growth, by income level, so as to reduce the pressures that lead to in-commuting from outside the nine-county region. In November 2010, ABAG adopted a methodology to define this figure. This target is also intended to limit the displacement of low-income residents, defined as the outward movement of current low-income residents from locations in the region's urban core to locations with lower accessibility to transportation options and limited services as a result of new development pressures. This target complements the Regional Housing Need Allocation (RHNA), as discussed in Chapter 3.

Plan Bay Area succeeds in identifying housing opportunities for all of the region's population. Working with cities and counties to underscore the importance of achieving this target, MTC and ABAG

are putting forward a plan that provides sufficient housing for the number of new jobs created in the region. The focus on spurring housing in locally supported Priority Development Areas and high-quality transit corridors allows the plan to meet this target, and also helps to achieve the GHG emissions reduction target (see above).

Voluntary Performance Targets

Healthy and Safe Communities

Reduce Particulate Matter

Target #3:
Reduce premature deaths from exposure to particulate emissions:

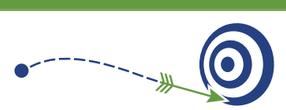
Target #3a:
Reduce premature deaths from exposure to fine particulates ($PM_{2.5}$) by 10 percent.

Plan meets and exceeds target; reduces premature deaths from exposure to fine particulates by 71 percent.



Target #3b:
Reduce coarse particulate emissions (PM_{10}) by 30 percent.

Plan reduces coarse particulate emissions by 17 percent, but falls short of target.



Target #3c:
Achieve greater reductions in highly impacted areas.

Plan meets target; achieves greater particulate emission reductions in highly impacted neighborhoods.



Particulate matter (PM) consists of very small particles that can pass through the throat and nose and into the lungs, and may even enter the blood-stream. Over time this can affect the heart and lungs and lead to serious health effects such as heart attacks or asthma, and can even contribute to premature death. While particulate matter is directly linked to vehicle miles traveled, the approach taken with this target moves from simply measuring vehicle use to measuring healthy outcomes for the region's residents.

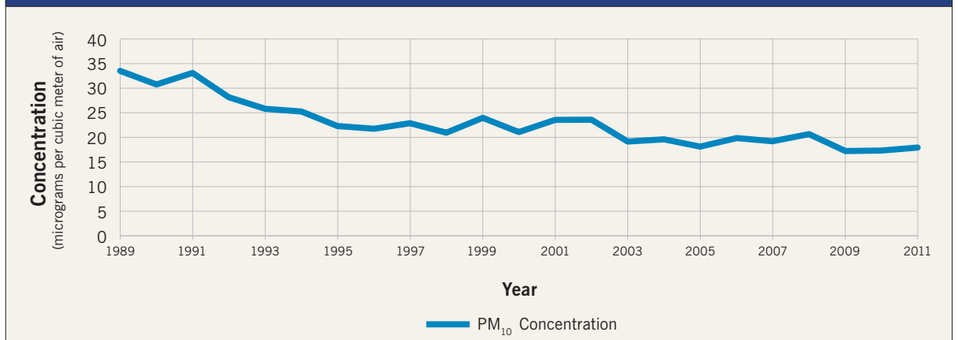
The Bay Area does not meet the federal standard for fine particulate matter ($PM_{2.5}$), which is extremely hazardous to health. The goal of a 10 percent reduction in premature deaths due to $PM_{2.5}$ reflects the expected benefit from meeting the federal standard, assuming each emission sector (both mobile and non-mobile sources) takes on similar emission reduction shares. The region, like all major metropolitan regions in the state, also does not yet attain the state standard for the coarser PM_{10}, which also causes health impacts. The 30 percent reduction goal for PM_{10} is consistent with the reduction needed to meet the state standard.

There has been substantial progress in reducing Bay Area PM levels in recent years[1]. The state and the Bay Area Air Quality Management District have taken major steps to address pollution impacts of Bay Area traffic — primarily, to clean up truck engines and fuel, the chief sources of particulate emissions. New regional and state regulations are expected to reduce premature deaths by 71 percent by 2040, saving 159 lives per year compared to the 2005 baseline. This projection far exceeds the 10 percent reduction target for Plan Bay Area. Coarse particulates, known as PM_{10}, also represent a major threat to air quality and public health; in 2005, Bay Area vehicles emitted 15 tons (approximately the weight of seven passenger vehicles) of particulate matter every day. While the historical trend has been favorable (see Figure 22), and aforementioned regulations help move us in the right direction with regard to this ambitious target (reducing emissions by 17 percent by 2040), they still fall short of achieving the 30 percent target established for Plan Bay Area.

Despite more stringent controls on tailpipe emissions and fuels, meeting the PM_{10} target will be difficult given the region's long-term mobility needs. To achieve the public health benefits of this target, it will be necessary to reduce auto trip distances and to promote the use of alternative modes of transportation such as transit, biking and walking. While Plan Bay Area offers more individuals new public transit options and supports the trend toward shorter-distance commutes, regional growth will lead to more vehicles (and more vehicle miles) than ever before.

1 Air quality monitoring data shows that the Bay Area met the national 24-hour $PM_{2.5}$ standard during the 2008–2012 period. However, the Bay Area is still formally designated a non-attainment area for the national 24-hour $PM_{2.5}$ standard.

FIGURE 22: Bay Area Annual Mean PM_{10} (Quarterly Averaged, 9-site Mean, 1989–2011)



Source: Bay Area Air Quality Management District

Reduce Injuries and Fatalities From Collisions

Target #4:
Reduce by 50 percent the number of injuries and fatalities from all collisions (including bike and pedestrian).

Plan moves in opposite direction from target; injury and fatality collisions are projected to increase during plan period by 18 percent.



Making the Bay Area safer for motorists, pedestrians and bicyclists is an important and ongoing priority. This target reflects an emphasis in Plan Bay Area to enhance safety for all travel modes across the Bay Area. The target is adapted from the state's Strategic Highway Safety Plan (2006), and also reflects a long-standing regional goal of making streets, highways and transit service safer.

Approximately 39,000 individuals were injured or killed in collisions on Bay Area roads during the year 2005, highlighting the critical need to improve roadway safety. Unfortunately, as a result of the region's growth in total population and in total vehicle miles traveled, we lose ground against this target over the course of the plan. Although as a region we continue to invest in safer roads for all modes of transport, over 46,000 individuals are forecasted to be injured or killed in collisions in year 2040, an 18 percent increase in roadway tragedies compared to 2005. While it is some comfort to know that the per-capita rate of collisions is projected to decline by 10 percent during the plan period, the sheer number of people traveling on the network — combined with the certainty of occasional human error — overwhelms the safety improvements for which the plan allocates funding.

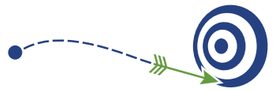


John J. Kim

Encourage Active Transport

Target #5:
Increase the average daily time walking or biking per person for transportation by 70 percent (for an average of 15 minutes per person per day).

Plan boosts per-person active transportation by 17 percent, but falls short of target.



The U.S. Surgeon General recommends at least 30 minutes of physical activity per day to lower the risk of chronic disease and increase life expectancy. While Bay Area residents are more physically active than residents in most other parts of the country, the current measure of Bay Area residents' average daily physical activity still falls well short of the Surgeon General's recommendation. The average time Bay Area residents spent walking and biking for transportation was about 9 minutes per person in 2005. There is no accepted standard for the amount of activity people should get through day-to-day transportation compared to other activities. However, in order to increase the health of our communities, Plan Bay Area set out to bring the average up to 15 minutes per person per day by encouraging people to spend more time walking or biking.

In order to improve public health in the light of rising obesity rates, it is essential to construct and improve facilities to allow for walking and bicycling during one's daily routine. The plan invests in complete streets, local streetscape improvements, and new bike and pedestrian paths, with an objective of providing new opportunities for Bay Area residents to walk and bike to daily destinations.



YinYang, iStock

Unfortunately, while these investments will boost the amount of time individuals spend walking and biking, the region continues to fall short of this public health target. The typical Bay Area resident spent about 9 minutes per day walking or biking for transportation purposes in the year 2005, while Plan Bay Area will increase the average amount to 10 minutes per day in year 2040 (a 17 percent increase).

While many people who make the effort to exercise regularly do so by going to the gym or playing on a sports team, transportation-related exercise could play a crucial role in boosting regional health. Unless additional efforts are initiated to encourage walking and biking for daily commutes or daily errands, exercise from walking and biking is expected to only increase slightly as a result of Plan Bay Area.

Open Space and Agricultural Land

Target #6:
Direct all non-agricultural development within the year 2010 urban footprint (existing urban development and urban growth boundaries).

Plan meets target; directs all non-agricultural development within the existing urban footprint.



SB 375 requires consideration of open space and natural resource protection and supports accommodating new housing and commercial development within existing areas designated for urban growth. This is of particular importance to the Bay Area, where so much of the region's spectacular natural setting has been preserved as open space. And whether it is the scenic wine country or the small farms that supply thriving farmers markets with local produce, agricultural lands also merit special protection.

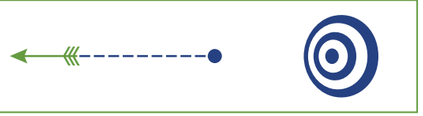
The intent of this target, therefore, is to support infill development in established communities while protecting the Bay Area's agriculture and open space lands.

To ensure that the Bay Area retains the landscapes that its residents value so highly, Plan Bay Area aims to protect open space and agricultural land by directing 100 percent of the region's growth inside the year 2010 urban footprint, which means that all growth occurs as infill development or within established urban growth boundaries or urban limit lines. As the plan assumes that all urban growth boundaries/urban limit lines are held fixed through the year 2040, no sprawl-style development is expected to occur on the region's scenic or agricultural lands. This will help preserve the natural beauty of the Bay Area for future generations to enjoy.

Equitable Access

Target #7:
Decrease by 10 percentage points (to 56 percent, from 66 percent) the share of low-income and lower-middle income residents' household income consumed by transportation and housing.

Plan moves in wrong direction; the share of household income needed to cover transportation and housing costs is projected to rise by 3 percentage points to 69 percent for low-income and lower-middle income residents during the Plan Bay Area period.



Not only have housing costs increased over the years, but gasoline costs have crept (and sometimes leapt) up as well. Higher gas prices disproportionately burden low-income residents who drive, and in the Bay Area most low-income residents own and drive cars. In 2005, low-income and working class families in the Bay Area spent 66 percent of household income on housing and transportation, which is about 10 percentage points higher than similar families in other major U.S. metropolitan areas, and a significant cost burden.



Sergio Ruiz

This target addresses this situation by setting a goal of reducing the share of household income that poorer residents must devote to housing and transportation. It aims to bring the Bay Area in line with the national average and help ensure that low-income residents are able to continue to live and work in the region.

However, expected increases in gasoline prices, combined with forecasts of a regional housing market recovery, are expected to disproportionately affect those at the lower end of the income spectrum — a challenge that will face not only the Bay Area, but the nation as a whole. For this group, transportation and housing costs are likely to rise faster than household incomes during the Plan Bay Area period. On the plus side, Plan Bay Area policies should help to stabilize the length and duration of commute trips for lower-income residents — which provides benefits in terms of overall quality of life.

Economic Vitality

Target #8:
Increase gross regional product (GRP) by 110 percent — an average annual growth rate of approximately 2 percent (in current dollars).

Plan meets and exceeds the economic growth target; 119 percent increase in GRP is forecasted over the life of the plan.



Past long-range transportation plans have not included an analysis of economic impacts, even though they have directed the spending of billions of dollars of transportation funds. Of course, past transportation investments — such as transit expansion projects and freeway improvements — have certainly provided significant benefits to the Bay Area economy, but those benefits were not quantitatively estimated during plan development. Plan Bay Area takes the first step to directly address this issue through a quantitative performance target.

Gross regional product (GRP) reflects overall economic output of the region's residents and businesses. While the Bay Area economy is affected by global and national trends, regional land use patterns and transportation system efficiency also affect freight mobility and general productivity.

Between 2005 and 2040, taking Plan Bay Area into account, the region's gross regional product is forecasted to increase by 119 percent, slightly exceeding the region's historical growth rate of approximately 2 percent per year. Forecasted job growth and population growth play a primary role in the expected rise in GRP; as more households and employers decide to locate in the Bay Area, regional economic activity tends to grow by a proportionate amount.

In addition, plan investments in congestion relief projects improve workers' mobility across the region, benefitting the economy as a whole. The planned land use pattern, which emphasizes growth in high-density job centers, boosts regional economic productivity and supports overall economic growth. By boosting the efficiency of the region's land use pattern and transportation network, Plan Bay Area works to enhance the region's economic competitiveness on both national and international levels.

For more information, see the Economic Impact Analysis for Future Regional Plans*, listed in Appendix 1.*



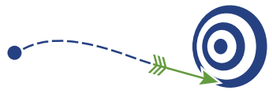
Peter Beeler

Transportation System Effectiveness

Increase Non-Auto Mode Share and Reduce VMT per Capita

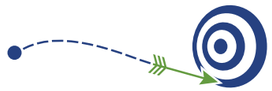
Target #9a:
Increase non-auto mode share by 10 percentage points (to 26 percent of trips).

Plan boosts non-auto mode share to 20 percent of trips, but falls short of target.



Target #9b:
Decrease automobile vehicle miles traveled (VMT) per capita by 10 percent.

Plan reduces VMT per capita by 9 percent, but falls short of target.



In order to reduce emissions and improve public health, Plan Bay Area sets goals to increase non-auto mode share and reduce VMT per capita. These targets are a reflection of how effective the transportation system is in providing easier, faster access to individuals' travel destinations. Plan Bay Area strives to achieve these targets by making alternatives to the private automobile more convenient, more frequent and more appealing. Supportive land use patterns also play a role; if destinations are closer to home, non-auto modes become more competitive and all trip lengths become shorter.

While Plan Bay Area increases the proportion of Bay Area travelers who walk, bike or utilize public transit, and decreases the daily miles traveled by the average Bay Area resident, it falls slightly short on both measures. Sixteen percent of Bay Area trips did not require an automobile in the year 2005; the region's target envisioned growing that share by 10 percentage points (to 26 percent) by the year 2040. Plan Bay Area's achievement of a 20 percent non-auto mode share means that one in five Bay Area trips would be expected to be car-free by year 2040, thanks to investments in transit, bike and pedestrian infrastructure that makes these modes more attractive.

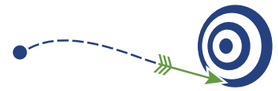
This shift, when combined with reduced average distances between home, work and retail locations, also leads to a reduction in per-capita VMT. The average Bay Area resident traveled about 22 miles by car on a typical weekday in 2005; by 2040, the average resident is expected to travel only 20 miles per day, a reduction of 9 percent. This near-achievement of the per-capita VMT target reflects the carefully targeted locations of envisioned housing and commercial development in Priority Development Areas with excellent transit service.

Maintain the Transportation System in a State of Good Repair: Local Road, Highway and Transit Maintenance

MTC has a long-standing commitment to a "fix-it-first" policy in the realm of transportation. This means that, as a region, we should strive to maintain our streets, highways and transit system before investing in system expansions. However, the Bay Area's extensive network of roads and highways is extremely expensive to maintain. Some of our cities and counties receive poor pavement ratings year after year, and the average PCI score for local pavement is currently 66, which is only "fair" in qualitative terms. The state highway system in the region faces similar challenges. Furthermore, our extensive transit system is rapidly aging and reaching the point where many of our assets are due for replacement at once. Failure to maintain the existing system at all levels would result in increased future maintenance costs, unreliable service and increased costs to travelers.

Target #10a:
Increase local road pavement condition index (PCI) to 75 or better.

Plan improves pavement condition of local roads to a PCI of 68, but falls short of target.



While the region has made progress on local road conditions over the past decade (increasing its pavement condition index from 63 in 2005 to 66 today), Bay Area road conditions remain in the "Fair" category. Thus, the targeted improvement to a "Good" PCI of 75 was clearly an ambitious objective.

Even though approximately one-third of Plan Bay Area funding is directed toward maintaining and operating our existing road network, average PCI is only expected to increase to 68 by year 2040. This represents an 8 percent improvement in local road conditions over year 2005. Given the costs of maintaining the region's aging infrastructure, this is still a notable achievement, especially considered relative to the degradation of state highway and transit assets over the plan's lifespan (see below).



Sergio Ruiz

This target's performance is aided by voter-approved local sales tax measures, which have boosted the funding available for preserving and maintaining local streets and roads. Yet even this funding is not adequate to enable most local roads to reach a "Good" PCI of 75. Without increased funding from a regional gas tax or a shift to a vehicle miles traveled tax, it will continue to be a challenge to achieve this ambitious target.

Target #10b:
Decrease distressed lane-miles of state highways to less than 10 percent of total lane-miles.

Plan moves in opposite direction from target; the percentage of distressed state highway lane-miles in the region will rise to 44 percent of the regional highway system by year 2040.



Given the state's ongoing budget constraints, the state highway system continues to suffer from deferred maintenance and worsening roadway conditions. As the highway system is owned and maintained by Caltrans, the system's safety and upkeep lies with them. If current budget constraints continue over the coming decades, the share of distressed lane-miles is expected to increase from 27 percent of the overall Bay Area highway network to 44 percent of the network.

Plan Bay Area does not allocate any discretionary funding toward the maintenance of the state highway system, given that the state is responsible for its preservation. Additional statewide funding for roadway maintenance would be the most direct approach to address this target's degradation over the lifespan of the plan.

Transit Maintenance

Target #10c:
Reduce the share of transit assets past their useful life to 0 percent.

Plan moves in opposite direction from target; the share of transit assets past their useful life is projected to increase to 24 percent of all assets during the Plan Bay Area period.



Bay Area transit riders depend on well-maintained vehicles, stations and trackways in order to ensure system reliability and performance. While all transit agencies would prefer to retire transit vehicles at the end of their prescribed life, the high cost of such vehicles delays their replacement, leading to more vehicle breakdowns and systemwide delays. In 2012, approximately 13 percent of all Bay Area transit assets were past their useful life; by 2040, 24 percent of transit assets are expected to be past their useful life, even though the plan allocates over half the region's funding to operate and maintain the existing transit system.

Given that almost one in four transit assets is expected to exceed its useful life in year 2040, passenger comfort is expected to degrade, along with customer satisfaction in the system's reliability, safety and speed. Of course, transit assets do not need to be in an ideal state of repair for transit service to be provided successfully. However, as the state of repair declines, the negative effects on equipment availability and reliability will eventually reach the point of impairing service levels, and would likely impede transit agencies' efforts to boost ridership. That said, it should also be noted that transit asset management is a relatively new and evolving field, and there have been no established guidelines for a minimum required state of repair, or for how to evaluate whether the state of repair is sufficient to sustain transit services. New transit asset management requirements contained in the recently enacted federal law known as MAP-21 will help focus attention on this long-term issue, but in the long run, greater financial support from the federal or state levels will be needed to bring the Bay Area transit network into an ideal state of good repair.



Sergio Ruiz

Summary of Performance

TABLE 25: Results of Plan Bay Area Target Assessment

Plan Meets or Exceeds Target			
Climate Protection	**Target #1:** Reduce per-capita CO_2 emissions from cars and light-duty trucks by 15 percent.	Plan meets and exceeds target; reduces per-capita emissions of CO_2 by 18 percent (by 2040).	
Adequate Housing	**Target #2:** House 100 percent of the region's projected growth by income level (very-low, low, moderate, above-moderate) without displacing current low-income residents.	Plan meets target; houses 100 percent of population growth.	
Healthy and Safe Communities Reduce Particulate Matter	**Target #3a:** Reduce premature deaths from exposure to fine particulates ($PM_{2.5}$) by 10 percent.	Plan meets and exceeds target; reduces premature deaths from exposure to fine particulates by 71 percent.	
	Target #3c: Achieve greater reductions in highly impacted areas.	Plan meets target; achieves greater particulate emission reductions in highly impacted neighborhoods.	
Open Space and Agricultural Land	**Target #6:** Direct all non-agricultural development within the year 2010 urban footprint (existing urban development and urban growth boundaries).	Plan meets target; directs all non-agricultural development within the existing urban footprint.	
Economic Vitality	**Target #8:** Increase gross regional product (GRP) by 110 percent — an average annual growth rate of approximately 2 percent (in current dollars).	Plan meets and exceeds the economic growth target; 119 percent increase in GRP is forecasted over the life of the plan.	
Plan Makes Progress Toward Target			
Healthy and Safe Communities Reduce Particulate Matter	**Target #3b:** Reduce coarse particulate emissions (PM_{10}) by 30 percent.	Plan reduces coarse particulate emissions by 17 percent, but falls short of target.	
Active Transport	**Target #5:** Increase the average daily time walking or biking per person for transportation by 70 percent (for an average of 15 minutes per person per day).	Plan boosts per-person active transportation by 17 percent, but falls short of target.	
Transportation System Effectiveness Increase Non-Auto Mode Share	**Target #9a:** Increase non-auto mode share by 10 percentage points (to 26 percent of trips).	Plan boosts non-auto mode share to 20 percent of trips, but falls short of target.	
Reduce VMT per Capita	**Target #9b:** Decrease automobile vehicle miles traveled (VMT) per capita by 10 percent.	Plan reduces VMT per capita by 9 percent, but falls short of target.	
Local Road Maintenance	**Target #10a:** Increase local road pavement condition index (PCI) to 75 or better.	Plan improves pavement condition of local roads to a PCI of 68, but falls short of target.	

Table continues on following page

TABLE 25: Results of Plan Bay Area Target Assessment *(continued)*

Plan Moves in Opposite Direction From Target			
Reduce Injuries and Fatalities from Collisions	**Target #4:** Reduce by 50 percent the number of injuries and fatalities from all collisions (including bike and pedestrian).	Plan moves in opposite direction from target; injury and fatality collisions are projected to increase during plan period by 18 percent.	
Equitable Access	**Target #7:** Decrease by 10 percentage points (to 56 percent from 66 percent) the share of low-income and lower-middle income residents' household income consumed by transportation and housing.	Plan moves in wrong direction; the share of household income needed to cover transportation and housing costs is projected to rise to 69 percent for low-income and lower-middle income residents during the Plan Bay Area period.	
Transportation System Effectiveness Highway Maintenance	**Target #10b:** Decrease distressed lane-miles of state highways to less than 10 percent of total lane-miles.	Plan moves in opposite direction from target; the percentage of distressed state highway lane-miles in the region will rise to 44 percent of the regional highway system by year 2040.	
Transit Maintenance	**Target #10c:** Reduce the share of transit assets past their useful life to 0 percent.	Plan moves in opposite direction from target; the share of transit assets past their useful life is projected to increase to 24 percent of all assets during the Plan Bay Area period.	

Key Targets Achieved in Solid Overall Effort, But Breakthrough Strategies Needed for Some Targets

As has been the case in past long-term transportation plans, no single strategy is able to achieve all the plan's performance targets. A review of the performance results for the 10 main targets and five sub-targets (for a total of 15 performance measures) clearly bears this out. Specifically, Plan Bay Area meets or exceeds six targets, including the statutory greenhouse gas emissions and housing targets, narrowly misses three targets, falls well short of two targets and moves in the wrong direction on four of the targets. In other words, the plan makes great progress on nine of 15 performance measures, which represents a solid first effort. MTC and ABAG will need to focus future attention on conceptualizing breakthrough strategies to achieve the four targets where we are falling behind.



Noah Berger

Key Equity Analysis Findings

With respect to the separately conducted analysis of the plan's social equity impacts (see Chapter 1 for background on the Equity Analysis), most of the measures studied do not show improvements for either "communities of concern" or the rest of region relative to conditions in 2010. However, Plan Bay Area does perform better than the year 2040 baseline forecast across most measures. This is notable in the case of the Housing and Transportation Affordability measure. One of the most notable findings in the Equity Analysis is in the Potential for Displacement measure, where the focused concentration of growth in Plan Bay Area overlaps with a larger share of today's rent-burdened households than in the baseline forecast. This measure reflects Plan Bay Area's support for investment and development in communities of concern, while also flagging the potential for market-based displacement due to rising rents as these neighborhoods improve. The plan responds with increased emphasis on funding to support the provision of affordable housing, requires the adoption of local housing elements

TABLE 26: Results of Plan Bay Area Equity Analysis, 2010–2040

	Equity Performance Measure	Target Population	2010	2040 (Baseline Forecast)	2040 (Plan Bay Area)
1	**Housing and Transportation Affordability** Percentage of income spent on housing and transportation by low-income households	Low-Income Households	72%	80%	74%
		All Other Households	41%	44%	43%
2	**Potential for Displacement** Percentage of rent-burdened households in high-growth areas	Communities of Concern	n/a	21%	36%
		Remainder of Region	n/a	5%	8%
3	**Healthy Communities** Average daily vehicle miles traveled per populated square mile within 1,000 feet of heavily used roadways	Communities of Concern	9,737	11,447	11,693
		Remainder of Region	9,861	11,717	11,895
4	**Access to Jobs** Average travel time in minutes for commute trips	Communities of Concern	25	26	26
		Remainder of Region	27	29	27
5	**Equitable Mobility** Average travel time in minutes for non-work-based trips	Communities of Concern	12	13	13
		Remainder of Region	13	13	13

Communities of Concern

The definition of "communities of concern" for Plan Bay Area is intended to represent a diverse cross-section of populations and communities that could be considered disadvantaged or vulnerable in terms of both current conditions and potential impacts of future growth. (See the map on facing page, which shows the locations of these communities of concern.) For purposes of the Equity Analysis, communities of concern are defined as those neighborhoods with notably high concentrations of four or more of the following: minority persons; low-income individuals; persons who are Limited English Proficient; seniors age 75 and over; persons with disabilities; households without cars; single-parent households; and renters paying more than 50 percent of household income on rent. Under this definition, about one-fifth of today's total regional population lives in areas defined as communities of concern. The Equity Analysis attempts to determine how the plan's proposed investments distribute benefits and burdens to these communities relative to the remainder of the region.



Peter Beeler



Evelyn Johnson

to receive key funds, and sets forth a requirement for PDA Investment and Growth Strategies that will examine key housing policy issues.

Several other findings of significance emerged from the Equity Analysis.

- Alongside displacement pressures, housing and transportation affordability are forecast to continue to be key challenges for low-income households in the future.
- While air quality will improve in the region overall with improved technologies, increased vehicle traffic and congestion in communities of concern raise safety concerns for those areas where walking and biking are more common modes of travel.
- Travel times to jobs and other destinations will increase slightly for communities of concern compared to today, due to higher levels of congestion in the urban core and some trips shifting from driving to transit, walking and biking.

The key findings of the Equity Analysis are displayed in Table 26.

More information and detailed results, including all other alternatives studied, are included in the Plan Bay Area Equity Analysis Report *listed in Appendix 1.*

MAP 12

Communities of Concern



Project-Level Performance Assessment of Transportation Projects

Much effort in long-range planning is spent on big-picture questions: Should the region focus on expanding the transportation system or on maintaining what we have already built? Should the region invest more in transit for future generations or emphasize highway projects to improve the lives of today's drivers? While planners can address these questions at the scenario level, Plan Bay Area is also based on MTC's commitment to evaluate individual projects to make sure dollars are being allocated to the most cost-effective projects that support a more sustainable future for the region.

In order to take a closer look at major transportation projects, MTC performed a project performance assessment, examining billions of dollars of potential transportation projects to identify the highest-performing investments across the region. Each major project was evaluated based on two criteria: benefit-cost ratio (which captures the project's cost-effectiveness); and a "target" score (which measures the contribution the project makes toward achieving Plan Bay Area's 10 adopted performance targets). Figure 23 displays the results of this analysis by transportation project type. Since all projects were analyzed across the region consistently using the regional travel demand model, high-performing projects were able to be prioritized for regional funding opportunities.

For more information about the specific scoring criteria, please refer to the Performance Assessment Report, *listed in Appendix 1.*

As shown in Table 27, most of the high-performing projects in the region are focused on leveraging existing assets and improving their efficiency.



Sergio Ruiz

Notable projects include BART Metro, which will increase service frequencies on the highest-demand segment of the BART system, and San Francisco's congestion pricing initiatives, under which vehicles entering downtown (or Treasure Island) will be charged a toll, with the proceeds being used to pay for more frequent transit services.

To further ensure that Plan Bay Area advances the most cost-effective and beneficial projects, MTC required a second level of project review. Any project with a benefit-cost ratio less than 1 or an "adverse" score on the targets assessment had to submit a compelling case to policy-makers for inclusion in the plan. Over 30 projects were identified as low-performers as a result of this process, and the vast majority of these are not included in this plan. The handful of low-performing projects that remain in the plan tend to demonstrate their positive impact on social equity and low-income neighborhoods — an issue not fully captured in the benefit-cost ratio or targets score.

Not only did the project performance assessment help identify regional funding priorities and remove ineffective projects, but it has informed the tradeoffs among competing priorities. When combined with input from transportation partners and stakeholders on the vast majority of projects that were neither high- nor low-performing, the project-level assessment has significantly influenced this plan.

FIGURE 23: Project-Level Performance Assessment: Results by Transportation Project Type

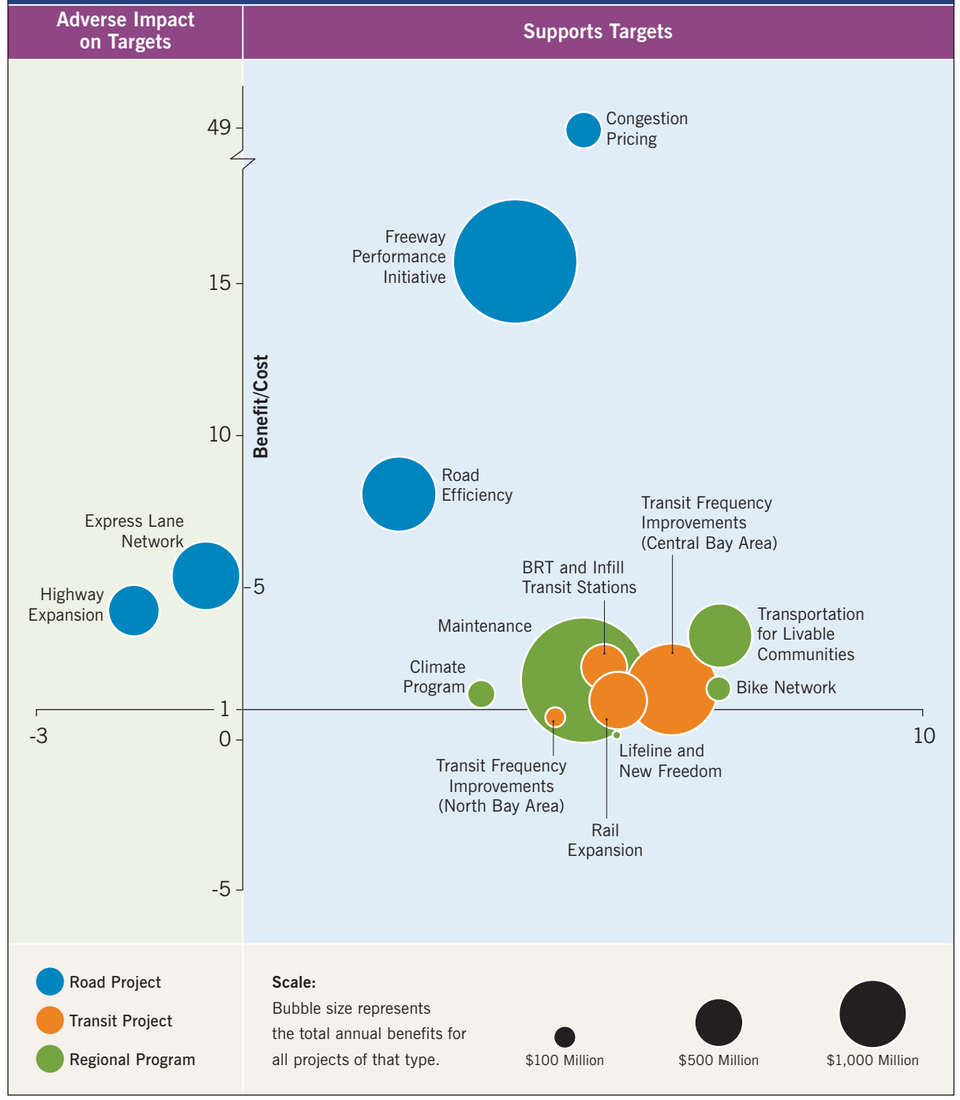


TABLE 27: Highest-Performing Transportation Projects, Ranked by Benefit/Cost (B/C) Ratio and Target Score

	Project Name	County	Benefit/ Cost Ratio	Overall Targets Score	Project Capital Costs* (Million $)	Project Description
1	BART Metro Program (including Bay Fair Connection & Civic Center Turnback)	Multi-County	>60	8.5	650	Increases the efficiency of BART in the urban core by constructing new turnbacks and providing new express train service.
2	Treasure Island Congestion Pricing	San Francisco	59	4.0	59	Charges a $5 toll for residents to enter/exit Treasure Island during peak hours; net revenues designated for transit service.
3	Congestion Pricing Pilot	San Francisco	45	6.0	102	Charges a $3 toll to enter/exit the northeast quadrant of San Francisco during peak hours; net revenues designated for transit service.
4	AC Transit Grand-MacArthur Bus Rapid Transit (BRT)	Alameda	18	5.5	36	Constructs a bus rapid transit line along the Grand Avenue and MacArthur Avenue corridors in Oakland, providing faster service for AC Transit Line NR.
5	Freeway Performance Initiative	Regional	16	4.0	2,991	Maximizes the efficiency of the roadway network through arterial signal coordination and freeway ramp metering.
6	Intelligent Transportation System (ITS) Improvements in San Mateo County	San Mateo	16	4.0	66	Maximizes the efficiency of the roadway network through arterial signal coordination and freeway ramp metering.
7	ITS Improvements in Santa Clara County	Santa Clara	16	4.0	320	Maximizes the efficiency of the roadway network through arterial signal coordination and freeway ramp metering.
8	Irvington BART Station	Alameda	12	5.5	123	Constructs a new infill BART station in the Irvington district of Fremont.
9	SFMTA Transit Effectiveness Project	San Francisco	11	7.5	157	Improves reliability and reduces travel times on key Muni bus corridors through signal prioritization and bus lanes.
10	Caltrain Service Frequency Improvements (6-Train Service during Peak Hours) + Electrification (SF to Tamien)	Multi-County	5	7.5	848	Electrifies the Caltrain line and purchases additional train vehicles to provide faster, more frequent service during peak hours.
11	BART to San Jose/Santa Clara (Phase 2: Berryessa to Santa Clara)	Santa Clara	5	7.0	4,094	Extends BART from the Phase 1 terminus in Berryessa (North San Jose) through a new BART subway to Alum Rock, Downtown San Jose, Diridon Station, and Santa Clara.
12	Van Ness Avenue BRT	San Francisco	6	6.5	140	Constructs a bus rapid transit line with dedicated lanes along the Van Ness corridor in San Francisco (from Lombard to Mission).
13	Better Market Street	San Francisco	6	6.0	200	Increases transit speeds along San Francisco's Market Street between the Embarcadero & Octavia by restricting auto traffic on the corridor.

*Project costs as analyzed (in year of expenditure $).

6

A Plan to Build On



Noah Berger



Karl Nielsen

Chapter 6

A Plan to Build On

Plan Bay Area is a work in progress that will be updated every four years to reflect new initiatives and priorities.

It builds upon the work of previous initiatives, complements ongoing work and lays the groundwork for closer examination of certain critical issues that can further prepare the region to meet the future head-on. The plan highlights the relationship between transportation investments and land use decisions, and represents the region's best effort to position itself to make the most of what the future will bring.

No single level of government can be expected to address all the critical components needed to create a stronger and more resilient Bay Area. It will take a coordinated effort among diverse partners to promote regional economic development, adapt to climate change, prepare for natural disasters, get creative about how to provide affordable housing for all Bay Area residents, ensure clean and healthy air for our communities, and prepare for emerging technologies that will change the way people work and get around. Here we take a look at the complementary initiatives under way in those areas.

In some cases, new legislation, updated regulations or additional resources will be needed to fully realize the Plan Bay Area vision and implement the plan's policies and programs. This chapter identifies the most important of these challenges, and proposes steps to address them.

A Vibrant Economy

The Bay Area economy has seen massive swings in employment over the last 20 years. While job growth is once again on the rise, MTC and ABAG — through the Joint Policy Committee in partnership with the Bay Area Air Quality Management District (BAAQMD) and the San Francisco Bay Conservation and Development Commission (BCDC) — will work with regional business interests and stakeholders to make sure the region fosters the conditions for a healthy economy for all.

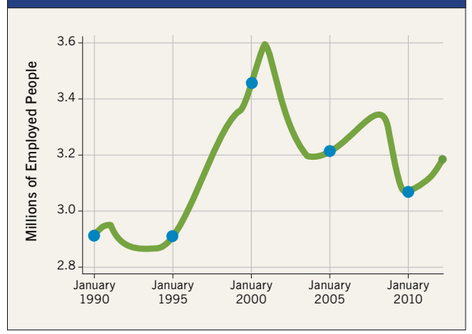
Improve Permitting Process

A major impediment to infill development in the Bay Area is the often lengthy project entitlement process. This further increases Bay Area housing prices, which rank among the highest in the nation, and impedes the region's ability to provide adequate amounts of affordable housing. The amount of time required for planning and environmental review can cause projects to miss the economic cycle when demand exists for new housing or commercial space. ABAG and MTC will work with local jurisdictions to implement proven strategies for advancing infill development in Priority Development Areas (PDAs). Among these strategies are specific plans, neighborhood-appropriate parking requirements, expedited permit processing, and programmatic Environmental Impact Reports (EIRs) that eliminate the need for individual project EIRs. ABAG and MTC will continue to support these efforts through PDA planning grants and technical assistance, including supporting community engagement throughout the planning process.

Improve the Bay Area's Economic Prosperity

MTC and ABAG are currently undertaking a three-year initiative funded by a $5 million grant from the U.S. Department of Housing and Urban Development (HUD), in conjunction with the U.S. Environmental Protection Agency and the U.S. Department of Transportation. The initiative — the Bay Area Regional Prosperity Plan — is intended to identify strategies to improve the region's economic prosperity by encouraging stronger, more sustainable communities, integrating housing and jobs planning, fostering local innovation in support of new jobs, and building a healthy regional economy for all. Over $2 million in grants will be awarded to pilot projects to expand economic opportunities for low- and moderate-income workers and improve housing affordability near transit. The three-pronged planning effort includes the Economic Opportunity Strategy, a Housing the Workforce Initiative and an Equity Collaborative that together will implement this program. Recommended strategies from this effort will be considered by MTC and ABAG in implementing Plan Bay Area and as input to the update of the plan.

FIGURE 24: Bay Area Employment, 1990–2011



Source: California Economic Development Department; calculations by Bay Area Council Economic Institute

In addition to the Prosperity Plan, Bay Area economic development organizations are preparing strategies to strengthen the regional economy. MTC and ABAG will consider these two efforts and conduct additional research to identify job creation and career pathway strategies including local best practices on apprenticeship programs, and local hire and standard wage guidelines. This research can be utilized in the implementation of the current Plan Bay Area, shared with local jurisdictions in the Bay Area and considered for the next update of Plan Bay Area.

For more information, visit: http://onebayarea.org/regional-initiatives/Bay-Area-Prosperity-Plan.html

Link Housing, Transportation and Economic Development

Understanding the role of housing and transportation investment in supporting the region's economy was a key theme that ABAG and MTC heard from the public, in polls and from business advocates throughout the development of Plan Bay Area. At the urging of Bay Area business and housing industry leaders, ABAG and MTC — along with BCDC and the BAAQMD — commissioned an economic impact white paper to consider how land use patterns and transportation investments affect the region's economy. The analysis looked at best practices around the country to integrate long-range planning with regional economic development, the tradeoffs between maintaining the existing system versus investing in new infrastructure to address growth, the impact of various pricing mechanisms to manage demand for transportation facilities, as well as housing policies and goods movement. Findings from this review will set the stage for more detailed economic analysis when Plan Bay Area is updated in 2017. Regional agencies will also develop land use guidelines for growing industries, as well as place-based strategies to support the growth of different types of PDAs and job centers, including small towns, mixed-use corridors and existing office parks.

More information is available in the Economic Impact Analysis for Future Regional Plans*, listed in Appendix 1.*

Goods Movement and Industrial Land, and Inter-Regional Coordination

The nine-county Bay Area is closely connected with its adjacent counties and metropolitan areas. Alameda, Solano, Contra Costa and Santa Clara counties are especially affected by decisions in neighboring counties outside of the nine-county Bay Area related to inter-regional commuting and land use patterns, housing needs and job access. ABAG and MTC recognize the need to encourage more coordinated planning and, in some cases, more coordinated state and local investment strategies to ensure that the Bay Area's inter-regional challenges



Tom Tracy

are adequately addressed. ABAG and MTC will work with local jurisdictions and the county congestion management agencies to advance coordinated planning and modeling efforts with neighboring metropolitan planning organizations such as SJCOG (San Joaquin), SACOG (Sacramento), and AMBAG (Monterey/Santa Cruz).

The movement of freight, and the protection of production and distribution businesses, have important environmental, economic and equity implications for the region. The region is home to the fifth-busiest maritime port in the nation, the Port of Oakland, which serves not only Bay Area residents and industries but also provides a critical link to national and international markets for North Bay and Central Valley agriculture.



Port of Oakland

MTC's *Regional Goods Movement Study,* last updated in 2009, found that manufacturing, freight transportation and wholesale trade account for nearly 40 percent of regional output, and that Bay Area businesses spend over $6.6 billion on transportation services. Goods movement businesses also create over 10 percent of regional employment, including many high-paying blue- and green-collar jobs accessible to those without higher levels of education. However, continued land development pressure is placing many industrial and manufacturing land uses at risk, and the activities at these places could shift to other locations, as documented in MTC's 2008 *Goods Movement/ Land Use Study.* MTC and ABAG will work with the business community and local jurisdictions and stakeholders to explore economic development best practices for goods movement and industrial businesses, and to identify funding to assess the role of goods movement businesses and industrial land in the regional economy.

Air quality considerations related to goods movement activities are an important part of the larger goods movement and industrial lands discussions. The Bay Area Air Quality Management District manages a number of programs related to goods movement, including initiatives to support cleaner trucks within the region, and specifically at the Port of Oakland.

MTC is currently working with Caltrans District 4 and county congestion management agencies to update the information from the 2004 and 2009 studies and to identify key goods movement issues for the region to address in the coming years. This work will help inform the region's input to the California Freight Mobility Plan and implementation of the newest federal transportation bill, MAP-21, which addresses the performance of the national freight network and supports investment in freight-related surface transportation projects.



David Baker + Partners, Architects

In addition to the regional analysis conducted for Plan Bay Area, MTC and ABAG will undertake sub-regional studies (e.g. Solano County, Tri-Valley) to analyze goods movement at a more local level, including truck flows on I-80, I-580 and I-880 corridors, and passenger (Capitol Corridor, ACE) and freight rail. These studies will be conducted in coordination with local jurisdictions, CMAs and the Bay Area Air Quality Management District, as appropriate.

Increase Housing Choices and Community Stability

To achieve the goals of Plan Bay Area — to retain and improve the region's quality of life, accommodate future growth and strengthen the economy by providing homes for a diverse workforce — the region must retain and increase the availability of affordable housing and support the vitality of our existing neighborhoods. Priority Development Areas (PDAs) provide a policy framework that can support investments and stability in disadvantaged communities, as well as encourage housing production in communities with access to employment and educational opportunities based on regional and local collaboration.

Affordable Housing

The loss of local redevelopment funding, combined with reduced funding at the state and federal level, has created a structural financing gap that reduces affordable housing production that would otherwise occur. Given housing production costs in the Bay Area and the complexity of building in locations near transit, additional resources are needed to preserve, rehabilitate and construct new affordable homes.

Plan Bay Area aligns funding from the new One-BayArea Grant (OBAG) program with PDAs and the development of housing including affordable housing in PDAs. The OBAG program requires that 50 to 70 percent of funding, depending on the county, be invested in PDAs. To be eligible for OBAG funding, all local jurisdictions must have certified housing elements, and congestion management agencies are required to develop PDA Investment and Growth Strategies that include a consideration of housing affordability and affordable housing policies. The plan links funding from an expanded Transit-Oriented Affordable Housing (TOAH) loan fund to PDAs, and identifies transit-oriented affordable housing as an eligible use for Cap and Trade revenues. This funding can effectively leverage local



Noah Berger

government, private and foundation resources. Production, acquisition and rehabilitation of affordable housing also will require local planning and entitlement processes that support this effort. Provision of incentives for local jurisdictions and coordination with congestion management agencies (CMAs) will be essential. MTC and ABAG will continue to use PDA Planning Grants to facilitate the entitlement of affordable housing in transit corridors. Through the Bay Area Regional Prosperity Plan, the regional agencies are working with a consortium of local jurisdictions and community-based organizations to identify strategies and pilot projects to build different types of housing and identify new alternative housing funds.

Potential for Displacement

The plan addresses the potential for displacement by increasing resources for the creation and preservation of affordable housing, and improving economic opportunities for current residents. The task is to support investments in low-income neighborhoods that can expand the range of services and amenities, and provide economic opportunity to local workers.

Local and regional initiatives will need to recognize the unique qualities of individual neighborhoods and the need for locally defined policy interventions. ABAG and MTC will work with local and county agencies to provide a menu of neighborhood stabilization and anti-displacement policies where a jurisdiction deems necessary, as well as affordable housing policies for consideration relative to future funding opportunities. MTC and ABAG also will link OBAG funding to jurisdiction-level approval of affordable housing planning, production, acquisition and rehabilitation. Best practices from the HUD-funded Bay Area Regional Prosperity Plan, including capacity building, knowledge sharing, policy development and funding, will be an important source of input to inform future programs.

Cleaning Our Air

Healthy Infill Development

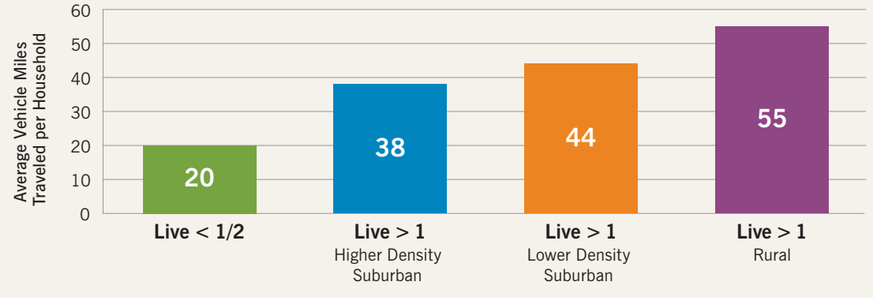
One of the main goals of both Plan Bay Area and the Bay Area Air Quality Management District's *2010 Clean Air Plan* is to reduce greenhouse gas emissions from cars and trucks by focusing future land development in existing urban areas that are easily accessible to transit, jobs, shopping and other services. Compact infill development can reduce vehicle use and vehicle miles traveled by 20 to 60 percent when compared to traditional suburban developments. (See Figure 25.) In addition, compact development preserves open space, forests and other carbon sinks that remove greenhouse gases from the atmosphere. It also encourages more walkable communities, which can help to reduce obesity and diabetes. Further, infill buildings are typically more energy-efficient, which reduces the amount of greenhouse gas emissions from power plants.

However, people who live or work near major freeways, ports, distribution centers, gas stations or other local sources of toxic air contaminants (TAC) and particulate matter (PM) may be disproportionately exposed to higher concentrations of these pollutants and therefore face a greater risk to their health. It would seem, then, that reducing the public's exposure to TACs and PM and protecting public health conflicts with the regional goal to increase compact infill development.

That is not necessarily the case, as there are effective ways the region can plan for compact infill development within existing urban and transit corridors that both protect public health and reduce greenhouse gases. The compact land use patterns envisioned in Plan Bay Area can be readily accomplished through the implementation of various health-protective measures in most infill locations. The regional agencies are collaborating on a comprehensive set of best practices, or guidance, for local governments on how to best address local pollutants in their planning and development decisions.

Best practices for compact infill development can ensure that health-protective strategies are available to mitigate or lessen the potential health risks in areas that have high TAC and PM emission sources. The most effective strategy, or best practice, is to always provide as much distance as possible between sensitive land uses and major sources of TAC and PM emissions.

FIGURE 25: Average Daily Vehicle Miles Traveled, by Proximity to Rail or Ferry Stops*



*Distance in miles from rail or ferry stops

Evolving Transport

From driverless cars to informal ridesharing networks to private shuttles that whisk workers from their homes to high-tech companies in Silicon Valley and beyond, a number of start-up methods are redefining how we get from Point A to Point B. Here are some of the innovative programs transportation planners will be watching with keen interest in years to come.



Google

Autonomous Vehicles

Once the subject of science fiction, driverless cars have now logged over 300,000 miles of autonomous operation, much of it on Bay Area roads. Mountain View-based Google, eager to set an international standard, has been the force behind these early efforts. In late 2012, California, Florida and Nevada cleared some early legal hurdles by directing their state departments of motor vehicles to adopt rules regarding safe operations, insurance and privacy. Elements of driverless technology are also being researched with regard to transit vehicles, with a focus on enhancing safety of bus rapid transit (BRT) systems.

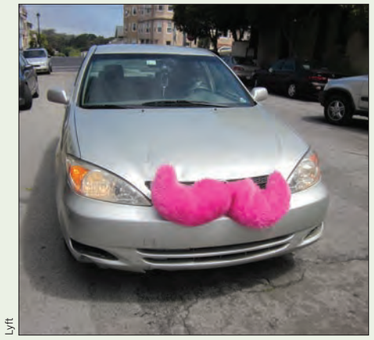


Noah Berger

Corporate Shuttles

As high-tech firms continue their quest to attract world-class talent, the lack of fast and convenient public transportation between home and the office is viewed as an increasing liability. The solution: major companies such as Google, Facebook and Genentech now offer private shuttles to and from dozens of Bay Area communities to their suburban campuses. A recent study carried out by a graphic design firm estimated that the shuttles carry nearly 14,000 people per day to the Silicon Valley, or about 33 percent of Caltrain's weekday ridership.

Not only do the shuttles remove private vehicles from congested freeways — reducing pollution and greenhouse gases — they also assist commuters by offering on-board Wi-Fi access.



Lyft

Ride-sharing Networks

Pink mustaches have become the hottest new trend in San Francisco. Or rather, pink mustaches affixed to the fronts of cars, a trademark of the informal ride-sharing service known as Lyft. Lyft, WeGo Rideshare and Sidecar, alongside other services such as Uber that utilize excess capacity from livery car companies, have effectively increased the region's ridesharing capacity through crowd sourcing. All four companies use smart phone technology to connect vehicles to riders, and in the case of Lyft, WeGo Rideshare and Sidecar, anyone with a private vehicle and a clean driving record can sign up to be a driver.

Curbing Greenhouse Gases

In December 2009 MTC programmed $80 million to implement the Climate Initiatives Program, a multi-faceted program aimed at reducing transportation-related emissions and vehicle miles traveled (VMT), while also informing the region as to the most effective strategies to reduce emissions. Since then, the program has funded innovative pilot projects to test the effectiveness of reducing emissions through incentives for alternative fuels and vehicles, creation of electric vehicle and bike-sharing programs, and removal of barriers to walking and biking for youth and their families, and other projects.

Building on results to date, new and refined demonstration projects will be introduced in years to come as outlined in the proposed investments in Chapter 4, including:

- Launch of a regional bike-sharing pilot, led by the Bay Area Air Quality Management District and focused along the Caltrain corridor from San Francisco to San Jose. The initial launch, anticipated in late 2013, includes 1,000 bikes with plans for future expansion.
- An educational campaign to increase demand among Bay Area residents for plug-in electric and plug-in hybrid electric vehicles. The campaign is aimed at building awareness and demand for electric vehicles through targeted marketing.
- Enhancements to the Spare the Air Youth program based on results from past demonstration projects. Projects that best reduce emissions and are most suited for regional application will be introduced in 2013–2015.
- Launch of a "smart driving" pilot program that will assess whether in-vehicle devices and education about driving behavior will assist drivers in maximizing fuel economy and lowering emissions.

Planning for Resilience

Climate Adaptation and Sea Level Rise

Given the significant number of residential, commercial and industrial structures situated on the San Francisco Bay's shorelines and low-lying areas — not to mention many miles of freeways, airports, port facilities and other transportation infrastructure adjacent to the Bay — our region is especially vulnerable to future sea level rise (see Map 13). In a 2009 report, the Bay Conservation and Development Commission identified 671 miles of existing and 337 miles of future road, rail, air and other infrastructure at risk of being affected by sea level rise. MTC is now partnering with BCDC, the California Department of Transportation (Caltrans), the National Oceanic Atmospheric Administration Coastal Services Center, ABAG and Bay Area communities to increase preparedness and resilience to sea level rise and storm events while protecting critical ecosystem and community services. The project, known as Adapting to Rising Tides, is a collaborative planning effort that addresses two questions:

The San Francisco Bay Area is especially vulnerable to future sea level rise.

- How will climate change impacts of sea level rise and storm events affect the future of communities, infrastructure, ecosystems and the economy in the Bay Area?
- What strategies can we pursue, both locally and regionally, to reduce and manage these risks?

The project includes a comprehensive inventory of potentially vulnerable transportation assets along a section of the Alameda County shoreline. The effort also measures the relative importance of these assets to the health of the transportation network as a whole. Next steps in the project include development and analysis of adaptation strategies. While the specific policy recommendations that emerge from this effort have not yet been identified, we anticipate that sea level rise preparedness — as well as climate change adaptation generally — will be a prominent feature of the planning strategies of MTC, ABAG, BCDC and the BAAQMD over the next several decades.

While some parts of the region designated as priority development areas could be affected by climate change, adaptation measures will protect homes, businesses and infrastructure in harm's way.

Earthquake Mitigation and Recovery

Plan Bay Area seeks to provide more housing options to accommodate our growing region. Yet we are also aware that some of the region's existing housing stock is vulnerable to damage in an earthquake. The United States Geological Survey has estimated there is a 63 percent chance that the region will experience an earthquake of magnitude 6.7 or greater in the next 30 years. ABAG models predict that a major earthquake on the San Andreas or Hayward faults will leave 150,000 homes — 5 percent of the region's housing stock — uninhabitable. This scenario could displace 350,000 people for an extended period of time and disrupt our economy for many years. Much of the infrastructure along the Bay shorelines and low-lying areas that is vulnerable to sea level rise is also vulnerable to liquefaction damage in an earthquake. The region has already made great strides in improving our resilience to natural disasters. The Bay Area is a national model for earthquake planning and research, and many of our public agencies have made major investments to strengthen their infrastructure against seismic risks. BART has retrofitted its elevated tracks and stations; Caltrans has retrofitted or replaced all the toll bridges and freeway overpasses; water districts have retrofitted their major transmission lines crossing faults; local governments across the region have retrofitted or replaced vulnerable city halls, fire stations and critical facilities; regional hazard mitigation planning is ongoing; and investment in emergency response planning has been significant in recent years.



USGS

Damage from the 1989 Loma Prieta earthquake in San Francisco's Marina District

MAP 13

12-Inch Sea Level Rise In 2040

Inundated Area
Potentially at Risk
Urbanized Area

ROADS
Freeway
Major Road

RAIL SYSTEM
Altamont Corridor Express
Amtrak
BART
Caltrain
Light Rail (Muni & VTA)
Cable Car (Muni)

POPULATION
Oakland > 350,000
Novato 50,000–350,000
Pacifica <50,000

Data Source: Farmland Mapping & Monitoring Program (FMMP), Department of Conservation, State of California, 2008–2010; ESRI, 2012; TeleAtlas North America, Inc., 2008; Dyett & Bhatia, 2013

0 10 20 30 Miles
0 10 20 30 40 Kilometers

NOTE: This map is intended to serve as a planning tool to illustrate the potential for inundation and coastal flooding under future sea level rise scenarios and does not represent the exact location of flooding. The map is based on model outputs and does not account for all of the complex and dynamic Bay processes or future conditions such as erosion, subsidence, future construction or shoreline protection upgrades, or other changes to San Francisco Bay or the region that may occur in response to sea level rise. For more context about the map, including a description of the data and methods used, please see the Plan Bay Area EIR.

But more can be done, especially to help ensure an effective recovery of housing, businesses, infrastructure, and the supply chains and delivery systems for essential goods and services. This is the focus of ABAG's Regional Disaster Resilience Initiative. Begun in late 2011, it has brought together businesses, local governments, community leaders, major institutions and infrastructure agencies to determine roles, responsibilities and decision-making structures in the aftermath of a major disaster. In partnership with emergency response agencies, regional partners and local governments, the initiative will build on findings from four workshops to develop an Action Plan that summarizes and prioritizes actions for jurisdictions and organizations, and develops a cohesive regional policy platform. The Action Plan will prime the region to launch into the next steps needed for a resilient Bay Area.

Regional Open Space and Agricultural Land Preservation

Plan Bay Area sets the stage for the integration of land use, open space and transportation planning by focusing growth and investment in Priority Development Areas, and by seeking to protect habitat, recreational and agricultural land in Priority Conservation Areas (PCAs). Regional efforts include a $10 million pilot program to support transportation and conservation projects aimed at protecting PCAs (part of the OneBayArea Grant program). Open space preservation and agricultural vitality remain long-term challenges that will require a continued commitment to regional coordination.

Following adoption of Plan Bay Area, ABAG will update the PCA guidelines to further define the role of different kinds of PCAs to support habitat, agriculture, recreation and other ecological functions. Updates to individual PCAs will be made in consultation with local jurisdictions. ABAG and MTC will draw upon best practices and lessons learned from the OBAG PCA Pilot Program as well as the resources of open space agencies, local jurisdictions, state and county farm bureaus, non-profit organizations, foundations, and state and federal agencies.

The California Coastal Trail (CCT) is a network of public trails for walkers, bikers, equestrians, wheelchair users and others along the 1,200-mile California coastline. Many of the CCT segments in the Bay Area overlap with the region's Priority Conservation Areas (PCAs) and will be considered in ABAG's update of the PCA guidelines.

A Platform for Advocacy

Plan Bay Area advances projects and lays out a development framework to bolster our region's economy, protect its environment, and improve housing and transportation choices for our residents. A reliable, efficient transportation network and a housing market with a range of price options for our workforce are absolutely vital to growing our economy. We need to take steps now in order to preserve what we value about our region and to build a Bay Area that we are proud to pass along to future generations.

For example, to keep our roads, bridges and transit network in a state of good repair as well as make strategic improvements, we need cooperation from Congress and the state Legislature to increase funding to maintain the infrastructure currently in place. The state also should prioritize job creation and speed much-needed housing and transportation projects by updating the 43-year-old California Environmental Quality Act, or CEQA, to provide for more timely review of projects.

Plan Bay Area is but a beginning. ABAG and MTC look forward to working with policy-makers at all levels of government to create a statutory and regulatory framework that preserves what we cherish about our region, while taking some prudent steps to make it more livable in the coming years.



Tom Meyers

Land Use

In order to make progress toward Plan Bay Area land use performance targets, MTC and ABAG have identified four legislative advocacy objectives that seek changes in both federal and state law.

Support PDA Development With Locally Controlled Funding

Until last year, Bay Area jurisdictions could count on redevelopment programs for over $1 billion per year in tax-increment financing to support affordable housing projects, critical infrastructure improvements, and economic development projects in designated areas of many cities and counties. This funding stream was lost in 2012 as a result of the elimination of redevelopment agencies throughout the state. ABAG and MTC will work to strategically replace this revenue source with new, locally controlled funding tools. A top priority should be a newly authorized tax-increment financing authority that specifically supports housing construction and infrastructure improvements near existing and planned public transit service as called for in this plan.

Modernize the California Environmental Quality Act (CEQA)

MTC and ABAG strongly support the original goals of the California Environmental Quality Act (CEQA). Over the four decades since it was enacted, CEQA has undoubtedly helped to improve environmental quality in California. At the same time, it is commonly used as a tool by project opponents who are more interested in halting a project than minimizing its harm to the environment. Sensible CEQA reform is needed to create a more economically vibrant state and region.

MTC and ABAG will support efforts to update CEQA to encourage and expand infill development opportunities that can help reduce urban sprawl consistent with Plan Bay Area and California Senate Bill 375.

Stabilize Federal Funding Levels

As the region grows, so will its need for workforce housing, especially to meet Plan Bay Area's goal of housing employment growth within the region. Deep funding cuts for two of the most important affordable housing programs at the U.S. Department of Housing and Urban Development — the HOME Investment Partnership Program and the Community Development Block Grant (CDBG) program — have significantly affected the allocation of funds to Bay Area jurisdictions. CDBG budget allocations to the region fell 27 percent (from $86 million to $63 million) from 2010 to 2012, and Bay Area allocations from the HOME program dropped by 51 percent ($38 million to $18 million) from 2009 to 2012. In order to increase the supply of

CEQA's Impact on Infill

While it can take years to prepare a detailed environmental impact report (EIR) — which evaluates a project's various potential significant impacts — lengthy document preparation and its associated costs are not the main challenges that the California Environmental Quality Act (CEQA) presents for cities and project sponsors seeking to build new housing or commercial buildings. The primary challenge is the uncertainty created by potential litigation on the project and subsequent delays.

Research sponsored by the Silicon Valley Leadership Group looked at which types of projects are most often the target of lawsuits filed under CEQA. The review found that CEQA litigation is aimed more often at infill than greenfield projects, and even when a project undergoes an extensive EIR analysis, the project is rejected 50 percent of the time when a court challenge is brought under CEQA, resulting in major revisions, increased costs and project delay.

What Kinds of Projects Are Most Often Tied Up in CEQA Litigation?

59 percent of challenged projects identified as either infill or greenfield were infill projects.

36 percent of projects challenged were public projects rather than private development.

38 percent of challenged projects were infrastructure projects (19 percent) or mixed-use developments (19 percent).

a variety of workforce housing options, key federal programs need to deliver increased financial certainty for local jurisdictions and developers.

In addition to funding, incentives in the tax code for multifamily development should be established for the long run so cities and developers can plan with certainty. While real estate market research shows strong unmet demand for multifamily living, particularly in close proximity to public transit and walkable neighborhoods, the market is not yet meeting the demand. One of the side effects of the Tax Reform Act of 1986 was a dramatic reduction in the incentives embedded in the federal tax code for private investment in multifamily housing.

"Defiscalize" Land Use Decision-Making

The structure of property taxes in California is a major obstacle to creating a balanced regional growth pattern. The current approach to taxation creates incentives to attract development that maximizes sales tax revenues rather than a more balanced approach of both retail and residential land uses. This trend — the so-called "fiscalization of land use" — has discouraged housing development and small business growth in many communities. ABAG and MTC would support a long-term adjustment to commercial or residential tax structures to balance the financial incentives for new development.

Transportation

To support the transportation investment strategy contained in Plan Bay Area, MTC and ABAG will seek the following three state and federal legislative changes.

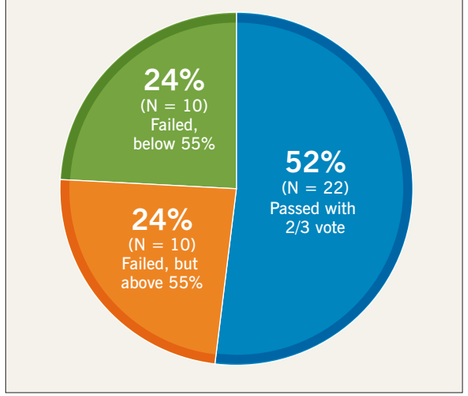
Support Local Self-Help

Local taxes now generate about two-thirds of the state's total transportation funding. Yet passage of new local taxes is exceedingly difficult due to the two-thirds supermajority requirement. This undermines local initiatives, leaving California residents more dependent upon Sacramento and Washington, D.C., for assistance. MTC and ABAG will strongly support efforts to lower the vote threshold for local and regional transportation tax measures from two-thirds to 55 percent. Lowering the voter approval threshold is a major step toward preserving and expanding our existing roadway and public transportation infrastructure and helping them run more efficiently.

The impact of lowering the vote threshold requirement for school bonds in California has been striking — more than half of those passed in 2012 would have failed under the two-thirds requirement. Had the 55 percent threshold been applicable to transportation since 2002, an additional 10 local transportation measures would have passed statewide (see Figure 26).

While eight of the Bay Area's counties have managed to pass transportation sales taxes under current law, success has repeatedly eluded Solano County, home to one of the region's worst bottlenecks at the Interstate 80/680 interchange. Most recently, the 2012 election dealt a serious blow to Alameda County's effort to extend and increase their transportation sales tax measure; with 66.53 percent of voters supporting the measure, it fell short of passage by a mere 0.14 percent. A 55 percent voting standard also could aid the passage of a regional gasoline tax that MTC is already authorized to place on the ballot.

FIGURE 26: Missed Opportunities: Local Transportation Measures in California Since 2002



Source: Move LA



John Huseby, Caltrans

Seek Reliable Federal Transportation Funding Levels and Flexibility

Over the last 50 years transportation funding has been characterized by a federal/state/local partnership. And whether it be restoring the Interstate Highway System to a state of good repair or removing bottlenecks in key freight corridors, the federal government continues to have a vital role to play with respect to transportation. The current federal surface transportation bill, Moving Ahead for Progress in the 21st Century (MAP 21), provides funding through fiscal year 2014 only by relying on support from the nation's beleaguered general fund. MTC and ABAG will urge Congress to identify a long-term, user-based funding source for transportation in the successor to MAP 21. That bill should build on the streamlined structure and performance-based framework established by MAP 21 and provide flexibility for the region to respond to its diverse transportation needs.

The next authorization should place a stronger emphasis on metropolitan areas, the economic engines of our nation. Metro areas with a population over 1 million include 65 percent of the

Local Transportation Revenues: Bay Area Experience

It has been nearly three decades since Santa Clara County voters passed Measure A, a local half-cent sales tax dedicated to transportation. This vote, which took place in 1984, ushered in a new era. Today, eight counties in the region have a sales tax dedicated to transportation purposes, including every Bay Area county except Solano County, which twice has failed to meet the two-thirds vote requirement.

In 2012, State Transportation Improvement Program funds for the Bay Area were $100 million, while revenue from the region's sales tax measures was five times larger and totaled $530 million.



Noah Berger

nation's population, yet contribute 75 percent of the nation's wealth, as measured by gross domestic product. They also endure 97 percent of the nation's traffic congestion and carry 97 percent of public transit passenger miles. Yet, rather than investing a larger share of federal transportation funds in the areas where the vast majority of the population lives and works, MAP 21 actually shifts some funds away from such areas.

Grow State Transportation Funding

MTC/ABAG will urge the Bay Area's state legislative delegation to create a new, permanent revenue source for transportation to better maintain and increase the efficiency of the existing network, and to invest in high-performing network improvements that further the goals and performance metrics of Plan Bay Area. One such source is the state's new Cap and Trade permitting system, where the revenue raised is directly linked to greenhouse gas emission reductions.

Previous generations of Californians stepped up to build a network of highways that were the envy of the world and that made possible the Bay Area's phenomenal economic growth and prosperity. But our transportation infrastructure has matured and deteriorated in recent decades due to the simple fact that the user-based mechanisms designed to build it and keep it in good repair — state and federal gas taxes — have not kept pace with inflation and have eroded in value by some 40 percent in the past two decades.

Any new state funds should be constitutionally dedicated to transportation so as to avoid the diversion of funds that plagued transportation over the last decade. Consistent with Plan Bay Area's "fix it first" policy, MTC and ABAG will advocate that the majority of revenues from any new statewide transportation fund source be focused on preservation of the existing state highway, local street and road, and public transit network.

Appendices

Supplementary Reports, Additional Resources and Maps



Noah Berger

Appendix 1

Supplementary Reports and Additional Resources

The Plan Bay Area materials listed below can be found at:
http://onebayarea.org/regional-initiatives/plan-bay-area/final-plan-bay-area/final-supplementary-reports.html

Economic Impact Analysis for Future Regional Plans

Environmental Impact Report

Equity Analysis Report: Including Title VI, Environmental Justice and Equity Analysis for Plan Bay Area

Financial Assumptions

Forecast of Jobs, Population and Housing

Glossary

Government-to-Government Consultation with Native American Tribes

Local Street and Road Needs and Revenue Assessment

Online Project Database and Transportation Project List

Performance Assessment Report

Priority Development Area Development Feasibility and Readiness Assessment

Public Outreach and Participation Program (Volumes 1–4)

Regional Housing Need Plan for the San Francisco Bay Area: 2014–2022

State Highway Needs and Revenue Assessment

Summary of Predicted Land Use Responses

Summary of Predicted Traveler Responses

Transit Operating and Capital Needs and Revenue Assessment

Transportation Air Quality Conformity Analysis for Plan Bay Area and the 2013 Transportation Improvement Program

Appendix 2
Maps

Appendix 2 includes a set of 18 detailed maps of the region showing key resource lands, job and housing growth (2010–2040), and total future housing and job intensities for 2040. For each topic, three close-up maps of different parts of the Bay Area region are included. See page 153 for legend information.

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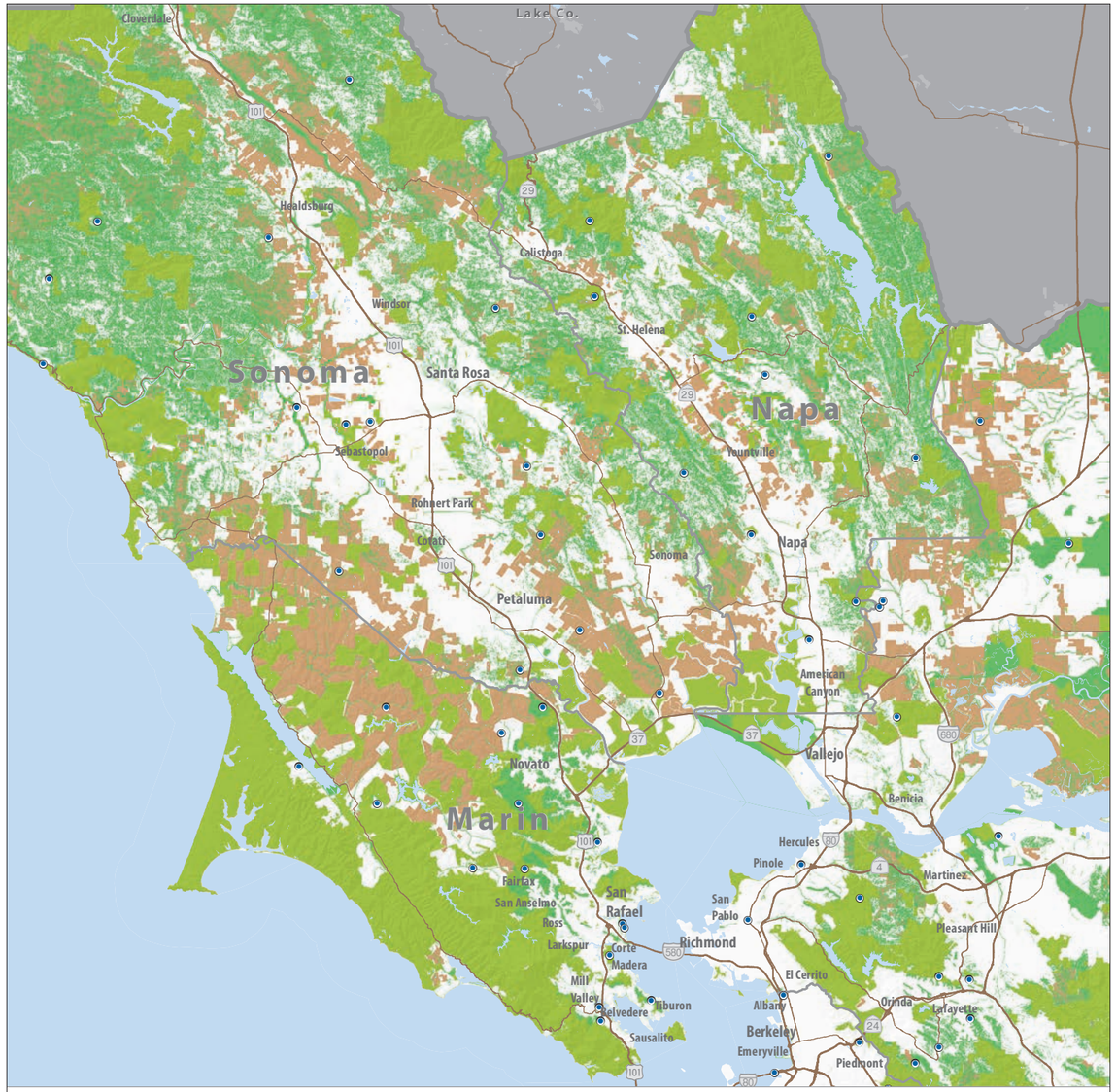
MAP 14 **North Bay/West: Open Space and Williamson Act Lands**



Open Space and Williamson Act Lands

- **Publicly Owned Parks and Open Space**
- **Priority Conservation Areas**
- **Williamson Act Lands**
  Some Williamson Act contracts are set to expire and be decommissioned during the plan period.
- **Riparian Corridors, Hillside Areas, Greenbelt Reserves and Floodplains**
- **Not Categorized**
  Includes land that may be designated as Urban and Built-up as defined by the Farmland Mapping and Monitoring Program in 2010. These lands include areas occupied by structures with a building density of at least 1 unit to 1.5 acres, or approximately 6 structures to a 10-acre parcel. This land is used for residential, industrial, commercial, construction, institutional, public administration, railroad and other transportation yards, cemeteries, airports, golf courses, sanitary landfills, sewage treatment, water control structures and other developed purposes. Also may include areas within Urban Growth Boundaries/ Urban Limit Lines, Urban Service Areas and Spheres of Influence. This category may also include undeveloped lands classified as Farmland, Critical Habitat and Grazing Lands. See "Resource Lands" map for the location of these areas.

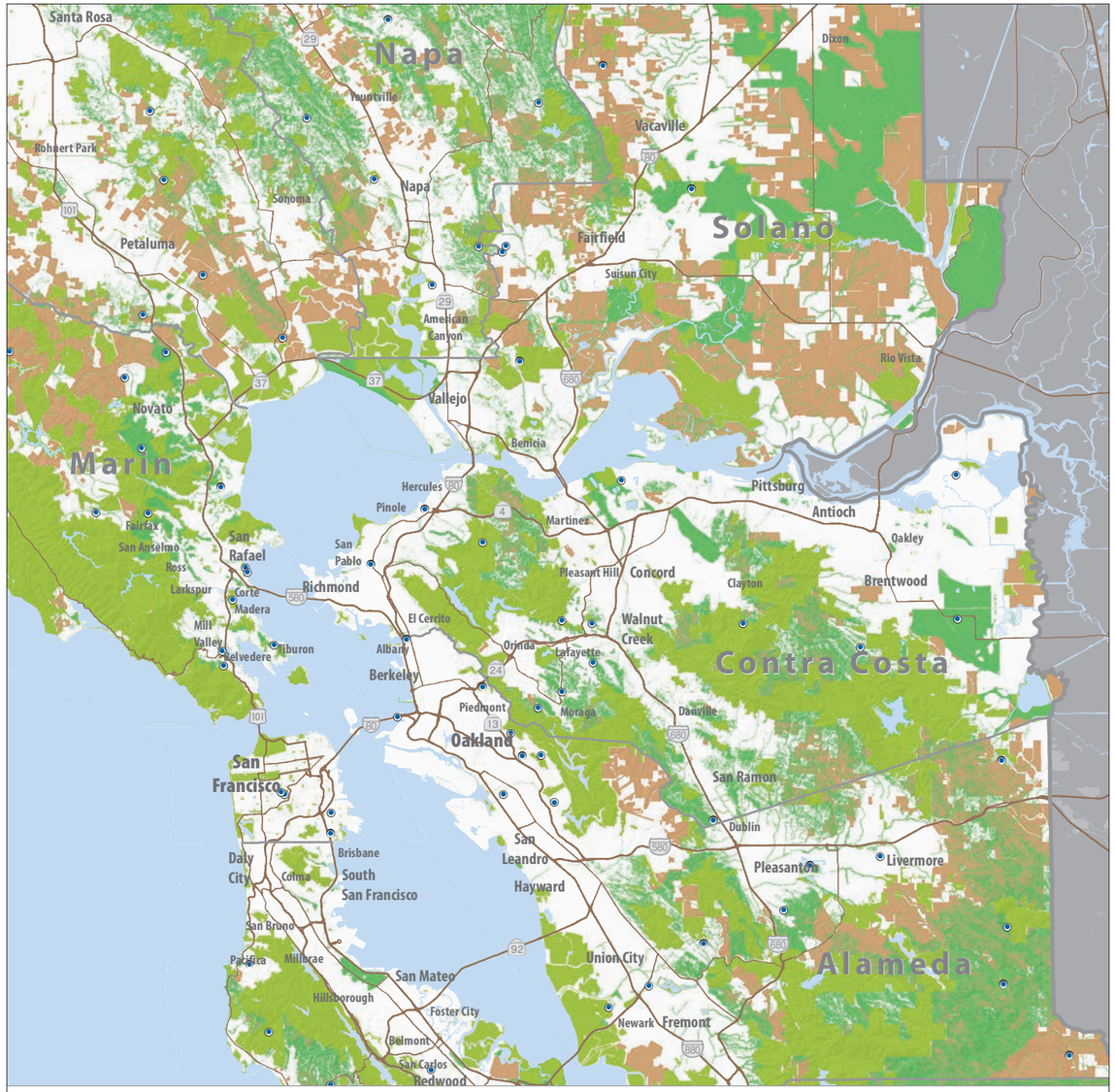
0 5 10 15 Miles

0 5 10 15 Kilometers

	POPULATION
Oakland	> 350,000
Novato	50,000 - 350,000
Pacifica	< 50,000

Map is for general information. For more information on local zoning or designations for a particular site or parcel, please contact your city or county.
See page 153 for legend information.

MAP 15 Northeast and Central Bay: Open Space and Williamson Act Lands



Open Space and Williamson Act Lands

Publicly Owned Parks and Open Space

Priority Conservation Areas

Williamson Act Lands

Some Williamson Act contracts are set to expire and be decommissioned during the plan period.

Riparian Corridors, Hillside Areas, Greenbelt Reserves and Floodplains

0 5 10 15 Miles

0 5 10 15 Kilometers

	POPULATION
Oakland	> 350,000
Novato	50,000 - 350,000
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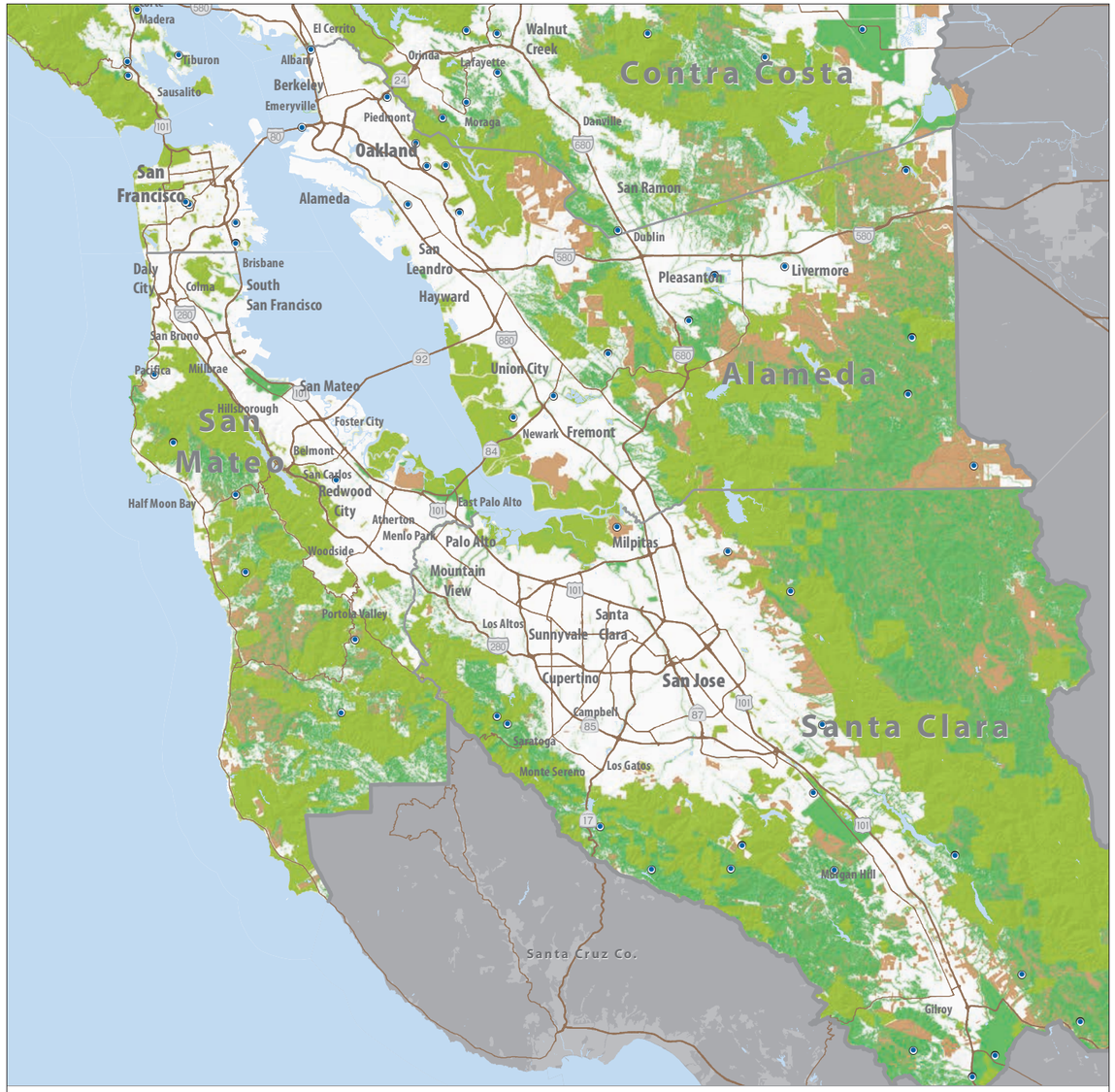
See page 153 for legend information.

MAP 16 South and West Bay: Open Space and Williamson Act Lands



Open Space and Williamson Act Lands

Publicly Owned Parks and Open Space

Priority Conservation Areas

Williamson Act Lands

Some Williamson Act contracts are set to expire and be decommissioned during the plan period.

Riparian Corridors, Hillside Areas, Greenbelt Reserves and Floodplains

0 5 10 15 Miles

0 5 10 15 Kilometers

	POPULATION
Oakland	> 350,000
Novato	50,000 - 350,000
Pacifica	< 50,000

Not Categorized

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Map is for general information. For more information on local zoning or designations for a particular site or parcel, please contact your city or county.
See page 153 for legend information.

MAP 17 North Bay/West: Resource Lands



Resource Lands

Farmland | Critical Habitat | Grazing Lands | Not Categorized

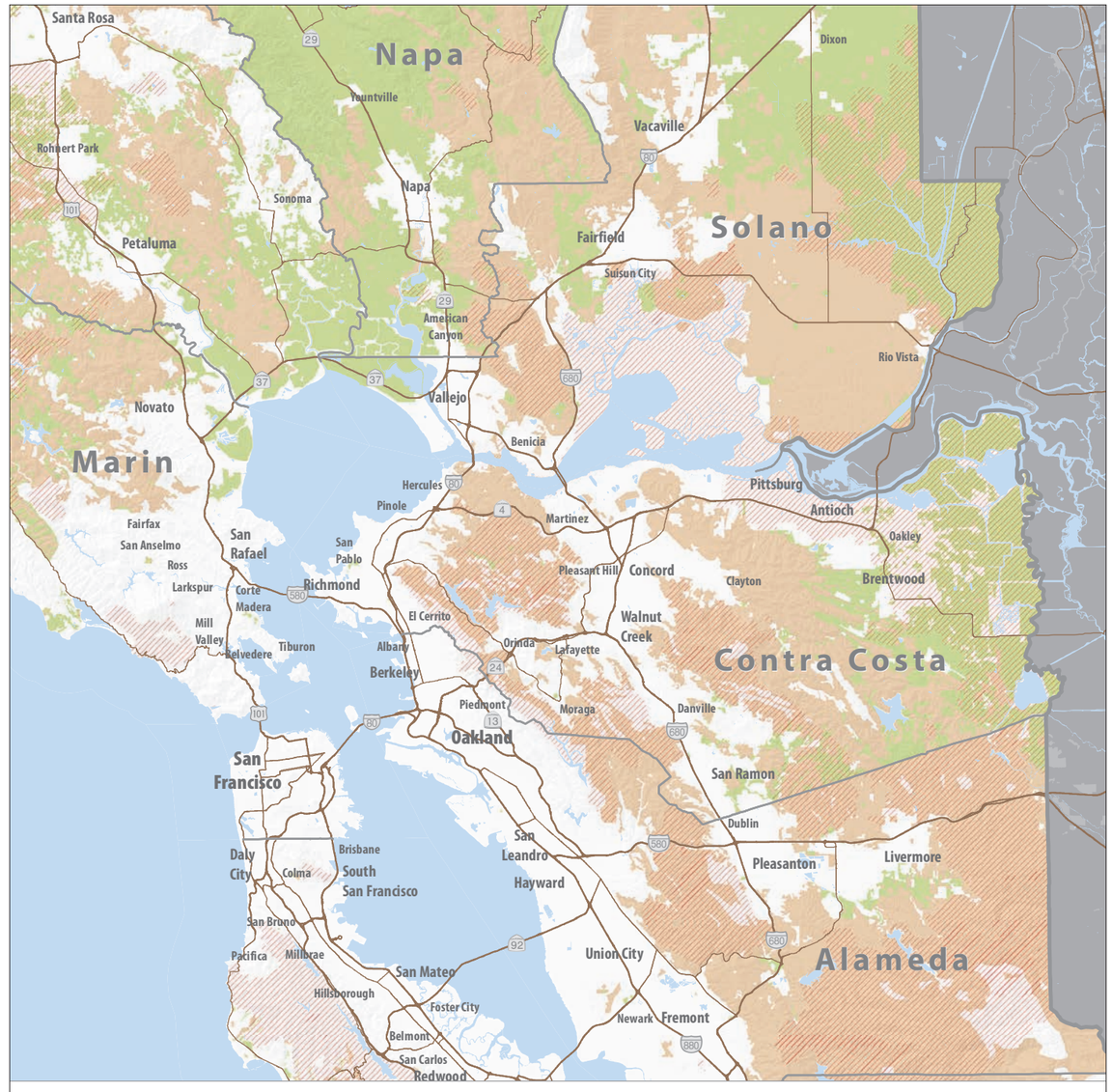
Includes land that may be designated as Urban and Built-up as defined by the Farmland Mapping and Monitoring Program in 2010. These lands include areas occupied by structures with a building density of at least 1 unit to 1.5 acres, or approximately 6 structures to a 10-acre parcel. This land is used for residential, industrial, commercial, construction, institutional, public administration, railroad and other transportation yards, cemeteries, airports, golf courses, sanitary landfills, sewage treatment, water control structures, and other developed purposes. Also may include areas within Urban Growth Boundaries/ Urban Limit Lines, Urban Service Areas, and Spheres of Influence. These areas may also include Open Space/Parks, Riparian Corridors, Hillside Areas, Greenbelt Reserves, Floodplains and Williamson Act Lands. See "Open Space and Williamson Act Lands" map for the location of these areas.

POPULATION
Oakland > 350,000
Novato 50,000 - 350,000
Pacifica < 50,000

0 5 10 15 Miles
0 5 10 15 Kilometers

Map is for general information. For more information on local zoning or designations for a particular site or parcel, please contact your city or county.
See page 153 for legend information.

MAP 18 Northeast and Central Bay: Resource Lands



Resource Lands

Farmland | Critical Habitat | Grazing Lands | Not Categorized

Includes land that may be designated as Urban and Built-up as defined by the Farmland Mapping and Monitoring Program in 2010. These lands include areas occupied by structures with a building density of at least 1 unit to 1.5 acres, or approximately 6 structures to a 10-acre parcel. This land is used for residential, industrial, commercial, construction, institutional, public administration, railroad and other transportation yards, cemeteries, airports, golf courses, sanitary landfills, sewage treatment, water control structures, and other developed purposes. Also may include areas within Urban Growth Boundaries/ Urban Limit Lines, Urban Service Areas, and Spheres of Influence. These areas may also include Open Space/Parks, Riparian Corridors, Hillside Areas, Greenbelt Reserves, Floodplains and Williamson Act Lands. See "Open Space and Williamson Act Lands" map for the location of these areas.

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Oakland > 350,000
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0 5 10 15 Miles
0 5 10 15 Kilometers

Map is for general information. For more information on local zoning or designations for a particular site or parcel, please contact your city or county.
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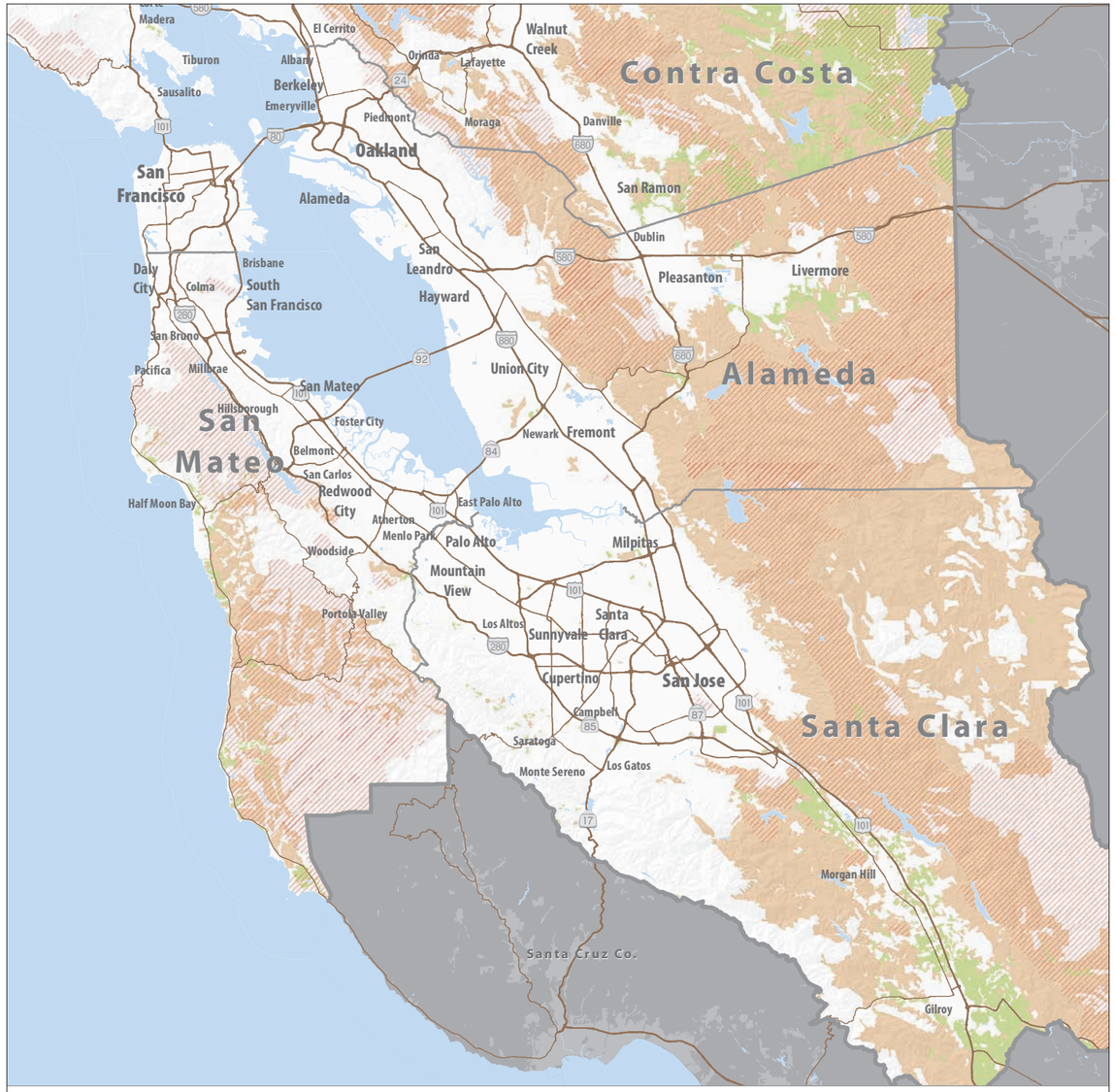
MAP 19 South and West Bay: Resource Lands



Resource Lands

Farmland **Critical Habitat** **Grazing Lands**

Not Categorized

Includes land that may be designated as Urban and Built-up as defined by the Farmland Mapping and Monitoring Program in 2010. These lands include areas occupied by structures with a building density of at least 1 unit to 1.5 acres, or approximately 6 structures to a 10-acre parcel. This land is used for residential, industrial, commercial, construction, institutional, public administration, railroad and other transportation yards, cemeteries, airports, golf courses, sanitary landfills, sewage treatment, water control structures, and other developed purposes. Also may include areas within Urban Growth Boundaries/ Urban Limit Lines, Urban Service Areas, and Spheres of Influence. These areas may also include Open Space/Parks, Riparian Corridors, Hillside Areas, Greenbelt Reserves, Floodplains and Williamson Act Lands. See "Open Space and Williamson Act Lands" map for the location of these areas.

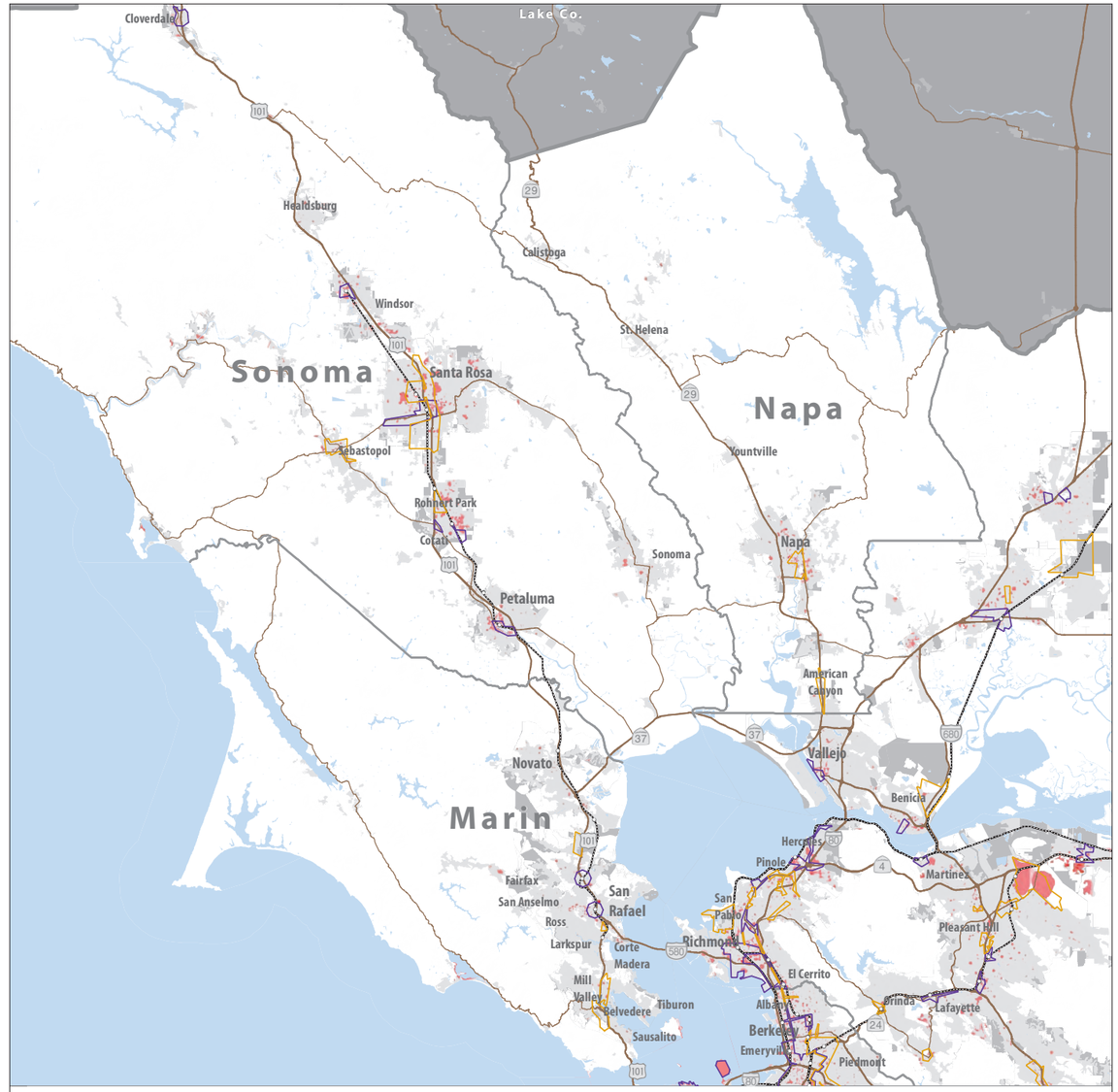
Map is for general information. For more information on local zoning or designations for a particular site or parcel, please contact your city or county.
See page 153 for legend information.

POPULATION	
Oakland	> 350,000
Novato	50,000 - 350,000
Pacifica	< 50,000

0 5 10 15 Miles

0 5 10 15 Kilometers

MAP 20 North Bay/West: Change in Jobs per Acre — 2010–2040



Change in Jobs per Acre, 2010 - 2040

Very Low	1 - 50	Med. High	5,000 - 10,000
Low	50 - 1,000	High	10,000 - 20,000
Medium	1,000 - 5,000	Very High	Greater than 20,000

Priority Development Areas

Planned

A Planned PDA has a formally adopted plan, as determined by a local jurisdiction.

Potential

A Potential PDA requires more local planning, review and action before it can become a Planned PDA.

Rail Lines

Urbanized Areas

Urban Boundary Zones

Urbanized Areas: Includes land designated as Urban and Built-up as defined by the Farmland Mapping and Monitoring Program in 2010. These lands include areas occupied by structures with a building density of at least 1 unit to 1.5 acres or approximately 6 structures to a 10-acre parcel. This land is used for residential, industrial, commercial, construction, institutional, public administration, railroad and other transportation yards, cemeteries, airports, golf courses, sanitary landfills, sewage treatment, water control structures and other developed purposes.

Urban Boundary Zones: Includes areas within Urban Growth Boundaries/ Urban Limit Lines, Urban Service Areas and Spheres of Influence.

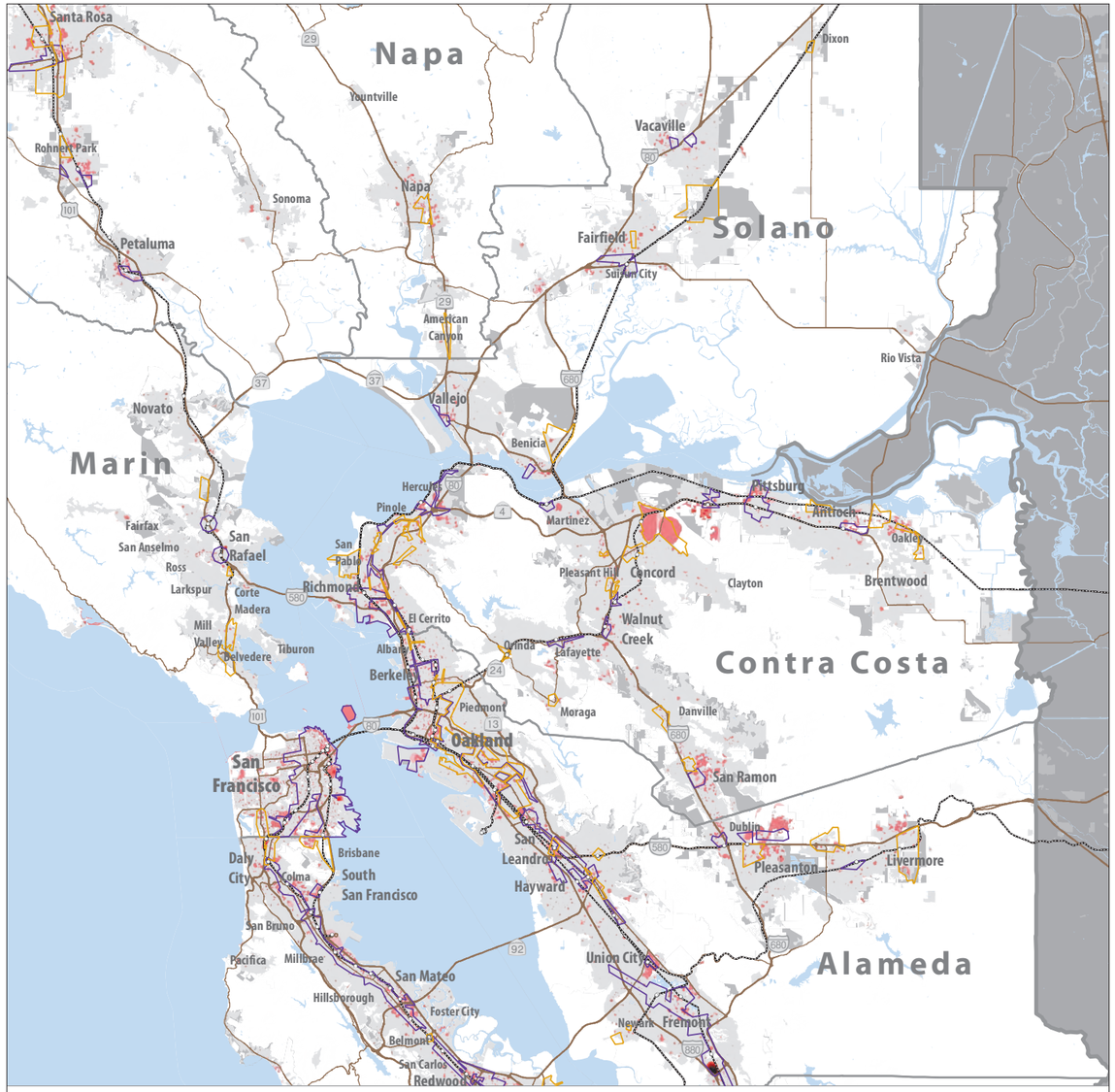
Map is for general information. For more information on local zoning or designations for a particular site or parcel, please contact your city or county.

POPULATION	
Oakland	> 350,000
Novato	50,000 - 350,000
Pacifica	< 50,000

0 5 10 15 Miles

0 5 10 15 Kilometers

MAP 21 **Northeast and Central Bay: Change in Jobs per Acre — 2010–2040**



Change in Jobs per Acre, 2010 - 2040

Very Low	1 - 50	Med. High	5,000 - 10,000
Low	50 - 1,000	High	10,000 - 20,000
Medium	1,000 - 5,000	Very High	Greater than 20,000

Priority Development Areas

Planned

A Planned PDA has a formally adopted plan, as determined by a local jurisdiction.

Potential

A Potential PDA requires more local planning, review and action before it can become a Planned PDA.

Rail Lines

Urbanized Areas

Urban Boundary Zones

Urbanized Areas: Includes land designated as Urban and Built-up as defined by the Farmland Mapping and Monitoring Program in 2010. These lands include areas occupied by structures with a building density of at least 1 unit to 1.5 acres or approximately 6 structures to a 10-acre parcel. This land is used for residential, industrial, commercial, construction, institutional, public administration, railroad and other transportation yards, cemeteries, airports, golf courses, sanitary landfills, sewage treatment, water control structures and other developed purposes.

Urban Boundary Zones: Includes areas within Urban Growth Boundaries/ Urban Limit Lines, Urban Service Areas and Spheres of Influence.

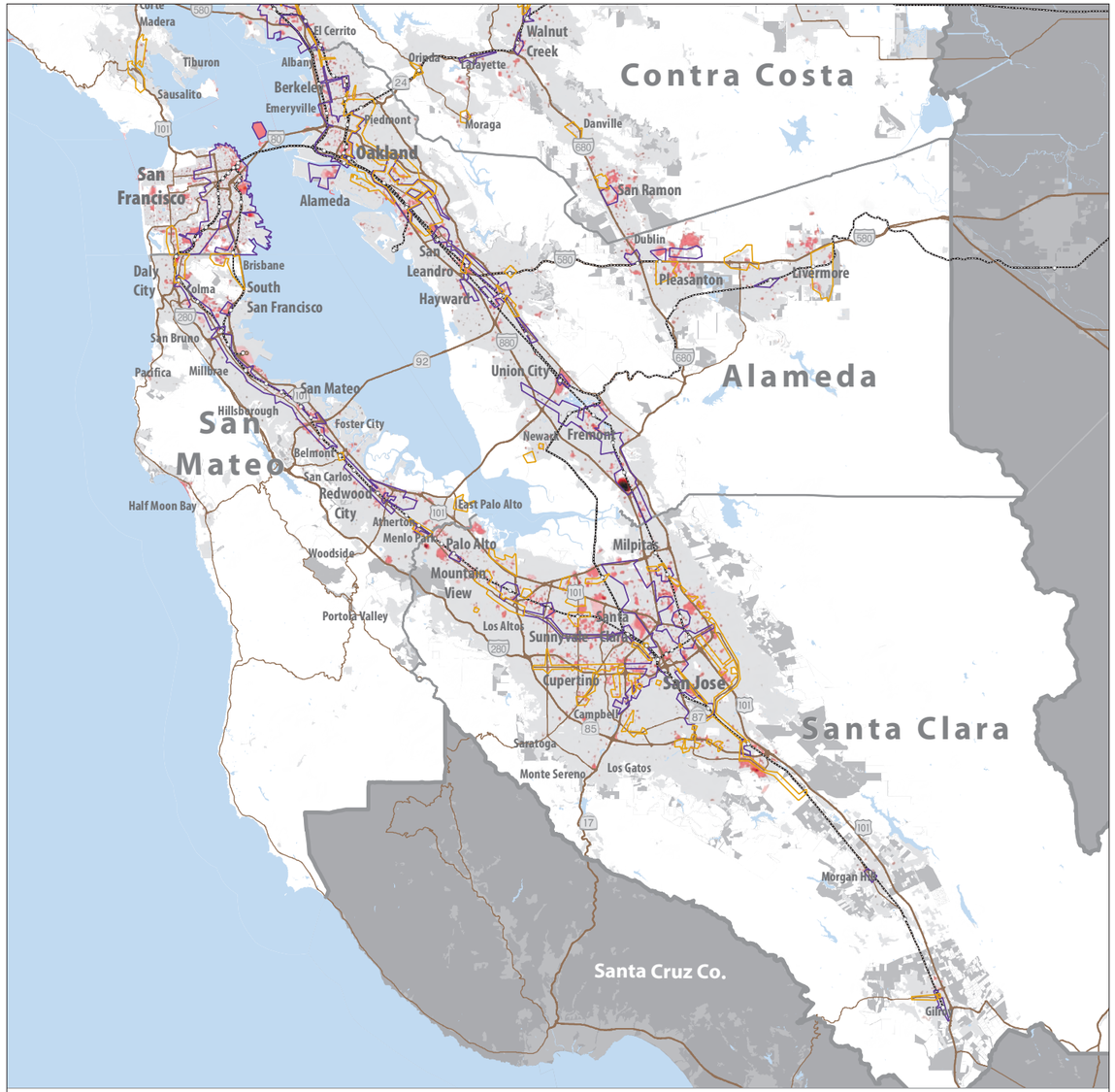
POPULATION	
Oakland	> 350,000
Novato	50,000 - 350,000
Pacifica	< 50,000

0 5 10 15 Miles

0 5 10 15 Kilometers

Map is for general information. For more information on local zoning or designations for a particular site or parcel, please contact your city or county.

MAP 22 **South and West Bay: Change in Jobs per Acre — 2010–2040**



Change in Jobs per Acre, 2010 - 2040

Very Low	1 - 50	Med. High	5,000 - 10,000
Low	50 - 1,000	High	10,000 - 20,000
Medium	1,000 - 5,000	Very High	Greater than 20,000

Priority Development Areas

Planned

A Planned PDA has a formally adopted plan, as determined by a local jurisdiction.

Potential

A Potential PDA requires more local planning, review and action before it can become a Planned PDA.

Rail Lines

Urbanized Areas

Urban Boundary Zones

Urbanized Areas: Includes land designated as Urban and Built-up as defined by the Farmland Mapping and Monitoring Program in 2010. These lands include areas occupied by structures with a building density of at least 1 unit to 1.5 acres or approximately 6 structures to a 10-acre parcel. This land is used for residential, industrial, commercial, construction, institutional, public administration, railroad and other transportation yards, cemeteries, airports, golf courses, sanitary landfills, sewage treatment, water control structures and other developed purposes.

Urban Boundary Zones: Includes areas within Urban Growth Boundaries/ Urban Limit Lines, Urban Service Areas and Spheres of Influence.

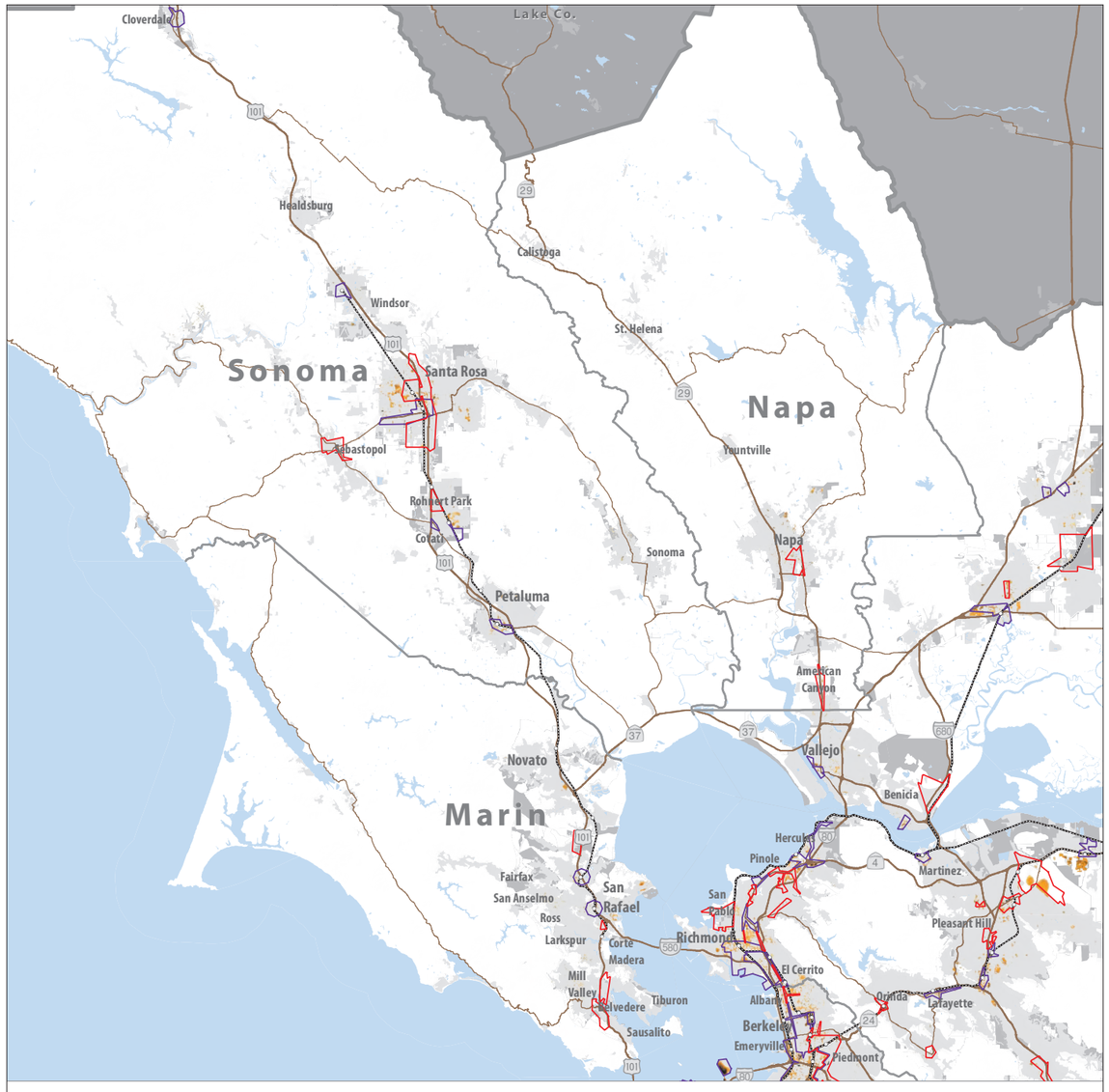
POPULATION	
Oakland	> 350,000
Novato	50,000 - 350,000
Pacifica	< 50,000

0 5 10 15 Miles

0 5 10 15 Kilometers

Map is for general information. For more information on local zoning or designations for a particular site or parcel, please contact your city or county.

MAP 23 North Bay/West: Change in Households per Acre — 2010–2040



Change in Households per Acre, 2010 - 2040

Very Low	1 - 8	Med. High	30 - 60
Low	8 - 10	High	60 - 85
Medium	10 - 30	Very High	Greater than 85

Priority Development Areas

Planned

A Planned PDA has a formally adopted plan, as determined by a local jurisdiction.

Potential

A Potential PDA requires more local planning, review and action before it can become a Planned PDA.

Rail Lines

Urbanized Areas

Urban Boundary Zones

Urbanized Areas: Includes land designated as Urban and Built-up as defined by the Farmland Mapping and Monitoring Program in 2010. These lands include areas occupied by structures with a building density of at least 1 unit to 1.5 acres or approximately 6 structures to a 10-acre parcel. This land is used for residential, industrial, commercial, construction, institutional, public administration, railroad and other transportation yards, cemeteries, airports, golf courses, sanitary landfills, sewage treatment, water control structures and other developed purposes.

Urban Boundary Zones: Includes areas within Urban Growth Boundaries/ Urban Limit Lines, Urban Service Areas and Spheres of Influence.

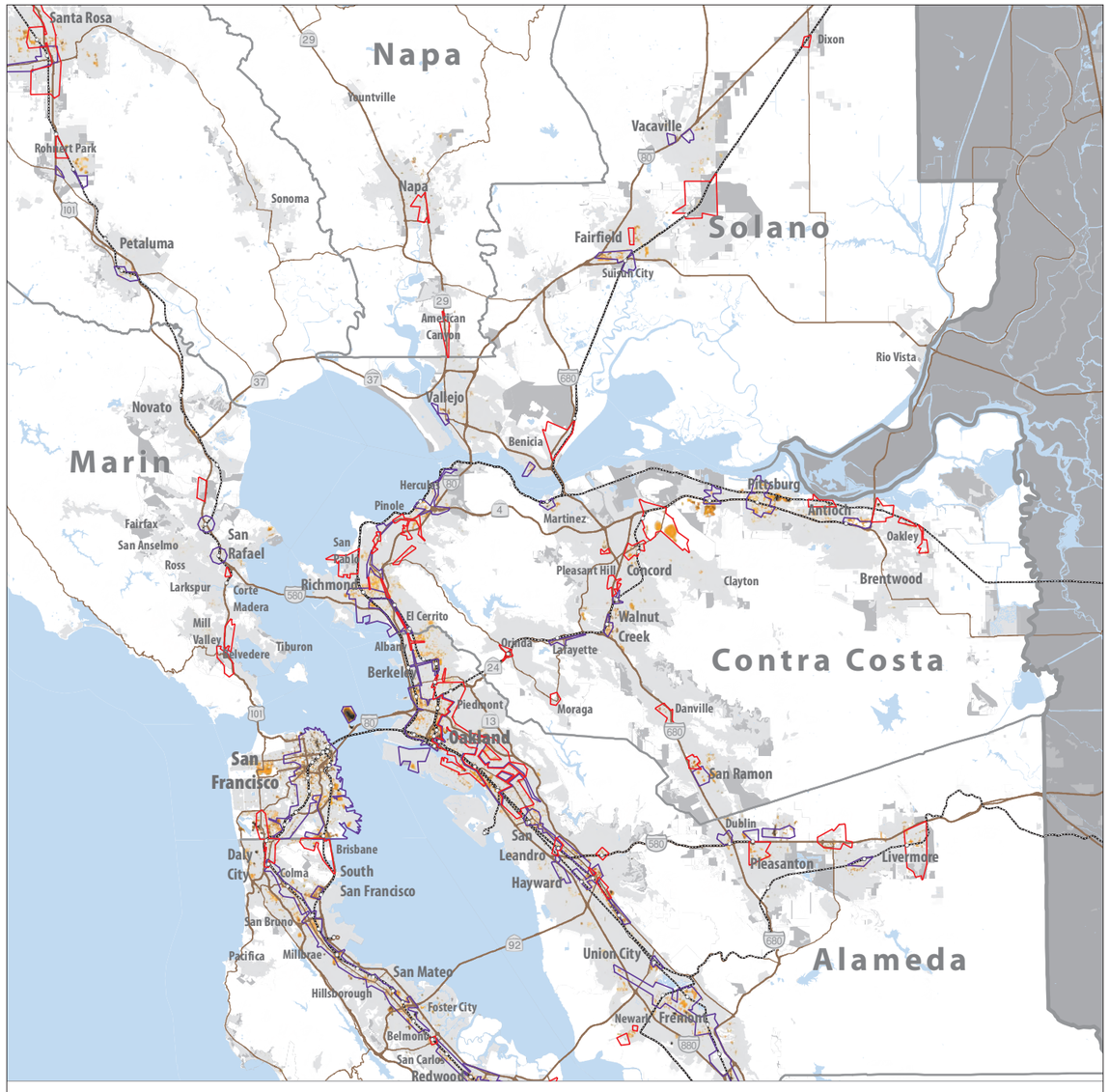
	POPULATION
Oakland	> 350,000
Novato	50,000 - 350,000
Pacifica	< 50,000

0 5 10 15 Miles

0 5 10 15 Kilometers

Map is for general information. For more information on local zoning or designations for a particular site or parcel, please contact your city or county.

MAP 24 Northeast and Central Bay: Change in Households per Acre — 2010–2040



Change in Households per Acre, 2010 - 2040

Very Low	1 - 8	Med. High	30 - 60
Low	8 - 10	High	60 - 85
Medium	10 - 30	Very High	Greater than 85

Priority Development Areas

Planned

A Planned PDA has a formally adopted plan, as determined by a local jurisdiction.

Potential

A Potential PDA requires more local planning, review and action before it can become a Planned PDA.

Rail Lines

Urbanized Areas

Urban Boundary Zones

Urbanized Areas: Includes land designated as Urban and Built-up as defined by the Farmland Mapping and Monitoring Program in 2010. These lands include areas occupied by structures with a building density of at least 1 unit to 1.5 acres or approximately 6 structures to a 10-acre parcel. This land is used for residential, industrial, commercial, construction, institutional, public administration, railroad and other transportation yards, cemeteries, airports, golf courses, sanitary landfills, sewage treatment, water control structures and other developed purposes.

Urban Boundary Zones: Includes areas within Urban Growth Boundaries/ Urban Limit Lines, Urban Service Areas and Spheres of Influence.

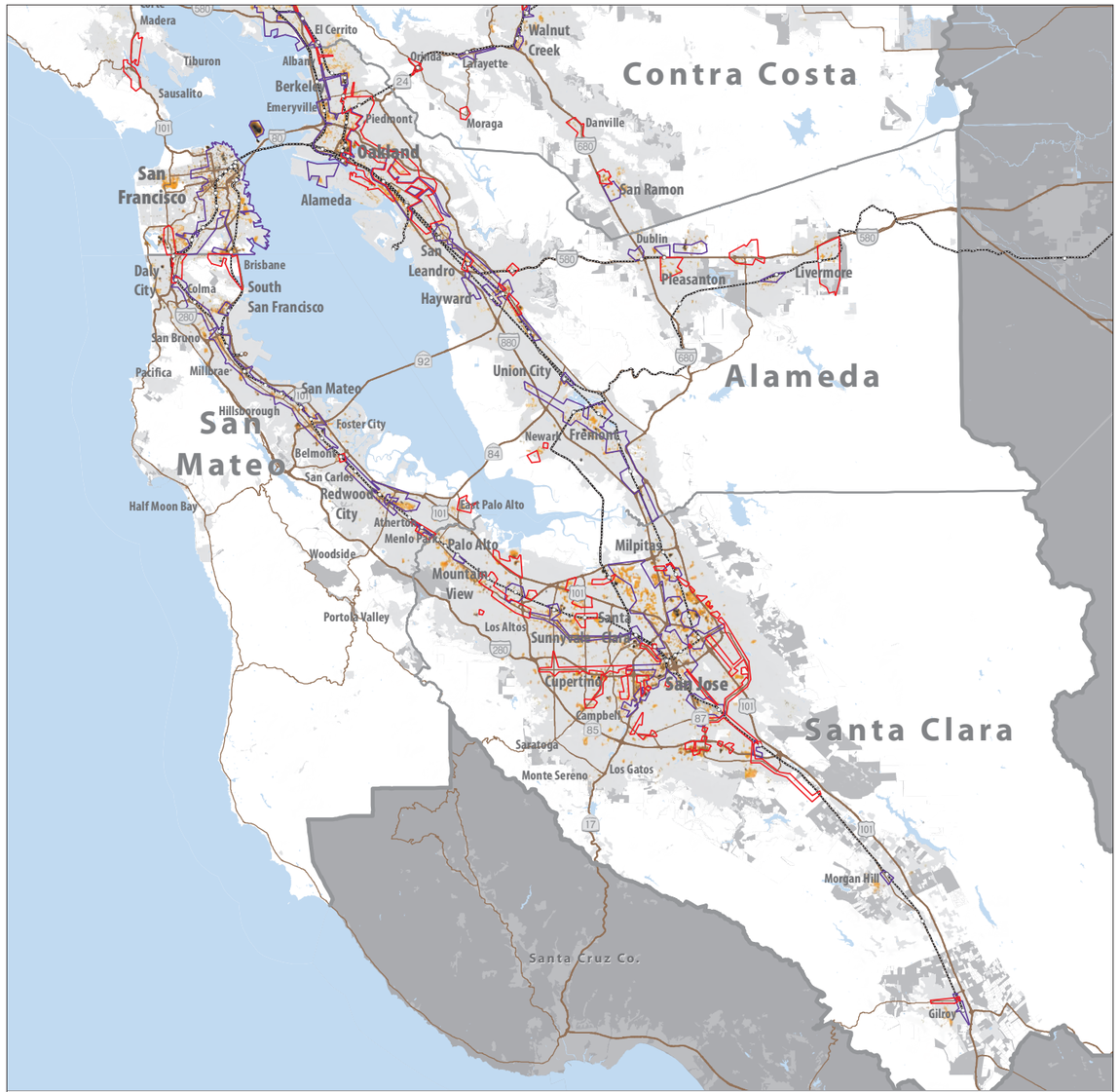
	POPULATION
Oakland	> 350,000
Novato	50,000 - 350,000
Pacifica	< 50,000

0 5 10 15 Miles

0 5 10 15 Kilometers

Map is for general information. For more information on local zoning or designations for a particular site or parcel, please contact your city or county.

MAP 25 South and West Bay: Change in Households per Acre — 2010–2040



Change in Households per Acre, 2010 - 2040

Very Low	1 - 8	Med. High	30 - 60
Low	8 - 10	High	60 - 85
Medium	10 - 30	Very High	Greater than 85

Priority Development Areas

- **Planned**
  A Planned PDA has a formally adopted plan, as determined by a local jurisdiction.
- **Potential**
  A Potential PDA requires more local planning, review and action before it can become a Planned PDA.
- **Rail Lines**

- **Urbanized Areas**
- **Urban Boundary Zones**

Urbanized Areas: Includes land designated as Urban and Built-up as defined by the Farmland Mapping and Monitoring Program in 2010. These lands include areas occupied by structures with a building density of at least 1 unit to 1.5 acres or approximately 6 structures to a 10-acre parcel. This land is used for residential, industrial, commercial, construction, institutional, public administration, railroad and other transportation yards, cemeteries, airports, golf courses, sanitary landfills, sewage treatment, water control structures and other developed purposes.

Urban Boundary Zones: Includes areas within Urban Growth Boundaries/ Urban Limit Lines, Urban Service Areas and Spheres of Influence.

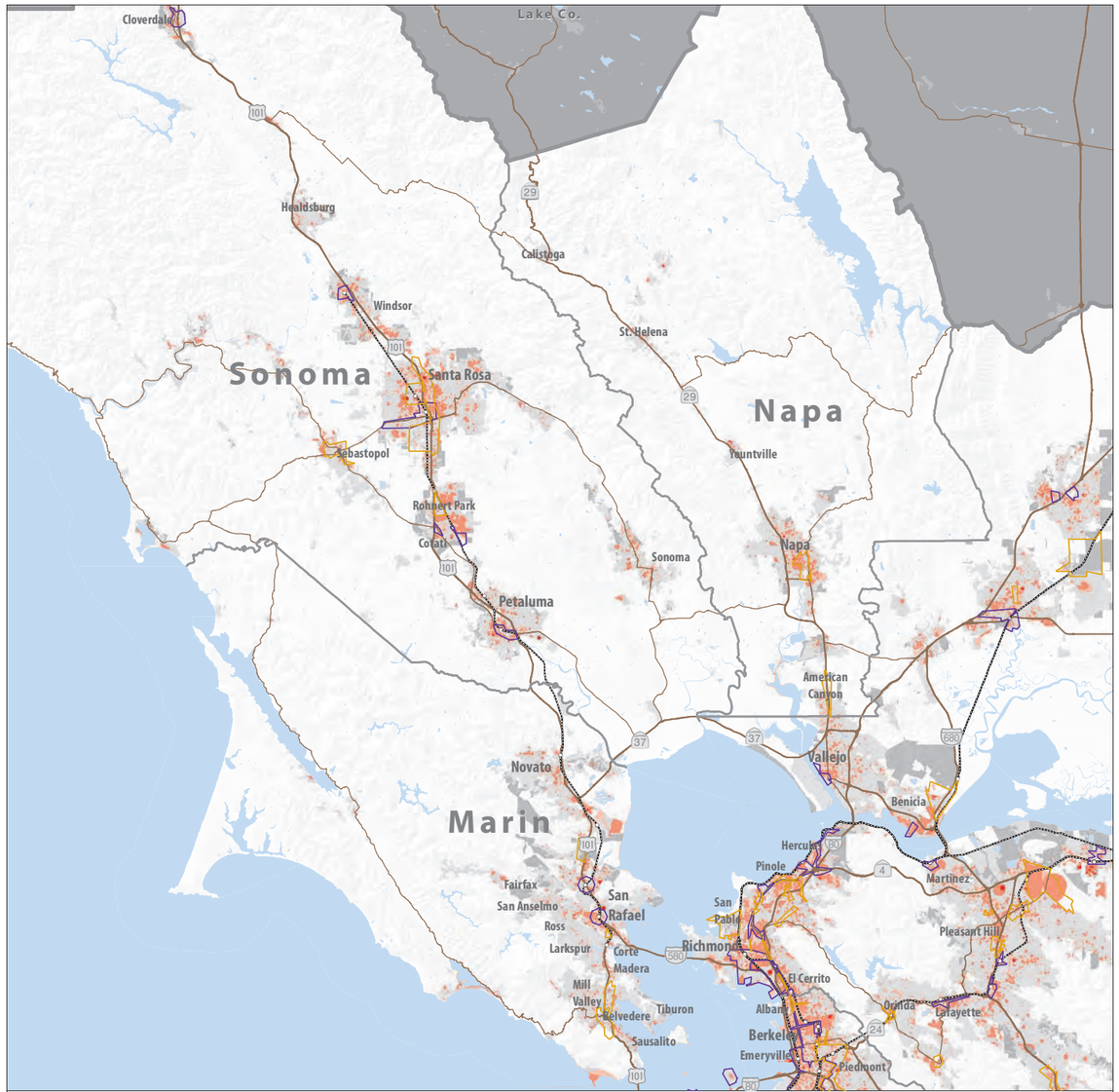
POPULATION	
Oakland	> 350,000
Novato	50,000 - 350,000
Pacifica	< 50,000

0 5 10 15 Miles

0 5 10 15 Kilometers

Map is for general information. For more information on local zoning or designations for a particular site or parcel, please contact your city or county.

MAP 26 North Bay/West: Jobs per Acre in 2040



Jobs per Acre in 2040

Very Low		Med. High	
Low		High	
Medium		Very High	

Priority Development Areas

- **Planned**
  A Planned PDA has a formally adopted plan, as determined by a local jurisdiction.
- **Potential**
  A Potential PDA requires more local planning, review and action before it can become a Planned PDA.
- **Rail Lines**

- **Urbanized Areas**
- **Urban Boundary Zones**

Urbanized Areas: Includes land designated as Urban and Built-up as defined by the Farmland Mapping and Monitoring Program in 2010. These lands include areas occupied by structures with a building density of at least 1 unit to 1.5 acres or approximately 6 structures to a 10-acre parcel. This land is used for residential, industrial, commercial, construction, institutional, public administration, railroad and other transportation yards, cemeteries, airports, golf courses, sanitary landfills, sewage treatment, water control structures and other developed purposes.

Urban Boundary Zones: Includes areas within Urban Growth Boundaries/ Urban Limit Lines, Urban Service Areas and Spheres of Influence.

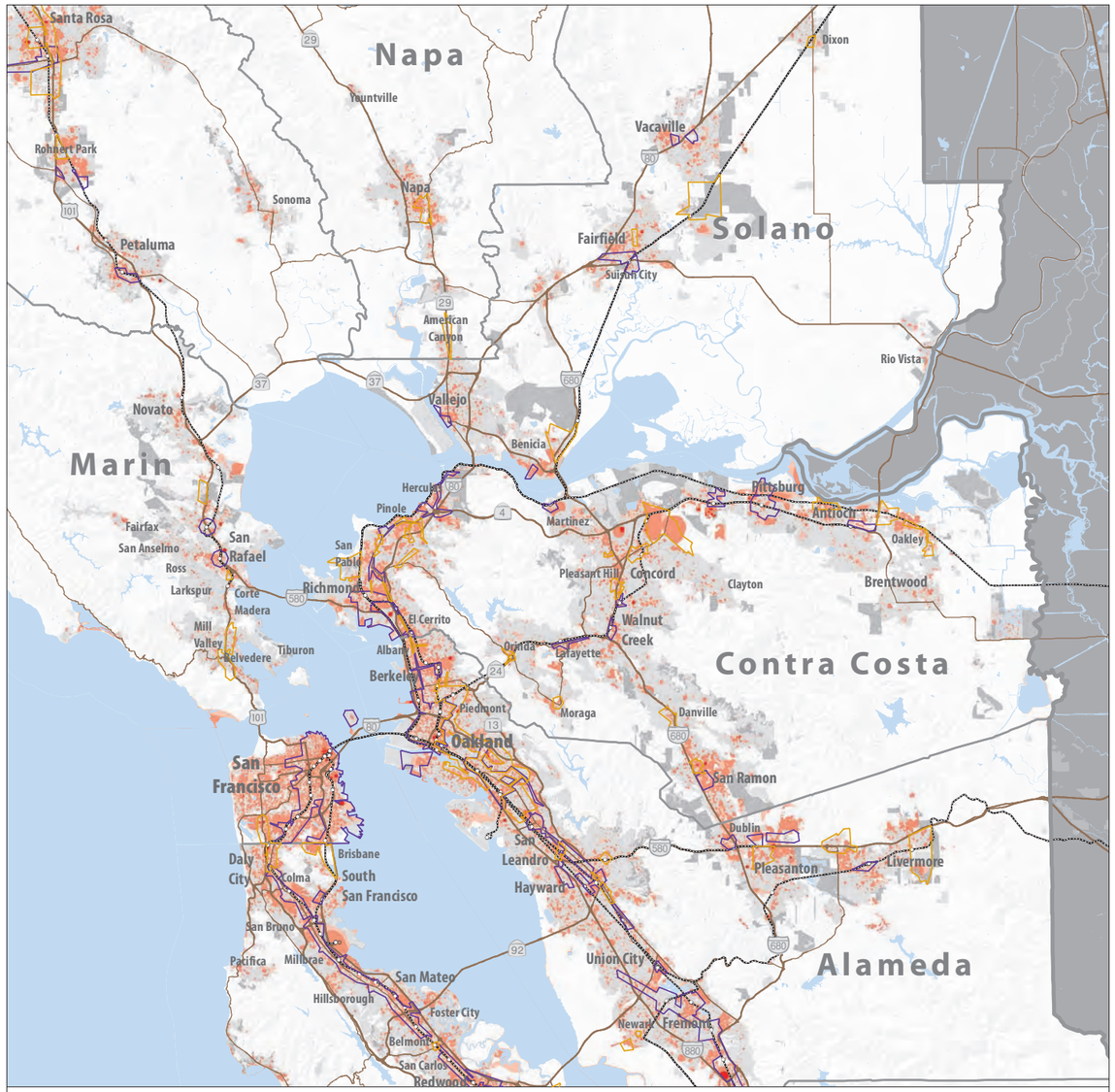
POPULATION	
Oakland	> 350,000
Novato	50,000 - 350,000
Pacifica	< 50,000

0 5 10 15 Miles

0 5 10 15 Kilometers

Map is for general information. For more information on local zoning or designations for a particular site or parcel, please contact your city or county.

MAP 27 Northeast and Central Bay: Jobs per Acre in 2040



Jobs per Acre in 2040

Very Low | Low | Medium | High | Med. High | Very High

Priority Development Areas

- **Planned**
  A Planned PDA has a formally adopted plan, as determined by a local jurisdiction.
- **Potential**
  A Potential PDA requires more local planning, review and action before it can become a Planned PDA.
- **Rail Lines**

Urbanized Areas

Urban Boundary Zones

Urbanized Areas: Includes land designated as Urban and Built-up as defined by the Farmland Mapping and Monitoring Program in 2010. These lands include areas occupied by structures with a building density of at least 1 unit to 1.5 acres or approximately 6 structures to a 10-acre parcel. This land is used for residential, industrial, commercial, construction, institutional, public administration, railroad and other transportation yards, cemeteries, airports, golf courses, sanitary landfills, sewage treatment, water control structures and other developed purposes.

Urban Boundary Zones: Includes areas within Urban Growth Boundaries/ Urban Limit Lines, Urban Service Areas and Spheres of Influence.

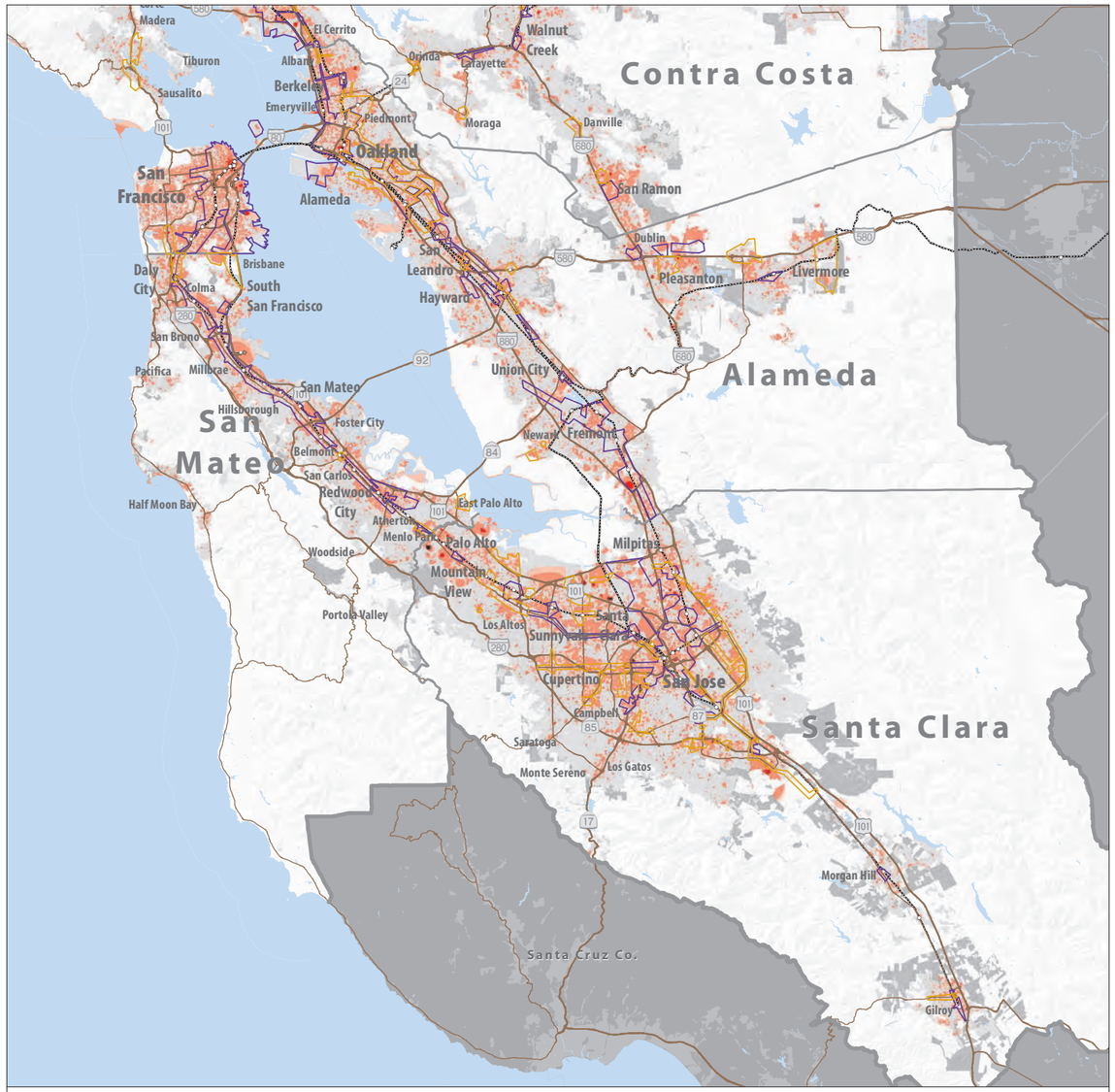
POPULATION	
Oakland	> 350,000
Novato	50,000 - 350,000
Pacifica	< 50,000

0 5 10 15 Miles

0 5 10 15 Kilometers

Map is for general information. For more information on local zoning or designations for a particular site or parcel, please contact your city or county.

MAP 28 South and West Bay: Jobs per Acre in 2040



Jobs per Acre in 2040

Very Low | Low | Medium | High | Med. High | Very High

Priority Development Areas

- **Planned**
  A Planned PDA has a formally adopted plan, as determined by a local jurisdiction.
- **Potential**
  A Potential PDA requires more local planning, review and action before it can become a Planned PDA.
- **Rail Lines**

Urbanized Areas

Urban Boundary Zones

Urbanized Areas: Includes land designated as Urban and Built-up as defined by the Farmland Mapping and Monitoring Program in 2010. These lands include areas occupied by structures with a building density of at least 1 unit to 1.5 acres or approximately 6 structures to a 10-acre parcel. This land is used for residential, industrial, commercial, construction, institutional, public administration, railroad and other transportation yards, cemeteries, airports, golf courses, sanitary landfills, sewage treatment, water control structures and other developed purposes.

Urban Boundary Zones: Includes areas within Urban Growth Boundaries/ Urban Limit Lines, Urban Service Areas and Spheres of Influence.

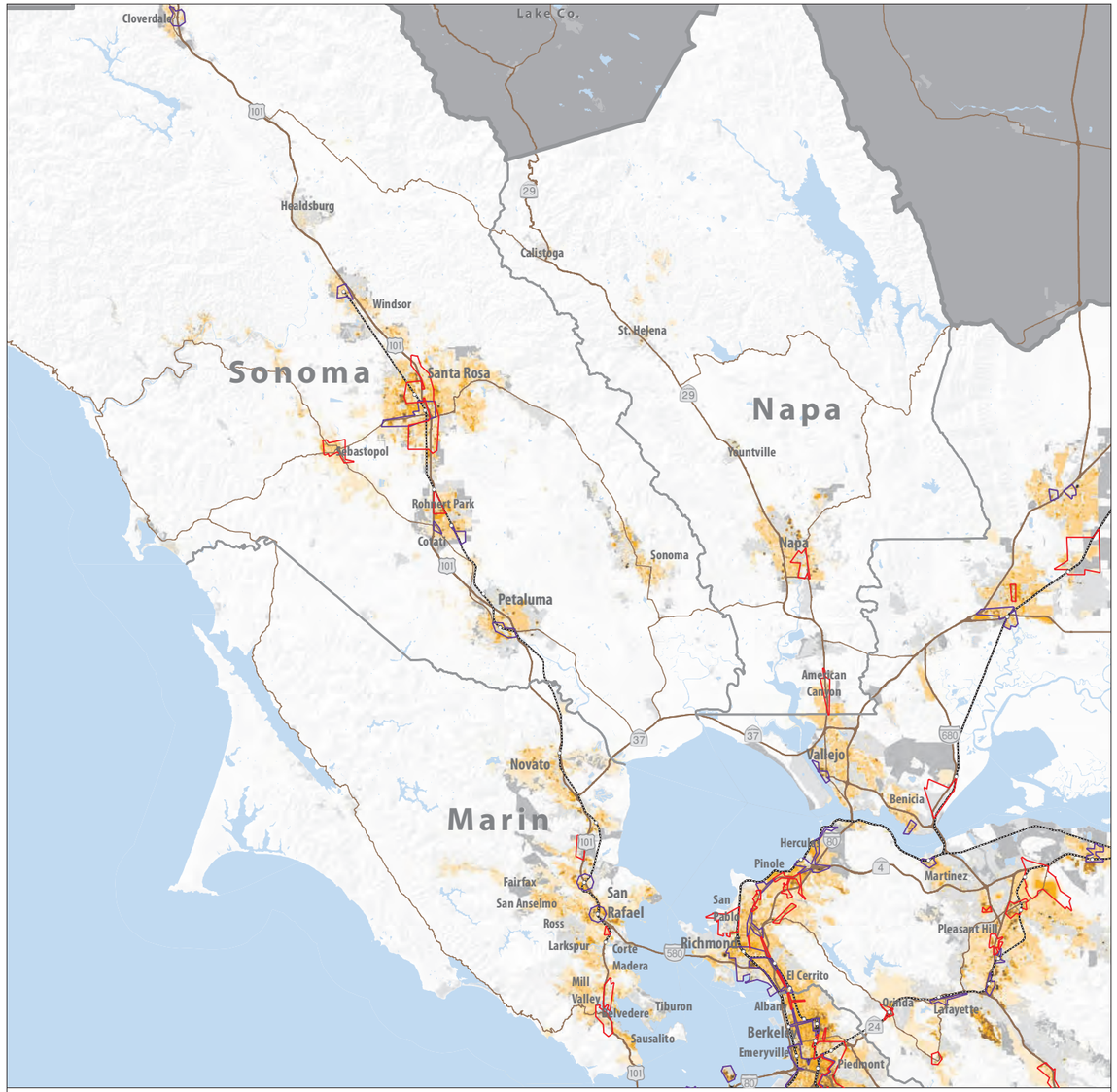
POPULATION	
Oakland	> 350,000
Novato	50,000 - 350,000
Pacifica	< 50,000

0 5 10 15 Miles

0 5 10 15 Kilometers

Map is for general information. For more information on local zoning or designations for a particular site or parcel, please contact your city or county.

MAP 29 North Bay/West: Households per Acre in 2040



Households per Acre in 2040



Priority Development Areas

- Planned
  A Planned PDA has a formally adopted plan, as determined by a local jurisdiction.
- Potential
  A Potential PDA requires more local planning, review and action before it can become a Planned PDA.
- Rail Lines

Urbanized Areas

Urban Boundary Zones

Urbanized Areas: Includes land designated as Urban and Built-up as defined by the Farmland Mapping and Monitoring Program in 2010. These lands include areas occupied by structures with a building density of at least 1 unit to 1.5 acres or approximately 6 structures to a 10-acre parcel. This land is used for residential, industrial, commercial, construction, institutional, public administration, railroad and other transportation yards, cemeteries, airports, golf courses, sanitary landfills, sewage treatment, water control structures and other developed purposes.

Urban Boundary Zones: Includes areas within Urban Growth Boundaries/ Urban Limit Lines, Urban Service Areas and Spheres of Influence.

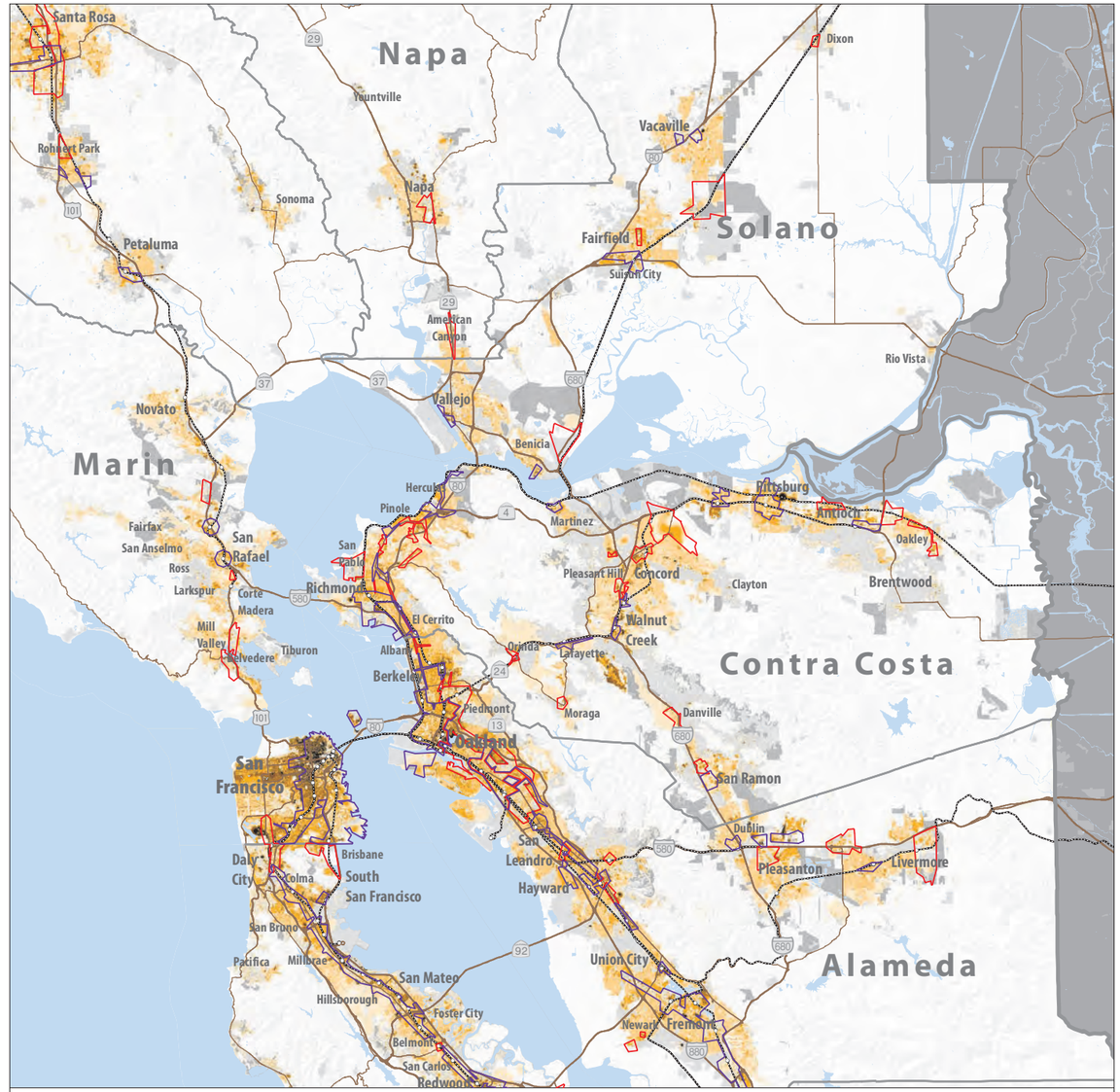
	POPULATION
Oakland	> 350,000
Novato	50,000 - 350,000
Pacifica	< 50,000

0 5 10 15 Miles

0 5 10 15 Kilometers

Map is for general information. For more information on local zoning or designations for a particular site or parcel, please contact your city or county.

MAP 30 Northeast and Central Bay: Households per Acre in 2040



Households per Acre in 2040



Priority Development Areas

- Planned
  A Planned PDA has a formally adopted plan, as determined by a local jurisdiction.
- Potential
  A Potential PDA requires more local planning, review and action before it can become a Planned PDA.
- Rail Lines

Urbanized Areas

Urban Boundary Zones

Urbanized Areas: Includes land designated as Urban and Built-up as defined by the Farmland Mapping and Monitoring Program in 2010. These lands include areas occupied by structures with a building density of at least 1 unit to 1.5 acres or approximately 6 structures to a 10-acre parcel. This land is used for residential, industrial, commercial, construction, institutional, public administration, railroad and other transportation yards, cemeteries, airports, golf courses, sanitary landfills, sewage treatment, water control structures and other developed purposes.

Urban Boundary Zones: Includes areas within Urban Growth Boundaries/ Urban Limit Lines, Urban Service Areas and Spheres of Influence.

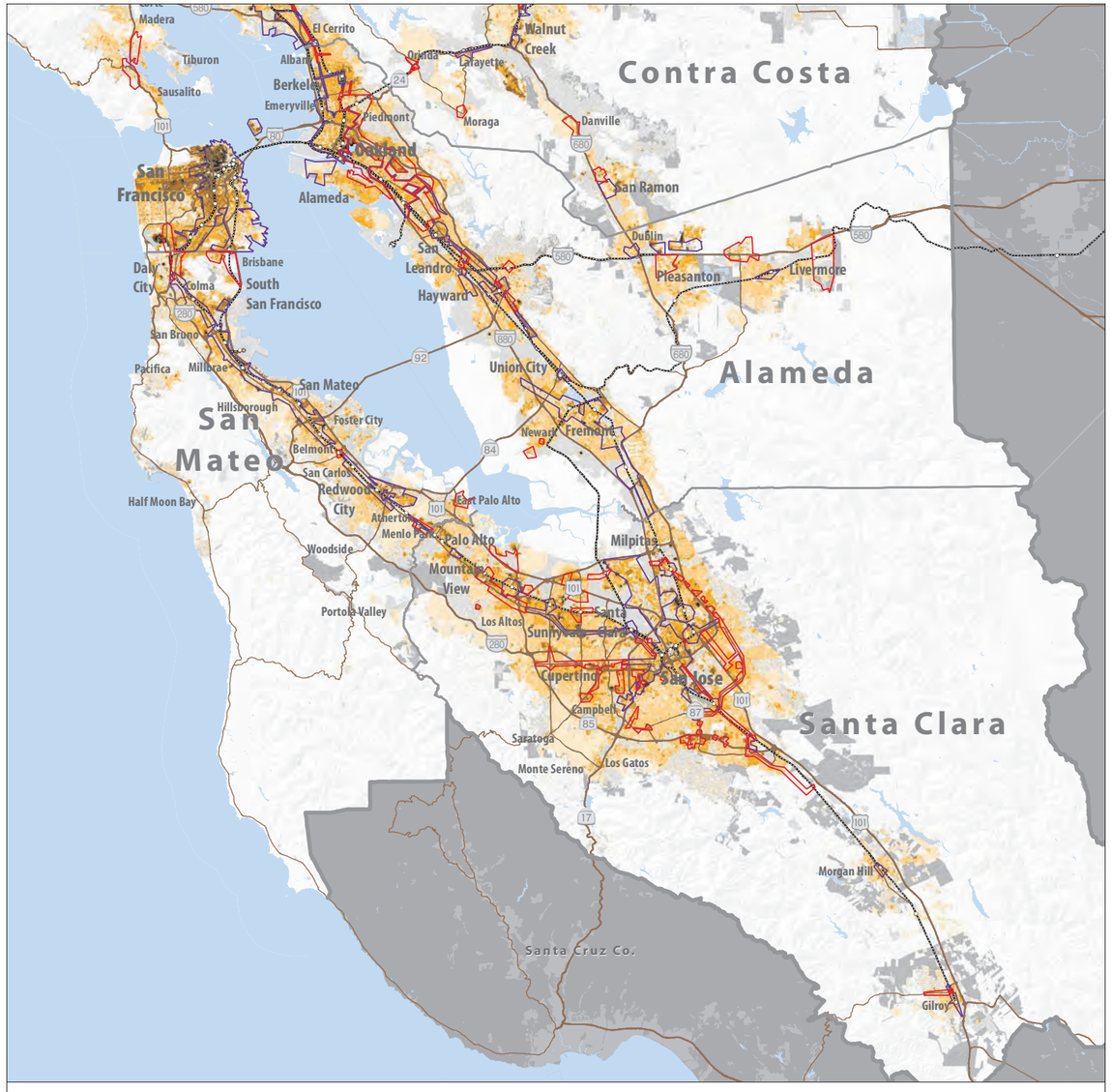
	POPULATION
Oakland	> 350,000
Novato	50,000 - 350,000
Pacifica	< 50,000

0 5 10 15 Miles

0 5 10 15 Kilometers

Map is for general information. For more information on local zoning or designations for a particular site or parcel, please contact your city or county.

MAP 31 **South and West Bay: Households per Acre in 2040**



Households per Acre in 2040



Priority Development Areas

Planned

A Planned PDA has a formally adopted plan, as determined by a local jurisdiction.

Potential

A Potential PDA requires more local planning, review and action before it can become a Planned PDA.

Rail Lines

Urbanized Areas

Urban Boundary Zones

Urbanized Areas: Includes land designated as Urban and Built-up as defined by the Farmland Mapping and Monitoring Program in 2010. These lands include areas occupied by structures with a building density of at least 1 unit to 1.5 acres or approximately 6 structures to a 10-acre parcel. This land is used for residential, industrial, commercial, construction, institutional, public administration, railroad and other transportation yards, cemeteries, airports, golf courses, sanitary landfills, sewage treatment, water control structures and other developed purposes.

Urban Boundary Zones: Includes areas within Urban Growth Boundaries/ Urban Limit Lines, Urban Service Areas and Spheres of Influence.

	POPULATION
Oakland	> 350,000
Novato	50,000 - 350,000
Pacifica	< 50,000

0 5 10 15 Miles

Kilometers 0 5 10 15

Map is for general information. For more information on local zoning or designations for a particular site or parcel, please contact your city or county.

Legend Information for Plan Bay Area Maps

Data	Description
Critical Habitat **Source:** National Marine Fisheries Service; U.S. Fish and Wildlife Service; California Department of Fish and Wildlife; California Natural Diversity Database.	Includes lands designated as habitat for protected, sensitive or special-status species as defined by local, state or federal agencies, or protected by the federal Endangered Species Act, the California Endangered Species Act or the Native Plant Protection Act.
Farmland **Source:** Farmland Mapping and Monitoring Program, 2010.	Includes voter-approved, agriculturally zoned land that is identified as important for protection from urban development, and land outside all existing city spheres of influence or city limits as of January 2010 that is one of the following Department of Conservation's Farmland Mapping and Monitoring Program (FMMP) classifications: • Prime Farmland • Unique Farmland • Farmland of Statewide Importance
Floodplains **Source:** U.S. Federal Emergency Management Agency; data compiled by Greenbelt Alliance staff in February 2012.	Floodplain areas identified as important for protection within a city's general plan. Based upon general plans and 100-year storm flood level from the U.S. Federal Emergency Management Agency.
Grazing Lands **Source:** Farmland Mapping and Monitoring Program, 2010.	Defined by the FMMP in 2010, this category includes land on which the existing vegetation is suited to the grazing of livestock. This category was developed in cooperation with the California Cattlemen's Association, University of California Cooperative Extension and other groups interested in the extent of grazing activities.
Greenbelt Reserves **Source:** Based upon Local Jurisdiction General Plan maps. Data compiled by Greenbelt Alliance staff in March 2012.	Large open space reserves that are set aside permanently or temporarily by a single jurisdiction or several jurisdictions.
Hillside Areas **Source:** Based upon local jurisdiction General Plan maps. Data compiled by Greenbelt Alliance staff in March 2012.	Hillside areas identified as important for protection or conservation based on city and county general plans. Policies mapped include areas identified based up the slope of a hill, the area above a certain elevation, and the area within a certain vertical or horizontal distance from a ridge line.

Continues on following page

Legend Information for Plan Bay Area Maps *(Continued)*

Data	Description
Priority Conservation Areas **Source:** Association of Bay Area Governments, 2013.	These areas include lands of regional significance that have broad community support and an urgent need for protection. These areas provide important agricultural, natural resource, historical, scenic, cultural, recreational, and/or ecological values and ecosystem functions.
Publicly Owned Parks and Open Space **Source:** Data is derived from the Bay Area Protected Areas Database, Bay Area Open Space Council, 2012; California State Park Boundaries, 2012; The Conservation Lands Network, 2012.	These areas include publicly owned lands that are accessible to the public.
Riparian Corridors **Source:** Based upon local jurisdiction General Plan maps. Data compiled by Greenbelt Alliance staff in November 2011.	A policy that limits or prohibits new construction within a certain distance from rivers and streams to avoid the adverse impacts of urban development, such as pollution runoff, erosion and habitat degradation.
Urban Boundary Zones **Source:** Based upon local jurisdiction General Plan maps. Data compiled by ABAG Planning staff, March 2012.	Includes areas within Urban Growth Boundaries/ Urban Limit Lines, Urban Service Areas and Spheres of Influence. For more information, see the supplementary report, *Summary of Predicted Land Use Responses*.
Urbanized Areas **Source:** Farmland Mapping and Monitoring Program, 2010.	Includes land designated as Urban and Built-up as defined by the Farmland Mapping and Monitoring Program in 2010. These lands include areas occupied by structures with a building density of at least 1 unit to 1.5 acres, or approximately 6 structures to a 10-acre parcel. This land is used for residential, industrial, commercial, construction, institutional, public administration, railroad and other transportation yards, cemeteries, airports, golf courses, sanitary landfills, sewage treatment, water control structures, and other developed purposes.
Williamson Act Lands **Source:** Williamson Act Program, California Department of Conservation, 2006.	The California Land Conservation Act of 1965 — commonly referred to as the Williamson Act — enables local governments to enter into contracts with private landowners for the purpose of restricting specific parcels of land to agricultural or related open space use. Some Williamson Act contracts are set to expire and be decommissioned during the plan period.

Metropolitan Transportation Commission

Management Staff

Steve Heminger
Executive Director

Ann Flemer
Deputy Executive Director, Policy

Andrew B. Fremier
Deputy Executive Director, Operations

Adrienne D. Weil
General Counsel

Brian Mayhew
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Association of Bay Area Governments

Management Staff

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Executive Director

Bradford Paul
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Legal Counsel

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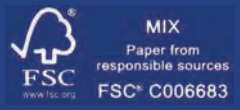


Association
of Bay Area
Governments

P.O. Box 2050
Oakland, California 94604

101 Eighth Street
Oakland, California 94607

510.464.7900 PHONE
info@abag.ca.gov EMAIL
www.abag.ca.gov WEB

METROPOLITAN
TRANSPORTATION
COMMISSION

Joseph P. Bort MetroCenter
101 Eighth Street
Oakland, California 94607

510.817.5700 PHONE
510.817.5769 TDD/TTY
510.817.5848 FAX
info@mtc.ca.gov EMAIL
www.mtc.ca.gov WEB

Countywide Travel Demand Model

The Alameda countywide travel demand model is an essential tool for the CMP planning process. The model allows the Alameda CTC to anticipate and forecast the potential impacts of local land development decisions on the major roadways in the county. The model is periodically updated to be consistent with the most recent land use and socio-economic database of the Association of Bay Area Governments (ABAG) and assumptions of the Metropolitan Transportation Commission's regional travel demand model. The most recent Alameda countywide travel demand model completed in July 2014 includes land use and transportation assumptions updated to Plan Bay Area and several revised features.

Key features of the model (Uploaded 6/26/2015)

MODEL DOCUMENTATION

- Documentation for the Countywide Model (Uploaded 7/1/2015)
- Complete Model Documentation for the Prior Model Updated in 2011
- Performance Measure Maps (Uploaded 12/29/2014)

Final Traffic Analysis Zones (TAZs)

(Uploaded 2/6/2015)

- Planning Area 1 (North)
- Planning Area 2 (Central)
- Planning Area 3 (South)
- Planning Area 4 (East)

Model Vehicle Volumes

(Uploaded 12/29/2014)

Below are the plots of the model volumes for a.m. peak 1-hour, p.m. peak 1-hour, a.m. peak 4-hour, p.m. peak 4-hour and daily for the four Planning Areas of Alameda County. Volume plots for each time period are combined for all horizon years (2010, 2020 and 2040) for each planning area. The volume numbers appear directly on the network roadway links. The volume numbers for each horizon year are indicated by color: 2010 (black), 2020 (green) and 2040 (red). They are printed quite small to show volumes on as many links as possible, but you can use the Adobe viewer to zoom in on them (view at 800 percent recommended).

Planning Area 1	Planning Area 2	Planning Area 3	Planning Area 4
AM 1 HR	AM 1 HR	AM 1 HR	AM 1 HR
AM 4 HR	AM 4 HR	AM 4 HR	AM 4 HR
Daily	Daily	Daily	Daily
PM 1 HR	PM 1 HR	PM 1 HR	PM 1 HR
PM 4 HR	PM 4 HR	PM 4 HR	PM 4 HR

Performance Measure Maps

(Uploaded 12/29/2014)

In support of Alameda CTC's documentation of the 2013 Model update, the agency has created maps for the three following performance measures: vehicle miles traveled, transit accessibility and miles of congested roads. Maps are available for model study years 2010, 2020 and 2040.

VEHICLE MILES TRAVELED (VMT)

VMT Per Person	VMT Per Employee
2010	2010
2020	2020
2040	2040

TRANSIT ACCESSIBILITY

Transit accessibility is based on the number of jobs within a certain number of minutes of travel time by transit.

Jobs Within 30 Minutes	Jobs Within 60 Minutes
2010	2010
2020	2020
2040	2040

MILES OF CONGESTED ROADS

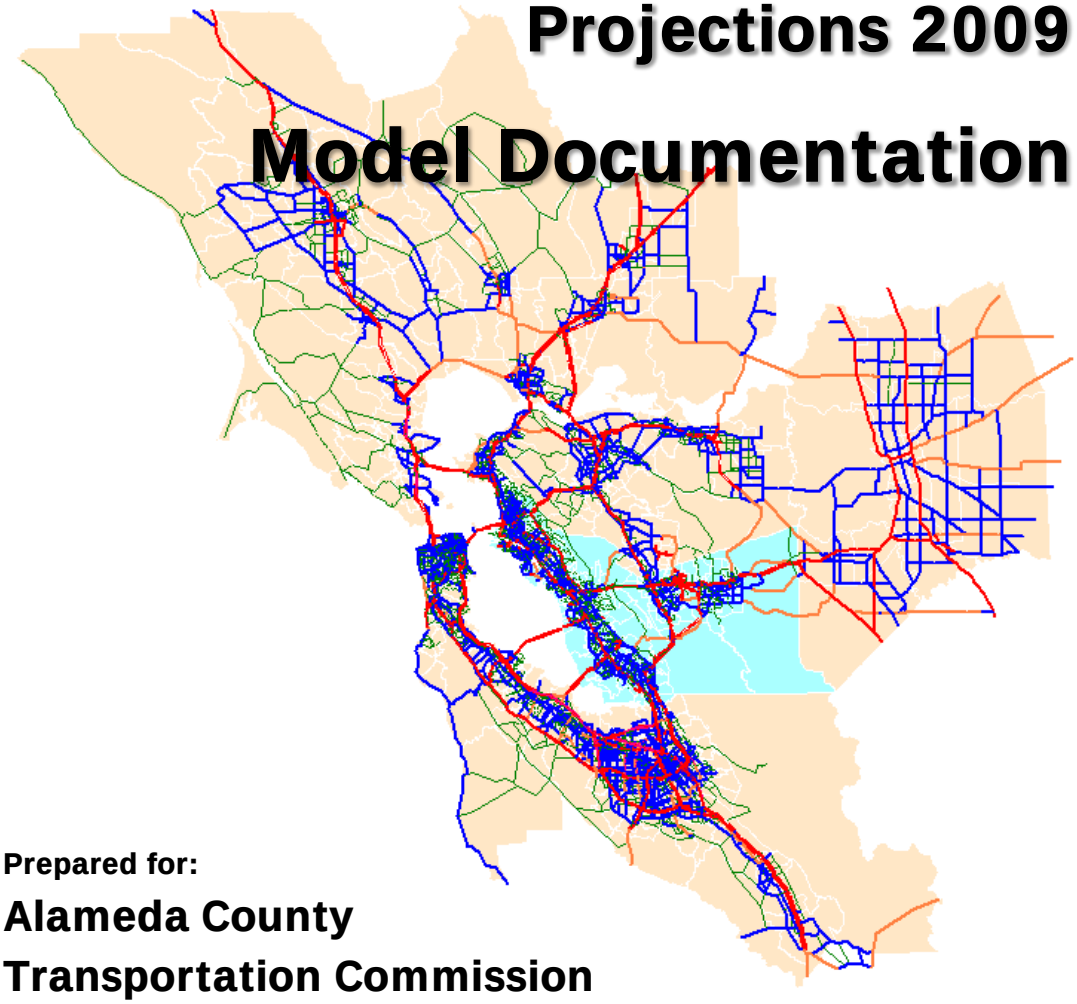
The color codes indicate network link volume/capacity ratios for the p.m. 4-hour peak period.

PM 4 HR Period
2010
2020
2040

Alameda Countywide Transportation Model Update

Projections 2009

Model Documentation



Prepared for:

Alameda County Transportation Commission

Submitted by:

Dowling Associates, Inc.

Transportation Engineering • Planning • Research • Education

180 Grand Avenue, Suite 250
Oakland, CA 94612
(510) 839.1742

August 9, 2011
(Chapter 6, July 19, 2012)

Dowling Associates, Inc.
Transportation Engineering • Planning • Research • Education

August 9, 2011

Ms. Saravana Suthanthira
Alameda County Transportation Commission
1333 Broadway, Suite 200
Oakland, CA 94612

Subject: Alameda Countywide Travel Demand Model P10016

ABAG Projections 2009 Update
Model Documentation

Dear Ms. Suthanthira:

Dowling Associates is submitting the documentation of the Alameda Countywide Travel Demand Model ABAG Projections 2009 Update.

The key features of the Projections 2009 update are:

- Jurisdiction totals for housing and employment were updated from ABAG Projections 2007 to Projections 2009
- The mid-term forecast year was changed from 2015 to 2020
- Several cities provided a thorough review and geographic reallocation of future (mainly 2035) and in some cases base year housing and employment
- Land use forecasts for San Joaquin County have been updated, which reflects current economic conditions
- Several revisions were made in the model process to improve flexibility of analysis years and more accurate peak hour traffic forecasts
- A more detailed truck forecast model has been incorporated within the travel model
- Future capacity-constrained peak hour traffic forecasts are now provided in addition to peak hour traffic forecasts based on unconstrained demand
- A greenhouse gas calculation tool has been added to the travel model

We would like to acknowledge the Dowling Associates staff who participated in the Projections 2009 update. Mr. Michael Aronson was principal-in-charge and project manager for the model update. Mr. Damian Stefanakis assisted with supervision of the road and transit network updates. Mr. Antonios Garefalakis set up the land use allocations and updated the road network and transit line coding. Mr. Pratyush Bhatia and Mr. Kevin Chen completed the final updates to the road and transit networks. Mr. Joe Holland programmed the greenhouse gas calculation tool.

Please contact me at 510-839-1742 extension 119 if you have any questions or comments.

Sincerely,

Dowling Associates, Inc.



Michael N. Aronson, P.E.

Principal

c:\users\mike\projects\2010\p10016_alameda_county_model_p09\documents\accma_model_p09_110831.docx

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1 Introduction

The Alameda Countywide Travel Demand Model has been updated based on the Association of Bay Area Governments (ABAG) *Projections 2009*.

The Cube software version of the Alameda Countywide Travel Demand Model (Alameda County Model) was originally completed in June, 2007 based on the Metropolitan Transportation Commission (MTC) BAYCAST travel model. The June, 2007 update was based on land use assumptions from ABAG *Projections 2005*. A second update completed in February, 2009 revised the land use assumptions to be consistent with ABAG *Projections 2007,* extended the forecast year from 2030 to 2035 and added ramp metering analysis. A related truck forecast model was completed in 2010. This model update revised the land use forecasts based on ABAG *Projections 2009* and incorporates additional features including the truck forecast model.

This report documents the Alameda Countywide Model Update, incorporating the following elements:

- Model description
- Calibration and validation results
- Forecast results
- Performance measures
- MTC model consistency findings
- Appendices

The model description describes the road and transit networks, TAZ system, model processes, and any deviations from the MTC model processes.

The calibration and validation results compare the updated model's traffic and transit estimates for the year 2000 against traffic and transit ridership counts.

The forecast results summarize the model traffic and transit results for 2005, 2020 and 2035.

The MTC consistency findings compare the results of the updated model with the MTC model.

The seven technical appendices provide additional detail on:

A. Prior land use/socio-demographic data development

B. Traffic validation

C. Traffic forecasts

D. TAZ correspondence

E. Ramp metering assumptions

F. Transportation projects

G. User guide

The following section describes changes made in the Alameda Countywide Travel Demand Model since the P07 version completed in February, 2009.

1.1 Summary of Model Changes Since February, 2009

The following revisions were included as part of the update to ABAG *Projections 2009*:

1.1.1 Land Use

- Jurisdiction totals for housing and employment were updated from ABAG Projections 2007 to Projections 2009.
- Initial land use allocations within each jurisdiction were based directly on ABAG allocations by census tract/MTC regional transportation analysis zone (RTAZ) rather than starting with allocations from prior versions of the Alameda County model.
- The mid-range forecast year was changed from 2015 to 2020.
- Most cities provided a thorough review and reallocation of future and, in some cases, base year housing and employment to Alameda County Model transportation analysis zones (TAZs).
- Base year (2000 and in some cases 2005) land uses were reallocated in several jurisdictions to be consistent with reallocated future land uses, in particular in Dublin, Fremont, Hayward, Livermore, Newark and Pleasanton.
- San Joaquin County land uses were updated to be consistent with the most current version of the San Joaquin County travel forecast model as of February, 2010.
- TAZ 1405 was added to represent the portion of the Oakland International Airport connecting to Ron Cowan Parkway (Federal Express, etc…) and land uses were split from TAZ 453.

1.1.2 Road Network

- The master road network coding system was revised to identify specific years for road improvements and provide for creation of a road network for any interim year, not just the discrete forecast years (2000, 2005, 2020, 2035).

- The network coding was revised to allow direct input of speed assumptions rather than relying on a lookup based on MTC area type and facility type.

- Local street assumptions were updated based on detailed review by several of the jurisdictions.

- Turn prohibitors at freeway interchanges were reviewed and updated.

- Freeway capacities were increased to be based on passenger car equivalents (PCE) where medium trucks count as 1.5 cars and large trucks count as 2.0 cars, in order to provide more direct calculation of congestion and speed with the updated truck forecast model. The prior versions of the model used freeway capacities based on total number of vehicles (autos plus trucks) assuming average truck percentages rather than specific truck assignments.

1.1.3 Transit Network

- The BART extension to Santa Clara was added to the 2035 network and coding was updated to ensure correct walk, drive and local transit access to the Santa Clara County BART stations.

- Transit lines were reorganized to clearly identify ranges of years for each service level.

- AC Transit bus lines were updated to correctly reflect service changes associated with the San Pablo and Telegraph Rapid Bus services as well as the planned Bus Rapid Transit (BRT) corridor.

1.1.4 Model Process

- The model process was reorganized so that all inputs to the model run are located in one single subdirectory rather than spread among many data directories. This allows for much more compact archiving and easier creation of new model scenarios.

- All model scripts were revised to standardize file name conventions and script formats.

- Model scripts were revised to generate distinct tables of person trips and vehicle trips by trip purpose and travel mode.

- An error in calculation of peak period non-home based trips was corrected and overall peak spreading factors were correspondingly adjusted.

1.1.5 Traffic Assignment

- Traffic assignments were revised to directly account for medium (equivalent to 1.5 passenger cars) and large combination (equivalent to 2.0 passenger cars) truck volumes during the calculation of link volume/capacity ratio and congested speeds.

2 Model Description

The Alameda Countywide Transportation Demand Model generally follows the processes of the MTC trip-based model as used for the current Regional Transportation Plan (2009 RTP). A new activity-based travel model is currently being implemented at MTC, and the Alameda County Model has not incorporated processes from that newer model.

The Alameda County Model directly uses MTC formulas for trip generation, trip distribution, transit travel time analysis, peak period factors by trip purpose and traffic assignment. The mode choice model has been revised to provide further detail on types of transit and recalibrated, although it generally produces similar results as the MTC model when aggregated to the MTC level of detail.

The MTC model includes the nine Bay Area counties. The Alameda County Model includes the nine Bay Area counties plus San Joaquin County and the external gateways to and from San Joaquin County. The Alameda County Model includes adjusted peak spreading factors to represent more detailed traffic conditions within Alameda County.

The following sections describe the components of the Alameda County Model.

2.1 Transportation Analysis Zones

The Alameda County Model contains a total of 2,692 TAZs including gateway zones. There are 2,662 internal TAZ's, of which there are 1,405 zones in Alameda County. The TAZs in Bay Area counties outside of Alameda County are generally consistent with the MTC regional TAZs (RTAZ) except for additional TAZ detail in three "buffer" areas adjacent to Alameda County. There are 26 TAZs within San Joaquin County and 31 external gateway TAZs surrounding the nine Bay Area counties and San Joaquin County.

Table 2-1 gives an overview of the TAZ number ranges by subarea; Table 2-2 shows the TAZ number ranges by jurisdiction. A detailed correspondence between Alameda County Model TAZs and MTC RTAZs is shown in Appendix D.

Table 2-1. TAZ Number Ranges by Subarea

TAZ Number Range					Location
1	–	3597			Internal zones:
		1	–	1405	Alameda County
		2001	–	2299	Buffer areas (West Contra Costa County, San Ramon, Milpitas)
		2301	--	2326	San Joaquin County
		2501	–	3597	Remainder of Bay Area (MTC zones)
4455	–	4485			Gateway zones

Table 2-2. TAZ Ranges by Jurisdiction

Jurisdiction	Zone Number Range			Number of Zones
Alameda	461	—	530	70
Albany	1	—	13	13
Ashland	637	—	649	13
Berkeley	14	—	114	101
Castro Valley	602	—	624	23
Cherryland	650	—	654	5
Dublin	941	—	1052	112
Emeryville	115	—	126	12
Fremont	802	—	917	116
Hayward	655	—	768	114
Livermore	1192	—	1375	184
Newark	918	—	940	23
Oakland	127	—	454	328
	1401	—	1405	5
Piedmont	455	—	460	6
Pleasanton	1053	—	1191	139
San Leandro	531	—	601	71
San Lorenzo	625	—	636	12
Union City	769	—	801	33
Remainder of Alameda County	1376	—	1400	25
West Contra Costa buffer zones	2001	—	2052	52
South Contra Costa buffer zones	2101	—	2148	48
Santa Clara buffer zones	2201	—	2233	33
San Joaquin buffer zones	2301	—	2326	26
Remainder of Bay Area Counties	2501	—	3597	1097
Gateway zones	4455	—	4485	31
Total Zones				**2,692**

2.2 Land Use/Socioeconomic Data

The land use and socio-economic data were updated to be consistent with ABAG *Projections 2009*. The initial allocations to Alameda County model TAZs were based directly on the ABAG allocations to MTC RTAZs, subdivided according to the prior allocations to Alameda County TAZs based on *Projections 2007*. The initial allocations were later revised based on input from many of the jurisdictions.

ABAG does not generate all of the demographic input data required by the MTC model, so the ABAG data was supplemented with MTC developed demographic data for each forecast year.

2.2.1 ABAG Projections

The Association of Bay Area Governments provides forecasts of demographics for the nine-county Bay Area. The forecasts are generally updated every two years and are referred to as a certain projections series, such as Projections 2007 (P07) or Projections 2009 (P09).

The published version of the ABAG forecast contains quantities of population, households and various types of employment for five-year increments, starting with the most recent United States Census year at the time of the ABAG forecast (currently 2000). The Projections 2009 series includes forecasts for years from 2000 up to 2035. The quantities are provided for the Bay Area region, for the individual nine counties, and for jurisdictions and spheres of influence within each of the nine counties.

The following tables compare the Projections 2007 and Projections 2009 forecasts for Alameda County. Table 2-2-3 compares households, Table 2-2-4 compares jobs (employment) and Table 2-2-5 lists the differences between the two sets of projections.

For the year 2035, P09 assumes increases in households in Oakland, Castro Valley, Hayward, Emeryville and Berkeley compared to P07. Household growth forecasts were reduced in Pleasanton, Alameda and Livermore. The total 2035 household forecast for all of Alameda County is one percent higher in P09 than in P07.

Job forecasts were reduced significantly in most Alameda County jurisdictions in P09 compared to P07. The total 2035 job forecast for all of Alameda County is 5.4 percent lower in P09 than in P07.

Table 2-2-3. ABAG Projections of Alameda County Households

ABAG Projections 2007

	HOUSEHOLDS							
SUBREGIONAL STUDY AREA	**2000**	**2005**	**2010**	**2015**	**2020**	**2025**	**2030**	**2035**
ALAMEDA*	30,226	30,980	31,900	32,970	34,040	35,160	36,400	37,520
ALBANY*	7,011	7,130	7,310	7,490	7,630	7,790	7,950	8,110
BERKELEY*	44,955	45,530	46,320	47,050	47,960	48,960	49,980	50,980
DUBLIN**	9,335	13,440	16,600	19,070	21,310	23,770	26,250	28,720
EMERYVILLE*	3,975	4,830	5,510	6,100	6,700	7,320	7,940	8,360
FREMONT**	68,237	70,130	72,140	74,470	77,050	79,820	82,520	85,500
HAYWARD***	44,979	46,690	48,150	49,790	51,310	53,120	54,960	56,780
LIVERMORE**	26,315	28,550	31,160	33,360	35,750	38,090	40,470	42,820
NEWARK**	12,992	13,250	13,620	14,090	14,620	15,190	15,970	16,740
OAKLAND*	150,790	154,580	159,610	168,910	177,440	187,420	197,390	207,250
PIEDMONT*	3,804	3,810	3,820	3,830	3,840	3,850	3,860	3,870
PLEASANTON**	23,831	25,260	26,700	28,120	29,570	31,170	32,790	34,400
SAN LEANDRO*	30,642	31,250	31,750	32,300	33,020	33,890	34,780	35,660
UNION CITY**	18,647	19,660	20,730	21,740	22,870	24,330	25,810	27,280
ASHLAND***	7,223	7,360	7,560	7,750	7,950	8,180	8,410	8,640
CASTRO VALLEY***	21,606	22,170	22,520	22,890	23,410	24,070	24,740	25,400
CHERRYLAND-FAIRVIEW***	9,022	9,230	9,340	9,580	9,840	10,150	10,460	10,770
SAN LORENZO***	7,500	7,540	7,550	7,570	7,660	7,790	7,920	8,050
REMAINDER	2,276	2,400	2,590	2,700	2,820	2,960	3,100	3,240
ALAMEDA COUNTY	**523,366**	**543,790**	**564,880**	**589,780**	**614,790**	**643,030**	**671,700**	**700,090**

*CITY **CITY SPHERE OF INFLUENCE ***OTHER SUBREGIONAL AREA

ABAG Projections 2009

	HOUSEHOLDS							
SUBREGIONAL STUDY AREA	**2000**	**2005**	**2010**	**2015**	**2020**	**2025**	**2030**	**2035**
ALAMEDA*	30,226	30,980	31,770	32,740	33,410	34,080	34,750	35,620
ALBANY*	7,011	7,130	7,150	7,340	7,520	7,710	7,890	8,080
BERKELEY*	44,955	45,530	46,150	47,330	48,510	49,690	50,870	52,050
DUBLIN**	9,335	13,440	16,230	18,560	20,930	23,310	25,690	28,000
EMERYVILLE*	3,975	4,830	5,770	6,470	7,280	8,100	8,920	9,750
FREMONT**	68,237	70,130	71,120	73,660	76,790	79,730	82,870	86,000
HAYWARD***	44,979	46,690	47,480	49,460	51,580	53,810	56,130	58,500
LIVERMORE**	26,315	28,550	29,820	31,820	34,210	36,610	39,060	41,500
NEWARK**	12,992	13,250	13,300	13,900	14,490	15,090	15,680	16,280
OAKLAND*	150,790	154,580	157,840	167,940	178,730	189,630	200,530	212,000
PIEDMONT*	3,804	3,810	3,810	3,810	3,810	3,820	3,820	3,820
PLEASANTON**	23,831	25,260	25,850	27,070	28,290	29,510	30,760	32,000
SAN LEANDRO*	30,642	31,250	31,270	31,960	32,950	33,990	35,090	36,500
UNION CITY**	18,647	19,660	20,430	21,950	23,480	25,000	26,530	28,050
ASHLAND***	7,223	7,360	7,520	7,670	7,810	7,960	8,110	8,250
CASTRO VALLEY***	21,606	22,170	22,380	23,660	24,940	26,220	27,500	28,790
CHERRYLAND-FAIRVIEW***	9,022	9,230	9,310	9,670	10,040	10,400	10,760	11,130
SAN LORENZO***	7,500	7,540	7,560	7,590	7,620	7,650	7,670	7,700
REMAINDER	2,276	2,400	2,510	2,800	3,080	3,370	3,650	3,940
ALAMEDA COUNTY	**523,366**	**543,790**	**557,270**	**585,400**	**615,470**	**645,680**	**676,280**	**707,960**

*CITY **CITY SPHERE OF INFLUENCE ***OTHER SUBREGIONAL AREA

Table 2-2-4. ABAG Projections of Alameda County Jobs

ABAG Projections 2007

TOTAL JOBS

SUBREGIONAL STUDY AREA	2000	2005	2010	2015	2020	2025	2030	2035
ALAMEDA*	27,380	27,400	29,870	34,330	38,230	43,120	48,520	50,550
ALBANY*	5,190	4,840	5,430	5,540	5,660	5,740	5,780	5,880
BERKELEY*	78,320	75,430	78,380	80,740	82,150	83,660	85,410	87,150
DUBLIN**	16,540	19,520	22,910	26,730	31,790	36,590	42,900	49,810
EMERYVILLE*	19,860	19,670	21,140	22,440	23,800	25,220	26,690	28,210
FREMONT**	104,830	93,950	97,530	103,200	114,130	125,720	137,240	148,840
HAYWARD***	77,660	72,950	75,880	81,370	87,160	93,260	99,630	106,260
LIVERMORE**	48,250	48,110	53,650	60,410	65,840	71,240	76,960	82,990
NEWARK**	21,420	20,590	21,930	23,000	23,720	24,290	24,900	25,750
OAKLAND*	199,470	202,570	218,350	231,250	243,100	258,390	273,600	285,600
PIEDMONT*	2,120	2,090	2,100	2,110	2,120	2,120	2,130	2,140
PLEASANTON**	59,480	58,110	64,260	70,260	73,180	76,020	78,720	81,270
SAN LEANDRO*	44,370	41,650	43,540	46,190	49,770	53,480	57,080	60,630
UNION CITY**	19,310	19,370	21,880	26,010	31,900	37,350	43,130	46,500
ASHLAND***	2,960	2,720	2,770	4,280	5,870	7,540	9,280	11,090
CASTRO VALLEY***	13,280	12,180	12,400	13,190	13,980	14,910	15,830	16,790
CHERRYLAND-FAIRVIEW***	2,630	2,470	2,510	2,610	2,710	2,820	2,780	2,890
SAN LORENZO***	3,530	3,240	3,410	3,460	3,510	3,540	3,550	3,580
REMAINDER	3,560	3,410	3,580	3,540	3,560	3,580	3,600	3,620
ALAMEDA COUNTY	**750,160**	**730,270**	**781,520**	**840,660**	**902,180**	**968,590**	**1,037,730**	**1,099,550**

*CITY **CITY SPHERE OF INFLUENCE ***OTHER SUBREGIONAL AREA

ABAG Projections 2009

TOTAL JOBS

SUBREGIONAL STUDY AREA	2000	2005	2010	2015	2020	2025	2030	2035
ALAMEDA*	27,380	27,400	26,970	29,650	32,850	36,160	39,470	42,730
ALBANY*	5,190	4,840	5,030	5,240	5,440	5,500	5,540	5,580
BERKELEY*	78,320	75,430	76,170	77,040	79,610	82,540	84,350	86,200
DUBLIN**	16,540	19,520	19,650	22,900	26,610	32,970	37,020	42,620
EMERYVILLE*	19,860	19,670	18,610	20,460	22,340	24,150	26,110	28,010
FREMONT**	104,830	93,950	94,440	96,410	101,050	112,920	127,800	140,440
HAYWARD***	77,660	72,950	72,400	73,670	79,750	86,060	92,740	99,100
LIVERMORE**	48,250	48,110	46,600	51,260	57,000	62,950	67,960	73,170
NEWARK**	21,420	20,590	20,350	21,490	22,810	23,570	24,180	24,830
OAKLAND*	199,470	202,570	188,590	209,340	229,720	246,780	264,390	281,900
PIEDMONT*	2,120	2,090	2,090	2,100	2,110	2,120	2,130	2,140
PLEASANTON**	59,480	58,110	56,700	62,320	67,790	71,320	75,450	79,130
SAN LEANDRO*	44,370	41,650	40,940	42,300	45,680	49,390	53,770	57,760
UNION CITY**	19,310	19,370	20,230	22,170	24,860	31,540	37,270	41,110
ASHLAND***	2,960	2,720	3,250	3,370	4,510	5,520	6,580	8,000
CASTRO VALLEY***	13,280	12,180	11,650	12,230	13,050	13,930	14,860	15,690
CHERRYLAND-FAIRVIEW***	2,630	2,470	2,500	2,580	2,900	3,260	3,500	3,750
SAN LORENZO***	3,530	3,240	3,260	3,300	3,430	3,490	3,590	3,680
REMAINDER	3,560	3,410	3,420	3,440	3,560	3,640	3,780	3,840
ALAMEDA COUNTY	**750,160**	**730,270**	**712,850**	**761,270**	**825,070**	**897,810**	**970,490**	**1,039,680**

*CITY **CITY SPHERE OF INFLUENCE ***OTHER SUBREGIONAL AREA

Table 2-2-5. Comparison of ABAG Projections 2007 and 2009

Difference in Households, P2007 to P2009

HOUSEHOLDS

SUBREGIONAL STUDY AREA	2000	2005	2010	2015	2020	2025	2030	2035
ALAMEDA*	0	0	-130	-230	-630	-1,080	-1,650	-1,900
ALBANY*	0	0	-160	-150	-110	-80	-60	-30
BERKELEY*	0	0	-170	280	550	730	890	1,070
DUBLIN**	0	0	-370	-510	-380	-460	-560	-720
EMERYVILLE*	0	0	260	370	580	780	980	1,390
FREMONT**	0	0	-1,020	-810	-260	-90	350	500
HAYWARD***	0	0	-670	-330	270	690	1,170	1,720
LIVERMORE**	0	0	-1,340	-1,540	-1,540	-1,480	-1,410	-1,320
NEWARK**	0	0	-320	-190	-130	-100	-290	-460
OAKLAND*	0	0	-1,770	-970	1,290	2,210	3,140	4,750
PIEDMONT*	0	0	-10	-20	-30	-30	-40	-50
PLEASANTON**	0	0	-850	-1,050	-1,280	-1,660	-2,030	-2,400
SAN LEANDRO*	0	0	-480	-340	-70	100	310	840
UNION CITY**	0	0	-300	210	610	670	720	770
ASHLAND***	0	0	-40	-80	-140	-220	-300	-390
CASTRO VALLEY***	0	0	-140	770	1,530	2,150	2,760	3,390
CHERRYLAND-FAIRVIEW***	0	0	-30	90	200	250	300	360
SAN LORENZO***	0	0	10	20	-40	-140	-250	-350
REMAINDER	0	0	-80	100	260	410	550	700
ALAMEDA COUNTY	**0**	**0**	**-7,610**	**-4,380**	**680**	**2,650**	**4,580**	**7,870**

*CITY **CITY SPHERE OF INFLUENCE ***OTHER SUBREGIONAL AREA

Difference in Jobs, P2007 to P2009

TOTAL JOBS

SUBREGIONAL STUDY AREA	2000	2005	2010	2015	2020	2025	2030	2035
ALAMEDA*	0	0	-2,900	-4,680	-5,380	-6,960	-9,050	-7,820
ALBANY*	0	0	-400	-300	-220	-240	-240	-300
BERKELEY*	0	0	-2,210	-3,700	-2,540	-1,120	-1,060	-950
DUBLIN**	0	0	-3,260	-3,830	-5,180	-3,620	-5,880	-7,190
EMERYVILLE*	0	0	-2,530	-1,980	-1,460	-1,070	-580	-200
FREMONT**	0	0	-3,090	-6,790	-13,080	-12,800	-9,440	-8,400
HAYWARD***	0	0	-3,480	-7,700	-7,410	-7,200	-6,890	-7,160
LIVERMORE**	0	0	-7,050	-9,150	-8,840	-8,290	-9,000	-9,820
NEWARK**	0	0	-1,580	-1,510	-910	-720	-720	-920
OAKLAND*	0	0	-29,760	-21,910	-13,380	-11,610	-9,210	-3,700
PIEDMONT*	0	0	-10	-10	-10	0	0	0
PLEASANTON**	0	0	-7,560	-7,940	-5,390	-4,700	-3,270	-2,140
SAN LEANDRO*	0	0	-2,600	-3,890	-4,090	-4,090	-3,310	-2,870
UNION CITY**	0	0	-1,650	-3,840	-7,040	-5,810	-5,860	-5,390
ASHLAND***	0	0	480	-910	-1,360	-2,020	-2,700	-3,090
CASTRO VALLEY***	0	0	-750	-960	-930	-980	-970	-1,100
CHERRYLAND-FAIRVIEW***	0	0	-10	-30	190	440	720	860
SAN LORENZO***	0	0	-150	-160	-80	-50	40	100
REMAINDER	0	0	-160	-100	0	60	180	220
ALAMEDA COUNTY	**0**	**0**	**-68,670**	**-79,390**	**-77,110**	**-70,780**	**-67,240**	**-59,870**

*CITY **CITY SPHERE OF INFLUENCE ***OTHER SUBREGIONAL AREA

2.2.2 ABAG Projections in Travel Models

There are several steps required to translate ABAG projections into a form where they can be used for travel models.

Geographic Detail

Travel models require more geographic detail than county or city totals. The ABAG Projections are prepared at the census tract level of detail. In order to provide inputs to the regional transportation planning process, ABAG works with MTC to convert the census tract information into the 1,454 RTAZs used in the MTC model. The MTC RTAZs are generally equivalent to one or more census tracts.

The TAZs in Alameda County in the Alameda County Model are smaller and more detailed than the MTC RTAZs. The ABAG Projections must be further disaggregated to be used in the Alameda County Model. This process is described below.

Employment Categories

The MTC trip-based model calculates trip generation based on six categories of employment. These categories are based on the older SIC classification system. The Alameda County Model is consistent with the MTC employment classifications and trip generation calculations. Starting with *Projections 2005*, ABAG generated employment forecasts based on the newer NAICS employment classifications. In order to use these forecasts with the calibrated trip generation equations, the employment forecasts must be converted back to the previous SIC classification system. ABAG works with MTC to provide this conversion.

Additional Model Inputs

In addition to total households and employment by six categories, the MTC model process requires many other land use and demographic inputs, such as households by income quartile and population age stratifications. These additional characteristics were derived from the 2000 United States Census and were applied to further disaggregate the ABAG projections.

2.2.3 Allocations to Alameda County TAZs

The allocations of ABAG *Projections 2009* land uses to Alameda County TAZs were based on the ABAG allocations to MTC RTAZs. As stated before, the initial allocations to detailed Alameda County Model TAZs within each MTC RTAZ were based on the final results of the P07 allocations. The initial P09 allocations were reviewed by the local jurisdictions. Some jurisdictions shifted land uses within their jurisdiction boundaries and/or provided totals that were more than one percent different from the ABAG allocation to the jurisdiction. Additional work was then done in consultation with the jurisdictions to maintain county control totals and to ensure consistency between study years in each jurisdiction.

For jurisdictions which did not provide detailed review of the allocations, the allocations within MTC RTAZs may still resemble the allocations from previous updates (P05 and/or P07). These processes are summarized in Appendix A for reference.

Initial Projections 2009 Allocations

The initial allocations of Projections 2009 land uses to Alameda County Model TAZs directly used the ABAG allocations to MTC RTAZs. For each MTC RTAZ, the land uses were disaggregated to the corresponding Alameda County Model TAZs based on the allocation splits for that MTC RTAZ from the final P07 allocations. The Projections 2009 allocations for 2020 were based on the final Projections 2007 allocations for 2015.

For example, if a specific Alameda County Model TAZ in Fremont contained 35 percent of the manufacturing jobs in the corresponding MTC RTAZ in 2035 according to the final Projections 2007 allocations, then the initial Projections 2009 allocations would place 35 percent of that MTC RTAZ's 2035 manufacturing jobs according to Projections 2009 in that Alameda County Model TAZ.

Local Review

The initial allocations of Projections 2009 households and employment were distributed to each jurisdiction in Alameda County for review. The local jurisdictions were initially asked to maintain household and employment totals within each MTC RTAZ.

However, during the local review of the initial Projections 2009 allocations, Alameda CTC attempted to use the Countywide Model Update process as a step to assist ABAG in developing the Sustainable Community Strategy (SCS) Base Case for Alameda County. Alameda CTC held meetings with the local jurisdictions in each Planning Area jointly with ABAG staff to discuss the P09 allocations. The local jurisdictions were invited to discuss whether and how far they agree with the ABAG Projections and to provide information on what they anticipated to be developed in their respective jurisdictions, likely based on adopted plans.

As requested at the Planning Area meetings, comments and suggested reallocations were received from the jurisdictions at the census tract/RTAZ level highlighting issues in terms of the differences between their individual General Plan assumptions and Projections 2009. It was intended that, based on the jurisdictions' comments and ABAG's anticipated follow-up response, Alameda CTC would re-allocate the housing and employment to Alameda County Model TAZs and that the revised P09 allocations would be sent to the jurisdictions for another review and re-distribution, if needed. Since it was expected that the updated ABAG allocations to census tracts/RTAZs would respond to the information provided by the jurisdictions, the jurisdictions would be requested to keep their local reallocations within plus or minus one percent of RTAZ totals.

Since ABAG works with all of the nine counties in the Bay Area, ABAG was not able to provide adjusted P09 or SCS Base Case land use allocations for Alameda County on a schedule compatible with the requirements of the model update. Therefore, in order to complete the model update, Alameda CTC approached the jurisdictions where the requested reallocations exceeded the one percent permitted difference from the ABAG jurisdiction control total and suggested further adjustments or reallocation in order to bring them within the plus or minus one percent difference from the ABAG jurisdiction control totals.

The countywide totals were then reviewed to determine if further adjustments would be required as described in the following section.

The types and extent of land use review received are summarized in Table 2-6. No revisions were requested from the cities of Berkeley or San Leandro. Several cities provided full reallocations of land uses for two or more model years, including Emeryville (housing only), Fremont, Livermore, Newark and Piedmont. The cities of Dublin, Oakland and Pleasanton requested revisions to the MTC RTAZ totals within their jurisdictions but did not modify the allocation splits of those land uses to the smaller Alameda County Model TAZs.

The land use totals for each jurisdiction following the incorporation of comments are shown in Tables 2-7 to 2-10.

Table 2-6. Land Use Review by Local Jurisdictions

	Households				Employment			
Jurisdiction	**2000**	**2005**	**2020**	**2035**	**2000**	**2005**	**2020**	**2035**
Alameda				Minor				Minor
Alameda County				Minor		Minor	Minor	**Major**
Albany							Minor	Minor
Berkeley								
Dublin		**All***	Minor	**All***		**All***		**All***
Emeryville	**All**	**All**	**All**	**All**				
Fremont		**Major**	**Major**	**All**		**Major**	**Major**	**All**
Hayward		Minor		Minor		Minor		Minor
Livermore		**Major**	**All**	**All**		**Major**	**Major**	**Major**
Newark		**Major**	**All**	**All**		**Major**	**All**	**All**
Oakland				**All***				**All***
Piedmont			Minor	**Major**		**All**	**All**	**All**
Pleasanton		**Major***		**Major***		**All***		**All***
San Leandro								
Union City			Minor	Minor				

Notes:
All = Complete revision of initial land use allocations
Major = Revisions to more than half of TAZs in jurisdiction
Minor = Revisions to less than half of TAZs in jurisdiction
* = Revisions to MTC RTAZ totals only; splits to Alameda County Model TAZs were not adjusted

Revisions Following Local Review

If a jurisdiction reallocated land uses for some years but not all years, there could be major inconsistencies between the land uses shown in a specific TAZ for 2000 or 2005 and the future estimates shown for 2020 or 2035. Since the Alameda County Model is often used to estimate incremental growth of traffic on specific road segments, it is important to have consistent land use assumptions between the base years and forecast years, unless there is a specific and justifiable reason for a reduction in trips through planned land use changes.

Dowling Associates checked each TAZ for inconsistencies between years and made adjustments to land use quantities for years not addressed by jurisdiction comments. This was particularly necessary for Alameda (2020 housing), Alameda County (2020 employment), Dublin (2000), Fremont (2000), Hayward (2000, 2005 and 2020), Livermore (2000), Newark (2000), Oakland (2020) and Pleasanton (2000 and 2020). The adjustments for 2000 were necessary as 2000 is still the model validation year and is often used as the basis for model forecast adjustments.

Table 2-7. 2000 Land Use Allocation Summary

	ABAG/ MTC Controls		Allocations w/Comments		Percent Difference		Allocations Adjusted		Percent Difference	
Jurisdiction	**HH**	**Tot Emp**	**HH**	**Tot Emp**	**HH**	**Tot Emp**	**HH**	**Tot Emp**	**HH**	**Tot Emp**
Alameda	30,224	27,384	30,224	27,384	0.0%	0.0%	30,224	27,384	0.0%	0.0%
Alameda County	1,358	197	1,358	197	0.0%	0.0%	1,358	197	0.0%	0.0%
Albany	7,010	5,188	7,010	5,188	0.0%	0.0%	7,010	5,188	0.0%	0.0%
Ashland	7,247	3,342	7,247	3,342	0.0%	0.0%	7,247	3,342	0.0%	0.0%
Berkeley	44,953	78,341	44,953	78,341	0.0%	0.0%	44,953	78,341	0.0%	0.0%
Castro Valley	22,125	13,617	22,125	13,617	0.0%	0.0%	22,125	13,617	0.0%	0.0%
Cherryland	4,605	1,778	4,605	1,778	0.0%	0.0%	4,605	1,778	0.0%	0.0%
Dublin	9,441	17,899	9,601	20,499	1.7%	14.5%	***9,441***	***20,499***	0.0%	14.5%
Emeryville	3,975	19,861	**3,976**	19,861	0.0%	0.0%	3,976	19,861	0.0%	0.0%
Fremont	68,236	104,826	68,234	104,834	0.0%	0.0%	***68,235***	***104,834***	0.0%	0.0%
Hayward	47,119	77,986	47,119	77,987	0.0%	0.0%	47,119	***77,987***	0.0%	0.0%
Livermore	26,880	48,086	26,881	48,079	0.0%	0.0%	***26,881***	***48,079***	0.0%	0.0%
Newark	12,993	21,413	12,987	20,222	0.0%	-5.6%	***12,987***	***21,413***	0.0%	0.0%
Oakland	150,791	199,424	150,791	199,424	0.0%	0.0%	150,791	199,424	0.0%	0.0%
Piedmont	3,804	2,117	3,804	2,117	0.0%	0.0%	3,804	2,117	0.0%	0.0%
Pleasanton	24,175	60,475	24,175	60,475	0.0%	0.0%	24,175	***60,475***	0.0%	0.0%
San Leandro	31,116	44,371	31,116	44,371	0.0%	0.0%	31,116	44,371	0.0%	0.0%
San Lorenzo	9,032	4,687	9,032	4,457	0.0%	-4.9%	9,032	***4,687***	0.0%	0.0%
Union City	18,282	19,157	18,282	19,157	0.0%	0.0%	18,282	19,157	0.0%	0.0%
Total	**523,366**	**750,149**	**523,520**	**751,330**	**0.0%**	**0.2%**	**523,361**	**752,750**	**0.0%**	**0.3%**

3,976 Jurisdiction provided comments

9,441 Additional adjustments for consistency with other years and countywide totals

Note: Jurisdiction boundaries used for tabulation do not precisely correspond to actual city limits or sphere of influence boundaries

Table 2-8. 2005 Land Use Allocation Summary

	ABAG/ MTC Controls		Allocations w/Comments		Percent Difference		Allocations Adjusted		Percent Difference	
Jurisdiction	**HH**	**Tot Emp**	**HH**	**Tot Emp**	**HH**	**Tot Emp**	**HH**	**Tot Emp**	**HH**	**Tot Emp**
Alameda	30,984	27,400	30,984	27,400	0.0%	0.0%	30,984	27,400	0.0%	0.0%
Alameda County	1,367	188	1,367	188	0.0%	0.0%	1,367	188	0.0%	0.0%
Albany	7,131	4,841	7,131	4,841	0.0%	0.0%	7,131	4,841	0.0%	0.0%
Ashland	7,386	3,083	7,386	3,083	0.0%	0.0%	7,386	3,083	0.0%	0.0%
Berkeley	45,526	75,453	45,526	75,453	0.0%	0.0%	45,526	75,453	0.0%	0.0%
Castro Valley	22,777	12,533	22,777	12,533	0.0%	0.0%	22,777	12,533	0.0%	0.0%
Cherryland	4,684	1,687	4,684	1,687	0.0%	0.0%	4,684	1,687	0.0%	0.0%
Dublin	13,597	20,836	**12,852**	**24,871**	-5.5%	19.4%	12,853	***20,824***	-5.5%	-0.1%
Emeryville	4,830	19,670	**4,830**	19,670	0.0%	0.0%	4,830	19,670	0.0%	0.0%
Fremont	70,127	93,951	**71,561**	**100,258**	2.0%	6.7%	71,460	100,289	1.9%	6.7%
Hayward	48,879	73,249	48,879	73,249	0.0%	0.0%	***48,879***	***73,249***	0.0%	0.0%
Livermore	29,157	47,920	**29,086**	**47,932**	-0.2%	0.0%	29,077	47,932	-0.3%	0.0%
Newark	13,251	20,588	**13,251**	**19,561**	0.0%	-5.0%	13,251	19,561	0.0%	-5.0%
Oakland	154,573	202,522	154,573	202,522	0.0%	0.0%	154,563	202,523	0.0%	0.0%
Piedmont	3,810	2,090	3,810	**2,216**	0.0%	6.0%	3,810	2,216	0.0%	6.0%
Pleasanton	25,607	59,071	**25,842**	**59,534**	0.9%	0.8%	25,842	59,534	0.9%	0.8%
San Leandro	31,738	41,636	31,738	41,636	0.0%	0.0%	31,738	41,636	0.0%	0.0%
San Lorenzo	9,076	4,339	9,076	4,120	0.0%	-5.1%	9,076	***4,120***	0.0%	-5.1%
Union City	19,276	19,207	19,276	19,207	0.0%	0.0%	19,276	19,207	0.0%	0.0%
Total	**543,776**	**730,264**	**544,627**	**739,961**	**0.2%**	**1.3%**	**544,509**	**735,945**	**0.1%**	**0.8%**

3,976 Jurisdiction provided comments

9,441 Additional adjustments for consistency with other years and countywide totals

Note: Jurisdiction boundaries used for tabulation do not precisely correspond to actual city limits or sphere of influence boundaries

Table 2-9. 2020 Land Use Allocation Summary

	ABAG/ MTC Controls		Allocations w/Comments		Percent Difference		Allocations Adjusted		Percent Difference	
Jurisdiction	**HH**	**Tot Emp**	**HH**	**Tot Emp**	**HH**	**Tot Emp**	**HH**	**Tot Emp**	**HH**	**Tot Emp**
Alameda	33,417	32,849	33,417	32,849	0.0%	0.0%	***33,417***	32,849	0.0%	0.0%
Alameda County	1,367	204	1,367	204	0.0%	0.0%	1,367	204	0.0%	0.0%
Albany	7,520	5,441	7,520	**5,521**	0.0%	1.5%	7,520	5,521	0.0%	1.5%
Ashland	7,837	5,018	7,837	5,258	0.0%	4.8%	7,837	***5,258***	0.0%	4.8%
Berkeley	48,508	79,634	48,508	79,634	0.0%	0.0%	48,508	79,634	0.0%	0.0%
Castro Valley	26,049	13,451	26,049	13,387	0.0%	-0.5%	26,049	***13,387***	0.0%	-0.5%
Cherryland	4,951	1,882	4,951	1,882	0.0%	0.0%	4,951	1,882	0.0%	0.0%
Dublin	21,436	28,161	21,474	30,599	0.2%	8.7%	21,474	30,599	0.2%	8.7%
Emeryville	7,280	22,340	**7,281**	22,340	0.0%	0.0%	7,281	22,340	0.0%	0.0%
Fremont	76,797	101,053	**76,067**	**115,283**	-1.0%	14.1%	76,068	***106,966***	-0.9%	5.9%
Hayward	53,938	80,191	53,932	80,191	0.0%	0.0%	***53,932***	***80,191***	0.0%	0.0%
Livermore	34,865	56,657	**35,189**	**56,607**	0.9%	-0.1%	35,189	56,607	0.9%	-0.1%
Newark	14,490	22,813	**14,488**	**21,680**	0.0%	-5.0%	14,488	21,680	0.0%	-5.0%
Oakland	178,727	229,673	173,247	227,132	-3.1%	-1.1%	***173,775***	***227,132***	-2.8%	-1.1%
Piedmont	3,810	2,110	3,810	**2,011**	0.0%	-4.7%	3,810	2,011	0.0%	-4.7%
Pleasanton	28,677	68,786	28,820	77,779	0.5%	13.1%	***28,820***	***72,871***	0.5%	5.9%
San Leandro	33,441	45,550	33,441	45,550	0.0%	0.0%	33,441	45,550	0.0%	0.0%
San Lorenzo	9,265	4,573	9,265	4,303	0.0%	-5.9%	9,265	***4,303***	0.0%	-5.9%
Union City	23,096	24,677	**22,022**	24,677	-4.6%	0.0%	***22,126***	24,677	-4.2%	0.0%
Total	**615,471**	**825,063**	**608,685**	**846,887**	**-1.1%**	**2.6%**	**609,317**	**833,662**	**-1.0%**	**1.0%**

3,976 Jurisdiction provided comments

9,441 Additional adjustments for consistency with other years and countywide totals

Note: Jurisdiction boundaries used for tabulation do not precisely correspond to actual city limits or sphere of influence boundaries

Table 2-10. 2035 Land Use Allocation Summary

	ABAG/ MTC Controls		Allocations w/Comments		Percent Difference		Allocations Adjusted		Percent Difference	
Jurisdiction	**HH**	**Tot Emp**	**HH**	**Tot Emp**	**HH**	**Tot Emp**	**HH**	**Tot Emp**	**HH**	**Tot Emp**
Alameda	35,631	42,736	**35,631**	**43,213**	0.0%	1.1%	35,631	43,213	0.0%	1.1%
Alameda County	1,368	231	1,368	231	0.0%	0.0%	1,368	231	0.0%	0.0%
Albany	8,079	5,578	8,079	**5,658**	0.0%	1.4%	8,079	5,658	0.0%	1.4%
Ashland	8,276	8,833	8,276	**8,201**	0.0%	-7.2%	8,276	8,201	0.0%	-7.2%
Berkeley	52,044	86,216	52,044	86,216	0.0%	0.0%	52,044	86,216	0.0%	0.0%
Castro Valley	30,501	16,325	**30,401**	**15,723**	-0.3%	-3.7%	30,401	15,725	-0.3%	-3.7%
Cherryland	5,215	2,354	**5,139**	**2,394**	-1.5%	1.7%	5,139	2,394	-1.5%	1.7%
Dublin	28,911	44,652	**28,667**	**56,886**	-0.8%	27.4%	28,667	***47,681***	-0.8%	6.8%
Emeryville	9,749	28,010	**9,749**	28,010	0.0%	0.0%	9,749	28,010	0.0%	0.0%
Fremont	86,009	140,442	**86,623**	**141,508**	0.7%	0.8%	86,623	141,508	0.7%	0.8%
Hayward	61,281	99,712	**56,762**	**97,202**	-7.4%	-2.5%	***60,062***	97,202	-2.0%	-2.5%
Livermore	42,281	72,484	**42,323**	**72,353**	0.1%	-0.2%	42,323	72,353	0.1%	-0.2%
Newark	16,281	24,832	**16,281**	**24,822**	0.0%	0.0%	16,281	24,822	0.0%	0.0%
Oakland	211,992	281,875	**193,519**	**286,043**	-8.7%	1.5%	***207,009***	286,042	-2.4%	1.5%
Piedmont	3,820	2,140	**3,821**	**2,140**	0.0%	0.0%	3,821	2,140	0.0%	0.0%
Pleasanton	32,427	80,208	**32,264**	**101,192**	-0.5%	26.2%	32,264	***85,405***	-0.5%	6.5%
San Leandro	36,990	57,329	36,990	57,329	0.0%	0.0%	36,990	57,329	0.0%	0.0%
San Lorenzo	9,448	4,952	9,448	**5,178**	0.0%	4.6%	9,448	5,179	0.0%	4.6%
Union City	27,667	40,792	**24,135**	40,792	-12.8%	0.0%	***26,714***	40,792	-3.4%	0.0%
Total	**707,970**	**1,039,701**	**681,521**	**1,075,091**	**-3.7%**	**3.4%**	**700,890**	**1,050,101**	**-1.0%**	**1.0%**

3,976 Jurisdiction provided comments

9,441 Additional adjustments for consistency with other years and countywide totals

Note: Jurisdiction boundaries used for tabulation do not precisely correspond to actual city limits or sphere of influence boundaries

Comparison to Control Totals

After land uses were revised based on comments from the jurisdictions and adjusted for consistency between years, the total housing and employment were compared to the jurisdiction control totals from ABAG *Projections 2009* as well as the totals for Alameda County.

For the year 2000, the countywide totals were within one percent of ABAG totals for Alameda County. The adjusted employment totals for Dublin were 14.5 percent higher than the ABAG control totals, but this is primarily due to MTC's inclusion of the north Livermore employment area near Airway Boulevard in one of Dublin's RTAZs.

For the year 2005, the countywide housing totals were within one percent of ABAG totals, but the countywide employment totals were 1.3 percent higher. The revisions provided by Dublin resulted in citywide totals 19.4 percent higher than the ABAG allocation, again partially due to the inclusion of some Livermore employment within the Dublin totals. In order to maintain countywide totals within one percent of ABAG, the Dublin numbers were factored down to match the ABAG allocation.

For 2020, the countywide housing totals were 1.1 percent lower than the ABAG totals and the employment totals were 2.6 percent higher. In order to be within one percent of the ABAG totals for Alameda County, adjustments were made to both housing and employment. For housing, units were added to the two jurisdictions that were the lowest relative to ABAG, Oakland (about 500 units)

and Union City (about 100 units). For employment, assumed growth was factored down in Fremont and Pleasanton.

For 2035, the countywide housing totals were 3.7 percent lower than the ABAG totals and the employment totals were 3.4 percent higher. For housing, units were added to the three jurisdictions that were the lowest relative to ABAG, Oakland (about 13,500 units), Hayward (3,300 units) and Union City (about 2,600 units). For employment, assumed growth was factored down in Dublin and Pleasanton.

Final P09 Land Use Allocations

Based on the review comments from the local jurisdictions, and the needed follow-up adjustments by Dowling Associates as described above, the final allocations of households and employment were prepared.

Once the revised household and employment totals were established for each Alameda County Model TAZ, the appropriate disaggregations of household type, population, employed residents, households by income quartile, population by age category and other inputs to the MTC (and Alameda County Model) model process were estimated using the MTC RTAZ data from Projections 2009. If one MTC RTAZ contained six Alameda County Model TAZs, similar stratifications of housing and population were assumed for all six Alameda County Model TAZs.

2.2.4 Areas Outside Alameda County

Land use and socieoeconomic inputs for areas outside Alameda County were also updated as part of the Projections 2009 update.

Bay Area

The land use inputs for the eight Bay Area Counties outside Alameda County were derived directly from the ABAG P09 allocations to MTC RTAZs. Land uses in Alameda County Model TAZs subdivided from MTC RTAZs in west Contra Costa County, Milpitas, and San Ramon were allocated based on the prior allocations from P07 and P05. These allocations were not distributed to the local jurisdictions for review.

San Joaquin County

Household and employment inputs were obtained from the San Joaquin County travel model maintained by the San Joaquin County Council of Governments (SJCOG). The land use assumptions were current as of February, 2010. The SJCOG land use forecasts went up to the year 2030. The 2035 land uses were estimated by adding the growth increment from 2025 to 2030 to the 2030 land uses. The 2035 estimates were compared to population forecasts from the California Department of Finance to ensure that the extrapolation was consistent with anticipated growth rates. The land uses were aggregated from the San Joaquin model TAZs to the Alameda County Model TAZs.

The updated San Joaquin County land use forecasts are significantly different than those used in prior versions of the Alameda County Model (Table 2-11). In particular, the updated extrapolated forecast of 2035 housing is 29 percent lower, while the extrapolated forecast of 2035 employment is 13 percent lower. This results in less of a jobs-housing imbalance in San Joaquin County in the P09 model compared to prior versions, which significantly changes the travel forecasts across the Altamont Pass.

Table 2-11. San Joaquin County Land Use Summary

Land Use	2000	2005	2020	2035
HOUSING				
P07 Model	191,100	209,200	262,400	521,300*
P09 Model	189,700	223,800	269,800	369,400*
Change	-0.7%	+7.0%	+2.8%	-29.1%
EMPLOYMENT				
P07 Model	199,900	206,500	234,900	401,100*
P09 Model	202,300	225,600	258,500	349,800*
Change	+1.2%	+9.3%	+10.1%	-12.8%

*Extrapolated from 2030 projections from SJCOG

2.3 Transportation Networks

The Alameda County Transportation Demand Model requires input networks to define the road and transit systems for each year and analysis scenario. The road and transit networks are based directly on the networks from the MTC travel model.

2.3.1 Road Network

The travel model road network has been built with the general rule of roads that carry traffic through an area as opposed to just serving fronting properties. The network includes the following road types:

- Freeways
- Freeway ramps
- Metered ramps
- State routes
- Arterial streets
- Collector streets that carry traffic through neighborhoods to adjacent neighborhoods

Most local streets do not need to be included in the countywide model if they only serve local traffic.

Functional Classification

Functional classification is a hierarchy of street function that is used to designate speed, capacity, access control and other characteristics. The Alameda County Model uses the MTC Functional Classification, as shown in Table 2-12.

Capacity

The travel model uses an estimate of street capacity on each segment. The capacity is a one-hour capacity (vehicles per hour) and is generally derived from the functional classification and the area type (Table 2-12). However, there are other characteristics such as type of traffic control or presence of pedestrians that may be important for the model.

Number of Lanes

The numbers of lanes coded in the model represent the minimum number of through-lanes in each direction on the segment. Turn lanes are not included in the lane total, as the additional capacity provided by turn lanes is assumed in the higher functional classifications such as expressway or major arterial. If a segment has a different number of lanes in one direction than the other, then it should be coded that way.

The Alameda County Model uses coding for auxiliary lanes, which are not actively used in the MTC model. The total number of directional lanes including auxiliary lanes is coded on each segment. If the AUX field is coded, indicating that one of the lanes terminates at a ramp rather than continuing through to the next segment, the model assumes one-half the normal capacity for that auxiliary lane.

Speed

The model requires input uncongested speeds for each segment. The slowing down effects of congestion and interaction with other vehicles are accounted for within the traffic assignment process. Typical input speeds used in the model are shown in Table 2-12.

The speeds used in a travel model do not in general coincide with the posted speed limit or with radar speed surveys, and are not literally "free flow" speeds. The model speed should represent the average speed during off-peak hours and with congestion for vehicles to traverse the segment, including delays at signals or stop signs. The model speeds can be thought of as the "11:00 P.M." speed, when there are few conflicts with other vehicles, but signals are still operating normally at intersections.

The MTC model and prior versions of the Alameda County Model always used the speed values shown in Table 2-12. The P09 version of the Alameda County

Model allows for direct coding of segment speeds that can vary from the values in the table.

Ramp Metering

The MTC model defines network characteristics for metered ramps. However, the network attributes were never coded. The P07 version of the Alameda County Model implemented detailed ramp metering capacities and speed-flow relationships for all existing and proposed metered ramps in Alameda County. The list of ramps with existing and planned metering along with assumed metering rates were based on information provided by Caltrans and are listed in Appendix E.

Existing and Proposed Ramp Meters. Caltrans staff from the District 4 Division of Operations, Office of Traffic Systems, Ramp Metering Unit provided information on ramp meters on all state highways in Alameda County, including the dates when meters became or would become operational.

Ramp Metering Rates in the Travel Model. Metered ramps in Alameda County operate using sensors which detect the flow rate on the mainline freeway and adjust the metering rate accordingly. Caltrans adjusts the metering strategy at each individual location to balance freeway mainline operations with queues and operations affecting local streets. This process cannot be easily replicated in a travel demand model. Therefore, it was necessary to estimate average hourly rates for each metered on-ramp in Alameda County for the A.M. and P.M. peak periods.

Existing Metering Rates. Existing average ramp metering rates for travel modeling purposes were estimated based on several sources:

- Detailed ramp metering operations strategies provided by Caltrans staff
- Traffic counts at specific on-ramps with operational ramp meters
- Freeway speed data measured by loop detectors from the Performance Monitoring System (PeMS)

For the I-580 corridor in the Dublin/Pleasanton area, peak period traffic counts had been collected for every freeway ramp during the spring of 2008. These traffic counts could be used to estimate the average hourly throughput on metered on-ramps.

For the I-880 corridor, Caltrans provided detailed ramp meter operational strategies. The strategies generally specify one to four different metering rates depending on conditions on the adjacent mainline freeway as measured by loop detectors. The freeway speed data from PeMS were evaluated in detail to determine the approximate percent of time during the peak period that each speed category would be in effect, and therefore which metering rate would be

likely for the adjacent on-ramps. A weighted average of the various metering rates was applied for the analysis.

Future Metering Rates. Future traffic growth can cause conflicts between the need to increase or decrease ramp metering rates. Increases in congestion on the mainline freeway would tend to decrease the number of vehicles allowed through the on-ramp meters, if current operational strategies were left in place. However, increased traffic demand on on-ramps would tend to indicate a need to increase ramp metering rates to prevent long queues and blockages on local streets.

2.3.2 Transit Network

The transit network is represented as a series of transit lines that overlay the road network. Bus lines are coded as a series of points on the road system, with certain points designated as stops. Rail lines are coded on separate segments, with connections coded to the road network at rail stations to represent walk, drive and bus transfer access.

Additional information coded for each transit line includes peak and off-peak headways (service frequencies) and travel time relative to the road network.

Table 2-12. MTC Functional Classification

Speed/Capacity Table (With revised speeds)
San Francisco Bay Area Regional Highway Networks (MTC)

Area type	Facility type							Speed class*				
	Frwy to frwy (1)	Freeway (2)	Expwy (3)	Collector (4)	Fwy ramp (5)	Conctrs. (6)	Major arterial (7)	Metered ramp (8)	Special (9)		Special (10)	
Core (0)	1,700 40	1,850 55	1,300 25	550 10	1,300 25	N.A.	800 15	700 20	1,900 55	(A)	1,350 25	(G)
CBD (1)	1,700 40	1,850 55	12,300 25	600 10	1,300 25	N.A.	850 20	700 20	1,950 60	(B)	1,500 30	(H)
UBD (2)	1,750 45	1,900 60	1,450 30	650 15	1,400 30	N.A.	900 25	800 25	2,000 65	(C)	1,530 40	(I)
Urban (3)	1,750 45	1,900 60	1,450 30	650 20	1,400 30	N.A.	900 25	800 25	1,780 50	(D)	900 20	(J)
Suburb (4)	1,800 50	1,950 65	1,500 35	800 25	1,400 35	N.A.	950 30	900 30	1,800 45	(E)	950 25	(K)
Rural (5)	1,800 50	1,950 65	1,500 40	850 30	1,400 35	N.A.	950 35	900 30	1,840 50	(F)	980 35	(L)

Upper entry: Capacity at level of service E in vehicles per hour per lane; i.e., ultimate capacity.
Lower entry: Free-flow speed (mph)
N.A. = Not applicable.

Notes:
(A) TOS Fwy (AT = 0,1); (B) TOS Fwy (AT = 2,3); (C) TOS Fwy (AT = 4,5); (D) Golden Gate; (E) TOS Fwy (AT = 0,3);
(F) TOS Fwy (AT = 4,5); (G) Expwy TOS (AT = 0,1); (H) Expwy TOS (AT = 2,3); (I) Expwy TOS (AT = 4,5);
(J) Art Sig Coor. (AT = 0,1); (K) Art Sig Coor. (AT = 2,3); (L) Art Sig Coor. (AT = 4,5).

Speed values are used in MTC speed post-processing routine, now considered the "main processing" routine

Source: Table 11, Appendix B, Travel Forecasting Assumptions, 2001 Regional Transportation Plan

2.3.3 Future Year Transportation Networks

The Alameda County Model includes assumptions for road and transit transportation improvements for each forecast year. The improvement assumptions are based on a combination of known programmed improvements and review by participating jurisdictions. Specific major improvements are listed in Appendix A.

The Alameda County Model road and transit networks were originally built from the MTC model networks that were current at the time of the P05 model development. The 2015 road and transit networks were the MTC TIP network and the 2030 road and transit networks were the MTC RTP (Alternative 5) network. The road networks were reviewed by the jurisdictions and Caltrans.

Projections 2007 Network Update

For the Projections 2007 model update, the road network assumptions for each year were reviewed to ensure consistency with the Alameda County Transportation Improvement Plan (TIP) dated November 13, 2006 and the Alameda County Project Submittal to the MTC Transportation 2035 Regional Transportation Plan (RTP) dated March 5, 2008. The long range improvement year was extended from 2030 to 2035. Network coding was also updated to be consistent with the most current project descriptions for Express Lane projects on I-580 and I-680 as of August, 2008. The updated road networks were not reviewed by local agencies during the Projections 2007 update.

Projections 2009 Network Update

For the P09 update, the road networks were once again distributed to the local jurisdictions for review and comment. Many updates were made based on comments received from the jurisdictions. The P09 update also included revisions to regional road improvement projects based on information provided by Alameda CTC. As a result, the network improvements for 2005, 2020 and 2035 are based on the Countywide Transportation Plan and the Regional Transportation Plan as of 2008, supplemented by review and updates by many of the jurisdictions in 2010.

The major changes to the transit assumptions in the P09 update include the BART extension to San Jose and Santa Clara by 2035 (the P07 model assumed extension of BART only to Warm Springs) and the more current definitions of proposed AC Transit BRT service along International Boulevard and Telegraph Avenue.

The P09 network updates did not include a comprehensive review of the Alameda County TIP or the MTC RTP.

2.4 Travel Demand Models

The Alameda County Transportation Demand Model is based on the MTC BAYCAST trip-based model as used in the current Regional Transportation Plan (2009 RTP). This section documents differences between the Alameda County Model and the MTC model. For details on the MTC model, the reader is referred to the MTC model documentation on the MTC web site.[1]

2.4.1 Trip Generation

The Alameda County Model uses the same trip purposes and trip generation procedures as the MTC model. The trip purposes in the model are shown in Table 2-13.

Table 2-13. Trip Purposes

Trip purpose	Definition
Home-work (4 subtypes):	Commute trips between residences and places of employment, including both trips from home to work and from work to home. The MTC model stratifies these work trips into four income groups.
Income quartile 1	
Income quartile 2	
Income quartile 3	
Income quartile 4	
Home-shop/other	Trips between residences and places of retail employment or personal errands.
Home-social/recreation	trips between residences and social visits or recreational attractions.
Non-home-based	Trips where neither end is at home, such as trips between work and shopping.
Home-grade school	Trips between home and elementary school.
Home-high school	Trips between home and high school.
Home college	Trips between home and college/university.

San Joaquin County Trips

The MTC model treats trips from San Joaquin County as external trips. To represent more accurately the interrelation between Alameda County and San Joaquin County, San Joaquin County is included as an internal area in the Alameda County Model. The trip generation equations in the Alameda County Model for San Joaquin County trips are similar to those in the San Joaquin County travel model. Trip production and trip attraction rates used are summarized in Table 2-14.

[1] http://www.mtc.ca.gov/maps_and_data/datamart/forecast/baycast1.htm

Table 2-14. San Joaquin County Trip Generation Rates

	Number of households		Employment			Enrollment	
	Single family	Multi family	Retail	Service	Other	Full-time	Part-time
Trip productions							
Home-work	1.830	1.070	--	--	--	--	--
Home-shop/other	2.230	2.230	--	--	--	--	--
Home-social/recreational	1.010	1.010	--	--	--	--	--
Non-home-based	0.707	0.707	0.798	2.984	0.916	--	--
Home-grade school	1.005	0.571	--	--	--	--	--
Home-high school	0.211	0.120	--	--	--	--	--
Home-college	0.063	0.110	--	--	--	--	--
Trip attractions							
Home-work	--	--	1.270	1.270	1.270	--	--
Home-shop/other	--	--	1.850	1.850	1.850	--	--
Home-social/recreational	--	--	1.260	1.260	1.260	--	--
Non-home-based	0.803	0.803	0.636	3.194	0.730	--	--
Home-grade school	1.005	0.571	--	--	--	--	--
Home-high school	0.183	0.104	--	--	--	--	--
Home-college	--	--	--	--	--	1.470	0.969

Truck Trips

The Alameda County Model forecasts four types of truck trips:

- Very Small trucks
- Small Trucks
- Medium Trucks
- Large or "Combo" Trucks

The trip generation rates for Very Small trucks (for example, pickup trucks) are consistent with the MTC model. The Very Small trucks are modeled as passenger autos for the purposes of traffic assignment and capacity calculations. The trip generation rates for the other three types of trucks were updated based on the Alameda County CMA truck modeling study completed in early 2010. These updated truck rates were based on updated research and a series of detailed truck classification counts throughout Alameda County.

Cordon ("Gateway") Trips

The Alameda County Model includes two types of external trips at the cordons or "gateways" to the model area:

- Through trips – Also called external-external (X-X), through trips are trips that pass through the model area without stopping

- External-internal trips – These trips, denoted by X-I and I-X, have one trip end in the model area and the other trip end outside the model area.

Through Trips. It is assumed that very few trips pass from one gateway to another without interacting with a land use in Bay Area. Hence, through trips are assumed to be minimal. The one exception is trips on I-5 and SR-99 through San Joaquin County. The shares for through vehicle trips on these facilities were estimated from the Caltrans statewide model and applied to the 2000 traffic counts. The external-external trips (X-X) are added to the vehicle trip tables prior to traffic assignment.

External-Internal Trips. Base year external trips to and from Alameda County were estimated from 2000 traffic counts at the cordon points. The external-internal trips (I-X and X-I) at each of the gateways are split into the ten trip purposes and further divided into gateway productions (trips produced outside Alameda County and attracted to Alameda County) and attractions. CTPP data were used to determine the share of trips for the home- work trip purpose. The remainder is split amongst the other trip purposes based on information from the Caltrans statewide model at the respective locations. External-internal vehicle trips for each trip purpose are multiplied by the appropriate average auto occupancy rate to convert them to person trips. The initial estimates of productions and attractions at each gateway are added to the internally generated trips. These gateway trips are then distributed to the model zones along with the internal model area trips.

Future External Trips. Future total gateway volumes are factored from the 2000 base year gateway traffic counts based on growth rate forecasts from the Caltrans statewide model.

2.4.2 Trip Distribution

Trip distribution procedures in the Alameda County Model are consistent with the MTC model.

Zone-To-Zone Travel Times

The travel time between each pair of zones is calculated by determining the shortest time path along the coded road network between the two zones, and accumulating the travel time along that path. The path building process produces a table (skim matrix) of travel times between each pair of zones in the model. The resulting table of zone-to-zone travel times is then used as an input to the trip distribution analysis.

For this estimation, road travel times are used since the large majority of person-travel is on the road system. Estimated average travel speeds (average of peak and of-peak conditions) are used in the estimates of the trip distribution. The average travel speeds are based on facility type and area type and are somewhat slower than the uncongested speeds shown in Table 2-12.

Intrazonal Travel Times and Terminal Times

Procedures to compute intrazonal travel times (time for trips within a TAZ) and terminal times (out-of-auto times at each end of a vehicle trip) are consistent with the MTC regional model.

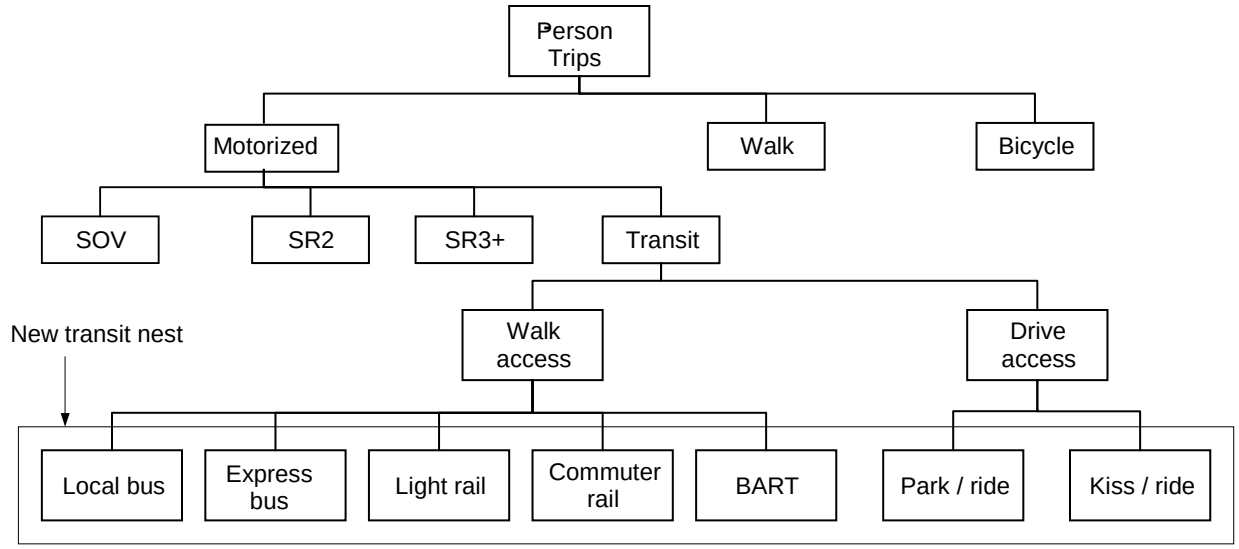
Distribution Adjustment Factors

A set of further adjustments to the MTC model adjustment factors (*k*-factors) were developed. This allows the Alameda County Model to better replicate the trip distribution from the MTC regional model.

2.4.3 Mode Choice

The Alameda County mode choice models are based on the MTC BAYCAST model but add additional detail, particularly for non-work trip purposes. The additional features in the Alameda County mode choice models were derived directly from the mode choice models developed by the Santa Clara Valley Transportation Authority (VTA) for the Santa Clara County travel model. The structure of the Alameda County nested logit mode choice model is shown in Figure 2-1.

Figure 2-1. Alameda County Model Mode Choice Model Structure



The MTC BAYCAST model includes a nested logit mode choice model for home-based work trips. Two nests were added for the Alameda County Model:

- The transit/walk access submode was subdivided into further submodes: local bus, express bus (which includes ferries), light rail, commuter rail, and BART.

- The transit/drive access submode was subdivided further into park/ride and kiss/ride submodes.

The MTC BAYCAST model uses simpler choice structures for mode choice for non-work trip purposes. The Alameda County Model uses the full nested logit mode choice structure with transit submodes for all trip purposes.

The mode choice models were calibrated only for trips with an origin or destination in Alameda County. The mode choice results are only used directly for trips with one or both ends in Alameda or San Joaquin counties. For trips with both ends in one of the other eight Bay Area counties, the mode choice results are factored from the year 2000 MTC model mode choice results.

The mode choice models were calibrated by adjusting the mode-specific constants so that outputs from the mode choice model matched transit mode shares from household travel survey data as well as transit ridership data from the operators.

2.4.4 Time of Day Factors

The regional peaking factors to convert daily vehicle trips into time-of-day proportions were developed using the 2000 Bay Area Travel Survey (BATS). The factors were extracted by trip purpose from the 2000 BATS Table 2.3.7B for all the Alameda County Model analysis time periods, including AM 1-hour, AM 2-hour, PM 1-hour, PM 2-hour and PM 4-hour.

Truck peaking factors were updated during the P09 update based on the Alameda County CMA truck model study completed in 2010.

Peaking factors by trip purpose, direction of travel, vehicle type (drive-alone, shared-ride) and time period are presented in Table 2-15.

Diurnal Factors

The average regional time-of-day factors are not accurate for all trip interchanges, particularly those with higher levels of congestion. An additional set of district-to-district "diurnal" factors are applied for each peak period based on traffic counts at county line crossings and other major screenlines. The factors were originally based on those used in the MTC model on a county-to-county basis, with additional detail within Alameda County to provide individual time-of-day adjustment factors for specific city areas.

Table 2-15. Regional Peaking (Time of Day) Factors

Direction	From Home		To Home	
Vehicle Type	**DA**	**SR**	**DA**	**SR**
Purpose	**Home-Based Work**			
Period				
AM 1HR	13.14%	24.72%	0.17%	0.06%
AM 2 HR	24.59%	38.56%	0.40%	0.36%
AM 4 HR	34.76%	47.41%	0.82%	0.52%
PM 1 HR	0.52%	0.34%	11.80%	11.65%
PM 2 HR	0.99%	0.78%	20.44%	19.32%
PM 4 HR	1.85%	1.96%	33.14%	27.76%
Purpose	**Home-Based Non-Work**			
Period				
AM 1HR	4.44%	6.89%	2.11%	0.89%
AM 2 HR	9.05%	11.04%	3.69%	1.41%
AM 4 HR	17.76%	16.93%	6.86%	2.89%
PM 1 HR	2.68%	3.91%	4.04%	4.08%
PM 2 HR	6.22%	8.31%	8.62%	8.83%
PM 4 HR	18.57%	19.13%	21.93%	20.17%
Purpose	**Home-Based School**			
Period				
AM 1HR	14.24%	35.31%	0.77%	0.03%
AM 2 HR	21.20%	47.93%	1.25%	0.12%
AM 4 HR	30.17%	52.36%	3.86%	0.42%
PM 1 HR	2.22%	0.53%	3.34%	5.43%
PM 2 HR	6.02%	1.05%	6.55%	11.31%
PM 4 HR	10.88%	2.94%	14.38%	23.64%
Purpose	**Non Home Based**			
Period				
AM 1HR	2.19%	2.46%	0.00%	0.00%
AM 2 HR	4.74%	4.41%	0.00%	0.00%
AM 4 HR	12.69%	9.11%	0.00%	0.00%
PM 1 HR	11.72%	9.15%	0.00%	0.00%
PM 2 HR	24.95%	19.51%	0.00%	0.00%
PM 4 HR	55.10%	42.00%	0.00%	0.00%
Purpose	**Trucks**			
Period	**Small**	**Medium**	**Large Commercial**	**Very Small**
AM 1HR	5.85%	7.03%	5.75%	5.85%
AM 2 HR	11.70%	14.05%	11.50%	11.70%
AM 4 HR	23.40%	28.10%	23.00%	23.40%
PM 1 HR	5.85%	7.03%	5.75%	5.85%
PM 2 HR	11.70%	14.05%	11.50%	11.70%
PM 4 HR	23.40%	28.10%	23.00%	23.40%

2.4.5 Trip Assignment

Vehicle and transit trips are assigned to the transportation networks. The road assignment considers the effects of traffic congestion and diverts vehicles to alternative routes to balance out congestion among available routes. The transit assignment assigns all transit passengers between a specific origin and destination to the best available transit path and does not divert passengers to other paths based on congestion.

Traffic Assignment

The Alameda County Model follows MTC traffic assignment procedures for estimating congested times and finding equilibrium travel times between all available routes. The Alameda County Model produces Daily, AM peak 1-hour, PM peak 1-hour, PM Peak 2-hour, and PM Peak 4-hour assignments of auto and truck traffic volumes. These trips are assigned in origin-destination format (OD). Vehicle types are assigned separately as a multi-class assignment with seven vehicle classes stored on each road segment:

1. Drive Alone
2. Shared Ride 2
3. Shared-ride 3+
4. Very Small Trucks
5. Small Trucks
6. Medium Trucks
7. Large Combo Trucks

The MTC BAYCAST model does not typically include a constrained daily traffic assignment, and instead produces an "all or nothing" single iteration unconstrained daily traffic_assignment with a production-attraction (P to A) vehicle trip table. The Alameda County Model assigns a daily origin-destination vehicle trip table using equilibrium assignment procedure to get an approximate constrained daily traffic assignment. A capacity factor of 16 is used (daily capacity = 16 * hourly capacity) to estimate average daily capacities on links.

Metered Ramp Delays

The traffic assignment portion of the travel demand model uses a speed-flow curve to estimate the congested speed and time that would result from a certain demand-to-capacity ratio. The standard speed-flow relationships defined for freeways, highways, and local streets do not properly represent metered ramps.

Several speed-flow relationships were investigated to determine an appropriate curve for the Alameda County Model. The curve which was selected was the curve used in the SACMET model maintained by the Sacramento Council of Governments (SACOG). The SACMET curve was based on detailed analysis of observed volumes and delays at metered on-ramps in Santa Clara County. The coefficients from the SACMET model were adjusted slightly to provide better results with the Alameda County Model capacity values:

Delay = -0.03 + SQRT(324*(1-1.06*V/C)^2) + 1.06) – 17.9*(1-1.06*V/C)

A maximum delay of 15 minutes is assumed.

The equation produces the following values (Table 2-16):

Table 2-16. Metered Ramp Delays

Demand/Capacity Ratio	Ramp Meter Delay in Seconds	Ramp Meter Delay in Minutes
0.10	6	0.1
0.50	5	0.1
0.70	7	0.1
0.90	28	0.5
0.95	68	1.1
1.00	152	2.5
1.05	256	4.3
1.10	366	6.1
1.15	478	8.0
1.20	591	9.8
1.50	900	15.0
2.00	900	15.0

Transit Assignment

Transit trips are assigned in production-attraction (P-A) format in order to keep track of the home end of trips where vehicle access to and from transit is possible as opposed to the non-home end where vehicle access is not typically possible.

The transit trips are split into peak period (approximately three hours during the A.M. and three hours during the P.M.) and off-peak period trips. The peak period trips are assumed to be 60 percent of home-work trips and 40 percent of non-work trips.

The transit trips for each period are then assigned to each of the seven transit submodes (park-ride, kiss-ride, walk to BART, walk to rail, walk to LRT, walk to express bus, walk to local bus) according to the results of the mode choice models. Peak period trips are assigned to (A.M.) peak period transit services. Off-peak period trips are assigned to midday transit services. This results in 14 total transit assignments. The final results are obtained by adding together the results of the 14 individual transit assignments.

2.5 Greenhouse Gas Estimates

The Projections 2009 update of the Alameda County model has added a procedure to calculate greenhouse gas emissions (GHG) for Alameda County. The GHG estimates use standard procedures established by the California Air Resources Board (ARB). The GHG calculations are based on vehicle miles of travel (VMT) and travel speeds within Alameda County, and therefore will respond to changes in travel demand due to land use development or changes in traffic operations due to network improvements.

2.5.1 EMFAC Software

The emissions calculations for the Alameda County travel model use the Emfac software developed for the ARB. Emfac2007 version 2.30 is the latest emission inventory model that calculates emission inventories for motor vehicles operating on roads in California. This model reflects the ARB's current understanding of how vehicles travel and how much they pollute. The Emfac2007 model can be used to show how California motor vehicle emissions have changed over time and are projected to change in the future.

The model calculates emission factors and emission inventories for the following primary pollutants:

- Hydrocarbons (HC). HC can be expressed as TOG (total organic gases), ROG (reactive organic gases), THC (total hydrocarbon), or CH4 (methane). Carbon monoxide (CO).
- Nitrogen oxides (NOx).
- Carbon dioxide (CO2).
- Particulate matter (PM). PM estimates are provided for total suspended particulate, particulate matter 10 microns or less in diameter (PM10), and particulate matter 2.5 microns or less in diameter (PM2.5).
- Fuel consumption. Although, this is not a pollutant, fuel consumption is calculated based on the emissions of CO, CO2 and THC using the carbon balance equation.
- Oxides of sulfur (SOx).
- Lead (Pb). Lead emissions are a function of the lead content in fuel.

The Emfac model uses output from the travel model to establish VMT in different speed categories. There are different emission rates associated with each speed category. Many other inputs come from default values established by ARB. These include splits of vehicle types (autos, trucks), vehicle fleet characteristics for each year (such as fuel mileage), fuel composition (use of

diesel, lead content), weather characteristics, VMT distribution through the 24 hours of the day, and many other parameters that affect emissions.

Many of the Emfac assumptions are specific to different regions of California or specific counties. The input assumptions to be used for Alameda County were verified with ARB as well as MTC who is responsible for emissions estimates for the Bay Area.

2.5.2 Alameda County GHG Processor

The Emfac software was not designed to integrate seamlessly with travel models, and generally requires significant pre- and post-processing. An automated GHG processor was developed for the Alameda County model to ensure consistency of application and provide GHG totals that are not provided in the standard Emfac output.

The GHG processor performs the following functions:

- Reads the formatted output from the travel model that contains VMT by speed category
- Reformats the VMT data and adds it to inputs required for Bay Area and Alameda County emissions calculations
- Creates an Emfac input file in the required format
- Starts and runs the Emfac program
- Reads the standard detailed output file from Emfac and extracts the specific emissions results required for quantification of greenhouse gases
- Creates a formatted report summarizing GHG results

An example output from the Alameda County GHG processor is shown in Figure 2-2. The report includes total emissions as well as per capita emissions values for comparison to other regions.

2.5.3 GHG Calculation

Greenhouse gas emissions are typically reported in terms of "carbon dioxide equivalent" (CO2e) values. The calculation of CO2e is based on weighted values of the component pollutants in proportion to their contribution to GHG. The Emfac software does not report CO2e, but it provides the required input to the calculation. The Alameda County GHG processor calculates CO2e as:

Methane (CH4) * 21 + Nitrous Oxide (NOX) * 310 + Carbon Dioxide (CO2)

The weight factors are consistent with the values recommended by the United States Environmental Protection Agency (EPA) ("Emission Facts: Metrics for

Expressing Greenhouse Gas Emissions: Carbon Equivalents and Carbon Dioxide Equivalents," http://www.epa.gov/OMS/climate/420f05002.htm).

Figure 2-2: Example GHG Report

Title	Alameda County 2035
Area	Alameda County
Year	2035
Vehs/day	1,678,280
VMT/day	55,219,000
Trips/day	11,137,000
Population	1,966,300
Total GHG pollutants	
CH4 (tons/day) (wt=21)	0.69
NOx (tons/day) (wt=310)	15.76
CO2 (tons/day) (wt=1)	31,910
Total GHG CO2eq (tons/day)	36,810.09 (37.44 lbs/capita)
Run GHG pollutants	
CH4 (tons/day) (wt=21)	0.62
NOx (tons/day) (wt=310)	11.79
CO2 (tons/day) (wt=1)	30,890
Run GHG CO2eq (tons/day)	34,557.92 (35.15 lbs/capita)
Idle GHG pollutants	
CH4 (tons/day) (wt=21)	0.01
NOx (tons/day) (wt=310)	2.34
CO2 (tons/day) (wt=1)	130
Idle GHG CO2eq (tons/day)	855.61 (.87 lbs/capita)
Start GHG pollutants	
CH4 (tons/day) (wt=21)	0.06
NOx (tons/day) (wt=310)	1.63
CO2 (tons/day) (wt=1)	880
Start GHG CO2eq (tons/day)	1,386.56 (1.41 lbs/capita)
Fuel Consumption	
Gasoline (gals/day)	2,697,230
Diesel (gals/day)	510,490

GHG Calculator 5/13/2011 Page 1
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3 Model Validation

This chapter presents the traffic count information, validation criteria and validation results for the updated Alameda Countywide Transportation Model. The results of the 2000 model validation are presented, including estimated 2000 traffic and transit volumes from the model and a summary of the model's performance relative to the validation criteria. The year 2000 is still used for model validation as it is the most recent year with a complete database of traffic counts by time period for all designated Alameda County validation locations.

3.1 Definitions of Calibration and Validation

Model calibration refers to estimating and adjusting the model parameters for each model step (auto ownership, trip generation, trip distribution, mode choice) based on household survey data and other sources. During calibration, adjustments are made to parameters such as auto ownership, trip generation rates and distribution factors to more closely match observed and MTC results.

The Alameda County Model primarily uses input parameters from the MTC model that MTC calibrated from 2000 Census survey and household survey data. Therefore, little additional calibration was required. The exception was the mode choice model which uses a more detailed structure than the MTC model and requires additional parameters for the transit submodes.

Model validation refers to comparing the model outputs (traffic or transit volumes) to observed conditions (traffic or transit ridership counts). During validation, adjustments are primarily made to model inputs, such as the road network and base year land uses, rather than calibrated parameters such as trip generation rates or distribution factors. Once validated, the model can be used to predict future travel patterns with a high degree of confidence.

The validation results are presented in the remaining sections of this chapter.

3.2 Validation Data

Validation data included traffic counts and transit ridership counts.

3.2.1 Traffic Data

Traffic data for the year 2000 validation were obtained from a variety of sources, including traffic counts provided by the Alameda County Congestion Management Agency (ACCMA) from its efforts with the jurisdictions for a countywide 24-hour traffic counts collection in 2000, the Caltrans traffic count databases, traffic counts provided by Alameda County, and additional counts

provided by most jurisdictions in Alameda County. Where necessary, the raw traffic counts were processed to derive average mid-week (Tuesday to Thursday) volumes. Finally, the counts were organized by screenlines.

3.2.2 Screenlines

Screenlines are imaginary lines, often along natural or man-made physical barriers (e.g., rivers, railroad tracks) that have a limited number of crossings. The screenlines should "cut" the entire study area, intercepting all travel across them, thereby eliminating issues about individual route choice. Use of a system of screenlines allows systematic comparison of total model estimated versus observed travel in different parts of the model area. However, they do not ensure that traffic is being assigned to the correct routes across each screenline.

The study area includes 15 screenlines and a cordon line which incorporates the entire perimeter of Alameda County (see Figure 3-1 through Figure 3-5). These screenlines were previously developed by the CMA in coordination with the jurisdictions.

3.2.3 Traffic Count Database

The traffic counts were reviewed to ensure that they were reasonable, and to identify the best count to use in locations where multiple counts were provided. There are approximately 300 unique traffic count locations in the database.

The link counts for Daily, A.M. 1-hour, P.M. 1-hour, P.M. 2-hour and P.M. 4-hour peak periods and hours were included in separate spreadsheets delivered to the Model Task Force in electronic format. These spreadsheets are not reproduced here due to their length.

Several attempts were made by ACCMA and local agencies to obtain traffic counts for year 2000 for all roads crossing each screenline. However, ultimately, there were approximately 25 screenline traffic count locations where satisfactory counts could not be found for the desired Year 2000 calibration year. Those locations are listed in Table 3-1.

In five of the missing freeway locations, the traffic counts could be estimated using published daily traffic volumes from Caltrans combined with peak period and direction rates from a nearby location on the same freeway. However, no estimation process is available for local streets.

3.2.4 Transit Validation Data

Average weekday transit ridership counts for the year 2000 were obtained from AC Transit for individual bus lines and from BART for individual stations within Alameda County. Total weekday ridership information was also obtained for Union City Transit and LAVTA services.

Figure 3-1. Alameda County Cordon Line

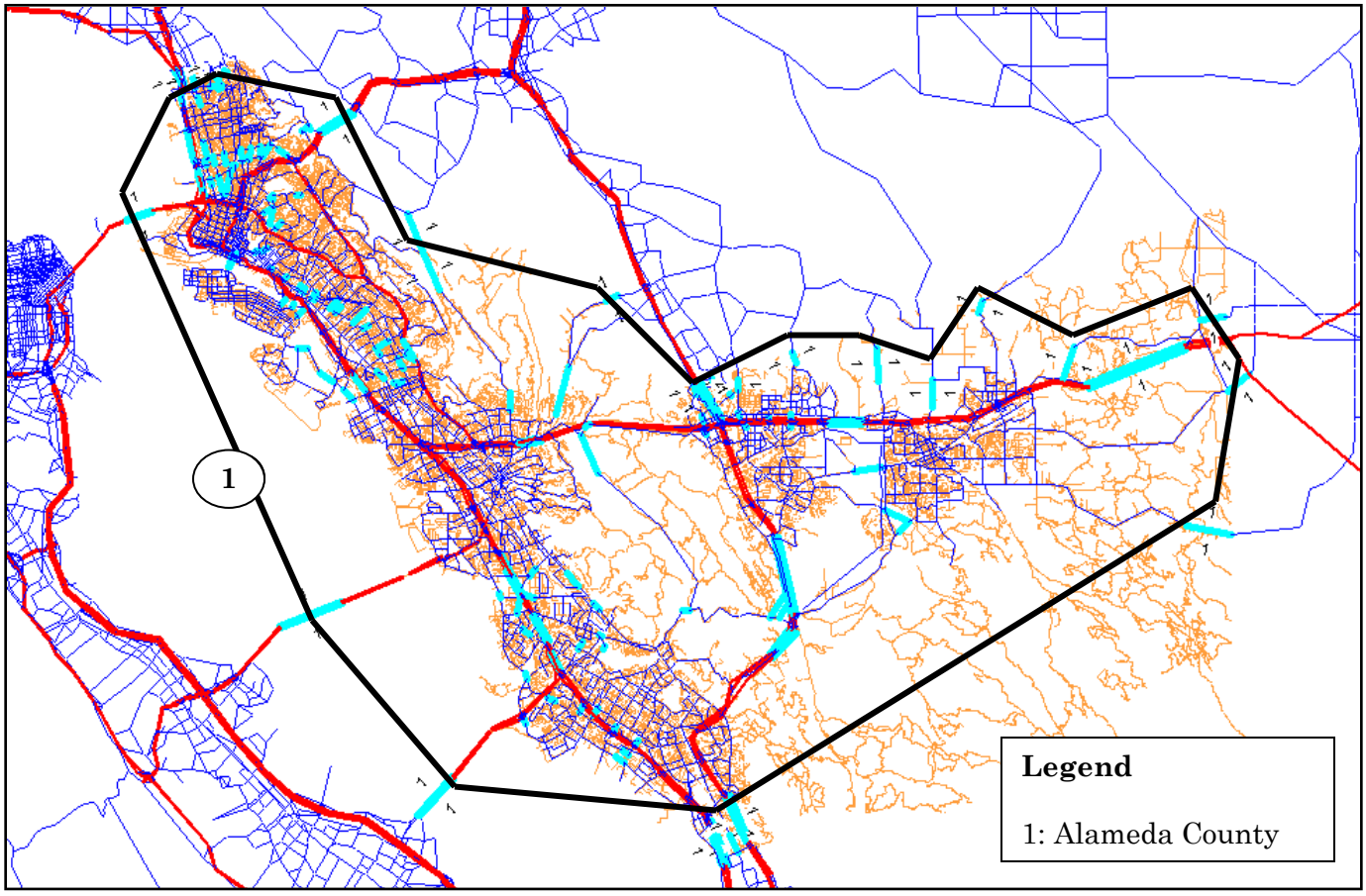


Figure 3-2. Screenlines for Planning Area 1 - Albany, Berkeley, Emeryville, Oakland, Piedmont and San Leandro

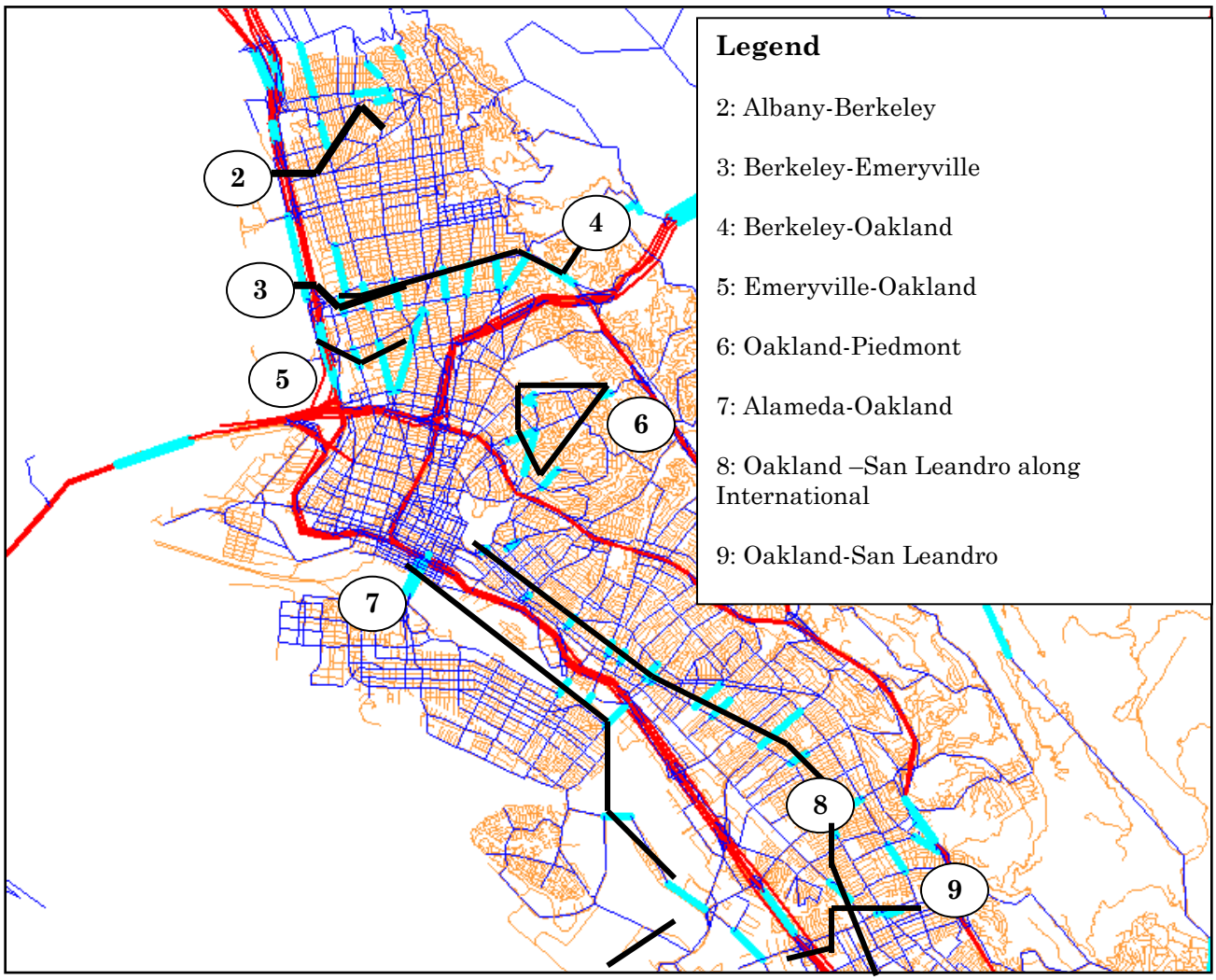


Figure 3-3. Screenlines for Planning Area 2- Hayward, Union City and Castro Valley

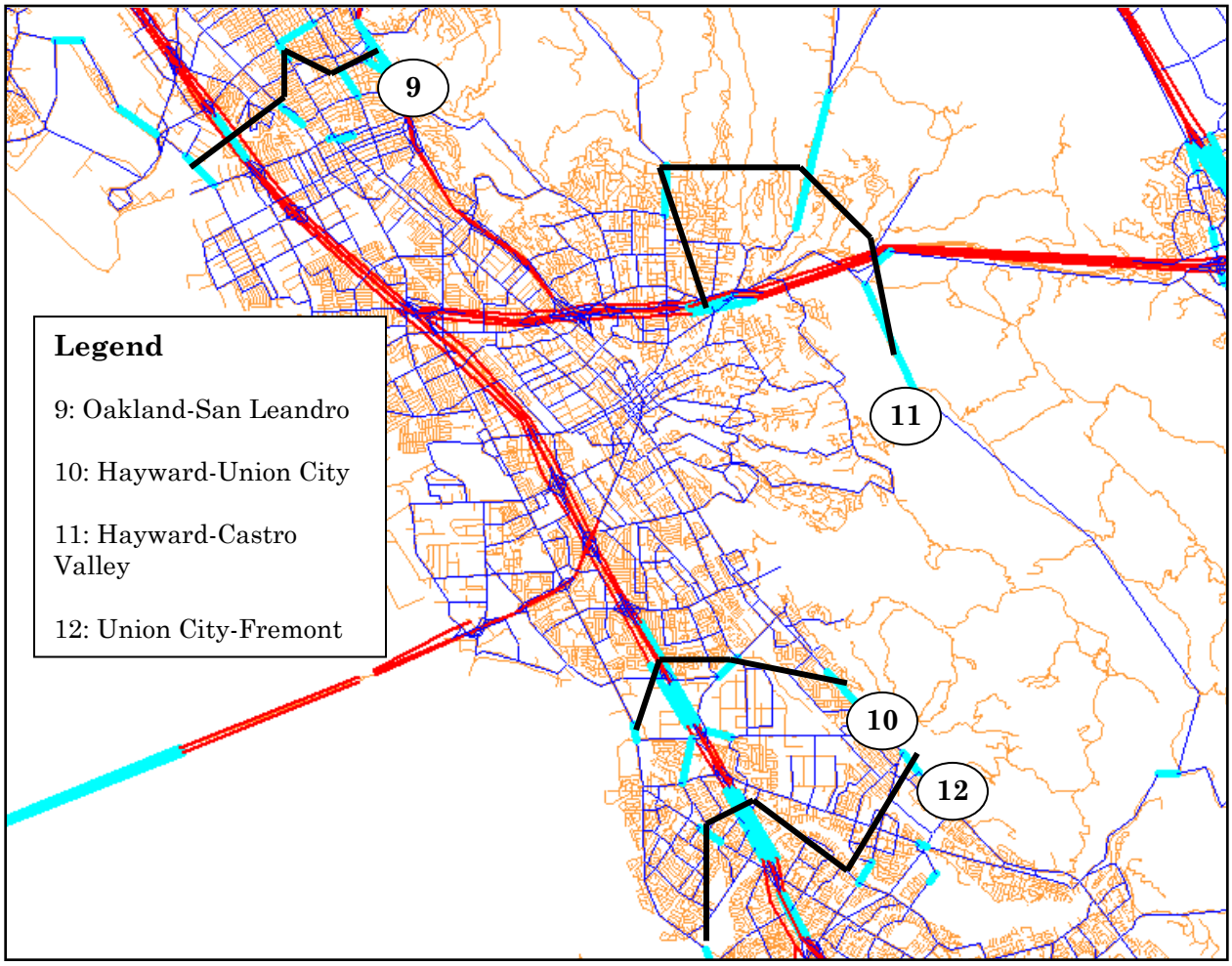


Figure 3-4. Screenlines for Planning Area 3 &4 - Fremont, Newark and County

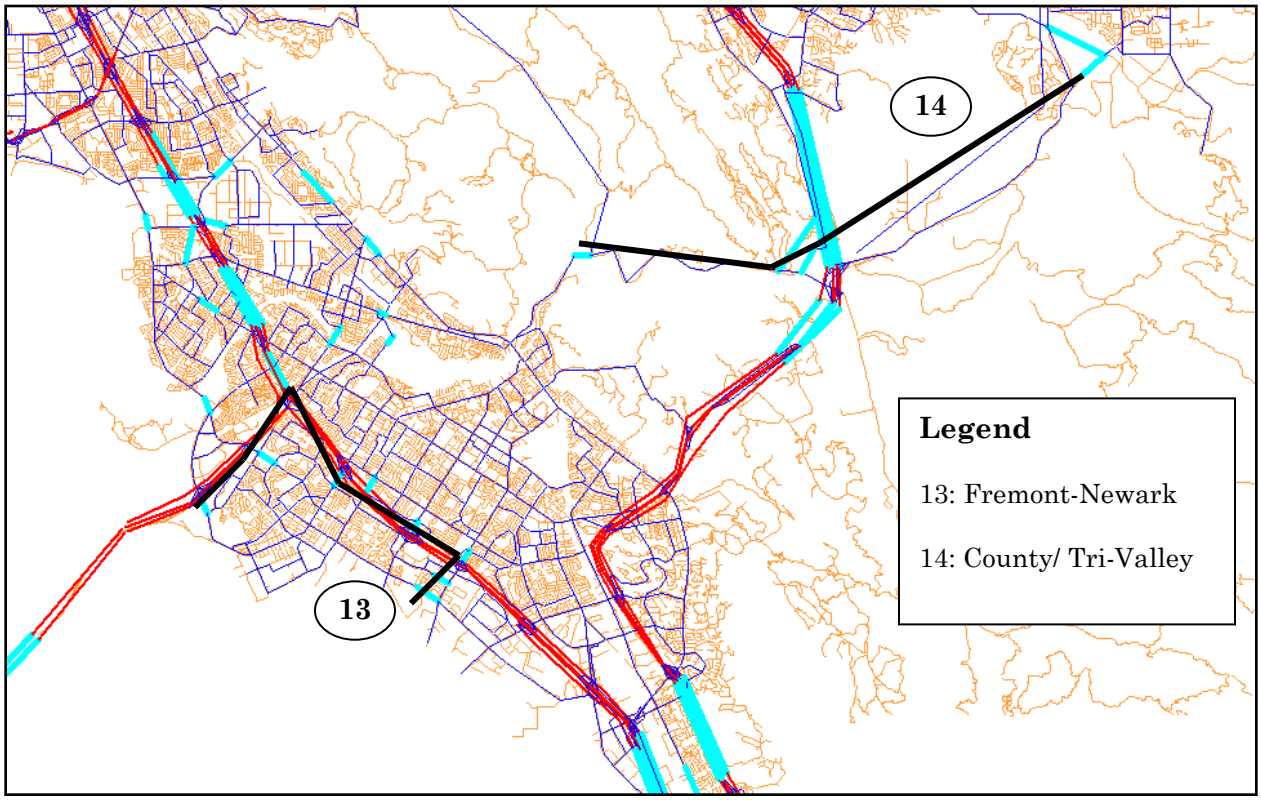


Figure 3-5. Screenlines for Planning Area 4 - Dublin, Pleasanton and Livermore

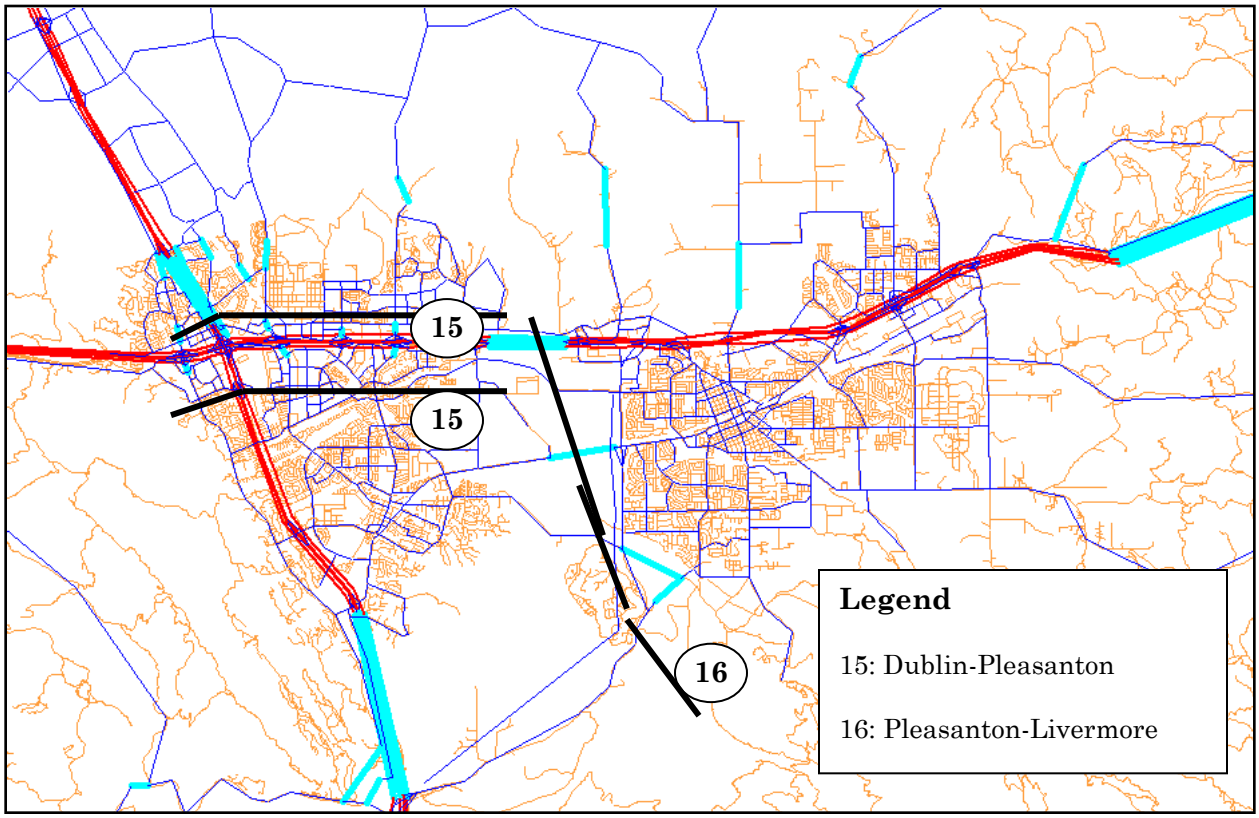


Table 3-1. Missing Traffic Count Locations

Main Street	Cross Street	Jurisdiction	Comments
County Screenlines			
Canyon Road	At County Line	Berkeley	
Arlington Avenue	At County Line	Berkeley	
Colusa Avenue	At County Line	Berkeley	
Albany - Berkeley Screenline			
I-80	Between Gilman and Buchanan	Caltrans	Nearest count at University Ave
Berkeley - Emeryville Screenline			
I-80	At Powell (CS #'s 133 and 549)	Caltrans	Nearest count at University Ave
Hollis St.	Near Ashby/City Limit	Emeryville	Only PM Peak Hour counts
Berkeley - Oakland Screenline			
Sacramento Street	Near City Limits	Oakland	
Emeryville - Oakland Screenline			
I-80	At Powell (CS #'s 133 and 549)	Caltrans	Nearest count at University Ave
Shellmound Street	Near 40th/City Limit	Emeryville	
Hollis St.	Near Ashby/City Limit	Emeryville	Only PM Peak Hour counts
Oakland - San Leandro Screenline			
I-580	Between 98th and Estudillo	Caltrans	Nearest count at Edwards Ave
Hayward - Union City Screenline			
Union City Blvd.	Near City Limits	Union City	
Hayward - Castro Valley Screenline			
I-580 WB	At Crow Canyon	Caltrans	At Crow Canyon
Union City - Fremont Screenline			
Decoto Road	South of Alvarado Niles	Union City	
Alvarado-Niles Rd.	Near City Limits	Union City	
Fremont - Newark Screenline			
Thornton Ave.	South of SR 84	Newark	
Newark Blvd.	South of SR 85	Newark	
Thornton Ave.	Near I-880/City Limits (CS# 135 Newark Jct. 880)	Caltrans	
Cedar Blvd.	Near City Limits	Fremont	
Cherry Street	Near City Limits	Newark	
I-880 SB	Near SR 84	Caltrans	

3.3 Traffic Validation

This section provides the criteria for the traffic validation to 2000 traffic counts and the validation results.

3.3.1 Traffic Validation Criteria

The criteria for acceptance of the Alameda Countywide Transportation Model traffic validation were split into primary and secondary criteria, as follows:

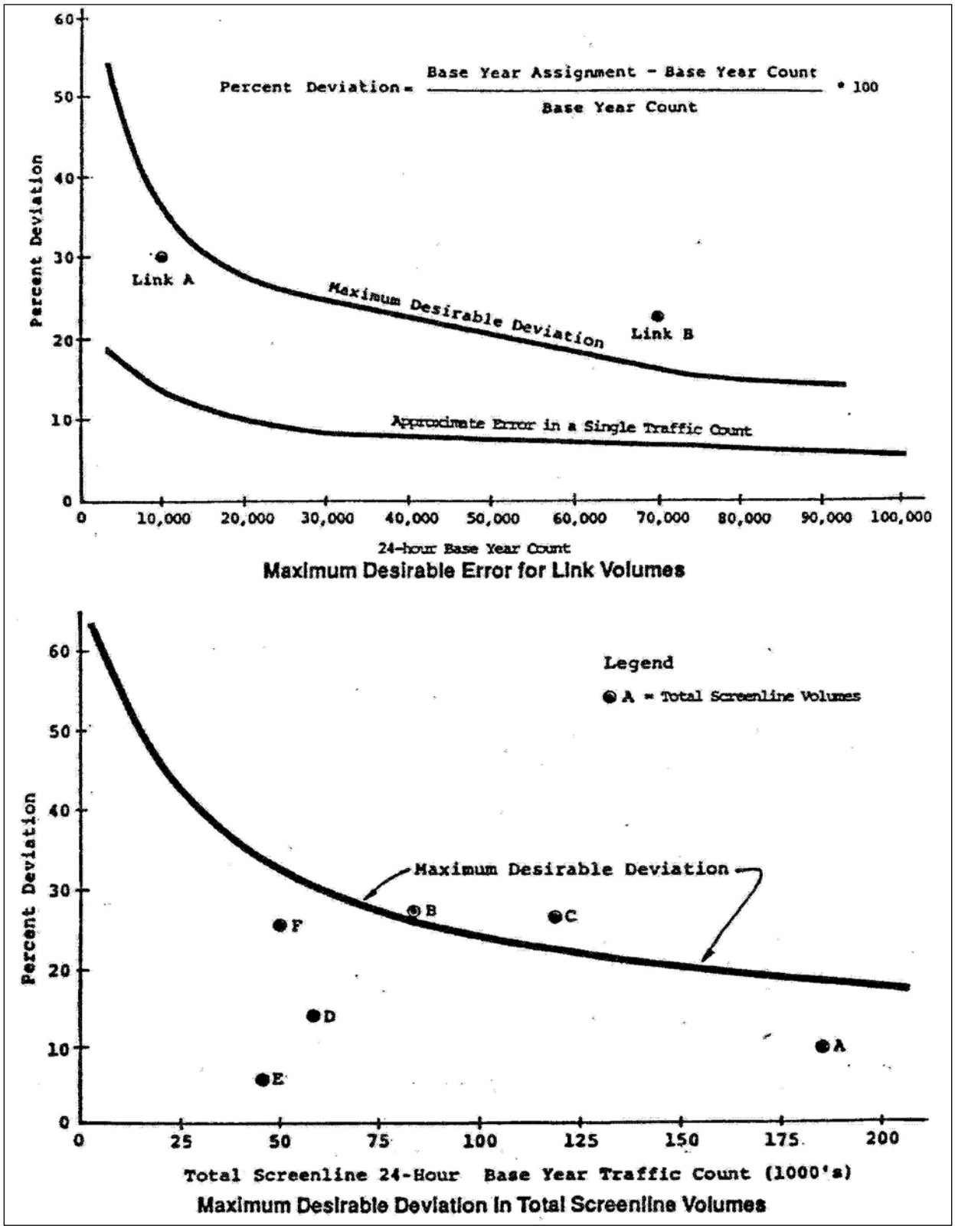
Primary Criteria

- Comparison to observed traffic counts across screenlines by percent volume deviation.

Secondary Criteria

- Comparison to Vehicle Miles of Travel (VMT) from the Caltrans Highway Performance Monitoring System (HPMS)
- Total volume and percent root mean square error (RMSE) by facility type and volume group
- The percentage of links falling within the FHWA validation curve. The FHWA suggested link-specific validation criteria is that 75 percent of freeway and principal arterials and all screenlines fall below the validation curve shown in Figure 3-6.
- Use the Federal Highway Administration and Caltrans recommended error limits for total error by functional classification (type of road) as a regionwide validation :
    - Freeways — less than 7 percent error
    - Principal Arterials — less than 10 percent error
    - Minor Arterials — less than 15 percent error
    - Collectors — less than 25 percent error
    - Frontage Roads — less than 25 percent error

Figure 3-6. Maximum Desirable Error for Links and Screenlines



3.3.2 Traffic Validation Results

This section presents the highway volume validation results for the model. First the screenline results are presented, then various supplementary statistics are presented for assessing the quality of the results. Detailed screenline tables are provided in Appendix B.

3.3.3 Screenline Validation

A comparison of year 2000 model volumes to year 2000 traffic counts across screenlines for the daily, A.M. peak 1-hour, P.M. peak 1-hour, P.M. peak 2-hour and P.M. peak 4-hour periods is presented in Table 3-2 through Table 3-6. The tables also list recommended screenline validation criteria based on the FHWA curve shown in Figure 3-6.

Daily Screenline Validation

The daily validation with the P09 update meets the FHWA criteria on 15 of the 16 screenlines. The model is within 10 percent of traffic counts on 9 screenlines, and within 15 percent of traffic counts on 12 of the 16 screenlines. The daily model volumes are 2 percent higher than traffic counts on the cordon to and from Alameda County, and 1 percent lower than daily traffic counts on all screenlines combined.

AM Peak Hour Screenline Validation

For the updated A.M. peak hour traffic validation, the model meets the FHWA criteria on all of the 16 screenlines (note that criteria are specifically intended for daily volume comparisons). The model is within 10 percent of traffic counts on 13 out of 16 screenlines, and within 15 percent of traffic counts on all 16 screenlines. The model volumes are 3 percent higher than traffic counts on the cordon to and from Alameda County, and are within 3 percent compared to traffic counts on all screenlines combined.

PM Peak Hour Screenline Validation

For the updated P.M. peak hour traffic validation, the model meets the FHWA criteria on all of the 16 screenlines (note that criteria are specifically intended for daily volume comparisons). The model is within 10 percent of traffic counts on 12 out of 16 screenlines, and within 15 percent of traffic counts on 14 screenlines. The model volumes are 2 percent higher compared to traffic counts on all screenlines combined.

Table 3-2. 2000 Daily Screenline Volumes

Screenline	Description	Criteria	No. of Links	Observed Counts	Model Volumes	Difference (Model - Count)	%RMSE	Percent Difference	Meets Criteria
1	County Screenline	+/- 20%	57	1,707,871	1,747,471	39,600	24%	2%	YES
2	Albany - Berkeley Screenline	+/- 20%	8	323,433	323,579	146	13%	0%	YES
3	Berkeley - Emeryville Screenline	+/- 20%	6	272,468	275,238	2,770	11%	1%	YES
4	Berkeley - Oakland Screenline	+/- 25%	20	175,491	153,893	(21,598)	37%	-12%	YES
5	Emeryville - Oakland Screenline	+/- 20%	2	307,565	299,352	(8,213)	2%	-3%	YES
6	Oakland - Piedmont Screenline	+/- 30%	14	83,838	66,887	(16,951)	35%	-20%	YES
7	Alameda - Oakland Screenline	+/- 20%	12	217,388	214,363	(3,025)	13%	-1%	YES
8	Oakland - San Leandro: E-W along Int/E14th St	+/- 20%	30	220,060	164,780	(55,280)	43%	-25%	NO
9	Oakland - San Leandro Screenline	+/- 20%	16	452,326	514,041	61,715	46%	14%	YES
10	Hayward - Union City Screenline	+/- 20%	10	330,957	354,503	23,546	27%	7%	YES
11	Hayward - Castro Valley Screenline	+/- 20%	10	218,659	230,048	11,389	20%	5%	YES
12	Union City - Fremont Screenline	+/- 20%	14	345,110	363,926	18,816	129%	5%	YES
13	Fremont - Newark Screenline	+/- 20%	16	378,105	317,079	(61,026)	33%	-16%	YES
14	Fremont - Tri-Valley Screenline	+/- 25%	10	170,886	194,642	23,756	47%	14%	YES
15	Dublin - Pleasanton Screenline	+/- 20%	19	396,751	334,285	(62,465)	23%	-16%	YES
16	Pleasanton - Livermore Screenline	+/- 20%	8	251,588	261,067	9,479	19%	4%	YES
	Total		**252**	**5,852,497**	**5,815,156**	**(37,341)**	**41%**	**-1%**	

Note: Correct name for Screenline 14, Fremont – Tri-Valley is "County/Tri-Valley"

Criteria met based on Percent Difference comparison.

Target for overall %RMSE is 40%.

Table 3-3. 2000 AM Peak 1 Hour Screenline Volumes

Screenline	Description	Criteria	No. of Links	Observed Counts	Model Volumes	Difference (Model - Count)	%RMSE	Percent Difference	Meets Criteria
1	County Screenline	+/- 25%	57	112,882	116,001	3,119	36%	3%	YES
2	Albany - Berkeley Screenline	+/- 55%	8	19,943	21,630	1,687	21%	8%	YES
3	Berkeley - Emeryville Screenline	+/- 55%	6	17,137	18,730	1,593	53%	9%	YES
4	Berkeley - Oakland Screenline	+/- 55%	20	13,399	13,568	169	60%	1%	YES
5	Emeryville - Oakland Screenline	+/- 55%	2	19,533	20,910	1,377	3%	7%	YES
6	Oakland - Piedmont Screenline	+/- 60%	14	6,405	6,214	(191)	47%	-3%	YES
7	Alameda - Oakland Screenline	+/- 55%	12	16,682	17,211	529	27%	3%	YES
8	Oakland - San Leandro: E-W along Int/E14th St	+/- 55%	30	14,596	13,439	(1,157)	41%	-8%	YES
9	Oakland - San Leandro Screenline	+/- 45%	15	30,815	35,248	4,433	33%	14%	YES
10	Hayward - Union City Screenline	+/- 55%	8	18,839	21,033	2,194	45%	12%	YES
11	Hayward - Castro Valley Screenline	+/- 55%	10	17,513	15,812	(1,701)	61%	-10%	YES
12	Union City - Fremont Screenline	+/- 55%	10	19,563	20,861	1,298	134%	7%	YES
13	Fremont - Newark Screenline	+/- 55%	8	17,448	18,711	1,263	40%	7%	YES
14	Fremont - Tri-Valley Screenline	+/- 55%	9	13,885	14,737	852	41%	6%	YES
15	Dublin - Pleasanton Screenline	+/- 45%	19	30,685	25,964	(4,722)	26%	-15%	YES
16	Pleasanton - Livermore Screenline	+/- 55%	8	17,566	18,582	1,016	15%	6%	YES
	Total		**236**	**386,891**	**398,650**	**11,759**	**48%**	**3%**	

Note: Correct name for Screenline 14, Fremont – Tri-Valley is "County/Tri-Valley"

Criteria met based on Percent Difference comparison.

Target for overall %RMSE is 40%.

Table 3-4. 2000 PM Peak 1 Hour Screenline Volumes

Screenline	Description	Criteria	No. of Links	Observed Counts	Model Volumes	Difference (Model - Count)	%RMSE	Percent Difference	Meets Criteria
1	County Screenline	+/- 25%	57	123,467	121,755	(1,712)	28%	-1%	YES
2	Albany - Berkeley Screenline	+/- 50%	8	21,788	24,043	2,255	28%	10%	YES
3	Berkeley - Emeryville Screenline	+/- 55%	6	15,933	19,299	3,366	45%	21%	YES
4	Berkeley - Oakland Screenline	+/- 55%	20	15,329	14,898	(432)	45%	-3%	YES
5	Emeryville - Oakland Screenline	+/- 55%	2	19,606	21,698	2,092	3%	11%	YES
6	Oakland - Piedmont Screenline	+/- 60%	14	8,084	8,132	48	29%	1%	YES
7	Alameda - Oakland Screenline	+/- 55%	12	18,835	18,818	(17)	22%	0%	YES
8	Oakland - San Leandro: E-W along Int/E14th St	+/- 55%	30	18,680	17,133	(1,547)	45%	-8%	YES
9	Oakland - San Leandro Screenline	+/- 40%	16	35,299	39,083	3,784	30%	11%	YES
10	Hayward - Union City Screenline	+/- 55%	8	19,614	22,855	3,241	42%	17%	YES
11	Hayward - Castro Valley Screenline	+/- 55%	10	17,847	17,275	(572)	35%	-3%	YES
12	Union City - Fremont Screenline	+/- 50%	10	21,661	23,275	1,614	120%	7%	YES
13	Fremont - Newark Screenline	+/- 50%	8	20,317	19,346	(971)	27%	-5%	YES
14	Fremont - Tri-Valley Screenline	+/- 55%	8	12,884	13,486	602	20%	5%	YES
15	Dublin - Pleasanton Screenline	+/- 40%	19	36,416	32,935	(3,481)	22%	-10%	YES
16	Pleasanton - Livermore Screenline	+/- 50%	8	20,115	19,907	(208)	15%	-1%	YES
	Total		**236**	**425,875**	**433,938**	**8,062**	**40%**	**2%**	

Note: Correct name for Screenline 14, Fremont – Tri-Valley is "County/Tri-Valley"

Criteria met based on Percent Difference comparison.

Target for overall %RMSE is 40%.

Table 3-5. 2000 PM Peak 2 Hour Screenline Volumes

Screenline	Description	Criteria	No. of Links	Observed Counts	Model Volumes	Difference (Model - Count)	%RMSE	Percent Difference	Meets Criteria
1	County Screenline	+/- 20%	55	236,756	226,154	(10,602)	27%	-4%	YES
2	Albany - Berkeley Screenline	+/- 35%	8	42,646	46,993	4,347	28%	10%	YES
3	Berkeley - Emeryville Screenline	+/- 45%	6	32,021	37,580	5,559	36%	17%	YES
4	Berkeley - Oakland Screenline	+/- 45%	20	29,029	28,419	(611)	46%	-2%	YES
5	Emeryville - Oakland Screenline	+/- 40%	2	39,128	41,998	2,870	2%	7%	YES
6	Oakland - Piedmont Screenline	+/- 55%	14	14,370	16,073	1,703	36%	12%	YES
7	Alameda - Oakland Screenline	+/- 45%	12	33,955	37,890	3,935	23%	12%	YES
8	Oakland - San Leandro: E-W along Int/E14th St	+/- 45%	30	34,231	34,642	412	49%	1%	YES
9	Oakland - San Leandro Screenline	+/- 30%	16	67,725	75,829	8,104	32%	12%	YES
10	Hayward - Union City Screenline	+/- 40%	8	39,060	44,713	5,653	38%	14%	YES
11	Hayward - Castro Valley Screenline	+/- 45%	8	28,965	27,989	(976)	26%	-3%	YES
12	Union City - Fremont Screenline	+/- 35%	10	42,331	44,363	2,032	122%	5%	YES
13	Fremont - Newark Screenline	+/- 40%	8	38,890	38,395	(495)	25%	-1%	YES
14	Fremont - Tri-Valley Screenline	+/- 50%	6	23,725	23,497	(228)	17%	-1%	YES
15	Dublin - Pleasanton Screenline	+/- 30%	19	68,071	64,525	(3,547)	22%	-5%	YES
16	Pleasanton - Livermore Screenline	+/- 40%	8	38,745	38,258	(487)	18%	-1%	YES
	Total		**230**	**809,648**	**827,319**	**17,671**	**40%**	**2%**	

Note: Correct name for Screenline 14, Fremont – Tri-Valley is "County/Tri-Valley"

Criteria met based on Percent Difference comparison.

Target for overall %RMSE is 40%.

Table 3-6. 2000 PM Peak 4 Hour Screenline Volumes

Screenline	Description	Criteria	No. of Links	Observed Counts	Model Volumes	Difference (Model - Count)	%RMSE	Percent Difference	Meets Criteria
1	County Screenline	+/- 20%	55	478,780	462,361	(16,419)	22%	-3%	YES
2	Albany - Berkeley Screenline	+/- 30%	8	83,108	89,366	6,258	26%	8%	YES
3	Berkeley - Emeryville Screenline	+/- 30%	6	63,700	71,506	7,806	25%	12%	YES
4	Berkeley - Oakland Screenline	+/- 35%	20	53,912	54,828	916	41%	2%	YES
5	Emeryville - Oakland Screenline	+/- 30%	2	75,332	81,303	5,970	4%	8%	YES
6	Oakland - Piedmont Screenline	+/- 45%	14	27,831	26,802	(1,029)	31%	-4%	YES
7	Alameda - Oakland Screenline	+/- 30%	12	62,842	69,132	6,290	21%	10%	YES
8	Oakland - San Leandro: E-W along Int/E14th St	+/- 30%	30	65,224	60,520	(4,704)	46%	-7%	YES
9	Oakland - San Leandro Screenline	+/- 25%	16	126,941	153,235	26,295	42%	21%	YES
10	Hayward - Union City Screenline	+/- 30%	8	79,291	85,365	6,074	22%	8%	YES
11	Hayward - Castro Valley Screenline	+/- 35%	8	54,132	55,735	1,603	27%	3%	YES
12	Union City - Fremont Screenline	+/- 30%	10	81,308	87,092	5,784	122%	7%	YES
13	Fremont - Newark Screenline	+/- 30%	8	76,117	72,929	(3,188)	23%	-4%	YES
14	Fremont - Tri-Valley Screenline	+/- 35%	6	46,649	50,778	4,129	23%	9%	YES
15	Dublin - Pleasanton Screenline	+/- 25%	19	122,332	120,135	(2,198)	24%	-2%	YES
16	Pleasanton - Livermore Screenline	+/- 30%	8	71,336	73,590	2,254	15%	3%	YES
	Total		**230**	**1,568,835**	**1,614,678**	**45,843**	**38%**	**3%**	

Note: Correct name for Screenline 14, Fremont – Tri-Valley is "County/Tri-Valley"

Criteria met based on Percent Difference comparison.

Target for overall %RMSE is 40%.

PM Peak 2-Hour Screenline Validation

The updated P.M. peak 2-hour traffic validation meets the FHWA criteria on all of the 16 screenlines (note that criteria are specifically intended for daily volume comparisons). The model is within 10 percent of traffic counts on 11 out of 16 screenlines, and within 15 percent of traffic counts on 15 of 16 screenlines. The model volumes are 2 percent higher compared to traffic counts on all screenlines combined.

PM Peak 4-Hour Screenline Validation

The updated P.M. peak 4-hour traffic validation meets the FHWA criteria on all of the 16 screenlines (note that criteria are specifically intended for daily volume comparisons). The model is within 10 percent of traffic counts on 14 out of 16 screenlines, and within 15 percent of traffic counts on 15 screenlines. The model volumes are 3 percent higher compared to traffic counts on all screenlines combined.

3.3.4 Vehicle Miles of Travel Validation

Vehicle Miles of Travel (VMT) is calculated as the number of vehicles on a road segment multiplied by the length of the segment, summed over all road segments in a certain geographic area. The Caltrans Highway Performance Monitoring System (HPMS) estimates daily vehicle miles of travel for each county in California based on a sample of traffic counts on various road types. A comparison of model-estimated VMT with VMT from the HPMS can indicate if the model is generating the correct magnitude of travel, even if there are inaccuracies in the specific road segment traffic volumes.

Vehicle miles of travel are calculated from the Alameda Countywide travel demand model by multiplying link volumes by link distances. The Alameda County model VMT estimates are compared with the HPMS estimates (Table 3-7). The FHWA model validation criterion is that the VMT calculated from the model should be within 5 percent of the HPMS estimate. The VMT from the final validation is 5.8 percent lower than the VMT from HPMS. This indicates that the model is generating a somewhat low amount of total traffic within Alameda County even if regional county-to-county movements are being correctly estimated.

Table 3-7. Daily Validation Comparison by VMT

	Links	2000 HPMS	2000 Model	Percent	FHWA Standard	Meets Criteria
All Links	18,812	37,197,500	35,038,554	-5.8%	+/-5%	NO

3.3.5 Total Volumes and Root Mean Square Error

The traffic counts and the model volumes are compared by facility type (see Table 3-9 through Table 3-13) and by the volume range in which they are classified (see Table 3-14). The comparison is made in terms of total model volume compared to total traffic counts, and the root mean square error (RMSE) is also used as a validation criterion.

Root Mean Square Error

The root mean square error (RMSE) is a statistical estimator that is intended to represent the average percent error between an estimated value (such as a model volume) and an observed value (such as a traffic count). The RMSE is calculated as:

$$RMSE = \sqrt{\frac{\sum_{i=1}^{n}(C_i - V_i)^2}{n-1}},$$

Where:
n is the total number of links
C_i is the observed count for road i
V_i is the model volume for road i
i represents a road link

The RMSE provides a measure of accuracy based on the statistical standard deviation. The RMSE puts a greater emphasis on larger errors that may cancel each other out in the comparison of total model volumes and traffic counts. The overall target RMSE is 40 percent.

Validation by Facility Type

The Federal Highway Administration[1] and Caltrans[2] recommend error limits for total error by functional classification or type of road (Table 3-8). For the Alameda County Model, the "Principal Arterial" criterion is applied to expressways, while the "Minor Arterial" criterion is applied to all local arterial streets.

Table 3-9 through Table 3-13 present the Alameda County Model validation relative to 2000 traffic counts by facility type.

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[1] Federal Highway Administration, *Calibration and Adjustment of System Planning Models*, 1990

[2] California Department of Transportation, *Travel Forecasting Guidelines*, 1992

Table 3-8: Facility Type Validation Criteria

Facility Type	Criterion
Freeways	less than 7 percent error
Principal Arterials	less than 10 percent error
Minor Arterials	less than 15 percent error
Collectors	less than 25 percent error
Frontage Roads	less than 25 percent error

Source: California Department of Transportation, *Travel Forecasting Guidelines*, 1992

Table 3-9. Daily Validation by Facility Type

Facility Type	CapClass	Criteria	Observed Counts	Model Volumes	No. of Links	Difference	%RMSE	Percent Difference	Meets Criteria
Freeways	2	+/- 7%	3,844,474	4,125,047	44	280,573	24%	7.3%	NO
Principal Arterials	3	+/- 10%	268,242	246,473	22	(21,769)	33%	-8.1%	YES
Arterials	7	+/- 15%	1,580,145	1,342,598	138	(237,547)	42%	-15.0%	YES
Collectors	4	+/- 25%	158,173	90,811	48	(67,362)	88%	-42.6%	NO
All			**5,851,034**	**5,804,930**	**252**	**(46,104)**	**41%**	**-0.8%**	

Note: Criteria met based on Percent Difference comparison.
Target for overall %RMSE is 40%.

Table 3-10. AM Peak 1 Hour Validation by Facility Type

Facility Type	CapClass	Criteria	Observed Counts	Model Volumes	No. of Links	Difference	%RMSE	Percent Difference	Meets Criteria
Freeways	2	+/- 7%	245,318	273,539	44	28,221	30%	11.5%	NO
Principal Arterials	3	+/- 10%	22,345	20,573	22	(1,772)	28%	-7.9%	YES
Arterials	7	+/- 15%	104,407	95,202	123	(9,205)	48%	-8.8%	YES
Collectors	4	+/- 25%	14,345	8,686	47	(5,659)	93%	-39.5%	NO
All			**386,415**	**398,001**	**236**	**11,586**	**48%**	**3.0%**	

Note: Criteria met based on Percent Difference comparison.
Target for overall %RMSE is 40%.

Table 3-11. PM Peak 1 Hour Validation by Facility Type

Facility Type	CapClass	Criteria	Observed Counts	Model Volumes	No. of Links	Difference	%RMSE	Percent Difference	Meets Criteria
Freeways	2	+/- 7%	260,479	284,305	44	23,826	26%	9.1%	NO
Principal Arterials	3	+/- 10%	24,543	22,463	22	(2,080)	26%	-8.5%	YES
Arterials	7	+/- 15%	125,849	116,910	123	(8,939)	39%	-7.1%	YES
Collectors	4	+/- 25%	14,925	10,001	47	(4,924)	81%	-33.0%	NO
All			**425,796**	**433,679**	**236**	**7,883**	**40%**	**1.9%**	

Note: Criteria met based on Percent Difference comparison.
Target for overall %RMSE is 40%.

Table 3-12. PM Peak 2 Hour Validation by Facility Type

Facility Type	CapClass	Criteria	Observed Counts	Model Volumes	No. of Links	Difference	%RMSE	Percent Difference	Meets Criteria
Freeways	2	+/- 7%	515,576	548,205	44	32,629	25%	6.3%	YES
Principal Arterials	3	+/- 10%	40,062	39,015	20	(1,047)	24%	-2.6%	YES
Arterials	7	+/- 15%	227,345	221,687	120	(5,658)	41%	-2.5%	YES
Collectors	4	+/- 25%	26,523	17,799	46	(8,724)	83%	-32.9%	NO
All			**809,506**	**826,706**	**230**	**17,200**	**40%**	**2.1%**	

Note: Criteria met based on Percent Difference comparison.
Target for overall %RMSE is 40%.

Table 3-13. PM Peak 4 Hour Validation by Facility Type

Facility Type	CapClass	Criteria	Observed Counts	Model Volumes	No. of Links	Difference	%RMSE	Percent Difference	Meets Criteria
Freeways	2	+/- 7%	1,025,825	1,082,095	44	56,270	23%	5.5%	YES
Principal Arterials	3	+/- 10%	73,092	74,031	20	939	29%	1.3%	YES
Arterials	7	+/- 15%	419,754	422,548	120	2,794	39%	0.7%	YES
Collectors	4	+/- 25%	49,947	34,335	46	(15,612)	80%	-31.3%	NO
All			**1,568,618**	**1,613,009**	**230**	**44,391**	**38%**	**2.8%**	

Note: Criteria met based on Percent Difference comparison.
Target for overall %RMSE is 40%.

The daily 2000 traffic validation of the Alameda County Model meets the criteria for principal arterials and arterials (as shown in Table 3-9) and is slightly high on freeways (7.3 percent high compared to criterion of +/- 7.0 percent). The validation results are low compared to counts on collector streets (-42.6%) and do not meet the criterion for that facility type. This indicates that the model is most reliable for daily traffic estimates on principal arterial and arterial streets, while it will tend to be slightly high on daily estimates of freeway traffic volumes and low on collector street traffic estimates.

Additional improvement to the validation on collector streets would require smaller TAZs, as well as possible deviations from the MTC-consistent trip generation and/or distribution so that the model generates more short-distance trips within Alameda County. For local traffic studies involving collector streets, it is recommended that the model be locally updated and validated, potentially including splits of the current TAZs to allow more precise loading onto individual collector streets.

The 2000 traffic validation for the four peak periods meets the criteria for principal arterials and arterials for all periods. The freeway validation meets the criterion for the PM 2-hour and PM 4-hour periods. The freeway validation for the AM 1-hour and PM 1-hour periods is higher than the 7 percent criterion, and the collector validation is low for all four periods.

Travel models are based on travel demand rather than actual constrained throughput. Therefore, it is likely that the estimated peak hour demand will

exceed the observed traffic count on some congested freeway corridors. The additional demand represents the vehicles that can be observed in queues waiting to get through congested segments during the peak hour.

The validation meets the overall RMSE criterion (40% or less overall) for the PM 1-hour, PM 2-hour and PM 4-hour periods, although the daily validation is within one percent of the RMSE criterion. The AM 1-hour assignment does not meet the RMSE criterion, although it does meet the RMSE criteria for freeways and principal arterials.

Validation by Volume Range

The FHWA and Caltrans travel forecasting guidelines include a figure showing the maximum desirable deviation between daily model volumes and traffic counts for individual link volumes and for screenlines (Figure 3-6, page 44). The maximum desirable deviations in total screenline volume from the FHWA figure are recommended for the validation by volume range and are included as criteria in Table 3-14. The model validation meets the FHWA criteria for all ten of the volume ranges.

Table 3-14. Daily Validation by Volume Range

Volume Range From	Volume Range To	Criteria	Observed Counts	Model Volumes	No. of Links	Difference	%RMSE	Percent Difference	Meets Criteria
1	5,000	+/- 60%	142,349	98,901	54	(43,448)	67%	-30.5%	YES
5,000	10,000	+/- 55%	404,484	316,127	55	(88,357)	55%	-21.8%	YES
10,000	20,000	+/- 45%	1,266,427	1,120,513	92	(145,914)	33%	-11.5%	YES
20,000	30,000	+/- 40%	92,694	93,801	4	1,107	63%	1.2%	YES
30,000	40,000	+/- 37%	128,100	99,122	4	(28,978)	29%	-22.6%	YES
40,000	50,000	+/- 34%	171,047	206,504	4	35,457	27%	20.7%	YES
50,000	75,000	+/- 28%	576,439	712,298	9	135,859	31%	23.6%	YES
75,000	100,000	+/- 27%	1,304,661	1,289,559	15	(15,102)	9%	-1.2%	YES
100,000	125,000	+/- 25%	716,951	663,791	7	(53,160)	8%	-7.4%	YES
125,000	150,000	+/- 23%	1,047,882	1,058,463	8	10,581	7%	1.0%	YES
Sum			**5,851,034**	**5,968,441**	**252**	**117,407**	**26%**	**2.0%**	

Note: Criteria met based on Percent Difference comparison.
Target for overall %RMSE is 40%.

3.4 Transit Validation

Transit validation is based on a comparison of the model assigned transit trips with observed transit boardings. Observed transit trips are rarely available by time period and so all comparisons are presented based on daily ridership.

3.4.1 Ridership by Operator

Table 3-15 compares the daily ridership by transit operator within Alameda County and for the rest of the Bay Area.

Table 3-15. Comparison of 2000 Daily Ridership by Transit Operator

	MTC 2000 Observed Ridership	Alameda Co Model 2000 P09	Percent Difference
ALAMEDA COUNTY SERVICES			
BART	326,009	300,572	-8%
AC Transit Local	186,983	190,155	2%
AC Transit Transbay	13,917	10,754	-23%
LAVTA/Wheels	6,003	3,869	-36%
East Bay Ferries	2,546	902	-65%
Union City	1,920	2,293	19%
ACE Rail	1,743	1,784	2%
Amtrak (Capitol, etc…)	1,015	1,217	20%
AirBART	750	1,819	143%
Subtotal Alameda Co.	**540,886**	**513,365**	**-5%**
OTHER TRANSIT SERVICES			
MUNI	754,293	614,532	-19%
SCVTA	183,842	226,024	23%
SamTrans	62,557	75,816	21%
Golden Gate Transit	39,562	36,154	-9%
CalTrain	31,291	47,279	51%
CCCTA	16,602	20,559	24%
Fairfield/Suisun	3,165	3,506	11%
Vallejo Bus + Ferry	10,160	6,978	-31%
Sonoma County Providers	10,772	31,435	192%
Tri-Delta Transit	7,580	15,978	111%
Napa County Vine	2,427	2,682	11%
WestCAT	3,526	8,242	134%
Other	19,502	12,596	-35%
Subtotal Other	**1,145,279**	**1,101,781**	**-4%**
TOTAL	**1,686,165**	**1,615,146**	**-4%**

Source: Metropolitan Transportation Commission, "2000 Base Year Validation of Travel Demand Models for the San Francisco Bay Area (BAYCAST-90) Technical Summary," May 2004, Table 6.2

The Alameda County Model generates 2000 transit ridership totals that are within 5 percent of 2000 ridership counts for services within Alameda County, services outside Alameda County and for the total model area.

Within Alameda County, the Alameda County Model is 8 percent lower than counts for BART systemwide ridership, 2 percent higher than counts for AC Transit local bus service and 23 percent lower than counts for AC Transit Transbay Service. The model is within 0.5 percent of total AC Transit ridership. The Alameda County Model is very close to ridership counts on ACE Rail. The model underpredicts East Bay Ferry and LAVTA bus ridership and overpredicts ridership on the Union City bus system.

Outside Alameda County, the Alameda County Model tends to underpredict MUNI transit use in the denser urbanized are of San Francisco, but tends to overpredict transit use in less dense suburban areas such as Contra Costa, Solano or Sonoma counties. The Alameda County Model is not coded to the same level of detail in these areas as it is in Alameda County, and therefore the estimates of transit use are based on very average measures of transit accessibility and demographics. However, the Alameda County Model estimates the correct total amount of transit ridership outside of Alameda County.

3.4.2 Rail Station Boardings

Table 3-16 compares model estimates of total station entries and exits with 2000 passenger counts at specific BART rail stations within Alameda County. Specific year 2000 station counts were available for BART only, and were not available for Amtrak or ACE.

The model is most accurate on BART station activity in downtown Oakland. In other areas, the model tends to underestimate BART station activity. In total, the Alameda County Model is 15 percent lower than year 2000 station entry and exit counts at BART stations within Alameda County. However, as noted above, the model predicts systemwide BART ridership within 8 percent of 2000 ridership counts.

Table 3-16. Comparison of 2000 Volumes at BART Stations in Alameda County

Station	Node	Model Total	2000 Count	Difference	Percent
ALAMEDA COUNTY					
Rockridge	15506	6,927	9,785	-2,858	-29%
MacArthur	15507	20,064	13,171	6,893	52%
19th Street/Oakland	15508	17,781	16,364	1,417	9%
Oakland City Center/12th Street	15509	28,967	24,851	4,116	17%
West Oakland	15510	7,175	10,048	-2,873	-29%
North Berkeley	15524	5,412	22,213	-16,801	-76%
Downtown Berkeley	15523	15,249	7,678	7,571	99%
Ashby	15525	5,156	8,748	-3,592	-41%
Lake Merritt	15534	8,347	12,748	-4,401	-35%
Fruitvale	15533	18,170	19,412	-1,242	-6%
Coliseum/Oakland Airport	15532	9,103	14,814	-5,711	-39%
San Leandro	15531	6,717	10,594	-3,877	-37%
Bay Fair	15530	12,300	10,828	1,472	14%
Hayward	15529	5,449	9,733	-4,284	-44%
South Hayward	15528	3,545	6,215	-2,670	-43%
Union City	15527	7,113	8,331	-1,218	-15%
Fremont	15526	6,009	9,589	-3,580	-37%
Warm Springs	15544	0			
Castro Valley	15537	1,349	4,411	-3,062	-69%
West Dublin	15545	0	0	0	
Dublin/Pleasanton	15538	13,831	13,310	521	4%
Subtotal Alameda County		**198,664**	**232,844**	**-34,180**	**-15%**

4 Model Forecasts

Once validated, the updated model was tested for its ability to produce reasonable forecasts for Alameda County.

It should be recognized though that the Alameda County Model uses ABAG *Projections 2009*, so it should be expected to produce forecasts that are different than other models using older land use forecasts.

4.1 Assumptions

The traffic forecasts were developed based on the following assumptions:

- The Alameda Countywide model socio-demographic data for 2005, 2020 and 2035 based on ABAG *Projections 2009* with zonal allocations updated by many of the jurisdictions.
- The network improvements for 2005, 2020 and 2035 based on the Countywide Transportation Plan and the Regional Transportation Plan as of 2008, supplemented by review and updates by many of the jurisdictions in 2010.
- Pricing assumptions based on MTC projections

The detailed transit and auto forecast results are described below.

4.2 Vehicle Traffic Forecasts Results

The traffic forecasts have been summarized at the identical screenlines as described in the model validation. These include 15 screenlines and a county cordon line which incorporates the entire perimeter of Alameda County.

A summary comparison across screenlines with year 2000 model volumes to 2005, 2020 and 2035 for the daily, A.M. peak 1-hour, P.M. peak 1-hour, P.M. peak 2-hour and P.M. peak 4-hour periods are presented in Table 4-1 through Table 4-5. Detailed tables comparing the forecasts for all the screenlines are provided in Appendix C.

The trends observed in the model forecast volumes are consistent with the trends in the ABAG socio-demographic data and the MTC regional model. Based on the forecast results, the general trend, except for 2005, shows increasing vehicle volume. The model estimated low or negative growth from 2000 to 2005 in some locations. This generally reflects the economic trends observed at the peak of the economy in 2000 and the subsequent downturn in employment after 2000.

Table 4-1. Screenline Forecast Volumes, Daily

Screenline	Description	Observed Counts 2000	Model Volumes 2000	Model Volumes 2005	Model Volumes 2020	Model Volumes 2035	Difference 2005-2000	% Difference 2005-2000	Difference 2020-2000	% Difference 2020-2000	Difference 2035-2000	% Difference 2035-2000
1	County Screenline	1,707,871	1,766,042	1,845,424	2,281,365	2,804,360	79,382	4%	515,323	29%	1,038,318	59%
2	Albany - Berkeley Screenline	323,433	323,579	339,775	398,482	439,057	16,196	5%	74,903	23%	115,477	36%
3	Berkeley - Emeryville Screenline	272,468	296,455	303,677	346,432	391,826	7,222	2%	49,977	17%	95,371	32%
4	Berkeley - Oakland Screenline	175,491	174,057	192,549	237,932	308,234	18,491	11%	63,874	37%	134,177	77%
5	Emeryville - Oakland Screenline	307,565	315,009	324,080	377,788	446,482	9,072	3%	62,780	20%	131,474	42%
6	Oakland - Piedmont Screenline	83,838	66,887	70,275	74,513	90,414	3,388	5%	7,625	11%	23,527	35%
7	Alameda - Oakland Screenline	217,388	214,363	209,894	246,095	302,645	(4,469)	-2%	31,733	15%	88,282	41%
8	Oakland - San Leandro: Int/E14th	220,060	164,780	168,009	203,533	255,268	3,230	2%	38,753	24%	90,489	55%
9	Oakland - San Leandro Screenline	452,326	514,041	527,751	627,836	742,799	13,711	3%	113,795	22%	228,759	45%
10	Hayward - Union City Screenline	330,957	354,503	366,121	416,847	493,799	11,617	3%	62,344	18%	139,296	39%
11	Hayward - Castro Valley Screenline	218,659	230,048	242,597	304,458	358,530	12,549	5%	74,410	32%	128,482	56%
12	Union City - Fremont Screenline	345,110	363,926	372,571	400,215	500,285	8,645	2%	36,289	10%	136,358	37%
13	Fremont - Newark Screenline	378,105	356,326	362,852	395,434	480,730	6,526	2%	39,109	11%	124,405	35%
14	Fremont - Tri-Valley Screenline	170,886	194,642	215,783	285,463	322,949	21,141	11%	90,821	47%	128,306	66%
15	Dublin - Pleasanton Screenline	396,751	334,285	368,307	505,840	611,134	34,021	10%	171,554	51%	276,849	83%
16	Pleasanton - Livermore Screenline	251,588	261,067	282,532	376,582	510,572	21,465	8%	115,515	44%	249,505	96%
	Total	**5,852,497**	**5,930,011**	**6,192,198**	**7,478,815**	**9,059,085**	**262,187**	**4%**	**1,548,804**	**26%**	**3,129,074**	**53%**

Note: Correct name for Screenline 14, Fremont – Tri-Valley is "County/Tri-Valley"

Table 4-2. Screenline Forecast Volumes, AM Peak 1 Hour

Screenline	Description	Observed Counts 2000	Model Volumes 2000	Model Volumes 2005	Model Volumes 2020	Model Volumes 2035	Difference 2005-2000	% Difference 2005-2000	Difference 2020-2000	% Difference 2020-2000	Difference 2035-2000	% Difference 2035-2000
1	County Screenline	112,882	117,200	121,117	153,022	188,496	3,917	3%	35,822	31%	71,296	61%
2	Albany - Berkeley Screenline	19,943	21,630	22,532	27,022	30,786	902	4%	5,392	25%	9,156	42%
3	Berkeley - Emeryville Screenline	17,137	20,167	21,116	25,563	30,580	949	5%	5,396	27%	10,413	52%
4	Berkeley - Oakland Screenline	13,399	15,309	18,239	21,165	25,681	2,929	19%	5,856	38%	10,372	68%
5	Emeryville - Oakland Screenline	19,533	21,839	23,731	28,411	35,973	1,893	9%	6,572	30%	14,134	65%
6	Oakland - Piedmont Screenline	6,405	6,214	7,006	8,159	10,948	792	13%	1,946	31%	4,734	76%
7	Alameda - Oakland Screenline	16,682	17,211	16,755	20,167	26,588	(456)	-3%	2,956	17%	9,377	54%
8	Oakland - San Leandro: Int/E14th	14,596	13,439	14,002	18,310	24,008	563	4%	4,871	36%	10,569	79%
9	Oakland - San Leandro Screenline	30,815	35,728	36,613	44,519	53,575	885	2%	8,791	25%	17,847	50%
10	Hayward - Union City Screenline	18,839	24,637	25,158	29,927	37,040	521	2%	5,291	21%	12,404	50%
11	Hayward - Castro Valley Screenline	17,513	15,812	16,408	21,430	25,712	597	4%	5,618	36%	9,900	63%
12	Union City - Fremont Screenline	19,563	25,505	25,857	29,214	37,120	352	1%	3,709	15%	11,615	46%
13	Fremont - Newark Screenline	17,448	25,145	25,168	28,789	37,757	22	0%	3,643	14%	12,611	50%
14	Fremont - Tri-Valley Screenline	13,885	14,764	16,101	18,643	22,540	1,337	9%	3,878	26%	7,775	53%
15	Dublin - Pleasanton Screenline	30,685	25,964	28,630	40,358	50,899	2,667	10%	14,394	55%	24,936	96%
16	Pleasanton - Livermore Screenline	17,566	18,582	19,610	27,156	36,318	1,027	6%	8,574	46%	17,735	95%
	Total	**386,891**	**419,148**	**438,044**	**541,856**	**674,021**	**18,896**	**5%**	**122,708**	**29%**	**254,873**	**61%**

Note: Correct name for Screenline 14, Fremont – Tri-Valley is "County/Tri-Valley"

Table 4-3. Screenline Forecast Volumes, PM Peak 1-Hour

Screenline	Description	Observed Counts 2000	Model Volumes 2000	Model Volumes 2005	Model Volumes 2020	Model Volumes 2035	Difference 2005-2000	% Difference 2005-2000	Difference 2020-2000	% Difference 2020-2000	Difference 2035-2000	% Difference 2035-2000
1	County Screenline	123,467	123,418	128,332	163,361	198,628	4,914	4%	39,943	32%	75,210	61%
2	Albany - Berkeley Screenline	21,788	24,043	25,214	29,818	34,305	1,171	5%	5,775	24%	10,263	43%
3	Berkeley - Emeryville Screenline	15,933	21,225	21,569	25,635	30,729	343	2%	4,410	21%	9,504	45%
4	Berkeley - Oakland Screenline	15,329	16,834	18,006	22,304	27,821	1,171	7%	5,470	32%	10,986	65%
5	Emeryville - Oakland Screenline	19,606	23,131	24,087	29,272	36,834	956	4%	6,140	27%	13,703	59%
6	Oakland - Piedmont Screenline	8,084	8,132	8,699	10,691	14,168	567	7%	2,558	31%	6,035	74%
7	Alameda - Oakland Screenline	18,835	18,818	18,522	21,450	26,927	(296)	-2%	2,632	14%	8,109	43%
8	Oakland - San Leandro: Int/E14th	18,680	17,133	17,364	21,707	30,372	231	1%	4,574	27%	13,239	77%
9	Oakland - San Leandro Screenline	35,299	39,083	39,817	49,025	58,967	734	2%	9,943	25%	19,884	51%
10	Hayward - Union City Screenline	19,614	27,169	27,690	31,427	37,871	521	2%	4,258	16%	10,703	39%
11	Hayward - Castro Valley Screenline	17,847	17,275	18,079	23,106	27,742	804	5%	5,831	34%	10,467	61%
12	Union City - Fremont Screenline	21,661	28,803	29,173	31,156	38,443	370	1%	2,352	8%	9,639	33%
13	Fremont - Newark Screenline	20,317	26,976	27,242	31,312	40,946	266	1%	4,337	16%	13,971	52%
14	Fremont - Tri-Valley Screenline	12,884	13,768	15,417	19,428	22,178	1,649	12%	5,660	41%	8,410	61%
15	Dublin - Pleasanton Screenline	36,416	32,935	35,425	50,353	59,605	2,490	8%	17,418	53%	26,669	81%
16	Pleasanton - Livermore Screenline	20,115	19,907	21,880	30,243	40,130	1,973	10%	10,336	52%	20,223	102%
	Total	**425,875**	**458,651**	**476,516**	**590,288**	**725,666**	**17,864**	**4%**	**131,637**	**29%**	**267,015**	**58%**

Note: Correct name for Screenline 14, Fremont – Tri-Valley is "County/Tri-Valley"

Table 4-4. Screenline Forecast Volumes, PM Peak 2 Hour

Screenline	Description	Observed Counts 2000	Model Volumes 2000	Model Volumes 2005	Model Volumes 2020	Model Volumes 2035	Difference 2005-2000	% Difference 2005-2000	Difference 2020-2000	% Difference 2020-2000	Difference 2035-2000	% Difference 2035-2000
1	County Screenline	236,756	233,648	243,141	303,729	370,270	9,493	4%	70,080	30%	136,621	58%
2	Albany - Berkeley Screenline	42,646	46,993	49,024	57,444	65,311	2,030	4%	10,451	22%	18,318	39%
3	Berkeley - Emeryville Screenline	32,021	41,468	42,198	48,813	58,246	730	2%	7,345	18%	16,778	40%
4	Berkeley - Oakland Screenline	29,029	32,048	34,283	42,418	52,348	2,235	7%	10,370	32%	20,300	63%
5	Emeryville - Oakland Screenline	39,128	44,908	46,815	56,631	69,197	1,907	4%	11,723	26%	24,290	54%
6	Oakland - Piedmont Screenline	14,370	16,073	17,124	19,762	27,284	1,052	7%	3,690	23%	11,211	70%
7	Alameda - Oakland Screenline	33,955	37,890	37,433	43,601	53,697	(457)	-1%	5,711	15%	15,807	42%
8	Oakland - San Leandro: Int/E14th	34,231	34,642	35,137	43,458	55,917	495	1%	8,816	25%	21,274	61%
9	Oakland - San Leandro Screenline	67,725	75,829	77,204	93,353	112,174	1,375	2%	17,523	23%	36,345	48%
10	Hayward - Union City Screenline	39,060	53,230	54,053	60,181	71,955	823	2%	6,951	13%	18,725	35%
11	Hayward - Castro Valley Screenline	28,965	32,335	34,158	43,236	51,918	1,823	6%	10,901	34%	19,583	61%
12	Union City - Fremont Screenline	42,331	55,069	55,927	59,253	72,136	858	2%	4,184	8%	17,067	31%
13	Fremont - Newark Screenline	38,890	53,196	53,849	59,852	76,462	652	1%	6,655	13%	23,266	44%
14	Fremont - Tri-Valley Screenline	23,725	25,356	28,342	36,791	41,544	2,986	12%	11,435	45%	16,188	64%
15	Dublin - Pleasanton Screenline	68,071	64,525	69,871	99,191	116,563	5,346	8%	34,666	54%	52,039	81%
16	Pleasanton - Livermore Screenline	38,745	38,258	41,873	56,970	75,961	3,614	9%	18,712	49%	37,703	99%
	Total	**809,648**	**885,468**	**920,432**	**1,124,682**	**1,370,983**	**34,964**	**4%**	**239,214**	**27%**	**485,515**	**55%**

Note: Correct name for Screenline 14, Fremont – Tri-Valley is "County/Tri-Valley"

Table 4-5. Screenline Forecast Volumes, PM Peak 4 Hour

Screenline	Description	Observed Counts 2000	Model Volumes 2000	Model Volumes 2005	Model Volumes 2020	Model Volumes 2035	Difference 2005-2000	% Difference 2005-2000	Difference 2020-2000	% Difference 2020-2000	Difference 2035-2000	% Difference 2035-2000
1	County Screenline	478,780	476,766	495,911	619,758	751,888	19,146	4%	142,992	30%	275,122	58%
2	Albany - Berkeley Screenline	83,108	89,366	93,881	110,089	124,382	4,515	5%	20,723	23%	35,016	39%
3	Berkeley - Emeryville Screenline	63,700	79,271	81,436	94,899	112,540	2,165	3%	15,628	20%	33,269	42%
4	Berkeley - Oakland Screenline	53,912	61,883	67,390	82,052	97,362	5,507	9%	20,169	33%	35,479	57%
5	Emeryville - Oakland Screenline	75,332	87,310	90,956	108,891	131,151	3,645	4%	21,581	25%	43,841	50%
6	Oakland - Piedmont Screenline	27,831	26,802	28,957	35,314	48,436	2,155	8%	8,512	32%	21,634	81%
7	Alameda - Oakland Screenline	62,842	69,132	68,156	79,136	97,977	(977)	-1%	10,004	14%	28,844	42%
8	Oakland - San Leandro: Int/E14th	65,224	60,520	62,023	77,259	109,052	1,503	2%	16,739	28%	48,532	80%
9	Oakland - San Leandro Screenline	126,941	153,235	156,803	190,355	223,513	3,568	2%	37,119	24%	70,277	46%
10	Hayward - Union City Screenline	79,291	101,234	103,849	117,306	141,254	2,614	3%	16,072	16%	40,020	40%
11	Hayward - Castro Valley Screenline	54,132	63,888	67,767	85,301	100,236	3,879	6%	21,413	34%	36,348	57%
12	Union City - Fremont Screenline	81,308	107,863	109,739	117,377	144,162	1,877	2%	9,514	9%	36,299	34%
13	Fremont - Newark Screenline	76,117	100,831	103,451	117,540	151,205	2,620	3%	16,709	17%	50,374	50%
14	Fremont - Tri-Valley Screenline	46,649	56,873	61,224	75,566	85,802	4,351	8%	18,693	33%	28,929	51%
15	Dublin - Pleasanton Screenline	122,332	120,135	130,964	184,870	218,275	10,829	9%	64,735	54%	98,140	82%
16	Pleasanton - Livermore Screenline	71,336	73,590	80,106	108,886	144,864	6,516	9%	35,297	48%	71,274	97%
	Total	**1,568,835**	**1,728,698**	**1,802,612**	**2,204,598**	**2,682,098**	**73,914**	**4%**	**475,900**	**28%**	**953,400**	**55%**

Note: Correct name for Screenline 14, Fremont – Tri-Valley is "County/Tri-Valley"

4.3 Transit Forecast Results

Following the validation to observed year 2000 survey results and ridership counts, transit forecasts were developed using the model for 2005, 2020 and 2035 transit service. Table 4-6 provides a comparison of transit ridership forecasts predicted by the model and summarized by operator for Alameda County service for each year. The 2000 results are provided as comparison.

Decreases in transit ridership between 2000 and 2005 would be due to decreases in employment in certain employment centers during that period.

Table 4-6. Transit Ridership Forecasts by Transit Operator

					Percent Change	
	2000	**2005**	**2020**	**2035**	**2005-2020**	**2005-2035**
ALAMEDA COUNTY SERVICES						
BART	300,572	313,973	429,358	717,163	37%	128%
BART OAC	0	0	0	25,173		
AC Transit Local	190,155	221,114	267,847	355,671	21%	61%
AC Transit Transbay	10,754	12,073	17,027	22,500	41%	86%
LAVTA/Wheels	3,869	3,460	5,552	10,045	60%	190%
East Bay Ferries	902	5,400	6,863	6,128	27%	13%
Union City	2,293	1,759	1,849	2,365	5%	34%
ACE Rail	1,784	1,403	2,551	4,469	82%	219%
Amtrak (Capitol, etc…)	1,217	1,312	3,767	5,127	187%	291%
AirBART	1,819	2,840	6,632	22	134%	-99%
Subtotal Alameda Co.	**513,365**	**563,334**	**741,446**	**1,148,663**	**32%**	**104%**
OTHER TRANSIT SERVICES						
MUNI	614,532	567,015	639,827	821,596	13%	45%
SCVTA	226,024	264,047	352,349	626,818	33%	137%
SamTrans	75,816	78,315	93,818	123,705	20%	58%
Golden Gate Transit	36,154	33,391	35,438	38,106	6%	14%
CalTrain	47,279	56,986	93,183	145,878	64%	156%
CCCTA	20,559	23,259	32,454	46,590	40%	100%
Fairfield/Suisun	3,506	7,881	15,227	17,110	93%	117%
Vallejo Bus + Ferry	6,978	9,425	13,327	14,909	41%	58%
Sonoma County Providers	31,435	31,679	36,307	36,020	15%	14%
Tri-Delta Transit	15,978	23,954	39,762	54,741	66%	129%
Napa County Vine	2,682	3,139	5,594	5,442	78%	73%
WestCAT	8,242	7,904	14,773	28,988	87%	267%
eBART	0	0	18,453	30,944		
Other	12,596	26,110	44,830	61,779	72%	137%
Subtotal Other	**1,101,781**	**1,133,105**	**1,435,342**	**2,052,626**	**27%**	**81%**
TOTAL	**1,615,146**	**1,696,439**	**2,176,788**	**3,201,289**	**28%**	**89%**

BART Station ridership forecasts within Alameda County are summarized in Table 4-7. The new Warm Springs and West Dublin/Pleasanton stations are included in the 2020 and 2035 forecasts.

Table 4-7. Transit Ridership Forecasts for BART at Alameda County Stations

Station	2000	2005	2020	2035
ALAMEDA COUNTY				
Rockridge	6,927	6,128	5,720	8,620
MacArthur	20,064	20,861	32,418	54,113
19th Street/Oakland	17,781	16,715	22,216	35,817
Oakland City Center/12th Street	28,967	28,071	35,135	56,960
West Oakland	7,175	8,014	15,898	32,978
North Berkeley	5,412	4,442	5,424	9,196
Downtown Berkeley	15,249	15,798	15,039	27,867
Ashby	5,156	4,360	5,361	8,335
Lake Merritt	8,347	9,623	13,735	25,584
Fruitvale	18,170	18,167	21,999	33,017
Coliseum/Oakland Airport	9,103	9,607	15,529	38,577
San Leandro	6,717	7,495	12,761	14,653
Bay Fair	12,300	13,047	19,611	42,312
Hayward	5,449	6,025	8,401	14,531
South Hayward	3,545	3,987	5,632	9,780
Union City	7,113	7,471	10,692	19,886
Fremont	6,009	6,989	8,539	17,925
Warm Springs	0	0	4,144	8,344
Castro Valley	1,349	1,735	3,070	8,800
West Dublin	0	0	16,826	30,185
Dublin/Pleasanton	13,831	14,531	17,067	33,623
TOTAL	**198,664**	**203,066**	**295,217**	**531,103**

The Alameda County Model transit forecasts were also compared to the most recent version of the MTC trip-based model used for the current 2009 Regional Transportation Plan (Table 4-8). The Alameda County Model is within two percent of the MTC transit forecasts for services within Alameda County, and within five percent for all Bay Area transit services.

The MTC model reports did not have available estimates for BART ridership at Alameda County stations only, but the overall BART system ridership for 2035 using ABAG *Projections 2007* was approximately 659,500 daily boardings. The total 2035 BART boardings from the P09 update of the Alameda County Model was 717,163, about 9% higher than the MTC model forecast or 13 percent higher if the BART Oakland Airport Connector (OAC) is included. The ABAG P09 employment forecasts include more jobs in Santa Clara County than P07, which would result in higher ridership on the Santa Clara extension. The Alameda County Model also includes the commute from San Joaquin County (external transit trips are not included in the MTC model, only vehicles) and more detailed representation of development areas around BART stations in Alameda County. Therefore it would be reasonable for the 2035 BART forecasts from the Alameda County model to be somewhat higher than the 2035 BART forecasts from the MTC model.

Table 4-8. Comparison of 2035 Transit Ridership Forecasts with MTC

	MTC 2009 RTP 2035 With Project	Alameda Co Model 2035 P09	Percent Difference
ALAMEDA COUNTY SERVICES			
BART	659,500	717,163	13%
BART OAC		25,173	
AC Transit Local	437,100	355,671	-13%
AC Transit Transbay		22,500	
LAVTA/Wheels	22,500	10,045	-55%
East Bay Ferries	23,100	6,128	-73%
Union City		2,365	
ACE Rail		4,469	
Amtrak (Capitol, etc…)		5,127	
AirBART		22	
Subtotal Alameda Co.	**1,142,200**	**1,114,180**	**-2%**
OTHER TRANSIT SERVICES			
MUNI	1,070,300	821,596	-23%
SCVTA	415,900	626,818	51%
SamTrans	84,600	123,705	46%
Golden Gate Transit	58,300	38,106	-35%
CalTrain	45,300	145,878	222%
CCCTA	28,600	46,590	63%
Fairfield/Suisun	5,500	17,110	211%
Vallejo Bus + Ferry	16,200	14,909	-8%
Sonoma County Providers	9,300	36,020	287%
Tri-Delta Transit	17,700	54,741	209%
Napa County Vine	7,100	5,442	-23%
WestCAT	8,400	28,988	245%
eBART	19,400	30,944	60%
Other	100,800	61,779	-39%
Subtotal Other	**1,887,400**	**2,052,626**	**9%**
TOTAL	**3,029,600**	**3,166,806**	**5%**

Source: Metropolitan Transportation Commission, "Transportation 2035 Plan for the San Francisco Bay Area, Travel Forecasts Data Summary," December 2008.

Note: MTC forecasts are based on ABAG P07 and Alameda County forecasts are based on ABAG P09.

5 Performance Measures

The Alameda County Congestion Management Agency (ACCMA) adopted a set of standard performance measures to provide overall systemwide assessment of transportation conditions with various transportation model scenarios.

5.1 Development of Performance Measures

The development of the selected performance measures is described in greater detail in the June, 2007 version report on the Projections 2005 version of the Alameda Countywide Transportation Model. Transportation performance measures were compared from several sources:

- Alameda County Congestion Management Plan (CMP), 2005 version
- Alameda Countywide Transportation Plan (CWTP), 2004 version
- Santa Clara Valley Transportation Authority (VTA) Valley Transportation Plan (VTP) 2030, adopted in 2004
- Metropolitan Transportation Commission (MTC) 2001 Regional Transportation Plan (RTP)
- MTC Transportation 2030 Plan Project Performance Evaluation Technical Report, December, 2004

During the Alameda County Model P07 update, the selected performance measures were compared to more current performance measures being used by MTC. MTC developed performance objectives and quantitative project evaluation measures to support the development of the Transportation 2035 RTP[4]. The quantitative project evaluation measures were based more on costs and benefits for individual transportation projects, and were not as appropriate for regional evaluation of land use and transportation patterns. The Transportation 2035 project evaluation measures included:

- Combined benefit-cost, where benefit equals value in dollars of reduction in delay, particulate matter emissions, carbon dioxide emissions, and fatalities and injuries
- Cost per vehicle-mile traveled (VMT) reduced

[4] Metropolitan Transportation Commission, Memorandum to Planning Committee, "Transportation 2035: Project Performance Assessment – Preliminary Findings," May 2, 2008

- Cost per low-income household served (trial measure)

- Alternative benefit-cost for maintenance, where benefit equals direct public and private cost savings from performing maintenance on time

The Alameda County Model would support the calculation of these MTC performance measures. However, the measures also require detailed information on project costs, which are not provided by the travel model. Therefore, no changes were recommended for the performance measures produced by the Alameda County Model.

5.2 Recommended Performance Measures

The recommended performance measures which can be based directly on the results of the travel model are:

1. Home-based work (HBW) mode split.

2. Total trip mode split

3. Directional miles of congested highways (v/c > 1.00).

4. Plot maps of congested highways (v/c > 1.00)

5. Travel times for selected OD pairs by mode

6. Mean highway speed

7. Transit accessibility (percent of HBW transit trips with walk access)

Additional performance measures included in the Alameda County CMP/CWTP, the Santa Clara VTA transportation plans, and MTC RTP analysis, such as duration of congestion, safety, air quality, etc., generally cannot be added directly to the Alameda County Model. The Alameda County Model does produce output vehicle performance data that are critical inputs to the computation of these additional performance measures.

5.3 Performance Measure Results

The two tables below present the performance measure results for the updated Alameda County Model results for 2000, 2005, 2020, and 2035.

Table 5-1. Performance Measure Results

Measure	2000	2005	2020	2035
1. Home-based work (HBW) mode split				
Drive Alone	73.2%	73.2%	70.9%	67.5%
HOV 2	10.8	11.0	11.5	11.8
HOV 3+	4.8	4.8	5.2	5.9
Transit – Walk Access	3.4	3.4	4.0	5.0
Transit – Auto Access	4.7	4.6	5.2	6.2
Bike	1.1	1.1	1.3	1.5
Walk	2.0	1.9	1.9	2.1
TOTAL	**100.0%**	**100.0%**	**100.0%**	**100.0%**
2. Total trip mode split				
Drive Alone	53.3%	52.7%	52.3%	51.4%
HOV 2	18.6	18.8	18.8	18.5
HOV 3+	11.9	12.2	12.5	12.5
Transit – Walk Access	3.2	3.4	3.6	4.3
Transit – Auto Access	1.8	1.8	2.2	2.8
Bike	1.7	1.7	1.7	1.7
Walk	9.5	9.4	8.9	8.7
TOTAL	**100.0%**	**100.0%**	**100.0%**	**100.0%**
3. Directional miles of congested highways (v/c > 1.00) Miles of congested road during P.M. peak 4-hour period (percent of total miles)				
Freeway	12.1 (4%)	21.5 (6%)	52.0 (13%)	165.8 (42%)
Expressway/Highway	7.0 (6%)	8.9 (7%)	20.6 (16%)	42.9 (33%)
Arterial	14.3 (1%)	16.9 (2%)	35.9 (4%)	120.5 (12%)
All roads	39.0 (1%)	53.6 (1%)	127.6 (3%)	381.8 (9%)
4. Plot maps of congested highways	Available from Alameda CTC			
5. Travel Times for selected OD pairs by mode	See Table 5-2			
6. Mean highway speed Mean congested speed (mph) during P.M. peak 4-hour period (percent of mean uncongested speed)				
Freeway	43.5 (69%)	41.5 (66%)	32.9 (52%)	20.6 (33%)
Expressway/Highway	42.3 (89%)	38.6 (81%)	28.9 (61%)	19.6 (42%)
Arterial	30.7 (93%)	29.8 (90%)	26.4 (80%)	19.1 (58%)
All roads	35.4 (80%)	34.2 (77%)	28.3 (65%)	19.2 (45%)
7. Transit accessibility (percent of HBW transit trips with walk access)	41.9%	42.9%	43.8%	44.7%

Table 5-2. Travel Times for Selected Origin-Destination Pairs

Measure	2000	2005	2020	2035
1. Hayward (724) to Newark (920) – PM Peak				
Drive Alone	13.4	13.3	14.7	19.0
Shared Ride	10.5	10.7	11.6	15.4
Transit	47.8	50.9	53.6	62.4
2. Emeryville (123) to Berkeley (19) – PM Peak				
Drive Alone	9.3	10.0	10.5	17.5
Shared Ride	9.3	10.0	10.5	17.5
Transit	36.3	35.4	35.5	37.3
3. Hayward (706) to Livermore (1265) – PM Peak				
Drive Alone	30.6	33.7	42.7	65.2
Shared Ride	30.6	33.7	41.4	64.0
Transit	121.0	n/a	n/a	n/a
4. Oakland (232) to San Leandro (533) – PM Peak				
Drive Alone	20.1	20.4	22.1	26.8
Shared Ride	20.1	20.4	21.8	26.3
Transit	51.6	50.0	49.0	49.6
5. Fremont (898) to Pleasanton (1137) – PM Peak				
Drive Alone	24.3	26.8	37.0	65.7
Shared Ride	24.3	26.8	23.8	34.7
Transit	n/a	n/a	n/a	n/a
6. Fremont (854) to San Jose (2910) – AM Peak				
Drive Alone	21.4	20.4	21.2	24.3
Shared Ride	20.6	19.4	18.9	19.3
Transit	78.4	81.7	70.0	69.3
7. Fremont (854) to San Jose (2910) – PM Peak				
Drive Alone	20.7	20.2	21.9	24.2
Shared Ride	20.6	19.5	19.0	20.0
Transit	81.4	87.0	73.2	72.9
8. Oakland (233) to Pleasanton (1137) – PM Peak				
Drive Alone	39.0	41.3	52.4	74.8
Shared Ride	38.9	41.1	51.9	74.3
Transit	75.7	77.6	79.4	77.5
9. Fremont (854) to Alameda (513) – PM Peak				
Drive Alone	33.9	34.1	37.6	60.8
Shared Ride	28.6	28.8	31.9	48.1
Transit	77.8	73.9	73.2	73.7
10. Alameda (475) to Oakland (137) – PM Peak				
Drive Alone	11.9	11.9	13.9	22.1
Shared Ride	11.9	11.9	13.9	22.1
Transit	52.0	41.3	41.5	42.0

Notes:

Transit times represent best available path using walk access where possible (n/a = model did not find transit path within acceptable time and transfer limits).

P.M. peak period transit times estimated based on A.M. peak period transit times in reverse direction.

Since the Alameda County Model does not include all local streets, it was necessary to convert the local street intersections referred to in the ACCMA LOS Monitoring Report to the nearest cross street represented in the model for each OD pair. The nearest cross streets are as follows:

1. PM – Hayward (Hesperian Blvd. and West Tennyson Road) to Newark (Thornton Ave. and Newark Blvd.)

2. PM – Emeryville (Hollis St. and Powell St.) to Berkeley (Marin Ave. and Arlington Ave.)

3. PM – Hayward (Carlos Bee and Hayward Blvd.) to Livermore (North Murrieta Blvd. and Portola Ave.)

4. PM – Oakland (14th and Broadway) to San Leandro (Farnsworth St. and Lewelling Blvd.)

5. PM – Fremont (Fremont Blvd. at I-880) to Pleasanton (Valley Avenue and Hopyard Rd.)

6. AM – Fremont (Thornton Ave. and Fremont Blvd.) to San Jose (Zanker Rd. at Tasman)

7. AM – Fremont (Thornton Ave. and Fremont Blvd.) to San Jose (Zanker Rd. at Tasman) [Identical to #6 above]

8. PM – Oakland (Jefferson and 14th St.) to Pleasanton (Hopyard Rd. and Valley Ave.)

9. PM – Fremont (Mowry and Paseo Padre Parkway) to Alameda (Island Drive and Robert Davey)

10. PM – Alameda (Atlantic and Main) to Oakland (College Avenue and SR 24)

6 MTC Model Consistency

The Alameda Countywide Transportation Model is intended to be consistent with the MTC regional travel model, while providing additional detail within Alameda County. A set of guidelines have been prepared by MTC to check the consistency of local travel models with the MTC regional model. This chapter summarizes the MTC checklist and comparison findings.

6.1 MTC Consistency Guidelines

The Alameda Countywide Transportation Model was originally designed to be consistent with the MTC BAYCAST trip-based model. The consistency guidelines used for model development were documented in Appendix B of the "Guidance For Consistency Of Congestion Management Programs With The Regional Transportation Plan," Metropolitan Transportation Commission, June 2005. The consistency findings primarily focused on the 2000 calibration year, and were documented in the prior Alameda Countywide Model reports for the Projections 2005 and Projections 2007 updates.

The newer MTC travel model, Travel Model One, is a more sophisticated activity-based travel model. A set of travel forecasts have been prepared using Travel Model One and ABAG Projections 2009. The consistency requirements for Projections 2009 are documented in Appendix B of the "2011 County Congestion Management Plans: Updated MTC Guidance and Review Process," June, 2011. The consistency checklist includes 13 products that are used to compare travel model results. The MTC consistency checklist is summarized below:

A. General approach

B. Demographic/economic/land use forecasts

C. Pricing assumptions

D. Network assumptions

E. Automobile ownership

F. Tour/trip generation

G. Activity/trip location

H. Travel mode choice

I. Traffic assignment

The specific MTC Travel Model One results used for comparison are provided in an Excel workbook titled "Consistency_Projections2009.xlsx," September, 2011.

6.2 Consistency of Alameda Countywide Model

This chapter compares the Alameda County Model outputs to the MTC regional travel model, Travel Model One based on ABAG Projections 2009 demographic inputs.

6.2.1 General Approach

PRODUCT 1: The Alameda County Model is primarily a parallel implementation of the MTC BAYCAST-90 model. The auto ownership, trip generation, trip distribution and trip assignment steps all use MTC procedures. The truck trip generation has been modified based on updated information developed for the Alameda County Congestion Management Agency Truck Modeling study. The trip distribution adjustment factors have been modified to reflect the greater level of detail in Alameda County. The mode choice model has been revised to provide greater detail in transit modes, but is consistent with the MTC BAYCAST model at the higher level of aggregation.

6.2.2 Land Use

The land use in the Alameda County Model is ABAG Projections 2009 disaggregated within Alameda County to the Alameda County model zone system.

PRODUCT 2: The 2035 horizon year Alameda County totals for population, households and jobs differ from the ABAG Projections 2009 control totals by no more than one percent. The total employed residents in the Alameda County model are 1.3 percent lower than the ABAG Projections 2009 total for Alameda County. This difference occurs because the Alameda County model reallocated households in several jurisdictions based on input from the local jurisdictions, and in those cases households would have been shifted to areas with different employed residents per household characteristics. The land uses outside Alameda County are identical to ABAG Projections 2009 at the Census Tract level.

PRODUCT 3: Tables comparing ABAG Projections 2009 with the Alameda County land use estimates are attached. Comparisons are provided for the 2035 horizon year. The Alameda County Model does not include a 2010 base year. The next update to the Alameda County Model will update the base year to 2010, and comparisons of 2010 land use will be provided at that time.

Product 3
ABAG County-Level Estimates for Population, Households, Jobs, and Employed Residents
Year 2035, Projections 2009 with T-2035 (v 0.1)
2010 and 2035

2035

County	Population	Households	Jobs	Employed Residents
San Francisco	810,007	346,687	568,706	411,856
San Mateo	733,285	264,404	346,319	330,700
Santa Clara	1,821,988	613,970	906,247	815,793
Alameda	1,549,803	557,257	712,834	725,197
Contra Costa	1,090,292	392,697	376,799	490,195
Solano	443,097	148,165	140,120	205,697
Napa	138,801	51,242	70,772	66,300
Sonoma	497,889	188,335	218,363	242,395
Marin	256,495	104,615	135,592	124,428
Bay Area	7,341,657	2,667,372	3,475,752	3,412,561

PRODUCT 4: Land uses were reallocated within Alameda County, with control totals for the county maintained within one percent of ABAG Projections 2009 county totals for households and jobs. To the extent possible, ABAG control totals were also maintained at the jurisdiction level within Alameda County.

Several jurisdictions requested revised allocations of land uses within their jurisdictions and/or control totals that differed from ABAG. Alameda CTC staff met with each of these jurisdictions, often together with ABAG staff. Discussion summaries are available at Alameda CTC. Detailed Excel workbooks are available to provide information on the reallocation process at the jurisdiction and MTC TAZ level, but there are currently no detailed maps of land use differences at the census tract level.

Product 3 (continued)
ABAG County-Level Estimates for Population, Households, Jobs, and Employed Residents
Year 2035, Projections 2009 with T-2035 (v 0.1)
2010 and 2035

2035

MTC Travel Model One

County	Population	Households	Jobs	Employed Residents
San Francisco	968,995	415,013	806,831	543,596
San Mateo	892,995	322,728	505,848	467,201
Santa Clara	2,431,397	827,191	1,412,632	1,252,505
Alameda	1,966,289	707,970	1,039,701	1,098,611
Contra Costa	1,322,908	480,495	555,657	718,704
Solano	506,499	171,296	211,883	264,697
Napa	148,797	54,624	91,477	76,200
Sonoma	561,492	211,287	325,104	287,196
Marin	274,301	112,229	158,274	128,926
Bay Area	9,073,673	3,302,833	5,107,407	4,837,636

2035

Alameda County Model

County	Population	Households	Jobs	Employed Residents
San Francisco	968,995	415,013	806,831	543,596
San Mateo	892,995	322,728	505,848	467,201
Santa Clara	2,431,401	827,191	1,412,633	1,252,503
Alameda	1,959,550	700,877	1,050,112	1,083,947
Contra Costa	1,322,531	480,319	555,296	718,490
Solano	502,698	171,296	211,883	264,697
Napa	148,797	54,624	91,477	76,200
Sonoma	561,492	211,287	325,104	287,196
Marin	274,301	112,229	158,274	128,926
Bay Area	9,062,760	3,295,564	5,117,458	4,822,756

2035

Alameda County Model Difference from MTC Travel Model One

County	Population	Households	Jobs	Employed Residents
San Francisco	0.0%	0.0%	0.0%	0.0%
San Mateo	0.0%	0.0%	0.0%	0.0%
Santa Clara	0.0%	0.0%	0.0%	0.0%
Alameda	-0.3%	-1.0%	1.0%	-1.3%
Contra Costa	0.0%	0.0%	-0.1%	0.0%
Solano	-0.8%	0.0%	0.0%	0.0%
Napa	0.0%	0.0%	0.0%	0.0%
Sonoma	0.0%	0.0%	0.0%	0.0%
Marin	0.0%	0.0%	0.0%	0.0%
Bay Area	-0.1%	-0.2%	0.2%	-0.3%

6.2.3 Pricing

PRODUCT 5: Pricing assumptions are compared in the attached Product 5 table. The Alameda County model was calibrated to 2000 assumptions and conditions consistent with the BAYCAST 90 model. The pricing assumptions were consistent with the BAYCAST model at that time. Because these were the calibrated values, they have not been adjusted as adjustments may have required recalibration of the model.

In the next update of the countywide model, the most current MTC consistent pricing assumptions will be used, and the model will be recalibrated.

Product 5
Region-Level Auto Operating Cost, Key Transit Fares and Bridge Tolls
Year 2035, Projections 2009 with T-2035 (v 0.1)

Pricing Assumption	Travel Model One 2035 Value in 2000 dollars	Travel Model One 2035 Value in 2010 dollars	Alameda County Model 2035 Value in 2000 dollars	Alameda County Model 2035 Value in 2010 dollars
Auto Operating Cost per Mile	$0.222	$0.280	$0.135	$0.170
Bridge Tolls	Toll schedule starting July 1, 2012	Toll schedule starting July 1, 2012	$2.424	$3.055
Transit Fares	---	---	---	---
Muni Local Bus	$1.606	$2.000	$0.962	$1.212
AC Transit Local Bus	$1.606	$2.000	$1.304	$1.643
VTA Local Bus	$1.606	$2.000	$1.212	$1.527
SamTrans Local Bus	$1.606	$2.000	$1.067	$1.345

6.2.4 Network

PRODUCT 6: MTC highway and transit networks were used in the development of the Alameda County model networks with disaggregation within Alameda County to match the Alameda County model zone system. Road and transit networks were added for San Joaquin County using MTC model coding procedures. The road networks have subsequently been updated based on MTC's Regional Transportation Plan, *Transportation 2035*, and additional input from local jurisdictions. Improvements were included only if they were consistent with the current Transportation Improvement Program (2009 TIP at time of network review) or if they had committed local funding through a local jurisdiction.

6.2.5 Auto Ownership

MTC consistency guidelines require the use of MTC's auto ownership model or submit alternative models to the MTC for review and comment. The Alameda County model directly uses MTC's BAYCAST procedure for auto ownership (reprogrammed from FORTRAN to Cube script). The Alameda County model auto ownership model was tested to verify it would provide consistent results to the BAYCAST model for the 2000 calibration year. The calibrated auto ownership parameters were held constant for forecast years. The auto ownership model was not recalibrated for the smaller scale Alameda County model TAZ system. Several inputs, in particular the auto and transit accessibility factors, were derived directly from the corresponding MTC BAYCAST model TAZs and were not recalculated for the smaller Alameda County model TAZs. The intent at the time that this process was developed was to maintain consistency with the MTC BAYCAST model and its results.

PRODUCT 7: The attached Product 7 tables compare MTC auto ownership results with the Alameda County Model for the 2035 horizon year. The Alameda County model is within ten percent of the MTC model for total households in each county, for total regional households with zero automobiles and for total regional households with two or more automobiles. The Alameda County model is also within ten percent of the Travel Model One for households with two or more automobiles in all counties except San Francisco and San Mateo.

The Alameda County Model differs significantly from Travel Model One in estimating the numbers of households with zero automobiles, although since this is the smallest category, the numerical differences are not large relative to total households in each county. The Alameda County Model tends to underestimate households with one automobile in all counties. The estimates of households with two or more automobiles are generally consistent in most counties, but significantly higher than the Travel Model One in San Francisco and San Mateo counties.

Because the auto ownership parameters are based on the documented calibration to year 2000 conditions using the BAYCAST process, the auto ownership model was not adjusted to better match the MTC results.

When the Alameda County model is next updated, the auto ownership results will be directly compared to 2010 Census data as well as the corresponding results from MTC Travel Model One. Adjustments will be made to the calculation of auto and transit accessibility as well as calibration coefficients to ensure better consistency of auto ownership results.

Product 7
Households by Number of Automobiles, by County
Year 2035, Projections 2009 with T-2035 (v 0.1)

Travel Model One

County	Zero Automobiles	One Automobile	Two Automobiles	Three Automobiles	Four-Plus Automobiles	Total
San Francisco	138,538	178,614	92,624	16,276	9,654	435,706
San Mateo	18,086	111,872	136,346	45,412	22,858	334,574
Santa Clara	66,668	265,268	338,606	121,550	64,398	856,490
Alameda	86,622	225,966	268,610	104,094	54,962	740,254
Contra Costa	18,672	145,380	213,506	78,970	35,806	492,334
Solano	10,830	49,744	74,478	32,912	15,460	183,424
Napa	3,308	18,210	25,142	9,666	3,968	60,294
Sonoma	12,710	61,190	94,486	39,102	14,938	222,426
Marin	6,488	41,874	54,406	15,212	5,184	123,164
Bay Area	361,922	1,098,118	1,298,204	463,194	227,228	3,448,666

Alameda County Model

County	Zero Automobiles	One Automobile	Two-Plus Automobiles	Total
San Francisco	118,460	122,777	173,777	415,014
San Mateo	21,111	83,351	218,273	322,735
Santa Clara	88,921	230,383	507,894	827,198
Alameda	114,855	177,978	408,001	700,834
Contra Costa	30,908	116,933	332,484	480,325
Solano	7,558	33,161	130,580	171,299
Napa	1,778	10,911	41,932	54,621
Sonoma	8,048	50,204	153,030	211,282
Marin	4,446	33,466	74,315	112,227
Bay Area	396,085	859,164	2,040,286	3,295,535

Alameda County Model Difference from MTC Travel Model One

County	Zero Automobiles	One Automobile	Two-Plus Automobiles	Total
San Francisco	-14.5%	-31.3%	46.6%	-4.7%
San Mateo	16.7%	-25.5%	60.1%	-3.5%
Santa Clara	33.4%	-13.2%	-3.2%	-3.4%
Alameda	32.6%	-21.2%	-4.6%	-5.3%
Contra Costa	65.5%	-19.6%	1.3%	-2.4%
Solano	-30.2%	-33.3%	6.3%	-6.6%
Napa	-46.3%	-40.1%	8.1%	-9.4%
Sonoma	-36.7%	-18.0%	3.0%	-5.0%
Marin	-31.5%	-20.1%	-0.7%	-8.9%
Bay Area	9.4%	-21.8%	2.6%	-4.4%

6.2.6 Tour/Trip Generation

The Alameda County Model implements the MTC BAYCAST trip generation process, although the process is implemented in Cube/TP+ script rather than the MTC FORTRAN program. The Travel Model One does not calculate trips from each land use, but instead develops a set of tours based on activities which are then turned into trips.

PRODUCT 8: The attached Product 8 table compares 2035 horizon year tours by type from Travel Model One with trips by purpose from the Alameda County Model. The total daily trips in the Alameda County Model are eight percent lower than the daily trips generated from tours in Travel Model One. This is likely because the tours can consider several types of short trips on the way to and from primary activities that may be consolidated in the BAYCAST model system.

Product 8
Number of Trips by Tour Purpose
Year 2035, Projections 2009 with T-2035 (v 0.1)

MTC Travel Model One

Tour Purpose	Tours	Share
Work	10,509,848	33.8%
University	585,372	1.9%
School	3,081,348	9.9%
At-Work	2,530,990	8.1%
Eat Out	1,305,678	4.2%
Escort	2,692,358	8.7%
Shopping	4,094,132	13.2%
Social	857,048	2.8%
Other	5,448,496	17.5%
Total	31,105,270	100.0%

Alameda County Model

Trip Purpose	Trips	Share
Home-Based Work	7,312,850	25.6%
Home-Based College	639,086	2.2%
Home-Based School	2,006,897	7.0%
Home-Based Shop/Other	7,365,672	25.7%
Home-Based Social/Recreation	3,394,593	11.9%
Non-Home Based	7,902,324	27.6%
Total	28,621,422	100.0%

6.2.7 Activity/Trip Location

The Alameda County Model uses the MTC BAYCAST model trip distribution process and basic factors to estimate activity/trip locations. Additional adjustment factors ("K factors") were applied to more closely match the MTC BAYCAST model estimates of county-to-county trip patterns for the 2000 calibration year. These calibrated adjustment factors are used for all forecast years.

Trip distribution is compared in terms of average trip lengths and county-to-county trips.

Trip Lengths

PRODUCT 9: Average trip lengths in miles are compared for the 2035 horizon year. The MTC Travel Model One results are reported for tour types while the Alameda County Model results are reported for trip purposes.

County-to-County Trips

PRODUCT 10: The county to county trip patterns were compared for 2035 journey-to-work patterns. The 2035 journey-to-work patterns for the Alameda County Model were estimated by dividing Home-Based Work trips by a factor of 1.5. This factor was estimated based on prior comparisons of 2000 Census Journey to Work data and 2000 Home-Based Work trip estimates from various travel models.

The Alameda County Model estimates 2035 work trip home locations that are within four percent of MTC's Travel Model One for eight out of the nine counties. The workplace destination counties vary more, with the Alameda County Model estimating higher numbers of workplace destinations in San Francisco and Santa Clara counties and lower numbers of destinations in most other counties compared to the MTC's Travel Model One.

The Alameda County Model is nearly identical to MTC's Travel Model One for the number of people with both home and workplace within Alameda County, and is within three percent for commuters from Alameda County to Santa Clara County. Compared to the Travel Model One, the Alameda County Model estimates higher numbers of commuters from Alameda County to San Francisco and lower numbers from Alameda County to most other counties including Contra Costa County.

Product 9
Average Trip Distance by Tour Purpose
Year 2035, Projections 2009 with T-2035 (v 0.1)

Tour Purpose (Trip Purpose)	Travel Model One Average Trip Distance	Alameda County Model Average Trip Distance
Work (Home-Based Work)	10.33	14.63
University (Home-Based College)	7.16	12.26
School (Home-Based School)	4.08	5.35
At-Work	3.32	
Eat Out	5.49	
Escort	4.38	
Shopping (Home-Based Shopping/Other)	4.28	5.49
Social (Home-Based Social/Recreational)	5.03	7.73
Other (Non-Home Based)	5.14	6.95
All Purposes	6.48	8.15

Product 10
Journey to Work, County-to-County Usual Workplace
Year 2035, Projections 2009 with T-2035 (v 0.1)

Travel Model One

	Destination County									
Origin County	San Francisco	San Mateo	Santa Clara	Alameda	Contra Costa	Solano	Napa	Sonoma	Marin	Bay Area
San Francisco	413,582	64,398	7,862	35,462	8,676	842	302	1,482	14,054	546,660
San Mateo	97,866	246,296	79,734	36,334	5,028	378	176	726	5,712	472,250
Santa Clara	11,922	65,656	1,099,028	83,348	4,862	200	52	156	736	1,265,960
Alameda	137,744	74,060	142,906	642,318	83,756	4,852	1,810	1,568	13,128	1,102,142
Contra Costa	74,444	18,316	22,050	166,190	373,352	24,706	7,396	4,188	20,314	710,956
Solano	12,664	2,374	1,600	17,606	38,464	152,308	20,816	8,362	7,976	262,170
Napa	2,172	466	226	2,740	4,876	8,016	44,232	11,644	2,798	77,170
Sonoma	3,908	984	164	1,644	1,816	2,140	8,366	254,656	14,144	287,822
Marin	25,382	5,304	922	7,738	5,908	1,370	968	10,006	69,780	127,378
Bay Area	779,684	477,854	1,354,492	993,380	526,738	194,812	84,118	292,788	148,642	4,852,508

Alameda County Model

	Destination County									
Origin County	San Francisco	San Mateo	Santa Clara	Alameda	Contra Costa	Solano	Napa	Sonoma	Marin	Bay Area
San Francisco	400,710	67,113	25,532	24,175	6,408	447	311	710	7,780	533,184
San Mateo	95,359	259,170	87,016	19,432	2,242	323	81	641	1,095	465,360
Santa Clara	14,441	60,506	1,104,962	56,756	5,360	1,512	171	1,041	1,655	1,246,406
Alameda	163,488	58,295	147,594	641,937	63,137	3,262	583	2,225	7,237	1,087,758
Contra Costa	103,116	19,271	28,711	155,375	387,572	9,812	2,388	1,473	11,715	719,434
Solano	17,379	5,914	6,376	21,621	41,698	129,068	18,154	4,212	8,138	252,561
Napa	3,857	1,675	2,134	2,823	4,160	6,279	42,636	3,718	1,422	68,704
Sonoma	26,019	7,048	3,633	2,897	2,507	1,774	3,122	209,376	20,386	276,762
Marin	30,483	6,002	2,091	4,901	3,730	725	332	4,582	73,599	126,445
Bay Area	854,852	484,993	1,408,049	929,917	516,815	153,203	67,778	227,979	133,027	4,776,613

Alameda County Model Difference from Travel Model One

	Destination County									
Origin County	San Francisco	San Mateo	Santa Clara	Alameda	Contra Costa	Solano	Napa	Sonoma	Marin	Bay Area
San Francisco	-3.1%	4.2%	224.7%	-31.8%	-26.1%	-47.0%	3.1%	-52.1%	-44.6%	-2.5%
San Mateo	-2.6%	5.2%	9.1%	-46.5%	-55.4%	-14.5%	-54.1%	-11.7%	-80.8%	-1.5%
Santa Clara	21.1%	-7.8%	0.5%	-31.9%	10.2%	656.2%	228.1%	567.4%	124.9%	-1.5%
Alameda	18.7%	-21.3%	3.3%	-0.1%	-24.6%	-32.8%	-67.8%	41.9%	-44.9%	-1.3%
Contra Costa	38.5%	5.2%	30.2%	-6.5%	3.8%	-60.3%	-67.7%	-64.8%	-42.3%	1.2%
Solano	37.2%	149.1%	298.5%	22.8%	8.4%	-15.3%	-12.8%	-49.6%	2.0%	-3.7%
Napa	77.6%	259.3%	844.3%	3.0%	-14.7%	-21.7%	-3.6%	-68.1%	-49.2%	-11.0%
Sonoma	565.8%	616.2%	2115.2%	76.2%	38.0%	-17.1%	-62.7%	-17.8%	44.1%	-3.8%
Marin	20.1%	13.2%	126.7%	-36.7%	-36.9%	-47.1%	-65.7%	-54.2%	5.5%	-0.7%
Bay Area	9.6%	1.5%	4.0%	-6.4%	-1.9%	-21.4%	-19.4%	-22.1%	-10.5%	-1.6%

6.2.8 Travel Mode Choice

The mode choice in the Alameda County Model is based on the MTC BAYCAST model, but the BAYCAST mode choice model was expanded to include additional detail on transit modes. Comparisons between the Alameda County Model and the MTC' Travel Model One focus on the more aggregate results ("higher level nests") where direct comparisons are possible. Lower level nests were adjusted based on observed transit ridership.

PRODUCT 11: Trips by mode for the 2035 horizon year are compared between the tour types in MTC's Travel Model One and the closest corresponding trip purpose in the Alameda County Model.

The Alameda County 2035 model is 3.4 percent lower than the MTC's Travel Model One for automobile mode share and 2.2 percent higher for transit mode share. There are bigger differences in the walk and bicycle modes, where the Alameda County model is 15 percent higher for walk mode share and 68 percent higher for bicycle mode share. Many of these differences appear to be related to the different definitions of school trips in the tour-based and trip-based models.

For 2035 work tours/trips, the Alameda County Model is 1.6 percent higher than the MTC model for automobile mode share and 7.4 percent higher for transit mode share.

6.2.9 Traffic Assignment

Traffic assignment results are compared to the MTC's Travel Model One in terms of region-level, time-period-specific comparison of vehicle miles traveled (VMT) and vehicle hours traveled (VHT) by facility type, and region-level, time-period-specific comparison of estimated average speed on freeways and all other facilities.

PRODUCT 12: Vehicle miles and hours of travel are compared with the MTC's Travel Model One for the 2035 horizon year. The only time periods that can be directly compared with the Alameda County model are the P.M. peak 4 hour period and daily totals. The Alameda County model does not include traffic assignments for the early A.M., A.M. peak four-hour, midday or evening periods.

The Alameda County model estimates 2035 VMT that is 14 percent higher than the MTC's Travel Model One for daily totals and 22 percent higher during the P.M. peak period. The Alameda County model VMT estimates on freeways are within five percent of the MTC's Travel Model One, but the VMT estimates on non-freeway streets are much higher.

Product 11
Region-Level Mode Share by Tour Purpose
Year 2035, Projections 2009 with T-2035 (v 0.1)

Travel Model One

Tour Purpose	Travel Mode: Automobile	Walk	Bicycle	Transit	All Modes
Work	80.7%	5.7%	1.6%	11.9%	100.0%
University	63.8%	13.2%	1.3%	21.7%	100.0%
School	69.7%	20.1%	1.4%	8.9%	100.0%
At-Work	68.0%	30.6%	0.7%	0.7%	100.0%
Eat Out	79.9%	16.2%	1.2%	2.7%	100.0%
Escort	93.8%	5.7%	0.3%	0.3%	100.0%
Shopping	86.3%	10.1%	1.1%	2.4%	100.0%
Social	78.5%	15.5%	1.8%	4.2%	100.0%
Other	85.4%	10.0%	1.5%	3.0%	100.0%
All Purposes	80.9%	11.4%	1.3%	6.5%	100.0%

Alameda County Model

Trip Purpose	Travel Mode: Automobile	Walk	Bicycle	Transit	All Modes
Home-Based Work)	82.0%	3.7%	1.5%	12.8%	100.0%
Home-Based College)	72.7%	14.5%	2.3%	10.5%	100.0%
Home-Based School)	12.4%	52.5%	6.8%	28.3%	100.0%
At-Work	n/a	n/a	n/a	n/a	
Eat Out	n/a	n/a	n/a	n/a	
Escort	n/a	n/a	n/a	n/a	
Home-Based Shopping)	76.5%	15.6%	1.1%	6.8%	100.0%
Home-Based Social/Rec)	80.3%	12.5%	3.0%	4.2%	100.0%
Non-Home Based)	80.2%	14.9%	1.9%	3.0%	100.0%
All Purposes	78.1%	13.1%	2.2%	6.6%	100.0%

Differences

Tour/Trip Purpose	Travel Mode: Automobile	Walk	Bicycle	Transit	All Modes
Work/HB Work	1.6%	-35.5%	-6.8%	7.4%	
University/HB College	14.0%	9.9%	71.5%	-51.5%	
School/HB School	-82.2%	161.4%	385.4%	219.7%	
At-Work	n/a	n/a	n/a	n/a	
Eat Out	n/a	n/a	n/a	n/a	
Escort	n/a	n/a	n/a	n/a	
Shopping/HB Shop	-11.4%	53.8%	0.0%	185.3%	
Social/HB Soc-Rec	2.3%	-19.6%	69.4%	0.0%	
Other/Non Home Based	-6.1%	48.3%	23.8%	0.0%	
All Purposes	-3.4%	15.3%	68.4%	2.2%	

Product 12
Region-Level VMT and VHT by Facility Type and Time Period
Year 2035, Projections 2009 with T-2035 (v 0.1)

VMT

Travel Model One

	Facility Type					
Time Period	Freeways	Expressways	Major Arterials	Collectors	Other	All Facilities
Early AM (3 a.m. - 6 a.m.)	5,983,210	575,266	1,246,569	408,982	384,853	8,598,880
AM Peak (6 a.m. - 10 a.m.)	28,812,866	3,156,321	10,769,575	3,350,577	3,608,840	49,698,178
Midday (10 a.m. - 3 p.m.)	27,622,110	3,142,869	11,197,707	3,118,012	4,450,343	49,531,040
PM Peak (3 p.m. - 7 p.m.)	30,425,475	3,580,714	13,088,378	3,809,172	4,582,817	55,486,556
Evening (7 p.m. - 3 a.m.)	19,280,230	1,929,834	6,211,939	1,841,011	2,340,853	31,603,867
Daily	112,123,890	12,385,004	42,514,168	12,527,754	15,367,706	194,918,522

VHT

Travel Model One

	Facility Type					
Time Period	Freeways	Expressways	Major Arterials	Collectors	Other	All Facilities
Early AM (3 a.m. - 6 a.m.)	98,061	11,752	37,363	14,132	24,694	186,002
AM Peak (6 a.m. - 10 a.m.)	652,595	77,474	369,313	138,079	219,330	1,456,790
Midday (10 a.m. - 3 p.m.)	495,123	67,857	368,419	124,277	257,199	1,312,875
PM Peak (3 p.m. - 7 p.m.)	674,659	88,733	459,436	168,556	264,276	1,655,659
Evening (7 p.m. - 3 a.m.)	323,245	40,049	193,377	65,236	135,570	757,477
Daily	2,243,682	285,865	1,427,907	510,280	901,069	5,368,803

Product 12 (continued)
Region-Level VMT and VHT by Facility Type and Time Period
Year 2035, Projections 2009 with T-2035 (v 0.1)

VMT

Alameda County Model

	Facility Type					
Time Period	Freeways	Expressways	Major Arterials	Collectors	Other	All Facilities
Early AM (3 a.m. - 6 a.m.)	n/a	n/a	n/a	n/a	n/a	n/a
AM Peak (6 a.m. - 10 a.m.)	n/a	n/a	n/a	n/a	n/a	n/a
Midday (10 a.m. - 3 p.m.)	n/a	n/a	n/a	n/a	n/a	n/a
PM Peak (3 p.m. - 7 p.m.)	31,549,820	5,134,965	18,277,076	5,170,017	7,379,971	67,511,849
Evening (7 p.m. - 3 a.m.)	n/a	n/a	n/a	n/a	n/a	n/a
Daily	117,704,555	17,108,720	50,493,301	12,130,526	24,124,372	221,561,473

VHT

Alameda County Model

	Facility Type					
Time Period	Freeways	Expressways	Major Arterials	Collectors	Other	All Facilities
Early AM (3 a.m. - 6 a.m.)	n/a	n/a	n/a	n/a	n/a	n/a
AM Peak (6 a.m. - 10 a.m.)	n/a	n/a	n/a	n/a	n/a	n/a
Midday (10 a.m. - 3 p.m.)	n/a	n/a	n/a	n/a	n/a	n/a
PM Peak (3 p.m. - 7 p.m.)	1,389,409	179,661	827,961	382,126	364,329	3,143,486
Evening (7 p.m. - 3 a.m.)	n/a	n/a	n/a	n/a	n/a	n/a
Daily	3,177,908	416,735	1,709,526	702,380	1,042,842	7,049,390

Product 12 (continued)
Region-Level VMT and VHT by Facility Type and Time Period
Year 2035, Projections 2009 with T-2035 (v 0.1)

VMT

Differences

	Facility Type					
Time Period	Freeways	Expressways	Major Arterials	Collectors	Other	All Facilities
Early AM (3 a.m. - 6 a.m.)	n/a	n/a	n/a	n/a	n/a	n/a
AM Peak (6 a.m. - 10 a.m.)	n/a	n/a	n/a	n/a	n/a	n/a
Midday (10 a.m. - 3 p.m.)	n/a	n/a	n/a	n/a	n/a	n/a
PM Peak (3 p.m. - 7 p.m.)	3.7%	43.4%	39.6%	35.7%	61.0%	21.7%
Evening (7 p.m. - 3 a.m.)	n/a	n/a	n/a	n/a	n/a	n/a
Daily	5.0%	38.1%	18.8%	-3.2%	57.0%	13.7%

VHT

Differences

	Facility Type					
Time Period	Freeways	Expressways	Major Arterials	Collectors	Other	All Facilities
Early AM (3 a.m. - 6 a.m.)	n/a	n/a	n/a	n/a	n/a	n/a
AM Peak (6 a.m. - 10 a.m.)	n/a	n/a	n/a	n/a	n/a	n/a
Midday (10 a.m. - 3 p.m.)	n/a	n/a	n/a	n/a	n/a	n/a
PM Peak (3 p.m. - 7 p.m.)	105.9%	102.5%	80.2%	126.7%	37.9%	89.9%
Evening (7 p.m. - 3 a.m.)	n/a	n/a	n/a	n/a	n/a	n/a
Daily	41.6%	45.8%	19.7%	37.6%	15.7%	31.3%

The Alameda County model estimates significantly higher levels of delay in 2035 compared to the MTC's Travel Model One, as indicated by the comparisons of vehicle hours of travel (VHT). Daily VHT estimates are 31 percent higher and P.M. peak period VHT estimates are 90 percent higher than the MTC model.

The significant differences in vehicle hours appears to be due to the feedback process used for the Travel Model One forecasts, where congested travel times are repeatedly input back to the destination choice process, influencing different destination choices that are closer to origins in order to avoid congestion. The Alameda County model does not include the feedback process used for the Travel Model One. The feedback process used for MTC BAYCAST was a manual process rather than an automated process with established closure criteria, and was therefore difficult to replicate in another modeling system. The Alameda County model therefore represents the total demand for future travel based on the assumptions established in the 2000 calibration. The Alameda County model does not assume that people will significantly change their desired trip destinations due to projected congestion levels. As a result, the Alameda County model may generate more conservative estimates of transportation demand than the MTC's Travel Model One.

The additional congestion forecast by the Alameda County model would also affect the VMT estimates, as drivers may take longer routes between origins and destinations to avoid significant congestion locations.

PRODUCT 13: Estimated average speeds for freeways and non-freeways are compared with the MTC model for the 2035 horizon year. The only time periods that can be directly compared with the Alameda County model are the P.M. peak 4 hour period and daily totals. As stated previously, the Alameda County model does not include traffic assignments for the early A.M., A.M. peak four-hour, midday or evening periods.

The Alameda County model estimates average daily speeds on non-freeway roads within 1.2 percent of the MTC model estimates. Average freeway speeds are 26 percent lower than the MTC model and overall daily speeds are 13.5 percent lower. For the P.M. peak period, the speeds estimated by the Alameda County model are 36 percent lower than the MTC model, with freeway speeds 50 percent lower.

The most likely explanations for the lower speeds in the Alameda County model would be similar to the reasons for the higher VHT estimates. The Alameda County model uses destination choice procedures established during calibration and does not have a feedback process that changes destination choices due to increased future congestion.

Product 13
Region-Level Average Speed (VMT/VHT) by Facility Type and Time Period Year 2035, Projections 2009 with T-2035 (v 0.1)

Travel Model One

	Facility Type		
Time Period	Freeways	All Other Facilities	All Facilities
Early AM (3 a.m. - 6 a.m.)	61.0	29.7	46.2
AM Peak (6 a.m. - 10 a.m.)	44.2	26.0	34.1
Midday (10 a.m. - 3 p.m.)	55.8	26.8	37.7
PM Peak (3 p.m. - 7 p.m.)	45.1	25.5	33.5
Evening (7 p.m. - 3 a.m.)	59.6	28.4	41.7
Daily	50.0	26.5	36.3

Alameda County Model

	Facility Type		
Time Period	Freeways	All Other Facilities	All Facilities
Early AM (3 a.m. - 6 a.m.)	n/a	n/a	n/a
AM Peak (6 a.m. - 10 a.m.)	n/a	n/a	n/a
Midday (10 a.m. - 3 p.m.)	n/a	n/a	n/a
PM Peak (3 p.m. - 7 p.m.)	22.7	20.5	21.5
Evening (7 p.m. - 3 a.m.)	n/a	n/a	n/a
Daily	37.0	26.8	31.4

Differences

	Facility Type		
Time Period	Freeways	All Other Facilities	All Facilities
Early AM (3 a.m. - 6 a.m.)	n/a	n/a	n/a
AM Peak (6 a.m. - 10 a.m.)	n/a	n/a	n/a
Midday (10 a.m. - 3 p.m.)	n/a	n/a	n/a
PM Peak (3 p.m. - 7 p.m.)	-49.7%	-19.8%	-35.8%
Evening (7 p.m. - 3 a.m.)	n/a	n/a	n/a
Daily	-26.0%	1.2%	-13.5%

7 Appendix A: Prior Land Use Allocations

For jurisdictions which did not provide detailed review of the allocations based on *Projections 2009*, the allocations within MTC RTAZs may still resemble the allocations from previous updates. These processes are summarized below.

7.1 Projections 2005 Allocations

The allocation process for Projections 2005 was completed by Economic and Planning Systems (EPS) and was documented in Appendix A of the June, 2007 model report.

7.1.1 Projections 2005 Household Allocations

For year 2000 household allocations, EPS used data from the 2000 United States Census at the census block level to distribute the ABAG P05 households in each MTC RTAZ to the smaller Alameda County Model TAZs. In locations where the Alameda County Model TAZs were even smaller than census blocks, EPS estimated the allocations based on proportional land areas in the Alameda County Model TAZs.

7.1.2 Projections 2005 Employment Allocations

For year 2000 employment allocations, EPS used data from the 2000 United States Census Transportation Planning Package (CTPP) which includes places of work at the census block group level. Block groups are larger than census blocks, and therefore further disaggregation was required to allocate employment to Alameda County Model TAZs. After testing various allocation systems, EPS used allocations based on proportional miles of roadway for each Alameda County Model TAZ within a specific MTC RTAZ or census block group.

7.1.3 Projections 2005 Final Allocations

Initial forecast year (2005, 2015 and 2030) allocations used the P05 forecasts at the MTC RTAZ level and the proportional splits based on the year 2000 allocations.

The initial allocations for all four study years were distributed to the local jurisdictions for review and adjusted based on the review comments.

If a jurisdiction did not adjust allocations to Alameda County Model TAZs during either the P05, P07 or P09 updates, the allocations would still resemble the initial P05 allocations described above. In particular, the allocations of households within an MTC RTAZ would be based on relative land area, and the

allocations of employment within an MTC RTAZ would be based on proportional miles of roadway.

7.2 Projections 2007 Allocations

The P07 land use allocations were not based on the new allocations of ABAG Projections 2007 to individual census tracts and MTC RTAZs within each jurisdiction. It was assumed that the prior local review of P05 allocations would provide a better basis for land uses within each jurisdiction than the new allocations provided by ABAG and MTC.

The initial allocation by Alameda County Model TAZ was based on each jurisdiction's prior review and reallocation of ABAG Projections 2005 to the Alameda County Model TAZs. The proportionate allocations of each land use (such as households or retail employment) to the TAZs within each jurisdiction were applied to the updated control totals for each jurisdiction based on ABAG Projections 2007. For example, if a specific TAZ in Fremont contained 5.8 percent of the manufacturing jobs in Fremont in 2015 according to the final Projections 2005 allocations, then the Projections 2007 allocations would place 5.8 percent of the updated 2015 Fremont manufacturing jobs according to Projections 2007 in that TAZ.

The Projections 2007 allocations for 2035 were based on the final Projections 2005 allocations for 2030.

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8 Appendix B: Detailed Validation Tables

Appendix B is a separate electronic file:

"2000_Validation_Tables_110510.pdf"

Table 1. 2000 Daily Traffic Counts and Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count	Model Volume	Difference	Percent Difference
1 Cordon Line	IN	SF-Oakland Bay Bridge	At County Line	143,664	157,108	13,444	9%
1 Cordon Line	IN	San Mateo Bridge	At County Line	44,085	48,540	4,455	10%
1 Cordon Line	IN	Dumbarton Bridge	At County Line	50,473	51,711	1,238	2%
1 Cordon Line	IN	I-880	At Santa Clara County Line or SR 262	82,270	88,219	5,949	7%
1 Cordon Line	IN	Warm Springs Blvd.	At County Line	14,433	17,347	2,914	20%
1 Cordon Line	IN	I-680	At E. Warren/Scott Creek	71,049	78,266	7,217	10%
1 Cordon Line	IN	Calaveras Road	At County Line	1,323	0	0	0%
1 Cordon Line	IN	Mines Road	At County Line	142	0	0	0%
1 Cordon Line	IN	Tesla Road	At County Line	675	94	-581	-86%
1 Cordon Line	IN	Patterson Pass Road	At County Line	424	0	0	0%
1 Cordon Line	IN	I-580	At Altamont Pass	67,742	79,589	11,847	17%
1 Cordon Line	IN	Altamont Pass Rd.	West of Dyer Road	3,273	227	-3,046	-93%
1 Cordon Line	IN	Grant Line Road	At County Line	1,889	0	-1,889	-100%
1 Cordon Line	IN	Vasco Road	Vasco Road at County Line	12,045	8,177	-3,868	-32%
1 Cordon Line	IN	N. Livermore Ave.	South of Hartford Avenue	2,875	615	-2,260	-79%
1 Cordon Line	IN	Collier Canyon Rd.	At County Line	285	71	-214	-75%
1 Cordon Line	IN	Tassajara Road	At County Line	3,935	1,993	-1,942	-49%
1 Cordon Line	IN	Dougherty Road	At County Line	8,437	2,914	-5,523	-65%
1 Cordon Line	IN	Stagecoach Road	Between Amador Valley and Turquoise St.	2,738	2,184	-554	-20%
1 Cordon Line	IN	Village Parkway	At County Line	6,841	940	-5,901	-86%
1 Cordon Line	IN	Davona Drive	Between Alcosta and Wicklow	2,085	2,062	-23	-1%
1 Cordon Line	IN	I-680	At Contra Costa County Line/Alcosta	79,208	72,611	-6,597	-8%
1 Cordon Line	IN	San Ramon Road	Between Alcosta Ave. and Volmac	18,546	4,644	-13,902	-75%
1 Cordon Line	IN	Crow Canyon Rd.	At County Line	11,531	14,876	3,345	29%
1 Cordon Line	IN	Pinehurst Rd.	At County Line	662	2,277	1,615	244%
1 Cordon Line	IN	Redwood Rd.	East of Skyline	827	2,278	1,451	176%
1 Cordon Line	IN	SR 24	At Caldecott Tunnel	87,628	86,558	-1,070	-1%
1 Cordon Line	IN	Canyon Road	At County Line	0	0	0	0%
1 Cordon Line	IN	Arlington Avenue	At County Line	0	7,289	7,289	0%
1 Cordon Line	IN	Colusa Avenue	At County Line	0	2,116	2,116	0%
1 Cordon Line	IN	San Pablo Avenue	At Solano and Central	13,724	10,842	-2,882	-21%
1 Cordon Line	IN	I-80	At Central	89,348	90,250	902	1%
1 Cordon Line	IN	I-580	At Portola and Albany/Jct 80 East	41,782	53,544	11,762	28%
			Subtotal	**863,939**	**877,936**	**13,997**	**2%**

Table 1. 2000 Daily Traffic Counts and Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count	Model Volume	Difference	Percent Difference
1 Cordon Line	OUT	SF-Oakland Bay Bridge	At County Line	135,218	152,254	17,036	13%
1 Cordon Line	OUT	San Mateo Bridge	At County Line	43,924	48,477	4,553	10%
1 Cordon Line	OUT	Dumbarton Bridge	At County Line	27,494	48,581	21,087	77%
1 Cordon Line	OUT	I-880	At Santa Clara County Line or SR 262	89,815	100,708	10,893	12%
1 Cordon Line	OUT	Warm Springs Blvd.	At County Line	14,020	11,422	-2,598	-19%
1 Cordon Line	OUT	I-680	At E. Warren/Scott Creek	95,672	75,814	-19,858	-21%
1 Cordon Line	OUT	Calaveras Road	At County Line	0	0	0	0%
1 Cordon Line	OUT	Mines Road	At County Line	0	0	0	0%
1 Cordon Line	OUT	Tesla Road	At County Line	1,115	94	-1,021	-92%
1 Cordon Line	OUT	Patterson Pass Road	At County Line	1,180	0	0	0%
1 Cordon Line	OUT	I-580	At Altamont Pass	71,013	78,825	7,812	11%
1 Cordon Line	OUT	Altamont Pass Rd.	West of Dyer Road	2,839	226	-2,613	-92%
1 Cordon Line	OUT	Grant Line Road	At County Line	1,887	0	-1,887	-100%
1 Cordon Line	OUT	Vasco Road	Vasco Road at County Line	11,860	7,671	-4,189	-35%
1 Cordon Line	OUT	N. Livermore Ave.	South of Hartford Avenue	1,671	615	-1,056	-63%
1 Cordon Line	OUT	Collier Canyon Rd.	At County Line	214	71	-143	-67%
1 Cordon Line	OUT	Tassajara Road	At County Line	4,016	2,020	-1,996	-50%
1 Cordon Line	OUT	Dougherty Road	At County Line	10,974	3,068	-7,906	-72%
1 Cordon Line	OUT	Stagecoach Road	Between Amador Valley and Turquoise St.	2,267	1,929	-338	-15%
1 Cordon Line	OUT	Village Parkway	At County Line	5,545	499	-5,046	-91%
1 Cordon Line	OUT	Davona Drive	Between Alcosta and Wicklow	3,847	1,920	-1,927	-50%
1 Cordon Line	OUT	I-680	At Contra Costa County Line/Alcosta	70,068	76,904	6,836	10%
1 Cordon Line	OUT	San Ramon Road	Between Alcosta Ave. and Volmac	11,385	2,858	-8,527	-75%
1 Cordon Line	OUT	Crow Canyon Rd.	At County Line	14,280	15,967	1,687	12%
1 Cordon Line	OUT	Pinehurst Rd.	At County Line	671	2,523	1,852	276%
1 Cordon Line	OUT	Redwood Rd.	East of Skyline	844	2,215	1,371	162%
1 Cordon Line	OUT	SR 24	At Caldecott Tunnel	82,416	77,181	-5,235	-6%
1 Cordon Line	OUT	Canyon Road	At County Line	0	0	0	0%
1 Cordon Line	OUT	Arlington Avenue	At County Line	0	7,049	7,049	0%
1 Cordon Line	OUT	Colusa Avenue	At County Line	0	2,116	2,116	0%
1 Cordon Line	OUT	San Pablo Avenue	At Solano and Central	13,911	11,191	-2,720	-20%
1 Cordon Line	OUT	I-80	At Central	84,530	90,558	6,028	7%
1 Cordon Line	OUT	I-580	At Portola and Albany/Jct 80 East	41,256	55,944	14,688	36%
			Subtotal	**843,932**	**869,535**	**25,602**	**3%**
			Total	**1,707,871**	**1,747,471**	**39,600**	**2%**

Table 1. 2000 Daily Traffic Counts and Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count	Model Volume	Difference	Percent Difference
2 Albany - Berkeley	NB	I-80	Between Gilman and Buchanan	129,500	136,220	6,720	5%
2 Albany - Berkeley	NB	San Pablo Avenue	At Gilman and Marin	12,680	15,302	2,622	21%
2 Albany - Berkeley	NB	Marin Avenue	Near Cityline	8,881	10,858	1,977	22%
2 Albany - Berkeley	NB	Solano Avenue	Near Cityline	5,734	2,277	-3,457	-60%
			Subtotal	**156,795**	**164,657**	**7,862**	**5%**
2 Albany - Berkeley	SB	I-80	Between Gilman and Buchanan	129,500	132,590	3,090	2%
2 Albany - Berkeley	SB	San Pablo Avenue	At Gilman and Marin	14,153	12,809	-1,344	-9%
2 Albany - Berkeley	SB	Marin Avenue	Near Cityline	9,981	11,353	1,372	14%
2 Albany - Berkeley	SB	Solano Avenue	Near Cityline	13,004	2,170	-10,834	-83%
			Subtotal	**166,638**	**158,922**	**-7,716**	**-5%**
			Total	**323,433**	**323,579**	**146**	**0%**
3 Berkeley - Emeryville	NB	I-80	At Powell	127,500	133,064	5,564	4%
3 Berkeley - Emeryville	NB	Seventh	Near Ashby/City Limit	0	4,743	4,743	0%
3 Berkeley - Emeryville	NB	Hollis St.	Near Ashby/City Limit	0	2,925	2,925	0%
3 Berkeley - Emeryville	NB	West Frontage Road	Near Ashby/City Limit	9,613	6,490	-3,123	-32%
3 Berkeley - Emeryville	NB	Shellmound Street	Near Ashby/City Limit	0	3,245	3,245	0%
			Subtotal	**137,113**	**139,555**	**2,442**	**2%**
3 Berkeley - Emeryville	SB	I-80	At Powell	127,500	123,390	-4,110	-3%
3 Berkeley - Emeryville	SB	Seventh	Near Ashby/City Limit	0	4,115	4,115	0%
3 Berkeley - Emeryville	SB	Hollis St.	Near Ashby/City Limit	0	4,032	4,032	0%
3 Berkeley - Emeryville	SB	West Frontage Road	Near Ashby/City Limit	7,855	12,293	4,438	57%
3 Berkeley - Emeryville	SB	Shellmound Street	Near Ashby/City Limit	0	2,156	2,156	0%
			Subtotal	**135,355**	**135,683**	**328**	**0%**
			Total	**272,468**	**275,238**	**2,770**	**1%**

Table 1. 2000 Daily Traffic Counts and Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count	Model Volume	Difference	Percent Difference
4 Berkeley - Oakland	NB	San Pablo Avenue	At Stanford and Ashby Ave.	13,505	8,574	-4,931	-37%
4 Berkeley - Oakland	NB	Sacramento Street	Near City Limits	0	10,479	10,479	0%
4 Berkeley - Oakland	NB	Adeline Street	South of Alcatraz	15,111	12,843	-2,268	-15%
4 Berkeley - Oakland	NB	Shattuck Avenue	Near City Limits	9,039	10,939	1,900	21%
4 Berkeley - Oakland	NB	Telegraph Avenue	Near City Limits	13,946	16,856	2,910	21%
4 Berkeley - Oakland	NB	College Avenue	Near City Limits	6,459	2,218	-4,241	-66%
4 Berkeley - Oakland	NB	Claremont Avenue	South of Ashby	7,044	7,248	204	3%
4 Berkeley - Oakland	NB	Tunnel Road	Near City Limits	17,592	15,987	-1,605	-9%
4 Berkeley - Oakland	NB	Grizzly Peak Blvd.	North of 24	3,292	156	-3,136	-95%
4 Berkeley - Oakland	NB	Fish Ranch Road	North of 24	3,122	4,291	1,169	37%
			Subtotal	**89,110**	**79,111**	**-9,998**	**-11%**
4 Berkeley - Oakland	SB	San Pablo Avenue	At Stanford and Ashby Ave.	13,197	8,546	-4,651	-35%
4 Berkeley - Oakland	SB	Sacramento Street	Near City Limits	0	9,685	9,685	0%
4 Berkeley - Oakland	SB	Adeline Street	South of Alcatraz	13,755	10,908	-2,847	-21%
4 Berkeley - Oakland	SB	Shattuck Avenue	Near City Limits	9,155	10,378	1,223	13%
4 Berkeley - Oakland	SB	Telegraph Avenue	Near City Limits	10,798	7,407	-3,391	-31%
4 Berkeley - Oakland	SB	College Avenue	Near City Limits	6,216	3,460	-2,756	-44%
4 Berkeley - Oakland	SB	Claremont Avenue	South of Ashby	6,862	7,117	255	4%
4 Berkeley - Oakland	SB	Tunnel Road	Near City Limits	18,794	15,958	-2,836	-15%
4 Berkeley - Oakland	SB	Grizzly Peak Blvd.	North of 24	2,927	301	-2,626	-90%
4 Berkeley - Oakland	SB	Fish Ranch Road	North of 24	4,678	10,707	6,029	129%
			Subtotal	**86,382**	**74,782**	**-11,600**	**-13%**
			Total	**175,491**	**153,893**	**-21,598**	**-12%**

Table 1. 2000 Daily Traffic Counts and Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count	Model Volume	Difference	Percent Difference
5 Emeryville - Oakland	NB	I-80	At Powell	127,500	133,064	5,564	4%
5 Emeryville - Oakland	NB	Shellmound Street	Near 40th/City Limit	0	1,396	1,396	0%
5 Emeryville - Oakland	NB	Adeline Street	South of Alcatraz	15,111	12,843	-2,268	-15%
5 Emeryville - Oakland	NB	Hollis St.	Near Powell	0	7,205	7,205	0%
5 Emeryville - Oakland	NB	San Pablo Avenue	At Stanford and Ashby Ave.	11,850	9,192	-2,658	-22%
			Subtotal	**154,461**	**155,099**	**639**	**0%**
5 Emeryville - Oakland	SB	I-80	At Powell	127,500	123,390	-4,110	-3%
5 Emeryville - Oakland	SB	Shellmound Street	Near 40th/City Limit	0	2,225	2,225	0%
5 Emeryville - Oakland	SB	Adeline Street	South of Alcatraz	13,755	10,908	-2,847	-21%
5 Emeryville - Oakland	SB	Hollis St.	Near Powell	0	4,830	4,830	0%
5 Emeryville - Oakland	SB	San Pablo Avenue	At Stanford and Ashby Ave.	11,850	9,955	-1,895	-16%
			Subtotal	**153,105**	**144,253**	**-8,852**	**-6%**
			Total	**307,565**	**299,352**	**-8,213**	**-3%**
6 Oakland - Piedmont	NB	Pleasant Valley	Near City Limits	8,229	7,407	-822	-10%
6 Oakland - Piedmont	NB	Moraga Avenue	Eastern Border	6,728	3,886	-2,842	-42%
6 Oakland - Piedmont	NB	Moraga Avenue	Western Border	4,506	3,652	-854	-19%
6 Oakland - Piedmont	NB	Grand Avenue	Northern Border	5,734	6,445	711	12%
6 Oakland - Piedmont	NB	Grand Avenue	Southern Border	10,592	7,033	-3,559	-34%
6 Oakland - Piedmont	NB	Oakland Avenue	North of Monte Vista	5,074	4,912	-162	-3%
6 Oakland - Piedmont	NB	Lakeshore Avenue	Between Windsor and Walavista Avenue	1,594	219	-1,375	-86%
			Subtotal	**42,457**	**33,554**	**-8,903**	**-21%**
6 Oakland - Piedmont	SB	Pleasant Valley	Near City Limits	7,284	7,615	331	5%
6 Oakland - Piedmont	SB	Moraga Avenue	Eastern Border	6,679	3,828	-2,851	-43%
6 Oakland - Piedmont	SB	Moraga Avenue	Western Border	4,422	3,597	-825	-19%
6 Oakland - Piedmont	SB	Grand Avenue	Northern Border	6,218	5,863	-355	-6%
6 Oakland - Piedmont	SB	Grand Avenue	Southern Border	10,457	6,196	-4,261	-41%
6 Oakland - Piedmont	SB	Oakland Avenue	North of Monte Vista	4,544	6,063	1,519	33%
6 Oakland - Piedmont	SB	Lakeshore Avenue	Between Windsor and Walavista Avenue	1,777	171	-1,606	-90%
			Subtotal	**41,381**	**33,333**	**-8,048**	**-19%**
			Total	**83,838**	**66,887**	**-16,951**	**-20%**

Table 1. 2000 Daily Traffic Counts and Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count	Model Volume	Difference	Percent Difference
7 Alameda - Oakland	NB	Webster-Posey Tubes	Near entrance and exits Oakland side	32,737	29,750	-2,987	-9%
7 Alameda - Oakland	NB	Park St. Bridge	West of Bridge	23,200	23,105	-95	0%
7 Alameda - Oakland	NB	Fruitvale Bridge	West of Bridge	10,746	12,300	1,554	14%
7 Alameda - Oakland	NB	High St. Bridge	West of Bridge	12,710	10,268	-2,442	-19%
7 Alameda - Oakland	NB	Doolittle Street	Near City Limits	14,087	14,356	269	2%
7 Alameda - Oakland	NB	SR 61/Doolittle	North of Hegenberger	13,662	15,736	2,074	15%
			Subtotal	**107,142**	**105,516**	**-1,626**	**-2%**
7 Alameda - Oakland	SB	Webster-Posey Tubes	Near entrance and exits Oakland side	34,980	29,434	-5,546	-16%
7 Alameda - Oakland	SB	Park St. Bridge	West of Bridge	19,428	20,581	1,153	6%
7 Alameda - Oakland	SB	Fruitvale Bridge	West of Bridge	14,696	14,760	64	0%
7 Alameda - Oakland	SB	High St. Bridge	West of Bridge	12,579	11,757	-822	-7%
7 Alameda - Oakland	SB	Doolittle Street	Near City Limits	13,394	15,465	2,071	15%
7 Alameda - Oakland	SB	SR 61/Doolittle	North of Hegenberger	15,169	16,849	1,680	11%
			Subtotal	**110,246**	**108,847**	**-1,399**	**-1%**
			Total	**217,388**	**214,363**	**-3,025**	**-1%**

Table 1. 2000 Daily Traffic Counts and Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count	Model Volume	Difference	Percent Difference
8 Oakland - San Leandro: Along Internat.	EB	Lakeshore Avenue	E/O International	10,142	12,263	2,121	21%
8 Oakland - San Leandro: Along Internat.	EB	Park Blvd - 5th Avenue	E/O International	1,747	498	-1,249	-72%
8 Oakland - San Leandro: Along Internat.	EB	14th Avenue	E/O International	9,375	9,411	36	0%
8 Oakland - San Leandro: Along Internat.	EB	23rd Avenue	E/O International	3,353	1,492	-1,861	-55%
8 Oakland - San Leandro: Along Internat.	EB	Fruitvale Avenue	E/O International	11,265	7,358	-3,907	-35%
8 Oakland - San Leandro: Along Internat.	EB	35th Avenue	E/O International	6,028	2,364	-3,664	-61%
8 Oakland - San Leandro: Along Internat.	EB	42nd/Courtland	E/O International	6,941	13,106	6,165	89%
8 Oakland - San Leandro: Along Internat.	EB	High Street	E/O International	8,103	1,629	-6,474	-80%
8 Oakland - San Leandro: Along Internat.	EB	55th Avenue	E/O International	2,054	1,424	-630	-31%
8 Oakland - San Leandro: Along Internat.	EB	Seminary Avenue	E/O International	5,573	2,688	-2,885	-52%
8 Oakland - San Leandro: Along Internat.	EB	73rd Avenue	E/O International	14,182	12,313	-1,869	-13%
8 Oakland - San Leandro: Along Internat.	EB	82nd Avenue	E/O International	1,681	1,487	-194	-12%
8 Oakland - San Leandro: Along Internat.	EB	98th Avenue	E/O International	10,363	6,560	-3,803	-37%
8 Oakland - San Leandro: Along Internat.	EB	Davis Street (SR 112)	W/O International	12,256	8,192	-4,064	-33%
8 Oakland - San Leandro: Along Internat.	EB	Estudillo	E/O International	4,927	7,182	2,255	46%
			Subtotal	**107,990**	**87,966**	**-20,024**	**-19%**
8 Oakland - San Leandro: Along Internat.	WB	Lakeshore Avenue	E/O International	4,959	3,594	-1,365	-28%
8 Oakland - San Leandro: Along Internat.	WB	Park Blvd - 5th Avenue	E/O International	2,098	948	-1,150	-55%
8 Oakland - San Leandro: Along Internat.	WB	14th Avenue	E/O International	10,973	8,734	-2,239	-20%
8 Oakland - San Leandro: Along Internat.	WB	23rd Avenue	E/O International	3,265	2,148	-1,117	-34%
8 Oakland - San Leandro: Along Internat.	WB	Fruitvale Avenue	E/O International	11,694	7,379	-4,315	-37%
8 Oakland - San Leandro: Along Internat.	WB	35th Avenue	E/O International	6,709	2,361	-4,348	-65%
8 Oakland - San Leandro: Along Internat.	WB	42nd/Courtland	E/O International	7,410	5,896	-1,514	-20%
8 Oakland - San Leandro: Along Internat.	WB	High Street	E/O International	9,213	5,381	-3,832	-42%
8 Oakland - San Leandro: Along Internat.	WB	55th Avenue	E/O International	2,724	1,433	-1,291	-47%
8 Oakland - San Leandro: Along Internat.	WB	Seminary Avenue	E/O International	5,444	2,953	-2,491	-46%
8 Oakland - San Leandro: Along Internat.	WB	73rd Avenue	E/O International	15,098	12,353	-2,745	-18%
8 Oakland - San Leandro: Along Internat.	WB	82nd Avenue	E/O International	2,942	1,522	-1,420	-48%
8 Oakland - San Leandro: Along Internat.	WB	98th Avenue	E/O International	10,957	6,359	-4,598	-42%
8 Oakland - San Leandro: Along Internat.	WB	Davis Street (SR 112)	W/O International	12,959	8,499	-4,460	-34%
8 Oakland - San Leandro: Along Internat.	WB	Estudillo	E/O International	5,625	7,255	1,630	29%
			Subtotal	**112,070**	**76,814**	**-35,256**	**-31%**
			Total	**220,060**	**164,780**	**-55,280**	**-25%**

Table 1. 2000 Daily Traffic Counts and Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count	Model Volume	Difference	Percent Difference
9 Oakland - San Leandro	NB	Doolittle Drive	Near Davis	18,064	25,589	7,525	42%
9 Oakland - San Leandro	NB	I-880	Between Davis and 98th Avenue	104,704	106,599	1,895	2%
9 Oakland - San Leandro	NB	San Leandro Blvd.	Near City Limits	6,340	4,497	-1,843	-29%
9 Oakland - San Leandro	NB	Int'l/E. 14th	Near 98th Avenue	13,997	5,019	-8,978	-64%
9 Oakland - San Leandro	NB	Bancroft Avenue	Near City Limits	4,734	3,451	-1,283	-27%
9 Oakland - San Leandro	NB	MacArthur Blvd.	Near City Limits	5,796	7,582	1,786	31%
9 Oakland - San Leandro	NB	Foothill Blvd.	Near City Limits	3,163	2,757	-406	-13%
9 Oakland - San Leandro	NB	I-580	Between 98th and Estudillo	69,500	100,065	30,565	44%
			Subtotal	**226,298**	**255,558**	**29,260**	**13%**
9 Oakland - San Leandro	SB	Doolittle Drive	Near Davis	17,059	19,536	2,477	15%
9 Oakland - San Leandro	SB	I-880	Between Davis and 98th Avenue	106,102	108,823	2,721	3%
9 Oakland - San Leandro	SB	San Leandro Blvd.	Near City Limits	6,805	4,909	-1,896	-28%
9 Oakland - San Leandro	SB	Int'l/E. 14th	Near 98th Avenue	11,647	5,355	-6,292	-54%
9 Oakland - San Leandro	SB	Bancroft Avenue	Near City Limits	4,924	3,051	-1,873	-38%
9 Oakland - San Leandro	SB	MacArthur Blvd.	Near City Limits	5,796	6,858	1,062	18%
9 Oakland - San Leandro	SB	Foothill Blvd.	Near City Limits	4,195	2,896	-1,299	-31%
9 Oakland - San Leandro	SB	I-580	Between 98th and Estudillo	69,500	107,056	37,556	54%
			Subtotal	**226,028**	**258,483**	**32,455**	**14%**
			Total	**452,326**	**514,041**	**61,715**	**14%**

Table 1. 2000 Daily Traffic Counts and Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count	Model Volume	Difference	Percent Difference
10 Hayward - Union City	NB	Union City Blvd.	Near City Limits	12,550	30,150	17,600	140%
10 Hayward - Union City	NB	I-880	At Industrial Parkway	100,029	110,904	10,875	11%
10 Hayward - Union City	NB	Industrial Pkwy	Near Huntwood	17,152	11,272	-5,880	-34%
10 Hayward - Union City	NB	Whipple Road	Near City Limit on east side of I-880	16,821	11,324	-5,497	-33%
10 Hayward - Union City	NB	Mission Blvd	At Greasel Street	15,394	12,778	-2,616	-17%
			Subtotal	**161,946**	**176,429**	**14,483**	**9%**
10 Hayward - Union City	SB	Union City Blvd.	Near City Limits	12,550	23,521	10,971	87%
10 Hayward - Union City	SB	I-880	At Industrial Parkway	103,056	115,083	12,027	12%
10 Hayward - Union City	SB	Industrial Pkwy	Near Huntwood	19,171	12,169	-7,002	-37%
10 Hayward - Union City	SB	Whipple Road	Near City Limit on east side of I-880	16,829	12,493	-4,336	-26%
10 Hayward - Union City	SB	Mission Blvd	At Greasel Street	17,405	14,809	-2,596	-15%
			Subtotal	**169,011**	**178,075**	**9,064**	**5%**
			Total	**330,957**	**354,503**	**23,546**	**7%**
11 Hayward - Castro Valley	NB	Redwood Rd.	North of Seven Hills	5,682	1,720	-3,962	-70%
11 Hayward - Castro Valley	NB	Crow Canyon Rd.	North of Cold Water Drive	12,882	16,003	3,121	24%
11 Hayward - Castro Valley	NB	I-580	At Crow Canyon	87,108	95,419	8,311	10%
11 Hayward - Castro Valley	NB	Dublin Canyon Road	East of Palomares	1,817	975	-842	-46%
11 Hayward - Castro Valley	NB	Palomares Road	South of Palo Verde Road	971	1,469	498	51%
			Subtotal	**108,460**	**115,585**	**7,125**	**7%**
11 Hayward - Castro Valley	SB	Redwood Rd.	North of Seven Hills	6,526	1,778	-4,748	-73%
11 Hayward - Castro Valley	SB	Crow Canyon Rd.	North of Cold Water Drive	12,797	15,963	3,166	25%
11 Hayward - Castro Valley	SB	I-580	At Crow Canyon	87,532	94,251	6,719	8%
11 Hayward - Castro Valley	SB	Dublin Canyon Road	East of Palomares	2,560	986	-1,574	-61%
11 Hayward - Castro Valley	SB	Palomares Road	South of Palo Verde Road	784	1,484	700	89%
			Subtotal	**110,199**	**114,463**	**4,264**	**4%**
			Total	**218,659**	**230,048**	**11,389**	**5%**

Table 1. 2000 Daily Traffic Counts and Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count	Model Volume	Difference	Percent Difference
12 Union City - Fremont	NB	Ardenwood Blvd.	Near City Limits	12,748	14,059	1,311	10%
12 Union City - Fremont	NB	Alvarado Blvd.	Around Lowry Road	10,398	10,807	409	4%
12 Union City - Fremont	NB	I-880	South of Alvarado-Niles Interchange	101,082	111,916	10,834	11%
12 Union City - Fremont	NB	Decoto Road	South of Alvarado Niles	18,650	24,287	5,637	30%
12 Union City - Fremont	NB	Isherwood Way	Near City Limits	4,761	1,028	-3,733	-78%
12 Union City - Fremont	NB	Alvarado-Niles Rd.	Near City Limits	7,900	7,949	49	1%
12 Union City - Fremont	NB	Mission Blvd	South of Decoto Road	14,733	11,855	-2,878	-20%
			Subtotal	**170,272**	**181,900**	**11,628**	**7%**
12 Union City - Fremont	SB	Ardenwood Blvd.	Near City Limits	11,533	11,457	-76	-1%
12 Union City - Fremont	SB	Alvarado Blvd.	Around Lowry Road	9,838	10,264	426	4%
12 Union City - Fremont	SB	I-880	South of Alvarado-Niles Interchange	101,801	113,799	11,998	12%
12 Union City - Fremont	SB	Decoto Road	South of Alvarado Niles	18,650	24,167	5,517	30%
12 Union City - Fremont	SB	Isherwood Way	Near City Limits	8,764	1,110	-7,654	-87%
12 Union City - Fremont	SB	Alvarado-Niles Rd.	Near City Limits	7,900	7,984	84	1%
12 Union City - Fremont	SB	Mission Blvd	South of Decoto Road	16,352	13,246	-3,106	-19%
			Subtotal	**174,838**	**182,027**	**7,189**	**4%**
			Total	**345,110**	**363,926**	**18,816**	**5%**

Table 1. 2000 Daily Traffic Counts and Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count	Model Volume	Difference	Percent Difference
13 Fremont - Newark	NB	Thornton Ave.	South of SR 84	11,125	4,048	-7,077	-64%
13 Fremont - Newark	NB	Newark Blvd.	South of SR 84	21,000	10,036	-10,964	-52%
13 Fremont - Newark	NB	I-880	Near SR 84	100,177	94,941	-5,236	-5%
13 Fremont - Newark	NB	Thornton Ave.	Near I-880/City Limits	0	20,425	20,425	0%
13 Fremont - Newark	WB	Central Ave.	Near I-880/City Limits	7,112	2,042	-5,070	-71%
13 Fremont - Newark	WB	Mowry Ave.	Near I-880/City Limits	30,348	17,390	-12,958	-43%
13 Fremont - Newark	WB	Stevenson Blvd.	Near I-880/City Limits	7,306	20,037	12,731	174%
13 Fremont - Newark	WB	Cedar Blvd.	Near City Limits	6,125	904	-5,221	-85%
13 Fremont - Newark	WB	Cherry Street	Near City Limits	8,500	5,119	-3,381	-40%
			Subtotal	**191,693**	**154,516**	**-37,177**	**-19%**
13 Fremont - Newark	SB	Thornton Ave.	South of SR 84	11,125	4,615	-6,510	-59%
13 Fremont - Newark	SB	Newark Blvd.	South of SR 84	21,000	12,079	-8,921	-42%
13 Fremont - Newark	SB	I-880	Near SR 84	94,500	100,938	6,438	7%
13 Fremont - Newark	SB	Thornton Ave.	Near I-880/City Limits	0	18,821	18,821	0%
13 Fremont - Newark	EB	Central Ave.	Near I-880/City Limits	8,462	1,992	-6,470	-76%
13 Fremont - Newark	EB	Mowry Ave.	Near I-880/City Limits	30,035	22,548	-7,487	-25%
13 Fremont - Newark	EB	Stevenson Blvd.	Near I-880/City Limits	6,665	11,238	4,573	69%
13 Fremont - Newark	EB	Cedar Blvd.	Near City Limits	6,125	2,600	-3,525	-58%
13 Fremont - Newark	EB	Cherry Street	Near City Limits	8,500	6,553	-1,947	-23%
			Subtotal	**186,412**	**162,563**	**-23,849**	**-13%**
			Total	**378,105**	**317,079**	**-61,026**	**-16%**
14 Fremont - Tri-Valley	NB	Niles Canyon Road	At Palomares	9,828	7,528	-2,300	-23%
14 Fremont - Tri-Valley	NB	I-680	At SR 84 East	52,825	70,127	17,302	33%
14 Fremont - Tri-Valley	NB	Foothill Road	North of Niles Canyon Road	1,247	1,924	677	54%
14 Fremont - Tri-Valley	NB	Pleasanton-Sunol	North of Niles Canyon Road	6,153	2,969	-3,184	-52%
14 Fremont - Tri-Valley	NB	Vallecitos Road	Near Vineyard	13,655	13,647	-8	0%
			Subtotal	**83,708**	**96,196**	**12,488**	**15%**
14 Fremont - Tri-Valley	SB	Niles Canyon Road	At Palomares	11,637	9,056	-2,581	-22%
14 Fremont - Tri-Valley	SB	I-680	At SR 84 East	54,269	69,755	15,486	29%
14 Fremont - Tri-Valley	SB	Foothill Road	North of Niles Canyon Road	3,939	2,040	-1,899	-48%
14 Fremont - Tri-Valley	SB	Pleasanton-Sunol	North of Niles Canyon Road	6,288	3,643	-2,645	-42%
14 Fremont - Tri-Valley	SB	Vallecitos Road	Near Vineyard	11,045	13,953	2,908	26%
			Subtotal	**87,178**	**98,447**	**11,269**	**13%**
			Total	**170,886**	**194,642**	**23,756**	**14%**

Table 1. 2000 Daily Traffic Counts and Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count	Model Volume	Difference	Percent Difference
15 Dublin - Pleasanton	NB	San Ramon Road	Between Dublin and Amador Valley Blvds.	13,446	8,097	-5,349	-40%
15 Dublin - Pleasanton	NB	I-680	North of I-580	79,123	74,852	-4,271	-5%
15 Dublin - Pleasanton	NB	Village Parkway	Between Dublin Blvd. and Lewis Ave.	10,745	4,137	-6,608	-61%
15 Dublin - Pleasanton	NB	Dougherty Road	Between Dublin Blvd. and Sierra Lane	14,768	10,808	-3,960	-27%
15 Dublin - Pleasanton	NB	Hacienda Drive	Between I-580 and Dublin Blvd.	8,873	6,396	-2,477	-28%
15 Dublin - Pleasanton	NB	Tassajara Road	Between I-580 and Dublin Blvd.	9,569	3,060	-6,509	-68%
15 Dublin - Pleasanton	NB	Santa Rita Road	South of I-580	16,055	9,586	-6,469	-40%
15 Dublin - Pleasanton	NB	Hacienda Drive	South of I-580	11,845	14,735	2,889	24%
15 Dublin - Pleasanton	NB	Hopyard Rd.	South of I-580	14,005	17,589	3,585	26%
15 Dublin - Pleasanton	NB	Foothill Road	South of I-580	15,464	15,765	301	2%
			Subtotal	**193,892**	**165,026**	**-28,866**	**-15%**
15 Dublin - Pleasanton	SB	San Ramon Road	Between Dublin and Amador Valley Blvds.	16,789	9,192	-7,597	-45%
15 Dublin - Pleasanton	SB	I-680	North of I-580	79,208	72,611	-6,597	-8%
15 Dublin - Pleasanton	SB	Village Parkway	Between Dublin Blvd. and Lewis Ave.	9,602	5,410	-4,192	-44%
15 Dublin - Pleasanton	SB	Dougherty Road	Between Dublin Blvd. and Sierra Lane	13,561	10,419	-3,142	-23%
15 Dublin - Pleasanton	SB	Hacienda Drive	Between I-580 and Dublin Blvd.	12,677	6,042	-6,635	-52%
15 Dublin - Pleasanton	SB	Tassajara Road	Between I-580 and Dublin Blvd.	10,485	3,070	-7,415	-71%
15 Dublin - Pleasanton	SB	Santa Rita Road	South of I-580	12,605	10,324	-2,281	-18%
15 Dublin - Pleasanton	SB	Hacienda Drive	South of I-580	14,027	17,510	3,482	25%
15 Dublin - Pleasanton	SB	Hopyard Rd.	South of I-580	19,864	17,834	-2,030	-10%
15 Dublin - Pleasanton	SB	Foothill Road	South of I-580	14,041	16,848	2,807	20%
			Subtotal	**202,858**	**169,260**	**-33,599**	**-17%**
			Total	**396,751**	**334,285**	**-62,465**	**-16%**
16 Pleasanton - Livermore	EB	I-580	At Airway	91,710	97,152	5,442	6%
16 Pleasanton - Livermore	EB	Stanley Blvd.	West of Isabel Avenue	15,373	9,193	-6,180	-40%
16 Pleasanton - Livermore	EB	Vineyard Avenue	East of Ruby Hill	4,063	1,323	-2,740	-67%
16 Pleasanton - Livermore	EB	Vallecitos Road	S/O Isabel Avenue	13,963	22,230	8,267	59%
			Subtotal	**125,109**	**129,898**	**4,789**	**4%**
16 Pleasanton - Livermore	WB	I-580	At Airway	94,593	97,625	3,032	3%
16 Pleasanton - Livermore	WB	Stanley Blvd.	West of Isabel Avenue	14,063	9,962	-4,101	-29%
16 Pleasanton - Livermore	WB	Vineyard Avenue	East of Ruby Hill	4,360	1,219	-3,141	-72%
16 Pleasanton - Livermore	WB	Vallecitos Road	S/O Isabel Avenue	13,463	22,363	8,900	66%
			Subtotal	**126,479**	**131,169**	**4,690**	**4%**
			Total	**251,588**	**261,067**	**9,479**	**4%**

Table 2. 2000 AM Peak 1-Hour Traffic Counts and Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count	Model Volume	Difference	Percent Difference
1 Cordon Line	IN	SF-Oakland Bay Bridge	At County Line	7,468	8,190	722	10%
1 Cordon Line	IN	San Mateo Bridge	At County Line	2,757	2,462	-295	-11%
1 Cordon Line	IN	Dumbarton Bridge	At County Line	1,725	1,917	192	11%
1 Cordon Line	IN	I-880	At Santa Clara County Line or SR 262	4,221	5,011	790	19%
1 Cordon Line	IN	Warm Springs Blvd.	At County Line	758	1,344	586	77%
1 Cordon Line	IN	I-680	At E. Warren/Scott Creek	4,745	4,710	-35	-1%
1 Cordon Line	IN	Calaveras Road	At County Line	462	0	0	0%
1 Cordon Line	IN	Mines Road	At County Line	13	0	0	0%
1 Cordon Line	IN	Tesla Road	At County Line	146	9	-137	-94%
1 Cordon Line	IN	Patterson Pass Road	At County Line	158	13	-145	-92%
1 Cordon Line	IN	I-580	At Altamont Pass	4,909	6,313	1,404	29%
1 Cordon Line	IN	Altamont Pass Rd.	West of Dyer Road	702	21	-681	-97%
1 Cordon Line	IN	Grant Line Road	At County Line	657	157	-500	-76%
1 Cordon Line	IN	Vasco Road	Vasco Road at County Line	1,773	1,586	-187	-11%
1 Cordon Line	IN	N. Livermore Ave.	South of Hartford Avenue	755	76	-679	-90%
1 Cordon Line	IN	Collier Canyon Rd.	At County Line	22	1	-21	-95%
1 Cordon Line	IN	Tassajara Road	At County Line	467	274	-193	-41%
1 Cordon Line	IN	Dougherty Road	At County Line	1,301	818	-483	-37%
1 Cordon Line	IN	Stagecoach Road	Between Amador Valley and Turquoise St.	353	339	-14	-4%
1 Cordon Line	IN	Village Parkway	At County Line	431	167	-264	-61%
1 Cordon Line	IN	Davona Drive	Between Alcosta and Wicklow	176	102	-74	-42%
1 Cordon Line	IN	I-680	At Contra Costa County Line/Alcosta	5,459	5,579	120	2%
1 Cordon Line	IN	San Ramon Road	Between Alcosta Ave. and Volmac	2,268	808	-1,460	-64%
1 Cordon Line	IN	Crow Canyon Rd.	At County Line	1,239	1,171	-68	-5%
1 Cordon Line	IN	Pinehurst Rd.	At County Line	97	266	169	174%
1 Cordon Line	IN	Redwood Rd.	East of Skyline	56	217	161	288%
1 Cordon Line	IN	SR 24	At Caldecott Tunnel	8,168	8,544	376	5%
1 Cordon Line	IN	Canyon Road	At County Line	0	0	0	0%
1 Cordon Line	IN	Arlington Avenue	At County Line	0	689	689	0%
1 Cordon Line	IN	Colusa Avenue	At County Line	0	211	211	0%
1 Cordon Line	IN	San Pablo Avenue	At Solano and Central	871	2,006	1,135	130%
1 Cordon Line	IN	I-80	At Central	6,897	6,917	20	0%
1 Cordon Line	IN	I-580	At Portola and Albany/Jct 80 East	3,306	4,061	755	23%
			Subtotal	**62,360**	**63,079**	**719**	**1%**

Table 2. 2000 AM Peak 1-Hour Traffic Counts and Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count	Model Volume	Difference	Percent Difference
1 Cordon Line	OUT	SF-Oakland Bay Bridge	At County Line	8,996	10,520	1,524	17%
1 Cordon Line	OUT	San Mateo Bridge	At County Line	3,449	3,224	-225	-7%
1 Cordon Line	OUT	Dumbarton Bridge	At County Line	2,415	3,910	1,495	62%
1 Cordon Line	OUT	I-880	At Santa Clara County Line or SR 262	4,474	7,145	2,670	60%
1 Cordon Line	OUT	Warm Springs Blvd.	At County Line	692	700	8	1%
1 Cordon Line	OUT	I-680	At E. Warren/Scott Creek	7,735	5,204	-2,531	-33%
1 Cordon Line	OUT	Calaveras Road	At County Line	0	0	0	0%
1 Cordon Line	OUT	Mines Road	At County Line	0	0	0	0%
1 Cordon Line	OUT	Tesla Road	At County Line	18	7	-11	-60%
1 Cordon Line	OUT	Patterson Pass Road	At County Line	9	0	-9	-100%
1 Cordon Line	OUT	I-580	At Altamont Pass	3,120	3,016	-104	-3%
1 Cordon Line	OUT	Altamont Pass Rd.	West of Dyer Road	114	5	-109	-96%
1 Cordon Line	OUT	Grant Line Road	At County Line	22	0	-22	-100%
1 Cordon Line	OUT	Vasco Road	Vasco Road at County Line	383	163	-220	-57%
1 Cordon Line	OUT	N. Livermore Ave.	South of Hartford Avenue	105	24	-81	-77%
1 Cordon Line	OUT	Collier Canyon Rd.	At County Line	9	4	-5	-56%
1 Cordon Line	OUT	Tassajara Road	At County Line	135	88	-47	-35%
1 Cordon Line	OUT	Dougherty Road	At County Line	570	94	-476	-83%
1 Cordon Line	OUT	Stagecoach Road	Between Amador Valley and Turquoise St.	100	66	-34	-34%
1 Cordon Line	OUT	Village Parkway	At County Line	314	63	-251	-80%
1 Cordon Line	OUT	Davona Drive	Between Alcosta and Wicklow	362	281	-81	-22%
1 Cordon Line	OUT	I-680	At Contra Costa County Line/Alcosta	5,118	5,357	239	5%
1 Cordon Line	OUT	San Ramon Road	Between Alcosta Ave. and Volmac	749	311	-438	-59%
1 Cordon Line	OUT	Crow Canyon Rd.	At County Line	1,262	1,042	-220	-17%
1 Cordon Line	OUT	Pinehurst Rd.	At County Line	44	173	129	293%
1 Cordon Line	OUT	Redwood Rd.	East of Skyline	102	130	28	28%
1 Cordon Line	OUT	SR 24	At Caldecott Tunnel	3,724	4,043	319	9%
1 Cordon Line	OUT	Canyon Road	At County Line	0	0	0	0%
1 Cordon Line	OUT	Arlington Avenue	At County Line	0	224	224	0%
1 Cordon Line	OUT	Colusa Avenue	At County Line	0	76	76	0%
1 Cordon Line	OUT	San Pablo Avenue	At Solano and Central	419	313	-106	-25%
1 Cordon Line	OUT	I-80	At Central	3,612	3,999	387	11%
1 Cordon Line	OUT	I-580	At Portola and Albany/Jct 80 East	2,470	3,039	569	23%
			Subtotal	**50,522**	**52,922**	**2,399**	**5%**
			Total	**112,882**	**116,001**	**3,119**	**3%**

Table 2. 2000 AM Peak 1-Hour Traffic Counts and Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count	Model Volume	Difference	Percent Difference
2 Albany - Berkeley	NB	I-80	Between Gilman and Buchanan	6,122	6,884	762	12%
2 Albany - Berkeley	NB	San Pablo Avenue	At Gilman and Marin	297	306	9	3%
2 Albany - Berkeley	NB	Marin Avenue	Near Cityline	623	773	150	24%
2 Albany - Berkeley	NB	Solano Avenue	Near Cityline	253	150	-103	-41%
			Subtotal	**7,295**	**8,113**	**818**	**11%**
2 Albany - Berkeley	SB	I-80	Between Gilman and Buchanan	9,976	10,291	315	3%
2 Albany - Berkeley	SB	San Pablo Avenue	At Gilman and Marin	1,074	1,969	895	83%
2 Albany - Berkeley	SB	Marin Avenue	Near Cityline	768	1,058	290	38%
2 Albany - Berkeley	SB	Solano Avenue	Near Cityline	829	198	-631	-76%
			Subtotal	**12,647**	**13,517**	**869**	**7%**
			Total	**19,943**	**21,630**	**1,687**	**8%**
3 Berkeley - Emeryville	NB	I-80	At Powell	5,693	8,009	2,316	41%
3 Berkeley - Emeryville	NB	Seventh	Near Ashby/City Limit	0	417	417	0%
3 Berkeley - Emeryville	NB	Hollis St.	Near Ashby/City Limit	0	105	105	0%
3 Berkeley - Emeryville	NB	West Frontage Road	Near Ashby/City Limit	1,208	286	-922	-76%
3 Berkeley - Emeryville	NB	Shellmound Street	Near Ashby/City Limit	0	98	98	0%
			Subtotal	**6,901**	**8,295**	**1,394**	**20%**
3 Berkeley - Emeryville	SB	I-80	At Powell	9,076	9,228	152	2%
3 Berkeley - Emeryville	SB	Seventh	Near Ashby/City Limit	0	140	140	0%
3 Berkeley - Emeryville	SB	Hollis St.	Near Ashby/City Limit	0	343	343	0%
3 Berkeley - Emeryville	SB	West Frontage Road	Near Ashby/City Limit	1,160	1,207	47	4%
3 Berkeley - Emeryville	SB	Shellmound Street	Near Ashby/City Limit	0	334	334	0%
			Subtotal	**10,236**	**10,435**	**199**	**2%**
			Total	**17,137**	**18,730**	**1,593**	**9%**

Table 2. 2000 AM Peak 1-Hour Traffic Counts and Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count	Model Volume	Difference	Percent Difference
4 Berkeley - Oakland	NB	San Pablo Avenue	At Stanford and Ashby Ave.	596	452	-144	-24%
4 Berkeley - Oakland	NB	Sacramento Street	Near City Limits	0	760	760	0%
4 Berkeley - Oakland	NB	Adeline Street	South of Alcatraz	1,568	1,069	-500	-32%
4 Berkeley - Oakland	NB	Shattuck Avenue	Near City Limits	810	994	184	23%
4 Berkeley - Oakland	NB	Telegraph Avenue	Near City Limits	1,181	2,001	820	69%
4 Berkeley - Oakland	NB	College Avenue	Near City Limits	441	547	106	24%
4 Berkeley - Oakland	NB	Claremont Avenue	South of Ashby	468	740	272	58%
4 Berkeley - Oakland	NB	Tunnel Road	Near City Limits	1,384	1,052	-332	-24%
4 Berkeley - Oakland	NB	Grizzly Peak Blvd.	North of 24	238	46	-192	-81%
4 Berkeley - Oakland	NB	Fish Ranch Road	North of 24	313	858	545	174%
			Subtotal	**6,999**	**7,758**	**758**	**11%**
4 Berkeley - Oakland	SB	San Pablo Avenue	At Stanford and Ashby Ave.	732	1,148	416	57%
4 Berkeley - Oakland	SB	Sacramento Street	Near City Limits	0	982	982	0%
4 Berkeley - Oakland	SB	Adeline Street	South of Alcatraz	1,462	854	-607	-42%
4 Berkeley - Oakland	SB	Shattuck Avenue	Near City Limits	555	823	268	48%
4 Berkeley - Oakland	SB	Telegraph Avenue	Near City Limits	800	562	-238	-30%
4 Berkeley - Oakland	SB	College Avenue	Near City Limits	326	165	-161	-49%
4 Berkeley - Oakland	SB	Claremont Avenue	South of Ashby	613	763	150	24%
4 Berkeley - Oakland	SB	Tunnel Road	Near City Limits	1,171	943	-228	-19%
4 Berkeley - Oakland	SB	Grizzly Peak Blvd.	North of 24	292	51	-241	-82%
4 Berkeley - Oakland	SB	Fish Ranch Road	North of 24	449	502	53	12%
			Subtotal	**6,400**	**5,811**	**-589**	**-9%**
			Total	**13,399**	**13,568**	**169**	**1%**

Table 2. 2000 AM Peak 1-Hour Traffic Counts and Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count	Model Volume	Difference	Percent Difference
5 Emeryville - Oakland	NB	I-80	At Powell	5,693	8,009	2,316	41%
5 Emeryville - Oakland	NB	Shellmound Street	Near 40th/City Limit	0	155	155	0%
5 Emeryville - Oakland	NB	Adeline Street	South of Alcatraz	1,568	1,069	-500	-32%
5 Emeryville - Oakland	NB	Hollis St.	Near Powell	0	383	383	0%
5 Emeryville - Oakland	NB	San Pablo Avenue	At Stanford and Ashby Ave.	803	636	-167	-21%
			Subtotal	**8,065**	**9,714**	**1,650**	**20%**
5 Emeryville - Oakland	SB	I-80	At Powell	9,076	9,228	152	2%
5 Emeryville - Oakland	SB	Shellmound Street	Near 40th/City Limit	0	77	77	0%
5 Emeryville - Oakland	SB	Adeline Street	South of Alcatraz	1,462	854	-607	-42%
5 Emeryville - Oakland	SB	Hollis St.	Near Powell	0	314	314	0%
5 Emeryville - Oakland	SB	San Pablo Avenue	At Stanford and Ashby Ave.	931	1,114	183	20%
			Subtotal	**11,468**	**11,196**	**-272**	**-2%**
			Total	**19,533**	**20,910**	**1,377**	**7%**
6 Oakland - Piedmont	NB	Pleasant Valley	Near City Limits	585	529	-56	-10%
6 Oakland - Piedmont	NB	Moraga Avenue	Eastern Border	784	458	-326	-42%
6 Oakland - Piedmont	NB	Moraga Avenue	Western Border	616	404	-212	-34%
6 Oakland - Piedmont	NB	Grand Avenue	Northern Border	440	743	303	69%
6 Oakland - Piedmont	NB	Grand Avenue	Southern Border	799	710	-89	-11%
6 Oakland - Piedmont	NB	Oakland Avenue	North of Monte Vista	302	230	-72	-24%
6 Oakland - Piedmont	NB	Lakeshore Avenue	Between Windsor and Walavista Avenue	96	12	-84	-87%
			Subtotal	**3,622**	**3,087**	**-535**	**-15%**
6 Oakland - Piedmont	SB	Pleasant Valley	Near City Limits	386	915	529	137%
6 Oakland - Piedmont	SB	Moraga Avenue	Eastern Border	373	292	-81	-22%
6 Oakland - Piedmont	SB	Moraga Avenue	Western Border	237	288	51	22%
6 Oakland - Piedmont	SB	Grand Avenue	Northern Border	334	385	51	15%
6 Oakland - Piedmont	SB	Grand Avenue	Southern Border	612	523	-89	-15%
6 Oakland - Piedmont	SB	Oakland Avenue	North of Monte Vista	641	706	65	10%
6 Oakland - Piedmont	SB	Lakeshore Avenue	Between Windsor and Walavista Avenue	200	17	-183	-91%
			Subtotal	**2,783**	**3,126**	**343**	**12%**
			Total	**6,405**	**6,214**	**-191**	**-3%**

Table 2. 2000 AM Peak 1-Hour Traffic Counts and Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count	Model Volume	Difference	Percent Difference
7 Alameda - Oakland	EB	Webster-Posey Tubes	Near entrance and exits Oakland side	3,048	2,607	-441	-14%
7 Alameda - Oakland	EB	Park St. Bridge	West of Bridge	2,292	2,018	-274	-12%
7 Alameda - Oakland	EB	Fruitvale Bridge	West of Bridge	1,017	1,152	135	13%
7 Alameda - Oakland	EB	High St. Bridge	West of Bridge	1,157	638	-519	-45%
7 Alameda - Oakland	EB	Doolittle Street	Near City Limits	1,167	1,012	-155	-13%
7 Alameda - Oakland	EB	SR 61/Doolittle	North of Hegenberger	599	1,199	600	100%
			Subtotal	**9,280**	**8,626**	**-654**	**-7%**
7 Alameda - Oakland	WB	Webster-Posey Tubes	Near entrance and exits Oakland side	2,440	2,160	-280	-11%
7 Alameda - Oakland	WB	Park St. Bridge	West of Bridge	1,149	1,435	286	25%
7 Alameda - Oakland	WB	Fruitvale Bridge	West of Bridge	1,014	1,308	294	29%
7 Alameda - Oakland	WB	High St. Bridge	West of Bridge	815	836	21	3%
7 Alameda - Oakland	WB	Doolittle Street	Near City Limits	1,035	1,449	414	40%
7 Alameda - Oakland	WB	SR 61/Doolittle	North of Hegenberger	949	1,397	448	47%
			Subtotal	**7,402**	**8,586**	**1,184**	**16%**
			Total	**16,682**	**17,211**	**529**	**3%**

Table 2. 2000 AM Peak 1-Hour Traffic Counts and Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count	Model Volume	Difference	Percent Difference
8 Oakland - San Leandro: Along International	EB	Lakeshore Avenue	E/O International	477	572	95	20%
8 Oakland - San Leandro: Along International	EB	Park Blvd - 5th Avenue	E/O International	89	17	-72	-81%
8 Oakland - San Leandro: Along International	EB	14th Avenue	E/O International	469	415	-54	-11%
8 Oakland - San Leandro: Along International	EB	23rd Avenue	E/O International	166	63	-103	-62%
8 Oakland - San Leandro: Along International	EB	Fruitvale Avenue	E/O International	675	418	-257	-38%
8 Oakland - San Leandro: Along International	EB	35th Avenue	E/O International	348	162	-186	-53%
8 Oakland - San Leandro: Along International	EB	42nd/Courtland	E/O International	326	692	366	112%
8 Oakland - San Leandro: Along International	EB	High Street	E/O International	667	86	-581	-87%
8 Oakland - San Leandro: Along International	EB	55th Avenue	E/O International	106	60	-46	-43%
8 Oakland - San Leandro: Along International	EB	Seminary Avenue	E/O International	294	125	-169	-57%
8 Oakland - San Leandro: Along International	EB	73rd Avenue	E/O International	670	670	0	0%
8 Oakland - San Leandro: Along International	EB	82nd Avenue	E/O International	95	67	-28	-29%
8 Oakland - San Leandro: Along International	EB	98th Avenue	E/O International	591	339	-252	-43%
8 Oakland - San Leandro: Along International	EB	Davis Street (SR 112)	W/O International	588	321	-266	-45%
8 Oakland - San Leandro: Along International	EB	Estudillo	E/O International	295	308	13	4%
			Subtotal	**5,856**	**4,316**	**-1,539**	**-26%**
8 Oakland - San Leandro: Along International	WB	Lakeshore Avenue	E/O International	274	324	50	18%
8 Oakland - San Leandro: Along International	WB	Park Blvd - 5th Avenue	E/O International	177	142	-35	-20%
8 Oakland - San Leandro: Along International	WB	14th Avenue	E/O International	1,081	1,326	245	23%
8 Oakland - San Leandro: Along International	WB	23rd Avenue	E/O International	263	258	-5	-2%
8 Oakland - San Leandro: Along International	WB	Fruitvale Avenue	E/O International	779	816	37	5%
8 Oakland - San Leandro: Along International	WB	35th Avenue	E/O International	633	271	-362	-57%
8 Oakland - San Leandro: Along International	WB	42nd/Courtland	E/O International	776	828	52	7%
8 Oakland - San Leandro: Along International	WB	High Street	E/O International	487	555	68	14%
8 Oakland - San Leandro: Along International	WB	55th Avenue	E/O International	217	195	-22	-10%
8 Oakland - San Leandro: Along International	WB	Seminary Avenue	E/O International	401	369	-32	-8%
8 Oakland - San Leandro: Along International	WB	73rd Avenue	E/O International	1,181	1,391	210	18%
8 Oakland - San Leandro: Along International	WB	82nd Avenue	E/O International	197	157	-40	-20%
8 Oakland - San Leandro: Along International	WB	98th Avenue	E/O International	797	732	-65	-8%
8 Oakland - San Leandro: Along International	WB	Davis Street (SR 112)	W/O International	1,010	953	-57	-6%
8 Oakland - San Leandro: Along International	WB	Estudillo	E/O International	467	805	338	72%
			Subtotal	**8,740**	**9,123**	**383**	**4%**
			Total	**14,596**	**13,439**	**-1,157**	**-8%**

Table 2. 2000 AM Peak 1-Hour Traffic Counts and Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count	Model Volume	Difference	Percent Difference
9 Oakland - San Leandro	NB	Doolittle Drive	Near Davis	1,299	2,026	727	56%
9 Oakland - San Leandro	NB	I-880	Between Davis and 98th Avenue	7,281	8,027	746	10%
9 Oakland - San Leandro	NB	San Leandro Blvd.	Near City Limits	356	712	356	100%
9 Oakland - San Leandro	NB	Int'l/E. 14th	Near 98th Avenue	575	508	-67	-12%
9 Oakland - San Leandro	NB	Bancroft Avenue	Near City Limits	268	222	-46	-17%
9 Oakland - San Leandro	NB	MacArthur Blvd.	Near City Limits	0	480	480	0%
9 Oakland - San Leandro	NB	Foothill Blvd.	Near City Limits	305	195	-110	-36%
9 Oakland - San Leandro	NB	I-580	Between 98th and Estudillo	5,948	7,778	1,830	31%
			Subtotal	**16,032**	**19,469**	**3,437**	**21%**
9 Oakland - San Leandro	SB	Doolittle Drive	Near Davis	866	1,039	173	20%
9 Oakland - San Leandro	SB	I-880	Between Davis and 98th Avenue	6,746	6,659	-87	-1%
9 Oakland - San Leandro	SB	San Leandro Blvd.	Near City Limits	370	240	-130	-35%
9 Oakland - San Leandro	SB	Int'l/E. 14th	Near 98th Avenue	477	332	-145	-30%
9 Oakland - San Leandro	SB	Bancroft Avenue	Near City Limits	299	209	-90	-30%
9 Oakland - San Leandro	SB	MacArthur Blvd.	Near City Limits	294	360	66	22%
9 Oakland - San Leandro	SB	Foothill Blvd.	Near City Limits	276	165	-111	-40%
9 Oakland - San Leandro	SB	I-580	Between 98th and Estudillo	5,455	6,776	1,321	24%
			Subtotal	**14,783**	**15,779**	**996**	**7%**
			Total	**30,815**	**35,248**	**4,433**	**14%**

Table 2. 2000 AM Peak 1-Hour Traffic Counts and Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count	Model Volume	Difference	Percent Difference
10 Hayward - Union City	NB	Union City Blvd.	Near City Limits	0	2,187	2,187	0%
10 Hayward - Union City	NB	I-880	At Industrial Parkway	5,500	7,870	2,370	43%
10 Hayward - Union City	NB	Industrial Pkwy	Near Huntwood	1,124	819	-305	-27%
10 Hayward - Union City	NB	Whipple Road	Near City Limit on east side of I-880	1,046	640	-406	-39%
10 Hayward - Union City	NB	Mission Blvd	At Greasel Street	1,100	1,317	217	20%
			Subtotal	**8,770**	**10,646**	**1,876**	**21%**
10 Hayward - Union City	SB	Union City Blvd.	Near City Limits	0	1,417	1,417	0%
10 Hayward - Union City	SB	I-880	At Industrial Parkway	5,630	7,390	1,760	31%
10 Hayward - Union City	SB	Industrial Pkwy	Near Huntwood	1,612	1,032	-580	-36%
10 Hayward - Union City	SB	Whipple Road	Near City Limit on east side of I-880	1,011	790	-221	-22%
10 Hayward - Union City	SB	Mission Blvd	At Greasel Street	1,816	1,174	-642	-35%
			Subtotal	**10,069**	**10,387**	**318**	**3%**
			Total	**18,839**	**21,033**	**2,194**	**12%**
11 Hayward - Castro Valley	NB	Redwood Rd.	North of Seven Hills	383	125	-258	-67%
11 Hayward - Castro Valley	NB	Crow Canyon Rd.	North of Cold Water Drive	1,323	1,006	-317	-24%
11 Hayward - Castro Valley	NB	I-580	At Crow Canyon	6,801	4,398	-2,403	-35%
11 Hayward - Castro Valley	NB	Dublin Canyon Road	East of Palomares	135	243	108	80%
11 Hayward - Castro Valley	NB	Palomares Road	South of Palo Verde Road	74	94	20	27%
			Subtotal	**8,716**	**5,866**	**-2,850**	**-33%**
11 Hayward - Castro Valley	SB	Redwood Rd.	North of Seven Hills	679	151	-528	-78%
11 Hayward - Castro Valley	SB	Crow Canyon Rd.	North of Cold Water Drive	1,331	1,175	-156	-12%
11 Hayward - Castro Valley	SB	I-580	At Crow Canyon	6,442	8,404	1,962	30%
11 Hayward - Castro Valley	SB	Dublin Canyon Road	East of Palomares	269	82	-187	-69%
11 Hayward - Castro Valley	SB	Palomares Road	South of Palo Verde Road	76	134	58	77%
			Subtotal	**8,797**	**9,946**	**1,149**	**13%**
			Total	**17,513**	**15,812**	**-1,701**	**-10%**

Table 2. 2000 AM Peak 1-Hour Traffic Counts and Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count	Model Volume	Difference	Percent Difference
12 Union City - Fremont	NB	Ardenwood Blvd.	Near City Limits	627	649	22	3%
12 Union City - Fremont	NB	Alvarado Blvd.	Around Lowry Road	553	931	378	68%
12 Union City - Fremont	NB	I-880	South of Alvarado-Niles Interchange	6,373	7,610	1,237	19%
12 Union City - Fremont	NB	Decoto Road	South of Alvarado Niles	0	1,333	1,333	0%
12 Union City - Fremont	NB	Isherwood Way	Near City Limits	278	32	-246	-89%
12 Union City - Fremont	NB	Alvarado-Niles Rd.	Near City Limits	0	996	996	0%
12 Union City - Fremont	NB	Mission Blvd	South of Decoto Road	1,324	1,104	-220	-17%
			Subtotal	**9,155**	**10,326**	**1,171**	**13%**
12 Union City - Fremont	SB	Ardenwood Blvd.	Near City Limits	1,438	1,198	-240	-17%
12 Union City - Fremont	SB	Alvarado Blvd.	Around Lowry Road	728	739	11	2%
12 Union City - Fremont	SB	I-880	South of Alvarado-Niles Interchange	6,228	7,489	1,261	20%
12 Union City - Fremont	SB	Decoto Road	South of Alvarado Niles	0	2,073	2,073	0%
12 Union City - Fremont	SB	Isherwood Way	Near City Limits	706	180	-526	-74%
12 Union City - Fremont	SB	Alvarado-Niles Rd.	Near City Limits	0	243	243	0%
12 Union City - Fremont	SB	Mission Blvd	South of Decoto Road	1,308	928	-380	-29%
			Subtotal	**10,408**	**10,535**	**127**	**1%**
			Total	**19,563**	**20,861**	**1,298**	**7%**

Table 2. 2000 AM Peak 1-Hour Traffic Counts and Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count	Model Volume	Difference	Percent Difference
13 Fremont - Newark	NB	Thornton Ave.	South of SR 84	0	186	186	0%
13 Fremont - Newark	NB	Newark Blvd.	South of SR 84	0	844	844	0%
13 Fremont - Newark	NB	I-880	Near SR 84	5,595	6,309	714	13%
13 Fremont - Newark	NB	Thornton Ave.	Near I-880/City Limits	0	1,502	1,502	0%
13 Fremont - Newark	WB	Central Ave.	Near I-880/City Limits	552	140	-412	-75%
13 Fremont - Newark	WB	Mowry Ave.	Near I-880/City Limits	1,853	1,550	-303	-16%
13 Fremont - Newark	WB	Stevenson Blvd.	Near I-880/City Limits	798	1,950	1,152	144%
13 Fremont - Newark	WB	Cedar Blvd.	Near City Limits	0	14	14	0%
13 Fremont - Newark	WB	Cherry Street	Near City Limits	0	174	174	0%
			Subtotal	**8,798**	**9,949**	**1,151**	**13%**
13 Fremont - Newark	SB	Thornton Ave.	South of SR 84	0	362	362	0%
13 Fremont - Newark	SB	Newark Blvd.	South of SR 84	0	816	816	0%
13 Fremont - Newark	SB	I-880	Near SR 84	5,781	7,304	1,523	26%
13 Fremont - Newark	SB	Thornton Ave.	Near I-880/City Limits	0	1,192	1,192	0%
13 Fremont - Newark	EB	Central Ave.	Near I-880/City Limits	578	110	-468	-81%
13 Fremont - Newark	EB	Mowry Ave.	Near I-880/City Limits	1,799	910	-889	-49%
13 Fremont - Newark	EB	Stevenson Blvd.	Near I-880/City Limits	492	438	-54	-11%
13 Fremont - Newark	EB	Cedar Blvd.	Near City Limits	0	217	217	0%
13 Fremont - Newark	EB	Cherry Street	Near City Limits	0	1,128	1,128	0%
			Subtotal	**8,650**	**8,761**	**111**	**1%**
			Total	**17,448**	**18,711**	**1,263**	**7%**
14 Fremont - Tri-Valley	NB	Niles Canyon Road	At Palomares	551	280	-271	-49%
14 Fremont - Tri-Valley	NB	I-680	At SR 84 East	3,193	3,669	476	15%
14 Fremont - Tri-Valley	NB	Foothill Road	North of Niles Canyon Road	0	28	28	0%
14 Fremont - Tri-Valley	NB	Pleasanton-Sunol	North of Niles Canyon Road	525	154	-371	-71%
14 Fremont - Tri-Valley	NB	Vallecitos Road	Near Vineyard	461	755	294	64%
			Subtotal	**4,730**	**4,857**	**127**	**3%**
14 Fremont - Tri-Valley	SB	Niles Canyon Road	At Palomares	1,335	1,589	254	19%
14 Fremont - Tri-Valley	SB	I-680	At SR 84 East	4,679	5,892	1,213	26%
14 Fremont - Tri-Valley	SB	Foothill Road	North of Niles Canyon Road	1,547	497	-1,050	-68%
14 Fremont - Tri-Valley	SB	Pleasanton-Sunol	North of Niles Canyon Road	667	962	295	44%
14 Fremont - Tri-Valley	SB	Vallecitos Road	Near Vineyard	927	939	12	1%
			Subtotal	**9,155**	**9,880**	**725**	**8%**
			Total	**13,885**	**14,737**	**852**	**6%**

Table 2. 2000 AM Peak 1-Hour Traffic Counts and Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count	Model Volume	Difference	Percent Difference
15 Dublin - Pleasanton	NB	San Ramon Road	Between Dublin and Amador Valley Blvds.	898	292	-606	-68%
15 Dublin - Pleasanton	NB	I-680	North of I-580	5,644	5,235	-409	-7%
15 Dublin - Pleasanton	NB	Village Parkway	Between Dublin Blvd. and Lewis Ave.	488	168	-320	-66%
15 Dublin - Pleasanton	NB	Dougherty Road	Between Dublin Blvd. and Sierra Lane	997	667	-330	-33%
15 Dublin - Pleasanton	NB	Hacienda Drive	Between I-580 and Dublin Blvd.	839	514	-325	-39%
15 Dublin - Pleasanton	NB	Tassajara Road	Between I-580 and Dublin Blvd.	908	170	-738	-81%
15 Dublin - Pleasanton	NB	Santa Rita Road	South of I-580	930	762	-168	-18%
15 Dublin - Pleasanton	NB	Hacienda Drive	South of I-580	508	410	-99	-19%
15 Dublin - Pleasanton	NB	Hopyard Rd.	South of I-580	895	1,633	738	83%
15 Dublin - Pleasanton	NB	Foothill Road	South of I-580	935	829	-106	-11%
			Subtotal	**13,042**	**10,679**	**-2,363**	**-18%**
15 Dublin - Pleasanton	SB	San Ramon Road	Between Dublin and Amador Valley Blvds.	1,614	1,703	89	5%
15 Dublin - Pleasanton	SB	I-680	North of I-580	5,459	5,579	120	2%
15 Dublin - Pleasanton	SB	Village Parkway	Between Dublin Blvd. and Lewis Ave.	665	784	119	18%
15 Dublin - Pleasanton	SB	Dougherty Road	Between Dublin Blvd. and Sierra Lane	1,399	1,162	-237	-17%
15 Dublin - Pleasanton	SB	Hacienda Drive	Between I-580 and Dublin Blvd.	878	375	-503	-57%
15 Dublin - Pleasanton	SB	Tassajara Road	Between I-580 and Dublin Blvd.	820	373	-447	-54%
15 Dublin - Pleasanton	SB	Santa Rita Road	South of I-580	1,422	995	-427	-30%
15 Dublin - Pleasanton	SB	Hacienda Drive	South of I-580	1,735	1,175	-559	-32%
15 Dublin - Pleasanton	SB	Hopyard Rd.	South of I-580	2,185	1,704	-481	-22%
15 Dublin - Pleasanton	SB	Foothill Road	South of I-580	1,466	1,434	-33	-2%
			Subtotal	**17,643**	**15,285**	**-2,358**	**-13%**
			Total	**30,685**	**25,964**	**-4,722**	**-15%**
16 Pleasanton - Livermore	EB	I-580	At Airway	4,264	4,869	605	14%
16 Pleasanton - Livermore	EB	Stanley Blvd.	West of Isabel Avenue	530	380	-150	-28%
16 Pleasanton - Livermore	EB	Vineyard Avenue	East of Ruby Hill	184	115	-69	-37%
16 Pleasanton - Livermore	EB	Vallecitos Road	S/O Isabel Avenue	555	1,048	493	89%
			Subtotal	**5,533**	**6,412**	**879**	**16%**
16 Pleasanton - Livermore	WB	I-580	At Airway	7,895	8,122	227	3%
16 Pleasanton - Livermore	WB	Stanley Blvd.	West of Isabel Avenue	2,023	2,071	48	2%
16 Pleasanton - Livermore	WB	Vineyard Avenue	East of Ruby Hill	697	394	-303	-44%
16 Pleasanton - Livermore	WB	Vallecitos Road	S/O Isabel Avenue	1,418	1,584	166	12%
			Subtotal	**12,033**	**12,171**	**138**	**1%**
			Total	**17,566**	**18,582**	**1,016**	**6%**

Table 3. 2000 PM Peak 1-Hour Traffic Counts and Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count	Model Volume	Difference	Percent Difference
1 Cordon Line	IN	SF-Oakland Bay Bridge	At County Line	9,563	10,477	914	10%
1 Cordon Line	IN	San Mateo Bridge	At County Line	2,934	3,917	983	33%
1 Cordon Line	IN	Dumbarton Bridge	At County Line	5,447	4,772	-675	-12%
1 Cordon Line	IN	I-880	At Santa Clara County Line or SR 262	6,088	5,707	-380	-6%
1 Cordon Line	IN	Warm Springs Blvd.	At County Line	1,693	900	-793	-47%
1 Cordon Line	IN	I-680	At E. Warren/Scott Creek	5,546	5,003	-543	-10%
1 Cordon Line	IN	Calaveras Road	At County Line	64	0	0	0%
1 Cordon Line	IN	Mines Road	At County Line	16	0	0	0%
1 Cordon Line	IN	Tesla Road	At County Line	32	5	-27	-84%
1 Cordon Line	IN	Patterson Pass Road	At County Line	8	0	0	0%
1 Cordon Line	IN	I-580	At Altamont Pass	3,544	3,103	-441	-12%
1 Cordon Line	IN	Altamont Pass Rd.	West of Dyer Road	105	9	-96	-91%
1 Cordon Line	IN	Grant Line Road	At County Line	37	0	0	0%
1 Cordon Line	IN	Vasco Road	Vasco Road at County Line	434	347	-87	-20%
1 Cordon Line	IN	N. Livermore Ave.	South of Hartford Avenue	203	43	-160	-79%
1 Cordon Line	IN	Collier Canyon Rd.	At County Line	32	7	-25	-78%
1 Cordon Line	IN	Tassajara Road	At County Line	272	140	-132	-49%
1 Cordon Line	IN	Dougherty Road	At County Line	666	253	-413	-62%
1 Cordon Line	IN	Stagecoach Road	Between Amador Valley and Turquoise St.	230	220	-10	-4%
1 Cordon Line	IN	Village Parkway	At County Line	666	196	-470	-71%
1 Cordon Line	IN	Davona Drive	Between Alcosta and Wicklow	234	277	43	18%
1 Cordon Line	IN	I-680	At Contra Costa County Line/Alcosta	5,781	5,286	-495	-9%
1 Cordon Line	IN	San Ramon Road	Between Alcosta Ave. and Volmac	1,535	520	-1,015	-66%
1 Cordon Line	IN	Crow Canyon Rd.	At County Line	1,271	1,064	-207	-16%
1 Cordon Line	IN	Pinehurst Rd.	At County Line	58	215	157	271%
1 Cordon Line	IN	Redwood Rd.	East of Skyline	123	179	56	46%
1 Cordon Line	IN	SR 24	At Caldecott Tunnel	5,079	4,622	-457	-9%
1 Cordon Line	IN	Canyon Road	At County Line	0	0	0	0%
1 Cordon Line	IN	Arlington Avenue	At County Line	0	451	451	0%
1 Cordon Line	IN	Colusa Avenue	At County Line	0	154	154	0%
1 Cordon Line	IN	San Pablo Avenue	At Solano and Central	800	814	14	2%
1 Cordon Line	IN	I-80	At Central	4,616	5,466	850	18%
1 Cordon Line	IN	I-580	At Portola and Albany/Jct 80 East	2,890	3,799	909	31%
			Subtotal	**59,967**	**57,342**	**-2,625**	**-4%**

Table 3. 2000 PM Peak 1-Hour Traffic Counts and Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count	Model Volume	Difference	Percent Difference
1 Cordon Line	OUT	SF-Oakland Bay Bridge	At County Line	8,113	6,473	-1,640	-20%
1 Cordon Line	OUT	San Mateo Bridge	At County Line	2,779	2,721	-58	-2%
1 Cordon Line	OUT	Dumbarton Bridge	At County Line	1,086	2,394	1,308	120%
1 Cordon Line	OUT	I-880	At Santa Clara County Line or SR 262	5,994	6,720	726	12%
1 Cordon Line	OUT	Warm Springs Blvd.	At County Line	1,652	1,281	-371	-22%
1 Cordon Line	OUT	I-680	At E. Warren/Scott Creek	5,742	5,013	-729	-13%
1 Cordon Line	OUT	Calaveras Road	At County Line	0	0	0	0%
1 Cordon Line	OUT	Mines Road	At County Line	0	0	0	0%
1 Cordon Line	OUT	Tesla Road	At County Line	187	7	-180	-96%
1 Cordon Line	OUT	Patterson Pass Road	At County Line	152	4	-148	-97%
1 Cordon Line	OUT	I-580	At Altamont Pass	5,612	5,908	296	5%
1 Cordon Line	OUT	Altamont Pass Rd.	West of Dyer Road	481	22	-459	-95%
1 Cordon Line	OUT	Grant Line Road	At County Line	410	12	-398	-97%
1 Cordon Line	OUT	Vasco Road	Vasco Road at County Line	1,612	1,503	-109	-7%
1 Cordon Line	OUT	N. Livermore Ave.	South of Hartford Avenue	183	100	-83	-45%
1 Cordon Line	OUT	Collier Canyon Rd.	At County Line	18	3	-15	-82%
1 Cordon Line	OUT	Tassajara Road	At County Line	376	409	33	9%
1 Cordon Line	OUT	Dougherty Road	At County Line	1,614	730	-884	-55%
1 Cordon Line	OUT	Stagecoach Road	Between Amador Valley and Turquoise St.	265	326	61	23%
1 Cordon Line	OUT	Village Parkway	At County Line	556	125	-431	-77%
1 Cordon Line	OUT	Davona Drive	Between Alcosta and Wicklow	363	97	-266	-73%
1 Cordon Line	OUT	I-680	At Contra Costa County Line/Alcosta	5,138	6,827	1,689	33%
1 Cordon Line	OUT	San Ramon Road	Between Alcosta Ave. and Volmac	1,185	651	-534	-45%
1 Cordon Line	OUT	Crow Canyon Rd.	At County Line	1,564	1,178	-386	-25%
1 Cordon Line	OUT	Pinehurst Rd.	At County Line	116	374	258	222%
1 Cordon Line	OUT	Redwood Rd.	East of Skyline	82	291	209	255%
1 Cordon Line	OUT	SR 24	At Caldecott Tunnel	7,353	7,915	562	8%
1 Cordon Line	OUT	Canyon Road	At County Line	0	0	0	0%
1 Cordon Line	OUT	Arlington Avenue	At County Line	0	720	720	0%
1 Cordon Line	OUT	Colusa Avenue	At County Line	0	339	339	0%
1 Cordon Line	OUT	San Pablo Avenue	At Solano and Central	1,314	2,080	766	58%
1 Cordon Line	OUT	I-80	At Central	6,213	6,967	754	12%
1 Cordon Line	OUT	I-580	At Portola and Albany/Jct 80 East	3,341	4,283	942	28%
			Subtotal	**63,501**	**64,413**	**913**	**1%**
			Total	**123,467**	**121,755**	**-1,712**	**-1%**

Table 3. 2000 PM Peak 1-Hour Traffic Counts and Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count	Model Volume	Difference	Percent Difference
2 Albany - Berkeley	NB	I-80	Between Gilman and Buchanan	9,766	10,237	471	5%
2 Albany - Berkeley	NB	San Pablo Avenue	At Gilman and Marin	1,356	2,005	649	48%
2 Albany - Berkeley	NB	Marin Avenue	Near Cityline	830	1,157	327	39%
2 Albany - Berkeley	NB	Solano Avenue	Near Cityline	440	161	-279	-63%
			Subtotal	**12,392**	**13,561**	**1,169**	**9%**
2 Albany - Berkeley	SB	I-80	Between Gilman and Buchanan	6,727	8,346	1,619	24%
2 Albany - Berkeley	SB	San Pablo Avenue	At Gilman and Marin	919	957	38	4%
2 Albany - Berkeley	SB	Marin Avenue	Near Cityline	772	1,016	244	32%
2 Albany - Berkeley	SB	Solano Avenue	Near Cityline	978	163	-815	-83%
			Subtotal	**9,396**	**10,482**	**1,087**	**12%**
			Total	**21,788**	**24,043**	**2,255**	**10%**
3 Berkeley - Emeryville	NB	I-80	At Powell	8,186	9,471	1,285	16%
3 Berkeley - Emeryville	NB	Seventh	Near Ashby/City Limit	0	408	408	0%
3 Berkeley - Emeryville	NB	Hollis St.	Near Ashby/City Limit	0	378	378	0%
3 Berkeley - Emeryville	NB	West Frontage Road	Near Ashby/City Limit	754	1,002	248	33%
3 Berkeley - Emeryville	NB	Shellmound Street	Near Ashby/City Limit	0	439	439	0%
			Subtotal	**8,940**	**10,473**	**1,533**	**17%**
3 Berkeley - Emeryville	SB	I-80	At Powell	6,500	7,842	1,342	21%
3 Berkeley - Emeryville	SB	Seventh	Near Ashby/City Limit	0	360	360	0%
3 Berkeley - Emeryville	SB	Hollis St.	Near Ashby/City Limit	0	227	227	0%
3 Berkeley - Emeryville	SB	West Frontage Road	Near Ashby/City Limit	493	984	491	100%
3 Berkeley - Emeryville	SB	Shellmound Street	Near Ashby/City Limit	0	115	115	0%
			Subtotal	**6,993**	**8,826**	**1,833**	**26%**
			Total	**15,933**	**19,299**	**3,366**	**21%**

Table 3. 2000 PM Peak 1-Hour Traffic Counts and Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count	Model Volume	Difference	Percent Difference
4 Berkeley - Oakland	NB	San Pablo Avenue	At Stanford and Ashby Ave.	1,190	1,468	278	23%
4 Berkeley - Oakland	NB	Sacramento Street	Near City Limits	0	1,211	1,211	0%
4 Berkeley - Oakland	NB	Adeline Street	South of Alcatraz	1,454	1,073	-381	-26%
4 Berkeley - Oakland	NB	Shattuck Avenue	Near City Limits	695	975	280	40%
4 Berkeley - Oakland	NB	Telegraph Avenue	Near City Limits	982	1,360	378	39%
4 Berkeley - Oakland	NB	College Avenue	Near City Limits	430	181	-249	-58%
4 Berkeley - Oakland	NB	Claremont Avenue	South of Ashby	710	770	60	9%
4 Berkeley - Oakland	NB	Tunnel Road	Near City Limits	1,165	999	-166	-14%
4 Berkeley - Oakland	NB	Grizzly Peak Blvd.	North of 24	439	174	-265	-60%
4 Berkeley - Oakland	NB	Fish Ranch Road	North of 24	218	706	488	224%
			Subtotal	**7,283**	**7,707**	**425**	**6%**
4 Berkeley - Oakland	SB	San Pablo Avenue	At Stanford and Ashby Ave.	1,006	877	-129	-13%
4 Berkeley - Oakland	SB	Sacramento Street	Near City Limits	0	726	726	0%
4 Berkeley - Oakland	SB	Adeline Street	South of Alcatraz	1,289	759	-530	-41%
4 Berkeley - Oakland	SB	Shattuck Avenue	Near City Limits	815	919	104	13%
4 Berkeley - Oakland	SB	Telegraph Avenue	Near City Limits	1,354	1,656	302	22%
4 Berkeley - Oakland	SB	College Avenue	Near City Limits	461	376	-85	-19%
4 Berkeley - Oakland	SB	Claremont Avenue	South of Ashby	515	670	155	30%
4 Berkeley - Oakland	SB	Tunnel Road	Near City Limits	1,631	1,055	-576	-35%
4 Berkeley - Oakland	SB	Grizzly Peak Blvd.	North of 24	269	51	-218	-81%
4 Berkeley - Oakland	SB	Fish Ranch Road	North of 24	706	826	120	17%
			Subtotal	**8,046**	**7,190**	**-856**	**-11%**
			Total	**15,329**	**14,898**	**-432**	**-3%**

Table 3. 2000 PM Peak 1-Hour Traffic Counts and Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count	Model Volume	Difference	Percent Difference
5 Emeryville - Oakland	NB	I-80	At Powell	8,186	9,471	1,285	16%
5 Emeryville - Oakland	NB	Shellmound Street	Near 40th/City Limit	0	93	93	0%
5 Emeryville - Oakland	NB	Adeline Street	South of Alcatraz	1,454	1,073	-381	-26%
5 Emeryville - Oakland	NB	Hollis St.	Near Powell	0	501	501	0%
5 Emeryville - Oakland	NB	San Pablo Avenue	At Stanford and Ashby Ave.	1,268	1,395	127	10%
			Subtotal	**10,907**	**11,939**	**1,032**	**9%**
5 Emeryville - Oakland	SB	I-80	At Powell	6,500	7,842	1,342	21%
5 Emeryville - Oakland	SB	Shellmound Street	Near 40th/City Limit	0	339	339	0%
5 Emeryville - Oakland	SB	Adeline Street	South of Alcatraz	1,289	759	-530	-41%
5 Emeryville - Oakland	SB	Hollis St.	Near Powell	0	500	500	0%
5 Emeryville - Oakland	SB	San Pablo Avenue	At Stanford and Ashby Ave.	909	1,158	248	27%
			Subtotal	**8,699**	**9,759**	**1,060**	**12%**
			Total	**19,606**	**21,698**	**2,092**	**11%**
6 Oakland - Piedmont	NB	Pleasant Valley	Near City Limits	745	1,104	359	48%
6 Oakland - Piedmont	NB	Moraga Avenue	Eastern Border	602	375	-227	-38%
6 Oakland - Piedmont	NB	Moraga Avenue	Western Border	342	398	56	16%
6 Oakland - Piedmont	NB	Grand Avenue	Northern Border	507	651	144	28%
6 Oakland - Piedmont	NB	Grand Avenue	Southern Border	950	853	-97	-10%
6 Oakland - Piedmont	NB	Oakland Avenue	North of Monte Vista	680	667	-13	-2%
6 Oakland - Piedmont	NB	Lakeshore Avenue	Between Windsor and Walavista Avenue	189	33	-156	-83%
			Subtotal	**4,015**	**4,080**	**65**	**2%**
6 Oakland - Piedmont	SB	Pleasant Valley	Near City Limits	735	794	59	8%
6 Oakland - Piedmont	SB	Moraga Avenue	Eastern Border	743	589	-154	-21%
6 Oakland - Piedmont	SB	Moraga Avenue	Western Border	506	616	110	22%
6 Oakland - Piedmont	SB	Grand Avenue	Northern Border	632	783	151	24%
6 Oakland - Piedmont	SB	Grand Avenue	Southern Border	1,018	829	-189	-19%
6 Oakland - Piedmont	SB	Oakland Avenue	North of Monte Vista	289	425	136	47%
6 Oakland - Piedmont	SB	Lakeshore Avenue	Between Windsor and Walavista Avenue	146	17	-129	-89%
			Subtotal	**4,069**	**4,052**	**-17**	**0%**
			Total	**8,084**	**8,132**	**48**	**1%**

Table 3. 2000 PM Peak 1-Hour Traffic Counts and Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count	Model Volume	Difference	Percent Difference
7 Alameda - Oakland	EB	Webster-Posey Tubes	Near entrance and exits Oakland side	2,385	2,193	-192	-8%
7 Alameda - Oakland	EB	Park St. Bridge	West of Bridge	1,693	1,554	-139	-8%
7 Alameda - Oakland	EB	Fruitvale Bridge	West of Bridge	836	1,172	336	40%
7 Alameda - Oakland	EB	High St. Bridge	West of Bridge	950	627	-323	-34%
7 Alameda - Oakland	EB	Doolittle Street	Near City Limits	1,339	1,635	296	22%
7 Alameda - Oakland	EB	SR 61/Doolittle	North of Hegenberger	935	1,631	696	74%
			Subtotal	**8,138**	**8,813**	**675**	**8%**
7 Alameda - Oakland	WB	Webster-Posey Tubes	Near entrance and exits Oakland side	3,634	3,028	-606	-17%
7 Alameda - Oakland	WB	Park St. Bridge	West of Bridge	1,773	1,861	88	5%
7 Alameda - Oakland	WB	Fruitvale Bridge	West of Bridge	1,437	1,571	134	9%
7 Alameda - Oakland	WB	High St. Bridge	West of Bridge	1,166	986	-180	-15%
7 Alameda - Oakland	WB	Doolittle Street	Near City Limits	1,311	1,188	-123	-9%
7 Alameda - Oakland	WB	SR 61/Doolittle	North of Hegenberger	1,376	1,370	-6	0%
			Subtotal	**10,697**	**10,005**	**-692**	**-6%**
			Total	**18,835**	**18,818**	**-17**	**0%**

Table 3. 2000 PM Peak 1-Hour Traffic Counts and Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count	Model Volume	Difference	Percent Difference
8 Oakland - San Leandro: Along International	EB	Lakeshore Avenue	E/O International	1,231	1,525	294	24%
8 Oakland - San Leandro: Along International	EB	Park Blvd - 5th Avenue	E/O International	232	78	-154	-66%
8 Oakland - San Leandro: Along International	EB	14th Avenue	E/O International	1,083	1,603	520	48%
8 Oakland - San Leandro: Along International	EB	23rd Avenue	E/O International	302	196	-106	-35%
8 Oakland - San Leandro: Along International	EB	Fruitvale Avenue	E/O International	965	712	-253	-26%
8 Oakland - San Leandro: Along International	EB	35th Avenue	E/O International	664	309	-355	-53%
8 Oakland - San Leandro: Along International	EB	42nd/Courtland	E/O International	727	1,502	775	107%
8 Oakland - San Leandro: Along International	EB	High Street	E/O International	543	274	-269	-50%
8 Oakland - San Leandro: Along International	EB	55th Avenue	E/O International	212	211	-1	-1%
8 Oakland - San Leandro: Along International	EB	Seminary Avenue	E/O International	511	419	-92	-18%
8 Oakland - San Leandro: Along International	EB	73rd Avenue	E/O International	1,347	1,583	236	18%
8 Oakland - San Leandro: Along International	EB	82nd Avenue	E/O International	143	190	47	33%
8 Oakland - San Leandro: Along International	EB	98th Avenue	E/O International	826	884	58	7%
8 Oakland - San Leandro: Along International	EB	Davis Street (SR 112)	W/O International	1,168	871	-297	-25%
8 Oakland - San Leandro: Along International	EB	Estudillo	E/O International	511	674	163	32%
			Subtotal	**10,465**	**11,029**	**564**	**5%**
8 Oakland - San Leandro: Along International	WB	Lakeshore Avenue	E/O International	559	237	-322	-58%
8 Oakland - San Leandro: Along International	WB	Park Blvd - 5th Avenue	E/O International	148	41	-107	-72%
8 Oakland - San Leandro: Along International	WB	14th Avenue	E/O International	757	1,051	294	39%
8 Oakland - San Leandro: Along International	WB	23rd Avenue	E/O International	240	137	-103	-43%
8 Oakland - San Leandro: Along International	WB	Fruitvale Avenue	E/O International	822	653	-169	-21%
8 Oakland - San Leandro: Along International	WB	35th Avenue	E/O International	445	220	-225	-51%
8 Oakland - San Leandro: Along International	WB	42nd/Courtland	E/O International	486	605	119	24%
8 Oakland - San Leandro: Along International	WB	High Street	E/O International	803	343	-460	-57%
8 Oakland - San Leandro: Along International	WB	55th Avenue	E/O International	200	113	-87	-43%
8 Oakland - San Leandro: Along International	WB	Seminary Avenue	E/O International	429	241	-188	-44%
8 Oakland - San Leandro: Along International	WB	73rd Avenue	E/O International	1,027	828	-199	-19%
8 Oakland - San Leandro: Along International	WB	82nd Avenue	E/O International	227	120	-107	-47%
8 Oakland - San Leandro: Along International	WB	98th Avenue	E/O International	727	501	-226	-31%
8 Oakland - San Leandro: Along International	WB	Davis Street (SR 112)	W/O International	917	516	-401	-44%
8 Oakland - San Leandro: Along International	WB	Estudillo	E/O International	428	498	70	16%
			Subtotal	**8,215**	**6,104**	**-2,111**	**-26%**
			Total	**18,680**	**17,133**	**-1,547**	**-8%**

Table 3. 2000 PM Peak 1-Hour Traffic Counts and Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count	Model Volume	Difference	Percent Difference
9 Oakland - San Leandro	NB	Doolittle Drive	Near Davis	1,228	2,040	812	66%
9 Oakland - San Leandro	NB	I-880	Between Davis and 98th Avenue	7,038	7,548	510	7%
9 Oakland - San Leandro	NB	San Leandro Blvd.	Near City Limits	543	388	-155	-29%
9 Oakland - San Leandro	NB	Int'l/E. 14th	Near 98th Avenue	1,069	592	-477	-45%
9 Oakland - San Leandro	NB	Bancroft Avenue	Near City Limits	465	411	-54	-12%
9 Oakland - San Leandro	NB	MacArthur Blvd.	Near City Limits	481	541	60	12%
9 Oakland - San Leandro	NB	Foothill Blvd.	Near City Limits	289	202	-87	-30%
9 Oakland - San Leandro	NB	I-580	Between 98th and Estudillo	5,863	7,453	1,590	27%
			Subtotal	**16,976**	**19,174**	**2,199**	**13%**
9 Oakland - San Leandro	SB	Doolittle Drive	Near Davis	1,671	2,028	357	21%
9 Oakland - San Leandro	SB	I-880	Between Davis and 98th Avenue	7,312	7,664	352	5%
9 Oakland - San Leandro	SB	San Leandro Blvd.	Near City Limits	638	660	22	3%
9 Oakland - San Leandro	SB	Int'l/E. 14th	Near 98th Avenue	985	682	-303	-31%
9 Oakland - San Leandro	SB	Bancroft Avenue	Near City Limits	455	259	-196	-43%
9 Oakland - San Leandro	SB	MacArthur Blvd.	Near City Limits	431	443	12	3%
9 Oakland - San Leandro	SB	Foothill Blvd.	Near City Limits	433	222	-211	-49%
9 Oakland - San Leandro	SB	I-580	Between 98th and Estudillo	6,398	7,951	1,553	24%
			Subtotal	**18,323**	**19,908**	**1,585**	**9%**
			Total	**35,299**	**39,083**	**3,784**	**11%**

Table 3. 2000 PM Peak 1-Hour Traffic Counts and Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count	Model Volume	Difference	Percent Difference
10 Hayward - Union City	NB	Union City Blvd.	Near City Limits	0	2,144	2,144	0%
10 Hayward - Union City	NB	I-880	At Industrial Parkway	6,160	7,751	1,591	26%
10 Hayward - Union City	NB	Industrial Pkwy	Near Huntwood	1,275	1,171	-104	-8%
10 Hayward - Union City	NB	Whipple Road	Near City Limit on east side of I-880	1,224	737	-487	-40%
10 Hayward - Union City	NB	Mission Blvd	At Greasel Street	1,622	1,572	-50	-3%
			Subtotal	**10,281**	**11,231**	**950**	**9%**
10 Hayward - Union City	SB	Union City Blvd.	Near City Limits	0	2,170	2,170	0%
10 Hayward - Union City	SB	I-880	At Industrial Parkway	5,763	8,115	2,352	41%
10 Hayward - Union City	SB	Industrial Pkwy	Near Huntwood	1,188	816	-372	-31%
10 Hayward - Union City	SB	Whipple Road	Near City Limit on east side of I-880	1,142	1,077	-65	-6%
10 Hayward - Union City	SB	Mission Blvd	At Greasel Street	1,240	1,617	377	30%
			Subtotal	**9,333**	**11,624**	**2,291**	**25%**
			Total	**19,614**	**22,855**	**3,241**	**17%**
11 Hayward - Castro Valley	NB	Redwood Rd.	North of Seven Hills	604	219	-385	-64%
11 Hayward - Castro Valley	NB	Crow Canyon Rd.	North of Cold Water Drive	1,194	1,151	-43	-4%
11 Hayward - Castro Valley	NB	I-580	At Crow Canyon	6,617	8,141	1,524	23%
11 Hayward - Castro Valley	NB	Dublin Canyon Road	East of Palomares	212	110	-102	-48%
11 Hayward - Castro Valley	NB	Palomares Road	South of Palo Verde Road	90	142	52	58%
			Subtotal	**8,717**	**9,764**	**1,047**	**12%**
11 Hayward - Castro Valley	SB	Redwood Rd.	North of Seven Hills	398	170	-228	-57%
11 Hayward - Castro Valley	SB	Crow Canyon Rd.	North of Cold Water Drive	1,489	1,073	-416	-28%
11 Hayward - Castro Valley	SB	I-580	At Crow Canyon	6,704	5,877	-827	-12%
11 Hayward - Castro Valley	SB	Dublin Canyon Road	East of Palomares	464	279	-185	-40%
11 Hayward - Castro Valley	SB	Palomares Road	South of Palo Verde Road	75	112	37	50%
			Subtotal	**9,130**	**7,511**	**-1,619**	**-18%**
			Total	**17,847**	**17,275**	**-572**	**-3%**

Table 3. 2000 PM Peak 1-Hour Traffic Counts and Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count	Model Volume	Difference	Percent Difference
12 Union City - Fremont	NB	Ardenwood Blvd.	Near City Limits	1,784	1,729	-55	-3%
12 Union City - Fremont	NB	Alvarado Blvd.	Around Lowry Road	1,049	1,221	172	16%
12 Union City - Fremont	NB	I-880	South of Alvarado-Niles Interchange	6,606	7,602	996	15%
12 Union City - Fremont	NB	Decoto Road	South of Alvarado Niles	0	2,110	2,110	0%
12 Union City - Fremont	NB	Isherwood Way	Near City Limits	609	298	-311	-51%
12 Union City - Fremont	NB	Alvarado-Niles Rd.	Near City Limits	0	512	512	0%
12 Union City - Fremont	NB	Mission Blvd	South of Decoto Road	1,366	1,263	-103	-8%
			Subtotal	**11,414**	**12,113**	**699**	**6%**
12 Union City - Fremont	SB	Ardenwood Blvd.	Near City Limits	716	946	230	32%
12 Union City - Fremont	SB	Alvarado Blvd.	Around Lowry Road	735	1,257	522	71%
12 Union City - Fremont	SB	I-880	South of Alvarado-Niles Interchange	6,374	7,339	965	15%
12 Union City - Fremont	SB	Decoto Road	South of Alvarado Niles	0	1,956	1,956	0%
12 Union City - Fremont	SB	Isherwood Way	Near City Limits	986	78	-908	-92%
12 Union City - Fremont	SB	Alvarado-Niles Rd.	Near City Limits	0	951	951	0%
12 Union City - Fremont	SB	Mission Blvd	South of Decoto Road	1,436	1,542	106	7%
			Subtotal	**10,247**	**11,162**	**915**	**9%**
			Total	**21,661**	**23,275**	**1,614**	**7%**

Table 3. 2000 PM Peak 1-Hour Traffic Counts and Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count	Model Volume	Difference	Percent Difference
13 Fremont - Newark	NB	Thornton Ave.	South of SR 84	0	396	396	0%
13 Fremont - Newark	NB	Newark Blvd.	South of SR 84	0	1,053	1,053	0%
13 Fremont - Newark	NB	I-880	Near SR 84	6,876	7,486	610	9%
13 Fremont - Newark	NB	Thornton Ave.	Near I-880/City Limits	0	1,473	1,473	0%
13 Fremont - Newark	WB	Central Ave.	Near I-880/City Limits	603	156	-447	-74%
13 Fremont - Newark	WB	Mowry Ave.	Near I-880/City Limits	2,142	1,053	-1,089	-51%
13 Fremont - Newark	WB	Stevenson Blvd.	Near I-880/City Limits	639	1,117	478	75%
13 Fremont - Newark	WB	Cedar Blvd.	Near City Limits	0	81	81	0%
13 Fremont - Newark	WB	Cherry Street	Near City Limits	0	791	791	0%
			Subtotal	**10,260**	**9,812**	**-448**	**-4%**
13 Fremont - Newark	SB	Thornton Ave.	South of SR 84	0	318	318	0%
13 Fremont - Newark	SB	Newark Blvd.	South of SR 84	0	1,439	1,439	0%
13 Fremont - Newark	SB	I-880	Near SR 84	5,916	6,396	480	8%
13 Fremont - Newark	SB	Thornton Ave.	Near I-880/City Limits	0	1,376	1,376	0%
13 Fremont - Newark	EB	Central Ave.	Near I-880/City Limits	919	219	-700	-76%
13 Fremont - Newark	EB	Mowry Ave.	Near I-880/City Limits	2,524	1,841	-683	-27%
13 Fremont - Newark	EB	Stevenson Blvd.	Near I-880/City Limits	698	1,077	379	54%
13 Fremont - Newark	EB	Cedar Blvd.	Near City Limits	0	105	105	0%
13 Fremont - Newark	EB	Cherry Street	Near City Limits	0	597	597	0%
			Subtotal	**10,057**	**9,534**	**-523**	**-5%**
			Total	**20,317**	**19,346**	**-971**	**-5%**
14 Fremont - Tri-Valley	NB	Niles Canyon Road	At Palomares	1,041	1,206	165	16%
14 Fremont - Tri-Valley	NB	I-680	At SR 84 East	4,864	5,069	205	4%
14 Fremont - Tri-Valley	NB	Foothill Road	North of Niles Canyon Road	238	275	37	16%
14 Fremont - Tri-Valley	NB	Pleasanton-Sunol	North of Niles Canyon Road	515	687	172	33%
14 Fremont - Tri-Valley	NB	Vallecitos Road	Near Vineyard	1,469	918	-551	-38%
			Subtotal	**8,127**	**8,156**	**29**	**0%**
14 Fremont - Tri-Valley	SB	Niles Canyon Road	At Palomares	755	567	-188	-25%
14 Fremont - Tri-Valley	SB	I-680	At SR 84 East	3,567	3,962	395	11%
14 Fremont - Tri-Valley	SB	Foothill Road	North of Niles Canyon Road	0	99	99	0%
14 Fremont - Tri-Valley	SB	Pleasanton-Sunol	North of Niles Canyon Road	0	183	183	0%
14 Fremont - Tri-Valley	SB	Vallecitos Road	Near Vineyard	435	801	366	84%
			Subtotal	**4,757**	**5,331**	**574**	**12%**
			Total	**12,884**	**13,486**	**602**	**5%**

Table 3. 2000 PM Peak 1-Hour Traffic Counts and Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count	Model Volume	Difference	Percent Difference
15 Dublin - Pleasanton	NB	San Ramon Road	Between Dublin and Amador Valley Blvds.	1,478	1,366	-112	-8%
15 Dublin - Pleasanton	NB	I-680	North of I-580	6,622	6,605	-17	0%
15 Dublin - Pleasanton	NB	Village Parkway	Between Dublin Blvd. and Lewis Ave.	945	668	-277	-29%
15 Dublin - Pleasanton	NB	Dougherty Road	Between Dublin Blvd. and Sierra Lane	1,502	1,462	-40	-3%
15 Dublin - Pleasanton	NB	Hacienda Drive	Between I-580 and Dublin Blvd.	877	517	-360	-41%
15 Dublin - Pleasanton	NB	Tassajara Road	Between I-580 and Dublin Blvd.	669	510	-159	-24%
15 Dublin - Pleasanton	NB	Santa Rita Road	South of I-580	1,858	1,258	-600	-32%
15 Dublin - Pleasanton	NB	Hacienda Drive	South of I-580	1,861	1,580	-281	-15%
15 Dublin - Pleasanton	NB	Hopyard Rd.	South of I-580	1,906	2,577	671	35%
15 Dublin - Pleasanton	NB	Foothill Road	South of I-580	2,157	1,829	-328	-15%
			Subtotal	**19,876**	**18,372**	**-1,504**	**-8%**
15 Dublin - Pleasanton	SB	San Ramon Road	Between Dublin and Amador Valley Blvds.	1,165	665	-500	-43%
15 Dublin - Pleasanton	SB	I-680	North of I-580	5,781	5,286	-495	-9%
15 Dublin - Pleasanton	SB	Village Parkway	Between Dublin Blvd. and Lewis Ave.	755	535	-220	-29%
15 Dublin - Pleasanton	SB	Dougherty Road	Between Dublin Blvd. and Sierra Lane	1,175	1,177	2	0%
15 Dublin - Pleasanton	SB	Hacienda Drive	Between I-580 and Dublin Blvd.	1,222	761	-461	-38%
15 Dublin - Pleasanton	SB	Tassajara Road	Between I-580 and Dublin Blvd.	1,379	272	-1,107	-80%
15 Dublin - Pleasanton	SB	Santa Rita Road	South of I-580	864	1,010	146	17%
15 Dublin - Pleasanton	SB	Hacienda Drive	South of I-580	1,071	1,534	463	43%
15 Dublin - Pleasanton	SB	Hopyard Rd.	South of I-580	1,787	1,737	-51	-3%
15 Dublin - Pleasanton	SB	Foothill Road	South of I-580	1,342	1,587	245	18%
			Subtotal	**16,541**	**14,563**	**-1,978**	**-12%**
			Total	36,416	32,935	-3,481	-10%
16 Pleasanton - Livermore	EB	I-580	At Airway	7,815	7,950	135	2%
16 Pleasanton - Livermore	EB	Stanley Blvd.	West of Isabel Avenue	2,533	2,019	-514	-20%
16 Pleasanton - Livermore	EB	Vineyard Avenue	East of Ruby Hill	930	458	-472	-51%
16 Pleasanton - Livermore	EB	Vallecitos Road	S/O Isabel Avenue	1,512	1,489	-23	-1%
			Subtotal	**12,790**	**11,916**	**-874**	**-7%**
16 Pleasanton - Livermore	WB	I-580	At Airway	5,479	5,785	306	6%
16 Pleasanton - Livermore	WB	Stanley Blvd.	West of Isabel Avenue	724	756	32	4%
16 Pleasanton - Livermore	WB	Vineyard Avenue	East of Ruby Hill	369	146	-223	-60%
16 Pleasanton - Livermore	WB	Vallecitos Road	S/O Isabel Avenue	753	1,304	551	73%
			Subtotal	**7,325**	**7,991**	**666**	**9%**
			Total	**20,115**	**19,907**	**-208**	**-1%**

Table 4. 2000 PM Peak 2-Hour Traffic Counts and Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count	Model Volume	Difference	Percent Difference
1 Cordon Line	IN	SF-Oakland Bay Bridge	At County Line	19,304	19,473	169	1%
1 Cordon Line	IN	San Mateo Bridge	At County Line	6,048	7,186	1,138	19%
1 Cordon Line	IN	Dumbarton Bridge	At County Line	10,948	8,482	-2,466	-23%
1 Cordon Line	IN	I-880	At Santa Clara County Line or SR 262	11,846	10,968	-878	-7%
1 Cordon Line	IN	Warm Springs Blvd.	At County Line	3,105	1,595	-1,510	-49%
1 Cordon Line	IN	I-680	At E. Warren/Scott Creek	10,955	9,503	-1,452	-13%
1 Cordon Line	IN	Calaveras Road	At County Line	119	0	0	0%
1 Cordon Line	IN	Mines Road	At County Line	25	0	0	0%
1 Cordon Line	IN	Tesla Road	At County Line	56	9	-47	-83%
1 Cordon Line	IN	Patterson Pass Road	At County Line	14	0	0	0%
1 Cordon Line	IN	I-580	At Altamont Pass	7,388	6,064	-1,324	-18%
1 Cordon Line	IN	Altamont Pass Rd.	West of Dyer Road	173	20	-153	-88%
1 Cordon Line	IN	Grant Line Road	At County Line	74	0	0	0%
1 Cordon Line	IN	Vasco Road	Vasco Road at County Line	835	630	-205	-25%
1 Cordon Line	IN	N. Livermore Ave.	South of Hartford Avenue	318	101	-217	-68%
1 Cordon Line	IN	Collier Canyon Rd.	At County Line	44	17	-27	-62%
1 Cordon Line	IN	Tassajara Road	At County Line	524	247	-277	-53%
1 Cordon Line	IN	Dougherty Road	At County Line	1,264	481	-783	-62%
1 Cordon Line	IN	Stagecoach Road	Between Amador Valley and Turquoise St.	410	453	43	11%
1 Cordon Line	IN	Village Parkway	At County Line	1,250	328	-922	-74%
1 Cordon Line	IN	Davona Drive	Between Alcosta and Wicklow	434	545	111	26%
1 Cordon Line	IN	I-680	At Contra Costa County Line/Alcosta	11,246	10,167	-1,079	-10%
1 Cordon Line	IN	San Ramon Road	Between Alcosta Ave. and Volmac	2,800	951	-1,849	-66%
1 Cordon Line	IN	Crow Canyon Rd.	At County Line	0	2,060	2,060	0%
1 Cordon Line	IN	Pinehurst Rd.	At County Line	108	381	273	253%
1 Cordon Line	IN	Redwood Rd.	East of Skyline	220	320	100	45%
1 Cordon Line	IN	SR 24	At Caldecott Tunnel	10,062	8,797	-1,265	-13%
1 Cordon Line	IN	Canyon Road	At County Line	0	0	0	0%
1 Cordon Line	IN	Arlington Avenue	At County Line	0	930	930	0%
1 Cordon Line	IN	Colusa Avenue	At County Line	0	320	320	0%
1 Cordon Line	IN	San Pablo Avenue	At Solano and Central	1,672	1,673	1	0%
1 Cordon Line	IN	I-80	At Central	9,145	10,833	1,688	18%
1 Cordon Line	IN	I-580	At Portola and Albany/Jct 80 East	5,557	7,553	1,996	36%
			Subtotal	**115,944**	**106,776**	**-9,168**	**-8%**

Table 4. 2000 PM Peak 2-Hour Traffic Counts and Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count	Model Volume	Difference	Percent Difference
1 Cordon Line	OUT	SF-Oakland Bay Bridge	At County Line	15,675	12,438	-3,237	-21%
1 Cordon Line	OUT	San Mateo Bridge	At County Line	5,385	5,152	-233	-4%
1 Cordon Line	OUT	Dumbarton Bridge	At County Line	2,068	4,570	2,502	121%
1 Cordon Line	OUT	I-880	At Santa Clara County Line or SR 262	11,856	13,053	1,197	10%
1 Cordon Line	OUT	Warm Springs Blvd.	At County Line	3,117	2,232	-885	-28%
1 Cordon Line	OUT	I-680	At E. Warren/Scott Creek	11,443	9,734	-1,709	-15%
1 Cordon Line	OUT	Calaveras Road	At County Line	0	0	0	0%
1 Cordon Line	OUT	Mines Road	At County Line	0	0	0	0%
1 Cordon Line	OUT	Tesla Road	At County Line	277	9	-268	-97%
1 Cordon Line	OUT	Patterson Pass Road	At County Line	232	0	-232	-100%
1 Cordon Line	OUT	I-580	At Altamont Pass	11,236	10,745	-491	-4%
1 Cordon Line	OUT	Altamont Pass Rd.	West of Dyer Road	667	44	-623	-93%
1 Cordon Line	OUT	Grant Line Road	At County Line	608	0	-608	-100%
1 Cordon Line	OUT	Vasco Road	Vasco Road at County Line	2,929	2,545	-384	-13%
1 Cordon Line	OUT	N. Livermore Ave.	South of Hartford Avenue	302	151	-151	-50%
1 Cordon Line	OUT	Collier Canyon Rd.	At County Line	31	7	-24	-78%
1 Cordon Line	OUT	Tassajara Road	At County Line	649	687	38	6%
1 Cordon Line	OUT	Dougherty Road	At County Line	2,669	1,127	-1,542	-58%
1 Cordon Line	OUT	Stagecoach Road	Between Amador Valley and Turquoise St.	448	624	176	39%
1 Cordon Line	OUT	Village Parkway	At County Line	946	211	-735	-78%
1 Cordon Line	OUT	Davona Drive	Between Alcosta and Wicklow	666	202	-464	-70%
1 Cordon Line	OUT	I-680	At Contra Costa County Line/Alcosta	10,602	12,897	2,295	22%
1 Cordon Line	OUT	San Ramon Road	Between Alcosta Ave. and Volmac	2,290	1,057	-1,233	-54%
1 Cordon Line	OUT	Crow Canyon Rd.	At County Line	0	2,275	2,275	0%
1 Cordon Line	OUT	Pinehurst Rd.	At County Line	206	623	417	203%
1 Cordon Line	OUT	Redwood Rd.	East of Skyline	145	499	354	244%
1 Cordon Line	OUT	SR 24	At Caldecott Tunnel	14,850	14,768	-82	-1%
1 Cordon Line	OUT	Canyon Road	At County Line	0	0	0	0%
1 Cordon Line	OUT	Arlington Avenue	At County Line	0	1,408	1,408	0%
1 Cordon Line	OUT	Colusa Avenue	At County Line	0	503	503	0%
1 Cordon Line	OUT	San Pablo Avenue	At Solano and Central	2,518	4,068	1,550	62%
1 Cordon Line	OUT	I-80	At Central	12,555	13,512	957	8%
1 Cordon Line	OUT	I-580	At Portola and Albany/Jct 80 East	6,442	8,422	1,980	31%
			Subtotal	**120,812**	**119,378**	**-1,434**	**-1%**
			Total	**236,756**	**226,154**	**-10,602**	**-4%**

Table 4. 2000 PM Peak 2-Hour Traffic Counts and Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count	Model Volume	Difference	Percent Difference
2 Albany - Berkeley	NB	I-80	Between Gilman and Buchanan	19,161	19,782	621	3%
2 Albany - Berkeley	NB	San Pablo Avenue	At Gilman and Marin	2,495	3,851	1,356	54%
2 Albany - Berkeley	NB	Marin Avenue	Near Cityline	1,585	2,158	573	36%
2 Albany - Berkeley	NB	Solano Avenue	Near Cityline	831	344	-487	-59%
			Subtotal	**24,072**	**26,135**	**2,063**	**9%**
2 Albany - Berkeley	SB	I-80	Between Gilman and Buchanan	13,406	16,636	3,229	24%
2 Albany - Berkeley	SB	San Pablo Avenue	At Gilman and Marin	1,873	1,912	39	2%
2 Albany - Berkeley	SB	Marin Avenue	Near Cityline	1,524	1,962	438	29%
2 Albany - Berkeley	SB	Solano Avenue	Near Cityline	1,771	348	-1,423	-80%
			Subtotal	**18,574**	**20,858**	**2,284**	**12%**
			Total	**42,646**	**46,993**	**4,347**	**10%**
3 Berkeley - Emeryville	NB	I-80	At Powell	16,680	18,312	1,632	10%
3 Berkeley - Emeryville	NB	Seventh	Near Ashby/City Limit	0	738	738	0%
3 Berkeley - Emeryville	NB	Hollis St.	Near Ashby/City Limit	0	734	734	0%
3 Berkeley - Emeryville	NB	West Frontage Road	Near Ashby/City Limit	1,432	1,930	498	35%
3 Berkeley - Emeryville	NB	Shellmound Street	Near Ashby/City Limit	0	865	865	0%
			Subtotal	**18,112**	**20,242**	**2,130**	**12%**
3 Berkeley - Emeryville	SB	I-80	At Powell	12,996	15,471	2,475	19%
3 Berkeley - Emeryville	SB	Seventh	Near Ashby/City Limit	0	732	732	0%
3 Berkeley - Emeryville	SB	Hollis St.	Near Ashby/City Limit	0	559	559	0%
3 Berkeley - Emeryville	SB	West Frontage Road	Near Ashby/City Limit	913	1,867	954	105%
3 Berkeley - Emeryville	SB	Shellmound Street	Near Ashby/City Limit	0	258	258	0%
			Subtotal	**13,909**	**17,338**	**3,429**	**25%**
			Total	**32,021**	**37,580**	**5,559**	**17%**

Table 4. 2000 PM Peak 2-Hour Traffic Counts and Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count	Model Volume	Difference	Percent Difference
4 Berkeley - Oakland	NB	San Pablo Avenue	At Stanford and Ashby Ave.	2,222	2,604	382	17%
4 Berkeley - Oakland	NB	Sacramento Street	Near City Limits	0	2,169	2,169	0%
4 Berkeley - Oakland	NB	Adeline Street	South of Alcatraz	2,863	2,074	-789	-28%
4 Berkeley - Oakland	NB	Shattuck Avenue	Near City Limits	1,329	1,930	601	45%
4 Berkeley - Oakland	NB	Telegraph Avenue	Near City Limits	1,878	2,699	821	44%
4 Berkeley - Oakland	NB	College Avenue	Near City Limits	848	324	-524	-62%
4 Berkeley - Oakland	NB	Claremont Avenue	South of Ashby	1,236	1,502	266	22%
4 Berkeley - Oakland	NB	Tunnel Road	Near City Limits	2,306	1,994	-312	-14%
4 Berkeley - Oakland	NB	Grizzly Peak Blvd.	North of 24	819	265	-554	-68%
4 Berkeley - Oakland	NB	Fish Ranch Road	North of 24	430	1,324	894	208%
			Subtotal	**13,931**	**14,714**	**784**	**6%**
4 Berkeley - Oakland	SB	San Pablo Avenue	At Stanford and Ashby Ave.	1,955	1,637	-318	-16%
4 Berkeley - Oakland	SB	Sacramento Street	Near City Limits	0	1,460	1,460	0%
4 Berkeley - Oakland	SB	Adeline Street	South of Alcatraz	2,321	1,479	-842	-36%
4 Berkeley - Oakland	SB	Shattuck Avenue	Near City Limits	1,512	1,813	301	20%
4 Berkeley - Oakland	SB	Telegraph Avenue	Near City Limits	2,554	3,131	577	23%
4 Berkeley - Oakland	SB	College Avenue	Near City Limits	885	700	-185	-21%
4 Berkeley - Oakland	SB	Claremont Avenue	South of Ashby	1,019	1,284	265	26%
4 Berkeley - Oakland	SB	Tunnel Road	Near City Limits	3,115	2,112	-1,003	-32%
4 Berkeley - Oakland	SB	Grizzly Peak Blvd.	North of 24	467	85	-382	-82%
4 Berkeley - Oakland	SB	Fish Ranch Road	North of 24	1,271	1,464	193	15%
			Subtotal	**15,099**	**13,704**	**-1,395**	**-9%**
			Total	**29,029**	**28,419**	**-611**	**-2%**

Table 4. 2000 PM Peak 2-Hour Traffic Counts and Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count	Model Volume	Difference	Percent Difference
5 Emeryville - Oakland	NB	I-80	At Powell	16,680	18,312	1,632	10%
5 Emeryville - Oakland	NB	Shellmound Street	Near 40th/City Limit	0	218	218	0%
5 Emeryville - Oakland	NB	Adeline Street	South of Alcatraz	2,863	2,074	-789	-28%
5 Emeryville - Oakland	NB	Hollis St.	Near Powell	0	1,007	1,007	0%
5 Emeryville - Oakland	NB	San Pablo Avenue	At Stanford and Ashby Ave.	2,466	2,506	40	2%
			Subtotal	**22,008**	**22,891**	**883**	**4%**
5 Emeryville - Oakland	SB	I-80	At Powell	12,996	15,471	2,475	19%
5 Emeryville - Oakland	SB	Shellmound Street	Near 40th/City Limit	0	672	672	0%
5 Emeryville - Oakland	SB	Adeline Street	South of Alcatraz	2,321	1,479	-842	-36%
5 Emeryville - Oakland	SB	Hollis St.	Near Powell	0	1,013	1,013	0%
5 Emeryville - Oakland	SB	San Pablo Avenue	At Stanford and Ashby Ave.	1,803	2,157	354	20%
			Subtotal	**17,120**	**19,107**	**1,987**	**12%**
			Total	**39,128**	**41,998**	**2,870**	**7%**
6 Oakland - Piedmont	NB	Pleasant Valley	Near City Limits	1,284	2,081	797	62%
6 Oakland - Piedmont	NB	Moraga Avenue	Eastern Border	1,020	762	-258	-25%
6 Oakland - Piedmont	NB	Moraga Avenue	Western Border	645	814	169	26%
6 Oakland - Piedmont	NB	Grand Avenue	Northern Border	905	1,328	423	47%
6 Oakland - Piedmont	NB	Grand Avenue	Southern Border	1,718	1,688	-30	-2%
6 Oakland - Piedmont	NB	Oakland Avenue	North of Monte Vista	1,015	1,318	303	30%
6 Oakland - Piedmont	NB	Lakeshore Avenue	Between Windsor and Walavista Avenue	360	64	-296	-82%
			Subtotal	**6,947**	**8,055**	**1,108**	**16%**
6 Oakland - Piedmont	SB	Pleasant Valley	Near City Limits	1,277	1,587	310	24%
6 Oakland - Piedmont	SB	Moraga Avenue	Eastern Border	1,333	1,091	-242	-18%
6 Oakland - Piedmont	SB	Moraga Avenue	Western Border	945	1,157	212	22%
6 Oakland - Piedmont	SB	Grand Avenue	Northern Border	1,137	1,558	421	37%
6 Oakland - Piedmont	SB	Grand Avenue	Southern Border	1,899	1,645	-254	-13%
6 Oakland - Piedmont	SB	Oakland Avenue	North of Monte Vista	561	944	383	68%
6 Oakland - Piedmont	SB	Lakeshore Avenue	Between Windsor and Walavista Avenue	271	36	-235	-87%
			Subtotal	**7,423**	**8,018**	**595**	**8%**
			Total	**14,370**	**16,073**	**1,703**	**12%**

Table 4. 2000 PM Peak 2-Hour Traffic Counts and Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count	Model Volume	Difference	Percent Difference
7 Alameda - Oakland	EB	Webster-Posey Tubes	Near entrance and exits Oakland side	4,363	4,541	178	4%
7 Alameda - Oakland	EB	Park St. Bridge	West of Bridge	2,937	3,267	330	11%
7 Alameda - Oakland	EB	Fruitvale Bridge	West of Bridge	1,508	2,320	812	54%
7 Alameda - Oakland	EB	High St. Bridge	West of Bridge	1,708	1,239	-469	-27%
7 Alameda - Oakland	EB	Doolittle Street	Near City Limits	2,429	3,190	761	31%
7 Alameda - Oakland	EB	SR 61/Doolittle	North of Hegenberger	1,736	3,234	1,498	86%
			Subtotal	**14,681**	**17,790**	**3,109**	**21%**
7 Alameda - Oakland	WB	Webster-Posey Tubes	Near entrance and exits Oakland side	6,553	6,161	-392	-6%
7 Alameda - Oakland	WB	Park St. Bridge	West of Bridge	3,400	3,928	528	16%
7 Alameda - Oakland	WB	Fruitvale Bridge	West of Bridge	2,421	3,097	676	28%
7 Alameda - Oakland	WB	High St. Bridge	West of Bridge	2,021	1,978	-43	-2%
7 Alameda - Oakland	WB	Doolittle Street	Near City Limits	2,350	2,287	-63	-3%
7 Alameda - Oakland	WB	SR 61/Doolittle	North of Hegenberger	2,529	2,650	121	5%
			Subtotal	**19,274**	**20,100**	**826**	**4%**
			Total	**33,955**	**37,890**	**3,935**	**12%**

Table 4. 2000 PM Peak 2-Hour Traffic Counts and Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count	Model Volume	Difference	Percent Difference
8 Oakland - San Leandro: Along International	EB	Lakeshore Avenue	E/O International	1,970	3,060	1,090	55%
8 Oakland - San Leandro: Along International	EB	Park Blvd - 5th Avenue	E/O International	397	158	-239	-60%
8 Oakland - San Leandro: Along International	EB	14th Avenue	E/O International	1,888	3,103	1,215	64%
8 Oakland - San Leandro: Along International	EB	23rd Avenue	E/O International	575	379	-196	-34%
8 Oakland - San Leandro: Along International	EB	Fruitvale Avenue	E/O International	1,770	1,438	-332	-19%
8 Oakland - San Leandro: Along International	EB	35th Avenue	E/O International	1,238	602	-636	-51%
8 Oakland - San Leandro: Along International	EB	42nd/Courtland	E/O International	1,356	2,940	1,584	117%
8 Oakland - San Leandro: Along International	EB	High Street	E/O International	923	539	-384	-42%
8 Oakland - San Leandro: Along International	EB	55th Avenue	E/O International	373	407	34	9%
8 Oakland - San Leandro: Along International	EB	Seminary Avenue	E/O International	966	818	-148	-15%
8 Oakland - San Leandro: Along International	EB	73rd Avenue	E/O International	2,480	3,048	568	23%
8 Oakland - San Leandro: Along International	EB	82nd Avenue	E/O International	247	379	132	54%
8 Oakland - San Leandro: Along International	EB	98th Avenue	E/O International	1,553	1,697	144	9%
8 Oakland - San Leandro: Along International	EB	Davis Street (SR 112)	W/O International	2,292	1,711	-581	-25%
8 Oakland - San Leandro: Along International	EB	Estudillo	E/O International	955	1,363	408	43%
			Subtotal	**18,983**	**21,643**	**2,659**	**14%**
8 Oakland - San Leandro: Along International	WB	Lakeshore Avenue	E/O International	844	602	-242	-29%
8 Oakland - San Leandro: Along International	WB	Park Blvd - 5th Avenue	E/O International	266	108	-158	-60%
8 Oakland - San Leandro: Along International	WB	14th Avenue	E/O International	1,413	2,075	662	47%
8 Oakland - San Leandro: Along International	WB	23rd Avenue	E/O International	427	308	-119	-28%
8 Oakland - San Leandro: Along International	WB	Fruitvale Avenue	E/O International	1,614	1,365	-249	-15%
8 Oakland - San Leandro: Along International	WB	35th Avenue	E/O International	851	468	-383	-45%
8 Oakland - San Leandro: Along International	WB	42nd/Courtland	E/O International	818	1,264	446	55%
8 Oakland - San Leandro: Along International	WB	High Street	E/O International	1,556	709	-847	-54%
8 Oakland - San Leandro: Along International	WB	55th Avenue	E/O International	349	247	-102	-29%
8 Oakland - San Leandro: Along International	WB	Seminary Avenue	E/O International	800	548	-252	-31%
8 Oakland - San Leandro: Along International	WB	73rd Avenue	E/O International	1,912	1,760	-152	-8%
8 Oakland - San Leandro: Along International	WB	82nd Avenue	E/O International	441	260	-181	-41%
8 Oakland - San Leandro: Along International	WB	98th Avenue	E/O International	1,381	1,103	-278	-20%
8 Oakland - San Leandro: Along International	WB	Davis Street (SR 112)	W/O International	1,779	1,127	-652	-37%
8 Oakland - San Leandro: Along International	WB	Estudillo	E/O International	796	1,055	259	33%
			Subtotal	**15,247**	**13,000**	**-2,247**	**-15%**
			Total	**34,231**	**34,642**	**412**	**1%**

Table 4. 2000 PM Peak 2-Hour Traffic Counts and Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count	Model Volume	Difference	Percent Difference
9 Oakland - San Leandro	NB	Doolittle Drive	Near Davis	2,300	4,027	1,727	75%
9 Oakland - San Leandro	NB	I-880	Between Davis and 98th Avenue	13,715	14,969	1,254	9%
9 Oakland - San Leandro	NB	San Leandro Blvd.	Near City Limits	1,065	830	-235	-22%
9 Oakland - San Leandro	NB	Int'l/E. 14th	Near 98th Avenue	2,125	1,170	-955	-45%
9 Oakland - San Leandro	NB	Bancroft Avenue	Near City Limits	864	805	-59	-7%
9 Oakland - San Leandro	NB	MacArthur Blvd.	Near City Limits	914	1,105	191	21%
9 Oakland - San Leandro	NB	Foothill Blvd.	Near City Limits	502	427	-75	-15%
9 Oakland - San Leandro	NB	I-580	Between 98th and Estudillo	10,817	14,281	3,465	32%
			Subtotal	**32,302**	**37,613**	**5,312**	**16%**
9 Oakland - San Leandro	SB	Doolittle Drive	Near Davis	3,196	3,939	743	23%
9 Oakland - San Leandro	SB	I-880	Between Davis and 98th Avenue	14,556	14,910	354	2%
9 Oakland - San Leandro	SB	San Leandro Blvd.	Near City Limits	1,248	1,188	-60	-5%
9 Oakland - San Leandro	SB	Int'l/E. 14th	Near 98th Avenue	1,854	1,278	-576	-31%
9 Oakland - San Leandro	SB	Bancroft Avenue	Near City Limits	852	526	-326	-38%
9 Oakland - San Leandro	SB	MacArthur Blvd.	Near City Limits	837	840	3	0%
9 Oakland - San Leandro	SB	Foothill Blvd.	Near City Limits	758	463	-295	-39%
9 Oakland - San Leandro	SB	I-580	Between 98th and Estudillo	12,122	15,073	2,951	24%
			Subtotal	**35,423**	**38,216**	**2,793**	**8%**
			Total	**67,725**	**75,829**	**8,104**	**12%**

Table 4. 2000 PM Peak 2-Hour Traffic Counts and Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count	Model Volume	Difference	Percent Difference
10 Hayward - Union City	NB	Union City Blvd.	Near City Limits	0	4,220	4,220	0%
10 Hayward - Union City	NB	I-880	At Industrial Parkway	12,239	15,339	3,100	25%
10 Hayward - Union City	NB	Industrial Pkwy	Near Huntwood	2,756	2,329	-427	-15%
10 Hayward - Union City	NB	Whipple Road	Near City Limit on east side of I-880	2,268	1,569	-699	-31%
10 Hayward - Union City	NB	Mission Blvd	At Greasel Street	3,216	2,782	-434	-13%
			Subtotal	**20,479**	**22,020**	**1,541**	**8%**
10 Hayward - Union City	SB	Union City Blvd.	Near City Limits	0	4,297	4,297	0%
10 Hayward - Union City	SB	I-880	At Industrial Parkway	11,694	15,928	4,234	36%
10 Hayward - Union City	SB	Industrial Pkwy	Near Huntwood	2,307	1,659	-648	-28%
10 Hayward - Union City	SB	Whipple Road	Near City Limit on east side of I-880	2,148	2,127	-21	-1%
10 Hayward - Union City	SB	Mission Blvd	At Greasel Street	2,432	2,979	547	22%
			Subtotal	**18,581**	**22,693**	**4,112**	**22%**
			Total	**39,060**	**44,713**	**5,653**	**14%**
11 Hayward - Castro Valley	NB	Redwood Rd.	North of Seven Hills	1,033	361	-672	-65%
11 Hayward - Castro Valley	NB	Crow Canyon Rd.	North of Cold Water Drive	0	2,228	2,228	0%
11 Hayward - Castro Valley	NB	I-580	At Crow Canyon	13,191	15,164	1,973	15%
11 Hayward - Castro Valley	NB	Dublin Canyon Road	East of Palomares	382	158	-224	-59%
11 Hayward - Castro Valley	NB	Palomares Road	South of Palo Verde Road	170	261	91	54%
			Subtotal	**14,776**	**15,944**	**1,168**	**8%**
11 Hayward - Castro Valley	SB	Redwood Rd.	North of Seven Hills	776	300	-476	-61%
11 Hayward - Castro Valley	SB	Crow Canyon Rd.	North of Cold Water Drive	0	2,118	2,118	0%
11 Hayward - Castro Valley	SB	I-580	At Crow Canyon	12,444	11,353	-1,091	-9%
11 Hayward - Castro Valley	SB	Dublin Canyon Road	East of Palomares	847	169	-678	-80%
11 Hayward - Castro Valley	SB	Palomares Road	South of Palo Verde Road	122	223	101	83%
			Subtotal	**14,189**	**12,045**	**-2,144**	**-15%**
			Total	**28,965**	**27,989**	**-976**	**-3%**

Table 4. 2000 PM Peak 2-Hour Traffic Counts and Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count	Model Volume	Difference	Percent Difference
12 Union City - Fremont	NB	Ardenwood Blvd.	Near City Limits	3,354	2,978	-376	-11%
12 Union City - Fremont	NB	Alvarado Blvd.	Around Lowry Road	1,954	2,265	311	16%
12 Union City - Fremont	NB	I-880	South of Alvarado-Niles Interchange	13,274	15,070	1,796	14%
12 Union City - Fremont	NB	Decoto Road	South of Alvarado Niles	0	4,212	4,212	0%
12 Union City - Fremont	NB	Isherwood Way	Near City Limits	1,131	357	-774	-68%
12 Union City - Fremont	NB	Alvarado-Niles Rd.	Near City Limits	0	1,019	1,019	0%
12 Union City - Fremont	NB	Mission Blvd	South of Decoto Road	2,539	2,244	-295	-12%
			Subtotal	**22,252**	**22,914**	**662**	**3%**
12 Union City - Fremont	SB	Ardenwood Blvd.	Near City Limits	1,385	1,739	354	26%
12 Union City - Fremont	SB	Alvarado Blvd.	Around Lowry Road	1,371	2,150	779	57%
12 Union City - Fremont	SB	I-880	South of Alvarado-Niles Interchange	12,818	14,659	1,841	14%
12 Union City - Fremont	SB	Decoto Road	South of Alvarado Niles	0	3,768	3,768	0%
12 Union City - Fremont	SB	Isherwood Way	Near City Limits	1,817	135	-1,682	-93%
12 Union City - Fremont	SB	Alvarado-Niles Rd.	Near City Limits	0	1,707	1,707	0%
12 Union City - Fremont	SB	Mission Blvd	South of Decoto Road	2,688	2,766	78	3%
			Subtotal	**20,079**	**21,449**	**1,370**	**7%**
			Total	**42,331**	**44,363**	**2,032**	**5%**

Table 4. 2000 PM Peak 2-Hour Traffic Counts and Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count	Model Volume	Difference	Percent Difference
13 Fremont - Newark	NB	Thornton Ave.	South of SR 84	0	758	758	0%
13 Fremont - Newark	NB	Newark Blvd.	South of SR 84	0	1,992	1,992	0%
13 Fremont - Newark	NB	I-880	Near SR 84	13,672	14,768	1,096	8%
13 Fremont - Newark	NB	Thornton Ave.	Near I-880/City Limits	0	2,966	2,966	0%
13 Fremont - Newark	WB	Central Ave.	Near I-880/City Limits	1,123	332	-791	-70%
13 Fremont - Newark	WB	Mowry Ave.	Near I-880/City Limits	3,567	2,164	-1,403	-39%
13 Fremont - Newark	WB	Stevenson Blvd.	Near I-880/City Limits	849	2,366	1,517	179%
13 Fremont - Newark	WB	Cedar Blvd.	Near City Limits	0	200	200	0%
13 Fremont - Newark	WB	Cherry Street	Near City Limits	0	1,499	1,499	0%
			Subtotal	**19,211**	**19,629**	**418**	**2%**
13 Fremont - Newark	SB	Thornton Ave.	South of SR 84	0	624	624	0%
13 Fremont - Newark	SB	Newark Blvd.	South of SR 84	0	2,555	2,555	0%
13 Fremont - Newark	SB	I-880	Near SR 84	11,898	12,569	671	6%
13 Fremont - Newark	SB	Thornton Ave.	Near I-880/City Limits	0	2,752	2,752	0%
13 Fremont - Newark	EB	Central Ave.	Near I-880/City Limits	1,750	459	-1,291	-74%
13 Fremont - Newark	EB	Mowry Ave.	Near I-880/City Limits	4,798	3,694	-1,104	-23%
13 Fremont - Newark	EB	Stevenson Blvd.	Near I-880/City Limits	1,233	2,044	811	66%
13 Fremont - Newark	EB	Cedar Blvd.	Near City Limits	0	276	276	0%
13 Fremont - Newark	EB	Cherry Street	Near City Limits	0	1,179	1,179	0%
			Subtotal	**19,679**	**18,766**	**-913**	**-5%**
			Total	**38,890**	**38,395**	**-495**	**-1%**
14 Fremont - Tri-Valley	NB	Niles Canyon Road	At Palomares	2,027	1,857	-170	-8%
14 Fremont - Tri-Valley	NB	I-680	At SR 84 East	9,595	9,587	-8	0%
14 Fremont - Tri-Valley	NB	Foothill Road	North of Niles Canyon Road	0	503	503	0%
14 Fremont - Tri-Valley	NB	Pleasanton-Sunol	North of Niles Canyon Road	0	905	905	0%
14 Fremont - Tri-Valley	NB	Vallecitos Road	Near Vineyard	2,882	1,829	-1,053	-37%
			Subtotal	**14,504**	**13,273**	**-1,231**	**-8%**
14 Fremont - Tri-Valley	SB	Niles Canyon Road	At Palomares	1,372	995	-377	-27%
14 Fremont - Tri-Valley	SB	I-680	At SR 84 East	6,926	7,624	698	10%
14 Fremont - Tri-Valley	SB	Foothill Road	North of Niles Canyon Road	0	147	147	0%
14 Fremont - Tri-Valley	SB	Pleasanton-Sunol	North of Niles Canyon Road	0	303	303	0%
14 Fremont - Tri-Valley	SB	Vallecitos Road	Near Vineyard	923	1,605	682	74%
			Subtotal	**9,221**	**10,224**	**1,003**	**11%**
			Total	**23,725**	**23,497**	**-228**	**-1%**

Table 4. 2000 PM Peak 2-Hour Traffic Counts and Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count	Model Volume	Difference	Percent Difference
15 Dublin - Pleasanton	NB	San Ramon Road	Between Dublin and Amador Valley Blvds.	2,647	2,523	-124	-5%
15 Dublin - Pleasanton	NB	I-680	North of I-580	12,882	12,439	-443	-3%
15 Dublin - Pleasanton	NB	Village Parkway	Between Dublin Blvd. and Lewis Ave.	1,872	1,251	-621	-33%
15 Dublin - Pleasanton	NB	Dougherty Road	Between Dublin Blvd. and Sierra Lane	2,615	2,723	108	4%
15 Dublin - Pleasanton	NB	Hacienda Drive	Between I-580 and Dublin Blvd.	1,554	1,200	-354	-23%
15 Dublin - Pleasanton	NB	Tassajara Road	Between I-580 and Dublin Blvd.	1,236	913	-323	-26%
15 Dublin - Pleasanton	NB	Santa Rita Road	South of I-580	3,345	2,529	-815	-24%
15 Dublin - Pleasanton	NB	Hacienda Drive	South of I-580	3,350	3,141	-208	-6%
15 Dublin - Pleasanton	NB	Hopyard Rd.	South of I-580	3,431	4,834	1,403	41%
15 Dublin - Pleasanton	NB	Foothill Road	South of I-580	3,883	3,606	-277	-7%
			Subtotal	**36,815**	**35,159**	**-1,656**	**-4%**
15 Dublin - Pleasanton	SB	San Ramon Road	Between Dublin and Amador Valley Blvds.	2,282	1,329	-953	-42%
15 Dublin - Pleasanton	SB	I-680	North of I-580	11,246	10,167	-1,079	-10%
15 Dublin - Pleasanton	SB	Village Parkway	Between Dublin Blvd. and Lewis Ave.	1,438	1,086	-352	-24%
15 Dublin - Pleasanton	SB	Dougherty Road	Between Dublin Blvd. and Sierra Lane	2,227	2,421	194	9%
15 Dublin - Pleasanton	SB	Hacienda Drive	Between I-580 and Dublin Blvd.	2,142	1,672	-470	-22%
15 Dublin - Pleasanton	SB	Tassajara Road	Between I-580 and Dublin Blvd.	2,548	499	-2,049	-80%
15 Dublin - Pleasanton	SB	Santa Rita Road	South of I-580	1,814	2,065	251	14%
15 Dublin - Pleasanton	SB	Hacienda Drive	South of I-580	1,928	3,176	1,248	65%
15 Dublin - Pleasanton	SB	Hopyard Rd.	South of I-580	3,217	3,856	639	20%
15 Dublin - Pleasanton	SB	Foothill Road	South of I-580	2,415	3,096	680	28%
			Subtotal	**31,257**	**29,366**	**-1,891**	**-6%**
			Total	68,071	64,525	-3,547	-5%
16 Pleasanton - Livermore	EB	I-580	At Airway	15,580	15,201	-379	-2%
16 Pleasanton - Livermore	EB	Stanley Blvd.	West of Isabel Avenue	4,833	3,918	-915	-19%
16 Pleasanton - Livermore	EB	Vineyard Avenue	East of Ruby Hill	1,651	359	-1,292	-78%
16 Pleasanton - Livermore	EB	Vallecitos Road	S/O Isabel Avenue	2,995	2,923	-72	-2%
			Subtotal	**25,059**	**22,400**	**-2,659**	**-11%**
16 Pleasanton - Livermore	WB	I-580	At Airway	10,377	11,418	1,041	10%
16 Pleasanton - Livermore	WB	Stanley Blvd.	West of Isabel Avenue	1,240	1,492	252	20%
16 Pleasanton - Livermore	WB	Vineyard Avenue	East of Ruby Hill	671	298	-373	-56%
16 Pleasanton - Livermore	WB	Vallecitos Road	S/O Isabel Avenue	1,398	2,650	1,252	90%
			Subtotal	**13,686**	**15,858**	**2,172**	**16%**
			Total	**38,745**	**38,258**	**-487**	**-1%**

Table 5. 2000 PM Peak 4-Hour Traffic Counts and Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count	Model Volume	Difference	Percent Difference
1 Cordon Line	IN	SF-Oakland Bay Bridge	At County Line	40,962	43,039	2,077	5%
1 Cordon Line	IN	San Mateo Bridge	At County Line	12,450	14,341	1,891	15%
1 Cordon Line	IN	Dumbarton Bridge	At County Line	22,500	18,434	-4,066	-18%
1 Cordon Line	IN	I-880	At Santa Clara County Line or SR 262	22,926	23,041	115	1%
1 Cordon Line	IN	Warm Springs Blvd.	At County Line	6,102	6,805	703	12%
1 Cordon Line	IN	I-680	At E. Warren/Scott Creek	22,843	21,263	-1,580	-7%
1 Cordon Line	IN	Calaveras Road	At County Line	176	0	0	0%
1 Cordon Line	IN	Mines Road	At County Line	41	0	0	0%
1 Cordon Line	IN	Tesla Road	At County Line	93	26	-67	-72%
1 Cordon Line	IN	Patterson Pass Road	At County Line	25	0	-25	-100%
1 Cordon Line	IN	I-580	At Altamont Pass	14,776	14,762	-14	0%
1 Cordon Line	IN	Altamont Pass Rd.	West of Dyer Road	355	45	-310	-87%
1 Cordon Line	IN	Grant Line Road	At County Line	121	0	-121	-100%
1 Cordon Line	IN	Vasco Road	Vasco Road at County Line	1,570	1,234	-336	-21%
1 Cordon Line	IN	N. Livermore Ave.	South of Hartford Avenue	619	162	-457	-74%
1 Cordon Line	IN	Collier Canyon Rd.	At County Line	110	27	-83	-76%
1 Cordon Line	IN	Tassajara Road	At County Line	1,062	436	-626	-59%
1 Cordon Line	IN	Dougherty Road	At County Line	2,215	889	-1,326	-60%
1 Cordon Line	IN	Stagecoach Road	Between Amador Valley and Turquoise St.	753	848	95	13%
1 Cordon Line	IN	Village Parkway	At County Line	2,213	587	-1,626	-73%
1 Cordon Line	IN	Davona Drive	Between Alcosta and Wicklow	751	930	179	24%
1 Cordon Line	IN	I-680	At Contra Costa County Line/Alcosta	20,913	19,162	-1,751	-8%
1 Cordon Line	IN	San Ramon Road	Between Alcosta Ave. and Volmac	5,313	1,934	-3,379	-64%
1 Cordon Line	IN	Crow Canyon Rd.	At County Line	0	3,828	3,828	0%
1 Cordon Line	IN	Pinehurst Rd.	At County Line	183	722	539	295%
1 Cordon Line	IN	Redwood Rd.	East of Skyline	388	641	253	65%
1 Cordon Line	IN	SR 24	At Caldecott Tunnel	20,976	17,003	-3,973	-19%
1 Cordon Line	IN	Canyon Road	At County Line	0	0	0	0%
1 Cordon Line	IN	Arlington Avenue	At County Line	0	1,778	1,778	0%
1 Cordon Line	IN	Colusa Avenue	At County Line	0	608	608	0%
1 Cordon Line	IN	San Pablo Avenue	At Solano and Central	3,350	3,411	61	2%
1 Cordon Line	IN	I-80	At Central	18,889	20,794	1,905	10%
1 Cordon Line	IN	I-580	At Portola and Albany/Jct 80 East	10,603	14,208	3,605	34%
			Subtotal	**233,278**	**224,743**	**-8,536**	**-4%**

Table 5. 2000 PM Peak 4-Hour Traffic Counts and Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count	Model Volume	Difference	Percent Difference
1 Cordon Line	OUT	SF-Oakland Bay Bridge	At County Line	33,420	29,864	-3,556	-11%
1 Cordon Line	OUT	San Mateo Bridge	At County Line	9,957	10,831	874	9%
1 Cordon Line	OUT	Dumbarton Bridge	At County Line	4,274	9,514	5,240	123%
1 Cordon Line	OUT	I-880	At Santa Clara County Line or SR 262	23,182	24,426	1,244	5%
1 Cordon Line	OUT	Warm Springs Blvd.	At County Line	5,939	4,454	-1,485	-25%
1 Cordon Line	OUT	I-680	At E. Warren/Scott Creek	22,905	18,477	-4,428	-19%
1 Cordon Line	OUT	Calaveras Road	At County Line	0	0	0	0%
1 Cordon Line	OUT	Mines Road	At County Line	0	0	0	0%
1 Cordon Line	OUT	Tesla Road	At County Line	582	99	-483	-83%
1 Cordon Line	OUT	Patterson Pass Road	At County Line	612	24	-588	-96%
1 Cordon Line	OUT	I-580	At Altamont Pass	24,437	22,873	-1,564	-6%
1 Cordon Line	OUT	Altamont Pass Rd.	West of Dyer Road	1,421	88	-1,333	-94%
1 Cordon Line	OUT	Grant Line Road	At County Line	1,263	352	-911	-72%
1 Cordon Line	OUT	Vasco Road	Vasco Road at County Line	5,036	4,557	-479	-10%
1 Cordon Line	OUT	N. Livermore Ave.	South of Hartford Avenue	680	260	-420	-62%
1 Cordon Line	OUT	Collier Canyon Rd.	At County Line	71	11	-60	-85%
1 Cordon Line	OUT	Tassajara Road	At County Line	1,452	1,197	-255	-18%
1 Cordon Line	OUT	Dougherty Road	At County Line	4,638	2,094	-2,544	-55%
1 Cordon Line	OUT	Stagecoach Road	Between Amador Valley and Turquoise St.	799	1,141	342	43%
1 Cordon Line	OUT	Village Parkway	At County Line	1,725	396	-1,329	-77%
1 Cordon Line	OUT	Davona Drive	Between Alcosta and Wicklow	1,211	415	-796	-66%
1 Cordon Line	OUT	I-680	At Contra Costa County Line/Alcosta	24,412	24,569	157	1%
1 Cordon Line	OUT	San Ramon Road	Between Alcosta Ave. and Volmac	4,239	2,027	-2,212	-52%
1 Cordon Line	OUT	Crow Canyon Rd.	At County Line	0	4,355	4,355	0%
1 Cordon Line	OUT	Pinehurst Rd.	At County Line	349	1,302	953	273%
1 Cordon Line	OUT	Redwood Rd.	East of Skyline	261	1,062	801	307%
1 Cordon Line	OUT	SR 24	At Caldecott Tunnel	30,110	28,376	-1,734	-6%
1 Cordon Line	OUT	Canyon Road	At County Line	0	0	0	0%
1 Cordon Line	OUT	Arlington Avenue	At County Line	0	2,658	2,658	0%
1 Cordon Line	OUT	Colusa Avenue	At County Line	0	1,177	1,177	0%
1 Cordon Line	OUT	San Pablo Avenue	At Solano and Central	4,832	7,680	2,848	59%
1 Cordon Line	OUT	I-80	At Central	25,737	25,840	103	0%
1 Cordon Line	OUT	I-580	At Portola and Albany/Jct 80 East	11,958	15,691	3,733	31%
			Subtotal	**245,502**	**237,619**	**-7,883**	**-3%**
			Total	**478,780**	**462,361**	**-16,419**	**-3%**

Table 5. 2000 PM Peak 4-Hour Traffic Counts and Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count	Model Volume	Difference	Percent Difference
2 Albany - Berkeley	NB	I-80	Between Gilman and Buchanan	37,922	37,450	-472	-1%
2 Albany - Berkeley	NB	San Pablo Avenue	At Gilman and Marin	4,565	7,360	2,795	61%
2 Albany - Berkeley	NB	Marin Avenue	Near Cityline	2,884	4,104	1,220	42%
2 Albany - Berkeley	NB	Solano Avenue	Near Cityline	1,726	647	-1,079	-62%
			Subtotal	**47,097**	**49,561**	**2,464**	**5%**
2 Albany - Berkeley	SB	I-80	Between Gilman and Buchanan	25,957	31,484	5,528	21%
2 Albany - Berkeley	SB	San Pablo Avenue	At Gilman and Marin	3,596	3,935	339	9%
2 Albany - Berkeley	SB	Marin Avenue	Near Cityline	2,910	3,741	831	29%
2 Albany - Berkeley	SB	Solano Avenue	Near Cityline	3,548	644	-2,904	-82%
			Subtotal	**36,011**	**39,804**	**3,794**	**11%**
			Total	**83,108**	**89,366**	**6,258**	**8%**
3 Berkeley - Emeryville	NB	I-80	At Powell	33,846	35,199	1,353	4%
3 Berkeley - Emeryville	NB	Seventh	Near Ashby/City Limit	0	1,578	1,578	0%
3 Berkeley - Emeryville	NB	Hollis St.	Near Ashby/City Limit	0	1,449	1,449	0%
3 Berkeley - Emeryville	NB	West Frontage Road	Near Ashby/City Limit	2,525	3,401	876	35%
3 Berkeley - Emeryville	NB	Shellmound Street	Near Ashby/City Limit	0	1,810	1,810	0%
			Subtotal	**36,371**	**38,600**	**2,229**	**6%**
3 Berkeley - Emeryville	SB	I-80	At Powell	25,640	29,303	3,663	14%
3 Berkeley - Emeryville	SB	Seventh	Near Ashby/City Limit	0	1,397	1,397	0%
3 Berkeley - Emeryville	SB	Hollis St.	Near Ashby/City Limit	0	1,044	1,044	0%
3 Berkeley - Emeryville	SB	West Frontage Road	Near Ashby/City Limit	1,689	3,603	1,914	113%
3 Berkeley - Emeryville	SB	Shellmound Street	Near Ashby/City Limit	0	487	487	0%
			Subtotal	**27,329**	**32,906**	**5,577**	**20%**
			Total	**63,700**	**71,506**	**7,806**	**12%**

Table 5. 2000 PM Peak 4-Hour Traffic Counts and Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count	Model Volume	Difference	Percent Difference
4 Berkeley - Oakland	NB	San Pablo Avenue	At Stanford and Ashby Ave.	4,079	5,463	1,384	34%
4 Berkeley - Oakland	NB	Sacramento Street	Near City Limits	0	4,261	4,261	0%
4 Berkeley - Oakland	NB	Adeline Street	South of Alcatraz	4,362	4,180	-182	-4%
4 Berkeley - Oakland	NB	Shattuck Avenue	Near City Limits	2,496	3,575	1,079	43%
4 Berkeley - Oakland	NB	Telegraph Avenue	Near City Limits	3,715	5,255	1,540	41%
4 Berkeley - Oakland	NB	College Avenue	Near City Limits	1,747	663	-1,084	-62%
4 Berkeley - Oakland	NB	Claremont Avenue	South of Ashby	2,386	2,586	200	8%
4 Berkeley - Oakland	NB	Tunnel Road	Near City Limits	4,565	3,707	-858	-19%
4 Berkeley - Oakland	NB	Grizzly Peak Blvd.	North of 24	1,506	537	-969	-64%
4 Berkeley - Oakland	NB	Fish Ranch Road	North of 24	1,001	2,474	1,473	147%
			Subtotal	**25,857**	**28,440**	**2,583**	**10%**
4 Berkeley - Oakland	SB	San Pablo Avenue	At Stanford and Ashby Ave.	3,709	3,596	-113	-3%
4 Berkeley - Oakland	SB	Sacramento Street	Near City Limits	0	2,793	2,793	0%
4 Berkeley - Oakland	SB	Adeline Street	South of Alcatraz	3,868	2,767	-1,102	-28%
4 Berkeley - Oakland	SB	Shattuck Avenue	Near City Limits	2,946	3,490	544	18%
4 Berkeley - Oakland	SB	Telegraph Avenue	Near City Limits	4,870	6,047	1,177	24%
4 Berkeley - Oakland	SB	College Avenue	Near City Limits	1,719	1,353	-366	-21%
4 Berkeley - Oakland	SB	Claremont Avenue	South of Ashby	1,913	2,256	343	18%
4 Berkeley - Oakland	SB	Tunnel Road	Near City Limits	5,981	3,905	-2,076	-35%
4 Berkeley - Oakland	SB	Grizzly Peak Blvd.	North of 24	886	177	-709	-80%
4 Berkeley - Oakland	SB	Fish Ranch Road	North of 24	2,163	2,799	636	29%
			Subtotal	**28,055**	**26,389**	**-1,667**	**-6%**
			Total	**53,912**	**54,828**	**916**	**2%**

Table 5. 2000 PM Peak 4-Hour Traffic Counts and Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count	Model Volume	Difference	Percent Difference
5 Emeryville - Oakland	NB	I-80	At Powell	33,846	35,199	1,353	4%
5 Emeryville - Oakland	NB	Shellmound Street	Near 40th/City Limit	0	425	425	0%
5 Emeryville - Oakland	NB	Adeline Street	South of Alcatraz	4,362	4,180	-182	-4%
5 Emeryville - Oakland	NB	Hollis St.	Near Powell	0	2,069	2,069	0%
5 Emeryville - Oakland	NB	San Pablo Avenue	At Stanford and Ashby Ave.	4,253	5,373	1,120	26%
			Subtotal	**42,461**	**44,752**	**2,292**	**5%**
5 Emeryville - Oakland	SB	I-80	At Powell	25,640	29,303	3,663	14%
5 Emeryville - Oakland	SB	Shellmound Street	Near 40th/City Limit	0	1,368	1,368	0%
5 Emeryville - Oakland	SB	Adeline Street	South of Alcatraz	3,868	2,767	-1,102	-28%
5 Emeryville - Oakland	SB	Hollis St.	Near Powell	0	2,146	2,146	0%
5 Emeryville - Oakland	SB	San Pablo Avenue	At Stanford and Ashby Ave.	3,363	4,481	1,118	33%
			Subtotal	**32,871**	**36,550**	**3,679**	**11%**
			Total	**75,332**	**81,303**	**5,970**	**8%**
6 Oakland - Piedmont	NB	Pleasant Valley	Near City Limits	2,566	3,461	895	35%
6 Oakland - Piedmont	NB	Moraga Avenue	Eastern Border	2,107	1,259	-848	-40%
6 Oakland - Piedmont	NB	Moraga Avenue	Western Border	1,239	1,343	104	8%
6 Oakland - Piedmont	NB	Grand Avenue	Northern Border	1,769	2,301	532	30%
6 Oakland - Piedmont	NB	Grand Avenue	Southern Border	3,304	2,779	-525	-16%
6 Oakland - Piedmont	NB	Oakland Avenue	North of Monte Vista	1,948	2,148	200	10%
6 Oakland - Piedmont	NB	Lakeshore Avenue	Between Windsor and Walavista Avenue	629	94	-535	-85%
			Subtotal	**13,562**	**13,385**	**-177**	**-1%**
6 Oakland - Piedmont	SB	Pleasant Valley	Near City Limits	2,402	2,754	352	15%
6 Oakland - Piedmont	SB	Moraga Avenue	Eastern Border	2,597	1,848	-749	-29%
6 Oakland - Piedmont	SB	Moraga Avenue	Western Border	1,767	1,942	175	10%
6 Oakland - Piedmont	SB	Grand Avenue	Northern Border	2,233	2,558	325	15%
6 Oakland - Piedmont	SB	Grand Avenue	Southern Border	3,721	2,670	-1,051	-28%
6 Oakland - Piedmont	SB	Oakland Avenue	North of Monte Vista	1,045	1,588	543	52%
6 Oakland - Piedmont	SB	Lakeshore Avenue	Between Windsor and Walavista Avenue	504	57	-447	-89%
			Subtotal	**14,269**	**13,417**	**-852**	**-6%**
			Total	**27,831**	**26,802**	**-1,029**	**-4%**

Table 5. 2000 PM Peak 4-Hour Traffic Counts and Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count	Model Volume	Difference	Percent Difference
7 Alameda - Oakland	EB	Webster-Posey Tubes	Near entrance and exits Oakland side	8,256	8,705	449	5%
7 Alameda - Oakland	EB	Park St. Bridge	West of Bridge	5,698	5,944	246	4%
7 Alameda - Oakland	EB	Fruitvale Bridge	West of Bridge	3,021	4,339	1,318	44%
7 Alameda - Oakland	EB	High St. Bridge	West of Bridge	3,276	2,286	-990	-30%
7 Alameda - Oakland	EB	Doolittle Street	Near City Limits	4,405	5,851	1,446	33%
7 Alameda - Oakland	EB	SR 61/Doolittle	North of Hegenberger	3,577	6,018	2,441	68%
			Subtotal	**28,233**	**33,143**	**4,910**	**17%**
7 Alameda - Oakland	WB	Webster-Posey Tubes	Near entrance and exits Oakland side	11,391	10,498	-893	-8%
7 Alameda - Oakland	WB	Park St. Bridge	West of Bridge	6,229	6,512	283	5%
7 Alameda - Oakland	WB	Fruitvale Bridge	West of Bridge	4,573	5,399	826	18%
7 Alameda - Oakland	WB	High St. Bridge	West of Bridge	3,764	3,633	-131	-3%
7 Alameda - Oakland	WB	Doolittle Street	Near City Limits	4,110	4,635	525	13%
7 Alameda - Oakland	WB	SR 61/Doolittle	North of Hegenberger	4,542	5,312	770	17%
			Subtotal	**34,609**	**35,990**	**1,381**	**4%**
			Total	**62,842**	**69,132**	**6,290**	**10%**

Table 5. 2000 PM Peak 4-Hour Traffic Counts and Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count	Model Volume	Difference	Percent Difference
8 Oakland - San Leandro: Along International	EB	Lakeshore Avenue	E/O International	3,773	5,499	1,726	46%
8 Oakland - San Leandro: Along International	EB	Park Blvd - 5th Avenue	E/O International	664	231	-433	-65%
8 Oakland - San Leandro: Along International	EB	14th Avenue	E/O International	3,440	4,627	1,187	34%
8 Oakland - San Leandro: Along International	EB	23rd Avenue	E/O International	1,104	627	-477	-43%
8 Oakland - San Leandro: Along International	EB	Fruitvale Avenue	E/O International	3,475	2,477	-998	-29%
8 Oakland - San Leandro: Along International	EB	35th Avenue	E/O International	2,209	1,014	-1,195	-54%
8 Oakland - San Leandro: Along International	EB	42nd/Courtland	E/O International	2,440	4,974	2,534	104%
8 Oakland - San Leandro: Along International	EB	High Street	E/O International	1,931	843	-1,088	-56%
8 Oakland - San Leandro: Along International	EB	55th Avenue	E/O International	696	681	-15	-2%
8 Oakland - San Leandro: Along International	EB	Seminary Avenue	E/O International	1,778	1,280	-498	-28%
8 Oakland - San Leandro: Along International	EB	73rd Avenue	E/O International	3,809	5,394	1,585	42%
8 Oakland - San Leandro: Along International	EB	82nd Avenue	E/O International	493	650	157	32%
8 Oakland - San Leandro: Along International	EB	98th Avenue	E/O International	3,000	3,012	12	0%
8 Oakland - San Leandro: Along International	EB	Davis Street (SR 112)	W/O International	4,259	3,435	-824	-19%
8 Oakland - San Leandro: Along International	EB	Estudillo	E/O International	1,724	2,537	813	47%
			Subtotal	**34,795**	**37,279**	**2,484**	**7%**
8 Oakland - San Leandro: Along International	WB	Lakeshore Avenue	E/O International	1,606	890	-716	-45%
8 Oakland - San Leandro: Along International	WB	Park Blvd - 5th Avenue	E/O International	519	168	-351	-68%
8 Oakland - San Leandro: Along International	WB	14th Avenue	E/O International	2,833	3,541	708	25%
8 Oakland - San Leandro: Along International	WB	23rd Avenue	E/O International	665	513	-152	-23%
8 Oakland - San Leandro: Along International	WB	Fruitvale Avenue	E/O International	3,159	2,396	-763	-24%
8 Oakland - San Leandro: Along International	WB	35th Avenue	E/O International	1,669	790	-879	-53%
8 Oakland - San Leandro: Along International	WB	42nd/Courtland	E/O International	1,706	2,307	601	35%
8 Oakland - San Leandro: Along International	WB	High Street	E/O International	2,807	1,220	-1,587	-57%
8 Oakland - San Leandro: Along International	WB	55th Avenue	E/O International	705	429	-276	-39%
8 Oakland - San Leandro: Along International	WB	Seminary Avenue	E/O International	1,555	919	-636	-41%
8 Oakland - San Leandro: Along International	WB	73rd Avenue	E/O International	4,587	3,167	-1,420	-31%
8 Oakland - San Leandro: Along International	WB	82nd Avenue	E/O International	849	457	-392	-46%
8 Oakland - San Leandro: Along International	WB	98th Avenue	E/O International	2,771	1,920	-851	-31%
8 Oakland - San Leandro: Along International	WB	Davis Street (SR 112)	W/O International	3,406	2,303	-1,103	-32%
8 Oakland - San Leandro: Along International	WB	Estudillo	E/O International	1,592	2,222	630	40%
			Subtotal	**30,429**	**23,241**	**-7,188**	**-24%**
			Total	**65,224**	**60,520**	**-4,704**	**-7%**

Table 5. 2000 PM Peak 4-Hour Traffic Counts and Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count	Model Volume	Difference	Percent Difference
9 Oakland - San Leandro	NB	Doolittle Drive	Near Davis	4,455	7,645	3,190	72%
9 Oakland - San Leandro	NB	I-880	Between Davis and 98th Avenue	26,058	29,640	3,582	14%
9 Oakland - San Leandro	NB	San Leandro Blvd.	Near City Limits	1,939	2,108	169	9%
9 Oakland - San Leandro	NB	Int'l/E. 14th	Near 98th Avenue	4,051	2,960	-1,091	-27%
9 Oakland - San Leandro	NB	Bancroft Avenue	Near City Limits	1,670	2,084	414	25%
9 Oakland - San Leandro	NB	MacArthur Blvd.	Near City Limits	1,711	2,196	485	28%
9 Oakland - San Leandro	NB	Foothill Blvd.	Near City Limits	895	769	-126	-14%
9 Oakland - San Leandro	NB	I-580	Between 98th and Estudillo	20,300	28,766	8,465	42%
			Subtotal	**61,079**	**76,167**	**15,088**	**25%**
9 Oakland - San Leandro	SB	Doolittle Drive	Near Davis	5,859	7,615	1,756	30%
9 Oakland - San Leandro	SB	I-880	Between Davis and 98th Avenue	27,974	29,274	1,300	5%
9 Oakland - San Leandro	SB	San Leandro Blvd.	Near City Limits	2,280	3,199	919	40%
9 Oakland - San Leandro	SB	Int'l/E. 14th	Near 98th Avenue	3,557	2,743	-814	-23%
9 Oakland - San Leandro	SB	Bancroft Avenue	Near City Limits	1,621	1,272	-349	-22%
9 Oakland - San Leandro	SB	MacArthur Blvd.	Near City Limits	1,564	2,456	892	57%
9 Oakland - San Leandro	SB	Foothill Blvd.	Near City Limits	1,390	907	-483	-35%
9 Oakland - San Leandro	SB	I-580	Between 98th and Estudillo	21,616	29,602	7,985	37%
			Subtotal	**65,861**	**77,069**	**11,207**	**17%**
			Total	**126,941**	**153,235**	**26,295**	**21%**

Table 5. 2000 PM Peak 4-Hour Traffic Counts and Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count	Model Volume	Difference	Percent Difference
10 Hayward - Union City	NB	Union City Blvd.	Near City Limits	0	7,936	7,936	0%
10 Hayward - Union City	NB	I-880	At Industrial Parkway	26,383	29,851	3,468	13%
10 Hayward - Union City	NB	Industrial Pkwy	Near Huntwood	5,201	4,295	-906	-17%
10 Hayward - Union City	NB	Whipple Road	Near City Limit on east side of I-880	4,258	2,705	-1,553	-36%
10 Hayward - Union City	NB	Mission Blvd	At Greasel Street	5,923	5,738	-185	-3%
			Subtotal	**41,765**	**42,588**	**823**	**2%**
10 Hayward - Union City	SB	Union City Blvd.	Near City Limits	0	7,933	7,933	0%
10 Hayward - Union City	SB	I-880	At Industrial Parkway	24,374	30,020	5,646	23%
10 Hayward - Union City	SB	Industrial Pkwy	Near Huntwood	4,397	3,340	-1,057	-24%
10 Hayward - Union City	SB	Whipple Road	Near City Limit on east side of I-880	4,201	3,942	-259	-6%
10 Hayward - Union City	SB	Mission Blvd	At Greasel Street	4,554	5,474	920	20%
			Subtotal	**37,526**	**42,776**	**5,250**	**14%**
			Total	**79,291**	**85,365**	**6,074**	**8%**
11 Hayward - Castro Valley	NB	Redwood Rd.	North of Seven Hills	1,906	796	-1,110	-58%
11 Hayward - Castro Valley	NB	Crow Canyon Rd.	North of Cold Water Drive	0	4,210	4,210	0%
11 Hayward - Castro Valley	NB	I-580	At Crow Canyon	25,109	29,700	4,591	18%
11 Hayward - Castro Valley	NB	Dublin Canyon Road	East of Palomares	654	344	-310	-47%
11 Hayward - Castro Valley	NB	Palomares Road	South of Palo Verde Road	309	610	301	97%
			Subtotal	**27,978**	**31,450**	**3,472**	**12%**
11 Hayward - Castro Valley	SB	Redwood Rd.	North of Seven Hills	1,659	568	-1,091	-66%
11 Hayward - Castro Valley	SB	Crow Canyon Rd.	North of Cold Water Drive	0	3,942	3,942	0%
11 Hayward - Castro Valley	SB	I-580	At Crow Canyon	22,962	22,479	-483	-2%
11 Hayward - Castro Valley	SB	Dublin Canyon Road	East of Palomares	1,271	805	-466	-37%
11 Hayward - Castro Valley	SB	Palomares Road	South of Palo Verde Road	262	432	170	65%
			Subtotal	**26,154**	**24,285**	**-1,869**	**-7%**
			Total	**54,132**	**55,735**	**1,603**	**3%**

Table 5. 2000 PM Peak 4-Hour Traffic Counts and Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count	Model Volume	Difference	Percent Difference
12 Union City - Fremont	NB	Ardenwood Blvd.	Near City Limits	5,972	6,712	740	12%
12 Union City - Fremont	NB	Alvarado Blvd.	Around Lowry Road	3,709	4,514	805	22%
12 Union City - Fremont	NB	I-880	South of Alvarado-Niles Interchange	26,617	29,173	2,556	10%
12 Union City - Fremont	NB	Decoto Road	South of Alvarado Niles	0	7,765	7,765	0%
12 Union City - Fremont	NB	Isherwood Way	Near City Limits	1,943	1,328	-615	-32%
12 Union City - Fremont	NB	Alvarado-Niles Rd.	Near City Limits	0	2,117	2,117	0%
12 Union City - Fremont	NB	Mission Blvd	South of Decoto Road	4,832	4,630	-202	-4%
			Subtotal	**43,073**	**46,358**	**3,285**	**8%**
12 Union City - Fremont	SB	Ardenwood Blvd.	Near City Limits	2,562	3,427	865	34%
12 Union City - Fremont	SB	Alvarado Blvd.	Around Lowry Road	2,645	4,011	1,366	52%
12 Union City - Fremont	SB	I-880	South of Alvarado-Niles Interchange	24,825	27,845	3,020	12%
12 Union City - Fremont	SB	Decoto Road	South of Alvarado Niles	0	7,199	7,199	0%
12 Union City - Fremont	SB	Isherwood Way	Near City Limits	3,265	311	-2,954	-90%
12 Union City - Fremont	SB	Alvarado-Niles Rd.	Near City Limits	0	3,690	3,690	0%
12 Union City - Fremont	SB	Mission Blvd	South of Decoto Road	4,938	5,140	202	4%
			Subtotal	**38,235**	**40,734**	**2,499**	**7%**
			Total	**81,308**	**87,092**	**5,784**	**7%**

Table 5. 2000 PM Peak 4-Hour Traffic Counts and Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count	Model Volume	Difference	Percent Difference
13 Fremont - Newark	NB	Thornton Ave.	South of SR 84	0	1,395	1,395	0%
13 Fremont - Newark	NB	Newark Blvd.	South of SR 84	0	3,774	3,774	0%
13 Fremont - Newark	NB	I-880	Near SR 84	27,472	28,436	964	4%
13 Fremont - Newark	NB	Thornton Ave.	Near I-880/City Limits	0	5,513	5,513	0%
13 Fremont - Newark	WB	Central Ave.	Near I-880/City Limits	2,128	618	-1,510	-71%
13 Fremont - Newark	WB	Mowry Ave.	Near I-880/City Limits	7,204	4,025	-3,179	-44%
13 Fremont - Newark	WB	Stevenson Blvd.	Near I-880/City Limits	1,573	4,268	2,695	171%
13 Fremont - Newark	WB	Cedar Blvd.	Near City Limits	0	359	359	0%
13 Fremont - Newark	WB	Cherry Street	Near City Limits	0	2,857	2,857	0%
			Subtotal	**38,377**	**37,348**	**-1,029**	**-3%**
13 Fremont - Newark	SB	Thornton Ave.	South of SR 84	0	1,200	1,200	0%
13 Fremont - Newark	SB	Newark Blvd.	South of SR 84	0	4,890	4,890	0%
13 Fremont - Newark	SB	I-880	Near SR 84	23,044	24,242	1,198	5%
13 Fremont - Newark	SB	Thornton Ave.	Near I-880/City Limits	0	5,258	5,258	0%
13 Fremont - Newark	EB	Central Ave.	Near I-880/City Limits	3,161	825	-2,336	-74%
13 Fremont - Newark	EB	Mowry Ave.	Near I-880/City Limits	9,341	6,959	-2,382	-25%
13 Fremont - Newark	EB	Stevenson Blvd.	Near I-880/City Limits	2,194	3,555	1,361	62%
13 Fremont - Newark	EB	Cedar Blvd.	Near City Limits	0	523	523	0%
13 Fremont - Newark	EB	Cherry Street	Near City Limits	0	2,133	2,133	0%
			Subtotal	**37,740**	**35,581**	**-2,159**	**-6%**
			Total	**76,117**	**72,929**	**-3,188**	**-4%**
14 Fremont - Tri-Valley	NB	Niles Canyon Road	At Palomares	3,884	5,739	1,855	48%
14 Fremont - Tri-Valley	NB	I-680	At SR 84 East	19,038	21,016	1,978	10%
14 Fremont - Tri-Valley	NB	Foothill Road	North of Niles Canyon Road	0	1,385	1,385	0%
14 Fremont - Tri-Valley	NB	Pleasanton-Sunol	North of Niles Canyon Road	0	3,236	3,236	0%
14 Fremont - Tri-Valley	NB	Vallecitos Road	Near Vineyard	5,711	3,414	-2,297	-40%
			Subtotal	**28,633**	**30,168**	**1,535**	**5%**
14 Fremont - Tri-Valley	SB	Niles Canyon Road	At Palomares	2,393	2,347	-46	-2%
14 Fremont - Tri-Valley	SB	I-680	At SR 84 East	13,842	15,147	1,305	9%
14 Fremont - Tri-Valley	SB	Foothill Road	North of Niles Canyon Road	0	473	473	0%
14 Fremont - Tri-Valley	SB	Pleasanton-Sunol	North of Niles Canyon Road	0	1,001	1,001	0%
14 Fremont - Tri-Valley	SB	Vallecitos Road	Near Vineyard	1,781	3,116	1,335	75%
			Subtotal	**18,016**	**20,610**	**2,594**	**14%**
			Total	**46,649**	**50,778**	**4,129**	**9%**

Table 5. 2000 PM Peak 4-Hour Traffic Counts and Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count	Model Volume	Difference	Percent Difference
15 Dublin - Pleasanton	NB	San Ramon Road	Between Dublin and Amador Valley Blvds.	4,680	4,643	-37	-1%
15 Dublin - Pleasanton	NB	I-680	North of I-580	25,036	23,738	-1,298	-5%
15 Dublin - Pleasanton	NB	Village Parkway	Between Dublin Blvd. and Lewis Ave.	3,365	2,298	-1,067	-32%
15 Dublin - Pleasanton	NB	Dougherty Road	Between Dublin Blvd. and Sierra Lane	4,796	4,978	182	4%
15 Dublin - Pleasanton	NB	Hacienda Drive	Between I-580 and Dublin Blvd.	2,585	2,142	-443	-17%
15 Dublin - Pleasanton	NB	Tassajara Road	Between I-580 and Dublin Blvd.	2,351	1,587	-764	-33%
15 Dublin - Pleasanton	NB	Santa Rita Road	South of I-580	5,575	4,679	-895	-16%
15 Dublin - Pleasanton	NB	Hacienda Drive	South of I-580	5,583	5,757	175	3%
15 Dublin - Pleasanton	NB	Hopyard Rd.	South of I-580	5,719	9,156	3,437	60%
15 Dublin - Pleasanton	NB	Foothill Road	South of I-580	6,472	6,914	442	7%
			Subtotal	**66,161**	**65,893**	**-268**	**0%**
15 Dublin - Pleasanton	SB	San Ramon Road	Between Dublin and Amador Valley Blvds.	4,324	2,772	-1,552	-36%
15 Dublin - Pleasanton	SB	I-680	North of I-580	20,913	19,162	-1,751	-8%
15 Dublin - Pleasanton	SB	Village Parkway	Between Dublin Blvd. and Lewis Ave.	2,648	2,068	-580	-22%
15 Dublin - Pleasanton	SB	Dougherty Road	Between Dublin Blvd. and Sierra Lane	3,982	4,366	384	10%
15 Dublin - Pleasanton	SB	Hacienda Drive	Between I-580 and Dublin Blvd.	4,172	2,919	-1,253	-30%
15 Dublin - Pleasanton	SB	Tassajara Road	Between I-580 and Dublin Blvd.	4,235	973	-3,262	-77%
15 Dublin - Pleasanton	SB	Santa Rita Road	South of I-580	3,297	3,263	-35	-1%
15 Dublin - Pleasanton	SB	Hacienda Drive	South of I-580	3,213	5,557	2,344	73%
15 Dublin - Pleasanton	SB	Hopyard Rd.	South of I-580	5,362	6,724	1,362	25%
15 Dublin - Pleasanton	SB	Foothill Road	South of I-580	4,025	6,437	2,412	60%
			Subtotal	**56,171**	**54,242**	**-1,930**	**-3%**
			Total	122,332	120,135	-2,198	-2%
16 Pleasanton - Livermore	EB	I-580	At Airway	29,802	29,850	48	0%
16 Pleasanton - Livermore	EB	Stanley Blvd.	West of Isabel Avenue	7,967	7,520	-447	-6%
16 Pleasanton - Livermore	EB	Vineyard Avenue	East of Ruby Hill	2,385	1,961	-424	-18%
16 Pleasanton - Livermore	EB	Vallecitos Road	S/O Isabel Avenue	5,834	5,503	-331	-6%
			Subtotal	**45,988**	**44,834**	**-1,154**	**-3%**
16 Pleasanton - Livermore	WB	I-580	At Airway	19,379	21,378	1,999	10%
16 Pleasanton - Livermore	WB	Stanley Blvd.	West of Isabel Avenue	2,486	1,945	-541	-22%
16 Pleasanton - Livermore	WB	Vineyard Avenue	East of Ruby Hill	1,084	387	-697	-64%
16 Pleasanton - Livermore	WB	Vallecitos Road	S/O Isabel Avenue	2,399	5,046	2,647	110%
			Subtotal	**25,348**	**28,756**	**3,408**	**13%**
			Total	**71,336**	**73,590**	**2,254**	**3%**

9 Appendix C: Detailed Forecast Tables

Appendix C is a separate electronic file:

"Forecasts_Volumes_110510.pdf"

Table C-1: Daily Traffic Forecast Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count 2000	Model Volume 2000	Model Volume 2005	Model Volume 2020	Model Volume 2035	Difference 2000-2005	Percent Difference 2000-2005	Difference 2000-2020	Percent Difference 2000-2020	Difference 2000-2035	Percent Difference 2000-2035
1 Cordon Line	IN	SF-Oakland Bay Bridge	At County Line	143,664	157,108	156,227	181,532	204,237	-880	-1%	24,425	16%	47,130	30%
1 Cordon Line	IN	San Mateo Bridge	At County Line	44,085	48,540	47,327	67,357	86,297	-1,213	-2%	18,817	39%	37,757	78%
1 Cordon Line	IN	Dumbarton Bridge	At County Line	50,473	51,711	48,064	62,095	83,355	-3,647	-7%	10,384	20%	31,644	61%
1 Cordon Line	IN	I-880	At S Clara Co Line or SR 262	82,270	88,219	110,186	133,032	157,277	21,967	25%	44,813	51%	69,058	78%
1 Cordon Line	IN	Warm Springs Blvd.	At County Line	14,433	17,347	9,905	9,114	19,859	-7,442	-43%	-8,233	-47%	2,513	14%
1 Cordon Line	IN	I-680	At E. Warren/Scott Creek	71,049	78,266	76,659	95,669	115,019	-1,606	-2%	17,403	22%	36,754	47%
1 Cordon Line	IN	Calaveras Road	At County Line	1,323	0	0	0	0	0	0%	0	0%	0	0%
1 Cordon Line	IN	Mines Road	At County Line	142	0	0	0	0	0	0%	0	0%	0	0%
1 Cordon Line	IN	Tesla Road	At County Line	675	94	194	3,279	16,056	99	106%	3,185	3383%	15,961	16956%
1 Cordon Line	IN	Patterson Pass Road	At County Line	424	0	1	752	14,928	1	0%	752	0%	14,928	0%
1 Cordon Line	IN	I-580	At Altamont Pass	67,742	79,589	85,469	106,914	117,227	5,880	7%	27,326	34%	37,638	47%
1 Cordon Line	IN	Altamont Pass Rd.	West of Dyer Road	3,273	227	327	2,495	14,338	100	44%	2,268	1001%	14,111	6226%
1 Cordon Line	IN	Grant Line Road	At County Line	1,889	0	0	201	3,577	0	-100%	201	607061%	3,577	10816772%
1 Cordon Line	IN	Vasco Road	Vasco Road at County Line	12,045	8,177	9,934	15,835	22,319	1,757	21%	7,657	94%	14,141	173%
1 Cordon Line	IN	N. Livermore Ave.	South of Hartford Avenue	2,875	615	638	655	600	22	4%	40	6%	-15	-2%
1 Cordon Line	IN	Collier Canyon Rd.	At County Line	285	71	62	76	91	-9	-13%	5	7%	20	29%
1 Cordon Line	IN	Tassajara Road	At County Line	3,935	1,993	1,614	2,069	4,134	-379	-19%	76	4%	2,140	107%
1 Cordon Line	IN	Dougherty Road	At County Line	8,437	2,914	2,824	5,416	5,313	-90	-3%	2,502	86%	2,399	82%
1 Cordon Line	IN	Stagecoach Road	Btwn Amador Vly and Turquoise	2,738	2,184	2,253	4,163	5,062	69	3%	1,979	91%	2,878	132%
1 Cordon Line	IN	Village Parkway	At County Line	6,841	940	816	3,126	5,643	-123	-13%	2,186	233%	4,703	501%
1 Cordon Line	IN	Davona Drive	Between Alcosta and Wicklow	2,085	2,062	2,013	1,864	2,151	-49	-2%	-198	-10%	89	4%
1 Cordon Line	IN	I-680	At CC Co. Line/Alcosta	79,208	72,611	85,239	96,918	117,336	12,627	17%	24,307	33%	44,724	62%
1 Cordon Line	IN	San Ramon Road	Between Alcosta Ave. and Volmac	18,546	4,644	3,574	10,386	14,680	-1,070	-23%	5,742	124%	10,036	216%
1 Cordon Line	IN	Crow Canyon Rd.	At County Line	11,531	14,876	15,543	17,749	22,719	666	4%	2,873	19%	7,843	53%
1 Cordon Line	IN	Pinehurst Rd.	At County Line	662	2,277	2,602	3,535	5,686	326	14%	1,259	55%	3,410	150%
1 Cordon Line	IN	Redwood Rd.	East of Skyline	827	2,278	2,408	3,180	5,197	130	6%	902	40%	2,919	128%
1 Cordon Line	IN	SR 24	At Caldecott Tunnel	87,628	86,558	93,856	111,704	131,852	7,297	8%	25,146	29%	45,293	52%
1 Cordon Line	IN	Canyon Road	At County Line	0	0	0	0	0	0	0%	0	0%	0	0%
1 Cordon Line	IN	Arlington Avenue	At County Line	0	7,289	7,354	8,295	10,828	64	1%	1,006	14%	3,539	49%
1 Cordon Line	IN	Colusa Avenue	At County Line	0	2,116	2,090	2,379	4,683	-27	-1%	263	12%	2,566	121%
1 Cordon Line	IN	San Pablo Avenue	At Solano and Central	13,724	10,842	11,044	23,213	32,513	202	2%	12,371	114%	21,671	200%
1 Cordon Line	IN	I-80	At Central	89,348	90,250	91,295	99,251	109,487	1,045	1%	9,001	10%	19,237	21%
1 Cordon Line	IN	I-580	At Portola and Albany/Jct 80 East	41,782	53,544	58,087	69,261	74,024	4,544	8%	15,717	29%	20,480	38%
		Subtotal		**863,939**	**887,342**	**927,606**	**1,141,516**	**1,406,486**	**40,264**	**5%**	**254,174**	**29%**	**519,144**	**59%**

Table C-1: Daily Traffic Forecast Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count 2000	Model Volume 2000	Model Volume 2005	Model Volume 2020	Model Volume 2035	Difference 2000-2005	Percent Difference 2000-2005	Difference 2000-2020	Percent Difference 2000-2020	Difference 2000-2035	Percent Difference 2000-2035
1 Cordon Line	OUT	SF-Oakland Bay Bridge	At County Line	135,218	152,254	150,601	174,177	197,287	-1,653	-1%	21,923	14%	45,033	30%
1 Cordon Line	OUT	San Mateo Bridge	At County Line	43,924	48,477	48,084	68,113	87,641	-393	-1%	19,636	41%	39,165	81%
1 Cordon Line	OUT	Dumbarton Bridge	At County Line	27,494	48,581	43,727	59,094	79,413	-4,854	-10%	10,513	22%	30,832	63%
1 Cordon Line	OUT	I-880	At S Clara Co. Line or SR 262	89,815	100,708	104,531	128,166	149,010	3,823	4%	27,458	27%	48,302	48%
1 Cordon Line	OUT	Warm Springs Blvd.	At County Line	14,020	11,422	9,224	11,422	26,980	-2,198	-19%	0	0%	15,558	136%
1 Cordon Line	OUT	I-680	At E. Warren/Scott Creek	95,672	75,814	87,406	99,703	107,735	11,592	15%	23,889	32%	31,922	42%
1 Cordon Line	OUT	Calaveras Road	At County Line	0	0	0	0	0	0	0%	0	0%	0	0%
1 Cordon Line	OUT	Mines Road	At County Line	0	0	0	0	0	0	0%	0	0%	0	0%
1 Cordon Line	OUT	Tesla Road	At County Line	1,115	94	193	1,030	14,359	99	105%	936	994%	14,265	15155%
1 Cordon Line	OUT	Patterson Pass Road	At County Line	1,180	0	1	1,356	14,574	1	0%	1,356	0%	14,574	0%
1 Cordon Line	OUT	I-580	At Altamont Pass	71,013	78,825	85,841	112,418	122,297	7,017	9%	33,593	43%	43,473	55%
1 Cordon Line	OUT	Altamont Pass Rd.	West of Dyer Road	2,839	226	327	572	12,875	101	44%	345	153%	12,648	5586%
1 Cordon Line	OUT	Grant Line Road	At County Line	1,887	0	1	234	5,962	1	1600%	234	707520%	5,962	18028144%
1 Cordon Line	OUT	Vasco Road	Vasco Road at County Line	11,860	7,671	9,952	16,332	24,486	2,280	30%	8,661	113%	16,815	219%
1 Cordon Line	OUT	N. Livermore Ave.	South of Hartford Avenue	1,671	615	640	665	664	26	4%	51	8%	49	8%
1 Cordon Line	OUT	Collier Canyon Rd.	At County Line	214	71	65	80	96	-6	-9%	9	12%	25	35%
1 Cordon Line	OUT	Tassajara Road	At County Line	4,016	2,020	1,665	2,054	5,070	-355	-18%	34	2%	3,050	151%
1 Cordon Line	OUT	Dougherty Road	At County Line	10,974	3,068	3,181	6,091	7,532	113	4%	3,023	99%	4,464	146%
1 Cordon Line	OUT	Stagecoach Road	Btwn Amador Vly and Turquoise	2,267	1,929	2,261	4,131	5,709	332	17%	2,202	114%	3,780	196%
1 Cordon Line	OUT	Village Parkway	At County Line	5,545	499	550	1,479	3,969	51	10%	980	196%	3,470	695%
1 Cordon Line	OUT	Davona Drive	Between Alcosta and Wicklow	3,847	1,920	2,013	1,357	2,228	93	5%	-563	-29%	309	16%
1 Cordon Line	OUT	I-680	At CC Co. Line/Alcosta	70,068	76,904	84,613	103,247	121,507	7,709	10%	26,343	34%	44,603	58%
1 Cordon Line	OUT	San Ramon Road	Between Alcosta Ave. and Volmac	11,385	2,858	3,941	7,104	14,423	1,082	38%	4,245	149%	11,565	405%
1 Cordon Line	OUT	Crow Canyon Rd.	At County Line	14,280	15,967	16,157	17,143	21,590	190	1%	1,176	7%	5,623	35%
1 Cordon Line	OUT	Pinehurst Rd.	At County Line	671	2,523	2,746	3,450	5,902	223	9%	926	37%	3,379	134%
1 Cordon Line	OUT	Redwood Rd.	East of Skyline	844	2,215	2,442	3,130	5,445	227	10%	915	41%	3,230	146%
1 Cordon Line	OUT	SR 24	At Caldecott Tunnel	82,416	77,181	80,019	109,954	128,567	2,838	4%	32,773	42%	51,386	67%
1 Cordon Line	OUT	Canyon Road	At County Line	0	0	0	0	0	0	0%	0	0%	0	0%
1 Cordon Line	OUT	Arlington Avenue	At County Line	0	7,049	7,269	8,105	10,810	220	3%	1,056	15%	3,760	53%
1 Cordon Line	OUT	Colusa Avenue	At County Line	0	2,116	2,229	2,408	4,898	113	5%	292	14%	2,782	131%
1 Cordon Line	OUT	San Pablo Avenue	At Solano and Central	13,911	11,191	11,071	26,374	31,993	-120	-1%	15,183	136%	20,802	186%
1 Cordon Line	OUT	I-80	At Central	84,530	90,558	93,978	99,234	111,259	3,420	4%	8,676	10%	20,701	23%
1 Cordon Line	OUT	I-580	At Portola and Albany/Jct 80 East	41,256	55,944	63,090	71,226	73,592	7,146	13%	15,283	27%	17,648	32%
		Subtotal		**843,932**	**878,700**	**917,819**	**1,139,849**	**1,397,874**	**39,119**	**4%**	**261,149**	**30%**	**519,174**	**59%**
		Total		**1,707,871**	**1,766,042**	**1,845,424**	**2,281,365**	**2,804,360**	**79,382**	**4%**	**515,323**	**29%**	**1,038,318**	**59%**

Table C-1: Daily Traffic Forecast Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count 2000	Model Volume 2000	Model Volume 2005	Model Volume 2020	Model Volume 2035	Difference 2000-2005	Percent Difference 2000-2005	Difference 2000-2020	Percent Difference 2000-2020	Difference 2000-2035	Percent Difference 2000-2035
2 Albany - Berkeley	NB	I-80	Between Gilman and Buchanan	129,500	136,220	139,899	152,961	167,650	3,680	3%	16,741	12%	31,430	23%
2 Albany - Berkeley	NB	San Pablo Avenue	At Gilman and Marin	12,680	15,302	21,260	30,215	31,253	5,958	39%	14,913	97%	15,951	104%
2 Albany - Berkeley	NB	Marin Avenue	Near Cityline	8,881	10,858	10,855	14,425	15,367	-3	0%	3,567	33%	4,509	42%
2 Albany - Berkeley	NB	Solano Avenue	Near Cityline	5,734	2,277	2,339	3,416	5,022	61	3%	1,139	50%	2,745	121%
		Subtotal		**156,795**	**164,657**	**174,353**	**201,017**	**219,292**	**9,696**	**6%**	**36,360**	**22%**	**54,635**	**33%**
2 Albany - Berkeley	SB	I-80	Between Gilman and Buchanan	129,500	132,590	136,438	149,749	167,742	3,848	3%	17,159	13%	35,153	27%
2 Albany - Berkeley	SB	San Pablo Avenue	At Gilman and Marin	14,153	12,809	14,512	30,465	31,641	1,703	13%	17,655	138%	18,832	147%
2 Albany - Berkeley	SB	Marin Avenue	Near Cityline	9,981	11,353	12,134	14,139	15,353	780	7%	2,786	25%	4,000	35%
2 Albany - Berkeley	SB	Solano Avenue	Near Cityline	13,004	2,170	2,338	3,112	5,027	168	8%	942	43%	2,857	132%
		Subtotal		**166,638**	**158,922**	**165,422**	**197,465**	**219,764**	**6,500**	**4%**	**38,543**	**24%**	**60,842**	**38%**
		Total		**323,433**	**323,579**	**339,775**	**398,482**	**439,057**	**16,196**	**5%**	**74,903**	**23%**	**115,477**	**36%**
3 Berkeley - Emeryville	NB	I-80	At Powell	127,500	133,064	136,925	144,242	154,778	3,861	3%	11,178	8%	21,713	16%
3 Berkeley - Emeryville	NB	Seventh	Near Ashby/City Limit	0	4,743	3,981	5,712	8,879	-763	-16%	968	20%	4,135	87%
3 Berkeley - Emeryville	NB	Hollis St.	Near Ashby/City Limit	0	2,925	2,937	4,486	7,081	12	0%	1,561	53%	4,155	142%
3 Berkeley - Emeryville	NB	West Frontage Road	Near Ashby/City Limit	9,613	6,490	8,302	14,391	15,501	1,812	28%	7,901	122%	9,010	139%
3 Berkeley - Emeryville	NB	Shellmound Street	Near Ashby/City Limit	0	3,245	3,362	4,751	8,722	117	4%	1,505	46%	5,477	169%
		Subtotal		**137,113**	**150,468**	**155,507**	**173,582**	**194,960**	**5,039**	**3%**	**23,113**	**15%**	**44,491**	**30%**
3 Berkeley - Emeryville	SB	I-80	At Powell	127,500	123,390	124,226	142,829	153,376	836	1%	19,439	16%	29,987	24%
3 Berkeley - Emeryville	SB	Seventh	Near Ashby/City Limit	0	4,115	3,590	4,573	6,640	-525	-13%	457	11%	2,525	61%
3 Berkeley - Emeryville	SB	Hollis St.	Near Ashby/City Limit	0	4,032	4,108	5,240	8,600	76	2%	1,207	30%	4,568	113%
3 Berkeley - Emeryville	SB	West Frontage Road	Near Ashby/City Limit	7,855	12,293	14,072	17,562	23,762	1,779	14%	5,268	43%	11,469	93%
3 Berkeley - Emeryville	SB	Shellmound Street	Near Ashby/City Limit	0	2,156	2,173	2,647	4,488	17	1%	491	23%	2,332	108%
		Subtotal		**135,355**	**145,987**	**148,170**	**172,850**	**196,866**	**2,183**	**1%**	**26,863**	**18%**	**50,879**	**35%**
		Total		**272,468**	**296,455**	**303,677**	**346,432**	**391,826**	**7,222**	**2%**	**49,977**	**17%**	**95,371**	**32%**

Table C-1: Daily Traffic Forecast Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count 2000	Model Volume 2000	Model Volume 2005	Model Volume 2020	Model Volume 2035	Difference 2000-2005	Percent Difference 2000-2005	Difference 2000-2020	Percent Difference 2000-2020	Difference 2000-2035	Percent Difference 2000-2035
4 Berkeley - Oakland	NB	San Pablo Avenue	At Stanford and Ashby Ave.	13,505	8,574	9,571	17,910	27,743	996	12%	9,336	109%	19,169	224%
4 Berkeley - Oakland	NB	Sacramento Street	Near City Limits	0	10,479	10,826	13,452	21,219	347	3%	2,974	28%	10,740	102%
4 Berkeley - Oakland	NB	Adeline Street	South of Alcatraz	15,111	12,843	13,571	15,203	19,426	729	6%	2,360	18%	6,583	51%
4 Berkeley - Oakland	NB	Shattuck Avenue	Near City Limits	9,039	10,939	11,127	12,810	15,473	188	2%	1,871	17%	4,534	41%
4 Berkeley - Oakland	NB	Telegraph Avenue	Near City Limits	13,946	16,856	23,903	25,057	29,948	7,047	42%	8,201	49%	13,092	78%
4 Berkeley - Oakland	NB	College Avenue	Near City Limits	6,459	2,218	2,004	1,868	4,003	-214	-10%	-350	-16%	1,785	80%
4 Berkeley - Oakland	NB	Claremont Avenue	South of Ashby	7,044	7,248	7,905	9,880	10,795	657	9%	2,632	36%	3,547	49%
4 Berkeley - Oakland	NB	Tunnel Road	Near City Limits	17,592	15,987	16,048	16,364	16,225	61	0%	377	2%	238	1%
4 Berkeley - Oakland	NB	Grizzly Peak Blvd.	North of 24	3,292	156	291	915	1,559	135	87%	759	487%	1,404	900%
4 Berkeley - Oakland	NB	Fish Ranch Road	North of 24	3,122	4,291	4,488	10,149	12,332	197	5%	5,858	137%	8,041	187%
		Subtotal		**89,110**	**89,590**	**99,732**	**123,608**	**158,723**	**10,142**	**11%**	**34,018**	**38%**	**69,133**	**77%**
4 Berkeley - Oakland	SB	San Pablo Avenue	At Stanford and Ashby Ave.	13,197	8,546	8,339	18,435	29,243	-207	-2%	9,890	116%	20,697	242%
4 Berkeley - Oakland	SB	Sacramento Street	Near City Limits	0	9,685	9,585	11,430	20,880	-101	-1%	1,745	18%	11,195	116%
4 Berkeley - Oakland	SB	Adeline Street	South of Alcatraz	13,755	10,908	11,758	11,860	16,680	850	8%	952	9%	5,772	53%
4 Berkeley - Oakland	SB	Shattuck Avenue	Near City Limits	9,155	10,378	12,618	13,961	14,462	2,239	22%	3,582	35%	4,084	39%
4 Berkeley - Oakland	SB	Telegraph Avenue	Near City Limits	10,798	7,407	10,006	18,865	22,395	2,600	35%	11,458	155%	14,988	202%
4 Berkeley - Oakland	SB	College Avenue	Near City Limits	6,216	3,460	3,787	4,139	5,282	327	9%	679	20%	1,822	53%
4 Berkeley - Oakland	SB	Claremont Avenue	South of Ashby	6,862	7,117	7,218	8,595	9,941	101	1%	1,477	21%	2,824	40%
4 Berkeley - Oakland	SB	Tunnel Road	Near City Limits	18,794	15,958	16,083	16,170	16,294	124	1%	212	1%	336	2%
4 Berkeley - Oakland	SB	Grizzly Peak Blvd.	North of 24	2,927	301	543	400	1,503	242	80%	99	33%	1,202	399%
4 Berkeley - Oakland	SB	Fish Ranch Road	North of 24	4,678	10,707	12,881	10,468	12,832	2,174	20%	-239	-2%	2,125	20%
		Subtotal		**86,382**	**84,468**	**92,817**	**114,324**	**149,511**	**8,349**	**10%**	**29,856**	**35%**	**65,044**	**77%**
		Total		**175,491**	**174,057**	**192,549**	**237,932**	**308,234**	**18,491**	**11%**	**63,874**	**37%**	**134,177**	**77%**

Table C-1: Daily Traffic Forecast Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count 2000	Model Volume 2000	Model Volume 2005	Model Volume 2020	Model Volume 2035	Difference 2000-2005	Percent Difference 2000-2005	Difference 2000-2020	Percent Difference 2000-2020	Difference 2000-2035	Percent Difference 2000-2035
5 Emeryville - Oakland	NB	I-80	At Powell	127,500	133,064	136,925	144,242	154,778	3,861	3%	11,178	8%	21,713	16%
5 Emeryville - Oakland	NB	Shellmound Street	Near 40th/City Limit	0	1,396	2,749	4,628	7,789	1,353	97%	3,232	231%	6,393	458%
5 Emeryville - Oakland	NB	Adeline Street	South of Alcatraz	15,111	12,843	13,571	15,203	19,426	729	6%	2,360	18%	6,583	51%
5 Emeryville - Oakland	NB	Hollis St.	Near Powell	0	7,205	6,466	6,503	10,716	-739	-10%	-702	-10%	3,511	49%
5 Emeryville - Oakland	NB	San Pablo Avenue	At Stanford and Ashby Ave.	11,850	9,192	10,142	17,824	29,094	949	10%	8,632	94%	19,901	216%
		Subtotal		**154,461**	**163,701**	**169,853**	**188,401**	**221,802**	**6,152**	**4%**	**24,700**	**15%**	**58,102**	**35%**
5 Emeryville - Oakland	SB	I-80	At Powell	127,500	123,390	124,226	142,829	153,376	836	1%	19,439	16%	29,987	24%
5 Emeryville - Oakland	SB	Shellmound Street	Near 40th/City Limit	0	2,225	3,965	7,723	12,934	1,740	78%	5,498	247%	10,709	481%
5 Emeryville - Oakland	SB	Adeline Street	South of Alcatraz	13,755	10,908	11,758	11,860	16,680	850	8%	952	9%	5,772	53%
5 Emeryville - Oakland	SB	Hollis St.	Near Powell	0	4,830	4,485	8,128	11,472	-346	-7%	3,298	68%	6,642	138%
5 Emeryville - Oakland	SB	San Pablo Avenue	At Stanford and Ashby Ave.	11,850	9,955	9,795	18,848	30,218	-161	-2%	8,893	89%	20,262	204%
		Subtotal		**153,105**	**151,308**	**154,228**	**189,387**	**224,680**	**2,920**	**2%**	**38,079**	**25%**	**73,372**	**48%**
		Total		**307,565**	**315,009**	**324,080**	**377,788**	**446,482**	**9,072**	**3%**	**62,780**	**20%**	**131,474**	**42%**
6 Oakland - Piedmont	NB	Pleasant Valley	Near City Limits	8,229	7,407	8,047	8,982	11,328	641	9%	1,576	21%	3,921	53%
6 Oakland - Piedmont	NB	Moraga Avenue	Eastern Border	6,728	3,886	3,724	3,817	4,245	-162	-4%	-69	-2%	359	9%
6 Oakland - Piedmont	NB	Moraga Avenue	Western Border	4,506	3,652	3,822	4,015	4,946	170	5%	363	10%	1,294	35%
6 Oakland - Piedmont	NB	Grand Avenue	Northern Border	5,734	6,445	6,968	7,001	9,175	523	8%	555	9%	2,730	42%
6 Oakland - Piedmont	NB	Grand Avenue	Southern Border	10,592	7,033	7,471	7,335	9,155	438	6%	303	4%	2,122	30%
6 Oakland - Piedmont	NB	Oakland Avenue	North of Monte Vista	5,074	4,912	4,945	4,845	5,136	33	1%	-68	-1%	223	5%
6 Oakland - Piedmont	NB	Lakeshore Avenue	Between Windsor and Walavista	1,594	219	233	228	201	14	6%	8	4%	-18	-8%
		Subtotal		**42,457**	**33,554**	**35,210**	**36,222**	**44,184**	**1,656**	**5%**	**2,668**	**8%**	**10,630**	**32%**
6 Oakland - Piedmont	SB	Pleasant Valley	Near City Limits	7,284	7,615	8,102	8,870	11,513	488	6%	1,255	16%	3,899	51%
6 Oakland - Piedmont	SB	Moraga Avenue	Eastern Border	6,679	3,828	3,815	3,888	4,175	-14	0%	59	2%	346	9%
6 Oakland - Piedmont	SB	Moraga Avenue	Western Border	4,422	3,597	3,933	4,247	5,241	336	9%	651	18%	1,644	46%
6 Oakland - Piedmont	SB	Grand Avenue	Northern Border	6,218	5,863	6,328	7,475	9,191	465	8%	1,612	27%	3,327	57%
6 Oakland - Piedmont	SB	Grand Avenue	Southern Border	10,457	6,196	6,621	7,649	9,137	425	7%	1,453	23%	2,940	47%
6 Oakland - Piedmont	SB	Oakland Avenue	North of Monte Vista	4,544	6,063	6,081	6,001	6,794	18	0%	-61	-1%	731	12%
6 Oakland - Piedmont	SB	Lakeshore Avenue	Between Windsor and Walavista	1,777	171	184	160	180	14	8%	-10	-6%	9	5%
		Subtotal		**41,381**	**33,333**	**35,065**	**38,291**	**46,230**	**1,732**	**5%**	**4,957**	**15%**	**12,897**	**39%**
		Total		**83,838**	**66,887**	**70,275**	**74,513**	**90,414**	**3,388**	**5%**	**7,625**	**11%**	**23,527**	**35%**

Table C-1: Daily Traffic Forecast Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count 2000	Model Volume 2000	Model Volume 2005	Model Volume 2020	Model Volume 2035	Difference 2000-2005	Percent Difference 2000-2005	Difference 2000-2020	Percent Difference 2000-2020	Difference 2000-2035	Percent Difference 2000-2035
7 Alameda - Oakland	NB	Webster-Posey Tubes	Near entrance/exit Oakland side	32,737	29,750	30,206	39,524	42,896	456	2%	9,774	33%	13,146	44%
7 Alameda - Oakland	NB	Park St. Bridge	West of Bridge	23,200	23,105	22,995	25,291	32,436	-110	0%	2,187	9%	9,331	40%
7 Alameda - Oakland	NB	Fruitvale Bridge	West of Bridge	10,746	12,300	13,069	14,178	18,441	769	6%	1,878	15%	6,141	50%
7 Alameda - Oakland	NB	High St. Bridge	West of Bridge	12,710	10,268	9,354	8,109	9,850	-914	-9%	-2,159	-21%	-418	-4%
7 Alameda - Oakland	NB	Doolittle Street	Near City Limits	14,087	14,356	10,054	12,789	17,710	-4,302	-30%	-1,567	-11%	3,354	23%
7 Alameda - Oakland	NB	SR 61/Doolittle	North of Hegenberger	13,662	15,736	11,663	14,787	20,113	-4,074	-26%	-949	-6%	4,376	28%
7 Alameda - Oakland	NB	Ron Cowan Pkwy	South of Harbor Bay Pkwy	0	0	5,927	7,260	8,195	5,927	0%	7,260	0%	8,195	0%
		Subtotal		**107,142**	**105,516**	**103,269**	**121,939**	**149,641**	**-2,247**	**-2%**	**16,423**	**16%**	**44,125**	**42%**
7 Alameda - Oakland	SB	Webster-Posey Tubes	Near entrance/exit Oakland side	34,980	29,434	29,715	38,871	51,064	281	1%	9,437	32%	21,630	73%
7 Alameda - Oakland	SB	Park St. Bridge	West of Bridge	19,428	20,581	20,446	20,639	25,563	-135	-1%	58	0%	4,982	24%
7 Alameda - Oakland	SB	Fruitvale Bridge	West of Bridge	14,696	14,760	15,202	17,691	19,552	442	3%	2,931	20%	4,791	32%
7 Alameda - Oakland	SB	High St. Bridge	West of Bridge	12,579	11,757	11,563	10,958	8,932	-194	-2%	-798	-7%	-2,825	-24%
7 Alameda - Oakland	SB	Doolittle Street	Near City Limits	13,394	15,465	11,299	13,897	19,462	-4,167	-27%	-1,569	-10%	3,996	26%
7 Alameda - Oakland	SB	SR 61/Doolittle	North of Hegenberger	15,169	16,849	12,414	14,891	20,500	-4,434	-26%	-1,958	-12%	3,651	22%
7 Alameda - Oakland	SB	Ron Cowan Pkwy	South of Harbor Bay Pkwy	0	0	5,985	7,209	7,931	5,985	0%	7,209	0%	7,931	0%
		Subtotal		**110,246**	**108,847**	**106,625**	**124,157**	**153,004**	**-2,222**	**-2%**	**15,310**	**14%**	**44,158**	**41%**
		Total		**217,388**	**214,363**	**209,894**	**246,095**	**302,645**	**-4,469**	**-2%**	**31,733**	**15%**	**88,282**	**41%**

Table C-1: Daily Traffic Forecast Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count 2000	Model Volume 2000	Model Volume 2005	Model Volume 2020	Model Volume 2035	Difference 2000-2005	Percent Difference 2000-2005	Difference 2000-2020	Percent Difference 2000-2020	Difference 2000-2035	Percent Difference 2000-2035
8 Oak - San L E14th/Int	EB	Lakeshore Avenue	E/O International	10,142	12,263	12,456	14,215	17,479	194	2%	1,952	16%	5,216	43%
8 Oak - San L E14th/Int	EB	Park Blvd - 5th Avenue	E/O International	1,747	498	513	711	929	15	3%	213	43%	431	87%
8 Oak - San L E14th/Int	EB	14th Avenue	E/O International	9,375	9,411	9,356	10,486	12,880	-55	-1%	1,076	11%	3,469	37%
8 Oak - San L E14th/Int	EB	23rd Avenue	E/O International	3,353	1,492	1,452	1,532	1,443	-41	-3%	39	3%	-49	-3%
8 Oak - San L E14th/Int	EB	Fruitvale Avenue	E/O International	11,265	7,358	7,461	8,267	10,046	103	1%	909	12%	2,689	37%
8 Oak - San L E14th/Int	EB	35th Avenue	E/O International	6,028	2,364	2,344	2,558	3,162	-20	-1%	194	8%	799	34%
8 Oak - San L E14th/Int	EB	42nd/Courtland	E/O International	6,941	13,106	12,913	14,178	17,928	-193	-1%	1,072	8%	4,822	37%
8 Oak - San L E14th/Int	EB	High Street	E/O International	8,103	1,629	1,551	1,971	2,746	-78	-5%	342	21%	1,117	69%
8 Oak - San L E14th/Int	EB	55th Avenue	E/O International	2,054	1,424	1,434	1,734	1,872	10	1%	309	22%	448	31%
8 Oak - San L E14th/Int	EB	Seminary Avenue	E/O International	5,573	2,688	2,782	3,618	4,629	93	3%	929	35%	1,940	72%
8 Oak - San L E14th/Int	EB	73rd Avenue	E/O International	14,182	12,313	13,810	19,390	21,864	1,496	12%	7,077	57%	9,551	78%
8 Oak - San L E14th/Int	EB	82nd Avenue	E/O International	1,681	1,487	1,528	1,730	1,889	41	3%	243	16%	402	27%
8 Oak - San L E14th/Int	EB	98th Avenue	E/O International	10,363	6,560	6,606	7,544	8,423	46	1%	984	15%	1,864	28%
8 Oak - San L E14th/Int	EB	Davis Street (SR 112)	W/O International	12,256	8,192	8,349	10,158	15,596	157	2%	1,967	24%	7,404	90%
8 Oak - San L E14th/Int	EB	Estudillo	E/O International	4,927	7,182	7,264	7,686	7,823	82	1%	503	7%	640	9%
		Subtotal		**107,990**	**87,966**	**89,816**	**105,776**	**128,710**	**1,850**	**2%**	**17,810**	**20%**	**40,744**	**46%**
8 Oak - San L E14th/Int	WB	Lakeshore Avenue	E/O International	4,959	3,594	3,764	3,451	3,619	170	5%	-143	-4%	25	1%
8 Oak - San L E14th/Int	WB	Park Blvd - 5th Avenue	E/O International	2,098	948	926	754	895	-22	-2%	-193	-20%	-53	-6%
8 Oak - San L E14th/Int	WB	14th Avenue	E/O International	10,973	8,734	8,953	11,547	15,836	218	3%	2,813	32%	7,102	81%
8 Oak - San L E14th/Int	WB	23rd Avenue	E/O International	3,265	2,148	2,136	1,725	1,941	-12	-1%	-424	-20%	-207	-10%
8 Oak - San L E14th/Int	WB	Fruitvale Avenue	E/O International	11,694	7,379	7,424	8,689	9,513	45	1%	1,310	18%	2,134	29%
8 Oak - San L E14th/Int	WB	35th Avenue	E/O International	6,709	2,361	2,375	2,558	3,025	14	1%	198	8%	664	28%
8 Oak - San L E14th/Int	WB	42nd/Courtland	E/O International	7,410	5,896	5,994	9,957	14,363	98	2%	4,061	69%	8,467	144%
8 Oak - San L E14th/Int	WB	High Street	E/O International	9,213	5,381	5,179	4,162	5,028	-202	-4%	-1,219	-23%	-353	-7%
8 Oak - San L E14th/Int	WB	55th Avenue	E/O International	2,724	1,433	1,458	1,789	1,982	25	2%	356	25%	548	38%
8 Oak - San L E14th/Int	WB	Seminary Avenue	E/O International	5,444	2,953	3,080	5,614	10,684	127	4%	2,660	90%	7,730	262%
8 Oak - San L E14th/Int	WB	73rd Avenue	E/O International	15,098	12,353	12,962	17,701	17,384	610	5%	5,348	43%	5,031	41%
8 Oak - San L E14th/Int	WB	82nd Avenue	E/O International	2,942	1,522	1,495	1,696	1,819	-26	-2%	174	11%	297	20%
8 Oak - San L E14th/Int	WB	98th Avenue	E/O International	10,957	6,359	6,574	8,249	8,700	216	3%	1,890	30%	2,341	37%
8 Oak - San L E14th/Int	WB	Davis Street (SR 112)	W/O International	12,959	8,499	8,565	10,040	17,820	66	1%	1,541	18%	9,321	110%
8 Oak - San L E14th/Int	WB	Estudillo	E/O International	5,625	7,255	7,307	9,826	13,950	52	1%	2,572	35%	6,695	92%
		Subtotal		**112,070**	**76,814**	**78,193**	**97,757**	**126,558**	**1,379**	**2%**	**20,943**	**27%**	**49,744**	**65%**
		Total		**220,060**	**164,780**	**168,009**	**203,533**	**255,268**	**3,230**	**2%**	**38,753**	**24%**	**90,489**	**55%**

Table C-1: Daily Traffic Forecast Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count 2000	Model Volume 2000	Model Volume 2005	Model Volume 2020	Model Volume 2035	Difference 2000-2005	Percent Difference 2000-2005	Difference 2000-2020	Percent Difference 2000-2020	Difference 2000-2035	Percent Difference 2000-2035
9 Oakland - San Leandro	NB	Doolittle Drive	Near Davis	18,064	25,589	29,471	32,751	33,903	3,882	15%	7,162	28%	8,314	32%
9 Oakland - San Leandro	NB	I-880	Between Davis and 98th Avenue	104,704	106,599	106,633	120,556	130,372	35	0%	13,957	13%	23,773	22%
9 Oakland - San Leandro	NB	San Leandro Blvd.	Near City Limits	6,340	4,497	4,319	9,034	25,856	-177	-4%	4,538	101%	21,360	475%
9 Oakland - San Leandro	NB	Int'l/E. 14th	Near 98th Avenue	13,997	5,019	5,319	8,527	16,755	300	6%	3,508	70%	11,736	234%
9 Oakland - San Leandro	NB	Bancroft Avenue	Near City Limits	4,734	3,451	3,470	5,710	11,648	19	1%	2,259	65%	8,198	238%
9 Oakland - San Leandro	NB	MacArthur Blvd.	Near City Limits	5,796	7,582	7,645	9,215	10,154	63	1%	1,634	22%	2,572	34%
9 Oakland - San Leandro	NB	Foothill Blvd.	Near City Limits	3,163	2,757	2,719	3,012	3,221	-38	-1%	256	9%	464	17%
9 Oakland - San Leandro	NB	I-580	Between 98th and Estudillo	69,500	100,065	103,342	123,743	138,003	3,277	3%	23,678	24%	37,937	38%
		Subtotal		**226,298**	**255,558**	**262,919**	**312,549**	**369,912**	**7,361**	**3%**	**56,991**	**22%**	**114,354**	**45%**
9 Oakland - San Leandro	SB	Doolittle Drive	Near Davis	17,059	19,536	23,003	25,684	33,181	3,467	18%	6,148	31%	13,645	70%
9 Oakland - San Leandro	SB	I-880	Between Davis and 98th Avenue	106,102	108,823	108,448	132,435	145,805	-374	0%	23,612	22%	36,982	34%
9 Oakland - San Leandro	SB	San Leandro Blvd.	Near City Limits	6,805	4,909	4,872	7,739	15,739	-37	-1%	2,830	58%	10,830	221%
9 Oakland - San Leandro	SB	Int'l/E. 14th	Near 98th Avenue	11,647	5,355	5,735	8,301	15,265	381	7%	2,946	55%	9,910	185%
9 Oakland - San Leandro	SB	Bancroft Avenue	Near City Limits	4,924	3,051	3,061	3,865	8,503	11	0%	814	27%	5,453	179%
9 Oakland - San Leandro	SB	MacArthur Blvd.	Near City Limits	5,796	6,858	6,700	8,297	10,190	-158	-2%	1,439	21%	3,332	49%
9 Oakland - San Leandro	SB	Foothill Blvd.	Near City Limits	4,195	2,896	2,860	3,351	3,422	-36	-1%	454	16%	526	18%
9 Oakland - San Leandro	SB	I-580	Between 98th and Estudillo	69,500	107,056	110,153	125,616	140,783	3,096	3%	18,560	17%	33,726	32%
		Subtotal		**226,028**	**258,483**	**264,832**	**315,287**	**372,887**	**6,350**	**2%**	**56,804**	**22%**	**114,405**	**44%**
		Total		**452,326**	**514,041**	**527,751**	**627,836**	**742,799**	**13,711**	**3%**	**113,795**	**22%**	**228,759**	**45%**

Table C-1: Daily Traffic Forecast Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count 2000	Model Volume 2000	Model Volume 2005	Model Volume 2020	Model Volume 2035	Difference 2000-2005	Percent Difference 2000-2005	Difference 2000-2020	Percent Difference 2000-2020	Difference 2000-2035	Percent Difference 2000-2035
10 Hayward - Union City	NB	Union City Blvd.	Near City Limits	12,550	30,150	30,717	33,503	34,597	567	2%	3,353	11%	4,447	15%
10 Hayward - Union City	NB	I-880	At Industrial Parkway	100,029	110,904	113,633	122,982	141,280	2,729	2%	12,078	11%	30,377	27%
10 Hayward - Union City	NB	Industrial Pkwy	Near Huntwood	17,152	11,272	12,610	15,380	17,648	1,337	12%	4,108	36%	6,376	57%
10 Hayward - Union City	NB	Whipple Road	Near City Limit, E side of I-880	16,821	11,324	11,243	11,425	15,270	-81	-1%	101	1%	3,946	35%
10 Hayward - Union City	NB	Mission Blvd	At Greasel Street	15,394	12,778	14,771	21,420	29,773	1,993	16%	8,641	68%	16,995	133%
		Subtotal		**161,946**	**176,429**	**182,974**	**204,710**	**238,568**	**6,545**	**4%**	**28,282**	**16%**	**62,140**	**35%**
10 Hayward - Union City	SB	Union City Blvd.	Near City Limits	12,550	23,521	24,034	33,145	34,602	513	2%	9,624	41%	11,080	47%
10 Hayward - Union City	SB	I-880	At Industrial Parkway	103,056	115,083	116,443	125,677	148,333	1,360	1%	10,594	9%	33,250	29%
10 Hayward - Union City	SB	Industrial Pkwy	Near Huntwood	19,171	12,169	13,320	13,627	18,199	1,152	9%	1,459	12%	6,030	50%
10 Hayward - Union City	SB	Whipple Road	Near City Limit, E side of I-880	16,829	12,493	12,501	14,599	23,437	8	0%	2,106	17%	10,944	88%
10 Hayward - Union City	SB	Mission Blvd	At Greasel Street	17,405	14,809	16,849	25,088	30,660	2,040	14%	10,279	69%	15,851	107%
		Subtotal		**169,011**	**178,075**	**183,147**	**212,137**	**255,231**	**5,072**	**3%**	**34,063**	**19%**	**77,156**	**43%**
		Total		**330,957**	**354,503**	**366,121**	**416,847**	**493,799**	**11,617**	**3%**	**62,344**	**18%**	**139,296**	**39%**
11 Hayward - Castro Vall	NB	Redwood Rd.	North of Seven Hills	5,682	1,720	1,971	2,531	4,486	252	15%	812	47%	2,766	161%
11 Hayward - Castro Vall	NB	Crow Canyon Rd.	North of Cold Water Drive	12,882	16,003	16,303	17,203	19,646	301	2%	1,200	8%	3,643	23%
11 Hayward - Castro Vall	NB	I-580	At Crow Canyon	87,108	95,419	101,200	124,434	139,854	5,781	6%	29,015	30%	44,435	47%
11 Hayward - Castro Vall	NB	Dublin Canyon Road	East of Palomares	1,817	975	949	4,633	10,350	-26	-3%	3,658	375%	9,375	962%
11 Hayward - Castro Vall	NB	Palomares Road	South of Palo Verde Road	971	1,469	1,342	1,928	2,569	-126	-9%	460	31%	1,100	75%
		Subtotal		**108,460**	**115,585**	**121,767**	**150,729**	**176,905**	**6,181**	**5%**	**35,144**	**30%**	**61,320**	**53%**
11 Hayward - Castro Vall	SB	Redwood Rd.	North of Seven Hills	6,526	1,778	1,935	2,574	4,205	157	9%	795	45%	2,427	136%
11 Hayward - Castro Vall	SB	Crow Canyon Rd.	North of Cold Water Drive	12,797	15,963	16,460	17,823	20,447	497	3%	1,860	12%	4,484	28%
11 Hayward - Castro Vall	SB	I-580	At Crow Canyon	87,532	94,251	100,113	127,222	146,123	5,863	6%	32,972	35%	51,873	55%
11 Hayward - Castro Vall	SB	Dublin Canyon Road	East of Palomares	2,560	986	964	4,336	8,534	-22	-2%	3,350	340%	7,547	765%
11 Hayward - Castro Vall	SB	Palomares Road	South of Palo Verde Road	784	1,484	1,357	1,773	2,316	-127	-9%	289	19%	831	56%
		Subtotal		**110,199**	**114,463**	**120,830**	**153,729**	**181,625**	**6,368**	**6%**	**39,266**	**34%**	**67,162**	**59%**
		Total		**218,659**	**230,048**	**242,597**	**304,458**	**358,530**	**12,549**	**5%**	**74,410**	**32%**	**128,482**	**56%**

Table C-1: Daily Traffic Forecast Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count 2000	Model Volume 2000	Model Volume 2005	Model Volume 2020	Model Volume 2035	Difference 2000-2005	Percent Difference 2000-2005	Difference 2000-2020	Percent Difference 2000-2020	Difference 2000-2035	Percent Difference 2000-2035
12 Union City - Fremont	NB	Ardenwood Blvd.	Near City Limits	12,748	14,059	13,975	18,158	31,971	-84	-1%	4,099	29%	17,912	127%
12 Union City - Fremont	NB	Alvarado Blvd.	Around Lowry Road	10,398	10,807	11,294	16,631	19,418	488	5%	5,825	54%	8,612	80%
12 Union City - Fremont	NB	I-880	South of Alvarado-Niles I/C	101,082	111,916	114,648	118,450	131,712	2,733	2%	6,534	6%	19,797	18%
12 Union City - Fremont	NB	Decoto Road	South of Alvarado Niles	18,650	24,287	26,080	23,208	32,202	1,793	7%	-1,079	-4%	7,915	33%
12 Union City - Fremont	NB	Isherwood Way	Near City Limits	4,761	1,028	1,185	697	741	157	15%	-331	-32%	-286	-28%
12 Union City - Fremont	NB	Alvarado-Niles Rd.	Near City Limits	7,900	7,949	7,311	3,872	5,278	-639	-8%	-4,077	-51%	-2,671	-34%
12 Union City - Fremont	NB	Mission Blvd	South of Decoto Road	14,733	11,855	12,626	16,629	24,026	771	7%	4,774	40%	12,171	103%
		Subtotal		**170,272**	**181,900**	**187,119**	**197,645**	**245,349**	**5,219**	**3%**	**15,745**	**9%**	**63,449**	**35%**
12 Union City - Fremont	SB	Ardenwood Blvd.	Near City Limits	11,533	11,457	11,335	18,264	31,537	-122	-1%	6,807	59%	20,080	175%
12 Union City - Fremont	SB	Alvarado Blvd.	Around Lowry Road	9,838	10,264	10,847	15,523	24,852	583	6%	5,259	51%	14,588	142%
12 Union City - Fremont	SB	I-880	South of Alvarado-Niles I/C	101,801	113,799	114,643	120,543	130,473	844	1%	6,744	6%	16,674	15%
12 Union City - Fremont	SB	Decoto Road	South of Alvarado Niles	18,650	24,167	24,622	22,330	32,327	455	2%	-1,836	-8%	8,161	34%
12 Union City - Fremont	SB	Isherwood Way	Near City Limits	8,764	1,110	1,224	688	2,172	114	10%	-421	-38%	1,063	96%
12 Union City - Fremont	SB	Alvarado-Niles Rd.	Near City Limits	7,900	7,984	8,614	3,422	5,251	630	8%	-4,562	-57%	-2,733	-34%
12 Union City - Fremont	SB	Mission Blvd	South of Decoto Road	16,352	13,246	14,167	21,799	28,323	921	7%	8,553	65%	15,077	114%
		Subtotal		**174,838**	**182,027**	**185,452**	**202,571**	**254,936**	**3,425**	**2%**	**20,544**	**11%**	**72,909**	**40%**
		Total		**345,110**	**363,926**	**372,571**	**400,215**	**500,285**	**8,645**	**2%**	**36,289**	**10%**	**136,358**	**37%**

Table C-1: Daily Traffic Forecast Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count 2000	Model Volume 2000	Model Volume 2005	Model Volume 2020	Model Volume 2035	Difference 2000-2005	Percent Difference 2000-2005	Difference 2000-2020	Percent Difference 2000-2020	Difference 2000-2035	Percent Difference 2000-2035
13 Fremont - Newark	NB	Thornton Ave.	South of SR 84	11,125	4,048	3,570	5,527	8,434	-478	-12%	1,479	37%	4,386	108%
13 Fremont - Newark	NB	Newark Blvd.	South of SR 84	21,000	10,036	10,425	13,488	16,289	389	4%	3,452	34%	6,253	62%
13 Fremont - Newark	NB	I-880	Near SR 84	100,177	94,941	97,868	105,959	121,122	2,927	3%	11,018	12%	26,181	28%
13 Fremont - Newark	NB	Thornton Ave.	Near I-880/City Limits	0	20,425	20,228	19,384	27,039	-197	-1%	-1,041	-5%	6,614	32%
13 Fremont - Newark	WB	Central Ave.	Near I-880/City Limits	7,112	2,042	2,115	2,258	2,780	73	4%	216	11%	738	36%
13 Fremont - Newark	WB	Mowry Ave.	Near I-880/City Limits	30,348	17,390	17,674	18,218	18,635	285	2%	828	5%	1,246	7%
13 Fremont - Newark	WB	Stevenson Blvd.	Near I-880/City Limits	7,306	20,037	20,781	20,086	19,736	744	4%	49	0%	-301	-2%
13 Fremont - Newark	WB	Cedar Blvd.	Near City Limits	6,125	904	1,063	1,301	1,384	159	18%	397	44%	480	53%
13 Fremont - Newark	WB	Cherry Street	Near City Limits	8,500	5,119	5,907	8,292	15,700	788	15%	3,173	62%	10,580	207%
		Subtotal		**191,693**	**174,941**	**179,632**	**194,512**	**231,119**	4,690	3%	19,571	11%	56,178	32%
13 Fremont - Newark	SB	Thornton Ave.	South of SR 84	11,125	4,615	4,064	6,162	9,638	-551	-12%	1,547	34%	5,022	109%
13 Fremont - Newark	SB	Newark Blvd.	South of SR 84	21,000	12,079	11,956	15,942	28,169	-123	-1%	3,863	32%	16,090	133%
13 Fremont - Newark	SB	I-880	Near SR 84	94,500	100,938	101,379	110,446	124,821	441	0%	9,509	9%	23,883	24%
13 Fremont - Newark	SB	Thornton Ave.	Near I-880/City Limits	0	18,821	18,923	18,126	20,593	101	1%	-695	-4%	1,772	9%
13 Fremont - Newark	EB	Central Ave.	Near I-880/City Limits	8,462	1,992	2,159	2,327	3,349	167	8%	335	17%	1,357	68%
13 Fremont - Newark	EB	Mowry Ave.	Near I-880/City Limits	30,035	22,548	22,907	21,827	22,023	359	2%	-721	-3%	-525	-2%
13 Fremont - Newark	EB	Stevenson Blvd.	Near I-880/City Limits	6,665	11,238	11,889	12,562	13,624	651	6%	1,323	12%	2,386	21%
13 Fremont - Newark	EB	Cedar Blvd.	Near City Limits	6,125	2,600	3,126	3,176	3,226	526	20%	576	22%	627	24%
13 Fremont - Newark	EB	Cherry Street	Near City Limits	8,500	6,553	6,817	10,354	24,169	264	4%	3,801	58%	17,616	269%
		Subtotal		**186,412**	**181,384**	**183,220**	**200,922**	**249,612**	**1,835**	**1%**	**19,538**	**11%**	**68,227**	**38%**
		Total		**378,105**	**356,326**	**362,852**	**395,434**	**480,730**	**6,526**	**2%**	**39,109**	**11%**	**124,405**	**35%**
14 County - Tri-Valley	NB	Niles Canyon Road	At Palomares	9,828	7,528	9,742	20,631	24,305	2,214	29%	13,103	174%	16,777	223%
14 County - Tri-Valley	NB	I-680	At SR 84 East	52,825	70,127	76,357	102,335	106,545	6,230	9%	32,208	46%	36,418	52%
14 County - Tri-Valley	NB	Foothill Road	North of Niles Canyon Road	1,247	1,924	3,905	4,809	6,836	1,981	103%	2,886	150%	4,913	255%
14 County - Tri-Valley	NB	Pleasanton-Sunol	North of Niles Canyon Road	6,153	2,969	3,964	11,577	14,617	994	33%	8,607	290%	11,648	392%
14 County - Tri-Valley	NB	Vallecitos Road	Near Vineyard	13,655	13,647	13,873	4,356	13,167	225	2%	-9,291	-68%	-480	-4%
		Subtotal		**83,708**	**96,196**	**107,841**	**143,708**	**165,470**	**11,645**	**12%**	**47,513**	**49%**	**69,274**	**72%**
14 County - Tri-Valley	SB	Niles Canyon Road	At Palomares	11,637	9,056	8,650	24,388	24,834	-406	-4%	15,332	169%	15,778	174%
14 County - Tri-Valley	SB	I-680	At SR 84 East	54,269	69,755	79,497	95,672	109,195	9,741	14%	25,917	37%	39,440	57%
14 County - Tri-Valley	SB	Foothill Road	North of Niles Canyon Road	3,939	2,040	3,667	4,976	4,205	1,627	80%	2,936	144%	2,166	106%
14 County - Tri-Valley	SB	Pleasanton-Sunol	North of Niles Canyon Road	6,288	3,643	2,227	11,159	5,878	-1,416	-39%	7,516	206%	2,235	61%
14 County - Tri-Valley	SB	Vallecitos Road	Near Vineyard	11,045	13,953	13,902	5,560	13,366	-51	0%	-8,393	-60%	-587	-4%
		Subtotal		**87,178**	**98,447**	**107,942**	**141,755**	**157,479**	**9,496**	**10%**	**43,308**	**44%**	**59,032**	**60%**
		Total		**170,886**	**194,642**	**215,783**	**285,463**	**322,949**	**21,141**	**11%**	**90,821**	**47%**	**128,306**	**66%**

Table C-1: Daily Traffic Forecast Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count 2000	Model Volume 2000	Model Volume 2005	Model Volume 2020	Model Volume 2035	Difference 2000-2005	Percent Difference 2000-2005	Difference 2000-2020	Percent Difference 2000-2020	Difference 2000-2035	Percent Difference 2000-2035
15 Dublin - Pleasanton	NB	San Ramon Road	Btwn Dublin Blvd. and Amador Vly	13,446	8,097	9,631	13,925	21,046	1,534	19%	5,827	72%	12,948	160%
15 Dublin - Pleasanton	NB	I-680	North of I-580	79,123	74,852	82,210	99,176	112,085	7,358	10%	24,324	32%	37,232	50%
15 Dublin - Pleasanton	NB	Village Parkway	Between Dublin Blvd. and Lewis	10,745	4,137	4,896	5,918	9,900	759	18%	1,781	43%	5,763	139%
15 Dublin - Pleasanton	NB	Dougherty Road	Between Dublin Blvd. and Sierra	14,768	10,808	11,145	16,215	18,115	337	3%	5,407	50%	7,307	68%
15 Dublin - Pleasanton	NB	Hacienda Drive	Between I-580 and Dublin Blvd.	8,873	6,396	6,844	14,321	15,479	448	7%	7,925	124%	9,083	142%
15 Dublin - Pleasanton	NB	Tassajara Road	Between I-580 and Dublin Blvd.	9,569	3,060	6,017	17,385	27,551	2,957	97%	14,325	468%	24,491	800%
15 Dublin - Pleasanton	NB	Santa Rita Road	South of I-580	16,055	9,586	11,165	16,655	16,385	1,579	16%	7,069	74%	6,799	71%
15 Dublin - Pleasanton	NB	Hacienda Drive	South of I-580	11,845	14,735	13,938	17,215	16,976	-796	-5%	2,481	17%	2,241	15%
15 Dublin - Pleasanton	NB	Hopyard Rd.	South of I-580	14,005	17,589	18,615	27,027	41,710	1,026	6%	9,438	54%	24,121	137%
15 Dublin - Pleasanton	NB	Foothill Road	South of I-580	15,464	15,765	17,916	23,056	28,728	2,151	14%	7,291	46%	12,963	82%
		Subtotal		**193,892**	**165,026**	**182,379**	**250,892**	**307,974**	**17,353**	**11%**	**85,866**	**52%**	**142,948**	**87%**
15 Dublin - Pleasanton	SB	San Ramon Road	Btwn Dublin Blvd. and Amador Vly	16,789	9,192	8,594	16,309	20,399	-598	-7%	7,117	77%	11,207	122%
15 Dublin - Pleasanton	SB	I-680	North of I-580	79,208	72,611	85,239	96,918	117,336	12,627	17%	24,307	33%	44,724	62%
15 Dublin - Pleasanton	SB	Village Parkway	Between Dublin Blvd. and Lewis	9,602	5,410	6,514	10,957	13,616	1,104	20%	5,547	103%	8,206	152%
15 Dublin - Pleasanton	SB	Dougherty Road	Between Dublin Blvd. and Sierra	13,561	10,419	9,547	12,618	13,968	-872	-8%	2,199	21%	3,549	34%
15 Dublin - Pleasanton	SB	Hacienda Drive	Between I-580 and Dublin Blvd.	12,677	6,042	6,703	14,043	20,860	661	11%	8,001	132%	14,818	245%
15 Dublin - Pleasanton	SB	Tassajara Road	Between I-580 and Dublin Blvd.	10,485	3,070	5,989	13,081	14,255	2,919	95%	10,011	326%	11,185	364%
15 Dublin - Pleasanton	SB	Santa Rita Road	South of I-580	12,605	10,324	11,293	16,905	14,954	969	9%	6,582	64%	4,630	45%
15 Dublin - Pleasanton	SB	Hacienda Drive	South of I-580	14,027	17,510	18,122	22,315	30,381	613	3%	4,805	27%	12,871	74%
15 Dublin - Pleasanton	SB	Hopyard Rd.	South of I-580	19,864	17,834	17,685	24,301	27,820	-149	-1%	6,467	36%	9,987	56%
15 Dublin - Pleasanton	SB	Foothill Road	South of I-580	14,041	16,848	16,242	27,501	29,571	-606	-4%	10,653	63%	12,723	76%
		Subtotal		**202,858**	**169,260**	**185,928**	**254,948**	**303,160**	**16,668**	**10%**	**85,688**	**51%**	**133,900**	**79%**
		Total		**396,751**	**334,285**	**368,307**	**505,840**	**611,134**	**34,021**	**10%**	**171,554**	**51%**	**276,849**	**83%**
16 Pleasanton - Livermore	EB	Dublin Blvd	West of Doolan Rd	0	0	0	2,309	8,234	0	0%	2,309	0%	8,234	0%
16 Pleasanton - Livermore	EB	I-580	At Airway	91,710	97,152	105,490	133,828	160,540	8,338	9%	36,677	38%	63,388	65%
16 Pleasanton - Livermore	EB	W Jack London Blvd	SW of Airport	0	0	0	381	6,256	0	0%	381	0%	6,256	0%
16 Pleasanton - Livermore	EB	Stanley Blvd.	West of Isabel Avenue	15,373	9,193	11,731	27,902	35,982	2,538	28%	18,709	204%	26,789	291%
16 Pleasanton - Livermore	EB	Vineyard Avenue	East of Ruby Hill	4,063	1,323	1,558	2,679	3,054	235	18%	1,356	102%	1,731	131%
16 Pleasanton - Livermore	EB	Vallecitos Road	S/O Isabel Avenue	13,963	22,230	22,684	22,443	43,135	454	2%	213	1%	20,905	94%
		Subtotal		**125,109**	**129,898**	**141,463**	**189,542**	**257,202**	**11,565**	**9%**	**59,644**	**46%**	**127,304**	**98%**
16 Pleasanton - Livermore	WB	Dublin Blvd	West of Doolan Rd	0	0	0	2,265	16,456	0	0%	2,265	0%	16,456	0%
16 Pleasanton - Livermore	WB	I-580	At Airway	94,593	97,625	102,959	133,006	156,827	5,334	5%	35,381	36%	59,202	61%
16 Pleasanton - Livermore	WB	W Jack London Blvd	SW of Airport	0	0	0	1,667	7,669	0	0%	1,667	0%	7,669	0%
16 Pleasanton - Livermore	WB	Stanley Blvd.	West of Isabel Avenue	14,063	9,962	13,613	24,942	35,857	3,652	37%	14,981	150%	25,895	260%
16 Pleasanton - Livermore	WB	Vineyard Avenue	East of Ruby Hill	4,360	1,219	1,610	2,862	2,310	391	32%	1,642	135%	1,091	89%
16 Pleasanton - Livermore	WB	Vallecitos Road	S/O Isabel Avenue	13,463	22,363	22,886	22,298	34,252	523	2%	-66	0%	11,889	53%
		Subtotal		**126,479**	**131,169**	**141,069**	**187,040**	**253,371**	**9,900**	**8%**	**55,871**	**43%**	**122,202**	**93%**
		Total		**251,588**	**261,067**	**282,532**	**376,582**	**510,572**	**21,465**	**8%**	**115,515**	**44%**	**249,505**	**96%**

Table C-2: AM Peak 1-Hour Traffic Forecast Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count 2000	Model Volume 2000	Model Volume 2005	Model Volume 2020	Model Volume 2035	Difference 2000-2005	Percent Difference 2000-2005	Difference 2000-2020	Percent Difference 2000-2020	Difference 2000-2035	Percent Difference 2000-2035
1 Cordon Line	IN	SF-Oakland Bay Bridge	At County Line	7,468	8,190	8,218	8,996	10,251	28	0%	806	10%	2,062	25%
1 Cordon Line	IN	San Mateo Bridge	At County Line	2,757	2,462	2,046	2,527	3,866	-417	-17%	65	3%	1,404	57%
1 Cordon Line	IN	Dumbarton Bridge	At County Line	1,725	1,917	1,601	2,138	2,939	-316	-16%	221	12%	1,022	53%
1 Cordon Line	IN	I-880	At S Clara Co Line or SR 262	4,221	5,011	6,566	7,871	8,163	1,555	31%	2,860	57%	3,152	63%
1 Cordon Line	IN	Warm Springs Blvd.	At County Line	758	1,344	784	732	1,650	-559	-42%	-612	-46%	306	23%
1 Cordon Line	IN	I-680	At E. Warren/Scott Creek	4,745	4,710	4,468	5,886	6,780	-242	-5%	1,176	25%	2,070	44%
1 Cordon Line	IN	Calaveras Road	At County Line	462	0	0	0	0	0	0%	0	0%	0	0%
1 Cordon Line	IN	Mines Road	At County Line	13	0	0	0	0	0	0%	0	0%	0	0%
1 Cordon Line	IN	Tesla Road	At County Line	146	9	13	238	1,233	4	48%	229	2552%	1,224	13659%
1 Cordon Line	IN	Patterson Pass Road	At County Line	158	13	20	494	960	7	57%	481	3840%	947	7554%
1 Cordon Line	IN	I-580	At Altamont Pass	4,909	6,313	6,430	7,436	8,188	117	2%	1,123	18%	1,875	30%
1 Cordon Line	IN	Altamont Pass Rd.	West of Dyer Road	702	21	34	676	1,419	13	64%	655	3182%	1,398	6791%
1 Cordon Line	IN	Grant Line Road	At County Line	657	157	39	44	241	-118	-75%	-114	-72%	84	53%
1 Cordon Line	IN	Vasco Road	Vasco Road at County Line	1,773	1,586	1,649	1,744	1,883	64	4%	159	10%	298	19%
1 Cordon Line	IN	N. Livermore Ave.	South of Hartford Avenue	755	76	84	145	227	8	11%	70	92%	151	199%
1 Cordon Line	IN	Collier Canyon Rd.	At County Line	22	1	1	3	8	0	19%	2	130%	6	535%
1 Cordon Line	IN	Tassajara Road	At County Line	467	274	211	310	828	-63	-23%	36	13%	554	202%
1 Cordon Line	IN	Dougherty Road	At County Line	1,301	818	583	718	1,462	-235	-29%	-100	-12%	644	79%
1 Cordon Line	IN	Stagecoach Road	Btwn Amador Vly and Turquoise	353	339	341	717	740	2	1%	378	111%	401	118%
1 Cordon Line	IN	Village Parkway	At County Line	431	167	97	954	1,402	-71	-42%	787	470%	1,235	738%
1 Cordon Line	IN	Davona Drive	Between Alcosta and Wicklow	176	102	110	88	171	8	7%	-14	-14%	69	67%
1 Cordon Line	IN	I-680	At CC Co. Line/Alcosta	5,459	5,579	6,517	7,615	9,024	938	17%	2,036	36%	3,445	62%
1 Cordon Line	IN	San Ramon Road	Between Alcosta Ave. and Volmac	2,268	808	657	1,567	2,030	-151	-19%	759	94%	1,221	151%
1 Cordon Line	IN	Crow Canyon Rd.	At County Line	1,239	1,171	1,184	1,634	1,650	13	1%	462	39%	479	41%
1 Cordon Line	IN	Pinehurst Rd.	At County Line	97	266	276	566	858	11	4%	301	113%	592	223%
1 Cordon Line	IN	Redwood Rd.	East of Skyline	56	217	196	376	523	-21	-10%	159	73%	306	141%
1 Cordon Line	IN	SR 24	At Caldecott Tunnel	8,168	8,544	9,131	11,172	12,843	587	7%	2,628	31%	4,298	50%
1 Cordon Line	IN	Canyon Road	At County Line	0	0	0	0	0	0	0%	0	0%	0	0%
1 Cordon Line	IN	Arlington Avenue	At County Line	0	689	690	754	843	1	0%	65	9%	154	22%
1 Cordon Line	IN	Colusa Avenue	At County Line	0	211	231	212	378	20	9%	2	1%	168	80%
1 Cordon Line	IN	San Pablo Avenue	At Solano and Central	871	2,006	2,069	2,134	2,210	63	3%	128	6%	204	10%
1 Cordon Line	IN	I-80	At Central	6,897	6,917	7,276	8,943	10,373	359	5%	2,027	29%	3,456	50%
1 Cordon Line	IN	I-580	At Portola and Albany/Jct 80 East	3,306	4,061	4,531	5,250	5,910	470	12%	1,189	29%	1,849	46%
		Subtotal		**62,360**	**63,979**	**66,054**	**81,940**	**99,052**	**2,075**	**3%**	**17,961**	**28%**	**35,073**	**55%**

Table C-2: AM Peak 1-Hour Traffic Forecast Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count 2000	Model Volume 2000	Model Volume 2005	Model Volume 2020	Model Volume 2035	Difference 2000-2005	Percent Difference 2000-2005	Difference 2000-2020	Percent Difference 2000-2020	Difference 2000-2035	Percent Difference 2000-2035
1 Cordon Line	OUT	SF-Oakland Bay Bridge	At County Line	8,996	10,520	10,009	12,275	14,008	-511	-5%	1,755	17%	3,488	33%
1 Cordon Line	OUT	San Mateo Bridge	At County Line	3,449	3,224	3,317	5,211	6,771	94	3%	1,987	62%	3,547	110%
1 Cordon Line	OUT	Dumbarton Bridge	At County Line	2,415	3,910	3,407	4,825	6,786	-503	-13%	914	23%	2,876	74%
1 Cordon Line	OUT	I-880	At S Clara Co. Line or SR 262	4,474	7,145	7,072	8,971	10,750	-72	-1%	1,826	26%	3,606	50%
1 Cordon Line	OUT	Warm Springs Blvd.	At County Line	692	700	948	997	1,963	248	35%	297	42%	1,263	180%
1 Cordon Line	OUT	I-680	At E. Warren/Scott Creek	7,735	5,204	6,168	7,534	8,415	964	19%	2,330	45%	3,212	62%
1 Cordon Line	OUT	Calaveras Road	At County Line	0	0	0	0	0	0	0%	0	0%	0	0%
1 Cordon Line	OUT	Mines Road	At County Line	0	0	0	0	0	0	0%	0	0%	0	0%
1 Cordon Line	OUT	Tesla Road	At County Line	18	7	15	20	631	8	109%	13	181%	623	8595%
1 Cordon Line	OUT	Patterson Pass Road	At County Line	9	0	0	1	728	0	-100%	1	2439%	728	2072756%
1 Cordon Line	OUT	I-580	At Altamont Pass	3,120	3,016	3,306	6,132	7,642	290	10%	3,116	103%	4,626	153%
1 Cordon Line	OUT	Altamont Pass Rd.	West of Dyer Road	114	5	5	5	335	0	-4%	0	7%	330	6548%
1 Cordon Line	OUT	Grant Line Road	At County Line	22	0	0	0	325	0	-100%	0	-100%	325	515437%
1 Cordon Line	OUT	Vasco Road	Vasco Road at County Line	383	163	204	358	552	41	25%	194	119%	389	238%
1 Cordon Line	OUT	N. Livermore Ave.	South of Hartford Avenue	105	24	23	21	76	-1	-6%	-3	-14%	52	216%
1 Cordon Line	OUT	Collier Canyon Rd.	At County Line	9	4	4	6	8	0	-7%	2	49%	4	104%
1 Cordon Line	OUT	Tassajara Road	At County Line	135	88	128	458	986	40	45%	370	421%	898	1021%
1 Cordon Line	OUT	Dougherty Road	At County Line	570	94	121	253	733	27	29%	158	168%	639	679%
1 Cordon Line	OUT	Stagecoach Road	Btwn Amador Vly and Turquoise	100	66	137	220	550	71	107%	154	233%	483	730%
1 Cordon Line	OUT	Village Parkway	At County Line	314	63	73	168	205	10	15%	105	166%	141	223%
1 Cordon Line	OUT	Davona Drive	Between Alcosta and Wicklow	362	281	300	217	213	19	7%	-64	-23%	-68	-24%
1 Cordon Line	OUT	I-680	At CC Co. Line/Alcosta	5,118	5,357	6,101	7,026	7,386	745	14%	1,669	31%	2,030	38%
1 Cordon Line	OUT	San Ramon Road	Between Alcosta Ave. and Volmac	749	311	332	589	1,130	21	7%	278	89%	819	263%
1 Cordon Line	OUT	Crow Canyon Rd.	At County Line	1,262	1,042	1,114	896	1,456	73	7%	-146	-14%	415	40%
1 Cordon Line	OUT	Pinehurst Rd.	At County Line	44	173	224	312	463	51	30%	139	80%	290	168%
1 Cordon Line	OUT	Redwood Rd.	East of Skyline	102	130	181	299	576	50	39%	169	130%	446	342%
1 Cordon Line	OUT	SR 24	At Caldecott Tunnel	3,724	4,043	4,112	5,209	6,001	69	2%	1,166	29%	1,958	48%
1 Cordon Line	OUT	Canyon Road	At County Line	0	0	0	0	0	0	0%	0	0%	0	0%
1 Cordon Line	OUT	Arlington Avenue	At County Line	0	224	226	254	281	2	1%	30	13%	57	25%
1 Cordon Line	OUT	Colusa Avenue	At County Line	0	76	68	87	161	-7	-10%	11	15%	85	113%
1 Cordon Line	OUT	San Pablo Avenue	At Solano and Central	419	313	317	454	901	3	1%	140	45%	588	188%
1 Cordon Line	OUT	I-80	At Central	3,612	3,999	4,203	4,994	5,416	204	5%	995	25%	1,417	35%
1 Cordon Line	OUT	I-580	At Portola and Albany/Jct 80 East	2,470	3,039	2,948	3,290	3,993	-91	-3%	251	8%	955	31%
		Subtotal		**50,522**	**53,221**	**55,063**	**71,082**	**89,444**	**1,842**	**3%**	**17,860**	**34%**	**36,223**	**68%**
		Total		**112,882**	**117,200**	**121,117**	**153,022**	**188,496**	**3,917**	**3%**	**35,822**	**31%**	**71,296**	**61%**

Table C-2: AM Peak 1-Hour Traffic Forecast Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count 2000	Model Volume 2000	Model Volume 2005	Model Volume 2020	Model Volume 2035	Difference 2000-2005	Percent Difference 2000-2005	Difference 2000-2020	Percent Difference 2000-2020	Difference 2000-2035	Percent Difference 2000-2035
2 Albany - Berkeley	NB	I-80	Between Gilman and Buchanan	6,122	6,884	7,048	7,951	9,131	164	2%	1,067	15%	2,246	33%
2 Albany - Berkeley	NB	San Pablo Avenue	At Gilman and Marin	297	306	373	686	1,110	67	22%	380	124%	804	263%
2 Albany - Berkeley	NB	Marin Avenue	Near Cityline	623	773	610	622	641	-163	-21%	-151	-20%	-132	-17%
2 Albany - Berkeley	NB	Solano Avenue	Near Cityline	253	150	148	190	216	-2	-1%	40	27%	67	45%
		Subtotal		**7,295**	**8,113**	**8,179**	**9,449**	**11,098**	**66**	**1%**	**1,336**	**16%**	**2,985**	**37%**
2 Albany - Berkeley	SB	I-80	Between Gilman and Buchanan	9,976	10,291	10,477	13,920	15,987	186	2%	3,629	35%	5,696	55%
2 Albany - Berkeley	SB	San Pablo Avenue	At Gilman and Marin	1,074	1,969	1,990	2,074	2,061	21	1%	105	5%	92	5%
2 Albany - Berkeley	SB	Marin Avenue	Near Cityline	768	1,058	1,651	1,018	1,050	593	56%	-40	-4%	-9	-1%
2 Albany - Berkeley	SB	Solano Avenue	Near Cityline	829	198	235	560	591	37	19%	361	182%	392	198%
		Subtotal		**12,647**	**13,517**	**14,353**	**17,572**	**19,688**	**836**	**6%**	**4,055**	**30%**	**6,171**	**46%**
		Total		**19,943**	**21,630**	**22,532**	**27,022**	**30,786**	**902**	**4%**	**5,392**	**25%**	**9,156**	**42%**
3 Berkeley - Emeryville	NB	I-80	At Powell	5,693	8,009	8,782	8,923	10,345	773	10%	914	11%	2,336	29%
3 Berkeley - Emeryville	NB	Seventh	Near Ashby/City Limit	0	417	375	600	719	-42	-10%	183	44%	302	73%
3 Berkeley - Emeryville	NB	Hollis St.	Near Ashby/City Limit	0	105	119	175	651	14	14%	70	67%	546	522%
3 Berkeley - Emeryville	NB	West Frontage Road	Near Ashby/City Limit	1,208	286	377	749	969	91	32%	463	162%	683	239%
3 Berkeley - Emeryville	NB	Shellmound Street	Near Ashby/City Limit	0	98	112	333	541	14	14%	234	239%	442	450%
		Subtotal		**6,901**	**8,915**	**9,765**	**10,780**	**13,225**	**850**	**10%**	**1,865**	**21%**	**4,310**	**48%**
3 Berkeley - Emeryville	SB	I-80	At Powell	9,076	9,228	9,365	11,233	12,949	137	1%	2,005	22%	3,721	40%
3 Berkeley - Emeryville	SB	Seventh	Near Ashby/City Limit	0	140	122	474	625	-19	-13%	334	238%	485	345%
3 Berkeley - Emeryville	SB	Hollis St.	Near Ashby/City Limit	0	343	345	632	744	2	0%	289	84%	401	117%
3 Berkeley - Emeryville	SB	West Frontage Road	Near Ashby/City Limit	1,160	1,207	1,186	1,892	2,059	-21	-2%	685	57%	852	71%
3 Berkeley - Emeryville	SB	Shellmound Street	Near Ashby/City Limit	0	334	334	553	977	0	0%	219	66%	643	193%
		Subtotal		**10,236**	**11,252**	**11,351**	**14,783**	**17,355**	**98**	**1%**	**3,531**	**31%**	**6,102**	**54%**
		Total		**17,137**	**20,167**	**21,116**	**25,563**	**30,580**	**949**	**5%**	**5,396**	**27%**	**10,413**	**52%**

Table C-2: AM Peak 1-Hour Traffic Forecast Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count 2000	Model Volume 2000	Model Volume 2005	Model Volume 2020	Model Volume 2035	Difference 2000-2005	Percent Difference 2000-2005	Difference 2000-2020	Percent Difference 2000-2020	Difference 2000-2035	Percent Difference 2000-2035
4 Berkeley - Oakland	NB	San Pablo Avenue	At Stanford and Ashby Ave.	596	452	945	1,724	1,954	493	109%	1,272	281%	1,502	332%
4 Berkeley - Oakland	NB	Sacramento Street	Near City Limits	0	760	1,884	1,952	2,014	1,124	148%	1,192	157%	1,255	165%
4 Berkeley - Oakland	NB	Adeline Street	South of Alcatraz	1,568	1,069	1,318	1,257	1,964	250	23%	188	18%	895	84%
4 Berkeley - Oakland	NB	Shattuck Avenue	Near City Limits	810	994	1,073	1,018	1,163	79	8%	24	2%	169	17%
4 Berkeley - Oakland	NB	Telegraph Avenue	Near City Limits	1,181	2,001	2,074	2,049	2,146	73	4%	48	2%	145	7%
4 Berkeley - Oakland	NB	College Avenue	Near City Limits	441	547	559	715	545	13	2%	168	31%	-2	0%
4 Berkeley - Oakland	NB	Claremont Avenue	South of Ashby	468	740	1,145	1,076	1,623	405	55%	336	45%	883	119%
4 Berkeley - Oakland	NB	Tunnel Road	Near City Limits	1,384	1,052	1,032	1,070	1,044	-20	-2%	19	2%	-8	-1%
4 Berkeley - Oakland	NB	Grizzly Peak Blvd.	North of 24	238	46	33	167	657	-13	-28%	121	262%	611	1329%
4 Berkeley - Oakland	NB	Fish Ranch Road	North of 24	313	858	904	927	1,023	46	5%	69	8%	164	19%
		Subtotal		**6,999**	**8,517**	**10,967**	**11,954**	**14,132**	**2,450**	**29%**	**3,437**	**40%**	**5,615**	**66%**
4 Berkeley - Oakland	SB	San Pablo Avenue	At Stanford and Ashby Ave.	732	1,148	1,146	1,970	2,094	-3	0%	822	72%	945	82%
4 Berkeley - Oakland	SB	Sacramento Street	Near City Limits	0	982	1,143	1,677	2,005	161	16%	695	71%	1,023	104%
4 Berkeley - Oakland	SB	Adeline Street	South of Alcatraz	1,462	854	985	1,069	1,908	131	15%	215	25%	1,053	123%
4 Berkeley - Oakland	SB	Shattuck Avenue	Near City Limits	555	823	718	874	846	-105	-13%	51	6%	23	3%
4 Berkeley - Oakland	SB	Telegraph Avenue	Near City Limits	800	562	526	823	999	-35	-6%	261	47%	438	78%
4 Berkeley - Oakland	SB	College Avenue	Near City Limits	326	165	229	276	454	64	39%	111	68%	289	175%
4 Berkeley - Oakland	SB	Claremont Avenue	South of Ashby	613	763	944	1,110	1,475	181	24%	348	46%	713	93%
4 Berkeley - Oakland	SB	Tunnel Road	Near City Limits	1,171	943	799	674	668	-144	-15%	-269	-28%	-275	-29%
4 Berkeley - Oakland	SB	Grizzly Peak Blvd.	North of 24	292	51	209	297	604	158	308%	246	481%	553	1082%
4 Berkeley - Oakland	SB	Fish Ranch Road	North of 24	449	502	573	441	497	71	14%	-61	-12%	-5	-1%
		Subtotal		**6,400**	**6,792**	**7,272**	**9,211**	**11,549**	**479**	**7%**	**2,419**	**36%**	**4,757**	**70%**
		Total		**13,399**	**15,309**	**18,239**	**21,165**	**25,681**	**2,929**	**19%**	**5,856**	**38%**	**10,372**	**68%**

Table C-2: AM Peak 1-Hour Traffic Forecast Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count 2000	Model Volume 2000	Model Volume 2005	Model Volume 2020	Model Volume 2035	Difference 2000-2005	Percent Difference 2000-2005	Difference 2000-2020	Percent Difference 2000-2020	Difference 2000-2035	Percent Difference 2000-2035
5 Emeryville - Oakland	NB	I-80	At Powell	5,693	8,009	8,782	8,923	10,345	773	10%	914	11%	2,336	29%
5 Emeryville - Oakland	NB	Shellmound Street	Near 40th/City Limit	0	155	239	405	1,865	84	54%	250	161%	1,710	1104%
5 Emeryville - Oakland	NB	Adeline Street	South of Alcatraz	1,568	1,069	1,318	1,257	1,964	250	23%	188	18%	895	84%
5 Emeryville - Oakland	NB	Hollis St.	Near Powell	0	383	388	617	690	5	1%	233	61%	307	80%
5 Emeryville - Oakland	NB	San Pablo Avenue	At Stanford and Ashby Ave.	803	636	1,124	1,889	2,073	487	77%	1,253	197%	1,436	226%
		Subtotal		**8,065**	**10,252**	**11,851**	**13,090**	**16,936**	**1,599**	**16%**	**2,838**	**28%**	**6,684**	**65%**
5 Emeryville - Oakland	SB	I-80	At Powell	9,076	9,228	9,365	11,233	12,949	137	1%	2,005	22%	3,721	40%
5 Emeryville - Oakland	SB	Shellmound Street	Near 40th/City Limit	0	77	140	397	1,234	63	82%	320	415%	1,157	1501%
5 Emeryville - Oakland	SB	Adeline Street	South of Alcatraz	1,462	854	985	1,069	1,908	131	15%	215	25%	1,053	123%
5 Emeryville - Oakland	SB	Hollis St.	Near Powell	0	314	300	748	998	-14	-4%	434	138%	684	218%
5 Emeryville - Oakland	SB	San Pablo Avenue	At Stanford and Ashby Ave.	931	1,114	1,090	1,875	1,947	-23	-2%	761	68%	834	75%
		Subtotal		**11,468**	**11,587**	**11,880**	**15,321**	**19,036**	**294**	**3%**	**3,734**	**32%**	**7,450**	**64%**
		Total		**19,533**	**21,839**	**23,731**	**28,411**	**35,973**	**1,893**	**9%**	**6,572**	**30%**	**14,134**	**65%**
6 Oakland - Piedmont	NB	Pleasant Valley	Near City Limits	585	529	548	659	938	18	3%	130	25%	409	77%
6 Oakland - Piedmont	NB	Moraga Avenue	Eastern Border	784	458	549	635	698	91	20%	176	38%	240	52%
6 Oakland - Piedmont	NB	Moraga Avenue	Western Border	616	404	535	635	675	131	32%	230	57%	271	67%
6 Oakland - Piedmont	NB	Grand Avenue	Northern Border	440	743	840	932	1,431	96	13%	188	25%	687	92%
6 Oakland - Piedmont	NB	Grand Avenue	Southern Border	799	710	886	986	1,598	176	25%	276	39%	888	125%
6 Oakland - Piedmont	NB	Oakland Avenue	North of Monte Vista	302	230	240	237	284	10	4%	7	3%	54	24%
6 Oakland - Piedmont	NB	Lakeshore Avenue	Between Windsor and Walavista	96	12	13	13	13	1	6%	1	5%	1	6%
		Subtotal		**3,622**	**3,087**	**3,611**	**4,096**	**5,637**	**523**	**17%**	**1,008**	**33%**	**2,549**	**83%**
6 Oakland - Piedmont	SB	Pleasant Valley	Near City Limits	386	915	1,106	1,324	1,884	191	21%	409	45%	969	106%
6 Oakland - Piedmont	SB	Moraga Avenue	Eastern Border	373	292	283	291	283	-9	-3%	0	0%	-9	-3%
6 Oakland - Piedmont	SB	Moraga Avenue	Western Border	237	288	295	345	401	6	2%	57	20%	113	39%
6 Oakland - Piedmont	SB	Grand Avenue	Northern Border	334	385	390	530	796	5	1%	146	38%	412	107%
6 Oakland - Piedmont	SB	Grand Avenue	Southern Border	612	523	509	640	926	-14	-3%	117	22%	403	77%
6 Oakland - Piedmont	SB	Oakland Avenue	North of Monte Vista	641	706	791	910	989	85	12%	204	29%	283	40%
6 Oakland - Piedmont	SB	Lakeshore Avenue	Between Windsor and Walavista	200	17	21	22	32	3	20%	5	27%	15	84%
		Subtotal		**2,783**	**3,126**	**3,395**	**4,063**	**5,311**	**269**	**9%**	**937**	**30%**	**2,185**	**70%**
		Total		**6,405**	**6,214**	**7,006**	**8,159**	**10,948**	**792**	**13%**	**1,946**	**31%**	**4,734**	**76%**

Table C-2: AM Peak 1-Hour Traffic Forecast Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count 2000	Model Volume 2000	Model Volume 2005	Model Volume 2020	Model Volume 2035	Difference 2000-2005	Percent Difference 2000-2005	Difference 2000-2020	Percent Difference 2000-2020	Difference 2000-2035	Percent Difference 2000-2035
7 Alameda - Oakland	NB	Webster-Posey Tubes	Near entrance/exit Oakland side	3,048	2,607	2,675	2,799	3,230	68	3%	192	7%	623	24%
7 Alameda - Oakland	NB	Park St. Bridge	West of Bridge	2,292	2,018	2,041	2,101	2,404	23	1%	83	4%	386	19%
7 Alameda - Oakland	NB	Fruitvale Bridge	West of Bridge	1,017	1,152	1,324	1,683	1,946	172	15%	531	46%	794	69%
7 Alameda - Oakland	NB	High St. Bridge	West of Bridge	1,157	638	611	953	1,118	-27	-4%	315	49%	481	75%
7 Alameda - Oakland	NB	Doolittle Street	Near City Limits	1,167	1,012	750	764	1,587	-262	-26%	-248	-25%	575	57%
7 Alameda - Oakland	NB	SR 61/Doolittle	North of Hegenberger	599	1,199	983	1,034	1,793	-216	-18%	-165	-14%	594	50%
7 Alameda - Oakland	NB	Ron Cowan Pkwy	South of Harbor Bay Pkwy	0	0	464	331	305	464	0%	331	0%	305	0%
		Subtotal		**9,280**	**8,626**	**8,848**	**9,665**	**12,384**	**222**	**3%**	**1,040**	**12%**	**3,758**	**44%**
7 Alameda - Oakland	SB	Webster-Posey Tubes	Near entrance/exit Oakland side	2,440	2,160	1,871	2,880	3,632	-288	-13%	720	33%	1,472	68%
7 Alameda - Oakland	SB	Park St. Bridge	West of Bridge	1,149	1,435	1,430	1,963	2,618	-5	0%	528	37%	1,184	82%
7 Alameda - Oakland	SB	Fruitvale Bridge	West of Bridge	1,014	1,308	1,326	1,622	2,033	18	1%	314	24%	725	55%
7 Alameda - Oakland	SB	High St. Bridge	West of Bridge	815	836	839	924	1,246	3	0%	87	10%	409	49%
7 Alameda - Oakland	SB	Doolittle Street	Near City Limits	1,035	1,449	1,082	1,145	1,340	-367	-25%	-305	-21%	-110	-8%
7 Alameda - Oakland	SB	SR 61/Doolittle	North of Hegenberger	949	1,397	997	1,034	1,275	-400	-29%	-363	-26%	-122	-9%
7 Alameda - Oakland	SB	Ron Cowan Pkwy	South of Harbor Bay Pkwy	0	0	362	935	2,060	362	0%	935	0%	2,060	0%
		Subtotal		**7,402**	**8,586**	**7,908**	**10,502**	**14,204**	**-678**	**-8%**	**1,916**	**22%**	**5,619**	**65%**
		Total		**16,682**	**17,211**	**16,755**	**20,167**	**26,588**	**-456**	**-3%**	**2,956**	**17%**	**9,377**	**54%**

Table C-2: AM Peak 1-Hour Traffic Forecast Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count 2000	Model Volume 2000	Model Volume 2005	Model Volume 2020	Model Volume 2035	Difference 2000-2005	Percent Difference 2000-2005	Difference 2000-2020	Percent Difference 2000-2020	Difference 2000-2035	Percent Difference 2000-2035
8 Oak - San L E14th/Int	EB	Lakeshore Avenue	E/O International	477	572	678	755	678	106	19%	182	32%	106	18%
8 Oak - San L E14th/Int	EB	Park Blvd - 5th Avenue	E/O International	89	17	19	42	104	2	11%	25	150%	87	520%
8 Oak - San L E14th/Int	EB	14th Avenue	E/O International	469	415	432	517	780	17	4%	102	25%	364	88%
8 Oak - San L E14th/Int	EB	23rd Avenue	E/O International	166	63	64	57	508	1	2%	-6	-10%	446	711%
8 Oak - San L E14th/Int	EB	Fruitvale Avenue	E/O International	675	418	439	509	395	21	5%	91	22%	-23	-6%
8 Oak - San L E14th/Int	EB	35th Avenue	E/O International	348	162	169	192	387	6	4%	29	18%	225	138%
8 Oak - San L E14th/Int	EB	42nd/Courtland	E/O International	326	692	717	763	1,403	25	4%	71	10%	711	103%
8 Oak - San L E14th/Int	EB	High Street	E/O International	667	86	83	100	317	-3	-4%	14	17%	232	271%
8 Oak - San L E14th/Int	EB	55th Avenue	E/O International	106	60	66	83	96	6	10%	23	38%	36	60%
8 Oak - San L E14th/Int	EB	Seminary Avenue	E/O International	294	125	133	157	275	8	6%	32	25%	149	119%
8 Oak - San L E14th/Int	EB	73rd Avenue	E/O International	670	670	729	776	688	59	9%	106	16%	18	3%
8 Oak - San L E14th/Int	EB	82nd Avenue	E/O International	95	67	82	87	123	14	21%	20	30%	56	83%
8 Oak - San L E14th/Int	EB	98th Avenue	E/O International	591	339	338	383	502	0	0%	44	13%	163	48%
8 Oak - San L E14th/Int	EB	Davis Street (SR 112)	W/O International	588	321	332	549	832	11	3%	228	71%	510	159%
8 Oak - San L E14th/Int	EB	Estudillo	E/O International	295	308	296	343	650	-12	-4%	35	11%	342	111%
		Subtotal		**5,856**	**4,316**	**4,577**	**5,313**	**7,738**	**261**	**6%**	**996**	**23%**	**3,422**	**79%**
8 Oak - San L E14th/Int	WB	Lakeshore Avenue	E/O International	274	324	329	318	461	6	2%	-6	-2%	137	42%
8 Oak - San L E14th/Int	WB	Park Blvd - 5th Avenue	E/O International	177	142	165	215	378	22	16%	73	51%	235	166%
8 Oak - San L E14th/Int	WB	14th Avenue	E/O International	1,081	1,326	1,294	1,973	1,989	-32	-2%	647	49%	663	50%
8 Oak - San L E14th/Int	WB	23rd Avenue	E/O International	263	258	242	273	575	-16	-6%	15	6%	316	122%
8 Oak - San L E14th/Int	WB	Fruitvale Avenue	E/O International	779	816	807	900	991	-9	-1%	84	10%	175	21%
8 Oak - San L E14th/Int	WB	35th Avenue	E/O International	633	271	261	349	499	-10	-4%	78	29%	228	84%
8 Oak - San L E14th/Int	WB	42nd/Courtland	E/O International	776	828	813	1,492	2,131	-15	-2%	664	80%	1,303	157%
8 Oak - San L E14th/Int	WB	High Street	E/O International	487	555	520	807	1,298	-35	-6%	252	45%	744	134%
8 Oak - San L E14th/Int	WB	55th Avenue	E/O International	217	195	192	332	354	-3	-2%	137	70%	159	81%
8 Oak - San L E14th/Int	WB	Seminary Avenue	E/O International	401	369	365	953	663	-4	-1%	584	158%	294	80%
8 Oak - San L E14th/Int	WB	73rd Avenue	E/O International	1,181	1,391	1,399	1,570	2,510	8	1%	180	13%	1,119	80%
8 Oak - San L E14th/Int	WB	82nd Avenue	E/O International	197	157	149	159	167	-8	-5%	2	1%	10	6%
8 Oak - San L E14th/Int	WB	98th Avenue	E/O International	797	732	773	1,269	1,787	41	6%	537	73%	1,055	144%
8 Oak - San L E14th/Int	WB	Davis Street (SR 112)	W/O International	1,010	953	1,193	1,602	1,589	240	25%	648	68%	636	67%
8 Oak - San L E14th/Int	WB	Estudillo	E/O International	467	805	922	784	877	116	14%	-21	-3%	72	9%
		Subtotal		**8,740**	**9,123**	**9,425**	**12,998**	**16,270**	**302**	**3%**	**3,875**	**42%**	**7,147**	**78%**
		Total		**14,596**	**13,439**	**14,002**	**18,310**	**24,008**	**563**	**4%**	**4,871**	**36%**	**10,569**	**79%**

Table C-2: AM Peak 1-Hour Traffic Forecast Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count 2000	Model Volume 2000	Model Volume 2005	Model Volume 2020	Model Volume 2035	Difference 2000-2005	Percent Difference 2000-2005	Difference 2000-2020	Percent Difference 2000-2020	Difference 2000-2035	Percent Difference 2000-2035
9 Oakland - San Leandro	NB	Doolittle Drive	Near Davis	1,299	2,026	2,105	2,282	2,828	79	4%	256	13%	802	40%
9 Oakland - San Leandro	NB	I-880	Between Davis and 98th Avenue	7,281	8,027	8,516	8,862	9,598	489	6%	835	10%	1,571	20%
9 Oakland - San Leandro	NB	San Leandro Blvd.	Near City Limits	356	712	1,228	1,902	1,892	516	72%	1,189	167%	1,179	166%
9 Oakland - San Leandro	NB	Int'l/E. 14th	Near 98th Avenue	575	508	740	1,439	1,700	232	46%	932	184%	1,192	235%
9 Oakland - San Leandro	NB	Bancroft Avenue	Near City Limits	268	222	281	850	2,001	58	26%	628	282%	1,778	800%
9 Oakland - San Leandro	NB	MacArthur Blvd.	Near City Limits	0	480	490	933	911	9	2%	453	94%	430	90%
9 Oakland - San Leandro	NB	Foothill Blvd.	Near City Limits	305	195	178	168	288	-17	-9%	-27	-14%	92	47%
9 Oakland - San Leandro	NB	I-580	Between 98th and Estudillo	5,948	7,778	8,280	8,856	9,793	502	6%	1,078	14%	2,015	26%
		Subtotal		**16,032**	**19,949**	**21,817**	**25,292**	**29,010**	**1,868**	**9%**	**5,343**	**27%**	**9,061**	**45%**
9 Oakland - San Leandro	SB	Doolittle Drive	Near Davis	866	1,039	918	722	963	-121	-12%	-318	-31%	-76	-7%
9 Oakland - San Leandro	SB	I-880	Between Davis and 98th Avenue	6,746	6,659	6,269	8,106	9,019	-389	-6%	1,447	22%	2,360	35%
9 Oakland - San Leandro	SB	San Leandro Blvd.	Near City Limits	370	240	208	446	1,616	-32	-13%	206	86%	1,376	573%
9 Oakland - San Leandro	SB	Int'l/E. 14th	Near 98th Avenue	477	332	318	660	1,242	-14	-4%	328	99%	910	274%
9 Oakland - San Leandro	SB	Bancroft Avenue	Near City Limits	299	209	189	345	1,471	-20	-9%	136	65%	1,262	605%
9 Oakland - San Leandro	SB	MacArthur Blvd.	Near City Limits	294	360	328	517	758	-31	-9%	157	44%	399	111%
9 Oakland - San Leandro	SB	Foothill Blvd.	Near City Limits	276	165	159	190	211	-6	-4%	25	15%	46	28%
9 Oakland - San Leandro	SB	I-580	Between 98th and Estudillo	5,455	6,776	6,406	8,242	9,284	-370	-5%	1,466	22%	2,509	37%
		Subtotal		**14,783**	**15,779**	**14,796**	**19,227**	**24,565**	**-984**	**-6%**	**3,447**	**22%**	**8,786**	**56%**
		Total		**30,815**	**35,728**	**36,613**	**44,519**	**53,575**	**885**	**2%**	**8,791**	**25%**	**17,847**	**50%**

Table C-2: AM Peak 1-Hour Traffic Forecast Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count 2000	Model Volume 2000	Model Volume 2005	Model Volume 2020	Model Volume 2035	Difference 2000-2005	Percent Difference 2000-2005	Difference 2000-2020	Percent Difference 2000-2020	Difference 2000-2035	Percent Difference 2000-2035
10 Hayward - Union City	NB	Union City Blvd.	Near City Limits	0	2,187	2,187	2,239	2,463	1	0%	53	2%	277	13%
10 Hayward - Union City	NB	I-880	At Industrial Parkway	5,500	7,870	8,346	9,331	11,084	476	6%	1,461	19%	3,214	41%
10 Hayward - Union City	NB	Industrial Pkwy	Near Huntwood	1,124	819	768	512	845	-51	-6%	-307	-37%	26	3%
10 Hayward - Union City	NB	Whipple Road	Near City Limit, E side of I-880	1,046	640	747	994	1,388	107	17%	354	55%	748	117%
10 Hayward - Union City	NB	Mission Blvd	At Greasel Street	1,100	1,317	1,644	1,891	2,068	327	25%	575	44%	752	57%
		Subtotal		**8,770**	**12,832**	**13,693**	**14,968**	**17,849**	**861**	**7%**	**2,136**	**17%**	**5,016**	**39%**
10 Hayward - Union City	SB	Union City Blvd.	Near City Limits	0	1,417	1,219	2,082	2,310	-198	-14%	664	47%	893	63%
10 Hayward - Union City	SB	I-880	At Industrial Parkway	5,630	7,390	6,976	8,034	11,031	-415	-6%	644	9%	3,641	49%
10 Hayward - Union City	SB	Industrial Pkwy	Near Huntwood	1,612	1,032	1,281	1,605	1,942	249	24%	573	56%	910	88%
10 Hayward - Union City	SB	Whipple Road	Near City Limit, E side of I-880	1,011	790	822	1,400	1,814	31	4%	609	77%	1,024	130%
10 Hayward - Union City	SB	Mission Blvd	At Greasel Street	1,816	1,174	1,167	1,839	2,094	-7	-1%	665	57%	920	78%
		Subtotal		**10,069**	**11,804**	**11,465**	**14,960**	**19,192**	**-339**	**-3%**	**3,155**	**27%**	**7,387**	**63%**
		Total		**18,839**	**24,637**	**25,158**	**29,927**	**37,040**	**521**	**2%**	**5,291**	**21%**	**12,404**	**50%**
11 Hayward - Castro Vall	NB	Redwood Rd.	North of Seven Hills	383	125	166	229	368	41	33%	104	83%	242	193%
11 Hayward - Castro Vall	NB	Crow Canyon Rd.	North of Cold Water Drive	1,323	1,006	1,058	806	1,024	52	5%	-200	-20%	18	2%
11 Hayward - Castro Vall	NB	I-580	At Crow Canyon	6,801	4,398	4,385	5,590	6,707	-12	0%	1,193	27%	2,309	53%
11 Hayward - Castro Vall	NB	Dublin Canyon Road	East of Palomares	135	243	393	902	1,094	150	62%	659	272%	851	351%
11 Hayward - Castro Vall	NB	Palomares Road	South of Palo Verde Road	74	94	83	102	124	-11	-12%	8	8%	29	31%
		Subtotal		**8,716**	**5,866**	**6,086**	**7,629**	**9,316**	**220**	**4%**	**1,763**	**30%**	**3,450**	**59%**
11 Hayward - Castro Vall	SB	Redwood Rd.	North of Seven Hills	679	151	166	495	788	14	9%	343	227%	637	420%
11 Hayward - Castro Vall	SB	Crow Canyon Rd.	North of Cold Water Drive	1,331	1,175	1,187	1,600	1,942	12	1%	425	36%	767	65%
11 Hayward - Castro Vall	SB	I-580	At Crow Canyon	6,442	8,404	8,752	11,332	12,930	348	4%	2,929	35%	4,526	54%
11 Hayward - Castro Vall	SB	Dublin Canyon Road	East of Palomares	269	82	83	133	346	1	1%	51	62%	264	322%
11 Hayward - Castro Vall	SB	Palomares Road	South of Palo Verde Road	76	134	136	242	391	2	1%	108	80%	256	191%
		Subtotal		**8,797**	**9,946**	**10,323**	**13,801**	**16,396**	**376**	**4%**	**3,855**	**39%**	**6,450**	**65%**
		Total		**17,513**	**15,812**	**16,408**	**21,430**	**25,712**	**597**	**4%**	**5,618**	**36%**	**9,900**	**63%**

Table C-2: AM Peak 1-Hour Traffic Forecast Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count 2000	Model Volume 2000	Model Volume 2005	Model Volume 2020	Model Volume 2035	Difference 2000-2005	Percent Difference 2000-2005	Difference 2000-2020	Percent Difference 2000-2020	Difference 2000-2035	Percent Difference 2000-2035
12 Union City - Fremont	NB	Ardenwood Blvd.	Near City Limits	627	649	724	936	1,538	75	12%	287	44%	890	137%
12 Union City - Fremont	NB	Alvarado Blvd.	Around Lowry Road	553	931	1,179	1,486	2,069	248	27%	555	60%	1,138	122%
12 Union City - Fremont	NB	I-880	South of Alvarado-Niles I/C	6,373	7,610	8,010	8,568	9,737	400	5%	959	13%	2,127	28%
12 Union City - Fremont	NB	Decoto Road	South of Alvarado Niles	0	1,333	1,608	1,821	2,056	275	21%	488	37%	723	54%
12 Union City - Fremont	NB	Isherwood Way	Near City Limits	278	32	38	16	171	6	19%	-15	-48%	139	440%
12 Union City - Fremont	NB	Alvarado-Niles Rd.	Near City Limits	0	996	931	394	635	-64	-6%	-601	-60%	-360	-36%
12 Union City - Fremont	NB	Mission Blvd	South of Decoto Road	1,324	1,104	1,281	1,635	2,027	177	16%	531	48%	923	84%
		Subtotal		**9,155**	**12,654**	**13,770**	**14,857**	**18,235**	**1,115**	**9%**	**2,203**	**17%**	**5,581**	**44%**
12 Union City - Fremont	SB	Ardenwood Blvd.	Near City Limits	1,438	1,198	990	2,014	2,201	-208	-17%	816	68%	1,003	84%
12 Union City - Fremont	SB	Alvarado Blvd.	Around Lowry Road	728	739	754	1,099	2,387	15	2%	359	49%	1,647	223%
12 Union City - Fremont	SB	I-880	South of Alvarado-Niles I/C	6,228	7,489	7,038	7,844	9,119	-451	-6%	355	5%	1,630	22%
12 Union City - Fremont	SB	Decoto Road	South of Alvarado Niles	0	2,073	2,024	1,610	2,082	-50	-2%	-463	-22%	9	0%
12 Union City - Fremont	SB	Isherwood Way	Near City Limits	706	180	173	69	499	-7	-4%	-111	-62%	319	177%
12 Union City - Fremont	SB	Alvarado-Niles Rd.	Near City Limits	0	243	245	141	603	2	1%	-101	-42%	360	148%
12 Union City - Fremont	SB	Mission Blvd	South of Decoto Road	1,308	928	863	1,579	1,995	-66	-7%	651	70%	1,066	115%
		Subtotal		**10,408**	**12,851**	**12,087**	**14,357**	**18,885**	**-764**	**-6%**	**1,506**	**12%**	**6,034**	**47%**
		Total		**19,563**	**25,505**	**25,857**	**29,214**	**37,120**	**352**	**1%**	**3,709**	**15%**	**11,615**	**46%**

Table C-2: AM Peak 1-Hour Traffic Forecast Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count 2000	Model Volume 2000	Model Volume 2005	Model Volume 2020	Model Volume 2035	Difference 2000-2005	Percent Difference 2000-2005	Difference 2000-2020	Percent Difference 2000-2020	Difference 2000-2035	Percent Difference 2000-2035
13 Fremont - Newark	NB	Thornton Ave.	South of SR 84	0	186	201	406	760	15	8%	221	119%	574	309%
13 Fremont - Newark	NB	Newark Blvd.	South of SR 84	0	844	980	1,159	1,999	136	16%	315	37%	1,155	137%
13 Fremont - Newark	NB	I-880	Near SR 84	5,595	6,309	6,899	7,526	8,707	589	9%	1,217	19%	2,398	38%
13 Fremont - Newark	NB	Thornton Ave.	Near I-880/City Limits	0	1,502	1,500	1,425	1,713	-3	0%	-78	-5%	210	14%
13 Fremont - Newark	WB	Central Ave.	Near I-880/City Limits	552	140	131	154	853	-9	-6%	14	10%	713	510%
13 Fremont - Newark	WB	Mowry Ave.	Near I-880/City Limits	1,853	1,550	1,491	1,426	2,797	-59	-4%	-124	-8%	1,247	80%
13 Fremont - Newark	WB	Stevenson Blvd.	Near I-880/City Limits	798	1,950	1,853	1,932	2,025	-97	-5%	-18	-1%	75	4%
13 Fremont - Newark	WB	Cedar Blvd.	Near City Limits	0	14	19	25	27	5	33%	10	72%	13	88%
13 Fremont - Newark	WB	Cherry Street	Near City Limits	0	174	214	339	459	40	23%	165	95%	285	164%
		Subtotal		**8,798**	**12,670**	**13,288**	**14,393**	**19,341**	618	5%	1,723	14%	6,671	53%
13 Fremont - Newark	SB	Thornton Ave.	South of SR 84	0	362	278	510	784	-84	-23%	148	41%	422	117%
13 Fremont - Newark	SB	Newark Blvd.	South of SR 84	0	816	766	1,265	1,889	-50	-6%	449	55%	1,073	132%
13 Fremont - Newark	SB	I-880	Near SR 84	5,781	7,304	6,894	7,835	9,573	-410	-6%	531	7%	2,269	31%
13 Fremont - Newark	SB	Thornton Ave.	Near I-880/City Limits	0	1,192	1,154	1,333	1,966	-38	-3%	141	12%	774	65%
13 Fremont - Newark	EB	Central Ave.	Near I-880/City Limits	578	110	126	160	314	16	15%	50	46%	204	186%
13 Fremont - Newark	EB	Mowry Ave.	Near I-880/City Limits	1,799	910	963	949	1,025	52	6%	38	4%	115	13%
13 Fremont - Newark	EB	Stevenson Blvd.	Near I-880/City Limits	492	438	488	483	558	50	11%	45	10%	121	28%
13 Fremont - Newark	EB	Cedar Blvd.	Near City Limits	0	217	233	275	425	16	7%	58	27%	208	96%
13 Fremont - Newark	EB	Cherry Street	Near City Limits	0	1,128	979	1,586	1,882	-149	-13%	459	41%	755	67%
		Subtotal		**8,650**	**12,475**	**11,880**	**14,396**	**18,416**	**-595**	**-5%**	**1,921**	**15%**	**5,941**	**48%**
		Total		**17,448**	**25,145**	**25,168**	**28,789**	**37,757**	**22**	**0%**	**3,643**	**14%**	**12,611**	**50%**
14 County - Tri-Valley	NB	Niles Canyon Road	At Palomares	551	280	335	622	1,444	55	20%	343	123%	1,165	416%
14 County - Tri-Valley	NB	I-680	At SR 84 East	3,193	3,669	3,946	4,712	4,666	277	8%	1,043	28%	997	27%
14 County - Tri-Valley	NB	Foothill Road	North of Niles Canyon Road	0	28	71	107	175	43	156%	79	286%	147	532%
14 County - Tri-Valley	NB	Pleasanton-Sunol	North of Niles Canyon Road	525	154	158	407	634	4	3%	253	165%	480	313%
14 County - Tri-Valley	NB	Vallecitos Road	Near Vineyard	461	755	801	135	800	46	6%	-620	-82%	46	6%
		Subtotal		**4,730**	**4,885**	**5,310**	**5,983**	**7,719**	**425**	**9%**	**1,098**	**22%**	**2,834**	**58%**
14 County - Tri-Valley	SB	Niles Canyon Road	At Palomares	1,335	1,589	1,526	1,711	2,044	-63	-4%	122	8%	455	29%
14 County - Tri-Valley	SB	I-680	At SR 84 East	4,679	5,892	6,609	8,059	9,955	717	12%	2,167	37%	4,063	69%
14 County - Tri-Valley	SB	Foothill Road	North of Niles Canyon Road	1,547	497	699	983	824	201	40%	486	98%	327	66%
14 County - Tri-Valley	SB	Pleasanton-Sunol	North of Niles Canyon Road	667	962	1,016	1,106	1,095	55	6%	145	15%	134	14%
14 County - Tri-Valley	SB	Vallecitos Road	Near Vineyard	927	939	941	800	902	2	0%	-140	-15%	-37	-4%
		Subtotal		**9,155**	**9,880**	**10,791**	**12,660**	**14,821**	**912**	**9%**	**2,780**	**28%**	**4,941**	**50%**
		Total		**13,885**	**14,764**	**16,101**	**18,643**	**22,540**	**1,337**	**9%**	**3,878**	**26%**	**7,775**	**53%**

Table C-2: AM Peak 1-Hour Traffic Forecast Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count 2000	Model Volume 2000	Model Volume 2005	Model Volume 2020	Model Volume 2035	Difference 2000-2005	Percent Difference 2000-2005	Difference 2000-2020	Percent Difference 2000-2020	Difference 2000-2035	Percent Difference 2000-2035
15 Dublin - Pleasanton	NB	San Ramon Road	Btwn Dublin Blvd. and Amador Vly	898	292	319	571	1,059	28	9%	280	96%	767	263%
15 Dublin - Pleasanton	NB	I-680	North of I-580	5,644	5,235	5,934	6,232	6,468	700	13%	998	19%	1,233	24%
15 Dublin - Pleasanton	NB	Village Parkway	Between Dublin Blvd. and Lewis	488	168	247	347	400	79	47%	179	107%	232	138%
15 Dublin - Pleasanton	NB	Dougherty Road	Between Dublin Blvd. and Sierra	997	667	780	1,030	1,671	113	17%	363	54%	1,004	151%
15 Dublin - Pleasanton	NB	Hacienda Drive	Between I-580 and Dublin Blvd.	839	514	363	904	1,308	-151	-29%	389	76%	794	154%
15 Dublin - Pleasanton	NB	Tassajara Road	Between I-580 and Dublin Blvd.	908	170	341	621	984	171	100%	450	264%	813	477%
15 Dublin - Pleasanton	NB	Santa Rita Road	South of I-580	930	762	806	1,054	1,033	44	6%	292	38%	272	36%
15 Dublin - Pleasanton	NB	Hacienda Drive	South of I-580	508	410	431	841	1,342	21	5%	432	105%	932	228%
15 Dublin - Pleasanton	NB	Hopyard Rd.	South of I-580	895	1,633	1,777	1,890	2,706	144	9%	257	16%	1,073	66%
15 Dublin - Pleasanton	NB	Foothill Road	South of I-580	935	829	851	960	1,793	22	3%	130	16%	964	116%
		Subtotal		**13,042**	**10,679**	**11,849**	**14,450**	**18,764**	**1,170**	**11%**	**3,771**	**35%**	**8,085**	**76%**
15 Dublin - Pleasanton	SB	San Ramon Road	Btwn Dublin Blvd. and Amador Vly	1,614	1,703	1,490	2,125	2,169	-213	-13%	423	25%	466	27%
15 Dublin - Pleasanton	SB	I-680	North of I-580	5,459	5,579	6,517	7,615	9,024	938	17%	2,036	36%	3,445	62%
15 Dublin - Pleasanton	SB	Village Parkway	Between Dublin Blvd. and Lewis	665	784	914	1,720	1,917	130	17%	936	119%	1,133	145%
15 Dublin - Pleasanton	SB	Dougherty Road	Between Dublin Blvd. and Sierra	1,399	1,162	826	1,750	2,588	-337	-29%	587	51%	1,426	123%
15 Dublin - Pleasanton	SB	Hacienda Drive	Between I-580 and Dublin Blvd.	878	375	663	1,534	2,704	288	77%	1,159	309%	2,328	621%
15 Dublin - Pleasanton	SB	Tassajara Road	Between I-580 and Dublin Blvd.	820	373	809	1,650	2,325	436	117%	1,277	342%	1,952	523%
15 Dublin - Pleasanton	SB	Santa Rita Road	South of I-580	1,422	995	1,239	1,906	2,505	244	25%	910	91%	1,509	152%
15 Dublin - Pleasanton	SB	Hacienda Drive	South of I-580	1,735	1,175	1,486	2,357	2,859	311	26%	1,181	101%	1,684	143%
15 Dublin - Pleasanton	SB	Hopyard Rd.	South of I-580	2,185	1,704	1,605	2,852	3,001	-100	-6%	1,147	67%	1,296	76%
15 Dublin - Pleasanton	SB	Foothill Road	South of I-580	1,466	1,434	1,233	2,400	3,045	-201	-14%	966	67%	1,611	112%
		Subtotal		**17,643**	**15,285**	**16,781**	**25,907**	**32,136**	**1,497**	**10%**	**10,623**	**69%**	**16,851**	**110%**
		Total		**30,685**	**25,964**	**28,630**	**40,358**	**50,899**	**2,667**	**10%**	**14,394**	**55%**	**24,936**	**96%**
16 Pleasanton - Livermore	EB	Dublin Blvd	West of Doolan Rd	0	0	0	290	871	0	0%	290	0%	871	0%
16 Pleasanton - Livermore	EB	I-580	At Airway	4,264	4,869	5,113	8,068	10,067	244	5%	3,199	66%	5,199	107%
16 Pleasanton - Livermore	EB	W Jack London Blvd	SW of Airport	0	0	0	4	263	0	0%	4	0%	263	0%
16 Pleasanton - Livermore	EB	Stanley Blvd.	West of Isabel Avenue	530	380	370	811	1,036	-9	-2%	431	114%	656	173%
16 Pleasanton - Livermore	EB	Vineyard Avenue	East of Ruby Hill	184	115	138	238	310	23	20%	123	106%	195	169%
16 Pleasanton - Livermore	EB	Vallecitos Road	S/O Isabel Avenue	555	1,048	1,179	1,305	2,518	131	12%	257	25%	1,470	140%
		Subtotal		**5,533**	**6,412**	**6,800**	**10,717**	**15,065**	**388**	**6%**	**4,305**	**67%**	**8,654**	**135%**
16 Pleasanton - Livermore	WB	Dublin Blvd	West of Doolan Rd	0	0	0	827	1,564	0	0%	827	0%	1,564	0%
16 Pleasanton - Livermore	WB	I-580	At Airway	7,895	8,122	8,415	10,441	11,246	294	4%	2,319	29%	3,124	38%
16 Pleasanton - Livermore	WB	W Jack London Blvd	SW of Airport	0	0	0	923	1,643	0	0%	923	0%	1,643	0%
16 Pleasanton - Livermore	WB	Stanley Blvd.	West of Isabel Avenue	2,023	2,071	2,020	2,051	3,025	-52	-3%	-21	-1%	953	46%
16 Pleasanton - Livermore	WB	Vineyard Avenue	East of Ruby Hill	697	394	780	611	687	386	98%	217	55%	293	74%
16 Pleasanton - Livermore	WB	Vallecitos Road	S/O Isabel Avenue	1,418	1,584	1,595	1,587	3,088	11	1%	3	0%	1,504	95%
		Subtotal		**12,033**	**12,171**	**12,810**	**16,439**	**21,252**	**639**	**5%**	**4,269**	**35%**	**9,081**	**75%**
		Total		**17,566**	**18,582**	**19,610**	**27,156**	**36,318**	**1,027**	**6%**	**8,574**	**46%**	**17,735**	**95%**

Table C-3: PM Peak 1-Hour Traffic Forecast Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count 2000	Model Volume 2000	Model Volume 2005	Model Volume 2020	Model Volume 2035	Difference 2000-2005	Percent Difference 2000-2005	Difference 2000-2020	Percent Difference 2000-2020	Difference 2000-2035	Percent Difference 2000-2035
1 Cordon Line	IN	SF-Oakland Bay Bridge	At County Line	9,563	10,477	10,326	12,576	14,327	-151	-1%	2,099	20%	3,850	37%
1 Cordon Line	IN	San Mateo Bridge	At County Line	2,934	3,917	4,242	5,613	6,774	325	8%	1,696	43%	2,857	73%
1 Cordon Line	IN	Dumbarton Bridge	At County Line	5,447	4,772	4,535	5,643	6,697	-237	-5%	871	18%	1,926	40%
1 Cordon Line	IN	I-880	At S Clara Co Line or SR 262	6,088	5,707	7,035	8,218	10,324	1,327	23%	2,511	44%	4,617	81%
1 Cordon Line	IN	Warm Springs Blvd.	At County Line	1,693	900	639	716	1,763	-261	-29%	-185	-21%	863	96%
1 Cordon Line	IN	I-680	At E. Warren/Scott Creek	5,546	5,003	5,019	6,978	8,179	16	0%	1,975	39%	3,176	63%
1 Cordon Line	IN	Calaveras Road	At County Line	64	0	0	0	0	0	0%	0	0%	0	0%
1 Cordon Line	IN	Mines Road	At County Line	16	0	0	0	0	0	0%	0	0%	0	0%
1 Cordon Line	IN	Tesla Road	At County Line	32	5	10	52	743	5	100%	47	954%	738	14831%
1 Cordon Line	IN	Patterson Pass Road	At County Line	8	0	0	28	817	0	0%	28	0%	817	0%
1 Cordon Line	IN	I-580	At Altamont Pass	3,544	3,103	3,489	6,301	7,038	386	12%	3,198	103%	3,936	127%
1 Cordon Line	IN	Altamont Pass Rd.	West of Dyer Road	105	9	11	12	877	2	23%	3	38%	868	9652%
1 Cordon Line	IN	Grant Line Road	At County Line	37	0	0	79	467	0	0%	79	0%	467	0%
1 Cordon Line	IN	Vasco Road	Vasco Road at County Line	434	347	362	559	809	15	4%	212	61%	462	133%
1 Cordon Line	IN	N. Livermore Ave.	South of Hartford Avenue	203	43	68	49	118	25	59%	6	13%	75	175%
1 Cordon Line	IN	Collier Canyon Rd.	At County Line	32	7	6	9	12	-1	-11%	2	24%	4	62%
1 Cordon Line	IN	Tassajara Road	At County Line	272	140	171	445	853	31	22%	305	218%	713	511%
1 Cordon Line	IN	Dougherty Road	At County Line	666	253	254	459	554	1	0%	205	81%	301	119%
1 Cordon Line	IN	Stagecoach Road	Btwn Amador Vly and Turquoise	230	220	190	354	475	-31	-14%	133	61%	255	116%
1 Cordon Line	IN	Village Parkway	At County Line	666	196	115	428	663	-81	-41%	232	119%	467	238%
1 Cordon Line	IN	Davona Drive	Between Alcosta and Wicklow	234	277	248	201	258	-28	-10%	-75	-27%	-18	-7%
1 Cordon Line	IN	I-680	At CC Co. Line/Alcosta	5,781	5,286	6,447	7,182	7,928	1,161	22%	1,896	36%	2,642	50%
1 Cordon Line	IN	San Ramon Road	Between Alcosta Ave. and Volmac	1,535	520	467	988	1,203	-53	-10%	467	90%	682	131%
1 Cordon Line	IN	Crow Canyon Rd.	At County Line	1,271	1,064	1,136	1,249	1,662	72	7%	185	17%	598	56%
1 Cordon Line	IN	Pinehurst Rd.	At County Line	58	215	240	340	552	25	12%	125	58%	337	157%
1 Cordon Line	IN	Redwood Rd.	East of Skyline	123	179	195	300	568	16	9%	121	67%	389	217%
1 Cordon Line	IN	SR 24	At Caldecott Tunnel	5,079	4,622	4,829	6,493	7,413	207	4%	1,872	40%	2,791	60%
1 Cordon Line	IN	Canyon Road	At County Line	0	0	0	0	0	0	0%	0	0%	0	0%
1 Cordon Line	IN	Arlington Avenue	At County Line	0	451	458	571	776	7	2%	120	27%	325	72%
1 Cordon Line	IN	Colusa Avenue	At County Line	0	154	150	273	272	-4	-3%	119	77%	118	77%
1 Cordon Line	IN	San Pablo Avenue	At Solano and Central	800	814	875	1,959	2,023	61	7%	1,145	141%	1,209	148%
1 Cordon Line	IN	I-80	At Central	4,616	5,466	5,522	6,000	6,931	55	1%	534	10%	1,465	27%
1 Cordon Line	IN	I-580	At Portola and Albany/Jct 80 East	2,890	3,799	4,016	4,514	5,060	217	6%	716	19%	1,261	33%
		Subtotal		**59,967**	**57,946**	**61,054**	**78,587**	**96,136**	**3,108**	**5%**	**20,641**	**36%**	**38,190**	**66%**

Table C-3: PM Peak 1-Hour Traffic Forecast Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count 2000	Model Volume 2000	Model Volume 2005	Model Volume 2020	Model Volume 2035	Difference 2000-2005	Percent Difference 2000-2005	Difference 2000-2020	Percent Difference 2000-2020	Difference 2000-2035	Percent Difference 2000-2035
1 Cordon Line	OUT	SF-Oakland Bay Bridge	At County Line	8,113	6,473	6,320	7,628	9,132	-154	-2%	1,155	18%	2,659	41%
1 Cordon Line	OUT	San Mateo Bridge	At County Line	2,779	2,721	2,334	3,058	4,257	-387	-14%	337	12%	1,536	56%
1 Cordon Line	OUT	Dumbarton Bridge	At County Line	1,086	2,394	1,906	2,722	4,174	-488	-20%	328	14%	1,780	74%
1 Cordon Line	OUT	I-880	At S Clara Co. Line or SR 262	5,994	6,720	6,746	7,980	8,928	26	0%	1,260	19%	2,208	33%
1 Cordon Line	OUT	Warm Springs Blvd.	At County Line	1,652	1,281	864	1,067	1,872	-417	-33%	-214	-17%	591	46%
1 Cordon Line	OUT	I-680	At E. Warren/Scott Creek	5,742	5,013	5,446	6,619	6,851	433	9%	1,606	32%	1,837	37%
1 Cordon Line	OUT	Calaveras Road	At County Line	0	0	0	0	0	0	0%	0	0%	0	0%
1 Cordon Line	OUT	Mines Road	At County Line	0	0	0	0	0	0	0%	0	0%	0	0%
1 Cordon Line	OUT	Tesla Road	At County Line	187	7	216	357	1,337	209	3024%	350	5060%	1,331	19252%
1 Cordon Line	OUT	Patterson Pass Road	At County Line	152	4	37	716	1,105	33	781%	712	16818%	1,101	26007%
1 Cordon Line	OUT	I-580	At Altamont Pass	5,612	5,908	6,823	7,939	8,652	915	15%	2,031	34%	2,744	46%
1 Cordon Line	OUT	Altamont Pass Rd.	West of Dyer Road	481	22	100	502	1,513	78	355%	480	2189%	1,491	6798%
1 Cordon Line	OUT	Grant Line Road	At County Line	410	12	68	207	361	57	488%	196	1687%	349	3014%
1 Cordon Line	OUT	Vasco Road	Vasco Road at County Line	1,612	1,503	1,641	1,748	1,899	138	9%	245	16%	396	26%
1 Cordon Line	OUT	N. Livermore Ave.	South of Hartford Avenue	183	100	137	403	588	37	37%	303	302%	487	487%
1 Cordon Line	OUT	Collier Canyon Rd.	At County Line	18	3	3	6	377	0	4%	2	75%	374	11396%
1 Cordon Line	OUT	Tassajara Road	At County Line	376	409	289	773	1,165	-120	-29%	364	89%	756	185%
1 Cordon Line	OUT	Dougherty Road	At County Line	1,614	730	825	1,009	1,946	95	13%	279	38%	1,217	167%
1 Cordon Line	OUT	Stagecoach Road	Btwn Amador Vly and Turquoise	265	326	338	741	745	12	4%	415	127%	420	129%
1 Cordon Line	OUT	Village Parkway	At County Line	556	125	184	723	1,048	58	47%	597	477%	923	737%
1 Cordon Line	OUT	Davona Drive	Between Alcosta and Wicklow	363	97	121	184	393	24	25%	87	90%	296	305%
1 Cordon Line	OUT	I-680	At CC Co. Line/Alcosta	5,138	6,827	7,112	7,649	8,898	285	4%	823	12%	2,072	30%
1 Cordon Line	OUT	San Ramon Road	Between Alcosta Ave. and Volmac	1,185	651	705	1,845	2,119	54	8%	1,194	183%	1,468	225%
1 Cordon Line	OUT	Crow Canyon Rd.	At County Line	1,564	1,178	1,221	1,591	1,667	44	4%	413	35%	489	42%
1 Cordon Line	OUT	Pinehurst Rd.	At County Line	116	374	396	671	903	22	6%	297	79%	529	141%
1 Cordon Line	OUT	Redwood Rd.	East of Skyline	82	291	311	535	786	20	7%	244	84%	495	170%
1 Cordon Line	OUT	SR 24	At Caldecott Tunnel	7,353	7,915	8,260	10,574	11,969	345	4%	2,659	34%	4,054	51%
1 Cordon Line	OUT	Canyon Road	At County Line	0	0	0	0	0	0	0%	0	0%	0	0%
1 Cordon Line	OUT	Arlington Avenue	At County Line	0	720	720	817	875	0	0%	97	13%	155	22%
1 Cordon Line	OUT	Colusa Avenue	At County Line	0	339	348	333	265	9	3%	-6	-2%	-74	-22%
1 Cordon Line	OUT	San Pablo Avenue	At Solano and Central	1,314	2,080	2,108	2,183	2,260	28	1%	104	5%	180	9%
1 Cordon Line	OUT	I-80	At Central	6,213	6,967	7,046	8,793	10,325	80	1%	1,827	26%	3,358	48%
1 Cordon Line	OUT	I-580	At Portola and Albany/Jct 80 East	3,341	4,283	4,655	5,403	6,081	371	9%	1,119	26%	1,798	42%
		Subtotal		**63,501**	**65,472**	**67,279**	**84,774**	**102,492**	**1,806**	**3%**	**19,302**	**29%**	**37,020**	**57%**
		Total		**123,467**	**123,418**	**128,332**	**163,361**	**198,628**	**4,914**	**4%**	**39,943**	**32%**	**75,210**	**61%**

Table C-3: PM Peak 1-Hour Traffic Forecast Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count 2000	Model Volume 2000	Model Volume 2005	Model Volume 2020	Model Volume 2035	Difference 2000-2005	Percent Difference 2000-2005	Difference 2000-2020	Percent Difference 2000-2020	Difference 2000-2035	Percent Difference 2000-2035
2 Albany - Berkeley	NB	I-80	Between Gilman and Buchanan	9,766	10,237	10,608	13,216	15,411	370	4%	2,978	29%	5,174	51%
2 Albany - Berkeley	NB	San Pablo Avenue	At Gilman and Marin	1,356	2,005	2,055	2,204	2,348	50	3%	199	10%	343	17%
2 Albany - Berkeley	NB	Marin Avenue	Near Cityline	830	1,157	1,569	1,040	1,064	412	36%	-117	-10%	-93	-8%
2 Albany - Berkeley	NB	Solano Avenue	Near Cityline	440	161	168	481	608	7	4%	320	198%	446	277%
		Subtotal		**12,392**	**13,561**	**14,400**	**16,941**	**19,431**	**840**	**6%**	**3,380**	**25%**	**5,871**	**43%**
2 Albany - Berkeley	SB	I-80	Between Gilman and Buchanan	6,727	8,346	8,421	9,592	11,395	76	1%	1,246	15%	3,050	37%
2 Albany - Berkeley	SB	San Pablo Avenue	At Gilman and Marin	919	957	1,217	1,920	2,006	260	27%	963	101%	1,049	110%
2 Albany - Berkeley	SB	Marin Avenue	Near Cityline	772	1,016	1,008	967	998	-8	-1%	-49	-5%	-19	-2%
2 Albany - Berkeley	SB	Solano Avenue	Near Cityline	978	163	167	398	475	3	2%	235	144%	312	191%
		Subtotal		**9,396**	**10,482**	**10,813**	**12,877**	**14,874**	**331**	**3%**	**2,395**	**23%**	**4,392**	**42%**
		Total		**21,788**	**24,043**	**25,214**	**29,818**	**34,305**	**1,171**	**5%**	**5,775**	**24%**	**10,263**	**43%**
3 Berkeley - Emeryville	NB	I-80	At Powell	8,186	9,471	9,695	11,241	13,447	224	2%	1,770	19%	3,975	42%
3 Berkeley - Emeryville	NB	Seventh	Near Ashby/City Limit	0	408	425	631	761	17	4%	224	55%	353	87%
3 Berkeley - Emeryville	NB	Hollis St.	Near Ashby/City Limit	0	378	417	682	776	39	10%	304	80%	397	105%
3 Berkeley - Emeryville	NB	West Frontage Road	Near Ashby/City Limit	754	1,002	902	1,038	1,239	-100	-10%	36	4%	237	24%
3 Berkeley - Emeryville	NB	Shellmound Street	Near Ashby/City Limit	0	439	447	656	876	9	2%	217	49%	438	100%
		Subtotal		**8,940**	**11,698**	**11,886**	**14,248**	**17,098**	**188**	**2%**	**2,550**	**22%**	**5,400**	**46%**
3 Berkeley - Emeryville	SB	I-80	At Powell	6,500	7,842	7,962	8,749	9,837	120	2%	907	12%	1,995	25%
3 Berkeley - Emeryville	SB	Seventh	Near Ashby/City Limit	0	360	334	496	684	-26	-7%	136	38%	324	90%
3 Berkeley - Emeryville	SB	Hollis St.	Near Ashby/City Limit	0	227	242	478	636	15	7%	251	110%	409	180%
3 Berkeley - Emeryville	SB	West Frontage Road	Near Ashby/City Limit	493	984	1,025	1,419	1,852	41	4%	435	44%	868	88%
3 Berkeley - Emeryville	SB	Shellmound Street	Near Ashby/City Limit	0	115	119	246	621	4	4%	131	114%	506	441%
		Subtotal		**6,993**	**9,528**	**9,683**	**11,387**	**13,631**	**155**	**2%**	**1,859**	**20%**	**4,103**	**43%**
		Total		**15,933**	**21,225**	**21,569**	**25,635**	**30,729**	**343**	**2%**	**4,410**	**21%**	**9,504**	**45%**

Table C-3: PM Peak 1-Hour Traffic Forecast Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count 2000	Model Volume 2000	Model Volume 2005	Model Volume 2020	Model Volume 2035	Difference 2000-2005	Percent Difference 2000-2005	Difference 2000-2020	Percent Difference 2000-2020	Difference 2000-2035	Percent Difference 2000-2035
4 Berkeley - Oakland	NB	San Pablo Avenue	At Stanford and Ashby Ave.	1,190	1,468	1,629	2,015	2,093	160	11%	547	37%	625	43%
4 Berkeley - Oakland	NB	Sacramento Street	Near City Limits	0	1,211	1,314	1,867	1,990	103	9%	656	54%	780	64%
4 Berkeley - Oakland	NB	Adeline Street	South of Alcatraz	1,454	1,073	1,129	1,326	2,200	56	5%	253	24%	1,127	105%
4 Berkeley - Oakland	NB	Shattuck Avenue	Near City Limits	695	975	979	916	1,007	4	0%	-59	-6%	32	3%
4 Berkeley - Oakland	NB	Telegraph Avenue	Near City Limits	982	1,360	1,530	1,776	1,905	169	12%	416	31%	545	40%
4 Berkeley - Oakland	NB	College Avenue	Near City Limits	430	181	195	457	617	14	8%	276	153%	436	241%
4 Berkeley - Oakland	NB	Claremont Avenue	South of Ashby	710	770	768	1,167	1,686	-2	0%	396	51%	916	119%
4 Berkeley - Oakland	NB	Tunnel Road	Near City Limits	1,165	999	1,002	976	1,033	3	0%	-23	-2%	34	3%
4 Berkeley - Oakland	NB	Grizzly Peak Blvd.	North of 24	439	174	211	291	707	37	21%	117	67%	533	306%
4 Berkeley - Oakland	NB	Fish Ranch Road	North of 24	218	706	763	604	779	57	8%	-102	-14%	74	10%
		Subtotal		**7,283**	**8,918**	**9,520**	**11,396**	**14,018**	**602**	**7%**	**2,478**	**28%**	**5,100**	**57%**
4 Berkeley - Oakland	SB	San Pablo Avenue	At Stanford and Ashby Ave.	1,006	877	934	1,722	1,906	57	6%	845	96%	1,029	117%
4 Berkeley - Oakland	SB	Sacramento Street	Near City Limits	0	726	803	1,441	1,966	77	11%	715	99%	1,240	171%
4 Berkeley - Oakland	SB	Adeline Street	South of Alcatraz	1,289	759	925	1,258	1,993	166	22%	498	66%	1,233	162%
4 Berkeley - Oakland	SB	Shattuck Avenue	Near City Limits	815	919	928	978	1,026	9	1%	58	6%	107	12%
4 Berkeley - Oakland	SB	Telegraph Avenue	Near City Limits	1,354	1,656	1,807	1,976	2,024	151	9%	320	19%	368	22%
4 Berkeley - Oakland	SB	College Avenue	Near City Limits	461	376	443	465	572	68	18%	90	24%	196	52%
4 Berkeley - Oakland	SB	Claremont Avenue	South of Ashby	515	670	673	842	1,488	3	0%	172	26%	818	122%
4 Berkeley - Oakland	SB	Tunnel Road	Near City Limits	1,631	1,055	1,038	1,049	1,089	-17	-2%	-6	-1%	34	3%
4 Berkeley - Oakland	SB	Grizzly Peak Blvd.	North of 24	269	51	115	298	775	64	127%	247	486%	725	1426%
4 Berkeley - Oakland	SB	Fish Ranch Road	North of 24	706	826	820	879	963	-6	-1%	53	6%	137	17%
		Subtotal		**8,046**	**7,916**	**8,486**	**10,908**	**13,802**	**570**	**7%**	**2,992**	**38%**	**5,886**	**74%**
		Total		**15,329**	**16,834**	**18,006**	**22,304**	**27,821**	**1,171**	**7%**	**5,470**	**32%**	**10,986**	**65%**

Table C-3: PM Peak 1-Hour Traffic Forecast Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count 2000	Model Volume 2000	Model Volume 2005	Model Volume 2020	Model Volume 2035	Difference 2000-2005	Percent Difference 2000-2005	Difference 2000-2020	Percent Difference 2000-2020	Difference 2000-2035	Percent Difference 2000-2035
5 Emeryville - Oakland	NB	I-80	At Powell	8,186	9,471	9,695	11,241	13,447	224	2%	1,770	19%	3,975	42%
5 Emeryville - Oakland	NB	Shellmound Street	Near 40th/City Limit	0	93	199	561	1,811	107	115%	469	506%	1,719	1854%
5 Emeryville - Oakland	NB	Adeline Street	South of Alcatraz	1,454	1,073	1,129	1,326	2,200	56	5%	253	24%	1,127	105%
5 Emeryville - Oakland	NB	Hollis St.	Near Powell	0	501	458	921	990	-44	-9%	420	84%	489	98%
5 Emeryville - Oakland	NB	San Pablo Avenue	At Stanford and Ashby Ave.	1,268	1,395	1,535	1,901	1,966	141	10%	506	36%	571	41%
		Subtotal		**10,907**	**12,533**	**13,016**	**15,951**	**20,414**	**483**	**4%**	**3,417**	**27%**	**7,880**	**63%**
5 Emeryville - Oakland	SB	I-80	At Powell	6,500	7,842	7,962	8,749	9,837	120	2%	907	12%	1,995	25%
5 Emeryville - Oakland	SB	Shellmound Street	Near 40th/City Limit	0	339	528	745	1,846	189	56%	406	120%	1,507	444%
5 Emeryville - Oakland	SB	Adeline Street	South of Alcatraz	1,289	759	925	1,258	1,993	166	22%	498	66%	1,233	162%
5 Emeryville - Oakland	SB	Hollis St.	Near Powell	0	500	428	677	784	-73	-15%	177	35%	284	57%
5 Emeryville - Oakland	SB	San Pablo Avenue	At Stanford and Ashby Ave.	909	1,158	1,229	1,893	1,961	71	6%	736	64%	803	69%
		Subtotal		**8,699**	**10,598**	**11,071**	**13,321**	**16,421**	**473**	**4%**	**2,723**	**26%**	**5,822**	**55%**
		Total		**19,606**	**23,131**	**24,087**	**29,272**	**36,834**	**956**	**4%**	**6,140**	**27%**	**13,703**	**59%**
6 Oakland - Piedmont	NB	Pleasant Valley	Near City Limits	745	1,104	1,168	1,491	1,991	64	6%	388	35%	888	80%
6 Oakland - Piedmont	NB	Moraga Avenue	Eastern Border	602	375	399	466	452	24	6%	92	24%	78	21%
6 Oakland - Piedmont	NB	Moraga Avenue	Western Border	342	398	440	516	602	42	10%	118	30%	204	51%
6 Oakland - Piedmont	NB	Grand Avenue	Northern Border	507	651	721	1,003	1,380	70	11%	353	54%	730	112%
6 Oakland - Piedmont	NB	Grand Avenue	Southern Border	950	853	892	1,162	1,637	39	5%	309	36%	784	92%
6 Oakland - Piedmont	NB	Oakland Avenue	North of Monte Vista	680	667	682	704	912	15	2%	38	6%	246	37%
6 Oakland - Piedmont	NB	Lakeshore Avenue	Between Windsor and Walavista	189	33	35	38	79	2	6%	5	16%	46	141%
		Subtotal		**4,015**	**4,080**	**4,338**	**5,381**	**7,054**	**258**	**6%**	**1,301**	**32%**	**2,974**	**73%**
6 Oakland - Piedmont	SB	Pleasant Valley	Near City Limits	735	794	887	1,249	1,643	93	12%	456	57%	849	107%
6 Oakland - Piedmont	SB	Moraga Avenue	Eastern Border	743	589	591	654	714	2	0%	65	11%	124	21%
6 Oakland - Piedmont	SB	Moraga Avenue	Western Border	506	616	634	668	683	18	3%	52	8%	67	11%
6 Oakland - Piedmont	SB	Grand Avenue	Northern Border	632	783	862	1,102	1,585	79	10%	319	41%	802	102%
6 Oakland - Piedmont	SB	Grand Avenue	Southern Border	1,018	829	931	1,094	1,641	102	12%	265	32%	812	98%
6 Oakland - Piedmont	SB	Oakland Avenue	North of Monte Vista	289	425	436	520	819	12	3%	96	23%	394	93%
6 Oakland - Piedmont	SB	Lakeshore Avenue	Between Windsor and Walavista	146	17	21	21	30	5	27%	5	27%	13	78%
		Subtotal		**4,069**	**4,052**	**4,362**	**5,309**	**7,113**	**309**	**8%**	**1,257**	**31%**	**3,061**	**76%**
		Total		**8,084**	**8,132**	**8,699**	**10,691**	**14,168**	**567**	**7%**	**2,558**	**31%**	**6,035**	**74%**

Table C-3: PM Peak 1-Hour Traffic Forecast Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count 2000	Model Volume 2000	Model Volume 2005	Model Volume 2020	Model Volume 2035	Difference 2000-2005	Percent Difference 2000-2005	Difference 2000-2020	Percent Difference 2000-2020	Difference 2000-2035	Percent Difference 2000-2035
7 Alameda - Oakland	NB	Webster-Posey Tubes	Near entrance/exit Oakland side	2,385	2,193	2,220	2,686	3,281	27	1%	493	23%	1,088	50%
7 Alameda - Oakland	NB	Park St. Bridge	West of Bridge	1,693	1,554	1,578	2,060	2,469	24	2%	507	33%	915	59%
7 Alameda - Oakland	NB	Fruitvale Bridge	West of Bridge	836	1,172	1,176	1,304	1,886	3	0%	132	11%	714	61%
7 Alameda - Oakland	NB	High St. Bridge	West of Bridge	950	627	615	846	1,159	-13	-2%	219	35%	531	85%
7 Alameda - Oakland	NB	Doolittle Street	Near City Limits	1,339	1,635	1,317	1,479	1,485	-318	-19%	-156	-10%	-150	-9%
7 Alameda - Oakland	NB	SR 61/Doolittle	North of Hegenberger	935	1,631	1,284	1,445	1,502	-347	-21%	-186	-11%	-129	-8%
7 Alameda - Oakland	NB	Ron Cowan Pkwy	South of Harbor Bay Pkwy	0	0	485	666	1,742	485	0%	666	0%	1,742	0%
		Subtotal		**8,138**	**8,813**	**8,674**	**10,487**	**13,523**	**-138**	**-2%**	**1,674**	**19%**	**4,711**	**53%**
7 Alameda - Oakland	SB	Webster-Posey Tubes	Near entrance/exit Oakland side	3,634	3,028	3,124	3,417	3,828	95	3%	389	13%	800	26%
7 Alameda - Oakland	SB	Park St. Bridge	West of Bridge	1,773	1,861	1,816	2,227	2,650	-45	-2%	366	20%	789	42%
7 Alameda - Oakland	SB	Fruitvale Bridge	West of Bridge	1,437	1,571	1,572	1,844	2,056	0	0%	273	17%	484	31%
7 Alameda - Oakland	SB	High St. Bridge	West of Bridge	1,166	986	969	1,048	1,263	-17	-2%	62	6%	277	28%
7 Alameda - Oakland	SB	Doolittle Street	Near City Limits	1,311	1,188	854	800	1,549	-335	-28%	-388	-33%	360	30%
7 Alameda - Oakland	SB	SR 61/Doolittle	North of Hegenberger	1,376	1,370	1,062	1,055	1,788	-308	-22%	-315	-23%	418	30%
7 Alameda - Oakland	SB	Ron Cowan Pkwy	South of Harbor Bay Pkwy	0	0	451	572	271	451	0%	572	0%	271	0%
		Subtotal		**10,697**	**10,005**	**9,847**	**10,963**	**13,404**	**-158**	**-2%**	**958**	**10%**	**3,399**	**34%**
		Total		**18,835**	**18,818**	**18,522**	**21,450**	**26,927**	**-296**	**-2%**	**2,632**	**14%**	**8,109**	**43%**

Table C-3: PM Peak 1-Hour Traffic Forecast Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count 2000	Model Volume 2000	Model Volume 2005	Model Volume 2020	Model Volume 2035	Difference 2000-2005	Percent Difference 2000-2005	Difference 2000-2020	Percent Difference 2000-2020	Difference 2000-2035	Percent Difference 2000-2035
8 Oak - San L E14th/Int	EB	Lakeshore Avenue	E/O International	1,231	1,525	1,507	1,341	1,284	-19	-1%	-184	-12%	-241	-16%
8 Oak - San L E14th/Int	EB	Park Blvd - 5th Avenue	E/O International	232	78	87	286	285	9	11%	208	266%	207	265%
8 Oak - San L E14th/Int	EB	14th Avenue	E/O International	1,083	1,603	1,634	1,691	1,658	31	2%	88	5%	55	3%
8 Oak - San L E14th/Int	EB	23rd Avenue	E/O International	302	196	191	519	696	-6	-3%	323	164%	499	254%
8 Oak - San L E14th/Int	EB	Fruitvale Avenue	E/O International	965	712	719	830	1,400	7	1%	118	17%	688	97%
8 Oak - San L E14th/Int	EB	35th Avenue	E/O International	664	309	295	394	828	-14	-4%	86	28%	519	168%
8 Oak - San L E14th/Int	EB	42nd/Courtland	E/O International	727	1,502	1,498	1,991	2,137	-4	0%	489	33%	636	42%
8 Oak - San L E14th/Int	EB	High Street	E/O International	543	274	262	635	1,346	-12	-4%	361	132%	1,072	391%
8 Oak - San L E14th/Int	EB	55th Avenue	E/O International	212	211	205	257	320	-5	-2%	46	22%	110	52%
8 Oak - San L E14th/Int	EB	Seminary Avenue	E/O International	511	419	443	780	619	25	6%	362	86%	200	48%
8 Oak - San L E14th/Int	EB	73rd Avenue	E/O International	1,347	1,583	1,588	1,569	2,220	5	0%	-14	-1%	637	40%
8 Oak - San L E14th/Int	EB	82nd Avenue	E/O International	143	190	187	209	290	-3	-1%	19	10%	100	53%
8 Oak - San L E14th/Int	EB	98th Avenue	E/O International	826	884	897	960	1,336	14	2%	77	9%	452	51%
8 Oak - San L E14th/Int	EB	Davis Street (SR 112)	W/O International	1,168	871	880	1,430	1,975	9	1%	559	64%	1,104	127%
8 Oak - San L E14th/Int	EB	Estudillo	E/O International	511	674	648	665	859	-26	-4%	-10	-1%	185	27%
		Subtotal		**10,465**	**11,029**	**11,040**	**13,557**	**17,252**	**11**	**0%**	**2,528**	**23%**	**6,223**	**56%**
8 Oak - San L E14th/Int	WB	Lakeshore Avenue	E/O International	559	237	261	298	443	24	10%	61	26%	206	87%
8 Oak - San L E14th/Int	WB	Park Blvd - 5th Avenue	E/O International	148	41	57	122	429	16	38%	81	199%	388	948%
8 Oak - San L E14th/Int	WB	14th Avenue	E/O International	757	1,051	1,151	1,570	1,834	100	10%	519	49%	783	74%
8 Oak - San L E14th/Int	WB	23rd Avenue	E/O International	240	137	137	133	664	0	0%	-4	-3%	528	386%
8 Oak - San L E14th/Int	WB	Fruitvale Avenue	E/O International	822	653	651	692	938	-2	0%	39	6%	285	44%
8 Oak - San L E14th/Int	WB	35th Avenue	E/O International	445	220	229	272	615	9	4%	52	24%	395	180%
8 Oak - San L E14th/Int	WB	42nd/Courtland	E/O International	486	605	621	903	1,509	16	3%	298	49%	904	150%
8 Oak - San L E14th/Int	WB	High Street	E/O International	803	343	334	318	1,075	-9	-3%	-26	-7%	731	213%
8 Oak - San L E14th/Int	WB	55th Avenue	E/O International	200	113	120	163	243	6	6%	50	44%	129	114%
8 Oak - San L E14th/Int	WB	Seminary Avenue	E/O International	429	241	268	568	500	27	11%	326	135%	259	107%
8 Oak - San L E14th/Int	WB	73rd Avenue	E/O International	1,027	828	828	986	1,900	0	0%	158	19%	1,071	129%
8 Oak - San L E14th/Int	WB	82nd Avenue	E/O International	227	120	127	145	171	8	6%	25	21%	51	43%
8 Oak - San L E14th/Int	WB	98th Avenue	E/O International	727	501	515	603	821	15	3%	103	21%	321	64%
8 Oak - San L E14th/Int	WB	Davis Street (SR 112)	W/O International	917	516	520	770	1,289	4	1%	254	49%	773	150%
8 Oak - San L E14th/Int	WB	Estudillo	E/O International	428	498	505	607	689	8	2%	109	22%	192	39%
		Subtotal		**8,215**	**6,104**	**6,324**	**8,151**	**13,120**	**220**	**4%**	**2,047**	**34%**	**7,015**	**115%**
		Total		**18,680**	**17,133**	**17,364**	**21,707**	**30,372**	**231**	**1%**	**4,574**	**27%**	**13,239**	**77%**

Table C-3: PM Peak 1-Hour Traffic Forecast Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count 2000	Model Volume 2000	Model Volume 2005	Model Volume 2020	Model Volume 2035	Difference 2000-2005	Percent Difference 2000-2005	Difference 2000-2020	Percent Difference 2000-2020	Difference 2000-2035	Percent Difference 2000-2035
9 Oakland - San Leandro	NB	Doolittle Drive	Near Davis	1,228	2,040	2,051	2,126	2,310	12	1%	87	4%	270	13%
9 Oakland - San Leandro	NB	I-880	Between Davis and 98th Avenue	7,038	7,548	7,612	8,398	9,889	64	1%	850	11%	2,341	31%
9 Oakland - San Leandro	NB	San Leandro Blvd.	Near City Limits	543	388	371	1,507	1,957	-17	-4%	1,119	289%	1,569	405%
9 Oakland - San Leandro	NB	Int'l/E. 14th	Near 98th Avenue	1,069	592	626	1,281	1,710	33	6%	689	116%	1,118	189%
9 Oakland - San Leandro	NB	Bancroft Avenue	Near City Limits	465	411	412	1,204	2,088	1	0%	793	193%	1,677	408%
9 Oakland - San Leandro	NB	MacArthur Blvd.	Near City Limits	481	541	523	742	760	-18	-3%	202	37%	219	41%
9 Oakland - San Leandro	NB	Foothill Blvd.	Near City Limits	289	202	195	214	507	-6	-3%	12	6%	305	151%
9 Oakland - San Leandro	NB	I-580	Between 98th and Estudillo	5,863	7,453	7,517	8,957	10,982	64	1%	1,504	20%	3,529	47%
		Subtotal		**16,976**	**19,174**	**19,307**	**24,430**	**30,203**	**132**	**1%**	**5,256**	**27%**	**11,029**	**58%**
9 Oakland - San Leandro	SB	Doolittle Drive	Near Davis	1,671	2,028	2,092	2,152	2,552	64	3%	124	6%	524	26%
9 Oakland - San Leandro	SB	I-880	Between Davis and 98th Avenue	7,312	7,664	7,837	9,488	10,199	172	2%	1,824	24%	2,535	33%
9 Oakland - San Leandro	SB	San Leandro Blvd.	Near City Limits	638	660	763	1,568	1,892	103	16%	908	138%	1,232	187%
9 Oakland - San Leandro	SB	Int'l/E. 14th	Near 98th Avenue	985	682	765	1,311	1,652	83	12%	629	92%	970	142%
9 Oakland - San Leandro	SB	Bancroft Avenue	Near City Limits	455	259	268	444	1,916	10	4%	185	71%	1,657	640%
9 Oakland - San Leandro	SB	MacArthur Blvd.	Near City Limits	431	443	560	694	840	117	26%	250	57%	397	90%
9 Oakland - San Leandro	SB	Foothill Blvd.	Near City Limits	433	222	218	236	325	-4	-2%	14	6%	103	47%
9 Oakland - San Leandro	SB	I-580	Between 98th and Estudillo	6,398	7,951	8,008	8,703	9,388	57	1%	752	9%	1,438	18%
		Subtotal		**18,323**	**19,908**	**20,510**	**24,595**	**28,763**	**602**	**3%**	**4,687**	**24%**	**8,855**	**44%**
		Total		**35,299**	**39,083**	**39,817**	**49,025**	**58,967**	**734**	**2%**	**9,943**	**25%**	**19,884**	**51%**

Table C-3: PM Peak 1-Hour Traffic Forecast Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count 2000	Model Volume 2000	Model Volume 2005	Model Volume 2020	Model Volume 2035	Difference 2000-2005	Percent Difference 2000-2005	Difference 2000-2020	Percent Difference 2000-2020	Difference 2000-2035	Percent Difference 2000-2035
10 Hayward - Union City	NB	Union City Blvd.	Near City Limits	0	2,144	2,124	2,215	2,549	-20	-1%	71	3%	405	19%
10 Hayward - Union City	NB	I-880	At Industrial Parkway	6,160	7,751	7,859	9,267	11,763	108	1%	1,516	20%	4,012	52%
10 Hayward - Union City	NB	Industrial Pkwy	Near Huntwood	1,275	1,171	1,276	1,212	1,563	105	9%	41	4%	392	34%
10 Hayward - Union City	NB	Whipple Road	Near City Limit, E side of I-880	1,224	737	774	1,339	1,884	37	5%	602	82%	1,147	156%
10 Hayward - Union City	NB	Mission Blvd	At Greasel Street	1,622	1,572	1,606	1,902	2,101	34	2%	329	21%	529	34%
		Subtotal		**10,281**	**13,375**	**13,640**	**15,935**	**19,861**	**265**	**2%**	**2,560**	**19%**	**6,486**	**48%**
10 Hayward - Union City	SB	Union City Blvd.	Near City Limits	0	2,170	2,165	2,204	2,320	-5	0%	35	2%	150	7%
10 Hayward - Union City	SB	I-880	At Industrial Parkway	5,763	8,115	8,252	9,181	10,746	138	2%	1,066	13%	2,631	32%
10 Hayward - Union City	SB	Industrial Pkwy	Near Huntwood	1,188	816	838	666	1,214	22	3%	-150	-18%	398	49%
10 Hayward - Union City	SB	Whipple Road	Near City Limit, E side of I-880	1,142	1,077	1,170	1,567	1,699	93	9%	489	45%	622	58%
10 Hayward - Union City	SB	Mission Blvd	At Greasel Street	1,240	1,617	1,624	1,874	2,032	7	0%	258	16%	416	26%
		Subtotal		**9,333**	**13,794**	**14,050**	**15,492**	**18,010**	**256**	**2%**	**1,698**	**12%**	**4,217**	**31%**
		Total		**19,614**	**27,169**	**27,690**	**31,427**	**37,871**	**521**	**2%**	**4,258**	**16%**	**10,703**	**39%**
11 Hayward - Castro Vall	NB	Redwood Rd.	North of Seven Hills	604	219	242	533	852	23	10%	314	143%	633	289%
11 Hayward - Castro Vall	NB	Crow Canyon Rd.	North of Cold Water Drive	1,194	1,151	1,177	1,426	1,736	26	2%	275	24%	584	51%
11 Hayward - Castro Vall	NB	I-580	At Crow Canyon	6,617	8,141	8,577	10,304	11,787	436	5%	2,163	27%	3,646	45%
11 Hayward - Castro Vall	NB	Dublin Canyon Road	East of Palomares	212	110	102	433	667	-8	-7%	323	294%	558	508%
11 Hayward - Castro Vall	NB	Palomares Road	South of Palo Verde Road	90	142	154	224	447	11	8%	82	58%	305	214%
		Subtotal		**8,717**	**9,764**	**10,252**	**12,921**	**15,489**	**488**	**5%**	**3,157**	**32%**	**5,725**	**59%**
11 Hayward - Castro Vall	SB	Redwood Rd.	North of Seven Hills	398	170	183	251	458	13	8%	81	48%	287	169%
11 Hayward - Castro Vall	SB	Crow Canyon Rd.	North of Cold Water Drive	1,489	1,073	1,094	1,133	1,381	22	2%	61	6%	308	29%
11 Hayward - Castro Vall	SB	I-580	At Crow Canyon	6,704	5,877	6,106	7,885	9,288	228	4%	2,007	34%	3,411	58%
11 Hayward - Castro Vall	SB	Dublin Canyon Road	East of Palomares	464	279	342	780	968	63	23%	501	180%	689	247%
11 Hayward - Castro Vall	SB	Palomares Road	South of Palo Verde Road	75	112	102	136	159	-10	-9%	24	21%	47	42%
		Subtotal		**9,130**	**7,511**	**7,827**	**10,185**	**12,253**	**316**	**4%**	**2,674**	**36%**	**4,742**	**63%**
		Total		**17,847**	**17,275**	**18,079**	**23,106**	**27,742**	**804**	**5%**	**5,831**	**34%**	**10,467**	**61%**

Table C-3: PM Peak 1-Hour Traffic Forecast Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count 2000	Model Volume 2000	Model Volume 2005	Model Volume 2020	Model Volume 2035	Difference 2000-2005	Percent Difference 2000-2005	Difference 2000-2020	Percent Difference 2000-2020	Difference 2000-2035	Percent Difference 2000-2035
12 Union City - Fremont	NB	Ardenwood Blvd.	Near City Limits	1,784	1,729	1,720	2,159	2,200	-9	-1%	430	25%	471	27%
12 Union City - Fremont	NB	Alvarado Blvd.	Around Lowry Road	1,049	1,221	1,313	1,655	2,218	92	8%	434	36%	997	82%
12 Union City - Fremont	NB	I-880	South of Alvarado-Niles I/C	6,606	7,602	7,709	8,229	10,279	107	1%	627	8%	2,676	35%
12 Union City - Fremont	NB	Decoto Road	South of Alvarado Niles	0	2,110	2,122	1,936	2,134	12	1%	-174	-8%	24	1%
12 Union City - Fremont	NB	Isherwood Way	Near City Limits	609	298	388	95	617	90	30%	-203	-68%	320	107%
12 Union City - Fremont	NB	Alvarado-Niles Rd.	Near City Limits	0	512	473	269	699	-38	-8%	-242	-47%	188	37%
12 Union City - Fremont	NB	Mission Blvd	South of Decoto Road	1,366	1,263	1,254	1,817	1,972	-9	-1%	554	44%	709	56%
		Subtotal		**11,414**	**14,734**	**14,979**	**16,160**	**20,120**	**245**	**2%**	**1,426**	**10%**	**5,386**	**37%**
12 Union City - Fremont	SB	Ardenwood Blvd.	Near City Limits	716	946	914	1,244	1,838	-32	-3%	298	32%	892	94%
12 Union City - Fremont	SB	Alvarado Blvd.	Around Lowry Road	735	1,257	1,186	1,541	2,116	-71	-6%	284	23%	859	68%
12 Union City - Fremont	SB	I-880	South of Alvarado-Niles I/C	6,374	7,339	7,433	7,925	9,068	94	1%	586	8%	1,729	24%
12 Union City - Fremont	SB	Decoto Road	South of Alvarado Niles	0	1,956	1,977	1,881	2,070	21	1%	-75	-4%	113	6%
12 Union City - Fremont	SB	Isherwood Way	Near City Limits	986	78	88	73	405	10	13%	-5	-6%	327	420%
12 Union City - Fremont	SB	Alvarado-Niles Rd.	Near City Limits	0	951	1,031	429	828	80	8%	-521	-55%	-123	-13%
12 Union City - Fremont	SB	Mission Blvd	South of Decoto Road	1,436	1,542	1,566	1,902	1,998	23	2%	360	23%	456	30%
		Subtotal		**10,247**	**14,069**	**14,194**	**14,995**	**18,322**	**125**	**1%**	**926**	**7%**	**4,253**	**30%**
		Total		**21,661**	**28,803**	**29,173**	**31,156**	**38,443**	**370**	**1%**	**2,352**	**8%**	**9,639**	**33%**

Table C-3: PM Peak 1-Hour Traffic Forecast Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count 2000	Model Volume 2000	Model Volume 2005	Model Volume 2020	Model Volume 2035	Difference 2000-2005	Percent Difference 2000-2005	Difference 2000-2020	Percent Difference 2000-2020	Difference 2000-2035	Percent Difference 2000-2035
13 Fremont - Newark	NB	Thornton Ave.	South of SR 84	0	396	326	474	852	-70	-18%	78	20%	456	115%
13 Fremont - Newark	NB	Newark Blvd.	South of SR 84	0	1,053	1,077	1,383	1,742	24	2%	330	31%	689	65%
13 Fremont - Newark	NB	I-880	Near SR 84	6,876	7,486	7,638	8,224	9,817	152	2%	738	10%	2,331	31%
13 Fremont - Newark	NB	Thornton Ave.	Near I-880/City Limits	0	1,473	1,452	1,872	1,655	-21	-1%	399	27%	182	12%
13 Fremont - Newark	WB	Central Ave.	Near I-880/City Limits	603	156	166	179	458	9	6%	22	14%	302	193%
13 Fremont - Newark	WB	Mowry Ave.	Near I-880/City Limits	2,142	1,053	1,072	1,117	1,421	19	2%	64	6%	368	35%
13 Fremont - Newark	WB	Stevenson Blvd.	Near I-880/City Limits	639	1,117	1,153	1,086	1,356	36	3%	-31	-3%	239	21%
13 Fremont - Newark	WB	Cedar Blvd.	Near City Limits	0	81	108	141	240	26	32%	59	73%	159	196%
13 Fremont - Newark	WB	Cherry Street	Near City Limits	0	791	833	1,383	1,827	42	5%	591	75%	1,036	131%
		Subtotal		**10,260**	**13,607**	**13,824**	**15,859**	**19,369**	217	2%	2,252	17%	5,762	42%
13 Fremont - Newark	SB	Thornton Ave.	South of SR 84	0	318	301	567	1,057	-18	-6%	249	78%	739	232%
13 Fremont - Newark	SB	Newark Blvd.	South of SR 84	0	1,439	1,362	1,871	2,056	-77	-5%	432	30%	617	43%
13 Fremont - Newark	SB	I-880	Near SR 84	5,916	6,396	6,405	7,114	8,477	9	0%	717	11%	2,081	33%
13 Fremont - Newark	SB	Thornton Ave.	Near I-880/City Limits	0	1,376	1,429	1,385	1,936	52	4%	8	1%	559	41%
13 Fremont - Newark	EB	Central Ave.	Near I-880/City Limits	919	219	222	276	1,684	2	1%	57	26%	1,465	668%
13 Fremont - Newark	EB	Mowry Ave.	Near I-880/City Limits	2,524	1,841	1,983	1,943	2,788	143	8%	102	6%	947	51%
13 Fremont - Newark	EB	Stevenson Blvd.	Near I-880/City Limits	698	1,077	1,027	1,247	1,830	-50	-5%	169	16%	753	70%
13 Fremont - Newark	EB	Cedar Blvd.	Near City Limits	0	105	157	176	189	52	50%	71	67%	84	80%
13 Fremont - Newark	EB	Cherry Street	Near City Limits	0	597	533	876	1,560	-64	-11%	280	47%	963	161%
		Subtotal		**10,057**	**13,369**	**13,418**	**15,454**	**21,578**	**49**	**0%**	**2,085**	**16%**	**8,209**	**61%**
		Total		**20,317**	**26,976**	**27,242**	**31,312**	**40,946**	**266**	**1%**	**4,337**	**16%**	**13,971**	**52%**
14 County - Tri-Valley	NB	Niles Canyon Road	At Palomares	1,041	1,206	1,567	1,638	1,829	360	30%	432	36%	623	52%
14 County - Tri-Valley	NB	I-680	At SR 84 East	4,864	5,069	5,642	7,545	8,800	573	11%	2,476	49%	3,731	74%
14 County - Tri-Valley	NB	Foothill Road	North of Niles Canyon Road	238	275	404	735	830	129	47%	460	167%	555	202%
14 County - Tri-Valley	NB	Pleasanton-Sunol	North of Niles Canyon Road	515	687	871	1,024	1,084	183	27%	337	49%	396	58%
14 County - Tri-Valley	NB	Vallecitos Road	Near Vineyard	1,469	918	951	725	769	33	4%	-193	-21%	-149	-16%
		Subtotal		**8,127**	**8,156**	**9,435**	**11,667**	**13,312**	**1,279**	**16%**	**3,511**	**43%**	**5,156**	**63%**
14 County - Tri-Valley	SB	Niles Canyon Road	At Palomares	755	567	547	1,269	1,559	-21	-4%	702	124%	992	175%
14 County - Tri-Valley	SB	I-680	At SR 84 East	3,567	3,962	4,269	5,238	5,609	306	8%	1,276	32%	1,646	42%
14 County - Tri-Valley	SB	Foothill Road	North of Niles Canyon Road	0	99	134	320	348	35	35%	221	223%	249	252%
14 County - Tri-Valley	SB	Pleasanton-Sunol	North of Niles Canyon Road	0	183	214	641	562	31	17%	458	251%	379	207%
14 County - Tri-Valley	SB	Vallecitos Road	Near Vineyard	435	801	819	292	789	18	2%	-509	-64%	-12	-1%
		Subtotal		**4,757**	**5,613**	**5,982**	**7,761**	**8,867**	**370**	**7%**	**2,148**	**38%**	**3,254**	**58%**
		Total		**12,884**	**13,768**	**15,417**	**19,428**	**22,178**	**1,649**	**12%**	**5,660**	**41%**	**8,410**	**61%**

Table C-3: PM Peak 1-Hour Traffic Forecast Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count 2000	Model Volume 2000	Model Volume 2005	Model Volume 2020	Model Volume 2035	Difference 2000-2005	Percent Difference 2000-2005	Difference 2000-2020	Percent Difference 2000-2020	Difference 2000-2035	Percent Difference 2000-2035
15 Dublin - Pleasanton	NB	San Ramon Road	Btwn Dublin Blvd. and Amador Vly	1,478	1,366	1,400	2,114	2,134	34	2%	748	55%	768	56%
15 Dublin - Pleasanton	NB	I-680	North of I-580	6,622	6,605	6,860	6,648	8,289	255	4%	43	1%	1,684	25%
15 Dublin - Pleasanton	NB	Village Parkway	Between Dublin Blvd. and Lewis	945	668	763	1,404	1,626	95	14%	736	110%	958	143%
15 Dublin - Pleasanton	NB	Dougherty Road	Between Dublin Blvd. and Sierra	1,502	1,462	1,589	2,482	2,796	128	9%	1,020	70%	1,334	91%
15 Dublin - Pleasanton	NB	Hacienda Drive	Between I-580 and Dublin Blvd.	877	517	715	3,377	3,645	198	38%	2,861	553%	3,128	605%
15 Dublin - Pleasanton	NB	Tassajara Road	Between I-580 and Dublin Blvd.	669	510	850	2,812	3,585	340	67%	2,301	451%	3,075	603%
15 Dublin - Pleasanton	NB	Santa Rita Road	South of I-580	1,858	1,258	1,027	2,484	2,443	-231	-18%	1,226	97%	1,185	94%
15 Dublin - Pleasanton	NB	Hacienda Drive	South of I-580	1,861	1,580	1,730	3,425	3,679	150	9%	1,844	117%	2,099	133%
15 Dublin - Pleasanton	NB	Hopyard Rd.	South of I-580	1,906	2,577	2,714	3,227	3,294	137	5%	650	25%	717	28%
15 Dublin - Pleasanton	NB	Foothill Road	South of I-580	2,157	1,829	1,962	2,501	3,712	133	7%	672	37%	1,883	103%
		Subtotal		**19,876**	**18,372**	**19,610**	**30,473**	**35,202**	**1,238**	**7%**	**12,101**	**66%**	**16,830**	**92%**
15 Dublin - Pleasanton	SB	San Ramon Road	Btwn Dublin Blvd. and Amador Vly	1,165	665	665	1,158	1,354	1	0%	494	74%	689	104%
15 Dublin - Pleasanton	SB	I-680	North of I-580	5,781	5,286	6,447	7,182	7,928	1,161	22%	1,896	36%	2,642	50%
15 Dublin - Pleasanton	SB	Village Parkway	Between Dublin Blvd. and Lewis	755	535	510	921	1,448	-25	-5%	386	72%	913	171%
15 Dublin - Pleasanton	SB	Dougherty Road	Between Dublin Blvd. and Sierra	1,175	1,177	1,071	1,415	1,546	-106	-9%	238	20%	369	31%
15 Dublin - Pleasanton	SB	Hacienda Drive	Between I-580 and Dublin Blvd.	1,222	761	585	1,135	2,334	-176	-23%	374	49%	1,573	207%
15 Dublin - Pleasanton	SB	Tassajara Road	Between I-580 and Dublin Blvd.	1,379	272	596	930	1,553	324	119%	658	242%	1,280	470%
15 Dublin - Pleasanton	SB	Santa Rita Road	South of I-580	864	1,010	1,071	1,552	1,405	61	6%	542	54%	395	39%
15 Dublin - Pleasanton	SB	Hacienda Drive	South of I-580	1,071	1,534	1,813	1,633	1,835	278	18%	98	6%	300	20%
15 Dublin - Pleasanton	SB	Hopyard Rd.	South of I-580	1,787	1,737	1,591	2,091	2,816	-145	-8%	354	20%	1,080	62%
15 Dublin - Pleasanton	SB	Foothill Road	South of I-580	1,342	1,587	1,466	1,865	2,185	-122	-8%	278	17%	597	38%
		Subtotal		**16,541**	**14,563**	**15,815**	**19,880**	**24,402**	**1,252**	**9%**	**5,317**	**37%**	**9,839**	**68%**
		Total		**36,416**	**32,935**	**35,425**	**50,353**	**59,605**	**2,490**	**8%**	**17,418**	**53%**	**26,669**	**81%**
16 Pleasanton - Livermore	EB	Dublin Blvd	West of Doolan Rd	0	0	0	1,703	1,980	0	0%	1,703	0%	1,980	0%
16 Pleasanton - Livermore	EB	I-580	At Airway	7,815	7,950	8,948	10,319	11,801	998	13%	2,369	30%	3,852	48%
16 Pleasanton - Livermore	EB	W Jack London Blvd	SW of Airport	0	0	0	920	1,907	0	0%	920	0%	1,907	0%
16 Pleasanton - Livermore	EB	Stanley Blvd.	West of Isabel Avenue	2,533	2,019	1,990	2,076	3,017	-29	-1%	57	3%	998	49%
16 Pleasanton - Livermore	EB	Vineyard Avenue	East of Ruby Hill	930	458	892	862	884	435	95%	404	88%	426	93%
16 Pleasanton - Livermore	EB	Vallecitos Road	S/O Isabel Avenue	1,512	1,489	1,596	1,473	3,028	106	7%	-16	-1%	1,539	103%
		Subtotal		**12,790**	**11,916**	**13,426**	**17,352**	**22,617**	**1,510**	**13%**	**5,436**	**46%**	**10,701**	**90%**
16 Pleasanton - Livermore	WB	Dublin Blvd	West of Doolan Rd	0	0	0	350	1,890	0	0%	350	0%	1,890	0%
16 Pleasanton - Livermore	WB	I-580	At Airway	5,479	5,785	6,154	8,669	10,082	370	6%	2,884	50%	4,297	74%
16 Pleasanton - Livermore	WB	W Jack London Blvd	SW of Airport	0	0	0	313	500	0	0%	313	0%	500	0%
16 Pleasanton - Livermore	WB	Stanley Blvd.	West of Isabel Avenue	724	756	735	1,851	2,064	-22	-3%	1,095	145%	1,308	173%
16 Pleasanton - Livermore	WB	Vineyard Avenue	East of Ruby Hill	369	146	208	315	352	61	42%	169	115%	206	141%
16 Pleasanton - Livermore	WB	Vallecitos Road	S/O Isabel Avenue	753	1,304	1,358	1,392	2,624	54	4%	88	7%	1,320	101%
		Subtotal		**7,325**	**7,991**	**8,454**	**12,891**	**17,513**	**463**	**6%**	**4,900**	**61%**	**9,522**	**119%**
		Total		**20,115**	**19,907**	**21,880**	**30,243**	**40,130**	**1,973**	**10%**	**10,336**	**52%**	**20,223**	**102%**

Table C-4: PM Peak 2-Hour Traffic Forecast Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count 2000	Model Volume 2000	Model Volume 2005	Model Volume 2020	Model Volume 2035	Difference 2000-2005	Percent Difference 2000-2005	Difference 2000-2020	Percent Difference 2000-2020	Difference 2000-2035	Percent Difference 2000-2035
1 Cordon Line	IN	SF-Oakland Bay Bridge	At County Line	19,304	19,473	19,344	23,354	26,481	-129	-1%	3,881	20%	7,008	36%
1 Cordon Line	IN	San Mateo Bridge	At County Line	6,048	7,186	7,579	10,223	12,409	393	5%	3,037	42%	5,224	73%
1 Cordon Line	IN	Dumbarton Bridge	At County Line	10,948	8,482	8,084	10,145	12,388	-398	-5%	1,663	20%	3,906	46%
1 Cordon Line	IN	I-880	At S Clara Co Line or SR 262	11,846	10,968	13,408	15,176	19,211	2,440	22%	4,208	38%	8,243	75%
1 Cordon Line	IN	Warm Springs Blvd.	At County Line	3,105	1,595	1,107	1,140	2,719	-488	-31%	-455	-29%	1,124	70%
1 Cordon Line	IN	I-680	At E. Warren/Scott Creek	10,955	9,503	9,476	13,188	15,378	-27	0%	3,685	39%	5,875	62%
1 Cordon Line	IN	Calaveras Road	At County Line	119	0	0	0	0	0	0%	0	0%	0	0%
1 Cordon Line	IN	Mines Road	At County Line	25	0	0	0	0	0	0%	0	0%	0	0%
1 Cordon Line	IN	Tesla Road	At County Line	56	9	19	28	1,044	9	101%	18	195%	1,035	11074%
1 Cordon Line	IN	Patterson Pass Road	At County Line	14	0	0	3	1,090	0	0%	3	0%	1,090	0%
1 Cordon Line	IN	I-580	At Altamont Pass	7,388	6,064	6,507	11,231	13,998	443	7%	5,167	85%	7,934	131%
1 Cordon Line	IN	Altamont Pass Rd.	West of Dyer Road	173	20	27	28	1,302	6	31%	8	37%	1,282	6276%
1 Cordon Line	IN	Grant Line Road	At County Line	74	0	0	0	404	0	0%	0	0%	404	0%
1 Cordon Line	IN	Vasco Road	Vasco Road at County Line	835	630	706	1,144	1,548	76	12%	514	81%	918	146%
1 Cordon Line	IN	N. Livermore Ave.	South of Hartford Avenue	318	101	99	91	105	-2	-2%	-10	-10%	4	4%
1 Cordon Line	IN	Collier Canyon Rd.	At County Line	44	17	11	18	22	-5	-32%	1	9%	6	34%
1 Cordon Line	IN	Tassajara Road	At County Line	524	247	305	564	1,182	58	24%	317	128%	935	379%
1 Cordon Line	IN	Dougherty Road	At County Line	1,264	481	496	879	997	15	3%	399	83%	517	107%
1 Cordon Line	IN	Stagecoach Road	Btwn Amador Vly and Turquoise	410	453	388	649	851	-65	-14%	196	43%	397	88%
1 Cordon Line	IN	Village Parkway	At County Line	1,250	328	220	756	1,168	-108	-33%	428	130%	840	256%
1 Cordon Line	IN	Davona Drive	Between Alcosta and Wicklow	434	545	493	397	472	-52	-10%	-149	-27%	-74	-13%
1 Cordon Line	IN	I-680	At CC Co. Line/Alcosta	11,246	10,167	12,503	14,017	15,529	2,337	23%	3,850	38%	5,363	53%
1 Cordon Line	IN	San Ramon Road	Between Alcosta Ave. and Volmac	2,800	951	834	1,763	2,192	-117	-12%	812	85%	1,241	131%
1 Cordon Line	IN	Crow Canyon Rd.	At County Line	0	2,060	2,155	2,309	3,289	95	5%	249	12%	1,229	60%
1 Cordon Line	IN	Pinehurst Rd.	At County Line	108	381	421	576	920	40	11%	195	51%	539	142%
1 Cordon Line	IN	Redwood Rd.	East of Skyline	220	320	344	498	898	24	8%	178	56%	578	181%
1 Cordon Line	IN	SR 24	At Caldecott Tunnel	10,062	8,797	9,401	12,272	14,311	604	7%	3,474	39%	5,514	63%
1 Cordon Line	IN	Canyon Road	At County Line	0	0	0	0	0	0	0%	0	0%	0	0%
1 Cordon Line	IN	Arlington Avenue	At County Line	0	930	951	1,101	1,549	21	2%	171	18%	620	67%
1 Cordon Line	IN	Colusa Avenue	At County Line	0	320	310	396	587	-10	-3%	76	24%	267	84%
1 Cordon Line	IN	San Pablo Avenue	At Solano and Central	1,672	1,673	1,770	3,732	4,059	97	6%	2,059	123%	2,387	143%
1 Cordon Line	IN	I-80	At Central	9,145	10,833	10,991	12,025	13,587	158	1%	1,192	11%	2,754	25%
1 Cordon Line	IN	I-580	At Portola and Albany/Jct 80 East	5,557	7,553	8,010	9,020	9,860	457	6%	1,467	19%	2,307	31%
		Subtotal		**115,944**	**110,085**	**115,959**	**146,722**	**179,554**	**5,874**	**5%**	**36,637**	**33%**	**69,469**	**63%**

Table C-4: PM Peak 2-Hour Traffic Forecast Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count 2000	Model Volume 2000	Model Volume 2005	Model Volume 2020	Model Volume 2035	Difference 2000-2005	Percent Difference 2000-2005	Difference 2000-2020	Percent Difference 2000-2020	Difference 2000-2035	Percent Difference 2000-2035
1 Cordon Line	OUT	SF-Oakland Bay Bridge	At County Line	15,675	12,438	12,193	14,842	17,399	-245	-2%	2,404	19%	4,962	40%
1 Cordon Line	OUT	San Mateo Bridge	At County Line	5,385	5,152	4,486	5,715	7,865	-666	-13%	563	11%	2,712	53%
1 Cordon Line	OUT	Dumbarton Bridge	At County Line	2,068	4,570	3,649	5,045	7,923	-922	-20%	475	10%	3,353	73%
1 Cordon Line	OUT	I-880	At S Clara Co. Line or SR 262	11,856	13,053	13,105	15,475	17,705	51	0%	2,422	19%	4,652	36%
1 Cordon Line	OUT	Warm Springs Blvd.	At County Line	3,117	2,232	1,570	1,826	3,392	-662	-30%	-406	-18%	1,160	52%
1 Cordon Line	OUT	I-680	At E. Warren/Scott Creek	11,443	9,734	10,543	12,644	13,207	809	8%	2,910	30%	3,473	36%
1 Cordon Line	OUT	Calaveras Road	At County Line	0	0	0	0	0	0	0%	0	0%	0	0%
1 Cordon Line	OUT	Mines Road	At County Line	0	0	0	0	0	0	0%	0	0%	0	0%
1 Cordon Line	OUT	Tesla Road	At County Line	277	9	28	481	1,966	19	207%	472	5158%	1,957	21383%
1 Cordon Line	OUT	Patterson Pass Road	At County Line	232	0	28	421	1,895	28	25750%	421	391839%	1,895	1764734%
1 Cordon Line	OUT	I-580	At Altamont Pass	11,236	10,745	12,604	15,373	16,363	1,859	17%	4,628	43%	5,618	52%
1 Cordon Line	OUT	Altamont Pass Rd.	West of Dyer Road	667	44	66	301	1,833	22	50%	257	581%	1,789	4043%
1 Cordon Line	OUT	Grant Line Road	At County Line	608	0	163	64	566	163	367214%	64	145415%	566	1277614%
1 Cordon Line	OUT	Vasco Road	Vasco Road at County Line	2,929	2,545	3,103	3,421	3,599	557	22%	876	34%	1,053	41%
1 Cordon Line	OUT	N. Livermore Ave.	South of Hartford Avenue	302	151	206	477	1,014	55	36%	326	215%	862	569%
1 Cordon Line	OUT	Collier Canyon Rd.	At County Line	31	7	7	12	184	0	5%	5	75%	178	2640%
1 Cordon Line	OUT	Tassajara Road	At County Line	649	687	447	874	2,103	-240	-35%	186	27%	1,416	206%
1 Cordon Line	OUT	Dougherty Road	At County Line	2,669	1,127	1,339	1,578	3,220	212	19%	452	40%	2,093	186%
1 Cordon Line	OUT	Stagecoach Road	Btwn Amador Vly and Turquoise	448	624	655	1,429	1,462	31	5%	806	129%	838	134%
1 Cordon Line	OUT	Village Parkway	At County Line	946	211	261	1,254	1,519	50	24%	1,043	495%	1,308	621%
1 Cordon Line	OUT	Davona Drive	Between Alcosta and Wicklow	666	202	266	330	482	64	32%	128	63%	280	138%
1 Cordon Line	OUT	I-680	At CC Co. Line/Alcosta	10,602	12,897	13,664	14,859	17,109	767	6%	1,962	15%	4,212	33%
1 Cordon Line	OUT	San Ramon Road	Between Alcosta Ave. and Volmac	2,290	1,057	1,140	3,403	4,078	83	8%	2,346	222%	3,021	286%
1 Cordon Line	OUT	Crow Canyon Rd.	At County Line	0	2,275	2,312	2,896	3,277	38	2%	622	27%	1,002	44%
1 Cordon Line	OUT	Pinehurst Rd.	At County Line	206	623	632	1,126	1,628	8	1%	503	81%	1,004	161%
1 Cordon Line	OUT	Redwood Rd.	East of Skyline	145	499	509	935	1,378	10	2%	436	87%	879	176%
1 Cordon Line	OUT	SR 24	At Caldecott Tunnel	14,850	14,768	15,355	19,299	22,258	588	4%	4,532	31%	7,491	51%
1 Cordon Line	OUT	Canyon Road	At County Line	0	0	0	0	0	0	0%	0	0%	0	0%
1 Cordon Line	OUT	Arlington Avenue	At County Line	0	1,408	1,446	1,570	1,772	38	3%	162	11%	364	26%
1 Cordon Line	OUT	Colusa Avenue	At County Line	0	503	530	442	472	28	5%	-61	-12%	-31	-6%
1 Cordon Line	OUT	San Pablo Avenue	At Solano and Central	2,518	4,068	4,065	4,185	4,389	-3	0%	117	3%	321	8%
1 Cordon Line	OUT	I-80	At Central	12,555	13,512	13,658	16,628	19,244	146	1%	3,116	23%	5,732	42%
1 Cordon Line	OUT	I-580	At Portola and Albany/Jct 80 East	6,442	8,422	9,153	10,098	11,413	732	9%	1,676	20%	2,992	36%
		Subtotal		**120,812**	**123,563**	**127,183**	**157,006**	**190,716**	**3,619**	**3%**	**33,443**	**27%**	**67,152**	**54%**
		Total		**236,756**	**233,648**	**243,141**	**303,729**	**370,270**	**9,493**	**4%**	**70,080**	**30%**	**136,621**	**58%**

Table C-4: PM Peak 2-Hour Traffic Forecast Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count 2000	Model Volume 2000	Model Volume 2005	Model Volume 2020	Model Volume 2035	Difference 2000-2005	Percent Difference 2000-2005	Difference 2000-2020	Percent Difference 2000-2020	Difference 2000-2035	Percent Difference 2000-2035
2 Albany - Berkeley	NB	I-80	Between Gilman and Buchanan	19,161	19,782	20,536	24,937	28,819	754	4%	5,154	26%	9,037	46%
2 Albany - Berkeley	NB	San Pablo Avenue	At Gilman and Marin	2,495	3,851	3,904	4,140	4,269	53	1%	289	8%	418	11%
2 Albany - Berkeley	NB	Marin Avenue	Near Cityline	1,585	2,158	2,688	2,069	2,057	530	25%	-89	-4%	-102	-5%
2 Albany - Berkeley	NB	Solano Avenue	Near Cityline	831	344	369	993	1,327	25	7%	649	189%	983	286%
		Subtotal		**24,072**	**26,135**	**27,498**	**32,138**	**36,472**	**1,363**	**5%**	**6,003**	**23%**	**10,337**	**40%**
2 Albany - Berkeley	SB	I-80	Between Gilman and Buchanan	13,406	16,636	16,883	18,781	21,975	247	1%	2,146	13%	5,339	32%
2 Albany - Berkeley	SB	San Pablo Avenue	At Gilman and Marin	1,873	1,912	2,282	3,885	4,004	370	19%	1,973	103%	2,092	109%
2 Albany - Berkeley	SB	Marin Avenue	Near Cityline	1,524	1,962	2,022	1,900	1,962	59	3%	-63	-3%	0	0%
2 Albany - Berkeley	SB	Solano Avenue	Near Cityline	1,771	348	340	741	898	-8	-2%	392	113%	550	158%
		Subtotal		**18,574**	**20,858**	**21,526**	**25,306**	**28,839**	**668**	**3%**	**4,448**	**21%**	**7,981**	**38%**
		Total		**42,646**	**46,993**	**49,024**	**57,444**	**65,311**	**2,030**	**4%**	**10,451**	**22%**	**18,318**	**39%**
3 Berkeley - Emeryville	NB	I-80	At Powell	16,680	18,312	18,899	21,102	25,212	587	3%	2,790	15%	6,899	38%
3 Berkeley - Emeryville	NB	Seventh	Near Ashby/City Limit	0	738	697	1,218	1,451	-41	-6%	480	65%	712	96%
3 Berkeley - Emeryville	NB	Hollis St.	Near Ashby/City Limit	0	734	774	1,283	1,396	40	5%	549	75%	662	90%
3 Berkeley - Emeryville	NB	West Frontage Road	Near Ashby/City Limit	1,432	1,930	1,767	2,032	1,970	-162	-8%	102	5%	40	2%
3 Berkeley - Emeryville	NB	Shellmound Street	Near Ashby/City Limit	0	865	953	720	1,720	87	10%	-146	-17%	855	99%
		Subtotal		**18,112**	**22,580**	**23,091**	**26,355**	**31,749**	**511**	**2%**	**3,775**	**17%**	**9,169**	**41%**
3 Berkeley - Emeryville	SB	I-80	At Powell	12,996	15,471	15,637	17,347	19,004	166	1%	1,876	12%	3,533	23%
3 Berkeley - Emeryville	SB	Seventh	Near Ashby/City Limit	0	732	682	899	1,342	-50	-7%	167	23%	610	83%
3 Berkeley - Emeryville	SB	Hollis St.	Near Ashby/City Limit	0	559	565	981	1,375	6	1%	421	75%	816	146%
3 Berkeley - Emeryville	SB	West Frontage Road	Near Ashby/City Limit	913	1,867	1,952	2,875	3,603	85	5%	1,008	54%	1,736	93%
3 Berkeley - Emeryville	SB	Shellmound Street	Near Ashby/City Limit	0	258	271	356	1,173	13	5%	98	38%	915	354%
		Subtotal		**13,909**	**18,888**	**19,107**	**22,458**	**26,497**	**220**	**1%**	**3,570**	**19%**	**7,609**	**40%**
		Total		**32,021**	**41,468**	**42,198**	**48,813**	**58,246**	**730**	**2%**	**7,345**	**18%**	**16,778**	**40%**

Table C-4: PM Peak 2-Hour Traffic Forecast Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count 2000	Model Volume 2000	Model Volume 2005	Model Volume 2020	Model Volume 2035	Difference 2000-2005	Percent Difference 2000-2005	Difference 2000-2020	Percent Difference 2000-2020	Difference 2000-2035	Percent Difference 2000-2035
4 Berkeley - Oakland	NB	San Pablo Avenue	At Stanford and Ashby Ave.	2,222	2,604	2,722	4,051	4,070	119	5%	1,447	56%	1,466	56%
4 Berkeley - Oakland	NB	Sacramento Street	Near City Limits	0	2,169	2,317	3,646	3,984	148	7%	1,476	68%	1,814	84%
4 Berkeley - Oakland	NB	Adeline Street	South of Alcatraz	2,863	2,074	2,228	2,735	3,762	154	7%	662	32%	1,688	81%
4 Berkeley - Oakland	NB	Shattuck Avenue	Near City Limits	1,329	1,930	1,933	1,941	2,103	3	0%	11	1%	173	9%
4 Berkeley - Oakland	NB	Telegraph Avenue	Near City Limits	1,878	2,699	3,207	3,338	3,739	508	19%	639	24%	1,040	39%
4 Berkeley - Oakland	NB	College Avenue	Near City Limits	848	324	383	752	1,118	60	18%	428	132%	794	245%
4 Berkeley - Oakland	NB	Claremont Avenue	South of Ashby	1,236	1,502	1,499	2,022	3,129	-3	0%	520	35%	1,627	108%
4 Berkeley - Oakland	NB	Tunnel Road	Near City Limits	2,306	1,994	2,008	2,012	1,995	14	1%	19	1%	1	0%
4 Berkeley - Oakland	NB	Grizzly Peak Blvd.	North of 24	819	265	372	439	974	107	40%	175	66%	709	268%
4 Berkeley - Oakland	NB	Fish Ranch Road	North of 24	430	1,324	1,423	1,222	1,530	100	8%	-102	-8%	206	16%
		Subtotal		**13,931**	**16,884**	**18,094**	**22,158**	**26,401**	**1,210**	**7%**	**5,275**	**31%**	**9,517**	**56%**
4 Berkeley - Oakland	SB	San Pablo Avenue	At Stanford and Ashby Ave.	1,955	1,637	1,683	3,180	3,847	45	3%	1,543	94%	2,210	135%
4 Berkeley - Oakland	SB	Sacramento Street	Near City Limits	0	1,460	1,546	2,279	3,747	86	6%	819	56%	2,287	157%
4 Berkeley - Oakland	SB	Adeline Street	South of Alcatraz	2,321	1,479	1,783	2,402	3,475	304	21%	923	62%	1,996	135%
4 Berkeley - Oakland	SB	Shattuck Avenue	Near City Limits	1,512	1,813	1,870	1,893	2,023	57	3%	80	4%	211	12%
4 Berkeley - Oakland	SB	Telegraph Avenue	Near City Limits	2,554	3,131	3,447	3,738	3,990	316	10%	608	19%	859	27%
4 Berkeley - Oakland	SB	College Avenue	Near City Limits	885	700	835	844	1,198	135	19%	144	21%	499	71%
4 Berkeley - Oakland	SB	Claremont Avenue	South of Ashby	1,019	1,284	1,305	1,701	2,452	20	2%	416	32%	1,167	91%
4 Berkeley - Oakland	SB	Tunnel Road	Near City Limits	3,115	2,112	2,103	2,096	2,100	-9	0%	-16	-1%	-13	-1%
4 Berkeley - Oakland	SB	Grizzly Peak Blvd.	North of 24	467	85	110	311	1,194	25	30%	226	267%	1,110	1310%
4 Berkeley - Oakland	SB	Fish Ranch Road	North of 24	1,271	1,464	1,508	1,817	1,921	44	3%	353	24%	457	31%
		Subtotal		**15,099**	**15,164**	**16,189**	**20,259**	**25,947**	**1,025**	**7%**	**5,095**	**34%**	**10,782**	**71%**
		Total		**29,029**	**32,048**	**34,283**	**42,418**	**52,348**	**2,235**	**7%**	**10,370**	**32%**	**20,300**	**63%**

Table C-4: PM Peak 2-Hour Traffic Forecast Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count 2000	Model Volume 2000	Model Volume 2005	Model Volume 2020	Model Volume 2035	Difference 2000-2005	Percent Difference 2000-2005	Difference 2000-2020	Percent Difference 2000-2020	Difference 2000-2035	Percent Difference 2000-2035
5 Emeryville - Oakland	NB	I-80	At Powell	16,680	18,312	18,899	21,102	25,212	587	3%	2,790	15%	6,899	38%
5 Emeryville - Oakland	NB	Shellmound Street	Near 40th/City Limit	0	218	413	950	3,034	195	89%	732	336%	2,816	1292%
5 Emeryville - Oakland	NB	Adeline Street	South of Alcatraz	2,863	2,074	2,228	2,735	3,762	154	7%	662	32%	1,688	81%
5 Emeryville - Oakland	NB	Hollis St.	Near Powell	0	1,007	964	1,766	1,899	-43	-4%	759	75%	892	89%
5 Emeryville - Oakland	NB	San Pablo Avenue	At Stanford and Ashby Ave.	2,466	2,506	2,689	3,813	3,854	183	7%	1,307	52%	1,349	54%
		Subtotal		**22,008**	**24,116**	**25,193**	**30,366**	**37,760**	**1,076**	**4%**	**6,250**	**26%**	**13,643**	**57%**
5 Emeryville - Oakland	SB	I-80	At Powell	12,996	15,471	15,637	17,347	19,004	166	1%	1,876	12%	3,533	23%
5 Emeryville - Oakland	SB	Shellmound Street	Near 40th/City Limit	0	672	1,065	1,475	3,279	393	58%	803	120%	2,607	388%
5 Emeryville - Oakland	SB	Adeline Street	South of Alcatraz	2,321	1,479	1,783	2,402	3,475	304	21%	923	62%	1,996	135%
5 Emeryville - Oakland	SB	Hollis St.	Near Powell	0	1,013	902	1,383	1,648	-110	-11%	370	37%	635	63%
5 Emeryville - Oakland	SB	San Pablo Avenue	At Stanford and Ashby Ave.	1,803	2,157	2,235	3,658	4,032	78	4%	1,501	70%	1,875	87%
		Subtotal		**17,120**	**20,791**	**21,622**	**26,264**	**31,437**	**831**	**4%**	**5,473**	**26%**	**10,646**	**51%**
		Total		**39,128**	**44,908**	**46,815**	**56,631**	**69,197**	**1,907**	**4%**	**11,723**	**26%**	**24,290**	**54%**
6 Oakland - Piedmont	NB	Pleasant Valley	Near City Limits	1,284	2,081	2,213	2,733	3,770	131	6%	651	31%	1,689	81%
6 Oakland - Piedmont	NB	Moraga Avenue	Eastern Border	1,020	762	816	907	949	54	7%	145	19%	187	25%
6 Oakland - Piedmont	NB	Moraga Avenue	Western Border	645	814	899	1,004	1,192	85	10%	190	23%	378	46%
6 Oakland - Piedmont	NB	Grand Avenue	Northern Border	905	1,328	1,454	1,719	2,685	127	10%	391	29%	1,358	102%
6 Oakland - Piedmont	NB	Grand Avenue	Southern Border	1,718	1,688	1,765	1,980	3,114	78	5%	292	17%	1,427	85%
6 Oakland - Piedmont	NB	Oakland Avenue	North of Monte Vista	1,015	1,318	1,340	1,413	1,763	21	2%	95	7%	444	34%
6 Oakland - Piedmont	NB	Lakeshore Avenue	Between Windsor and Walavista	360	64	70	73	133	6	9%	10	16%	70	110%
		Subtotal		**6,947**	**8,055**	**8,556**	**9,830**	**13,606**	**502**	**6%**	**1,775**	**22%**	**5,552**	**69%**
6 Oakland - Piedmont	SB	Pleasant Valley	Near City Limits	1,277	1,587	1,769	2,171	3,192	182	11%	584	37%	1,604	101%
6 Oakland - Piedmont	SB	Moraga Avenue	Eastern Border	1,333	1,091	1,106	1,232	1,390	15	1%	141	13%	299	27%
6 Oakland - Piedmont	SB	Moraga Avenue	Western Border	945	1,157	1,231	1,313	1,357	75	6%	157	14%	200	17%
6 Oakland - Piedmont	SB	Grand Avenue	Northern Border	1,137	1,558	1,656	2,011	2,958	98	6%	453	29%	1,400	90%
6 Oakland - Piedmont	SB	Grand Avenue	Southern Border	1,899	1,645	1,790	2,100	3,125	145	9%	455	28%	1,480	90%
6 Oakland - Piedmont	SB	Oakland Avenue	North of Monte Vista	561	944	975	1,061	1,594	31	3%	117	12%	650	69%
6 Oakland - Piedmont	SB	Lakeshore Avenue	Between Windsor and Walavista	271	36	41	44	62	5	13%	8	23%	26	72%
		Subtotal		**7,423**	**8,018**	**8,568**	**9,932**	**13,677**	**550**	**7%**	**1,914**	**24%**	**5,659**	**71%**
		Total		**14,370**	**16,073**	**17,124**	**19,762**	**27,284**	**1,052**	**7%**	**3,690**	**23%**	**11,211**	**70%**

Table C-4: PM Peak 2-Hour Traffic Forecast Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count 2000	Model Volume 2000	Model Volume 2005	Model Volume 2020	Model Volume 2035	Difference 2000-2005	Percent Difference 2000-2005	Difference 2000-2020	Percent Difference 2000-2020	Difference 2000-2035	Percent Difference 2000-2035
7 Alameda - Oakland	NB	Webster-Posey Tubes	Near entrance/exit Oakland side	4,363	4,541	4,581	5,382	6,492	40	1%	841	19%	1,950	43%
7 Alameda - Oakland	NB	Park St. Bridge	West of Bridge	2,937	3,267	3,305	4,132	4,799	38	1%	865	26%	1,532	47%
7 Alameda - Oakland	NB	Fruitvale Bridge	West of Bridge	1,508	2,320	2,341	2,655	3,820	22	1%	335	14%	1,501	65%
7 Alameda - Oakland	NB	High St. Bridge	West of Bridge	1,708	1,239	1,208	1,642	2,260	-31	-2%	403	33%	1,021	82%
7 Alameda - Oakland	NB	Doolittle Street	Near City Limits	2,429	3,190	2,498	3,103	3,249	-692	-22%	-87	-3%	59	2%
7 Alameda - Oakland	NB	SR 61/Doolittle	North of Hegenberger	1,736	3,234	2,521	3,122	3,344	-713	-22%	-112	-3%	110	3%
7 Alameda - Oakland	NB	Ron Cowan Pkwy	South of Harbor Bay Pkwy	0	0	1,010	1,292	3,182	1,010	0%	1,292	0%	3,182	0%
		Subtotal		**14,681**	**17,790**	**17,464**	**21,328**	**27,146**	**-326**	**-2%**	**3,538**	**20%**	**9,356**	**53%**
7 Alameda - Oakland	SB	Webster-Posey Tubes	Near entrance/exit Oakland side	6,553	6,161	6,342	6,881	7,638	181	3%	720	12%	1,477	24%
7 Alameda - Oakland	SB	Park St. Bridge	West of Bridge	3,400	3,928	3,843	4,484	5,331	-85	-2%	556	14%	1,403	36%
7 Alameda - Oakland	SB	Fruitvale Bridge	West of Bridge	2,421	3,097	3,141	3,714	4,052	44	1%	617	20%	955	31%
7 Alameda - Oakland	SB	High St. Bridge	West of Bridge	2,021	1,978	1,973	2,135	2,543	-5	0%	157	8%	565	29%
7 Alameda - Oakland	SB	Doolittle Street	Near City Limits	2,350	2,287	1,662	1,654	2,982	-624	-27%	-632	-28%	696	30%
7 Alameda - Oakland	SB	SR 61/Doolittle	North of Hegenberger	2,529	2,650	2,090	2,228	3,478	-559	-21%	-421	-16%	829	31%
7 Alameda - Oakland	SB	Ron Cowan Pkwy	South of Harbor Bay Pkwy	0	0	918	1,177	528	918	0%	1,177	0%	528	0%
		Subtotal		**19,274**	**20,100**	**19,969**	**22,273**	**26,551**	**-131**	**-1%**	**2,173**	**11%**	**6,452**	**32%**
		Total		**33,955**	**37,890**	**37,433**	**43,601**	**53,697**	**-457**	**-1%**	**5,711**	**15%**	**15,807**	**42%**

Table C-4: PM Peak 2-Hour Traffic Forecast Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count 2000	Model Volume 2000	Model Volume 2005	Model Volume 2020	Model Volume 2035	Difference 2000-2005	Percent Difference 2000-2005	Difference 2000-2020	Percent Difference 2000-2020	Difference 2000-2035	Percent Difference 2000-2035
8 Oak - San L E14th/Int	EB	Lakeshore Avenue	E/O International	1,970	3,060	3,048	2,893	2,282	-11	0%	-167	-5%	-777	-25%
8 Oak - San L E14th/Int	EB	Park Blvd - 5th Avenue	E/O International	397	158	168	382	688	10	7%	224	142%	530	335%
8 Oak - San L E14th/Int	EB	14th Avenue	E/O International	1,888	3,103	3,171	3,477	2,860	68	2%	373	12%	-244	-8%
8 Oak - San L E14th/Int	EB	23rd Avenue	E/O International	575	379	365	790	1,408	-14	-4%	411	108%	1,029	271%
8 Oak - San L E14th/Int	EB	Fruitvale Avenue	E/O International	1,770	1,438	1,439	1,613	2,664	1	0%	175	12%	1,226	85%
8 Oak - San L E14th/Int	EB	35th Avenue	E/O International	1,238	602	593	821	1,646	-8	-1%	220	36%	1,044	174%
8 Oak - San L E14th/Int	EB	42nd/Courtland	E/O International	1,356	2,940	2,905	3,702	3,805	-36	-1%	761	26%	865	29%
8 Oak - San L E14th/Int	EB	High Street	E/O International	923	539	504	947	2,410	-34	-6%	408	76%	1,871	347%
8 Oak - San L E14th/Int	EB	55th Avenue	E/O International	373	407	400	495	620	-7	-2%	88	22%	212	52%
8 Oak - San L E14th/Int	EB	Seminary Avenue	E/O International	966	818	847	1,503	1,237	29	4%	685	84%	419	51%
8 Oak - San L E14th/Int	EB	73rd Avenue	E/O International	2,480	3,048	3,082	3,363	3,878	34	1%	316	10%	831	27%
8 Oak - San L E14th/Int	EB	82nd Avenue	E/O International	247	379	378	437	545	-1	0%	58	15%	166	44%
8 Oak - San L E14th/Int	EB	98th Avenue	E/O International	1,553	1,697	1,711	1,973	2,103	14	1%	276	16%	406	24%
8 Oak - San L E14th/Int	EB	Davis Street (SR 112)	W/O International	2,292	1,711	1,715	2,382	3,769	3	0%	671	39%	2,057	120%
8 Oak - San L E14th/Int	EB	Estudillo	E/O International	955	1,363	1,327	1,396	1,929	-36	-3%	32	2%	566	41%
		Subtotal		**18,983**	**21,643**	**21,654**	**26,175**	**31,843**	**12**	**0%**	**4,532**	**21%**	**10,201**	**47%**
8 Oak - San L E14th/Int	WB	Lakeshore Avenue	E/O International	844	602	605	613	855	3	1%	11	2%	253	42%
8 Oak - San L E14th/Int	WB	Park Blvd - 5th Avenue	E/O International	266	108	127	250	729	20	18%	142	132%	622	578%
8 Oak - San L E14th/Int	WB	14th Avenue	E/O International	1,413	2,075	2,358	3,198	3,236	283	14%	1,123	54%	1,160	56%
8 Oak - San L E14th/Int	WB	23rd Avenue	E/O International	427	308	311	307	1,366	3	1%	-2	-1%	1,058	343%
8 Oak - San L E14th/Int	WB	Fruitvale Avenue	E/O International	1,614	1,365	1,362	1,488	1,823	-3	0%	123	9%	458	34%
8 Oak - San L E14th/Int	WB	35th Avenue	E/O International	851	468	491	569	1,264	22	5%	101	21%	795	170%
8 Oak - San L E14th/Int	WB	42nd/Courtland	E/O International	818	1,264	1,335	1,783	2,443	71	6%	519	41%	1,178	93%
8 Oak - San L E14th/Int	WB	High Street	E/O International	1,556	709	698	685	1,819	-11	-2%	-24	-3%	1,111	157%
8 Oak - San L E14th/Int	WB	55th Avenue	E/O International	349	247	261	337	405	14	6%	91	37%	158	64%
8 Oak - San L E14th/Int	WB	Seminary Avenue	E/O International	800	548	614	1,201	1,055	65	12%	653	119%	506	92%
8 Oak - San L E14th/Int	WB	73rd Avenue	E/O International	1,912	1,760	1,774	2,059	3,678	14	1%	299	17%	1,918	109%
8 Oak - San L E14th/Int	WB	82nd Avenue	E/O International	441	260	272	303	308	12	5%	43	17%	48	19%
8 Oak - San L E14th/Int	WB	98th Avenue	E/O International	1,381	1,103	1,098	1,397	1,459	-5	0%	294	27%	356	32%
8 Oak - San L E14th/Int	WB	Davis Street (SR 112)	W/O International	1,779	1,127	1,127	1,661	2,437	0	0%	534	47%	1,309	116%
8 Oak - San L E14th/Int	WB	Estudillo	E/O International	796	1,055	1,050	1,432	1,197	-5	0%	377	36%	142	13%
		Subtotal		**15,247**	**13,000**	**13,483**	**17,283**	**24,074**	**483**	**4%**	**4,283**	**33%**	**11,074**	**85%**
		Total		**34,231**	**34,642**	**35,137**	**43,458**	**55,917**	**495**	**1%**	**8,816**	**25%**	**21,274**	**61%**

Table C-4: PM Peak 2-Hour Traffic Forecast Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count 2000	Model Volume 2000	Model Volume 2005	Model Volume 2020	Model Volume 2035	Difference 2000-2005	Percent Difference 2000-2005	Difference 2000-2020	Percent Difference 2000-2020	Difference 2000-2035	Percent Difference 2000-2035
9 Oakland - San Leandro	NB	Doolittle Drive	Near Davis	2,300	4,027	4,031	4,232	4,643	4	0%	206	5%	617	15%
9 Oakland - San Leandro	NB	I-880	Between Davis and 98th Avenue	13,715	14,969	14,993	16,486	18,861	24	0%	1,517	10%	3,892	26%
9 Oakland - San Leandro	NB	San Leandro Blvd.	Near City Limits	1,065	830	789	2,708	3,791	-41	-5%	1,878	226%	2,962	357%
9 Oakland - San Leandro	NB	Int'l/E. 14th	Near 98th Avenue	2,125	1,170	1,211	2,390	3,192	41	4%	1,220	104%	2,022	173%
9 Oakland - San Leandro	NB	Bancroft Avenue	Near City Limits	864	805	792	1,683	4,083	-13	-2%	878	109%	3,278	407%
9 Oakland - San Leandro	NB	MacArthur Blvd.	Near City Limits	914	1,105	1,101	1,370	1,761	-3	0%	265	24%	656	59%
9 Oakland - San Leandro	NB	Foothill Blvd.	Near City Limits	502	427	423	457	771	-4	-1%	31	7%	344	81%
9 Oakland - San Leandro	NB	I-580	Between 98th and Estudillo	10,817	14,281	14,423	17,474	20,609	142	1%	3,193	22%	6,328	44%
		Subtotal		**32,302**	**37,613**	**37,763**	**46,801**	**57,712**	**149**	**0%**	**9,187**	**24%**	**20,099**	**53%**
9 Oakland - San Leandro	SB	Doolittle Drive	Near Davis	3,196	3,939	4,099	4,292	4,974	161	4%	353	9%	1,035	26%
9 Oakland - San Leandro	SB	I-880	Between Davis and 98th Avenue	14,556	14,910	15,321	18,420	19,345	411	3%	3,510	24%	4,435	30%
9 Oakland - San Leandro	SB	San Leandro Blvd.	Near City Limits	1,248	1,188	1,244	2,351	3,857	56	5%	1,163	98%	2,669	225%
9 Oakland - San Leandro	SB	Int'l/E. 14th	Near 98th Avenue	1,854	1,278	1,401	2,226	3,097	123	10%	948	74%	1,819	142%
9 Oakland - San Leandro	SB	Bancroft Avenue	Near City Limits	852	526	547	739	2,778	21	4%	213	40%	2,252	428%
9 Oakland - San Leandro	SB	MacArthur Blvd.	Near City Limits	837	840	836	1,440	1,647	-4	0%	600	71%	807	96%
9 Oakland - San Leandro	SB	Foothill Blvd.	Near City Limits	758	463	457	510	527	-6	-1%	47	10%	64	14%
9 Oakland - San Leandro	SB	I-580	Between 98th and Estudillo	12,122	15,073	15,535	16,575	18,238	462	3%	1,503	10%	3,165	21%
		Subtotal		**35,423**	**38,216**	**39,441**	**46,552**	**54,462**	**1,225**	**3%**	**8,336**	**22%**	**16,246**	**43%**
		Total		**67,725**	**75,829**	**77,204**	**93,353**	**112,174**	**1,375**	**2%**	**17,523**	**23%**	**36,345**	**48%**

Table C-4: PM Peak 2-Hour Traffic Forecast Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count 2000	Model Volume 2000	Model Volume 2005	Model Volume 2020	Model Volume 2035	Difference 2000-2005	Percent Difference 2000-2005	Difference 2000-2020	Percent Difference 2000-2020	Difference 2000-2035	Percent Difference 2000-2035
10 Hayward - Union City	NB	Union City Blvd.	Near City Limits	0	4,220	4,227	4,330	4,762	7	0%	111	3%	543	13%
10 Hayward - Union City	NB	I-880	At Industrial Parkway	12,239	15,339	15,553	17,586	22,449	214	1%	2,247	15%	7,110	46%
10 Hayward - Union City	NB	Industrial Pkwy	Near Huntwood	2,756	2,329	2,563	2,331	2,800	234	10%	2	0%	470	20%
10 Hayward - Union City	NB	Whipple Road	Near City Limit, E side of I-880	2,268	1,569	1,523	2,127	3,593	-47	-3%	558	36%	2,023	129%
10 Hayward - Union City	NB	Mission Blvd	At Greasel Street	3,216	2,782	2,864	3,694	4,229	82	3%	912	33%	1,447	52%
		Subtotal		**20,479**	**26,240**	**26,729**	**30,070**	**37,833**	**489**	**2%**	**3,830**	**15%**	**11,593**	**44%**
10 Hayward - Union City	SB	Union City Blvd.	Near City Limits	0	4,297	4,291	4,353	4,493	-6	0%	56	1%	196	5%
10 Hayward - Union City	SB	I-880	At Industrial Parkway	11,694	15,928	16,129	17,633	20,328	201	1%	1,705	11%	4,400	28%
10 Hayward - Union City	SB	Industrial Pkwy	Near Huntwood	2,307	1,659	1,709	1,589	2,092	50	3%	-70	-4%	433	26%
10 Hayward - Union City	SB	Whipple Road	Near City Limit, E side of I-880	2,148	2,127	2,200	2,933	3,331	73	3%	806	38%	1,204	57%
10 Hayward - Union City	SB	Mission Blvd	At Greasel Street	2,432	2,979	2,995	3,602	3,877	16	1%	624	21%	899	30%
		Subtotal		**18,581**	**26,990**	**27,324**	**30,111**	**34,122**	**334**	**1%**	**3,121**	**12%**	**7,132**	**26%**
		Total		**39,060**	**53,230**	**54,053**	**60,181**	**71,955**	**823**	**2%**	**6,951**	**13%**	**18,725**	**35%**
11 Hayward - Castro Vall	NB	Redwood Rd.	North of Seven Hills	1,033	361	369	823	1,465	8	2%	462	128%	1,104	306%
11 Hayward - Castro Vall	NB	Crow Canyon Rd.	North of Cold Water Drive	0	2,228	2,254	2,628	3,174	26	1%	400	18%	946	42%
11 Hayward - Castro Vall	NB	I-580	At Crow Canyon	13,191	15,164	16,256	19,266	22,112	1,092	7%	4,102	27%	6,948	46%
11 Hayward - Castro Vall	NB	Dublin Canyon Road	East of Palomares	382	158	181	637	1,170	23	14%	479	303%	1,012	640%
11 Hayward - Castro Vall	NB	Palomares Road	South of Palo Verde Road	170	261	278	392	759	17	6%	131	50%	498	191%
		Subtotal		**14,776**	**18,172**	**19,337**	**23,746**	**28,681**	**1,165**	**6%**	**5,574**	**31%**	**10,508**	**58%**
11 Hayward - Castro Vall	SB	Redwood Rd.	North of Seven Hills	776	300	325	415	725	26	9%	115	38%	425	142%
11 Hayward - Castro Vall	SB	Crow Canyon Rd.	North of Cold Water Drive	0	2,118	2,153	2,211	2,631	36	2%	93	4%	513	24%
11 Hayward - Castro Vall	SB	I-580	At Crow Canyon	12,444	11,353	11,743	15,334	17,821	389	3%	3,981	35%	6,468	57%
11 Hayward - Castro Vall	SB	Dublin Canyon Road	East of Palomares	847	169	402	1,272	1,744	233	137%	1,102	652%	1,574	931%
11 Hayward - Castro Vall	SB	Palomares Road	South of Palo Verde Road	122	223	199	259	317	-25	-11%	36	16%	94	42%
		Subtotal		**14,189**	**14,163**	**14,821**	**19,490**	**23,238**	**659**	**5%**	**5,327**	**38%**	**9,075**	**64%**
		Total		**28,965**	**32,335**	**34,158**	**43,236**	**51,918**	**1,823**	**6%**	**10,901**	**34%**	**19,583**	**61%**

Table C-4: PM Peak 2-Hour Traffic Forecast Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count 2000	Model Volume 2000	Model Volume 2005	Model Volume 2020	Model Volume 2035	Difference 2000-2005	Percent Difference 2000-2005	Difference 2000-2020	Percent Difference 2000-2020	Difference 2000-2035	Percent Difference 2000-2035
12 Union City - Fremont	NB	Ardenwood Blvd.	Near City Limits	3,354	2,978	3,018	4,084	4,360	40	1%	1,106	37%	1,382	46%
12 Union City - Fremont	NB	Alvarado Blvd.	Around Lowry Road	1,954	2,265	2,459	2,697	4,039	194	9%	432	19%	1,774	78%
12 Union City - Fremont	NB	I-880	South of Alvarado-Niles I/C	13,274	15,070	15,247	16,163	19,140	178	1%	1,093	7%	4,071	27%
12 Union City - Fremont	NB	Decoto Road	South of Alvarado Niles	0	4,212	4,233	3,803	4,201	21	1%	-408	-10%	-11	0%
12 Union City - Fremont	NB	Isherwood Way	Near City Limits	1,131	357	499	132	711	142	40%	-225	-63%	354	99%
12 Union City - Fremont	NB	Alvarado-Niles Rd.	Near City Limits	0	1,019	925	540	1,269	-94	-9%	-479	-47%	251	25%
12 Union City - Fremont	NB	Mission Blvd	South of Decoto Road	2,539	2,244	2,315	3,147	3,982	71	3%	903	40%	1,738	77%
		Subtotal		**22,252**	**28,145**	**28,696**	**30,567**	**37,703**	**551**	**2%**	**2,423**	**9%**	**9,558**	**34%**
12 Union City - Fremont	SB	Ardenwood Blvd.	Near City Limits	1,385	1,739	1,608	2,170	3,305	-131	-8%	431	25%	1,566	90%
12 Union City - Fremont	SB	Alvarado Blvd.	Around Lowry Road	1,371	2,150	2,229	2,759	3,924	80	4%	610	28%	1,775	83%
12 Union City - Fremont	SB	I-880	South of Alvarado-Niles I/C	12,818	14,659	14,756	15,659	17,395	97	1%	1,000	7%	2,736	19%
12 Union City - Fremont	SB	Decoto Road	South of Alvarado Niles	0	3,768	3,723	3,561	4,144	-45	-1%	-207	-5%	376	10%
12 Union City - Fremont	SB	Isherwood Way	Near City Limits	1,817	135	155	76	597	20	15%	-59	-43%	462	343%
12 Union City - Fremont	SB	Alvarado-Niles Rd.	Near City Limits	0	1,707	1,923	744	1,339	215	13%	-963	-56%	-368	-22%
12 Union City - Fremont	SB	Mission Blvd	South of Decoto Road	2,688	2,766	2,837	3,715	3,728	71	3%	949	34%	962	35%
		Subtotal		**20,079**	**26,924**	**27,231**	**28,685**	**34,433**	**307**	**1%**	**1,761**	**7%**	**7,509**	**28%**
		Total		**42,331**	**55,069**	**55,927**	**59,253**	**72,136**	**858**	**2%**	**4,184**	**8%**	**17,067**	**31%**

Table C-4: PM Peak 2-Hour Traffic Forecast Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count 2000	Model Volume 2000	Model Volume 2005	Model Volume 2020	Model Volume 2035	Difference 2000-2005	Percent Difference 2000-2005	Difference 2000-2020	Percent Difference 2000-2020	Difference 2000-2035	Percent Difference 2000-2035
13 Fremont - Newark	NB	Thornton Ave.	South of SR 84	0	758	634	935	1,334	-124	-16%	177	23%	576	76%
13 Fremont - Newark	NB	Newark Blvd.	South of SR 84	0	1,992	2,014	2,454	3,406	22	1%	463	23%	1,415	71%
13 Fremont - Newark	NB	I-880	Near SR 84	13,672	14,768	15,035	15,924	18,493	267	2%	1,157	8%	3,725	25%
13 Fremont - Newark	NB	Thornton Ave.	Near I-880/City Limits	0	2,966	2,863	3,304	3,508	-103	-3%	339	11%	542	18%
13 Fremont - Newark	WB	Central Ave.	Near I-880/City Limits	1,123	332	346	368	740	14	4%	36	11%	408	123%
13 Fremont - Newark	WB	Mowry Ave.	Near I-880/City Limits	3,567	2,164	2,193	2,314	2,750	29	1%	151	7%	586	27%
13 Fremont - Newark	WB	Stevenson Blvd.	Near I-880/City Limits	849	2,366	2,479	2,260	2,695	113	5%	-105	-4%	329	14%
13 Fremont - Newark	WB	Cedar Blvd.	Near City Limits	0	200	249	293	416	49	24%	93	47%	216	108%
13 Fremont - Newark	WB	Cherry Street	Near City Limits	0	1,499	1,588	2,371	3,520	89	6%	872	58%	2,021	135%
		Subtotal		**19,211**	**27,044**	**27,400**	**30,225**	**36,863**	356	1%	3,181	12%	9,819	36%
13 Fremont - Newark	SB	Thornton Ave.	South of SR 84	0	624	584	1,018	2,052	-40	-6%	394	63%	1,427	229%
13 Fremont - Newark	SB	Newark Blvd.	South of SR 84	0	2,555	2,395	3,156	4,075	-161	-6%	601	24%	1,520	59%
13 Fremont - Newark	SB	I-880	Near SR 84	11,898	12,569	12,736	13,975	16,193	167	1%	1,406	11%	3,624	29%
13 Fremont - Newark	SB	Thornton Ave.	Near I-880/City Limits	0	2,752	2,829	2,788	3,682	76	3%	35	1%	930	34%
13 Fremont - Newark	EB	Central Ave.	Near I-880/City Limits	1,750	459	455	493	2,514	-4	-1%	34	7%	2,055	447%
13 Fremont - Newark	EB	Mowry Ave.	Near I-880/City Limits	4,798	3,694	3,896	3,799	4,693	202	5%	106	3%	1,000	27%
13 Fremont - Newark	EB	Stevenson Blvd.	Near I-880/City Limits	1,233	2,044	2,081	2,379	3,159	36	2%	335	16%	1,115	55%
13 Fremont - Newark	EB	Cedar Blvd.	Near City Limits	0	276	380	410	424	105	38%	134	49%	148	54%
13 Fremont - Newark	EB	Cherry Street	Near City Limits	0	1,179	1,094	1,608	2,806	-85	-7%	430	36%	1,627	138%
		Subtotal		**19,679**	**26,152**	**26,449**	**29,626**	**39,599**	**297**	**1%**	**3,474**	**13%**	**13,447**	**51%**
		Total		**38,890**	**53,196**	**53,849**	**59,852**	**76,462**	**652**	**1%**	**6,655**	**13%**	**23,266**	**44%**
14 County - Tri-Valley	NB	Niles Canyon Road	At Palomares	2,027	1,857	2,520	3,197	3,520	663	36%	1,340	72%	1,663	90%
14 County - Tri-Valley	NB	I-680	At SR 84 East	9,595	9,587	10,848	14,003	15,631	1,261	13%	4,416	46%	6,045	63%
14 County - Tri-Valley	NB	Foothill Road	North of Niles Canyon Road	0	503	624	1,213	1,446	120	24%	710	141%	943	187%
14 County - Tri-Valley	NB	Pleasanton-Sunol	North of Niles Canyon Road	0	905	1,246	2,015	2,108	342	38%	1,110	123%	1,203	133%
14 County - Tri-Valley	NB	Vallecitos Road	Near Vineyard	2,882	1,829	1,785	1,386	1,788	-44	-2%	-443	-24%	-41	-2%
		Subtotal		**14,504**	**14,681**	**17,023**	**21,813**	**24,493**	**2,343**	**16%**	**7,132**	**49%**	**9,812**	**67%**
14 County - Tri-Valley	SB	Niles Canyon Road	At Palomares	1,372	995	883	2,224	3,079	-112	-11%	1,229	124%	2,084	209%
14 County - Tri-Valley	SB	I-680	At SR 84 East	6,926	7,624	8,350	10,375	10,639	725	10%	2,751	36%	3,014	40%
14 County - Tri-Valley	SB	Foothill Road	North of Niles Canyon Road	0	147	195	549	581	47	32%	402	273%	434	294%
14 County - Tri-Valley	SB	Pleasanton-Sunol	North of Niles Canyon Road	0	303	306	1,044	1,228	3	1%	741	244%	925	305%
14 County - Tri-Valley	SB	Vallecitos Road	Near Vineyard	923	1,605	1,585	785	1,524	-20	-1%	-820	-51%	-81	-5%
		Subtotal		**9,221**	**10,675**	**11,319**	**14,978**	**17,051**	**644**	**6%**	**4,303**	**40%**	**6,376**	**60%**
		Total		**23,725**	**25,356**	**28,342**	**36,791**	**41,544**	**2,986**	**12%**	**11,435**	**45%**	**16,188**	**64%**

Table C-4: PM Peak 2-Hour Traffic Forecast Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count 2000	Model Volume 2000	Model Volume 2005	Model Volume 2020	Model Volume 2035	Difference 2000-2005	Percent Difference 2000-2005	Difference 2000-2020	Percent Difference 2000-2020	Difference 2000-2035	Percent Difference 2000-2035
15 Dublin - Pleasanton	NB	San Ramon Road	Btwn Dublin Blvd. and Amador Vly	2,647	2,523	2,536	4,154	4,182	13	1%	1,632	65%	1,660	66%
15 Dublin - Pleasanton	NB	I-680	North of I-580	12,882	12,439	13,154	12,813	15,270	715	6%	373	3%	2,831	23%
15 Dublin - Pleasanton	NB	Village Parkway	Between Dublin Blvd. and Lewis	1,872	1,251	1,383	2,637	2,485	133	11%	1,386	111%	1,234	99%
15 Dublin - Pleasanton	NB	Dougherty Road	Between Dublin Blvd. and Sierra	2,615	2,723	2,997	4,712	5,852	274	10%	1,989	73%	3,130	115%
15 Dublin - Pleasanton	NB	Hacienda Drive	Between I-580 and Dublin Blvd.	1,554	1,200	1,560	6,404	7,709	359	30%	5,203	434%	6,508	542%
15 Dublin - Pleasanton	NB	Tassajara Road	Between I-580 and Dublin Blvd.	1,236	913	1,566	5,510	6,821	654	72%	4,597	504%	5,908	647%
15 Dublin - Pleasanton	NB	Santa Rita Road	South of I-580	3,345	2,529	2,001	4,530	4,688	-529	-21%	2,001	79%	2,159	85%
15 Dublin - Pleasanton	NB	Hacienda Drive	South of I-580	3,350	3,141	3,479	6,655	7,105	338	11%	3,513	112%	3,963	126%
15 Dublin - Pleasanton	NB	Hopyard Rd.	South of I-580	3,431	4,834	5,077	6,352	6,505	243	5%	1,518	31%	1,671	35%
15 Dublin - Pleasanton	NB	Foothill Road	South of I-580	3,883	3,606	3,933	4,842	6,945	327	9%	1,236	34%	3,339	93%
		Subtotal		**36,815**	**35,159**	**37,685**	**58,609**	**67,563**	**2,526**	**7%**	**23,450**	**67%**	**32,404**	**92%**
15 Dublin - Pleasanton	SB	San Ramon Road	Btwn Dublin Blvd. and Amador Vly	2,282	1,329	1,308	2,223	2,589	-21	-2%	894	67%	1,260	95%
15 Dublin - Pleasanton	SB	I-680	North of I-580	11,246	10,167	12,503	14,017	15,529	2,337	23%	3,850	38%	5,363	53%
15 Dublin - Pleasanton	SB	Village Parkway	Between Dublin Blvd. and Lewis	1,438	1,086	1,081	1,810	2,863	-6	-1%	724	67%	1,777	164%
15 Dublin - Pleasanton	SB	Dougherty Road	Between Dublin Blvd. and Sierra	2,227	2,421	2,215	2,823	3,362	-206	-9%	403	17%	941	39%
15 Dublin - Pleasanton	SB	Hacienda Drive	Between I-580 and Dublin Blvd.	2,142	1,672	1,470	2,481	4,737	-203	-12%	809	48%	3,065	183%
15 Dublin - Pleasanton	SB	Tassajara Road	Between I-580 and Dublin Blvd.	2,548	499	1,096	2,066	3,179	598	120%	1,567	314%	2,680	538%
15 Dublin - Pleasanton	SB	Santa Rita Road	South of I-580	1,814	2,065	2,235	3,142	2,970	170	8%	1,077	52%	905	44%
15 Dublin - Pleasanton	SB	Hacienda Drive	South of I-580	1,928	3,176	3,791	3,929	4,365	615	19%	753	24%	1,189	37%
15 Dublin - Pleasanton	SB	Hopyard Rd.	South of I-580	3,217	3,856	3,481	4,071	5,003	-375	-10%	216	6%	1,147	30%
15 Dublin - Pleasanton	SB	Foothill Road	South of I-580	2,415	3,096	3,005	4,020	4,403	-91	-3%	924	30%	1,308	42%
		Subtotal		**31,257**	**29,366**	**32,185**	**40,582**	**49,000**	**2,820**	**10%**	**11,216**	**38%**	**19,635**	**67%**
		Total		**68,071**	**64,525**	**69,871**	**99,191**	**116,563**	**5,346**	**8%**	**34,666**	**54%**	**52,039**	**81%**
16 Pleasanton - Livermore	EB	Dublin Blvd	West of Doolan Rd	0	0	0	2,176	3,582	0	0%	2,176	0%	3,582	0%
16 Pleasanton - Livermore	EB	I-580	At Airway	15,580	15,201	16,780	20,078	22,152	1,580	10%	4,877	32%	6,951	46%
16 Pleasanton - Livermore	EB	W Jack London Blvd	SW of Airport	0	0	0	1,528	3,078	0	0%	1,528	0%	3,078	0%
16 Pleasanton - Livermore	EB	Stanley Blvd.	West of Isabel Avenue	4,833	3,918	3,984	4,092	5,967	66	2%	174	4%	2,049	52%
16 Pleasanton - Livermore	EB	Vineyard Avenue	East of Ruby Hill	1,651	359	1,552	1,496	1,377	1,193	332%	1,137	317%	1,018	284%
16 Pleasanton - Livermore	EB	Vallecitos Road	S/O Isabel Avenue	2,995	2,923	3,022	2,961	5,906	99	3%	38	1%	2,983	102%
		Subtotal		**25,059**	**22,400**	**25,338**	**32,331**	**42,062**	**2,937**	**13%**	**9,931**	**44%**	**19,662**	**88%**
16 Pleasanton - Livermore	WB	Dublin Blvd	West of Doolan Rd	0	0	0	534	3,634	0	0%	534	0%	3,634	0%
16 Pleasanton - Livermore	WB	I-580	At Airway	10,377	11,418	12,051	17,107	19,801	633	6%	5,689	50%	8,384	73%
16 Pleasanton - Livermore	WB	W Jack London Blvd	SW of Airport	0	0	0	145	827	0	0%	145	0%	827	0%
16 Pleasanton - Livermore	WB	Stanley Blvd.	West of Isabel Avenue	1,240	1,492	1,459	3,530	3,812	-33	-2%	2,038	137%	2,320	155%
16 Pleasanton - Livermore	WB	Vineyard Avenue	East of Ruby Hill	671	298	357	533	563	59	20%	235	79%	265	89%
16 Pleasanton - Livermore	WB	Vallecitos Road	S/O Isabel Avenue	1,398	2,650	2,668	2,791	5,261	18	1%	140	5%	2,611	99%
		Subtotal		**13,686**	**15,858**	**16,535**	**24,639**	**33,899**	**677**	**4%**	**8,781**	**55%**	**18,041**	**114%**
		Total		**38,745**	**38,258**	**41,873**	**56,970**	**75,961**	**3,614**	**9%**	**18,712**	**49%**	**37,703**	**99%**

Table C-5: PM Peak 4-Hour Traffic Forecast Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count 2000	Model Volume 2000	Model Volume 2005	Model Volume 2020	Model Volume 2035	Difference 2000-2005	Percent Difference 2000-2005	Difference 2000-2020	Percent Difference 2000-2020	Difference 2000-2035	Percent Difference 2000-2035
1 Cordon Line	IN	SF-Oakland Bay Bridge	At County Line	40,962	43,039	42,474	49,652	56,200	-565	-1%	6,613	15%	13,161	31%
1 Cordon Line	IN	San Mateo Bridge	At County Line	12,450	14,341	15,765	21,313	25,954	1,424	10%	6,972	49%	11,613	81%
1 Cordon Line	IN	Dumbarton Bridge	At County Line	22,500	18,434	17,464	21,055	24,792	-970	-5%	2,622	14%	6,358	34%
1 Cordon Line	IN	I-880	At S Clara Co Line or SR 262	22,926	23,041	29,472	35,055	41,447	6,431	28%	12,014	52%	18,406	80%
1 Cordon Line	IN	Warm Springs Blvd.	At County Line	6,102	6,805	5,771	4,798	7,558	-1,034	-15%	-2,007	-29%	753	11%
1 Cordon Line	IN	I-680	At E. Warren/Scott Creek	22,843	21,263	20,412	28,408	34,480	-851	-4%	7,145	34%	13,217	62%
1 Cordon Line	IN	Calaveras Road	At County Line	176	0	0	0	0	0	0%	0	0%	0	0%
1 Cordon Line	IN	Mines Road	At County Line	41	0	0	0	0	0	0%	0	0%	0	0%
1 Cordon Line	IN	Tesla Road	At County Line	93	26	50	953	4,520	24	94%	927	3592%	4,494	17415%
1 Cordon Line	IN	Patterson Pass Road	At County Line	25	0	0	390	3,392	0	-100%	389	741541%	3,392	6458501%
1 Cordon Line	IN	I-580	At Altamont Pass	14,776	14,762	16,046	25,181	27,979	1,285	9%	10,419	71%	13,218	90%
1 Cordon Line	IN	Altamont Pass Rd.	West of Dyer Road	355	45	60	818	3,744	15	34%	773	1718%	3,699	8218%
1 Cordon Line	IN	Grant Line Road	At County Line	121	0	0	94	1,956	0	-100%	94	82039%	1,956	1714333%
1 Cordon Line	IN	Vasco Road	Vasco Road at County Line	1,570	1,234	1,408	2,178	3,411	174	14%	944	77%	2,177	176%
1 Cordon Line	IN	N. Livermore Ave.	South of Hartford Avenue	619	162	255	202	357	93	58%	40	25%	195	121%
1 Cordon Line	IN	Collier Canyon Rd.	At County Line	110	27	27	33	40	0	1%	6	22%	13	50%
1 Cordon Line	IN	Tassajara Road	At County Line	1,062	436	503	1,291	2,693	67	15%	854	196%	2,257	517%
1 Cordon Line	IN	Dougherty Road	At County Line	2,215	889	974	1,687	1,940	85	10%	798	90%	1,051	118%
1 Cordon Line	IN	Stagecoach Road	Btwn Amador Vly and Turquoise	753	848	761	1,262	1,595	-87	-10%	414	49%	747	88%
1 Cordon Line	IN	Village Parkway	At County Line	2,213	587	410	1,547	2,329	-177	-30%	960	164%	1,742	297%
1 Cordon Line	IN	Davona Drive	Between Alcosta and Wicklow	751	930	872	735	968	-58	-6%	-195	-21%	38	4%
1 Cordon Line	IN	I-680	At CC Co. Line/Alcosta	20,913	19,162	23,390	26,059	29,181	4,228	22%	6,897	36%	10,019	52%
1 Cordon Line	IN	San Ramon Road	Between Alcosta Ave. and Volmac	5,313	1,934	1,744	3,547	4,529	-190	-10%	1,613	83%	2,595	134%
1 Cordon Line	IN	Crow Canyon Rd.	At County Line	0	3,828	4,066	4,298	6,054	238	6%	469	12%	2,226	58%
1 Cordon Line	IN	Pinehurst Rd.	At County Line	183	722	822	1,101	1,823	100	14%	379	53%	1,101	152%
1 Cordon Line	IN	Redwood Rd.	East of Skyline	388	641	712	1,017	1,926	71	11%	376	59%	1,285	200%
1 Cordon Line	IN	SR 24	At Caldecott Tunnel	20,976	17,003	17,927	24,394	28,024	924	5%	7,391	43%	11,021	65%
1 Cordon Line	IN	Canyon Road	At County Line	0	0	0	0	0	0	0%	0	0%	0	0%
1 Cordon Line	IN	Arlington Avenue	At County Line	0	1,778	1,809	2,204	2,774	30	2%	425	24%	996	56%
1 Cordon Line	IN	Colusa Avenue	At County Line	0	608	590	944	1,425	-17	-3%	336	55%	817	135%
1 Cordon Line	IN	San Pablo Avenue	At Solano and Central	3,350	3,411	3,810	7,181	7,339	399	12%	3,770	111%	3,928	115%
1 Cordon Line	IN	I-80	At Central	18,889	20,794	20,740	22,714	25,943	-54	0%	1,920	9%	5,149	25%
1 Cordon Line	IN	I-580	At Portola and Albany/Jct 80 East	10,603	14,208	14,906	16,743	18,608	698	5%	2,535	18%	4,400	31%
		Subtotal		**233,278**	**230,957**	**243,239**	**306,853**	**372,980**	**12,282**	**5%**	**75,896**	**33%**	**142,023**	**61%**

Table C-5: PM Peak 4-Hour Traffic Forecast Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count 2000	Model Volume 2000	Model Volume 2005	Model Volume 2020	Model Volume 2035	Difference 2000-2005	Percent Difference 2000-2005	Difference 2000-2020	Percent Difference 2000-2020	Difference 2000-2035	Percent Difference 2000-2035
1 Cordon Line	OUT	SF-Oakland Bay Bridge	At County Line	33,420	29,864	28,835	33,904	39,657	-1,029	-3%	4,040	14%	9,793	33%
1 Cordon Line	OUT	San Mateo Bridge	At County Line	9,957	10,831	9,829	12,993	17,420	-1,002	-9%	2,161	20%	6,589	61%
1 Cordon Line	OUT	Dumbarton Bridge	At County Line	4,274	9,514	7,710	10,913	15,843	-1,805	-19%	1,398	15%	6,329	67%
1 Cordon Line	OUT	I-880	At S Clara Co. Line or SR 262	23,182	24,426	24,770	29,757	34,203	345	1%	5,331	22%	9,778	40%
1 Cordon Line	OUT	Warm Springs Blvd.	At County Line	5,939	4,454	3,231	3,794	5,908	-1,223	-27%	-660	-15%	1,454	33%
1 Cordon Line	OUT	I-680	At E. Warren/Scott Creek	22,905	18,477	20,528	24,307	25,292	2,051	11%	5,830	32%	6,815	37%
1 Cordon Line	OUT	Calaveras Road	At County Line	0	0	0	0	0	0	0%	0	0%	0	0%
1 Cordon Line	OUT	Mines Road	At County Line	0	0	0	0	0	0	0%	0	0%	0	0%
1 Cordon Line	OUT	Tesla Road	At County Line	582	99	738	1,195	4,951	640	648%	1,097	1112%	4,853	4920%
1 Cordon Line	OUT	Patterson Pass Road	At County Line	612	24	122	1,467	3,803	97	399%	1,442	5916%	3,779	15499%
1 Cordon Line	OUT	I-580	At Altamont Pass	24,437	22,873	24,881	29,067	31,596	2,008	9%	6,194	27%	8,724	38%
1 Cordon Line	OUT	Altamont Pass Rd.	West of Dyer Road	1,421	88	434	2,043	5,539	346	393%	1,955	2220%	5,451	6189%
1 Cordon Line	OUT	Grant Line Road	At County Line	1,263	352	309	974	1,707	-43	-12%	622	177%	1,355	385%
1 Cordon Line	OUT	Vasco Road	Vasco Road at County Line	5,036	4,557	5,491	6,297	6,642	934	20%	1,740	38%	2,085	46%
1 Cordon Line	OUT	N. Livermore Ave.	South of Hartford Avenue	680	260	282	883	1,958	22	9%	623	240%	1,698	654%
1 Cordon Line	OUT	Collier Canyon Rd.	At County Line	71	11	11	21	643	0	4%	11	103%	632	6018%
1 Cordon Line	OUT	Tassajara Road	At County Line	1,452	1,197	931	1,779	3,957	-266	-22%	582	49%	2,760	231%
1 Cordon Line	OUT	Dougherty Road	At County Line	4,638	2,094	2,505	2,960	6,120	411	20%	866	41%	4,025	192%
1 Cordon Line	OUT	Stagecoach Road	Btwn Amador Vly and Turquoise	799	1,141	1,184	2,585	2,688	43	4%	1,444	127%	1,547	136%
1 Cordon Line	OUT	Village Parkway	At County Line	1,725	396	532	2,100	2,885	136	34%	1,704	431%	2,489	629%
1 Cordon Line	OUT	Davona Drive	Between Alcosta and Wicklow	1,211	415	534	985	1,555	119	29%	570	137%	1,140	275%
1 Cordon Line	OUT	I-680	At CC Co. Line/Alcosta	24,412	24,569	25,705	27,406	32,225	1,136	5%	2,837	12%	7,656	31%
1 Cordon Line	OUT	San Ramon Road	Between Alcosta Ave. and Volmac	4,239	2,027	2,374	6,717	7,609	347	17%	4,690	231%	5,582	275%
1 Cordon Line	OUT	Crow Canyon Rd.	At County Line	0	4,355	4,542	5,659	6,042	187	4%	1,304	30%	1,687	39%
1 Cordon Line	OUT	Pinehurst Rd.	At County Line	349	1,302	1,451	2,425	3,138	148	11%	1,122	86%	1,836	141%
1 Cordon Line	OUT	Redwood Rd.	East of Skyline	261	1,062	1,158	1,990	2,900	96	9%	928	87%	1,838	173%
1 Cordon Line	OUT	SR 24	At Caldecott Tunnel	30,110	28,376	29,672	37,904	42,894	1,296	5%	9,528	34%	14,518	51%
1 Cordon Line	OUT	Canyon Road	At County Line	0	0	0	0	0	0	0%	0	0%	0	0%
1 Cordon Line	OUT	Arlington Avenue	At County Line	0	2,658	2,720	2,907	3,178	61	2%	249	9%	519	20%
1 Cordon Line	OUT	Colusa Avenue	At County Line	0	1,177	1,227	558	1,552	51	4%	-619	-53%	375	32%
1 Cordon Line	OUT	San Pablo Avenue	At Solano and Central	4,832	7,680	7,474	7,751	8,016	-206	-3%	71	1%	337	4%
1 Cordon Line	OUT	I-80	At Central	25,737	25,840	26,282	32,043	37,234	442	2%	6,203	24%	11,394	44%
1 Cordon Line	OUT	I-580	At Portola and Albany/Jct 80 East	11,958	15,691	17,212	19,524	21,753	1,521	10%	3,833	24%	6,062	39%
		Subtotal		**245,502**	**245,809**	**252,672**	**312,904**	**378,907**	**6,863**	**3%**	**67,096**	**27%**	**133,099**	**54%**
		Total		**478,780**	**476,766**	**495,911**	**619,758**	**751,888**	**19,146**	**4%**	**142,992**	**30%**	**275,122**	**58%**

Table C-5: PM Peak 4-Hour Traffic Forecast Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count 2000	Model Volume 2000	Model Volume 2005	Model Volume 2020	Model Volume 2035	Difference 2000-2005	Percent Difference 2000-2005	Difference 2000-2020	Percent Difference 2000-2020	Difference 2000-2035	Percent Difference 2000-2035
2 Albany - Berkeley	NB	I-80	Between Gilman and Buchanan	37,922	37,450	39,489	48,008	55,316	2,039	5%	10,558	28%	17,866	48%
2 Albany - Berkeley	NB	San Pablo Avenue	At Gilman and Marin	4,565	7,360	7,215	7,806	8,284	-145	-2%	445	6%	924	13%
2 Albany - Berkeley	NB	Marin Avenue	Near Cityline	2,884	4,104	5,307	4,100	3,926	1,204	29%	-4	0%	-178	-4%
2 Albany - Berkeley	NB	Solano Avenue	Near Cityline	1,726	647	717	2,189	1,982	69	11%	1,542	238%	1,335	206%
		Subtotal		**47,097**	**49,561**	**52,728**	**62,103**	**69,508**	**3,167**	**6%**	**12,541**	**25%**	**19,946**	**40%**
2 Albany - Berkeley	SB	I-80	Between Gilman and Buchanan	25,957	31,484	31,719	35,778	42,263	234	1%	4,294	14%	10,779	34%
2 Albany - Berkeley	SB	San Pablo Avenue	At Gilman and Marin	3,596	3,935	5,080	7,393	7,241	1,144	29%	3,458	88%	3,305	84%
2 Albany - Berkeley	SB	Marin Avenue	Near Cityline	2,910	3,741	3,689	3,579	3,680	-52	-1%	-162	-4%	-61	-2%
2 Albany - Berkeley	SB	Solano Avenue	Near Cityline	3,548	644	665	1,236	1,690	21	3%	592	92%	1,046	163%
		Subtotal		**36,011**	**39,804**	**41,152**	**47,986**	**54,874**	**1,348**	**3%**	**8,182**	**21%**	**15,070**	**38%**
		Total		**83,108**	**89,366**	**93,881**	**110,089**	**124,382**	**4,515**	**5%**	**20,723**	**23%**	**35,016**	**39%**
3 Berkeley - Emeryville	NB	I-80	At Powell	33,846	35,199	36,123	40,575	48,893	924	3%	5,376	15%	13,693	39%
3 Berkeley - Emeryville	NB	Seventh	Near Ashby/City Limit	0	1,578	1,768	2,317	2,625	190	12%	739	47%	1,047	66%
3 Berkeley - Emeryville	NB	Hollis St.	Near Ashby/City Limit	0	1,449	1,620	2,175	2,552	171	12%	727	50%	1,103	76%
3 Berkeley - Emeryville	NB	West Frontage Road	Near Ashby/City Limit	2,525	3,401	3,506	3,653	3,778	106	3%	252	7%	377	11%
3 Berkeley - Emeryville	NB	Shellmound Street	Near Ashby/City Limit	0	1,810	1,831	2,657	3,872	21	1%	846	47%	2,062	114%
		Subtotal		**36,371**	**43,437**	**44,848**	**51,377**	**61,720**	**1,411**	**3%**	**7,940**	**18%**	**18,283**	**42%**
3 Berkeley - Emeryville	SB	I-80	At Powell	25,640	29,303	29,815	32,712	36,302	512	2%	3,409	12%	6,999	24%
3 Berkeley - Emeryville	SB	Seventh	Near Ashby/City Limit	0	1,397	1,451	1,962	2,403	54	4%	565	40%	1,006	72%
3 Berkeley - Emeryville	SB	Hollis St.	Near Ashby/City Limit	0	1,044	1,051	1,973	2,433	7	1%	929	89%	1,389	133%
3 Berkeley - Emeryville	SB	West Frontage Road	Near Ashby/City Limit	1,689	3,603	3,735	5,780	7,039	132	4%	2,177	60%	3,436	95%
3 Berkeley - Emeryville	SB	Shellmound Street	Near Ashby/City Limit	0	487	536	1,094	2,643	49	10%	607	125%	2,155	442%
		Subtotal		**27,329**	**35,834**	**36,588**	**43,522**	**50,820**	**754**	**2%**	**7,687**	**21%**	**14,986**	**42%**
		Total		**63,700**	**79,271**	**81,436**	**94,899**	**112,540**	**2,165**	**3%**	**15,628**	**20%**	**33,269**	**42%**

Table C-5: PM Peak 4-Hour Traffic Forecast Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count 2000	Model Volume 2000	Model Volume 2005	Model Volume 2020	Model Volume 2035	Difference 2000-2005	Percent Difference 2000-2005	Difference 2000-2020	Percent Difference 2000-2020	Difference 2000-2035	Percent Difference 2000-2035
4 Berkeley - Oakland	NB	San Pablo Avenue	At Stanford and Ashby Ave.	4,079	5,463	5,698	7,783	7,806	235	4%	2,320	42%	2,343	43%
4 Berkeley - Oakland	NB	Sacramento Street	Near City Limits	0	4,261	4,991	6,862	7,337	730	17%	2,601	61%	3,076	72%
4 Berkeley - Oakland	NB	Adeline Street	South of Alcatraz	4,362	4,180	4,350	4,590	6,031	170	4%	410	10%	1,851	44%
4 Berkeley - Oakland	NB	Shattuck Avenue	Near City Limits	2,496	3,575	3,582	3,777	3,676	7	0%	202	6%	101	3%
4 Berkeley - Oakland	NB	Telegraph Avenue	Near City Limits	3,715	5,255	6,076	6,296	7,286	821	16%	1,042	20%	2,031	39%
4 Berkeley - Oakland	NB	College Avenue	Near City Limits	1,747	663	776	1,736	2,227	113	17%	1,073	162%	1,563	236%
4 Berkeley - Oakland	NB	Claremont Avenue	South of Ashby	2,386	2,586	2,898	3,863	6,124	312	12%	1,277	49%	3,538	137%
4 Berkeley - Oakland	NB	Tunnel Road	Near City Limits	4,565	3,707	3,656	3,762	3,681	-50	-1%	55	1%	-25	-1%
4 Berkeley - Oakland	NB	Grizzly Peak Blvd.	North of 24	1,506	537	730	870	1,995	193	36%	333	62%	1,458	271%
4 Berkeley - Oakland	NB	Fish Ranch Road	North of 24	1,001	2,474	2,774	2,178	2,522	300	12%	-297	-12%	48	2%
		Subtotal		**25,857**	**32,701**	**35,531**	**41,717**	**48,683**	**2,830**	**9%**	**9,016**	**28%**	**15,982**	**49%**
4 Berkeley - Oakland	SB	San Pablo Avenue	At Stanford and Ashby Ave.	3,709	3,596	3,872	6,384	7,390	276	8%	2,788	78%	3,794	106%
4 Berkeley - Oakland	SB	Sacramento Street	Near City Limits	0	2,793	2,923	4,786	7,302	130	5%	1,993	71%	4,509	161%
4 Berkeley - Oakland	SB	Adeline Street	South of Alcatraz	3,868	2,767	3,479	4,856	5,626	712	26%	2,089	76%	2,859	103%
4 Berkeley - Oakland	SB	Shattuck Avenue	Near City Limits	2,946	3,490	3,479	3,573	3,752	-11	0%	83	2%	262	8%
4 Berkeley - Oakland	SB	Telegraph Avenue	Near City Limits	4,870	6,047	6,741	7,228	7,558	694	11%	1,181	20%	1,511	25%
4 Berkeley - Oakland	SB	College Avenue	Near City Limits	1,719	1,353	1,573	1,681	2,134	221	16%	329	24%	781	58%
4 Berkeley - Oakland	SB	Claremont Avenue	South of Ashby	1,913	2,256	2,517	3,248	4,969	261	12%	992	44%	2,714	120%
4 Berkeley - Oakland	SB	Tunnel Road	Near City Limits	5,981	3,905	3,862	3,861	3,883	-43	-1%	-44	-1%	-22	-1%
4 Berkeley - Oakland	SB	Grizzly Peak Blvd.	North of 24	886	177	416	1,321	2,503	239	135%	1,144	647%	2,326	1316%
4 Berkeley - Oakland	SB	Fish Ranch Road	North of 24	2,163	2,799	2,996	3,397	3,561	197	7%	598	21%	762	27%
		Subtotal		**28,055**	**29,182**	**31,859**	**40,335**	**48,679**	**2,677**	**9%**	**11,153**	**38%**	**19,497**	**67%**
		Total		**53,912**	**61,883**	**67,390**	**82,052**	**97,362**	**5,507**	**9%**	**20,169**	**33%**	**35,479**	**57%**

Table C-5: PM Peak 4-Hour Traffic Forecast Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count 2000	Model Volume 2000	Model Volume 2005	Model Volume 2020	Model Volume 2035	Difference 2000-2005	Percent Difference 2000-2005	Difference 2000-2020	Percent Difference 2000-2020	Difference 2000-2035	Percent Difference 2000-2035
5 Emeryville - Oakland	NB	I-80	At Powell	33,846	35,199	36,123	40,575	48,893	924	3%	5,376	15%	13,693	39%
5 Emeryville - Oakland	NB	Shellmound Street	Near 40th/City Limit	0	425	919	2,354	6,147	494	116%	1,929	454%	5,722	1347%
5 Emeryville - Oakland	NB	Adeline Street	South of Alcatraz	4,362	4,180	4,350	4,590	6,031	170	4%	410	10%	1,851	44%
5 Emeryville - Oakland	NB	Hollis St.	Near Powell	0	2,069	1,937	3,331	3,535	-133	-6%	1,262	61%	1,466	71%
5 Emeryville - Oakland	NB	San Pablo Avenue	At Stanford and Ashby Ave.	4,253	5,373	5,613	7,557	7,355	240	4%	2,184	41%	1,982	37%
		Subtotal		**42,461**	**47,246**	**48,942**	**58,407**	**71,961**	**1,695**	**4%**	**11,161**	**24%**	**24,714**	**52%**
5 Emeryville - Oakland	SB	I-80	At Powell	25,640	29,303	29,815	32,712	36,302	512	2%	3,409	12%	6,999	24%
5 Emeryville - Oakland	SB	Shellmound Street	Near 40th/City Limit	0	1,368	2,056	3,103	6,835	688	50%	1,735	127%	5,467	400%
5 Emeryville - Oakland	SB	Adeline Street	South of Alcatraz	3,868	2,767	3,479	4,856	5,626	712	26%	2,089	76%	2,859	103%
5 Emeryville - Oakland	SB	Hollis St.	Near Powell	0	2,146	1,906	2,806	2,998	-240	-11%	661	31%	852	40%
5 Emeryville - Oakland	SB	San Pablo Avenue	At Stanford and Ashby Ave.	3,363	4,481	4,759	7,007	7,429	278	6%	2,526	56%	2,949	66%
		Subtotal		**32,871**	**40,064**	**42,014**	**50,485**	**59,191**	**1,950**	**5%**	**10,421**	**26%**	**19,127**	**48%**
		Total		**75,332**	**87,310**	**90,956**	**108,891**	**131,151**	**3,645**	**4%**	**21,581**	**25%**	**43,841**	**50%**
6 Oakland - Piedmont	NB	Pleasant Valley	Near City Limits	2,566	3,461	3,693	4,889	6,657	232	7%	1,428	41%	3,195	92%
6 Oakland - Piedmont	NB	Moraga Avenue	Eastern Border	2,107	1,259	1,414	1,670	1,741	155	12%	411	33%	482	38%
6 Oakland - Piedmont	NB	Moraga Avenue	Western Border	1,239	1,343	1,535	1,782	2,150	192	14%	439	33%	807	60%
6 Oakland - Piedmont	NB	Grand Avenue	Northern Border	1,769	2,301	2,564	3,228	4,947	263	11%	927	40%	2,647	115%
6 Oakland - Piedmont	NB	Grand Avenue	Southern Border	3,304	2,779	3,000	3,635	5,466	222	8%	857	31%	2,687	97%
6 Oakland - Piedmont	NB	Oakland Avenue	North of Monte Vista	1,948	2,148	2,203	2,298	2,959	55	3%	150	7%	811	38%
6 Oakland - Piedmont	NB	Lakeshore Avenue	Between Windsor and Walavista	629	94	105	110	167	11	12%	16	17%	73	77%
		Subtotal		**13,562**	**13,385**	**14,515**	**17,611**	**24,088**	**1,130**	**8%**	**4,227**	**32%**	**10,703**	**80%**
6 Oakland - Piedmont	SB	Pleasant Valley	Near City Limits	2,402	2,754	3,174	4,094	5,998	420	15%	1,340	49%	3,244	118%
6 Oakland - Piedmont	SB	Moraga Avenue	Eastern Border	2,597	1,848	1,875	2,207	2,524	27	1%	359	19%	676	37%
6 Oakland - Piedmont	SB	Moraga Avenue	Western Border	1,767	1,942	2,085	2,332	2,503	143	7%	390	20%	561	29%
6 Oakland - Piedmont	SB	Grand Avenue	Northern Border	2,233	2,558	2,679	3,497	5,184	122	5%	940	37%	2,626	103%
6 Oakland - Piedmont	SB	Grand Avenue	Southern Border	3,721	2,670	2,889	3,504	5,169	219	8%	834	31%	2,499	94%
6 Oakland - Piedmont	SB	Oakland Avenue	North of Monte Vista	1,045	1,588	1,666	1,997	2,867	78	5%	410	26%	1,279	81%
6 Oakland - Piedmont	SB	Lakeshore Avenue	Between Windsor and Walavista	504	57	74	71	102	17	30%	14	24%	45	79%
		Subtotal		**14,269**	**13,417**	**14,442**	**17,703**	**24,348**	**1,025**	**8%**	**4,285**	**32%**	**10,931**	**81%**
		Total		**27,831**	**26,802**	**28,957**	**35,314**	**48,436**	**2,155**	**8%**	**8,512**	**32%**	**21,634**	**81%**

Table C-5: PM Peak 4-Hour Traffic Forecast Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count 2000	Model Volume 2000	Model Volume 2005	Model Volume 2020	Model Volume 2035	Difference 2000-2005	Percent Difference 2000-2005	Difference 2000-2020	Percent Difference 2000-2020	Difference 2000-2035	Percent Difference 2000-2035
7 Alameda - Oakland	NB	Webster-Posey Tubes	Near entrance/exit Oakland side	8,256	8,705	8,899	10,095	12,122	194	2%	1,390	16%	3,417	39%
7 Alameda - Oakland	NB	Park St. Bridge	West of Bridge	5,698	5,944	5,923	7,689	9,101	-21	0%	1,745	29%	3,157	53%
7 Alameda - Oakland	NB	Fruitvale Bridge	West of Bridge	3,021	4,339	4,407	5,228	7,322	68	2%	889	20%	2,983	69%
7 Alameda - Oakland	NB	High St. Bridge	West of Bridge	3,276	2,286	2,202	3,155	4,239	-84	-4%	868	38%	1,953	85%
7 Alameda - Oakland	NB	Doolittle Street	Near City Limits	4,405	5,851	4,618	5,210	5,585	-1,233	-21%	-640	-11%	-266	-5%
7 Alameda - Oakland	NB	SR 61/Doolittle	North of Hegenberger	3,577	6,018	4,725	5,212	5,867	-1,292	-21%	-805	-13%	-151	-3%
7 Alameda - Oakland	NB	Ron Cowan Pkwy	South of Harbor Bay Pkwy	0	0	1,811	2,223	5,162	1,811	0%	2,223	0%	5,162	0%
		Subtotal		**28,233**	**33,143**	**32,585**	**38,812**	**49,398**	**-557**	**-2%**	**5,669**	**17%**	**16,256**	**49%**
7 Alameda - Oakland	SB	Webster-Posey Tubes	Near entrance/exit Oakland side	11,391	10,498	10,892	12,342	13,758	394	4%	1,845	18%	3,260	31%
7 Alameda - Oakland	SB	Park St. Bridge	West of Bridge	6,229	6,512	6,431	7,870	9,394	-82	-1%	1,357	21%	2,882	44%
7 Alameda - Oakland	SB	Fruitvale Bridge	West of Bridge	4,573	5,399	5,367	6,589	7,431	-32	-1%	1,190	22%	2,032	38%
7 Alameda - Oakland	SB	High St. Bridge	West of Bridge	3,764	3,633	3,612	3,765	4,554	-21	-1%	132	4%	921	25%
7 Alameda - Oakland	SB	Doolittle Street	Near City Limits	4,110	4,635	3,408	3,376	5,726	-1,228	-26%	-1,259	-27%	1,091	24%
7 Alameda - Oakland	SB	SR 61/Doolittle	North of Hegenberger	4,542	5,312	4,112	4,192	6,527	-1,200	-23%	-1,120	-21%	1,215	23%
7 Alameda - Oakland	SB	Ron Cowan Pkwy	South of Harbor Bay Pkwy	0	0	1,750	2,190	1,189	1,750	0%	2,190	0%	1,189	0%
		Subtotal		**34,609**	**35,990**	**35,571**	**40,325**	**48,579**	**-419**	**-1%**	**4,335**	**12%**	**12,589**	**35%**
		Total		**62,842**	**69,132**	**68,156**	**79,136**	**97,977**	**-977**	**-1%**	**10,004**	**14%**	**28,844**	**42%**

Table C-5: PM Peak 4-Hour Traffic Forecast Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count 2000	Model Volume 2000	Model Volume 2005	Model Volume 2020	Model Volume 2035	Difference 2000-2005	Percent Difference 2000-2005	Difference 2000-2020	Percent Difference 2000-2020	Difference 2000-2035	Percent Difference 2000-2035
8 Oak - San L E14th/Int	EB	Lakeshore Avenue	E/O International	3,773	5,499	5,310	4,903	3,495	-189	-3%	-596	-11%	-2,004	-36%
8 Oak - San L E14th/Int	EB	Park Blvd - 5th Avenue	E/O International	664	231	239	677	721	8	3%	446	193%	490	212%
8 Oak - San L E14th/Int	EB	14th Avenue	E/O International	3,440	4,627	4,708	6,130	5,777	81	2%	1,504	32%	1,150	25%
8 Oak - San L E14th/Int	EB	23rd Avenue	E/O International	1,104	627	578	1,218	2,599	-48	-8%	591	94%	1,973	315%
8 Oak - San L E14th/Int	EB	Fruitvale Avenue	E/O International	3,475	2,477	2,583	3,005	4,862	106	4%	529	21%	2,385	96%
8 Oak - San L E14th/Int	EB	35th Avenue	E/O International	2,209	1,014	1,003	1,463	3,452	-11	-1%	449	44%	2,437	240%
8 Oak - San L E14th/Int	EB	42nd/Courtland	E/O International	2,440	4,974	5,004	6,682	7,643	30	1%	1,708	34%	2,669	54%
8 Oak - San L E14th/Int	EB	High Street	E/O International	1,931	843	848	1,708	4,764	5	1%	865	103%	3,921	465%
8 Oak - San L E14th/Int	EB	55th Avenue	E/O International	696	681	660	791	946	-21	-3%	110	16%	264	39%
8 Oak - San L E14th/Int	EB	Seminary Avenue	E/O International	1,778	1,280	1,365	2,504	1,821	85	7%	1,224	96%	541	42%
8 Oak - San L E14th/Int	EB	73rd Avenue	E/O International	3,809	5,394	5,451	5,112	7,527	58	1%	-281	-5%	2,134	40%
8 Oak - San L E14th/Int	EB	82nd Avenue	E/O International	493	650	657	706	957	7	1%	56	9%	307	47%
8 Oak - San L E14th/Int	EB	98th Avenue	E/O International	3,000	3,012	2,894	3,141	5,555	-117	-4%	130	4%	2,543	84%
8 Oak - San L E14th/Int	EB	Davis Street (SR 112)	W/O International	4,259	3,435	3,724	5,718	7,448	289	8%	2,283	66%	4,013	117%
8 Oak - San L E14th/Int	EB	Estudillo	E/O International	1,724	2,537	2,567	2,760	3,325	31	1%	223	9%	789	31%
		Subtotal		**34,795**	**37,279**	**37,592**	**46,520**	**60,891**	**313**	**1%**	**9,241**	**25%**	**23,612**	**63%**
8 Oak - San L E14th/Int	WB	Lakeshore Avenue	E/O International	1,606	890	994	1,066	1,718	104	12%	176	20%	827	93%
8 Oak - San L E14th/Int	WB	Park Blvd - 5th Avenue	E/O International	519	168	190	463	859	22	13%	295	176%	691	413%
8 Oak - San L E14th/Int	WB	14th Avenue	E/O International	2,833	3,541	3,838	5,123	6,830	297	8%	1,582	45%	3,289	93%
8 Oak - San L E14th/Int	WB	23rd Avenue	E/O International	665	513	513	556	2,373	0	0%	42	8%	1,860	362%
8 Oak - San L E14th/Int	WB	Fruitvale Avenue	E/O International	3,159	2,396	2,396	2,630	3,440	0	0%	234	10%	1,044	44%
8 Oak - San L E14th/Int	WB	35th Avenue	E/O International	1,669	790	801	958	2,711	12	2%	168	21%	1,922	243%
8 Oak - San L E14th/Int	WB	42nd/Courtland	E/O International	1,706	2,307	2,361	3,131	4,756	54	2%	824	36%	2,449	106%
8 Oak - San L E14th/Int	WB	High Street	E/O International	2,807	1,220	1,231	1,342	3,738	11	1%	122	10%	2,518	206%
8 Oak - San L E14th/Int	WB	55th Avenue	E/O International	705	429	446	574	761	17	4%	145	34%	332	77%
8 Oak - San L E14th/Int	WB	Seminary Avenue	E/O International	1,555	919	1,052	2,129	1,860	133	15%	1,210	132%	941	102%
8 Oak - San L E14th/Int	WB	73rd Avenue	E/O International	4,587	3,167	3,250	3,700	7,312	83	3%	533	17%	4,145	131%
8 Oak - San L E14th/Int	WB	82nd Avenue	E/O International	849	457	492	547	597	35	8%	90	20%	140	31%
8 Oak - San L E14th/Int	WB	98th Avenue	E/O International	2,771	1,920	2,056	2,412	3,770	136	7%	492	26%	1,850	96%
8 Oak - San L E14th/Int	WB	Davis Street (SR 112)	W/O International	3,406	2,303	2,488	3,831	5,084	185	8%	1,528	66%	2,781	121%
8 Oak - San L E14th/Int	WB	Estudillo	E/O International	1,592	2,222	2,323	2,278	2,352	101	5%	57	3%	130	6%
		Subtotal		**30,429**	**23,241**	**24,431**	**30,740**	**48,162**	**1,190**	**5%**	**7,499**	**32%**	**24,921**	**107%**
		Total		**65,224**	**60,520**	**62,023**	**77,259**	**109,052**	**1,503**	**2%**	**16,739**	**28%**	**48,532**	**80%**

Table C-5: PM Peak 4-Hour Traffic Forecast Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count 2000	Model Volume 2000	Model Volume 2005	Model Volume 2020	Model Volume 2035	Difference 2000-2005	Percent Difference 2000-2005	Difference 2000-2020	Percent Difference 2000-2020	Difference 2000-2035	Percent Difference 2000-2035
9 Oakland - San Leandro	NB	Doolittle Drive	Near Davis	4,455	7,645	7,711	7,928	9,143	66	1%	283	4%	1,498	20%
9 Oakland - San Leandro	NB	I-880	Between Davis and 98th Avenue	26,058	29,640	29,684	31,978	38,756	44	0%	2,338	8%	9,116	31%
9 Oakland - San Leandro	NB	San Leandro Blvd.	Near City Limits	1,939	2,108	2,319	7,022	7,140	212	10%	4,914	233%	5,033	239%
9 Oakland - San Leandro	NB	Int'l/E. 14th	Near 98th Avenue	4,051	2,960	3,145	5,530	5,767	184	6%	2,569	87%	2,806	95%
9 Oakland - San Leandro	NB	Bancroft Avenue	Near City Limits	1,670	2,084	2,086	7,055	7,800	2	0%	4,972	239%	5,716	274%
9 Oakland - San Leandro	NB	MacArthur Blvd.	Near City Limits	1,711	2,196	2,206	3,007	2,883	10	0%	812	37%	688	31%
9 Oakland - San Leandro	NB	Foothill Blvd.	Near City Limits	895	769	760	761	2,091	-9	-1%	-8	-1%	1,322	172%
9 Oakland - San Leandro	NB	I-580	Between 98th and Estudillo	20,300	28,766	29,332	33,569	41,656	567	2%	4,804	17%	12,890	45%
		Subtotal		**61,079**	**76,167**	**77,243**	**96,850**	**115,236**	**1,076**	**1%**	**20,683**	**27%**	**39,070**	**51%**
9 Oakland - San Leandro	SB	Doolittle Drive	Near Davis	5,859	7,615	7,829	8,041	9,345	213	3%	426	6%	1,730	23%
9 Oakland - San Leandro	SB	I-880	Between Davis and 98th Avenue	27,974	29,274	29,994	35,732	38,684	720	2%	6,458	22%	9,410	32%
9 Oakland - San Leandro	SB	San Leandro Blvd.	Near City Limits	2,280	3,199	3,844	6,434	7,271	645	20%	3,235	101%	4,072	127%
9 Oakland - San Leandro	SB	Int'l/E. 14th	Near 98th Avenue	3,557	2,743	3,161	4,791	5,942	417	15%	2,048	75%	3,199	117%
9 Oakland - San Leandro	SB	Bancroft Avenue	Near City Limits	1,621	1,272	1,306	2,578	7,278	35	3%	1,306	103%	6,006	472%
9 Oakland - San Leandro	SB	MacArthur Blvd.	Near City Limits	1,564	2,456	2,378	2,817	2,871	-78	-3%	361	15%	415	17%
9 Oakland - San Leandro	SB	Foothill Blvd.	Near City Limits	1,390	907	896	910	1,303	-11	-1%	3	0%	396	44%
9 Oakland - San Leandro	SB	I-580	Between 98th and Estudillo	21,616	29,602	30,153	32,202	35,582	551	2%	2,600	9%	5,980	20%
		Subtotal		**65,861**	**77,069**	**79,560**	**93,505**	**108,276**	**2,492**	**3%**	**16,436**	**21%**	**31,208**	**40%**
		Total		**126,941**	**153,235**	**156,803**	**190,355**	**223,513**	**3,568**	**2%**	**37,119**	**24%**	**70,277**	**46%**

Table C-5: PM Peak 4-Hour Traffic Forecast Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count 2000	Model Volume 2000	Model Volume 2005	Model Volume 2020	Model Volume 2035	Difference 2000-2005	Percent Difference 2000-2005	Difference 2000-2020	Percent Difference 2000-2020	Difference 2000-2035	Percent Difference 2000-2035
10 Hayward - Union City	NB	Union City Blvd.	Near City Limits	0	7,936	7,870	8,202	9,534	-66	-1%	266	3%	1,598	20%
10 Hayward - Union City	NB	I-880	At Industrial Parkway	26,383	29,851	30,411	36,012	45,047	560	2%	6,161	21%	15,196	51%
10 Hayward - Union City	NB	Industrial Pkwy	Near Huntwood	5,201	4,295	4,164	4,659	5,834	-132	-3%	364	8%	1,538	36%
10 Hayward - Union City	NB	Whipple Road	Near City Limit, E side of I-880	4,258	2,705	2,921	4,729	6,563	216	8%	2,024	75%	3,858	143%
10 Hayward - Union City	NB	Mission Blvd	At Greasel Street	5,923	5,738	6,337	6,983	7,952	599	10%	1,245	22%	2,214	39%
		Subtotal		**41,765**	**50,525**	**51,702**	**60,585**	**74,929**	**1,178**	**2%**	**10,061**	**20%**	**24,404**	**48%**
10 Hayward - Union City	SB	Union City Blvd.	Near City Limits	0	7,933	7,945	7,992	8,519	12	0%	59	1%	586	7%
10 Hayward - Union City	SB	I-880	At Industrial Parkway	24,374	30,020	30,378	33,248	39,357	357	1%	3,228	11%	9,337	31%
10 Hayward - Union City	SB	Industrial Pkwy	Near Huntwood	4,397	3,340	3,511	3,421	5,242	172	5%	81	2%	1,902	57%
10 Hayward - Union City	SB	Whipple Road	Near City Limit, E side of I-880	4,201	3,942	4,459	5,135	5,921	517	13%	1,193	30%	1,979	50%
10 Hayward - Union City	SB	Mission Blvd	At Greasel Street	4,554	5,474	5,852	6,924	7,285	379	7%	1,450	26%	1,811	33%
		Subtotal		**37,526**	**50,709**	**52,146**	**56,720**	**66,325**	**1,437**	**3%**	**6,011**	**12%**	**15,615**	**31%**
		Total		**79,291**	**101,234**	**103,849**	**117,306**	**141,254**	**2,614**	**3%**	**16,072**	**16%**	**40,020**	**40%**
11 Hayward - Castro Vall	NB	Redwood Rd.	North of Seven Hills	1,906	796	907	1,849	2,938	110	14%	1,053	132%	2,142	269%
11 Hayward - Castro Vall	NB	Crow Canyon Rd.	North of Cold Water Drive	0	4,210	4,399	5,147	6,125	188	4%	936	22%	1,915	45%
11 Hayward - Castro Vall	NB	I-580	At Crow Canyon	25,109	29,700	31,707	37,215	42,207	2,007	7%	7,516	25%	12,507	42%
11 Hayward - Castro Vall	NB	Dublin Canyon Road	East of Palomares	654	344	368	1,772	2,441	24	7%	1,428	415%	2,097	609%
11 Hayward - Castro Vall	NB	Palomares Road	South of Palo Verde Road	309	610	535	1,307	1,927	-75	-12%	697	114%	1,317	216%
		Subtotal		**27,978**	**35,661**	**37,915**	**47,290**	**55,639**	**2,254**	**6%**	**11,629**	**33%**	**19,978**	**56%**
11 Hayward - Castro Vall	SB	Redwood Rd.	North of Seven Hills	1,659	568	631	813	1,504	62	11%	245	43%	936	165%
11 Hayward - Castro Vall	SB	Crow Canyon Rd.	North of Cold Water Drive	0	3,942	4,006	4,162	4,902	64	2%	220	6%	960	24%
11 Hayward - Castro Vall	SB	I-580	At Crow Canyon	22,962	22,479	23,508	29,731	34,069	1,029	5%	7,251	32%	11,590	52%
11 Hayward - Castro Vall	SB	Dublin Canyon Road	East of Palomares	1,271	805	1,279	2,765	3,324	474	59%	1,960	244%	2,519	313%
11 Hayward - Castro Vall	SB	Palomares Road	South of Palo Verde Road	262	432	428	540	798	-4	-1%	108	25%	365	85%
		Subtotal		**26,154**	**28,227**	**29,852**	**38,011**	**44,596**	**1,625**	**6%**	**9,784**	**35%**	**16,369**	**58%**
		Total		**54,132**	**63,888**	**67,767**	**85,301**	**100,236**	**3,879**	**6%**	**21,413**	**34%**	**36,348**	**57%**

Table C-5: PM Peak 4-Hour Traffic Forecast Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count 2000	Model Volume 2000	Model Volume 2005	Model Volume 2020	Model Volume 2035	Difference 2000-2005	Percent Difference 2000-2005	Difference 2000-2020	Percent Difference 2000-2020	Difference 2000-2035	Percent Difference 2000-2035
12 Union City - Fremont	NB	Ardenwood Blvd.	Near City Limits	5,972	6,712	6,849	7,951	8,219	137	2%	1,239	18%	1,507	22%
12 Union City - Fremont	NB	Alvarado Blvd.	Around Lowry Road	3,709	4,514	4,885	6,603	8,633	371	8%	2,088	46%	4,118	91%
12 Union City - Fremont	NB	I-880	South of Alvarado-Niles I/C	26,617	29,173	29,839	31,845	39,254	667	2%	2,672	9%	10,082	35%
12 Union City - Fremont	NB	Decoto Road	South of Alvarado Niles	0	7,765	7,874	7,317	8,006	110	1%	-447	-6%	242	3%
12 Union City - Fremont	NB	Isherwood Way	Near City Limits	1,943	1,328	1,624	663	2,635	296	22%	-665	-50%	1,307	98%
12 Union City - Fremont	NB	Alvarado-Niles Rd.	Near City Limits	0	2,117	1,885	1,192	3,069	-232	-11%	-925	-44%	952	45%
12 Union City - Fremont	NB	Mission Blvd	South of Decoto Road	4,832	4,630	4,755	6,629	7,323	125	3%	1,999	43%	2,692	58%
		Subtotal		**43,073**	**56,239**	**57,712**	**62,200**	**77,139**	**1,473**	**3%**	**5,961**	**11%**	**20,900**	**37%**
12 Union City - Fremont	SB	Ardenwood Blvd.	Near City Limits	2,562	3,427	3,393	4,589	7,207	-34	-1%	1,162	34%	3,781	110%
12 Union City - Fremont	SB	Alvarado Blvd.	Around Lowry Road	2,645	4,011	4,450	6,008	7,572	439	11%	1,997	50%	3,561	89%
12 Union City - Fremont	SB	I-880	South of Alvarado-Niles I/C	24,825	27,845	27,883	29,058	33,413	38	0%	1,213	4%	5,568	20%
12 Union City - Fremont	SB	Decoto Road	South of Alvarado Niles	0	7,199	7,234	7,027	7,667	35	0%	-172	-2%	468	6%
12 Union City - Fremont	SB	Isherwood Way	Near City Limits	3,265	311	363	243	1,303	52	17%	-67	-22%	992	319%
12 Union City - Fremont	SB	Alvarado-Niles Rd.	Near City Limits	0	3,690	3,368	1,423	2,608	-322	-9%	-2,267	-61%	-1,082	-29%
12 Union City - Fremont	SB	Mission Blvd	South of Decoto Road	4,938	5,140	5,335	6,828	7,253	195	4%	1,688	33%	2,113	41%
		Subtotal		**38,235**	**51,624**	**52,027**	**55,177**	**67,023**	**404**	**1%**	**3,553**	**7%**	**15,399**	**30%**
		Total		**81,308**	**107,863**	**109,739**	**117,377**	**144,162**	**1,877**	**2%**	**9,514**	**9%**	**36,299**	**34%**

Table C-5: PM Peak 4-Hour Traffic Forecast Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count 2000	Model Volume 2000	Model Volume 2005	Model Volume 2020	Model Volume 2035	Difference 2000-2005	Percent Difference 2000-2005	Difference 2000-2020	Percent Difference 2000-2020	Difference 2000-2035	Percent Difference 2000-2035
13 Fremont - Newark	NB	Thornton Ave.	South of SR 84	0	1,395	1,206	1,691	3,281	-188	-14%	297	21%	1,886	135%
13 Fremont - Newark	NB	Newark Blvd.	South of SR 84	0	3,774	3,957	5,298	6,265	183	5%	1,524	40%	2,492	66%
13 Fremont - Newark	NB	I-880	Near SR 84	27,472	28,436	29,058	31,248	37,075	622	2%	2,812	10%	8,639	30%
13 Fremont - Newark	NB	Thornton Ave.	Near I-880/City Limits	0	5,513	5,258	6,715	5,983	-256	-5%	1,202	22%	470	9%
13 Fremont - Newark	WB	Central Ave.	Near I-880/City Limits	2,128	618	646	741	1,814	28	5%	123	20%	1,196	193%
13 Fremont - Newark	WB	Mowry Ave.	Near I-880/City Limits	7,204	4,025	4,128	4,405	5,312	102	3%	379	9%	1,286	32%
13 Fremont - Newark	WB	Stevenson Blvd.	Near I-880/City Limits	1,573	4,268	4,423	4,334	5,146	155	4%	66	2%	878	21%
13 Fremont - Newark	WB	Cedar Blvd.	Near City Limits	0	359	454	542	817	95	26%	183	51%	457	127%
13 Fremont - Newark	WB	Cherry Street	Near City Limits	0	2,857	3,448	5,326	6,837	591	21%	2,470	86%	3,980	139%
		Subtotal		**38,377**	**51,245**	**52,578**	**60,300**	**72,530**	1,333	3%	9,055	18%	21,284	42%
13 Fremont - Newark	SB	Thornton Ave.	South of SR 84	0	1,200	1,154	1,961	3,828	-45	-4%	761	63%	2,628	219%
13 Fremont - Newark	SB	Newark Blvd.	South of SR 84	0	4,890	4,913	6,551	7,599	23	0%	1,662	34%	2,709	55%
13 Fremont - Newark	SB	I-880	Near SR 84	23,044	24,242	24,539	26,719	30,996	297	1%	2,478	10%	6,754	28%
13 Fremont - Newark	SB	Thornton Ave.	Near I-880/City Limits	0	5,258	5,366	5,505	6,788	108	2%	247	5%	1,530	29%
13 Fremont - Newark	EB	Central Ave.	Near I-880/City Limits	3,161	825	821	828	6,148	-5	-1%	2	0%	5,323	645%
13 Fremont - Newark	EB	Mowry Ave.	Near I-880/City Limits	9,341	6,959	7,169	7,081	10,300	210	3%	122	2%	3,341	48%
13 Fremont - Newark	EB	Stevenson Blvd.	Near I-880/City Limits	2,194	3,555	3,848	4,388	6,858	292	8%	832	23%	3,303	93%
13 Fremont - Newark	EB	Cedar Blvd.	Near City Limits	0	523	704	762	806	181	35%	238	46%	283	54%
13 Fremont - Newark	EB	Cherry Street	Near City Limits	0	2,133	2,358	3,446	5,352	225	11%	1,312	62%	3,219	151%
		Subtotal		**37,740**	**49,585**	**50,872**	**57,240**	**78,675**	**1,287**	**3%**	**7,654**	**15%**	**29,090**	**59%**
		Total		**76,117**	**100,831**	**103,451**	**117,540**	**151,205**	**2,620**	**3%**	**16,709**	**17%**	**50,374**	**50%**
14 County - Tri-Valley	NB	Niles Canyon Road	At Palomares	3,884	5,739	5,829	6,191	7,043	90	2%	453	8%	1,305	23%
14 County - Tri-Valley	NB	I-680	At SR 84 East	19,038	21,016	22,594	29,476	34,084	1,577	8%	8,460	40%	13,068	62%
14 County - Tri-Valley	NB	Foothill Road	North of Niles Canyon Road	0	1,385	2,016	2,982	3,284	631	46%	1,598	115%	1,899	137%
14 County - Tri-Valley	NB	Pleasanton-Sunol	North of Niles Canyon Road	0	3,236	3,640	3,730	4,072	404	12%	495	15%	837	26%
14 County - Tri-Valley	NB	Vallecitos Road	Near Vineyard	5,711	3,414	3,540	2,377	3,127	127	4%	-1,036	-30%	-287	-8%
		Subtotal		**28,633**	**34,789**	**37,618**	**44,757**	**51,611**	**2,829**	**8%**	**9,969**	**29%**	**16,822**	**48%**
14 County - Tri-Valley	SB	Niles Canyon Road	At Palomares	2,393	2,347	2,215	5,026	5,850	-132	-6%	2,679	114%	3,504	149%
14 County - Tri-Valley	SB	I-680	At SR 84 East	13,842	15,147	16,840	20,109	21,745	1,693	11%	4,962	33%	6,597	44%
14 County - Tri-Valley	SB	Foothill Road	North of Niles Canyon Road	0	473	708	1,456	1,278	235	50%	983	208%	805	170%
14 County - Tri-Valley	SB	Pleasanton-Sunol	North of Niles Canyon Road	0	1,001	824	2,969	2,379	-177	-18%	1,968	197%	1,378	138%
14 County - Tri-Valley	SB	Vallecitos Road	Near Vineyard	1,781	3,116	3,019	1,248	2,938	-97	-3%	-1,868	-60%	-178	-6%
		Subtotal		**18,016**	**22,084**	**23,606**	**30,808**	**34,191**	**1,522**	**7%**	**8,724**	**40%**	**12,107**	**55%**
		Total		**46,649**	**56,873**	**61,224**	**75,566**	**85,802**	**4,351**	**8%**	**18,693**	**33%**	**28,929**	**51%**

Table C-5: PM Peak 4-Hour Traffic Forecast Model Volumes by Screenline

Screenline	Direction	Street Name	Location	Traffic Count 2000	Model Volume 2000	Model Volume 2005	Model Volume 2020	Model Volume 2035	Difference 2000-2005	Percent Difference 2000-2005	Difference 2000-2020	Percent Difference 2000-2020	Difference 2000-2035	Percent Difference 2000-2035
15 Dublin - Pleasanton	NB	San Ramon Road	Btwn Dublin Blvd. and Amador Vly	4,680	4,643	4,828	7,764	7,750	184	4%	3,121	67%	3,107	67%
15 Dublin - Pleasanton	NB	I-680	North of I-580	25,036	23,738	24,755	23,649	28,606	1,018	4%	-89	0%	4,868	21%
15 Dublin - Pleasanton	NB	Village Parkway	Between Dublin Blvd. and Lewis	3,365	2,298	2,606	4,846	5,216	308	13%	2,548	111%	2,918	127%
15 Dublin - Pleasanton	NB	Dougherty Road	Between Dublin Blvd. and Sierra	4,796	4,978	5,576	8,433	10,174	598	12%	3,455	69%	5,195	104%
15 Dublin - Pleasanton	NB	Hacienda Drive	Between I-580 and Dublin Blvd.	2,585	2,142	2,763	12,009	13,762	621	29%	9,867	461%	11,620	543%
15 Dublin - Pleasanton	NB	Tassajara Road	Between I-580 and Dublin Blvd.	2,351	1,587	3,033	10,208	13,043	1,446	91%	8,622	543%	11,456	722%
15 Dublin - Pleasanton	NB	Santa Rita Road	South of I-580	5,575	4,679	3,836	8,822	8,318	-843	-18%	4,143	89%	3,639	78%
15 Dublin - Pleasanton	NB	Hacienda Drive	South of I-580	5,583	5,757	6,284	12,701	13,376	527	9%	6,943	121%	7,619	132%
15 Dublin - Pleasanton	NB	Hopyard Rd.	South of I-580	5,719	9,156	9,940	11,802	12,078	784	9%	2,646	29%	2,922	32%
15 Dublin - Pleasanton	NB	Foothill Road	South of I-580	6,472	6,914	7,495	9,276	13,138	581	8%	2,362	34%	6,224	90%
		Subtotal		**66,161**	**65,893**	**71,116**	**109,510**	**125,461**	**5,223**	**8%**	**43,616**	**66%**	**59,568**	**90%**
15 Dublin - Pleasanton	SB	San Ramon Road	Btwn Dublin Blvd. and Amador Vly	4,324	2,772	2,704	4,435	4,880	-68	-2%	1,663	60%	2,107	76%
15 Dublin - Pleasanton	SB	I-680	North of I-580	20,913	19,162	23,390	26,059	29,181	4,228	22%	6,897	36%	10,019	52%
15 Dublin - Pleasanton	SB	Village Parkway	Between Dublin Blvd. and Lewis	2,648	2,068	2,083	3,597	5,498	14	1%	1,528	74%	3,429	166%
15 Dublin - Pleasanton	SB	Dougherty Road	Between Dublin Blvd. and Sierra	3,982	4,366	4,129	5,238	5,782	-237	-5%	872	20%	1,416	32%
15 Dublin - Pleasanton	SB	Hacienda Drive	Between I-580 and Dublin Blvd.	4,172	2,919	2,275	4,420	8,880	-644	-22%	1,501	51%	5,961	204%
15 Dublin - Pleasanton	SB	Tassajara Road	Between I-580 and Dublin Blvd.	4,235	973	2,362	4,105	6,258	1,389	143%	3,132	322%	5,284	543%
15 Dublin - Pleasanton	SB	Santa Rita Road	South of I-580	3,297	3,263	4,167	5,635	5,135	904	28%	2,373	73%	1,873	57%
15 Dublin - Pleasanton	SB	Hacienda Drive	South of I-580	3,213	5,557	6,543	6,430	7,244	986	18%	872	16%	1,687	30%
15 Dublin - Pleasanton	SB	Hopyard Rd.	South of I-580	5,362	6,724	6,494	8,223	11,614	-229	-3%	1,499	22%	4,890	73%
15 Dublin - Pleasanton	SB	Foothill Road	South of I-580	4,025	6,437	5,701	7,219	8,343	-736	-11%	782	12%	1,905	30%
		Subtotal		**56,171**	**54,242**	**59,848**	**75,361**	**92,814**	**5,607**	**10%**	**21,119**	**39%**	**38,572**	**71%**
		Total		**122,332**	**120,135**	**130,964**	**184,870**	**218,275**	**10,829**	**9%**	**64,735**	**54%**	**98,140**	**82%**
16 Pleasanton - Livermore	EB	Dublin Blvd	West of Doolan Rd	0	0	0	5,673	7,337	0	0%	5,673	0%	7,337	0%
16 Pleasanton - Livermore	EB	I-580	At Airway	29,802	29,850	32,909	37,850	43,284	3,059	10%	8,000	27%	13,434	45%
16 Pleasanton - Livermore	EB	W Jack London Blvd	SW of Airport	0	0	0	3,336	6,555	0	0%	3,336	0%	6,555	0%
16 Pleasanton - Livermore	EB	Stanley Blvd.	West of Isabel Avenue	7,967	7,520	7,337	7,620	11,110	-183	-2%	100	1%	3,589	48%
16 Pleasanton - Livermore	EB	Vineyard Avenue	East of Ruby Hill	2,385	1,961	3,658	3,125	3,223	1,697	87%	1,164	59%	1,263	64%
16 Pleasanton - Livermore	EB	Vallecitos Road	S/O Isabel Avenue	5,834	5,503	5,752	5,685	11,284	249	5%	181	3%	5,781	105%
		Subtotal		**45,988**	**44,834**	**49,656**	**63,288**	**82,793**	**4,822**	**11%**	**18,454**	**41%**	**37,959**	**85%**
16 Pleasanton - Livermore	WB	Dublin Blvd	West of Doolan Rd	0	0	0	931	6,025	0	0%	931	0%	6,025	0%
16 Pleasanton - Livermore	WB	I-580	At Airway	19,379	21,378	22,709	31,391	36,709	1,331	6%	10,013	47%	15,331	72%
16 Pleasanton - Livermore	WB	W Jack London Blvd	SW of Airport	0	0	0	430	1,397	0	0%	430	0%	1,397	0%
16 Pleasanton - Livermore	WB	Stanley Blvd.	West of Isabel Avenue	2,486	1,945	2,073	6,629	7,104	128	7%	4,684	241%	5,159	265%
16 Pleasanton - Livermore	WB	Vineyard Avenue	East of Ruby Hill	1,084	387	534	1,020	885	147	38%	633	163%	498	129%
16 Pleasanton - Livermore	WB	Vallecitos Road	S/O Isabel Avenue	2,399	5,046	5,134	5,198	9,951	88	2%	152	3%	4,905	97%
		Subtotal		**25,348**	**28,756**	**30,450**	**45,598**	**62,071**	**1,694**	**6%**	**16,842**	**59%**	**33,315**	**116%**
		Total		**71,336**	**73,590**	**80,106**	**108,886**	**144,864**	**6,516**	**9%**	**35,297**	**48%**	**71,274**	**97%**

10 Appendix D: Detailed TAZ Correspondence

Appendix D is a separate electronic file:

"ACtoMTC_TAZ_Correspondence_110510.pdf"

ACCMA_TAZ	SUBREGION	JURISDICTION	MTC_TAZ	SDISTRICT	COUNTY	COUNTY_LABEL	CDP
1	ACCMA	Albany	1039	19	4	Alameda	Albany
2	ACCMA	Albany	1039	19	4	Alameda	Albany
3	ACCMA	Albany	1039	19	4	Alameda	Albany
4	ACCMA	Albany	1038	19	4	Alameda	Albany
5	ACCMA	Albany	1038	19	4	Alameda	Albany
6	ACCMA	Albany	1038	19	4	Alameda	Albany
7	ACCMA	Albany	1037	19	4	Alameda	Albany
8	ACCMA	Albany	1037	19	4	Alameda	Albany
9	ACCMA	Albany	1036	19	4	Alameda	Albany
10	ACCMA	Albany	1036	19	4	Alameda	Albany
11	ACCMA	Albany	1035	19	4	Alameda	Albany
12	ACCMA	Albany	1034	19	4	Alameda	Albany
13	ACCMA	Albany	1034	19	4	Alameda	Albany
14	ACCMA	Berkeley	1033	19	4	Alameda	Berkeley
15	ACCMA	Berkeley	1033	19	4	Alameda	Berkeley
16	ACCMA	Berkeley	1033	19	4	Alameda	Berkeley
17	ACCMA	Berkeley	1033	19	4	Alameda	Berkeley
18	ACCMA	Berkeley	1033	19	4	Alameda	Berkeley
19	ACCMA	Berkeley	1032	19	4	Alameda	Berkeley
20	ACCMA	Berkeley	1031	19	4	Alameda	Berkeley
21	ACCMA	Berkeley	1031	19	4	Alameda	Berkeley
22	ACCMA	Berkeley	1030	19	4	Alameda	Berkeley
23	ACCMA	Berkeley	1029	19	4	Alameda	Berkeley
24	ACCMA	Berkeley	1028	19	4	Alameda	Berkeley
25	ACCMA	Berkeley	1028	19	4	Alameda	Berkeley
26	ACCMA	Berkeley	1027	19	4	Alameda	Berkeley
27	ACCMA	Berkeley	1027	19	4	Alameda	Berkeley
28	ACCMA	Berkeley	1026	19	4	Alameda	Berkeley
29	ACCMA	Berkeley	1025	19	4	Alameda	Berkeley
30	ACCMA	Berkeley	1025	19	4	Alameda	Berkeley
31	ACCMA	Berkeley	1025	19	4	Alameda	Berkeley
32	ACCMA	Berkeley	1025	19	4	Alameda	Berkeley
33	ACCMA	Berkeley	1025	19	4	Alameda	Berkeley
34	ACCMA	Berkeley	1024	19	4	Alameda	Berkeley
35	ACCMA	Berkeley	1024	19	4	Alameda	Berkeley
36	ACCMA	Berkeley	1024	19	4	Alameda	Berkeley
37	ACCMA	Berkeley	1023	19	4	Alameda	Berkeley
38	ACCMA	Berkeley	1023	19	4	Alameda	Berkeley
39	ACCMA	Berkeley	1023	19	4	Alameda	Berkeley
40	ACCMA	Berkeley	1023	19	4	Alameda	Berkeley
41	ACCMA	Berkeley	1022	19	4	Alameda	Berkeley
42	ACCMA	Berkeley	1022	19	4	Alameda	Berkeley
43	ACCMA	Berkeley	1022	19	4	Alameda	Berkeley
44	ACCMA	Berkeley	1022	19	4	Alameda	Berkeley
45	ACCMA	Berkeley	1021	19	4	Alameda	Berkeley
46	ACCMA	Berkeley	1021	19	4	Alameda	Berkeley
47	ACCMA	Berkeley	1021	19	4	Alameda	Berkeley
48	ACCMA	Berkeley	1020	19	4	Alameda	Berkeley
49	ACCMA	Berkeley	1020	19	4	Alameda	Berkeley
50	ACCMA	Berkeley	1019	19	4	Alameda	Berkeley
51	ACCMA	Berkeley	1019	19	4	Alameda	Berkeley
52	ACCMA	Berkeley	1018	19	4	Alameda	Berkeley
53	ACCMA	Berkeley	1018	19	4	Alameda	Berkeley
54	ACCMA	Berkeley	1018	19	4	Alameda	Berkeley
55	ACCMA	Berkeley	1018	19	4	Alameda	Berkeley
56	ACCMA	Berkeley	1018	19	4	Alameda	Berkeley
57	ACCMA	Berkeley	1018	19	4	Alameda	Berkeley
58	ACCMA	Berkeley	1018	19	4	Alameda	Berkeley
59	ACCMA	Berkeley	1018	19	4	Alameda	Berkeley
60	ACCMA	Berkeley	1017	19	4	Alameda	Berkeley
61	ACCMA	Berkeley	1017	19	4	Alameda	Berkeley

ACCMA_TAZ	SUBREGION	JURISDICTION	MTC_TAZ	SDISTRICT	COUNTY	COUNTY_LABEL	CDP
62	ACCMA	Berkeley	1017	19	4	Alameda	Berkeley
63	ACCMA	Berkeley	1017	19	4	Alameda	Berkeley
64	ACCMA	Berkeley	1016	19	4	Alameda	Berkeley
65	ACCMA	Berkeley	1016	19	4	Alameda	Berkeley
66	ACCMA	Berkeley	1016	19	4	Alameda	Berkeley
67	ACCMA	Berkeley	1016	19	4	Alameda	Berkeley
68	ACCMA	Berkeley	1015	19	4	Alameda	Berkeley
69	ACCMA	Berkeley	1015	19	4	Alameda	Berkeley
70	ACCMA	Berkeley	1014	19	4	Alameda	Berkeley
71	ACCMA	Berkeley	1014	19	4	Alameda	Berkeley
72	ACCMA	Berkeley	1014	19	4	Alameda	Berkeley
73	ACCMA	Berkeley	1014	19	4	Alameda	Berkeley
74	ACCMA	Berkeley	1014	19	4	Alameda	Berkeley
75	ACCMA	Berkeley	1014	19	4	Alameda	Berkeley
76	ACCMA	Berkeley	1014	19	4	Alameda	Berkeley
77	ACCMA	Berkeley	1014	19	4	Alameda	Berkeley
78	ACCMA	Berkeley	1014	19	4	Alameda	Berkeley
79	ACCMA	Berkeley	1014	19	4	Alameda	Berkeley
80	ACCMA	Berkeley	1014	19	4	Alameda	Berkeley
81	ACCMA	Berkeley	1014	19	4	Alameda	Berkeley
82	ACCMA	Berkeley	1014	19	4	Alameda	Berkeley
83	ACCMA	Berkeley	1014	19	4	Alameda	Berkeley
84	ACCMA	Berkeley	1014	19	4	Alameda	Berkeley
85	ACCMA	Berkeley	1013	19	4	Alameda	Berkeley
86	ACCMA	Berkeley	1013	19	4	Alameda	Berkeley
87	ACCMA	Berkeley	1013	19	4	Alameda	Berkeley
88	ACCMA	Berkeley	1012	19	4	Alameda	Berkeley
89	ACCMA	Berkeley	1012	19	4	Alameda	Berkeley
90	ACCMA	Berkeley	1012	19	4	Alameda	Berkeley
91	ACCMA	Berkeley	1011	19	4	Alameda	Berkeley
92	ACCMA	Berkeley	1011	19	4	Alameda	Berkeley
93	ACCMA	Berkeley	1011	19	4	Alameda	Berkeley
94	ACCMA	Berkeley	1010	19	4	Alameda	Berkeley
95	ACCMA	Berkeley	1010	19	4	Alameda	Berkeley
96	ACCMA	Berkeley	1010	19	4	Alameda	Berkeley
97	ACCMA	Berkeley	1009	19	4	Alameda	Berkeley
98	ACCMA	Berkeley	1009	19	4	Alameda	Berkeley
99	ACCMA	Berkeley	1008	19	4	Alameda	Berkeley
100	ACCMA	Berkeley	1008	19	4	Alameda	Berkeley
101	ACCMA	Berkeley	1008	19	4	Alameda	Berkeley
102	ACCMA	Berkeley	1008	19	4	Alameda	Berkeley
103	ACCMA	Berkeley	1008	19	4	Alameda	Berkeley
104	ACCMA	Berkeley	1007	19	4	Alameda	Berkeley
105	ACCMA	Berkeley	1006	19	4	Alameda	Berkeley
106	ACCMA	Berkeley	1006	19	4	Alameda	Berkeley
107	ACCMA	Berkeley	1006	19	4	Alameda	Berkeley
108	ACCMA	Berkeley	1004	19	4	Alameda	Berkeley
109	ACCMA	Berkeley	1004	19	4	Alameda	Berkeley
110	ACCMA	Berkeley	1003	19	4	Alameda	Berkeley
111	ACCMA	Berkeley	1002	19	4	Alameda	Berkeley
112	ACCMA	Berkeley	1002	19	4	Alameda	Oakland
113	ACCMA	Berkeley	995	19	4	Alameda	Berkeley
114	ACCMA	Berkeley	994	19	4	Alameda	Berkeley
115	ACCMA	Emeryville	991	19	4	Alameda	Emeryville
116	ACCMA	Emeryville	991	19	4	Alameda	Berkeley
117	ACCMA	Emeryville	991	19	4	Alameda	Emeryville
118	ACCMA	Emeryville	991	19	4	Alameda	Emeryville
119	ACCMA	Emeryville	991	19	4	Alameda	Emeryville
120	ACCMA	Emeryville	991	19	4	Alameda	Emeryville
121	ACCMA	Emeryville	991	19	4	Alameda	Emeryville
122	ACCMA	Emeryville	991	19	4	Alameda	Emeryville

ACCMA_TAZ	SUBREGION	JURISDICTION	MTC_TAZ	SDISTRICT	COUNTY	COUNTY_LABEL	CDP
123	ACCMA	Emeryville	991	19	4	Alameda	Emeryville
124	ACCMA	Emeryville	991	19	4	Alameda	Emeryville
125	ACCMA	Emeryville	991	19	4	Alameda	Emeryville
126	ACCMA	Emeryville	991	19	4	Alameda	Emeryville
127	ACCMA	Oakland	1005	19	4	Alameda	Oakland
128	ACCMA	Oakland	1001	19	4	Alameda	Oakland
129	ACCMA	Oakland	1001	19	4	Alameda	Oakland
130	ACCMA	Oakland	1001	19	4	Alameda	Oakland
131	ACCMA	Oakland	1000	19	4	Alameda	Oakland
132	ACCMA	Oakland	1000	19	4	Alameda	Oakland
133	ACCMA	Oakland	1000	19	4	Alameda	Oakland
134	ACCMA	Oakland	999	19	4	Alameda	Oakland
135	ACCMA	Oakland	999	19	4	Alameda	Oakland
136	ACCMA	Oakland	999	19	4	Alameda	Oakland
137	ACCMA	Oakland	998	19	4	Alameda	Oakland
138	ACCMA	Oakland	998	19	4	Alameda	Oakland
139	ACCMA	Oakland	998	19	4	Alameda	Oakland
140	ACCMA	Oakland	998	19	4	Alameda	Oakland
141	ACCMA	Oakland	997	19	4	Alameda	Oakland
142	ACCMA	Oakland	997	19	4	Alameda	Oakland
143	ACCMA	Oakland	996	19	4	Alameda	Oakland
144	ACCMA	Oakland	996	19	4	Alameda	Oakland
145	ACCMA	Oakland	993	19	4	Alameda	Oakland
146	ACCMA	Oakland	993	19	4	Alameda	Oakland
147	ACCMA	Oakland	993	19	4	Alameda	Oakland
148	ACCMA	Oakland	993	19	4	Alameda	Oakland
149	ACCMA	Oakland	992	19	4	Alameda	Oakland
150	ACCMA	Oakland	992	19	4	Alameda	Oakland
151	ACCMA	Oakland	990	18	4	Alameda	Oakland
152	ACCMA	Oakland	990	18	4	Alameda	Oakland
153	ACCMA	Oakland	989	18	4	Alameda	Oakland
154	ACCMA	Oakland	989	18	4	Alameda	Oakland
155	ACCMA	Oakland	988	18	4	Alameda	Oakland
156	ACCMA	Oakland	988	18	4	Alameda	Oakland
157	ACCMA	Oakland	988	18	4	Alameda	Oakland
158	ACCMA	Oakland	988	18	4	Alameda	Oakland
159	ACCMA	Oakland	988	18	4	Alameda	Oakland
160	ACCMA	Oakland	988	18	4	Alameda	Oakland
161	ACCMA	Oakland	988	18	4	Alameda	Oakland
162	ACCMA	Oakland	988	18	4	Alameda	Oakland
163	ACCMA	Oakland	988	18	4	Alameda	Oakland
164	ACCMA	Oakland	988	18	4	Alameda	Oakland
165	ACCMA	Oakland	988	18	4	Alameda	Oakland
166	ACCMA	Oakland	988	18	4	Alameda	Oakland
167	ACCMA	Oakland	988	18	4	Alameda	Oakland
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172	ACCMA	Oakland	988	18	4	Alameda	Oakland
173	ACCMA	Oakland	988	18	4	Alameda	Oakland
174	ACCMA	Oakland	987	18	4	Alameda	Oakland
175	ACCMA	Oakland	986	18	4	Alameda	Oakland
176	ACCMA	Oakland	986	18	4	Alameda	Oakland
177	ACCMA	Oakland	985	18	4	Alameda	Oakland
178	ACCMA	Oakland	984	18	4	Alameda	Oakland
179	ACCMA	Oakland	983	18	4	Alameda	Oakland
180	ACCMA	Oakland	982	18	4	Alameda	Oakland
181	ACCMA	Oakland	981	18	4	Alameda	Oakland
182	ACCMA	Oakland	981	18	4	Alameda	Oakland
183	ACCMA	Oakland	980	18	4	Alameda	Oakland

ACCMA_TAZ	SUBREGION	JURISDICTION	MTC_TAZ	SDISTRICT	COUNTY	COUNTY_LABEL	CDP
184	ACCMA	Oakland	980	18	4	Alameda	Oakland
185	ACCMA	Oakland	979	18	4	Alameda	Oakland
186	ACCMA	Oakland	979	18	4	Alameda	Oakland
187	ACCMA	Oakland	979	18	4	Alameda	Oakland
188	ACCMA	Oakland	979	18	4	Alameda	Oakland
189	ACCMA	Oakland	979	18	4	Alameda	Oakland
190	ACCMA	Oakland	979	18	4	Alameda	Oakland
191	ACCMA	Oakland	978	18	4	Alameda	Oakland
192	ACCMA	Oakland	978	18	4	Alameda	Oakland
193	ACCMA	Oakland	978	18	4	Alameda	Oakland
194	ACCMA	Oakland	977	18	4	Alameda	Oakland
195	ACCMA	Oakland	977	18	4	Alameda	Oakland
196	ACCMA	Oakland	977	18	4	Alameda	Oakland
197	ACCMA	Oakland	977	18	4	Alameda	Oakland
198	ACCMA	Oakland	976	18	4	Alameda	Oakland
199	ACCMA	Oakland	976	18	4	Alameda	Oakland
200	ACCMA	Oakland	976	18	4	Alameda	Oakland
201	ACCMA	Oakland	976	18	4	Alameda	Oakland
202	ACCMA	Oakland	976	18	4	Alameda	Oakland
203	ACCMA	Oakland	976	18	4	Alameda	Oakland
204	ACCMA	Oakland	976	18	4	Alameda	Oakland
205	ACCMA	Oakland	976	18	4	Alameda	Oakland
206	ACCMA	Oakland	975	18	4	Alameda	Oakland
207	ACCMA	Oakland	975	18	4	Alameda	Oakland
208	ACCMA	Oakland	975	18	4	Alameda	Oakland
209	ACCMA	Oakland	974	18	4	Alameda	Oakland
210	ACCMA	Oakland	974	18	4	Alameda	Oakland
211	ACCMA	Oakland	974	18	4	Alameda	Oakland
212	ACCMA	Oakland	973	18	4	Alameda	Oakland
213	ACCMA	Oakland	973	18	4	Alameda	Oakland
214	ACCMA	Oakland	972	18	4	Alameda	Oakland
215	ACCMA	Oakland	972	18	4	Alameda	Oakland
216	ACCMA	Oakland	972	18	4	Alameda	Oakland
217	ACCMA	Oakland	972	18	4	Alameda	Oakland
218	ACCMA	Oakland	972	18	4	Alameda	Oakland
219	ACCMA	Oakland	971	18	4	Alameda	Oakland
220	ACCMA	Oakland	971	18	4	Alameda	Oakland
221	ACCMA	Oakland	971	18	4	Alameda	Oakland
222	ACCMA	Oakland	971	18	4	Alameda	Oakland
223	ACCMA	Oakland	971	18	4	Alameda	Oakland
224	ACCMA	Oakland	971	18	4	Alameda	Oakland
225	ACCMA	Oakland	970	18	4	Alameda	Oakland
226	ACCMA	Oakland	970	18	4	Alameda	Oakland
227	ACCMA	Oakland	970	18	4	Alameda	Oakland
228	ACCMA	Oakland	970	18	4	Alameda	Oakland
229	ACCMA	Oakland	970	18	4	Alameda	Oakland
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231	ACCMA	Oakland	970	18	4	Alameda	Oakland
232	ACCMA	Oakland	969	18	4	Alameda	Oakland
233	ACCMA	Oakland	969	18	4	Alameda	Oakland
234	ACCMA	Oakland	969	18	4	Alameda	Oakland
235	ACCMA	Oakland	969	18	4	Alameda	Oakland
236	ACCMA	Oakland	969	18	4	Alameda	Oakland
237	ACCMA	Oakland	969	18	4	Alameda	Oakland
238	ACCMA	Oakland	968	18	4	Alameda	Oakland
239	ACCMA	Oakland	968	18	4	Alameda	Oakland
240	ACCMA	Oakland	968	18	4	Alameda	Oakland
241	ACCMA	Oakland	968	18	4	Alameda	Oakland
242	ACCMA	Oakland	968	18	4	Alameda	Oakland
243	ACCMA	Oakland	968	18	4	Alameda	Oakland
244	ACCMA	Oakland	967	18	4	Alameda	Oakland

ACCMA_TAZ	SUBREGION	JURISDICTION	MTC_TAZ	SDISTRICT	COUNTY	COUNTY_LABEL	CDP
245	ACCMA	Oakland	967	18	4	Alameda	Oakland
246	ACCMA	Oakland	967	18	4	Alameda	Oakland
247	ACCMA	Oakland	967	18	4	Alameda	Oakland
248	ACCMA	Oakland	967	18	4	Alameda	Oakland
249	ACCMA	Oakland	967	18	4	Alameda	Oakland
250	ACCMA	Oakland	966	18	4	Alameda	Oakland
251	ACCMA	Oakland	966	18	4	Alameda	Oakland
252	ACCMA	Oakland	966	18	4	Alameda	Oakland
253	ACCMA	Oakland	966	18	4	Alameda	Oakland
254	ACCMA	Oakland	966	18	4	Alameda	Oakland
255	ACCMA	Oakland	965	18	4	Alameda	Oakland
256	ACCMA	Oakland	965	18	4	Alameda	Oakland
257	ACCMA	Oakland	965	18	4	Alameda	Oakland
258	ACCMA	Oakland	965	18	4	Alameda	Oakland
259	ACCMA	Oakland	965	18	4	Alameda	Oakland
260	ACCMA	Oakland	965	18	4	Alameda	Oakland
261	ACCMA	Oakland	947	18	4	Alameda	Oakland
262	ACCMA	Oakland	947	18	4	Alameda	Oakland
263	ACCMA	Oakland	947	18	4	Alameda	Oakland
264	ACCMA	Oakland	947	18	4	Alameda	Oakland
265	ACCMA	Oakland	947	18	4	Alameda	Oakland
266	ACCMA	Oakland	947	18	4	Alameda	Oakland
267	ACCMA	Oakland	947	18	4	Alameda	Oakland
268	ACCMA	Oakland	947	18	4	Alameda	Oakland
269	ACCMA	Oakland	947	18	4	Alameda	Oakland
270	ACCMA	Oakland	946	18	4	Alameda	Oakland
271	ACCMA	Oakland	946	18	4	Alameda	Oakland
272	ACCMA	Oakland	946	18	4	Alameda	Oakland
273	ACCMA	Oakland	946	18	4	Alameda	Oakland
274	ACCMA	Oakland	946	18	4	Alameda	Oakland
275	ACCMA	Oakland	946	18	4	Alameda	Oakland
276	ACCMA	Oakland	946	18	4	Alameda	Oakland
277	ACCMA	Oakland	946	18	4	Alameda	Oakland
278	ACCMA	Oakland	945	18	4	Alameda	Oakland
279	ACCMA	Oakland	945	18	4	Alameda	Oakland
280	ACCMA	Oakland	945	18	4	Alameda	Oakland
281	ACCMA	Oakland	944	18	4	Alameda	Oakland
282	ACCMA	Oakland	944	18	4	Alameda	Oakland
283	ACCMA	Oakland	943	18	4	Alameda	Oakland
284	ACCMA	Oakland	943	18	4	Alameda	Oakland
285	ACCMA	Oakland	943	18	4	Alameda	Oakland
286	ACCMA	Oakland	942	18	4	Alameda	Oakland
287	ACCMA	Oakland	942	18	4	Alameda	Oakland
288	ACCMA	Oakland	941	18	4	Alameda	Oakland
289	ACCMA	Oakland	940	18	4	Alameda	Oakland
290	ACCMA	Oakland	939	18	4	Alameda	Oakland
291	ACCMA	Oakland	938	18	4	Alameda	Oakland
292	ACCMA	Oakland	937	18	4	Alameda	Oakland
293	ACCMA	Oakland	936	18	4	Alameda	Oakland
294	ACCMA	Oakland	935	18	4	Alameda	Oakland
295	ACCMA	Oakland	935	18	4	Alameda	Oakland
296	ACCMA	Oakland	934	18	4	Alameda	Oakland
297	ACCMA	Oakland	934	18	4	Alameda	Oakland
298	ACCMA	Oakland	934	18	4	Alameda	Oakland
299	ACCMA	Oakland	934	18	4	Alameda	Oakland
300	ACCMA	Oakland	933	18	4	Alameda	Oakland
301	ACCMA	Oakland	933	18	4	Alameda	Oakland
302	ACCMA	Oakland	933	18	4	Alameda	Oakland
303	ACCMA	Oakland	933	18	4	Alameda	Oakland
304	ACCMA	Oakland	933	18	4	Alameda	Oakland
305	ACCMA	Oakland	932	18	4	Alameda	Oakland

ACCMA_TAZ	SUBREGION	JURISDICTION	MTC_TAZ	SDISTRICT	COUNTY	COUNTY_LABEL	CDP
306	ACCMA	Oakland	932	18	4	Alameda	Oakland
307	ACCMA	Oakland	931	18	4	Alameda	Oakland
308	ACCMA	Oakland	931	18	4	Alameda	Oakland
309	ACCMA	Oakland	930	18	4	Alameda	Oakland
310	ACCMA	Oakland	929	18	4	Alameda	Oakland
311	ACCMA	Oakland	928	18	4	Alameda	Oakland
312	ACCMA	Oakland	928	18	4	Alameda	Oakland
313	ACCMA	Oakland	927	18	4	Alameda	Oakland
314	ACCMA	Oakland	927	18	4	Alameda	Oakland
315	ACCMA	Oakland	926	18	4	Alameda	Oakland
316	ACCMA	Oakland	926	18	4	Alameda	Oakland
317	ACCMA	Oakland	926	18	4	Alameda	Oakland
318	ACCMA	Oakland	926	18	4	Alameda	Oakland
319	ACCMA	Oakland	926	18	4	Alameda	Oakland
320	ACCMA	Oakland	926	18	4	Alameda	Oakland
321	ACCMA	Oakland	925	18	4	Alameda	Oakland
322	ACCMA	Oakland	925	18	4	Alameda	Oakland
323	ACCMA	Oakland	924	18	4	Alameda	Oakland
324	ACCMA	Oakland	924	18	4	Alameda	Oakland
325	ACCMA	Oakland	923	18	4	Alameda	Oakland
326	ACCMA	Oakland	923	18	4	Alameda	Oakland
327	ACCMA	Oakland	922	18	4	Alameda	Oakland
328	ACCMA	Oakland	922	18	4	Alameda	Oakland
329	ACCMA	Oakland	921	18	4	Alameda	Oakland
330	ACCMA	Oakland	920	18	4	Alameda	Oakland
331	ACCMA	Oakland	919	18	4	Alameda	Oakland
332	ACCMA	Oakland	916	18	4	Alameda	Oakland
333	ACCMA	Oakland	916	18	4	Alameda	Oakland
334	ACCMA	Oakland	915	18	4	Alameda	Oakland
335	ACCMA	Oakland	915	18	4	Alameda	Oakland
336	ACCMA	Oakland	915	18	4	Alameda	Oakland
337	ACCMA	Oakland	914	18	4	Alameda	Oakland
338	ACCMA	Oakland	913	18	4	Alameda	Oakland
339	ACCMA	Oakland	913	18	4	Alameda	Oakland
340	ACCMA	Oakland	912	18	4	Alameda	Oakland
341	ACCMA	Oakland	912	18	4	Alameda	Oakland
342	ACCMA	Oakland	911	18	4	Alameda	Oakland
343	ACCMA	Oakland	910	18	4	Alameda	Oakland
344	ACCMA	Oakland	910	18	4	Alameda	Oakland
345	ACCMA	Oakland	909	18	4	Alameda	Oakland
346	ACCMA	Oakland	909	18	4	Alameda	Oakland
347	ACCMA	Oakland	908	18	4	Alameda	Oakland
348	ACCMA	Oakland	907	18	4	Alameda	Oakland
349	ACCMA	Oakland	906	18	4	Alameda	Oakland
350	ACCMA	Oakland	906	18	4	Alameda	Oakland
351	ACCMA	Oakland	905	18	4	Alameda	Oakland
352	ACCMA	Oakland	905	18	4	Alameda	Oakland
353	ACCMA	Oakland	905	18	4	Alameda	Oakland
354	ACCMA	Oakland	904	18	4	Alameda	Oakland
355	ACCMA	Oakland	904	18	4	Alameda	Oakland
356	ACCMA	Oakland	904	18	4	Alameda	Oakland
357	ACCMA	Oakland	903	18	4	Alameda	Oakland
358	ACCMA	Oakland	903	18	4	Alameda	Oakland
359	ACCMA	Oakland	903	18	4	Alameda	Oakland
360	ACCMA	Oakland	902	18	4	Alameda	Oakland
361	ACCMA	Oakland	902	18	4	Alameda	Oakland
362	ACCMA	Oakland	901	18	4	Alameda	Oakland
363	ACCMA	Oakland	901	18	4	Alameda	Oakland
364	ACCMA	Oakland	900	18	4	Alameda	Oakland
365	ACCMA	Oakland	900	18	4	Alameda	Oakland
366	ACCMA	Oakland	900	18	4	Alameda	Oakland

ACCMA_TAZ	SUBREGION	JURISDICTION	MTC_TAZ	SDISTRICT	COUNTY	COUNTY_LABEL	CDP
367	ACCMA	Oakland	900	18	4	Alameda	Oakland
368	ACCMA	Oakland	900	18	4	Alameda	Oakland
369	ACCMA	Oakland	899	18	4	Alameda	Oakland
370	ACCMA	Oakland	899	18	4	Alameda	Oakland
371	ACCMA	Oakland	899	18	4	Alameda	Oakland
372	ACCMA	Oakland	899	18	4	Alameda	Oakland
373	ACCMA	Oakland	898	18	4	Alameda	Oakland
374	ACCMA	Oakland	898	18	4	Alameda	Oakland
375	ACCMA	Oakland	898	18	4	Alameda	Oakland
376	ACCMA	Oakland	897	18	4	Alameda	Oakland
377	ACCMA	Oakland	897	18	4	Alameda	Oakland
378	ACCMA	Oakland	896	18	4	Alameda	Oakland
379	ACCMA	Oakland	896	18	4	Alameda	Oakland
380	ACCMA	Oakland	896	18	4	Alameda	Oakland
381	ACCMA	Oakland	896	18	4	Alameda	Oakland
382	ACCMA	Oakland	896	18	4	Alameda	Oakland
383	ACCMA	Oakland	895	18	4	Alameda	Oakland
384	ACCMA	Oakland	895	18	4	Alameda	Oakland
385	ACCMA	Oakland	895	18	4	Alameda	Oakland
386	ACCMA	Oakland	895	18	4	Alameda	Oakland
387	ACCMA	Oakland	894	18	4	Alameda	Oakland
388	ACCMA	Oakland	894	18	4	Alameda	Oakland
389	ACCMA	Oakland	894	18	4	Alameda	Oakland
390	ACCMA	Oakland	893	18	4	Alameda	Oakland
391	ACCMA	Oakland	893	18	4	Alameda	Oakland
392	ACCMA	Oakland	893	18	4	Alameda	Oakland
393	ACCMA	Oakland	892	18	4	Alameda	Oakland
394	ACCMA	Oakland	892	18	4	Alameda	Oakland
395	ACCMA	Oakland	892	18	4	Alameda	Oakland
396	ACCMA	Oakland	891	18	4	Alameda	Oakland
397	ACCMA	Oakland	891	18	4	Alameda	Oakland
398	ACCMA	Oakland	891	18	4	Alameda	Oakland
399	ACCMA	Oakland	891	18	4	Alameda	Oakland
400	ACCMA	Oakland	890	18	4	Alameda	Oakland
401	ACCMA	Oakland	890	18	4	Alameda	Oakland
402	ACCMA	Oakland	890	18	4	Alameda	Oakland
403	ACCMA	Oakland	890	18	4	Alameda	Oakland
404	ACCMA	Oakland	889	18	4	Alameda	Oakland
405	ACCMA	Oakland	889	18	4	Alameda	Oakland
406	ACCMA	Oakland	888	18	4	Alameda	Oakland
407	ACCMA	Oakland	888	18	4	Alameda	Oakland
408	ACCMA	Oakland	888	18	4	Alameda	Oakland
409	ACCMA	Oakland	888	18	4	Alameda	Oakland
410	ACCMA	Oakland	887	18	4	Alameda	Oakland
411	ACCMA	Oakland	887	18	4	Alameda	Oakland
412	ACCMA	Oakland	886	18	4	Alameda	Oakland
413	ACCMA	Oakland	886	18	4	Alameda	Oakland
414	ACCMA	Oakland	886	18	4	Alameda	Oakland
415	ACCMA	Oakland	885	18	4	Alameda	Oakland
416	ACCMA	Oakland	885	18	4	Alameda	Oakland
417	ACCMA	Oakland	885	18	4	Alameda	Oakland
418	ACCMA	Oakland	884	18	4	Alameda	Oakland
419	ACCMA	Oakland	884	18	4	Alameda	Oakland
420	ACCMA	Oakland	883	18	4	Alameda	Oakland
421	ACCMA	Oakland	883	18	4	Alameda	Oakland
422	ACCMA	Oakland	883	18	4	Alameda	Oakland
423	ACCMA	Oakland	883	18	4	Alameda	Oakland
424	ACCMA	Oakland	882	18	4	Alameda	Oakland
425	ACCMA	Oakland	882	18	4	Alameda	Oakland
426	ACCMA	Oakland	882	18	4	Alameda	Oakland
427	ACCMA	Oakland	881	18	4	Alameda	Oakland

ACCMA_TAZ	SUBREGION	JURISDICTION	MTC_TAZ	SDISTRICT	COUNTY	COUNTY_LABEL	CDP
428	ACCMA	Oakland	881	18	4	Alameda	Oakland
429	ACCMA	Oakland	881	18	4	Alameda	Oakland
430	ACCMA	Oakland	880	18	4	Alameda	Oakland
431	ACCMA	Oakland	880	18	4	Alameda	Oakland
432	ACCMA	Oakland	880	18	4	Alameda	Oakland
433	ACCMA	Oakland	880	18	4	Alameda	Oakland
434	ACCMA	Oakland	879	18	4	Alameda	Oakland
435	ACCMA	Oakland	879	18	4	Alameda	Oakland
436	ACCMA	Oakland	879	18	4	Alameda	Oakland
437	ACCMA	Oakland	878	18	4	Alameda	Oakland
438	ACCMA	Oakland	878	18	4	Alameda	Oakland
439	ACCMA	Oakland	878	18	4	Alameda	Oakland
440	ACCMA	Oakland	878	18	4	Alameda	Oakland
441	ACCMA	Oakland	877	18	4	Alameda	Oakland
442	ACCMA	Oakland	876	18	4	Alameda	Oakland
443	ACCMA	Oakland	875	18	4	Alameda	Oakland
444	ACCMA	Oakland	875	18	4	Alameda	Oakland
445	ACCMA	Oakland	875	18	4	Alameda	Oakland
446	ACCMA	Oakland	875	18	4	Alameda	Oakland
447	ACCMA	Oakland	875	18	4	Alameda	Oakland
448	ACCMA	Oakland	875	18	4	Alameda	Oakland
449	ACCMA	Oakland	875	18	4	Alameda	Oakland
450	ACCMA	Oakland	875	18	4	Alameda	Oakland
451	ACCMA	Oakland	875	18	4	Alameda	Oakland
452	ACCMA	Oakland	875	18	4	Alameda	Oakland
453	ACCMA	Oakland	874	18	4	Alameda	Oakland
454	ACCMA	Oakland	874	18	4	Alameda	Oakland
455	ACCMA	Piedmont	918	18	4	Alameda	Piedmont
456	ACCMA	Piedmont	918	18	4	Alameda	Piedmont
457	ACCMA	Piedmont	918	18	4	Alameda	Piedmont
458	ACCMA	Piedmont	917	18	4	Alameda	Piedmont
459	ACCMA	Piedmont	917	18	4	Alameda	Piedmont
460	ACCMA	Piedmont	917	18	4	Alameda	Piedmont
461	ACCMA	Alameda	964	18	4	Alameda	Alameda
462	ACCMA	Alameda	964	18	4	Alameda	Alameda
463	ACCMA	Alameda	964	18	4	Alameda	Alameda
464	ACCMA	Alameda	964	18	4	Alameda	Alameda
465	ACCMA	Alameda	964	18	4	Alameda	Alameda
466	ACCMA	Alameda	964	18	4	Alameda	Alameda
467	ACCMA	Alameda	964	18	4	Alameda	Alameda
468	ACCMA	Alameda	964	18	4	Alameda	Alameda
469	ACCMA	Alameda	964	18	4	Alameda	Alameda
470	ACCMA	Alameda	964	18	4	Alameda	Alameda
471	ACCMA	Alameda	964	18	4	Alameda	Alameda
472	ACCMA	Alameda	964	18	4	Alameda	Alameda
473	ACCMA	Alameda	964	18	4	Alameda	Alameda
474	ACCMA	Alameda	964	18	4	Alameda	Alameda
475	ACCMA	Alameda	964	18	4	Alameda	Alameda
476	ACCMA	Alameda	963	18	4	Alameda	Alameda
477	ACCMA	Alameda	963	18	4	Alameda	Alameda
478	ACCMA	Alameda	963	18	4	Alameda	Alameda
479	ACCMA	Alameda	962	18	4	Alameda	Alameda
480	ACCMA	Alameda	962	18	4	Alameda	Alameda
481	ACCMA	Alameda	961	18	4	Alameda	Alameda
482	ACCMA	Alameda	961	18	4	Alameda	Alameda
483	ACCMA	Alameda	961	18	4	Alameda	Alameda
484	ACCMA	Alameda	961	18	4	Alameda	Alameda
485	ACCMA	Alameda	961	18	4	Alameda	Alameda
486	ACCMA	Alameda	960	18	4	Alameda	Alameda
487	ACCMA	Alameda	960	18	4	Alameda	Alameda
488	ACCMA	Alameda	960	18	4	Alameda	Alameda

ACCMA_TAZ	SUBREGION	JURISDICTION	MTC_TAZ	SDISTRICT	COUNTY	COUNTY_LABEL	CDP
489	ACCMA	Alameda	960	18	4	Alameda	Alameda
490	ACCMA	Alameda	960	18	4	Alameda	Alameda
491	ACCMA	Alameda	960	18	4	Alameda	Alameda
492	ACCMA	Alameda	960	18	4	Alameda	Alameda
493	ACCMA	Alameda	960	18	4	Alameda	Alameda
494	ACCMA	Alameda	960	18	4	Alameda	Alameda
495	ACCMA	Alameda	960	18	4	Alameda	Alameda
496	ACCMA	Alameda	960	18	4	Alameda	Alameda
497	ACCMA	Alameda	960	18	4	Alameda	Alameda
498	ACCMA	Alameda	959	18	4	Alameda	Alameda
499	ACCMA	Alameda	959	18	4	Alameda	Alameda
500	ACCMA	Alameda	959	18	4	Alameda	Alameda
501	ACCMA	Alameda	958	18	4	Alameda	Alameda
502	ACCMA	Alameda	958	18	4	Alameda	Alameda
503	ACCMA	Alameda	958	18	4	Alameda	Alameda
504	ACCMA	Alameda	957	18	4	Alameda	Alameda
505	ACCMA	Alameda	957	18	4	Alameda	Alameda
506	ACCMA	Alameda	956	18	4	Alameda	Alameda
507	ACCMA	Alameda	956	18	4	Alameda	Alameda
508	ACCMA	Alameda	956	18	4	Alameda	Alameda
509	ACCMA	Alameda	955	18	4	Alameda	Alameda
510	ACCMA	Alameda	955	18	4	Alameda	Alameda
511	ACCMA	Alameda	954	18	4	Alameda	Alameda
512	ACCMA	Alameda	954	18	4	Alameda	Alameda
513	ACCMA	Alameda	953	18	4	Alameda	Alameda
514	ACCMA	Alameda	952	18	4	Alameda	Alameda
515	ACCMA	Alameda	952	18	4	Alameda	Alameda
516	ACCMA	Alameda	952	18	4	Alameda	Alameda
517	ACCMA	Alameda	951	18	4	Alameda	Alameda
518	ACCMA	Alameda	951	18	4	Alameda	Alameda
519	ACCMA	Alameda	951	18	4	Alameda	Alameda
520	ACCMA	Alameda	951	18	4	Alameda	Alameda
521	ACCMA	Alameda	950	18	4	Alameda	Alameda
522	ACCMA	Alameda	950	18	4	Alameda	Alameda
523	ACCMA	Alameda	950	18	4	Alameda	Alameda
524	ACCMA	Alameda	949	18	4	Alameda	Alameda
525	ACCMA	Alameda	949	18	4	Alameda	Alameda
526	ACCMA	Alameda	949	18	4	Alameda	Alameda
527	ACCMA	Alameda	948	18	4	Alameda	Alameda
528	ACCMA	Alameda	948	18	4	Alameda	Alameda
529	ACCMA	Alameda	948	18	4	Alameda	Alameda
530	ACCMA	Alameda	948	18	4	Alameda	Alameda
531	ACCMA	San Leandro	858	17	4	Alameda	San Leandro
532	ACCMA	San Leandro	858	17	4	Alameda	San Leandro
533	ACCMA	San Leandro	859	17	4	Alameda	San Leandro
534	ACCMA	San Leandro	859	17	4	Alameda	San Leandro
535	ACCMA	San Leandro	860	17	4	Alameda	San Leandro
536	ACCMA	San Leandro	860	17	4	Alameda	San Leandro
537	ACCMA	San Leandro	860	17	4	Alameda	San Leandro
538	ACCMA	San Leandro	861	17	4	Alameda	San Leandro
539	ACCMA	San Leandro	861	17	4	Alameda	San Leandro
540	ACCMA	San Leandro	861	17	4	Alameda	San Leandro
541	ACCMA	San Leandro	861	17	4	Alameda	San Leandro
542	ACCMA	San Leandro	862	17	4	Alameda	San Leandro
543	ACCMA	San Leandro	862	17	4	Alameda	San Leandro
544	ACCMA	San Leandro	862	17	4	Alameda	San Leandro
545	ACCMA	San Leandro	862	17	4	Alameda	San Leandro
546	ACCMA	San Leandro	863	17	4	Alameda	San Leandro
547	ACCMA	San Leandro	863	17	4	Alameda	San Leandro
548	ACCMA	San Leandro	863	17	4	Alameda	San Leandro
549	ACCMA	San Leandro	864	17	4	Alameda	San Leandro

ACCMA_TAZ	SUBREGION	JURISDICTION	MTC_TAZ	SDISTRICT	COUNTY	COUNTY_LABEL	CDP
550	ACCMA	San Leandro	864	17	4	Alameda	San Leandro
551	ACCMA	San Leandro	864	17	4	Alameda	San Leandro
552	ACCMA	San Leandro	864	17	4	Alameda	San Leandro
553	ACCMA	San Leandro	864	17	4	Alameda	San Leandro
554	ACCMA	San Leandro	864	17	4	Alameda	San Leandro
555	ACCMA	San Leandro	865	17	4	Alameda	San Leandro
556	ACCMA	San Leandro	865	17	4	Alameda	San Leandro
557	ACCMA	San Leandro	865	17	4	Alameda	San Leandro
558	ACCMA	San Leandro	865	17	4	Alameda	San Leandro
559	ACCMA	San Leandro	865	17	4	Alameda	San Leandro
560	ACCMA	San Leandro	866	17	4	Alameda	San Leandro
561	ACCMA	San Leandro	867	17	4	Alameda	San Leandro
562	ACCMA	San Leandro	867	17	4	Alameda	San Leandro
563	ACCMA	San Leandro	867	17	4	Alameda	San Leandro
564	ACCMA	San Leandro	868	17	4	Alameda	San Leandro
565	ACCMA	San Leandro	868	17	4	Alameda	San Leandro
566	ACCMA	San Leandro	868	17	4	Alameda	San Leandro
567	ACCMA	San Leandro	868	17	4	Alameda	San Leandro
568	ACCMA	San Leandro	869	17	4	Alameda	San Leandro
569	ACCMA	San Leandro	869	17	4	Alameda	San Leandro
570	ACCMA	San Leandro	869	17	4	Alameda	San Leandro
571	ACCMA	San Leandro	869	17	4	Alameda	San Leandro
572	ACCMA	San Leandro	870	17	4	Alameda	San Leandro
573	ACCMA	San Leandro	870	17	4	Alameda	San Leandro
574	ACCMA	San Leandro	870	17	4	Alameda	San Leandro
575	ACCMA	San Leandro	871	17	4	Alameda	San Leandro
576	ACCMA	San Leandro	871	17	4	Alameda	San Leandro
577	ACCMA	San Leandro	871	17	4	Alameda	San Leandro
578	ACCMA	San Leandro	871	17	4	Alameda	San Leandro
579	ACCMA	San Leandro	871	17	4	Alameda	San Leandro
580	ACCMA	San Leandro	871	17	4	Alameda	San Leandro
581	ACCMA	San Leandro	871	17	4	Alameda	San Leandro
582	ACCMA	San Leandro	871	17	4	Alameda	San Leandro
583	ACCMA	San Leandro	871	17	4	Alameda	San Leandro
584	ACCMA	San Leandro	872	17	4	Alameda	San Leandro
585	ACCMA	San Leandro	872	17	4	Alameda	San Leandro
586	ACCMA	San Leandro	872	17	4	Alameda	San Leandro
587	ACCMA	San Leandro	873	17	4	Alameda	San Leandro
588	ACCMA	San Leandro	873	17	4	Alameda	San Leandro
589	ACCMA	San Leandro	873	17	4	Alameda	San Leandro
590	ACCMA	San Leandro	873	17	4	Alameda	San Leandro
591	ACCMA	San Leandro	873	17	4	Alameda	San Leandro
592	ACCMA	San Leandro	873	17	4	Alameda	San Leandro
593	ACCMA	San Leandro	873	17	4	Alameda	San Leandro
594	ACCMA	San Leandro	873	17	4	Alameda	San Leandro
595	ACCMA	San Leandro	873	17	4	Alameda	San Leandro
596	ACCMA	San Leandro	873	17	4	Alameda	San Leandro
597	ACCMA	San Leandro	873	17	4	Alameda	San Leandro
598	ACCMA	San Leandro	873	17	4	Alameda	San Leandro
599	ACCMA	San Leandro	873	17	4	Alameda	San Leandro
600	ACCMA	San Leandro	873	17	4	Alameda	San Leandro
601	ACCMA	San Leandro	873	17	4	Alameda	San Leandro
602	ACCMA	Castro Valley	866	17	4	Alameda	Castro Valley
603	ACCMA	Castro Valley	853	17	4	Alameda	Castro Valley
604	ACCMA	Castro Valley	853	17	4	Alameda	Castro Valley
605	ACCMA	Castro Valley	852	17	4	Alameda	Castro Valley
606	ACCMA	Castro Valley	851	17	4	Alameda	Castro Valley
607	ACCMA	Castro Valley	850	17	4	Alameda	Castro Valley
608	ACCMA	Castro Valley	849	17	4	Alameda	Castro Valley
609	ACCMA	Castro Valley	848	17	4	Alameda	Castro Valley
610	ACCMA	Castro Valley	848	17	4	Alameda	Castro Valley

ACCMA_TAZ	SUBREGION	JURISDICTION	MTC_TAZ	SDISTRICT	COUNTY	COUNTY_LABEL	CDP
611	ACCMA	Castro Valley	847	17	4	Alameda	Castro Valley
612	ACCMA	Castro Valley	847	17	4	Alameda	Castro Valley
613	ACCMA	Castro Valley	847	17	4	Alameda	Castro Valley
614	ACCMA	Castro Valley	847	17	4	Alameda	Castro Valley
615	ACCMA	Castro Valley	846	17	4	Alameda	Castro Valley
616	ACCMA	Castro Valley	845	17	4	Alameda	Castro Valley
617	ACCMA	Castro Valley	844	17	4	Alameda	Castro Valley
618	ACCMA	Castro Valley	844	17	4	Alameda	Castro Valley
619	ACCMA	Castro Valley	842	17	4	Alameda	Castro Valley
620	ACCMA	Castro Valley	842	17	4	Alameda	Castro Valley
621	ACCMA	Castro Valley	840	17	4	Alameda	Castro Valley
622	ACCMA	Castro Valley	840	17	4	Alameda	Castro Valley
623	ACCMA	Castro Valley	840	17	4	Alameda	Castro Valley
624	ACCMA	Castro Valley	840	17	4	Alameda	Castro Valley
625	ACCMA	San Lorenzo	836	17	4	Alameda	San Lorenzo
626	ACCMA	San Lorenzo	835	17	4	Alameda	San Lorenzo
627	ACCMA	San Lorenzo	835	17	4	Alameda	San Lorenzo
628	ACCMA	San Lorenzo	835	17	4	Alameda	San Lorenzo
629	ACCMA	San Lorenzo	834	17	4	Alameda	San Lorenzo
630	ACCMA	San Lorenzo	834	17	4	Alameda	San Lorenzo
631	ACCMA	San Lorenzo	834	17	4	Alameda	San Lorenzo
632	ACCMA	San Lorenzo	833	17	4	Alameda	San Lorenzo
633	ACCMA	San Lorenzo	833	17	4	Alameda	San Lorenzo
634	ACCMA	San Lorenzo	832	17	4	Alameda	San Lorenzo
635	ACCMA	San Lorenzo	832	17	4	Alameda	San Lorenzo
636	ACCMA	San Lorenzo	831	17	4	Alameda	Hayward
637	ACCMA	Ashland	857	17	4	Alameda	Ashland
638	ACCMA	Ashland	857	17	4	Alameda	Ashland
639	ACCMA	Ashland	857	17	4	Alameda	Ashland
640	ACCMA	Ashland	857	17	4	Alameda	Ashland
641	ACCMA	Ashland	856	17	4	Alameda	Ashland
642	ACCMA	Ashland	856	17	4	Alameda	Ashland
643	ACCMA	Ashland	856	17	4	Alameda	Ashland
644	ACCMA	Ashland	856	17	4	Alameda	Ashland
645	ACCMA	Ashland	855	17	4	Alameda	Ashland
646	ACCMA	Ashland	855	17	4	Alameda	Ashland
647	ACCMA	Ashland	855	17	4	Alameda	Ashland
648	ACCMA	Ashland	854	17	4	Alameda	Ashland
649	ACCMA	Ashland	854	17	4	Alameda	Ashland
650	ACCMA	Cherryland	838	17	4	Alameda	Cherryland
651	ACCMA	Cherryland	838	17	4	Alameda	Cherryland
652	ACCMA	Cherryland	837	17	4	Alameda	Cherryland
653	ACCMA	Cherryland	837	17	4	Alameda	Cherryland
654	ACCMA	Cherryland	837	17	4	Alameda	Cherryland
655	ACCMA	Hayward	841	17	4	Alameda	Hayward
656	ACCMA	Hayward	840	17	4	Alameda	Hayward
657	ACCMA	Hayward	839	17	4	Alameda	Hayward
658	ACCMA	Hayward	839	17	4	Alameda	Hayward
659	ACCMA	Hayward	839	17	4	Alameda	Hayward
660	ACCMA	Hayward	839	17	4	Alameda	Hayward
661	ACCMA	Hayward	839	17	4	Alameda	Hayward
662	ACCMA	Hayward	839	17	4	Alameda	Hayward
663	ACCMA	Hayward	839	17	4	Alameda	Hayward
664	ACCMA	Hayward	839	17	4	Alameda	Hayward
665	ACCMA	Hayward	839	17	4	Alameda	Hayward
666	ACCMA	Hayward	839	17	4	Alameda	Hayward
667	ACCMA	Hayward	839	17	4	Alameda	Hayward
668	ACCMA	Hayward	839	17	4	Alameda	Hayward
669	ACCMA	Hayward	839	17	4	Alameda	Hayward
670	ACCMA	Hayward	839	17	4	Alameda	Hayward
671	ACCMA	Hayward	839	17	4	Alameda	Hayward

ACCMA_TAZ	SUBREGION	JURISDICTION	MTC_TAZ	SDISTRICT	COUNTY	COUNTY_LABEL	CDP
672	ACCMA	Hayward	839	17	4	Alameda	Hayward
673	ACCMA	Hayward	839	17	4	Alameda	Hayward
674	ACCMA	Hayward	838	17	4	Alameda	Hayward
675	ACCMA	Hayward	838	17	4	Alameda	Cherryland
676	ACCMA	Hayward	838	17	4	Alameda	Hayward
677	ACCMA	Hayward	836	17	4	Alameda	Hayward
678	ACCMA	Hayward	830	17	4	Alameda	Hayward
679	ACCMA	Hayward	830	17	4	Alameda	Hayward
680	ACCMA	Hayward	829	17	4	Alameda	Hayward
681	ACCMA	Hayward	828	17	4	Alameda	Hayward
682	ACCMA	Hayward	828	17	4	Alameda	Hayward
683	ACCMA	Hayward	828	17	4	Alameda	Cherryland
684	ACCMA	Hayward	828	17	4	Alameda	Hayward
685	ACCMA	Hayward	828	17	4	Alameda	Hayward
686	ACCMA	Hayward	828	17	4	Alameda	Hayward
687	ACCMA	Hayward	828	17	4	Alameda	Hayward
688	ACCMA	Hayward	828	17	4	Alameda	Hayward
689	ACCMA	Hayward	827	17	4	Alameda	Hayward
690	ACCMA	Hayward	826	17	4	Alameda	Hayward
691	ACCMA	Hayward	826	17	4	Alameda	Hayward
692	ACCMA	Hayward	825	17	4	Alameda	Hayward
693	ACCMA	Hayward	825	17	4	Alameda	Hayward
694	ACCMA	Hayward	824	17	4	Alameda	Hayward
695	ACCMA	Hayward	824	17	4	Alameda	Hayward
696	ACCMA	Hayward	824	17	4	Alameda	Hayward
697	ACCMA	Hayward	824	17	4	Alameda	Hayward
698	ACCMA	Hayward	824	17	4	Alameda	Hayward
699	ACCMA	Hayward	824	17	4	Alameda	Hayward
700	ACCMA	Hayward	823	17	4	Alameda	Hayward
701	ACCMA	Hayward	823	17	4	Alameda	Hayward
702	ACCMA	Hayward	823	17	4	Alameda	Fairview
703	ACCMA	Hayward	823	17	4	Alameda	Fairview
704	ACCMA	Hayward	822	17	4	Alameda	Fairview
705	ACCMA	Hayward	821	17	4	Alameda	Hayward
706	ACCMA	Hayward	821	17	4	Alameda	Hayward
707	ACCMA	Hayward	820	17	4	Alameda	Hayward
708	ACCMA	Hayward	820	17	4	Alameda	Hayward
709	ACCMA	Hayward	820	17	4	Alameda	Hayward
710	ACCMA	Hayward	820	17	4	Alameda	Hayward
711	ACCMA	Hayward	820	17	4	Alameda	Hayward
712	ACCMA	Hayward	820	17	4	Alameda	Hayward
713	ACCMA	Hayward	819	17	4	Alameda	Hayward
714	ACCMA	Hayward	819	17	4	Alameda	Hayward
715	ACCMA	Hayward	819	17	4	Alameda	Hayward
716	ACCMA	Hayward	818	17	4	Alameda	Hayward
717	ACCMA	Hayward	818	17	4	Alameda	Hayward
718	ACCMA	Hayward	817	17	4	Alameda	Hayward
719	ACCMA	Hayward	816	17	4	Alameda	Hayward
720	ACCMA	Hayward	816	17	4	Alameda	Hayward
721	ACCMA	Hayward	815	17	4	Alameda	Hayward
722	ACCMA	Hayward	814	17	4	Alameda	Hayward
723	ACCMA	Hayward	813	17	4	Alameda	Hayward
724	ACCMA	Hayward	813	17	4	Alameda	Hayward
725	ACCMA	Hayward	812	17	4	Alameda	Hayward
726	ACCMA	Hayward	812	17	4	Alameda	Hayward
727	ACCMA	Hayward	812	17	4	Alameda	Hayward
728	ACCMA	Hayward	811	17	4	Alameda	Hayward
729	ACCMA	Hayward	811	17	4	Alameda	Hayward
730	ACCMA	Hayward	811	17	4	Alameda	Hayward
731	ACCMA	Hayward	811	17	4	Alameda	Hayward
732	ACCMA	Hayward	811	17	4	Alameda	Hayward

ACCMA_TAZ	SUBREGION	JURISDICTION	MTC_TAZ	SDISTRICT	COUNTY	COUNTY_LABEL	CDP
733	ACCMA	Hayward	811	17	4	Alameda	Hayward
734	ACCMA	Hayward	811	17	4	Alameda	Hayward
735	ACCMA	Hayward	810	17	4	Alameda	Hayward
736	ACCMA	Hayward	810	17	4	Alameda	Hayward
737	ACCMA	Hayward	810	17	4	Alameda	Hayward
738	ACCMA	Hayward	810	17	4	Alameda	Hayward
739	ACCMA	Hayward	810	17	4	Alameda	Hayward
740	ACCMA	Hayward	810	17	4	Alameda	Hayward
741	ACCMA	Hayward	810	17	4	Alameda	Hayward
742	ACCMA	Hayward	810	17	4	Alameda	Hayward
743	ACCMA	Hayward	810	17	4	Alameda	Hayward
744	ACCMA	Hayward	810	17	4	Alameda	Hayward
745	ACCMA	Hayward	810	17	4	Alameda	Hayward
746	ACCMA	Hayward	810	17	4	Alameda	Hayward
747	ACCMA	Hayward	810	17	4	Alameda	Hayward
748	ACCMA	Hayward	810	17	4	Alameda	Hayward
749	ACCMA	Hayward	810	17	4	Alameda	Hayward
750	ACCMA	Hayward	810	17	4	Alameda	Hayward
751	ACCMA	Hayward	810	17	4	Alameda	Hayward
752	ACCMA	Hayward	810	17	4	Alameda	Hayward
753	ACCMA	Hayward	809	17	4	Alameda	Hayward
754	ACCMA	Hayward	809	17	4	Alameda	Hayward
755	ACCMA	Hayward	808	17	4	Alameda	Hayward
756	ACCMA	Hayward	808	17	4	Alameda	Hayward
757	ACCMA	Hayward	807	17	4	Alameda	Hayward
758	ACCMA	Hayward	806	17	4	Alameda	Hayward
759	ACCMA	Hayward	806	17	4	Alameda	Hayward
760	ACCMA	Hayward	806	17	4	Alameda	Hayward
761	ACCMA	Hayward	806	17	4	Alameda	Hayward
762	ACCMA	Hayward	806	17	4	Alameda	Hayward
763	ACCMA	Hayward	806	17	4	Alameda	Hayward
764	ACCMA	Hayward	806	17	4	Alameda	Hayward
765	ACCMA	Hayward	806	17	4	Alameda	Hayward
766	ACCMA	Hayward	805	17	4	Alameda	Hayward
767	ACCMA	Hayward	805	17	4	Alameda	Hayward
768	ACCMA	Hayward	804	17	4	Alameda	Hayward
769	ACCMA	Union City	804	17	4	Alameda	Union City
770	ACCMA	Union City	803	16	4	Alameda	Union City
771	ACCMA	Union City	803	16	4	Alameda	Union City
772	ACCMA	Union City	802	16	4	Alameda	Union City
773	ACCMA	Union City	801	16	4	Alameda	Union City
774	ACCMA	Union City	801	16	4	Alameda	Union City
775	ACCMA	Union City	801	16	4	Alameda	Union City
776	ACCMA	Union City	801	16	4	Alameda	Union City
777	ACCMA	Union City	801	16	4	Alameda	Union City
778	ACCMA	Union City	801	16	4	Alameda	Union City
779	ACCMA	Union City	800	16	4	Alameda	Union City
780	ACCMA	Union City	800	16	4	Alameda	Union City
781	ACCMA	Union City	800	16	4	Alameda	Union City
782	ACCMA	Union City	798	16	4	Alameda	Union City
783	ACCMA	Union City	798	16	4	Alameda	Union City
784	ACCMA	Union City	797	16	4	Alameda	Union City
785	ACCMA	Union City	797	16	4	Alameda	Union City
786	ACCMA	Union City	797	16	4	Alameda	Union City
787	ACCMA	Union City	797	16	4	Alameda	Union City
788	ACCMA	Union City	797	16	4	Alameda	Union City
789	ACCMA	Union City	796	16	4	Alameda	Union City
790	ACCMA	Union City	796	16	4	Alameda	Union City
791	ACCMA	Union City	796	16	4	Alameda	Union City
792	ACCMA	Union City	796	16	4	Alameda	Union City
793	ACCMA	Union City	796	16	4	Alameda	Union City

ACCMA_TAZ	SUBREGION	JURISDICTION	MTC_TAZ	SDISTRICT	COUNTY	COUNTY_LABEL	CDP
794	ACCMA	Union City	795	16	4	Alameda	Union City
795	ACCMA	Union City	795	16	4	Alameda	Union City
796	ACCMA	Union City	795	16	4	Alameda	Union City
797	ACCMA	Union City	794	16	4	Alameda	Union City
798	ACCMA	Union City	793	16	4	Alameda	Union City
799	ACCMA	Union City	792	16	4	Alameda	Union City
800	ACCMA	Union City	791	16	4	Alameda	Union City
801	ACCMA	Union City	790	16	4	Alameda	Union City
802	ACCMA	Fremont	799	16	4	Alameda	Fremont
803	ACCMA	Fremont	789	16	4	Alameda	Fremont
804	ACCMA	Fremont	789	16	4	Alameda	Fremont
805	ACCMA	Fremont	788	16	4	Alameda	Fremont
806	ACCMA	Fremont	787	16	4	Alameda	Fremont
807	ACCMA	Fremont	787	16	4	Alameda	Fremont
808	ACCMA	Fremont	787	16	4	Alameda	Fremont
809	ACCMA	Fremont	786	16	4	Alameda	Fremont
810	ACCMA	Fremont	786	16	4	Alameda	Fremont
811	ACCMA	Fremont	785	16	4	Alameda	Fremont
812	ACCMA	Fremont	785	16	4	Alameda	Fremont
813	ACCMA	Fremont	784	16	4	Alameda	Fremont
814	ACCMA	Fremont	784	16	4	Alameda	Fremont
815	ACCMA	Fremont	784	16	4	Alameda	Fremont
816	ACCMA	Fremont	783	16	4	Alameda	Fremont
817	ACCMA	Fremont	783	16	4	Alameda	Fremont
818	ACCMA	Fremont	783	16	4	Alameda	Fremont
819	ACCMA	Fremont	783	16	4	Alameda	Fremont
820	ACCMA	Fremont	782	16	4	Alameda	Fremont
821	ACCMA	Fremont	782	16	4	Alameda	Fremont
822	ACCMA	Fremont	782	16	4	Alameda	Fremont
823	ACCMA	Fremont	782	16	4	Alameda	Fremont
824	ACCMA	Fremont	781	16	4	Alameda	Fremont
825	ACCMA	Fremont	781	16	4	Alameda	Fremont
826	ACCMA	Fremont	781	16	4	Alameda	Fremont
827	ACCMA	Fremont	780	16	4	Alameda	Fremont
828	ACCMA	Fremont	780	16	4	Alameda	Fremont
829	ACCMA	Fremont	779	16	4	Alameda	Fremont
830	ACCMA	Fremont	779	16	4	Alameda	Fremont
831	ACCMA	Fremont	778	16	4	Alameda	Fremont
832	ACCMA	Fremont	778	16	4	Alameda	Fremont
833	ACCMA	Fremont	778	16	4	Alameda	Fremont
834	ACCMA	Fremont	778	16	4	Alameda	Fremont
835	ACCMA	Fremont	778	16	4	Alameda	Fremont
836	ACCMA	Fremont	778	16	4	Alameda	Fremont
837	ACCMA	Fremont	778	16	4	Alameda	Fremont
838	ACCMA	Fremont	778	16	4	Alameda	Fremont
839	ACCMA	Fremont	778	16	4	Alameda	Fremont
840	ACCMA	Fremont	778	16	4	Alameda	Fremont
841	ACCMA	Fremont	777	16	4	Alameda	Fremont
842	ACCMA	Fremont	777	16	4	Alameda	Fremont
843	ACCMA	Fremont	777	16	4	Alameda	Fremont
844	ACCMA	Fremont	777	16	4	Alameda	Fremont
845	ACCMA	Fremont	777	16	4	Alameda	Fremont
846	ACCMA	Fremont	776	16	4	Alameda	Fremont
847	ACCMA	Fremont	776	16	4	Alameda	Fremont
848	ACCMA	Fremont	776	16	4	Alameda	Fremont
849	ACCMA	Fremont	776	16	4	Alameda	Fremont
850	ACCMA	Fremont	775	16	4	Alameda	Fremont
851	ACCMA	Fremont	775	16	4	Alameda	Fremont
852	ACCMA	Fremont	775	16	4	Alameda	Fremont
853	ACCMA	Fremont	775	16	4	Alameda	Fremont
854	ACCMA	Fremont	774	16	4	Alameda	Fremont

ACCMA_TAZ	SUBREGION	JURISDICTION	MTC_TAZ	SDISTRICT	COUNTY	COUNTY_LABEL	CDP
855	ACCMA	Fremont	774	16	4	Alameda	Fremont
856	ACCMA	Fremont	774	16	4	Alameda	Fremont
857	ACCMA	Fremont	769	16	4	Alameda	Fremont
858	ACCMA	Fremont	769	16	4	Alameda	Fremont
859	ACCMA	Fremont	769	16	4	Alameda	Fremont
860	ACCMA	Fremont	768	16	4	Alameda	Fremont
861	ACCMA	Fremont	766	16	4	Alameda	Fremont
862	ACCMA	Fremont	766	16	4	Alameda	Fremont
863	ACCMA	Fremont	765	16	4	Alameda	Fremont
864	ACCMA	Fremont	764	16	4	Alameda	Fremont
865	ACCMA	Fremont	763	16	4	Alameda	Fremont
866	ACCMA	Fremont	763	16	4	Alameda	Fremont
867	ACCMA	Fremont	762	16	4	Alameda	Fremont
868	ACCMA	Fremont	761	16	4	Alameda	Fremont
869	ACCMA	Fremont	761	16	4	Alameda	Fremont
870	ACCMA	Fremont	761	16	4	Alameda	Fremont
871	ACCMA	Fremont	760	16	4	Alameda	Fremont
872	ACCMA	Fremont	760	16	4	Alameda	Fremont
873	ACCMA	Fremont	759	16	4	Alameda	Fremont
874	ACCMA	Fremont	758	16	4	Alameda	Fremont
875	ACCMA	Fremont	758	16	4	Alameda	Fremont
876	ACCMA	Fremont	757	16	4	Alameda	Fremont
877	ACCMA	Fremont	756	16	4	Alameda	Fremont
878	ACCMA	Fremont	756	16	4	Alameda	Fremont
879	ACCMA	Fremont	756	16	4	Alameda	Fremont
880	ACCMA	Fremont	755	16	4	Alameda	Fremont
881	ACCMA	Fremont	755	16	4	Alameda	Fremont
882	ACCMA	Fremont	755	16	4	Alameda	Fremont
883	ACCMA	Fremont	755	16	4	Alameda	Fremont
884	ACCMA	Fremont	755	16	4	Alameda	Fremont
885	ACCMA	Fremont	754	16	4	Alameda	Fremont
886	ACCMA	Fremont	754	16	4	Alameda	Fremont
887	ACCMA	Fremont	754	16	4	Alameda	Fremont
888	ACCMA	Fremont	753	16	4	Alameda	Fremont
889	ACCMA	Fremont	753	16	4	Alameda	Fremont
890	ACCMA	Fremont	753	16	4	Alameda	Fremont
891	ACCMA	Fremont	753	16	4	Alameda	Fremont
892	ACCMA	Fremont	752	16	4	Alameda	Fremont
893	ACCMA	Fremont	752	16	4	Alameda	Fremont
894	ACCMA	Fremont	752	16	4	Alameda	Fremont
895	ACCMA	Fremont	752	16	4	Alameda	Fremont
896	ACCMA	Fremont	752	16	4	Alameda	Fremont
897	ACCMA	Fremont	752	16	4	Alameda	Fremont
898	ACCMA	Fremont	752	16	4	Alameda	Fremont
899	ACCMA	Fremont	751	16	4	Alameda	Fremont
900	ACCMA	Fremont	751	16	4	Alameda	Fremont
901	ACCMA	Fremont	751	16	4	Alameda	Fremont
902	ACCMA	Fremont	751	16	4	Alameda	Fremont
903	ACCMA	Fremont	751	16	4	Alameda	Fremont
904	ACCMA	Fremont	751	16	4	Alameda	Fremont
905	ACCMA	Fremont	751	16	4	Alameda	Fremont
906	ACCMA	Fremont	751	16	4	Alameda	Fremont
907	ACCMA	Fremont	751	16	4	Alameda	Fremont
908	ACCMA	Fremont	750	16	4	Alameda	Fremont
909	ACCMA	Fremont	750	16	4	Alameda	Fremont
910	ACCMA	Fremont	750	16	4	Alameda	Fremont
911	ACCMA	Fremont	750	16	4	Alameda	Fremont
912	ACCMA	Fremont	749	16	4	Alameda	Fremont
913	ACCMA	Fremont	749	16	4	Alameda	Fremont
914	ACCMA	Fremont	748	16	4	Alameda	Fremont
915	ACCMA	Fremont	748	16	4	Alameda	Fremont

ACCMA_TAZ	SUBREGION	JURISDICTION	MTC_TAZ	SDISTRICT	COUNTY	COUNTY_LABEL	CDP
916	ACCMA	Fremont	747	16	4	Alameda	Fremont
917	ACCMA	Fremont	747	16	4	Alameda	Fremont
918	ACCMA	Newark	773	16	4	Alameda	Newark
919	ACCMA	Newark	773	16	4	Alameda	Newark
920	ACCMA	Newark	773	16	4	Alameda	Newark
921	ACCMA	Newark	772	16	4	Alameda	Newark
922	ACCMA	Newark	772	16	4	Alameda	Newark
923	ACCMA	Newark	771	16	4	Alameda	Newark
924	ACCMA	Newark	771	16	4	Alameda	Newark
925	ACCMA	Newark	771	16	4	Alameda	Newark
926	ACCMA	Newark	770	16	4	Alameda	Newark
927	ACCMA	Newark	770	16	4	Alameda	Newark
928	ACCMA	Newark	768	16	4	Alameda	Newark
929	ACCMA	Newark	768	16	4	Alameda	Newark
930	ACCMA	Newark	768	16	4	Alameda	Newark
931	ACCMA	Newark	768	16	4	Alameda	Newark
932	ACCMA	Newark	768	16	4	Alameda	Newark
933	ACCMA	Newark	767	16	4	Alameda	Newark
934	ACCMA	Newark	767	16	4	Alameda	Newark
935	ACCMA	Newark	767	16	4	Alameda	Newark
936	ACCMA	Newark	767	16	4	Alameda	Newark
937	ACCMA	Newark	767	16	4	Alameda	Newark
938	ACCMA	Newark	767	16	4	Alameda	Newark
939	ACCMA	Newark	767	16	4	Alameda	Newark
940	ACCMA	Newark	767	16	4	Alameda	Newark
941	ACCMA	Dublin	734	15	4	Alameda	Dublin
942	ACCMA	Dublin	734	15	4	Alameda	Dublin
943	ACCMA	Dublin	734	15	4	Alameda	Dublin
944	ACCMA	Dublin	734	15	4	Alameda	Dublin
945	ACCMA	Dublin	734	15	4	Alameda	Dublin
946	ACCMA	Dublin	734	15	4	Alameda	Dublin
947	ACCMA	Dublin	734	15	4	Alameda	Dublin
948	ACCMA	Dublin	734	15	4	Alameda	Dublin
949	ACCMA	Dublin	734	15	4	Alameda	Dublin
950	ACCMA	Dublin	734	15	4	Alameda	Dublin
951	ACCMA	Dublin	733	15	4	Alameda	Dublin
952	ACCMA	Dublin	733	15	4	Alameda	Dublin
953	ACCMA	Dublin	733	15	4	Alameda	Dublin
954	ACCMA	Dublin	733	15	4	Alameda	Dublin
955	ACCMA	Dublin	733	15	4	Alameda	Dublin
956	ACCMA	Dublin	733	15	4	Alameda	Dublin
957	ACCMA	Dublin	733	15	4	Alameda	Dublin
958	ACCMA	Dublin	733	15	4	Alameda	Dublin
959	ACCMA	Dublin	733	15	4	Alameda	Dublin
960	ACCMA	Dublin	733	15	4	Alameda	Dublin
961	ACCMA	Dublin	733	15	4	Alameda	Dublin
962	ACCMA	Dublin	733	15	4	Alameda	Dublin
963	ACCMA	Dublin	733	15	4	Alameda	Dublin
964	ACCMA	Dublin	733	15	4	Alameda	Dublin
965	ACCMA	Dublin	732	15	4	Alameda	Dublin
966	ACCMA	Dublin	732	15	4	Alameda	Dublin
967	ACCMA	Dublin	732	15	4	Alameda	Dublin
968	ACCMA	Dublin	732	15	4	Alameda	Dublin
969	ACCMA	Dublin	732	15	4	Alameda	Dublin
970	ACCMA	Dublin	732	15	4	Alameda	Dublin
971	ACCMA	Dublin	732	15	4	Alameda	Dublin
972	ACCMA	Dublin	732	15	4	Alameda	Dublin
973	ACCMA	Dublin	732	15	4	Alameda	Dublin
974	ACCMA	Dublin	732	15	4	Alameda	Dublin
975	ACCMA	Dublin	732	15	4	Alameda	Dublin
976	ACCMA	Dublin	732	15	4	Alameda	Dublin

ACCMA_TAZ	SUBREGION	JURISDICTION	MTC_TAZ	SDISTRICT	COUNTY	COUNTY_LABEL	CDP
977	ACCMA	Dublin	732	15	4	Alameda	Dublin
978	ACCMA	Dublin	731	15	4	Alameda	Dublin
979	ACCMA	Dublin	731	15	4	Alameda	Dublin
980	ACCMA	Dublin	731	15	4	Alameda	Dublin
981	ACCMA	Dublin	731	15	4	Alameda	Dublin
982	ACCMA	Dublin	730	15	4	Alameda	Dublin
983	ACCMA	Dublin	730	15	4	Alameda	Dublin
984	ACCMA	Dublin	730	15	4	Alameda	Dublin
985	ACCMA	Dublin	730	15	4	Alameda	Dublin
986	ACCMA	Dublin	730	15	4	Alameda	Dublin
987	ACCMA	Dublin	730	15	4	Alameda	Dublin
988	ACCMA	Dublin	730	15	4	Alameda	Dublin
989	ACCMA	Dublin	730	15	4	Alameda	Dublin
990	ACCMA	Dublin	730	15	4	Alameda	Dublin
991	ACCMA	Dublin	730	15	4	Alameda	Dublin
992	ACCMA	Dublin	730	15	4	Alameda	Dublin
993	ACCMA	Dublin	730	15	4	Alameda	Dublin
994	ACCMA	Dublin	730	15	4	Alameda	Dublin
995	ACCMA	Dublin	730	15	4	Alameda	Dublin
996	ACCMA	Dublin	730	15	4	Alameda	Dublin
997	ACCMA	Dublin	730	15	4	Alameda	Dublin
998	ACCMA	Dublin	730	15	4	Alameda	Dublin
999	ACCMA	Dublin	730	15	4	Alameda	Dublin
1000	ACCMA	Dublin	730	15	4	Alameda	Dublin
1001	ACCMA	Dublin	730	15	4	Alameda	Dublin
1002	ACCMA	Dublin	730	15	4	Alameda	Dublin
1003	ACCMA	Dublin	730	15	4	Alameda	Dublin
1004	ACCMA	Dublin	730	15	4	Alameda	Dublin
1005	ACCMA	Dublin	730	15	4	Alameda	Dublin
1006	ACCMA	Dublin	730	15	4	Alameda	Dublin
1007	ACCMA	Dublin	730	15	4	Alameda	Dublin
1008	ACCMA	Dublin	730	15	4	Alameda	Dublin
1009	ACCMA	Dublin	730	15	4	Alameda	Dublin
1010	ACCMA	Dublin	730	15	4	Alameda	Dublin
1011	ACCMA	Dublin	730	15	4	Alameda	Dublin
1012	ACCMA	Dublin	730	15	4	Alameda	Dublin
1013	ACCMA	Dublin	729	15	4	Alameda	Livermore
1014	ACCMA	Dublin	729	15	4	Alameda	Dublin
1015	ACCMA	Dublin	729	15	4	Alameda	
1016	ACCMA	Dublin	729	15	4	Alameda	Dublin
1017	ACCMA	Dublin	729	15	4	Alameda	Dublin
1018	ACCMA	Dublin	729	15	4	Alameda	Dublin
1019	ACCMA	Dublin	729	15	4	Alameda	Dublin
1020	ACCMA	Dublin	729	15	4	Alameda	Dublin
1021	ACCMA	Dublin	729	15	4	Alameda	Dublin
1022	ACCMA	Dublin	729	15	4	Alameda	Dublin
1023	ACCMA	Dublin	729	15	4	Alameda	Dublin
1024	ACCMA	Dublin	729	15	4	Alameda	Dublin
1025	ACCMA	Dublin	729	15	4	Alameda	Dublin
1026	ACCMA	Dublin	729	15	4	Alameda	Dublin
1027	ACCMA	Dublin	729	15	4	Alameda	Dublin
1028	ACCMA	Dublin	729	15	4	Alameda	
1029	ACCMA	Dublin	729	15	4	Alameda	Dublin
1030	ACCMA	Dublin	729	15	4	Alameda	Dublin
1031	ACCMA	Dublin	729	15	4	Alameda	Dublin
1032	ACCMA	Dublin	729	15	4	Alameda	Dublin
1033	ACCMA	Dublin	729	15	4	Alameda	Dublin
1034	ACCMA	Dublin	729	15	4	Alameda	Dublin
1035	ACCMA	Dublin	729	15	4	Alameda	Dublin
1036	ACCMA	Dublin	729	15	4	Alameda	Dublin
1037	ACCMA	Dublin	729	15	4	Alameda	Dublin

ACCMA_TAZ	SUBREGION	JURISDICTION	MTC_TAZ	SDISTRICT	COUNTY	COUNTY_LABEL	CDP
1038	ACCMA	Dublin	729	15	4	Alameda	Dublin
1039	ACCMA	Dublin	729	15	4	Alameda	Dublin
1040	ACCMA	Dublin	729	15	4	Alameda	Dublin
1041	ACCMA	Dublin	729	15	4	Alameda	Dublin
1042	ACCMA	Dublin	729	15	4	Alameda	Dublin
1043	ACCMA	Dublin	729	15	4	Alameda	Dublin
1044	ACCMA	Dublin	729	15	4	Alameda	
1045	ACCMA	Dublin	729	15	4	Alameda	
1046	ACCMA	Dublin	729	15	4	Alameda	Dublin
1047	ACCMA	Dublin	729	15	4	Alameda	
1048	ACCMA	Dublin	729	15	4	Alameda	Dublin
1049	ACCMA	Dublin	729	15	4	Alameda	
1050	ACCMA	Dublin	729	15	4	Alameda	Dublin
1051	ACCMA	Dublin	729	15	4	Alameda	
1052	ACCMA	Dublin	729	15	4	Alameda	Dublin
1053	ACCMA	Pleasanton	746	15	4	Alameda	Pleasanton
1054	ACCMA	Pleasanton	746	15	4	Alameda	Sunol
1055	ACCMA	Pleasanton	746	15	4	Alameda	Pleasanton
1056	ACCMA	Pleasanton	746	15	4	Alameda	Pleasanton
1057	ACCMA	Pleasanton	746	15	4	Alameda	Pleasanton
1058	ACCMA	Pleasanton	746	15	4	Alameda	Sunol
1059	ACCMA	Pleasanton	746	15	4	Alameda	Pleasanton
1060	ACCMA	Pleasanton	745	15	4	Alameda	Pleasanton
1061	ACCMA	Pleasanton	745	15	4	Alameda	Pleasanton
1062	ACCMA	Pleasanton	745	15	4	Alameda	Livermore
1063	ACCMA	Pleasanton	745	15	4	Alameda	Pleasanton
1064	ACCMA	Pleasanton	744	15	4	Alameda	Pleasanton
1065	ACCMA	Pleasanton	744	15	4	Alameda	Pleasanton
1066	ACCMA	Pleasanton	744	15	4	Alameda	Pleasanton
1067	ACCMA	Pleasanton	744	15	4	Alameda	Pleasanton
1068	ACCMA	Pleasanton	744	15	4	Alameda	Pleasanton
1069	ACCMA	Pleasanton	743	15	4	Alameda	Pleasanton
1070	ACCMA	Pleasanton	743	15	4	Alameda	Pleasanton
1071	ACCMA	Pleasanton	743	15	4	Alameda	Pleasanton
1072	ACCMA	Pleasanton	743	15	4	Alameda	
1073	ACCMA	Pleasanton	743	15	4	Alameda	Pleasanton
1074	ACCMA	Pleasanton	743	15	4	Alameda	Pleasanton
1075	ACCMA	Pleasanton	743	15	4	Alameda	Pleasanton
1076	ACCMA	Pleasanton	743	15	4	Alameda	Pleasanton
1077	ACCMA	Pleasanton	743	15	4	Alameda	Pleasanton
1078	ACCMA	Pleasanton	743	15	4	Alameda	Pleasanton
1079	ACCMA	Pleasanton	743	15	4	Alameda	Pleasanton
1080	ACCMA	Pleasanton	743	15	4	Alameda	Pleasanton
1081	ACCMA	Pleasanton	743	15	4	Alameda	Pleasanton
1082	ACCMA	Pleasanton	743	15	4	Alameda	Pleasanton
1083	ACCMA	Pleasanton	743	15	4	Alameda	Pleasanton
1084	ACCMA	Pleasanton	743	15	4	Alameda	Pleasanton
1085	ACCMA	Pleasanton	743	15	4	Alameda	Pleasanton
1086	ACCMA	Pleasanton	743	15	4	Alameda	Pleasanton
1087	ACCMA	Pleasanton	743	15	4	Alameda	
1088	ACCMA	Pleasanton	743	15	4	Alameda	Pleasanton
1089	ACCMA	Pleasanton	742	15	4	Alameda	Pleasanton
1090	ACCMA	Pleasanton	742	15	4	Alameda	Pleasanton
1091	ACCMA	Pleasanton	742	15	4	Alameda	Pleasanton
1092	ACCMA	Pleasanton	742	15	4	Alameda	Pleasanton
1093	ACCMA	Pleasanton	742	15	4	Alameda	Pleasanton
1094	ACCMA	Pleasanton	742	15	4	Alameda	Pleasanton
1095	ACCMA	Pleasanton	742	15	4	Alameda	Pleasanton
1096	ACCMA	Pleasanton	742	15	4	Alameda	Pleasanton
1097	ACCMA	Pleasanton	742	15	4	Alameda	Pleasanton
1098	ACCMA	Pleasanton	742	15	4	Alameda	Pleasanton

ACCMA_TAZ	SUBREGION	JURISDICTION	MTC_TAZ	SDISTRICT	COUNTY	COUNTY_LABEL	CDP
1099	ACCMA	Pleasanton	742	15	4	Alameda	Pleasanton
1100	ACCMA	Pleasanton	742	15	4	Alameda	Pleasanton
1101	ACCMA	Pleasanton	742	15	4	Alameda	Pleasanton
1102	ACCMA	Pleasanton	742	15	4	Alameda	Pleasanton
1103	ACCMA	Pleasanton	742	15	4	Alameda	Pleasanton
1104	ACCMA	Pleasanton	742	15	4	Alameda	Pleasanton
1105	ACCMA	Pleasanton	742	15	4	Alameda	Pleasanton
1106	ACCMA	Pleasanton	742	15	4	Alameda	Pleasanton
1107	ACCMA	Pleasanton	742	15	4	Alameda	Pleasanton
1108	ACCMA	Pleasanton	742	15	4	Alameda	Pleasanton
1109	ACCMA	Pleasanton	742	15	4	Alameda	Pleasanton
1110	ACCMA	Pleasanton	742	15	4	Alameda	Pleasanton
1111	ACCMA	Pleasanton	742	15	4	Alameda	Pleasanton
1112	ACCMA	Pleasanton	742	15	4	Alameda	Pleasanton
1113	ACCMA	Pleasanton	742	15	4	Alameda	Pleasanton
1114	ACCMA	Pleasanton	742	15	4	Alameda	Pleasanton
1115	ACCMA	Pleasanton	742	15	4	Alameda	Pleasanton
1116	ACCMA	Pleasanton	742	15	4	Alameda	Pleasanton
1117	ACCMA	Pleasanton	742	15	4	Alameda	Pleasanton
1118	ACCMA	Pleasanton	742	15	4	Alameda	Pleasanton
1119	ACCMA	Pleasanton	742	15	4	Alameda	Pleasanton
1120	ACCMA	Pleasanton	742	15	4	Alameda	Pleasanton
1121	ACCMA	Pleasanton	742	15	4	Alameda	Dublin
1122	ACCMA	Pleasanton	742	15	4	Alameda	Pleasanton
1123	ACCMA	Pleasanton	742	15	4	Alameda	Pleasanton
1124	ACCMA	Pleasanton	742	15	4	Alameda	Pleasanton
1125	ACCMA	Pleasanton	742	15	4	Alameda	Pleasanton
1126	ACCMA	Pleasanton	742	15	4	Alameda	Pleasanton
1127	ACCMA	Pleasanton	742	15	4	Alameda	Pleasanton
1128	ACCMA	Pleasanton	742	15	4	Alameda	Pleasanton
1129	ACCMA	Pleasanton	742	15	4	Alameda	Pleasanton
1130	ACCMA	Pleasanton	742	15	4	Alameda	Pleasanton
1131	ACCMA	Pleasanton	741	15	4	Alameda	Pleasanton
1132	ACCMA	Pleasanton	741	15	4	Alameda	Pleasanton
1133	ACCMA	Pleasanton	741	15	4	Alameda	Pleasanton
1134	ACCMA	Pleasanton	740	15	4	Alameda	Pleasanton
1135	ACCMA	Pleasanton	740	15	4	Alameda	Pleasanton
1136	ACCMA	Pleasanton	740	15	4	Alameda	Pleasanton
1137	ACCMA	Pleasanton	740	15	4	Alameda	Pleasanton
1138	ACCMA	Pleasanton	740	15	4	Alameda	Pleasanton
1139	ACCMA	Pleasanton	740	15	4	Alameda	Pleasanton
1140	ACCMA	Pleasanton	739	15	4	Alameda	Pleasanton
1141	ACCMA	Pleasanton	739	15	4	Alameda	Pleasanton
1142	ACCMA	Pleasanton	739	15	4	Alameda	Pleasanton
1143	ACCMA	Pleasanton	739	15	4	Alameda	Pleasanton
1144	ACCMA	Pleasanton	739	15	4	Alameda	Pleasanton
1145	ACCMA	Pleasanton	739	15	4	Alameda	Pleasanton
1146	ACCMA	Pleasanton	739	15	4	Alameda	Pleasanton
1147	ACCMA	Pleasanton	739	15	4	Alameda	Pleasanton
1148	ACCMA	Pleasanton	739	15	4	Alameda	Pleasanton
1149	ACCMA	Pleasanton	739	15	4	Alameda	Pleasanton
1150	ACCMA	Pleasanton	739	15	4	Alameda	Pleasanton
1151	ACCMA	Pleasanton	739	15	4	Alameda	Pleasanton
1152	ACCMA	Pleasanton	739	15	4	Alameda	Pleasanton
1153	ACCMA	Pleasanton	738	15	4	Alameda	Pleasanton
1154	ACCMA	Pleasanton	738	15	4	Alameda	Pleasanton
1155	ACCMA	Pleasanton	737	15	4	Alameda	Pleasanton
1156	ACCMA	Pleasanton	737	15	4	Alameda	Pleasanton
1157	ACCMA	Pleasanton	737	15	4	Alameda	Pleasanton
1158	ACCMA	Pleasanton	737	15	4	Alameda	Pleasanton
1159	ACCMA	Pleasanton	737	15	4	Alameda	Pleasanton

ACCMA_TAZ	SUBREGION	JURISDICTION	MTC_TAZ	SDISTRICT	COUNTY	COUNTY_LABEL	CDP
1160	ACCMA	Pleasanton	737	15	4	Alameda	Pleasanton
1161	ACCMA	Pleasanton	737	15	4	Alameda	Pleasanton
1162	ACCMA	Pleasanton	737	15	4	Alameda	Pleasanton
1163	ACCMA	Pleasanton	737	15	4	Alameda	Pleasanton
1164	ACCMA	Pleasanton	737	15	4	Alameda	Pleasanton
1165	ACCMA	Pleasanton	737	15	4	Alameda	Pleasanton
1166	ACCMA	Pleasanton	737	15	4	Alameda	Pleasanton
1167	ACCMA	Pleasanton	736	15	4	Alameda	Pleasanton
1168	ACCMA	Pleasanton	736	15	4	Alameda	Pleasanton
1169	ACCMA	Pleasanton	736	15	4	Alameda	Pleasanton
1170	ACCMA	Pleasanton	736	15	4	Alameda	Pleasanton
1171	ACCMA	Pleasanton	736	15	4	Alameda	Pleasanton
1172	ACCMA	Pleasanton	736	15	4	Alameda	Pleasanton
1173	ACCMA	Pleasanton	736	15	4	Alameda	Pleasanton
1174	ACCMA	Pleasanton	736	15	4	Alameda	Pleasanton
1175	ACCMA	Pleasanton	736	15	4	Alameda	Pleasanton
1176	ACCMA	Pleasanton	736	15	4	Alameda	Pleasanton
1177	ACCMA	Pleasanton	736	15	4	Alameda	Pleasanton
1178	ACCMA	Pleasanton	736	15	4	Alameda	Pleasanton
1179	ACCMA	Pleasanton	736	15	4	Alameda	Pleasanton
1180	ACCMA	Pleasanton	736	15	4	Alameda	Pleasanton
1181	ACCMA	Pleasanton	735	15	4	Alameda	Pleasanton
1182	ACCMA	Pleasanton	735	15	4	Alameda	
1183	ACCMA	Pleasanton	735	15	4	Alameda	Pleasanton
1184	ACCMA	Pleasanton	735	15	4	Alameda	Pleasanton
1185	ACCMA	Pleasanton	735	15	4	Alameda	Sunol
1186	ACCMA	Pleasanton	735	15	4	Alameda	Pleasanton
1187	ACCMA	Pleasanton	735	15	4	Alameda	Pleasanton
1188	ACCMA	Pleasanton	735	15	4	Alameda	Pleasanton
1189	ACCMA	Pleasanton	735	15	4	Alameda	Pleasanton
1190	ACCMA	Pleasanton	735	15	4	Alameda	Dublin
1191	ACCMA	Pleasanton	728	15	4	Alameda	Livermore
1192	ACCMA	Livermore	729	15	4	Alameda	Livermore
1193	ACCMA	Livermore	729	15	4	Alameda	Livermore
1194	ACCMA	Livermore	729	15	4	Alameda	Livermore
1195	ACCMA	Livermore	729	15	4	Alameda	Livermore
1196	ACCMA	Livermore	729	15	4	Alameda	Livermore
1197	ACCMA	Livermore	729	15	4	Alameda	Livermore
1198	ACCMA	Livermore	729	15	4	Alameda	Livermore
1199	ACCMA	Livermore	729	15	4	Alameda	Livermore
1200	ACCMA	Livermore	728	15	4	Alameda	Livermore
1201	ACCMA	Livermore	728	15	4	Alameda	Livermore
1202	ACCMA	Livermore	728	15	4	Alameda	Livermore
1203	ACCMA	Livermore	728	15	4	Alameda	Livermore
1204	ACCMA	Livermore	728	15	4	Alameda	Livermore
1205	ACCMA	Livermore	728	15	4	Alameda	Livermore
1206	ACCMA	Livermore	728	15	4	Alameda	Livermore
1207	ACCMA	Livermore	728	15	4	Alameda	Livermore
1208	ACCMA	Livermore	728	15	4	Alameda	Livermore
1209	ACCMA	Livermore	728	15	4	Alameda	Livermore
1210	ACCMA	Livermore	728	15	4	Alameda	Livermore
1211	ACCMA	Livermore	728	15	4	Alameda	Livermore
1212	ACCMA	Livermore	728	15	4	Alameda	Livermore
1213	ACCMA	Livermore	728	15	4	Alameda	Livermore
1214	ACCMA	Livermore	728	15	4	Alameda	Livermore
1215	ACCMA	Livermore	728	15	4	Alameda	Livermore
1216	ACCMA	Livermore	728	15	4	Alameda	Livermore
1217	ACCMA	Livermore	728	15	4	Alameda	Livermore
1218	ACCMA	Livermore	728	15	4	Alameda	Livermore
1219	ACCMA	Livermore	728	15	4	Alameda	Livermore
1220	ACCMA	Livermore	727	15	4	Alameda	Livermore

ACCMA_TAZ	SUBREGION	JURISDICTION	MTC_TAZ	SDISTRICT	COUNTY	COUNTY_LABEL	CDP
1221	ACCMA	Livermore	727	15	4	Alameda	Livermore
1222	ACCMA	Livermore	727	15	4	Alameda	Livermore
1223	ACCMA	Livermore	727	15	4	Alameda	Livermore
1224	ACCMA	Livermore	726	15	4	Alameda	Livermore
1225	ACCMA	Livermore	726	15	4	Alameda	Livermore
1226	ACCMA	Livermore	726	15	4	Alameda	Livermore
1227	ACCMA	Livermore	726	15	4	Alameda	Livermore
1228	ACCMA	Livermore	726	15	4	Alameda	Livermore
1229	ACCMA	Livermore	726	15	4	Alameda	Livermore
1230	ACCMA	Livermore	726	15	4	Alameda	Livermore
1231	ACCMA	Livermore	725	15	4	Alameda	Livermore
1232	ACCMA	Livermore	725	15	4	Alameda	Livermore
1233	ACCMA	Livermore	725	15	4	Alameda	Livermore
1234	ACCMA	Livermore	725	15	4	Alameda	Livermore
1235	ACCMA	Livermore	725	15	4	Alameda	Livermore
1236	ACCMA	Livermore	724	15	4	Alameda	Livermore
1237	ACCMA	Livermore	724	15	4	Alameda	Livermore
1238	ACCMA	Livermore	724	15	4	Alameda	Livermore
1239	ACCMA	Livermore	724	15	4	Alameda	Livermore
1240	ACCMA	Livermore	724	15	4	Alameda	Livermore
1241	ACCMA	Livermore	724	15	4	Alameda	Livermore
1242	ACCMA	Livermore	724	15	4	Alameda	Livermore
1243	ACCMA	Livermore	724	15	4	Alameda	Livermore
1244	ACCMA	Livermore	724	15	4	Alameda	Livermore
1245	ACCMA	Livermore	724	15	4	Alameda	Livermore
1246	ACCMA	Livermore	724	15	4	Alameda	Livermore
1247	ACCMA	Livermore	724	15	4	Alameda	Livermore
1248	ACCMA	Livermore	724	15	4	Alameda	Livermore
1249	ACCMA	Livermore	724	15	4	Alameda	Livermore
1250	ACCMA	Livermore	724	15	4	Alameda	Livermore
1251	ACCMA	Livermore	724	15	4	Alameda	Livermore
1252	ACCMA	Livermore	723	15	4	Alameda	Livermore
1253	ACCMA	Livermore	723	15	4	Alameda	Livermore
1254	ACCMA	Livermore	723	15	4	Alameda	Livermore
1255	ACCMA	Livermore	723	15	4	Alameda	Livermore
1256	ACCMA	Livermore	723	15	4	Alameda	Livermore
1257	ACCMA	Livermore	723	15	4	Alameda	Livermore
1258	ACCMA	Livermore	723	15	4	Alameda	Livermore
1259	ACCMA	Livermore	723	15	4	Alameda	Livermore
1260	ACCMA	Livermore	723	15	4	Alameda	Livermore
1261	ACCMA	Livermore	723	15	4	Alameda	Livermore
1262	ACCMA	Livermore	723	15	4	Alameda	Livermore
1263	ACCMA	Livermore	723	15	4	Alameda	Livermore
1264	ACCMA	Livermore	722	15	4	Alameda	Livermore
1265	ACCMA	Livermore	722	15	4	Alameda	Livermore
1266	ACCMA	Livermore	722	15	4	Alameda	Livermore
1267	ACCMA	Livermore	722	15	4	Alameda	Livermore
1268	ACCMA	Livermore	722	15	4	Alameda	Livermore
1269	ACCMA	Livermore	722	15	4	Alameda	Livermore
1270	ACCMA	Livermore	722	15	4	Alameda	Livermore
1271	ACCMA	Livermore	722	15	4	Alameda	Livermore
1272	ACCMA	Livermore	722	15	4	Alameda	Livermore
1273	ACCMA	Livermore	722	15	4	Alameda	Livermore
1274	ACCMA	Livermore	721	15	4	Alameda	Livermore
1275	ACCMA	Livermore	721	15	4	Alameda	Livermore
1276	ACCMA	Livermore	721	15	4	Alameda	Livermore
1277	ACCMA	Livermore	721	15	4	Alameda	Livermore
1278	ACCMA	Livermore	721	15	4	Alameda	Livermore
1279	ACCMA	Livermore	721	15	4	Alameda	Livermore
1280	ACCMA	Livermore	721	15	4	Alameda	Livermore
1281	ACCMA	Livermore	721	15	4	Alameda	Livermore

ACCMA_TAZ	SUBREGION	JURISDICTION	MTC_TAZ	SDISTRICT	COUNTY	COUNTY_LABEL	CDP
1282	ACCMA	Livermore	721	15	4	Alameda	Livermore
1283	ACCMA	Livermore	721	15	4	Alameda	Livermore
1284	ACCMA	Livermore	721	15	4	Alameda	Livermore
1285	ACCMA	Livermore	721	15	4	Alameda	Livermore
1286	ACCMA	Livermore	721	15	4	Alameda	Livermore
1287	ACCMA	Livermore	721	15	4	Alameda	Livermore
1288	ACCMA	Livermore	721	15	4	Alameda	Livermore
1289	ACCMA	Livermore	721	15	4	Alameda	Livermore
1290	ACCMA	Livermore	720	15	4	Alameda	Livermore
1291	ACCMA	Livermore	720	15	4	Alameda	Livermore
1292	ACCMA	Livermore	720	15	4	Alameda	Livermore
1293	ACCMA	Livermore	720	15	4	Alameda	Livermore
1294	ACCMA	Livermore	720	15	4	Alameda	Livermore
1295	ACCMA	Livermore	720	15	4	Alameda	Livermore
1296	ACCMA	Livermore	720	15	4	Alameda	
1297	ACCMA	Livermore	720	15	4	Alameda	Livermore
1298	ACCMA	Livermore	720	15	4	Alameda	Livermore
1299	ACCMA	Livermore	720	15	4	Alameda	Livermore
1300	ACCMA	Livermore	720	15	4	Alameda	Livermore
1301	ACCMA	Livermore	720	15	4	Alameda	Livermore
1302	ACCMA	Livermore	720	15	4	Alameda	Livermore
1303	ACCMA	Livermore	720	15	4	Alameda	Livermore
1304	ACCMA	Livermore	720	15	4	Alameda	Livermore
1305	ACCMA	Livermore	719	15	4	Alameda	Livermore
1306	ACCMA	Livermore	719	15	4	Alameda	Livermore
1307	ACCMA	Livermore	719	15	4	Alameda	Livermore
1308	ACCMA	Livermore	719	15	4	Alameda	Livermore
1309	ACCMA	Livermore	719	15	4	Alameda	Livermore
1310	ACCMA	Livermore	719	15	4	Alameda	Livermore
1311	ACCMA	Livermore	719	15	4	Alameda	Livermore
1312	ACCMA	Livermore	719	15	4	Alameda	Livermore
1313	ACCMA	Livermore	719	15	4	Alameda	Livermore
1314	ACCMA	Livermore	718	15	4	Alameda	Livermore
1315	ACCMA	Livermore	718	15	4	Alameda	Livermore
1316	ACCMA	Livermore	718	15	4	Alameda	Livermore
1317	ACCMA	Livermore	718	15	4	Alameda	Livermore
1318	ACCMA	Livermore	718	15	4	Alameda	Livermore
1319	ACCMA	Livermore	718	15	4	Alameda	Livermore
1320	ACCMA	Livermore	718	15	4	Alameda	Livermore
1321	ACCMA	Livermore	718	15	4	Alameda	Livermore
1322	ACCMA	Livermore	718	15	4	Alameda	Livermore
1323	ACCMA	Livermore	718	15	4	Alameda	Livermore
1324	ACCMA	Livermore	718	15	4	Alameda	Livermore
1325	ACCMA	Livermore	718	15	4	Alameda	Livermore
1326	ACCMA	Livermore	717	15	4	Alameda	Livermore
1327	ACCMA	Livermore	717	15	4	Alameda	Livermore
1328	ACCMA	Livermore	717	15	4	Alameda	Livermore
1329	ACCMA	Livermore	717	15	4	Alameda	Livermore
1330	ACCMA	Livermore	717	15	4	Alameda	Livermore
1331	ACCMA	Livermore	717	15	4	Alameda	Livermore
1332	ACCMA	Livermore	717	15	4	Alameda	Livermore
1333	ACCMA	Livermore	717	15	4	Alameda	Livermore
1334	ACCMA	Livermore	716	15	4	Alameda	Livermore
1335	ACCMA	Livermore	716	15	4	Alameda	Livermore
1336	ACCMA	Livermore	716	15	4	Alameda	Livermore
1337	ACCMA	Livermore	716	15	4	Alameda	Livermore
1338	ACCMA	Livermore	716	15	4	Alameda	Livermore
1339	ACCMA	Livermore	716	15	4	Alameda	Livermore
1340	ACCMA	Livermore	716	15	4	Alameda	Livermore
1341	ACCMA	Livermore	715	15	4	Alameda	Livermore
1342	ACCMA	Livermore	715	15	4	Alameda	Livermore

ACCMA_TAZ	SUBREGION	JURISDICTION	MTC_TAZ	SDISTRICT	COUNTY	COUNTY_LABEL	CDP
1343	ACCMA	Livermore	715	15	4	Alameda	
1344	ACCMA	Livermore	715	15	4	Alameda	Livermore
1345	ACCMA	Livermore	715	15	4	Alameda	
1346	ACCMA	Livermore	715	15	4	Alameda	Livermore
1347	ACCMA	Livermore	715	15	4	Alameda	Livermore
1348	ACCMA	Livermore	715	15	4	Alameda	Livermore
1349	ACCMA	Livermore	715	15	4	Alameda	
1350	ACCMA	Livermore	715	15	4	Alameda	Livermore
1351	ACCMA	Livermore	715	15	4	Alameda	Livermore
1352	ACCMA	Livermore	715	15	4	Alameda	Livermore
1353	ACCMA	Livermore	715	15	4	Alameda	Livermore
1354	ACCMA	Livermore	715	15	4	Alameda	Livermore
1355	ACCMA	Livermore	715	15	4	Alameda	Livermore
1356	ACCMA	Livermore	715	15	4	Alameda	Livermore
1357	ACCMA	Livermore	715	15	4	Alameda	Livermore
1358	ACCMA	Livermore	715	15	4	Alameda	Livermore
1359	ACCMA	Livermore	715	15	4	Alameda	Livermore
1360	ACCMA	Livermore	715	15	4	Alameda	Livermore
1361	ACCMA	Livermore	715	15	4	Alameda	Livermore
1362	ACCMA	Livermore	715	15	4	Alameda	Livermore
1363	ACCMA	Livermore	715	15	4	Alameda	Livermore
1364	ACCMA	Livermore	715	15	4	Alameda	Livermore
1365	ACCMA	Livermore	715	15	4	Alameda	Livermore
1366	ACCMA	Livermore	715	15	4	Alameda	Livermore
1367	ACCMA	Livermore	715	15	4	Alameda	Livermore
1368	ACCMA	Livermore	715	15	4	Alameda	Livermore
1369	ACCMA	Livermore	715	15	4	Alameda	
1370	ACCMA	Livermore	715	15	4	Alameda	Livermore
1371	ACCMA	Livermore	715	15	4	Alameda	
1372	ACCMA	Livermore	715	15	4	Alameda	Livermore
1373	ACCMA	Livermore	715	15	4	Alameda	
1374	ACCMA	Livermore	715	15	4	Alameda	Livermore
1375	ACCMA	Livermore	715	15	4	Alameda	Livermore
1376	ACCMA	Alameda County	844	17	4	Alameda	Castro Valley
1377	ACCMA	Alameda County	843	17	4	Alameda	Fairview
1378	ACCMA	Alameda County	841	17	4	Alameda	Fairview
1379	ACCMA	Alameda County	822	17	4	Alameda	Fairview
1380	ACCMA	Alameda County	820	17	4	Alameda	Castro Valley
1381	ACCMA	Alameda County	820	17	4	Alameda	Hayward
1382	ACCMA	Alameda County	820	17	4	Alameda	Castro Valley
1383	ACCMA	Alameda County	820	17	4	Alameda	Fairview
1384	ACCMA	Alameda County	820	17	4	Alameda	Fairview
1385	ACCMA	Alameda County	746	15	4	Alameda	Fremont
1386	ACCMA	Alameda County	735	15	4	Alameda	Sunol
1387	ACCMA	Alameda County	734	15	4	Alameda	Dublin
1388	ACCMA	Alameda County	729	15	4	Alameda	Livermore
1389	ACCMA	Alameda County	720	15	4	Alameda	
1390	ACCMA	Alameda County	720	15	4	Alameda	
1391	ACCMA	Alameda County	720	15	4	Alameda	Livermore
1392	ACCMA	Alameda County	720	15	4	Alameda	Livermore
1393	ACCMA	Alameda County	720	15	4	Alameda	
1394	ACCMA	Alameda County	720	15	4	Alameda	Livermore
1395	ACCMA	Alameda County	720	15	4	Alameda	Livermore
1396	ACCMA	Alameda County	720	15	4	Alameda	
1397	ACCMA	Alameda County	720	15	4	Alameda	Livermore
1398	ACCMA	Alameda County	715	15	4	Alameda	Livermore
1399	ACCMA	Alameda County	715	15	4	Alameda	
1400	ACCMA	Alameda County	715	15	4	Alameda	
1401	ACCMA	Oakland	988	18	4	Alameda	Oakland
1402	ACCMA	Oakland	967	18	4	Alameda	Oakland
1403	ACCMA	Oakland	875	18	4	Alameda	Oakland

ACCMA_TAZ	SUBREGION	JURISDICTION	MTC_TAZ	SDISTRICT	COUNTY	COUNTY_LABEL	CDP
1404	ACCMA	Oakland	896	18	4	Alameda	Oakland
1405	ACCMA	Oakland	874	18	4	Alameda	Oakland
2001	CCTA_1454	West Contra Cost	1044	20	5	Contra Costa	Berkeley
2002	CCTA_REAGG	West Contra Cost	1043	20	5	Contra Costa	Albany
2003	CCTA_REAGG	West Contra Cost	1043	20	5	Contra Costa	Kensington
2004	CCTA_REAGG	West Contra Cost	1043	20	5	Contra Costa	Kensington
2005	CCTA_REAGG	West Contra Cost	1042	20	5	Contra Costa	Albany
2006	CCTA_REAGG	West Contra Cost	1042	20	5	Contra Costa	El Cerrito
2007	CCTA_REAGG	West Contra Cost	1041	20	0	Contra Costa	Albany
2008	CCTA_REAGG	West Contra Cost	1041	20	5	Contra Costa	Albany
2009	CCTA_REAGG	West Contra Cost	1041	20	5	Contra Costa	El Cerrito
2010	CCTA_REAGG	West Contra Cost	1041	20	5	Contra Costa	El Cerrito
2011	CCTA_REAGG	West Contra Cost	1041	20	5	Contra Costa	El Cerrito
2012	CCTA_1454	West Contra Cost	1040	20	5	Contra Costa	Albany
2013	CCTA_1454	West Contra Cost	1046	20	5	Contra Costa	El Cerrito
2014	CCTA_REAGG	West Contra Cost	1048	20	5	Contra Costa	El Cerrito
2015	CCTA_REAGG	West Contra Cost	1048	20	5	Contra Costa	El Cerrito
2016	CCTA_REAGG	West Contra Cost	1048	20	5	Contra Costa	El Cerrito
2017	CCTA_REAGG	West Contra Cost	1048	20	5	Contra Costa	El Cerrito
2018	CCTA_REAGG	West Contra Cost	1045	20	5	Contra Costa	El Cerrito
2019	CCTA_REAGG	West Contra Cost	1045	20	5	Contra Costa	El Cerrito
2020	CCTA_REAGG	West Contra Cost	1047	20	5	Contra Costa	El Cerrito
2021	CCTA_REAGG	West Contra Cost	1047	20	5	Contra Costa	El Cerrito
2022	CCTA_REAGG	West Contra Cost	1051	20	5	Contra Costa	El Cerrito
2023	CCTA_REAGG	West Contra Cost	1051	20	5	Contra Costa	El Cerrito
2024	CCTA_REAGG	West Contra Cost	1051	20	5	Contra Costa	El Cerrito
2025	CCTA_REAGG	West Contra Cost	1051	20	5	Contra Costa	El Cerrito
2026	CCTA_REAGG	West Contra Cost	1051	20	5	Contra Costa	El Cerrito
2027	CCTA_REAGG	West Contra Cost	1051	20	5	Contra Costa	El Cerrito
2028	CCTA_1454	West Contra Cost	1052	20	5	Contra Costa	El Cerrito
2029	CCTA_REAGG	West Contra Cost	1053	20	5	Contra Costa	El Cerrito
2030	CCTA_REAGG	West Contra Cost	1053	20	5	Contra Costa	El Cerrito
2031	CCTA_REAGG	West Contra Cost	1053	20	5	Contra Costa	El Cerrito
2032	CCTA_REAGG	West Contra Cost	1049	20	5	Contra Costa	Richmond
2033	CCTA_REAGG	West Contra Cost	1049	20	5	Contra Costa	Richmond
2034	CCTA_REAGG	West Contra Cost	1049	20	5	Contra Costa	Richmond
2035	CCTA_REAGG	West Contra Cost	1049	20	5	Contra Costa	Richmond
2036	CCTA_REAGG	West Contra Cost	1049	20	5	Contra Costa	Albany
2037	CCTA_REAGG	West Contra Cost	1050	20	5	Contra Costa	Albany
2038	CCTA_REAGG	West Contra Cost	1050	20	5	Contra Costa	Richmond
2039	CCTA_REAGG	West Contra Cost	1050	20	5	Contra Costa	Richmond
2040	CCTA_REAGG	West Contra Cost	1050	20	5	Contra Costa	Richmond
2041	CCTA_REAGG	West Contra Cost	1050	20	5	Contra Costa	Richmond
2042	CCTA_REAGG	West Contra Cost	1050	20	5	Contra Costa	Richmond
2043	CCTA_REAGG	West Contra Cost	1050	20	5	Contra Costa	Richmond
2044	CCTA_REAGG	West Contra Cost	1059	20	5	Contra Costa	Albany
2045	CCTA_REAGG	West Contra Cost	1059	20	5	Contra Costa	Richmond
2046	CCTA_REAGG	West Contra Cost	1059	20	5	Contra Costa	Richmond
2047	CCTA_REAGG	West Contra Cost	1059	20	5	Contra Costa	Richmond
2048	CCTA_REAGG	West Contra Cost	1059	20	5	Contra Costa	Richmond
2049	CCTA_REAGG	West Contra Cost	1059	20	5	Contra Costa	Richmond
2050	CCTA_REAGG	West Contra Cost	1058	20	5	Contra Costa	Richmond
2051	CCTA_REAGG	West Contra Cost	1058	20	5	Contra Costa	Richmond
2052	CCTA_REAGG	West Contra Cost	1058	20	5	Contra Costa	Richmond
2101	CCTA_REAGG	South Contra Cos	1171	23	5	Contra Costa	
2102	CCTA_REAGG	South Contra Cos	1171	23	5	Contra Costa	
2103	CCTA_REAGG	South Contra Cos	1171	23	5	Contra Costa	San Ramon
2104	CCTA_REAGG	South Contra Cos	1171	23	5	Contra Costa	San Ramon
2105	CCTA_REAGG	South Contra Cos	1171	23	5	Contra Costa	San Ramon
2106	CCTA_REAGG	South Contra Cos	1171	23	5	Contra Costa	San Ramon
2107	CCTA_REAGG	South Contra Cos	1171	23	5	Contra Costa	San Ramon

ACCMA_TAZ	SUBREGION	JURISDICTION	MTC_TAZ	SDISTRICT	COUNTY	COUNTY_LABEL	CDP
2108	CCTA_REAGG	South Contra Cos	1171	23	5	Contra Costa	San Ramon
2109	CCTA_REAGG	South Contra Cos	1170	23	5	Contra Costa	San Ramon
2110	CCTA_REAGG	South Contra Cos	1170	23	5	Contra Costa	San Ramon
2111	CCTA_REAGG	South Contra Cos	1170	23	5	Contra Costa	Danville
2112	CCTA_REAGG	South Contra Cos	1172	23	5	Contra Costa	
2113	CCTA_REAGG	South Contra Cos	1172	23	5	Contra Costa	San Ramon
2114	CCTA_REAGG	South Contra Cos	1172	23	5	Contra Costa	
2115	CCTA_REAGG	South Contra Cos	1172	23	5	Contra Costa	San Ramon
2116	CCTA_REAGG	South Contra Cos	1172	23	5	Contra Costa	San Ramon
2117	CCTA_REAGG	South Contra Cos	1173	23	5	Contra Costa	San Ramon
2118	CCTA_REAGG	South Contra Cos	1173	23	5	Contra Costa	San Ramon
2119	CCTA_REAGG	South Contra Cos	1174	23	5	Contra Costa	San Ramon
2120	CCTA_REAGG	South Contra Cos	1174	23	5	Contra Costa	San Ramon
2121	CCTA_REAGG	South Contra Cos	1174	23	5	Contra Costa	San Ramon
2122	CCTA_REAGG	South Contra Cos	1174	23	5	Contra Costa	
2123	CCTA_REAGG	South Contra Cos	1174	23	5	Contra Costa	
2124	CCTA_REAGG	South Contra Cos	1175	23	5	Contra Costa	San Ramon
2125	CCTA_REAGG	South Contra Cos	1175	23	5	Contra Costa	San Ramon
2126	CCTA_REAGG	South Contra Cos	1175	23	5	Contra Costa	San Ramon
2127	CCTA_REAGG	South Contra Cos	1175	23	5	Contra Costa	San Ramon
2128	CCTA_REAGG	South Contra Cos	1175	23	5	Contra Costa	San Ramon
2129	CCTA_REAGG	South Contra Cos	1175	23	5	Contra Costa	San Ramon
2130	CCTA_REAGG	South Contra Cos	1175	23	5	Contra Costa	San Ramon
2131	CCTA_REAGG	South Contra Cos	1168	23	5	Contra Costa	San Ramon
2132	CCTA_REAGG	South Contra Cos	1168	23	5	Contra Costa	San Ramon
2133	CCTA_REAGG	South Contra Cos	1168	23	5	Contra Costa	San Ramon
2134	CCTA_REAGG	South Contra Cos	1168	23	5	Contra Costa	San Ramon
2135	CCTA_REAGG	South Contra Cos	1176	23	5	Contra Costa	San Ramon
2136	CCTA_REAGG	South Contra Cos	1176	23	5	Contra Costa	
2137	CCTA_REAGG	South Contra Cos	1176	23	5	Contra Costa	
2138	CCTA_REAGG	South Contra Cos	1176	23	5	Contra Costa	
2139	CCTA_REAGG	South Contra Cos	1176	23	5	Contra Costa	
2140	CCTA_REAGG	South Contra Cos	1176	23	5	Contra Costa	
2141	CCTA_REAGG	South Contra Cos	1176	23	5	Contra Costa	
2142	CCTA_REAGG	South Contra Cos	1176	23	5	Contra Costa	San Ramon
2143	CCTA_REAGG	South Contra Cos	1176	23	5	Contra Costa	Danville
2144	CCTA_REAGG	South Contra Cos	1176	23	5	Contra Costa	
2145	CCTA_REAGG	South Contra Cos	1176	23	5	Contra Costa	
2146	CCTA_REAGG	South Contra Cos	1176	23	5	Contra Costa	
2147	CCTA_REAGG	South Contra Cos	1176	23	5	Contra Costa	Blackhawk-Camino Tassajara
2148	CCTA_REAGG	South Contra Cos	1176	23	5	Contra Costa	Alamo
2201	VTA_REAGG	Santa Clara	612	12	3	Santa Clara	Fremont
2202	VTA_REAGG	Santa Clara	612	12	3	Santa Clara	Fremont
2203	VTA_REAGG	Santa Clara	612	12	3	Santa Clara	Milpitas
2204	VTA_REAGG	Santa Clara	612	12	3	Santa Clara	Milpitas
2205	VTA_REAGG	Santa Clara	612	12	3	Santa Clara	Milpitas
2206	VTA_REAGG	Santa Clara	612	12	3	Santa Clara	Milpitas
2207	VTA_REAGG	Santa Clara	613	12	3	Santa Clara	Fremont
2208	VTA_REAGG	Santa Clara	613	12	3	Santa Clara	Milpitas
2209	VTA_REAGG	Santa Clara	613	12	3	Santa Clara	Milpitas
2210	VTA_REAGG	Santa Clara	614	12	3	Santa Clara	Milpitas
2211	VTA_REAGG	Santa Clara	614	12	3	Santa Clara	Milpitas
2212	VTA_REAGG	Santa Clara	614	12	3	Santa Clara	Milpitas
2213	VTA_REAGG	Santa Clara	614	12	3	Santa Clara	Milpitas
2214	VTA_REAGG	Santa Clara	611	12	3	Santa Clara	Milpitas
2215	VTA_REAGG	Santa Clara	611	12	3	Santa Clara	Milpitas
2216	VTA_REAGG	Santa Clara	611	12	3	Santa Clara	Milpitas
2217	VTA_REAGG	Santa Clara	611	12	3	Santa Clara	Milpitas
2218	VTA_REAGG	Santa Clara	611	12	3	Santa Clara	Milpitas
2219	VTA_REAGG	Santa Clara	610	12	3	Santa Clara	Milpitas
2220	VTA_REAGG	Santa Clara	610	12	3	Santa Clara	Milpitas

ACCMA_TAZ	SUBREGION	JURISDICTION	MTC_TAZ	SDISTRICT	COUNTY	COUNTY_LABEL	CDP
2221	VTA_REAGG	Santa Clara	610	12	3	Santa Clara	Milpitas
2222	VTA_REAGG	Santa Clara	609	12	3	Santa Clara	Milpitas
2223	VTA_REAGG	Santa Clara	609	12	3	Santa Clara	Milpitas
2224	VTA_REAGG	Santa Clara	609	12	3	Santa Clara	Milpitas
2225	VTA_REAGG	Santa Clara	615	12	3	Santa Clara	Fremont
2226	VTA_REAGG	Santa Clara	615	12	3	Santa Clara	Fremont
2227	VTA_REAGG	Santa Clara	615	12	3	Santa Clara	Milpitas
2228	VTA_REAGG	Santa Clara	615	12	3	Santa Clara	Milpitas
2229	VTA_REAGG	Santa Clara	616	12	3	Santa Clara	Milpitas
2230	VTA_REAGG	Santa Clara	616	12	3	Santa Clara	Milpitas
2231	VTA_REAGG	Santa Clara	405	9	3	Santa Clara	Fremont
2232	VTA_REAGG	Santa Clara	405	9	3	Santa Clara	Milpitas
2233	VTA_REAGG	Santa Clara	405	9	3	Santa Clara	Fremont
2301	SJCOG	San Joaquin	0	35	10	San Joaquin	Walnut Grove
2302	SJCOG	San Joaquin	0	35	10	San Joaquin	Stockton
2303	SJCOG	San Joaquin	0	35	10	San Joaquin	Lockeford
2304	SJCOG	San Joaquin	0	35	10	San Joaquin	Linden
2305	SJCOG	San Joaquin	0	35	10	San Joaquin	Stockton
2306	SJCOG	San Joaquin	0	35	10	San Joaquin	Stockton
2307	SJCOG	San Joaquin	0	35	10	San Joaquin	Stockton
2308	SJCOG	San Joaquin	0	35	10	San Joaquin	Country Club
2309	SJCOG	San Joaquin	0	35	10	San Joaquin	Stockton
2310	SJCOG	San Joaquin	0	35	10	San Joaquin	Stockton
2311	SJCOG	San Joaquin	0	35	10	San Joaquin	Stockton
2312	SJCOG	San Joaquin	0	35	10	San Joaquin	Stockton
2313	SJCOG	San Joaquin	0	35	10	San Joaquin	Stockton
2314	SJCOG	San Joaquin	0	35	10	San Joaquin	Stockton
2315	SJCOG	San Joaquin	0	35	10	San Joaquin	Kennedy
2316	SJCOG	San Joaquin	0	35	10	San Joaquin	French Camp
2317	SJCOG	San Joaquin	0	35	10	San Joaquin	Lathrop
2318	SJCOG	San Joaquin	0	35	10	San Joaquin	Manteca
2319	SJCOG	San Joaquin	0	35	10	San Joaquin	Manteca
2320	SJCOG	San Joaquin	0	35	10	San Joaquin	Escalon
2321	SJCOG	San Joaquin	0	35	10	San Joaquin	Lathrop
2322	SJCOG	San Joaquin	0	35	10	San Joaquin	Lathrop
2323	SJCOG	San Joaquin	0	35	10	San Joaquin	Tracy
2324	SJCOG	San Joaquin	0	35	10	San Joaquin	Tracy
2325	SJCOG	San Joaquin	0	35	10	San Joaquin	Tracy
2326	SJCOG	San Joaquin	0	35	10	San Joaquin	Tracy
2501	MTC_1454		1	1	1	San Francisco	San Francisco
2502	MTC_1454		2	1	1	San Francisco	San Francisco
2503	MTC_1454		3	1	1	San Francisco	San Francisco
2504	MTC_1454		4	1	1	San Francisco	San Francisco
2505	MTC_1454		5	1	1	San Francisco	San Francisco
2506	MTC_1454		6	1	1	San Francisco	San Francisco
2507	MTC_1454		7	1	1	San Francisco	San Francisco
2508	MTC_1454		8	1	1	San Francisco	San Francisco
2509	MTC_1454		9	1	1	San Francisco	San Francisco
2510	MTC_1454		10	1	1	San Francisco	San Francisco
2511	MTC_1454		11	1	1	San Francisco	San Francisco
2512	MTC_1454		12	1	1	San Francisco	San Francisco
2513	MTC_1454		13	1	1	San Francisco	San Francisco
2514	MTC_1454		14	1	1	San Francisco	San Francisco
2515	MTC_1454		15	1	1	San Francisco	San Francisco
2516	MTC_1454		16	1	1	San Francisco	San Francisco
2517	MTC_1454		17	1	1	San Francisco	San Francisco
2518	MTC_1454		18	1	1	San Francisco	San Francisco
2519	MTC_1454		19	1	1	San Francisco	San Francisco
2520	MTC_1454		20	1	1	San Francisco	San Francisco
2521	MTC_1454		21	1	1	San Francisco	San Francisco
2522	MTC_1454		22	1	1	San Francisco	San Francisco

ACCMA_TAZ	SUBREGION	JURISDICTION	MTC_TAZ	SDISTRICT	COUNTY	COUNTY_LABEL	CDP
2523	MTC_1454		23	1	1	San Francisco	San Francisco
2524	MTC_1454		24	1	1	San Francisco	San Francisco
2525	MTC_1454		25	1	1	San Francisco	San Francisco
2526	MTC_1454		26	1	1	San Francisco	San Francisco
2527	MTC_1454		27	1	1	San Francisco	San Francisco
2528	MTC_1454		28	1	1	San Francisco	San Francisco
2529	MTC_1454		29	1	1	San Francisco	San Francisco
2530	MTC_1454		30	1	1	San Francisco	San Francisco
2531	MTC_1454		31	1	1	San Francisco	San Francisco
2532	MTC_1454		32	1	1	San Francisco	San Francisco
2533	MTC_1454		33	1	1	San Francisco	San Francisco
2534	MTC_1454		34	1	1	San Francisco	San Francisco
2535	MTC_1454		35	1	1	San Francisco	San Francisco
2536	MTC_1454		36	1	1	San Francisco	San Francisco
2537	MTC_1454		37	1	1	San Francisco	San Francisco
2538	MTC_1454		38	1	1	San Francisco	San Francisco
2539	MTC_1454		39	1	1	San Francisco	San Francisco
2540	MTC_1454		40	1	1	San Francisco	San Francisco
2541	MTC_1454		41	1	1	San Francisco	San Francisco
2542	MTC_1454		42	1	1	San Francisco	San Francisco
2543	MTC_1454		43	2	1	San Francisco	San Francisco
2544	MTC_1454		44	2	1	San Francisco	San Francisco
2545	MTC_1454		45	2	1	San Francisco	San Francisco
2546	MTC_1454		46	2	1	San Francisco	San Francisco
2547	MTC_1454		47	2	1	San Francisco	San Francisco
2548	MTC_1454		48	2	1	San Francisco	San Francisco
2549	MTC_1454		49	2	1	San Francisco	San Francisco
2550	MTC_1454		50	2	1	San Francisco	San Francisco
2551	MTC_1454		51	2	1	San Francisco	San Francisco
2552	MTC_1454		52	2	1	San Francisco	San Francisco
2553	MTC_1454		53	2	1	San Francisco	San Francisco
2554	MTC_1454		54	2	1	San Francisco	San Francisco
2555	MTC_1454		55	2	1	San Francisco	San Francisco
2556	MTC_1454		56	2	1	San Francisco	San Francisco
2557	MTC_1454		57	2	1	San Francisco	San Francisco
2558	MTC_1454		58	2	1	San Francisco	San Francisco
2559	MTC_1454		59	2	1	San Francisco	San Francisco
2560	MTC_1454		60	2	1	San Francisco	San Francisco
2561	MTC_1454		61	2	1	San Francisco	San Francisco
2562	MTC_1454		62	2	1	San Francisco	San Francisco
2563	MTC_1454		63	2	1	San Francisco	San Francisco
2564	MTC_1454		64	2	1	San Francisco	San Francisco
2565	MTC_1454		65	2	1	San Francisco	San Francisco
2566	MTC_1454		66	2	1	San Francisco	San Francisco
2567	MTC_1454		67	2	1	San Francisco	San Francisco
2568	MTC_1454		68	2	1	San Francisco	San Francisco
2569	MTC_1454		69	2	1	San Francisco	San Francisco
2570	MTC_1454		70	2	1	San Francisco	San Francisco
2571	MTC_1454		71	2	1	San Francisco	San Francisco
2572	MTC_1454		72	2	1	San Francisco	San Francisco
2573	MTC_1454		73	2	1	San Francisco	San Francisco
2574	MTC_1454		74	2	1	San Francisco	San Francisco
2575	MTC_1454		75	2	1	San Francisco	San Francisco
2576	MTC_1454		76	2	1	San Francisco	San Francisco
2577	MTC_1454		77	2	1	San Francisco	San Francisco
2578	MTC_1454		78	2	1	San Francisco	San Francisco
2579	MTC_1454		79	2	1	San Francisco	San Francisco
2580	MTC_1454		80	2	1	San Francisco	San Francisco
2581	MTC_1454		81	2	1	San Francisco	San Francisco
2582	MTC_1454		82	2	1	San Francisco	San Francisco
2583	MTC_1454		83	2	1	San Francisco	San Francisco

ACCMA_TAZ	SUBREGION	JURISDICTION	MTC_TAZ	SDISTRICT	COUNTY	COUNTY_LABEL	CDP
2584	MTC_1454		84	2	1	San Francisco	San Francisco
2585	MTC_1454		85	2	1	San Francisco	San Francisco
2586	MTC_1454		86	2	1	San Francisco	San Francisco
2587	MTC_1454		87	2	1	San Francisco	San Francisco
2588	MTC_1454		88	2	1	San Francisco	San Francisco
2589	MTC_1454		89	2	1	San Francisco	San Francisco
2590	MTC_1454		90	3	1	San Francisco	San Francisco
2591	MTC_1454		91	3	1	San Francisco	San Francisco
2592	MTC_1454		92	3	1	San Francisco	San Francisco
2593	MTC_1454		93	3	1	San Francisco	San Francisco
2594	MTC_1454		94	3	1	San Francisco	San Francisco
2595	MTC_1454		95	3	1	San Francisco	San Francisco
2596	MTC_1454		96	3	1	San Francisco	San Francisco
2597	MTC_1454		97	3	1	San Francisco	San Francisco
2598	MTC_1454		98	3	1	San Francisco	San Francisco
2599	MTC_1454		99	3	1	San Francisco	San Francisco
2600	MTC_1454		100	3	1	San Francisco	San Francisco
2601	MTC_1454		101	3	1	San Francisco	San Francisco
2602	MTC_1454		102	3	1	San Francisco	San Francisco
2603	MTC_1454		103	3	1	San Francisco	San Francisco
2604	MTC_1454		104	3	1	San Francisco	San Francisco
2605	MTC_1454		105	3	1	San Francisco	San Francisco
2606	MTC_1454		106	3	1	San Francisco	San Francisco
2607	MTC_1454		107	3	1	San Francisco	San Francisco
2608	MTC_1454		108	3	1	San Francisco	San Francisco
2609	MTC_1454		109	3	1	San Francisco	San Francisco
2610	MTC_1454		110	3	1	San Francisco	San Francisco
2611	MTC_1454		111	3	1	San Francisco	San Francisco
2612	MTC_1454		112	3	1	San Francisco	San Francisco
2613	MTC_1454		113	3	1	San Francisco	San Francisco
2614	MTC_1454		114	3	1	San Francisco	San Francisco
2615	MTC_1454		115	3	1	San Francisco	San Francisco
2616	MTC_1454		116	3	1	San Francisco	San Francisco
2617	MTC_1454		117	3	1	San Francisco	San Francisco
2618	MTC_1454		118	3	1	San Francisco	San Francisco
2619	MTC_1454		119	3	1	San Francisco	San Francisco
2620	MTC_1454		120	3	1	San Francisco	San Francisco
2621	MTC_1454		121	3	1	San Francisco	San Francisco
2622	MTC_1454		122	3	1	San Francisco	San Francisco
2623	MTC_1454		123	3	1	San Francisco	San Francisco
2624	MTC_1454		124	3	1	San Francisco	San Francisco
2625	MTC_1454		125	3	1	San Francisco	San Francisco
2626	MTC_1454		126	3	1	San Francisco	San Francisco
2627	MTC_1454		127	3	1	San Francisco	San Francisco
2628	MTC_1454		128	3	1	San Francisco	San Francisco
2629	MTC_1454		129	3	1	San Francisco	San Francisco
2630	MTC_1454		130	3	1	San Francisco	San Francisco
2631	MTC_1454		131	3	1	San Francisco	San Francisco
2632	MTC_1454		132	3	1	San Francisco	San Francisco
2633	MTC_1454		133	3	1	San Francisco	San Francisco
2634	MTC_1454		134	3	1	San Francisco	San Francisco
2635	MTC_1454		135	3	1	San Francisco	San Francisco
2636	MTC_1454		136	3	1	San Francisco	San Francisco
2637	MTC_1454		137	3	1	San Francisco	San Francisco
2638	MTC_1454		138	3	1	San Francisco	San Francisco
2639	MTC_1454		139	3	1	San Francisco	San Francisco
2640	MTC_1454		140	3	1	San Francisco	San Francisco
2641	MTC_1454		141	3	1	San Francisco	San Francisco
2642	MTC_1454		142	3	1	San Francisco	San Francisco
2643	MTC_1454		143	3	1	San Francisco	San Francisco
2644	MTC_1454		144	3	1	San Francisco	San Francisco

ACCMA_TAZ	SUBREGION	JURISDICTION	MTC_TAZ	SDISTRICT	COUNTY	COUNTY_LABEL	CDP
2645	MTC_1454		145	3	1	San Francisco	San Francisco
2646	MTC_1454		146	3	1	San Francisco	San Francisco
2647	MTC_1454		147	3	1	San Francisco	San Francisco
2648	MTC_1454		148	3	1	San Francisco	San Francisco
2649	MTC_1454		149	3	1	San Francisco	San Francisco
2650	MTC_1454		150	3	1	San Francisco	San Francisco
2651	MTC_1454		151	3	1	San Francisco	San Francisco
2652	MTC_1454		152	3	1	San Francisco	San Francisco
2653	MTC_1454		153	3	1	San Francisco	San Francisco
2654	MTC_1454		154	3	1	San Francisco	San Francisco
2655	MTC_1454		155	3	1	San Francisco	San Francisco
2656	MTC_1454		156	3	1	San Francisco	San Francisco
2657	MTC_1454		157	3	1	San Francisco	San Francisco
2658	MTC_1454		158	3	1	San Francisco	San Francisco
2659	MTC_1454		159	3	1	San Francisco	San Francisco
2660	MTC_1454		160	3	1	San Francisco	San Francisco
2661	MTC_1454		161	3	1	San Francisco	San Francisco
2662	MTC_1454		162	3	1	San Francisco	San Francisco
2663	MTC_1454		163	3	1	San Francisco	San Francisco
2664	MTC_1454		164	3	1	San Francisco	San Francisco
2665	MTC_1454		165	3	1	San Francisco	San Francisco
2666	MTC_1454		166	3	1	San Francisco	San Francisco
2667	MTC_1454		167	3	1	San Francisco	San Francisco
2668	MTC_1454		168	4	1	San Francisco	San Francisco
2669	MTC_1454		169	4	1	San Francisco	San Francisco
2670	MTC_1454		170	4	1	San Francisco	San Francisco
2671	MTC_1454		171	4	1	San Francisco	San Francisco
2672	MTC_1454		172	4	1	San Francisco	San Francisco
2673	MTC_1454		173	4	1	San Francisco	San Francisco
2674	MTC_1454		174	4	1	San Francisco	San Francisco
2675	MTC_1454		175	4	1	San Francisco	San Francisco
2676	MTC_1454		176	4	1	San Francisco	San Francisco
2677	MTC_1454		177	4	1	San Francisco	San Francisco
2678	MTC_1454		178	4	1	San Francisco	San Francisco
2679	MTC_1454		179	4	1	San Francisco	San Francisco
2680	MTC_1454		180	4	1	San Francisco	San Francisco
2681	MTC_1454		181	4	1	San Francisco	San Francisco
2682	MTC_1454		182	4	1	San Francisco	San Francisco
2683	MTC_1454		183	4	1	San Francisco	San Francisco
2684	MTC_1454		184	4	1	San Francisco	San Francisco
2685	MTC_1454		185	4	1	San Francisco	San Francisco
2686	MTC_1454		186	4	1	San Francisco	San Francisco
2687	MTC_1454		187	4	1	San Francisco	San Francisco
2688	MTC_1454		188	4	1	San Francisco	San Francisco
2689	MTC_1454		189	4	1	San Francisco	San Francisco
2690	MTC_1454		190	4	1	San Francisco	San Francisco
2691	MTC_1454		191	5	2	San Mateo	Daly City
2692	MTC_1454		192	5	2	San Mateo	Daly City
2693	MTC_1454		193	5	2	San Mateo	Broadmoor
2694	MTC_1454		194	5	2	San Mateo	Daly City
2695	MTC_1454		195	5	2	San Mateo	Daly City
2696	MTC_1454		196	5	2	San Mateo	Daly City
2697	MTC_1454		197	5	2	San Mateo	Daly City
2698	MTC_1454		198	5	2	San Mateo	Daly City
2699	MTC_1454		199	5	2	San Mateo	Daly City
2700	MTC_1454		200	5	2	San Mateo	Colma
2701	MTC_1454		201	5	2	San Mateo	Daly City
2702	MTC_1454		202	5	2	San Mateo	Daly City
2703	MTC_1454		203	5	2	San Mateo	Daly City
2704	MTC_1454		204	5	2	San Mateo	Daly City
2705	MTC_1454		205	5	2	San Mateo	Daly City

ACCMA_TAZ	SUBREGION	JURISDICTION	MTC_TAZ	SDISTRICT	COUNTY	COUNTY_LABEL	CDP
2706	MTC_1454		206	5	2	San Mateo	San Francisco
2707	MTC_1454		207	5	2	San Mateo	Daly City
2708	MTC_1454		208	5	2	San Mateo	San Francisco
2709	MTC_1454		209	5	2	San Mateo	South San Francisco
2710	MTC_1454		210	5	2	San Mateo	South San Francisco
2711	MTC_1454		211	5	2	San Mateo	South San Francisco
2712	MTC_1454		212	5	2	San Mateo	South San Francisco
2713	MTC_1454		213	5	2	San Mateo	San Bruno
2714	MTC_1454		214	5	2	San Mateo	South San Francisco
2715	MTC_1454		215	5	2	San Mateo	South San Francisco
2716	MTC_1454		216	5	2	San Mateo	South San Francisco
2717	MTC_1454		217	5	2	San Mateo	South San Francisco
2718	MTC_1454		218	5	2	San Mateo	Daly City
2719	MTC_1454		219	5	2	San Mateo	Daly City
2720	MTC_1454		220	5	2	San Mateo	Pacifica
2721	MTC_1454		221	5	2	San Mateo	Pacifica
2722	MTC_1454		222	5	2	San Mateo	Pacifica
2723	MTC_1454		223	5	2	San Mateo	Pacifica
2724	MTC_1454		224	5	2	San Mateo	Pacifica
2725	MTC_1454		225	5	2	San Mateo	Pacifica
2726	MTC_1454		226	5	2	San Mateo	Pacifica
2727	MTC_1454		227	5	2	San Mateo	Pacifica
2728	MTC_1454		228	5	2	San Mateo	Pacifica
2729	MTC_1454		229	5	2	San Mateo	San Bruno
2730	MTC_1454		230	5	2	San Mateo	South San Francisco
2731	MTC_1454		231	5	2	San Mateo	South San Francisco
2732	MTC_1454		232	5	2	San Mateo	San Bruno
2733	MTC_1454		233	5	2	San Mateo	San Bruno
2734	MTC_1454		234	5	2	San Mateo	San Bruno
2735	MTC_1454		235	5	2	San Mateo	San Bruno
2736	MTC_1454		236	5	2	San Mateo	San Bruno
2737	MTC_1454		237	5	2	San Mateo	San Bruno
2738	MTC_1454		238	5	2	San Mateo	San Bruno
2739	MTC_1454		239	5	2	San Mateo	Millbrae
2740	MTC_1454		240	5	2	San Mateo	Millbrae
2741	MTC_1454		241	5	2	San Mateo	Millbrae
2742	MTC_1454		242	5	2	San Mateo	Millbrae
2743	MTC_1454		243	5	2	San Mateo	Millbrae
2744	MTC_1454		244	5	2	San Mateo	Millbrae
2745	MTC_1454		245	5	2	San Mateo	Millbrae
2746	MTC_1454		246	5	2	San Mateo	Millbrae
2747	MTC_1454		247	5	2	San Mateo	Burlingame
2748	MTC_1454		248	5	2	San Mateo	Burlingame
2749	MTC_1454		249	6	2	San Mateo	Burlingame
2750	MTC_1454		250	6	2	San Mateo	Burlingame
2751	MTC_1454		251	6	2	San Mateo	Burlingame
2752	MTC_1454		252	6	2	San Mateo	Hillsborough
2753	MTC_1454		253	6	2	San Mateo	San Mateo
2754	MTC_1454		254	6	2	San Mateo	Hillsborough
2755	MTC_1454		255	6	2	San Mateo	San Mateo
2756	MTC_1454		256	6	2	San Mateo	San Mateo
2757	MTC_1454		257	6	2	San Mateo	San Mateo
2758	MTC_1454		258	6	2	San Mateo	San Mateo
2759	MTC_1454		259	6	2	San Mateo	San Mateo
2760	MTC_1454		260	6	2	San Mateo	San Mateo
2761	MTC_1454		261	6	2	San Mateo	San Mateo
2762	MTC_1454		262	6	2	San Mateo	San Mateo
2763	MTC_1454		263	6	2	San Mateo	San Mateo
2764	MTC_1454		264	6	2	San Mateo	San Mateo
2765	MTC_1454		265	6	2	San Mateo	San Mateo
2766	MTC_1454		266	6	2	San Mateo	Foster City

ACCMA_TAZ	SUBREGION	JURISDICTION	MTC_TAZ	SDISTRICT	COUNTY	COUNTY_LABEL	CDP
2767	MTC_1454		267	6	2	San Mateo	Foster City
2768	MTC_1454		268	6	2	San Mateo	Foster City
2769	MTC_1454		269	6	2	San Mateo	Foster City
2770	MTC_1454		270	6	2	San Mateo	Foster City
2771	MTC_1454		271	6	2	San Mateo	Foster City
2772	MTC_1454		272	6	2	San Mateo	Foster City
2773	MTC_1454		273	6	2	San Mateo	Foster City
2774	MTC_1454		274	6	2	San Mateo	San Mateo
2775	MTC_1454		275	6	2	San Mateo	Belmont
2776	MTC_1454		276	6	2	San Mateo	San Mateo
2777	MTC_1454		277	6	2	San Mateo	San Mateo
2778	MTC_1454		278	6	2	San Mateo	San Mateo
2779	MTC_1454		279	6	2	San Mateo	San Mateo
2780	MTC_1454		280	6	2	San Mateo	San Mateo
2781	MTC_1454		281	6	2	San Mateo	San Mateo
2782	MTC_1454		282	6	2	San Mateo	Hillsborough
2783	MTC_1454		283	6	2	San Mateo	San Mateo
2784	MTC_1454		284	6	2	San Mateo	San Mateo
2785	MTC_1454		285	6	2	San Mateo	San Mateo
2786	MTC_1454		286	6	2	San Mateo	Belmont
2787	MTC_1454		287	6	2	San Mateo	Belmont
2788	MTC_1454		288	6	2	San Mateo	Belmont
2789	MTC_1454		289	6	2	San Mateo	Belmont
2790	MTC_1454		290	6	2	San Mateo	San Mateo
2791	MTC_1454		291	6	2	San Mateo	Highlands-Baywood Park
2792	MTC_1454		292	6	2	San Mateo	Highlands-Baywood Park
2793	MTC_1454		293	6	2	San Mateo	Montara
2794	MTC_1454		294	6	2	San Mateo	El Granada
2795	MTC_1454		295	6	2	San Mateo	Pacifica
2796	MTC_1454		296	6	2	San Mateo	Half Moon Bay
2797	MTC_1454		297	7	2	San Mateo	Palo Alto
2798	MTC_1454		298	7	2	San Mateo	Portola Valley
2799	MTC_1454		299	7	2	San Mateo	Woodside
2800	MTC_1454		300	7	2	San Mateo	Woodside
2801	MTC_1454		301	7	2	San Mateo	Redwood City
2802	MTC_1454		302	7	2	San Mateo	Redwood City
2803	MTC_1454		303	7	2	San Mateo	Emerald Lake Hills
2804	MTC_1454		304	7	2	San Mateo	San Carlos
2805	MTC_1454		305	7	2	San Mateo	San Carlos
2806	MTC_1454		306	7	2	San Mateo	Belmont
2807	MTC_1454		307	7	2	San Mateo	San Carlos
2808	MTC_1454		308	7	2	San Mateo	San Carlos
2809	MTC_1454		309	7	2	San Mateo	San Carlos
2810	MTC_1454		310	7	2	San Mateo	San Carlos
2811	MTC_1454		311	7	2	San Mateo	Redwood City
2812	MTC_1454		312	7	2	San Mateo	Redwood City
2813	MTC_1454		313	7	2	San Mateo	Redwood City
2814	MTC_1454		314	7	2	San Mateo	Redwood City
2815	MTC_1454		315	7	2	San Mateo	Redwood City
2816	MTC_1454		316	7	2	San Mateo	Redwood City
2817	MTC_1454		317	7	2	San Mateo	Redwood City
2818	MTC_1454		318	7	2	San Mateo	San Carlos
2819	MTC_1454		319	7	2	San Mateo	Redwood City
2820	MTC_1454		320	7	2	San Mateo	Redwood City
2821	MTC_1454		321	7	2	San Mateo	Redwood City
2822	MTC_1454		322	7	2	San Mateo	Atherton
2823	MTC_1454		323	7	2	San Mateo	Redwood City
2824	MTC_1454		324	7	2	San Mateo	Redwood City
2825	MTC_1454		325	7	2	San Mateo	Redwood City
2826	MTC_1454		326	7	2	San Mateo	Redwood City
2827	MTC_1454		327	7	2	San Mateo	North Fair Oaks

ACCMA_TAZ	SUBREGION	JURISDICTION	MTC_TAZ	SDISTRICT	COUNTY	COUNTY_LABEL	CDP
2828	MTC_1454		328	7	2	San Mateo	North Fair Oaks
2829	MTC_1454		329	7	2	San Mateo	North Fair Oaks
2830	MTC_1454		330	7	2	San Mateo	Redwood City
2831	MTC_1454		331	7	2	San Mateo	Menlo Park
2832	MTC_1454		332	7	2	San Mateo	Menlo Park
2833	MTC_1454		333	7	2	San Mateo	East Palo Alto
2834	MTC_1454		334	7	2	San Mateo	East Palo Alto
2835	MTC_1454		335	7	2	San Mateo	East Palo Alto
2836	MTC_1454		336	7	2	San Mateo	Menlo Park
2837	MTC_1454		337	7	2	San Mateo	Atherton
2838	MTC_1454		338	7	2	San Mateo	Menlo Park
2839	MTC_1454		339	7	2	San Mateo	Atherton
2840	MTC_1454		340	7	2	San Mateo	Menlo Park
2841	MTC_1454		341	7	2	San Mateo	Menlo Park
2842	MTC_1454		342	7	2	San Mateo	Atherton
2843	MTC_1454		343	7	2	San Mateo	Menlo Park
2844	MTC_1454		344	7	2	San Mateo	Menlo Park
2845	MTC_1454		345	7	2	San Mateo	West Menlo Park
2846	MTC_1454		346	7	2	San Mateo	Menlo Park
2847	VTA_1454		347	8	3	Santa Clara	Los Altos
2848	VTA_1454		348	8	3	Santa Clara	Palo Alto
2849	VTA_1454		349	8	3	Santa Clara	Palo Alto
2850	VTA_1454		350	8	3	Santa Clara	Stanford
2851	VTA_1454		351	8	3	Santa Clara	Palo Alto
2852	VTA_1454		352	8	3	Santa Clara	Stanford
2853	VTA_1454		353	8	3	Santa Clara	Stanford
2854	VTA_1454		354	8	3	Santa Clara	Stanford
2855	VTA_1454		355	8	3	Santa Clara	Stanford
2856	VTA_1454		356	8	3	Santa Clara	Palo Alto
2857	VTA_1454		357	8	3	Santa Clara	Palo Alto
2858	VTA_1454		358	8	3	Santa Clara	Palo Alto
2859	VTA_1454		359	8	3	Santa Clara	Palo Alto
2860	VTA_1454		360	8	3	Santa Clara	Palo Alto
2861	VTA_1454		361	8	3	Santa Clara	Palo Alto
2862	VTA_1454		362	8	3	Santa Clara	Palo Alto
2863	VTA_1454		363	8	3	Santa Clara	Palo Alto
2864	VTA_1454		364	8	3	Santa Clara	Palo Alto
2865	VTA_1454		365	8	3	Santa Clara	Mountain View
2866	VTA_1454		366	8	3	Santa Clara	Palo Alto
2867	VTA_1454		367	8	3	Santa Clara	Palo Alto
2868	VTA_1454		368	8	3	Santa Clara	Los Altos Hills
2869	VTA_1454		369	8	3	Santa Clara	Los Altos
2870	VTA_1454		370	8	3	Santa Clara	Los Altos
2871	VTA_1454		371	8	3	Santa Clara	Los Altos
2872	VTA_1454		372	8	3	Santa Clara	Mountain View
2873	VTA_1454		373	8	3	Santa Clara	Mountain View
2874	VTA_1454		374	8	3	Santa Clara	Mountain View
2875	VTA_1454		375	8	3	Santa Clara	Mountain View
2876	VTA_1454		376	8	3	Santa Clara	Mountain View
2877	VTA_1454		377	8	3	Santa Clara	Mountain View
2878	VTA_1454		378	8	3	Santa Clara	Mountain View
2879	VTA_1454		379	8	3	Santa Clara	Mountain View
2880	VTA_1454		380	8	3	Santa Clara	Mountain View
2881	VTA_1454		381	8	3	Santa Clara	Mountain View
2882	VTA_1454		382	8	3	Santa Clara	Mountain View
2883	VTA_1454		383	8	3	Santa Clara	Mountain View
2884	VTA_1454		384	8	3	Santa Clara	Los Altos
2885	VTA_1454		385	8	3	Santa Clara	Loyola
2886	VTA_1454		386	8	3	Santa Clara	Los Altos
2887	VTA_1454		387	8	3	Santa Clara	Los Altos
2888	VTA_1454		388	8	3	Santa Clara	Los Altos

ACCMA_TAZ	SUBREGION	JURISDICTION	MTC_TAZ	SDISTRICT	COUNTY	COUNTY_LABEL	CDP
2889	VTA_1454		389	8	3	Santa Clara	Mountain View
2890	VTA_1454		390	8	3	Santa Clara	Mountain View
2891	VTA_1454		391	9	3	Santa Clara	Mountain View
2892	VTA_1454		392	9	3	Santa Clara	Sunnyvale
2893	VTA_1454		393	9	3	Santa Clara	Sunnyvale
2894	VTA_1454		394	9	3	Santa Clara	Sunnyvale
2895	VTA_1454		395	9	3	Santa Clara	Sunnyvale
2896	VTA_1454		396	9	3	Santa Clara	Sunnyvale
2897	VTA_1454		397	9	3	Santa Clara	Mountain View
2898	VTA_1454		398	9	3	Santa Clara	Mountain View
2899	VTA_1454		399	9	3	Santa Clara	Mountain View
2900	VTA_1454		400	9	3	Santa Clara	Mountain View
2901	VTA_1454		401	9	3	Santa Clara	Mountain View
2902	VTA_1454		402	9	3	Santa Clara	Mountain View
2903	VTA_1454		403	9	3	Santa Clara	Sunnyvale
2904	VTA_1454		404	9	3	Santa Clara	San Jose
2905	VTA_1454		406	9	3	Santa Clara	Milpitas
2906	VTA_1454		407	9	3	Santa Clara	San Jose
2907	VTA_1454		408	9	3	Santa Clara	San Jose
2908	VTA_1454		409	9	3	Santa Clara	San Jose
2909	VTA_1454		410	9	3	Santa Clara	San Jose
2910	VTA_1454		411	9	3	Santa Clara	San Jose
2911	VTA_1454		412	9	3	Santa Clara	San Jose
2912	VTA_1454		413	9	3	Santa Clara	Santa Clara
2913	VTA_1454		414	9	3	Santa Clara	Santa Clara
2914	VTA_1454		415	9	3	Santa Clara	Santa Clara
2915	VTA_1454		416	9	3	Santa Clara	Santa Clara
2916	VTA_1454		417	9	3	Santa Clara	Santa Clara
2917	VTA_1454		418	9	3	Santa Clara	Sunnyvale
2918	VTA_1454		419	9	3	Santa Clara	Sunnyvale
2919	VTA_1454		420	9	3	Santa Clara	Sunnyvale
2920	VTA_1454		421	9	3	Santa Clara	Sunnyvale
2921	VTA_1454		422	9	3	Santa Clara	Sunnyvale
2922	VTA_1454		423	9	3	Santa Clara	Sunnyvale
2923	VTA_1454		424	9	3	Santa Clara	Sunnyvale
2924	VTA_1454		425	9	3	Santa Clara	Sunnyvale
2925	VTA_1454		426	9	3	Santa Clara	Sunnyvale
2926	VTA_1454		427	9	3	Santa Clara	Sunnyvale
2927	VTA_1454		428	9	3	Santa Clara	Sunnyvale
2928	VTA_1454		429	9	3	Santa Clara	Santa Clara
2929	VTA_1454		430	9	3	Santa Clara	Santa Clara
2930	VTA_1454		431	9	3	Santa Clara	Santa Clara
2931	VTA_1454		432	9	3	Santa Clara	Santa Clara
2932	VTA_1454		433	9	3	Santa Clara	Santa Clara
2933	VTA_1454		434	9	3	Santa Clara	San Jose
2934	VTA_1454		435	9	3	Santa Clara	San Jose
2935	VTA_1454		436	9	3	Santa Clara	Santa Clara
2936	VTA_1454		437	9	3	Santa Clara	Santa Clara
2937	VTA_1454		438	9	3	Santa Clara	Santa Clara
2938	VTA_1454		439	9	3	Santa Clara	Santa Clara
2939	VTA_1454		440	9	3	Santa Clara	Santa Clara
2940	VTA_1454		441	9	3	Santa Clara	Santa Clara
2941	VTA_1454		442	9	3	Santa Clara	Santa Clara
2942	VTA_1454		443	9	3	Santa Clara	Santa Clara
2943	VTA_1454		444	9	3	Santa Clara	Santa Clara
2944	VTA_1454		445	9	3	Santa Clara	Sunnyvale
2945	VTA_1454		446	9	3	Santa Clara	Sunnyvale
2946	VTA_1454		447	9	3	Santa Clara	Sunnyvale
2947	VTA_1454		448	9	3	Santa Clara	Sunnyvale
2948	VTA_1454		449	9	3	Santa Clara	Sunnyvale
2949	VTA_1454		450	9	3	Santa Clara	Sunnyvale

ACCMA_TAZ	SUBREGION	JURISDICTION	MTC_TAZ	SDISTRICT	COUNTY	COUNTY_LABEL	CDP
2950	VTA_1454		451	9	3	Santa Clara	Sunnyvale
2951	VTA_1454		452	9	3	Santa Clara	Sunnyvale
2952	VTA_1454		453	9	3	Santa Clara	Sunnyvale
2953	VTA_1454		454	9	3	Santa Clara	Sunnyvale
2954	VTA_1454		455	9	3	Santa Clara	Sunnyvale
2955	VTA_1454		456	9	3	Santa Clara	Sunnyvale
2956	VTA_1454		457	9	3	Santa Clara	Sunnyvale
2957	VTA_1454		458	9	3	Santa Clara	Sunnyvale
2958	VTA_1454		459	9	3	Santa Clara	Sunnyvale
2959	VTA_1454		460	10	3	Santa Clara	Cupertino
2960	VTA_1454		461	10	3	Santa Clara	Santa Clara
2961	VTA_1454		462	10	3	Santa Clara	Santa Clara
2962	VTA_1454		463	10	3	Santa Clara	Santa Clara
2963	VTA_1454		464	10	3	Santa Clara	Santa Clara
2964	VTA_1454		465	10	3	Santa Clara	Santa Clara
2965	VTA_1454		466	10	3	Santa Clara	San Jose
2966	VTA_1454		467	10	3	Santa Clara	San Jose
2967	VTA_1454		468	10	3	Santa Clara	Campbell
2968	VTA_1454		469	10	3	Santa Clara	Campbell
2969	VTA_1454		470	10	3	Santa Clara	San Jose
2970	VTA_1454		471	10	3	Santa Clara	San Jose
2971	VTA_1454		472	10	3	Santa Clara	San Jose
2972	VTA_1454		473	10	3	Santa Clara	San Jose
2973	VTA_1454		474	10	3	Santa Clara	San Jose
2974	VTA_1454		475	10	3	Santa Clara	San Jose
2975	VTA_1454		476	10	3	Santa Clara	San Jose
2976	VTA_1454		477	10	3	Santa Clara	San Jose
2977	VTA_1454		478	10	3	Santa Clara	San Jose
2978	VTA_1454		479	10	3	Santa Clara	Cupertino
2979	VTA_1454		480	10	3	Santa Clara	San Jose
2980	VTA_1454		481	10	3	Santa Clara	San Jose
2981	VTA_1454		482	10	3	Santa Clara	San Jose
2982	VTA_1454		483	10	3	Santa Clara	San Jose
2983	VTA_1454		484	10	3	Santa Clara	Cupertino
2984	VTA_1454		485	10	3	Santa Clara	Cupertino
2985	VTA_1454		486	10	3	Santa Clara	Cupertino
2986	VTA_1454		487	10	3	Santa Clara	Cupertino
2987	VTA_1454		488	10	3	Santa Clara	Cupertino
2988	VTA_1454		489	10	3	Santa Clara	Cupertino
2989	VTA_1454		490	10	3	Santa Clara	Cupertino
2990	VTA_1454		491	10	3	Santa Clara	Cupertino
2991	VTA_1454		492	10	3	Santa Clara	Cupertino
2992	VTA_1454		493	10	3	Santa Clara	Saratoga
2993	VTA_1454		494	10	3	Santa Clara	Saratoga
2994	VTA_1454		495	10	3	Santa Clara	Saratoga
2995	VTA_1454		496	10	3	Santa Clara	Monte Sereno
2996	VTA_1454		497	10	3	Santa Clara	Saratoga
2997	VTA_1454		498	10	3	Santa Clara	Saratoga
2998	VTA_1454		499	10	3	Santa Clara	San Jose
2999	VTA_1454		500	10	3	Santa Clara	Campbell
3000	VTA_1454		501	10	3	Santa Clara	San Jose
3001	VTA_1454		502	10	3	Santa Clara	Campbell
3002	VTA_1454		503	10	3	Santa Clara	Campbell
3003	VTA_1454		504	10	3	Santa Clara	Campbell
3004	VTA_1454		505	10	3	Santa Clara	Campbell
3005	VTA_1454		506	10	3	Santa Clara	Campbell
3006	VTA_1454		507	10	3	Santa Clara	Los Gatos
3007	VTA_1454		508	10	3	Santa Clara	Los Gatos
3008	VTA_1454		509	10	3	Santa Clara	Los Gatos
3009	VTA_1454		510	10	3	Santa Clara	Monte Sereno
3010	VTA_1454		511	10	3	Santa Clara	Los Gatos

ACCMA_TAZ	SUBREGION	JURISDICTION	MTC_TAZ	SDISTRICT	COUNTY	COUNTY_LABEL	CDP
3011	VTA_1454		512	10	3	Santa Clara	Lexington Hills
3012	VTA_1454		513	10	3	Santa Clara	Los Gatos
3013	VTA_1454		514	10	3	Santa Clara	Los Gatos
3014	VTA_1454		515	10	3	Santa Clara	San Jose
3015	VTA_1454		516	10	3	Santa Clara	San Jose
3016	VTA_1454		517	10	3	Santa Clara	San Jose
3017	VTA_1454		518	10	3	Santa Clara	Los Gatos
3018	VTA_1454		519	10	3	Santa Clara	San Jose
3019	VTA_1454		520	10	3	Santa Clara	San Jose
3020	VTA_1454		521	10	3	Santa Clara	San Jose
3021	VTA_1454		522	11	3	Santa Clara	San Jose
3022	VTA_1454		523	11	3	Santa Clara	San Jose
3023	VTA_1454		524	11	3	Santa Clara	San Jose
3024	VTA_1454		525	11	3	Santa Clara	San Jose
3025	VTA_1454		526	11	3	Santa Clara	San Jose
3026	VTA_1454		527	11	3	Santa Clara	San Jose
3027	VTA_1454		528	11	3	Santa Clara	San Jose
3028	VTA_1454		529	11	3	Santa Clara	San Jose
3029	VTA_1454		530	11	3	Santa Clara	Campbell
3030	VTA_1454		531	11	3	Santa Clara	San Jose
3031	VTA_1454		532	11	3	Santa Clara	San Jose
3032	VTA_1454		533	11	3	Santa Clara	San Jose
3033	VTA_1454		534	11	3	Santa Clara	San Jose
3034	VTA_1454		535	11	3	Santa Clara	Burbank
3035	VTA_1454		536	11	3	Santa Clara	San Jose
3036	VTA_1454		537	11	3	Santa Clara	San Jose
3037	VTA_1454		538	11	3	Santa Clara	San Jose
3038	VTA_1454		539	11	3	Santa Clara	San Jose
3039	VTA_1454		540	11	3	Santa Clara	San Jose
3040	VTA_1454		541	11	3	Santa Clara	San Jose
3041	VTA_1454		542	11	3	Santa Clara	San Jose
3042	VTA_1454		543	11	3	Santa Clara	Santa Clara
3043	VTA_1454		544	11	3	Santa Clara	Santa Clara
3044	VTA_1454		545	11	3	Santa Clara	Santa Clara
3045	VTA_1454		546	11	3	Santa Clara	San Jose
3046	VTA_1454		547	11	3	Santa Clara	San Jose
3047	VTA_1454		548	11	3	Santa Clara	San Jose
3048	VTA_1454		549	11	3	Santa Clara	San Jose
3049	VTA_1454		550	11	3	Santa Clara	San Jose
3050	VTA_1454		551	11	3	Santa Clara	San Jose
3051	VTA_1454		552	11	3	Santa Clara	San Jose
3052	VTA_1454		553	11	3	Santa Clara	San Jose
3053	VTA_1454		554	11	3	Santa Clara	San Jose
3054	VTA_1454		555	11	3	Santa Clara	San Jose
3055	VTA_1454		556	11	3	Santa Clara	San Jose
3056	VTA_1454		557	11	3	Santa Clara	San Jose
3057	VTA_1454		558	11	3	Santa Clara	San Jose
3058	VTA_1454		559	11	3	Santa Clara	San Jose
3059	VTA_1454		560	11	3	Santa Clara	San Jose
3060	VTA_1454		561	11	3	Santa Clara	San Jose
3061	VTA_1454		562	11	3	Santa Clara	San Jose
3062	VTA_1454		563	11	3	Santa Clara	San Jose
3063	VTA_1454		564	11	3	Santa Clara	San Jose
3064	VTA_1454		565	11	3	Santa Clara	San Jose
3065	VTA_1454		566	11	3	Santa Clara	San Jose
3066	VTA_1454		567	11	3	Santa Clara	San Jose
3067	VTA_1454		568	11	3	Santa Clara	San Jose
3068	VTA_1454		569	11	3	Santa Clara	San Jose
3069	VTA_1454		570	11	3	Santa Clara	San Jose
3070	VTA_1454		571	11	3	Santa Clara	San Jose
3071	VTA_1454		572	11	3	Santa Clara	San Jose

ACCMA_TAZ	SUBREGION	JURISDICTION	MTC_TAZ	SDISTRICT	COUNTY	COUNTY_LABEL	CDP
3072	VTA_1454		573	11	3	Santa Clara	San Jose
3073	VTA_1454		574	11	3	Santa Clara	San Jose
3074	VTA_1454		575	11	3	Santa Clara	San Jose
3075	VTA_1454		576	11	3	Santa Clara	San Jose
3076	VTA_1454		577	11	3	Santa Clara	San Jose
3077	VTA_1454		578	11	3	Santa Clara	San Jose
3078	VTA_1454		579	11	3	Santa Clara	San Jose
3079	VTA_1454		580	11	3	Santa Clara	San Jose
3080	VTA_1454		581	12	3	Santa Clara	San Jose
3081	VTA_1454		582	12	3	Santa Clara	San Jose
3082	VTA_1454		583	12	3	Santa Clara	San Jose
3083	VTA_1454		584	12	3	Santa Clara	San Jose
3084	VTA_1454		585	12	3	Santa Clara	San Jose
3085	VTA_1454		586	12	3	Santa Clara	San Jose
3086	VTA_1454		587	12	3	Santa Clara	San Jose
3087	VTA_1454		588	12	3	Santa Clara	San Jose
3088	VTA_1454		589	12	3	Santa Clara	San Jose
3089	VTA_1454		590	12	3	Santa Clara	San Jose
3090	VTA_1454		591	12	3	Santa Clara	San Jose
3091	VTA_1454		592	12	3	Santa Clara	San Jose
3092	VTA_1454		593	12	3	Santa Clara	San Jose
3093	VTA_1454		594	12	3	Santa Clara	San Jose
3094	VTA_1454		595	12	3	Santa Clara	San Jose
3095	VTA_1454		596	12	3	Santa Clara	San Jose
3096	VTA_1454		597	12	3	Santa Clara	San Jose
3097	VTA_1454		598	12	3	Santa Clara	San Jose
3098	VTA_1454		599	12	3	Santa Clara	San Jose
3099	VTA_1454		600	12	3	Santa Clara	San Jose
3100	VTA_1454		601	12	3	Santa Clara	San Jose
3101	VTA_1454		602	12	3	Santa Clara	San Jose
3102	VTA_1454		603	12	3	Santa Clara	San Jose
3103	VTA_1454		604	12	3	Santa Clara	San Jose
3104	VTA_1454		605	12	3	Santa Clara	San Jose
3105	VTA_1454		606	12	3	Santa Clara	Milpitas
3106	VTA_1454		607	12	3	Santa Clara	Milpitas
3107	VTA_1454		608	12	3	Santa Clara	Milpitas
3108	VTA_1454		617	12	3	Santa Clara	Milpitas
3109	VTA_1454		618	12	3	Santa Clara	Milpitas
3110	VTA_1454		619	12	3	Santa Clara	Milpitas
3111	VTA_1454		620	12	3	Santa Clara	Milpitas
3112	VTA_1454		621	12	3	Santa Clara	San Jose
3113	VTA_1454		622	12	3	Santa Clara	San Jose
3114	VTA_1454		623	12	3	Santa Clara	San Jose
3115	VTA_1454		624	12	3	Santa Clara	San Jose
3116	VTA_1454		625	12	3	Santa Clara	San Jose
3117	VTA_1454		626	12	3	Santa Clara	San Jose
3118	VTA_1454		627	12	3	Santa Clara	San Jose
3119	VTA_1454		628	12	3	Santa Clara	East Foothills
3120	VTA_1454		629	12	3	Santa Clara	East Foothills
3121	VTA_1454		630	12	3	Santa Clara	San Jose
3122	VTA_1454		631	12	3	Santa Clara	San Jose
3123	VTA_1454		632	12	3	Santa Clara	San Jose
3124	VTA_1454		633	12	3	Santa Clara	San Jose
3125	VTA_1454		634	12	3	Santa Clara	Alum Rock
3126	VTA_1454		635	12	3	Santa Clara	Alum Rock
3127	VTA_1454		636	12	3	Santa Clara	Alum Rock
3128	VTA_1454		637	12	3	Santa Clara	East Foothills
3129	VTA_1454		638	12	3	Santa Clara	San Jose
3130	VTA_1454		639	12	3	Santa Clara	San Jose
3131	VTA_1454		640	12	3	Santa Clara	San Jose
3132	VTA_1454		641	12	3	Santa Clara	San Jose

ACCMA_TAZ	SUBREGION	JURISDICTION	MTC_TAZ	SDISTRICT	COUNTY	COUNTY_LABEL	CDP
3133	VTA_1454		642	12	3	Santa Clara	San Jose
3134	VTA_1454		643	12	3	Santa Clara	San Jose
3135	VTA_1454		644	12	3	Santa Clara	San Jose
3136	VTA_1454		645	12	3	Santa Clara	San Jose
3137	VTA_1454		646	12	3	Santa Clara	San Jose
3138	VTA_1454		647	12	3	Santa Clara	San Jose
3139	VTA_1454		648	12	3	Santa Clara	San Jose
3140	VTA_1454		649	12	3	Santa Clara	San Jose
3141	VTA_1454		650	12	3	Santa Clara	San Jose
3142	VTA_1454		651	12	3	Santa Clara	San Jose
3143	VTA_1454		652	12	3	Santa Clara	San Jose
3144	VTA_1454		653	12	3	Santa Clara	San Jose
3145	VTA_1454		654	12	3	Santa Clara	San Jose
3146	VTA_1454		655	12	3	Santa Clara	San Jose
3147	VTA_1454		656	13	3	Santa Clara	San Jose
3148	VTA_1454		657	13	3	Santa Clara	San Jose
3149	VTA_1454		658	13	3	Santa Clara	San Jose
3150	VTA_1454		659	13	3	Santa Clara	San Jose
3151	VTA_1454		660	13	3	Santa Clara	San Jose
3152	VTA_1454		661	13	3	Santa Clara	San Jose
3153	VTA_1454		662	13	3	Santa Clara	San Jose
3154	VTA_1454		663	13	3	Santa Clara	San Jose
3155	VTA_1454		664	13	3	Santa Clara	San Jose
3156	VTA_1454		665	13	3	Santa Clara	San Jose
3157	VTA_1454		666	13	3	Santa Clara	San Jose
3158	VTA_1454		667	13	3	Santa Clara	San Jose
3159	VTA_1454		668	13	3	Santa Clara	San Jose
3160	VTA_1454		669	13	3	Santa Clara	San Jose
3161	VTA_1454		670	13	3	Santa Clara	San Jose
3162	VTA_1454		671	13	3	Santa Clara	San Jose
3163	VTA_1454		672	13	3	Santa Clara	San Jose
3164	VTA_1454		673	13	3	Santa Clara	San Jose
3165	VTA_1454		674	13	3	Santa Clara	San Jose
3166	VTA_1454		675	13	3	Santa Clara	San Jose
3167	VTA_1454		676	13	3	Santa Clara	San Jose
3168	VTA_1454		677	13	3	Santa Clara	San Jose
3169	VTA_1454		678	13	3	Santa Clara	San Jose
3170	VTA_1454		679	13	3	Santa Clara	San Jose
3171	VTA_1454		680	13	3	Santa Clara	San Jose
3172	VTA_1454		681	13	3	Santa Clara	San Jose
3173	VTA_1454		682	13	3	Santa Clara	San Jose
3174	VTA_1454		683	13	3	Santa Clara	San Jose
3175	VTA_1454		684	13	3	Santa Clara	San Jose
3176	VTA_1454		685	13	3	Santa Clara	San Jose
3177	VTA_1454		686	13	3	Santa Clara	San Jose
3178	VTA_1454		687	13	3	Santa Clara	San Jose
3179	VTA_1454		688	13	3	Santa Clara	San Jose
3180	VTA_1454		689	13	3	Santa Clara	San Jose
3181	VTA_1454		690	13	3	Santa Clara	San Jose
3182	VTA_1454		691	13	3	Santa Clara	San Jose
3183	VTA_1454		692	13	3	Santa Clara	San Jose
3184	VTA_1454		693	13	3	Santa Clara	San Jose
3185	VTA_1454		694	13	3	Santa Clara	San Jose
3186	VTA_1454		695	13	3	Santa Clara	Los Gatos
3187	VTA_1454		696	13	3	Santa Clara	San Jose
3188	VTA_1454		697	14	3	Santa Clara	San Jose
3189	VTA_1454		698	14	3	Santa Clara	San Jose
3190	VTA_1454		699	14	3	Santa Clara	Morgan Hill
3191	VTA_1454		700	14	3	Santa Clara	Morgan Hill
3192	VTA_1454		701	14	3	Santa Clara	Morgan Hill
3193	VTA_1454		702	14	3	Santa Clara	Morgan Hill

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3194	VTA_1454		703	14	3	Santa Clara	Morgan Hill
3195	VTA_1454		704	14	3	Santa Clara	San Jose
3196	VTA_1454		705	14	3	Santa Clara	Gilroy
3197	VTA_1454		706	14	3	Santa Clara	Gilroy
3198	VTA_1454		707	14	3	Santa Clara	Gilroy
3199	VTA_1454		708	14	3	Santa Clara	Gilroy
3200	VTA_1454		709	14	3	Santa Clara	Gilroy
3201	VTA_1454		710	14	3	Santa Clara	Gilroy
3202	VTA_1454		711	14	3	Santa Clara	Gilroy
3203	VTA_1454		712	14	3	Santa Clara	Gilroy
3204	VTA_1454		713	14	3	Santa Clara	Morgan Hill
3205	VTA_1454		714	14	3	Santa Clara	San Jose
3206	CCTA_1454		1054	20	5	Contra Costa	Richmond
3207	CCTA_1454		1055	20	5	Contra Costa	Richmond
3208	CCTA_1454		1056	20	5	Contra Costa	Richmond
3209	CCTA_1454		1057	20	5	Contra Costa	Richmond
3210	CCTA_1454		1060	20	5	Contra Costa	Richmond
3211	CCTA_1454		1061	20	5	Contra Costa	Richmond
3212	CCTA_1454		1062	20	5	Contra Costa	Richmond
3213	CCTA_1454		1063	20	5	Contra Costa	Richmond
3214	CCTA_1454		1064	20	5	Contra Costa	Richmond
3215	CCTA_1454		1065	20	5	Contra Costa	Richmond
3216	CCTA_1454		1066	20	5	Contra Costa	San Pablo
3217	CCTA_1454		1067	20	5	Contra Costa	San Pablo
3218	CCTA_1454		1068	20	5	Contra Costa	Richmond
3219	CCTA_1454		1069	20	5	Contra Costa	Richmond
3220	CCTA_1454		1070	20	5	Contra Costa	San Pablo
3221	CCTA_1454		1071	20	5	Contra Costa	San Pablo
3222	CCTA_1454		1072	20	5	Contra Costa	San Pablo
3223	CCTA_1454		1073	20	5	Contra Costa	Richmond
3224	CCTA_1454		1074	20	5	Contra Costa	Richmond
3225	CCTA_1454		1075	20	5	Contra Costa	Richmond
3226	CCTA_1454		1076	20	5	Contra Costa	East Richmond Heights
3227	CCTA_1454		1077	20	5	Contra Costa	Richmond
3228	CCTA_1454		1078	20	5	Contra Costa	Richmond
3229	CCTA_1454		1079	20	5	Contra Costa	Richmond
3230	CCTA_1454		1080	20	5	Contra Costa	Tara Hills
3231	CCTA_1454		1081	20	5	Contra Costa	Bayview-Montalvin
3232	CCTA_1454		1082	20	5	Contra Costa	Pinole
3233	CCTA_1454		1083	20	5	Contra Costa	Hercules
3234	CCTA_1454		1084	20	5	Contra Costa	Pinole
3235	CCTA_1454		1085	20	5	Contra Costa	Hercules
3236	CCTA_1454		1086	20	5	Contra Costa	Hercules
3237	CCTA_1454		1087	20	5	Contra Costa	Berkeley
3238	CCTA_1454		1088	20	5	Contra Costa	Rodeo
3239	CCTA_1454		1089	20	5	Contra Costa	Rodeo
3240	CCTA_1454		1090	20	5	Contra Costa	Crockett
3241	CCTA_1454		1091	21	5	Contra Costa	Port Costa
3242	CCTA_1454		1092	21	5	Contra Costa	Martinez
3243	CCTA_1454		1093	21	5	Contra Costa	Vine Hill
3244	CCTA_1454		1094	21	5	Contra Costa	Martinez
3245	CCTA_1454		1095	21	5	Contra Costa	Vine Hill
3246	CCTA_1454		1096	21	5	Contra Costa	Vine Hill
3247	CCTA_1454		1097	21	5	Contra Costa	Bay Point
3248	CCTA_1454		1098	21	5	Contra Costa	Concord
3249	CCTA_1454		1099	21	5	Contra Costa	Concord
3250	CCTA_1454		1100	21	5	Contra Costa	Clayton
3251	CCTA_1454		1101	21	5	Contra Costa	Clayton
3252	CCTA_1454		1102	21	5	Contra Costa	Concord
3253	CCTA_1454		1103	21	5	Contra Costa	Concord
3254	CCTA_1454		1104	21	5	Contra Costa	Concord

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3255	CCTA_1454		1105	21	5	Contra Costa	Concord
3256	CCTA_1454		1106	21	5	Contra Costa	Concord
3257	CCTA_1454		1107	21	5	Contra Costa	Concord
3258	CCTA_1454		1108	21	5	Contra Costa	Concord
3259	CCTA_1454		1109	21	5	Contra Costa	Concord
3260	CCTA_1454		1110	21	5	Contra Costa	Concord
3261	CCTA_1454		1111	21	5	Contra Costa	Concord
3262	CCTA_1454		1112	21	5	Contra Costa	Concord
3263	CCTA_1454		1113	21	5	Contra Costa	Concord
3264	CCTA_1454		1114	21	5	Contra Costa	Concord
3265	CCTA_1454		1115	21	5	Contra Costa	Concord
3266	CCTA_1454		1116	21	5	Contra Costa	Concord
3267	CCTA_1454		1117	21	5	Contra Costa	Concord
3268	CCTA_1454		1118	21	5	Contra Costa	Concord
3269	CCTA_1454		1119	21	5	Contra Costa	Concord
3270	CCTA_1454		1120	21	5	Contra Costa	Concord
3271	CCTA_1454		1121	21	5	Contra Costa	Pleasant Hill
3272	CCTA_1454		1122	21	5	Contra Costa	Concord
3273	CCTA_1454		1123	21	5	Contra Costa	Pacheco
3274	CCTA_1454		1124	21	5	Contra Costa	Martinez
3275	CCTA_1454		1125	21	5	Contra Costa	Martinez
3276	CCTA_1454		1126	21	5	Contra Costa	Pleasant Hill
3277	CCTA_1454		1127	21	5	Contra Costa	Pleasant Hill
3278	CCTA_1454		1128	21	5	Contra Costa	Pleasant Hill
3279	CCTA_1454		1129	21	5	Contra Costa	Pleasant Hill
3280	CCTA_1454		1130	21	5	Contra Costa	Pleasant Hill
3281	CCTA_1454		1131	21	5	Contra Costa	Pleasant Hill
3282	CCTA_1454		1132	22	5	Contra Costa	Lafayette
3283	CCTA_1454		1133	22	5	Contra Costa	Walnut Creek
3284	CCTA_1454		1134	22	5	Contra Costa	Walnut Creek
3285	CCTA_1454		1135	22	5	Contra Costa	Walnut Creek
3286	CCTA_1454		1136	22	5	Contra Costa	Waldon
3287	CCTA_1454		1137	22	5	Contra Costa	Walnut Creek
3288	CCTA_1454		1138	22	5	Contra Costa	Concord
3289	CCTA_1454		1139	22	5	Contra Costa	Walnut Creek
3290	CCTA_1454		1140	22	5	Contra Costa	Walnut Creek
3291	CCTA_1454		1141	22	5	Contra Costa	Walnut Creek
3292	CCTA_1454		1142	22	5	Contra Costa	Walnut Creek
3293	CCTA_1454		1143	22	5	Contra Costa	Walnut Creek
3294	CCTA_1454		1144	22	5	Contra Costa	Walnut Creek
3295	CCTA_1454		1145	22	5	Contra Costa	Walnut Creek
3296	CCTA_1454		1146	22	5	Contra Costa	Walnut Creek
3297	CCTA_1454		1147	22	5	Contra Costa	Alamo
3298	CCTA_1454		1148	22	5	Contra Costa	Walnut Creek
3299	CCTA_1454		1149	22	5	Contra Costa	Walnut Creek
3300	CCTA_1454		1150	22	5	Contra Costa	Lafayette
3301	CCTA_1454		1151	22	5	Contra Costa	Lafayette
3302	CCTA_1454		1152	22	5	Contra Costa	Lafayette
3303	CCTA_1454		1153	22	5	Contra Costa	Orinda
3304	CCTA_1454		1154	22	5	Contra Costa	Orinda
3305	CCTA_1454		1155	22	5	Contra Costa	Berkeley
3306	CCTA_1454		1156	22	5	Contra Costa	Oakland
3307	CCTA_1454		1157	22	5	Contra Costa	Oakland
3308	CCTA_1454		1158	22	5	Contra Costa	Moraga
3309	CCTA_1454		1159	22	5	Contra Costa	Moraga
3310	CCTA_1454		1160	22	5	Contra Costa	Moraga
3311	CCTA_1454		1161	23	5	Contra Costa	Walnut Creek
3312	CCTA_1454		1162	23	5	Contra Costa	Alamo
3313	CCTA_1454		1163	23	5	Contra Costa	Alamo
3314	CCTA_1454		1164	23	5	Contra Costa	Alamo
3315	CCTA_1454		1165	23	5	Contra Costa	Diablo

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3316	CCTA_REAGG		1166	23	5	Contra Costa	Danville
3317	CCTA_REAGG		1166	23	5	Contra Costa	Danville
3318	CCTA_1454		1167	23	5	Contra Costa	Danville
3319	CCTA_1454		1169	23	5	Contra Costa	Danville
3320	CCTA_1454		1177	24	5	Contra Costa	Brentwood
3321	CCTA_1454		1178	24	5	Contra Costa	Brentwood
3322	CCTA_1454		1179	24	5	Contra Costa	Brentwood
3323	CCTA_1454		1180	24	5	Contra Costa	Oakley
3324	CCTA_1454		1181	24	5	Contra Costa	Bethel Island
3325	CCTA_1454		1182	24	5	Contra Costa	Oakley
3326	CCTA_1454		1183	24	5	Contra Costa	Antioch
3327	CCTA_1454		1184	24	5	Contra Costa	Antioch
3328	CCTA_1454		1185	24	5	Contra Costa	Oakley
3329	CCTA_1454		1186	24	5	Contra Costa	Antioch
3330	CCTA_1454		1187	24	5	Contra Costa	Antioch
3331	CCTA_1454		1188	24	5	Contra Costa	Antioch
3332	CCTA_1454		1189	24	5	Contra Costa	Antioch
3333	CCTA_1454		1190	24	5	Contra Costa	Antioch
3334	CCTA_1454		1191	24	5	Contra Costa	Antioch
3335	CCTA_1454		1192	24	5	Contra Costa	Antioch
3336	CCTA_1454		1193	24	5	Contra Costa	Antioch
3337	CCTA_1454		1194	24	5	Contra Costa	Antioch
3338	CCTA_1454		1195	21	5	Contra Costa	Antioch
3339	CCTA_1454		1196	21	5	Contra Costa	Pittsburg
3340	CCTA_1454		1197	24	5	Contra Costa	Antioch
3341	CCTA_1454		1198	24	5	Contra Costa	Pittsburg
3342	CCTA_1454		1199	24	5	Contra Costa	Pittsburg
3343	CCTA_1454		1200	21	5	Contra Costa	Pittsburg
3344	CCTA_1454		1201	24	5	Contra Costa	Pittsburg
3345	CCTA_1454		1202	24	5	Contra Costa	Pittsburg
3346	CCTA_1454		1203	24	5	Contra Costa	Pittsburg
3347	CCTA_1454		1204	24	5	Contra Costa	Pittsburg
3348	CCTA_1454		1205	24	5	Contra Costa	Pittsburg
3349	CCTA_1454		1206	24	5	Contra Costa	Pittsburg
3350	CCTA_1454		1207	24	5	Contra Costa	Pittsburg
3351	CCTA_1454		1208	24	5	Contra Costa	Bay Point
3352	CCTA_1454		1209	24	5	Contra Costa	Bay Point
3353	CCTA_1454		1210	24	5	Contra Costa	Bay Point
3354	MTC_1454		1211	25	6	Solano	Benicia
3355	MTC_1454		1212	25	6	Solano	Benicia
3356	MTC_1454		1213	25	6	Solano	Benicia
3357	MTC_1454		1214	25	6	Solano	Benicia
3358	MTC_1454		1215	25	6	Solano	Benicia
3359	MTC_1454		1216	25	6	Solano	Benicia
3360	MTC_1454		1217	25	6	Solano	Benicia
3361	MTC_1454		1218	25	6	Solano	Vallejo
3362	MTC_1454		1219	25	6	Solano	Vallejo
3363	MTC_1454		1220	25	6	Solano	Vallejo
3364	MTC_1454		1221	25	6	Solano	Vallejo
3365	MTC_1454		1222	25	6	Solano	Vallejo
3366	MTC_1454		1223	25	6	Solano	Vallejo
3367	MTC_1454		1224	25	6	Solano	Vallejo
3368	MTC_1454		1225	25	6	Solano	Vallejo
3369	MTC_1454		1226	25	6	Solano	Vallejo
3370	MTC_1454		1227	25	6	Solano	Vallejo
3371	MTC_1454		1228	25	6	Solano	Vallejo
3372	MTC_1454		1229	25	6	Solano	Vallejo
3373	MTC_1454		1230	25	6	Solano	Vallejo
3374	MTC_1454		1231	25	6	Solano	Vallejo
3375	MTC_1454		1232	25	6	Solano	Vallejo
3376	MTC_1454		1233	25	6	Solano	Vallejo

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3377	MTC_1454		1234	25	6	Solano	Vallejo
3378	MTC_1454		1235	25	6	Solano	Vallejo
3379	MTC_1454		1236	25	6	Solano	Vallejo
3380	MTC_1454		1237	25	6	Solano	Vallejo
3381	MTC_1454		1238	25	6	Solano	Vallejo
3382	MTC_1454		1239	25	6	Solano	Vallejo
3383	MTC_1454		1240	25	6	Solano	Vallejo
3384	MTC_1454		1241	25	6	Solano	Vallejo
3385	MTC_1454		1242	25	6	Solano	Vallejo
3386	MTC_1454		1243	25	6	Solano	Vallejo
3387	MTC_1454		1244	25	6	Solano	Vallejo
3388	MTC_1454		1245	25	6	Solano	Vallejo
3389	MTC_1454		1246	25	6	Solano	Vallejo
3390	MTC_1454		1247	26	6	Solano	Fairfield
3391	MTC_1454		1248	26	6	Solano	Green Valley
3392	MTC_1454		1249	26	6	Solano	Fairfield
3393	MTC_1454		1250	26	6	Solano	Suisun City
3394	MTC_1454		1251	26	6	Solano	Pittsburg
3395	MTC_1454		1252	26	6	Solano	Fairfield
3396	MTC_1454		1253	26	6	Solano	Suisun City
3397	MTC_1454		1254	26	6	Solano	Suisun City
3398	MTC_1454		1255	26	6	Solano	Suisun City
3399	MTC_1454		1256	26	6	Solano	Suisun City
3400	MTC_1454		1257	26	6	Solano	Fairfield
3401	MTC_1454		1258	26	6	Solano	Fairfield
3402	MTC_1454		1259	26	6	Solano	Fairfield
3403	MTC_1454		1260	26	6	Solano	Fairfield
3404	MTC_1454		1261	26	6	Solano	Suisun City
3405	MTC_1454		1262	26	6	Solano	Fairfield
3406	MTC_1454		1263	26	6	Solano	Fairfield
3407	MTC_1454		1264	26	6	Solano	Fairfield
3408	MTC_1454		1265	26	6	Solano	Fairfield
3409	MTC_1454		1266	26	6	Solano	Fairfield
3410	MTC_1454		1267	26	6	Solano	Fairfield
3411	MTC_1454		1268	26	6	Solano	Fairfield
3412	MTC_1454		1269	26	6	Solano	Fairfield
3413	MTC_1454		1270	26	6	Solano	Fairfield
3414	MTC_1454		1271	26	6	Solano	Vacaville
3415	MTC_1454		1272	26	6	Solano	Vacaville
3416	MTC_1454		1273	26	6	Solano	Vacaville
3417	MTC_1454		1274	26	6	Solano	Vacaville
3418	MTC_1454		1275	26	6	Solano	Vacaville
3419	MTC_1454		1276	26	6	Solano	Vacaville
3420	MTC_1454		1277	26	6	Solano	Vacaville
3421	MTC_1454		1278	26	6	Solano	Vacaville
3422	MTC_1454		1279	26	6	Solano	Vacaville
3423	MTC_1454		1280	26	6	Solano	Vacaville
3424	MTC_1454		1281	26	6	Solano	Vacaville
3425	MTC_1454		1282	26	6	Solano	Vacaville
3426	MTC_1454		1283	26	6	Solano	Vacaville
3427	MTC_1454		1284	26	6	Solano	Vacaville
3428	MTC_1454		1285	26	6	Solano	Vacaville
3429	MTC_1454		1286	26	6	Solano	Vacaville
3430	MTC_1454		1287	26	6	Solano	Vacaville
3431	MTC_1454		1288	26	6	Solano	Dixon
3432	MTC_1454		1289	26	6	Solano	Dixon
3433	MTC_1454		1290	26	6	Solano	Rio Vista
3434	MTC_1454		1291	27	7	Napa	Napa
3435	MTC_1454		1292	27	7	Napa	Napa
3436	MTC_1454		1293	27	7	Napa	Napa
3437	MTC_1454		1294	27	7	Napa	Napa

ACCMA_TAZ	SUBREGION	JURISDICTION	MTC_TAZ	SDISTRICT	COUNTY	COUNTY_LABEL	CDP
3438	MTC_1454		1295	27	7	Napa	Napa
3439	MTC_1454		1296	27	7	Napa	Napa
3440	MTC_1454		1297	27	7	Napa	Napa
3441	MTC_1454		1298	27	7	Napa	Napa
3442	MTC_1454		1299	27	7	Napa	Napa
3443	MTC_1454		1300	27	7	Napa	Napa
3444	MTC_1454		1301	27	7	Napa	Napa
3445	MTC_1454		1302	27	7	Napa	Napa
3446	MTC_1454		1303	27	7	Napa	Napa
3447	MTC_1454		1304	27	7	Napa	Napa
3448	MTC_1454		1305	27	7	Napa	Napa
3449	MTC_1454		1306	27	7	Napa	Napa
3450	MTC_1454		1307	27	7	Napa	Napa
3451	MTC_1454		1308	27	7	Napa	Napa
3452	MTC_1454		1309	28	7	Napa	Yountville
3453	MTC_1454		1310	28	7	Napa	Yountville
3454	MTC_1454		1311	28	7	Napa	Napa
3455	MTC_1454		1312	28	7	Napa	
3456	MTC_1454		1313	28	7	Napa	Angwin
3457	MTC_1454		1314	28	7	Napa	St. Helena
3458	MTC_1454		1315	28	7	Napa	Deer Park
3459	MTC_1454		1316	28	7	Napa	Calistoga
3460	MTC_1454		1317	28	7	Napa	Calistoga
3461	MTC_1454		1318	29	8	Sonoma	Eldridge
3462	MTC_1454		1319	29	8	Sonoma	Boyes Hot Springs
3463	MTC_1454		1320	29	8	Sonoma	El Verano
3464	MTC_1454		1321	29	8	Sonoma	Boyes Hot Springs
3465	MTC_1454		1322	29	8	Sonoma	Boyes Hot Springs
3466	MTC_1454		1323	29	8	Sonoma	Sonoma
3467	MTC_1454		1324	29	8	Sonoma	Sonoma
3468	MTC_1454		1325	29	8	Sonoma	Petaluma
3469	MTC_1454		1326	29	8	Sonoma	Petaluma
3470	MTC_1454		1327	29	8	Sonoma	Petaluma
3471	MTC_1454		1328	29	8	Sonoma	
3472	MTC_1454		1329	29	8	Sonoma	Petaluma
3473	MTC_1454		1330	29	8	Sonoma	Petaluma
3474	MTC_1454		1331	29	8	Sonoma	Petaluma
3475	MTC_1454		1332	29	8	Sonoma	Petaluma
3476	MTC_1454		1333	29	8	Sonoma	Petaluma
3477	MTC_1454		1334	29	8	Sonoma	Petaluma
3478	MTC_1454		1335	29	8	Sonoma	Petaluma
3479	MTC_1454		1336	29	8	Sonoma	Petaluma
3480	MTC_1454		1337	29	8	Sonoma	Cotati
3481	MTC_1454		1338	29	8	Sonoma	Cotati
3482	MTC_1454		1339	29	8	Sonoma	Rohnert Park
3483	MTC_1454		1340	29	8	Sonoma	Rohnert Park
3484	MTC_1454		1341	29	8	Sonoma	Rohnert Park
3485	MTC_1454		1342	29	8	Sonoma	Rohnert Park
3486	MTC_1454		1343	29	8	Sonoma	Rohnert Park
3487	MTC_1454		1344	29	8	Sonoma	Rohnert Park
3488	MTC_1454		1345	29	8	Sonoma	Rohnert Park
3489	MTC_1454		1346	29	8	Sonoma	Rohnert Park
3490	MTC_1454		1347	29	8	Sonoma	Rohnert Park
3491	MTC_1454		1348	30	8	Sonoma	Santa Rosa
3492	MTC_1454		1349	30	8	Sonoma	Santa Rosa
3493	MTC_1454		1350	30	8	Sonoma	Santa Rosa
3494	MTC_1454		1351	30	8	Sonoma	Santa Rosa
3495	MTC_1454		1352	30	8	Sonoma	Santa Rosa
3496	MTC_1454		1353	30	8	Sonoma	Santa Rosa
3497	MTC_1454		1354	30	8	Sonoma	Santa Rosa
3498	MTC_1454		1355	30	8	Sonoma	Santa Rosa

ACCMA_TAZ	SUBREGION	JURISDICTION	MTC_TAZ	SDISTRICT	COUNTY	COUNTY_LABEL	CDP
3499	MTC_1454		1356	30	8	Sonoma	Santa Rosa
3500	MTC_1454		1357	30	8	Sonoma	Santa Rosa
3501	MTC_1454		1358	30	8	Sonoma	Santa Rosa
3502	MTC_1454		1359	30	8	Sonoma	Santa Rosa
3503	MTC_1454		1360	30	8	Sonoma	Santa Rosa
3504	MTC_1454		1361	30	8	Sonoma	Santa Rosa
3505	MTC_1454		1362	30	8	Sonoma	Santa Rosa
3506	MTC_1454		1363	30	8	Sonoma	Santa Rosa
3507	MTC_1454		1364	30	8	Sonoma	Santa Rosa
3508	MTC_1454		1365	30	8	Sonoma	Santa Rosa
3509	MTC_1454		1366	30	8	Sonoma	Santa Rosa
3510	MTC_1454		1367	30	8	Sonoma	Larkfield-Wikiup
3511	MTC_1454		1368	30	8	Sonoma	Santa Rosa
3512	MTC_1454		1369	30	8	Sonoma	Santa Rosa
3513	MTC_1454		1370	30	8	Sonoma	Santa Rosa
3514	MTC_1454		1371	30	8	Sonoma	Santa Rosa
3515	MTC_1454		1372	30	8	Sonoma	Santa Rosa
3516	MTC_1454		1373	30	8	Sonoma	Santa Rosa
3517	MTC_1454		1374	30	8	Sonoma	Santa Rosa
3518	MTC_1454		1375	30	8	Sonoma	Santa Rosa
3519	MTC_1454		1376	30	8	Sonoma	Santa Rosa
3520	MTC_1454		1377	30	8	Sonoma	Roseland
3521	MTC_1454		1378	30	8	Sonoma	Santa Rosa
3522	MTC_1454		1379	30	8	Sonoma	Roseland
3523	MTC_1454		1380	30	8	Sonoma	Santa Rosa
3524	MTC_1454		1381	30	8	Sonoma	Santa Rosa
3525	MTC_1454		1382	30	8	Sonoma	Sebastopol
3526	MTC_1454		1383	30	8	Sonoma	Graton
3527	MTC_1454		1384	30	8	Sonoma	Graton
3528	MTC_1454		1385	30	8	Sonoma	Sebastopol
3529	MTC_1454		1386	30	8	Sonoma	Sebastopol
3530	MTC_1454		1387	30	8	Sonoma	
3531	MTC_1454		1388	30	8	Sonoma	Occidental
3532	MTC_1454		1389	31	8	Sonoma	Bodega Bay
3533	MTC_1454		1390	31	8	Sonoma	Guerneville
3534	MTC_1454		1391	31	8	Sonoma	Guerneville
3535	MTC_1454		1392	31	8	Sonoma	Forestville
3536	MTC_1454		1393	31	8	Sonoma	Forestville
3537	MTC_1454		1394	31	8	Sonoma	Windsor
3538	MTC_1454		1395	31	8	Sonoma	Windsor
3539	MTC_1454		1396	31	8	Sonoma	Windsor
3540	MTC_1454		1397	31	8	Sonoma	Healdsburg
3541	MTC_1454		1398	31	8	Sonoma	Healdsburg
3542	MTC_1454		1399	31	8	Sonoma	Healdsburg
3543	MTC_1454		1400	31	8	Sonoma	Healdsburg
3544	MTC_1454		1401	31	8	Sonoma	
3545	MTC_1454		1402	31	8	Sonoma	Cloverdale
3546	MTC_1454		1403	31	8	Sonoma	Bodega Bay
3547	MTC_1454		1404	32	9	Marin	Black Point-Green Point
3548	MTC_1454		1405	32	9	Marin	Novato
3549	MTC_1454		1406	32	9	Marin	Novato
3550	MTC_1454		1407	32	9	Marin	Novato
3551	MTC_1454		1408	32	9	Marin	Novato
3552	MTC_1454		1409	32	9	Marin	Novato
3553	MTC_1454		1410	32	9	Marin	Novato
3554	MTC_1454		1411	32	9	Marin	Novato
3555	MTC_1454		1412	32	9	Marin	Novato
3556	MTC_1454		1413	32	9	Marin	Novato
3557	MTC_1454		1414	32	9	Marin	Novato
3558	MTC_1454		1415	33	9	Marin	Bodega Bay
3559	MTC_1454		1416	33	9	Marin	Inverness

ACCMA_TAZ	SUBREGION	JURISDICTION	MTC_TAZ	SDISTRICT	COUNTY	COUNTY_LABEL	CDP
3560	MTC_1454		1417	33	9	Marin	Lagunitas-Forest Knolls
3561	MTC_1454		1418	33	9	Marin	San Geronimo
3562	MTC_1454		1419	33	9	Marin	Fairfax
3563	MTC_1454		1420	33	9	Marin	San Anselmo
3564	MTC_1454		1421	33	9	Marin	San Rafael
3565	MTC_1454		1422	33	9	Marin	San Rafael
3566	MTC_1454		1423	33	9	Marin	Lucas Valley-Marinwood
3567	MTC_1454		1424	33	9	Marin	Lucas Valley-Marinwood
3568	MTC_1454		1425	33	9	Marin	Santa Venetia
3569	MTC_1454		1426	33	9	Marin	San Rafael
3570	MTC_1454		1427	33	9	Marin	San Rafael
3571	MTC_1454		1428	33	9	Marin	San Rafael
3572	MTC_1454		1429	33	9	Marin	San Rafael
3573	MTC_1454		1430	33	9	Marin	San Rafael
3574	MTC_1454		1431	33	9	Marin	San Rafael
3575	MTC_1454		1432	33	9	Marin	San Anselmo
3576	MTC_1454		1433	33	9	Marin	San Anselmo
3577	MTC_1454		1434	33	9	Marin	San Anselmo
3578	MTC_1454		1435	33	9	Marin	Ross
3579	MTC_1454		1436	33	9	Marin	Kentfield
3580	MTC_1454		1437	34	9	Marin	Kentfield
3581	MTC_1454		1438	34	9	Marin	Corte Madera
3582	MTC_1454		1439	34	9	Marin	
3583	MTC_1454		1440	34	9	Marin	Larkspur
3584	MTC_1454		1441	34	9	Marin	Corte Madera
3585	MTC_1454		1442	34	9	Marin	Mill Valley
3586	MTC_1454		1443	34	9	Marin	Mill Valley
3587	MTC_1454		1444	34	9	Marin	Strawberry
3588	MTC_1454		1445	34	9	Marin	Tiburon
3589	MTC_1454		1446	34	9	Marin	Tiburon
3590	MTC_1454		1447	34	9	Marin	Belvedere
3591	MTC_1454		1448	34	9	Marin	Sausalito
3592	MTC_1454		1449	34	9	Marin	Sausalito
3593	MTC_1454		1450	34	9	Marin	Tamalpais-Homestead Valley
3594	MTC_1454		1451	34	9	Marin	Tamalpais-Homestead Valley
3595	MTC_1454		1452	34	9	Marin	Mill Valley
3596	MTC_1454		1453	34	9	Marin	Sausalito
3597	MTC_1454		1454	34	9	Marin	Bolinas
4455	Gateways						
4456	Gateways						
4457	Gateways						
4458	Gateways						
4459	Gateways						
4460	Gateways						
4461	Gateways						
4462	Gateways						
4463	Gateways						
4464	Gateways	San Joaquin				San Joaquin	
4465	Gateways	San Joaquin				San Joaquin	
4466	Gateways	San Joaquin				San Joaquin	
4467	Gateways	San Joaquin				San Joaquin	
4468	Gateways						
4469	Gateways						
4470	Gateways						
4471	Gateways						
4472	Gateways						
4473	Gateways						
4474	Gateways						
4475	Gateways						
4476	Gateways	San Joaquin				San Joaquin	
4477	Gateways	San Joaquin				San Joaquin	

ACCMA_TAZ	SUBREGION	JURISDICTION	MTC_TAZ	SDISTRICT	COUNTY	COUNTY_LABEL	CDP
4478	Gateways	San Joaquin				San Joaquin	
4479	Gateways	San Joaquin				San Joaquin	
4480	Gateways	San Joaquin				San Joaquin	
4481	Gateways	San Joaquin				San Joaquin	
4482	Gateways	San Joaquin				San Joaquin	
4483	Gateways	San Joaquin				San Joaquin	
4484	Gateways	San Joaquin				San Joaquin	
4485	Gateways	San Joaquin				San Joaquin	

11 Appendix E: Ramp Metering

Table E-1 is contained in the file "Ramp_Metering_081016_Print.PDF"

Table G-1: Alameda County Travel Demand Model Ramp Metering Rates

Route	Post Mile	Description	Direction	Type	Meter	Year Open	Number of Lanes	Rate/ Lane 2000 AM	Rate/ Lane 2000 PM	Rate/ Lane 2005 AM	Rate/ Lane 2005 PM	Rate/ Lane 2015 AM	Rate/ Lane 2015 PM	Rate/ Lane 2035 AM	Rate/ Lane 2035 PM
580	?	WB ON FR 580 WB CONNECTOR.	WB	ON	YES	2008	2					470	0	470	0
580	001.661	WB ON FR GRANT LINE RD.	WB	ON	YES	2008	1					470	0	470	0
580	006.221	WB ON FR N.FLYNN RD.	WB	ON	YES	2008	1					470	0	470	0
580	008.521	EB ON FR GREENVILLE RD. (will be removed in 2030)	EB	ON	YES	2008	1					0	590		
580	XXX	EB ON FR GREENVILLE RD. (built in 2030)	EB	ON	YES	2030	1							0	590
580	XXX	EB ON FR GREENVILLE RD. (built in 2030)	EB	ON	YES	2030	1							0	820
580	008.551	WB ON FR GREENVILLE RD. (will be removed in 2030)	WB	ON	YES	2008	1					470	0		
580	XXX	WB ON FR GREENVILLE RD. (built in 2030)	WB	ON	YES	2030	1							470	0
580	XXX	WB ON FR GREENVILLE RD. (built in 2030)	WB	ON	YES	2030	1							820	0
580	009.481	EB ON NB FR VASCO RD	EB	ON	YES	2008	1					0	630	0	630
580	009.481	EB ON NB FR VASCO RD	EB	ON	YES	2030	1							0	820
580	XXX	EB ON SB FR VASCO RD	EB	ON	YES	2030	1							0	470
580	XXX	EB ON SB FR VASCO RD	EB	ON	YES	2030	1							0	820
580	009.791	SEG WB ON FR NB VASCO RD	WB	ON	YES	2008	1					470	0	470	0
580	009.791	SEG WB ON FR NB VASCO RD	WB	ON	YES	2030	1							820	0
580	009.792	SEG WB ON FR SB VASCO RD	WB	ON	YES	2008	1					470	0	470	0
580	009.792	SEG WB ON FR SB VASCO RD	WB	ON	YES	2030	1							820	0
580	010.571	EB ON FR NB RTE 84/FIRST	EB	ON	YES	2008	1					0	680	0	680
580	XXX	EB ON FR SB RTE 84/FIRST	EB	ON	YES	2030	1							0	470
580	XXX	WB ON FR NB RTE84/FIRST ST	WB	ON	YES	2030	1							470	0
580	010.825	WB ON FR SB RTE84/FIRST ST	WB	ON	YES	2008	2					470	0	470	0
580	012.421	EB ON FR LIVERMORE AVE	EB	ON	YES	2008	2					0	310	0	310
580	012.645	WB ON FR LIVERMORE AVE.	WB	ON	YES	2008	2					470	0	470	0
580	013.366	WB ON FR PORTOLA AVE.	WB	ON	YES	2008	1								
580	XXX	EB ON FR NB ISABEL AVE.	EB	ON	YES	2010	2					0	470	0	470
580	XXX	EB ON FR NB ISABEL AVE.	EB	ON	YES	2010	1					0	820	0	820
580	XXX	EB ON FR SB ISABEL AVE.	EB	ON	YES	2010	1					0	470	0	470
580	XXX	EB ON FR SB ISABEL AVE.	EB	ON	YES	2010	1					0	820	0	820
580	XXX	WB ON FR NB ISABEL AVE.	WB	ON	YES	2010	1					470	0	470	0
580	XXX	WB ON FR NB ISABEL AVE.	WB	ON	YES	2010	1					820	0	820	0
580	XXX	WB ON FR SB ISABEL AVE.	WB	ON	YES	2010	1					470	0	470	0
580	XXX	WB ON FR SB ISABEL AVE.	WB	ON	YES	2010	1					820	0	820	0
580	014.980	EB ON FR AIRWAY BLVD	EB	ON	YES	2008	1					0	810	0	810
580	014.980	EB ON FR AIRWAY BLVD	EB	ON	YES	2008	1					0	900	0	900
580	015.003	WB ON FR NB AIRWAY BLVD	WB	ON	YES	2008	1					470	0	470	0
580	015.003	WB ON FR NB AIRWAY BLVD	WB	ON	YES	2008	1					820	0	820	0
580	015.170	WB ON FR SB AIRWAY BLVD.	WB	ON	YES	2008	1					470	0	470	0
580	015.170	WB ON FR SB AIRWAY BLVD.	WB	ON	YES	2008	1					820	0	820	0
580	016.504	EB ON FR NB EL CHARRO RD	EB	ON	YES	2008	1					0	360	0	360
580	016.504	EB ON FR NB EL CHARRO RD	EB	ON	YES	2015	1					0	820	0	820
580	XXX	EB ON FR SB EL CHARRO RD	EB	ON	YES	2010	1					0	470	0	470
580	XXX	EB ON FR SB EL CHARRO RD	EB	ON	YES	2010	1					0	820	0	820
580	XXX	WB ON FR NB EL CHARRO RD	WB	ON	YES	2010	1					470	0	470	0
580	XXX	WB ON FR NB EL CHARRO RD	WB	ON	YES	2010	1					820	0	820	0
580	016.903	WB ON FR SB EL CHARRO RD	WB	ON	YES	2010	1					470	0	470	0
580	016.903	WB ON FR SB EL CHARRO RD	WB	ON	YES	2010	1					820	0	820	0
580	017.738	EB ON FR NB TASSAJARA	EB	ON	YES	2003	2			0	235	0	235	0	235
580	017.940	EB ON FR SB TASSAJARA RD	EB	ON	YES	2003	1			0	415	0	415	0	415
580	017.944	WB ON FR NB TASSAJARA RD	WB	ON	YES	2008	1					470	0	470	0
580	018.070	WB ON FR SB TASSAJARA RD	WB	ON	YES	2008	1					470	0	470	0
580	018.070	WB ON FR SB TASSAJARA RD	WB	ON	YES	2008	1					820	0	820	0

Table G-1: Alameda County Travel Demand Model Ramp Metering Rates

Route	Post Mile	Description	Direction	Type	Meter	Year Open	Number of Lanes	Rate/ Lane 2000 AM	Rate/ Lane 2000 PM	Rate/ Lane 2005 AM	Rate/ Lane 2005 PM	Rate/ Lane 2015 AM	Rate/ Lane 2015 PM	Rate/ Lane 2035 AM	Rate/ Lane 2035 PM
580	018.671	EB ON FR NB HACIENDA DR	EB	ON	YES	2003	1			0	470	0	470	0	470
580	018.671	EB ON FR NB HACIENDA DR	EB	ON	YES	2003	1			0	820	0	820	0	820
580	018.791	WB ON FR NB HACIENDA DR	WB	ON	YES	2008	1					470	0	470	0
580	018.791	WB ON FR NB HACIENDA DR	WB	ON	YES	2008	1					820	0	820	0
580	018.851	EB ON FR SB HACIENDA	EB	ON	YES	2003	1			0	350	0	350	0	350
580	018.941	WB ON FR SB HACIENDA DR	WB	ON	YES	2008	1					470	0	470	0
580	018.941	WB ON FR SB HACIENDA DR	WB	ON	YES	2008	1					820	0	820	0
580	019.741	EB ON FR NB HOPYARD	EB	ON	YES	2003	1			0	350	0	350	0	350
580	019.851	WB ON FR NB HOPYARD RD	WB	ON	YES	2008	1					470	0	470	0
580	019.851	WB ON FR NB HOPYARD RD	WB	ON	YES	2008	1					820	0	820	0
580	019.871	EB ON FR SB HOPYARD	EB	ON	YES	2003	1			0	350	0	350	0	350
580	019.871	EB ON FR SB HOPYARD	EB	ON	YES	2003	1			0	820	0	820	0	820
580	019.961	WB ON FR SB HOPYARD RD	WB	ON	YES	2008	1					470	0	470	0
580	019.961	WB ON FR SB HOPYARD RD	WB	ON	YES	2008	1					820	0	820	0
580	021.319	EB ON FR NB SAN RAMON RD	EB	ON	YES	2008	1					0	590	0	590
580	021.319	EB ON FR NB SAN RAMON RD	EB	ON	YES	2008	1					0	820	0	820
580	021.320	EB ON FR SB SAN RAMON RD	EB	ON	YES	2008	1					0	400	0	400
580	021.539	WB ON FR SB SAN RAMON	WB	ON	YES	2008	1					470	0	470	0
580	021.539	WB ON FR SB SAN RAMON	WB	ON	YES	2008	1					820	0	820	0
580	021.540	WB ON FR NB SAN RAMON	WB	ON	YES	2008	1					470	0	470	0

Table G-1: Alameda County Travel Demand Model Ramp Metering Rates

Route	Post Mile	Description	Direction	Type	Meter	Year Open	Number of Lanes	Rate/ Lane 2000 AM	Rate/ Lane 2000 PM	Rate/ Lane 2005 AM	Rate/ Lane 2005 PM	Rate/ Lane 2015 AM	Rate/ Lane 2015 PM	Rate/ Lane 2035 AM	Rate/ Lane 2035 PM
680	000.411	SB ON FR SCOTT CR RD	SB	ON	YES	2015	1					470	0	470	0
680	000.411	NB ON FR SCOTT CR RD	NB	ON	YES	2015	1					0	470	0	470
680	002.271	SEGSB ON FR SB MISSION BL/262	SB	ON	YES	2015	1					470	0	470	0
680	002.271	SEGSB ON FR SB MISSION BL/262	SB	ON	YES	2015	1					820	0	820	0
680	002.272	SEGSB ON FR NB MISSION BL/262	SB	ON	YES	2015	1					470	0	470	0
680	002.272	SEGSB ON FR NB MISSION BL/262	SB	ON	YES	2015	1					820	0	820	0
680	002.531	SEG NB ON FR SB MISSION/262	NB	ON	YES	2015	1					0	470	0	470
680	002.531	SEG NB ON FR SB MISSION/262	NB	ON	YES	2015	1					820	0	820	0
680	002.532	SEG NB ON FR NB MISSION/262	NB	ON	YES	2015	1					0	470	0	470
680	002.532	SEG NB ON FR NB MISSION/262	NB	ON	YES	2015	1					820	0	820	0
680	003.851	SB ON FR DURHAM RD	SB	ON	YES	2015	2					470	0	470	0
680	003.991	NB ON FR DURHAM RD.	NB	ON	YES	2015	1					0	470	0	470
680	005.331	SB ON FR WASHINGTON BLVD	SB	ON	YES	2015	1					470	0	470	0
680	005.601	NB ON FR WASHINGTON BLVD	NB	ON	YES	2015	1					0	470	0	470
680	006.391	SB ON FR MISSION/238	SB	ON	YES	2015	2					470	0	470	0
680	006.461	NB ON FR MISSION/238	NB	ON	YES	2015	1					0	470	0	470
680	007.191	NB ON FR VARGAS RD.	NB	ON	YES	2015	1					0	470	0	470
680	007.371	SB ON FR VARGAS RD.	SB	ON	YES	2015	1					470	0	470	0
680	008.195	SB ON FR SHERIDAN RD	SB	ON	YES	2015	1					470	0	470	0
680	009.571	SB ON FR ANDRADE RD	SB	ON	YES	2015	1					470	0	470	0
680	009.841	NB ON FR ANDRADE RD	NB	ON	YES	2015	1					0	470	0	470
680	010.881	SB ON FR CALAVERAS/84	SB	ON	YES	2015	1					470	0	470	0
680	010.971	NB ON FR CALAVERAS/84	NB	ON	YES	2015	1					0	470	0	470
680	011.621	SB ON FR SB RTE 84	SB	ON	YES	2015	1					470	0	470	0
680	012.021	NB ON FR SB RTE 84	NB	ON	YES	2015	1					0	470	0	470
680	012.611	NB ON FR SUNOL (KOOPMAN)	NB	ON	YES	2015	1					0	470	0	470
680	015.251	SB ON FR PLEASTN/SUNOL	SB	ON	YES	2015	1					470	0	470	0
680	015.481	NB ON FR PLEASTN/SUNOL	NB	ON	YES	2015	1					0	470	0	470
680	016.561	SB ON FR BERNAL AVE.	SB	ON	YES	2015	1					470	0	470	0
680	016.991	NB ON FR BERNAL AVE	NB	ON	YES	2015	1					0	470	0	470
680	019.151	SB ON FR EB STONERIDGE DR	SB	ON	YES	2015	1					470	0	470	0
680	019.261	NB ON FR EB STONERIDGE DR	NB	ON	YES	2015	1					0	470	0	470
680	019.351	SB ON FR WB STONERIDGE DR	SB	ON	YES	2015	1					470	0	470	0
680	019.371	NB ON FR WB STONERIDGE DR	NB	ON	YES	2015	1					0	470	0	470
680	019.851	SB ON FR RTE 580	SB	ON	YES	2015	1					470	0	470	0
680	020.281	NB ON FR WB RTE 580	NB	ON	YES	2015	1					0	470	0	470
680	021.731	SB ON FR ALCOSTA BLVD	SB	ON	YES	2015	1					470	0	470	0

Table G-1: Alameda County Travel Demand Model Ramp Metering Rates

Route	Post Mile	Description	Direction	Type	Meter	Year Open	Number of Lanes	Rate/ Lane 2000 AM	Rate/ Lane 2000 PM	Rate/ Lane 2005 AM	Rate/ Lane 2005 PM	Rate/ Lane 2015 AM	Rate/ Lane 2015 PM	Rate/ Lane 2035 AM	Rate/ Lane 2035 PM
880	000.041	SB ON FR WB DIXON RD	SB	ON	YES	1996	2	450	850	450	850	450	850	450	850
880	000.041	SB ON FR WB DIXON RD	SB	ON	YES	1996	1	850	850	850	850	850	850	850	850
880	?	SB ON FR EB DIXON RD	SB	ON	YES	1996	1	0	0	0	0	0	0	0	0
880	?	SB ON FR EB DIXON RD	SB	ON	YES	1996	1	0	0	0	0	0	0	0	0
880	000.051	NB ON FR DIXON RD	NB	ON	YES	1996	1	900	550	900	550	900	550	900	550
880	000.051	NB ON FR DIXON RD	NB	ON	YES	1996	1	900	820	900	820	900	820	900	820
880	001.670	SB ON FR Rte 262	SB	ON	YES	2015	2					480	900	480	900
880	001.670	SB ON FR Rte 262	SB	ON	YES	2015	1					820	900	820	900
880	001.671	SB ON FR RTE 262	SB	ON	YES	2015	1					480	900	480	900
880	002.431	NB ON FR SB RTE 262	NB	ON	YES	2015	2					900	480	900	480
880	002.431	NB ON FR SB RTE 262	NB	ON	YES	2015	1					900	820	900	820
880	003.050	SB ON FR EB LANDING RD (Fremont)	SB	ON	YES	1996	2	510	900	510	900	510	900	510	900
880	003.050	SB ON FR EB LANDING RD (Fremont)	SB	ON	YES	1996	1	820	900	820	900	820	900	820	900
880	003.280	NB ON FR EB LANDING RD (Fremont)	NB	ON	YES	1996	1	900	550	900	550	900	550	900	550
880	003.280	NB ON FR EB LANDING RD (Fremont)	NB	ON	YES	1996	1	900	820	900	820	900	820	900	820
880	003.240	SB ON FR WB LANDING RD (Fremont)	SB	ON	YES	1996	1	460	900	460	900	460	900	460	900
880	003.240	SB ON FR WB LANDING RD (Fremont)	SB	ON	YES	1996	1	820	900	820	900	820	900	820	900
880	003.470	NB ON FR WB LANDING RD (Fremont)	NB	ON	YES	1996	1	900	510	900	510	900	510	900	510
880	004.553	SB ON FR EB AUTO MALL PKWY	SB	ON	YES	1996	1	510	900	510	900	510	900	510	900
880	004.553	SB ON FR EB AUTO MALL PKWY	SB	ON	YES	1996	1	820	900	820	900	820	900	820	900
880	004.697	NB ON FR EB AUTO MALL PKWY	NB	ON	YES	1996	1	900	480	900	480	900	480	900	480
880	004.697	NB ON FR EB AUTO MALL PKWY	NB	ON	YES	1996	1	900	820	900	820	900	820	900	820
880	004.741	SB ON FR WB AUTO MALL PKWY	SB	ON	YES	1996	1	510	900	510	900	510	900	510	900
880	004.741	SB ON FR WB AUTO MALL PKWY	SB	ON	YES	1996	1	820	900	820	900	820	900	820	900
880	004.888	NB ON FR WB AUTO MALL PKWY	NB	ON	YES	1996	1	900	550	900	550	900	550	900	550
880	004.888	NB ON FR WB AUTO MALL PKWY	NB	ON	YES	1996	1	900	820	900	820	900	820	900	820
880	006.075	SB ON FR EB STEVENSON BL	SB	ON	YES	1996	1	450	900	450	900	450	900	450	900
880	006.203	NB ON FR EB STEVENSON	NB	ON	YES	1996	1	900	550	900	550	900	550	900	550
880	006.279	SB ON FR WB STEVENSON BL	SB	ON	YES	1996	1	450	900	450	900	450	900	450	900
880	006.397	NB ON FR WB STEVENSON	NB	ON	YES	1996	2	900	450	900	450	900	450	900	450
880	006.397	NB ON FR WB STEVENSON	NB	ON	YES	1996	1	900	820	900	820	900	820	900	820
880	007.032	SB ON FR EB MOWRY	SB	ON	YES	1996	1	450	900	450	900	450	900	450	900
880	007.157	NB ON FR EB MOWRY AVE	NB	ON	YES	1996	1	900	510	900	510	900	510	900	510
880	007.157	NB ON FR EB MOWRY AVE	NB	ON	YES	1996	1	900	820	900	820	900	820	900	820
880	007.227	SB ON FR WB MOWRY AVE	SB	ON	YES	1996	1	430	900	430	900	430	900	430	900
880	007.227	SB ON FR WB MOWRY AVE	SB	ON	YES	1996	1	820	900	820	900	820	900	820	900
880	007.368	NB ON FR WB MOWRY	NB	ON	YES	1996	2	900	450	900	450	900	450	900	450
880	008.645	SB ON FR EB THORNTON AV	SB	ON	YES	1996	2	420	900	420	900	420	900	420	900
880	008.645	SB ON FR EB THORNTON AV	SB	ON	YES	1996	1	820	900	820	900	820	900	820	900
880	008.827	NB ON FR EB THORNTON AV	NB	ON	YES	1996	1	900	450	900	450	900	450	900	450
880	008.827	NB ON FR EB THORNTON AV	NB	ON	YES	1996	1	900	820	900	820	900	820	900	820
880	008.868	SB ON FR WB THORTON AVE	SB	ON	YES	1996	1	510	900	510	900	510	900	510	900
880	008.868	SB ON FR WB THORTON AVE	SB	ON	YES	1996	1	820	900	820	900	820	900	820	900
880	009.008	NB ON FR WB THORNTON AV	NB	ON	YES	1996	2	900	430	900	430	900	430	900	430
880	009.008	NB ON FR WB THORNTON AV	NB	ON	YES	1996	1	900	820	900	820	900	820	900	820
880	010.146	SB ON FR EB 84	SB	ON	YES	1996	1	590	900	590	900	590	900	590	900
880	010.259	NB ON FR EB 84	NB	ON	YES	1996	1	900	0	900	0	900	0	900	0
880	010.331	SB ON FR WB DECOTO RD	SB	ON	YES	1996	1	600	600	600	600	600	600	600	600
880	010.457	NB ON FR WB DECOTO RD	NB	ON	YES	1996	1	900	510	900	510	900	510	900	510
880	?	SB ON FR WB FREMONT BLVD	SB	ON	YES	1996	1	550	900	550	900	550	900	550	900
880	011.341	SB ON EB FR FREMONT BLVD	SB	ON	YES	1996	2	450	900	450	900	450	900	450	900
880	011.341	SB ON EB FR FREMONT BLVD	SB	ON	YES	1996	1	820	900	820	900	820	900	820	900
880	011.661	NB ON FR FREMONT BLVD	NB	ON	YES	1996	2	900	300	900	300	900	300	900	300
880	011.661	NB ON FR FREMONT BLVD	NB	ON	YES	1996	1	900	720	900	720	900	720	900	720

Table G-1: Alameda County Travel Demand Model Ramp Metering Rates

Route	Post Mile	Description	Direction	Type	Meter	Year Open	Number of Lanes	Rate/ Lane 2000 AM	Rate/ Lane 2000 PM	Rate/ Lane 2005 AM	Rate/ Lane 2005 PM	Rate/ Lane 2015 AM	Rate/ Lane 2015 PM	Rate/ Lane 2035 AM	Rate/ Lane 2035 PM
880	012.871	SB ON FR EB ALVARADO NILES	SB	ON	YES	1996	1	480	900	480	900	480	900	480	900
880	012.871	SB ON FR EB ALVARADO NILES	SB	ON	YES	1996	1	820	900	820	900	820	900	820	900
880	?	SB ON FR WB ALVARADO NILES	SB	ON	YES	1996	1	480	900	480	900	480	900	480	900
880	?	SB ON FR WB ALVARADO NILES	SB	ON	YES	1996	1	820	900	820	900	820	900	820	900
880	013.136	NB ON FR ALVARADO-NILES	NB	ON	YES	1996	2	900	510	900	510	900	510	900	510
880	013.136	NB ON FR ALVARADO-NILES	NB	ON	YES	1996	1	900	820	900	820	900	820	900	820
880	013.554	SB ON FR WHIPPLE RD	SB	ON	YES	1996	2	450	900	450	900	450	900	450	900
880	013.554	SB ON FR WHIPPLE RD	SB	ON	YES	1996	1	820	900	820	900	820	900	820	900
880	013.764	NB ON FR WHIPPLE	NB	ON	YES	1996	1	550	550	550	550	550	550	550	550
880	014.524	SB ON FR INDUSTRIAL PKWY	SB	ON	YES	1996	1	550	900	550	900	550	900	550	900
880	014.633	NB ON FR INDUSTRIAL PKWY	NB	ON	YES	1996	1	430	575	430	575	430	575	430	575
880	014.633	NB ON FR INDUSTRIAL PKWY	NB	ON	YES	1996	1	580	580	580	580	580	580	580	580
880	015.548	SEG SB ON FR EB TENNYSON	SB	ON	YES	1996	1	510	900	510	900	510	900	510	900
880	015.548	SEG SB ON FR EB TENNYSON	SB	ON	YES	1996	1	820	900	820	900	820	900	820	900
880	015.549	SEG SB ON FR WB TENNYSON	SB	ON	YES	1996	1	510	900	510	900	510	900	510	900
880	015.747	NB ON FR WB TENNYSON	NB	ON	YES	1996	1	360	360	360	360	360	360	360	360
880	015.747	NB ON FR WB TENNYSON	NB	ON	YES	1996	1	820	720	820	720	820	720	820	720
880	015.748	NB ON FR EB TENNYSON RD	NB	ON	YES	1996	1	360	360	360	360	360	360	360	360
880	016.430	SB ON FR RTE 92\JACKSON	SB	ON	YES	1996	1	550	480	550	480				
880	016.430	SB ON FR RTE 92\JACKSON	SB	ON	YES	1996	1	550	480	550	480				
880	XXX	SB ON FR EB RTE 92\JACKSON	SB	ON	YES	2015	1					480	480	480	480
880	XXX	SB ON FR EB RTE 92\JACKSON	SB	ON	YES	2015	1					820	820	820	820
880	XXX	SB CONNECTOR FR RTE 92/JACKSON	SB	ON	YES	2015	1					480	480	480	480
880	XXX	SB CONNECTOR FR RTE 92/JACKSON	SB	ON	YES	2015	1					820	820	820	820
880	016.957	NB ON FR RTE 92/JACKSON	NB	ON	YES	1996	1	0	0	0	0				
880	016.957	NB ON FR RTE 92/JACKSON	NB	ON	YES	1996	1	0	0	0	0				
880	XXX	NB ON FR WB RTE 92\JACKSON	NB	ON	YES	2015	1	480	480	480	480	480	480	480	480
880	XXX	NB ON FR WB RTE 92\JACKSON	NB	ON	YES	2015	1	820	820	820	820	820	820	820	820
880	XXX	NB CONNECTOR FR RTE 92/JACKSON	NB	ON	YES	2015	1	480	480	480	480	480	480	480	480
880	XXX	NB CONNECTOR FR RTE 92/JACKSON	NB	ON	YES	2015	1	820	820	820	820	820	820	820	820
880	017.483	SEG SB ON FR EB WINTON	SB	ON	YES	1996	1	510	510	510	510	510	510	510	510
880	017.483	SEG SB ON FR EB WINTON	SB	ON	YES	1996	1	820	820	820	820	820	820	820	820
880	017.484	SEG SB ON FR WB WINTON	SB	ON	YES	1996	1	510	510	510	510	510	510	510	510
880	017.825	NB ON FR WINTON AVE	NB	ON	YES	1996	1	420	600	420	600	420	600	420	600
880	018.246	SB ON FR A STREET	SB	ON	YES	1996	1	600	900	600	900	600	900	600	900
880	018.246	SB ON FR A STREET	SB	ON	YES	1996	1	630	900	630	900	630	900	630	900
880	018.480	NB ON FR A STREET	NB	ON	YES	1996	1	400	400	400	400	400	400	400	400
880	018.480	NB ON FR A STREET	NB	ON	YES	1996	1	720	720	720	720	720	720	720	720
880	019.961	SB ON FR HESPERIAN BLVD	SB	ON	YES	1996	1	480	900	480	900	480	900	480	900
880	020.420	NB ON FR WB LEWELLING RD	NB	ON	YES	1996	1	510	600	510	600	510	600	510	600
880	020.420	NB ON FR WB LEWELLING RD	NB	ON	YES	1996	1	820	820	820	820	820	820	820	820
880	020.651	SB ON FR WB WASHINGTON AVE.	SB	ON	YES	1996	1	600	900	600	900				
880	XXX	SB ON FR EB WASHINGTON AVE.	SB	ON	YES	2015	1					640	900	640	900
880	XXX	SB ON FR EB WASHINGTON AVE.	SB	ON	YES	2015	1					640	900	640	900
880	020.820	SEG NB ON FROM EB WASHINGTON	NB	ON	YES	1996	1	820	600	820	600				
880	XXX	SEG NB ON FROM WB WASHINGTON	NB	ON	YES	2015	1					820	600	820	600
880	XXX	SEG NB ON FROM WB WASHINGTON	NB	ON	YES	2015	1					820	600	820	600
880	022.727	SB ON FR EB MARINA BLVD.	SB	ON	YES	1996	2	480	900	480	900	480	900	480	900
880	022.727	SB ON FR EB MARINA BLVD.	SB	ON	YES	2015	1					820	900	820	900
880	XXX	SB ON FR WB MARINA BLVD.	SB	ON	YES	2015	1					480	900	480	900
880	XXX	SB ON FR WB MARINA BLVD.	SB	ON	YES	2015	1					820	900	820	900
880	022.946	NB ON FR WB MARINA BLVD	NB	ON	YES	1996	2	510	550	510	550	510	550	510	550
880	022.946	NB ON FR WB MARINA BLVD	NB	ON	YES	2015	1					820	820	820	820
880	XXX	NB ON FR EB MARINA BLVD	NB	ON	YES	2015	1					510	550	510	550
880	XXX	NB ON FR EB MARINA BLVD	NB	ON	YES	2015	1					820	820	820	820

Table G-1: Alameda County Travel Demand Model Ramp Metering Rates

Route	Post Mile	Description	Direction	Type	Meter	Year Open	Number of Lanes	Rate/ Lane 2000 AM	Rate/ Lane 2000 PM	Rate/ Lane 2005 AM	Rate/ Lane 2005 PM	Rate/ Lane 2015 AM	Rate/ Lane 2015 PM	Rate/ Lane 2035 AM	Rate/ Lane 2035 PM
880	023.598	NB ON FR EB DAVIS ST	NB	ON	YES	1996	1	550	600	550	600	550	600	550	600
880	023.624	SB ON FR EB DAVIS ST	SB	ON	YES	1996	1	510	900	510	900	510	900	510	900
880	023.624	SB ON FR EB DAVIS ST	SB	ON	YES	1996	1	820	900	820	900	820	900	820	900
880	023.694	NB ON FR WB DAVIS ST	NB	ON	YES	1996	1	550	600	550	600	550	600	550	600
880	023.709	SB ON FR WB DAVIS ST	SB	ON	YES	1996	1	510	900	510	900	510	900	510	900
880	023.709	SB ON FR WB DAVIS ST	SB	ON	YES	1996	1	820	900	820	900	820	900	820	900
880	024.680	SB ON FR EB 98TH AVE	SB	ON	YES	1996	2	400	360	400	360	400	360	400	360
880	024.680	SB ON FR EB 98TH AVE	SB	ON	YES	1996	1	720	720	720	720	720	720	720	720
880	024.716	NB ON FR EB 98TH AVE	NB	ON	YES	1996	1	550	600	550	600	550	600	550	600
880	024.716	NB ON FR EB 98TH AVE	NB	ON	YES	1996	1	820	820	820	820	820	820	820	820
880	024.787	SB ON FR WB 98TH AVE	SB	ON	YES	1996	1	550	480	550	480	550	480	550	480
880	024.899	NB ON FR WB 98TH AVE	NB	ON	YES	1996	1	480	480	480	480	480	480	480	480
880	025.268	SB ON FR NB HEGENBERGER	SB	ON	YES	1996	2	420	400	420	400	420	400	420	400
880	025.268	SB ON FR NB HEGENBERGER	SB	ON	YES	1996	1	820	820	820	820	820	820	820	820
880	025.471	SB ON FR SB HEGENBERGER	SB	ON	YES	1996	1	480	480	480	480	480	480	480	480
880	025.522	NB ON FR NB HEGENBGR/EDES	NB	ON	YES	1996	2	510	600	510	600	510	600	510	600
880	025.611	NB ON FR SB HEGENBERGER	NB	ON	YES	1996	1	510	510	510	510	510	510	510	510
880	026.581	SEG SB ON FR OAKPORT ST	SB	ON	YES	1996	1	480	480	480	480	480	480	480	480
880	026.582	SEG SB ON FR WB 66TH	SB	ON	YES	1996	1	480	480	480	480	480	480	480	480
880	026.701	SEG NB ON FR WB 66TH AVE (diagonal)	NB	ON	YES	1996	1	400	450	400	450	400	450	400	450
880	026.702	SEG NBON FR EB 66TH/COL (loop)	NB	ON	YES	1996	2	400	450	400	450	400	450	400	450
880	027.531	SB ON FR HIGH ST.	SB	ON	YES	1996	1	0	0	0	0	0	0	0	0
880	028.071	NB ON FR RTE 77/HIGH ST	NB	ON	YES	1996	1	480	550	480	550	480	550	480	550
880	028.651	SB ON FR 29TH ST	SB	ON	YES	1996	1	600	550	600	550	600	550	600	550
880	028.881	SB ON FR 23RD/KENNEDY	SB	ON	YES	1996	1	510	550	510	550	510	550	510	550
880	029.101	NB ON FR EB 23RD AVE	NB	ON	YES	1996	1	690	550	690	550	690	550	690	550
880	029.101	NB ON FR EB 23RD AVE	NB	ON	YES	1996	1	690	690	690	690	690	690	690	690
880	029.151	NB ON FR WB 23RD AVE	NB	ON	YES	1996	1	550	900	550	900	550	900	550	900
880	030.961	SB ON FR OAK ST	SB	ON	YES	1996	2	330	330	330	330	330	330	330	330
880	030.961	SB ON FR OAK ST	SB	ON	YES	1996	1	720	720	720	720	720	720	720	720
880	031.308	SB ON FR BROADWAY	SB	ON	YES	1996	2	450	450	450	450	450	450	450	450
880	031.421	NB ON FR JACKSON ST.	NB	ON	YES	1996	2	0	0	0	0	0	0	0	0

12 Appendix F: Transportation Project List

A list of planned transportation improvement projects was prepared as part of the Projections 2007 model update. The project list is based on several sources:

- The Alameda County Congestion Management Agency (ACCMA) Transportation 2035 Project Submittal to the Metropolitan Transportation Commission dated March 5, 2008
- Detailed project descriptions contained in the Alameda County Transportation Improvement Program (TIP) ID Report dated November 13, 2006
- Assumed improvements inherited from the MTC travel model files as obtained in 2005
- Road and local street improvements which were coded into the Alameda County Model based on review of the travel model networks by local jurisdictions in 2006

The following pages list the road and major transit improvements included in the model networks. An exhibit for each Planning Area highlights the locations of the road improvements after 2005.

Appendix F Tables and exhibits are contained in the file:

"110706_ACCMA_NetworkImproveList.pdf"

Table F-1: Alameda County Model Road Network Improvements After 2000 Base Year

Jurisdiction	Facility	Direction	Project Name/Location	From	To	Description	Model Network Year	Alameda County TIP ID (11/06)	2035 TIP Application Project Number	Status	Model Network Node
Caltrans	I-580	EB & WB	Castro Valley I/C Improvements	Redwood Road		New ramps: EB Redwood on-ramp, WB Redwood off-ramp	2015	50009			27740
Caltrans	I-580	EB & WB	Castro Valley I/C Improvements	Center St		Remove: EB Center off-ramp, WB Castro Valley/Center St on-ramp	2010	50009			31101
Caltrans	I-580	EB	Castro Valley I/C Improvements	Grove Way		New ramp: Grove off-ramp.	2010	50009			28575
Caltrans	I-580	EB	Castro Valley I/C Improvements	Redwood Road	Grove Way	New auxiliary lane	2011	50009			28502
Caltrans	I-580	EB	I-680 Fly-over ramps	I-680	Hopyard	Widen from 4 to 6 lanes	2005				28994
Caltrans	I-580	EB & WB	Fallon Road I/C Improvements	El Charro Rd		Widen on-ramps and off-ramps, new loop on-ramps, install traffic signals	2015	50008	12	Tier 1 & 2	27759
Caltrans	I-580	EB	Local I/C Improvements in Dublin	El Charro Rd	Airway Blvd (SR84)	New aux lane	2012		12	Tier 1 & 2	27760
Caltrans	I-580	EB	Isabel Ave/SR 84/Portola Ave I/C Mod	Airway Blvd	Isabel Ave	New aux lane	2012	990072	15	Tier 1 & 2	8319
Caltrans	I-580	EB & WB	Isabel Ave/SR 84/Portola Ave I/C Mod	Isabel Ave		New Isabel I/C - partial cloverleaf	2015	990072	15	Tier 1 & 2	40914
Caltrans	I-580	EB & WB	Isabel Ave/SR 84/Portola Ave I/C Mod	Portola Ave		Remove existing Portola Ave ramps	2015	990072	15	Tier 1 & 2	32062
Caltrans	I-580	EB	First Street I/C Modification	First Street		Expand off ramp to 2 lanes	2035		13	Tier 1 & 2	40927
Caltrans	I-580	EB	Vasco Road I/C Modification	1st St	Vasco	New aux lane	2012	10013	13	Tier 1 & 2	29087
Caltrans	I-580	EB & WB	Vasco Road I/C Modification	Vasco Road		Modify Vasco I/C to partial cloverleaf	2035	10013	13	Tier 1 & 2	29112
Caltrans	I-580	EB	Eastbound HOV Lane	Tassajara	Greenville/Southfront	New HOV/HOT lane	2011	70020	15	Tier 1 & 2	9529
Caltrans	I-580	EB & WB	Greenville Road I/C Modification	Greenville		Relocate I/C from Southfront/Northfront to Greenville Road, new interchange will be modified diamond type	2035		13	Tier 1 & 2	40897
Caltrans	I-580	WB	Tri-Valley WB Aux Lanes	El Charro	Tassajara	New aux lane	2012	50011	12	Tier 1 & 2	27757
Caltrans	I-580	WB	Tri-Valley WB Aux Lanes	Airway Blvd (SR 84)	El Charro	New aux lane	2015	50011	15	Tier 1 & 2	8316
Caltrans	I-580	WB	Isabel Ave/SR 84/Portola Ave I/C Mod	Isabel Ave	Airway Blvd (SR84)	New aux lane	2035	990072	15	Tier 1 & 2	8318
Caltrans	I-580	WB	Local I/C Improvements in Livermore	Vasco	1st Ave	New aux lane	2015		13	Tier 1 & 2	29097
Caltrans	I-580	WB	Westbound HOV Lane	Northfront Rd on ramp	I-680	New HOV/HOT lane	2013	70017	15	Tier 1 & 2	9464
Caltrans	I-580	WB	I-580 WB to I-680 SB fly-over	I-680		New fly-over direct connectors - mixed flow and HOV	Not included		14	Tier 1 & 2	9479

Table F-1: Alameda County Model Road Network Improvements After 2000 Base Year

Jurisdiction	Facility	Direction	Project Name/Location	From	To	Description	Model Network Year	Alameda County TIP ID (11/06)	2035 TIP Application Project Number	Status	Model Network Node
Caltrans	I-680	NB & SB	I-580 & Hopyard ramp reconfiguration	I-580	Hopyard	Modified NB & SB freeway-freeway ramp to I580 EB & Hopyard	2005				29003
Caltrans	I-680	NB	Northbound HOV Lane	SR 237 (Milpitas)	Stoneridge Dr (Pleasanton)	New HOV lane	2015	10014			5775
Caltrans	I-680	NB	Auxiliary Lane	Washington Blvd on ramp	Mission (SR238) off ramp	New aux lane	2015				28814
Caltrans	I-680	NB	Auxiliary Lane	Durham Rd on ramp	Washington Blvd off ramp	New aux lane	2015				28583
Caltrans	I-680	NB	Auxiliary Lane	Mission (SR 262) on ramp	Durham Rd off ramp	New aux lane	2015		11	Tier 1 & 2	28873
Caltrans	I-680	NB	Auxiliary Lane	Scott Creek Rd interchange	Mission (SR262) on ramp	New aux lane	2015		11	Tier 1 & 2	28866
Caltrans	I-680	NB	Auxiliary Lane	Jacklin Rd	Scott Creek Rd interchange	New aux lane	2015				5775
Caltrans	I-680	SB	Amador Plaza interchange modification	Amador Plaza		Modify on-ramp and off-ramp from 1 lane to 2 lanes near ramp terminal	2005				40775
Caltrans	I-680	SB	SB HOV Final Phase	Sunol Blvd	SR84 interchange	New HOV lane	2035	991084			9539
Caltrans	I-680	SB	SB HOV Lane	SR 84 interchange	Vargas Rd interchange	New HOV lane	2005				9175
Caltrans	I-680	SB	SB HOV Lane	Vargas Rd interchange	Scott Creek Rd interchange	New HOV lane	2005				9187
Caltrans	I-680	SB	Auxiliary Lane	Washington Blvd on ramp	Durham Rd off ramp	New aux lane	2015				28817
Caltrans	I-680	SB	Auxiliary Lane	Mission (SR 262) off ramp	Scott Creek Rd interchange	New aux lane	2015		11	Tier 1 & 2	28870
Caltrans	I-680	SB	Auxiliary Lane	Scott Creek Rd interchange	Jacklin Rd	New aux lane	2015				5777
Caltrans	I-880	NB	HOV Lane	Dixon Landing Rd	Mission Blvd (SR262)	New HOV lane	2015	978027			9049
Caltrans	I-880	NB	SR 262 I/C	Dixon Landing Rd	Mission Blvd (SR262)	Widen from 3 lanes to 4	2005	978027			5795
Caltrans	I-880	NB	SR 262 I/C	Dixon Landing Rd	Mission Blvd (SR262)	Widen from 4 lanes to 5	2015	978027			5795
Caltrans	I-880	NB	Broadway Jackson	Broadway		New off-ramp to 5th/Market	2035		9	Tier 1 & 2	27785
Caltrans	I-880	NB	SR 92 I/C Reconstruction	Tennyson	SR 92	New aux lane	2015				26666
Caltrans	I-880	NB	SR 92 I/C Reconstruction	SR 92	Winton	New aux lane	2012				28597
Caltrans	I-880	SB	66th/Hegenberger Local I/C improvements	66th	Hegenberger	5th lane added	2015		9	Tier 1 & 2	27682
Caltrans	I-880	SB	SB HOV Lane	Hegenberger	Marina	New HOV Lane	2014				9853
Caltrans	I-880	SB	Central I-880 Local I/C improvements	Hesperian Blvd	A St	5th lane added	2010	990013	10	Tier 1 & 2	28416
Caltrans	I-880	SB	SR 92 I/C Reconstruction	Winton	SR 92	New aux lane	2012				28640
Caltrans	I-880	SB	SR 92 I/C Reconstruction	SR 92	Tennyson	New aux lane	2015				26638
Caltrans	I-880	SB	HOV Lane	Mission Blvd (SR 262)	Dixon Landing Rd	New HOV lane	2015	978027			9197
Caltrans	I-880	SB	SR 262 I/C	Mission Blvd (SR 262)	Dixon Landing Rd	Widen from 4 lanes to 5	2015	978027			28844
Caltrans	I-880	SB	Widening	Dixon Landing Rd	SR 237	Widen from 4 lanes to 5	2015				41268
Caltrans	SR 24	EB or WB	Caldecott Tunnel	Caldecott Tunnel		Widen from 2 lanes to 4	2035				28015
Caltrans	SR 84	WB	WB HOV Lane Extension	I-880 off ramp	Ardenwood Blvd off ramp	Extend HOV lane	2010	10006			9433
Caltrans	SR 84	WB	HOV on-ramp	Newark Boulevard		Direct HOV on-ramp		10005			28875
Caltrans	SR 84	EB & WB	Roadway widening	Overacker *	Mission (SR238)	Widen from 2 lanes to 4	2035				28795

Table F-1: Alameda County Model Road Network Improvements After 2000 Base Year

Jurisdiction	Facility	Direction	Project Name/Location	From	To	Description	Model Network Year	Alameda County TIP ID (11/06)	2035 TIP Application Project Number	Status	Model Network Node
Caltrans	SR 84	EB & WB	Roadway widening	Mowry	Fremont	Widen from 2 lanes to 4	2015				32872
Caltrans	SR 84	EB & WB	SR 84 Expwy/East-West Connector	I880 ramps	Paseo Padre	New 6-lane expressway	Not included	978004	20	Tier 1 & 2	12020
Caltrans	SR 84	EB & WB	SR 84 Expwy/East-West Connector	Paseo Padre	Mission (SR238)	New 6-lane expressway	2015	978004	20	Tier 1 & 2	8756
Caltrans	SR 84	EB & WB	SR 84 Expwy Widening	Isabel Rd	I680 ramps	Widen from 2 lanes to 4	2035	50014	21-22	Tier 1 & 2	27762
Caltrans	SR 84	EB & WB	SR 84 Expwy Widening	Stanley Blvd ramp	Vallecitos Rd	Widen from 2 lanes to 4	2015	50014	21-22	Tier 1 & 2	32015
Caltrans	SR 84	WB	SR 84 Expwy Widening	Stanley		New on-ramp to WB SR 84	2015	50014	21-22	Tier 1 & 2	8329
Caltrans	SR 84	EB & WB	SR 84 Expwy Widening	Stanley		Widen ramp from 1 to 2 lanes each way	2015	50014	21-22	Tier 1 & 2	32015
Caltrans	SR 84	EB & WB	SR 84 Expwy Widening	W Jack London	Stanley Blvd ramp	Widen from 2 lanes to 4	2015	50014	21-22	Tier 1 & 2	8324
Caltrans	SR 84	EB & WB	SR 84 Expwy Widening	W Jack London	Stanley Blvd ramp	New 2 lane road, done	2005	50014	21-22	Tier 1 & 2	8324
Caltrans	SR 84	EB & WB	SR 84 Expwy Widening	Isabel	W Jack London	Widen from 4 lanes to 6	2015	50014	21-22	Tier 1 & 2	8324
Caltrans	SR 84	EB & WB	SR 84 Expwy Widening	Airway Blvd	North Canyon Pkwy	New 4-6 lane road	2015	50014	21-22	Tier 1 & 2	8766
Caltrans	SR 92	EB	SR 92 I/C Reconstruction	Clawiter on ramp	Industrial off ramp	Widen from 3 lanes to 4	2005	H970002			28230
Caltrans	SR 92	EB	SR 92 I/C Reconstruction	Industrial Blvd on ramp	Hesperian Blvd off ramp	Widen from 3 lanes to 4	2005	H970002			28651
Caltrans	SR 92	EB	SR 92 I/C Reconstruction	Through I-880 interchange	End of freeway	Redesigned ramps and mainline, part of I-880 work	2015	H970002			40903
Caltrans	SR 92	EB	SR 92 I/C Reconstruction	I-880		New flyover ramp and HOV ramp to I-880 NB	2015	H970002			40906
Caltrans	SR 92	WB	SR 92 I/C Reconstruction	Clawiter off ramp	toll plaza	Widen from 2 lanes to 3	2005	H970002			28224
Caltrans	SR 92	WB	SR 92 I/C Reconstruction	Industrial on ramp	Clawiter off ramp	Widen from 2 lanes to 4	2005	H970002			28653
Caltrans	SR 92	WB	SR 92 I/C Reconstruction	I-880 interchange	Hesperian on ramp	Widen from 3 lanes to 4	2015	H970002			28634
Caltrans	SR 92	WB	SR 92 I/C Reconstruction	I-880		New flyover ramp and HOV ramp to I-880 SB	2015	H970002			40903
Caltrans	SR 92	WB	SR 92 I/C Reconstruction	freeway start	I880 interchange	Widen from 2 lanes to 3	2015	H970002			28612
Caltrans	SR185	EB & WB	SR 238 Corridor Improvement Project/Miniloop	A St	Foothill	Convert to one way SB	2015	977007			33026
Caltrans	SR 238	NB	I-238 Widening	I-880		Widen ramp to I-880 from 1 lane to 2	2010	990013			31040
Caltrans	SR 238	NB	I-238 Widening	I-880	Hesperian	Widen from 2 lanes to 3	2010	990013			28435
Caltrans	SR 238	SB	I-238 Widening	I-580		Widen from 2 lanes to 3 at the I-580 interchange	2010	990013			28411
Caltrans	SR 238	NB & SB	SR 238 Corridor Improvement Project/Miniloop	Mattox	City Center	Widen from 6 lanes to 8	2015	977007			31051
Caltrans	SR 238	NB & SB	SR 238 Corridor Improvement Project/Miniloop	City Center	A St	Widen from 6 lanes to 10	2015	977007			12219

Table F-1: Alameda County Model Road Network Improvements After 2000 Base Year

Jurisdiction	Facility	Direction	Project Name/Location	From	To	Description	Model Network Year	Alameda County TIP ID (11/06)	2035 TIP Application Project Number	Status	Model Network Node
Caltrans	SR 238	NB & SB	SR 238 Corridor Improvement Project/Miniloop	A St	Mission	Convert to one way NB (Mission to A)	2015	977007			28522
Caltrans	SR 238	NB & SB	SR 238 Corridor Improvement Project/Miniloop	E St	Highland	Widen from 6 lanes to 8	2015	977007			28579
Caltrans	SR 238	NB & SB	SR 238 Corridor Improvement Project/Miniloop	Highland	Industrial	Widen from 4 lanes to 6	2015	977007			28580
Caltrans	SR238	NB & SB	Roadway widening	Mowry (SR 84)	Pickering	Widen from 4 lanes to 6	2015				12048
Caltrans	SR 262	NB	SR 262 I/C Reconstruction	Warren	Warm Springs	Widen from 2 lanes to 3	2015	978027			28879
Caltrans	SR 262	SB	SR 262 I/C Reconstruction	Warm Springs	Warren	Widen from 2 lanes to 3	2015	978027			28864
Alameda	Atlantic Ave			Monarch St	Ferry Point	New 2 lane roadway	2015				
Alameda	Clement Ave			Grand St	Sherman St	4 lane extension	2015				
Alameda	Clement Ave			Park	Tilden	2 lane connection	2030				
Alameda	Lexington St			Monarch St	Ferry Point	New 2 lane roadway	2015				
Alameda	Lincoln Ave			Central Ave (SR 61)	Hornet Way	2 lane extension	Not included				
Alameda	Lincoln Ave			Oak	Park	Widen from 2 lanes to 4	2030				
Alameda	Midway Ave			Pan Am Way	Main St	Widen from 2 lanes to 4	Not included				
Alameda	Monarch St			Tower Ave	Atlantic Ave	New 2 lane roadway	2015				
Alameda	Naval Air Station area			Several new streets		New 2 lane roadway	2015				
Alameda	Saratoga St			Monarch St	Ferry Point	New 2 lane roadway	2015				
Alameda	Tinker Ave		Tinker Ave Reconfiguration	Mariner Square Loop	Constitution Way	Widen from 2 lanes to 4	2015	990054			
Alameda	Tinker Ave		Tinker Ave Reconfiguration	Moseley Ave	future road	New 2 lane roadway	2010	990054			
Alameda	Tinker Ave area			several new streets		New 2 lane roadway	2005				
Albany	Marin Ave			The Alameda	San Pablo Ave (SR 123)	Reduce from 4 lanes to 2	2015				
Castro Valley	Redwood Rd			I-580 EB ramps	Grove Way	Widen from 4 lanes to 6	2005				
Dublin	5th Street			Dougherty Rd	Arnold	Extend 2-lane public street	2035				
Dublin	Arnold Dr			Dublin Blvd	Gleason	Widen from 2 lanes to 4	2035				
Dublin	Dougherty Rd		Dougherty Rd Widening	Amador Valley Blvd	County Line	Widen from 4 lanes to 6	2015	50007			
Dublin	Dougherty Rd		Dougherty Rd Widening	Dublin Blvd	Amador Valley Blvd	Widen from 4 lanes to 6	2015	50007			28977
Dublin	Dublin Blvd			Hansen Dr *	Silvergate Dr	Widen from 2 lanes to 4	2015				
Dublin	Dublin Blvd			Tassajara Rd	terminus	New 4 lane roadway	2005				
Dublin	Dublin Blvd			Tassajara Rd	terminus	Widen from 4 lanes to 6	2015				
Dublin	Dublin Blvd Ext			Croak Rd	Doolan Rd	New 4 lane roadway	2015 & 2020				
Dublin	Dublin Blvd Ext			Lockhart St	Croak Rd	New 6 lane roadway	2015				
Dublin	Martinelli Way			Keppler	Hacienda	New 2 lane roadway	2008				
Dublin	St. Patrick			west of I-680 ramp		New 2 lane roadway	2015				
Dublin	San Ramon Rd			I-580 WB ramps	Dublin Blvd	Widen from 6 lanes to 8	Not included				
Dublin	Scarlett Dr			Dougherty Rd	Houston Pl	New 4 lane roadway	2005				
Dublin	Scarlett Dr			Houston Pl	Dublin Blvd	New 4 lane roadway	2015				
Dublin	Tassajara Rd			I-580	Dublin Blvd	Widen from 6 lanes to 8	2015				
Dublin	Tassajara Rd			Central	Fallon	Widen from 4 lanes to 6	2015				

Table F-1: Alameda County Model Road Network Improvements After 2000 Base Year

Jurisdiction	Facility	Direction	Project Name/Location	From	To	Description	Model Network Year	Alameda County TIP ID (11/06)	2035 TIP Application Project Number	Status	Model Network Node
Fremont	Auto Mall Pkwy		Auto Mall Pkwy Intersection Impr	Grimmer Blvd	Osgood Rd	Widen from 4 lanes to 6	2015		19	Tier 1 & 2	
Fremont	Blacow Rd			terminus	Osgood Rd	New 4-lane roadway (rail overpass)	2015				
Fremont	Cushing Pkwy			terminus	Fremont Blvd	Extension	2005				
Fremont	Dixon Landing Rd			Warm Springs Blvd	I-880 ramps	New 4-lane roadway	2005				
Fremont	Dixon Landing Rd			Warm Springs Blvd	I-880 ramps	Widen from 4 lanes to 6	2015				
Fremont	Fremont Blvd			Cushing Blvd	Lakeview Blvd *	Widen from 2 lanes to 4	2005				
Fremont	Fremont Blvd			Lakeview Blvd *	Dixon Landing Rd	Extension	2015				
Fremont	Paseo Padre Pkwy			Decoto Rd	Isherwood Way	Widen from 4 lanes to 6	2015				
Fremont	Paseo Padre Pkwy			Thornton Ave	Eggers Dr	Widen from 4 lanes to 6	2015				
Fremont	Warren Ave			Kato Rd	Mission Blvd (SR 262)	Extension of existing street	2015				
Hayward	A St			Foothill Blvd (SR 238)	Mission Blvd (SR 185)	Convert to one-way EB	2015				
Hayward	Corsair Blvd			terminus	West A St extension	Extension of existing street	2015				
Hayward	Tennyson Extension			Mission Blvd (SR 238)	new development	New 4-lane roadway	2015				
Hayward	West A St			Skywest Dr	Corsair Blvd extension	Extension of existing street	2015				
Hayward	Whitesell St			Breakwater Ave	shopping center	Widen from 2 lanes to 4	2015				
Hayward	Whitesell St			Enterprise Ave	Depot Rd	New 4 lane connector to Cabot Blvd	2015				
Livermore	1st St			Maple St	L Street	Decrease from 4 lanes to 2	2005				
Livermore	Greenville Rd			Northfront Rd	Las Positas Rd	Widen from 4 lanes to 6	2035				
Livermore	Holmes St			Lexington Way	Wetmore Rd	Widen from 2 lanes to 4	2035				
Livermore	Las Positas Rd		Las Positas Road Conn Ph 2	1st St	Capitol St	Widen from 2 lanes to 4	2015	30005			
Livermore	Las Positas Rd			Livermore Ave	shopping center	Widen from 2 lanes to 4	2015				32252
Livermore	Las Positas Rd			Vasco Rd	Lawrence Dr	New 2 lane roadway	2005				
Livermore	Las Positas Rd			Vasco Rd	Lawrence Dr	Widen from 2 lanes to 4	2035				
Livermore	Isabel Ave			North Canyons Pkwy	new 580 interchange	New 4 lane roadway	2015				
Livermore	North Canyons Pkwy			Collier Canyon Rd	Airway Blvd (SR 84)	Widen to 6 lanes	2035				
Livermore	North Canyons Pkwy			Portola Ave	Campus Hill Dr	New 4 lane roadway	2015				
Livermore	Northfront Rd			Vasco Rd	Herman Ave	Widen from 2 lanes to 4	2035				
Livermore	P St			Railroad Ave	Chestnut St	Widen from 2 lanes to 4	2035				
Livermore	Redwood Rd			terminus	Las Colinas Rd	Extension of 2-lane roadway	2035				
Livermore	Stanley Blvd			Isabel Ave (SR 84)	farm road	Widen from 4 lanes to 6	2005				
Livermore	Stanley Blvd			Murietta Blvd	Isabel Ave (SR 84)	Widen from 4 lanes to 6	2035				
Livermore	Vasco	SB		Dalton Ave	Scenic Ave	Widen from 2 lanes to 4 SB	2005				
Livermore	Vasco			I-580 EB ramps	Las Positas Rd	Widen from 4 lanes to 8	2035				
Livermore	Vasco			I-580 WB ramps	I-580 EB ramps	Widen from 2 lanes to 6	2035				
Livermore	Vasco			Scenic Ave	I-580 WB ramps	Widen from 4 lanes to 6	2035				
Livermore	W Jack London Blvd			Isabel Ave (SR 84)	terminus	Widen from 2 lanes to 4	2035				
Livermore	W Jack London Blvd			terminus	El Charro Rd	New 2 lane roadway	2015				
Livermore	W Jack London Blvd			terminus	El Charro Rd	Widen from 2 lanes to 4	2035				
Livermore	Wetmore Rd			Deer Hollow Lane	Vallecitos Rd	Realign 2 lane roadway	2015				
Livermore				I-580 EB ramps	I-580 WB ramps	Widen from 4 lanes to 6	2035				
Newark	Thornton Ave			Gateway Blvd	Hickory St *	Widen from 2 lanes to 4	2035	10053			
Oakland	Macarthur Blvd.			Lakeshore	Park	Narrow to 1 lane each way	2005				
Oakland	Mandela Pkwy		Mandela Pkwy Ext Ph2	32nd St	Horton	Extension of existing street	2005	30003			27763
Oakland	Airport Dr			Doolittle	Airport Dr	Widen from 4 lanes to 6	2005				
Oakland	Ron Cowan Pkwy			Harbor Bay Pkwy	Airport Dr	New 4-lane expressway	2005				
Pleasanton	Airway Blvd			North Canyons Pkwy	I-580 WB ramps	Widen from 4 lanes to 6	2035				
Pleasanton	Bernal Ave			1st St	Independence St *	Widen from 2 lanes to 4	2035				
Pleasanton	Bernal Ave			Foothill Rd	I-680 SB ramps	Widen from 2 lanes to 4	2015				
Pleasanton	Bernal Ave			I-680 SB ramps	I-680 NB ramps	Widen from 2 lanes to 4	2035				
Pleasanton	Busch Rd			Valley Ave	El Charro Rd	New 4 lane roadway	2035				

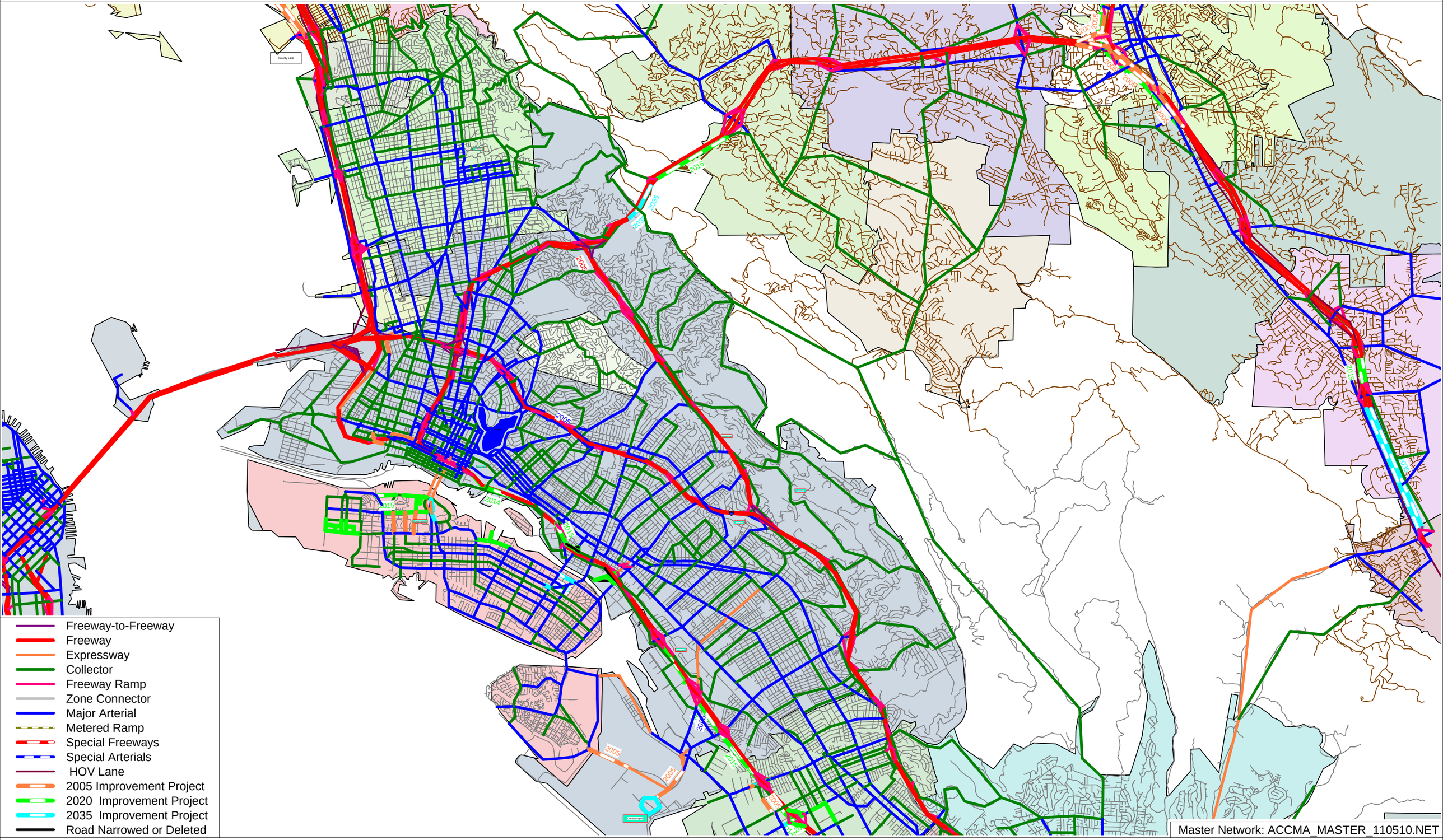
Table F-1: Alameda County Model Road Network Improvements After 2000 Base Year

Jurisdiction	Facility	Direction	Project Name/Location	From	To	Description	Model Network Year	Alameda County TIP ID (11/06)	2035 TIP Application Project Number	Status	Model Network Node
Pleasanton	Castlewood Dr			Pleasanton Sunol	I-680 SB ramps	Widen from 2 lanes to 4	2035				
Pleasanton	El Charro Rd			farm road	Stanley Blvd	New 4 lane roadway	2035				
Pleasanton	El Charro Rd			I580 EB ramps	Staples Ranch Dr	Widen from 2 lanes to 6	2015				
Pleasanton	El Charro Rd			Staples Ranch Dr	farm road	Widen from 2 lanes to 4	2015				
Pleasanton	Foothill Rd			Deodar Way	I580 EB ramps	Widen from 6 lanes to 8	2015				
Pleasanton	Foothill Rd			Stoneridge Dr	school	Widen from 2 lanes to 4	2035				
Dublin	Foothill Rd			I-580 EB ramps	I-580 WB ramps	Widen from 4 lanes to 8	2035				
Pleasanton	Hacienda Dr			I-580 EB ramps	Owens Dr	Widen from 6 lanes to 8	2005				
Pleasanton	Hopyard Rd			Valley Ave	Golden Rd	Widen from 2 lanes to 4	2005				
Pleasanton	North Canyons Pkwy			Collier Canyon Rd	Doolan Rd	Widen from 4 lanes to 6	2035				
Pleasanton	North Canyons Pkwy		North Canyon Pkwy Widening	Dublin Blvd	Collier Canyon Rd	New 6 lane roadway	2015	50012			32044
Pleasanton	Santa Rita Rd			Valley Ave	Mohr Ave	Widen from 6 lanes to 8	2035				
Pleasanton	Stoneridge Dr			Belleza Dr	Santa Rita Rd	Widen from 4 lanes to 6	2015				
Pleasanton	Stoneridge Dr			Santa Rita Rd	terminus	Widen from 4 lanes to 6	2035				
Pleasanton	Stoneridge Dr			terminus	El Charro Rd	New 4 lane roadway	2035				
Pleasanton	Sunol Blvd			I-680 NB ramps	Sycamore Rd	Widen from 4 lanes to 6	2005				
Pleasanton	Vineyard Ave			Bernal Ave	W Old Vineyard Ave	Widen from 2 lanes to 4	2035				
Pleasanton	W Las Positas Blvd			Foothill Rd	Payne Rd	Widen from 2 lanes to 4	2035				
San Leandro	Alvarado			Alladin	Marina	Widen from 2 lanes to 4	2015				
San Leandro	Lewelling Blvd		Lewelling Blvd Widening	Hesperian Blvd	Meekland Ave	Widen from 2 lanes to 4	2015	70008			28410
San Leandro	Marina Blvd			Alvarado St	Merced St	Widen from 4 lanes to 6	2035				
San Leandro	Marina Blvd			Teagarden	Alvarado	Widen from 4 lanes to 6	2015				
San Leandro	Westgate Pkwy.					Extension	2005				
Union City	11th St			future SR 84	Decoto Rd	New 4-lane roadway	2005 & 2015				

Table F-2: Alameda County Model Transit Network Improvements After 2005

Jurisdiction	Facility	Direction	Project Name/Location	From	To	Description	Model Network Year	Alameda County TIP ID (11/06)	2035 TIP Application Project Number	Status	Model Network Node
AC Transit	Local Service South		Revised Routes				2008	50017	23		
AC Transit	Bus Rapid Transit		Telegraph/ International BRT	San Leandro BART	UC Berkeley	Bus Rapid Transit corridor	2015	50017	23		
AC Transit	Local Service North		Line 325			Add Line 325	2015				
AC Transit	Local Service Fremont/Newark		Line 380			Add Line 380	2015				
BART	Dublin/Pleasanton Line		West Dublin/Pleasanton Station			Service to new station	2011	50016			
BART	E-BART		E-BART	Baypoint BART	Byron	E-BART service to Pittsburg, Antioch, Brentwood	2015				
BART	Fremont Line		Warm Springs Extension	Fremont BART	Warm Springs BART	Extension to new station	2015	50015	31		
BART	Oakland Airport Connector		Oakland Airport Connector	Coliseum BART	Oakland Airport	New automated guideway service, 8 minute travel time, 3.5 minute frequency	2015				
BART	Fremont Line		Berryessa Exten sion	Warm Springs BART	Berryessa BART	Extension to new station	2019				
BART	Fremont Line		Santa Clara Extension	Berryessa BART	Santa Clara BART	Extension to new station	2035				
Capitol Corridor	Capitol Corridor		Hercules Station			Add service to Hercules station	2015				
Dumbarton Rail	Dumbarton Rail		Dumbarton Rail	Union City	Millbrae and San Jose	New peak period rail service	2015		32		
Ferries	South San Francisco		South San Francisco Service	Oyster Point	San Francisco and Harbor Bay	Add new ferry service	2015				
Ferries	Redwood City		Redwood City Service	Redwood City	San Francisco and Harbor Bay	Add new ferry service	2035				
LAVTA	Bus Rapid Transit		Route 10 Bus Rapid Transit Project			Implement BRT service	Not included				

Alameda Countywide Model
Master Road Network with Improvements After 2000
Planning Area 1



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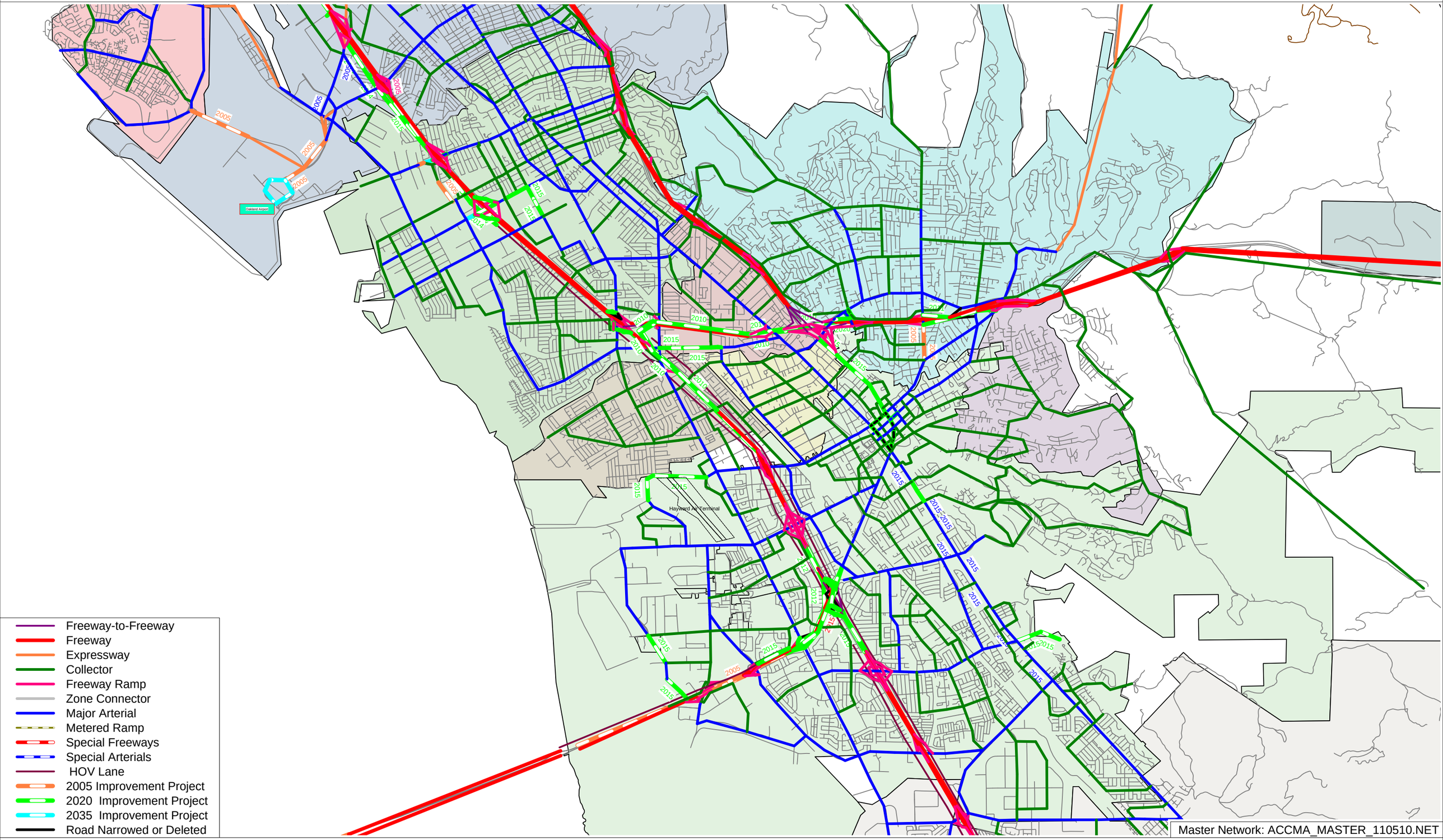
Alameda Countywide Model
Master Road Network with Improvements After 2000
Planning Area 2



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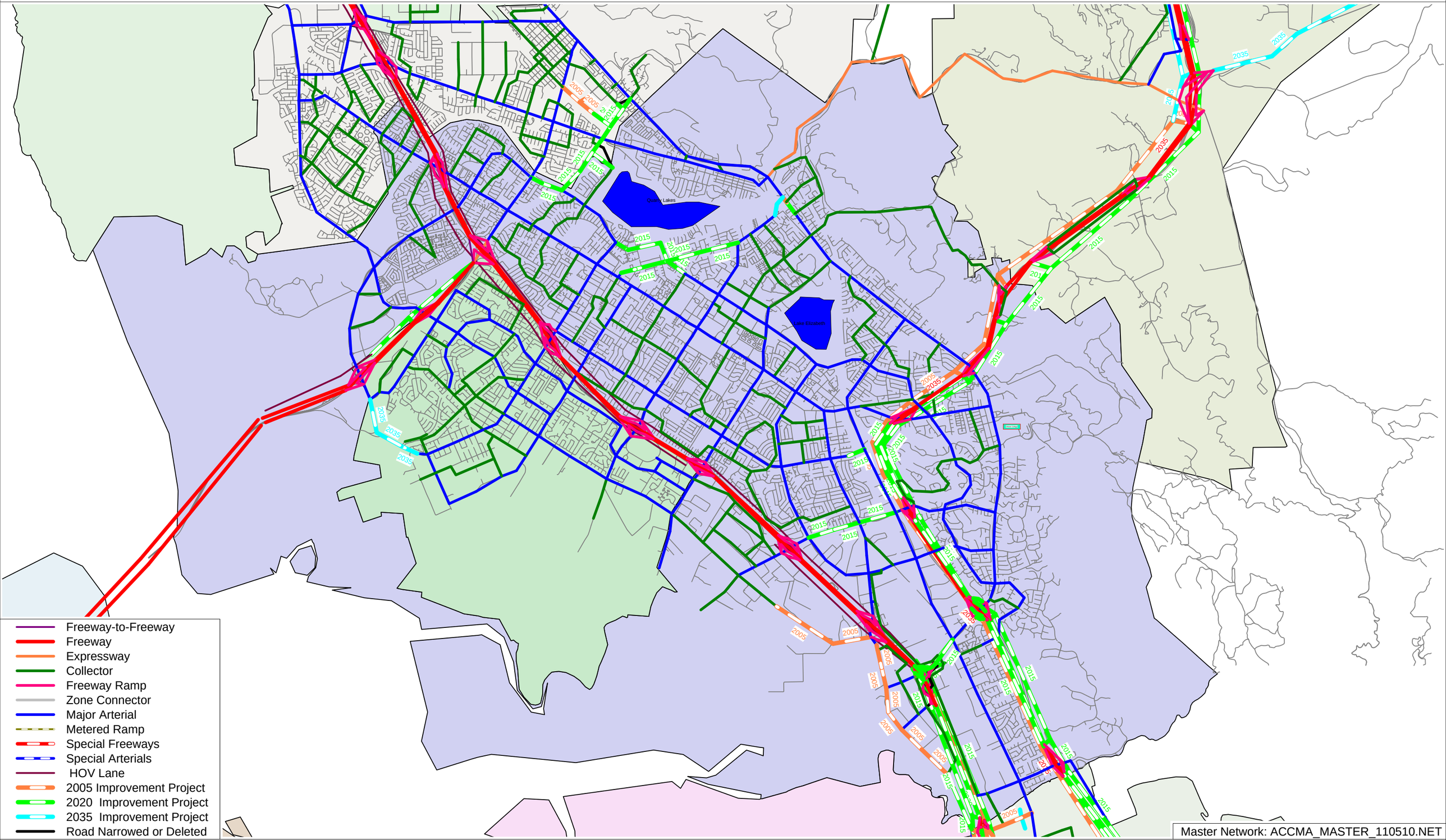
Alameda Countywide Model
Master Road Network with Improvements After 2000
Planning Area 3



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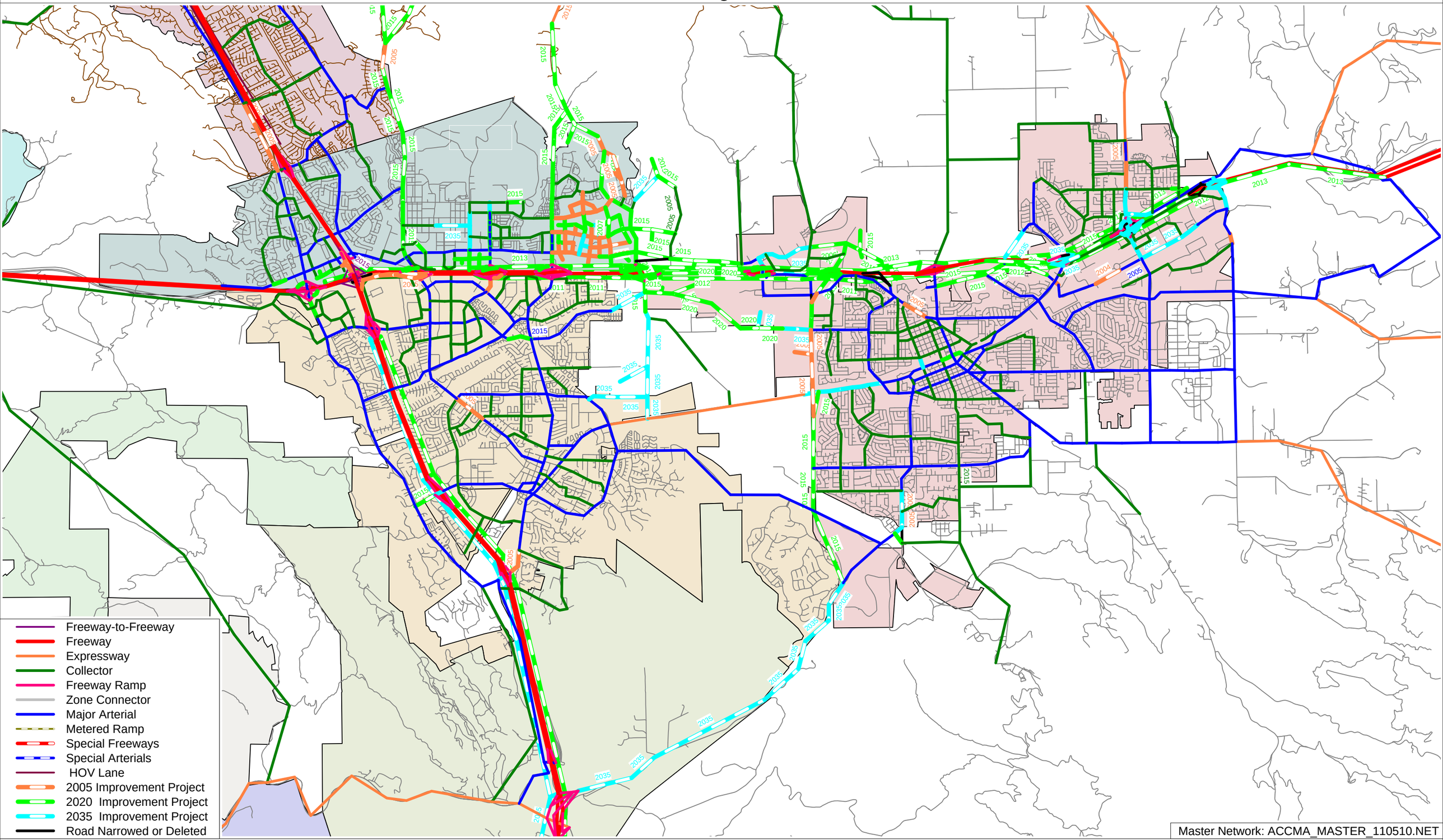
Alameda Countywide Model
Master Road Network with Improvements After 2000
Planning Area 4



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13 Appendix G: User Guide

This chapter provides instructions on starting a model run using the Alameda Countywide Travel Demand Model. Users should be familiar with the MTC model system, its documentation, and the CUBE modeling environment.

13.1 Model Process Updates

Several changes have been made in the process used to run the Alameda County Model since the Projections 2005 version of the model was developed.

13.1.1 Projections 2007 Update

The P05 version of the Alameda County Model used a "batch file" to call the Citilabs TP+ software (predecessor to Cube Voyager) and run individual model steps one at a time. If one of the steps encountered an error, the batch process would continue and attempt to complete the model run with the error included. This system made errors difficult to trace.

The P07 update of the model created a single script incorporating all steps. The single script stops running when a significant error is encountered. The updated version of the model still uses individual scripts compatible with the older TP+ software but now runs in the standard Cube Voyager environment.

The P07 update version of the model references a list of inputs ("Input_List.DAT"), such as file names or fuel costs. This allows the user to change inputs without reviewing any of the model scripts. It also allows the user complete freedom in naming important input files such as road networks or land use inputs.

13.1.2 Projections 2009 Update

The P09 update included the following process changes:

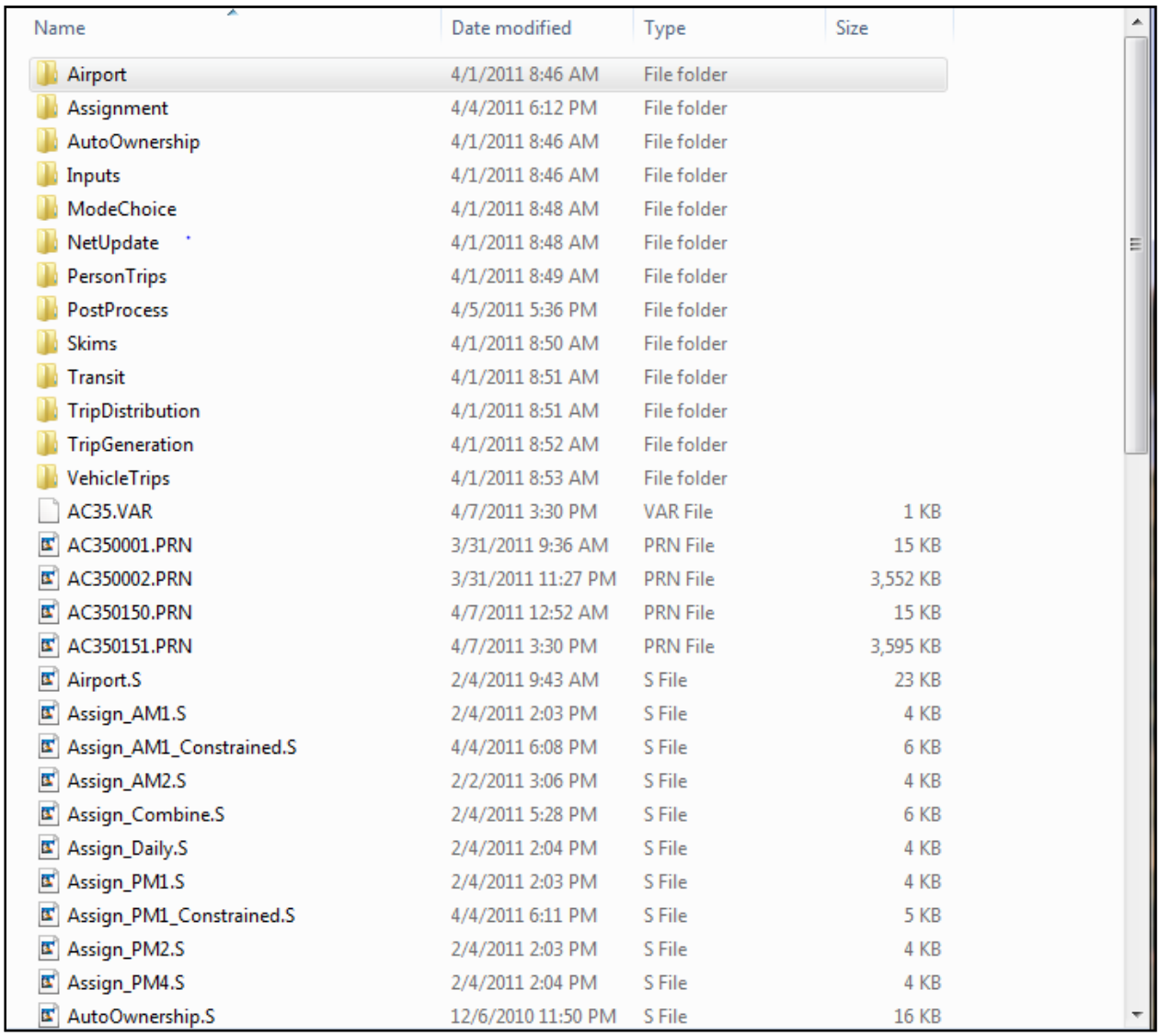
- All input files to the model are now organized under a single subdirectory titled "Inputs." This allows new scenarios to be developed by copying only the files contained in the Inputs subdirectory rather than copying all model subdirectories. The modification also makes it much simpler to archive model scenarios.

- Other model subdirectories have been renamed to more descriptive names, with model outputs clearly separated from model inputs (Figure 13-1).

- The master road network has been modified to allow coding of any year for an improvement project. Instead of coding all attributes for each discrete model year (i.e. 2000, 2005, 2015, 2035), the existing links are now coded

with BASE attributes for the 2000 base year. The only road segments with additional attributes in the IMP1 fields are those with changes from the 2000 base year, with a specified year for the improvements to be implemented (IMP1_YEAR).

Figure 13-1. Alameda County Model Directory Structure



Name	Date modified	Type	Size
Airport	4/1/2011 8:46 AM	File folder	
Assignment	4/4/2011 6:12 PM	File folder	
AutoOwnership	4/1/2011 8:46 AM	File folder	
Inputs	4/1/2011 8:46 AM	File folder	
ModeChoice	4/1/2011 8:48 AM	File folder	
NetUpdate	4/1/2011 8:48 AM	File folder	
PersonTrips	4/1/2011 8:49 AM	File folder	
PostProcess	4/5/2011 5:36 PM	File folder	
Skims	4/1/2011 8:50 AM	File folder	
Transit	4/1/2011 8:51 AM	File folder	
TripDistribution	4/1/2011 8:51 AM	File folder	
TripGeneration	4/1/2011 8:52 AM	File folder	
VehicleTrips	4/1/2011 8:53 AM	File folder	
AC35.VAR	4/7/2011 3:30 PM	VAR File	1 KB
AC350001.PRN	3/31/2011 9:36 AM	PRN File	15 KB
AC350002.PRN	3/31/2011 11:27 PM	PRN File	3,552 KB
AC350150.PRN	4/7/2011 12:52 AM	PRN File	15 KB
AC350151.PRN	4/7/2011 3:30 PM	PRN File	3,595 KB
Airport.S	2/4/2011 9:43 AM	S File	23 KB
Assign_AM1.S	2/4/2011 2:03 PM	S File	4 KB
Assign_AM1_Constrained.S	4/4/2011 6:08 PM	S File	6 KB
Assign_AM2.S	2/2/2011 3:06 PM	S File	4 KB
Assign_Combine.S	2/4/2011 5:28 PM	S File	6 KB
Assign_Daily.S	2/4/2011 2:04 PM	S File	4 KB
Assign_PM1.S	2/4/2011 2:03 PM	S File	4 KB
Assign_PM1_Constrained.S	4/4/2011 6:11 PM	S File	5 KB
Assign_PM2.S	2/4/2011 2:03 PM	S File	4 KB
Assign_PM4.S	2/4/2011 2:04 PM	S File	4 KB
AutoOwnership.S	12/6/2010 11:50 PM	S File	16 KB

13.2 Input Files

All model input files are contained in the subdirectory "Inputs," except for script files which are contained in the main directory for each scenario.

13.2.1 Script Files

All script files are located in the main directory of each model run. There is a master script that implements the full model run called "RunACTDM.S". This script incorporates a sequence of scripts that each implement a step of the model. The "RunACTDM.S" script is created using the "Build_Run.S" script.

13.2.2 Run Control Files

The run control files are in the Inputs directory. The model user would only edit two of these files:

Input List

The Input List file can be given any file name, as long as the file name in the Build_Run.S script is consistent. It sets up all of the input files and parameters for the model run.

The important parts of the Input List file for the model user are:

INP_Year	Year of the model scenario (such as 2035)
INP_NetMaster	File name for master network in Road_Network subdirectory
INP_NetYear	Year to designate level of improvements to use in master road network
INP_TurnPen	File name for turn penalty file network in Road_Network subdirectory
INP_RampMeter	File name for ramp metering rates network in Road_Network subdirectory
INP_Landuse	File name for land use scenario in Land_Use subdirectory
INP_IX_Ptrips:	File name for internal/external trips from gateway workbook in Land_Use subdirectory
INP_XX_Vtrips	File name for through trips from gateway workbook in Land_Use subdirectory

INP_SG	File name for truck special generators in Trucks subdirectory
INP_MTC_Year	MTC mode choice data for closest analysis year (must be 2000, 2006, 2020 or 2035)
INP_GCOST	Gas cost per mile in 1990 cents (calibrated at 6.13)
INP_NGCOST	Non-gas auto operating cost per mile in 1990 cents (calibrated at 4.09 or 2/3 of gas cost)
INP_OAK_Passengers	Daily average air passengers requiring ground access at Oakland International Airport (potential values are described in the Input List file)
INP_RunCluster	"Y" if the computer has Cube Cluster available, otherwise set to "N"

Save Turns

The file Save_Turns.DAT can be edited in a text editor to specify intersection node numbers where turn movements should be saved during the peak hour traffic assignments.

13.2.3 Calib

The Calib subdirectory contains calibrated model parameters such as trip generation rates, trip distribution friction factors and mode choice coefficients. The model user should not have to modify any of these files.

13.2.4 Correspondence

The Correspondence subdirectory contains files that relate the Alameda County model TAZs to other grouping systems such as counties, MTC Superdistricts or MTC RTAZs.

The model user would need to edit the correspondence files if any new TAZs are added to the Alameda County Model.

13.2.5 KFactors

The KFactors subdirectory contains the trip distribution adjustment factors (K Factors) from the MTC model as well as the county-to- county adjustments to the MTC K Factors used for the Alameda County Model. The model user should not have to modify any of these files.

13.2.6 Land Use

The Land_Use subdirectory contains the ZMAST land use input file. The subdirectory also contains the internal-external and through trips as well as the gateway workbook used to calculate them for each analysis year.

13.2.7 MTC Person Trips

The MTC_Person_Trips subdirectory contains the person trip outputs from the MTC 2009 RTP mode choice model results for the year closest to the Alameda County Model analysis year (2000, 2006, 2020 or 2035). There is a script in the subdirectory that reformats the MTC outputs into the form required for the Alameda County Model. The model user should not have to modify any of these files.

13.2.8 Peak Factors

The Peak_Factors subdirectory contains the district-specific peak spread or diurnal factors for each time period, as well as an Excel workbook that contains the current, prior and original MTC versions of the factors. The model user should not have to modify any of these files.

13.2.9 Road Network

The Road_Network subdirectory contains the user input master road network, turn penalties and ramp metering rates. When the model is run, there is a process called "NetUpdate.S" that creates the specific year scenario network from the master network.

The subdirectory also contains files that do not generally need to be modified by the model user, including the 2000 traffic count validation database, the road capacity lookup tables and the lane switch between AM and PM peak periods (such as the Golden Gate Bridge).

13.2.10 Transit

The Transit subdirectory contains inputs relating to the transit system.

The Transit_List files are user inputs that specify which specific versions of each transit operator's transit line files should be used for this model scenario.

The two AC00_PTrips_Transit files contain the 2000 transit mode shares from the MTC model and from the Alameda County Model 2000 validation, and are used to adjust transit forecasts for trips with neither end in Alameda County. The "transit.intrazonal.dat" and "transit_combined_headways.block" are standard inputs from the MTC model. The model user should not have to modify these files.

Transit Fares

Transit fare inputs are contained in the "tfares" subdirectory. The fares are in 1990 dollars. Most standard bus fares are specified in the "Xfare.far" file. Rail station-to-station fares (such as BART) are specified by service provider.

Transit Lines

The "tlines" subdirectory contains separate transit line files for each provider and service type. The P09 version of the Alameda County Model includes transit line files for all years in the "tlines" subdirectory. The Transit List files are used to specify which line file will be used for each scenario. This allows the user to quickly respecify the implementation year for a planned transit improvement.

Transit Access

The "tsupport" subdirectory contains specifications for walk access and drive access for each of the transit providers. These files should only need editing if new or relocated rail stations or ferry terminals are tested, or if new TAZs are added to the model.

13.2.11 Trucks

The Trucks subdirectory contains the special generator inputs for truck trips, as calibrated during the development of the Alameda County truck model. The truck special generators were calibrated to 2005 conditions, and forecast values should be based on factoring of the 2005 values rather than independent estimates of truck volumes.

13.3 Output Files

Output files generated by the model run will be located in appropriate sub-directories. Important output files and their locations are listed in Table 13-1. The code "xxxx" is a placeholder for a four (or three) character file prefix selected by the user when starting each model run.

13.4 Prepare Input Files

1. Copy files from the model run closest to the scenario year (for example, copy AC05 for a 2008 model run). The files to be copied are:

- The script files in the main directory
- The Inputs subdirectory

These are all of the files required to generate a new model run.

Table 13-1. Model Output Files

Output Information	File Name	Location
Person trips by TAZ by purpose	XXXX_[TripPurpose]PA.DBF	\TripGeneration
Trip distribution and summaries	XXXX_[TripPurpose].MAT XXXX_CO2CO.MAT (county summary)	\TripDistribution
Person trips by mode by trip purpose	XXXX_PTrips_[TripPurpose].MAT	\PersonTrips
Road network with volumes for all periods	xxxx_MERGE.NET	\Assignment
Transit volumes	XXXX_TR_Links_[Submode]_[Period].DBF (14 files) XXXX_Transit_Assign_[Period]_[Submode].PRN (14 files)	\Transit\tassign

2. Review any input files containing assumptions which will be changed for the current scenario.

- Land use inputs (Inputs\Land_Use\ZMASTnn.DBF)
- Road network (Inputs\Road_Network\ACCMA_MASTER_[Date].NET)
- Transit lines (*.TPL in Inputs\Transit\tlines)
- Transit station access (*.PNR, *.KNR, *.ZAC in Inputs\Transit\tsupport)
- Transit fares (*.FAR in Inputs\Transit\tfares)
- Turn prohibitors (Inputs\Road_Network\TURNPENxxxx.PEN)
- List of intersections to report peak hour turn movements (Save_Turns.DAT)

3. Make a copy of the appropriate input file, edit the inputs and save using a different file name. Model users should always keep the original source files with the correct names and dates.

4. Open "Input_List.DAT" (use a text editor or Cube) and change the input file names where needed to read in the revised files.

5. In "Input_List.DAT", set INP_RunCluster to "Y" or "N" depending on whether the computer has Cube Cluster available.

6. Change other parameters in "Input_List.DAT" as required.

   - INP_MTC_Year can only be MTC2000, MTC2006, MTC2020 or MTC2035

13.5 Run the Model

Once the input files are prepared, the following steps are used to run the model.

1. Start the Cube software
2. Open the file "BuildRun.S" in the correct scenario directory
3. Use the semicolon comment indicator to mark which steps of the model should be run. In general, a full model run requires every step except "Assign_AM1_Constrained.S" and Assign_PM1_Constrained.S" which generate the optional capacity constrained versions of the AM and PM peak one-hour traffic assignments.
4. Select **Run** from the top menu and then **Current File**. A Voyager run window will appear.
5. In Project Prefix, type in a 3 or 4 character identifier which will be part of each output file name (for example, "AC35" or "Alt1").
6. (OPTIONAL) In Run ID, type in a description of the model run.
7. Click **Start**.
8. Model run is complete when it indicates in the Cube Run Window.
9. Open the file "RunACTDM.S" in the same scenario directory. This is the combined script for the full model run.
10. Select **Run** from the top menu and then **Current File**.
11. Click **Start**. The model run will generally take at least 10 hours if all traffic assignment scenarios are selected.
12. If the GHG processor has been included in the model run, the model run will stop with the window for the Emfac software still open. This window cannot be closed automatically. Close the window to complete the model run.

13.6 GHG Processor

A separate detailed user guide for the Alameda County GHG processor has been included in a separate document. This section describes the basic procedures. Many of these procedures occur automatically if the Run_GHG.S script is included in the model run.

1. Input files must be in the same directory (folder):

- GHG_inp.exe
- Configuration file (see example below)
- Percentage matrix files (3 files) for the county

These files have been provided in the correct location for each Alameda County model year.

2. Model output file(s) with crosstab of speed & VMT for time periods (one for each calendar year in the scenario) must be where the configuration file indicates they can be located.

The automatic process creates the file "xxxx_Assign_Combine.PRN" and places it on the PostProcess subdirectory.

3. Run the GHGrun.bat file (the model run will do this automatically):

```
GHGrun.bat filePrefix

filePrefix = configuration file name without the .cfg extension
```

4. What will happen:

- GHG_inp.exe will run and create
  - the Speed Fractions file (_SpeedFractions_yyyy.dta)
  - the EMFAC input file (*filePrefix*.INP)
- EMFAC will run and create several files with *filePrefix* in their names. (The EMFAC software can be downloaded at http://www.arb.ca.gov/msei/onroad/latest_version.htm.)
- User must close EMFAC manually
- GHG_inp.exe will run and create the GHG Report file (*filePrefix*_GHG Report.rtf & .txt)
- Word will be launched with the *filePrefix*_GHG Report.rtf file

5. If there are runtime problems Error Codes will be displayed:

EC001	Error creating percentage matrices
EC002	Error processing _VMTPrcts.dta file
EC003	Error processing _PopPrcts.dta file
EC004	Error processing _TripPrcts.dta
EC005	Error reported from startup module
EC006	Error reading EMFAC INP file
EC007	Error creating reports document
EC008	Error reading Burden CSV file
EC009	Error reading Speed Bins crosstab file

Sample GHG configuration file (*project*.cfg **):**

```
EMFAC Version : Version 2 30 3 501
Scen Cnt : 1
;Speed-fraction-hour-groups----------------------
SpdFrac : 3 1 6
SpdFrac : 1 7 9
SpdFrac : 3 10 15
SpdFrac : 2 16 18
SpdFrac : 3 19 24
;Begin-scen-data---------------------------------
Scenario : Test inputs for 2011 & 2025
Geo Type : County
Area : A California County
Id No : 54
Calendar Years : 2011 2025
;     year vehpop   vmt     trips  Spd-Frac-File
Cyr : 2011 300000 11000000 2330000 SF140002.PRN
Cyr : 2025 400000 13000000 3000000 SF140012.PRN
;End-scen-data-----------------------------------
```



Congestion Management Program

October 2013







ALAMEDA
County Transportation Commission

Alameda County Transportation Commission
1111 Broadway, Suite 800 • Oakland, CA 94607
P | 510.208.7400 • www.AlamedaCTC.org

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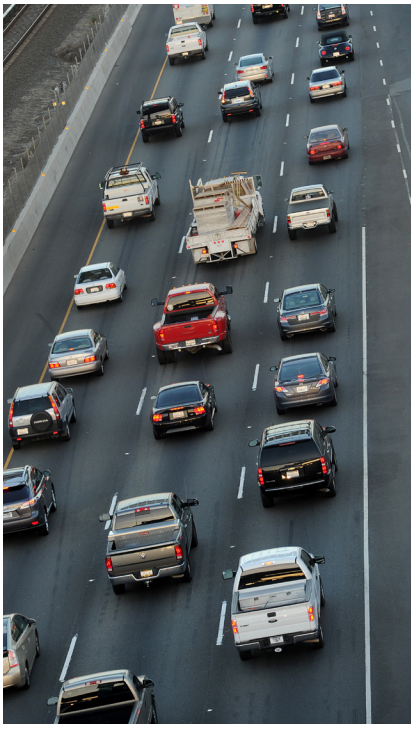

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Executive Summary

ES



California law requires urban areas to develop and biennially update a "congestion management program," or CMP—a plan that describes the strategies to assess and monitor the performance of the county's multimodal transportation system, address congestion and improve the performance of a multimodal system, and strengthen the integration of transportation and land use planning. In Alameda County, the Alameda County Transportation Commission (Alameda CTC) as the Congestion Management Agency (CMA) for Alameda County prepares the CMP. Alameda CTC works cooperatively with the Metropolitan Transportation Commission (MTC), transit agencies, local governments, the California Department of Transportation (Caltrans), and the Bay Area Air Quality Management District (BAAQMD) to manage and update the CMP.

The CMP for Alameda County incorporates various strategies and measures to improve congestion management on the Alameda County multimodal transportation system. The CMP is required to incorporate five key elements: designated CMP roadway network, level of service monitoring, multimodal performance element, land use analysis program, and capital improvement program. The CMP also acts as a short-range plan to implement the long-range Countywide Transportation Plan.

The CMP law places considerable authority with the CMAs for the CMP. Appendix A contains the full text of the pertinent sections of state law. For example, these agencies are required to oversee how local governments meet the requirements of the CMP. The legislation also forges a new relationship between local governments and the California Department of Transportation (Caltrans) by requiring new highway projects in urban areas to be included in a CMP if they will be part of the State Transportation Improvement Program (STIP). This means that funding of highway projects is, in part, controlled by local government in the form of the CMAs. With this authority comes the responsibility to recognize federal and state funding limitations and to work with Caltrans and MTC to formulate cost-effective projects.

The CMP is designed to meet legal requirements and address the challenges in doing so. Furthermore, Alameda CTC has developed working relationships with all levels of government as well as the private sector and is prepared to demonstrate that local governmental agencies—working together—can solve regional transportation problems.

The 2013 CMP update incorporates several actions identified as next steps in the 2011 CMP and more closely aligns the CMP with the 2012 Countywide

Transportation Plan (CWTP) and the 2013 Regional Transportation Plan and Sustainable Communities Strategy *(Plan Bay Area)*, and other related efforts and legislative requirements [e.g., Assembly Bill 32 (AB 32) and Senate Bill 375 (SB 375)] to better integrate transportation and land use for achieving greenhouse gas reductions. Outcomes of the update include a number of actions and recommendations by the Commission highlighted in the Table ES1, which follows (see details in the relevant chapters of the report).

Figure ES1—CMP and Five Main Elements

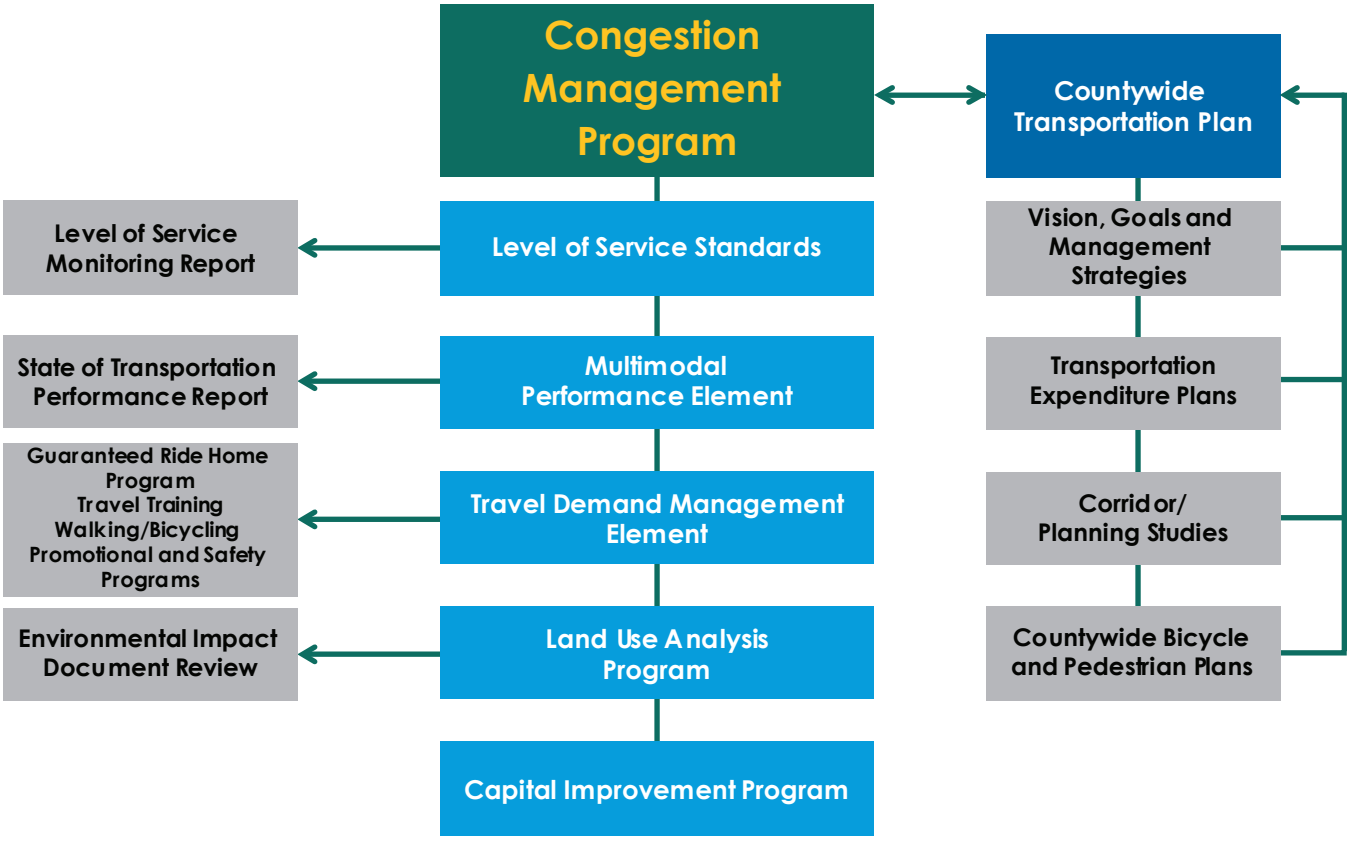

Table ES1—2013 CMP Update Actions/Recommendations and Policy Changes

Chapter	Technical Review, Evaluation, and Findings	Recommended Changes
2, Designated CMP Roadway Network	• Reviewed the designated CMP roadway network for potential additions as required by legislation. • Identified the need to review and update the CMP roadway criteria in the 2015 CMP update.	No new roadways were proposed by the jurisdictions. • Review and update the CMP roadway criteria in the 2015 CMP Update, including identifying ways to expand the CMP roadway network to include key rural roadways in the county. Outcomes of the Countywide Multimodal Arterial Plan should also be considered in the update of the criteria and identification of roadways.
3, Level of Service Standards	Assessed use of the most recent Highway Capacity Manual (HCM2010) to monitor LOS for auto and other modes. • Evaluation results for auto LOS showed that the HCM2010 methodology's shift from measuring speed to measuring density to assign auto LOS would result in the loss of Alameda CTC's ability to track network performance trends and conformity, particularly for the Tier 1 network that is subject to conformity. For Tier 2 arterials not subject to conformity, both HCM1985 and HCM2000 can be applied in 2014 when the next LOS monitoring is performed. • Evaluation results for LOS monitoring of alternative modes showed that HCM2010 multimodal LOS (MMLOS) is not well-designed for annual monitoring application, as it is very data-intensive.	• Continue to use speed-based HCM1985 for auto LOS monitoring for Tier 1 network. Apply both HCM2000 and HCM1985 to Tier 2 network as appropriate and reevaluate expanded HCM use in the 2015 CMP update. • Use countywide modal studies to identify countywide facilities and metrics for monitoring alternative modes, and incorporate these in the 2015 CMP for future LOS monitoring efforts.
4, Multimodal Performance Element	Updated performance report to continue tracking the performance of the CMP transportation network by mode and incorporate *Plan Bay Area* goals.	Conduct a comprehensive review and alignment of performance measures from all Alameda CTC planning efforts for use in programming and transportation investment decisions.
5, Travel Demand Management Element	Identified the need to update the 2013 CMP based on the Countywide Comprehensive Transportation Demand Management (TDM) Strategy adopted by the Commission in May 2013.	Incorporate Countywide Comprehensive TDM Strategy adopted by the Commission in May 2013 in the 2013 CMP.
6, Land Use Analysis Program	Comprehensively reviewed and reorganized the Land Use Analysis Program to better document the various related efforts of the agency and incorporate *Plan Bay Area* goals. • Identified that Alameda CTC will work with MTC and the Association of Bay Area Governments (ABAG) to identify ways to support improvements to rural roadways that facilitate agricultural operations and agricultural tourism in East Alameda County and to develop a more comprehensive approach to mitigating impacts from rural roadway improvements that support PCA goals and objectives.	• Incorporate the Alameda County Priority Development Area Investment and Growth Strategy adopted by the Commission March 2013. • Incorporate ways to address rural roadway improvement needs and efforts that support PCA goals. • Encourage use of HCM2010 to study auto impacts on roadways but provide flexibility to conform to local requirements as needed.

Table ES1—2013 CMP Update Actions/Recommendation and Policy Changes (cont'd)

Chapter	Technical Review, Evaluation, and Findings	Recommended Changes
6, Land Use Analysis Program (cont'd)	• Reviewed the application of HCM2010 to assess impact of autos and other modes. For auto impact analysis in the land use analysis program, using HCM2010 data to perform the impact analysis was found to be consistent with the current data requirements; therefore, use of HCM2010 is encouraged per regional direction, but flexibility to use HCM2000 is permitted where consistency is needed by local jurisdictions. Evaluation results for LOS monitoring of alternative modes showed that HCM2010 MMLOS is suitable to identify multimodal trade-offs in mitigation measures, and use of HCM2010 is encouraged. • Implemented development of a land use database based on development approvals information from the local jurisdictions. • Identified alternative trip generation methodologies to support infill development projects. • Updated subarea model guidelines consistent with MTC's updated regional model consistency requirements.	• Encourage study of multimodal tradeoffs of mitigation measures proposed in environmental documents, including use of HCM2010 MMLOS to perform the analysis. • Include recommendations for the types of impacts to be analyzed for alternative modes in Alameda CTC's standard response for environmental review. • Develop a database of countywide land use approvals and track local jurisdiction Housing Element progress. This is a new requirement for local jurisdictions to submit information on development approvals that occurred in the prior fiscal year for developing a countywide land use approvals database, and provide a copy of the most recent Housing Element Annual Progress Report submitted to the State Department of Housing and Community Development, starting 2014. See recommended changes under Chapter 9, Program Conformance and Monitoring. • Incorporate identified alternative trip generation methodologies for use in Traffic Impact Analysis. • Implement updated subarea model guidelines.
7, Database and Travel Demand Model	Included information that the countywide model is currently in the process of being updated.	No change
8, Capital Improvement Program	• Updated the 2013 CMP to include new State Transportation Improvement Program (STIP) projects, other capital improvement projects planned to improve the CMP transportation network for the next seven years, and new funding sources. • Identified the development of the Strategic Plan including a comprehensive Capital Improvement Program and Program Investment Plan (CIP/PIP).	• Incorporate 2014 STIP. • Incorporate updated Capital Improvement Program projects for FY2013-14 to 2019-20. • Develop Strategic Plan, including a comprehensive CIP/PIP as next steps.
9, Program Conformance and Monitoring	Identified two new requirements through the Land Use Analysis Program to track land developments and to identify how well transportation investments are coordinated with the land use to support monitoring the implementation of SB Bill 375 in Alameda County.	Starting in 2014, local jurisdictions will submit to Alameda CTC as part of the Annual Conformity Findings process: • Information on development approvals that occurred in the prior fiscal year; and • A copy of the most recent Housing Element Annual Progress Report submitted to the State Department of Housing and Community Development.
10, Deficiency Plans	• Updated deficiency plan guidelines to incorporate procedures for developing areawide deficiency plans to improve performance of multimodal transportation infrastructure over a larger area when localized improvements are not practical or workable. • Updated Conflict Resolution process for multijurisdictional deficiency plans.	• Follow updated deficiency plan guidelines for developing areawide deficiency plans when appropriate. • Follow updated conflict resolution process.

Following the adoption of the 2013 CMP by Alameda CTC Commission, Alameda CTC will submit the CMP to MTC. As the regional transportation planning agency in the San Francisco Bay Area, MTC is required to evaluate the CMP's consistency with MTC's RTP and with the CMPs of the other counties in the Bay Area. If the Alameda County CMP is found to be consistent with the RTP, MTC will incorporate the projects listed in the CMP's Capital Improvement Program into MTC's Regional Transportation Improvement Program (RTIP).

The Transportation System

Alameda CTC must define and identify components of the transportation system that are being monitored and improved. For the purposes of the CMP, two different systems are used: the designated CMP roadway network (Chapter 2, "Designated CMP Roadway Network") and the broader Metropolitan Transportation System (MTS). The CMP roadway network is a subset of the MTS. Alameda CTC monitors performance of the CMP roadway network in relation to established level of service (LOS) standards. Alameda CTC also uses the MTS in the "Land Use Analysis Program" (Chapter 6).

Designated CMP Roadway Network

The designated CMP roadway network was developed in 1991 and includes state highways and principal arterials that meet all minimum criteria (carry 30,000 vehicles per day; have four or more lanes; be a major cross-town connector; and connect at both ends to another CMP route or major activity center). The system of roadways carries at least 70 percent of the vehicle miles traveled countywide and contains 232 miles of roadways. Of this total, 134 miles (58 percent) are interstate freeways, 71 miles (31 percent) are state highways (conventional highways), and 27 miles (11 percent) are city/county arterials.

Recognizing the need to expand the CMP network to reflect the changes in land use patterns over the years, the Alameda CTC Commission in 2011 adopted a two-tier approach for the CMP network in Alameda County. The first tier (Tier 1) is the existing CMP network, and the second tier (Tier 2) consists of an expanded number of roadways identified using a set of adopted criteria. This Tier 2 network forms a supplemental network monitored for informational purposes only and is not used in the conformity findings process. The identified Tier 2 network roadways have a total length of 90 miles. Details are included in Chapter 2, "Designated CMP Roadway Network."

No new CMP roadways were proposed by the local jurisdictions during this 2013 update. For the 2015 CMP Update, Alameda CTC will review and update the CMP roadway criteria including identifying ways to expand the CMP roadway network to include key rural roadways that facilitate agricultural operations and tourism and support Priority Conservation Area goals and objectives in Alameda County. Outcomes of the Countywide Multimodal Arterial Plan should also be considered in the update of the criteria and identification of roadways.

MTS System

A regionally designated system, MTS includes the entire CMP network, as well as major arterials, transit services, rail, maritime ports, airports, and transfer hubs critical to the region's movement of people and freight. MTS roadways were originally developed in 1991 and updated in 2005 and include roadways recognized as "regionally significant" and all interstate highways, state routes, and portions of the street and road system operated and maintained by local jurisdictions.

LOS Monitoring

State law requires that level of service (LOS) standards be established to monitor the CMP roadway network's LOS as part of the CMP monitoring process. The legislation leaves the choice of LOS measurement methodology to the CMAs, but mandates that the LOS be measured by the most recent version of the Transportation Research Board's Highway Capacity Manual (HCM) or a uniform methodology adopted by the CMA, in our case Alameda CTC, that is consistent with the HCM. LOS definitions describe traffic conditions in terms of speed and travel time,

volume and capacity, freedom to maneuver, traffic interruptions, comfort and convenience, and safety. LOS is represented by letter designations, ranging from A to F. LOS A represents the best operating conditions, and LOS F represents the worst.

The purpose of these standards is to provide a quantitative tool to analyze the effects of land use changes and to monitor congestion, which is a measure of system performance. Alameda CTC is required to determine how well local governments meet the standards in the CMP, including how well they meet LOS standards. The CMP legislation requires a standard of LOS E for all CMP Tier 1 roadways in Alameda County.

Alameda CTC uses LOS standards as defined in the 1985 Highway Capacity Manual (HCM1985), the nationally accepted guidelines published by the Transportation Research Board, and re-evaluated its applicability in 2005 for roadway LOS monitoring purposes and again in 2013 for roadway and alternative mode purposes. The review conducted in 2013 showed that using the HCM2000 and HCM2010 versions for roadway LOS monitoring purposes would result in applying density-based rather than speed-based LOS methodology for freeways and would result in altering speed classifications for arterials, which would hinder the ability to compare past performance trends important for determining conformity with the CMP.

Based on this review, Alameda CTC will continue to use the speed-based LOS methodology and the classifications for arterials in the HCM1985 to monitor freeways and arterials for the Tier 1 roadway network, which is subject to the conformity process. For the Tier 2 network, which is only monitored for informational purposes and has only been monitored since 2012 and is therefore not comparable to any previous performance data, LOS will be reported using the methodologies in both the HCM1985 and HCM2000. The future use of the appropriate HCM for Tier 2 purposes will be re-evaluated in the 2015 CMP update.

The evaluation of HCM2010 for the 2013 CMP update also reviewed its applicability for monitoring service level standards for alternative modes by using Multi Modal Level of Service (MMLOS). It was found that using the 2010 HCM-based MMLOS is data and resource intensive and costly for large-scale applications such as monitoring countywide performance of alternative modes; therefore, it is not well designed for annual LOS monitoring purposes. Alameda CTC will assess how to best include the performance measurement metrics for monitoring alternative modal performance in the 2015 CMP update based on the outcomes of the following countywide modal plans—Goods Movement Plan, Multimodal Arterial Corridor Plan, and Transit Plan. A summary of the evaluation and comparison of using HCM1985, HCM2000, and HCM2010 for LOS monitoring purposes, including a comparison of approaches adopted by various CMAs in the Bay Area, is provided as Appendix B.

Alameda CTC conducts a LOS monitoring study every two years. The last study was conducted in spring 2012, and the next one will be in 2014. The 2013 CMP incorporates the results of 2012 LOS monitoring.

At present, Alameda CTC is monitoring the designated CMP roadway network by contracting biennially with a consultant to collect speed data. Alameda CTC analyzes the data and prepares the results. If a local government or Caltrans assumes responsibility for monitoring roadways in the CMP network within its jurisdiction, it will be required to do the following: biennially monitor the LOS on the designated system and report to the Alameda CTC by June 15 of each year relative to conformance with the adopted standards (see Chapter 3, "Level of Service Standards" for more information). Alameda CTC is exploring use of commercially available travel time data for the 2014 LOS monitoring effort.

Multimodal Performance Element

The CMP must contain performance measures that evaluate how highways and roads function, as well as the frequency, routing, and coordination of transit services. The performance measures should support

mobility, air quality, land use, and economic objectives and be used in various components of the CMP. The legislation intends for the performance element to include multimodal performance measures, in addition to the required roadway and transit measures. However, only the roadway LOS standards will be used to trigger the need for a deficiency plan in Alameda County.

Combined with LOS standards, the multimodal performance element provides a basis for evaluating whether the transportation system is achieving the broad mobility and congestion management goals in the CMP. These include developing the Capital Improvement Program, analyzing land use impacts, and preparing deficiency plans to address problems. It helps comprehensively evaluate the performance of the countywide multimodal transportation system and includes the goals and performance measures adopted for the 2012 CWTP and *Plan Bay Area* (refer to Chapter 4, "Multimodal Performance Element" for a more comprehensive table listing the performance measures and related goals). The CMP performance measures appear in Table ES2 below.

Using these measures, Alameda CTC prepares an annual Transportation System Performance Report, which local agencies and transit operators review prior to publication. To minimize cost, Alameda CTC relies on established data-collection processes and regularly published reports for data. A list of established data collection resources, by agency, follows in Table ES3.

Local agencies are encouraged to provide data to MTC or to maintain their own database of maintenance needs on the MTS. However, there is no compliance requirement for local agencies or transit operators related to the multimodal performance element.

Table ES2—Multimodal Performance Measures

CMP Performance Measures	
Average Highway Speeds	Roadway Maintenance
CO_2 Emissions*	Transit Availability
Completion of Countywide Bicycle Plan	Transit Capital Needs and Shortfall
Completion of Countywide Pedestrian Plan*	Transit Frequency
Coordination of Transit Service	Transit Ridership
Duration of Traffic Congestion	Transit Routing
Fine Particulate Emissions*	Transit Vehicle Maintenance
Low-income Households Near Activity Centers*	Travel Time*
Low-income Households Near Transit*	Trips by Alternative Modes*
Roadway Collisions*	

* Denotes new or expanded existing performance measure resulting from integrating the measures from the 2012 CWTP. Extent of data collection for these measures depends on additional funds being available.

Table ES3—Agency Data Collection Resources

Agency	Resources
Alameda CTC	• Roadway Speeds on CMP Roads, Except Freeways • Travel Times for Origin-Destination Pairs
Caltrans	• Accident Rates on State Freeways • Freeway Speed Runs and Duration of Freeway Congestion (when performed by Caltrans) • Highways in Need of Rehabilitation
Cities and County	• Countywide Bicycle Plan (Cities and County Public Works Department and Alameda CTC)
MTC	• Freeway Speed Runs and Duration of Freeway Congestion (when performed by MTC) • Pavement Management System Data for the MTS • Roadway Maintenance Needs
Transit Agencies	• Average Time Between Off-Loads (BART) • Frequency (number of lines operating at each frequency level) • Mean Time Between Service Delays (BART and ACE) • Miles Between Mechanical Road Calls (AC Transit, LAVTA and Union City Transit) • Service Coordination (number of transfer centers) • Service Schedules and On-Time Performance Transit Capital Needs and Shortfall for High Priority (Score 16) Projects • Transit Ridership Routing (percentage of major centers served within 1/4-mile of a transit stop) • Transit Service Frequency During Peak Periods and Population at All Transit Stations in County

The 2012 Performance Report for Fiscal Year 2011-2012 (the Executive Summary is attached as Appendix C) shows that the year 2012 marked the first time in five years that the Alameda County economy added jobs and reported increases in commuting and economic activity. Average travel speeds declined by roughly 1 mph from 2010 to 2012 and weekday freeway congestion increased by nearly 20 percent between FY10-11 and FY11-12. Transit boardings increased in 2012, reversing several years of decline; rail and ferry in particular showed strong ridership growth from 2011 to 2012, increasing ridership by 10 percent and 19 percent. State of repair improved in 2012, but major system investment needs loom on the horizon: local road pavement condition improved and transit service interruptions declined in 2012, but many miles of roadway are at risk of rapid deterioration and transit operators have a number of aging assets requiring rehabilitation or replacement. Biking and walking both saw increases in fiscal year 2012, and several key countywide projects were completed. In addition, several local pedestrian and bicycle master plans were completed, and most jurisdictions have up-to-date local master plans to guide investment in active transportation modes.

The 2012 Performance Report also revealed interesting longer term trends around commuting patterns in Alameda County. Alameda County's commuting has become more regional over the last decade, as the percent of workers employed in Alameda County who also live in the county has declined. Roughly two thirds of workers who live or work in Alameda County cross county lines as part of their daily commute. At the same time, the use of alternative modes for commuting

purposes has increased. Between 2000 and 2011, the share of workers carpooling declined by nearly 4 percent and the share of driving alone by 1 percent, while the shares working from home, riding BART, and bicycling all increased.

Based on the review of Performance Report and performance measures used in various monitoring activities, Alameda CTC identified the need for a comprehensive review to streamline the reporting timeline and availability of data for various multimodal performance measures from all Alameda CTC planning efforts for use in programming and transportation investment decisions. This will be done for the 2015 CMP update.

Travel Demand Management Element

Transportation demand management (TDM) measures seek to reduce pressure on existing roadway and parking capacity by using various strategies that include incentives and disincentives to influence travel choice. They reduce peak-period vehicle trips and total vehicle miles traveled. Related benefits include reducing congestion and carbon emissions, improving public health, and increasing transportation choice. The most effective TDM programs include some form of financial incentive, either through pricing parking or subsidizing transit and other non-drive alone modes. TDM strategies tend be cost-effective ways of meeting regional goals. By making the most efficient possible use of the available system capacity, they complement the region's investments in transit systems and other alternatives to driving.

The Commission adopted a Countywide Comprehensive TDM Strategy in May 2013 that provides an inventory of the broad range of TDM programs and activities present in Alameda County and recommends a strategy for better integrating, supporting, and building on these existing efforts, including implementation of the regional commute benefit program and the Guaranteed Ride Home Program. These programs are designed to reduce the need for new highway facilities over the long term and to make the most efficient use of existing facilities. The TDM element also incorporates strategies to integrate air quality planning requirements with transportation planning and programming. Funding generally comes from the Transportation Fund for Clean Air (from motor vehicle registration fees) and from the federal Surface Transportation Program and Congestion Mitigation and Air Quality Program. Alameda County's TDM element represents a fiscally realistic program that effectively complements the overall CMP.

A balanced TDM element requires actions that local jurisdictions, Alameda CTC, BAAQMD, Caltrans, MTC, and local transit agencies undertake. As required by state law, the Alameda County TDM program promotes alternative transportation methods (e.g., carpools, vanpools, transit, bicycles, park-and-ride lots), promotes improvements in the jobs-housing balance and SMART Growth, considers parking cash-out programs (paying employees who do not use parking), and promotes other strategies such as flextime and telecommuting.

The county's approach to TDM includes the following major actions:

- **Regional actions:** BAAQMD, Caltrans, and MTC take actions to support TDM throughout the San Francisco Bay Area. Alameda County's efforts work within the context of these broader regional initiatives.
- **Countywide actions:** Alameda CTC takes actions to encourage, supplement, and support local governments in their TDM efforts, including allocating funds for multimodal transportation improvements, providing guidance and technical assistance to localities in developing their own TDM programs, and monitoring compliance with the **Required Program** in the CMP. Alameda CTC also manages certain key TDM programs, such as Guaranteed Ride Home, that work most effectively at the countywide level.
- **Local jurisdiction actions:** Local governments have primary responsibility for implementing TDM programs and encouraging and incentivizing TDM by private organizations. The CMP requires local governments to undertake certain TDM actions, known as the **Required Program**. The CMP also

encourages local governments to undertake TDM efforts above and beyond these requirements.

- **Private TDM actions:** Private employers, developers, homeowner associations, and nonprofit organizations can undertake TDM measures on a voluntary basis or as required by a city. Alameda CTC provides resources to support these actions, including guidance on best practices and other technical resources.

Chapter 5, "Travel Demand Management Element" includes a variety of tools available to local governments for facilitating TDM. To be found in conformance with this element of the CMP, local jurisdictions must adopt and implement the **Required Program** by September 1 of each year.

Land Use Analysis Program

The CMP incorporates a program to analyze the impacts of land use decisions made by local jurisdictions on the regional transportation systems (MTS), including estimating costs associated with mitigating those impacts. The intent of this legislatively required component of the CMP is to:

- Coordinate local land use and regional transportation facility decisions;
- Assess the impacts of development in one community on another community; and
- Promote information sharing between local governments when the decisions made by one jurisdiction will impact another.

While the Alameda CTC's land use analysis program was initially developed as a program to meet the CMP legislative mandate, the growing focus at all levels of governments on improved coordination between land use and transportation planning has resulted in the program's evolution. In this context, the Alameda CTC's Land Use Analysis Program (Chapter 6) currently includes:

- Legislatively required review of:
  - Land use actions of local jurisdictions by Alameda CTC to ensure that impacts on the regional transportation system are disclosed and mitigation measures identified; and
  - Long-range land use projections by local jurisdictions for use in the countywide model database.
- Planning initiatives and programs that foster transportation and land use connections; and
- Strategic monitoring of transportation-land use coordination performance measures.

Although land use remains the purview of local governments, Alameda CTC can apply sanctions if local agencies do not conform to the requirements of the CMP. Local jurisdictions have the following responsibilities under the Alameda CTC Land Use Analysis Program element of the CMP:

- Throughout the year:
  - Forward to the Alameda CTC all Notices of Preparation, Draft and Final Environmental Impact Reports and Environmental Impact Statements, and final dispositions of General Plan Amendment and development requests.
  - Analyze large development projects according to the adopted guidelines, including the use of the Alameda Countywide Travel Demand Model or an approved subarea model and disclosure of impacts to the MTS, if the Alameda CTC determines the project exceeds the threshold for which CMP review is required.
  - Work with Alameda CTC on the mitigation of development impacts on the regional transportation system.
- By October 1 of each year as part of the annual conformity process:
  - Demonstrate to Alameda CTC that the Land Use Analysis Program is being carried out.

  - Provide the Alameda CTC with 1) a list of land use development projects approved during the previous fiscal year; and 2) a copy of the most recent Housing Element Annual Progress Report submitted to the state Department of Housing and Community Development. These items are new and to be used to develop a database of land use approvals for enhanced monitoring of transportation-land use coordination and planning.

- During travel model updates:

  - Provide an update (prepared by the jurisdiction's planning department) of the anticipated land use changes likely to occur using the most recent Association of Bay Area Government (ABAG) forecast for a near-term and long-term horizon year. This land use information should be provided in a format that is compatible with the countywide travel model.

The 2013 CMP update includes expanded discussion of the Alameda CTC's activities to fulfill the legislative requirements of SB 375 and AB 32 to better integrate transportation and land use and to reduce greenhouse gas emissions by curtailing vehicle miles traveled. The following enhancements are made to the Land Use Analysis Program to meet these objectives:

- Incorporate the recommendations of the Alameda County Priority Development Investment and Growth Strategy including facilitating implementation of Priority Conservation Areas as required by MTC and adopted by the Commission in March 2013; identify that Alameda CTC will work with MTC and ABAG to identify ways to support improvements to rural roadways that facilitate agricultural operations and agricultural tourism in East Alameda County and to develop a more comprehensive approach to mitigating impacts from rural roadway improvements that support PCA goals and objectives.

- Modify the agency's guidelines for environmental review consistent with action items identified in the 2011 CMP.

  - HCM2010: Alameda CTC performed an assessment of the HCM2010 including its MMLOS methodologies for use in the Land Use Analysis Program similar to the evaluation effort for the LOS Monitoring element. Based on this assessment, the following changes are made:

    - Encourage use of HCM2010 to study auto impacts on roadways but provide flexibility to conform to local requirements as needed.

    - Encourage study of multimodal tradeoffs of mitigation measures proposed in environmental documents, including use of HCM2010 MMLOS to perform the analysis.

    - Expand and clarify language as to the types of impacts to transit, bicyclists, and pedestrians that project sponsors should consider.

  - In-fill development trip generation: Alameda CTC performed an assessment of alternative project trip generation methodologies that more accurately account for the nature of trip generation in areas such as PDAs or infill sites; based on this assessment, Alameda CTC proposes three alternative methods for project sponsors to use for CMP land use analysis:

    - EPA's Mixed Use Development (MXD) model

    - Caltrans/UC Davis Smart Growth Trip Generation rates

    - MTC's Station Area Residents Study (STARS) mode share adjustment method

- Establish a development approvals database that will be populated using information provided by local jurisdictions as part of the annual conformity process starting in 2014.

Many action items identified in the 2011 CMP update for a further enhanced land use analysis program are still valid and continue to be carried forward, so that based on the resource availability and coordination with other efforts of Alameda CTC, they can be implemented.

Database and Travel Demand Model

Alameda CTC has developed a uniform land use database for use in the countywide travel model. The database and travel demand model bring to the congestion management decision-making process a uniform technical basis for analysis. This includes consideration of the benefits of transit service and TDM programs, as well as projects that improve congestion on the CMP network. The model is also intended to assist local agencies in assessing the impacts of new development on the transportation system.

The most recent update to the model was completed in May 2011. It incorporates land use assumptions based on ABAG's *Projections 2009*. Projections of socioeconomic variables were made for the traffic analysis zones defined for Alameda County. By aggregating the projections made for each zone, Alameda CTC produced projections of socioeconomic characteristics for unincorporated areas of the county, the 14 cities, and for the four planning areas (see Table ES4).

The countywide model is being updated to include the recently adopted RTP and SCS, the *Plan Bay Area*. The updated model will also incorporate 2010 US Census data along with updates to the model base year from 2000 to 2010, to correspond with the 2010 US Census and to change the long-term forecast year from 2035 to 2040, along with updates to other related features of the model (see Chapter 7, "Database and Travel Demand Model" for details). In spring 2014, the updated Alameda Countywide Travel Demand Model is expected to be available for use.

Capital Improvement Program

The Capital Improvement Program (CIP) reflects Alameda CTC's efforts to maintain or improve the performance of the multimodal transportation system for the movement of people and goods and to mitigate regional transportation impacts identified through the Land Use Analysis Program.

Per federal requirements, Alameda CTC considers various multimodal methods to improve the existing system, such as traffic operations systems, arterial signal timing, parking management, transit transfer coordination, and transit marketing programs. Projects selected for the CIP also are consistent with the assumptions, goals, policies, actions, and projects identified in *Plan Bay Area*, MTC's and ABAG's basic statement of Bay Area transportation and land use policy.

The 2013 CIP covers fiscal year 2013-2014 to 2019-2020 and comprises:

- Major capital projects and rehabilitation projects programmed in the 2014 STIP and Moving Ahead for Progress in the 21st Century (MAP-21); and
- Other major highway, transit, bicycle and pedestrian, and local projects intended to maintain or improve the performance of the CMP network.

Table ES4—Alameda County Planning Areas

Planning Area	Cities
North Planning Area	Alameda, Albany, Berkeley, Emeryville, Oakland, and Piedmont
Central Planning Area	Hayward, San Leandro, and the unincorporated areas of Castro Valley, Ashland, and San Lorenzo
South Planning Area	Fremont, Newark, and Union City
East Planning Area	Dublin, Livermore, Pleasanton, and the unincorporated areas of East County

The CIP projects link to the vision and projects presented in the 2012 Countywide Transportation Plan, either as a specific capital project or from funding set aside to cover categories of projects. Project types include maintaining and rehabilitating local streets and roads, transit capital replacement, bicycle and pedestrian improvements, and operational improvements.

By July 31 of each odd-numbered year, to be in conformance with the CMP, local jurisdictions and project sponsors must submit to Alameda CTC a list of projects intended to maintain or improve the LOS on the CMP network and to meet transit performance standards.

In 2013, Alameda CTC initiated a new process for an enhanced Strategic Plan/CMP that will include a Capital Improvement Program/Programs Investment Plan (CIP/PIP) and Allocation Plan. To meet legislative requirements and help maintain and improve the performance of the multimodal transportation system, the CIP/PIP will be incorporated in to the 2015 CMP update. The new comprehensive CIP/PIP is anticipated to be adopted in 2014.

Program Conformance and Monitoring

Alameda CTC is responsible for ensuring local government conformance with the CMP and annually monitors the implementation of four elements: LOS standards on CMP network, travel demand management including implementation of the **Required Program**, land use analysis program, and capital improvement program. Alameda CTC ensures local agencies are in conformance with CMP requirements for these elements as well as with payment of membership dues.

To assist local jurisdictions, Alameda CTC provides LOS standards resources (Chapter 3, "Level of Service Standards"); travel demand management resources and countywide programs to facilitate implementation of the **Required Program** (Chapter 5, "Travel Demand Management Element"); and a database and Countywide Travel Demand Model (Chapter 7, "Database and Travel Demand Model"). Alameda CTC has also developed a Land Use Analysis Program for implementation by local agencies. This program analyzes the impacts and determines mitigation costs of land use decisions on the regional transportation system (see Chapter 6, "Land Use Analysis Program"). Local jurisdictions remain responsible for approving, disallowing, or altering projects and land use decisions. The program must be able to determine land development impacts on the MTS and formulate appropriate mitigation measures commensurate with the magnitude of the expected impacts.

In addition, Alameda CTC is required to prepare and biennially update a CIP (see Chapter 8, "Capital Improvement Program") aimed at maintaining or improving transportation service levels. Each city, the county, transit operators, and Caltrans provide input to these biennial updates.

As part of Alameda CTC's annual monitoring, if it finds a local jurisdiction in non-conformance with the CMP, it will notify the local jurisdiction, which then has 90 days to remedy the area(s) of non-conformance. If the local jurisdiction fails to provide a remedy within the stipulated time, it may lose local, state, and/or federal funding (see Chapter 9, "Program Conformance and Monitoring" for more information).

Deficiency Plans

CMP legislation requires preparation of deficiency plans when a CMP roadway segment does not meet the adopted level of service standard, which is LOS E for Alameda County CMP roadways. Local jurisdictions must develop a deficiency plan to achieve the adopted LOS standards at the deficient segment or intersection, or to improve the LOS and contribute to significant air-quality improvements. The two types of deficiency plans include Localized Deficiency Plans and Areawide Deficiency Plans, which address transportation impacts to more than one CMP roadway and include alternative modes in a large geographic area. To provide support to local jurisdictions in terms of

meeting any potential deficiency plan requirements, Alameda CTC updated the deficiency plan guidelines to include more details and procedures for developing Areawide Deficiency Plans (included as Appendix D) as part of the 2013 CMP update.

Responsibilities for Deficiency Plans

Local governments are responsible for preparing and adopting deficiency plans; however, they need to consult with Alameda CTC, BAAQMD, Caltrans, and local transit providers regarding the deficient roadway segment, and coordinate with more than one jurisdiction to develop multijurisdictional Deficiency Plans. Local public-interest groups and members of the private sector may also have an interest in developing deficiency plans.

During the process of developing a deficiency plan, a local agency needs to consider whether it is possible to make physical improvements to the deficient segment or if an areawide deficiency plan needs to be prepared. In developing the deficiency plan, the local agency must consider and describe both local and system alternatives. Local governments and Alameda CTC must consider the impact of the proposed deficiency plan on the CMP system. The local agency must also provide an action plan to implement the chosen alternative. The selection of either alternative is subject to approval by Alameda CTC, which must find the action plan in the interest of the public's health, safety, and welfare. In 2011, Alameda CTC has adopted a policy to consider providing funding priority to projects that would improve the performance of deficient segments. The procedure for assigning priority for those projects will be defined in the CIP/PIP, which is anticipated to be adopted in 2014.

Conclusions and Future Considerations

The CMP has several interrelated elements intended to foster better coordination among decisions about land development, transportation, and air quality. Several conclusions can be reached about the CMP relative to the requirements of law and its purpose and intent (Chapter 11, "Conclusions and Future Considerations"). Specifically, the CMP:

- Contributes to maintaining or improving multimodal transportation service levels;
- Conforms to MTC's criteria for consistency with *Plan Bay Area*;
- Provides a travel model with specifications and output consistent with MTC's regional model;
- Is consistent with BAAQMD's Clean Air Plan Transportation Control Measures;
- Specifies a method for estimating roadway LOS that is consistent with state law and expanding options to assess LOS for alternative modes;
- Identifies candidate projects for the STIP and federal Transportation Improvement Program;
- Has been developed in cooperation with the cities, the County of Alameda, transit operators, the BAAQMD, MTC, adjacent counties, Caltrans, and other interested parties;
- Provides a forward-looking approach to deal with the transportation impacts of local land use decisions; and
- Considers the benefit of greenhouse gas reductions in developing the CIP.

During the development and update of the 2013 CMP for Alameda County, several long-standing issues have been uncovered that will continue to need further action by the Alameda CTC.

- Lack of funding to support the CMP, including adequate capital resources and Alameda CTC/ local government funding;
- Limited ability of Alameda CTC to influence transportation investments when most transportation funding programs are beyond the purview of the CMP legislation;

- The need to identify the responsible agency for monitoring and maintenance of LOS on the state highway system; and
- Scope of the CMP network and lack of incentive to local jurisdictions to add new roadways.

The 2013 CMP update made recommendations as next steps in addressing issues related to addressing new and existing legislative requirements, monitoring standards and other efforts related to congestion management, and better integrating transportation and land use. The following highlights key areas identified for follow-up:

- Based on the California Environmental Quality Act reform efforts and recently enacted Senate Bill 743, in collaboration with the local jurisdictions and regional agencies, comprehensively evaluate and identify efforts and next steps for Alameda CTC to actively participate in the process of developing new standards of significance for transportation impacts and in supporting local jurisdictions in implementing the new standards.
- Continue efforts to improve land use and transportation connections in Alameda County including addressing issues related to parking standards and policies to reduce greenhouse gas emissions and implementing the Alameda County Priority Development Area Investment and Growth Strategy.
- Coordinate the outcome of the countywide modal plans to identify facilities to monitor and metrics to follow for monitoring performance of countywide alternative modes along with auto LOS monitoring.
- Perform a comprehensive review and alignment of performance measures from all Alameda CTC planning efforts for use in programming and transportation investment decisions.
- Develop a land use development database to track land development approvals from local jurisdictions for use in various planning efforts and to analyze how and whether the land development and transportation investments are coordinated.
- Develop a comprehensive Strategic Plan that includes a performance-based Capital Improvement Program/Program Investment Plan (CIP/PIP) to better inform the programming process.

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Program Overview

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California law requires urban areas to develop and biennially update a "congestion management program," or CMP—a plan that describes the strategies to assess and monitor the performance of the county's multimodal transportation system, address congestion and improve the performance of a multimodal system, and strengthen the integration of transportation and land use planning. As the Congestion Management Agency (CMA) for Alameda County, the Alameda County Transportation Commission (Alameda CTC) prepares the CMP. Alameda CTC works cooperatively with the Metropolitan Transportation Commission (MTC), transit agencies, local governments, the California Department of Transportation (Caltrans), and the Bay Area Air Quality Management District (BAAQMD) to manage and update the CMP.

Alameda CTC, a Joint Powers Authority and countywide transportation agency, is a result of the July 2010 merger of the Alameda County Congestion Management Agency (ACCMA) and the Alameda County Transportation Improvement Authority (ACTIA). For over two decades, ACTIA and ACCMA often collaborated to spearhead transportation programs and projects. The merger of ACCMA and ACTIA eliminated redundancies and created efficiencies. Since 2010, Alameda CTC has been the CMA for Alameda County.

Alameda County's Congestion Management Agency

Alameda CTC performs congestion management activities, coordinates countywide transportation planning, and attracts federal, state, and local funding for project and program implementation (see Appendix A for full CMP legislation). The oversight and update of the CMP is one of Alameda CTC's key roles.

In addition, Alameda CTC continues to deliver the Expenditure Plan for Measure B, the half-cent sales tax approved by almost 82 percent of county voters in 2000 to fund a variety of highway, transit, local roadway projects, as wells as special transportation services for seniors and disabled individuals.

Mission

Alameda CTC's mission is to plan, fund, and deliver transportation programs and projects that expand access and improve mobility to foster a vibrant and livable Alameda County. This broad spectrum of projects and programs enhances mobility and improves air quality throughout Alameda County by:

- Providing streamlined methods to deliver transportation services;

- Strengthening local jurisdictions' ability to compete for transportation funds;
- Giving Alameda County a stronger voice in state and regional transportation decisions;
- Coordinating planning and development across jurisdictional lines; and
- Generating and supporting legislation to coordinate local and regional policies on transportation investment.

Key Responsibilities

To help guide and improve Alameda County's transportation system, Alameda CTC's activities and key responsibilities can be viewed in three parts:

- Developing plans that guide transportation development and funding decisions, including the Congestion Management Program;
- Programming funds to agencies for transportation improvements; and
- Delivering the projects, programs, legislative actions, and policy efforts set forth in the planning and programming documents.

As the congestion management agency, Alameda CTC also has the following functions and responsibilities to:

- Coordinate transportation planning and funding programs within Alameda County and with contiguous counties;
- Coordinate countywide input to the:
  - California Clean Air Act and Transportation Control Measures of the Metropolitan Transportation Commission (MTC) and the Bay Area Air Quality Management District (BAAQMD);
  - MTC's Regional Transportation Improvement Program (RTIP); and
  - California Transportation Commission (CTC) State Transportation Improvement Program (STIP);
- Prepare, adopt, update, and administer federal funding programs for Alameda County including the Surface Transportation Program (STP) and the Congestion Mitigation and Air Quality (CMAQ) Program;
- Levy and collect fees and charges, including administrative and operating costs; and
- Recommend projects for funding from the Alameda County share of the STIP, as specified in Senate Bill 45. The Commission also oversees project implementation to ensure that projects meet "timely use of funds" requirements and that no programmed funds are lost from Alameda County.

In addition, Alameda CTC acts as the program manager for the Transportation Fund for Clean Air (TFCA) in Alameda County. The TFCA program, which aims to reduce pollution by reducing the use of single-occupant vehicles, is funded through a $4 per-vehicle registration fee and is managed by the BAAQMD. The law requires BAAQMD to allocate 40 percent of the revenue to each county. Other functions could be added by amendments to the JPA or by actions of the state or federal government.

Governance

Under a Joint Powers Agreement, elected officials from throughout Alameda County—representing each city in the county, the County of Alameda, AC Transit, and BART (Bay Area Rapid Transit)—govern the Alameda CTC. The 22-member Commission considers the interests of local constituents and helps to include all areas of the county in guiding how the Alameda CTC plans, funds, and delivers projects and programs throughout Alameda County. The Commission's leadership from throughout the county ensures all residents are represented.

Advisory Committees

Alameda CTC relies on the guidance and direction of a number of advisory committees, including (see Appendix E for detail):

- Alameda County Technical Advisory Committee (ACTAC)
- Bicycle and Pedestrian Advisory Committee (BPAC)
- Citizens Advisory Committee (CAC)
- Citizens Watchdog Committee (CWC)
- Paratransit Advisory and Planning Committee (PAPCO)

Alameda County Congestion Managment Program

The Alameda County CMP is a short-range plan that includes a variety of congestion management strategies, programs, and projects that meet the legislative requirements and intend to further improve the countywide transportation system to better meet the needs of all users. It also supports the long-range Countywide Transportation Plan (CWTP) as an implementation tool and helps to move the programs and projects included in the CWTP closer to reality. The CWTP is supported by the Alameda County Transportation Expenditure Plan as well as the Countywide Bicycle and Pedestrian Plans.

Countywide Transportation Plan

Alameda CTC updated and adopted the Countywide Transportation Plan in June 2012. The plan is a long-range policy document that guides decisions and articulates the vision for the county's transportation system over a 28-year planning horizon. Through its funding allocation program, the CWTP seeks to ensure that transportation investments—over the 28-year planning period—are efficient and productive, and that maintenance and management of the system remain high priorities.

Specifically, the CWTP:

- Documents existing and future transportation conditions;
- Documents a vision for land use that houses the region's population across all income levels in accordance with the requirements of Senate Bill 375;
- Coordinates countywide input to MTC guidelines for county transportation plans pursuant to Government Code Section 66531;
- Coordinates countywide input to the Regional Transportation Plan and Sustainable Communities Strategy, known as Plan Bay Area;
- Addresses all modes of transportation from goods movement to bicycle and pedestrian priorities to transportation needs for seniors and people with disabilities;
- Provides a strategy to guide transportation improvements to address changes in the regulatory and financial environment;
- Lays the groundwork for an investment program tailored to the diverse needs of the county's residents, visitors and workers; and
- Identifies projects and programs for implementation over the next 28 or more years.

Transportation Expenditure Plan

The sales tax expenditure plan (currently Measure B) is a key source of funding for transportation projects and programs in Alameda County. Measure B was approved by the voters in 2000, and a previous measure was approved in 1986. Of the total collected funds under Measure B, 60 percent are dedicated to programs such as local streets and roads repair, bicycle and pedestrian safety, transit and paratransit operators, and 40 percent of collected funds are dedicated to capital projects including transit and highway improvements.

Concurrently with the CWTP update, Alameda CTC developed a new Transportation Expenditure Plan (TEP), derived from the CWTP that would serve as a mechanism to fund a portion of select projects and programs identified in the CWTP. In 2012, Measure B1, a measure to increase the existing half-cent county transaction and use tax for transportation by an additional half cent, and maintain this tax in perpetuity, was sponsored by Alameda CTC and placed on the

ballot by the Alameda County Board of Supervisors. Measure B1 would have continued a steady stream of local funding for important transportation projects and programs, specified in the 2012 Transportation Expenditure Plan, if passed by 66.67 percent of voters in Alameda County. The measure received 66.53 percent of voter support, not enough to surpass the state's two-thirds requirement for passage of voter-approved taxes.

In August 2013, Assembly Bill 210 was approved by the governor to amend Sections 7291 and 7292 of the Revenue and Taxation Code, relating to taxation, which allows Contra Costa County and Alameda County to impose a transactions and use tax for the support of countywide transportation programs at a rate of no more than 0.5 percent. This will allow for a TEP to be placed on the ballot again before year-end of 2020.

Reauthorization of a TEP is being considered for the following reasons:

- The majority of current Measure B capital projects have either been built or are fully funded. To proactively prepare for future transportation needs, a new plan and source of funds are needed for capital projects. These take several years to plan, design, fully fund, and build.
- The economic downturn reduced funding for many programs supported by Measure B and despite the upswing in the economy, transportation demand continues to grow as the population increases.

Because the current TEP is funded through a transportation sales tax, it is a financially constrained document. The existing half-cent sales tax will continue to be collected until 2022.

Purpose of CMP

The primary purpose of the CMP is to set forth fundamental congestion management strategies for implementing the long-range CWTP. The CMP deals with day-to-day congestion problems including:

- Setting level of service standards for roadways;
- Identifying multimodal performance measures to evaluate the performance of the countywide transportation system;
- Exploring ways to manage travel demand and identify TDM strategies for trip reduction and air quality improvement;
- Analyzing the impacts of land development on regional transportation system and implementing the Alameda County Priority Development Area Investment and Growth Strategy;
- Developing and maintaining a travel demand model to provide a technical basis for analysis and assess impact of local land development on regional transportation system;
- Developing a 7-year Capital Improvement Program that helps improve and maintain the countywide multimodal transportation system;
- Monitoring conformance of required CMP elements implementation by local agencies; and
- Identifying development of deficiency plans and monitoring their implementation by local governments to improve performance of non-conforming transportation systems.

While the CMP is designed to meet the requirements of the law, to ultimately reduce congestion and greenhouse gas emissions, and improve the ability of people and goods to move on the countywide multimodal transportation system, it also serves as an opportunity for strategic thinking to better integrate land use and transportation through collaboration with various local, regional, and state agencies, and develop transportation strategies and plan for land development that efficiently uses the transportation system, while ensuring it meets the mobility and access needs of residents and workers in Alameda County.

Organization

The CMP is organized into twelve chapters, with supporting appendices:

- Executive Summary
- Chapter 1, "Program Overview"
- Chapter 2, "Designated CMP Roadway Network"
- Chapter 3, "Level of Service Standards"
- Chapter 4, "Multimodal Performance Element"
- Chapter 5, "Travel Demand Management Element"
- Chapter 6, "Land Use Analysis Program"
- Chapter 7, "Database and Travel Demand Model"
- Chapter 8, "Capital Improvement Program"
- Chapter 9, "Program Conformance and Monitoring"
- Chapter 10, "Deficiency Plans"
- Chapter 11, "Conclusions and Future Considerations"

Alameda CTC updates the CMP biennually, and the next update will occur in 2015.



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Designated CMP Roadway Network

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The primary objective of designating a CMP roadway network is to monitor performance in relation to established level-of-service (LOS) standards. If adopted standards are not maintained on a specific roadway in the designated system, actions must be taken to address problems, or deficiency plans must be developed to improve the overall LOS of the system and improve air quality. To effectively manage congestion on Alameda County's transportation system, Alameda CTC has identified the components of Alameda County's CMP-designated roadway network, considered the core transportation network for the county.

California law requires that, at a minimum, the designated roadway system include all state highways and principal arterials.[1] Highways or roadways designated as part of the system cannot be removed from the system. The statutes also refer to the regional transportation systems as part of the required Land Use Analysis Program.[2] In the 1991 Alameda County CMP, the roadway system designated in the CMP was presumed to be the highway/street component of the regional transportation system. This changed with the passage of the federal Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA). ISTEA required the Metropolitan Transportation Commission (MTC) to develop a Metropolitan Transportation System (MTS)[3] that included both transit and highways. When the MTS was developed in 1991, it included roadways recognized as "regionally significant" and included all interstate highways, state routes, and portions of the major street and road system operated and maintained by the local jurisdictions.

MTC contracted with the congestion management agencies (CMAs) in the Bay Area to help develop the MTS and to use the CMPs to link land-use decisions to the MTS. The 1993 Alameda County CMP made a distinction between the CMP network and the MTS:

- The CMP network is used to monitor conformance with the level of service (LOS) standards; and
- The MTS[3] is used for the Land Use Analysis Program.

[1] California Government Code Section 65089(b)(1)(A).
[2] California Government Code Section 65089(b)(4).
[3] In 2005, MTC updated the MTS to include Rural Major Collector streets and higher based on the Federal Functional Classification System. The updated MTS is used by MTC for the purposes of funding and programming as well as in estimating roadway maintenance needs. The updated MTS was reviewed by the Commission during the 2009 CMP Update to determine its usefulness and applicability to the Land Use Analysis Program. Based on this input and discussions with MTC, it was determined that the updated MTS was not appropriate for the Land Use Analysis Program because it was too detailed for planning purposes and the previous version of the MTS would continue to be used.

Relationship to Regional Transportation Plan

Given the statutory requirement that MTC must find the CMP consistent with the Regional Transportation Plan (RTP), the designated CMP network has become a subset of the MTS. This helps to ensure regional consistency among the various CMP-designated systems, particularly for facilities that cross county borders. Alameda CTC's long-range Countywide Transportation Plan is the primary vehicle for coordination with the MTS. Continued coordination will be necessary to ensure consistency between Alameda County's CMP network and the MTS.

Designated CMP System

The Alameda County CMP roadway network was initially adopted in 1991 by the local CMA, based on CMP legislation. Since the adoption of the CMP network, land use and transportation patterns across the county have changed significantly; however, until 2011, the CMP network had very limited expansion with only the addition of Hegenberger Road between I-880 and Doolittle Drive near Oakland Airport in 2007.

Recognizing the need to expand the CMP network to reflect land use changes, the Alameda CTC Commission discussed various options in 2011 and adopted an expanded two-tier CMP network. The first tier (Tier 1) is the original adopted CMP network, and the second tier (Tier 2) consists of principal and major local arterials of countywide significance. This second tier network forms a supplemental network that Alameda CTC monitors for informational purposes only and is not used in the conformity findings process.

The characteristics of the CMP-designated network are as follows:

Tier 1

- When established in 1991, it carried 72 percent of the countywide vehicle miles traveled (VMT); and
- It contains 232 miles of roadways, of which 134 miles



- (58 percent) are interstate freeways, 71 miles (31 percent) are state highwys, and 27 miles (11 percent) are city/county arterials.

Tier 2

- All of the roadways are city/county arterials and of local or countywide significance, and
- It contains 90 miles of roadways.

Criteria for Identifying the CMP Network

The roadway system must be detailed enough to identify significant impacts, yet be manageable for administration. The advantage of designating a relatively detailed CMP roadway system is that it may be easier to establish a link between proposed development projects and their impact on the CMP network. However, too large a CMP network could become difficult and expensive to monitor. The following criteria attempt to strike this balance. Alameda CTC will periodically review the effectiveness of these criteria and the CMP network to determine if changes are warranted.

Tier 1 network criteria

The statutes require designation of all state highways and principal arterials as part of the CMP network but do not provide guidance for determining the principal arterials to include. After evaluating several possible methods, an approach was adopted in 1991 for the CMP that provided for the systematic selection of principal arterials to include in the CMP network. The selected approach, which met MTC's expectations

for a "reasonable" CMP network designation method, relies on a concept central to the CMP legislation—identifying a system that carries a majority of the vehicle trips countywide.

Using the countywide travel model, an average daily traffic volume was identified that would produce a system of roadways carrying at least 70 percent of the vehicle miles traveled countywide. This approach yielded an average daily traffic of roughly 30,000 vehicles per day as a minimum threshold. Additional criteria were included to refine the definition as described below.

All state highways:

- Must have a minium threshold of 30,000 vehicles per day.
- Will be evaluated according to the principal arterial criteria, if a route is relocated or removed from the State Highway System, to determine whether it should remain in the CMP network.

Principal arterials must meet all four criteria:

- Must carry 30,000 vehicles per day (average daily traffic) for at least one mile;
- Must be a roadway with four or more lanes;
- Must be a major cross-town connector, traversing from one side of town to the opposite side; and
- Must connect at both ends to another CMP route, unless the route terminates at a major activity center.

Tier 2 network criteria

In 2011, the Commission added 90 miles of roadways (arterials and major collectors) to the CMP network as Tier 2 roadways based on a set of qualitative criteria as follows.

Roadways must meet at least two of the following three criteria to be added to the Tier 2 network. Roadways must be:

- Major thoroughfares, not on the existing CMP network, whose primary function is to link districts within an Alameda County jurisdiction and to distribute traffic from and to the freeways;
- Routes of jurisdiction-wide significance not on the existing CMP network; and
- Streets that experience significant conflicts between auto traffic and transit/other modes.

Criteria Review

In the 1991 Alameda County CMP, the Countywide Travel Demand Model (Model) was used to identify an average daily traffic volume that would produce a system of roadways carrying at least 70 percent of the vehicle miles traveled countywide. This approach yielded the criteria used for the Tier 1 network.

During the 2011 CMP update, applying the aforementioned qualitative criteria resulted in the Tier 2 network. The Commission recommended that the criteria for adding roadways to the CMP network periodically be reviewed. Accordingly, Alameda CTC will review the criteria for adding roadways to Tiers 1 and 2 during every other CMP update year. The next review will be in 2015.

No new CMP roadways were proposed by the local jurisdictions during this 2013 update. For the 2015 CMP Update, Alameda CTC will review and update the CMP roadway criteria including identifying ways to expand the CMP roadway network to include key rural roadways that facilitate agricultural operations and tourism and support Priority Conservation Area goals and objectives in Alameda County. Outcomes of the Countywide Multimodal Arterial Plan should also be considered in the update of the criteria and identification of roadways.

Adding Potential Roadways

To identify potential roadways to add to the Tier 1 or Tier 2 networks, the jurisdictions review their roadway systems for roadways that may meet the Tier 1 and Tier 2 network criteria. This will be performed following the CMP update period when criteria for adding roadways are reviewed. There were no new roadways

proposed to be added in 2013. The next review for adding roadways to the CMP network will occur in 2015. At this time, addition of roadways to the CMP network is voluntary for the local jurisdictions, particularly for the Tier 1 network in view of the conformity requirements and related funding implications.

Regarding the Tier 1 network criteria, only the criteria for inclusion of principal arterials are applied for this purpose, as any changes or additions to the state highways or freeways are by default added to the Tier 1 network of the Designated Roadway System, as mandated by state law.

For potential roadways to be added to the Tier 1 network, each jurisdiction conducts 24-hour traffic counts from Tuesday through Thursday of a typical week. Traffic counts will be taken around the first week in April of the year when adding new roadways to the CMP network is reviewed. Based on the traffic counts, each jurisdiction must submit potential CMP-designated routes to the Alameda CTC by end of June.

For potential roadways to be added to the Tier 2 network, interested jurisdictions or transit operators could propose a roadway if it meets the Tier 2 criteria. While the collected traffic counts will be used as one of the criteria for identifying Tier 1 network roadways, it is used only as supplemental information for Tier 2 network roadways.

Alameda CTC staff performs a review of the proposed roadway additions to the CMP network with reference to the adopted criteria for both Tiers 1 and 2 and submits a recommendation to the Commission for final approval. In reviewing the proposed addition of new roadways that may meet the Tier 1 or Tier 2 criteria, the previously mentioned general approach to defining the CMP network is also considered (i.e., the roadway system must be detailed enough to identify significant impacts, yet be manageable for administration, as too large a network is difficult to manage and expensive to monitor).

Changes to the CMP Network Since 1991

The following changes were made to the CMP network after its initial adoption in 1991.

Tier 1 network changes: In 2005 and 2007 the following network changes were made:

- In 2003, Caltrans realigned State Route 84 (SR 84) in Livermore from 1st Street to Isabel Avenue-Airway Boulevard. Consequently, the new alignment was added to the CMP network in 2005. The former SR 84 alignment along 1st Street in Livermore was evaluated to see whether it met the principal arterial criteria for retention on the CMP network. Based on the results of the analysis, the 2.2-mile segment between Inman Street and I-580 was retained on the CMP network.
- In 2007, the City of Oakland conducted 24-hour traffic counts on Hegenberger Road between I-880 and Doolittle Drive. The traffic counts collected and other characteristics of the roadway met all the principal arterial criteria for inclusion in the CMP network. Accordingly, a 1.7-mile segment of Hegenberger Road between I-880 and Doolittle Drive was added to the CMP network.

Addition of Tier 2 network: Based on the new criteria approved by the Commission in 2011 for the Tier 2 CMP network, 90 miles of roadways were added during the 2011 CMP update. Alameda CTC will monitor the Tier 2 network only for informational purposes and will not be subject to conformity requirements.

CMP Network Update Schedule

To be in conformance with the CMP, local jurisdictions must submit a list of potential CMP-designated routes based on 24-hour counts by spring 2017. Table 1 shows the schedule for review and update of designated routes on the CMP network.

Table 1—Schedule for Updating CMP-Designated System

Task	Who	When
Re-evaluate Criteria for Adding Roadways	ACTAC/Commission	November/December 2014
Identify Potential Routes	Jurisdictions	January 2015
Review Routes	ACTAC	February 2015
Collect Traffic Data	Jurisdictions	March/April 2015
Review Data	ACTAC	May 2015
Select CMP Designated Routes	ACTAC/Commission	June 2015
Incorporate Routes in 2015 CMP	ACTAC/Commission	July 2015

Note: Criteria for adding roadways will be reviewed in one CMP update and the adopted criteria will be applied to identify potential routes in the subsequent CMP update.

CMP Network Tier 1 Roadways

Table 2 lists the designated Tier 1 CMP network, including all state highways and principal arterials that satisfy the Tier 1 criteria.

During the 2011 CMP update, applying the aforementioned qualitative criteria resulted in the Tier 2 network. The Commission recommended that the criteria for adding roadways to the CMP network be reviewed periodically. Accordingly, Alameda CTC will review the criteria for adding roadways to Tiers 1 and 2 during every other CMP update year. The next review will be in 2015.

Table 2—CMP-Designated System, Tier 1 Roadway List

Table 2.1—Cities of Albany and Berkeley

Route	From	To	Criteria[4][5]
SR-123 (San Pablo)	Contra Costa County line	Emeryville city limit	State Route
University Avenue	I-80	Milvia Street	Satisfies criteria
University Avenue	Milvia Street	Shattuck Avenue	Connectivity[6]
Shattuck Avenue	University Avenue	Haste Street	Connectivity
Shattuck Avenue	Haste Street	Derby Street	Satisfies criteria
Adeline Street	Derby Street	MLK Jr. Way	Satisfies criteria
MLK Jr. Way	Adeline Street	Oakland city limit	Satisfies criteria
SR-13 (Ashby Avenue)	I-80	Tunnel Road	State Route
SR-13 (Tunnel Road)	Ashby Avenue	Oakland city limit	State Route
I-80/I-580	University Avenue	Central	State Route

[4] Principal arterial criteria: a) must carry 30,000 average daily traffic for at least one mile; b) must be a 4- or more lane roadway; c) must be a major cross town arterial, traversing from one side of town to the opposite side; and d) must connect to another CMP route or major activity center.
[5] State highways and interstate freeways are included in their entirety within each jurisdiction and include all mileage within Alameda County.
[6] "Connectivity" indicates that the segment has been included in the designated system to provide continuity and avoid stub ends.

Table 2.2—City of Alameda

Route	From	To	Criteria
SR-61 (Doolittle Drive)	Oakland city limit	Fernside Boulevard	State Route
SR-61 (Otis Drive)	Fernside Boulevard	SR-61 (Broadway)	State Route
SR-61 (Broadway)	Otis Drive	SR-61 (Encinal Avenue)	State Route
SR-61 (Encinal Avenue)	SR-61 (Broadway)	Sherman Street	State Route
SR-61 (Central Avenue)	Sherman Street	SR-260 (Webster Street)	State Route
SR-260 (Webster Street)	SR-61 (Central Avenue)	Posey/Webster tubes	State Route
SR-260 (Posey/Webster tubes)	SR-260 (Webster Street)	Oakland city limit	State Route
Atlantic Avenue	SR-260 (Webster Street)	Poggi Street	Satisfies criteria
Atlantic Avenue	Poggi Street	Main Street	Connectivity
Park Street	Oakland city limit	Central Avenue	Satisfies criteria
Park Street	Central Avenue	SR-61 (Encinal Avenue)	Connectivity

Table 2.3—City of Hayward

Route	From	To	Criteria
SR-185 (Mission Boulevard)	Ashland (unincorporated)	SR-92 (Jackson Street)	State Route
SR-92 (Jackson Street)	I-880	SR-185 (Mission Boulevard)	State Route
SR-238 (Foothill Boulevard)	Ashland (unincorporated)	SR-185 (Mission Boulevard)	State Route
SR-238 (Mission Boulevard)	SR-92 (Jackson Street)	Union City city limit	State Route
A Street	I-880	SR-238 (Foothill Boulevard)	Satisfies criteria
Hesperian Boulevard	San Lorenzo (unincorporated)	Tennyson Road	Satisfies criteria
Tennyson Road	Hesperian Boulevard	SR-238 (Mission Boulevard)	Satisfies criteria
SR-92	San Mateo County line	I-880	State Route
I-880[7]	A Street	Alvarado-Niles	State Route

[7] A portion of this route to the Hayward border includes the city of Union City.

Table 2.4—Cities of Emeryville, Oakland and Piedmont

Route	From	To	Criteria
MLK Jr. Way	Berkeley city limit	SR-24	Satisfies criteria
SR-123 (San Pablo)	Berkeley city limit	35th Street	State Route
SR-13 (Tunnel Road)	Berkeley city limit	SR-24	State Route
SR-260 (Posey/Webster tubes)	Alameda city limit	I-880	Satisfies criteria
23rd/29th Avenue	Alameda city limit	I-880	Satisfies criteria
SR-77 (42nd Avenue)	I-880	SR-185 (E. 14th Street)	State Route
SR-185 (E. 14th Street)	SR-77 (42nd Avenue)	San Leandro city limit	State Route
Hegenberger Road	I-880	Doolittle Drive	Satisfies criteria[8]
Hegenberger Road	I-880	Hawley Street	Connectivity
Hegenberger Road	Hawley Street	SR-185 (E. 14th Street)	Satisfies criteria
SR-61 (Doolittle Drive)	Alameda city limit	San Leandro city limit	State Route
SR-13	SR-24	I-580	State Route
SR-24	I-980	Contra Costa County line	State Route
I-80[9]	SF County Line	University Avenue	State Route
I-580	I-80	MacArthur Boulevard	State Route
I-880	I-980	Hegenberger Road	State Route
I-980	I-880	SR-24	State Route

Table 2.5—City of San Leandro

Route	From	To	Criteria
SR-61 (Doolittle Drive)	Oakland city limit	SR-61/112 (Davis Street)	State Route
SR-61/112 (Davis Street)	SR-61 (Doolittle Drive)	SR-185 (E. 14th Street)	State Route
SR-61 (Broadway)	Otis Drive	SR-61 (Encinal Avenue)	State Route
SR-185 (E. 14th Street)	Oakland city limit	Ashland (unincorporated)	State Route
150th Avenue	Hesperian Boulevard	I-580	Satisfies criteria
Hesperian Boulevard	SR-185 (E. 14th Street)	San Lorenzo (unincorporated)	Satisfies criteria
I-880[10]	Hegenberger Avenue	I-238	State Route
I-580[11]	MacArthur Boulevard	I-238	State Route

[8] Found to meet principal arterial criteria in 2007.
[9] A portion of this route to the Emeryville border includes the City of Berkeley.
[10] A portion of this route to the San Leandro border includes the City of Oakland.
[11] A portion of this route to the San Leandro border includes the cities of Hayward and Oakland.

Table 2.6—San Lorenzo, Castro Valley and Ashland (unincorporated areas)

Route	From	To	Criteria
SR-185 (Mission Boulevard)	San Leandro city limit	Hayward city limit	State Route
Hesperian Boulevard	San Leandro city limit	Hayward city limit	Satisfies criteria
SR-238 (Foothill Boulevard)	I-238	Hayward city limit	State Route
I-880[12]	I-238	A Street	State Route
I-238[13]	I-880	I-580	State Route
I-580[14]	I-238	I-680	State Route

Table 2.7—Cities of Union City, Fremont and Newark

Route	From	To	Criteria
SR-238 (Mission Boulevard)	Hayward city limit	I-680	State Route
Decoto Road	I-880	SR-238 (Mission Boulevard)	Satisfies criteria
Mowry Avenue	I-880	SR-84 (Peralta Boulevard)	Satisfies criteria
SR-262 (Mission Boulevard)	I-880	I-680	State Route
SR-84 (Thornton Avenue)	I-880	Fremont Boulevard	State Route
SR-84 (Fremont Boulevard)	SR-84 (Thornton Avenue)	SR-84 (Peralta Boulevard)	State Route
SR-84 (Peralta Boulevard)	SR-84 (Fremont Boulevard)	SR-84 (Mowry Avenue)	State Route
SR-84 (Mowry Avenue)	SR-84 (Peralta Boulevard)	SR-238 (Mission Boulevard)	State Route
SR-84 (Niles Canyon)	SR-238 (Mission Boulevard)	I-680	State Route
SR-84	San Mateo County line	I-880	State Route
I-880	Alvarado-Niles	Dixon Landing	State Route
I-680	Scott Creek	SR-238	State Route

[12] A portion of this route in the county includes the City of Hayward.
[13] A portion of this route in the county includes the City of San Leandro.
[14] A portion of this route in the county includes the City of Pleasanton.

Table 2.8—Cities of Pleasanton, Dublin, Livermore and unincorporated areas

Route	From	To	Criteria
SR-84 (Vallecitos)[15]	I-680	SR-84 (Isabel Avenue)	State Route
SR-84 (Isabel Avenue)[16]	SR-84 (Vallecitos Road)	SR-84 (Kitty Hawk Road)	State Route
SR-84 (Kitty Hawk Road)[17]	SR-84 (Isabel Avenue)	SR-84 (Airway Boulevard)	State Route
SR-84 (Airway Boulevard)[18]	SR-84 (Kitty Hawk Road)	I-580	State Route
1st Street	Inman Street	I-580	Satisfies criteria
I-580	I-680	I-205	State Route
I-680	SR-238	Alcosta Boulevard	State Route



[15] New alignment of SR-84 by Caltrans in 2003.
[16] A portion of old SR-84 alignment found to meet the principal arterial criteria.
[17] A portion of old SR-84 alignment found to meet the principal arterial criteria.
[18] A portion of old SR-84 alignment found to meet the principal arterial criteria.

CMP Network Tier 2 Roadways

Table 3 lists the designated Tier 2 roadways identified using the adopted qualitative criteria.

Table 3—CMP-Designated System, Tier 2 Roadway List

Table 3.1—Cities of Alameda, Berkeley, Emeryville and Oakland

Route	From	To	Jurisdiction	Criteria[20]	Distance (miles)
W. Grand Avenue to Grand Avenue	I-80	I-580	Oakland	1,2	3.1
12th Street-Lakeshore Avenue	I-980	I-580	Oakland	1,2,3	2.4
Telegraph Avenue[21]	51st Street	Bancroft Way	Oakland, Berkeley	2,3	2.2
Broadway	I-880	College Avenue	Oakland	2,3	3.1
College Avenue	Broadway	Bancroft Way	Oakland, Berkeley	1,2,3	2.4
51st Street	Broadway	SR 24	Oakland	1,2	0.8
Shattuck Avenue	Adeline Street	51st Street	Oakland, Berkeley	1,2,3	1.5
Bancroft Way	College Avenue	Shattuck	Berkeley	2,3	0.7
Powell Street-Stanford Avenue	I-80	MLK Jr. Way/ Adeline Street	Emeryville, Berkeley	1,2	2.2
40th Street-Shellmound Avenue	San Pablo Avenue	Powell Street	Emeryville	1,2,3	1.5
International Boulevard	1st Avenue	42nd Avenue	Oakland	1,2,3	2.9
Foothill Boulevard	1st Avenue	73rd Avenue	Oakland	2,3	5.3
E. 15th Street	1st Avenue	14th Avenue	Oakland	2,3	1.0
73rd Avenue	International Boulevard	Foothill Boulevard	Oakland	1,2	1.1
High Street	Otis Drive	I-580	Alameda, Oakland	1,2	3.5

[19] Criteria applied:
1. Major thoroughfares, not on the existing CMP network, with the primary function to link districts within an Alameda County jurisdiction and to distribute traffic from and to the freeways.
2. Routes of countywide significance that are not on the existing CMP network.
3. Streets that experience significant conflicts between auto traffic, transit service, and bicyclists and pedestrians.

[20] Denotes that roadway traverses more than one jurisdiction.

Table 3.2—Alameda County and Cities of Hayward and Union City

Route	From	To	Jurisdiction	Criteria[21]	Distance (miles)
Crow Canyon Road	I-580	County Line	Alameda County	1,2	7.0
Winton Avenue-D Street	Hesperian Boulevard	Foothill Boulevard	Hayward	1,2	2.2
A Street	Foothill Boulevard	I-580	Hayward, Alameda County	1,2	1.2
Grove Way	A Street/ Redwood Road	I-580	Hayward, Alameda County	1,2	1.0
Hesperian Boulevard-Union City Boulevard[22]	Tennyson Road	Alvarado Boulevard	Hayward, Union City	1,2	2.9

Table 3.3—Cities of Fremont and Union City

Route	From	To	Jurisdiction	Criteria[21]	Distance (miles)
Alvarado Boulevard	Union City Blvd.	I-880	Union City	1,2	2.2
Fremont Boulevard	I-880 @ Alvarado Boulevard/ Fremont Boulevard	I-880 interchange south of Automall Parkway	Fremont	1,2	8.8
Automall Parkway	I-880	I-680	Fremont	1,2	1.6



[21] Criteria applied:
1. Major thoroughfares, not on the existing CMP network, with the primary function to link districts within an Alameda County jurisdiction and to distribute traffic from and to the freeways.
2. Routes of countywide significance that are not on the existing CMP network.
3. Streets that experience significant conflicts between auto traffic, transit service, and bicyclists and pedestrians.

[22] Denotes that roadway traverses more than one jurisdiction.

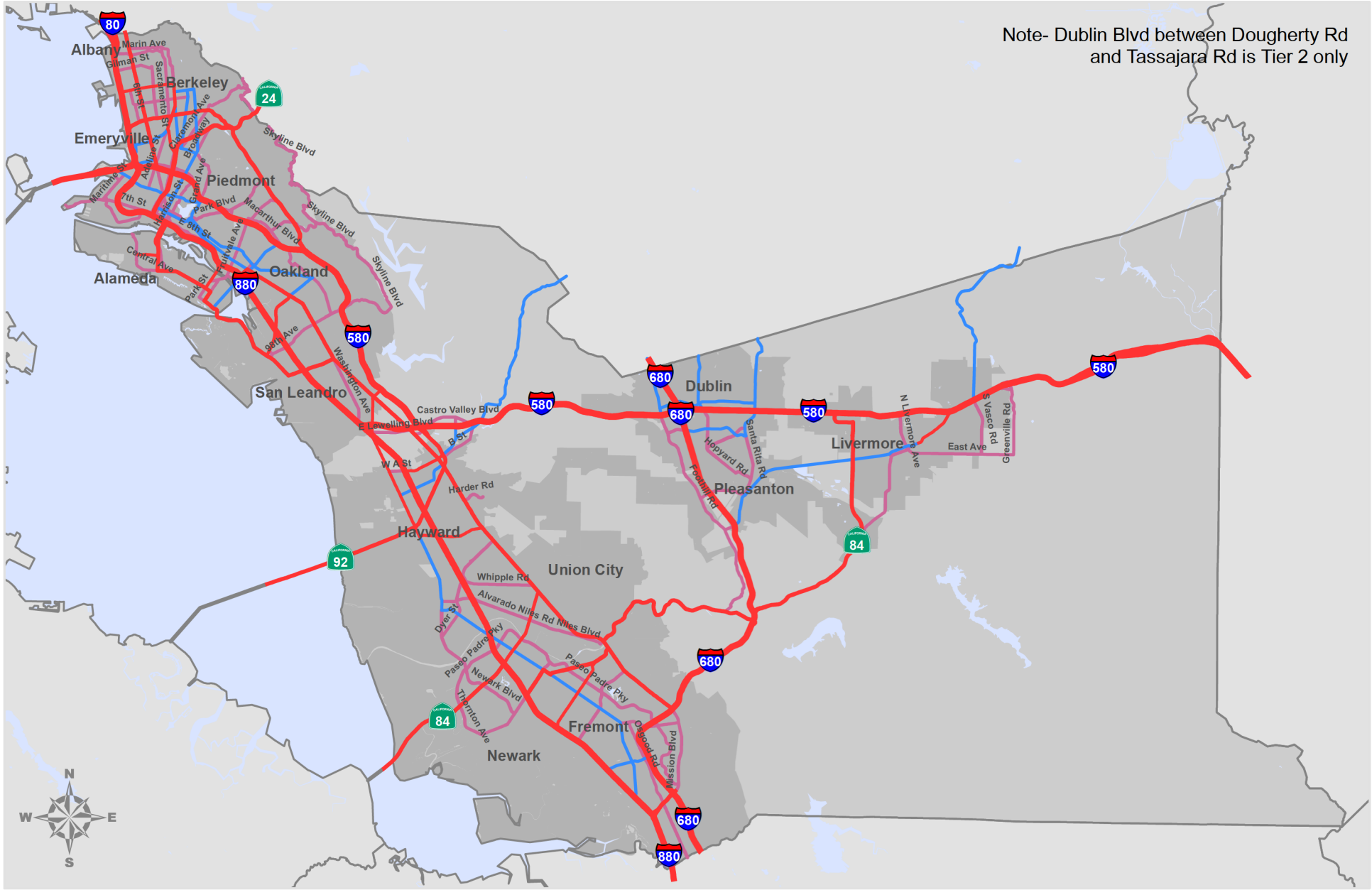
Table 3.4—Alameda County and Cities of Dublin, Livermore and Pleasanton

Route	From	To	Jurisdiction	Criteria[21]	Distance (miles)
Vasco Road	I-580	County Line	Livermore	1,2	5.7
Dublin Boulevard	San Ramon Road	Tassajara	Dublin	1,2	3.6
San Ramon Road	I-580	County Line	Dublin	1,2	1.7
Dougherty Road	I-580	County Line	Dublin	1,2	1.9
Tassajara Road	I-580	County Line	Dublin	1,2	2.8
E. Stanley Boulevard-Railroad Avenue-1st Street	Isabel Avenue	Inman Street (connecting I-580)	Livermore	1,2,3	4.2
Stoneridge Drive	I-680	Santa Rita Road	Pleasanton	1,2	2.5
Santa Rita Road	Stoneridge Drive	I-580	Pleasanton	1,2	1.2
Sunol Boulevard-1st Street-Stanley Boulevard	I-680	Isabel Avenue	Alameda County, Pleasanton	1,2	5.6

CMP and MTS Roadway Networks and MTS Transit Corridors

The entire CMP-designated system (Tiers 1 and 2) is illustrated in Figure 1, and detailed maps for each area within the county are shown in Figures 2 through 5. The Metropolitan Transportation System designated by MTC appears in Figure 1 through Figure 5. The MTS transit corridors appear in Figure 6 and Figure 7. The system includes the entire CMP-designated roadway network together with major arterials, transit routes, rail, maritime ports, airports, and transfer hubs critical to the region's movement of people and freight.

[21] Criteria applied:
1. Major thoroughfares, not on the existing CMP network, with the primary function to link districts within an Alameda County jurisdiction and to distribute traffic from and to the freeways.
2. Routes of countywide significance that are not on the existing CMP network.
3. Streets that experience significant conflicts between auto traffic, transit service, and bicyclists and pedestrians.

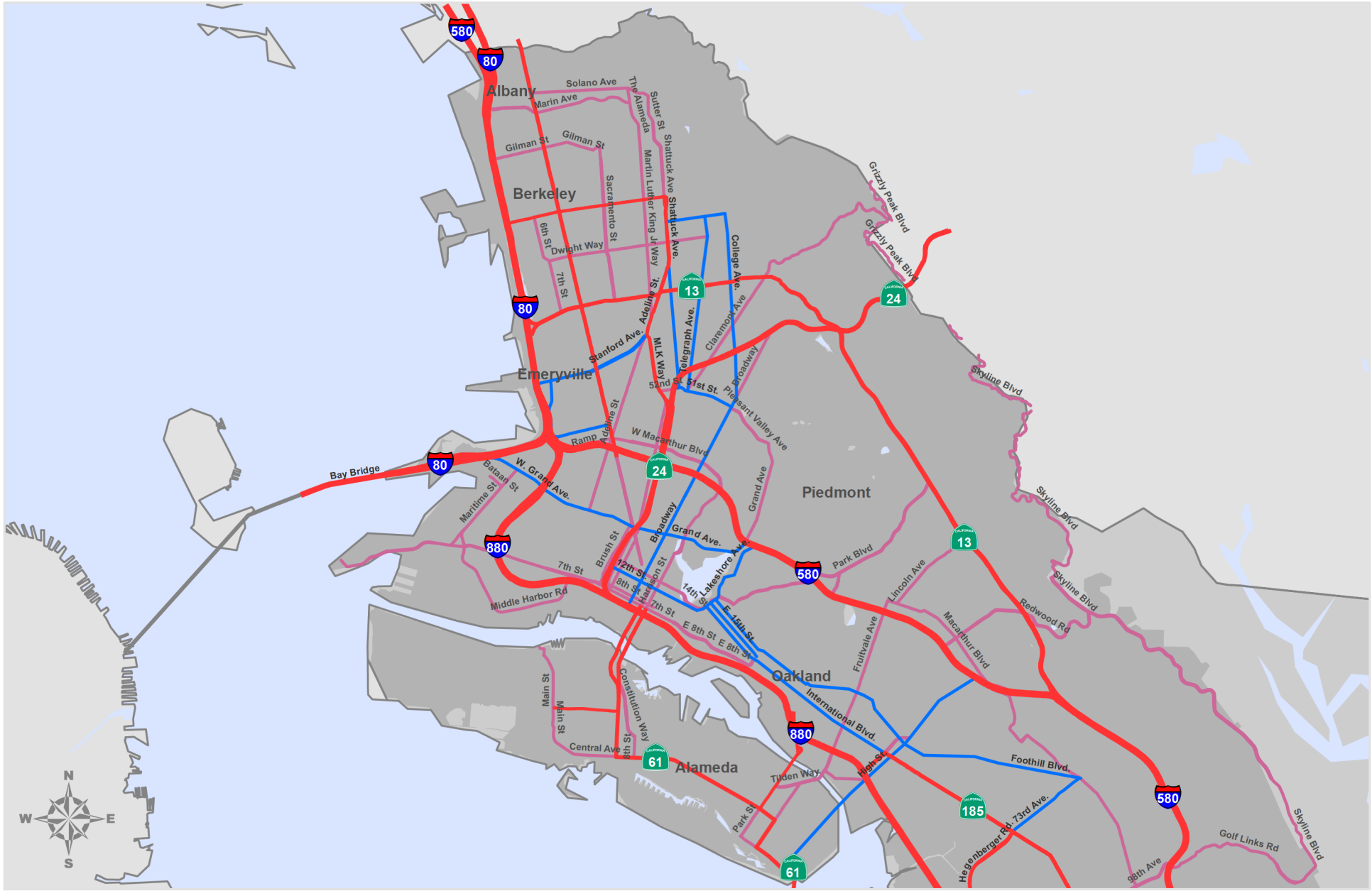


ALAMEDA County Transportation Commission

Figure 1: Designated Countywide System Map

Legend

- Interstate/Freeway (CMP - Tier 1 & MTS)
- State Highway (CMP - Tier 1 & MTS)
- Principal Arterial (CMP - Tier 1 & MTS)
- Principal Arterial (CMP - Tier 2 & MTS)
- MTS Routes



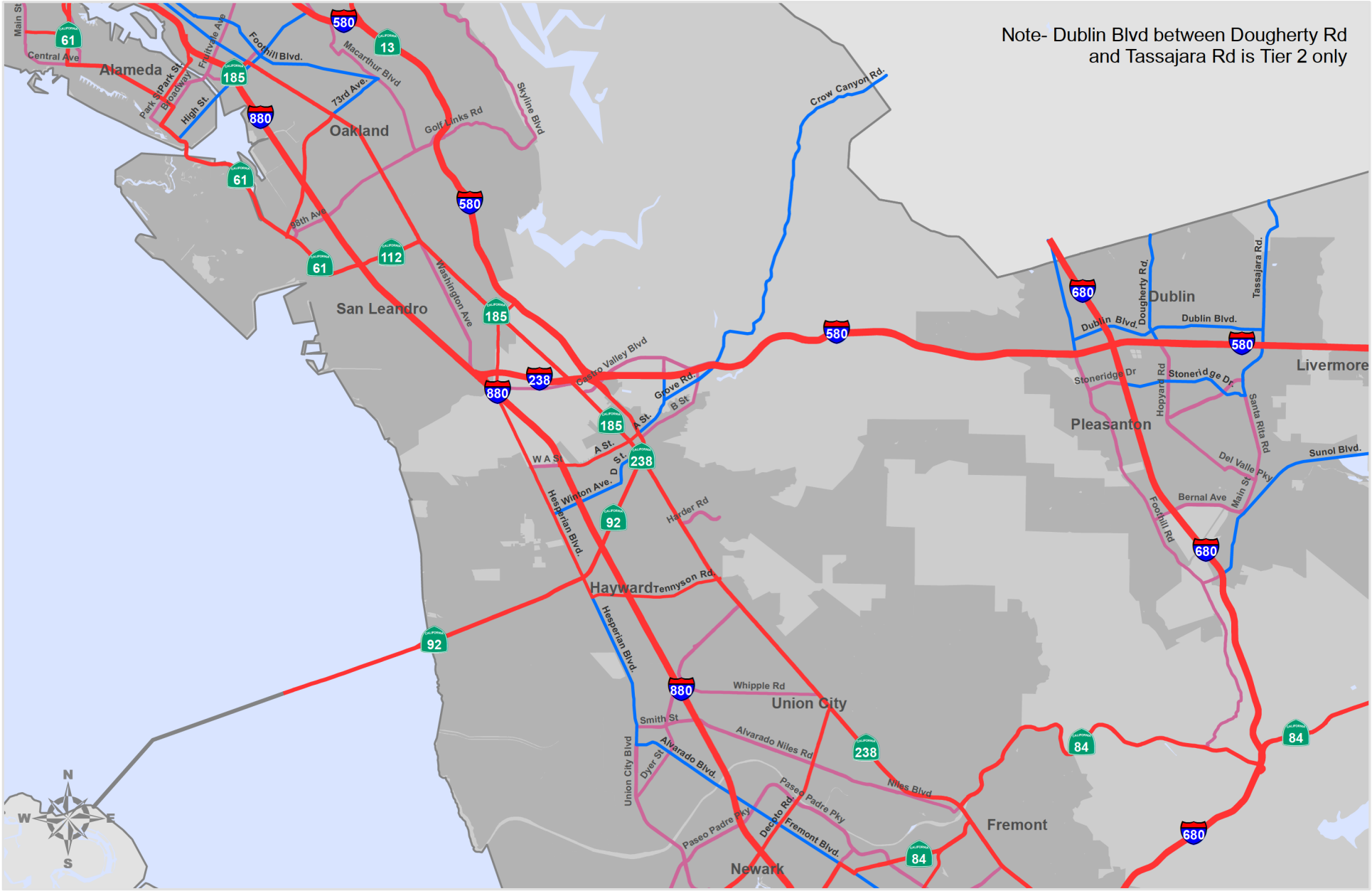
ALAMEDA County Transportation Commission

Figure 2: Designated System Map

Alameda, Albany, Berkeley, Emeryville, Oakland, and Piedmont

Legend

- Interstate/Freeway (CMP - Tier 1 & MTS)
- State Highway (CMP - Tier 1 & MTS)
- Principal Arterial (CMP - Tier 1 & MTS)
- Principal Arterial (CMP - Tier 2 & MTS)
- MTS Routes



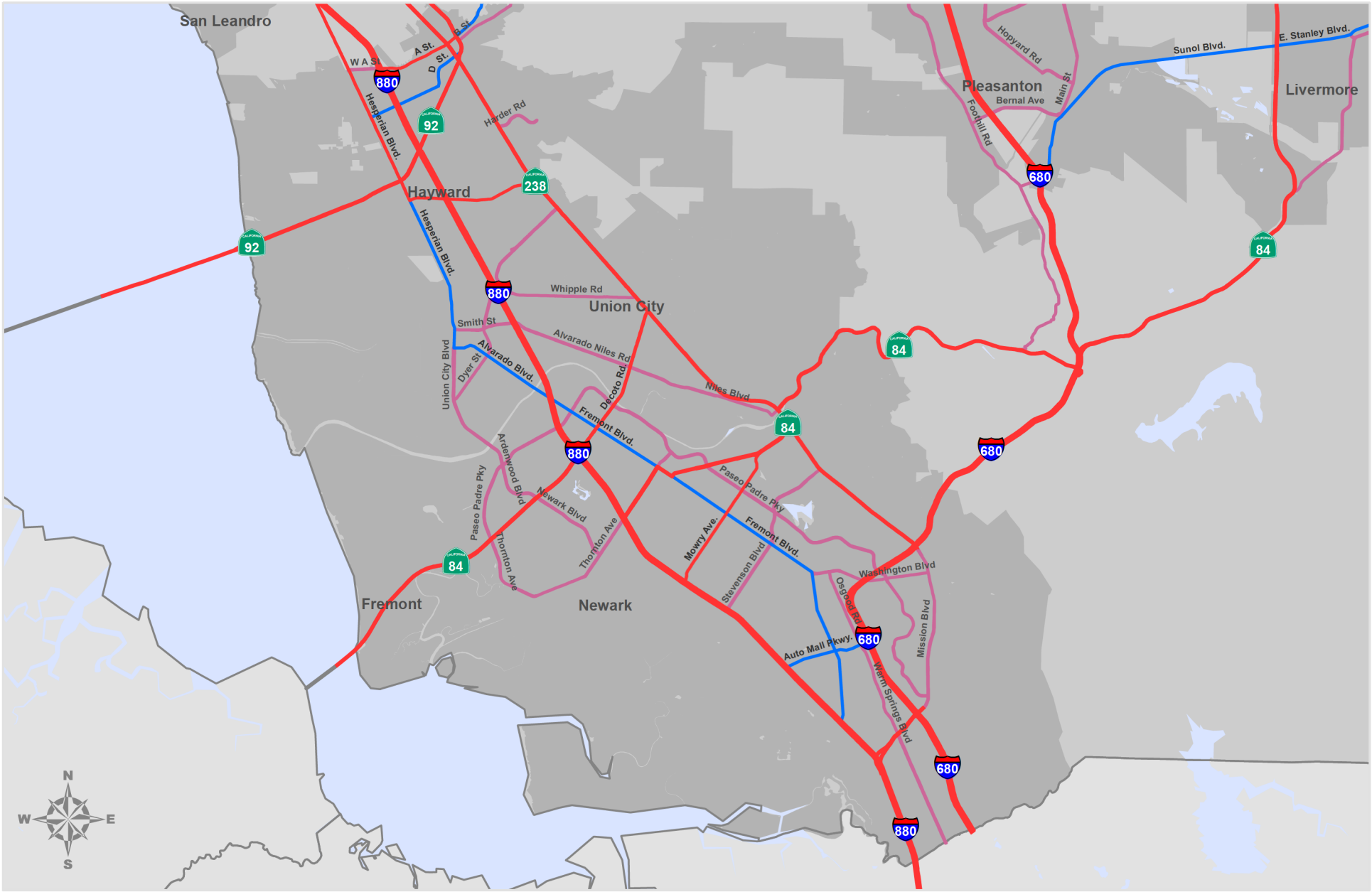
ALAMEDA County Transportation Commission

Figure 3: Designated System Map

Castro Valley, Hayward, San Leandro, and San Lorenzo

Legend

- Interstate/Freeway (CMP - Tier 1)
- State Highway (CMP - Tier 1)
- Principal Arterial (CMP - Tier 1)
- Principal Arterial (CMP - Tier 2)
- MTS Routes



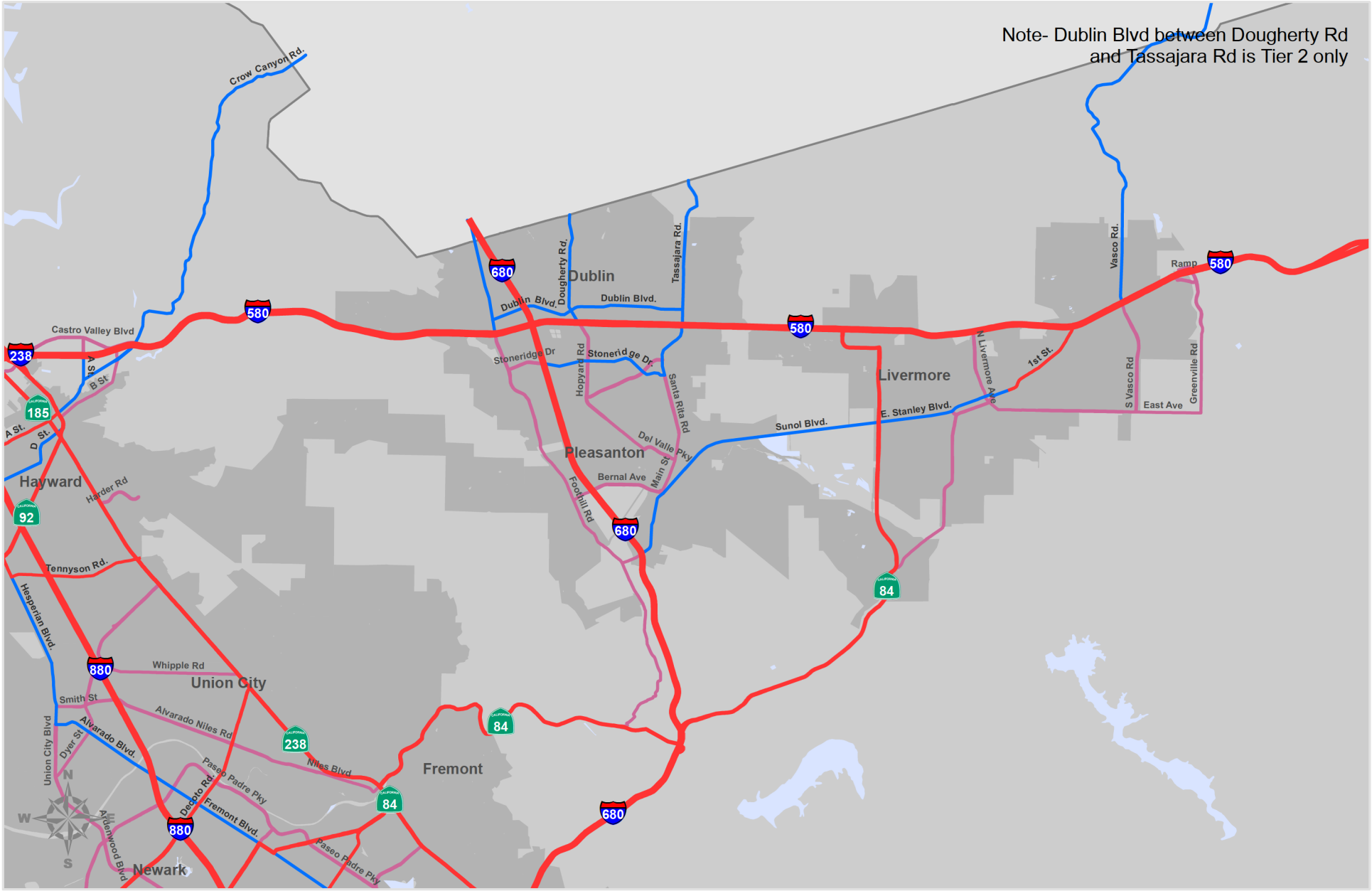
ALAMEDA County Transportation Commission

Figure 4: Designated System Map

Fremont, Newark, and Union City

Legend

- Interstate/Freeway (CMP - Tier 1 & MTS)
- State Highway (CMP - Tier 1 & MTS)
- Principal Arterial (CMP - Tier 1 & MTS)
- Principal Arterial (CMP - Tier 2 & MTS)
- MTS Routes



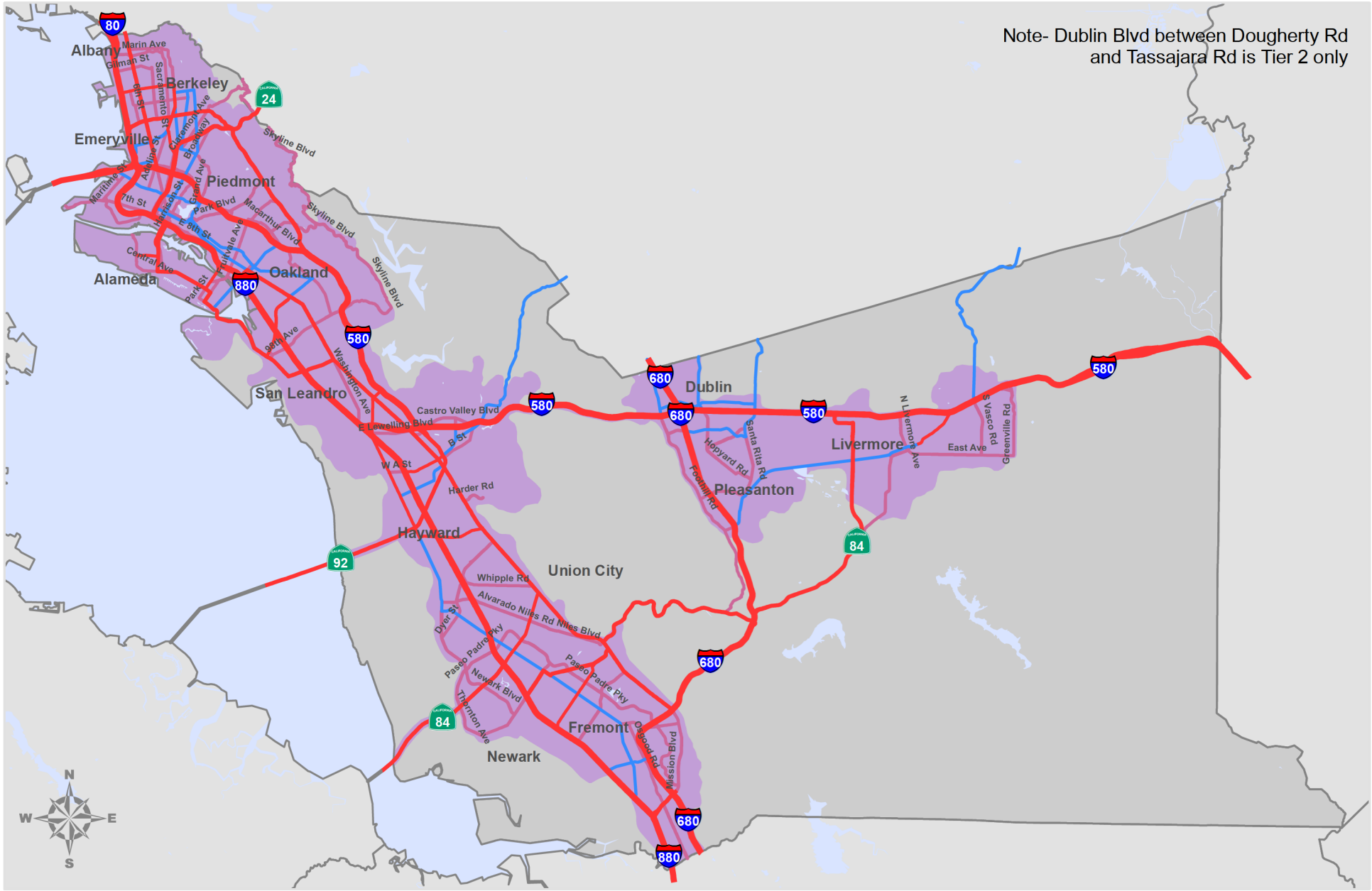
ALAMEDA County Transportation Commission

Figure 5: Designated System Map

Dublin, Livermore, and Pleasanton

Legend

- Interstate/Freeway (CMP - Tier 1 & MTS)
- State Highway (CMP - Tier 1 & MTS)
- Principal Arterial (CMP - Tier 1 & MTS)
- Principal Arterial (CMP - Tier 2 & MTS)
- MTS Routes



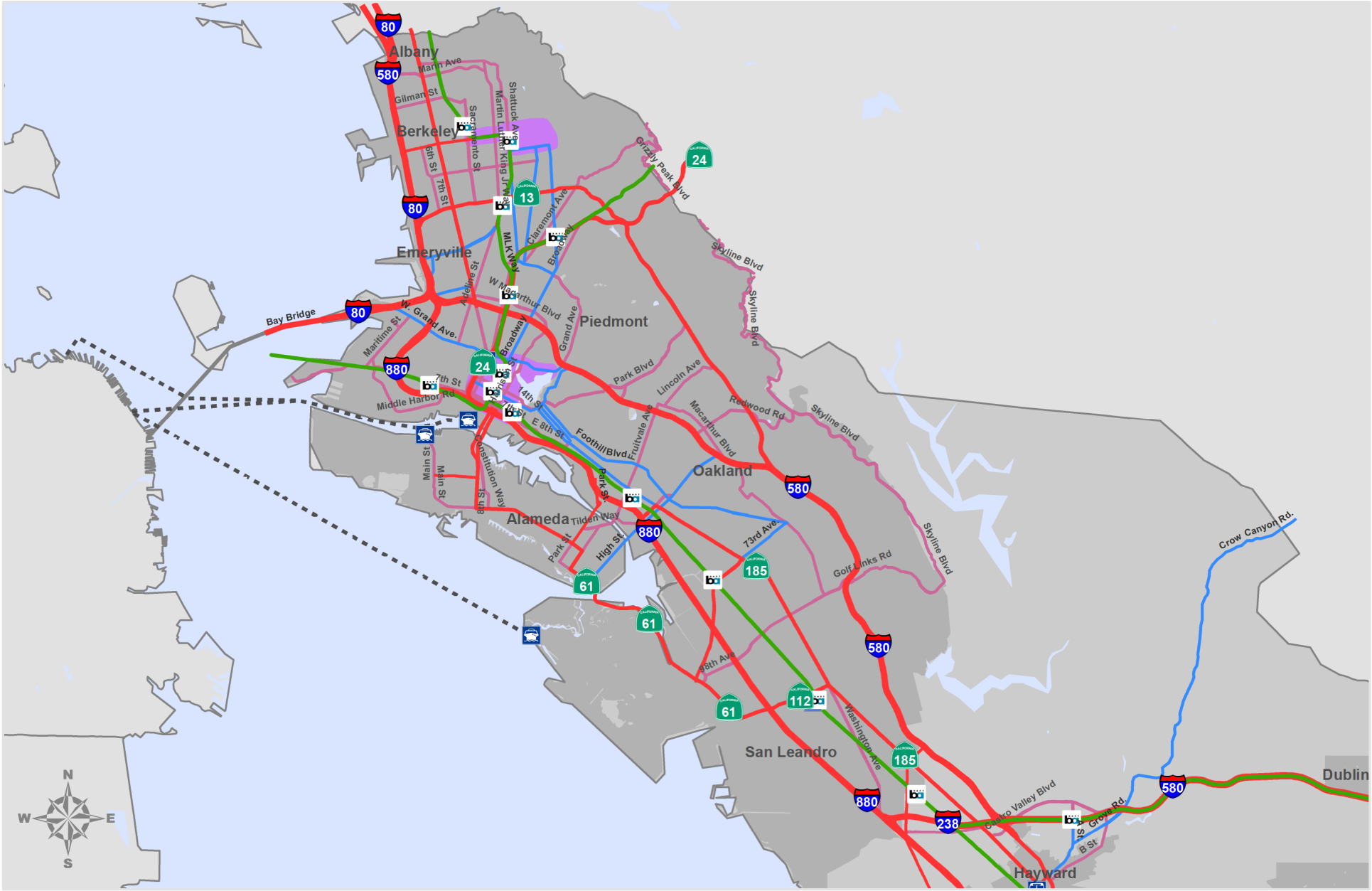
ALAMEDA County Transportation Commission

Figure 6: Metropolitan Transportation System

Transit Corridors of Alameda County

Legend

- Interstate/Freeway (CMP - Tier 1 & MTS)
- State Highway (CMP - Tier 1 & MTS)
- Principal Arterial (CMP - Tier 1 & MTS)
- Principal/Other Arterial (CMP - Tier 2 & MTS)
- MTS Routes
- Transit Service Area BART/Transit Corridor



ALAMEDA County Transportation Commission

Figure 7: Metropolitan Transportation System

Transit Corridors of Northern Alameda County

Legend

- Interstate/Freeway (CMP - Tier 1 & MTS)
- State Highway (CMP - Tier 1 &MTS)
- Principal Arterial (CMP - Tier 1 & MTS)
- Principal/Other Arterial (CMP - Tier 2 & MTS)
- MTS Routes
- Rail Transit / BART
- Ferry
- Key Service Area

The following operators provide transit services in Alameda County:

- Altamont Corridor Express Commuter Rail
- AC Transit
- Alameda-Oakland Ferry Service
- Bay Area Rapid Transit
- Capitol Corridor
- Harbor Bay Ferry Service
- Livermore Amador Valley Transit Authority
- Union City Transit

Next Steps

The 2013 CMP update identified the following next steps for the update of the Designated CMP Network System:

- Review and update the CMP roadway criteria in the 2015 CMP Update, including identifying ways to expand the CMP roadway network to include key rural roadways that facilitate agricultural operations and tourism and support Priority Conservation Area goals and objectives in Alameda County. Outcomes of the Countywide Multimodal Arterial Plan should also be considered in the update of the criteria and identification of roadways.



Level of Service Standards

3



State law requires that level of service (LOS) standards be established to monitor the CMP roadway network's LOS as part of the CMP process.[23] The legislation leaves the choice of LOS measurement methodology to the CMAs, but mandates that the LOS be measured by the most recent version of the Transportation Research Board's Highway Capacity Manual (HCM) or a uniform methodology adopted by the CMA, in our case Alameda CTC, that is consistent with the HCM.

LOS definitions generally describe traffic conditions in terms of speed and travel time, volume and capacity, freedom to maneuver, traffic interruptions, comfort and convenience, and safety. LOS is represented by letter designations, ranging from A to F, with LOS A representing the best operating conditions and LOS F representing the worst (see Appendix F for graphic representation of LOS).

The purpose of setting LOS standards for the CMP network is to provide a quantitative tool to analyze the effects of land use changes on the transportation network's performance (i.e., congestion). If the actual network performance falls below the standard (i.e., congestion worsens below LOS E), actions must be taken to improve the LOS.

Alameda CTC contracts with a consultant to perform the necessary LOS monitoring for the CMP network. Initially, the CMP network was monitored annually, but in 1998 a policy was adopted to perform the LOS monitoring every two years, which has proven to be the most cost-effective approach. The next monitoring study will be performed in spring 2014.

Additionally, to provide a basis for more definitive strategies for maintaining LOS standards in subareas of Alameda County, Alameda CTC has completed the following corridor studies on high-priority corridors, such as:

- Central County Freeway Study (SR 238 Local Area Transportation Improvement Program)
- I-580 Corridor BART to Livermore
- I-680 Value Pricing
- I-880 Strategic Plan
- North I-880 Safety and Operations Study
- San Pablo and I-880 SMART Corridor Programs
- SR 84 Local Area Transportation Improvement Program
- Tri-Valley Triangle Study

To comprehensively identify and address the multimodal transportation needs of the county as a whole, Alameda CTC is undertaking development of comprehensive countywide modal plans, specifically

[23] California Government Code Section 65089(b)(1)(A).

development is underway for a Countywide Goods Movement Plan, a Countywide Multimodal Arterial Corridor Plan, a Countywide Transit Plan, and updates to Community Based Transportation Plans.

Standards and Approach for LOS Monitoring

LOS is an indication of traffic growth trends using vehicular volumes, capacity, and measurement of average speed and delay. The goal is to develop a consistent approach for monitoring LOS that is easy to use, non-duplicative, and compatible with local government data and travel-demand models. Table 4, which follows, describes the approach for monitoring LOS in Alameda County and defines the facility classifications.

Range for LOS F for Freeway Sections:

- F30 – Average Travel Speed < 30 mph
- F20 – Average Travel Speed < 20 mph
- F10 – Average Travel Speed < 10 mph

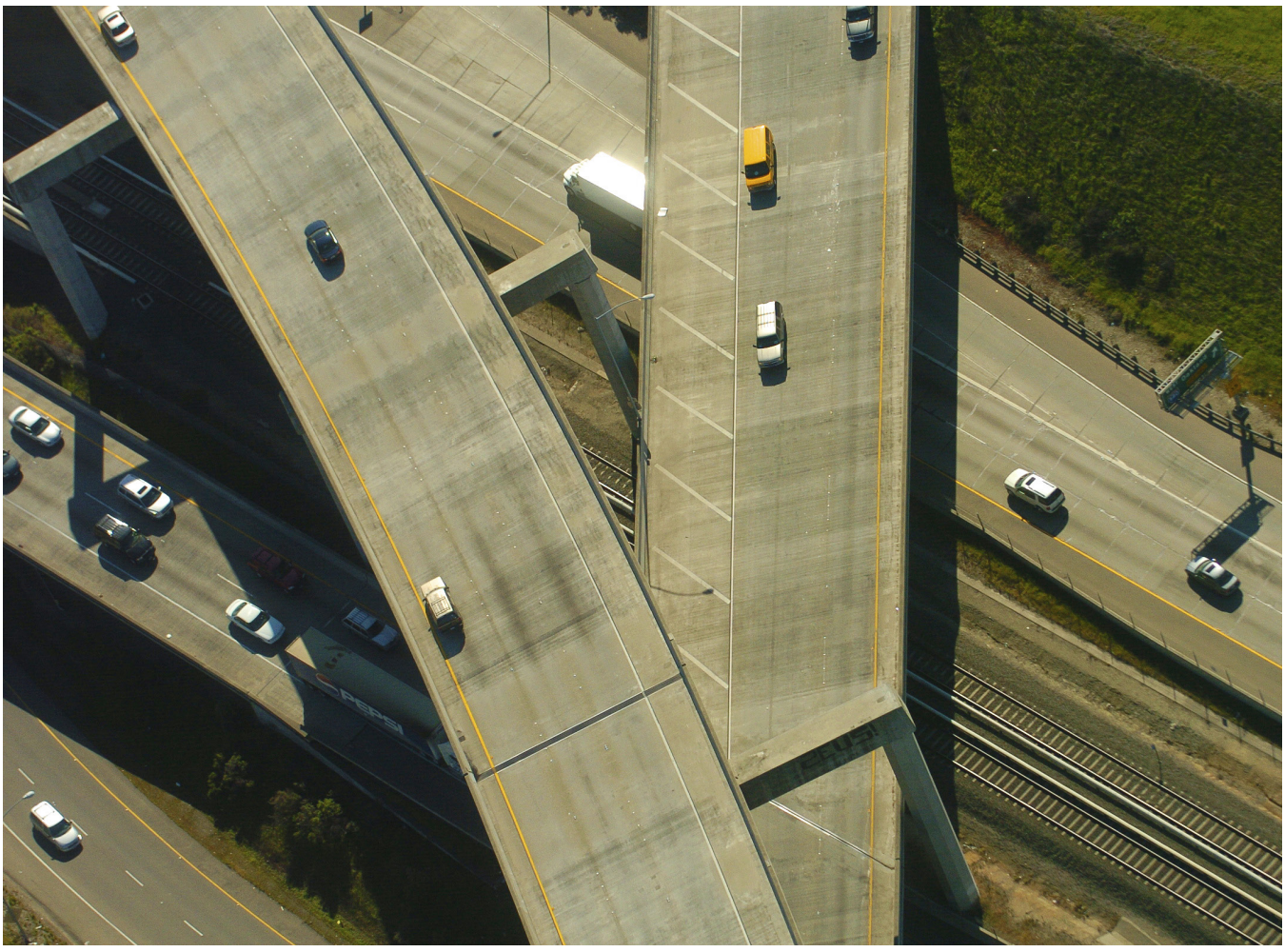


Table 4—Approach to LOS Monitoring

Element	Approach
Level of Service	As defined in the California Government Code Section 65089.3, the LOS standard is E, except where F was the LOS when originally measured, in which case the standard is F. The methods employed constitute a uniform methodology adopted that is consistent with the HCM1985 that includes speed-based LOS methodology. Methods described in HCM Chapter 8 (Two-Lane Highways) and Chapter 11 (Urban and Suburban Arterials) were the basis for establishing the level of service on the CMP network. LOS is assessed based on the average speed observed along a roadway segment (link speeds) or total volumes approaching an intersection (link volumes). These methods are not designed to replace the more detailed procedures that local agencies are likely to use for non-CMP purposes (such as local impact studies). Such procedures typically focus on an intersection's ability to handle individual turning movements rather than average speed on a roadway segment.
Facility Classifications	The HCM provides methods for determining LOS on several types of facilities. These facilities are grouped into "interrupted-flow" and "uninterrupted-flow" facilities. Interrupted-flow facilities include city streets and surface highways (for example, State Route 123/San Pablo Avenue) that are part of the state highway system. Freeways are uninterrupted-flow facilities. For the purposes of LOS monitoring, the CMP network can be classified into three functional types of facilities: 1) freeways; 2) two-lane roadways; and 3) urban/suburban arterials.
1) Freeways	Freeways are uninterrupted-flow facilities, since traffic never stops (except during the most congested periods or when incidents occur). The 1991 CMP, in coordination with local jurisdictions, defined appropriate segments and performed the necessary "floating car" runs on the freeways to obtain travel speed data (refer to "Data Collection and Requirements" in this chapter for information on this data collection method). This allowed the establishment of a baseline LOS for the roadway network, including identification of segments operating at LOS F.
2) Two-Lane Roadways	Two-lane roadways are uninterrupted-flow facilities. The criteria for including principal arterials in the CMP network specify a minimum of four lanes; therefore, two-lane roadways are not included as principal arterials. However, since all state highways must be in the system, two-lane state highways located in the county are also included. These two-lane roads constitute a fairly small portion of the CMP network mileage. For two-lane roads without interruptions (signals or stop signs), the methodology in HCM Chapter 8 is used, based on average travel speed.
3) Urban and Suburban Arterials	Urban and suburban arterials are multilane streets that have traffic signals spaced no more than two miles apart on average. Urban and suburban arterials are characterized by platoon flows. Operational quality is controlled primarily by the efficiency of signal coordination and is affected by how individual signalized intersections operate along the arterial. LOS is primarily a function of travel speed along segments and is calculated from field data. Because the CMP legislation emphasizes systems-level planning, HCM Chapter 11 is used to estimate arterial LOS. Advantages include the need for relatively little input data, simple applied calculations, and the results of explicitly determined LOS (A, B, C, etc.).
Monitoring	Alameda CTC will conduct LOS monitoring. The state statute[24] requires Caltrans to monitor LOS on the freeway network, unless Alameda CTC designates that responsibility to another entity. Monitoring will be conducted biennially, recognizing that other surveys could be done for development impact studies (e.g., intersection turning movement counts). The data collection method is the floating car technique of recording travel times between checkpoints based on actual travel time during the peak period. Data from several runs in all non-high-occupancy vehicle lanes are averaged for each roadway segment. Alameda CTC is currently exploring the feasibiltiy of using commercially available traffic data for CMP purposes.
Interregional Trips	As defined by the statute, "interregional travel means any trip that originates from outside" Alameda County. A trip means a one-direction vehicle movement. The origin of any trip is the starting point of that trip. In accordance with the Metropolitan Transportation Commission (MTC) guidelines, trips with no trip end in Alameda County (through trips) are not subtracted for monitoring reports.

[24] California Government Code Section 65089.3.

Highway Capacity Manual (HCM) and LOS Standards

The Congestion Management Program legislation requires that the LOS monitoring on CMP roadways be measured by the most recent version of the HCM or by a uniform methodology adopted by the CMA consistent with the HCM. For LOS Monitoring and Deficiency Plan purposes, Alameda CTC uses speed-based LOS methods included in the HCM1985 to determine LOS for the CMP roadways, as shown in Table 5, (adopted in 1991 and updated in 2004).

To transition to using the most recent HCM for the purposes of LOS monitoring and Land Use Analysis Programs of the CMP, efforts were made in 2005 to use HCM2000 and in 2013 to use HCM2000 or HCM2010. Based on comparitive analyses of the various HCMs, the following observations are made:

- **Different methodologies would hinder conformity.** For freeways, the differences between the HCM1985 and the HCM2000 and HCM2010 methodologies were significant. Specifically, the basis for determining LOS has changed from speed-based LOS in HCM1985 to density-based LOS in HCM2000 and HCM2010. This eliminates the ability to track previous LOS trends, monitoring of existing deficiency plans, and consistency in determining deficiency; hence, this affects conformity.

- **Classification changes would affect conformity.** For arterials, the roadway classifications changed after the HCM1985. Classifications were added in the HCM2000, and later classifications were eliminated in the 2010HCM. Further, in the 2010HCM, free-flow speed, which is the basis for estimating LOS in all HCM versions, requires additional facility-specific data that is excessive for large-scale use such as LOS monitoring on the countywide CMP network.

Using the later HCM2000 and HCM2010 versions would result in applying density-based LOS methodology for freeways and changed classifications for arterials. This would not provide any benefits and would hinder conformity and the ability to compare past performance trends. Based on this analysis for the Tier 1 network, which is subject to conformity, Alameda CTC will continue to use speed-based LOS methodology and arterial classifications in the HCM1985 to monitor freeways and arterials. For the Tier 2 network, which has been only monitored for informational purposes since 2012 and therefore has no previous performance data available to compare, LOS will be reported using both HCM1985 and HCM2000 methodologies. The future use of the appropriate HCM for Tier 2 purposes will be re-evaluated in the 2015 CMP update.

As part of the 2013 CMP update, Alameda CTC identified LOS standards to monitor alternative modes in a comparable way to auto performance. Since the HCM2010 also included LOS standards for monitoring alternative modes, such as Multi Modal Level of Service (MMLOS), Alameda CTC evaluated MMLOS for monitoring performance of transit and bicycle and pedestrian modes. A summary of evaluation and comparison of using HCM1985, HCM2000, and HCM2010 for LOS monitoring purposes and recommendation, including comparison of approaches adopted by various large CMAs in the Bay Area, is provided in Appendix B. It was found that using the 2010HCM-based MMLOS is data and resource intensive and costly for large-scale applications such as monitoring countywide performance of the alternative modes; therefore, it is not suitable for LOS monitoring purposes. Alameda CTC will assess how to best include the performance measurement metrics for monitoring alternative modal performance in the 2015 CMP, based on the outcomes of the following countywide modal plans—Goods Movement Plan, Multimodal Arterial Corridor Plan, and Transit Plan.



Table 5—Relationship Between Average Travel Speed and LOS

Arterials			
Arterial Class	**I**	**II**	**III**
Range of Free Flow Speeds (mph)	35 to 45	30 to 35	25 to 35
Typical Free Flow Speed (mph)	40	33	27
Level of Service	**Average Travel Speed (mph)**		
A	≥ 35	≥ 30	≥ 25
B	≥ 28	≥ 24	≥ 19
C	≥ 22	≥ 18	≥ 13
D	≥ 17	≥ 14	≥ 9
E	≥ 13	≥ 10	≥ 7
F	< 13	< 10	< 7

Freeway			
LOS	**Average Travel Speed (mph)**	**Volume-To-Capacity Ratio**	**Maximum Traffic Volume (vehicles/hour/lane)**
A	≥ 60	0.35	700
B	≥ 55	0.58	1,000
C	≥ 49	0.75	1,500
D	≥ 41	0.90	1,800
E	≥ 30	1.00	2,000
F	< 30	Variable	-

Note: *Highway Capacity Manual*, Transportation Research Board, 1985.

Traffic Monitoring Program

Alameda CTC currently conducts LOS monitoring on the Alameda County CMP network as described in Chapter 2. The CMP route segments were determined for travel-time analysis, with input from the Alameda County Technical Advisory Committee (ACTAC) and appropriate local jurisdiction departments (traffic engineering, planning department, etc.). Data collection time periods were determined based on the general congested peak periods on most of the CMP roadway network.

Definition of Roadway Segments

Alameda CTC used the following guidelines to determine the segments:

- Segments should be at least one mile and not more than five miles in length; and
- Logical segment break-points include jurisdictional boundaries, points where the basic number of travel lanes change, locations where land use changes occur (e.g., commercial areas versus residential), and points where the posted speed

limit changes or where the number of adjacent driveways is significantly different.

Since the adoption of the CMP roadway segments in 1991, the intensity and location of congestion throughout the county has changed. In 2007, the CMP roadway segment lengths and criteria for designating the CMP roadway segments to develop new segments were updated to better reflect existing land use and travel patterns. Many long segments were found to be operating at better levels of service because speeds were averaged over the length of longer segments. Splitting these segments using the approved criteria revealed congestion hot spots and more accurately identified congested segments. Because the original check points were retained, all new segments nest within the pre-2007 roadway segments. This approach was important so that trends can be evaluated over time. Many of the shorter segments were located on I-580 in the Tri-valley area. During the 2009 CMP Update, SR 84 in East County was divided into shorter segments based on the same criteria. From a field and operating perspective, the CMP roadway segmentation criteria are still appropriate; therefore, no changes are recommended for this update.

Data Collection and Requirements

The traffic monitoring program requires information about average travel speed, which is the basis for measuring level of service on all facility types (i.e., freeways, two-lane highways, and urban/suburban arterials). For a given roadway segment, speed data must be collected and reported separately for each travel direction. Travel speed studies for this purpose are conducted using "floating cars" that drive at the posted speed collecting travel time data or, if constrained by traffic conditions, at the average speed of traffic. Starting in 2008, a Global Positioning System (GPS) was used to record travel time data in the "floating car" method. In view of the increased access to commercially available traffic data and its use in transportation planning and monitoring around the country and in the region, Alameda CTC is currently exploring the feasibility of using commercially available traffic data for CMP purposes, particularly related to LOS monitoring. If it is feasible, floating car runs will be done to augment commercially available data beginning in 2014. This should result in a time and cost savings for data collection.

For any floating car runs that are done, the following methodology should be used.

- Monitoring time periods are 4:00 p.m. to 6:00 p.m. during the p.m. peak hours and 7:00 a.m. to 9:00 a.m. during the a.m. peak hours. Generally, p.m. peak period monitoring is used for conformity purposes, with the exception of monitoring the Tier 2 network, where both morning and afternoon peak periods are monitored for informational purposes only. Monitoring during the a.m. peak period for all CMP roadways is for informational purposes only. Until 2004, LOS monitoring was conducted for all the CMP segments during the p.m. peak hours and for selected freeway CMP segments during the a.m. peak hours. Starting in 2006 all CMP roadway segments were monitored during both peak periods.

- The approach to ensure acceptable monitoring data is based on the Institute of Transportation Engineer's Manual of Transportation Engineering Studies for Test Car Method. Alameda CTC uses the following guidelines to determine the acceptability of data for use in the CMP:

- A test car is driven six times in each direction on the entire CMP network. This frequency may be adjusted later for roadway segments found to consistently perform at LOS A or B. More than six test car runs are performed on roadway segments operating at LOS E or F, because a greater range or fluctuation in data typically occurs.

- Test car runs must be made on a Tuesday, Wednesday, and/or Thursday, because these days are most indicative of average weekday conditions.

- Test car runs on a particular segment must span a range of days and time of day. This means that

test car runs should not be bunched on the same day of the week or taken on separate days at the same time.

- Runs near holidays, when school is not in session, or when roadway construction is under way, must be avoided.
- Consistent monitoring periods must be observed for each roadway segment. For example, a comparison between April 2010 and April 2011 is likely to be more valid than a comparison between January 2010 and August 2011.
- If special generators are located within a few miles of the monitoring location, it must be determined whether unusual or unwanted activity levels are occurring at the special generators. A call to a shopping center management company, for example, could be made to ascertain that the test days were reasonably close to average, and that no retailers were holding major sales.

Self-Certification Process

By June 15 of each year, a set of travel time runs are to be submitted to Alameda CTC for the CMP network. A city or the county, if it assumes responsibility, would submit the information, except for the freeways, within its jurisdictional limits. If Caltrans assumes responsibility for the freeways, it would similarly submit summary data to Alameda CTC by June 15. Local jurisdictions or Caltrans will also be responsible for calculating LOS according to the HCM1985 methodology. Local agencies or Caltrans will keep raw field data available for Alameda CTC to examine for at least 3 years. Travel time runs will be completed by mid-May each year. ACTAC will provide technical guidance and assistance in reviewing methodology and interpreting LOS monitoring results.

Grandfathered LOS F Roadway Segments

CMP legislation exempts congested CMP roadway segments that did not meet the minimum LOS standards (LOS E) when the CMP network was formed (in 1991 and 1992) from deficiency identification and preparing a deficiency plan. These grandfathered segments were identified based on the LOS monitoring performed in 1991 for the CMP roadway segments and in 1992 for the CMP freeway-to-freeway connectors during the p.m. peak period, which is used for conformity. According to the study results, a total of 15 freeway segments (excluding freeway to freeway connectors) and 15 arterial segments were operating at LOS F in 1991 and five freeway-to-freeway connectors were operating at LOS F in 1992. Tables 6, 7, 8, and Figure 8 show the grandfathered CMP segments including the freeway-to-freeway connectors.

Although these segments are grandfathered by statute, they are not exempt from analysis and mitigation for purpose of satisfying the "Land Use Analysis Program" (Chapter 6), the California Environmental Quality Act (CEQA), and the federal National Environmental Protection Act. The CMP focuses on existing congestion; therefore, Alameda CTC will consider strategies and/or improvements to address grandfathered segments in corridor studies as well as the Countywide Transportation Plan and the CMP Capital Improvement Program.



Table 6—LOS F Freeways for Alameda County CMP-Designated Roadway Network

	Roadway		Limits	Jurisdiction	Average Speed (mph)
1	I-80	WB	From University to I-80/I-580 Split	Berkeley/Emeryville	16.6
2	I-80	WB	From I-80/I-580 Split to Bay Bridge Toll Plaza	Oakland	29.7
3	I-80	EB	From I-580/I-80 Split to University	Emeryville/Berkeley	25.8
4	I-80	EB	From University to Central	Berkeley/Albany	25.8
5	SR-24	EB	From I-580 to Fish Ranch Road	Oakland	28.5
6	I-580	SB	From I-80/I-580 to I-980/Hwy 24	Oakland	25.6
7	I-980	EB	From I-880 to SR-24/I-580	Oakland	28.5
8	I-238	EB	From I-880 to I-580	County/San Leandro	29.8
9	I-880	SB	From Hegenberger to Washington	San Leandro/Oakland	29.2
10	I-880	SB	From Washington to A Street	County/Hayward	24.3
11	I-880	NB	From Tennyson to SR-92 (Jackson)	Hayward	18.2
12	I-880	NB	From SR-92 to Lewelling	Hayward	23.2
13	I-880	NB	From Dixon Landing to SR-262/Mission	Fremont	29.3
14	SR-92	WB	From Clawiter to Toll Gate	Hayward/County	27.1
15	SR-92	EB	From Toll Gate to I-880	Hayward/County	27.5

Note: Data is based on surveys taken during the afternoon peak period in September/October, 1992.

Table 7—LOS F Freeway-to-Freeway Connectors, Alameda County CMP-Designated Roadway Network

	Freeway-to-Freeway Connectors	Jurisdiction	Length (miles)	Average Speed	Free Flow Speed
1	I-80 SB to I-580 EB[25]	Oakland	0.30	18.7	45.0
2	I-580 WB to I-80 NB[25]	Oakland	0.21	16.0	45.0
3	I-680 SB to I-580 EB	Pleasanton	0.67	16.3	35.0
4	SR-13 NB to SR-24 EB	Oakland	0.35	14.4	45.0
5	I-580 WB; SR-24 WB to I-80 NB	Oakland	0.69	22.1	45.0

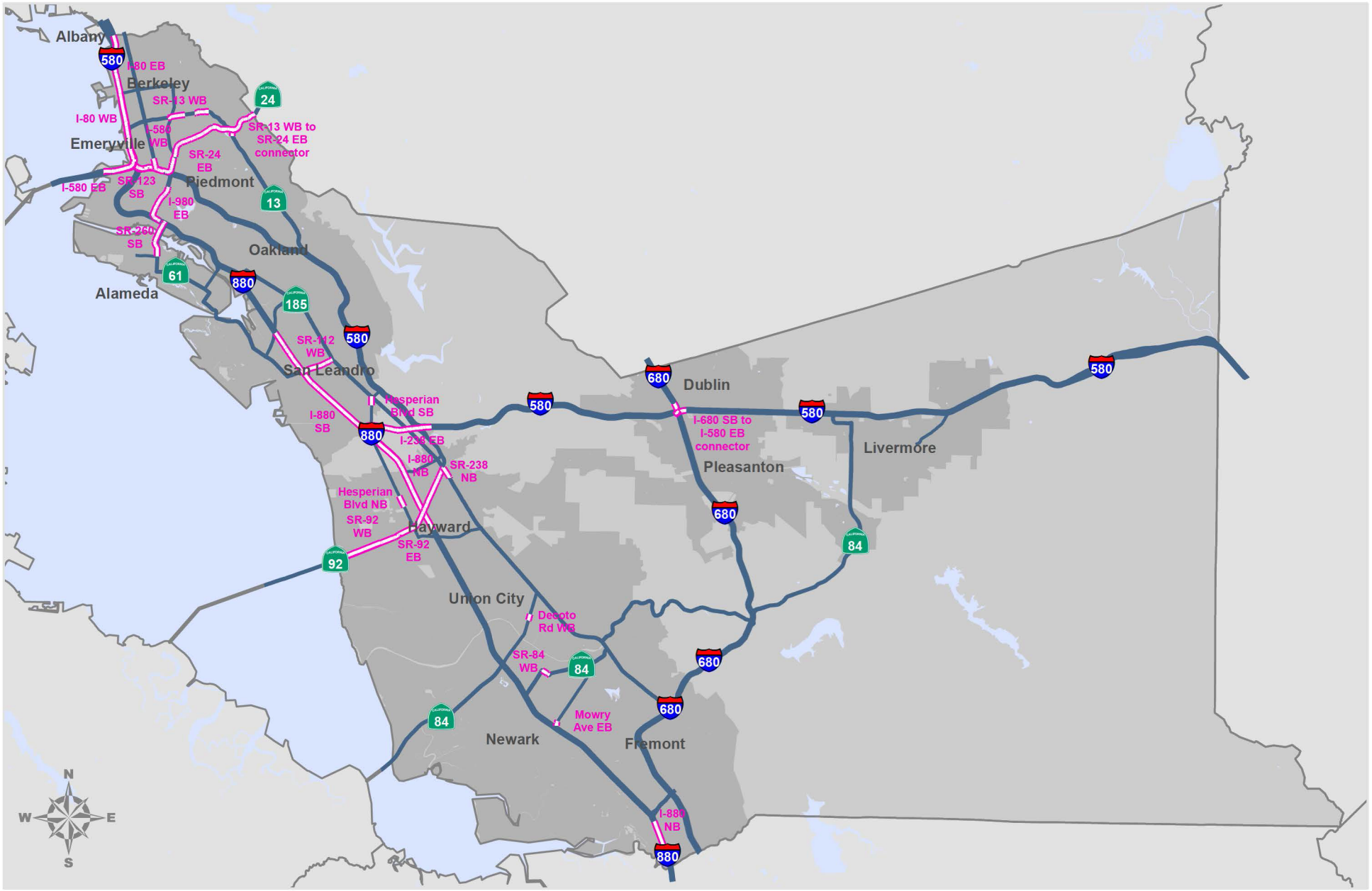
Note: Data is based on surveys taken during the afternoon peak period in September/October, 1992.

[25] LOS condition was first reported during the 1991 surveys.

Table 8—LOS F Arterial Segments, Alameda County CMP-Designated Roadway Network

	Roadway		Limits	Jurisdiction	Arterial Class	Average Speed (mph)
1	SR-13 (Ashby Avenue)	WB	From Telegraph Avenue to Shattuck Avenue	Berkeley	III	8.7
2	SR-13 (Ashby Avenue)	WB	From Shattuck Avenue to MLK, Jr. Way	Berkeley	III	9.3
3	SR-13 (Ashby Avenue)	EB	From College Avenue to Domingo Avenue	Berkeley	III	6.8
4	SR-123 (San Pablo Avenue)	SB	From Park Avenue to 35th Street	Emeryville/Oakland	II	9.4
5	SR-260	SB	From 7th/Webster Street to Atlantic Street	Oakland/Alameda	I	12.3
6	SR-238 (Mission Boulevard)	NB	From Sycamore Street to Jackson Street	Hayward	II	8.8
7	SR-92 (Jackson Street)	EB	From I-880 to Winton Avenue	Hayward	II	8.6
8	SR-92 (Jackson Street)	EB	From Winton Avenue to Mission Boulevard	Hayward	II	4.5
9	Hesperian Boulevard	NB	From La Playa to Winton Avenue	Hayward	I	11.1
10	Hesperian Boulevard	SB	From 14th Street to Fairmont Drive	San Leandro	II	9.9
11	Hesperian Boulevard	SB	From Spring Lake to Lewelling Boulevard	Unincorporated	II	9.6
12	SR-112 (Davis Street)	WB	From I-880 to San Leandro Boulevard	San Leandro	II	5.2
13	Decoto Road	WB	From Union Square to Alvarado-Niles Road	Union City	II	8.6
14	SR-84 (Fremont Boulevard)	WB	From Peralta Boulevard to Thornton Avenue	Fremont	II	7.2
15	Mowry Avenue	EB	From I-880 to Farwell Drive	Fremont	II	9.6

Note: Based on surveys during the afternoon peak period (4 p.m. to 6 p.m.) in July-August and October, 1991.



ALAMEDA County Transportation Commission

Figure 8: Congestion Management Program Roadway Network

Legend

- Level of Service "F" Segments
- Interstate/Freeway (CMP - Tier 1 & MTS)
- Other State Highway (CMP - Tier 1 & MTS)
- Principal Arterial (CMP - Tier 1 & MTS)

NB Northbound
WB Westbound
SB Southbound
EB Eastbound

Comparison with Previous LOS Results

The results of LOS monitoring over the last two decades for the key commute corridors in Alameda County appear in Table 9, which shows overall traffic conditions and comparisons of trends for long-distance trips on the CMP freeway network. The 2012 LOS Monitoring Study reported that congestion on the CMP network increased in 2012 as compared to 2010, as shown in the increased number of LOS F segments from 2010 and decreased average speed on freeways and arterials. Some areas that showed improvements appear to be related to the improvement projects completed since 2010 after the LOS monitoring was complete.

Alameda CTC concluded that the congestion increase could be likely due to the economy that is beginning to show improvement, combined with many construction activities occurring across the county.

Analysis of performance trends since 1991 shows that congestion on the Alameda County CMP network is stable, while vehicle miles traveled has increased. Further, as employment increases, freeway speed decreases, resulting in a corresponding increase in congestion. More details are available in the 2012 LOS Monitoring Study on the Alameda CTC website.

Table 9—LOS Trends on the CMP Network (afternoon peak period)

				Year/Miles Per Hour													
Road		Limits	mi.	08/ 91	10/ 91	92	94	96	98	00	02	04	06	08	10	12
I-80	EB	Bay Bridge Toll Plaza to Contra Costa line	6	-	23	20	22	21	20	27	19	32	23	21	29	22
I-80	WB	Contra Costa line to Bay Bridge Toll Plaza	6	26	25	24	23	25	28	18	22	28	28	36	27	26
I-580	EB	I-238 to I-205	31	-	56	55	55	55	na	41	31	34	36	35	31	40
I-580	WB	I-205 to I-238	31	-	57	56	57	61	na	55	55	60	58	61	66	65
I-580	EB	I-80 to I-238	16	-	53	52	44	53	60	63	55	43	34	47	42	41
I-580	WB	I-238 to I-80	16	-	58	55	51	52	61	63	60	57	55	63	60	54
I-680	NB	Scott Creek Road to Alcosta Boulevard	21	-	58	57	57	52	51	58	51	42	53	43	40	42
I-680	SB	Alcosta Boulevard to Scott Creek Road	21	-	59	58	55	61	67	63	62	66	58	63	66	66
I-880	NB	Dixon Landing Road to I-980	30	42	45	44	43	46	38	48	38	49	45	43	42	42
I-880	SB	I-980 to Dixon Landing Road	30	47	43	40	38	46	50	49	41	37	37	48	46	48
SR-13	NB	Mountain Boulevard to Hiller Drive	6	51	54	50	49	48	53	51	50	35	39	51	41	35
SR-13	SB	Hiller Drive to Mountain Boulevard	6	57	56	59	53	47	59	59	55	54	57	49	39	57
SR-24	EB	I-580 to Fish Ranch Road	5	29	30	29	30	24	39	33	21	40	25	24	18	17
SR-24	WB	Fish Ranch Road to I-580	5	53	54	58	54	50	60	57	61	59	59	58	67	66

Infill Opportunity Zones

Senate Bill 1636 (Figueroa), signed by the Governor in 2002, established "infill opportunity zones" (IOZs) to encourage transit supportive and infill developments. The statute exempted infill opportunity zones from the requirements to maintain the LOS E. None of the local jurisdictions within Alameda County established or adopted infill opportunity zones by the statute's sunset period of December 2009. However, Senate Bill 743 (SB 743), passed in September 2013, instituted key changes to the CMP statute that will support infill development, including lifting the sunset date on designating IOZs and directing the governor's Office of Planning and Research to develop new metrics for assessment of transportation impacts to replace the LOS measure. Alameda CTC will closely follow implementation of and provide input on this law. The 2015 CMP update will incorporate the outcome of implementation of SB 743 and how it impacts the CMP LOS Monitoring element. Chapter 6, "Land Use Analysis Program," provides more information on Alameda CTC's efforts in supporting infill development.

Local Government Responsibilities and Conformance

Alameda CTC is responsible for monitoring conformance of local jurisdictions with the adopted CMP.[26] Among the requirements, Alameda CTC must monitor compliance with the LOS standards. If a roadway segment does not conform to the LOS standards based on the biennial monitoring, Alameda CTC will notify the affected local jurisdiction that may elect to remedy the LOS problem or prepare a deficiency plan (see Chapter 10). If after 90 days the local jurisdiction is still in non-conformance, Alameda CTC is required to follow the conformance process as identified in Chapter 9, "Program Conformance and Monitoring." When a deficiency plan is adopted, status reports on the implementation of the deficiency plan showing progress must be submitted to the Alameda CTC annually as part of the annual conformity process.

The detailed process for finding of non-conformance and resulting withholding of Proposition 111 funds is described in Chapter 9.

Next Steps

- Continue to use speed-based HCM1985 for auto LOS monitoring for Tier 1 network. Apply both HCM2000 and HCM1985 to Tier 2 network as appropriate and re-evaluate expanded HCM use in the 2015 CMP update.
- Use countywide modal studies to identify countywide facilities and metrics for monitoring alternative modes, and incorporate these in the 2015 CMP for future LOS monitoring efforts.
- Closely follow and participate in the implementation of SB 743 including development of the replacement measure to assess the impact on the transportation system within and outside the infill development areas and identify impact to the CMP LOS monitoring element and update it in the 2015 CMP.
- Based on the validation efforts for the commercially available travel time database, identify the CMP roadways that will use the commercially available travel time data and the remaining CMP roads that will continue to use the floating care runs for LOS monitoring purposes, and apply this approach in the 2014 LOS Monitoring Study.

[26] California Government Code Section 65089.3.

Multimodal Performance Element 4



State law requires CMAs to evaluate how well their transportation systems do in meeting their CMP objectives of reducing congestion and improving air quality.[27] Specifically, the CMP must contain performance measures that evaluate how highways and roads function, as well as the frequency, routing, and coordination of transit services. The performance measures should support mobility, air quality, land use, and economic objectives and be used in various components of the CMP.

Combined with LOS standards, the performance element provides a basis for evaluating whether the transportation network is achieving the broad mobility goals in the CMP. These include developing the Capital Improvement Program, analyzing land use impacts, and preparing deficiency plans to address problems. The legislation intends for the performance element to include multimodal performance measures, in addition to the required roadway and transit measures. However, only the roadway LOS standards will be used to trigger the need for a deficiency plan in Alameda County.

The guiding principles used to develop the multimodal performance element for the Alameda County CMP are:

- Keep it simple and manageable;
- Be cost-effective, relying on available data and established monitoring processes;
- Use the Alameda CTC's long-range transportation goals and MTC's multimodal programming criteria as a philosophical framework;
- Use measures presented in easy-to-understand and consumer-oriented terms;
- Consider an array of measures since one measure will not serve all needs; and
- Satisfy California Assembly Bill 1963 (Katz) that defined the performance element of the CMP as in Government Code Section 65089(b)(2), and Federal Transportation Act requirements.

Relationship to the Countywide Transportation Plan

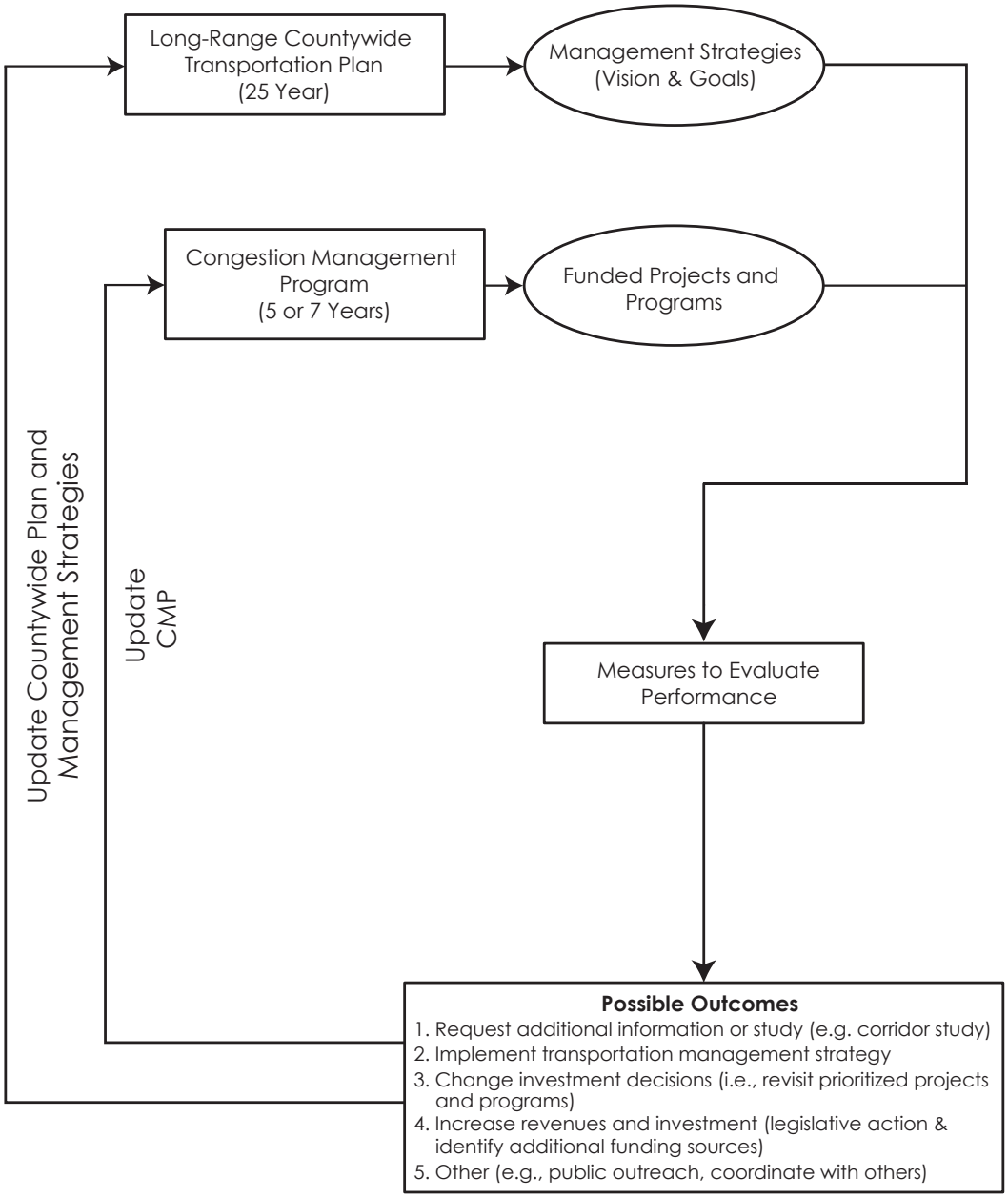
The philosophical framework envisioned for the performance element is to relate performance measures to the:

- Goals and management strategies adopted for the 2012 Countywide Transportation Plan (CWTP); and
- Policies set forth in the CMP.

[27] California Government Code Section 65089(b)(2).

Figure 9 shows how the performance measures are used in the CMP. Additionally, Figure ES1 in the Executive Summary shows how the performance element fits in the CMP and CWTP. Figure 9 presents the details of all the performance measures and their relationship to the long-range planning goals, adopted by Alameda CTC and MTC. Measuring the transportation network's performance will provide feedback on the effectiveness of management strategies and investment decisions.

Figure 9—How Performance Measures Are Used in the CMP



Performance Measures

The performance measures listed in Table 10, which follows, include the performance measures that Alameda CTC adopted for the 2012 CWTP. Alameda CTC monitors these with data collection or by using the countywide model. Additional details for the legislatively required transit performance measures—frequency, routing, and service coordination appear in a separate section of this chapter. The measures encompass all modes of transportation. Peak and off-peak travel periods are considered for typical weekdays. Measurements of current conditions rely primarily on available data and established data-collection processes.

The countywide travel model can forecast the following performance measures:

- Person trips by mode
- Vehicle volume by roadway segment
- Vehicle miles traveled by facility type
- Volume-to-capacity (v/c) ratios by facility type
- Vehicle hours of travel by facility type
- Lane miles by v/c ratio
- Person miles traveled by mode
- Passenger boarding by operator or line
- Travel time by mode
- Travel speed by mode
- Vehicle hours of delay by facility type
- Duration of congestion by facility
- Time spent in congestion
- Transit accessibility
- CO_2 emissions
- Fine particulate matter emissions

[28] MTS prior to 2005.

Acceptability of Data

An adopted approach to ensure that data collection methods are acceptable to Alameda CTC is described in "Data Collection and Requirements" in Chapter 3, "Level of Service Standards." This applies to speed and travel time data. An ongoing process will be necessary to review definitions and methods to ensure that the information is collected in a consistent manner prior to use in trend analyses.

System Definition

While the statute clearly requires designation of a CMP-network for purposes of LOS monitoring, it provides no guidance for selecting a system for the performance element. Alameda CTC will use the Metropolitan Transportation System (MTS) for the performance element. Alameda CTC also recognizes the MTS[28] in the Land Use Analysis Program as the focus of transportation analyses.

Description of Multimodal Performance Measures

Alameda CTC uses the following nineteen multimodal performance measures to monitor performance throughout the Alameda County transportation network.

- **Trips by alternative modes:** Measured in terms of percent of all trips made by alternative modes (bicycling, walking, or transit).
  Source: Countywide travel demand model.
- **Low-income households near activity centers:** Measured in terms of ratio or share of households by income group within a given travel time to activity centers. This measure is defined as being within a 30-minute bus/rail transit ride and a 20-minute auto ride of at least one major employment center, and within walking distance of schools.
  Source: Countywide travel demand model.
- **Low-income households near transit:** Measured in terms of ratio or share of households by income group near frequent bus/rail transit service. This measure is defined as being within one-half mile of rail and one-quarter mile of bus service operating

at LOS B or better during peak hours. Source: Countywide travel demand model.

- **Average highway speeds:** Measured in terms of the average travel speed of vehicles over specified segments in each lane during peak periods. This measurement is made a sufficient number of times to produce statistically significant results by the county measured using the countywide travel demand model or floating car data. Alameda CTC is exploring the use of commercially available travel-time data for this purpose. Based on the outcome, the data source and collection methodology will be updated in the 2015 CMP.
- **Travel time:** Measured in four parts to cover all modes as described below:
  - Average per-trip travel time for automobile, truck, and bus/rail transit modes. This measure also serves as a proxy for economic vitality;
  - Ratio of peak to off-peak travel time for automobile, truck, and transit modes;
  - Average daily travel time for bicycle and pedestrian trips; and
  - Average roadway travel time and transit time between origin and destination (O-D) pairs for up to 10 pairs using floating car data, which reflect major corridors in Alameda County.

With the exception of the data for travel time between the O-D pairs all other measures are estimated using the countywide travel demand model.

- **Duration of traffic congestion:** As defined by Caltrans, the period of time during either the a.m. or p.m. peak when a segment of roadway is congested (average speed is less than 35 m.p.h. for 15 minutes or more). Data are collected by Caltrans or MTC. Prior to 2009, highway congestion data were reported annually based on floating car runs conducted in April/May and September/October each year. Since 2009, Caltrans has reported this data on its website using the Freeway Performance Monitoring System (PeMS) database, based on loop detector data. If Alameda CTC transitions to using commercially available travel-time data in the future for the LOS monitoring, similar congestion information for the entire CMP network could be reported.
- **Roadway maintenance:** As defined by MTC, based on the roadway Pavement Condition Index (PCI) used in MTC's Pavement Management System. The PCI is a measure of surface deterioration on streets and roads.
- **Roadway collisions:** Measured in two parts to cover auto and bicycle/pedestrian modes as described below:
  - The number of accidents per one million miles of vehicle travel; and
  - Total injuries and fatalities from all pedestrian and bicyclist collisions on Alameda County roadways.

Caltrans collects the data as a part of the Statewide Integrated Traffic Record System (SWITRS)/Traffic Accident Surveillance and Analysis System (TASAS).

- **CO_2 emissions:** Measured in terms of per-capita CO_2 emissions from cars and light duty trucks. Source: Countywide travel demand model.
- **Fine particulate emissions:** Measured in terms of fine particulate emissions from cars and light duty trucks. Source: Countywide travel demand model.
- **Percent of Countywide Bicycle Plan completed:** Measured in terms of the number of miles and the percentage completed of the countywide bicycle plan network. Focus is on the progress of the priority projects and programs included in the Countywide Bicycle Plan. Additional performance measures are included in the Countywide Bicycle Plan to track progress on its implementation, which may be considered for future updates of the CMP.

Table 10—Multimodal Performance Measures

Performance Measure	RTP Goal	CWTP Goal	Objectives in Statute	Required Data	How Results Can Be Used	Notes on Data Use
Trips by Alternative Modes[29]	Climate Protection; Equitable Access; Healthy and Safe Communities	Multimodal	Mobility Air Quality Land Use	Percent of all trips by alternative modes from countywide travel demand model	Analyzing and comparing alternatives or as an evaluation of the effectiveness of the CWTP.	Forecasted data using the countywide model.
Low-income Households Near Activity Centers[29]	Healthy and Safe Communities; Equitable Access; Economic Vitality	Accessible, Affordable, and Equitable	Land Use Economic	Share of households by income group within a given travel time (30-min by bus/rail and 20-min by auto) of at least one major employment center and within walking distance of schools	Analyzing and comparing alternatives or as an evaluation of the effectiveness of the CWTP.	Forecasted data using a countywide model, which uses land use and socio-economic information adopted by ABAG/MTC.
Low-income Households Near Transit[29]	Healthy and Safe Communities; Equitable Access; Economic Vitality	Accessible, Affordable, and Equitable	Land Use Economic Mobility	Share of households by income group near frequent bus/rail transit service	Analyzing and comparing alternatives or as an evaluation of the effectiveness of the CWTP.	Forecasted data using a countywide model, which uses land use and socio-economic information adopted by ABAG/MTC.
Average Highway Speeds	Climate Protection; Transportation System Effectiveness	Connected, Reliable, and Efficient	Mobility Air Quality	Average speeds on CMP network	LOS determinations; trigger Deficiency Plans; evaluating direct effectiveness of projects in relieving congestion.	Adequate for determining CMP conformance; caution use as a measure of mobility.
Travel Time[29] Transit, Highways, HOV Lanes	Climate Protection; Transportation System Effectiveness	Multimodal, Connected, Reliable, and Efficient; Integrated with Land Use; Clean & Healthy Environment	Mobility Air Quality Land Use	Average per-trip travel time for automobile, truck, and bus/rail transit modes; ratio of peak to off-peak travel time for automobile, truck and transit modes; average daily travel time for bicycle and pedestrian trips; average travel time between selected O-D pairs (obtain data and transit schedules from biennial LOS monitoring)	Useful in analyzing trends for various modes, comparing alternatives or as an evaluation of the effectiveness of the CWTP. Problems can be spotted for targeted investment. Can compare travel times via roadway and transit along major corridors.	All data other than O-D pairs data are from the countywide model. Also, the model is not calibrated for bicycle and pedestrian trips. For O-D data, reliance on data collected on a few days each year is not always representative of conditions throughout the year.
Duration of Traffic Congestion	Climate Protection; Transportation System Effectiveness; Economic Vitality	Reliable and Efficient; Clean and Healthy Environment	Economic Air Quality	Hours of congestion at key locations	Could be used as trigger for certain traffic management strategies to contain congestion to normal peak periods to maintain smooth truck travel during mid-day.	Caution against congestion data based on PeMS, as PeMS data sometimes include not actual but interpolated data if any count tubes are not functioning.
Roadway Maintenance	Economic Vitality	Well Maintained, Reliable, and Efficient, Safe	Economic	MTC's Pavement Condition Index	Dollar amount of maintenance backlog for MTS roadways. Useful in guiding investment decisions for roadway maintenance needs.	Reliability dependent on subjective assumptions made by local agency staff. Assumptions can change depending on staff person conducting the estimate.
Roadway Collisions[29]	Healthy and Safe Communities	Safe, Clean and Healthy Environment	Mobility Air Quality	Number of accidents/one million miles; total injuries and fatalities from all pedestrian and bicyclists collisions in the county from SWITRS/TASAS	Identify safety issues. Useful in guiding investment decisions.	Data not available for local streets/roads. Accidents may not be caused by physical facilities.
CO_2 Emissions[29]	Climate Protection; Healthy and Safe Communities; Economic Vitality	Clean and Healthy Environment	Air Quality Economic	Per capita CO_2 emissions from cars and light-duty trucks	Analyzing and comparing alternatives to address climate change.	VMT data from the countywide model is used to input into an estimator based on a tool from the California Air Resources Board.
Fine Particulate Emissions[29]	Climate Protection; Healthy and Safe Communities; Economic Vitality	Clean and Healthy Environment	Air Quality Economic	Per capita fine particulate emissions from cars and light-duty trucks	Analyzing and comparing alternatives to address air quality.	VMT data from the countywide model is used to input into an estimator based on a tool from California Air Resources Board.
Completion of Countywide Bicycle Plan	Climate Protection; Equitable Access; Healthy and Safe Communities	Multimodal, Reliable, and Efficient; Clean and Healthy Environment	Mobility Air Quality	Miles and percent completion of bicycle network	Progress toward a connective system of countywide bicycleways.	Does not reflect actual use of bicycle facilities.
Completion of Countywide Pedestrian Plan[29]	Climate Protection; Equitable Access; Healthy and Safe Communities	Multimodal, Reliable, and Efficient; Clean and Healthy Environment	Mobility Air Quality	Number of jurisdictions with adopted Pedestrian Plan	Progress toward a connective system of countywide pedestrian facilities.	Does not reflect actual use of pedestrian facilities.

[29] Denotes new or expanded existing performance measure resulting from integrating the measures from the 2012 CWTP. Extent of data collection for these measures depends on additional funds being available.

Table 10—Multimodal Performance Measures (continued)

Performance Measure	RTP Goal	CWTP Goal	Objectives in Statute	Required Data	How Results Can Be Used	Notes on Data Use
Transit Routing	Climate Protection; Equitable Access; Healthy and Safe Communities; Transportation System Efficiency	Multimodal, Connectivity, Cost-Effective; Reliable and Efficient; Integrated with Land Use; Clean and Healthy Environment	Mobility Air Quality Land Use	Service area covered and pattern of the transit route network	To determine area coverage and proximity of transit service to residential areas and job centers.	Proximity to transit stops or stations is an important indicator of accessibility; however, the data is difficult to collect.
Transit Service Frequency	Climate Protection; Equitable Access; Healthy and Safe Communities; Transportation System Efficiency	Multimodal, Connectivity, Cost-Effective; Reliable and Efficient; Integrated with Land Use; Clean and Healthy Environment	Mobility Air Quality Land Use	Number of lines operating at each frequency level	To determine convenience of transit service.	Caution against using for transit trip planning.
Transit Service Coordination	Climate Protection; Equitable Access; Healthy and Safe Communities; Transportation System Efficiency	Multimodal, Connectivity, Cost-Effective; Reliable and Efficient; Integrated with Land Use; Clean and Healthy Environment	Mobility Air Quality	Coordination of service provided by different operators (e.g., timed transfers at transit centers, joint fare cards)	To determine reliability and convenience for travelers connecting between services.	Caution against using for transit trip planning.
Transit Ridership	Climate Protection; Equitable Access; Healthy and Safe Communities; Transportation System Efficiency	Multimodal, Connectivity, Cost-Effective; Reliable and Efficient; Integrated with Land Use; Clean and Healthy Environment	Economic Air Quality Land Use	Number of patrons	Trend analysis; comparison between operators.	Caution against using exclusively used to estimate the need for increase or decrease in transit investment.
Transit Vehicle Maintenance	Climate Protection; Healthy and Safe Communities	Cost-Effective, Reliable, and Efficient; Connected; Safe, Clean, and Healthy Environment	Air Quality	Mean time between service delays (BART) and miles between mechanical road calls (AC, LAVTA, Union City Transit)	Trend analysis; comparison between operators. Transit agencies have internal standards for comparison and investment allocation decisions.	
Transit Availability	Climate Protection; Equitable Access; Healthy and Safe Communities	Cost-Effective, Reliable, and Efficient; Connected; Integrated with Land Use; Clean and Healthy Environment	Mobility Air Quality Land Use	Transit service frequency during peak periods near all transit stations in county, and population density at these stations	Determine mobility options available to Alameda County residents over time. Track as a means of measuring efforts toward meeting climate change legislation.	Even with available transit options, this does not include the percentage of residents and employees who use transit. Population is based on census tract information, which is an approximation, not an exact correlation within one-half mile radius of stations.
Transit Capital Needs and Shortfall	Climate Protection; Equitable Access	Reliable and Efficient; Connected; Clean and Healthy Environment	Mobility Air Quality	Transit capital needs and shortfall for high-priority (Score 16) projects	Use transit capital needs gap to determine funding needs and investment options.	Measured every four years with the Regional Transportation Plan.
Community Based Transportation Plans	Healthy and Safe Communities; Equitable Access; Climate Protection	Cost-Effective, Reliable, and Efficient; Connected; Integrated with Land Use; Clean and Healthy Environment	Mobility Air Quality Land Use	CBTP Project Implementation Status (funded by Lifeline Transportation Program)	Track progress of projects included in CBTP.	

- **Extent of Countywide Pedestrian Plan completed:** Measured in terms of how many local jurisdictions have adopted pedestrian master plans, with a goal of all fifteen jurisdictions having current, adopted pedestrian plans. Similar to the Countywide Bicycle Plan, additional performance measures are included in the 2012 Countywide Pedestrian Plan to track progress on its implementation, which may be considered for future CMP updates.

- **Transit routing:** Refers to both the pattern of the transit route network (e.g., radial, grid, etc.) and the service area covered (e.g., percent of total population served within one-quarter mile of a station/bus stop or percent of total county served, etc.). Measurement of routing performance may be applied at the corridor or screenline level to allow users flexibility in locating service routes. Data is provided by transit operators.

- **Transit service frequency:** Refers to the headway, or the time between transit vehicle arrivals (e.g., one bus arrival every 15 minutes). Service should be frequent enough to encourage ridership but must also consider the amount of transit ridership the corridor (or transit line) is likely to generate. This measure also considers the capacity of the existing transit service in that corridor.

- **Transit service coordination:** Refers to coordination of transit service provided by different operators (e.g., timed transfers at transit centers, joint fare cards, etc.). Performance should be aimed at minimizing inconvenience to both the infrequent and frequent user. Information provided by transit agencies should address these questions:
  - Is there a coordination?
  - How convenient is it?
- **Transit ridership:** Measured in two parts as described below:
  - The average daily number of passengers boarding or de-boarding transit vehicles in Alameda County; and
  - Transit ridership per revenue hour of service. Source: Based on the input from transit operators.
- **Transit vehicle maintenance:** Measured in terms of "Miles between Mechanical Road Calls," and defined as the removal of a bus from revenue service due to mechanical failure and applied to AC Transit, Union City Transit (UC Transit) and the Livermore-Amador Valley Transit Authority (LAVTA). BART and Altamont Commuter Express (ACE) have a related term known as "Mean Time between Service Delays" where delays can be caused by personnel or by mechanical failures. Source: Based on the input from transit operators.

- **Transit availability:** Measured by the frequency of transit service during the morning peak period within one-half mile of rail stations or bus and ferry stops and terminals. Population density at the same stations is also measured to track availability of transit to Alameda County residents. The transit frequency portion of this measure is monitored annually based on input from transit operators.

- **Transit capital needs and shortfall:** Measured every four years, coinciding with the update of the Regional Transportation Plan. This is tracked for high priority (Score 16) transit projects for Alameda County transit operators.

- **Community Based Transportation Plans:** Projects identified in Community Based Transportation Plans (CBTPs) and funded through the Lifeline Transportation Program are monitored annually. Monitoring shows the status and progress of these projects, which meet transportation needs in low-income communities as identified in CBTPs. Project implementation progress is included as a performance measure.

Transit Service Performance Measures

The following transit service performance measures are legislatively required measures, and detailed

information for these measures are provided by the transit operators in the county based on their service standards as expressed in their short-range transit plans or other policy documents.

Table 11 shows performance measures for bus and rail transit in Alameda County. These measures apply to both existing services and future year (proposed) services.

For ferry services from Alameda and Oakland to San Francisco, the frequency measure is one vessel per hour during the a.m. and p.m. peak periods.

Routing

Performance measures for routing and area coverage vary by transit operator.

AC Transit has guidelines for route spacing. In the densest areas, with a population of more than 20,000 people per square mile, routes should be only one-quarter mile apart. In medium-density areas with 10,000-20,000 people per square mile, such as many of the grid sections of Oakland and Berkeley, routes should be between one-quarter and one-half mile apart. In low-density areas with 5,000-10,000 people per square mile, typical of sections in Castro Valley, Hayward, and Fremont, route spacing should be between one-half and three-quarters of a mile. For very low-density areas with less than 5,000 people per square mile, route spacing can one mile or more.

In making specific route decisions, AC Transit uses these guidelines but also bases current- and future-year bus route spacing (the average distance between bus lines) on residential densities, the location of major activity centers, topography, and street patterns. Route spacing in commercial areas is determined by location, level of activity, and layout of the development, on a case-by-case basis.

BART passenger loads are measured at selected "screenlines"—imaginary lines between two stations. Generally, screenlines are chosen at the points where

Table 11—Performance Measures for Frequency of Transit Service (Time of Day)

Service Type	Peak	Midday	Night	Owl	Sat/Sun/Holiday
	(minutes between services)				
Bus					
Primary Trunk	15	15	30	60	15
Major Corridor	15	30	30	N/A	30
Local/Crosstown	30	30	60	30-60	60
Suburban Local/Crosstown	30-45	60	N/A	N/A	N/A
Transbay Basic	15	30	60	N/A	60
Transbay Express	15-30	N/A	N/A	N/A	N/A
Rail					
BART	3.75-15	up to 20 (off-peak)[30]			
Ferries	60	varies	N/A	N/A	varies

Note: Overlapping bus routes provide more frequent service on some corridors.

[30] As of September 2009, Saturday daytime service is via five routes with up to 15-minute headways and all other off-peak times (week night/weekend night/Sunday) service is via three routes with 20-minute headways. The off-peak service includes service between San Francisco International Airport and Millbrae.

maximum loads in a given direction are sustained for a significant duration—often on the edge of a central business district.

Based on its experience, BART employs the following average loading goals, which it attempts to achieve whenever possible. Identical goals and standards are applied to all lines.

- **Peak hour:** 107 passengers per car
- **Shoulder two hours of peak period:** 90 passengers per car
- **Off-peak periods:** One passenger per seat (currently 60 per car)

BART aims for a maximum peak-hour average car load of 107 passengers per car at critical screenlines in the system such as through the Transbay Tube (West Oakland/Embarcadero). In future years, headways and train lengths will be adjusted in a manner that strives to equalize passenger loading levels across all of its lines, while staying under the 107 passengers per car standard.

LAVTA proposes the following performance measures for existing and future services:

- Expand routes and services to meet current and future demand for timely and reliable transit service;
- Provide service with a time span sufficient to effectively serve the primary target markets for each route:
  - 4:00 a.m.-1:00 a.m. or 24 hours in backbone corridor(s);
  - 5:00 a.m.-12:00 a.m. on primary feeder lines;
  - 6:00 a.m.-9:00 a.m. and 4:00 p.m.-7:00 p.m. on secondary feeder lines and regional routes; and
  - Bell time for supplemental school lines.
- Provide trip frequencies sufficient to effectively serve the primary target markets for each route:
  - 15 to 30 minutes on backbone lines, 10-minute peaks if demand warrants;
  - 30 to 60 minutes on other primary lines;
  - 60-minute peak service on neighborhood, local feeder, and regional express lines; and
  - Single daily roundtrips for supplemental school lines.

Union City Transit uses the following performance measures for existing and future service:

- 90 percent of all land with three or more dwelling units per acre within one-quarter mile of a transit route; and
- 90 percent of major activity centers within one-eighth mile of a transit route.

Transit Service Coordination

A number of measures are in place to ensure coordination among transit operators, including Senate Bill 602 (Service/Fare Coordination, 1989), Senate Bill 1474 (Transit Coordination, 1996), Senate Bill 916 (RM2, including Transit Connectivity, 2003), MTC Resolution No. 3055 (Inter-operator Transit Coordination Implementation Plan) and others. All transit operators in Alameda County will continue to implement the coordination projects required under these guidelines. Annually, the projects are agreed on among the operators and MTC. They relate to coordinating the following:

- Fare
- Schedule
- Service
- Public information
- Marketing
- Administration

Review Process

Alameda CTC will prepare an annual transportation Performance Report that analyzes performance measures and documents Alameda County

transportation network performance for review by local agencies and transit operators prior to publication. The report will include the most current available data from various agencies. (Alameda CTC will accept performance data that is up to two years old.) The Performance Report includes estimates of population growth during the preceding year, available from the State Department of Finance.

Local Government and Transit Agency Responsibilities and Conformance

To minimize cost, Alameda CTC relies on established data collection processes and regularly published reports for data. A list of established data collection efforts, by agency, is listed below. In 2011, the Alameda CTC Commission recommended that in odd number years, depending on funding availability, efforts be made to augment the data collection for all modes, as needed, for improved analysis of performance of the countywide transportation system.

Cities and County

- Pavement Management System data for the MTS
- Countywide Bicycle and Pedestrian Plans (Alameda County and cities' public works departments)

Transit Agencies

- Service schedules (on-time performance)
- Transit ridership routing (percentage of major centers served within one-quarter mile of a transit stop)
- Frequency (number of lines operating at each frequency level)
- Service coordination (number of transfer centers)
- Average time between off-loads (BART)
- Miles between mechanical road calls (AC Transit, LAVTA, and Union City Transit)
- Mean time between service delays (BART and ACE)
- Transit availability (frequency of transit and population within one-half mile of rail station or bus and ferry stops and terminals)
- Transit capital needs and shortfall (for high-priority, Score 16 transit projects for Alameda County transit operators)

MTC

- Roadway maintenance needs
- Freeway congestion monitoring data (if developed by MTC)

Caltrans

- Freeway speed runs, duration of freeway congestion (if developed by Caltrans)
- Accident rates on state freeways
- Roadway miles in need of rehabilitation

Alameda CTC

- Roadway speeds on CMP network (except freeways if developed by Caltrans)
- Travel times for O-D pairs
- Countywide Bicycle and Pedestrian Plans

Local agencies are encouraged to provide maintenance data to MTC or maintain their own database of maintenance needs on the MTS. However, there are no compliance requirements for local agencies or transit operators related to the multimodal performance element.

Next Steps

The performance measures identified in the multimodal performance element are based on measures established in a variety of plans and documents including the Countywide Transportation Plan, Countywide Bicycle and Pedestrian Plans, and the CMP document. Several additional measures are

reported in the Bicycle and Pedestrian Counts Report, and "existing conditions" analyses were performed for the Countywide Transportation Plan. Also, by 2015, Alameda CTC will have completed several new modal plans, which will produce additional performance measures.

Therefore, as part of the 2015 CMP update, Alameda CTC will re-evaluate and consolidate the performance measures and monitoring reports, and identify multimodal performance measures and timelines for reporting those measures. The comprehensive re-evaluation will ensure that the timeline for reporting on different measures is realistically aligned with data availability and potential changes in the measures. In addition, it will ensure that the various monitoring documents are complementary and non-duplicative. This will allow Alameda CTC to tailor its multimodal performance measures to project evaluation needs and inform programming decisions, as outlined in the upcoming Strategic Plan.

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Travel Demand Management Element 5



Continued population growth in the Bay Area and Alameda County places increasing demands on the region's transportation system. Investments in Alameda County transportation facilities and services will continue to help accommodate growing demand; however, to better manage this travel demand, a set of complementary strategies, or measures, is also necessary.

Transportation demand management (TDM) measures seek to reduce pressure on existing roadway and parking capacity by using incentives and disincentives to influence travel choice. They reduce peak-period vehicle trips and total vehicle miles traveled. Related benefits include reducing congestion and carbon emissions, improving public health, and increasing transportation choice. The most effective TDM programs include some form of financial incentive, either through pricing parking or subsidizing transit and other non-drive alone modes.

TDM strategies tend be cost-effective ways of meeting regional goals. By making the most efficient possible use of the available system capacity, they complement the region's investments in transit systems and other alternatives to driving.

State law requires that, at a minimum, the TDM Element of the Congestion Management Program[31] accomplish the following:

- Promote alternatives to single-occupant vehicle travel, including but not limited to carpools, vanpools, transit, bicycles and park-and-ride lots;
- Promote improvements in the balance between jobs and housing;
- Promote other strategies, including but not limited to flexible work hours, telecommuting, and parking management programs; and
- Consider parking "cash-out" programs.

Alameda CTC and the Bay Area Air Quality Management District (BAAQMD) are required to coordinate the development of trip-reduction responsibilities and avoid duplication of responsibilities between agencies. Cities and other local jurisdictions can establish their own TDM programs that go beyond what the Alameda CTC and BAAQMD develop. To meet the intent of the CMP legislation, the CMP requires local governments to undertake certain TDM actions, known as the Required Program.

[31] California Government Code Section 65089(b)(3).

Alameda CTC has developed a framework for implementing TDM in Alameda County that defines the roles and responsibilities of public and private organizations, summarizes the funding approach, and details how local jurisdictions must demonstrate compliance with the TDM program requirements. Appendix G provides a menu of various TDM measures and is intended as a resource for organizations developing TDM plans.

Framework

Transportation demand management in Alameda County is collaborative and cooperative; specific strategies are appropriate for the region as a whole, the county and local jurisdictions, and for individual employers or trip generators. Alameda CTC works to coordinate the activities of these types of organizations with the other elements of the CMP, so that capital investment, system management, and demand management work together to provide diverse transportation choices, contain congestion, and improve air quality. The county's approach to TDM includes the following major elements:

Regional actions: BAAQMD, Caltrans, and the Metropolitan Transportation Commission (MTC) take actions to support TDM throughout the San Francisco Bay Area. Alameda County's efforts work within the context of these broader regional initiatives.

Countywide actions: Alameda CTC takes actions to encourage, supplement, and support local governments in their TDM efforts, allocating funds for multimodal transportation improvements, providing guidance and technical assistance to localities in developing their own TDM programs, and monitoring compliance with the Required Program in the CMP. Alameda CTC also manages certain key TDM programs, such as Guaranteed Ride Home, that work most effectively at the countywide level.

Local jurisdiction actions: At the local level, local governments have primary responsibility for implementing TDM programs and encouraging and incentivizing TDM by private organizations. The CMP requires local governments to undertake certain TDM actions, known as the Required Program. The CMP also encourages local governments to undertake TDM efforts above and beyond these requirements.

Private TDM actions: Private employers, developers, homeowner associations, and nonprofit organizations can undertake TDM measures on a voluntary basis or as required by a city. Alameda CTC provides resources to support these actions, including guidance on best practices and other technical resources.

Regional Actions

The Regional TDM Program includes actions that MTC, BAAQMD, and Caltrans take to support TDM programs throughout the San Francisco Bay Area. While the primary role of these agencies is to provide for the infrastructure and services that allow for transportation options, they also work to manage demand for those facilities. Key regional TDM efforts include:

- **Regional Commute Benefit Program (Senate Bill 1339):** MTC and BAAQMD are currently in the process of implementing a commuter benefits pilot program that will apply to all Bay Area employers with 50 or more employees. Once implemented, the ordinance will require employers to offer one of four commuter benefits options, each intended to reduce vehicle miles traveled and employee commute costs. Employers may offer employees these options: Pay for 1) transit, vanpooling, or bicycling expenses with pre-tax dollars, as allowed by federal law; 2) a transit or vanpool subsidy of at least $75 per month; 3) a free shuttle or vanpool operated by or for the employer; or 4) an alternate option proposed by the employer and approved by MTC or BAAQMD.
- **511 Regional Rideshare Program:** MTC's 511 Regional Rideshare Program offers an online tool for commuters to find rideshare matches through its transportation information website, 511.org. MTC's website is designed to expand the range of potential carpoolers and facilitate coordination between people with similar commutes who

would not otherwise be aware of each other. MTC encourages users of the site to log their commutes, offering an incentive program with prizes of up to $500 for keeping track of carpool trips. In addition to offering travelers assistance with carpool ride matching, MTC's rideshare program also includes information on a network of free park-and-ride lots where carpools can meet.

- **511 Regional Bicycling and Transit Trip Planners:** The 511 program offers a bicycling trip planner with a regional bike mapper tool that provides turn-by-turn biking directions along the shortest and/or flattest route. The 511 Bicycling pages also provide information on safety, Bike to Work Day, taking bikes on transit, bicycle access on bridges, and bicycle parking options. The 511 program also offers a transit trip planner that provides point-to-point transit directions and real-time arrival information for all the Bay Area's transit agencies. The 511 Transit pages provide resources, important transit alerts, and other critical information for transit riders.

- **BAAQMD Spare the Air Resource Program:** The Bay Area Air Quality Management District's Spare the Air Resource Program engages the public through education and promotions to encourage changes in behavior that will reduce air pollution. BAAQMD provides "Air Alerts" when air quality is forecast to be unhealthy and to encourage people to alter their behavior on these days to prevent unhealthy air quality. The District works directly with employers by providing tools and resources to educate employees on reducing air pollution. As part of this program, BAAQMD has established local "resource teams" composed of local residents, civic groups, agencies, businesses, and environmental organizations that work together regularly to plan educational activities and programs that reduce air pollution in their communities. Two resource teams are in Alameda County: the Southern Alameda Resource Team and the Tri-Valley Resource Team.

Countywide Actions

Alameda CTC's actions complement regionwide activities and support the efforts of local jurisdictions. Alameda CTC activities include:

- **Funding for multimodal transportation infrastructure and services:** To shift trips away from single-occupant vehicles, travelers need other reliable transportation options. The 2012 Countywide Transportation Plan (CWTP) allocates approximately 40 percent of total project funding to transit projects and approximately 12 percent to bicycle and pedestrian projects. Similarly, the CWTP allocates 53 percent of total programmatic funding to transit and 7 percent to bicycle and pedestrian programs. Making transit, bicycling, and walking more convenient and safer in more places enables these modes to be viable alternatives for an increasing number of people in the county. In 2012, Alameda CTC updated the Alameda County Countywide Bicycle and Pedestrian Plans. Alameda CTC is also beginning the process of undertaking a Countywide Transit Plan, a Countywide Multimodal Arterial Corridor Plan, and updating the county's Community Based Transportation Plans that will help the agency optimize investments in the transit system and identify any other actions the agency can take to improve transit service throughout the county.

- **Congestion Pricing Strategies:** In 2002, the Alameda County CMA secured funding from MTC, Caltrans, and the Federal Highway Administration (FHWA) to conduct a feasibility study for a high-occupancy toll lane (now known as an express lane) in the I-680 corridor. The study evaluated a number of pricing options and analyzed key factors such as physical constraints, institutional opportunities and constraints, operational issues, and revenue potential. The study concluded in April 2003 and found that a SMART carpool lane (express lane) would be operationally, physically, and financially feasible. Subsequently, Assembly Bill 2032 (Dutra, 2004) authorized implementation of the I-680 Express Lane. The project was completed and

opened to traffic in September 2010. The legislation also approved a second express lane in the county. The CMA approved I-580 as a candidate corridor, and this project is currently in the design phase. As a first step, the eastbound I-580 HOV lane was opened in November 2010. Depending on available resources, the Alameda CTC will continue to investigate other pricing concepts such as off-peak transit fare discounts and parking ticket surcharges by local jurisdictions with revenues for transit use.

- **Guaranteed Ride Home:** The Alameda County GRH program, administered by Alameda CTC with funding from BAAQMD, gives commuters an "insurance policy" against being stranded at work if they need to make an unscheduled return trip home. By providing the assurance that commuters can get home in an emergency, GRH removes one of the greatest barriers to choosing an alternative to driving alone, addressing concerns such as, "What if I need to get home because my child is sick, or I have unscheduled overtime and miss my carpool ride home?" For employees, the availability of guaranteed rides home is an incentive to find an alternative to driving alone to work that avoids contributing to traffic congestion. The Alameda County GRH program has been in operation since April 1998. Over the last 15 years, the program has matured from a demonstration program with a handful of participating employers to a robust one with 5,104 registered employees and 282 active registered employers throughout Alameda County.

- **Technical support for new and existing Transportation Management Associations:** Transportation Management Associations (TMAs) are an effective mechanism to reduce traffic congestion and improve use of non-drive-alone modes by employees and sometimes residents. Depending on available resources, Alameda CTC will support creation of new TMAs in the county and strengthening existing TMAs through financial support and a technical resources "how to" handbook.

- **Comprehensive TDM clearinghouse and other TDM informational resources:** Alameda CTC is in the process of developing a user-friendly website that inventories the full range of TDM programs available in Alameda County and describes research-based best practices. This resource will help city staff, individual residents and employees, and other agencies and organizations to better understand the range of available programs as they pursue enhancements to their TDM programs. It will also enable better coordination between programs. An enhanced information program can be used to assist cities in developing informational and educational printed and web materials tailored to local circumstances.

- **Safe Routes to School:** The Alameda County Safe Routes to School (SR2S) program was started in 2007 and is intended to reduce traffic congestion and promote health by working with educators, parents, and students to increase walking, biking, and carpooling to school.[32] Funded through a combination of Measure B and federal funds, the program is in place at over 100 schools and has held over 300 individual events in Alameda County. Activities supported by SR2S funds in Alameda County include walking school buses and bike trains, monthly Walk & Roll to School Day events, annual International Walk and Bike to School Day events, annual Bike to School Day events, family cycling workshops, safety courses and educator guides on bike/pedestrian safety, school walk audit events to identify safety issues around schools, and carpool-to-school ride matching and promotional activities.

- **Walking and biking promotional programs and campaigns:** Alameda CTC funds and promotes active transportation modes through several related programs and advertising campaigns. *Ride, Strive, Arrive!* is an umbrella program encompassing both the "Step into Life" walking campaign and the "Ride into Life" bike campaign. The Step into Life website provides information on walking routes, organized walks, and other

[32] Alameda County Safe Routes to Schools websites: http://www.alamedacountysr2s.org/; http://www.alamedactc.org/app_pages/view/8070.

walking tools and tips. The Ride into Life website provides links to a wide range of existing bicycling information on the websites of Alameda County cities, 511.org's bicycle trip planner, and the East Bay Bicycle Coalition. In addition to the Ride into Life website, Alameda CTC has partnered with the East Bay Bicycle Coalition since 2008 to run Ride into Life advertisements in advance of the annual Bike to Work Day events to promote bicycling as a lifestyle. These advertisements appear on buses, bus shelters, street poles, and in storefronts throughout Alameda County.

- **Bike safety and education classes:** The East Bay Bicycle Coalition currently provides free bicycle safety classes in Alameda County with the financial support of Alameda CTC's Bicycle and Pedestrian Grant Program. Specialized classes are available that focus on urban cycling, adults learning to ride, and families. By training cyclists to ride safely and comfortably, the program is intended to reduce vehicle trips in Alameda County. Since its inception in 2007, the program has trained over 5,300 adults and teenagers through its bicycle safety classes[33].

- **Technical assistance:** Through its Transit Oriented Development Technical Assistance Program (TOD TAP), Alameda CTC has funded parking and TDM studies to assist local jurisdictions in reconsidering and improving their parking-management policies. The agency has funded two parking studies: a shared parking study at MacArthur BART and a parking and stormwater study at the Coliseum/ Oakland Airport BART. This program is being expanded to support jurisdictions in implementing parking reforms and TDM policies and programs. Alameda CTC is uniquely well positioned to provide this type of assistance. Technical support for jurisdictions will take two primary forms:

  1) *Technical resources*: Providing informational materials, case studies, and examples; model ordinance language; and other guidelines and information that can assist jurisdictions in implementing parking and TDM policies.

  2) *Planning grants*: Providing funds to cities to conduct studies and other planning efforts to overcome local parking and TDM challenges and move forward on adoption of parking management and TDM programs and policies, potentially including formation of new TMAs. Alameda CTC has already expanded its TOD technical assistance program into a Sustainable Communities Technical Assistance Program (SC-TAP) to support a wide range of planning and project development activities in Priority Development Areas.

Prior Countywide Initiatives

Financial incentives: A parking cash-out program is defined as an employer-funded program under which an employer offers to provide a cash allowance to an employee, equivalent to the parking subsidy that the employer would otherwise pay to provide the employee with a parking space. Parking cash-out programs apply to employers of 50 or more persons in air basins, areas that generally have similar meteorological and geographical conditions, designated as "non-attainment" areas. The parking subsidy is the difference between the out-of-pocket amount paid by an employer on a regular basis to secure an employee parking space not owned by the employer and the price, if any, charged to an employee for use of that space.

A demonstration financial incentives program for public agencies was implemented in Alameda County in 1997 for one year. The purpose of the demonstration program was to provide an opportunity for employees to choose alternative ways to get to work other than driving alone, to study the effectiveness of the program, and to find out whether increasing the incentives available made a difference in program participation. The ultimate goal was to reduce single-occupant vehicle use.

The results showed a potential for changing commute choices if the county could find continuous sources of revenues. The report on the 1997 Parking Cash-out Program is available on request from the Alameda CTC.

[33] http://www.alamedactc.org/files/managed/Document/9381/A090025_CW_Bicycle_Safety_Education_Program_101612.pdf.

Dynamic ridesharing: An alternative to traditional ride-matching and carpool programs, dynamic ridesharing maximizes flexibility and accommodates last-minute requests for ride matches. Rather than commuters forming ongoing daily carpools, dynamic ridesharing participants request ride matches only on days when they want to share a ride. The major benefits are that ridesharing requires minimal advance planning and accommodates changing travel times; therefore, it reduces the barriers to carpooling.

In 2005 and 2006, the Alameda County Congestion Management Agency in collaboration with the Environmental Defense Fund/RideNow!, Inc., implemented the dynamic ridesharing pilot project, known as RideNow, at the Dublin/Pleasanton BART station. A grant from FHWA provided funding to implement, test, and evaluate a dynamic ridesharing pilot project designed by RideNow!, Inc.

RideNow was an automated system that enabled BART patrons to request carpool partners minutes before they left home in the morning or while returning home in the evening on the BART train. It provided both web and automated telephone ("Interactive Voice Response") access for users. RideNow matched riders within a short time frame, providing "instant matches." The pilot project goals were to:

- Establish if dynamic ridesharing can provide a viable new travel option;
- Test the effectiveness of the program from a technical, administrative, marketing, cost, and operational perspective;
- Assess the level of interest and usage in the program and evaluate its benefits and limitations; and
- Determine the feasibility and applicability of expanding the program beyond the duration of the pilot project as well as to other locations within Alameda County or in the San Francisco Bay region.

Based on feedback from participants and the participating agencies, the program did have value for people who desire to carpool but have complex commutes that do not permit participation in more traditional carpool programs. However, more information is needed about how many people might be attracted to this type of flexible program compared to other ridesharing or TDM programs and whether or not the program would be cost effective.

In 2010, MTC approved a $1.5 million follow-up program currently underway for Contra Costa Transportation Authority, Solano County Transportation Authority, and Transportation Authority of Marin. Funded by MTC's Climate Initiatives Program, this program explores opportunities for more carpooling through the use of smart-phone applications ("apps") that can enable spontaneous ridesharing.

Local Jurisdiction Actions

Local governments have the primary responsibility for implementing TDM programs at the local level, and for encouraging and incentivizing TDM by private actors. The CMP requires local governments to undertake certain TDM actions, known as the Required Program. Alameda CTC also encourages local governments to undertake TDM efforts above and beyond these requirements.

Required Program

The Required Program includes those actions local jurisdictions must take to be in compliance with the CMP and consists of two basic elements: 1) adopting design guidelines or comparable policies that enhance transit and pedestrian and bicycle access; and 2) implementing capital improvements that contribute to congestion management and greenhouse gas reduction.

1) *Adopt design guidelines or comparable policies*: The CMP requires local jurisdictions to adopt and implement guidelines for site design that enhance transit, pedestrian, and bicycle access. To meet this requirement, local jurisdictions must carry out one of the following actions:

- Adopt and implement design strategies that encourage alternatives to single occupant automobile use through local development review;
- Adopt and implement design guidelines that meet the individual needs of the local jurisdiction and maintain the intent of the TDM Element to reduce the dependence on single-occupant vehicles;
- Demonstrate that existing policies meet the intent of the TDM Element to reduce the dependence on single-occupant vehicles.

2) *Implement capital improvements*: Local jurisdictions are also required to implement capital improvements that contribute to congestion management and emissions and greenhouse gas reduction. This requirement can be satisfied by participating in the regional Transportation Fund for Clean Air program, and the federal Surface Transportation Program and Congestion Mitigation and Air Quality Improvement Program.

Refer to "Local Government Responsibilities and Conformance and Compliance" in this chapter for a description of the steps required to demonstrate compliance with the Required Program.

Voluntary local actions

The Alameda CTC also encourages local jurisdictions to undertake TDM efforts above and beyond the Required Program. To support these efforts, Appendix G provides a listing of potential local TDM program elements and the context in which each program is likely to be most effective.

Cities across Alameda County have already adopted plans and programs to address TDM. Every city in Alameda County has adopted a Climate Action Plan, as has Alameda County for its government operations and for unincorporated portions of the county. Nearly every city in Alameda County has some type of TDM program and/or has re-considered its parking management strategies at the city or neighborhood level. Examples of these existing TDM programs are summarized in Table 12.

Tools for developing a local TDM program

A variety of tools are available to local governments for facilitating TDM. The most effective programs integrate several of these elements as a comprehensive package.

- **Modify zoning codes:** Local governments can implement TDM requirements through changes to their zoning code. For example, they can reduce or eliminate minimum parking requirements or grant reductions in minimum parking requirements on the condition that trip reduction programs are implemented. While local governments cannot require employers to implement an employee trip-reduction program unless the program is required by federal law, TDM requirements are often implemented as a condition of approval for new development, or a city's zoning code can require certain measures to address traffic congestion and reduce greenhouse gas emissions.
- **Partner to form a Transportation Management Association (TMA):** Local governments often collaborate with business associations to facilitate creation of a TMA. Actions can include requiring TMA membership as a condition of development approval; or providing staff time, office space, or start-up funding to the TMA.
- **Fund or manage programs directly:** Some local governments directly fund or manage TDM programs. For example, the local government may fund universal transit passes or contract with a private organization to provide bike-sharing services.
- **Implement capital projects:** A variety of capital investments can support TDM. For example, local governments can invest in updated parking meters to facilitate smart parking management, wayfinding signage, or bicycle and pedestrian facility improvements.

- **Offer a TDM program for local government employees:** Local governments can offer trip reduction incentives directly to their employees. These steps can reduce peak period trips while serving as a model to other employers.

TDM program principles

Whatever the implementing mechanism, Alameda CTC encourages local jurisdictions implementing new or expanded TDM programs and requirements to adhere to the following principles:

- **Outcome-based TDM, with specific performance targets:** Utilize performance-based strategies with specific project-level, corridor-level, or citywide targets, because these types of programs have potential to be the most effective and the easiest to implement and administer.
- **Effectiveness at achieving local and regional goals:** Invest in strategies that research has proven to be effective and to provide a good return on investment.
- **Well-balanced and thorough:** Develop a comprehensive program. The most effective TDM programs are ones that have varied and mutually supportive demand-management measures. For example, a TDM program that includes subsidized transit passes and a guaranteed ride home program has the potential to reduce vehicle trips to a greater degree than one of those measures alone.
- **Effective marketing and public outreach:** Develop programs through open communication with all stakeholders and tailor the programs to their needs, since the manner in which TDM programs are introduced is crucial to their success. Perform marketing and public outreach to encourage participation.
- **User friendly:** TDM programs must be easy for the public to understand and use. Policies and objectives should be clearly articulated and supported with data. New technologies, such as parking meters, should be designed for straightforward public usage.
- **Financially feasible and cost-effective:** Strategies that are low cost or no cost should be prioritized and provide the biggest return on the investment.
- **Easy and efficient to administer:** Place a priority on programs that can be easily and efficiently administered, relying on data that is collected in the normal course of business for the city. Where possible, cities should seek to collaborate with neighboring cities to reduce administrative burdens for all.

Table 12—Examples of Existing Local Government TDM Programs

City	Program
Alameda	Alameda is developing a citywide TDM plan that recommends a range of TDM measures, including establishing a Transportation Management Agency in the city. Alameda already allows for optional in-lieu parking fees for developments, which are used to pay for transit and bicycling improvements.
Berkeley	Berkeley's Downtown Parking and Transportation Demand Program seeks to manage parking demand through pricing, provide better information about public and private parking facilities, and develop shared parking facilities agreements between different uses. Berkeley also has extensive TDM programs both for city employees and for private companies in Berkeley. The city recently updated its zoning code in conjunction with its recently adopted Downtown Area Plan to require that new developments implement a number of TDM measures.

Table 12—Examples of Existing Local Government TDM Programs (cont'd)

City	Program
Emeryville	The City of Emeryville adopted a Sustainable Transportation Plan in 2012 that includes numerous best practices in TDM. The city is also evaluating parking management approaches for the Hollis Area intended to increase the availability of parking spaces for short-term use.
Oakland	The City of Oakland adopted a citywide policy framework for parking management in its commercial districts and is in the process of developing specific parking management plans for each district. For example, the "Temescal Parking Policies and Management Plan" was developed pursuant to this policy in 2012 and incorporates many parking management recommendations, including variable-rate pricing and better parking wayfinding signage.
Hayward	The City of Hayward is engaged in a TDM study to determine the most cost-effective parking and transportation strategies to support transit-oriented development.
Fremont	The City of Fremont just adopted a Downtown Community Plan that includes revised off-street parking standards, including shared parking, and general recommendations on TDM. The city has a TOD overlay district, with TOD-specific parking standards and required bike parking for all new developments, that applies to all rail station areas in Fremont.
Newark	The City of Newark has considered TOD-friendly parking considerations in planning for the Dumbarton TOD Priority Development Area.
Union City	Union City has begun moving toward more urban, transit-oriented strategies for parking management around its BART station. The city may reduce parking requirements for projects near the station, contingent on developments having a TDM program that could include transit incentives, carsharing, and bike parking. The city has also installed its first parking meters around the Union City BART station, both on the street and in municipal lots near the station.
Dublin	The Downtown Dublin and Eastern Dublin Specific Plans include provisions for shared parking and reductions in minimum parking requirements for TOD and senior housing as well as other multimodal enhancements in their recent plan updates. The city is beginning to consider other TDM strategies for Priority Development Areas around BART stations, but no formal plans have been initiated to date.
Livermore	The City of Livermore's Downtown Specific Plan includes provisions for shared parking downtown, reduced parking for multi-family residential areas, parking in-lieu of fees when public parking is available, and other TDM programs. The city has reached trip-reduction agreements with some new business park developments as well.
Pleasanton	The City of Pleasanton implemented TDM measures for city employees and employers at the Hacienda Business Park. It also promotes TDM through its Commendable Commutes program. The city's parking cash-out program, "pRide," reimburses city employees $2 a day for using travel modes other than a single-occupant vehicle. Pleasanton has also proactively managed travel demand at the Hacienda Business Park through the Hacienda Business Park Trip Reduction Ordinance (TRO).

Private Sector Actions

The private sector also has an important role to play in managing travel demand. While the CMP does not require private organizations to undertake any specific TDM actions, private organizations can take a number of steps, either on a voluntary basis or in response to local jurisdiction requirements. A full menu of potential TDM actions appears in Appendix G.

Examples of existing private TDM efforts in Alameda County include:

- **Emeryville Transportation Management Association** is a nonprofit organization funded through Business Improvement District fees paid by all commercial and industrial property owners in the city. The Emeryville TMA funds the Emery Go-Round shuttle, a free service which runs from the MacArthur BART station along two routes that serve the Amtrak station, Bay Street, and major employers in Emeryville. The TMA also provides information and referral services, coordination with local and regional government and transit agencies, the Alameda CTC GRH program, and car-sharing spaces.
- **Hacienda Business Park** in Pleasanton provides a "Commute Solutions" program that offers a comprehensive suite of commute services to encourage commuting by non-drive-alone modes. For these efforts, the Hacienda Business Park is recognized by the Best Workplaces for Commuters program.
- **Berkeley Gateway TMA** funds the West Berkeley shuttle that provides free service from the Ashby BART station to major employment centers in West Berkeley. The shuttle service is operated under a partnership with the Emeryville TMA.
- **The Broadway "B Line"** is a free shuttle that operates between Jack London Square and the Uptown/ Lake Merritt districts of Oakland. It is funded through a public-private partnership between City of Oakland, business associations throughout the areas it serves, and a BAAQMD grant; AC Transit operates the shuttle.
- **Bishop Ranch Office Park**, located in the San Ramon valley in Contra Costa County, provides nine free shuttle routes for employees, four of which serve Dublin/Pleasanton BART and the Pleasanton ACE station, along with a variety of other commute services for employees.
- **Other free shuttles for employees** are provided by the following employers and campuses in Alameda County: Alta Bates Summit Medical Center, CSU East Bay, Heald College, Kaiser Oakland Medical Center, Mills College, Lawrence Berkeley National Laboratory, and University of California Berkeley "Bear Transit."

Menu of TDM measures

Appendix G provides a set of tables describing TDM activities that can reduce automobile trips in Alameda County. Table G-1 describes actions that public agencies, including local governments and transit agencies can carry out. Table G-2 describes complementary actions that local governments or private organizations such as employers or developers can carry out in response to local government requirements or on a voluntary basis.

Funding Approach

TDM programs are often extremely cost-effective ways to meet regional congestion management and mobility goals and offer incentives to maximize use of existing facilities. Even when TDM programs place requirements on the private sector, well-designed programs may be cost-neutral or even save money for private organizations. For example, by shifting commuters away from single-occupant vehicle travel, TDM programs can reduce an employer's need to build or lease costly parking facilities, which partially or wholly offsets program costs.

Despite these advantages, many programs do require a public subsidy. Key funding sources for TDM programs and activities include:

- **Transportation Fund for Clean Air (TFCA):** The TFCA legislation permits BAAQMD to collect a fee (up to $4 per vehicle per year) for reducing air pollution

from motor vehicles and for related planning and programs. It requires the BAAQMD to allocate 40 percent of the revenue to an overall program manager(s) in each county. Alameda CTC has been designated as the overall program manager in Alameda County and has developed a program that allocates the funds as follows:

  - A maximum of 5 percent of the funds goes toward program implementation and administration;
  - Approximately 70 percent of the remaining funds goes to cities/county based on population with a minimum of $10,000 to each jurisdiction; city/county population is updated annually based on State Department of Finance estimates.
  - Approximately 30 percent of the remaining funds are allocated to transit-related projects; all eligible applicants may apply for these funds for transit-related projects.

- **Surface Transportation Program (STP):** MTC and the Alameda CTC both perform administrative functions for programming STP funds. For TDM purposes, the following projects are eligible for STP funds: highway projects including HOV lanes, signalization, transit projects, station area and transit-oriented development planning activities that result in the location of housing and/or jobs near high-frequency transit, and bicycle and pedestrian projects.

- **Congestion Mitigation and Air Quality Program (CMAQ):** MTC and the Alameda CTC both perform administrative functions for programming CMAQ funds. For TDM purposes, eligible projects include those types of transportation projects that improve air quality, such as ridesharing and bicycle and pedestrian projects.

Local Government Responsibilities and Conformance

Alameda CTC is required to monitor local jurisdictions' conformance with the adopted CMP. To meet this responsibility, the Alameda CTC requires annual reporting to determine if each city and the county has adopted and implemented a trip-reduction and travel-demand ordinance. The following monitoring policies are in place.

Local Government Responsibilities

The Required Program includes actions local jurisdictions must take to comply with the CMP. Local jurisdictions have until September 1 of each year to adopt and implement the Required Program.

To be found in conformance with the CMP, local jurisdictions must certify to Alameda CTC that they have adopted and implemented site design guidelines that enhance transit and pedestrian and bicycle access. To ensure consistency among all jurisdictions, Alameda CTC prepared and approved a TDM Checklist that identifies components to include in local design guidelines (Appendix H).

Local jurisdictions are also required to implement capital improvements that contribute to congestion management and reduce carbon emissions and greenhouse gases. This requirement can be satisfied by participating in the regional TFCA and the federal STP and CMAQ Programs. Refer to Chapter 8, "Capital Improvement Program" (CIP) for more information on the CIP, which incorporates numerous project types and programs identified in the Transportation Control Measures (TCM) Plan (see Appendix I).

Procedures for Non-conformance

If Alameda CTC finds a local jurisdiction has not adopted and implemented the Required Program, it may find the local jurisdiction in "non-conformance." At the time of the finding, Alameda CTC will provide recommendations for corrective actions. If after 90 days the local jurisdiction is still in non-conformance, Alameda CTC is required to follow the conformance process as identified in Chapter 9, "Program Conformance and Monitoring." This could impact the non-conforming jurisdiction's ability to receive its increment of subventions from the fuel tax made available by Proposition 111, and the jurisdiction's

ability to receive funding for projects through the federal STP and CMAQ Program.

Next Steps

Following are next steps for the CMP TDM Element to increase the impact of existing TDM programs, incentivize expansion of TDM offerings throughout the county, and ultimately increase the likelihood that individuals throughout the county will utilize TDM programs and travel by non-drive alone modes.

- Encourage the formation of new Transportation Management Associations (TMAs) and strengthen existing TMAs by providing financial support (as possible) as well as technical resources such as a "how to" handbook.
- Develop a comprehensive TDM clearinghouse and other TDM informational resources.
- Provide technical assistance to support jurisdictions in implementing parking reforms and TDM policies and programs. Technical support for jurisdictions can take two primary forms:
  - Technical Resources: Providing informational materials, case studies and examples, model ordinance language, and other guidelines and information that can assist jurisdictions in implementing parking and TDM policies.
  - Planning Grants: Providing funds to cities to conduct studies and other planning efforts to overcome local parking and TDM challenges and move forward on adoption of parking management and TDM programs and policies, potentially including formation of new TMAs. Alameda CTC has already expanded its TOD technical assistance program into a "Sustainable Communities Technical Assistance Program" (SC-TAP) to support a wide range of planning and project development activities in PDAs.
- Provide a robust Guaranteed Ride Home Program.
- Consider adopting future TDM/parking requirement policies as part of funding eligibility requirements for local jurisdictions.

Land Use Analysis Program

6



As part of the CMP, Alameda CTC must develop a program to analyze the impacts of land use decisions made by local jurisdictions on regional transportation systems. The program must generally be able to estimate the costs associated with those impacts, as well as provide credits for local public and private contributions to improve regional transportation systems.

The CMP statute does not change the role of local jurisdictions in making land use decisions or in determining the responsibilities of project proponents to mitigate possible negative effects of projects. However, Alameda CTC has the ability to apply certain sanctions, as described in Chapter 8, "Capital Improvement Program," if the local agency does not comply with the requirements of the law.

The intent of the Land Use Analysis Program is to:

- Better integrate local land use and regional transportation investment decisions;
- Better assess the impacts of development in one community on another community; and
- Promote information sharing between local governments when the decisions made by one jurisdiction will impact another.

The Land Use Analysis Program works best when Alameda CTC is involved at the very early stages of the development process, maximizing intergovernmental contacts before major decisions are complete. The process is intended to work in a positive, cooperative fashion that supports the needs of local, county, regional, and state governments. Proactive responses to potential impacts can occur during environmental review of specific land developments, corridor, or areawide studies, and preparation of local or regional CIPs.

Since the passage of the CMP legislation in 1991, a variety of other state and regional legislative and regulatory actions, shown in Table 13, have strengthened the need for a Land Use Analysis Program. These policies share the common theme that they coordinate transportation planning and investment decisions with existing and future land use patterns.

While the Alameda CTC's Land Use Analysis Program was initially conceived as a program to meet a particular state legislative mandate, the growing interest in coordinating land use and transportation planning has resulted in the program's evolution. The program now also serves as an opportunity for strategic thinking about how to plan for development that

efficiently uses the transportation system, while ensuring that the mobility and access needs of residents and workers in Alameda County are fulfilled. Refer to Table 13 for legislative and regulatory actions. As such, the program includes:

- Legislatively required review of:
  - Land use actions of local jurisdictions by the Alameda CTC; and
  - Land use projections for use in countywide model database by local jurisdictions;
- Planning initiatives and programs that foster transportation and land use connections; and
- Strategic monitoring of transportation-land use coordination performance measures.

Review of Land Use Actions

A major component of the Alameda CTC Land Use Analysis Program is the legislatively required review of land use development projects. The review of development projects allows Alameda CTC to assess impacts of individual development actions on the regional transportation system and ensures that significant impacts are appropriately mitigated.

Table 13—Legislative and Regulatory Actions

Legislation/Regulatory Action	Description
California Assembly Bill 32 (AB 32)	The California Global Warming Solutions Act of 2006 requires the State of California to meet aggressive Greenhouse Gas emissions reduction targets.
California Senate Bill 375 (SB 375)	Redesigning Communities to Reduce Greenhouse Gas of 2008 synchronizes long-range regional transportation and land use planning and requires regional preparation of a Sustainable Communities Strategy that details how a region will house its population.
Metropolitan Transportation Commission (MTC) Resolution 4035	This resolution establishes the One Bay Area Grant Program, which links federal transportation funding to location in or proximate access to locally designated Priority Development Areas.
MTC Resolution 3434	The Transit Oriented Development (TOD) Policy for Regional Transit Expansion Projects of 2005 links the expenditure of regional capital funding for transit expansion to the density of households allowed around future mass transit systems.
Bay Area Air Quality Management District (BAAQMD) California Environmental Quality Act (CEQA) Guidelines	These 2010 guidelines set low thresholds of significance for acceptable exposure to toxic air contaminants for residents and other users of new developments.
San Francisco Bay Conservation and Development Commission (BCDC) Sea Level Rise Estimates	These estimates identify many key development areas and transportation assets as being vulnerable to sea-level rise and needing adaption planning.

Alameda CTC also plays a key interjurisdictional facilitation role, and when disputes arise between two agencies as a result of the potential impacts of a land use project, Alameda CTC may act as a mediator, if requested by one of the parties involved.

Scope of Review

Alameda CTC reviews two types of land use actions.[34]

- **Projects requiring General Plan Amendments:** These projects require a change to the text or map of a city or unincorporated planning area's general plan. General Plan Amendments (GPAs) can be performed in conjunction with a General Plan update, a specific plan, or an area plan. GPAs can also be adopted for an individual development project that is not consistent with current land use designations and therefore requires a GPA.
- **Projects consistent with General Plan:** These plans or projects do not require any modification of the general plan text or map.

Alameda CTC limits the scope of its review of land use actions to those with the potential to cause countywide or regional scale impacts. Projects are reviewed if they will cause a net increase of 100 p.m. peak hour trips. The evening peak period is used, as this period generally experiences the highest travel demands. This threshold is applied differently, depending on whether a project requires a GPA or is consistent with an existing general plan. Mitigated Negative Declarations (MNDs) are also considered differently, depending on whether a GPA is required or not. Table 14 summarizes the application of the 100 p.m. peak hour trip threshold and consideration of MNDs.

Alameda CTC performs project trip generation calculations to determine whether CMP Land Use Analysis Program review is required. Project trip generation is computed using an approved trip generation methodology (see the following "Methodologies and Standards" section). The threshold for CMP review is based on net change in trips, meaning that trips from reclassified uses or existing redeveloped buildings are subtracted out of the total.

Alameda CTC reviews all large development projects and plans for which a city or the unincorporated county in Alameda County is the lead agency.[35] Alameda CTC may also review large development projects from institutions, federal agencies, or neighboring counties if these are likely to impact the regional transportation system in Alameda County.

Review Process

Consistent with the CMP statute, Alameda CTC's review of plans and development projects through its Land Use Analysis Program is designed to occur alongside the CEQA review process to avoid duplication of effort. Alameda CTC strives to perform its review on the same timeline to offer early and proactive input that can aid in refining project design. A project is considered "complete" from a CMP review perspective once Alameda CTC notifies the project sponsor that the project is exempt or that CMP requirements have been met and that it has no further comments on the project.

Table 14—Exemption from CMP Land Use Analysis Project Review

	Project Requiring General Plan Amendment	Project Consistent with General Plan
100 p.m. Peak Hour Trip Threshold Assessed Relative to:	Existing General Plan land use designation(s)	Existing use(s) at project site
Mitigated Negative Declarations	Considered (if trip generation threshold exceeded)	Not considered

[34] Previous versions of Alameda CTC CMPs referred to Plans and Development Projects as Tier 1A and Tier 1B. The "Tier" nomenclature has been discontinued to avoid confusion with the Tiers of the CMP network arterials.

[35] For purposes of compliance with the Land Use Analysis Program, the Port of Oakland is considered a governmental subdivision of the City of Oakland. Therefore, the Port is required to submit environmental documents to Alameda CTC for review and comment.

Figure 10 illustrates the typical review process. Once Alameda CTC receives a GPA or Notice of Preparation (NOP) of a Draft Environmental Impact Report (DEIR), it issues a response within 30 days. This response either indicates that the project is exempt from CMP Land Use Analysis Program review (if it does not exceed the 100 p.m. peak hour trip threshold) or provides comments on the scope of analysis to be performed in the DEIR to satisfy CMP requirements. If a project is not exempt, then once Alameda CTC receives a DEIR, it issues a response within 45 days. This response either indicates that the analysis contained within the DEIR adequately addresses CMP requirements or provides comments on changes or additional analysis needed to adequately address CMP requirements.

Use of the Alameda Countywide Travel Demand Model

The CMP statute assigns responsibility to CMAs to develop a travel demand model "that will be used by local jurisdictions to determine the quantitative impacts of development on the circulation system." The Alameda Countywide Travel Demand Model is typically used to determine traffic volumes, transit ridership, and other information for future years. Jurisdictions are required to use the most current version of the Countywide Travel Demand Model for the CMP Land Use Analysis Program. Alameda CTC amended the CMP requirements in 1998, so that local jurisdictions are responsible for applying the travel model. All local jurisdictions have signed Master Use Agreements with Alameda CTC that outline the procedure for requesting the model for a specific application.

Per the CMP statute, jurisdictions may also use an approved subarea travel demand model. Alameda CTC has responsibility for approving subarea models based on whether these models demonstrate adequate consistency with the countywide model. Appendix J describes Alameda CTC's policy on subarea models and required documentation for approval.

Methodologies and Standards

Project sponsors should use the following methodologies and standards when conducting Transportation Impact Analyses for the CMP Land Use Analysis Program. Guidance on methodologies and standards may also be given as part of Alameda CTC's GPA or NOP response to the particular project.

Transportation networks

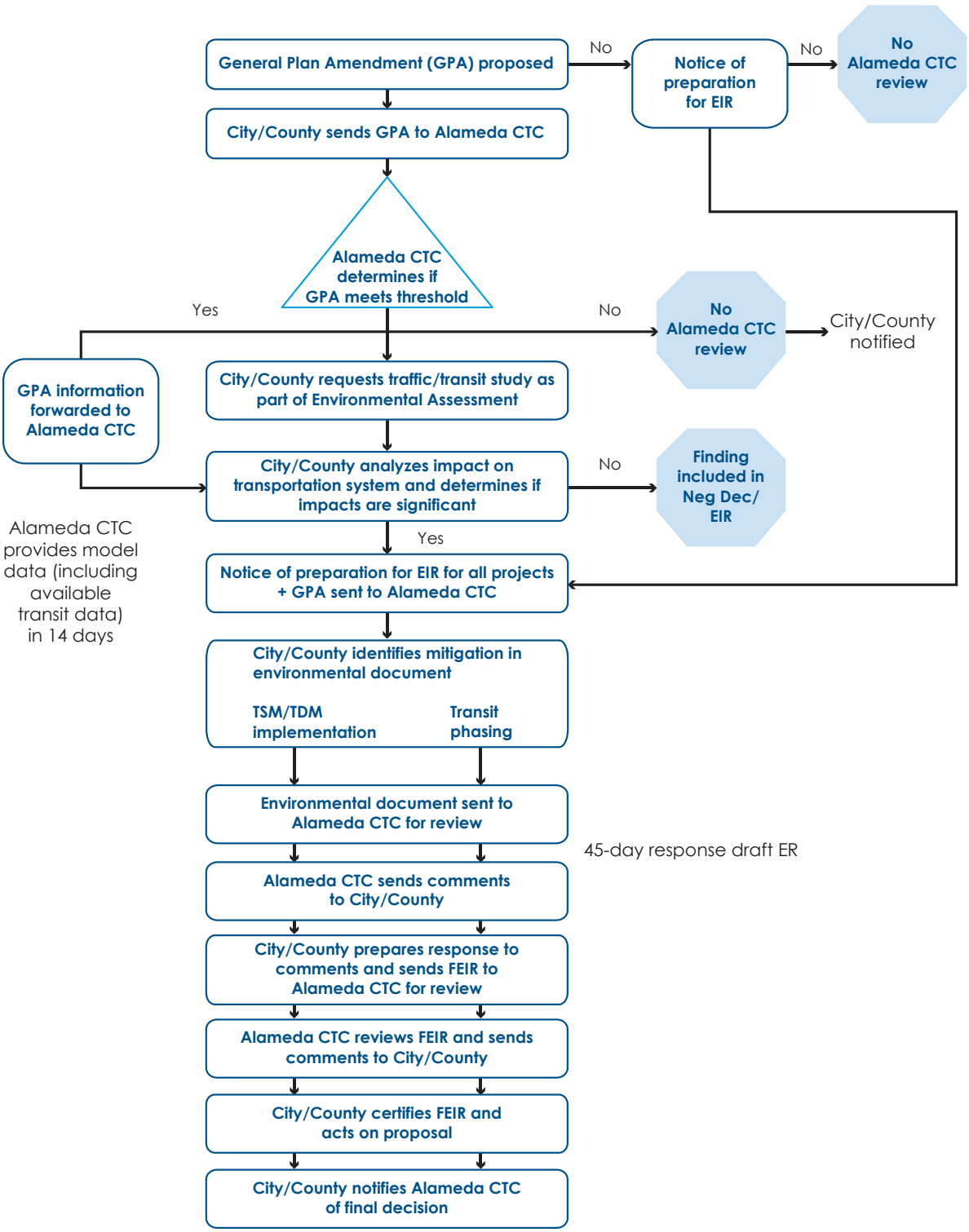
The CMP statute requires analysis of impacts of land use actions on regional transportation systems. For Alameda CTC's CMP analyses, "regional transportation systems" is interpreted as follows:

- Autos: Study impacts to roadway segments on the 2002 Metropolitan Transportation System;[36]
- Transit: Study impacts to Metropolitan Transit System (MTS) transit operators (ACE, AC Transit, BART, Capitol Corridor, LAVTA, Union City Transit, and WETA);
- Bicycles: Study impacts to cyclists on the Countywide Bicycle Network; and
- Pedestrians: Study impacts to pedestrians within the Areas of Countywide Significance identified in the Alameda Countywide Pedestrian Plan.

Use of the MTS network for the Land Use Analysis Program ensures that impacts on the CMP network will continue to be identified, since it is a subset of the MTS. The broader definition of regional transportation systems encourages early identification of impacts on a larger system of roadways and explicitly includes transit, bicycle, and pedestrian system impacts.

[36] With the passage of the federal Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991, MTC was required to develop an MTS that included transit and highways. MTC contracted with the CMAs in the Bay Area to develop the MTS and to use the CMPS to link land use decisions to the MTS. Therefore, a distinction is made between the CMP network, which is used for monitoring conformance with LOS standards, and the MTS, which is used for the Land Use Analysis Program. In 2005, MTC updated the MTS to include Rural Major Collector classified streets and higher classifications based on the Federal Functional Classification System. MTC uses the updated MTS for the purposes of funding and programming as well as in estimating roadway maintenance needs. The Alameda County Technical Advisory Committee reviewed the updated MTS during the 2009 CMP update to determine its usefulness and applicability to the Land Use Analysis Program. Based on input from local jurisdictions and discussion with MTC, Alameda CTC determined that the updated MTS was not appropriate for the Land Use Analysis Program, because it was too detailed for planning purposes, and the previous version of the MTS would continue to be used.

Figure 10—CMP Land Use Analysis Program Project Review Process



Trip generation estimates

Alameda CTC conducts a trip-generation calculation to estimate how many new trips will be on the transportation network due to a development project or plan. Project trip generation is used to determine whether a project meets the threshold for CMP review and to assess impacts on the transportation system.

The Institute of Transportation Engineers (ITE) *Trip Generation Manual* is an acceptable method for estimating project trip generation. This methodology, which works by relating a variable describing the size of the project (e.g., square feet, number of units, number of gas pumps, etc.) to trips generated, is an established methodology widely used for CMP and other purposes in the transportation industry.

The 2011 CMP identified that ITE rates do not always perform well in dense or transit-rich areas such as Alameda County's Priority Development Areas or other infill development sites. In such areas, ITE rates may over-estimate vehicle trip generation. As part of the 2013 CMP update, Alameda CTC performed a review of alternative trip generation methodologies that adjust ITE rates to more accurately reflect particular project contexts. Three methodologies were identified that have been adequately validated and are reasonable to apply in Alameda County. Project sponsors have the option of using one of the following adopted alternative trip generation methodologies:

- EPA's Mixed Use Development (MXD) model
- Caltrans/UC Davis Smart Growth Trip Generation rates
- MTC's Station Area Residents Study (STARS) mode-share adjustment method

Appendix K contains the review of the methodologies, and Appendix L contains guidance on how to apply the rate adjustments.

Projects in areas with travel demand management (TDM) programs may also experience lower vehicle trip generation, as these programs provide information, incentives/disincentives, and other mechanisms to shift auto trips to other modes, times of day, or closer destinations. Project sponsors may adjust trip-generation estimates to reflect the presence of TDM programs. The TDM element of the Alameda CTC CMP contains a menu of TDM programs with research-based expected ranges of trip reduction benefits that project analysts may use to adjust trip generation estimates. Assumptions should be clearly documented and justified.

Types of impacts and impact assessment methodologies

As part of the 2013 CMP update, Alameda CTC assessed the Highway Capacity Manual (HCM) 2010, including its new Multi Modal Level of Service (MMLOS) methodologies for transit, bicycles, and pedestrians to examine its utility for the Land Use Analysis Program. Appendix B fully documents this assessment. The findings of this assessment include:

- The HCM2010 auto LOS methodologies are suitable for use to study impacts to freeway and arterial segments, but there is a need for flexibility if project sponsors need to conform to local methodology requirements.
- The MMLOS methodologies are not well-suited to identify if a project causes impacts to transit, bicyclists, or pedestrians. Instead, Alameda CTC expanded and clarified language to standard responses to general plan amendments and development projects as to the types of multimodal impacts that project sponsors should consider.
- The assessment found that the HCM2010 MMLOS is well-suited to illustrate tradeoffs from different intersection and roadway segment design options. Many transportation impact analyses propose mitigation measures that change roadway design. Project sponsors should consider tradeoffs to all road users resulting from mitigation measures, and the HCM2010 MMLOS is encouraged in this analysis (see "Mitigation Measures" below).

Appendix L provides full information on impact types and impact assessment methodologies. Project sponsors should consider impacts to all modes, including:

- **Autos:** Vehicle delay using the HCM2010 methodology and consistency with adopted plans;
- **Transit:** Effects of vehicle traffic on mixed-flow transit operations, transit capacity, transit access/egress, need for future transit service, consistency with adopted plans, and Circulation Element needs;
- **Bicycles:** Effects of vehicle traffic on bicyclists conditions, site development, and roadway improvements, and consistency with adopted plans;
- **Pedestrians:** Effects of vehicle traffic on pedestrian conditions, site development, and roadway improvements, and consistency with adopted plans; and
- **Other impacts and opportunities:** Noise impacts for projects near state highway facilities and opportunities to clear access improvements for Transit Oriented Development projects.

Thresholds of significance

Alameda CTC has not adopted thresholds of significance for CMP land use analysis purposes.[30] Project sponsors should use professional judgment to 1) define a threshold that is appropriate for the project context; and 2) use this threshold to determine if segments are impacted.

Mitigation measures

Alameda CTC vs. local roles

The CMP statute requires that a Land Use Analysis Program assess the costs of mitigating impacts to the regional transportation system from local land use decisions. This authority must be balanced with the responsibility that local governments hold in the development review process under CEQA. Local governments have lead agency responsibility for preparing EIRs including transportation impact analysis. In addition, the decision of whether to implement a mitigation measure or to adopt a statement of overriding considerations is a local decision.

Alameda CTC's role is to provide comments through the EIR process on the adequacy of analysis. Alameda CTC has authority under the CMP statute to require disclosure of impacts and mitigation measures, and to require local agencies to establish a program for securing funding to mitigate transportation impacts of land use decisions. The CMP statute does not grant Alameda CTC authority to require implementation of a mitigation measure.

Adequacy of mitigation measures

Inadequate and/or underfunded transportation mitigation measures may have significant implications for the regional transportation system. Either might result in failure to meet LOS standards, triggering potential non-conformance and the need for a deficiency plan. Furthermore, an environmental document may rely on state or federal funding of mitigation measures. Such funding may not be consistent with Alameda CTC's project funding priorities.

Alameda CTC's policy regarding mitigation measures is that to be considered adequate they must be:

- Adequate to sustain CMP roadway and transit service standards;
- Fully funded; and
- Consistent with project funding priorities established in the Capital Improvement Program of the CMP, the Countywide Transportation Plan (CWTP), and the Regional Transportation Plan (RTP) or the federal Transportation Improvement Program, if the agency relies on state or federal funds programmed by Alameda CTC.

Types of mitigations

A project can propose mitigation measures of several types to address CMP impacts, including but not limited to:

[30] Note that the LOS E threshold used to determine deficiency as part of the LOS monitoring CMP element does not apply to the Land Use Analysis Program. This threshold is used for biennial monitoring, not to determine whether impacts will be caused over the long term by an individual land use action.

- **Transportation network changes** including changes to roadway geometry (e.g., adding lanes, adding turn pockets, adding mid-block crossings) and intersection control (e.g., adding stop control or signalizing an intersection).
- **Transportation demand management measures and programs** including amenities, information, incentives, and disincentives designed to influence demand for peak-hour auto trip making. The TDM element of the Alameda County CMP contains a menu of TDM programs (see Appendix G) with research-based expected ranges of trip reduction benefits that project analysts may use to estimate the effectiveness of TDM mitigation measures.
- **In lieu mitigations** including implementing a part of an Areawide Deficiency Plan or paying into a Transportation Impact Fee program.

In the case of smaller projects, local governments may wish to require project proponents to enter an agreement to provide a "fair share" portion for mitigating a cumulative impact. This addresses the legislative requirement that the CMP must be able to estimate costs associated with mitigating transportation impacts.

Multimodal tradeoffs

In certain settings, mitigation measures designed to resolve an impact to one mode may cause undesirable secondary impacts to other modes. These secondary impacts may be contrary to adopted policy objectives. A typical example is adding a turn pocket at an intersection, to address an auto circulation impact in a downtown or infill development area, which may increase crossing distances and exposure to vehicles for cyclists, pedestrians, and transit riders.

Jurisdictions are encouraged to discuss multimodal tradeoffs associated with mitigation measures that involve changes in roadway geometry, intersection control, or other changes of the transportation network. This analysis should identify whether the mitigation will result in an improvement, degradation, or no change in conditions for automobiles, transit, bicyclists, and pedestrians. The HCM2010 MMLOS methodology is encouraged as a tool to evaluate these tradeoffs, but project sponsors may use other methodologies as appropriate for particular contexts or types of mitigations.

Review of Land Use Projections[37]

Alameda CTC has responsibility for developing a database of housing and jobs projections utilized in the Alameda Countywide Travel Demand Model (more detail on the countywide model is available in Chapter 7). The CMP statute prescribes that this land use database must be consistent with the regional land use database and assumptions of the regional travel demand model. The Association of Bay Area Governments (ABAG) develops the regional land use database for the nine-county Bay Area. This database (formerly referred to as the *Projections* series) includes numbers of households and jobs by sector for existing and future planning horizon years. Alameda CTC works with local jurisdictions to develop the countywide database by allocating ABAG's housing and job projections to a refined-scale zone system for countywide model traffic analysis. For this reallocation to be deemed "consistent" in the sense of the CMP statute, the county-level totals from the two allocations must be within plus or minus 1 percent, per MTC's established guidelines as described in Chapter 9.

Alameda CTC's land use database development process typically happens as part of a Countywide Travel Demand Model update. During this process, local jurisdictions are required to review a draft allocation of ABAG totals to the Countywide Travel Demand Model transportation analysis zones (TAZs). Local jurisdictions then have 60 days to provide input on this draft allocation.

Alameda CTC is undertaking work to incorporate ABAG projections adopted as part of *Plan Bay Area*, the region's RTP and Sustainable Communities Strategy, into the Alameda Countywide Travel Demand Model. This work is scheduled to be complete by June 2014.

[37] The review of housing and job projections was referred to as Tier 2 review in previous versions of the Alameda CTC CMP. This nomenclature has been eliminated to avoid confusion with the tiers of the CMP arterial network.

Historically, the review of housing and job projections has occurred biennially along with the release of an updated set of Projections from ABAG. Senate Bill 375 (SB 375) changed transportation and land use planning to synchronize preparation of regional land use projections with regional transportation plans. In 2013, per the requirements of SB 375, ABAG and MTC adopted their first Sustainable Communities Strategy (SCS), which will likely be updated every four years on the RTP timeline. Alameda CTC's review and allocation of housing and job projections will likely now occur every four years, unless otherwise directed by ABAG or MTC.

Fostering Transportation-Land Use Connections

Alameda CTC oversees a variety of programs and planning activities that strengthen connections between transportation and land use.

SB 375 and Sustainable Communities Strategy

Climate change awareness and the urgency to reduce greenhouse gases has become a driving force in the transportation realm. Adopted in 2008, SB 375 mandates an integrated regional land use and transportation-planning approach to achieve targets for reducing greenhouse gas emissions from automobile/light trucks. The purpose of SB 375 is to define more concrete implementation requirements for the emission reductions expected from the land use sector in Assembly Bill 32. The focus of SB 375 is on reducing vehicle miles traveled (VMT) and reducing greenhouse emissions by 7 percent by 2020 and 15 percent by 2035.

To comply with SB 375, development of *Plan Bay Area* by MTC and ABAG was a joint planning process. The SCS component of *Plan Bay Area* is designed to:

- Lay out how development patterns and the transportation network can be integrated to help reduce greenhouse gas emissions;
- Identify how the region's housing needs will be met;
- Improve modeling of land use and transportation; and
- Be congruent with local general plans, specific plans, and zoning.

Adopted in July 2013, *Plan Bay Area* is a 28-year plan, and the SCS component of *Plan Bay Area* focuses on promoting compact, mixed-use commercial and residential development that is walkable and bikable and close to mass transit, jobs, schools, shopping, parks, recreation, and other amenities. Through *Plan Bay Area*, for the first time the region has simultaneously addressed its long range transportation planning and strategy for meeting its Regional Housing Needs Allocation (RHNA), in anticipation that the synchronization of these planning tasks will result in better transportation-land use coordination.

A key feature of the SCS is the designation of Priority Development Areas (PDAs), which are locally-nominated areas near planned or existing transit designed to accommodate significant housing and job growth over the life of *Plan Bay Area*. PDAs represent 4 percent of the land mass of the Bay Area but are designed to take on 80 percent and 66 percent of housing and jobs, respectively. If successful, Plan Bay Area will give people more transportation choices, create more livable communities, and reduce the pollution that causes climate change.

Alameda CTC participated in the *Plan Bay Area* process through its 2012 CWTP update process. Land use considerations played a more direct role in the CWTP process than in past updates to this plan in two primary ways:

- The goals, objectives, and performance measures explicitly addressed land use.
- The demographic forecasts used in the evaluation process were based on the Alameda County Draft Land Use Scenario Concept developed locally through an extensive 18-month process coordinated by Alameda CTC and city planning directors. The local land use scenario was developed in coordination with ABAG and MTC's

efforts and helped to inform the SCS process. Ultimately, the land use scenario used for CMP analysis purposes is the same as the land use alternative adopted by ABAG and MTC in the final RTP/SCS.

Priority Development Area Investment and Growth Strategy

PDAs are designated infill sites where greater housing and commercial density can be accommodated near transit stops. They were identified by local governments as part of the regional Focusing Our Vision (FOCUS) program, a regional development and conservation strategy led by ABAG and MTC, in partnership with the BAAQMD and BCDC, that promoted a more compact land use pattern for the Bay Area. The FOCUS program subsequently became the basis for the region's current SCS.

Alameda CTC worked with local jurisdictions through the FOCUS process to designate 43 PDAs. These PDAs represent a wide range of place types and land use contexts. This process occurred in parallel to MTC/ABAG's regional planning work to inform the regional SCS for Alameda County. The FOCUS process also identified Growth Opportunity Areas (GOAs), which are additional areas that can accommodate growth and may one day be able to transition to PDAs and Priority Conservation Areas (PCAs), which are environmentally sensitive areas needing protection.

MTC and ABAG adopted the One Bay Area Grant (OBAG) program as Resolution 4035 on May 17, 2012. OBAG provides guidance for the allocation of the Cycle 2 Federal Surface Transportation Program (STP) and CMAQ funds for fiscal year 2012-2013 (FY12-13) through FY15-16. CMAs are responsible for distribution of these funds to local jurisdictions and other eligible project sponsors. OBAG includes specific policy objectives and implementation requirements that CMAs must meet as a condition of the receipt of OBAG funds.

With the OBAG funding cycle, MTC implemented a new approach that links the region's federal transportation funding program with the Bay Area's first SCS efforts. In large counties, such as Alameda County, 70 percent of OBAG funding must be programmed to transportation projects or programs that support PDAs.

To ensure that CMAs have a transportation project priority-setting process for OBAG funding that supports and encourages development in the region's PDAs, MTC Resolution 4035 requires that Alameda CTC work with Alameda County jurisdictions to develop a Priority Development Area Investment and Growth Strategy. Alameda CTC's Commission adopted the Alameda County PDA Investment and Growth Strategy in March 2013.

The *Alameda County PDA Investment and Growth Strategy* fulfills the regional requirement and will guide the agency in supporting PDA development including facilitating implementation of PCAs over a longer time horizon than the current four-year funding cycle. The *Alameda County PDA Investment and Growth Strategy* describes existing conditions in the county's PDAs (including current level of market activity), explains how PDAs and projects were prioritized for the first OBAG cycle, and sets up a framework for additional work that the agency will undertake in the future to improve the link between transportation and land use within its PDAs.

The PDA Investment and Growth Strategy is designed to align with the Alameda CWTP. The most recent update of the CWTP included a goal of better coordinating transportation investments with the county's land use patterns. The PDA Investment and Growth Strategy will have the same time horizon as the current CWTP, through 2040, and will be updated every four years.

The PDA Investment and Growth Strategy contains an inventory of Alameda County's PCAs. Under the OBAG, MTC has also allocated $5 million between five counties for distribution through a competitive application process to fund projects that promote open space preservation and access, land conservation, and habitat protection in PCAs.

Based on the recommendations made during the 2013 CMP update, Alameda CTC will work with MTC and ABAG to identify ways to support improvements to rural roadways that facilitate agricultural operations and agricultural tourism in East County and to develop more comprehensive approach to mitigating impacts from rural roadway improvements and efforts that support PCA goals and objectives.

Support of Infill Development

The CMP statute seeks to balance congestion management and maintain LOS standards on CMP facilities with the need to promote infill development. In particular, infill development areas are more likely to have higher baseline levels of traffic and are more likely to trigger deficiencies. Senate Bill 1636, California's Infill Opportunity Zone Law, which amended the regulations governing CMPs, allowed jurisdictions to identify infill opportunity zones (IOZs) in which the requirement to maintain LOS E or better would not apply; however, no Alameda County jurisdictions nominated IOZs before the December 2009 deadline. The 2011 CMP identified a set of short-term and long-term strategies to promote infill development in the absence of IOZs. These strategies collectively could offset the difficulties faced by infill development projects under the CMP statute. Table 15, which follows, reports on Alameda CTC's progress toward implementing these strategies.

SB 743, passed in September 2013, institutes key changes to the CMP statute that will support infill development, including lifting the sunset date on designating IOZs and directing the governor's Office of Planning and Research (OPR) to develop new metrics for assessment of transportation impacts to replace vehicle delay-based measures such as LOS. Alameda CTC will closely follow implementation of and provide input on this law. Implementation of this law may take some time, and the strategies summarized in Table 15 should remain important over the life of the 2013 CMP.



Table 15—Implementation of Strategies to Support Infill Development

	Strategy	Alameda CTC Action
Short Term	Incorporate the use of LOS standards (qualitative and quantitative) for transit, pedestrian, and bicycles to allow a balancing of transportation performance goals	The 2013 CMP contains guidance on how development projects reviewed through Land Use Analysis Program should evaluate impacts to transit, bicycles, and pedestrians, including analyzing mitigation measures with respect to multimodal tradeoffs. It is anticipated that Alameda CTC's upcoming transit and multimodal arterial plans will consider performance measures to monitor non-auto modes as part of LOS monitoring.
	Establish policies and mitigation strategies aimed at congestion relief on a broader scale	The 2013 CMP contains updated areawide deficiency plan guidelines to apply where localized improvements are not workable or practical.
	Adopt urban trip generation rates that more accurately reflect automobile trip generation in areas well served by transit and other services.	The 2013 CMP contains list of approved alternative trip generation methodologies.
	Advocate for relaxation from traffic LOS standards to be extended to all designated "infill opportunity zones" statewide that meet established criteria, regardless of when the zones were established	SB 743, passed in September 2013, removes sunset date from designation of IOZs.
	Pursue legislative changes to eliminate strict requirements for the use of LOS standards to determine the performance of highways and roadways as part of the CMP	SB 743, passed in September 2013, directs OPR to revise CEQA guidelines to eliminate automobile LOS as a significant impact on the environment and to develop new criteria for determining significance of transportation impacts in transit priority areas that use metrics such as automobile trips generated or VMT per capita. Alameda CTC will monitor the development of these new impact assessment metrics and offer comment as appropriate.
Long Term	Adopt flexible standards for transportation impact assessment under CEQA in support of multimodal CMP goals	Alameda CTC currently does not have thresholds of significance for CMP analysis which permit analysts to respond to context sensitivity. As identified in the Countywide Bicycle and Pedestrian Plans Implementation Actions, Alameda CTC supports jurisdictions in attempts to reform local thresholds by sharing case studies of other cities that have revised CEQA thresholds in designated areas.
	Impose multimodal transportation impact development fees in support of multimodal CMP goals	Alameda CTC will explore the options, including conducting a feasibility study for a countywide transportation impact fee linked to auto trip generation as discussed in the next section "Areawide Transportation Impact Mitigation Fees" and also identified in the "Next Steps" in this chapter.
	Update conventional four-step models to provide a more accurate estimate of person trips by mode	Ongoing Alameda Countywide Travel Demand Model updates will incorporate enhanced responsiveness of bicycle and pedestrian mode choice to investments in these modes.

Areawide Transportation Impact Mitigation Fees

An areawide transportation impact fee and/or revenue measure such as establishing an assessment district could generate funds necessary to plan and implement transportation mitigation measures related to land development. Transportation impact fees are addressed in the CMP statute as a proactive method of addressing transportation needs arising from land development.

At present, Alameda CTC and most local jurisdictions in Alameda County review development projects and determine required mitigation measures on a project-by-project basis. If found to be feasible, a transportation impact fee could be designed to supplement current project-by-project review, in which case the fee would raise additional revenue to fund multi-jurisdictional mitigations. Another option is that a transportation impact fee could be designed to replace project-by-project review. In this case, the fee would be designed to generate revenues to fund both localized and multi-jurisdictional mitigations.

Alameda CTC conducted feasibility studies in 1997 and 2007 for a countywide traffic mitigation fee. These feasibility studies investigated a fee that would supplement the project review and mitigations required by local jurisdictions. These previous studies recommended that Alameda CTC not proceed with an areawide traffic impact fee due to concerns about discouraging development, particularly in urban areas where redevelopment projects already face higher costs than in suburban areas. The studies also recommended that Alameda CTC adopt the following policies:

- Support agreement among local jurisdictions to adopt an areawide fee within a planning area;
- Identify projects of countywide significance; and
- Consider integrating adoption of a countywide fee with a campaign for a sales tax extension or gas tax increase so the development community and the voters see a benefit in sharing costs with each other.

As part of the 2011 CMP update, Alameda CTC considered pursuing an areawide traffic impact fee, similar to the Tri-Valley Transportation Council Fee, for the other three planning areas in the county. Alameda CTC concluded that, given the weak local and national economic conditions at that time, an areawide traffic impact fee could adversely affect local development. As an alternative to a new areawide traffic impact fee, the 2011 CMP proposed exploring a fee based on automobile trip generation, such as San Francisco County is implementing. San Francisco's Fee, the Transportation Sustainability Program (formerly referred to as the Automobile Trip Generated, or ATG, measure) is an areawide fee unique in that it is designed to replace the city's current practice of reviewing individual development projects using auto LOS.

Rather than require individual project sponsors to study their impacts to intersection LOS and devise mitigations on a case-by-case basis, San Francisco has devised a countywide program of mitigations designed to accommodate all anticipated development over the next 20 years.

Developers will then pay for their portion of this full program of mitigations, according to a fee schedule based on motorized trips generated.[38] San Francisco is currently preparing an EIR for the Transportation Sustainability Program and, once completed, individual development projects will no longer be required to conduct cumulative transportation studies, as payment of the fee will constitute mitigation for their cumulative effects on the transportation system.

The 2011 CMP recommended that, pending availability of funding, Alameda CTC conduct a feasibility study

[38] The fee was initially based on Automobile Trips Generated. Nexus analysis revealed that the fee should also be extended to cover transit trips due to concerns with transit crowding in San Francisco. This finding resulted in the fee being restructured as the Transit Sustainability Fee, which is based on the projected generation of all types of motorized trips by development projects. Review of housing and job projections was referred to as Tier 2 review in previous versions of the Alameda CTC CMP. This nomenclature has been eliminated to avoid confusion with the tiers of the CMP arterial network.

for an areawide impact fee based on automobile trips generated. The study was postponed, while Alameda CTC sought passage of an extension and augmentation of its local transportation sales tax, but it will be carried forward as a next step for the 2015 CMP update.

The passage of Senate Bill 743 (SB 743) in September 2013 could heighten the importance of an areawide transportation impact fee feasibility study. This bill directs OPR to revise CEQA guidelines such that transportation impact analysis will no longer be based on automobile LOS. OPR is directed to develop alternative metrics for transportation impacts in transit priority areas, and the bill explicitly makes reference to metrics such as automobile trip generation and VMT per capita.

In addition to a feasibility study, an areawide transportation impact fee would likely require a nexus study in accordance with the Mitigation Fee Act as well as significant coordination and consensus building with the jurisdictions in Alameda County. In particular, a nexus study would be required to determine what share of transportation improvements are needed to correct issues associated with new development (as opposed to existing transportation system deficiencies) and to determine appropriate fee levels.

While it entails significant up-front study and coordination, an areawide transportation impact fee offers several key benefits:

- **Consistency with multimodal planning focus:** A variety of policy goals point to the need to respond to growing travel demand with mitigation measures such as improved transit service and non-motorized travel facilities. It is difficult for project sponsors to demonstrate how these improvements will fix a highly localized transportation system impact, which can lead to developers pursuing mitigations such as roadway capacity improvements that may be contrary to Alameda CTC's multimodal planning focus.
- **Adequately addresses regional impacts:** Project-by-project review of developments often results in underfunding of multi-jurisdictional improvements because Alameda CTC has no authority to require cities or developers to actually implement a mitigation measure, and local jurisdictions may not fully perceive the benefits of requiring a developer to pay for a mitigation measure outside of their boundaries.

If an areawide transportation impact fee is designed to replace project-by-project review that uses intersection LOS to determine impacts, additional benefits could accrue:

- **Simplicity, transparency, and predictability:** Transportation impact analysis is typically one of the most costly and time-consuming parts of developing and reviewing environmental impact reports. Under an areawide transportation impact fee, all of this analysis is conducted up front. Furthermore, developers can easily predict how much they will be required to pay for transportation system improvements.
- **Fixes "last-in pays" principle:** One feature of the project-by-project, LOS-based method of assessing transportation impacts used by most jurisdictions is that only projects that actually cause an intersection or a roadway segment to fall below a specified LOS threshold are forced to pay for mitigations. This fact results in a single project sponsor bearing the entire burden of mitigating a cumulative impact to an intersection or segment, or the jurisdiction adopting a statement of overriding considerations.

The Tri-Valley Transportation Council has adopted an areawide traffic fee. The fee is applied to regional transportation improvements in the Tri-Valley Transportation Expenditure Plan. Many local jurisdictions have also adopted transportation mitigation fees, some of which partially fund multi-jurisdictional mitigations. If such an areawide transportation impact fee is adopted in the future at a countywide level, it would include a system of credits, so that fees for

developments paid once for regional improvements are not unfairly "double billed" for contributions to the same improvement. Credits for some local impact improvements may also be considered.

Community Design and Transportation Program

The Santa Clara Valley Transportation Authority (SCVTA) has adopted a Community Design and Transportation (CDT) program as part of its CWTP to better integrate transportation and land use and augment its CMP Land Use Analysis Program. This program was developed in partnership with member agencies and communities and is endorsed by their elected bodies. The SCVTA Board promotes the CDT program as its policy tool and primary program to integrate transportation and land use. It includes a comprehensive toolkit for member agencies to use in all aspects of transportation and land use planning and for both public and private development projects. The CDT program also includes two grant funded programs and an incentive program designed to encourage better coordination of transportation and land use planning. One of the objectives of the CDT program is to support concentrated development in selected locations of the county.

In the 2011 CMP, Alameda CTC recommended exploring a similar approach to better integrating land use and transportation in Alameda County. Before the next update of the CMP, Alameda CTC will identify the level of interest from local jurisdictions and transit operators for implementing a similar program in Alameda County. Alameda CTC will develop a scope of work and the steps involved including the cost of developing and implementing the program.

Complete Streets Policy Development and Implementation

Complete streets are streets designed to accommodate all modes and all users. Complete streets can look different, depending on the local context, but broadly speaking, creating complete streets entails planning, funding, designing, and maintaining and operating transportation facilities and networks that drivers, transit users, pedestrians, bicyclists, and goods movement purveyors can use, regardless of age or ability.

The Complete Streets Act of 2008 (Assembly Bill 1358) stipulates that during the next major update of their General Plan's Circulation Element, all jurisdictions in California are required to incorporate complete streets principles. Alameda CTC required jurisdictions to adopt complete streets policies by June 30, 2013 as part of the Master Program Funding Agreements signed in 2012. All jurisdictions have now met this requirement, either in the form of a city council or Board of Supervisors resolution or an update to the Circulation Element of their General Plan that incorporates complete streets principles. Alameda CTC provides technical assistance to its jurisdictions, including identifying best practice examples, strong language, and recommended components to meet the General Plan component of this legislative requirement.

Implementation of complete streets policies is a multi-year process requiring organizational culture shift, participation from numerous city departments and other external stakeholders, and new levels of collaboration. Alameda CTC held a workshop in June 2012 on complete streets policy development and a workshop in July 2013 in which it provided information to local jurisdictions on implementing complete streets and highlighted examples of best practices. Alameda CTC will continue this effort by developing a series of targeted resources around specific complete streets implementation challenges.

Alameda CTC also implements the Complete Streets Checklist from MTC. All projects that apply for federal funds programmed by Alameda CTC must complete this checklist, which provides information when Alameda CTC evaluates projects for funding.

Corridor Planning

In 1994, Alameda CTC adopted a corridor/areawide transportation management planning process described in the CWTP. The process is based on cooperative planning and coordinated action by local governments, Caltrans, transit agencies, and MTC. Alameda CTC uses the corridor/areawide management

planning process to identify needed mitigation measures and for linking its funding decisions to needed mitigations. In a corridor/areawide management planning effort, participants address strategies to:

- Reconcile the competing demands that local and long-distance traffic make on the capacity of the freeway system;
- Reconcile continuing population and employment growth with the finite capacity of the freeway system;
- Reconcile the movement of people and goods;
- Prevent pass-through traffic from using local streets;
- Reconcile high occupancy vehicle and express lanes with plans to meter freeway ramps;
- Pair ramp metering with geometric metering at gateways to the metropolitan area; and
- Coordinate the operation of freeways and parallel arterials and to specify when and where to rely on transit as a corridor's primary strategy of traffic management.

As defined in the Alameda CWTP, the underlying principles for the planning process are based on the following:

- Alameda CTC should support, where appropriate, local plans to enhance the productivity of transit investment through such measures as supportive zoning, urban design/planning, and development approvals.
- Alameda CTC should give investment priority to those highway and transit operational improvements and major capital projects identified in the corridor/areawide management planning process.
- Alameda CTC recognizes that land use planning is solely the purview of local governments.

As part of the 2011 and 2013 CMP updates, Alameda CTC reviewed additional options for improving mobility and identifying and funding mitigation measures along travel corridors, specifically ones that cross county boundaries. The following approaches were recommended as next steps.

- For congested cross county corridors, explore developing partnerships for sharing the costs of implementing mitigation measures in the corridor.
- For long-term corridor improvements, explore establishing cross county partnerships to identify mutually agreeable strategies for developing and implementing improvements. As a first step in this direction, a county line development study in partnership with either San Joaquin or Santa Clara counties could be considered.
- Explore developing corridor improvement strategies as part of Countywide Transit Plan and Countywide Arterial Mobility Plan.

Examples of corridor/areawide management planning efforts include:

- Central County Freeway Study (SR 238 Local Area Transportation Improvement Program)
- I-580 Corridor BART to Livermore
- I-680 Value Pricing
- I-880 Strategic Plan
- North I-880 Safety and Operations Study
- San Pablo and I-880 SMART Corridor Programs
- SR 84 Local Area Transportation Improvement Program
- Tri-Valley Triangle Study

Alameda CTC is also conducting three countywide modal plans including a goods movement plan, a transit plan, and an arterials plan. These long-range modal plans are intended to feed into the CWTP and will identify projects, funding priorities, and future corridor planning priorities.

State-level CEQA Modernization Advocacy

Public agencies have gained decades of experience in applying CEQA rules. As new issues (such as global warming) emerge that were unanticipated by the original legislation, a variety of actors show growing interest in modernizing CEQA. Ideas for modernizing CEQA focus on a number of aspects of how the law works including reducing the scope of which types of projects must conduct intensive analysis, eliminating duplication between CEQA and other environmental laws and standards, and containing litigation generated by CEQA. Since the last CMP update, the OPR has issued regulations to implement Senate Bill 226, which seeks to streamline environmental review for eligible infill development projects. SB 743 will also streamline and modernize transportation analysis, particularly for projects in transit priority areas.

Much can be done within the existing CEQA legislation to streamline the review of development projects and to reduce the greater likelihood of causing impacts from infill development projects. Strong specific plans and area plans with thorough program EIRs can reduce the analytic burden of future development projects that implement those plans, and Alameda CTC will support these specific plans through its Sustainable Communities Technical Assistance Program (SC-TAP). The recently adopted Plan Bay Area discusses the potential for projects in Transit Priority Project (TPP) eligible areas that meet certain other conditions to receive CEQA relief under SB 375, and Alameda CTC will assist jurisdictions in understanding this eligibility.[39] As previously discussed, Alameda CTC has made some modifications to its review of EIRs through the Land Use Analysis Program that will benefit infill projects, and will continue to support local jurisdictions in revising their own CEQA thresholds as appropriate through information sharing and other technical assistance.

Even with the passage of SB 743, there are other aspects of the CEQA statute that may require modernization (e.g., limiting litigation, strengthening tiering provisions). These aspects of CEQA generally require legislative action. Alameda CTC will continue to monitor CEQA modernization-related bills and consider whether it is appropriate to take positions on these as part of its legislative platform.

[39] Plan Bay Area, p. 58

Parking Standards and Policies

Parking for automobiles is a significant but under-recognized factor in the relationship between land use and transportation. It has been customary for local jurisdictions to require development projects to provide a minimum number of parking spaces. Moreover, most parking is underpriced. These two factors encourage driving, leading to inefficient land use and more congestion. With the support of local jurisdictions, Alameda CTC plans to explore and review parking policies and standards as a way to develop parking management strategies as a land use tool for local jurisdictions to promote alternative modes and reduce greenhouse gases.

Regional Transit Expansion Program

The Regional Transit Expansion Program, originally adopted by MTC in 2001 as Resolution 3434 and updated as part of Plan Bay Area, identifies the regional commitment to transit investments in the Bay Area. Resolution 3434 identified $18 billion in transit expansion investment projects. It includes a TOD policy to condition transit expansion projects funded under Resolution 3434 on supportive land use policies. There are three key elements of the regional TOD policy:

- Corridor-level thresholds to quantify appropriate minimum levels of development around transit stations along new corridors;
- Local station area plans that address future land use changes, station access needs, circulation improvements, pedestrian-friendly design, and other key features of TODs; and
- Corridor working groups that bring together CMAs, city and county planning staff, transit agencies, and other key stakeholders to define expectations, timelines, roles, and responsibilities for key stages of the transit project development process.

This policy is relevant within Alameda County for the following Resolution 3434 transit expansion projects:

- AC Transit Bus Rapid Transit in Berkeley/Oakland/ San Leandro
- AC Transit Enhanced Bus: Grand-MacArthur Corridor
- BART/Oakland Airport Connector
- BART Warm Springs Extension to San Jose
- Dumbarton Rail
- Ferry service expansions in Alameda and Berkeley
- Tri-Valley Transit Access Improvements to/from BART

Alameda CTC is working with the local jurisdictions, transit providers, congestion management agencies in adjoining counties, ABAG, and MTC to address the policy in these corridors.

As part of *Plan Bay Area*, the region's $660 million in federal new and small starts funding will be directed to Resolution 3434 projects that ranked highly in the RTP Project Performance Assessment. These include several Alameda County projects including BART Warm Springs Extension to San Jose, AC Transit Berkeley/Oakland/ San Leandro Bus Rapid Transit, and AC Transit Enhanced Bus: Grand-MacArthur corridor.

A companion resolution, Resolution 3357, articulates rail extension and improvement criteria and regional express bus and rapid bus program criteria. These criteria will be considered during the funding process for the identified transit projects.

Strategic Monitoring of Transportation-Land Use Coordination

A core part of Alameda CTC's activities is monitoring trends in performance measures and transportation land use connections, and using this monitoring to inform planning and funding decisions.

Tracking New Development Activity

The 2011 CMP revealed that several other large Bay Area CMAs have created a database of land use approvals, and recommended that Alameda CTC explore creating such a database. As part of the 2013 CMP update process, creating and implementing a database of land use approvals in Alameda County is included. Beginning with the 2014 Conformity Findings process, Alameda CTC will require local jurisdictions to submit:

1) a list of land use development projects approved during the previous fiscal year; and
2) a copy of the most recent Housing Element Annual Progress Report submitted to the state Department of Housing and Community Development.

This information will be used to populate a database of development approvals in Alameda County. This development approvals database will prove invaluable for a variety of applications. It will provide:

- Enhanced monitoring of how well transportation investments are being coordinated with new developments and demands for mobility;
- The ability to compare land use projections with historic trends;
- The ability to comply with new requirements that CMAs assess local jurisdiction efforts at approving sufficient housing for all income levels from the OBAG Program (see PDA monitoring below); and
- A consistent database for multi-jurisdictional planning efforts.

Liveable Communities Performance Measures

The 2012 Alameda CWTP identified a series of performance measures related to transportation-land use connections. These measures were used to compare different long-range transportation investment scenarios during CWTP analysis. The measures were also incorporated in the CMP multimodal performance element.

For the 2015 CMP update, Alameda CTC will perform a comprehensive review of its performance measures

and consider opportunities to streamline measures and to strategically align reporting timelines with data availability. Some of the liveable communities measures (e.g., activity center accessibility and public transit accessibility) are not based on annually published, longitudinal data. These measures are most suitable for comparing different long-range scenarios rather than annual monitoring. The comprehensive review of performance measures performed for the 2015 CMP will explore identifying shorter-term measures of transportation-land use coordination that could leverage the database of new development activity. For example, Alameda CTC could monitor performance measures such as what percent of new dwelling units or commercial square footage is within a half-mile of transit or within a walkable neighborhood.

Priority Development Area Performance Monitoring

The *Alameda County PDA Investment and Growth Strategy* outlines a preliminary PDA monitoring plan developed both to fulfill MTC and ABAG requirements and as a step toward implementing the land use and sustainability goals of the 2012 CWTP. Collecting and assessing data on the county's PDAs will help Alameda CTC gauge progress on meeting the objectives of the 2012 CWTP and *Plan Bay Area*, identify what might need to be modified or improved, help gauge the impacts of policies and investments, and inform the agency's future policy and investment decisions. A more robust information set will also help inform decisions about adjusting the boundaries of existing PDAs and designating new PDAs in the future.

Alameda CTC conducted an extensive PDA Inventory in 2012. Over the course of the next several years, the agency will build on this inventory to create a more robust baseline dataset that Alameda CTC can update over time. Some of the data will be updated annually or biennially as new data is generated by the jurisdictions and then compiled and released by ABAG or MTC. The frequency of updates to the data will also be determined by the pace of change in the county's PDAs and MTC and ABAG requirements. Alameda CTC will work closely with ABAG and other regional agencies to ensure that the data provided is best suited to Alameda CTC's monitoring needs. The agency's goal is to minimize data collection work for Alameda CTC and the county's jurisdictions and avoid duplicative data collection efforts.

Alameda CTC intends to analyze the following types of data for each PDA (or potential PDA) in Alameda County, though Alameda CTC may make some alterations to existing categories to include different data points.

- Current housing, jobs, and population data
- Growth projections for housing, jobs, and population
- RHNA allocations
- Market strength and development activity
- Transit orientation, urban form and bicycle/pedestrian connectivity
- Policies (land use, housing, parking, and TDM)
- Impact of OBAG investments

Local Government Responsibilities and Conformance

Alameda CTC is responsible for monitoring conformance of local jurisdictions with the adopted CMP.[40] While Alameda CTC does not have the authority to approve or deny local land use projects, it may find the local jurisdiction in non-conformance. If it fails to comply with the requirements of the land use analysis program, a jurisdiction risks losing Proposition 111 funds. The detailed process for finding of non-conformance and resulting withholding of Proposition 111 funds is described in Chapter 8.

The following describes special circumstances related to conformance to the Land Use Analysis Program requirements. If a proposed development was specified in a development agreement entered into

[40] California Government Code Section 65089.3.

prior to July 10, 1989, then it is not subject to any action taken to comply with the CMP, with the exception of those actions required for the trip-reduction and travel-demand element of the CMP.[41]

In some cases Alameda CTC may find that additional mitigation measures are necessary to prevent certain segments of the CMP network from deteriorating below the established LOS standards, before a conformance finding is made. In such cases, Alameda CTC will require the local jurisdiction to determine whether the additional mitigation measures will be undertaken as a condition of project approval, or whether they will be implemented as part of a deficiency plan for the CMP network segments affected.

Local jurisdictions have the following specific responsibilities under the Alameda CTC Land Use Analysis Program.

Throughout the year
Local jurisdictions are required to do the following to ensure conformity with the CMP Land Use Analysis Program requirements:

- Forward to the Alameda CTC all Notices of Preparation, draft and final Environmental Impact Reports, and Environmental Impact Statements, and final dispositions of General Plan Amendment and development requests.
- Analyze large development projects according to the guidelines in this chapter, including the use of the Alameda Countywide Travel Demand Model or an approved subarea model and disclosure of impacts to the MTS, if Alameda CTC determines the project exceeds the threshold for which CMP review is required.
- Work with Alameda CTC on the mitigation of development impacts on the regional transportation system.

During annual conformity findings process
Local jurisdictions are required to do the following to ensure conformity with the CMP Land Use Analysis Program requirements during the annual conformity findings process which occurs from September to November:

- Review the record of Alameda CTC responses to environmental impact report documents for completeness and accuracy.
- Provide the Alameda CTC with:
  1) a list of land use development projects approved during the previous fiscal year; and
  2) a copy of the most recent Housing Element Annual Progress Report submitted to the state Department of Housing and Community Development.

As needed according to Alameda Countywide Travel Demand Model development schedule
During travel model updates, provide an update (prepared by the jurisdiction's planning department) of the anticipated land use changes likely to occur using ABAG's most recent forecast for a near-term and far-term horizon year. This land use information should be provided in a format compatible with the countywide travel model.

Next Steps

The following are next-step items for the CMP Land Use Analysis Program to strengthen the connection between land use and transportation.

- Develop Transportation Impact Analysis Guidelines that will assist project sponsors in analyzing and addressing project impacts to auto transit, bicycles, and pedestrians as described in this chapter.
- Develop a policy regarding tiering off of CMP analysis conducted as part of a Specific Plan or other Area Plan, if that analysis was conducted using a version of the Alameda Countywide Travel Demand Model that is no longer the most current version.

[41] California Government Code Section 65089.7.

- Pending availability of funding, conduct a Feasibility Study for implementing an ATG-based areawide transportation impact fee.
- Determine if there is interest from local jurisdictions and transit operators for a program similar to the SCVTA's CDT program in Alameda County, and develop a scope of work, schedule, and budget for developing and implementing the program.
- Continue to provide technical assistance to local jurisdictions on potential options to revise CEQA thresholds to reduce barriers to infill development approvals.
- Continue to monitor state level CEQA modernization efforts and opportunities for streamlining within existing CEQA law.
- Implement the Sustainable Communities Technical Assistance Program including matching project applicants with technical assistance for planning efforts designed to advance the readiness of Priority Development Areas.
- Identify ways to address rural roadway improvement needs and efforts that support PCA goals.
- Consider establishing a means for projects that impact long travel corridors and traverse multiple jurisdictions within Alameda County to contribute their fair share of required mitigation measures throughout the corridor.
- Explore development of partnerships for sharing the costs for implementing related mitigation measures for congested cross-county corridors.
- Explore establishing cross-county partnerships with adjacent counties to develop mutually agreeable strategies for cross-county-corridor improvements.
- Explore developing corridor improvement strategies as part of Countywide Transit Plan and Countywide Arterial Mobility Plan.

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Database and Travel Demand Model 7



The CMP legislation requires every CMA, in consultation with the regional transportation planning agency (the Metropolitan Transportation Commission (MTC) in the Bay Area), cities, and the county, to develop a uniform database on traffic impacts for use in a countywide travel demand model.[42] Further, the legislation mandates the countywide model to be consistent with the assumptions of the regional travel demand model developed by MTC and the most current land use and socioeconomic database adopted by the Association of Bay Area Governments (ABAG) for Alameda County. In its role as the CMA, Alameda CTC must approve computer models used for sub-areas, including models used by local jurisdictions for land use impact analysis. All models must be consistent with the countywide model and standardized modeling assumptions.

The purpose of this requirement is to bring a uniform technical basis for analysis to congestion management decisions. This includes consideration of the benefits of transit service and travel demand management (TDM) programs, as well as projects that improve congestion on the CMP-designated network. The modeling requirement is also intended to assist local agencies in assessing the impacts of new development on the transportation system.

Use of the Alameda Countywide Travel Demand Model is essential for the CMP planning process. The Alameda County CMP is a forward-looking program, promoting a philosophy of early action to prevent conditions from deteriorating. The countywide model allows Alameda CTC to anticipate and forecast the potential impacts of local land development decisions on the Metropolitan Transportation System network.

Countywide Travel Demand Model Features

The Countywide Travel Demand Model currently being updated is expected to be available for use by spring 2014. The updated model will:

- Incorporate the most recently adopted ABAG land use and socio-economic database, the Sustainable Communities Strategy;
- Update the model base year from 2000 to 2010 to be consistent with the most recent US Census (2010);
- Incorporate US Census 2010 data;
- Extend the outer forecast year from 2035 to 2040;

[42] California Government Code Section 65089(c).

- Update the traffic analysis zones and roadway and transit network;
- Enhance sensitivity for forecasting bicycle and pedestrian trips by incorporating the bicycle network in the model, at a minimum; and
- Update the calibration and validation of the model.

The currently active Alameda Countywide Travel Demand Model, completed in August 2011, includes the following key elements:

- It uses Cube software.
- The base year of the model is 2000, and the forecast years are 2005, 2020, and 2035.
- Five time periods are included: a.m. peak 1-hour; p.m. peak 1-hour; p.m. peak 2-hour; p.m. peak 4-hour; and daily.
- It contains 2,692 traffic analysis zones (TAZs).
- It includes more detailed road and transit networks; these networks are compatible with GIS.
- It incorporates the 2000 US Census and ABAGs' Projections 2009 land use and socioeconomic data with input from the local jurisdictions.

Regarding other model features, the model contains:

- San Joaquin County as an internal area in the countywide model through buffer zones. San Joaquin County land uses incorporated are based on the San Joaquin County travel forecast model as of February 2010.
- Other Bay Area Counties in more detail by including or retaining MTC's Regional Traffic Analysis Zones for these counties
- Home-work mode choice model that includes details on transit modes. Transit/walk access and transit/drive access sub-modes are divided into further sub-modes. The transit/walk access mode is divided into local bus, express bus including ferries, light rail, commuter rail and BART; the transit/drive access mode is divided into park/ride and kiss/ride.
- Ramp meters and HOV bypass lanes at each freeway ramp that has or plans to have ramp metering.
- A more detailed truck forecast model within the travel demand model.
- Future capacity-constrained peak-hour traffic forecasts in addition to peak-hour traffic forecasts based on unconstrained demand.
- A greenhouse gas calculation tool.

Documentation of specific features and assumptions for various components of the August 2011 model are available on the Alameda CTC website.

Land Use Database Development

The database included in the currently active countywide travel model is based on data summarized in ABAG's Projections 2009 and incorporated into MTC's regional model TAZs (RTAZ). The update to the countywide model will incorporate the newly adopted Sustainable Communities Strategy (SCS) land use and socio economic data.

The process of distributing the regional land use and socio-economic data to countywide TAZs begins with allocating ABAG's land-use and socioeconomic data from the larger MTC regional TAZs to the smaller Alameda CTC countywide model TAZs. The Alameda County jurisdictions then review and redistribute the data. The jurisdictions totals are requested to stay within a 1 percent variation from the ABAG totals, but they are permitted to redistribute them if appropriate. Countywide totals after redistribution will remain within plus or minus 1 percent of ABAG county totals, as required by MTC. By aggregating the projections made for each zone, Alameda CTC can produce projections of socioeconomic characteristics for unincorporated areas of the county, the fourteen cities, and the four Alameda County planning areas.

Model Development

The framework established for the model encompasses the following components:

- Trip generation (number of trips forecast by traffic analysis zone);
- Trip distribution (distribution of forecast trips between each traffic analysis zone);
- Modal split of inter-zonal trips (distribution of trips by mode within each traffic analysis zone); and
- Assignment (forecast of trips originating or destined to external zones).

These are typical model components found in any model that produces simulations of travel demand, based on different assumptions about land use and demographic and transportation characteristics.

The countywide model was developed using Cube software developed by Citilabs, which is an interactive transportation planning program that produces numerical and graphic representations of travel supply and demand. The model is structured to provide forecasting detail that adequately addresses the evaluation needs of both countywide and corridor-specific transportation strategies. The countywide model has been developed and validated by:

- Defining a traffic analysis zone structure detailed enough to depict changes in land use and demographics that would affect travel demand on arterials and intra-county transit systems; and
- Establishing highway and transit networks detailed enough for those types of travel demand.

Development and validation of the model were based on the following concepts:

- Consistency with the assumptions and procedures established and used by MTC to produce regional travel demand forecasts. Specifically, the model maintains the same variables in the equations that comprise the trip-generation, trip-distribution, and mode-split components of MTC's travel demand model framework based on the MTC BAYCAST-90 model.
- Where necessary to produce validated forecasts of travel on arterials or intra-county transit services, enhance the capacity of MTC's models by incorporating the simulation of certain types of travel not modeled by MTC. Specifically, this includes the addition of new transit sub modes.

The current update will validate the model to 2010 traffic and transit count data and include enhanced ability to forecast bicycle and pedestrian volumes by adding more detailed TAZs and more detailed roadway, transit, and non-motorized networks.

In addition, the currently active model incorporates land use and demographics of the nine-county Bay Area based on the ABAG's Projections 2009 and the San Joaquin County Travel Model for San Joaquin County. This allows the model to produce travel demand forecasts that incorporate influences of regional travel demand on transportation facilities in Alameda County. Travel originating or terminating outside the nine-county Bay Area and San Joaquin County is also taken into account, based on the data from the Caltrans statewide model.

Planning Areas

Alameda County has been subdivided into four areas of analysis, or planning areas. Planning areas are analogous to the five MTC super districts in Alameda County,[43] as part of the traffic analysis zone structure MTC uses[44] for its nine-county regional travel model. Traffic analysis zones are small geographical subdivisions of a region. Socioeconomic variables, such as households and employment data, are collected at the traffic analysis zone level for input into the travel demand models. Ultimately, the auto vehicle trips and number of individual trips on transit ("person trips")

[43] MTC superdistricts 18 and 19 comprise North County Planning Area, while superdistricts 17, 16 and 15 equate to Central County, South County and East County Planning Areas, respectively.

[44] MTC is in the process of updating their zone system to expand the TAZs and to add a Micro Analysis Zone (MAZ) to better capture local bike and walk trips.

are assigned from each traffic analysis zone onto the highway and transit networks.

The countywide model required disaggregating or splitting the MTC zones into more, smaller traffic analysis zones. Within Alameda County, MTC's zone system was refined to better suit the more detailed highway and transit networks in the countywide model. The traffic analysis zones nest within the larger MTC zones. This ensures accurate disaggregation of MTC's person trip tables to the traffic zones, and allows direct comparisons between the Alameda countywide model outputs and those of the MTC model. As a result of this zone refinement effort, the model contains the following 2,692 TAZs:

- 1,405 TAZs within Alameda County
- 159 TAZs in buffer areas (52 in West Contra Costa County, 48 in South Contra Costa County, 26 in San Joaquin County, and 33 in Santa Clara County)
- 1,097 TAZs in the remainder of the Bay Area same as the MTC's RTAZs
- 31 gateway zones

Maps of the 1,405 TAZs within Alameda County, grouped by the four planning areas, are available on the Alameda CTC website. The model update is anticipated to add more TAZs within Alameda County to reflect the 2010 US Census boundaries.

Transportation System Network

The countywide model roadway network includes the following road types:

- Freeways
- Freeway ramps and metered ramps
- State routes
- Arterial streets
- Collector streets that carry traffic through neighborhoods to adjacent neighborhoods
- Streets likely to be analyzed in a local traffic study

The transit network in the countywide model was developed from the MTC model network with refinements to match the additional zonal detail within Alameda County. Highway networks by planning areas are available on the Alameda CTC website. As part of the model update, the bicycle and pedestrian network will be added to the model network.

Model Results

The model produces the following countywide travel information:

- Trip generation
- Trip distribution
- Modal split of inter-zonal trips for home-based work trips and total trips
- Forecast of trips originating or destined to external zones
- Peak-hour LOS and traffic-volume projections by segment (2000, 2005, 2020, and 2035)
- Directional miles of congestion by type of facility (arterial, freeway)
- Mean highway speed
- Transit accessibility
- VMT by facility and by LOS
- Travel times for selected origin-destination (O-D) pairs
- Greenhouse emission for primary pollutants

Model output traffic volumes for all roadway segments for all horizon years and all time periods by planning areas are posted on the Alameda CTC website.

Model Adequacy

The model has been tested and validated for 2000[45] conditions. The validation procedure compared the model outputs to observed traffic volumes and transit ridership data. During validation, adjustments were primarily made to model inputs, such as the road network and base-year land uses, rather than calibrated parameters such as trip-generation rates or distribution factors. Based on the model calibration, MTC consistency check, and the model validation, Alameda CTC made the following conclusions:

- The countywide model is generally consistent with the MTC model in terms of numbers and types of trips, distribution between the Bay Area counties, and travel modes;
- The model estimates reasonable numbers of vehicles and transit riders to and from Alameda County; and
- The countywide model estimates 2000 base year traffic on most screen lines and major regional facilities at a level of accuracy sufficient to support evaluation of peak-hour traffic patterns on the CMP network; for example, select link analysis.

Local Government Responsibilities and Conformance

Alameda CTC is responsible for monitoring conformance of local jurisdictions with the adopted CMP. Among those requirements, Alameda CTC must find compliance with the development of the land use and socioeconomic database in the Countywide Travel Demand Model, which must be consistent with the regional land use database and assumptions of the regional travel demand model. Alameda CTC works with local jurisdictions to develop the countywide database by allocating ABAG's housing and job projections to a refined-scale zone system for countywide model traffic analysis. The county-level totals from the two allocations must be within plus or minus 1 percent, per MTC's established guidelines as described in Chapter 9.

Alameda CTC's land use database development process typically happens during the Countywide Travel Demand Model update. During this process, local jurisdictions are required to review a draft allocation of ABAG totals to the Countywide Travel Demand Model transportation analysis zones (TAZs). Local jurisdictions then have 60 days to provide input on this draft allocation. The detailed process for finding of non-conformance and the resulting withholding of Proposition 111 funds is described in Chapter 9.

Next Steps

Alameda CTC will further refine the Alameda County Travel Demand Model as part of the requirements to update the database to the latest ABAG Projections database. Further, Alameda CTC will update the database using the land use information and network characteristics submitted periodically by local jurisdictions as part of the land development impact analysis process of the Alameda CTC. Updates to the countywide model will include:

- Completing the current update to the model and making the updated model available for use by end of summer 2014; and
- Ensuring improved consistency with the regional model requirements.

[45] During the next model update, the model base year is anticipated to be updated to 2010 to be consistent with the most recent US Census.

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Capital Improvement Program

8



As part of the CMP, Alameda CTC must develop a seven-year Capital Improvement Program (CIP) to maintain or improve the performance of the multimodal transportation system in Alameda County, to move people and goods, and to mitigate regional transportation impacts identified through the land-use analysis program.[46] Capital improvement projects must conform to the Regional Transportation Plan (RTP), Alameda Countywide Transportation Plan (CWTP), and air quality mitigation measures[47] for transportation-related vehicle emissions.

The Bay Area cannot build its way out of congestion to maintain or improve performance of our transportation system by physically expanding the system. Consequently system-management strategies must be developed and implemented using various but limited federal, state, and local funding sources to maximize use of the existing system. Such strategies should be designed to improve the use and safety of the existing multimodal transportation system in the most cost-effective manner possible. Preservation and maintenance of the existing system in Alameda County—including local roads and transit—remains essential and is a key objective in programming discretionary funds. In particular, flexible funds in the CIP will be programmed to address maintenance and rehabilitation shortfalls that cannot be satisfied from other federal, state, regional, or local funding sources.

Relationship of CIP to Plans and Studies

Projects included in the Capital Improvement Plan must be consistent with the RTP and the CWTP. Since the RTP is required to be in conformance with the State Implementation Plan (SIP) for air quality, the CMP is also required to be in conformance with the SIP. To identify transportation needs and improvements to include in the CIP, Alameda CTC performs periodical monitoring and uses various areawide/corridor studies or plans.

Regional Transportation Plan

Since the CMP ultimately will be incorporated into the RTP action element, projects selected for the Capital Improvement Program need to be consistent with the assumptions, goals, policies, and actions identified in that plan. The RTP, prepared by the MTC, is the basic statement of Bay Area transportation policy. Because of the interdependence of transportation planning and other regional planning, the regional plan strives to adopt policies that complement and support programs of federal, state, and regional agencies. The most recently adopted RTP, *Plan Bay Area*, has

[46] California Government Code Section 65089(b)(5).
[47] The Air Quality Mitigation Measures are contained in the BAAQMD's 2010 Bay Area Clean Air Plan.

been developed by integrating land use and transportation for the first time and requires development of a Sustainable Communities Strategy to reduce greenhouse gas emissions from the transportation sector as required by SB 375.

MTC has adopted an investment policy for *Plan Bay Area*[48], which sets forth MTC's approach to investment in the transportation system. This approach has diverged from the prior approach and focuses more on preserving and maintaining the existing transportation infrastructure, supporting priority development areas and priority conservation areas, and investing in transit. Specifically, the adopted investment strategies are:

1. maintain the existing transportation system;
2. support focused growth;
3. build next-generation transit;
4. boost freeway and transit efficiency;
5. county investment priorities; and
6. protecting Bay Area climate.

Plan Bay Area includes seven specific goals and related specific targets (see Chapter 9, "Program Conformance and Monitoring"). Out of the seven goals, two were legislatively required housing and climate protection with mandated targets.

Countywide Transportation Plan

Alameda CTC will continue to use its CMP as the primary vehicle for implementing the long-range CWTP. The CMP CIP guidelines and other funding policies adopted by the Alameda CTC require projects seeking federal or state funding to be consistent with the CWTP.

Each county within the jurisdiction of MTC can prepare a long-range transportation plan (countywide transportation plan) in cooperation with the respective cities, county, and transit operators.[49]

The CWTP is the basis for the county's component of the RTP.

The Commission adopted the most recent CWTP for Alameda County in June 2012 that resulted from a major comprehensive effort and coordination with various regional and local agencies. Alameda CTC coordinated development of the 2012 CWTP with MTC's development of *Plan Bay Area* and, therefore, focused on identifying projects to meet the long-term transportation needs to better integrate land use and transportation to reduce greenhouse gas emissions in Alameda County. Performance-based planning was used for the first time to develop the 2012 CWTP. This approach effectively identified projects and programs that meet the adopted vision and goals for the plan. Alameda CTC used a set of performance measures to provide an objective and technical means to measure how well projects and programs performed together to meet the goals.

The 2012 CWTP's vision and goals for Alameda County are as follows:

> *Alameda County will be served by a premier transportation system that supports a vibrant and livable Alameda County through a connected and integrated multimodal transportation system promoting sustainability, access, transit operations, public health and economic opportunities.*
>
> To achieve this vision, our transportation system will be:
>
> - Multimodal
> - Accessible, Affordable and Equitable for people of all ages, incomes, abilities and geographies
> - Integrated with the land use patterns and local decision-making
> - Connected across the county, within and across the network of streets, highways and transit, bicycle and pedestrian routes

[48] MTC Resolution 4111.
[49] Assembly Bill 3705 (Eastin), Statutes of 1988.

- Reliable and Efficient
- Cost effective
- Well Maintained
- Safe
- Supportive of a Healthy and Clean Environment

Air Quality Attainment Plans

The CIP is closely related to federal and state air quality attainment plans. Because the Bay Area failed to attain national ambient air quality standards before the 1977 Federal Clean Air Act Amendments' 1987 deadline, a revised State Implementation Plan (SIP) was developed. The purpose of this plan is to show the measures to be taken to reduce air pollution and maintain compliance with federal requirements for annual emission reductions. The RTP is required by federal law to conform to the SIP. Because CMPs are required to be consistent with the RTP, CMPs must also conform to the programs and policies outlined in the SIP.

State air quality legislation, specifically the California Clean Air Act of 1988, requires the Bay Area Air Quality Management District (BAAQMD) to prepare a Clean Air Plan designed to bring the Bay region's air basin into compliance with state air quality standards by the earliest practicable date. The Clean Air Plan must include transportation control measures as well as stationary (e.g., oil refinery) source controls to achieve and maintain the respective standards for ozone and carbon monoxide. Other legislation established a joint process between the MTC and BAAQMD for preparing the transportation control measures plan as part of the state Clean Air Plan.[50] BAAQMD adopted the most recent Clean Air Plan in 2010.

To respond to air quality and climate protection challenges in the years ahead with a comprehensive planning approach, BAAQMD developed the 2010 Clean Air Plan to be a dual plan—to include the required update to the Bay Area's state ozone plan as well as to serve as a multi-pollutant action plan to protect public health and the climate. The 2010 Clean Air Plan Control Strategy component builds on a solid foundation established by the 2005 Ozone Strategy, and previous ozone plans prepared in the 1991 to 2005 period. It includes revised, updated, and new measures in the three traditional control measure categories: Stationary Source Measures, Mobile Source Measures, and Transportation Control Measures. In addition, the Clean Air Plan identifies two new categories of control measures: Land Use and Local Impact Measures, and Energy and Climate Measures. Out of the total 55 control measures in the 2010 Clean Air Plan, 17 are transportation control measures.

The federal and state transportation control measures listed in the attainment plans have implications for county CMPs. MTC will give priority to proposed projects that support or help implement any of the transportation control measures outlined in this revised plan (see Appendix I for federal and state transportation control measures).

Areawide and Corridor Studies

Alameda CTC identified a need for areawide/corridor management multimodal planning in the 2012 CWTP, re-emphasizing the prior policy on corridor/areawide transportation management planning, which is described in Chapter 6, "Land Use Analysis Program." As part of the 2012 CWTP, Alameda CTC developed a Briefing Book and many issue papers on key transportation issues. These collectively identified transportation issues to address, potential focused plans/studies to develop and strategies to explore as part of those plans, and studies to develop an accessible, reliable, and safe multimodal transportation system in Alameda County that is well connected and better integrated with land use.

As part of the next steps identified in the 2012 CWTP, Alameda CTC developed a comprehensive TDM strategy that the Commission adopted and embarked on developing a Countywide Goods Movement Plan, Countywide Transit Plan, and Multimodal Arterial Corridor

[50] Assembly Bill 3971 (Cortese).

Plan, along with updates to the Community Based Transportation Plans. These plans are anticipated to:

- Provide valuable information in assessing short- and long-term impacts to roadways, alternative modes, land use, and goods movement, as well as possible solutions;
- Identify comprehensive approaches to congestion management which can aid in the development of deficiency plans, particularly areawide deficiency plans that offer improvement options to a larger multimodal network, where level-of-service standards have been or are expected to be exceeded; and
- Provide support that allows each community within the corridor/area to demonstrate how the community's share of cumulative/regional transportation impacts could be mitigated through cooperative planning and investment.

So far, corridor studies have been completed for the following corridors:

- Central County Freeway Study (SR 238 Local Area Transportation Improvement Program)
- I-580 Corridor BART to Livermore
- I-680 Value Pricing
- I-880 Strategic Plan
- North I-880 Safety and Operations Study
- San Pablo and I-880 SMART Corridor Programs
- SR 84 Local Area Transportation Improvement Program
- Tri-Valley Triangle Study

A New Diversified Investment Strategy

The 2012 CWTP points to a new, integrated and diversified investment strategy for congestion management and environmental sustainability through connecting land use and transportation investment, and improving multimodal options. The following findings highlight this need for a strategy, which includes all reasonable options:

- The 2012 CWTP includes $9.5 billion in projects, programs and planning studies.
- Even with this extensive investment, the county-wide travel model forecasts congestion to become severe by 2035. Therefore, Alameda County cannot rely solely on investment in facilities as a way out of the congestion problem.
- The transportation needs in Alameda County outweigh the available revenues over the 28-year period.
- The Briefing Book and issue papers developed for the 2012 CWTP make it apparent that all available diverse and multimodal options must be considered to sustain an acceptable level of mobility, improved connectivity, and environmental sustainability in Alameda County—these options include land use strategies, pricing strategies, managing the existing multimodal system better to stretch its capacity, better TDM options for trip reduction, carefully selected transportation investments, new and/or expanded revenue sources, and other approaches which may surface, including strategies to reduce vehicle miles traveled and reduce greenhouse gas emissions.
- Any single approach by itself is unlikely to be successful.

Through a performance-based evaluation in the development of the CWTP, Alameda CTC has considered operational improvements intended to efficiently use existing facilities, improve transit investment and coordination, and support transit oriented developments (PDAs), intermodal freight facilities, non-motorized facilities, as well as other investment strategies to address all transportation issues. The CIP includes projects and programs that reinforce the diversified strategy identified in the CWTP.

Funding Sources

Various federal, state, and local funding sources fund the projects and programs identified in the CIP, which relate to the projects and programs identified in the CWTP. To obtain funding from these sources, projects and programs must meet specific requirements.

Federal Surface Transportation Act

As Alameda County's congestion management agency, Alameda CTC is responsible for soliciting and prioritizing projects in Alameda County for a portion of the federal Surface Transportation Program (STP). The STP provides funding from the reauthorization of federal funding for surface transportation, the legislation by which the Alameda CTC receives federal monies. MTC currently allocates these funds through its One Bay Area Grant Program (OBAG).

Congestion Mitigation & Air Quality Program

Similar to STP funding, Alameda CTC is responsible for soliciting and prioritizing projects in Alameda County for a portion of the federal Congestion Mitigation & Air Quality Program (CMAQ). These funds are used on projects that will provide an air quality benefit. MTC currently allocates these funds through OBAG.

State Transportation Improvement Program

Under state law, Alameda CTC works with project sponsors, including Caltrans, transit agencies, and local jurisdictions to solicit and prioritize projects that will be programmed through the Regional Transportation Improvement Program (RTIP) that makes up 75 percent of funds (county share) in the State Transportation Improvement Program (STIP). The remaining 25 percent of STIP funds are programmed at the state level and are part of the Interregional Transportation Improvement Program (ITIP). Therefore, STIP is made up of RTIP and ITIP. During each STIP cycle, the California Transportation Commission adopts a fund estimate that serves as the basis for financially constraining STIP proposals from counties and regions.

Transportation Fund for Clean Air Program

State law permits the BAAQMD to collect a fee of $4 per vehicle per year to reduce air pollution from motor vehicles through its Transportation Fund for Clean Air (TFCA) Program. Of these funds, BAAQMD programs 60 percent; BAAQMD annually allocates the remaining 40 percent to the designated overall program manager for each county—the Alameda CTC in Alameda County. Projects and programs that receive funding under this program must result in vehicle emission reductions and meet BAAQMD requirements for project cost effectiveness.

Lifeline Transportation Program

Alameda CTC is responsible for soliciting and prioritizing projects in Alameda County for the Lifeline Transportation Program (LTP). The LTP provides funds for transportation projects that serve low-income communities using a mixture of state and federal fund sources. The current program is comprised of multiple fund sources including the State Transit Account, Job Access Reverse Commute, and state Proposition 1B funds. The makeup of this program will likely change due to the passage of Moving Ahead for Progress in the 21st Century (MAP-21) and the programming of the majority of the available Proposition 1B funds.

Measure B Program Funds

Approximately 60 percent of Measure B transportation sales tax dollars are allocated to 20 separate organizations via direct pass-through funds or discretionary grant programs.

The funds allocated to jurisdictions include:

- Local transportation, including local streets and roads projects (22.33 percent)
- Mass transit, including express bus service (21.92 percent)
- Special transportation (paratransit) for seniors and people with disabilities (10.5 percent)
- Bicycle and pedestrian safety (5 percent)
- Transit-oriented development (0.19 percent)

The remaining 40 percent of the transportation sales tax dollars are allocated to specific projects as described

in the voter-approved Transportation Expenditure Plan. Funds are allocated through an annual strategic planning process that identifies project readiness and funding requirements. Project-specific funding allocations are made via specific recommendations approved by the Commission.

Vehicle Registration Fee

The Measure F Alameda County Vehicle Registration Fee (VRF) Program was approved by the voters on November 2, 2010. The fee will generate about $11 million per year by a $10 per year vehicle registration fee. The VRF legislation identifies the following eligible project categories and proportional distribution amounts:

- Local streets and roads (60 percent, pass through funds)
- Transit (25 percent, allocated through discretionary program)
- Local transportation technology (10 percent, allocated through discretionary program)
- Bicycle and pedestrian projects (5 percent, allocated through discretionary program)

Proposition 1B

As approved by the voters in the November 2006 general elections, Proposition 1B enacted the Highway Safety, Traffic Reduction, Air Quality, and Port Security Bond Act of 2006, authorizing $19.9 billion of state general obligation bonds for specified purposes. Proposition 1B includes funding for multiple programs, including the Corridor Mobility Improvement Account (CMIA), the Trade Corridors Improvement Fund (TCIF), and the Traffic Light Synchronization Program (TLSP).

Alameda CTC has successfully secured approximately $420 million in Proposition 1B Bond funding to complete the $800 million Alameda CTC I-Bond construction program. The seven projects that use Proposition 1B funds are complete or under construction.

Project Delivery

In light of the focus on project delivery, Alameda CTC has adopted an aggressive "Timely Use of Funds Policy."

The policy applies to all funding programs administered by the Alameda CTC, including projects programmed in the STIP, federal STP/CMAQ, and the TFCA program.

The policy defines a strategy for project delivery assistance and evaluation of extension requests. It includes the following provisions:

- Alameda CTC may provide sponsors with consultant support in the implementation of projects. This support could include assistance in the development of a baseline schedule and on-call availability for project delivery questions.
- Alameda CTC and the project delivery assistance consultant may host a project delivery workshop after the Commission adopts funding programs. Attendance at this workshop may be mandatory for project sponsors and provides an overview of the program-specific requirements for project delivery.
- The policy establishes criteria for the evaluation of reprogramming and extension requests. Alameda CTC will evaluate these requests based on the nature of the circumstances causing the delay, the sponsor's adherence to the baseline schedule and previous milestones, and the sponsor's ability to meet future project delivery deadlines.
- Any project sponsor that fails to meet a timely use of funds deadline that results in a loss of programmed funds to Alameda County will be penalized in a future state or federal funding cycle an amount equal to the funds that were lost to Alameda County.

The complete Timely Use of Funds Policy is included as Appendix M.

The CIP

The 2013 Alameda County Capital Improvement Program covers a seven-year period (fiscal year 2013-2014 to 2019-2020) and comprises the following:

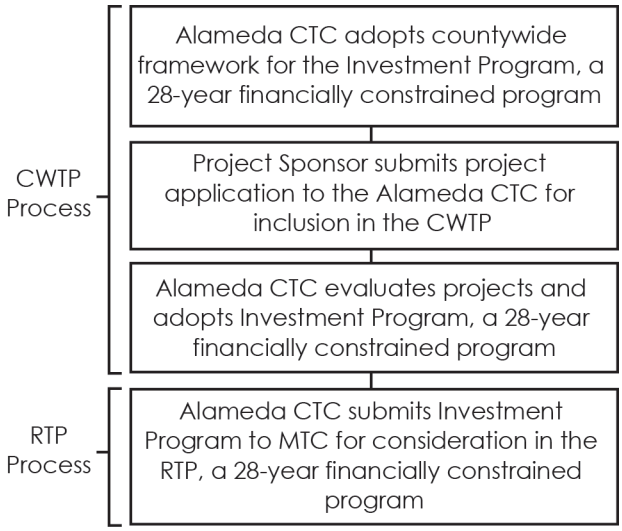
- Major capital projects and rehabilitation projects programmed in the 2014 STIP and Federal Funding Act extensions; and
- Other highway, transit, bicycle and pedestrian, and other local projects intended to maintain or improve the performance of the CMP network.

The projects in the CIP are linked to the vision and projects presented in the 2012 CWTP. The CIP projects are a subset of the 28-year plan, either as specific capital projects or from funding set aside to cover categories of projects, including maintenance and rehabilitation of local streets and roads, transit capital replacement, bicycle and pedestrian improvements, and operational improvements. To assure consistency with regional transportation and air quality goals, Alameda County's priorities for state and federal funding are developed to be consistent with MTC's programming policy.

The CIP includes projects anticipated to assist in maintaining the level of service and performance standards of the CMP. Funding for all projects, however, has not been secured. Some projects shown in the CIP may need supplemental funding from other sources or may be submitted for state/federal funding consideration in future years. Figures 11 and 12 describe the process for soliciting, evaluating, and selecting projects for state and federal funding.

In 2013, OBAG provided a new funding approach that supports California's climate change law, Senate Bill 375 (Steinberg, 2008) (SB 375), which requires a Sustainable Communities Strategy to integrate land use and transportation to reduce greenhouse gas emissions. OBAG is funded with MTC Cycle 2 federal STP and CMAQ funding sources for four fiscal years (FY12-13 through FY15-16) as addressed in MTC Resolution 4035. This resolution requires 70 percent of the overall OBAG funding to be programmed to transportation projects that support PDAs and allows the remaining 30 percent of the OBAG funds to be programmed for transportation projects anywhere in the county.

Figure 11—Process for Selecting Projects for the Countywide Transportation Plan (CWTP) and the Regional Transportation Plan (RTP)



Alameda CTC is exploring new revenue sources for transportation facilities and services considered in the CWTP. Revenue enhancement is a critical component of the plan; the transportation need over the next 28 years exceeds available revenues. Alameda CTC will support new revenue sources that best meet the goals of the long-range transportation plan and CMP. These revenue sources could include a regional, state, or federal gas tax increase, an extension and/or augmentation of the existing transportation sales tax, or a bridge toll increase. The CMP law itself suggests another possible funding source—traffic impact fees. The Tri-Valley Transportation Council including the cities of Dublin, Livermore, and Pleasanton, and Alameda County has developed a sub-area traffic mitigation fee. The Council has adopted an Expenditure Plan that identifies the projects included in the final fee and is implementing it. Chapter 6, "Land Use Analysis Program," describes in greater detail areawide transportation impact mitigation fees and their potential in Alameda County.

Figure 12—Process for Selecting Projects for State and Federal Funding

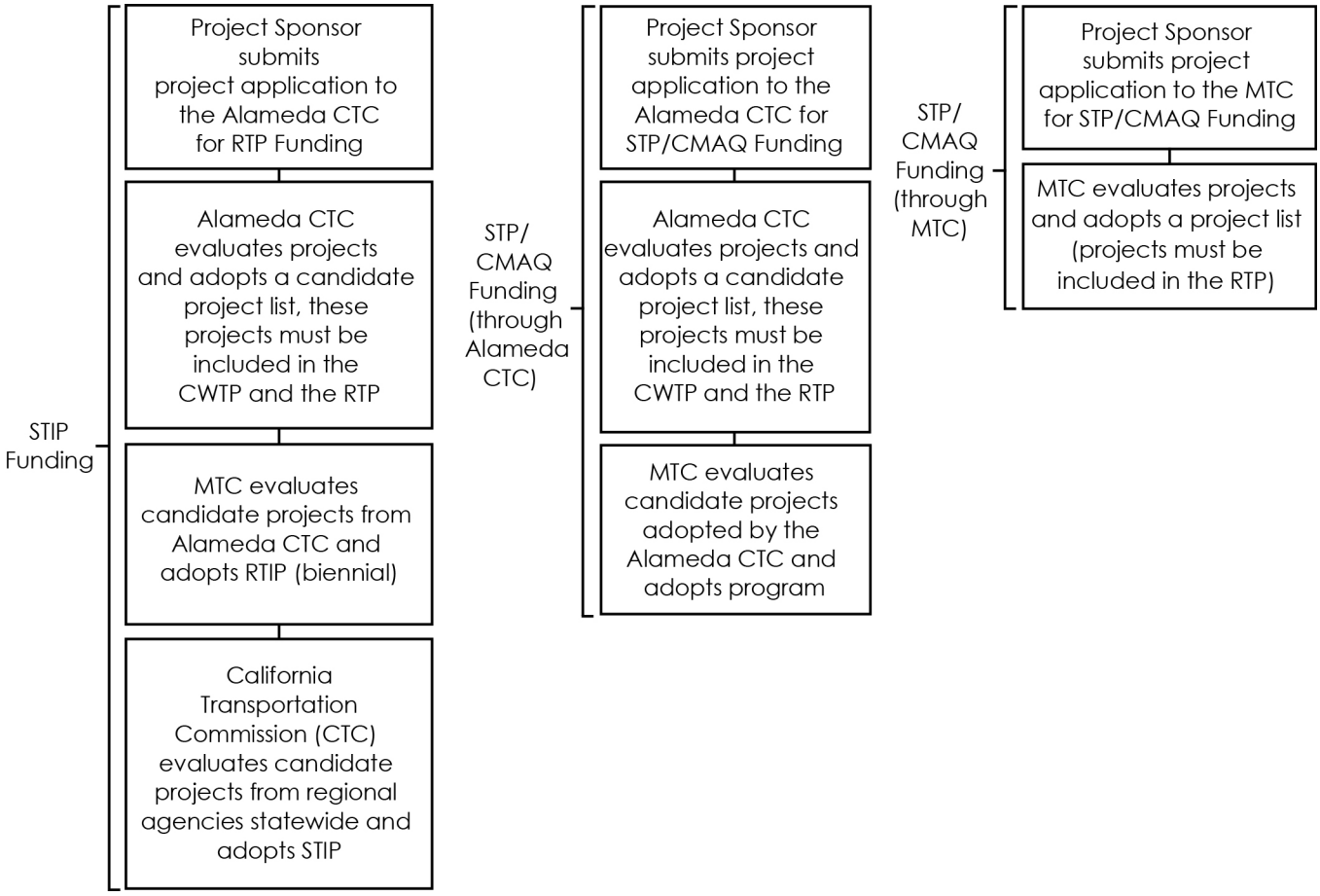


Table 16 lists the Alameda County projects recommended for funding in the 2014 STIP. These projects have been screened for consistency with the CWTP. The 2014 STIP is scheduled to be approved by the California Transportation Commission in April 2014.

Table 17, which begins on the following page, contains major capital projects and rehabilitation and other major highway, transit, and local projects intended to maintain or improve the performance of the CMP network.

The CMP law requires biennial updating of the CIP. To update the program, each city, the county, Caltrans, the Port of Oakland, each transit operator, and other project sponsors must, during each odd numbered year and in response to a call for projects from Alameda CTC, submit to Alameda CTC a list of projects intended to maintain or improve the level of service on the designated system and to meet transit performance standards.

In 2013, Alameda CTC initiated a new process for an enhanced Strategic Plan/CMP that will include a Capital Improvement Program/Programs Investment Plan (CIP/PIP) and Allocation Plan. To meet legislative requirements and help maintain and improve the performance of the multimodal transportation system, Alameda CTC is incorporating a comprehensive CIP and a Programs Investment Program (PIP) in the CMP document. The new comprehensive CIP/PIP is anticipated to be adopted in 2014.

Based on the policy framework proposed with the Strategic Planning and Programming Policy adopted by the Commission in March 2013, the CIP and PIP will be incorporated with an expanded Strategic Plan/CMP that meets state statutory requirements, and serves as a fully integrated strategic planning and programming document that can more effectively guide future planning and programming decisions.

Consistent with the requirements of the CMP, the CIP and PIP will each contain a multi-year planning horizon to guide the programming of federal, state, and local funds under Alameda CTC's purview.

The current CIP includes projects that contribute to alleviating traffic congestion and reducing carbon emissions consistent with legislative mandates and Alameda CTC adopted plans. Projects were prioritized based on funding eligibility and prioritization criteria.

The PIP will also contribute to reducing congestion and carbon emissions and include projects and programs that support capital improvements, transit operations, outreach and education, transportation maintenance activities, and reporting tasks not included in the CIP. Many of these activities are expected to be funded using available program funds through sources such as Measure B and the Vehicle Registration Fee.

Table 16—Projects Recommended for Funding in the 2014 STIP ($ X 1,000)

Table 16 reflects the 2014 STIP program approved by the Alameda CTC Commission on December 5, 2013.

Index #	Project	Proposed for 2014 STIP ($ x 1,000)
1	Alameda County I-Bond Projects	8,000
2	Route 84 Expressway (South Segment)	12,000
3	Route 24 Corridor – Caldecott Settlement Projects	2,000
4	AC Transit Bus Rapid Transit Project	7,995
5	Daly City BART Station Intermodal Improvements	200
6	STIP Administration	1,590
7	ARRA Backfill (Caldecott Tunnel)	2,000
	Total	**33,785**

Table 17—2013 Capital Improvement Program

Table 17 shows the major capital projects and rehabilitation projects programmed with federal Transportation Act, Measure B, VRF, TFCA, CMA TIP, and other funds intended to maintain or improve the performance of the CMP network.

Table 17.1— Project Groups

		Project Funding ($ x 1,000)			
Sponsor	**Project Name / Description**	**Federal**	**State**	**Local**	**Total**
All Alameda Jurisdictions	Roadway Capital Improvements	30,860	6,070	179,292	216,222
All Alameda Jurisdictions	Roadway Operations Improvements	1,203	2,800	32,389	36,392
All Alameda Jurisdictions	Bicycle Pedestrian Improvements	23,164	19,760	50,559	93,483
All Alameda Jurisdictions	Transit Capital Replacement/ Rehabilitation Improvements	250	241	825	1,316
All Alameda Jurisdictions	Other Capital Improvements	2,215	0	61,809	64,024



Table 17.2—Roadway Capital Improvement—Freeway

		Project Funding ($ x 1,000)			
Sponsor	**Project Name / Description**	**Federal**	**State**	**Local**	**Total**
Alameda CTC	I-80/Gilman Interchange Improvements	1,080		312	1,392
Alameda CTC	I-580 Express Lanes	8,500	6,000	40,480	54,980
Alameda CTC	I-580 Westbound HOV Lane - East Segment	6,337	63,053	13,512	82,902
Alameda CTC	I-580 Westbound HOV Lane - West Segment	100	52,674	8,201	60,975
Alameda CTC	I-580 Corridor ROW Preservation		4,700	114,000	118,700
Alameda CTC	I-680 Northbound HOT Lane (PA/ED)			15,500	15,500
Alameda CTC	I-880 Southbound HOV Lane - North Segment	2,723	29,765	4,222	36,710
Alameda CTC	I-880 Southbound HOV Lane - South Segment	5,057	52,846	11,881	69,784
Alameda CTC	Route 84 South Segment		37,000	48,000	85,000
Alameda CTC	I-880 North Safety and Operational Improvements at 23rd and 29th Avenues	1,800	85,000	15,000	102,000
Alameda	I-880 / Broadway Jackson			3,900	3,900
Emeryville	Ashby/Shellmound Interchange Modification			50,000	50,000
Emeryville	I-80 Powell Street Offramp Widening for Bus Stop Pull out				2,000
Hayward	I-880/SR-92 Reliever Route			15,477	15,477
Hayward	Dixon Street Improvements		1,800	250	2,050
Hayward	Route 238 Corridor Improvement Project			61,840	61,840
San Leandro	E. 14th Street/Hesperian Boulevard/150th Street Channelization Improvements			5,383	5,383
San Leandro	I-880 Davis Street Interchange	600	9,600		10,200
San Leandro	I-880 Marina Boulevard Interchange			31,800	31,800

Table 17.3—Roadway Capital Improvement—Non-Freeway/Rehabilitation

		Project Funding ($ x 1,000)			
Sponsor	**Project Name / Description**	**Federal**	**State**	**Local**	**Total**
Dublin	Dublin Boulevard Widening (Sierra Lane to Dublin Court)	1,670		1,400	3,070
Dublin	I-580 Interchange Improvements at Hacienda Drive and Fallon Road - Phase II	15,000		24,000	39,000
Dublin	Dublin Boulevard Extension from Fallon Road to Doolan Road in Livermore (Project Development and ROW phases only)	6,000	4,000	5,000	15,000
Dublin	Realign Tassajara Road between Fallon and City/County limits	16,000		8,000	24,000
Dublin	Fallon Road Extension from Cydonia Court to Tassajara Road	1,000		700	1,700
Dublin	Scarlett Drive Extension from Dougherty Road to Dublin Boulevard			14,500	14,500
Fremont	Route 262 Mission Boulevard Cross Connector Improvements between I-680 and Warm Springs Boulevard/SR 262 Mission Boulevard Improvements			20,000	20,000
Fremont	Kato Road Widening from Warren Avenue to Milmont Drive				13,000
Fremont	Auto Mall Parkway Cross Connector Widening between I-680 and I-880			25,000	25,000
Fremont	Upgrade Relinquished Route 84 in Fremont				45,000
Fremont	Widen Fremont Boulevard from I-880 to Grimmer Boulevard				5,000
Fremont	Warm Springs Station Improved Access - Auto Mall Parkway Project			3,500	3,500
Newark	Central Avenue Railroad Overpass			2,765	2,765
Oakland	42nd/High Street Access Improvements to I-880		7,736	2,000	9,736
Oakland	New Access Road and Realigned Burma Road for Oakland Army Base (OAB)		32,000	3,200	35,200
Oakland	Wake Avenue Roadway Improvements - OAB		2,000	200	2,200
Oakland	Maritime Street Reconstruction - OAB		30,000	3,000	33,000
Oakland	West Grand and Maritime Intersection Improvements - OAB		1,500	150	1,650
Port of Oakland/ Oakland	7th Street Grade Separation	110,000	110,000	3,250	223,250

Table 17.4—Roadway Operations Improvements

		Project Funding ($ x 1,000)			
Sponsor	**Project Name / Description**	**Federal**	**State**	**Local**	**Total**
Alameda CTC	I-80 ICM	3,243	67,600	9,157	80,000
Alameda County/ACTIA	I-580/Strobridge Off-Ramp Modification in Castro Valley		21,000		21,000
Alameda County	Patterson Pass Road Safety Improvements	800	3,200	2,000	6,000
Alameda County	Crow Canyon Road Safety Improvements	11,700	1,000	3,000	15,700
Alameda County	East County Roadways Shoulder Improvements - Phase I		10,000	5,000	15,000
Alameda County	Vasco Road Safety Improvements - Phase IB	14,000	4,000		18,000
Alameda County	Vasco Road Safety Improvements - Phase II	1,000	20,000		21,000
Alameda County	Grant Line Road Safety Improvements		10,000		10,000
Alameda County	Tesla Road Safety and Streetscape Improvements	1,500	5,000	4,500	11,000
Alameda County	Altamont Pass Safety Improvement	7,392	504	504	8,400
Alameda County	Redwood Road Safety Improvement	41,360	2,820	2,820	47,000
Dublin	ITS Technology Implementation to Achieve Higher Capacities without Street Expansion	2,000		200	2,200
Emeryville	Powell Street Bridge Widening				5,000
Fremont	Safety Improvements at UPRR - Fremont Boulevard, Maple, Dusterberry, Nursery				3,000
Fremont	Vargas Road Safety Improvement Project				5,000
Union City	Whipple Road Widening	8,800		1,200	10,000

Table 17.5—Bicycle/Pedestrian Improvements

		Project Funding ($ x 1,000)			
Sponsor	**Project Name / Description**	**Federal**	**State**	**Local**	**Total**
Alameda County	Castro Valley Boulevard Streetscape Improvements Phase II		15,000	3,000	18,000
Alameda County	E.14th/Mission Pedestrian/Transit/Streetscape Improvements - Phase II		5,000	5,000	10,000
Alameda County	Mission Boulevard Pedestrian/Transit/Streetscape Improvements Phase III		5,000	5,000	10,000
Alameda County	Hesperian Streetscape Improvements		13,100	1,500	14,600
Alameda County	East Lewelling Boulevard Improvements Phase II		11,700		11,700
Alameda County	Sunol Area Circulation Improvements		10,000		10,000
Alameda County	Pedestrian and Streetscape Improvements in Cherryland/Ashland	3,100	5,000		8,100
Alameda County	A Street Pedestrian and Bicycle Improvements		3,000		3,000
Alameda County	San Lorenzo Creek Trail	8,800	600	600	10,000
Alameda	Park Street Streetscape	1,490		353	1,843
Albany	Implementation of the San Pablo Avenue Complete Streets Project	3,000	500	250	3,750
Albany	Solano Avenue Complete Streets	2,000	500	250	2,750
Dublin	Dougherty Road Widening to provide bike lanes and transit access	8,531		11,999	20,530
Dublin	Amador Plaza Road Complete Street Improvements between Amador Valley Bouelevard and St. Patrick Way	4,813		624	5,437
Dublin	Village Parkway Bicycle and Pedestrian Improvements between the Alamo Canal Trail and North City Limit	2,533		329	2,862
Emeryville	Christie Avenue Bay Trail Gap Closure Class 1 Path and Bike and Pedestrian Intersection Improvements			550	550
Emeryville	South Bayfront Bicycle and Pedesrian Bridge			12,000	12,000
Emeryville	I-80 Bike and Pedestrian Bridge at 65th Street				15,000
Fremont	Greenbelt Gateway on Grimmer Boulevard				9,000
Fremont	Sullivan Road Overcrossing, Ped/Bike Safety and Trail Improvements				2,000
Fremont	Bicycle/Pedstrian Grade Separation on Blacow Road at UPPR and Future BART Line in Irvington				6,000
Fremont	Rails to Trails: Fremont UPRR/BART Corridor Trail				44,000
Fremont	BART Warm Springs Station West Side Access				20,000
Oakland	MLK/Peralta Streetscape Phase I	5,452		707	6,159

Table 17.5—Bicycle/Pedestrian Improvements (cont'd)

		Project Funding ($ x 1,000)			
Sponsor	Project Name / Description	Federal	State	Local	Total
Oakland	7th St West Oakland Transit Village Phase II	3,280		456	3,736
Oakland	Lakeside Green Streets	7,000		3,540	10,540
Oakland	Lake Merritt Bikeways	422		2,218	2,640
Oakland	Lake Merritt Channel Bike Ped Bridge - Project Development			2,500	2,500

Table 17.6—Transit Capital Replacement/Rehabilitation Improvements

		Project Funding ($ x 1,000)			
Sponsor	Project Name / Description	Federal	State	Local	Total
AC Transit	East Bay Bus Rapid Transit (BRT)	79,000	44,400	54,600	178,000
AC Transit	Revenue Vehicle Replacement	201,675	23,318	27,101	252,094
AC Transit	Broadway College (Route 51) Corridor Improvements	10,516		124	10,640
AC Transit	Facilities Rahabilitation and Maintenance	40,100	8,300	89,800	138,200
AC Transit	Grand MacArthur BRT	2,880		720	3,600
AC Transit	Zero Emission Bus Delta	148,625		29,725	178,350
AC Transit	Contra Flow Lanes/SF-Oak Bay Bridge			5,100	5,100
BART	BART Metro Program/Bay Fair Connection			150,000	150,000
BART	BART Rail Vehicle Capacity Expansion (Alameda County portion)		444,000		444,000
BART	BART Security Program (Alameda County portion)	43,200	43,200		86,400
BART	BART to Livermore Extension, Phase I			5,000	5,000
BART	Secure Bike Parking		237	2,635	2,872
Fremont/ BART	Irvington BART Station				127,000
Fremont	Altamont Commuter Express/Capitol Corridor Station at Auto Mall Parkway				11,000
LAVTA	Fixed Route Vehicle Replacement	13,008		3,252	16,260
LAVTA	Paratransit Vehicle Replacement	1,094		274	1,368
LAVTA	Facilities Planning & Construction	367		29,633	30,000
LAVTA	Capital Improvements subsequent to Tri-Valley Multimodal Access and PDA Connectivity Study	10,000			10,000

Table 17.7—Other Capital Improvements

		Project Funding ($ x 1,000)			
Sponsor	Project Name / Description	Federal	State	Local	Total
Alameda County	Castro Valley Transit Village	38,720	2,640	2,640	44,000
Alameda County	Miller Sweeney (Fruitvale Avenue) Roadway Bridge (Lifeline)	35,904	2,448	2,448	40,800
Alameda County	Fruitvale Avenue Railroad Bridge	9,680	660	660	11,000
Alameda County	Park Street Bridge Replacement	40,744	2,778	2,778	46,300
Alameda County	High Street Bridge Replacement	35,464	2,418	2,418	40,300
Fremont	Fremont City Center Multimodal Improvements (Downtown Project)	5,853			5,853
Livermore	Relocation and Restoration of Railroad Depot	2,500		500	3,000
Livermore	Modify I-580/Vasco Road Interchange	10,900		53,000	63,900
Oakland	Adeline Street Bridge Seismic Retrofit	3,742	485		4,227
Oakland	Embarcadero Street Bridge Seismic Retrofit	13,979	11	1,790	15,780
Oakland	23rd Avenue Bridge Seismic Retrofit	5,490		711	6,201
Oakland	Leimert Bridge Seismic Retrofit	4,528		587	5,115

Local Government Responsibilities and Conformance

Alameda CTC is responsible for monitoring conformance of local jurisdictions with the adopted CMP. Among the requirements, Alameda CTC must develop a Capital Improvement Program that includes projects and programs to improve or maintain the performance of the countywide multimodal transportation system. By July 31st of each odd-numbered year, to be in conformance with the CMP, local jurisdictions and project sponsors must submit to Alameda CTC a list of projects intended to maintain or improve the LOS on the CMP network and to meet transit performance standards. The detailed process for finding of non-conformance and the resulting withholding of Proposition 111 funds is described in Chapter 9.

Next Steps

In 2014, Alameda CTC will complete a comprehensive, performance-based five-year Capital Improvement Program and Program Investment Plan that is ready to be implemented so it can be incorporated into the 2015 CMP and used for programming funds.

Program Conformance and Monitoring 9



Alameda CTC is responsible for ensuring local government conformance with the Congestion Management Program.[51] Alameda CTC compares the monitoring information the local governments provide to the requirements of the adopted CMP. Reasons for non-conformance could include inadequate monitoring information, inadequate deficiency plan development, or failure to follow through with the program requirements for level of service standards, site design guidelines, capital improvements, and land use analysis. In addition to these requirements, each city and the county must contribute its apportioned share of Alameda CTC's administrative costs as membership dues.

The CMP legislation also requires that the Regional Transportation Planning Agency, the Metropolitan Transportation Commission in the Bay Area, evaluate the CMP for consistency with the Regional Transportation Plan (RTP) and compatibility of programs within the region. Once MTC finds consistency with the RTP, it will incorporate the Capital Improvement Program of the CMP into the Regional Transportation Improvement Program (RTIP).

Conformance

If Alameda CTC finds a local jurisdiction in non-conformance, it will notify the local jurisdiction, which then has 90 days to remedy the area(s) of non-conformance. If the local jurisdiction fails to provide a remedy within the stipulated time, Alameda CTC will notify the state controller, and the notice will include the reasons for the finding and evidence that Alameda CTC correctly followed procedures for making the determination. The state controller would then withhold the non-conforming jurisdiction's increment of subventions from the fuel tax made available by Proposition 111, and the jurisdiction will not be eligible to receive funding for projects through the federal Surface Transportation Program or Congestion Mitigation and Air Quality Program, or the State Transportation Improvement Program.

If over the next 12 months Alameda CTC determines that the jurisdiction is in conformance, the withheld Proposition 111 funds will be released to the jurisdiction. If after the 12-month period the city or county has not conformed, the withheld Proposition 111 funds will be released to Alameda CTC for other projects of regional

[51] If the City of Oakland is found to be out of conformance, the Port of Oakland's projects will be treated as City of Oakland projects for purposes of the CMP requirements and state statutes.

significance in Alameda County and included in the CMP or deficiency plans.

Alameda CTC is responsible for ensuring local government conformance with four elements of the CMP:

- LOS standards[52]
- Trip Reduction Program
- Land Use Analysis Program
- Payment of membership dues

Level of Service Standards

Local governments are accountable for meeting LOS standards as described in Chapter 3, "Level of Service Monitoring." If they do not meet the established LOS standards, they must develop a deficiency plan that describes how the jurisdiction will meet the adopted LOS standards at the deficient segment or intersection, and how it will achieve LOS and air quality improvements.[53]

Travel Demand Management Element

Local jurisdictions must adopt site design guidelines as described in Chapter 5, "Travel Demand Management Element" to meet TDM requirements. The site design guidelines must enhance transit/pedestrian/bicycle access. Each jurisdiction must submit a complete Site Design Guidelines Checklist that meets the annual conformity timeline each year and specifies that they have adopted and are implementing such guidelines to encourage the use of alternative travel modes.

Further, they must undertake capital improvements that contribute to congestion management and emissions reduction. Each jurisdiction is required to participate in the Transportation Fund for Clean Air, Surface Transportation Program, Congestion Mitigation and Air Quality Program, and other funding programs and to submit projects that support bicycle, pedestrian, transit, or carpool use. Chapter 5 provides more detail. See Appendix H for the TDM Checklist.

Land Use Analysis Program

Alameda CTC is required to develop a program that will analyze impacts and determine mitigation costs of land use decisions on the Regional Transportation System. Local governments are responsible for implementation of the program. The program approach is described in Chapter 6, "Land Use Analysis Program."

Local jurisdictions are responsible for approving, denying, or altering projects and land-use decisions and are required to determine land-development impacts on the Metropolitan Transportation System and formulate appropriate mitigation measures commensurate with the magnitude of the expected impacts.

Capital Improvement Program

Alameda CTC is required to prepare and biennially update a Capital Improvement Program (CIP) aimed at maintaining or improving transportation service levels as described in Chapter 8, "Capital Improvement Program." Each city, the county, transit operators, and Caltrans provide input to these biennial updates.

Monitoring

Monitoring provides feedback to determine whether the CMP's objectives are being met. The CMP network performance and Priority Development Area (PDA) implementation data collected in the monitoring process can be used to verify and update either the CMP or the actions of the local governments to meet legislative requirements. Monitoring also provides information that can be used to:

- Update the countywide travel model and database;
- Develop and update land development approval database;
- Update the travel demand management measures, transit standards, and LOS standards;
- Determine whether a local government is required to develop a deficiency plan; and

[52] California Government Code Section 65089.3.
[53] California Government Code Section 65089.3(d).

- Determine how well transportation investments are being coordinated with new developments and demands for access and mobility, and general congestion management.

Table 18 outlines the schedule and basic monitoring requirements that each jurisdiction must meet to document to Alameda CTC that the jurisdiction conforms to CMP requirements. Further action by Alameda CTC may be necessary to develop rules, procedures, and other data requirements for monitoring and conformance.

LOS Standards

Alameda CTC currently monitors LOS standards. If the cities, county, or Caltrans assume this responsibility, monitoring may be accomplished through a self-certification process involving the local jurisdictions and/or Caltrans and the Alameda CTC. In this event, the responsible agency will annually monitor the LOS on segments of the CMP network under its jurisdiction. Where a segment falls within two or more jurisdictions, the jurisdiction with the greatest segment mileage is responsible for monitoring the segment. Local jurisdictions that choose to conduct monitoring of LOS on CMP roadways must follow the process described below.

The jurisdiction must conduct p.m. peak period (4 p.m. to 6 p.m.) and a.m. peak period (7 a.m. to 9 a.m.) travel-speed sampling on a non-holiday Tuesday, Wednesday, or Thursday and analyze LOS based on that data consistent with the methods for determining LOS outlined in the Chapter 3, "Level of Service Standards." Studies on the impact of proposed developments and commercially available data may supply some of the data (provided the sampling is done during the timeframes specified above), thereby reducing the need for data collection.

Performance Measures

Although no statutory requirements regulate performance element monitoring, Alameda CTC prepares a transportation performance report annually. The report summarizes current performance data, highlights any significant changes in transportation system performance, and provides broad analyses of the results and any implications for policy and investment decisions made by Alameda CTC.

Consistency with the Regional Transportation Plan

The CMP must be consistent with the RTP related to the following:

- Goals and objectives established in the RTP;
- System definition with adjoining counties;
- Federal and state air quality plans;
- MTC travel demand modeling database and methodologies; and
- RTP financial assumptions.

In July 2013, MTC and ABAG jointly adopted the 2013 RTP and Sustainable Communities Strategy (SCS) called Plan Bay Area. It incorporates the land use and housing component (the SCS) for the first time as required by Senate Bill 375. Plan Bay Area includes the following goals, of which Climate Protection and Adequate Housing are mandatory:

- Climate Protection
- Adequate Housing
- Healthy and Safe Communities
- Open Space and Agricultural Preservation
- Equitable Access
- Economic Vitality
- Transportation System Effectiveness

The 2012 Countywide Transportation Plan adopted by Alameda CTC was developed based on principles of *Plan Bay Area* with the intent to support the RTP by meeting the mandatory and voluntary goals.

Table 18—Conformance and Monitoring

CMP Element	Responsible Agency	Requirement	Conformance/Monitoring Deadline
Designated CMP Roadway Network	Cities/County	Submit a list of potential CMP-designated routes based on 24-hour traffic data collected in the spring for Tier 1 CMP network and meeting the criteria for Tier 2 CMP network.	By end of the May 31 during the CMP update year (odd-numbered year)
LOS Standards[54]	Alameda CTC	Monitor the level of service on the CMP-designated network and report consistency with the LOS standards.	In even-numbered years, by July 31, incurring data collection in the spring and identification of potential deficiency by July 31
Performance Element	Alameda CTC/ Transit Operators/ Cities/County	Submit available transportation performance measurement data to Alameda CTC for use in the Annual Transportation Performance Report. Submit short-range transit plan and report to Alameda CTC relative to attainment of the established standards. As part of this report, identify the resources necessary to continue to maintain this transit performance level during the succeeding five years.	Annually as required for developing the Performance Report by October 1 of each year
Travel Demand Management	Cities/County	Submit the completed Site Design Guidelines Checklist to Alameda CTC certifying that the guidelines were adopted and implemented.	In response to annual conformity findings by October 1
Land Use Analysis Program	Cities/County	Demonstrate that the program is being carried out by submitting land development project information. Starting in year 2014, provide information on development approvals that occurred in the prior calendar year for developing countywide land use approvals data base and a copy of the most recent Housing Element Annual Progress Report submitted to the State Department of Housing and Community Development.	In response to annual conformity findings by October 1
Capital Improvement Program[54]	Cities/County/ Transit Operators/ Caltrans/Port of Oakland/Others	Submit a list of projects intended to maintain or improve the level of service on the designated system and to maintain transit performance standards. The TDM element requires that local jurisdictions consider including projects that support alternative modes in the CIP.	In response to call for projects during the biennial CMP update by July 31

[54] The submittal requirement and deadline will likely change for the 2015 CMP in view of the CIP/PIP adoption in 2014.

Additional consistency requirements are identified in the appropriate chapters in the CMP:

- Chapter 2, "Designated CMP Roadway Network" demonstrates 2013 CMP conformance with the CMP/MTS network;
- Chapter 4, "Multimodal Performance Element" identifies consistency with the RTP goals;
- Chapter 5, "Travel Demand Management Element" identifies trip-reduction measures in the Air Quality Plan Transportation Control Measures;
- Chapter 6, "Land Use Analysis Program" acknowledges the Resolution 3434 Regional Transit Expansion Program and PDA Investment and Growth Strategy per OBAG requirements in Resolution 4035;
- Chapter 7, "Database and Travel Demand Model" discusses travel demand model consistency;
- Chapter 8, "Capital Improvement Program" identifies projects and programs in the BAAQMD's Air Quality Plans' Transportation Control Measures as well as regional programming policies and principles; and
- Chapter 11, "Conclusions and Future Considerations" summarizes consistency requirements and the 2013 CMP's compliance with them.

Next Steps

- Based on results from validation work in 2013 evaluating the use of commercially available data for LOS monitoring purposes, Alameda CTC will update conformance for LOS standards during the 2015 CMP update.
- Based on the development of the Strategic Plan that will include a comprehensive Capital Improvement Program/Program Investment Plan, any change in related conformance requirement will be updated in the 2015 CMP.

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Deficiency Plans

10



Congestion Management Program legislation requires preparation of deficiency plans when a CMP roadway segment does not meet the adopted level of service standard, which is LOS E for Alameda County CMP roadways. Deficiency plans provide an opportunity to analyze the causes of the problems and determine whether localized improvements can address them or if it would be best to employ measures that will improve overall system efficiency and air quality. Deficiency plans also provide local governments the opportunity to give priority to system-wide and non-capital mitigation methods to relieve congestion. The statutes specifically point to improved public transit service and facilities, improved non-motorized transportation facilities, high occupancy vehicle (HOV) facilities, parking cash-out programs, and transportation control measures.

In view of the lack of availability of funds for transportation improvements, this deficiency plan requirement places hardship on local jurisdictions. Therefore, as part of the 2011 CMP update, Alameda CTC considered this issue and explored options to provide support to improve deficient segments. Based on Commission approval and input received from the jurisdictions, Alameda CTC aims to give priority consideration to projects during the evaluation process for funding that would improve the performance of deficient segments through approaches such as awarding additional points to those projects.

Requirements

The need for deficiency plans is identified following the biennial LOS monitoring of the CMP roadway network. Deficiency plans are required when a CMP segment does not meet the adopted LOS standard, after allowable exemptions. At a minimum, deficiency plans must include:

- Identification and analysis of the causes of the deficiency;
- A list of improvements necessary for the deficient segment or intersection to maintain the minimum LOS required and the estimated costs of the improvements;
- A list of improvements, programs, or actions (and estimates of their costs) that will measurably improve multimodal performance of the system and contribute to significant improvements in air quality; and
- An action plan of the most-effective implementation strategies to maintain the minimum LOS standards on the deficient segment, or to improve the current and future LOS, and contribute to significant air-quality improvements. The action plan must include implementation strategies, a specific

implementation schedule, and a description of funding and implementation strategies. Special consideration for state or federal requirements must be taken into account when determining the feasibility of the action plan. Improvements funded through the CMP Capital Improvement Program, whether having local or system impact, must not degrade air quality.

Deficiency Plan Types

Two types of deficiency plans can be developed, depending on the needs of the local jurisdiction(s) and how and whether the deficiency can be mitigated. If more than one local jurisdiction is responsible for causing a deficient segment, all responsible local jurisdictions must participate in development and approval of a multi-jurisdictional deficiency plan. Local jurisdictions outside Alameda County that contribute significantly to a deficiency plan will be invited to participate but cannot be compelled to do so.

Localized Deficiency Plan

This type of plan is appropriate for addressing transportation impacts to a single CMP segment or roadway identified as or anticipated to become deficient based on LOS monitoring. The Localized Deficiency Plan focuses on analyzing the cause of deficiency by including the immediate surrounding area as the project area and identifying the list of improvement or mitigation measures in the action plan.

Areawide Deficiency Plan

This type of plan is appropriate for addressing transportation impacts to more than one CMP roadway in a larger geographic area not able to be mitigated back to conformance within the CMP LOS standards if considered individually within a localized area. The Areawide Deficiency Plan focuses on offsetting the deficiency by including the broader surrounding area as the project area and identifying a list of improvements, programs, or actions to improve the performance of the larger multimodal network.

Guidelines

As part of the 2013 CMP update, Alameda CTC updated the deficiency plan guidelines to include more details and procedures for developing Areawide Deficiency Plans. The guidelines, developed with input from the Alameda County Technical Advisory Committee, describe the approval process, timelines, and acceptable methodologies for jurisdictions to use in development and approval of deficiency plans. The updated guidelines are in Appendix D.

Conflict Resolution

CMP legislation requires each congestion management agency to establish a conflict-resolution process for addressing conflicts or disputes between local jurisdictions in meeting the multi-jurisdictional deficiency plan responsibilities.

The intent of Alameda CTC's conflict-resolution process is to help local jurisdictions resolve conflicts that arise during multi-jurisdictional deficiency plan development or implementation that could impact the CMP conformance of one or more jurisdictions. The conflict resolution process is intended to be an effective and flexible process that responds to the issues and concerns of the respective jurisdictions.

Alameda CTC's conflict resolution process is based on the following principles.

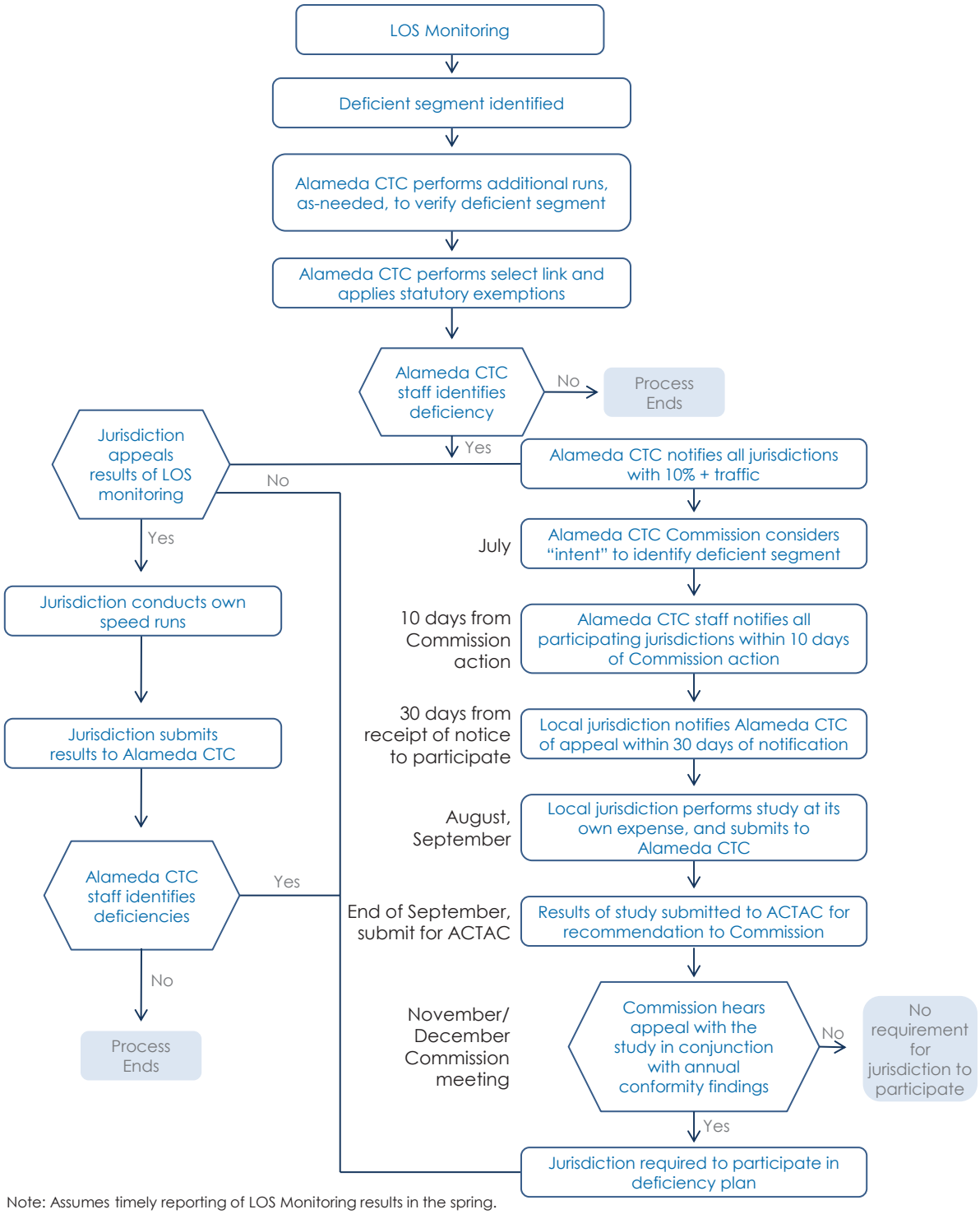
- First, consensus at the local level on the resolution of conflicts is encouraged through the Alameda County Technical Advisory Committee (ACTAC).
- Second, when the ACTAC is unable to reach consensus, Alameda CTC will look for evidence of "good faith" efforts among the parties involved when determining CMP conformance.
- Finally, any determination by Alameda CTC with respect to CMP conformance will not affect local agencies' land use authority or require programs that conflict with a community's fundamental socioeconomic or environmental character.

The conflict resolution process has the following four phases:

1. **Process initiation:** The lead jurisdiction requests Alameda CTC to initiate the conflict resolution process and outlines the issues needing resolution.
2. **Assessment of issues**: Alameda CTC staff meet with the parties involved to assess the issues in the dispute and its appropriateness for the conflict resolution process.
3. **Settlement sessions and agreement:** This phase involves holding/facilitating settlement sessions among the parties involved, facilitated by Alameda CTC staff (if appropriate), and the development of a settlement agreement, and obtaining all approvals that may be required from the governing bodies of the involved jurisdictions and/or Alameda CTC.
4. **Implementation and monitoring:** The final phase involves the implementation and monitoring of the agreement and Alameda CTC's assessment of good faith effort by the parties involved.

The conflict-resolution process outlined here is a general process that can be adjusted to meet the respective needs of local jurisdictions and/or the specific situation including identifying another mutually agreed upon conflict resolution process. See Figure 13, which describes the multi-jurisdictional deficiency plan appeal process.

Figure 13—Multi-jurisdictional Deficiency Plan Appeal Process



Note: Assumes timely reporting of LOS Monitoring results in the spring.

Completed and In-Progress Deficiency Plans

Tables 19 and 20 show the status and progress of the most recent deficiency plans. Table 19 shows the roadway orramp segments that have completed implementation of the required deficiency plans. Table 20 shows the roadways segments with deficiency plans being implemented.

Table 19—Completed Deficiency Plans

Segment	Jurisdiction	Year Required/ Approval	Implementation Status
Westbound I-580, from Center Street to I-238	Alameda County (participant jurisdictions: Dublin, Livermore, Oakland, Pleasanton, San Leandro)	2000/2001	Implementation completed in 2010 and LOS restored.
Northbound San Pablo Avenue, from Allston Way to University Avenue	Berkeley (participant jurisdictions: Albany, Emeryville, Oakland)	1998/1999	Deficiency plan has been implemented, LOS standard restored.
Southbound University Avenue, from San Pablo Avenue to 6th Street	Berkeley	1998/1999	Deficiency plan has been implemented, LOS standard restored.

Future Deficiency Plans

Other corridor plans or strategic plans developed by Alameda CTC can also inform future deficiency plans. When existing corridor or strategic plans are considered as a basis for developing a deficiency plan, appropriateness of the plan reflecting current conditions should be verified so that any improvement measure identified in the plan is still applicable. Beginning in fiscal year 2013-14, Alameda CTC will embark on three multimodal plans (the Countywide Goods Movement, Countywide Transit Plan, and Multimodal Arterial Corridor Plan), which may be used, at the Commission's discretion, as a basis for future deficiency plans, along with the San Pablo/I-80 Corridor Plan and the I-880 Strategic Plan described on the following page.

Table 20—Deficiency Plans Under Implementation

Segment	Jurisdiction	Year Required/ Approval	Implementation Status
Eastbound Mowry Avenue, from Peralta Boulevard to SR-238/ Mission Boulevard	Fremont (participating jurisdiction: Newark)	2000/2001	Short-term mitigation, widening Mission Boulevard from four lanes to six lanes, was completed in 2005.
The freeway connection between SR-260 Eastbound (Posey Tube) and Northbound I-880	Oakland (participating jurisdictions: Alameda, Berkeley)	1998/1999	Deficiency plan is being implemented.
Northbound SR 185 (14th Street) between 46th and 42nd Avenues	Oakland (participating jurisdiction: Alameda)	2008/2009	Deficiency plan is being implemented.

San Pablo Avenue/I-80 Corridor Plan

On April 24, 1997, the San Pablo/I-80 Corridor Plan was recognized as a basis for future deficiency plans. It applies to the CMP network within the following sub-area of the San Pablo corridor study limits, including the freeway ramps and future University Avenue/I-80 HOV ramp: Alameda/Contra Costa County line (north); 14th Street to western boundary of Mandela Parkway, extending north to the eastern I-80 right-of-way (south); Martin Luther King Jr. Way/San Pablo Avenue, Marin, east side of San Pablo Avenue (east); and the eastern boundary of the I-80 right-of-way (west).

I-880 Strategic Plan

On January 20, 2000, the I-880 Strategic Plan was similarly recognized as a basis for a future deficiency plan. The plan applies to the CMP network within the study limits of the I-880 Cypress Freeway connection (north); SR-237 in Milpitas (south); I-580/SR-238 and I-680 (east); and the San Francisco Bay (west).

Local Government Responsibilities and Conformance

Alameda CTC is responsible for monitoring conformance of local jurisdictions with the adopted CMP[55]. Among these requirements, Alameda CTC must find compliance with the implementation of approved deficiency plans to maintain LOS standards on the CMP network. When a deficiency plan is adopted and active, the lead jurisdiction must submit status reports on the implementation of the deficiency plan showing progress and concurrence from the participating jurisdictions to Alameda CTC annually as part of the annual conformity process. If after 90 days of the conformity timeline the local jurisdiction is still in non-conformance, Alameda CTC is required to follow the conformance process as identified in Chapter 9, "Program Conformance and Monitoring." The detailed process for finding of non-conformance and the resulting withholding of Proposition 111 funds is described in Chapter 9.

Next Steps

- As identified in Chapter 8, "Capital Improvement Program," on completion of the Countywide Comprehensive Capital Improvement Program and Program Investment Plan (CIP/PIP), Alameda CTC will update any policy adopted to provide funding priority for projects that would improve the performance of the deficient segments in the CIP/PIP.
- Alameda CTC will also explore recognizing the Countywide Goods Movement Plan, Countywide Transit Plan, and Arterial Corridor Mobility Plan or components of those plans and any other plans once they are completed and adopted as a basis for potential future deficiency plans.

[55] California Government Code Section 65089.3.

Conclusions and Future Considerations 11



The CMP contains several interrelated elements intended to foster better coordination and decision-making about transportation, land development, and air quality. Over the years, the CMP has evolved from being a program focused on meeting the legislative intent of congestion management to a program that uses the legislative mandate as an opportunity to develop and provide an integrated multimodal transportation system for all users of Alameda County. The following conclusions highlight how the 2013 CMP meets the legislative requirements and better integrates land use and transportation and reduces greenhouse gas emissions. During the update process, Alameda CTC also identified implementation issues and future considerations.

Conclusions

Based on the 2013 CMP update several conclusions can be reached about the CMP relative to the requirements of law and its purpose and intent. The CMP fulfills the spirit, purpose, and intent of the legislation because it:

1. **Contributes to maintaining or improving transportation service levels.**

The projects and programs contained in the CMP are a subset of the transportation investments adopted in the Alameda County 2012 Countywide Transportation Plan (CWTP). The CMP can be viewed as the short-range implementation program for the CWTP. As the first step toward transportation investment in Alameda County over the next 28 years, the CMP is making progress toward maintaining or improving transportation service levels.

2. **Conforms to MTC's criteria for consistency with Plan Bay Area.**

Table 21 on the following page lists the Metropolitan Transportation Commission's consistency requirements for CMPs in the Bay Area region. The CMP has met all these requirements.

3. **Provides a travel model consistent with MTC's regional model.**

The Alameda Countywide Travel Demand Model is being updated to include the land uses and projects and programs in Plan Bay Area adopted by MTC in July 2013. This update will also ensure that the countywide model meets the MTC regional modeling consistency requirements. The update is expected to be complete by June 2014. The current countywide model incorporates the previously regionally adopted Projections 2009 land use and Transportation 2035 transportation investments.

4. Is consistent with MTC's adopted Transportation Control Measures.

The transportation control measures in the Regional Transportation Plan for the Bay Area that are based on the federal and state air quality plans are shown in Appendix I. The CMP includes many project types and programs identified in the plan. The Alameda CTC will work with the Bay Area Air Quality Management District (BAAQMD) and project sponsors to define appropriate responsibility and timely implementation of these measures.

5. Specifies a method for estimating roadway level of service (LOS) consistent with state law.

Two approaches are permitted by the law for assessing LOS. The Alameda County CMP specifies using the 1985 Highway Capacity Manual (HCM1985) for LOS monitoring and conformity purposes and the HCM2000 for the Land Use Analysis Program. As part of the 2013 CMP update, Alameda CTC performed a comparative analysis of use of HCM1985 and HCM2000 to use of the most recent HCM2010. Based on the evaluation, as reported in the "Level of Service Standards" and "Land Use Analysis Program" chapters, a speed-based LOS measure as used in the HCM1985 will continue to be applied for LOS monitoring and conformity purposes. This approach is recommended to avoid loss of ability to track trends and for deficiency plan implementation. Use of HCM2010 will be encouraged in the CMP Land Use Analysis Program transportation impact analyses as specified in the MTC CMP guidance, but flexibility to use HCM2000 will be permitted if deemed necessary by local jurisdictions or project sponsors.

6. Identifies candidate projects for the RTIP and federal TIP that meet MTC's minimum requirements

The Regional Transportation Improvement Program and federal Transportation Improvement Program candidates listed in the CMP's Capital Improvement Program (CIP) have been evaluated, and all candidate projects conform to MTC's screening criteria for the respective projects and programs.

7. Was developed in cooperation with jurisdictions and other interested parties.

The 2013 CMP update process included circulation of proposed policy papers and draft documents to interested parties through regular mailings for the Alameda County Technical Advisory Committee, the Planning, Policy and Legislation Committee, and Alameda CTC Commission meetings, as well as on the Alameda CTC website. The mailing list included technical representatives of all cities in Alameda County, the County of Alameda, transit operators, the Port of Oakland, the Associations of Bay Area Governments (ABAG), BAAQMD, California Department of Transportation (Caltrans), and MTC. In addition, any future additions to the designated CMP network will be coordinated with adjacent counties within the MTC region and is expected to be consistent with those CMPs.

8. Provides a forward-looking approach to the impactof local land use decisions on transportation.

The Land Use Analysis Program allows consultation with the Alameda CTC early in the land development process. Early input will help ensure a better linkage between land use decisions and transportation investment. The 2013 CMP update includes an expanded discussion of the Alameda CTC's activities to fulfill the legislative requirements of Senate Bill 375 (SB 375) and Assembly Bill 32 to better integrate transportation and land use and to reduce greenhouse gas emissions by curtailing vehicle miles traveled (VMT). Several enhancements were made to the Land Use Analysis Program in this context to meet these objectives including:

- Incorporated the recommendations of the *Alameda County Priority Development Area Investment and Growth Strategy*;
- Established a development approvals database that will be populated using information provided by local jurisdictions as part of the annual conformity process starting in 2014;

Table 21—MTC's Regional Consistency Requirements for CMPs

RTP Consistency
Have the RTP goals and objectives been included in the CMP?
Does the CMP include references to Resolution 3434?
CMP System
Have all state highways and principal arterials been included?
Are all state highways identified?
Has the CMA developed a clear, reasonable definition for "principal arterials" as part of its submittal plan?
Has this definition been consistently applied in the selection of arterials to include in the designated system? If not, why?
How does the CMP-designated system relate to MTC's MTS in the Plan Bay Area?
Does the CMP System connect to the CMP Systems in adjacent counties?
Air Quality Requirements
Does the CMP include locally implementable Federal and State TCMs, as previously documented and included in MTC's Plan Bay Area, MTC Resolution 2131, and the BAAQMD's Bay Area 2010 Ozone Strategy?
Modeling Consistency (on completion of the current update to the countywide model)
Is the "base case" forecasting network limited to the approved TIP?
Are "ABAG consistent" demographics used? If alternative demographics have been used in addition to the "ABAG consistent" forecasts, have the demographic inputs and travel forecasts been compared to the "ABAG consistent" based travel forecasts?
Are the regional "core" assumptions for auto operating costs, transit fares and bridge tolls being used, or are reasons to the contrary documented?
Does the forecasting model include transit and carpool use (through either a person trip generation model or a "borrowed share" approach)?
Does the model produce trip distribution results that are reasonably consistent with those of MTC?
Is the modeling methodology documented?
LOS Consistency
Is LOS assessed using a methodology agreeable to MTC?
RTIP/TIP Requirements
Are the proposed RTIP projects consistent with the RTP?
Do the projects proposed for inclusion in the RTIP meet the minimum screening requirements established by MTC for the RTIP?
Process
Has the CMP been developed in cooperation with all concerned agencies (i.e., transit agencies, applicable air quality district(s), MTC, adjacent counties, etc.)?
Has the CMP been formally adopted according to the requirements of the legislation?

Note: Detailed requirements for regional consistency are outlined in MTC Resolution 3000, revised July 12, 2013.

- Modified the agency's guidelines for environmental review by identifying standards to evaluate impacts on auto and alternative modes; and
- Identified an alternative trip generation methodology for use in transportation impact analyses to support in-fill development.

9. Considers the benefit of greenhouse gas reductions in developing the CIP

The CMP considers the benefits of greenhouse gas reductions in the Land Use Analysis Program and in developing the CIP. The 2013 CMP now includes the *Alameda County Priority Development Area Investment and Growth Strategy* recommendations and options for alternative trip-generation rates to promote infill development in the Land Use Analysis Program that will help support the reduction of VMT and greenhouse gas emissions. Similarly the most recent long range plan, the 2012 CWTP, with which the CIP projects and programs are consistent, was developed for the first time to meet the county's share of greenhouse gas reduction targets for the region and better integrate transportation and land use through development of a closely coordinated land use component for the plan.

Implementation Issues

During the development and update of the 2013 CMP for Alameda County, several long-standing issues continue to need further action by the Alameda CTC. Some of these issues may also require action by the legislature.

1. Cost exceeds funding

Alameda CTC has identified the cost of maintaining or improving transportation service levels over the next 28 years as part of the 2012 CWTP to exceed $30 billion. This cost is large and well beyond existing and anticipated funding sources, which 2012 CWTP projects to be $9.5 billion. Further statewide attention to transportation funding is necessary, if the CMP law is to achieve its intended goal.

With the passage of the federal Intermodal Surface Transportation Efficiency Act of 1991, the Transportation Efficiency Act in 1997, the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) in 2005, and Moving Ahead for Progress in the 21st Century Act (MAP-21), new requirements have been placed on MTC relative to congestion management. MTC is passing funds through to the CMAs in the Bay Area region to assist in implementing the federal acts related to transportation funding. These funds, however, do not fully cover Alameda CTC's congestion management administration costs.

2. Limited CMA authority

It is difficult for Alameda CTC to fulfill the intent of the CMP legislation because so many programs are beyond its authority. Funding programs, such as transit operating funds, most transit capital funding, the interregional road program, the highway rehabilitation program, and the toll-bridge program are outside the scope of the CMP. Caltrans administers the interregional road program and highway rehabilitation program.

3. LOS responsibility

CMP law indicates that Caltrans is responsible for monitoring LOS standards on the state highway system, if the CMA designates responsibility to Caltrans.[56] As state-owned facilities, it is reasonable to assume that the state is responsible. Alameda CTC will continue to work with Caltrans on LOS monitoring to ensure that consistent LOS results can be maintained if Alameda CTC delegates future monitoring responsibilities to Caltrans.

The CMP law also recognizes that responsibility for sustaining LOS standards on local roadways and the state highway system should be shared between the local governments where other local jurisdictions contribute a significant percentage of traffic to the roadway. This change in state law recognizes that other jurisdictions may be partially responsible for the roadway exceeding the standards and that local government has little authority over the state highway system. Some exemptions, such as interregional trips, have been built into the current law, but these exemptions do not sufficiently address the problem. Corridor-level planning may offer a reasonable

[56] Katz, Statutes of 1995.

approach to this multi-jurisdictional problem and has been used successfully in the past to identify deficiencies and strategies to improve them. In this context, the 2013 CMP continues to recommend that corridor management strategies be explored as part of the Countywide Goods Movement Collaborative and Plan, Countywide Transit Plan, and Multimodal Arterial Corridor Plan, all of which are in the Alameda CTC FY13-14 work plan and are underway.

4. Scope of the CMP network
The CMP network is reviewed every four years; the next review is scheduled for 2017. However, state law does not provide incentives to local jurisdictions to add roadways to the CMP network. In fact, there are significant disincentives to add roadways that may in the future deteriorate to LOS F. In these cases, jurisdictions would be required to prepare a deficiency plan or risk losing Proposition 111 gas tax funds. Alameda CTC is currently addressing this issue by adding a network that will be monitored only for informational purposes and not for conformity. In 2011, 90 miles of arterial roadways across the county were added to the CMP network, which will be monitored for informational purposes.

5. Transportation revenue shortfalls
State and federal transportation funding continues to be inadequate to address both capital and transit operating costs. The shortfalls may jeopardize the ability to maintain and improve transportation LOS. Worsening traffic congestion on the CMP network will trigger requirements for local jurisdictions to prepare and adopt deficiency plans or risk losing Proposition 111 gas tax funds for local projects. This will be compounded by the requirements to implement SB 375, Redesigning Communities to Reduce Greenhouse Gases, which is currently an unfunded mandate.

Future Considerations

The 2013 CMP update also provides recommendations for next steps in addressing issues related to new and existing legislative requirements, monitoring standards, and other efforts related to congestion management and better integrating transportation and land use. The following highlight key areas identified for follow-up (see individual chapters for detailed next steps):

1. CMP roadway network Tier 1 and Tier 2 additions
Jurisdictions will review their roadway systems for routes that may meet the criteria for inclusion as roadways in the Tier 1 and Tier 2 CMP network. No new roadways were proposed in the 2013 CMP update. The next update to the CMP network criteria, including identifying new CMP roadways and applying the updated criteria, will occur in 2015. For the 2015 CMP Update, Alameda CTC will review and update the CMP roadway criteria including identifying ways to expand the CMP roadway network to include key rural roadways that facilitate agricultural operations and tourism and support Priority Conservation Area goals and objectives in Alameda County. Outcomes of the Countywide Multimodal Arterial Plan should also be considered in the update of the criteria and identification of roadways.

For potential new routes identified by a jurisdiction, the jurisdiction will conduct 24-hour traffic counts from Tuesday through Thursday of a typical week. Traffic counts will be taken in March/April in 2015. To be in compliance with the CMP, each jurisdiction must submit potential CMP-designated routes to the CMA by June 30, 2015.

2. Congestion pricing strategies
Congestion pricing strategies are considered one of the tools to manage congestion along the most congested corridors. The revenue collected from congestion pricing will be invested back into the corridor for improvement of transit after paying for operating expenses. Alameda CTC implemented the first express lane in the Bay Area on southbound I-680, which opened to traffic in fall 2010. Express lane work on northbound I-680 is in the environmental review stage. Legislation that approved the I-680 Express Lane also approved a second express lane in Alameda County. Alameda CTC approved I-580 as a candidate corridor for both the eastbound and westbound directions in East County. Both lanes are currently under construction and are

expected to be open to traffic in 2015. Currently, MTC is implementing a Bay Area Express Lane network of 550 miles across the region, first converting the existing HOV lanes and later expanding to close gaps in the carpool network. This will add about 90 additional miles to the express lane network in Alameda County along the I-80, I-680, and I-880 corridors and on the Bay Bridge, San Mateo Bridge, and Dumbarton Bridge. Phase 1, the conversion of existing carpool lanes into express lanes on the Regional Express Lane Network, is scheduled to be operational in 2015.

Other pricing strategies include:

- Off-peak transit fare discounts;
- Parking ticket surcharge by the Alameda County jurisdictions, with revenues devoted to transit; and
- Parking pricing in Berkeley.

3. Senate Bill 743 (SB 743), CEQA reform, and infill development areas

SB 743, passed in September 2013, institutes key changes to the CMP statute that will support infill development, including lifting the sunset date on designating Infill Opportunity Zones and directing the governor's Office of Planning and Research (OPR) to develop new metrics for assessment of transportation impacts to replace vehicle delay-based measures such as LOS. SB 743 also directs OPR to revise California Environmental Quality Act guidelines to eliminate automobile LOS as a significant impact on the environment and to develop new criteria for determining the significance of transportation impacts in transit priority areas that use metrics such as automobile trips generated or VMT per capita. Alameda CTC, in collaboration with the local jurisdictions and regional agencies, will comprehensively evaluate and identify efforts and next steps for Alameda CTC to participate in defining the process for developing new standards of significance for transportation impacts and in supporting local jurisdictions in implementing the new standards.

As part of the 2013 CMP Update, Alameda CTC also implemented several short- and long-term strategies identified in the 2011 CMP to promote infill development, prior to the enactment of SB 743. They include approved alternative trip generation methodologies for traffic impact analysis to support infill developments, focused guidance on CMP impact assessment and monitoring for alternative modes, and adopting areawide deficiency plan procedures for developing a multimodal improvement plan over a larger area where localized improvements are not feasible (for more details, see Chapter 6, "Land Use Analysis Program" and Chapter 10, "Deficiency Plans"). Monitoring implementation of these measures will continue.

4. Improving the land use and transportation connection in Alameda County and implementing SB 375

Since the adoption of the 2011 CMP, Alameda CTC has completed several major planning efforts to better integrate transportation and land use and to implement SB 375 to achieve reduced VMT and greenhouse gas emission reductions. The 2012 CWTP was one such major effort developed in close coordination with the regional and local agencies and included a land use component for the first time to contribute to the county's share of regional greenhouse gas reduction targets. The adopted *Alameda County Priority Development Area Investment and Growth Strategy* outlines a preliminary PDA monitoring plan developed both to fulfill MTC and ABAG requirements and is a step toward implementing the land use and sustainability goals of the 2012 CWTP. Alameda CTC also has been providing enhanced information sharing/support for the local jurisdictions in implementing the complete streets policy.

The 2013 CMP update includes expanded review of Alameda CTC's activities to fulfill the legislative requirements of SB 375 to better integrate transportation investment and land use, and made the following key enhancements to the Land Use Analysis Program to meet these objectives:

- Implement the *Alameda County Priority Development Area Investment and Growth Strategy*.

- Identify ways to address rural roadway improvement needs and efforts that support Priority Conservation Area goals.
- Develop a land use development database based on annual land development approvals data from the jurisdictions to track land development approvals from local jurisdictions for use in various planning efforts, and to analyze how and whether the land development and transportation investments are coordinated.
- Track local jurisdiction housing element progress by local jurisdictions providing Alameda CTC a copy of the most recent Housing Element Annual Program Report submitted to the State Department of Housing and Community Development.
- Prepare a feasibility study for implementing an impact analysis measure that supports alternative modes in Alameda County, similar to the Automobile Trips Generated (ATG) measure being considered by the San Francisco County Transportation Authority. Given the current focus on reducing VMT through better integration of land use and transportation, it has become important to have LOS measures that consider project impacts on all modes. If SB 743 implementation results in ATG as the standard to measure development impacts, Alameda CTC's work on this at the county level will help local jurisdictions in implementing ATG in their development impact analyses. Implementing ATG will require a nexus study and associated list of improvement measures, which is generally appropriate at a sub-regional or broader level.
- Develop a comprehensive program, similar to VTA's Community Design and Transportation Program that promotes better integration of land use development and transportation in Alameda County and is supported by financial incentives. Such a program could be developed in partnership with the member agencies and communities and endorsed by their elected bodies. As a next step, Alameda CTC will identify interest from local jurisdictions and the transit operators for implementing a similar program in Alameda County and develop a scope of work that details the steps involved, including costs of developing and implementing the program.
- Explore and review parking policies and standards as a way to develop parking management strategies as a land use tool for local jurisdictions to promote alternative modes and reduce greenhouse gases. Parking for automobiles is a significant but under-recognized factor in the relationship between land use and transportation.

5. Mitigating impacts on cross county corridors or long corridors traversing jurisdictions

Currently the CMP Land Use Analysis Program does not have a mechanism in place for "fair share" contributions for projects that would impact long travel or cross-county corridors that traverse several Alameda County jurisdictions. Since improvement measures to mitigate the cumulative impact will be too expensive for one agency or jurisdictions, Alameda CTC continues to carry forward the following recommendations.

- For congested cross county corridors, explore developing partnerships for sharing the cost of implementing related mitigation measures. Also, for long-term corridor improvements in such corridors, explore establishing cross-county partnerships to develop mutually agreeable strategies for improvements. A first step in this direction is consideration of a county line development study.
- For projects that may impact long travel corridors that traverse multiple jurisdictions within the county, explore establishing a means for the project to contribute their fair share of required mitigation measures.

6. LOS standards and HCM for assessing performance of auto and alternative modes

During the 2013 CMP update, Alameda CTC evaluated the application of HCM2010 to monitor LOS for auto and other modes, specifically transit, bicycling, and walking. Results for auto LOS monitoring showed that the HCM2010 methodology's shift from measuring speed to measuring density to assign auto LOS would result in the loss of Alameda CTC's ability to

track network performance trends and conformity, particularly for the Tier 1 network that is subject to conformity. Therefore, speed-based HCM1985 will continue to be used for auto LOS monitoring for Tier 1 network. For Tier 2 arterials not subject to conformity, both the HCM1985 and HCM2000 will be applied as appropriate and will be re-evaluated for expanded HCM use in the 2015 CMP update.

Evaluation results for LOS monitoring of alternative modes showed that HCM2010 Multi Modal LOS (MMLOS) is not well-designed for annual monitoring application, as it is very data-intensive and costly to implement. For assessing performance of alternative modes, the outcomes of the ongoing countywide modal studies will be used to identify countywide facilities and metrics for monitoring alternative modes, and will be incorporated in the 2015 CMP for future LOS monitoring efforts.

For application of HCM2010 in the Land Use Analysis Program, using HCM2010 to perform the impact analysis for autos was found to be consistent with the current data requirements; therefore, use of HCM2010 is encouraged per regional direction, but flexibility to use HCM2000 is permitted where consistency is needed by local jurisdictions. Evaluation results for LOS monitoring of alternative modes showed that HCM2010 MMLOS is suitable to identify multimodal trade-offs in mitigation measures, and use of HCM2010 is encouraged.

7. Review of performance measures and identification of monitoring periods and related measures aligned with data availability

The performance measures identified in the multimodal performance element are based on measures established in a variety of plans and documents including the Countywide Transportation Plan, Countywide Bicycle and Pedestrian Plans, and the CMP document. The Bicycle and Pedestrian Counts Report includes several additional measures, and "existing conditions" analyses were performed for the Countywide Transportation Plan. Also, by 2015, Alameda CTC will complete several new modal plans, which will produce additional performance measures. Therefore, as part of the 2015 CMP update, Alameda CTC will re-evaluate and consolidate the performance measures and monitoring reports, and identify multimodal performance measures and timelines for reporting those measures. This comprehensive re-evaluation will ensure that the timeline for reporting on different measures is realistically aligned with data availability and potential changes in the measures. In addition, it will ensure that the various monitoring documents are complementary and non-duplicative. This will allow Alameda CTC to tailor its multimodal performance measures to project evaluation needs and inform programming decisions, as outlined in the upcoming Strategic Plan/CMP.

8. Development of Strategic Plan/CMP

In an effort to better integrate planning, programming, implementation, and evaluation and monitoring, Alameda CTC has embarked on developing a Strategic Plan/CMP that will include a feedback process for future planning and funding decisions for an improved multimodal transportation system. This plan is expected to include a performance-based Capital Improvement Program/Program Investment Plan (CIP/PIP). The CIP will include all funding sources under the purview of the Alameda CTC and will establish a seven-year horizon for fund allocations to various transportation improvement needs. The PIP will be a companion to the CIP and will provide a seven-year horizon for programming funds for operations, technology, education, planning and monitoring needs for all funding sources related to these types of transportation investments. The focused plan development effort will occur by spring 2014.

9. Funding priority for deficient segments

Based on the biennial LOS Monitoring Study, if any of the CMP roadway segment fails to meet the required minimum LOS standard of E and is declared deficient, a localized or areawide deficiency plan is required that identifies mitigation measures including funding to improve the performance of that segment or study area. Given the lack of availability of funds for transportation improvements, this requirement places a

hardship on local jurisdictions. The 2011 CMP provided direction to develop a policy for giving funding priority to the CMP segments declared deficient based on LOS monitoring results. The evaluation process for determining funding priority should consider projects and programs that would improve the performance of deficient segments/areas through approaches such as awarding additional points to those projects. The ongoing development of the CIP/PIP for Alameda County as part of the comprehensive Strategic Plan is expected to address this issue and determine an approach to provide additional consideration to projects that would improve the performance of existing and future deficient segments/areas.

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Congestion Management Program Legislation

Government Code Section 65088—65089.10

65088.

The Legislature finds and declares all of the following:

(a) Although California's economy is critically dependent upon transportation, its current transportation system relies primarily upon a street and highway system designed to accommodate far fewer vehicles than are currently using the system.

(b) California's transportation system is characterized by fragmented planning, both among jurisdictions involved and among the means of available transport.

(c) The lack of an integrated system and the increase in the number of vehicles are causing traffic congestion that each day results in 400,000 hours lost in traffic, 200 tons of pollutants released into the air we breathe, and three million one hundred thousand dollars ($3,100,000) added costs to the motoring public.

(d) To keep California moving, all methods and means of transport between major destinations must be coordinated to connect our vital economic and population centers.

(e) In order to develop the California economy to its full potential, it is intended that federal, state, and local agencies join with transit districts, business, private and environmental interests to develop and implement comprehensive strategies needed to develop appropriate responses to transportation needs.

(f) In addition to solving California's traffic congestion crisis, rebuilding California's cities and suburbs, particularly with affordable housing and more walkable neighborhoods, is an important part of accommodating future increases in the state's population because homeownership is only now available to most Californians who are on the fringes of metropolitan areas and far from employment centers.

(g) The Legislature intends to do everything within its power to remove regulatory barriers around the development of infill housing, transit-oriented development, and mixed use commercial development in order to reduce regional traffic congestion and provide more housing choices for all Californians.

(h) The removal of regulatory barriers to promote infill housing, transit-oriented development, or mixed use commercial development does not preclude a city or county from holding a public hearing nor finding that an individual infill project would be adversely impacted by the surrounding environment or transportation patterns.

65088.1.

As used in this chapter the following terms have the following meanings:

(a) Unless the context requires otherwise, "regional agency" means the agency responsible for preparation of the regional transportation improvement program.

(b) Unless the context requires otherwise, "agency" means the agency responsible for the preparation and adoption of the congestion management program.

(c) "Commission" means the California Transportation Commission.

(d) "Department" means the Department of Transportation.

(e) "Local jurisdiction" means a city, a county, or a city and county.

(f) "Parking cash-out program" means an employer-funded program under which an employer offers to provide a cash allowance to an employee equivalent to the parking subsidy that the employer would otherwise pay to provide the employee with a parking space. "Parking subsidy" means the difference between the out-of-pocket amount paid by an employer on a regular basis in order to secure the availability of an employee parking space not owned by the employer and the price, if any, charged to an employee for use of that space.

A parking cash-out program may include a requirement that employee participants certify that

they will comply with guidelines established by the employer designed to avoid neighborhood parking problems, with a provision that employees not complying with the guidelines will no longer be eligible for the parking cash-out program.

(g) "Infill opportunity zone" means a specific area designated by a city or county, pursuant to subdivision (c) of Section 65088.4, zoned for new compact residential or mixed use development within one-third mile of a site with an existing or future rail transit station, a ferry terminal served by either a bus or rail transit service, an intersection of at least two major bus routes, or within 300 feet of a bus rapid transit corridor, in counties with a population over 400,000. The mixed use development zoning shall consist of three or more land uses that facilitate significant human interaction in close proximity, with residential use as the primary land use supported by other land uses such as office, hotel, health care, hospital, entertainment, restaurant, retail, and service uses. The transit service shall have maximum scheduled headways of 15 minutes for at least 5 hours per day. A qualifying future rail station shall have broken ground on construction of the station and programmed operational funds to provide maximum scheduled headways of 15 minutes for at least 5 hours per day.

(h) "Interregional travel" means any trips that originate outside the boundary of the agency. A "trip" means a one-direction vehicle movement. The origin of any trip is the starting point of that trip. A roundtrip consists of two individual trips.

(i) "Level of service standard" is a threshold that defines a deficiency on the congestion management program highway and roadway system which requires the preparation of a deficiency plan. It is the intent of the Legislature that the agency shall use all elements of the program to implement strategies and actions that avoid the creation of deficiencies and to improve multimodal mobility.

(j) "Multimodal" means the utilization of all available modes of travel that enhance the movement of people and goods, including, but not limited to, highway, transit, nonmotorized, and demand management strategies including, but not limited to, telecommuting. The availability and practicality of specific multimodal systems, projects, and strategies may vary by county and region in accordance with the size and complexity of different urbanized areas.

(k) "Performance measure" is an analytical planning tool that is used to quantitatively evaluate transportation improvements and to assist in determining effective implementation actions, considering all modes and strategies. Use of a performance measure as part of the program does not trigger the requirement for the preparation of deficiency plans.

(l) "Urbanized area" has the same meaning as is defined in the 1990 federal census for urbanized areas of more than 50,000 population.

(m) "Bus rapid transit corridor" means a bus service that includes at least four of the following attributes:

(1) Coordination with land use planning.

(2) Exclusive right-of-way.

(3) Improved passenger boarding facilities.

(4) Limited stops.

(5) Passenger boarding at the same height as the bus.

(6) Prepaid fares.

(7) Real-time passenger information.

(8) Traffic priority at intersections.

(9) Signal priority.

(10) Unique vehicles.

65088.3.
This chapter does not apply in a county in which a majority of local governments, collectively comprised of the city councils and the county board of supervisors, which in total also represent a

majority of the population in the county, each adopt resolutions electing to be exempt from the congestion management program.

65088.4.

(a) It is the intent of the Legislature to balance the need for level of service standards for traffic with the need to build infill housing and mixed use commercial developments within walking distance of mass transit facilities, downtowns, and town centers and to provide greater flexibility to local governments to balance these sometimes competing needs.

(b) Notwithstanding any other provision of law, level of service standards described in Section 65089 shall not apply to the streets and highways within an infill opportunity zone. The city or county shall do either of the following:

(1) Include these streets and highways under an alternative areawide level of service standard or multimodal composite or personal level of service standard that takes into account both of the following:

(A) The broader benefits of regional traffic congestion reduction by siting new residential development within walking distance of, and no more than one-third mile from, mass transit stations, shops, and services, in a manner that reduces the need for long vehicle commutes and improves the jobs-housing balance.

(B) Increased use of alternative transportation modes, such as mass transit, bicycling, and walking.

(2) Approve a list of flexible level of service mitigation options that includes roadway expansion and investments in alternate modes of transportation that may include, but are not limited to, transit infrastructure, pedestrian infrastructure, and ridesharing, vanpool, or shuttle programs.

(c) The city or county may designate an infill opportunity zone by adopting a resolution after determining that the infill opportunity zone is consistent with the general plan and any applicable specific plan. A city or county may not designate an infill opportunity zone after December 31, 2009.

(d) The city or county in which the infill opportunity zone is located shall ensure that a development project shall be completed within the infill opportunity zone not more than four years after the date on which the city or county adopted its resolution pursuant to subdivision (c). If no development project is completed within an infill opportunity zone by the time limit imposed by this subdivision, the infill opportunity zone shall automatically terminate.

65088.5.

Congestion management programs, if prepared by county transportation commissions and transportation authorities created pursuant to Division 12 (commencing with Section 130000) of the Public Utilities Code, shall be used by the regional transportation planning agency to meet federal requirements for a congestion management system, and shall be incorporated into the congestion management system.

65089.

(a) A congestion management program shall be developed, adopted, and updated biennially, consistent with the schedule for adopting and updating the regional transportation improvement program, for every county that includes an urbanized area, and shall include every city and the county. The program shall be adopted at a noticed public hearing of the agency. The program shall be developed in consultation with, and with the cooperation of, the transportation planning agency, regional transportation providers, local governments, the department, and the air pollution control district or the air quality management district, either by the county transportation commission, or by another public agency, as designated by resolutions adopted by the county board of supervisors and the city councils of a majority of the cities representing a majority of the population in the incorporated area of the county.

(b) The program shall contain all of the following elements:

(1) (A) Traffic level of service standards established for a system of highways and roadways designated by the agency. The highway and roadway system shall

include at a minimum all state highways and principal arterials. No highway or roadway designated as a part of the system shall be removed from the system. All new state highways and principal arterials shall be designated as part of the system, except when it is within an infill opportunity zone. Level of service (LOS) shall be measured by Circular 212, by the most recent version of the Highway Capacity Manual, or by a uniform methodology adopted by the agency that is consistent with the Highway Capacity Manual. The determination as to whether an alternative method is consistent with the Highway Capacity Manual shall be made by the regional agency, except that the department instead shall make this determination if either (i) the regional agency is also the agency, as those terms are defined in Section 65088.1, or (ii) the department is responsible for preparing the regional transportation improvement plan for the county.

(B) In no case shall the LOS standards established be below the level of service E or the current level, whichever is farthest from level of service A except when the area is in an infill opportunity zone. When the level of service on a segment or at an intersection fails to attain the established level of service standard outside an infill opportunity zone, a deficiency plan shall be adopted pursuant to Section 65089.4.

(2) A performance element that includes performance measures to evaluate current and future multimodal system performance for the movement of people and goods. At a minimum, these performance measures shall incorporate highway and roadway system performance, and measures established for the frequency and routing of public transit, and for the coordination of transit service provided by separate operators. These performance measures shall support mobility, air quality, land use, and economic objectives, and shall be used in the development of the capital improvement program required pursuant to paragraph (5), deficiency plans required pursuant to Section 65089.4, and the land use analysis program required pursuant to paragraph (4).

(3) A travel demand element that promotes alternative transportation methods, including, but not limited to, carpools, vanpools, transit, bicycles, and park-and-ride lots; improvements in the balance between jobs and housing; and other strategies, including, but not limited to, flexible work hours, telecommuting, and parking management programs. The agency shall consider parking cash-out programs during the development and update of the travel demand element.

(4) A program to analyze the impacts of land use decisions made by local jurisdictions on regional transportation systems, including an estimate of the costs associated with mitigating those impacts. This program shall measure, to the extent possible, the impact to the transportation system using the performance measures described in paragraph (2). In no case shall the program include an estimate of the costs of mitigating the impacts of interregional travel. The program shall provide credit for local public and private contributions to improvements to regional transportation systems. However, in the case of toll road facilities, credit shall only be allowed for local public and private contributions which are unreimbursed from toll revenues or other state or federal sources. The agency shall calculate the amount of the credit to be provided. The program defined under this section may require implementation through the requirements and analysis of the California Environmental Quality Act, in order to avoid duplication.

(5) A seven-year capital improvement program, developed using the performance measures described in paragraph (2) to determine effective projects that maintain or improve the performance of the multimodal system for the movement of people and goods, to mitigate regional transportation impacts identified pursuant to paragraph (4). The program shall conform to transportation-related vehicle emission air quality mitigation measures, and include any project that will increase the capacity of the multimodal system. It is the intent of the Legislature that, when roadway projects are identified in the program,

consideration be given for maintaining bicycle access and safety at a level comparable to that which existed prior to the improvement or alteration. The capital improvement program may also include safety, maintenance, and rehabilitation projects that do not enhance the capacity of the system but are necessary to preserve the investment in existing facilities.

(c) The agency, in consultation with the regional agency, cities, and the county, shall develop a uniform data base on traffic impacts for use in a countywide transportation computer model and shall approve transportation computer models of specific areas within the county that will be used by local jurisdictions to determine the quantitative impacts of development on the circulation system that are based on the countywide model and standardized modeling assumptions and conventions. The computer models shall be consistent with the modeling methodology adopted by the regional planning agency. The data bases used in the models shall be consistent with the data bases used by the regional planning agency. Where the regional agency has jurisdiction over two or more counties, the data bases used by the agency shall be consistent with the data bases used by the regional agency.

(d) (1) The city or county in which a commercial development will implement a parking cash-out program that is included in a congestion management program pursuant to subdivision (b), or in a deficiency plan pursuant to Section 65089.4, shall grant to that development an appropriate reduction in the parking requirements otherwise in effect for new commercial development.

(2) At the request of an existing commercial development that has implemented a parking cash-out program, the city or county shall grant an appropriate reduction in the parking requirements otherwise applicable based on the demonstrated reduced need for parking, and the space no longer needed for parking purposes may be used for other appropriate purposes.

(e) Pursuant to the federal Intermodal Surface Transportation Efficiency Act of 1991 and regulations adopted pursuant to the act, the department shall submit a request to the Federal Highway Administration Division Administrator to accept the congestion management program in lieu of development of a new congestion management system otherwise required by the act.

65089.1.

(a) For purposes of this section, "plan" means a trip reduction plan or a related or similar proposal submitted by an employer to a local public agency for adoption or approval that is designed to facilitate employee ridesharing, the use of public transit, and other means of travel that do not employ a single-occupant vehicle.

(b) An agency may require an employer to provide rideshare data bases; an emergency ride program; a preferential parking program; a transportation information program; a parking cash-out program, as defined in subdivision (f) of Section 65088.1; a public transit subsidy in an amount to be determined by the employer; bicycle parking areas; and other noncash value programs which encourage or facilitate the use of alternatives to driving alone. An employer may offer, but no agency shall require an employer to offer, cash, prizes, or items with cash value to employees to encourage participation in a trip reduction program as a condition of approving a plan.

(c) Employers shall provide employees reasonable notice of the content of a proposed plan and shall provide the employees an opportunity to comment prior to submittal of the plan to the agency for adoption.

(d) Each agency shall modify existing programs to conform to this section not later than June 30, 1995. Any plan adopted by an agency prior to January 1, 1994, shall remain in effect until adoption by the agency of a modified plan pursuant to this section.

(e) Employers may include disincentives in their plans that do not create a widespread and substantial disproportionate impact on ethnic or racial minorities, women, or low-income or disabled employees.

(f) This section shall not be interpreted to relieve any employer of the responsibility to prepare a plan that conforms with trip reduction goals specified in Division 26 (commencing with Section 39000) of the Health and Safety Code, or the Clean Air Act (42 U.S.C. Sec. 7401 et seq.).

(g) This section only applies to agencies and employers within the South Coast Air Quality Management District.

65089.2.

(a) Congestion management programs shall be submitted to the regional agency. The regional agency shall evaluate the consistency between the program and the regional transportation plans required pursuant to Section 65080. In the case of a multicounty regional transportation planning agency, that agency shall evaluate the consistency and compatibility of the programs within the region.

(b) The regional agency, upon finding that the program is consistent, shall incorporate the program into the regional transportation improvement program as provided for in Section 65082. If the regional agency finds the program is inconsistent, it may exclude any project in the congestion management program from inclusion in the regional transportation improvement program.

(c) (1) The regional agency shall not program any surface transportation program funds and congestion mitigation and air quality funds pursuant to Section 182.6 and 182.7 of the Streets and Highways Code in a county unless a congestion management program has been adopted by December 31, 1992, as required pursuant to Section 65089. No surface transportation program funds or congestion mitigation and air quality funds shall be programmed for a project in a local jurisdiction that has been found to be in nonconformance with a congestion management program pursuant to Section 65089.5 unless the agency finds that the project is of regional significance.

(2) Notwithstanding any other provision of law, upon the designation of an urbanized area, pursuant to the 1990 federal census or a subsequent federal census, within a county which previously did not include an urbanized area, a congestion management program as required pursuant to Section 65089 shall be adopted within a period of 18 months after designation by the Governor.

(d) (1) It is the intent of the Legislature that the regional agency, when its boundaries include areas in more than one county, should resolve inconsistencies and mediate disputes which arise between agencies related to congestion management programs adopted for those areas.

(2) It is the further intent of the Legislature that disputes which may arise between regional agencies, or agencies which are not within the boundaries of a multicounty regional transportation planning agency, should be mediated and resolved by the Secretary of Business, Housing and Transportation Agency, or an employee of that agency designated by the secretary, in consultation with the air pollution control district or air quality management district within whose boundaries the regional agency or agencies are located.

(e) At the request of the agency, a local jurisdiction that owns, or is responsible for operation of, a trip-generating facility in another county shall participate in the congestion management program of the county where the facility is located. If a dispute arises involving a local jurisdiction, the agency may request the regional agency to mediate the dispute through procedures pursuant to subdivision (d) of Section 65089.2. Failure to resolve the dispute does not invalidate the congestion management program.

65089.3.

The agency shall monitor the implementation of all elements of the congestion management program.

The department is responsible for data collection and analysis on state highways, unless the agency designates that responsibility to another entity. The agency may also assign data collection and analysis responsibilities to other owners and operators of facilities or services if the responsibilities are specified in its adopted program. The agency shall consult with the department and other affected owners and operators in developing data collection and analysis procedures and schedules prior to program adoption. At least biennially, the agency shall determine if the county and cities are conforming to the congestion management program, including, but not limited to, all of the following:

(a) Consistency with levels of service standards, except as provided in Section 65089.4.

(b) Adoption and implementation of a program to analyze the impacts of land use decisions, including the estimate of the costs associated with mitigating these impacts.

(c) Adoption and implementation of a deficiency plan pursuant to Section 65089.4 when highway and roadway level of service standards are not maintained on portions of the designated system.

65089.4.

(a) A local jurisdiction shall prepare a deficiency plan when highway or roadway level of service standards are not maintained on segments or intersections of the designated system. The deficiency plan shall be adopted by the city or county at a noticed public hearing.

(b) The agency shall calculate the impacts subject to exclusion pursuant to subdivision (f) of this section, after consultation with the regional agency, the department, and the local air quality management district or air pollution control district. If the calculated traffic level of service following exclusion of these impacts is consistent with the level of service standard, the agency shall make a finding at a publicly noticed meeting that no deficiency plan is required and so notify the affected local jurisdiction.

(c) The agency shall be responsible for preparing and adopting procedures for local deficiency plan development and implementation responsibilities, consistent with the requirements of this section. The deficiency plan shall include all of the following:

(1) An analysis of the cause of the deficiency. This analysis shall include the following:

(A) Identification of the cause of the deficiency.

(B) Identification of the impacts of those local jurisdictions within the jurisdiction of the agency that contribute to the deficiency. These impacts shall be identified only if the calculated traffic level of service following exclusion of impacts pursuant to subdivision (f) indicates that the level of service standard has not been maintained, and shall be limited to impacts not subject to exclusion.

(2) A list of improvements necessary for the deficient segment or intersection to maintain the minimum level of service otherwise required and the estimated costs of the improvements.

(3) A list of improvements, programs, or actions, and estimates of costs, that will (A) measurably improve multimodal performance, using measures defined in paragraphs (1) and (2) of subdivision (b) of Section 65089, and (B) contribute to significant improvements in air quality, such as improved public transit service and facilities, improved nonmotorized transportation facilities, high occupancy vehicle facilities, parking cash-out programs, and transportation control measures. The air quality management district or the air pollution control district shall establish and periodically revise a list of approved improvements, programs, and actions that meet the scope of this paragraph. If an improvement, program, or action on the approved list has not been fully implemented, it shall be deemed to contribute to significant improvements in air quality. If an improvement, program, or action is not on the approved list, it shall not be implemented unless approved by the local air quality management district or air pollution control district.

(4) An action plan, consistent with the provisions of Chapter 5 (commencing with Section 66000), that shall be implemented, consisting of improvements identified in paragraph (2), or improvements, programs, or actions identified in paragraph (3), that are found by the agency to be in the interest of the public health, safety, and welfare. The action plan shall include a specific implementation schedule. The action plan shall include implementation strategies for those jurisdictions that have contributed to the cause of the deficiency in accordance with the agency's deficiency plan procedures. The action plan need not mitigate the impacts of any exclusions identified in subdivision (f). Action plan strategies shall identify the most effective implementation strategies for improving current and future system performance.

(d) A local jurisdiction shall forward its adopted deficiency plan to the agency within 12 months of the identification of a deficiency. The agency shall hold a noticed public hearing within 60 days of receiving the deficiency plan. Following that hearing, the agency shall either accept or reject the deficiency plan in its entirety, but the agency may not modify the deficiency plan. If the agency rejects the plan, it shall notify the local jurisdiction of the reasons for that rejection, and the local jurisdiction shall submit a revised plan within 90 days addressing the agency's concerns. Failure of a local jurisdiction to comply with the schedule and requirements of this section shall be considered to be nonconformance for the purposes of Section 65089.5.

(e) The agency shall incorporate into its deficiency plan procedures, a methodology for determining if deficiency impacts are caused by more than one local jurisdiction within the boundaries of the agency.

(1) If, according to the agency's methodology, it is determined that more than one local jurisdiction is responsible for causing a deficient segment or intersection, all responsible local jurisdictions shall participate in the development of a deficiency plan to be adopted by all participating local jurisdictions.

(2) The local jurisdiction in which the deficiency occurs shall have lead responsibility for developing the deficiency plan and for coordinating with other impacting local jurisdictions. If a local jurisdiction responsible for participating in a multi-jurisdictional deficiency plan does not adopt the deficiency plan in accordance with the schedule and requirements of paragraph (a) of this section, that jurisdiction shall be considered in nonconformance with the program for purposes of Section 65089.5.

(3) The agency shall establish a conflict resolution process for addressing conflicts or disputes between local jurisdictions in meeting the multi-jurisdictional deficiency plan responsibilities of this section.

(f) The analysis of the cause of the deficiency prepared pursuant to paragraph (1) of subdivision (c) shall exclude the following:

(1) Interregional travel.

(2) Construction, rehabilitation, or maintenance of facilities that impact the system.

(3) Freeway ramp metering.

(4) Traffic signal coordination by the state or multi-jurisdictional agencies.

(5) Traffic generated by the provision of low-income and very low income housing.

(6) (A) Traffic generated by high-density residential development located within one-fourth mile of a fixed rail passenger station, and

(B) Traffic generated by any mixed use development located within one-fourth mile of a fixed rail passenger station, if more than half of the land area, or floor area, of the mixed use development is used for high density residential housing, as determined by the agency.

(g) For the purposes of this section, the following terms have the following meanings:

(1) "High density" means residential density development which contains a minimum of 24 dwelling units per acre and a minimum density per acre which is equal to or greater than 120 percent of the maximum

residential density allowed under the local general plan and zoning ordinance. A project providing a minimum of 75 dwelling units per acre shall automatically be considered high density.

(2) "Mixed use development" means development which integrates compatible commercial or retail uses, or both, with residential uses, and which, due to the proximity of job locations, shopping opportunities, and residences, will discourage new trip generation.

65089.5.

(a) If, pursuant to the monitoring provided for in Section 65089.3, the agency determines, following a noticed public hearing, that a city or county is not conforming with the requirements of the congestion management program, the agency shall notify the city or county in writing of the specific areas of nonconformance. If, within 90 days of the receipt of the written notice of nonconformance, the city or county has not come into conformance with the congestion management program, the governing body of the agency shall make a finding of nonconformance and shall submit the finding to the commission and to the Controller.

(b) (1) Upon receiving notice from the agency of nonconformance, the Controller shall withhold apportionments of funds required to be apportioned to that nonconforming city or county by Section 2105 of the Streets and Highways Code.

(2) If, within the 12-month period following the receipt of a notice of nonconformance, the Controller is notified by the agency that the city or county is in conformance, the Controller shall allocate the apportionments withheld pursuant to this section to the city or county.

(3) If the Controller is not notified by the agency that the city or county is in conformance pursuant to paragraph (2), the Controller shall allocate the apportionments withheld pursuant to this section to the agency.

(c) The agency shall use funds apportioned under this section for projects of regional significance which are included in the capital improvement program required by paragraph (5) of subdivision (b) of Section 65089, or in a deficiency plan which has been adopted by the agency. The agency shall not use these funds for administration or planning purposes.

65089.6.

Failure to complete or implement a congestion management program shall not give rise to a cause of action against a city or county for failing to conform with its general plan, unless the city or county incorporates the congestion management program into the circulation element of its general plan.

65089.7.

A proposed development specified in a development agreement entered into prior to July 10, 1989, shall not be subject to any action taken to comply with this chapter, except actions required to be taken with respect to the trip reduction and travel demand element of a congestion management program pursuant to paragraph (3) of subdivision (b) of Section 65089.

65089.9.

The study steering committee established pursuant to Section 6 of Chapter 444 of the Statutes of 1992 may designate at least two congestion management agencies to participate in a demonstration study comparing multimodal performance standards to highway level of service standards. The department shall make available, from existing resources, fifty thousand dollars ($50,000) from the Transportation Planning and Development Account in the State Transportation Fund to fund each of the demonstration projects. The designated agencies shall submit a report to the Legislature not later than June 30, 1997, regarding the findings of each demonstration project.

65089.10.

Any congestion management agency that is located in the Bay Area Air Quality Management District and receives funds pursuant to Section 44241 of the Health

and Safety Code for the purpose of implementing paragraph (3) of subdivision (b) of Section 65089 shall ensure that those funds are expended as part of an overall program for improving air quality and for the purposes of this chapter.

Assessment of HCM2010 and MMLOS

B.1—Assessment of HCM2010

Background

Alameda CTC, as a Congestion Management Agency (CMA), must prepare a Congestion Management Program biennially.

Two required CMP elements—level of service (LOS) monitoring and the Land Use Analysis Program—use Highway Capacity Manual methodologies.

Overview of Current CMP Practice

	Auto	Other Modes
LOS Monitoring	Track LOS on CMP network using HCM1985	Limited study of transit travel times and bicycle counts
Land Use Analysis Program	Require study of roadway segments using HCM2000 in Transportation Impact Analyses (TIAs)	Require analysis of impacts on transit operators in TIAs

What Is New in the HCM2010?

- Updated auto LOS methodologies
- Multi Modal LOS (MMLOS)—ability to assign LOS letter grades for transit, bicyclists, and pedestrians, based on quality of user experience.

Why Investigate HCM2010 Adoption?

The 2011 CMP recommended investigating use of HCM 2010 as a key next step. This recommendation was motivated by three considerations:

- *Legislative mandate*—The CMP statute advises CMAs to use the most recent HCM in LOS monitoring activities.
- *Regional guidance* — MTC's CMP guidance encourages use of the HCM 2010.
- *Increasing multimodal focus*—There is interest in whether HCM 2010's MMLOS techniques were suitable for CMP applications.

Assessment Activities

Staff conducted a technical evaluation of HCM 2010 including:

- Comparing the inputs required to assign auto LOS in the 1985, 2000, and 2010 HCMs.
- Sensitivity testing of how HCM2010 MMLOS grades respond to key inputs using a spreadsheet model
- Consultation with other CMAs regarding plans for use of HCM2010 (both auto LOS and MMLOS)

Assessment Findings

Auto LOS	HCM2010 MMLOS
• Cannot assign freeway segment LOS based on speed post-HCM1985	• Strong at illustrating effects of roadway design changes
• Arterial segment free flow speed classifications change after HCM 1985	• Grades not strongly sensitive to operational changes (e.g., speed for transit or vehicle volumes for bike/ped)
• New data needed for arterials in HCM2010—okay for project-level application, but excessive for larger scale use	• Can be difficult to tell why scores change
	• Very data-intensive

Considerations for recommendations

- *Current and future data availability (auto LOS)*: Can the methodology be applied with data available? Is it cost-effective/feasible to collect the data? What about future data collection methods?

- *Ability to track trends (auto LOS)*: Would the new methodology enable results to be compared to previous years (e.g., to assess CMP conformance in LOS).
- *Suitability (MMLOS)*: Does the methodology respond to the appropriate parameters (will it show change from year-to-year or from no project-to-project)?

Recommendations

	Auto	Other modes
LOS Monitoring	• Continue to use HCM1985 for deficiency purpose • Apply HCM 2000 and 1985 to Tier 2 arterials to make determination on future application in 2015 CMP	• Leverage modal plans to develop networks and metrics for enhanced multi-modal monitoring
Land Use Analysis Program	• Encourage use of HCM 2010 to study segment impacts; permit flexibility if analysts need to conform to local requirements	• Adopt more robust language describing types of impacts to transit, bicyclists, and pedestrians to be considered • Encourage use of MMLOS to evaluate multi-modal tradeoffs from mitigation measures

Table B1—Rationale for Recommended Use of HCM2010 for LOS Monitoring

Auto		Other Modes	
Recommendation	**Reasons for recommendation**	**Recommendation**	**Reasons for recommendation**
Continue to use HCM 1985 for deficiency purposes	• Change of methodology would result in loss of ability to track trends (and CMP conformance) • Post-1985 HCM freeway segment methodology not compatible with current (GPS-floating car) and possible future (commercially collected) data collection methods which provide speed data (LOS methodology based on density).	Leverage modal plans outcome to develop networks and metrics for enhanced multimodal monitoring	• Modal plans provide opportunity to look at ways to monitor critical network and metrics for non-auto modes (e.g., speed and reliability of key lines for transit) • HCM 2010 MMLOS mostly responds to changes in schedule (for transit) or roadway design (for bike and ped) but these do not change greatly from year-to-year • Would not be clear why HCM 2010 MMLOS grades change if multiple input variables change at the same time (black box)
Apply HCM 1985 and 2000 to Tier 2 arterials and make a determination on future application in the 2015 CMP update	• No new data needed • New CMP roadways and no LOS estimated yet, so can be applied to 2012 and 2014 monitoring results • Monitored only for informational purposes, so no conformity issue • Provides opportunity to compare results based on different methodologies, and determine future application		

Table B2—Rationale for Recommended Use of HCM 2010 for Land Use Analysis Program

Auto		Other Modes	
Recom-mendation	**Reasons for recommendation**	**Recom-mendation**	**Reasons for recommendation**
Encourage use of HCM 2010 to study segment impacts; permit flexibility if analysts need to conform to local requirements	• No change in data needs for freeway segments; additional data needs for arterials within scope of what is generally collected for TIAs	Adopt more robust language describing types of impacts to transit, bicyclists, and pedestrians to be considered	• HCM 2010 MMLOS is not strong at illustrating how transit, bicyclists, or pedestrians are affected by operational changes; for many projects, the primary impact to these modes is via increased project vehicle traffic
		Encourage use of HCM 2010 MMLOS to evaluate multimodal tradeoffs from mitigation measures	• HCM 2010 MMLOS is strong at illustrating modal tradeoffs from design changes (e.g., adding a turn pocket or retiming a signal) • Most TIAs propose mitigation measures for only a few segments, so scope of application would be limited

B.2—Approach to Use of HCM2010 and MMLOS at Other CMAs

Detailed information follows on other comparable Bay Area CMAs' (San Francisco County Transportation Authority, Valley Transportation Authority, and Contra Costa Transportation Authority) current and future plans for use of HCM methodologies in their CMPs. Specifically, information is provided on:

- Use of HCM 2010 for the auto based roadway LOS methodology
  - As part of LOS monitoring activities, since adoption of HCM 2010 is related to current and future plans for data collection
  - As a required methodology to study auto impacts in Transportation Impact Analyses reviewed for Land Use Analysis element
- Use of MMLOS methodologies
  - To provide increased monitoring for alternative modes in the LOS monitoring
  - As part of the guidelines for Transportation Impact Analyses reviewed for the land use analysis element

HCM 2010 Application for Auto-Based Roadway LOS

Table B3—Other CMA Approaches to Applying HCM Auto-based Roadway LOS Methodology for LOS Monitoring Data Collection

	SFCTA	VTA	CCTA	Alameda CTC
Data Collection	• Historically: GPS-based floating car runs • 2013 onwards: private, commercially available data (speed)	• Historically: Aerial photography • Testing in 2014: Private, commercially available data (speed) & PeMS data (flow)	• Historically: GPS-based floating car runs, PeMS • 2013 onwards: PeMS, private, commercially available (Bluetooth™) data (speed)	• Currently: GPS-based floating car runs • Interest in testing private, commercially available data (speed)
Freeway HCM Methodology (Auto)	• HCM 1985 (decided in 2011 CMP to continue to use speed as the LOS measure based on 1985 HCM to maintain historical comparisons, monitor exempt segments and identify potential deficiencies)	• HCM 2000 (since density data was collected historically, it was easy to move to using HCM 2000) • Testing in 2014—use of HCM 2010.	• Historically: HCM 1985 • Currently testing HCM 2010	• Currently: HCM 1985 • Proposed: maintain HCM 1985
Arterial HCM Methodology (Auto)	• HCM 1985 for deficiency purposes • HCM 2000 for informational purposes (segments)	• HCM 2000 (intersections) • Testing in 2014—HCM 2010 (intersections)	• Historically: CCTALOS (planning method based on Circular 212) • Currently testing HCM 2010 (HCM 2000 used at intersections where configuration does not allow use of HCM 2010)	• Currently: HCM 1985 • Proposed: maintain HCM 1985

Table B4—Other CMA Approaches to Applying HCM Auto-based Roadway LOS Methodology for Land Use Analysis Program Data Collection Related to Transportation Impact Analysis

	San Francisco Planning Department*	VTA	CCTA	Alameda CTC
Freeway	• HCM 2000	• Current: HCM 2000 • Under consideration: HCM 2010	• HCM 2010	• Current: HCM 2000 • Proposed: HCM 2010 encouraged
Non freeway	• HCM 2000 (intersections)	• Current: HCM 2000 (intersections) • Under consider-ation: HCM 2010 (intersections)	• HCM 2010 (intersections)	• Current: HCM 2000 (segments) • Proposed: HCM 2010 encouraged

* San Francisco's Planning Department reviews Traffic Impact Analyses on behalf of the CMA; however, considerations may be different as this review serves as both a city- and CMA-level review.

Table B5—Other CMA Approaches to Applying HCM 2010 MMLOS for LOS Monitoring

	SFCTA	VTA	CCTA	Alameda CTC
Overall	• No plans to adopt MMLOS	• Pilot analysis of MMLOS bike/ped methodologies	• Exploring applying multimodal LOS measures that may not be HCM 2010 MMLOS as part of Action Plan update	• Current: Limited multimodal reporting in LOS monitoring; extensive county-wide multimodal reporting in Performance Report
Transit	• Report on transit travel time; exploring reporting on transit reliability measures; utilizing data obtained from SFMTA APC and AVL units	• No facility-specific reporting • Exploring use of big data approach to study transit speed, reliability, and causes of delay on key corridors	• As above	• Proposed: Use countywide modal studies to identify monitoring network, metrics, and data sources
Bike/Ped	• No facility specific reporting • Report on bike/ped counts, network build-out (miles built), and collisions	• No facility specific reporting • Report bike/ped counts biannually	• As above	• Current: Annual bike/ped count program • Proposed: Use countywide modal studies to identify monitoring network, metrics, and data sources

APC: Automated Passenger Counter
AVL: Automatic Vehicle Locater (i.e., GPS)

Table B6—Other CMA Approaches to Applying HCM 2010 MMLOS in Land Use Analysis Program Related to Transportation Impact Analysis

	San Francisco Planning Department*	VTA	CCTA	Alameda CTC
Overall	• TIA guideline document • No plans to adopt MMLOS	• TIA guideline document • Pilot analysis of MMLOS bike/ped methodologies. • Continuing to study to determine role in TIAs.	• TIA guideline document • MMLOS encouraged but not required	• Current: No TIA guideline document; flexible NOP response • Proposed: TIA guidelines with expanded list of multimodal impacts; encourage MMLOS for evaluating mitigation measures
Transit Impact Requirements	• Custom methodology for studying transit impacts that looks at capacity • Consideration of access to transit and delays to transit from site-related activities also required	• TIA guidelines include list of specific effects on transit that should be considered • List includes capacity, congestion that affects transit services, and access/egress	• No language in TIA Guidelines about how to study transit, impacts	• Proposed: Require study of effects on transit operations, capacity, and access/egress; no required methodology and qualitative analysis sufficient
Bicycle/ Pedestrian Impact Requirements	• TIA guidelines state that impacts on pedestrians and bicycles should be analyzed qualitatively or quantitatively depending on project size and circumstances • HCM 2000 used if quantitative analysis required • Planning Dept. determines required analysis on case-by-case basis	• TIA guidelines name specific effects on bicycles and pedestrians that should be considered • List includes effects of vehicle trips on existing bike and pedestrian conditions, consistency with adopted plans, and if project or mitigations would impede current connections	• No language in TIA Guidelines about how to study bike or pedestrian impacts	• Proposed: Require study of effects of vehicles on bike and ped conditions, site development and roadway conditions, and consistency with adopted plans

B.3—Overview of MMLOS and Sensitivity Testing

Overview of MMLOS

The HCM 2010 introduced a series of new methodologies for assigning LOS scores for transit, bicycles, and pedestrians. Consistent with LOS for autos, these methodologies focus on the quality of experience for a user of a facility. However, unlike auto LOS for which a single variable (speed or density) determines LOS, transit, bicycle, and pedestrian LOS scores are composites based on a series of variables. For instance, transit LOS takes into account the frequency of vehicle arrivals, the on-time percentage, the travel time, the presence of covered shelters, and crowding, among other factors.

A key aspect of the research to develop MMLOS is the calibration of the various inputs – the determination of how much one factor should influence the overall modal LOS score, relative to other factors. The calibration was based on user surveys. For pedestrian and bicycle modes, participants in video labs in four cities watched footage of street segments and rated conditions on a 1-6 scale. For transit, national traveler response data to changes in transit service quality were used.

The MMLOS models can be applied at different scales, as illustrated in Figure B1. Pedestrian and cyclist LOS can be assessed at the link, signalized intersection, segment, or facility scale; transit LOS can be assessed at the segment or facility scale. The Alameda CTC applications of HCM methodologies involve application at a segment scale, the MMLOS scores for segments are based on scores for the link and intersection that comprise that segment.

Table B7 summarizes all of the different factors that the MMLOS model takes into account in its computation of a modal LOS score at a given scale. The plus or minus signs indicate whether this factor positively or negatively influences the LOS. It is difficult to generalize about the magnitude of influence of different factors on an LOS score. As the table indicates, larger scale applications (e.g., segment or facility) tend to make use of the LOS score from component units (e.g., the segment LOS combines the link and intersection LOS, plus a few additional factors).

Figure B1—Scales of Application of MMLOS

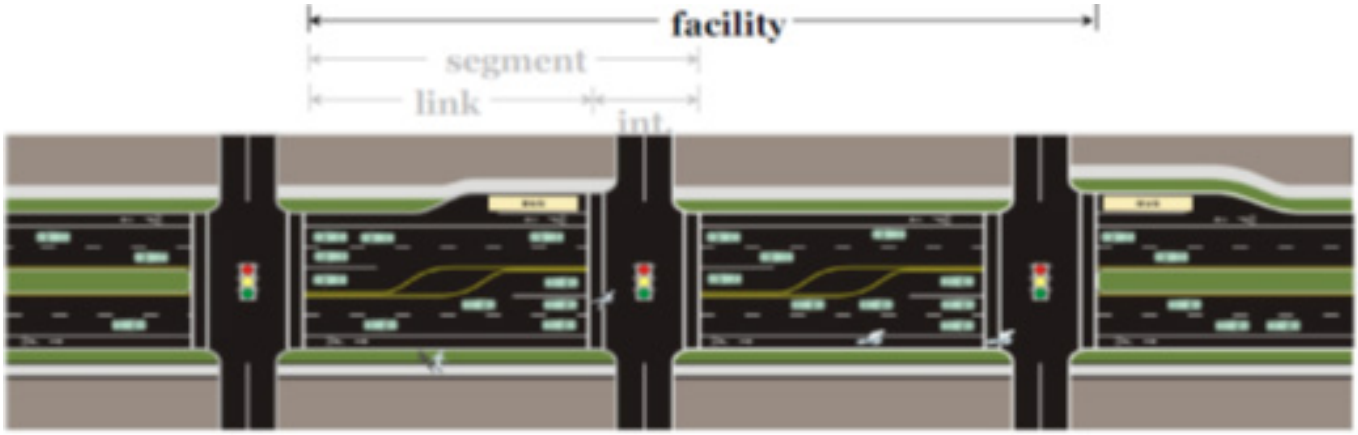


Table B7—Variables Used in MMLOS

Mode	Link	Signalized Intersection	Segment	Facility
Pedestrian	Outside travel lane width (+) Bicycle lane/ shoulder width (+) Buffer presence (e.g., on-street parking, street trees) (+) Sidewalk presence and width (+) Volume and speed of motor vehicle traffic in outside travel lane (–)	Permitted left turn and right-turn-on-red volumes (–) Cross-street motor vehicle volumes and speeds (–) Crossing length (–) Average pedestrian delay (–) Right-turn channelizing island presence (+)	Pedestrian link LOS (+) Pedestrian intersection LOS (+) Street-crossing difficulty (–/+) Delay diverting to signalized crossing Delay crossing street at legal unsignalized location	Length weighted average of component segment LOS
Bicycle	Volume and speed of traffic in outside travel lane (–) Heavy vehicle percent (–) PCI (+) Bicycle lane presence (+) Bicycle lane, shoulder, and outside lane widths (+) On-street parking use (–)	Width of outside through lane and bicycle lane (+) Cross-street width (–) Motor vehicle traffic volume in the outside lane (–)	Bicycle link LOS (+) Bicycle intersection LOS, if signalized (+) Number of access points on right side (–)	Length weighted average of component segment LOS
Transit (mixed flow vehicles)	N/A	N/A	Access to transit (uses pedestrian link LOS) Wait for transit (frequency) Actual bus travel speed (+) Stop amenities (+) Excess wait time due to late bus/train arrival (–) Crowding (–)	Length weighted average of component segment LOS

Source: Kittelson Associates, Inc. (2012) HCM 2010: Urban Street Concepts: Pedestrian, Bicycle, and Transit. Presentation to MTC Arterial Operations Committee. March 21, 2012.

Sensitivity Testing

Alameda CTC staff performed sensitivity testing of the MMLOS methodologies by implementing the MMLOS equations in a spreadsheet model, and then observing how the MMLOS score changed when key variables were allowed to change within reasonable ranges.[1] Sensitivity testing is performed for the following applications:

Table B8—Variables Considered for MMLOS Sensitivity Testing

Methodology	Variables Tested
Transit (Segment)	On-time percentage
	Bus speed (including delays)
	Frequency of Bus Arrivals
Bicycle (Link)	Automobile volumes
	Automobile speeds
	On-street parking occupancy
	Outside lane effective width
Pedestrian (Link)	Automobile volumes
	Automobile speeds
	Effective walkway width

General findings of sensitivity testing for (mixed flow) transit include the following:

- Transit LOS is highly sensitive to the frequency of bus arrivals (headway), though this sensitivity diminishes when headways reach 10 min or less.
- Transit LOS is not highly sensitive to on-time percentage. On-time percentage can decline by 20-30 percent without dropping an LOS grade. A substantial body of research[2] shows that poor reliability is a common reason why transit riders stop riding transit, so this attribute may be undervalued in the MMLOS transit score.
- Transit LOS is not highly sensitive to commercial speed[3] (i.e., speed that a transit vehicle actually achieves, when factoring in delays from boarding, signals, etc.). The commercial speed can drop by 5 mph or more without dropping an LOS grade. Many AC Transit routes operate at commercial speeds between 10 mph and 15 mph, so a 5 mph change in commercial speed is quite significant.

General findings of sensitivity testing for bicycles and pedestrian include the following:

- Bicycle and pedestrian LOS are both most sensitive to roadway space allocation. For bicycles, adding effective width to the outer lane—either through a wider lane or a bike lane—improves LOS by at least a letter grade. For pedestrians, adding on-street parking or items that provide a physical barrier from autos (e.g., trees, street furniture) greatly increase LOS.
- Bicycle and pedestrian LOS are not very sensitive to auto flow rates or speeds. For instance, flow rates can increase by several hundred veh/hr without seeing a change in bicycle or pedestrian LOS. Similarly, speeds can increase by 10 mph or more without registering a change in bicycle or pedestrian LOS. The lack of emphasis on traffic volumes and speeds in bicycle and pedestrian LOS seems contrary to some research on why people choose to use active transportation modes (e.g., a 2010 Alameda CTC survey found that safety concerns were the second most common reason why residents chose not to bicycle).[4]
- Bicycle LOS is highly sensitive to pavement quality.

1 This spreadsheet model uses the equations from the HCM 2010 MMLOS methodologies and computes the MMLOS "score" (which is used to determine letter grade) for a given set of inputs.

2 Carrell, A., A. Halvorsen, J. Walker (2012). Passengers Perceptions of and Behavioral Adaptation to Unreliability in Public Transportation. Submitted for presentation at the 92nd Transportation Research Board Annual Meeting.

3 When elasticity of demand to travel time set at its default value for urban areas.

4 Alameda CTC (2012). Bike to Work Day and Get Rolling Advertisement: Assessment Report. Prepared by EMC Research, February 2012.

Illustration of Sensitivity Testing

Figure B2 and Table B9, which follows, provide an illustration of the sensitivity testing Alameda CTC staff performed of MMLOS. Similar graphs were produced for the variables in Table B4, and are available on request.

Figure B2 illustrates how bicycle LOS score changes in response to variations in the automobile flow rate, when all other inputs are set to the typical values indicated in Table B9. The figure shows that at auto flow rates less than 100 vehicles per hour per lane (vphpl), bicycle LOS is A, from 100 vphpl to roughly 400 vphpl, bicycle LOS is at B, and above 400 vphpl bicycle LOS is at C. While most users would expect cyclist conditions to degrade if a facility handles hundreds of additional vehicle trips per hour (e.g., goes from 600 vphpl to 1100 vphpl), this analysis indicates that bicycle LOS can remain at C, even with significant added vehicle traffic.

Figure B2—Illustration of MMLOS Sensitivity Testing

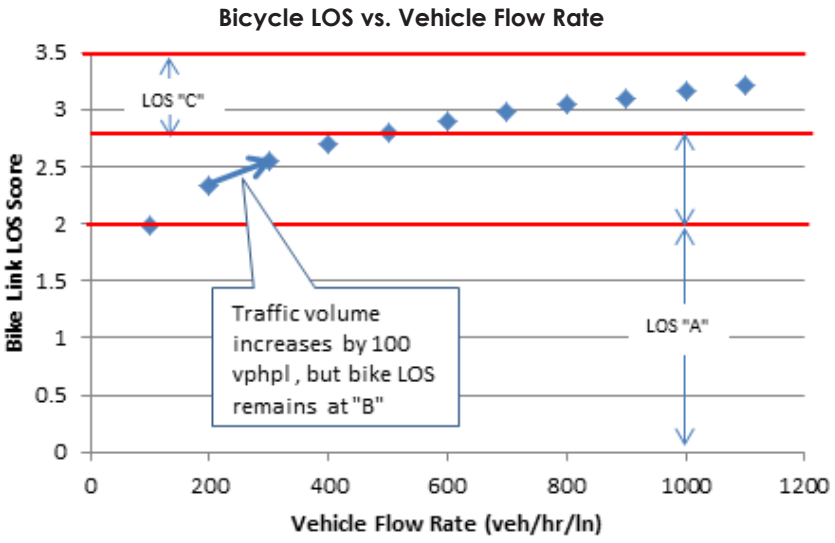


Table B9—Values Used in Illustration of MMLOS Sensitivity Testing

Input Variable	Value	Units
Segment length	500	ft
Bike running speed	13	mi/hr
Bike control delay	10	sec
Number through lanes (direction of travel)	2	#
Pavement condition rating	3	1-6 scale
On-street parking occupancy	50	%
Width outside through lane	10	ft
Width outside shoulder (can be parked in)	8	ft
Width bike lane	6	ft
Percent Heavy Vehicles	3	%
Automobile Flow Rate (direction of travel)	Allowed to vary	veh/hr/ln
Motorized vehicle running speed	25	mi/hr
Curb present?	Y	

2012 Performance Report for Fiscal Year 2011-2012, Executive Summary

Commuting Patterns

Alameda County's transportation system is critical not just to the travel of Alameda County residents and workers but also to overall regional commuting. Approximately 27 percent of regional commutes involve Alameda County in some way, though the county has just 21 percent of the region's population. Over the last decade, Alameda County commutes became more in regional nature. Of commuters with residences or jobs in Alameda County, the share of workers that commute within the county declined from 36 percent to 32 percent.

Driving mode share declined slightly from 2010 to 2011 (work trips only). The biggest increases in mode share were for BART, bicycling, and working from home. Over the longer term (between 2000 and 2011), drive-alone mode share has stayed essentially flat at 65 percent. The largest shift in mode share over this period is a nearly 4 percent decline in carpooling mode share; drive alone travel also dropped by 1 percent during this period. Working from home saw the largest increase in mode share, and bicycling's share of work trips has doubled since 2000.

Roadways

The year 2012 appeared to mark a resurgence of demand for use of Alameda County's roadways after several years of weaker travel demand amidst a recession and slow economic recovery. Average evening peak-hour freeway and arterial speeds each declined by about 1 mph from 2010, and average weekday vehicle hours of delay (VHD) increased by about 11,000 hours, a nearly 20 percent increase. Alameda County had four of the region's ten most congested freeway corridors in the second quarter of 2012.

Local street and road average Pavement Condition Index (PCI), a measure of pavement quality, increased by 4 points to 70, after staying flat at 66 for the previous four years. However, despite the significant increase, 30 percent of the centerline mileage in Alameda County has a PCI of "at risk" or worse, meaning it will deteriorate rapidly. Poor pavement quality affects road users of all types, and addressing outstanding maintenance needs will require significant future adherence to "fix it first" commitments.

Collisions on Alameda County roadways declined by 6 percent between 2009 and 2010 (the most recent year for which complete data is available). Since 2002, collisions have dropped nearly 50 percent. However, the absolute number of collisions on Alameda County roadways (19,000 in 2010, of which 6,000 were injury or fatal collisions) indicates that roadway safety requires continued attention.

Transit

Transit plays a critical role in Alameda County by taking cars off of freeways and arterials and providing vital accessibility to individuals and businesses in Alameda County. Transit ridership increased slightly in 2012, marking the first year of increase since 2008. Within Alameda County, ridership increased by 0.2 percent between 2011 and 2012 to reach 91 million boardings. Beneath this slight overall shift are significant swings for different transit modes. Rail and ferry boardings increased by 10 and 19 percent, respectively, while bus boardings fell by 6 percent between 2011 and 2012. Over the last decade, bus ridership has dropped from 64 percent to 54 percent of transit boardings in Alameda County.

Service utilization—the ratio of how many people ride transit (demand) to the amount of service operated (supply)—is a more accurate measure of transit operator success. Each operator has seen a unique trend in service utilization over the last decade. BART has seen a steady increase in boardings per revenue vehicle mile (RVM) operated since 2004. For AC Transit, 2012 was a year of decline in service utilization. AC Transit had seen several years of improving boardings per RVM. In 2010 and 2011, even though ridership declined amidst service cuts, the percentage decrease in RVM was greater than the percentage decrease in ridership, so the overall service utilization ratio improved. In 2012, AC Transit's ridership declined more than service was curtailed, so that overall utilization declined.

Most transit operators saw reductions in service interruptions in 2012. Only AC Transit saw more frequent vehicle breakdowns in 2012, and all operators, including AC Transit, have seen fewer breakdowns since 2008. Vehicle breakdowns and other equipment failures are frequently a product of aging equipment and infrastructure, and though service interruptions largely declined in 2012, the county's transit operators have a number of aging assets that require rehabilitation or replacement. AC Transit plans to unveil a new bus purchase in 2013, and BART is procuring new rail cars but has significant track, communications infrastructure, station, and other capital needs.

Bicycling

Bicycling is a critical mode within Alameda County's transportation system that is affordable for users, linked to positive public health outcomes, environmentally sustainable, and relatively cheap to invest in. Bicycling's work trip mode share increased in 2011, and bicycle counts also show significant growth in participation, suggesting bicycling is growing for all types of travel. The number of cyclists observed at the 63 count locations monitored by the Alameda CTC increased by 17 percent over the last year; in addition, a set of locations monitored over the longer term has seen a 75 percent growth since 2002. Expanding bicycling to an activity that people of all types feel comfortable engaging in remains an area for improvement; the gender imbalance in cyclists (only 30 percent of whom were women, according to 2011 counts) attests to the need for investment that moves bicycling in this direction.

During the last year, several significant components of the Alameda Countywide Bicycle Plan were completed, closing major network gaps. Four local jurisdictions completed or updated local bike plans, and eleven of Alameda County's jurisdictions have completed or updated plans within the last five years. Thousands of Alameda County residents and workers participated in bike safety and awareness programs.

There is some evidence that the collision rate involving cyclists is declining, as the number of collisions involving cyclists has grown more slowly than participation in cycling. At the same time, safety and an incomplete network remain barriers that prevent cycling from being a more prevalent activity in Alameda County whose participants reflect the demographics of the population that lives and works in the county.

Walking

Every trip begins and ends with walking. While walking may not move Alameda County's residents the most miles, walking is fundamental to all modes and is the only available travel option for many users of Alameda County's transportation system. Walking has held steady as the mode used by between 3 and 4 percent of Alameda County workers for their commute for the past decade, though this statistic understates walking's role in the transportation system, as the vast majority of walking trips are made for non-work purposes. The most recent household travel survey with data on all types of travel found that walking accounts for 11 percent of all trips, and this statistic excludes walking's role as an access and egress mode for transit and driving trips. Pedestrian counts collected through the Alameda Countywide Count Program suggest that pedestrian volumes are increasing.

In FY11-12, 10 jurisdictions reported completing a total of 18 projects in areas of countywide significance (these areas include walksheds around and along high-frequency transit, major regional activity centers, and interjurisdictional trails). Four jurisdictions completed or updated local pedestrian master plans, and nine jurisdictions have completed or updated plans within the last five years. Local Master Plans are vital to improving pedestrian infrastructure, because ultimately ownership of the right of way in which pedestrian infrastructure exists resides at the local level.

Deficiency Plan Guidelines

Background and Purpose

Deficiency Plans include various measures to improve transportation conditions on a Congestion Management Program (CMP) roadway that does not meet the established CMP level of service standard set forth in the California Government Code Section 65089 (b)(1)(B). The state legislation requires:

> *In no case shall the LOS standards for roads established be below the LOS E or at the current level, whichever is further from LOS A. When the LOS on a segment or at an intersection fails to attain the established LOS standard, a Deficiency Plan shall be adopted pursuant to Section 65089.4.*

Deficiency Plans are a way for jurisdictions to remain in compliance with the CMP. Deficiency Plans should be developed with consideration of the countywide transportation planning process, including forecasts of travel needs and planned capital improvements. Likewise, existing deficiencies should influence future countywide transportation planning and programming decisions. If the Deficiency Plan involves system-wide improvements, Alameda CTC staff, transit agencies, the Bay Area Air Quality Management District (BAAQMD), and the California Department of Transportation may also be involved.

Process Overview

When the LOS on a given CMP-network segment deteriorates below the established state standard, the responsible jurisdictions(s) must prepare a Deficiency Plan, or additional gasoline tax subventions (pursuant to Section 2105 of the Streets and Highways Code) will be withheld. During even number years, when the LOS Monitoring is performed, the Alameda CTC Commission determines whether a jurisdiction is required to prepare a Deficiency Plan based on the LOS Monitoring results. If any CMP segment is identified to be deficient, the respective jurisdiction(s) must prepare a Deficiency Plan within 12 months of the determination to prevent its forfeiting of additional gasoline tax subventions. Pages 5-8 herein include the relevant sections of the CMP legislation related to the Deficiency Plan requirements.

Deficiency Identification

Biennially, the Alameda CTC identifies potentially deficient roadway segments based on LOS monitoring. Only trips originating inside Alameda County in the p.m. peak period are included in determining LOS conformity with the established LOS standard exempting many types of travel. After applying the required exemptions, if a CMP roadway segment is still found to operate at LOS F, it will be determined as deficient and the respective local jurisdiction(s) will be informed.

Exemptions

The State statute requires several types of travel to be exempted from the deficiency determination, including:

- Interregional travel;
- Construction, rehabilitation, or maintenance of facilities that impact the system;
- Freeway ramp metering;
- Traffic signal coordination by the state or a multi-jurisdictional agency;
- Traffic generated by the provision of low and very low income housing;
- Traffic generated by high-density residential development within one-fourth mile of a fixed rail passenger station; and
- Traffic generated by any mixed use development located within one-fourth mile of a fixed rail passenger station; and if more than half of the land area or floor area of the mixed use development is used for high density residential housing.

Roadway Capacity Standards

For the purposes of determining deficiency, the following standards for roadway capacity will be used unless a local jurisdiction can demonstrate an alternative capacity:

- Freeways: 2,000 vehicles per lane per hour

- Two-lane: 1,400 vehicles per lane per hour highways
- Arterials: 800 vehicles per lane per hour

Jurisdictional Participation

If a deficient CMP roadway segment is located entirely in one jurisdiction and all other jurisdictions contribute less than 10% traffic, then the deficiency should be addressed through a local single-jurisdiction deficiency plan. However, if a deficient CMP roadway segment crosses jurisdiction boundaries, borders two jurisdictions, or if the following conditions are met that are considered to be contributing to the deficiency or for effective planning purposes, then the deficiency should be addressed through a multi-jurisdictional deficiency plan.

- A jurisdiction shall participate in a deficiency plan if traffic to or from that jurisdiction, either an origin or destination at the deficient segment, represents ten percent (10 percent) of the capacity of the freeway/roadway, as estimated by the countywide travel demand model.
- In some cases, (in order to eliminate any gaps and to ensure continuity in the planning process) a jurisdiction that does not meet the 10 percent threshold shall be required to participate in the deficiency plan process if it is surrounded by jurisdictions which meet the threshold for participation.

Additional features of the multi-jurisdictional deficiency plan in terms of participation are:

- All owners/operators of a deficient segment of freeway or roadway along with transit operators shall be invited to participate in the deficiency plan process
- The percent contribution of traffic specifically does not imply a commensurate financial share of the Deficiency Plan actions identified.
- All participating jurisdictions shall adopt identical deficiency plan action plans. A local jurisdiction shall have the right to appeal as depicted in the Multi-jurisdictional Deficiency Plan Appeal Process, (Figure D1) or to invoke the established Conflict Resolution Process to address conflicts or disputes that arise between the local jurisdictions in developing the multi-jurisdictional Deficiency Plan.
- If a local jurisdiction responsible for participating in a multi-jurisdictional deficiency plan does not adopt the deficiency plan in accordance with the schedule and requirements outlined above, that jurisdiction shall be considered in non-conformance with the CMP.

Types of Deficiency Plans

The Deficiency Plan process allows a local jurisdiction to choose one of two types of Deficiency Plans.

Localized Deficiency Plan

This type of plan is appropriate for addressing transportation impacts to a single CMP segment or roadway that has been identified as or is anticipated to become deficient based on the LOS Monitoring. This plan focuses on analyzing the cause of deficiency by including the immediate surrounding area as the project area and identifying the list of improvements or mitigation measures that are necessary to meet LOS standards, and estimates the costs and implementation schedule of the proposed improvements.

Areawide Deficiency Plan

An Areawide Deficiency Plan is appropriate when a CMP segment or roadway has been identified as or is anticipated to become deficient based on the LOS Monitoring and it cannot be improved to meet LOS standards and mitigated back to conformance if considered solely within a localized area. The jurisdiction must designate the segment as deficient, and develop and implement actions to measurably improve the performance of the larger network LOS in the study area and contribute to significant air quality improvements. Such actions may not necessarily directly pertain to or have a measurable impact on the deficient segment itself but must show system-wide improvement. This plan focuses on offsetting the deficiency by including the broader surrounding

area as the project area and identifying a list of improvements, programs or actions to improve the performance of the larger multimodal network. The plan should contain an estimate of the costs and implementation schedule of the proposed improvements, programs or actions.

The study area for an Areawide Deficiency Plan should generally be an area where improvements made to the multimodal network in one place of the study area provide improved overall performance of the larger network in that area. The study area should include or be served by one or more alternative transportation modes. The study area can be:

- An administrative jurisdiction such as a city/county or a part of a city/county
- An area comprising parts of multiple adjacent jurisdictions in which case it will be a multi-jurisdiction deficiency plan

Plan Development and Approval

Required Components

The scope of a Deficiency Plan should match the severity of the problem. Extreme deficiencies will need more significant actions. Action plans must be incorporated into future CMP documents. State law requires a Deficiency Plan contain the following:

- an analysis of the deficiency
- a list of improvements and related costs to mitigate the deficiency in that facility itself;
- a list of possible actions and costs that would result in improvements to the CMP system's LOS and be beneficial to air quality; and
- an action plan, including a schedule, to implement improvements from one of the two above lists.

In developing the deficiency plan addressing the required components, the following format should be used:

- *Introduction and Setting.* A short description of the facility, including a map showing its location.
- *Deficiency Analysis.* Analysis and assessment of deficiency in terms of likely causes and the magnitude.
- *Screening of Actions.* An array of suitable actions evaluated at a sketch-planning level for potential effects on system-wide traffic congestion and air quality (traffic operations analyses or model forecasts may be required). For this purpose, actions listed in the BAAQMD guidelines (described in more detail in the following section) and other actions identified and approved by the BAAQMD should be used.
- *Evaluation of Suitable Actions.* Selected actions from the screening process further evaluated to demonstrate how these actions when implemented contribute to improving the CMP network LOS conditions.
- *Implementation.* A detailed implementation plan should be developed, including description of the selected actions, anticipated costs, related funding sources and schedule.

Suitable Implementation Actions

Implementation actions fall into one of two categories:

- *Mitigation of Deficiency.* These types of improvements are designed to directly mitigate the specific deficiency such as highway, transit and other mode improvements, typically included in the localized deficiency plan.
- *Overall System Performance and Air Quality Improvement.* These actions are intended to provide overall measurable improvements to system performance and air quality, in cases where deficiencies cannot be mitigated directly. This will occur from implementing an areawide deficiency plan.

Areawide deficiency plans facilitate implementation of coordinated improvements to the multimodal transportation network and promote reduction of overall percentage of trips made by the single occupant vehicles while increasing the percentage of trips made

by transit, pedestrian and bicycle and resulting in improvements to air quality. For these types of plans, the legislation requires identifying an array of actions improving multimodal performance. In addition, the legislation requires the air quality management district, which is Bay Area Air Quality Management District (BAAQMD) for the Bay Area, to develop a list of improvements, programs and actions for this purpose as follows:

> *The deficiency plan shall include….a list of improvements, programs, or actions, and estimates of costs, that will (A) measurably improve multimodal performance, using measures defined in paragraphs (1) and (2) of subdivision (b) of Section 65089, and (B) contribute to significant improvements in air quality, such as improved public transit service and facilities, improved nonmotorized transportation facilities, high occupancy vehicle facilities, parking cash-out programs, and transportation control measures. The air quality management district or the air pollution control district shall establish and periodically revise a list of approved improvements, programs, and actions that meet the scope of this paragraph. If an improvement, program, or action on the approved list has not been fully implemented, it shall be deemed to contribute to significant improvements in air quality. If an improvement, program, or action is not on the approved list, it shall not be implemented unless approved by the local air quality management district or air pollution control district.*

The BAAQMD has developed a list of actions in Table D-1, which are considered beneficial for air quality and congestion management and includes measures to improve use of alternative modes, improved traffic flow and reducing trips. Jurisdictions may include actions other than those on this list, provided the BAAQMD reviews and approves the list prior to plan adoption. The most current BAAQMD list of actions should always be consulted.

In addition, the proposed improvement measures and actions for the Action Plan of the Deficiency Plan in Alameda County can be coordinated with the outcome of the upcoming countywide modal plans – (i.e., Countywide Goods Movement Plan, Countywide Transit Plan, and Countywide Multimodal Arterial Corridor Mobility Plan) and the adopted Comprehensive Countywide Travel Demand Management (TDM) Strategy to effectively improve the multimodal transportation network performance. This could support measures including but not limited to the potential improvement measures related to the priority transit routes, bicycle and pedestrian locations, priority roadways, and freight as identified in the modal plans. Alameda CTC will develop a list of multimodal improvement measures based on the outcome of these modal plans and work with the Air District to get their approval, so that more improvement options are readily available should an areawide deficiency plan be required.

Review and Evaluation

An acceptable Deficiency Plan will contain all of the required components listed above and will be evaluated on the following technical criteria:

- Completeness as required in California Government Code Section 65089.5;
- Appropriateness of the Deficiency Plan actions in relation to the magnitude of the deficiency;
- Reliability of the funding sources;
- Ability to implement the proposed actions (including jurisdictional control issues); and
- Reasonableness of the implementation plan schedule.

Alameda CTC staff and ACTAC members will review the draft Deficiency Plan and provide technical input to assist the respective local jurisdiction(s) in developing and finalizing the Deficiency Plan.

Adoption

A final plan must be adopted by the affected local jurisdiction(s) at a noticed public hearing no later than 12 months following identification of Deficiency by Alameda CTC. The Alameda CTC Commission will approve or reject a Deficiency Plan within 60 days of receipt of the Deficiency Plan from the local jurisdiction(s). If the plan is rejected, Alameda CTC will notify the local jurisdiction(s) of the reasons for that rejection, and the local jurisdiction must submit a revised plan within 90 days. Once a plan is adopted, written notification of the conformance findings of the Alameda CTC Commission (presently scheduled to occur at the November/December Alameda CTC Commission meeting) is required annually.

Updates

To facilitate the implementation process, the Alameda CTC Commission will accept minor updates to Deficiency Plans. The affected jurisdictions(s) may submit a notice to the Alameda CTC stating the reason for and content of the update. The Alameda CTC Commission will approve or reject the request for the update. Should the Alameda CTC Commission reject the request, the existing Deficiency Plan will remain in place.

Monitoring

Annually, the Alameda CTC will monitor implementation of the Deficiency Plans prior to the annual conformance determination, to establish whether:

- They are being executed according to the schedule detailed in the implementation plan; or
- Changes have occurred that require modifications of the original Deficiency Plan or schedule.

Jurisdictions that have prepared and are implementing a Deficiency Plan must prepare annual status report updates for the Annual Conformity Findings. Participating jurisdictions that did not prepare the Deficiency Plan must also review the annual status report updates and submit a letter to the Alameda CTC stating they are in concurrence with the annual update from the lead jurisdiction. This information is required for the Commission to make a determination whether the jurisdictions are in conformance with the CMP.

Compliance

Once the action plan identified in the Deficiency Plan is implemented, the local jurisdiction determines whether a measurable improvement in LOS has occurred or whether the plan needs to be further updated. Evaluation of the action plan may result in recommended changes to other elements of the CMP, such as the Capital Improvement Program or Travel Demand Management Element, if related improvement measures are included in these elements

A jurisdiction (lead or participating), which is either not implementing the actions or not adhering to the stated schedule in the approved Deficiency Plan may be found in non-conformance, if the deficiency still exists.

California Code Sections 65089.4 and 65089.5 Regarding the Congestion Management Program Deficiency Plan Process

65089.4.

(a) A local jurisdiction shall prepare a deficiency plan when highway or roadway level of service standards are not maintained on segments or intersections of the designated system. The deficiency plan shall be adopted by the city or county at a noticed public hearing.

(b) The agency shall calculate the impacts subject to exclusion pursuant to subdivision (f) of this section, after consultation with the regional agency, the department, and the local air quality management district or air pollution control district. If the calculated traffic level of service following exclusion of these impacts is consistent with the level of service standard, the agency shall make a finding at a publicly noticed meeting that no deficiency plan is required and so notify the affected local jurisdiction.

(c) The agency shall be responsible for preparing and adopting procedures for local deficiency plan development and implementation responsibilities, consistent with the requirements of this section. The deficiency plan shall include all of the following:

(1) An analysis of the cause of the deficiency. This analysis shall include the following:

(A) Identification of the cause of the deficiency.

(B) Identification of the impacts of those local jurisdictions within the jurisdiction of the agency that contribute to the deficiency. These impacts shall be identified only if the calculated traffic level of service following exclusion of impacts pursuant to subdivision (f) indicates that the level of service standard has not been maintained, and shall be limited to impacts not subject to exclusion.

(2) A list of improvements necessary for the deficient segment or intersection to maintain the minimum level of service otherwise required and the estimated costs of the improvements.

(3) A list of improvements, programs, or actions, and estimates of costs, that will (A) measurably improve multimodal performance, using measures defined in paragraphs (1) and (2) of subdivision (b) of Section 65089, and (B) contribute to significant improvements in air quality, such as improved public transit service and facilities, improved nonmotorized transportation facilities, high occupancy vehicle facilities, parking cash-out programs, and transportation control measures. The air quality management district or the air pollution control district shall establish and periodically revise a list of approved improvements, programs, and actions that meet the scope of this paragraph. If an improvement, program, or action on the approved list has not been fully implemented, it shall be deemed to contribute to significant improvements in air quality. If an improvement, program, or action is not on the approved list, it shall not be implemented unless approved by the local air quality management district or air pollution control district.

(4) An action plan, consistent with the provisions of Chapter 5 (commencing with Section 66000), that shall be implemented, consisting of improvements identified in paragraph (2), or improvements, programs, or actions identified in paragraph (3), that are found by the agency to be in the interest of the public health, safety, and welfare. The action plan shall include a specific implementation schedule. The action plan shall include implementation strategies for those jurisdictions that have contributed to the cause of the deficiency in accordance with the agency's deficiency plan procedures. The action plan need not mitigate the impacts of any exclusions identified in subdivision (f). Action plan strategies shall identify the most effective implementation strategies for improving current and future system performance.

(d) A local jurisdiction shall forward its adopted deficiency plan to the agency within 12 months of the identification of a deficiency. The agency shall hold a noticed public hearing within 60 days of receiving the deficiency plan. Following that hearing, the agency shall either accept or reject the deficiency plan in its entirety, but the agency may not modify the deficiency plan. If the agency rejects the plan, it shall notify the local jurisdiction of the reasons for that rejection, and the local jurisdiction shall submit a revised plan within 90 days addressing the agency's concerns. Failure of a local jurisdiction to comply with the schedule and requirements of this section shall be considered to be nonconformance for the purposes of Section 65089.5.

(e) The agency shall incorporate into its deficiency plan procedures, a methodology for determining if deficiency impacts are caused by more than one local jurisdiction within the boundaries of the agency.

(1) If, according to the agency's methodology, it is determined that more than one local jurisdiction is responsible for causing a deficient segment or intersection, all responsible local jurisdictions shall participate in the development of a deficiency

plan to be adopted by all participating local jurisdictions.

(2) The local jurisdiction in which the deficiency occurs shall have lead responsibility for developing the deficiency plan and for coordinating with other impacting local jurisdictions. If a local jurisdiction responsible for participating in a multi-jurisdictional deficiency plan does not adopt the deficiency plan in accordance with the schedule and requirements of paragraph (a) of this section, that jurisdiction shall be considered in nonconformance with the program for purposes of Section 65089.5.

(3) The agency shall establish a conflict resolution process for addressing conflicts or disputes between local jurisdictions in meeting the multi-jurisdictional deficiency plan responsibilities of this section.

(f) The analysis of the cause of the deficiency prepared pursuant to paragraph (1) of subdivision (c) shall exclude the following:

(1) Interregional travel.

(2) Construction, rehabilitation, or maintenance of facilities that impact the system.

(3) Freeway ramp metering.

(4) Traffic signal coordination by the state or multi-jurisdictional agencies.

(5) Traffic generated by the provision of low-income and very low income housing.

(6)

(A) Traffic generated by high-density residential development located within one-fourth mile of a fixed rail passenger station.

(B) Traffic generated by any mixed use development located within one-fourth mile of a fixed rail passenger station, if more than half of the land area, or floor area, of the mixed use development is used for high density residential housing, as determined by the agency.

(g) For the purposes of this section, the following terms have the following meanings:

(1) "High density" means residential density development which contains a minimum of 24 dwelling units per acre and a minimum density per acre which is equal to or greater than 120 percent of the maximum residential density allowed under the local general plan and zoning ordinance. A project providing a minimum of 75 dwelling units per acre shall automatically be considered high density.

(2) "Mixed use development" means development which integrates compatible commercial or retail uses, or both, with residential uses, and which, due to the proximity of job locations, shopping opportunities, and residences, will discourage new trip generation.

65089.5.

(a) If, pursuant to the monitoring provided for in Section 65089.3, the agency determines, following a noticed public hearing, that a city or county is not conforming with the requirements of the congestion management program, the agency shall notify the city or county in writing of the specific areas of nonconformance. If, within 90 days of the receipt of the written notice of nonconformance, the city or county has not come into conformance with the congestion management program, the governing body of the agency shall make a finding of nonconformance and shall submit the finding to the commission and to the Controller.

(b)

(1) Upon receiving notice from the agency of nonconformance, the Controller shall withhold apportionments of funds required to be apportioned to that nonconforming city or county by Section 2105 of the Streets and Highways Code.

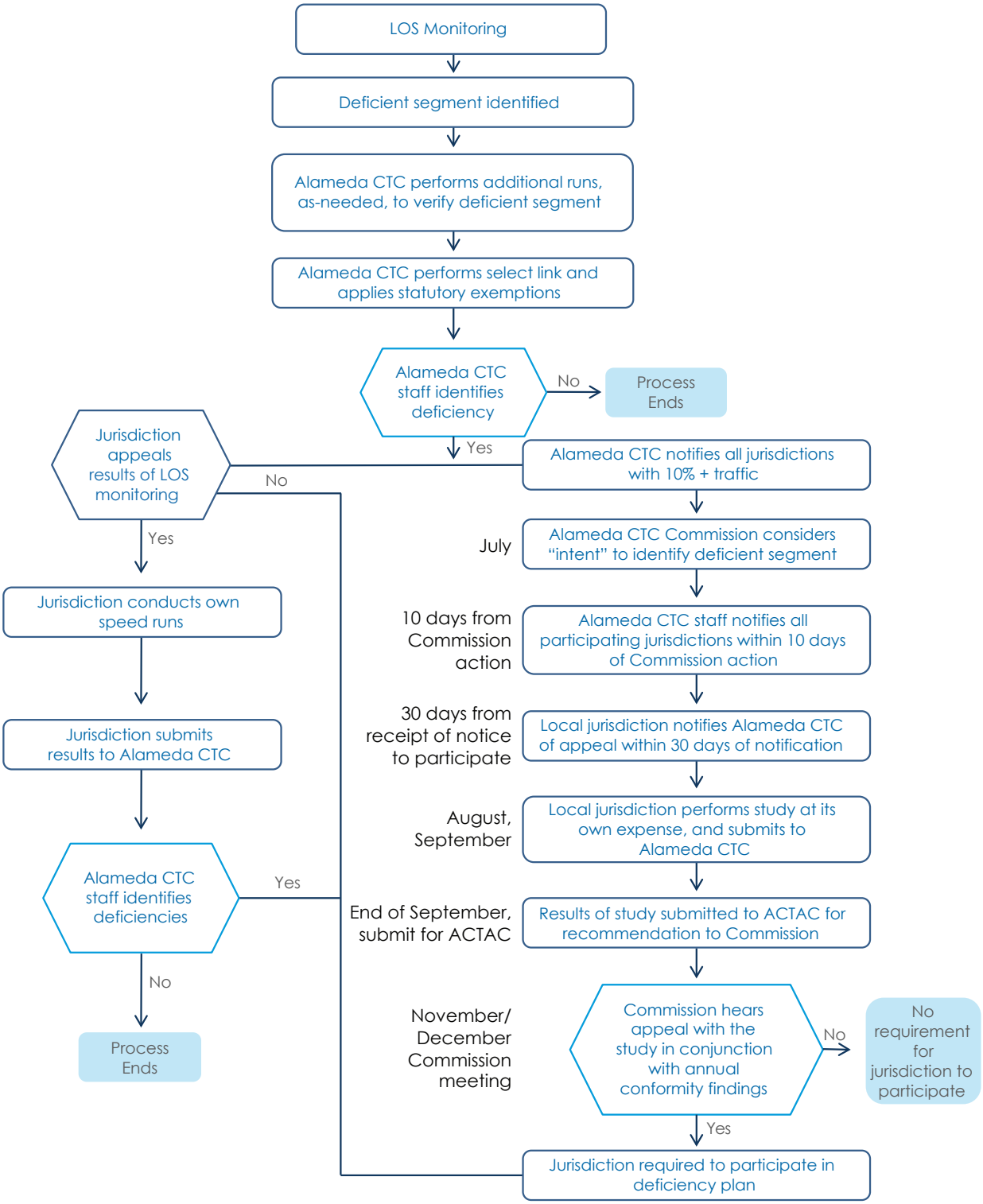
(2) If, within the 12-month period following the receipt of a notice of nonconformance, the Controller is notified by the agency that the city or county is in conformance, the Controller shall

allocate the apportionments withheld pursuant to this section to the city or county.

(3) If the Controller is not notified by the agency that the city or county is in conformance pursuant to paragraph (2), the Controller shall allocate the apportionments withheld pursuant to this section to the agency.

(c) The agency shall use funds apportioned under this section for projects of regional significance which are included in the capital improvement program required by paragraph (5) of subdivision (b) of Section 65089, or in a deficiency plan which has been adopted by the agency. The agency shall not use these funds for administration or planning purposes.

Figure D1—Multi-jurisdictional Deficiency Plan Appeal Process



Note: Assumes timely reporting of LOS Monitoring results in the spring.

Table D1—System-wide Deficiency Plan Actions List from BAAQMD*

TCM	Description
Action A—Bicycle and Pedestrian Measures	
A1	Improved Roadway Bicycle Facilities and Bike Paths
A2	Transit and Bicycle Integration
A3	Bicycle Lockers and Racks at Park and Ride Lots
A4	Bicycle Facilities and Showers at Developments
A5	Improved Pedestrian Facilities
A6	Pedestrian Signals
A7	Lighting for Pedestrian Safety
Action B—Transit	
B1	Improvement of Bus, Rail, and Ferry Transit Service
B2	Expansion of Rail Transit Service
B3	Expansion of Ferry Services
B4	Preferential Treatment for Buses and In-Street Light Rail Vehicle (LRVs)
B5	Transit Information and Promotion
B6	Transit Pricing Strategies to Encourage Ridership and Reduce Transit Vehicle Crowding
B7	Transit Fare Subsidy Programs
B8	Transit Centers
B9	Improved and Expanded Timed Transfer Programs
B10	Improved and Expanded Fare Coordination
B11	Signal Preemption by Transit Vehicles
B12	Bus Stop Bulbs
B13	School Bus Transit Service
Action C—Carpooling, Buspooling, Vanpooling, Taxipooling, Jitneys, Casual Carpooling and Other Shared Rides (Ridesharing)	
C1	Preferential Treatment for Shared Ride Vehicles
C2	Increased Use of Commuter/Employer Services

Table D1—System-wide Deficiency Plan Actions List from BAAQMD*, Continued

TCM	Description
Action D—High Occupancy Vehicle (HOV) Facilities	
D1	Preferential Treatment for HOVs
D2	Bus and Carpool/Buspool/Vanpool/Taxi-pool Priority Lanes on Local Arterials
D3	Accelerated Implementation of the 2005HOV Master Plan
D4	HOV to HOV Facilities
D5	Direct HOV Lane Entrance/Exit Ramps to Arterials and Space Generators
Action E—Other TCMs, Related Measures	
E1	Stricter Travel Demand Management/Trip Reduction Ordinance
E2	Expanded Public Education Programs
E3	Child Care Facilities at or close to Employment Sites, Transit Centers and Park and Ride Lots
E4	Retail Services at or close to Employment Sites, Transit Centers and Park and Ride Lots
E5	Telecommuting Centers and Work-at-Home Programs
E6	Parking Management
Action F—Traffic Flow Improvements	
F1	Preferential Treatment of HOVs (See measures B4 and C1)
F2	Ramp Metering
F3	Auxiliary Lanes
F4	Signalization Improvements
F5	Computerized Traffic and Transit Control/Management on Arterials
F6	Turn Lanes at Intersections
F7	Turn Restrictions at intersections
F8	Reversible Lanes
F9	One-Way Streets
F10	Targeted Traffic Enforcement Programs
F11	Restrictions on Curb Side Deliveries and On-Street Parking

* BAAQMD has not updated the list since November 1992. Staff will work with the Air District to develop an expanded and appropriate list of actions based on the outcome of the countywide modal plans.

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Alameda CTC Committees and Administration

Committees

The Alameda CTC Board has three standing committees: the Finance and Administration Committee (FAC), the Programs and Projects Committee (PPC), and the Planning, Policy and Legislation Committee (PPLC). Alameda CTC is also advised by the Alameda County Technical Advisory Committee (ACTAC).

Finance and Administration Committee

The functions and authority of the FAC are agency operations and performance; human resources and personnel policies and procedures; administrative code; salary and benefits; procurement policies and procedures; procurement of administrative contracts; contract preference programs for entities such as local business enterprises, small business enterprises and disabled business enterprises; bid protests and complaints related to administrative contract procurement; annual budget and financial reports; investment policy and reports; audit reports, financial reporting, internal controls and risk management; and the annual work program.

Programs and Projects Committee

The functions and authority of the PPC are local, state, CMA Transportation Improvement Program, Transportation Fund for Clean Air, Vehicle Registration Fee (VRF) programs and Expenditure Plan programs and projects; local, state and federally funded projects and funding programs; the annual strategic plan for programs and projects; funding requests from project sponsors and other eligible recipients; paratransit services programs and projects; bicycle and pedestrian projects and programs; funding allocations to various transportation programs and projects; eminent domain proceedings; environmental evaluations; contract procurement; good faith efforts policies and procedures; and bid protests and complaints regarding engineering and construction contract procurement.

Planning, Policy, and Legislation Committee

The functions and authority of the PPLC are the CMP; Countywide Transportation Plan; federal, state, regional, and local transportation and land-use planning policies and studies; amendments to the 1986 Expenditure Plan or the 2000 Expenditure Plans; amendments to the VRF Expenditure Plan; transit-oriented development and priority development area projects and programs; the annual legislative program; state and federal legislative matters; general and targeted outreach programs; and advisory committee performance and effectiveness.

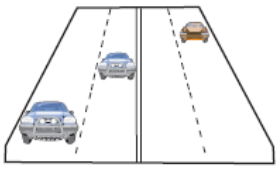
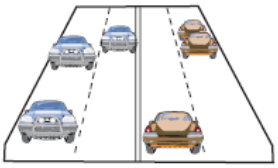
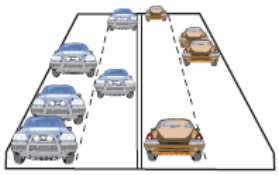
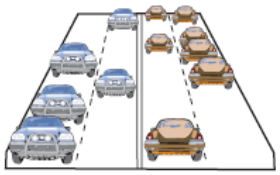
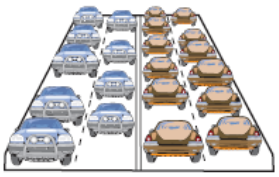
Technical Advisory Committee

ACTAC functions as the technical advisory committee to the Alameda CTC. ACTAC is comprised of one staff representative, preferably from a planning or public works department, from each of the following: Alameda CTC, each city, the county, BART, AC Transit, the Livermore Amador Valley Transit Agency, the Port of Oakland, the Metropolitan Transportation Commission, and Caltrans. Alameda CTC's executive director is the chairperson of ACTAC.

Administrative Costs

Alameda CTC's administrative costs regarding administration of the CMP-related activities are paid from levies on each city and the county in proportion to the fuel tax subventions under Proposition 111. The levies are based on the annual congestion management agency budget, which is adopted by April 1 of each year. MTC has entered into contracts with the Bay Area CMAs to assist in meeting the requirements of Moving Ahead for Progress in the 21st Century (MAP-21). These revenues have reduced the levy to the cities and county for support of congestion management activities. Alameda CTC will continue to advocate legislative measures that provide funding for these administrative costs so that fuel tax subventions to local government can be fully employed to address local transportation needs.

Levels of Service

Level of Service		Flow Conditions	Delay	Service Rating
A		Highest quality of service. Free traffic flow with low volumes. Little or no restriction on maneuverability or speed.	None	Good
B		Stable traffic flow, speed becoming slightly restricted. Low restriction on maneuverability.	None	Good
C		Stable traffic flow, but less freedom to select speed or to change lanes.	Minimal	Adequate
D		Approaching unstable flow. Speeds tolerable but subject to sudden and considerable variation. Less maneuverability and driver comfort.	Minimal	Adequate
E		Unstable traffic flow and rapidly fluctuating speeds and flow rates. Low maneuverability and low driver comfort.	Significant	Poor
F		Forced traffic flow. Speed and flow may drop to zero.	Considerable	Poor

Source: Highway Congestion Manual, 1985, Transportation Resource Board

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Appendix G1—Menu of TDM Measures, Alameda County TDM Program: City and Public Agency Measures

TDM Program	Description	Primary Agency Responsible	City Implementation mechanism	Recommended Application/Context	% Trip Reduction	Factors	Source
Trip Reduction Requirements							
Set trip reduction requirements for multifamily residential or commercial development	Require as a condition of approval for developments (either commercial, multifamily residential, or both) that certain TDM measures are implemented on an ongoing basis, or that specified vehicle trip reduction requirements are met.	Cities	Planning code or other municipal ordinance	Any urban area with good transit service; suburban downtowns, commercial and mixed use areas; transit stations. (particularly in high-growth areas)	5%-15%; Enables other strategies	Effects of this strategy depend on the location/accessibility of the development site(s), demographics of the project's residential/commercial occupants/ tenants and the type of measures required. The US EPA notes that "reasonable initial targets for the programs established under a trip reduction ordinance (TRO), might be a 5-10 percent reduction in single occupant vehicle (SOV) trips, with somewhat larger reductions (perhaps 15 percent) if substantial fees for parking are imposed."	http://www.epa.gov/otaq/stateresources/policy/transp/tcms/trip_reduction.pdf
Establish a Transportation Management Association	Establish an organization to assist businesses in reducing vehicle trips, either by administering programs, providing services (such as shuttle service), or providing technical assistance to businesses. Often implemented together with a trip reduction requirement.	Cities or business associations	Planning code or other municipal ordinance; or voluntary action by business association	Commercial area or other major business or employment districts	6%-7%	The TDM Resource Center (1996) estimated that just by improving coordination, and providing information on travel alternatives, establishment of a TMA can reduce commute-related vehicle trips by 6%-7%, with greater impact when implemented in concert with other trip reduction, TDM and parking management programs and services.	TDM Resource Center (1996), Transportation Demand Management; A Guide to Including TDM Strategies in Major Investment Studies and in Planning for Other Transportation Projects, Office of Urban Mobility, WSDOT (www.wsdot.wa.gov), as cited in the Victoria Transportation Policy Institute's TDM Encyclopedia (http://www.vtpi.org/tdm/tdm44.htm).
Implement an employee-trip reduction program for municipal employees.	Appoint an employee commute coordinator, and implement incentive programs to reduce single-occupant vehicle commuting among municipal employees. Elements may include: Subsidized transit passes; employee parking and/ or parking cash-out programs; commuter checks; Direct financial incentives to bike, walk, carpool or take transit; Ride sharing; Shuttles; Vanpools	Cities	Modify agency procedures	Any	4-20%	Management support and the presence of an on-site employee transportation corridor are important factors in the success of a program. Mandatory employee/ commute trip reduction (CTR) ordinances often require employers with more than 50 or 100 employees at a given employment site to implement a CTR program. This reduces the costs of administering TDM programs and compliance with survey and reporting requirements, but prevents such programs from reaching the majority of employees in a given city/region who work for small to mid-sized firms and organizations with less than 50 employees.	Marlon G. Boarnet, Hsin-Ping Hsu and Susan Handy (2010), Draft Policy Brief on the Impacts of Employer-Based Trip Reduction Based on a Review of the Empirical Literature, for Research on Impacts of Transportation and Land Use-Related Policies, California Air Resources Board http://arb.ca.gov/cc/sb375/policies/policies.htm); Philip Winters and Daniel Rudge (1995), Commute Alternatives Educational Outreach, National Urban Transit Institute, Center for Urban Transportation Research, University of South Florida; Tom Rye (2002), "Travel Plans: Do They Work?," Transport Policy, Vol. 9, No. 4 (www.elsevier.com/locate/tranpol), Oct. 2002, pp. 287-298.
Safety Net							
Guaranteed/ Emergency Ride Home program	Provide a guaranteed ride home for people who do not drive to work alone to ensure they are not stranded if they need to go home in the middle of the day due to an emergency, or stay late for work unexpectedly.	GRH in Alameda County is provided by Alameda CTC		Any	9%-38%	Coupled with active program marketing by employers, including marketing of other TDM programs and financial incentives, such as parking pricing, the Alameda County Guaranteed Ride Home program has been shown to reduce drive alone vehicle trips to participating employment sites by as much as 38% (Draft Alameda County Guaranteed Ride Home Program Evaluation (Nelson\Nygaard 2012).	Draft Alameda County Guaranteed Ride Home Program Evaluation (Nelson\Nygaard 2012)

Appendix G1—Menu of TDM Measures, Alameda County TDM Program: City and Public Agency Measures, Continued

TDM Program	Description	Primary Agency Responsible	City Implementation mechanism	Recommended Application/Context	% Trip Reduction	Factors	Source
Parking Management							
Demand-responsive pricing of on-street spaces	Set on-street parking prices based on parking demand in area to achieve parking availability targets.	Cities	Municipal code; capital project	Urban or suburban downtowns, commercial and mixed use areas; transit stations.	4%-18%	One of the most significant factors affecting motorists' choice of whether to drive or travel by another mode is the price of parking at the destination. Moreover, up to 28% of traffic in mixed-use districts is attributable to cruising for parking. By encouraging use of alternative modes and reducing parking search related delays for transit, demand responsive pricing can significantly reduce vehicle trips to major destinations/districts. The impact of parking pricing depends on the overall supply and availability of both on-street and off-street parking and the extent to which employers subsidize such parking.	Low-end estimate per Harvey and Deakin (1997), who estimated that parking pricing for work and non-work trips would reduce regional vehicle trips by 2.8% (Greig Harvey and Elizabeth Deakin (1997), "The STEP Analysis Package: Description and Application Examples," Appendix B, in Apogee Research, Guidance on the Use of Market Mechanisms to Reduce Transportation Emissions, US EPA (Washington DC; www.epa.gov/omswww/market.htm)). High end estimated based on the Victoria Transportation Policy Institute, Trip Reduction Tables (http://www.vtpi.org/tdm/tdm41.htm). Additional resource: http://www.spur.org/publications/library/report/critical_cooling/option27
Use of new meter technologies to allow multiple forms of payment and dynamic pricing	Install parking meters that allow payment by credit card or phone, and that connect to a central system in real-time, allowing for remote programming and management of parking prices.	Cities	Capital project	Urban or suburban downtowns, commercial and mixed use areas; transit stations.	Enables demand responsive parking pricing	Installation of new parking management technologies, including new meters and infrastructure to support payment by cell phone and real-time monitoring of parking space utilization and turnover enable implementation of demand responsive parking pricing, which in turn reduces vehicle travel (see Demand Responsive Parking Pricing).	San Francisco Planning and Urban Research (2009). "Critical Cooling," The Urbanist, Issue 482, May, 2009 (http://www.spur.org/publications/library/report/critical_cooling/option27
Use of parking revenue to support other mobility/ neighborhood programs	Dedicate meter revenue from designated area to uses such as mobility improvements, neighborhood or business improvement programs, potentially through the creation of a parking benefit district.	Cities	Form dedicated Transportation Management District to receive funds	Any area with paid parking	Enables investment in Multimodal Infrastructure and TDM Programs.	Creation of parking benefit district can directly support vehicle trip reduction by providing funding for investments in other multimodal access programs and services that increase opportunities for access by non-auto modes. The establishment of such districts and provisions requiring meter and permit revenues to be spent within the district can also indirectly support vehicle trip reduction by increasing local political support for demand responsive, market-based pricing of on-street and off-street parking.	
Require "Unbundling" of parking costs from rents and leases	Separate the charge for leasing or buying a unit or square footage in multifamily residential or commercial buildings from charges for parking spaces.	Cities	Modify planning code	Any	6%-16%	"Charging separately for parking is among the most effective strategies to encourage households to own fewer cars, and subsequently reduce vehicle trips. Parking costs are generally subsumed into the sale or rental price of housing and commercial real estate. For residential development, unbundled parking may prompt some residents to dispense with one of their cars and to make more of their trips by other modes. The elasticity of vehicle ownership with respect to price is typically -0.4 to -1.0. Assuming total annual vehicle spending of $7,788 (BLS Consumer Expenditure Survey, 2011), unbundling of an average of $100/month in parking costs would increase perceived transportation costs/vehicle by 15%/year for the typical hh, which in turn is expected to result in a decline in vehicle ownership of 6% (at a price elasticity of -0.4) to 16% (at -0.10), with corresponding declines in vehicle trips."	Victoria Transport Policy Institute (2009), Transportation Elasticities, http://www.vtpi.org/tdm/tdm11.htm; Bureau of Labor Statistics (2012), Consumer Expenditure Survey, 2011, www.bls.gov.

Appendix G1—Menu of TDM Measures, Alameda County TDM Program: City and Public Agency Measures, Continued

TDM Program	Description	Primary Agency Responsible	City Implementation mechanism	Recommended Application/ Context	% Trip Reduction	Factors	Source
Parking Management, Continued							
Reduced or eliminated minimum parking requirements	In areas that are well-served by transit and other alternatives to driving, allow developers to build residential and commercial buildings with fewer parking spaces or no parking.	Cities	Modify planning code	Any area with quality transit service	9%-16%	Eliminating or reducing off-street parking requirements allows a market based supply of parking, and eliminates the sometimes required over-supply of parking, which encourages property owners/managers to bundle parking in lease/sale agreements and provides an effective subsidy for vehicle travel. This policy reform does not directly influence vehicle travel demand associated with existing development, although elimination of minimum off-street parking requirements does remove a barrier to changes of use, and/or the lease or sale of underutilized private off-street parking constructed in accordance with previous requirements, supporting the development of market-based parking pricing that in turn reduces vehicle travel.	Range of vehicle trip reduction impact of eliminating minium parking requirements on Los Angeles' Westside, as incorporated in the vehicle trip reduction impact analysis conducted for the Los Angeles Westside Mobility Plan (http://www.westsidemobility-plan.com/transportation-demand-model/)
District-based parking management	Manage parking supply in a defined area as a unified whole in order to better manage parking demand between different facilities to eliminate cruising for parking and improve the customer experience.	Cities	Modify city agency procedures;	Urban or suburban downtowns, commercial and mixed use areas; transit stations.	Enables compact development	District-based parking management offers the same benefit as shared parking facilities at a wider scale. As with shared parking facilities, the coordinated provision and management of a shared, publicly accessible supply of on-street and off-street parking at a district-scale can reduce vehicle trips by facilitating dense/compact, clustered, and mixed-use development and by reducing expenditure of land and financial resources on off-street parking, thereby reducing an effective subsidy for auto access and mobility.	
Incentivize shared parking.	Facilitate the sharing of parking among multiple land uses that have complementary schedules (e.g., an office with greater demand during the day and restaurant with greater demand at night).	Enabled by cities, brokered by private businesses or developments	Modify planning code	Urban or suburban downtowns, commercial and mixed use areas.	Enables compact development	Shared parking facilities can reduce vehicle trips by reducing the need for construction of dedicated off-street parking facilities for each land use/activity commensurate with the peak parking demand for that use. By so doing, shared parking facilities can enable dense, clustered development that facilitates a greater share of trips by walking, cycling and public transit. Shared parking can also reduce the total amount of land and financial resources dedicated to parking facilities, in turn reducing the effective subsidy for access by automobile that such expenditures represent. However, if shared parking increases available parking supply and thereby reduces parking prices it may in some cases increase vehicle trips and VMT.	Shared Parking does not directly reduce vehicle travel if it substitutes for increased parking supply. To the degree that it increases the available supply of parking and reduces parking prices it can encourage automobile travel. To the degree that Shared Parking allows more Clustered Development it can encourage use of alternative modes.
Improved parking wayfinding signage	Install wayfinding signage to make parking easier to find. This can help to shift parking demand away from overfull spaces to underutilized areas and can help reduce local traffic impacts caused by searching for parking.	Cities	Capital project	Urban or suburban downtowns, commercial and mixed use areas; transit stations.	Not available.	Enhanced wayfinding, signage and provision of real-time information about parking supply and availability can reduce Vehicle Miles Traveled (VMT), and traffic congestion by reducing parking search time, but impacts on total vehicle trips are unclear.	
Urban Form and Land Use							
Compact, mixed use development and "park once" districts	Encourage development of districts that allow people to park just once if they drive to reach the district, and walk to destinations within the area once they are there.	Cities are responsible for zoning, land use planning, and development permissions	Amending general plans and zoning codes to plan for and facilitate compact, mixed-use development in appropriate areas. Support implementation of compact, mixed-use development by establishment of public development commissions and other mechanisms to support public investment.	Urban; suburban downtown; transit station	20%-40%	Recent literature indicates that compact development can reduce VMT per capita by 20%-40% compared to conventional "sprawl type" development characterized by low density and segregation of land uses and activities (vehicle trips are assumed to be reduced by a corresponding 20%-40%). Cumulative effects depend on the pace of new development in the County relative to the base of existing development (at a more rapid pace and extensive geographic scale, compact/mixed-use development/redevelopment can lead to greater reduction in vehicle trips.	Ewing, R. K. Bartholomew, S. Winkelman, J. Walters, and D. Chen (2008). Growing Cooler: The Evidence on Urban Development and Climate Change. Washington, DC: Urban Land Institute (ULI), p. 33.

Appendix G2—Menu of TDM Measures, Alameda County TDM Program: Public or Private Organization Measures

TDM Program	Description	Primary Agency Responsible	City Implementation mechanism	Recommended Application/Context	% Trip Reduction	Factors	Source
Multi-Modal Infrastructure							
Bicycle sharing services	Bicycles are available to members for short-term rental and can be returned at any bike share station. Bike share may be offered in city neighborhoods, near transit hubs, or at major employment centers.	Cities or private bicycle sharing companies (usually at invitation of a city)		Urban; suburban downtown; transit station	2% to 8%	The impact depends on the larger bike network and bicycling conditions. This research does not state if the shift from automobile trips to bicycle trips is for commute or non-commute trips, nor does the research state at what time of day these trips occur, i.e., peak or non peak trips.	Victoria Transport Policy Institute (2008), Public Bike Systems: Automated Bike Rentals for Short Utilitarian Trips, www.vtpi.org/tdm/tdm126.htm.
Enhanced transit service	Improve transit service to better serve potential riders and shift travel from driving trips.	Transit agencies, funded by cities, counties, TMAs, BIDs, regional agencies		Any	5% to 30%	Impacts depend on the level and quality of improvements. The elasticity of transit use with respect to transit service frequency is about 0.5, which means that a 1.0% increase in service (measured by transit vehicle mileage or operating hours) increases average ridership by 0.5%. Not all persons will be shifting from auto to transit so the relationship is not one to one.	Richard Pratt (2000) Traveler Response to Transportation System Changes, Interim Handbook, TCRP Web Document 12. http://onlinepubs.trb.org/Onlinepubs/tcrp/tcrp_webdoc_12.pdf.
High Occupancy Vehicle/Toll (HOV/HOT) lanes	Implement a system of express lanes for high-occupancy vehicles, transit, and/or people who pay a toll. This provides a time savings to people who commute by modes other than driving alone.	Highway districts, often led by counties or regional agencies		Freeways, any context	2% to 30%	Comsis (1993) and Turnbull, Levinson and Pratt (2006) find that HOV facilities can reduce vehicle trips on a particular roadway by 4-30%. Ewing (1993) estimates that HOV facilities can reduce peak-period vehicle trips on individual facilities by 2-10%, and up to 30% on very congested highways if HOV lanes are separated from general-purpose lanes by a barrier. (Turnbull, Levinson and Pratt, 2006) suggests that HOV highway lanes are most effective at reducing automobile use on congested highways to large employment centers in large urban areas with 25 or more buses per hour during peak periods, where transit provides time savings of at least 5 to 10 minutes per trip.	"Comsis Corporation (1993), Implementing Effective Travel Demand Management Measures: Inventory of Measures and Synthesis of Experience, USDOT and Institute of Transportation Engineers (www.ite.org); available atwww.bts.gov/ntl/DOCS/474.html. Katherine F. Turnbull, Herbert S. Levinson and Richard H. Pratt (2006), HOV Facilities – Traveler Response to Transportation System Changes, TCRB Report 95, Transportation Research Board (www.trb.org); available at http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_rpt_95c2.pdf."
Financial Incentives							
Transit "fare free" zones	Transit agency provides free rides in designated zone.	Transit agencies, can be initiated/funded by cities, transportation management associations (TMAs), Business Districts	Can be implemented directly by transit agency, or another organization can form a funding partnership with the transit agency	Urban or suburban downtowns	Not available	Impact of transit fare-free zones is highly context specific. Some cities have seen very large increases in transit ridership within free-fare zones.	http://www.theatlanticcities.com/jobs-and-economy/2012/10/what-really-happens-when-city-makes-its-transit-system-free/3708/

Travel Demand Management Checklist

The Travel Demand Management (TDM) Element included in Alameda County Congestion Management Program requires each jurisdiction to comply with the Required Program. This requirement can be satisfied in three ways:

- Adopting "Design Strategies for encouraging alternatives to using auto through local development review" prepared by ABAG and the Bay Area Quality Management District;
- Adoption of new design guidelines that meet the individual needs of the local jurisdictions and the intent of the goals of the TDM Element; or
- Providing evidence that existing local policies and programs meet the intent of the goals of the TDM Element.

For those jurisdictions that have chosen to satisfy this requirement by Option 2 or 3 above, the following checklist has been prepared. In order to insure consistency and equity throughout the County, this checklist identifies the components of a design strategy that should be included in a local program to meet the minimum CMP conformity requirements. The required components are highlighted in bold type and are shown at the beginning of each section. A jurisdiction must answer Yes to each of the required components to be considered consistent with the CMP. Each jurisdiction will be asked to annually certify that it is complying with the TDM Element. Local jurisdictions will not be asked to submit the back-up information to the CMA justifying its response; however it should be available at the request of the public or neighboring jurisdictions.

Questions regarding optional program components are also included. You are encouraged but not required to answer these questions.

(Note: Bold type face indicates those components that must be included the "Required Program" in order to be found in compliance with the Congestion Management Program.)

Bicycle Facilities

Goal

To develop and implement design strategies that foster the development of a countywide bicycle program that incorporates a wide range of bicycle facilities to reduce vehicle trips and promote bicycle use for commuting, shopping and school activities. (Note: examples of facilities are bike paths, lanes or racks.)

Local Responsibilities

1a. In order to achieve the above goal, does your jurisdiction have design strategies or adopted policies that include the following:

1a.1 provides a system of bicycle facilities that connect residential and/or non-residential development to other major activity centers?
Yes No

1a.2 bicycle facilities that provide access to transit?
Yes No

1a.3 that provide for construction of bicycle facilities needed to fill gaps, (i.e., gap closure), not provided through the development review process?
Yes No

1a.4 that consider bicycle safety such as safe crossing of busy arterials or along bike trails?
Yes No

1a.5 that provide for bicycle storage and bicycle parking for (A) multi-family residential and/or (B) non-residential developments?
Yes No

1b. How does your jurisdiction implement these strategies? Please identify.

- Zoning ordinance
- Design Review
  - Standard Conditions of Approval
  - Capital Improvement Program
- Specific Plan
  - Other

Pedestrian Facilities

Goal

To develop and implement design strategies that reduce vehicle trips and foster walking for commuting, shopping and school activities.

Local Responsibilities

2a. In order to achieve the above goal, does your jurisdiction have design strategies or adopted policies that incorporate the following:

2a.1 provide reasonably direct, convenient, accessible and safe pedestrian connections to major activity centers, transit stops or hubs parks/open space and other pedestrian facilities?
Yes No

2a.2 provide for construction of pedestrian paths needed to fill gaps, (i.e., gap closure), not provided through the development process?
Yes No

2a.3 include safety elements such as convenient crossing at arterials?
Yes No

2a.4 provide for amenities such as lighting, street trees, trash receptacles that promote walking?
Yes No

2a.5 that encourage uses on the first floor that are pedestrian oriented, entrances that are conveniently accessible from the sidewalk or transit stops or other strategies that promote pedestrian activities in commercial areas?
Yes No

2b. How does your jurisdiction implement these strategies? Please identify.

- Zoning ordinance
- Design Review
  - Standard Conditions of Approval
  - Capital Improvement Program
- Specific Plan
  - Other

Transit

Goal

To develop and implement design strategies in cooperation with the appropriate transit agencies that reduce vehicle trips and foster the use of transit for commuting, shopping and school activities.

Local Responsibilities

3a. In order to achieve the above goal, does your jurisdiction have design strategies or adopted policies that include the following:

3a.1 provide for the location of transit stops that minimize access time, facilitate intermodal transfers, and promote reasonably direct, accessible, convenient and safe connections to residential uses and major activity centers?
Yes No

3a.2 provide for transit stops that have shelters or benches, trash receptacles, street trees or other street furniture that promote transit use?
Yes No

3a.3 include a process for including transit operators in development review?
Yes No

3a.4 provide for directional signage for transit stations and/or stops?
Yes No

3a.5 include specifications for pavement width, bus pads or pavement structure, length of bus stops, and turning radii that accommodates bus transit?
Yes No

3.b How does your jurisdiction implement these strategies? Please identify.

- Zoning ordinance
- Design Review
  - Standard Conditions of Approval
  - Capital Improvement Program
- Specific Plan
  - Other

Carpools and Vanpools

Goal

To develop and implement design strategies that reduce the overall number of vehicle trips and foster carpool and vanpool use.

Local Responsibilities

4a. In order to achieve the above goal, does your jurisdiction have design strategies or adopted policies that include the following:

4a.1 For publicly owned parking garages or lots, are there preferential parking spaces and/or charges for carpools or vanpools?

Yes No

4a.2 that provide for convenient or preferential parking for carpools and vanpools in non¬residential developments?

Yes No

4.b How does your jurisdiction implement these strategies? Please identify.

- Zoning ordinance
- Design Review
  - Standard Conditions of Approval
  - Capital Improvement Program
- Specific Plan
  - Other

Park and Ride

Goal

To develop design strategies that reduce the overall number of vehicle trips and provide park and ride lots at strategic locations.

Local Responsibilities

5a. In order to achieve the above goal, does your jurisdiction have design strategies or adopted policies that include the following:

5a.1 promote park and ride lots that are located near freeways or major transit hubs?

Yes No

5a.2 a process that provides input to Caltrans to insure HOV by-pass at metered freeway ramps?

Yes No

5b. How does your jurisdiction implement these strategies? Please identify.

- Zoning ordinance
- Design Review
  - Standard Conditions of Approval
  - Capital Improvement Program
- Specific Plan
  - Other

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Federal and State Transportation Control Measures

The following lists include adopted federal and state transportation control measures (TCMs) for the San Francisco Bay Area. Detail on federal TCMs can be found in the Transportation Improvement Program (MTC) and the state TCMs in the 2010 Clean Air Plan (BAAQMD).

Table I1—Federal TCMs in the 2001 Federal Bay Area Ozone: Attainment Plan (State Implementation Plan)

TCM	Description
Original TCMs from 1982 Bay Area Air Quality Plan	
TCM 1	Reaffirm Commitment to 28 percent Transit Ridership Increase Between 1978 and 1983
TCM 2	Support Post-1983 Improvements in the Operators' Five-Year Plans and, After Consultation with the Operators, Adopt Ridership Increase Target for the Period 1983 through 1987
TCM 3	Seek to Expand and Improve Public Transit Beyond Committed Levels
TCM 4	Continue to support development of HOV Lanes and Ramp Metering
TCM 5	Support RIDES Efforts
TCM 6*	Continue Efforts to Obtain Funding to Support Long Range Transit Improvements
TCM 7	Preferential Parking
TCM 8	Shared Use Park and Ride Lots
TCM 9	Expand Commute Alternatives Program
TCM 10	Information Program for Local Governments
TCM 11**	Gasoline Conservation Awareness Program (GasCAP)
TCM 12**	Santa Clara County Commuter Transportation Program
Contingency Plan TCMs Adopted by MTC in February 1990 (MTC Resolution 2131)	
TCM 13	Increase Bridge Tolls to $1.00 on All Bridges
TCM 14	Bay Bridge Surcharge of $1.00
TCM 15	Increase State Gas Tax by 9 Cents
TCM 16*	Implement MTC Resolution 1876, Revised — New Rail Starts – BART Extension to Colma only
TCM 17	Continue October 1989 Post-Earthquake Transit Services
TCM 18	Sacramento-Bay Area Amtrak Service
TCM 19	Upgrade Caltrain Service
TCM 20	Regional HOV System Plan

Table I1, Continued—Federal TCMs in the 2001 Federal Bay Area Ozone: Attainment Plan (State Implementation Plan)

TCM	Description
Contingency Plan TCMs Adopted by MTC in February 1990 (MTC Resolution 2131), Continued	
TCM 21	Regional Transit Coordination
TCM 22	Expand Regional Transit Connection Ticket Distribution
TCM 23	Employer Audits
TCM 24	Expand Signal Timing Program to New Cities
TCM 25	Maintain Existing Signal Timing Programs
TCM 26	Incident Management on Bay Area Freeways
TCM 27	Update MTC Guidance on Development of Local TSM Programs
TCM 28	Local Transportation Systems Management (TSM) Initiatives
New TCMs in 2001 Ozone Attainment Plan	
TCM A	Regional Express Buss Program
TCM B	Bicycle/Pedestrian Program
TCM C	Transportation for Livable Communities
TCM D	Expansion of Freeway Service Patrol
TCM E	Transit Access to Airports

* Deleted by EPA action from ozone plan.
** Deleted by EPA action from ozone plan, but retained in Carbon Monoxide Maintenance Plan.

Source: Metropolitan Transportation Commission, 2009.

Table I2—State TCMs in the 2010 Clean Air Plan

TCM	Description
TCM A1	Local and Area-wide Bus Service Improvements
TCM A2	Local and Regional Rail Service Improvements
TCM B1	Freeway and Arterial Operations Strategies...
TCM B2	Transit Efficiency and Use Strategies
TCM B3	Bay Area Express Lane Network....
TCM B4	Goods Movement Improvements and Emission Reduction Strategies
TCM C1	Voluntary Employer-Based Trip Reduction Programs
TCM C2	Safe Routes to Schools and Safe Routes to Transit Programs
TCM C3	Ridesharing Services and Incentives
TCM C4	Conduct Public Outreach & Education
TCM C5	Smart Driving
TCM D1	Bicycle Access and Facilities Improvements
TCM D2	Pedestrian Access and Facilities Improvements
TCM D3	Local Land Use Strategies
TCM E1	Value Pricing Strategies
TCM E2	Promote Parking Policies to Reduce Motor Vehicle Travel
TCM E3	Implement Transportation Pricing Reform

Source: BAAQMD, 2010 Clean Air Plan

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Subarea Travel Demand Model Guidelines

General Policy Statement

The Alameda CTC maintains a Countywide Travel Demand Model (Countywide Model) which is in conformance with MTC's Regional Travel Demand Model and land use database and can therefore be used to satisfy Congestion Management Program (CMP) requirements in Alameda County.
The Master Transportation Demand Model Agreements made between the Alameda County Congestion Management Agency and local jurisdictions detail the process through which local jurisdictions can have access to the Countywide Model and use its results for CMP conformance purposes.

An alternative to use of the Countywide Model which local jurisdictions or groups of local jurisdictions may wish to pursue is the development of subarea travel demand models (subarea models) for the purpose of satisfying CMP requirements. Subarea models may be more effective than the Countywide Model for the evaluation of certain local conditions or CMP applications.

Local jurisdictions may use a subarea model for CMP purposes so long as the subarea model demonstrates consistency with the Countywide Model. Results from subarea models which are not consistent with the Countywide Model will not be accepted by the Alameda CTC for CMP purposes.

Consistency Guidelines

A two-step process has been established to determine consistency of a subarea model with the Countywide Model. The two-step process includes an initial evaluation of subarea model compatibility by the Alameda CTC (step one) and, if required, additional data and information to be submitted to the Alameda CTC to verify consistency (step two).

Step One:

A. Local jurisdictions apply to the Alameda CTC for a consistency finding. The application shall consist of the following:

   i. A written communication to the Alameda CTC requesting a model consistency finding.

   ii. A completed model consistency checklist.

B. In the case of new/proposed subarea models, Alameda CTC staff must be part of the Local Technical Advisory/Oversight Committee/Taskforce for model development.

Step Two:

C. If additional information is required to determine consistency, Alameda CTC staff will review modeling procedures and land use database issues with local modeling staff.

Acceptable CMP Related Uses of a Consistent Subarea Model

A subarea model that has been found to be consistent with the Countywide Model may be used for the following CMP related uses:

1. Forecasting of operating conditions on roadway segments.

2. Development impact analysis performed for the CMP Land Use Analysis Program.

3. Testing of mitigation measures or deficiency plan recommendations to address degradation of Level of Service (LOS) on CMP roadway segments operating below LOS E.

Annual Recertification

Annual recertification of subarea models is required by the Alameda CTC. Recertification requires a written request. The request must clearly explain why the subarea model should be recertified on the basis of one of the following two conditions:

1. All changes to the model specifications of the land use database (1) were reported to the Alameda CTC previously or (2) are changes done in coordination with the land use database update process of the Countywide Model.

   OR

2. Recertification request must include a completed consistency checklist.

Development and Operation of Subarea Models

It is assumed that subarea models will be developed by local jurisdictions who will have responsibility for their operation, maintenance, and the costs associated with them. As a condition for delegation of Alameda CTC modeling responsibilities, it is assumed that local jurisdictions will commit to providing adequate ongoing technical support for all model applications in support of a CMP requirement (e.g. land use analysis or deficiency analysis). It is assumed that consultant assistance would normally be required for model development and maintenance.

Dispute Resolution

Disputes regarding consistency or appropriate use of a subarea model shall be brought to the Alameda County Technical Advisory Committee.

Alameda CTC Checklist for Modeling Consistency for Local Jurisdictions

This checklist guides local jurisdictions wishing to develop a subarea model through their model development and consistency review process by providing an inventory of specific products to be developed and submitted to the Alameda CTC, and by describing standard practices and assumptions.

A. General approach:

Discuss the general approach to travel demand modeling by the local jurisdiction and the subarea model's relationship to the Alameda Countywide Travel Demand Model.

PRODUCT:

1) Description of the subarea model's general approach.

B. Demographic/economic/land use forecasts:

Both base and forecast year demographic/economic/land use ("land use") inputs must be consistent—though not identical—to the census tract-level data provided to the Alameda CTC by ABAG. Specifically, if local jurisdictions wish to reallocate land use within their own jurisdiction, they must consult with the Alameda CTC. Further, the resulting deviation in the subject jurisdiction (or jurisdictions) should be no greater than plus or minus one percent from the jurisdiction-level totals in the Alameda CTC land use database for the following variables: population, households, jobs, and employed residents.

Outside the subject jurisdiction (or jurisdictions) and within Alameda County, the land use variables in the travel analysis zones used by the jurisdiction's model must match the Alameda CTC model or another adopted subarea model (e.g. the City of Hayward could adopt the land use from within the City of Dublin if the City of Dublin's model for use in the TAZs within the City of Dublin had an approved subarea model).

Outside of Alameda County, the land use variables in the travel analysis zones used by the jurisdiction's model must match the Alameda CTC model exactly.

PRODUCTS:

2) A statement establishing that the differences between key Alameda CTC land use variables and those of the sub area model do not differ by more than one percent at the jurisdiction level for the subject jurisdiction. A statement establishing that no differences exist at the census-tract-level outside the jurisdiction between the Alameda CTC forecast or the forecast contained within an adopted subarea model.

3) A table comparing the Alameda CTC land use estimates with the subarea model land use estimates by jurisdiction for population, households, jobs, and employed residents for both the base year and the horizon year.

4) If land use estimates within the jurisdiction are modified from the Alameda CTC model's projections, agendas, discussion summaries, and action items from each meeting held with the Alameda CTC at which the redistribution was discussed, as well as before/after census-tract-level data summaries and maps.

C. Pricing assumptions:

Use Alameda CTC's automobile operating costs, transit fares, and bridge tolls or provide an explanation for the reason such values are not used.

PRODUCT:

5) Table comparing the assumed automobile operating cost, key transit fares, and bridge tolls to Alameda CTC's values for the horizon year.

D. Network Assumptions:

Use Alameda CTC's regional highway and transit network assumptions for the other Bay Area counties and other jurisdictions within Alameda County. Local jurisdictions should include more detailed network definition relevant to their own jurisdiction in addition to the regional highway and transit networks. For the CMP horizon year, to be compared with the TIP interim year, regionally significant network changes in the base case scenario shall be limited to the current Transportation Improvement Program (TIP) for projects subject to inclusion in the TIP.

PRODUCT:

6) Statement establishing satisfaction of the above.

E. Automobile ownership:

Use Alameda Countywide Travel Demand Model automobile ownership models or forecasts or submit alternative models to Alameda CTC for review and comment.

PRODUCT:

7) Planning Area-level table comparing estimates of households by automobile ownership level (zero, one, two or more automobiles) to Alameda CTC's estimates for the horizon year.

F. Trip generation:

Use Alameda Countywide Travel Demand Model trip generation models or submit alternative models to Alameda CTC for review and comment.

PRODUCT:

8) County-level tables comparing estimates of trip and/or tour frequency by purpose to MTC's estimates for the horizon year.

G. Trip distribution:

Use Alameda Countywide Travel Demand Model trip distribution models or submit alternative models to Alameda CTC for review and comment.

PRODUCTS:

9) County-level tables comparing estimates of average trip distance by tour/trip purpose to Alameda CTC's estimates for the horizon year.

10) Planning area-to-planning area comparison of journey-to-work or home-based work flow estimates to MTC's estimates for the horizon year.

H. Travel mode choice:

Use Alameda Countywide Travel Demand Model mode choice models or submit alternative models to Alameda CTC for review and comment.

PRODUCT:

11) County-level tables comparing travel mode share estimates by tour/trip purpose to Alameda CTC's estimates for the horizon year.

I. Traffic assignment:

Use Alameda Countywide Travel Demand Model models, or submit alternative models to Alameda CTC for review and comment.

PRODUCTS:

12) County-level, time-period-specific comparison of vehicle miles traveled and vehicle hours traveled estimates by facility type to Alameda CTC's estimates for the horizon year.

13) County-level, time-period-specific comparison of estimated average speed on freeways and all other facilities, separately, to Alameda CTC's estimates for the horizon year.

Assessment of Alternative Trip Generation Methodologies

As part of the 2013 CMP update, Alameda CTC staff reviewed seven alternative trip generation methodologies for applicability in the CMP Land Use Analysis Program. Considerations include:

- Inputs considered—what different variables does the methodology consider when estimating trip generation (e.g. land use factors, multimodal accessibility, TDM measures), and how readily available are data needed for these variables?
- Sample size and representativeness—how robust and California specific/Alameda County specific is the sample that the rates are estimated based on?
- Outputs—does the methodology simply produce a reduction of auto trips, or does it tell what modes non-auto trips utilize? Does the methodology work for peak hours or just daily rates?
- Validation—has the methodology been demonstrated to produce reasonable estimates of trip generation for development projects such as PDA or infill type developments and/or has the methodology been demonstrated to outperform ITE rates?

Table K1, which follows, below contains a detailed summary of how the methodologies reviewed perform in the above areas. To summarize:

- *ITE internal trip capture methodology* is based on a very limited sample size (none of which is in California). Furthermore, the methodology only accounts for land use mixing, excluding other critical factors like transit access, density, etc.
- *EPA's Trip Generation Tool for Mixed Use Development (MXD model)* is based on a robust sample size and applies elasticities from the peer-reviewed literature on transportation-land use connections. The tool is well-validated, considers many factors including density, land use mixing, distance to transit, and is implemented in an easily usable spreadsheet tool.
- *CARB's Urban Emissions (URBEMIS)* tool considers many different factors that impact urban trip generation rates and has withstood legal challenges in California; however, the tool does not provide peak hour specific estimates so it would not work for typical impact analysis.
- *The NCHRP 8-51 method* is an enhanced version of the ITE internal trip capture methodology. The sample size is still relatively limited and many required inputs may not be readily available as part of a typical impact analysis.
- *MTC's Station Area Residents Study (STARS) analysis (mode split based adjustment method)* is described in Table K1. This method is the most Bay Area and Alameda County specific. STARS looks at how mode share differs based on density and transit access, and this analysis implicitly accounts for land use mixing, parking pricing, etc. as these tend to be near more dense, transit accessible areas. The mode share estimates from STARS can be easily adapted for trip generation adjustment. An analyst would merely need to look-up and multiply by a trip generation rate percentage reduction factor.
- *Caltrans/UC Davis' Smart Growth Trip Generation Rates Study* produced ITE rate adjustment factors based on a fairly robust sample size that is very California specific. The rates are based on density, land use mixing, regional location, transit service, and parking, and the study included a validation component. The methodology is implemented in an easily usable tool that points to publically available data sources.
- *Caltrans Division of Transportation Planning and Research's Trip Generation Rates for Urban Infill Land Uses Study* produced alternative ITE rates for use in urban, infill settings. However, the rates have not yet been validated.

Of the methodologies reviewed, the following three are recommended for use in CMP Land Use Analysis

Program transportation impact analyses if project sponsors find them applicable:

- EPA's MXD model
- Caltrans/UC Davis Smart Growth Trip Generation Adjustment Method
- MTC's Station Area Residents (STARS) mode split adjustment method

See Table K1, which follows, for a detailed summary of alternative trip generation methodologies for priority development areas (PDAs) and infill development areas.

Table K1—Detailed Summary of Alternative Trip Generation Methodologies for PDAs and Infill Development Areas

	Methodology	Developed By	How it works	Inputs Considered	Sample Size & Representative-ness	Outputs	Validation
1	ITE Internal Trip Capture Methodology	ITE	• Provides percentage reductions to be applied to ITE rates	• Land use mixing	• Three case studies all in Florida	• Internal trip capture during PM peak hour	• Outperforms ITE but still tends to overestimate trips
2	MXD Model	EPA	• Reductions to ITE rates based on elasticities from literature • Spreadsheet tool • Required data relatively easily gathered	• Density • Land use mixing • Design • Distance to transit • Destination accessibility	• National sample of 239 multi-use developments in six metro areas	• Internal trip capture • External trip mode split • AM peak, PM peak, and Daily periods	• Outperforms ITE rates[2] • Validated at 40 sites, mostly in California
3	URBEMIS (URBan EMISsions) Model	CARB	• Reductions to ITE rates • Downloadable software • Must reference documentation to see calculations	• Density • Land use mixing • Transit • Street connectivity • Bike/ped facilities • TDM measures	• Reductions based on SANDAG trip generator data	• Internal trip capture • No peak hour trip estimates	• Outperforms ITE rates2 • Has withstood several legal challenges[2]
4	NCHRP 8-51 Method	NCHRP/ TxDOT	• Enhanced version of ITE Internal Trip Capture Methodology	• Requires mode split and vehicle occupancy as inputs • Distance between uses	• Based on data collected at six sites	• Internal trip capture • External trip mode split • AM and PM peak periods	• Outperforms ITE rates[2] • Validated at two sites in Texas and one site in Georgia

Table K1 Continued—Detailed Summary of Alternative Trip Generation Methodologies for PDAs and Infill Development Areas

	Methodology	Developed By	How it works	Inputs Considered	Sample Size & Representative-ness	Outputs	Validation
5	MTC Transit Station Area Residents Survey (STARS)	MTC	• Lookup table of mode split for given land use characteristics	• Density • Transit access	• Based on analysis of Bay Area Travel Survey 2000 at county-level	• Trips by mode for different locations and purposes	• Outperforms ITE rates[2]
6	California Smart-Growth Trip Generation Rates Study	Caltrans/UC Davis	• Reductions to ITE rates for common ITE categories • Clear criteria for when appropriate to use • Required data easily gathered from public sources • Spreadsheet tool	• Density • Regional location • Building setbacks • Transit service • Parking	• Estimated based on 50 "smart growth" sites in California	• Reduction to ITE rate • Adjustment can be applied to AM peak, PM peak, and Daily rates	• Validated on 11 (AM) and 13 (PM) mixed use sites in California
7	Trip-Generation Rates for Urban InfillLand Uses in California	Caltrans Divisions of Transportation Planning and Research & Innovation	• Alternative ITE rates for 10 common ITE categories • Clear criteria for when rates could be applied	• Rates based on single dependent variable, similar to ITE	• Intercept surveys of 26 urban infill sites	• Trips by mode • No way to estimate internal/external	• Data collection methodology reviewed by Technical Advisory Committee • No validation

CMP Transportation Impact Analysis Technical Guidelines

Project Trip Generation Methodologies

The ITE trip generation handbook should be used to determine project trip generation.

Projects near transit or in infill development areas may apply one of the following methodologies to adjust project vehicle trip generation to reflect project context. Other alternative trip generation methodologies will be considered on a case-by-case basis.

EPA's Trip Generation Tool for Mixed Use Development (MXD model):

A description of this method can be found online at:

http://www.epa.gov/smartgrowth/mxd_tripgeneration.html

Caltrans/UC Davis Smart Growth Trip Generation Adjustment Method

A description of this method can be found online at:

http://ultrans.its.ucdavis.edu/projects/smart-growth-trip-generation

MTC's Station Area Residents (STARS) Mode Split Based Adjustment Method

This method uses household travel survey data to determine how mode share varies by land use characteristics and then use this information to reduce ITE trip generation rates. The key assumption is that ITE rates produce a reasonably accurate estimate of person-trips, but that in a more dense, transit accessible setting, many of these person-trips may use modes other than driving, so the vehicle-trip rate will be lower.

In the Bay Area, MTC conducted extensive analysis of the 2000 Bay Area Travel Survey (BATS 2000), the most recent household travel survey, as part of its Station Area Residents Study (STARS). This analysis looked at how mode shares differ as a function of proximity to transit and land use density. The findings of this study are well-suited to producing urban trip generation rate estimates.

Table L1 below reproduces a table from the STARS analysis. This table illustrates how the mode shares of residents living in Alameda County differ based on the location of their residence. For instance, the driving mode share of residents living within a half-mile of transit is only 48.2 percent, while for residents living more than a mile from transit, in a lower density area, this share is 87.0 percent.

This information can be used to adjust ITE trip generation rates. For instance, for a development located more than a mile from transit in a high-suburban density area, an adjusted ITE rate could be computed as:

Adjusted Rate = ITE Rate X 0.82

Note that the STARS analysis examined mode share for specific trip purposes (e.g., school trips, shopping trips, social/recreation trips) and depending on the type of development project, an analyst may wish to use this information instead of the mode share for all trips to adjust ITE rates.

Types of Impacts and Impact Assessment Methodologies

Autos

Projects should consider auto impacts on MTS roadway segments including:

- **Vehicle delay:** the analysis should assess impacts to vehicle delay on MTS roadway segments. The Highway Capacity Manual 2010 (HCM 2010) freeway and urban streets methodologies are the preferred methodologies to study vehicle delay impacts. However, project sponsors may use the HCM 2000 if conformance with local requirements is required.
- **Consistency with adopted plans:** the analysis should disclose whether the project is consistent with plans including future Alameda Countywide Arterial Corridors Plan, and should consider opportunities to implement the plan in the project vicinity.

Table L1—BATS2000 Mode Shares by Trip Purpose and Proximity to Rail and Ferries—Alameda County Residents (MTC STARS study Table K-9)

Travel Characteristic	Proximity of Household to Rail Stations and Ferry Terminals						Total
	Within 1/2 mile	1/2 mile to 1 mile	Greater than 1 mile				
			Urban*	High-Sub**	Low-Sub ‡	Rural †	
Home-Based Work							
In-Vehicle Person	56.3%	69.4%	78.0%	86.3%	82.7%	94.5%	78.5%
Vehicle Driver	46.6%	57.6%	68.9%	77.0%	77.3%	84.2%	69.5%
Vehicle Passenger	9.7%	11.8%	9.1%	9.3%	5.4%	10.3%	9.1%
Total Transit	26.5%	18.3%	17.1%	10.0%	13.5%	3.8%	15.0%
Rail and Ferry	23.7%	12.7%	11.1%	6.7%	11.4%	3.8%	10.9%
Bus	2.8%	5.6%	6.0%	3.3%	2.2%	0.0%	4.2%
Bicycle	7.3%	5.2%	1.1%	1.1%	1.0%	1.1%	2.2%
Walk	8.1%	5.2%	2.8%	2.4%	2.4%	0.6%	3.3%
Other	1.8%	1.9%	1.0%	0.2%	0.4%	0.0%	0.9%
Non-Work Trips							
In-Vehicle Person	46.7%	65.5%	77.1%	80.8%	85.0%	85.1%	75.6%
Vehicle Driver	33.0%	40.5%	47.8%	51.5%	55.6%	55.2%	48.2%
Vehicle Passenger	13.7%	25.0%	29.3%	29.3%	29.5%	29.8%	27.4%
Total Transit	25.6%	7.1%	5.7%	3.7%	2.4%	0.4%	6.2%
Rail and Ferry	5.3%	3.8%	1.6%	1.5%	1.2%	0.3%	2.1%
Bus	20.3%	3.3%	4.1%	2.2%	1.2%	0.2%	4.1%
Bicycle	2.6%	4.5%	2.4%	1.1%	1.0%	0.8%	2.1%
Walk	21.7%	21.1%	13.6%	13.0%	10.3%	12.8%	14.6%
Other	3.4%	1.8%	1.2%	1.4%	1.3%	0.9%	1.5%
Total Trips							
In-Vehicle Person	48.2%	66.5%	77.3%	82.0%	84.6%	87.0%	76.2%
Vehicle Driver	35.2%	44.9%	52.6%	57.0%	60.1%	61.0%	52.8%
Vehicle Passenger	13.0%	21.6%	24.8%	25.0%	24.4%	25.9%	23.4%
Total Transit	25.7%	10.0%	8.3%	5.1%	4.7%	1.1%	8.1%
Rail and Ferry	8.2%	6.1%	3.7%	2.7%	3.3%	1.0%	4.0%
Bus	17.5%	3.9%	4.5%	2.4%	1.4%	0.1%	4.1%
Bicycle	3.3%	4.7%	2.1%	1.1%	1.0%	0.9%	2.1%
Walk	19.5%	17.0%	11.2%	10.7%	8.7%	10.4%	12.2%
Other	3.2%	1.8%	1.2%	1.2%	1.1%	0.7%	1.4%

* Urban: 10,000 or more persons/mi² (e.g., San Francisco, Berkeley, Oakland)
** High-Suburban: 6,000 to 9,999 persons/mi² (e.g., Palo Alto, Vallejo, Richmond, San Leandro)
‡ Low-Suburban: 500 to 5,999 persons/mi² (e.g., Lafayette, Walnut Creek, Sausalito)
† Rural: Less than 500 persons/mi² (e.g., Oakland Hills, Point Reyes Station, Guerneville)

Source: http://www.mtc.ca.gov/planning/smart_growth/stars/Appendix_K_Alameda_County_Residents_Walkable_Buffer.pdf, Page K-7

Transit

Projects should consider impacts to MTS transit operators and riders, including:

- **Effects of vehicle traffic on mixed flow transit operations:** the analysis should evaluate if vehicle trips generated by the project will cause congestion that degrades transit vehicle operations. Analysis may be qualitative and may be based on auto traffic circulation analysis, but should consider that transit vehicles may have unique considerations compared to autos (e.g., pulling into and out of stops, longer gaps needed for left turns). For instance, the analysis may use information about delay on a key segment or intersection with transit service to determine that impacts to transit operations will exist. It should not be assumed that transit operational impacts will not exist if a roadway operates at better than automobile LOS F. Furthermore, the mitigations required to address transit operations impacts may not be the same as those to address vehicle delay.

- **Transit capacity:** the analysis should evaluate if transit trips generated by the project will cause ridership to exceed existing transit capacity. Both vehicle and station circulation should be considered, as appropriate. Transit operators should be consulted to see if any routes or stations in the project area require capacity analysis. If a project will cause transit capacity impacts such that additional service will be required, funding for transit operations cannot be assumed and appropriate mitigations considered. If such analysis is required, it should consider volume to capacity ratios. The Alameda CTC can assist in providing ridership data by line or route if needed.

- **Transit access/egress:** the analysis should assess whether pedestrian connections between the project site and transit stops are adequate to support any project trip generation assumed to be served by transit. The site plan should provide good access between buildings and from buildings to transit stops and stations. Sidewalks should be provided on both sides of all streets to provide access to bus stops. Sidewalks and curb cuts at intersections should be designed for ADA accessibility. Designs should avoid requiring pedestrians to walk through parking lots to access transit service. The assessment should include consideration of the safety of crossing opportunities, as needed. Qualitative analysis is sufficient to assess this impact type.

- **Future transit service:** developments in areas without current transit service should seek to avoid designs which preclude future transit service. Trip generation estimates should assess the potential for new transit service, and if warranted by demand, the environmental review should address a funding mechanism to support service. Transit operators should be consulted to ensure that project design and surrounding roadway networks can accommodate transit vehicles (e.g., grades, turning radii, lane widths are appropriate). Where a project proposes private shuttle services, a cost analysis of providing this service versus subsidizing existing transit service should be included. Qualitative analysis is sufficient to assess this impact type.

- **Consistency with adopted plans:** the analysis should disclose whether the project is consistent with plans including transit operators Short Range Transit Plan and Long Range Transit Plan and the future Alameda Countywide Transit Plan, and should consider opportunities to implement the plan in the project vicinity.

- **Circulation Element:** for projects involving major update to a General Plan Circulation Element, local jurisdictions are encouraged to develop and maintain a transit component of their Circulation Element.

Bicycles

Projects should consider impacts including:

- **Effects of vehicle traffic on bicyclist conditions:** the analysis should evaluate if vehicle trips generated by the project will present barriers to bicyclists safely crossing roadways or executing turning movements

as well as whether project traffic volumes necessitate greater separation between bicyclists and vehicles. This analysis may be qualitative and may be based on auto traffic circulation analysis.

- **Site development and roadway improvements:** the analysis should evaluate if the project or its mitigations will reduce or sever existing bicycle access or circulation in the area as well as whether the project could produce conflicting movements between bicyclists and vehicle turning into and out of project driveways. Qualitative analysis is sufficient to assess this impact type.
- **Consistency with adopted plans:** the analysis should disclose whether the project is consistent with the Alameda Countywide Bicycle Plan, and should consider opportunities to implement the plan in the project vicinity, either in conjunction with other roadway improvements required by the project or as a mitigation measure for air quality or traffic circulation impacts. Qualitative analysis is sufficient to assess this impact type.

Pedestrians

Projects should consider impacts including:

- **Effects of vehicle traffic on pedestrian conditions:** the analysis should evaluate if vehicle trips generated by the project will present barriers to pedestrians safely crossing roadways at intersections and mid-block crossings. This analysis may be qualitative and may be based on auto traffic circulation analysis.
- **Site development and roadway improvements:** the analysis should evaluate if the project or its mitigations will reduce or sever existing pedestrian access or circulation in the area as well as whether the project could produce conflicting movements between pedestrian and vehicle turning into and out of project driveways. The need for new crossing opportunities or circulation given project pedestrian access points and likely access/egress routes should be considered. Qualitative analysis is sufficient to assess this impact type.
- **Consistency with adopted plans:** the analysis should disclose whether the project is consistent with the most recent Alameda Countywide Pedestrian Plan, and should consider opportunities to implement the plan in the project vicinity, either in conjunction with other roadway improvements required by the project or as a mitigation measure for air quality or traffic circulation impacts. Qualitative analysis is sufficient to assess this impact type.

Other Impacts and Opportunities

Projects should consider impacts including:

- **Noise impacts:** for projects adjacent to state roadway facilities, the analysis should address noise impacts of the project. If the analysis finds an impact, then mitigation measures (i.e., soundwalls) should be incorporated as part of the conditions of approval of the proposed project. It should not be assumed that federal or state funding is available.
- **Transit Oriented Development access:** local jurisdictions are encouraged to adopt a comprehensive Transit Oriented Development (TOD) program, including environmentally clearing all access improvements necessary to support TOD as part of environmental documentation.

Project Delivery and Timely Use of Funds Policy

Project Delivery Assistance

The Alameda CTC will provide consultant services to assist in monitoring the implementation of projects programmed to receive state, federal or TFCA funds programmed by the Alameda CTC. This service will include ongoing collection of project monitoring information and development of a quarterly status report on the delivery status of projects programmed to receive state, federal funds or TFCA funds programmed by the Alameda CTC. The Consultant will also meet with Caltrans local assistance as needed to review the status of the Caltrans review of Alameda County projects.

The Alameda CTC will provide consultant services to project sponsors to assist in the delivery of state, federal or TFCA funded projects programmed through the Alameda CTC. This assistance could include services such as project delivery workshops for sponsors and development and management of a project delivery website. Due to budget limitations in the Alameda CTC's project oversight contract, one on one on call assistance will likely be limited to the review of documents and answering questions relative to a specific funding program. Sponsors that require assistance beyond this level, such as completing documents that are required for project delivery, can contract with the Alameda CTC's oversight consultant directly or request the Alameda CTC expand the current scope of work on a task order basis to provide the necessary support. Any additional task order work completed through the Alameda CTC contract will be reimbursed to the Alameda CTC from the local agency receiving the support. Billing rates for any additional support work will be based on the rates in the current Alameda CTC contract with the oversight consultant.

Agencies receiving funding through the Alameda CTC will, as part of the application process, submit to the Alameda CTC a baseline schedule for project delivery. The Alameda CTC's project monitoring consultant will provide assistance to sponsors in the development of the baseline schedule to insure that all required state and federal approvals are accounted for in the schedule. Agencies agree to provide the Alameda CTC with quarterly updates on project delivery status and to notify and seek the Alameda CTC's concurrence on any significant changes to the project delivery schedule, scope or cost. The baseline schedule will identify major milestones for each project that are critical for timely delivery of the project. These milestones will likely include start and end dates for: environmental clearance, development of PS&E, acquisition of right of way and construction of the project. Deadlines associated with any timely use of funds provisions such as Caltrans or California Transportation Commission authorizations and/or approvals will also be identified.

The Alameda CTC may host a workshop on project delivery after the adoption of a state/federal/TFCA program by the Alameda Board. The workshop would review the project delivery requirements of the particular funding program(s) adopted by the Alameda CTC and provide an opportunity for project sponsors to have questions related to the specific program answered by both Alameda CTC staff and staff from other agencies that may have project approval authority (i.e., Caltrans, the Air District, MTC). Attendance at this workshop may be mandatory for all project sponsors.

Extension and Reprogramming Requests

The Alameda CTC will consider the following prior to endorsing an extension or reprogramming request: Are the circumstances causing the delay truly "extraordinary," or an oversight during project planning?

Although the circumstances may be unforeseen, baseline project schedules should incorporate risk factors related to unknowns. Are these circumstances "beyond the control" of the implementing agency. Sponsors requesting extensions or reprogramming will be required to provide justification why the circumstances causing the delay are "extraordinary and beyond their control."

Has the project sponsor exercised due diligence in the delivery of the project and is such diligence documented? Have previous milestones in the project delivery scheduled been met and has the Alameda CTC been notified of and concurred with any changes to the schedule? The Alameda CTC should be notified when a delay situation, or potential delay situation, arises in order to be prepared to review the request and to take whatever action may be required to assure no loss of funding to Alameda County. Sponsors requesting extensions or reprogramming must demonstrate that previous milestones identified in the baseline schedule as critical to the delivery of the project have been met, or that the Alameda CTC was notified and concurred with any potential delays to the project schedule.

If the Alameda CTC were to grant an extension or reprogramming, how prepared is the sponsor to meet future delivery deadlines? For example, failure to meet the initial STIP project delivery deadline—project allocation approval—will result in the funds being deprogrammed from the project but returned to the county share. However, once the initial allocation has been received, failure to meet any future SB 45 deadlines will result in a loss of funds to both the project and the county. Sponsors requesting extensions or reprogramming requests must provide the Alameda CTC with a revised schedule for project delivery and a strategy for resolution of the problem that is causing the delay in project delivery. This revised schedule will also provide detail relating to the impact this delay and modified schedule may have on other projects sponsored by the respective agency. The Alameda CTC will consider the circumstances causing the project delivery delay and the impact on other projects being implemented by the sponsor and may deny the extension or reprogramming request until the sponsor can demonstrate an acceptable resolution to the problem causing the delay.

Timely Use of Funds Policy

Any project sponsor that fails to meet a timely use of funds deadline that results in a loss of programmed funds to Alameda County will be penalized in a future state or federal funding cycle an amount equal to the funds that were lost to Alameda County.

This policy will apply to all funding programs administered by the Alameda CTC. Projects programmed to receive TFCA funds will be subject to additional delivery requirements included in the Alameda CTC's adopted TFCA Timely Use of Funds Policy.

Glossary of Terms

Air Quality Attainment Plan. The plan for attainment of state air quality standards, as required by the California Clean Air Act of 1988. It is adopted by air quality districts and subject to approval by the State Air Resources Board.

Assembly Bill 32 (AB 32). The California Global Warming Solutions Act passed in 2006, requires the California Air Resources Board (CARB) to develop regulations and other measures to achieve the maximum technologically feasible and cost-effective reductions in greenhouse gas emissions to 1990 levels by 2020, representing a 25% reduction statewide.

Assembly Bill 84 (AB 84). The original bill number for the legislation that required Project Study Reports (PSRs) and the development of Future Project Development lists by the counties.

Assembly Bill 210 (Wieckowski) (AB 210). Adopted in August 2013, AB 210 extends the authority of the County of Alameda and authorizes the County of Contra Costa to impose the transactions and use tax of no more than 0.5 percent for countywide transportation programs until December 31, 2020, conditioned upon prior voter approval.

Assembly Bill 1358 (Leno) (AB 1358). The Complete Streets Act of 2008 stipulates that during the next major update of their General Plan's Circulation Element, all jurisdictions in California are required to incorporate complete streets principles. Alameda CTC required jurisdictions to adopt complete streets policies by June 30, 2013 as part of the Master Program Funding Agreements signed in 2012. All jurisdictions have met this requirement.

Assembly Bill 1963 (Katz) (AB 1963). This legislation amended the Congestion Management Program in 1994 to define the performance element of the CMP as in Government Code Section 65089(b)(2) and to meet Federal Transportation Act requirements. Since that time, the California Department of Transportation Highway Capacity Manual 2010 and the California Environmental Quality Act transportation checklist have also emphasized the importance of multimodal transportation system performance measures. (See chapter 4 for the Alameda County CMP multimodal performance measures.)

Assembly Bill 2032 (Dutra) (AB 2032). Adopted in 2004, this legislation authorized implementation of the Interstate 680 Express Lane. The project was completed and opened to traffic in September 2010. The legislation also approved a second express lane in the county. The CMA approved Interstate 580 (I-580) as a candidate corridor, and this project is currently in the design phase. As a first step, the eastbound I-580 high occupancy vehicle lane opened in November 2010.

Association of Bay Area Governments (ABAG). The regional agency that is responsible for regional planning other than for transportation. ABAG publishes forecasts of projected growth for the region.

Average Daily Traffic (ADT). The average number of vehicles passing a specified point during a 24-hour period.

Bay Area Air Quality Management District (BAAQMD). The regional agency created by the state legislature for the Bay Area air basin (Alameda, Contra Costa, western Solano, southern Sonoma, Marin, Napa, San Francisco, San Mateo, Santa Clara counties) that develops, in conjunction with MTC and ABAG, the state and federal air quality plans for the region. BAAQMD has an active role in approving the TCM (see definition below) plan for the region, as well as in controlling stationary and indirect sources of air pollution.

Bid targets. Based on the county minimum formula, each county is limited in the amount of funds that can be requested from the state in a given STIP cycle. This limit is called the bid target. In a multi-county region such as MTC, bid targets can be pooled to give additional flexibility at the regional level. MTC also uses bid targets for the federal Surface Transportation Program.

California Transportation Commission (CTC). A body appointed by the Governor and confirmed by the legislature that considers Regional Transportation Improvement Programs (RTIPs) and the PSTIP (see definitions below) and then includes transportation projects from these programs into the State Transportation Improvement Program (STIP). This qualifies the projects for state funding. The CTC also has financial oversight over the major programs authorized by Propositions 111 and 108.

Caltrans—The California State Department of Transportation. Responsible, as the owner/operator of the state highway system, for its safe operation and maintenance. Proposes projects for Intercity Rail, Interregional Roads, and soundwalls in the PSTIP (see definition below). Also responsible for the HSOPP (see definition below), Toll Bridge, and Aeronautics programs. The TSM and State/Local Partnership Programs are administered by Caltrans. Caltrans is the implementing agency for most state highway projects, regardless of program, and for the Intercity Rail program.

Capital Improvement Program (CIP). As used in this document: A seven-year program of projects to maintain or improve the traffic level of service and performance measures developed by the CMP, and to mitigate regional transportation impacts identified by the CMP Land Use Analysis Program, which conforms to transportation-related vehicle emissions air quality mitigation measures.

Capital Outlay. "All money allocated by the CTC from the State Highway, Account, and the net revenues from the passenger rail transportation Bond Fund for streets, highways, guideways, and rail, but not including allocations or expenditures for projects for maintenance, traffic system management, intercity rail, and the state-local partnership program, which are expended for construction, including the acquisition of rights-of-way, reconstruction, and construction engineering." (Streets and Highways Code 188.)

Capital Priorities. A process used by MTC to evaluate and prioritize transit projects in the region. All sources of transit funding, including FTA grants, state programs, and other sources are considered. This process involves all of the transit operators in the region, including bus, rail, and ferries.

Congestion Management Agency (CMA). The agency responsible for developing the Congestion Management Program and coordinating and monitoring its implementation.

Congestion Management Program (CMP). A multi-jurisdictional program to reduce traffic congestion. Required of every county in California with an urbanized area as defined by the Census Bureau (at least 50,000 people).

Council of Governments. A voluntary consortium of local government representatives, from contiguous communities, meeting on a regular basis, and formed to cooperate on common planning and solve common development problems of their area. COGs can function as the RTPAs and MPOs in urbanized areas.

County Minimums. Instituted in 1983 by SB 215 (Foran), the county minimum represents the minimum share of programming each county should receive. Under this statute (Section 188.8 of the Streets and Highways Code), 70 percent of the capital outlay (defined above) funds must be expended in each county according to a formula based 75 percent on county population and 25 percent on state highway miles in the county. The county minimum calculated over a fixed five year period called a quinquennium.

Database. 1) A collection of data from which information is derived and from which decisions can be made; and 2) A non-redundant collection of data items that can be processed by one or more computer applications.

Federal Highway Administration (FHWA). A division of the U.S. Department of Transportation, established to ensure development of an effective national road and highway transportation system. It assists states in constructing highways and roads, and provides financial aid at the local level.

Federal Transit Administration (FTA). A division of the U.S. Department of Transportation, delegated by the Secretary of Transportation to administer the federal transit program under the Urban Mass Transportation Act of 1964, as amended, and various other statutes.

FTA Section 3 Funds. Discretionary transit capital fund provided by the federal government through FTA. New Rail Starts and Extensions are funded through this program, which operates through earmarking at the Congressional level. The Section 3 program is updated approximately every four years. The minimum local match is 20 percent, although larger local shares are encouraged.

FTA Section 8 Funds. Transit operating funds provided by the federal government through UMTA. Made available through Section 8 of the Urban Mass Transportation Act of 1972, Section 8 funds are available for planning components of the operating budget, only, such as development of Short Range Transit Plan.

FTA Section 9 Capital Funds. Capital funds provided by the Federal government through FTA. Section 9 capital funds are available to support capital purchases only. They must be matched with local capital funds on an 80 percent federal. 20 percent local basis.

FTA Section 9 Operating Funds. Operating funds provided by the Federal government through FTA. Available only to support annual operating budgets. Capital purchases must be supported with other funds. The total amount of Section 9 operating funds is determined by Congress each year and is then divided among regions and operators within regions on a formula basis.

FTA Section 16 (b) 2 Funds. Funds provided by the federal government through FTA to private non-profit providers of transportation for the elderly and handicapped. Program is administered annually in the Bay Area by MTC.

FTA Section 18 Funds. Transit funds provided by the federal government through FTA by formula to rural areas. Administered by Caltrans in California, these funds can be used for either capital or operating expenses. Capital projects require a 20 percent local match. Operating projects require a 50 percent local match.

Flexible Congestion Relief (FCR). One of the state's funding programs for local or regional transportation projects that will reduce congestion. State highway projects, local roads, and rail guideway projects are all eligible.

Fund Estimate. The STIP cycle begins with the development of the Fund Estimate, which compares existing commitments against total estimated revenue expected from state and federal sources. Caltrans estimates state and federal funds "reasonably expected" in annual increments for 7 years (the STIP period). The calculation of existing capital program commitments is based on Caltrans' Project Delivery Report (see definition below), while non capital expenditures of operation and administration costs are estimated based on current spending and projected needs. This comparison of revenues to commitments results in an estimate of total uncommitted funds that are available for programming and which are then prorated to each program category. The Fund Estimate is required by law to be submitted by 7/15 of odd-numbered years and to be adopted by the CTC by 8/15 of odd numbered years. CTC adopts a policy, known as the "Fund Estimate Methodology" that guides Caltrans in formulating the Fund Estimate.

High Occupancy Vehicle Lane (HOV). A lane of freeway reserved for the use of vehicles with more than a preset number of occupants; such vehicles often include buses, taxis and carpools.

Indirect Source Control Measure. The Federal Clean Air Act defines indirect source as "...a facility, building, structure, installation, real property, road or highway which attracts, or may attract, mobile sources of pollution." An indirect source control measure is a rule or ordinance established to reduce the mobile source emissions associated with specific activity centers such as those noted above.

Interregional Road System (IRRS). On February 1, 1990, Caltrans submitted a plan to the state legislature that identified a set of projects that "will provide the most adequate interregional road system to all economic centers in the State." Statute defines eligible routes that were included, and specified that these be located outside the boundaries of urbanized areas of over 50,000 population, "except as necessary to provide connection for continuation of the routes within urban areas." From this plan, Caltrans includes projects, consistent with the Fund estimate, in its PSTIP to the CTC for programming in the STIP.

Level of Service (LOS). A qualitative measure describing operational conditions within a traffic stream; generally described in terms of such factors as speed and travel time, freedom to maneuver, traffic interruptions, comfort and convenience, and safety.

Metropolitan Transportation Commission (MTC). Created by the state legislature in 1970 to prepare a Regional Transportation Plan for the nine counties of the Bay Area. Other important responsibilities include: approving transportation projects that receive state or federal funding, allocating several sources of funds for transit operations, evaluating the performance of the transportation system and the provision of transportation service, promoting and setting guidelines for transit systems coordination, and advocating adequate transportation funding. MTC consists of 16 voting members, including one member from ABAG, and one member from the Bay Conservation and Development Commission. MTC also includes 2 non-voting members, from the state and federal transportation agencies.

Metropolitan Transportation System. A regional, multi-modal transportation system defined as part of MTC's RTP (see definition below). Emphasizes a balanced strategy of highway, arterial, and transit capital investments and operational improvements to manage congestion projected over the next 20 years.

Model: Gravity. A mathematical trip distribution model that is based on the premise that the amount of travel between two zones in proportional to the amount of activity in each of the two zones and inversely proportional to the impedance to travel between the two zones. In other words, trips produced in any given area will distribute themselves in accordance with the accessibility of other areas and the opportunities.

Model: Land Use. A model used to predict the future spatial allocation of urban activities (land use), given total regional growth, the future transportation system, and other factors.

Model: Mode Choice. A model used to forecast the proportion of total person trips on each of the available transportation modes.

Model: Regional Growth. A model used to estimate land uses in a region.

Model: Travel Demand. A mathematical equation or graphic technique used to simulate traffic movements, particularly those in urban areas or on a freeway.

MTC Resolution No. 3434. The Regional Transit Expansion Program adopted by MTC in 2001 as Resolution 3434 identifies the regional commitment to transit investments in the Bay Area. It has been amended many times. The most recent September 2008 amendment identifies a nearly $18 billion investment in new rail and bus projects that will improve mobility and enhance connectivity for residents in Alameda County and the Bay Area. For Alameda County, Resolution 3434 includes the following transit expansion projects:

- AC Transit Bus Rapid Transit in Berkeley/Oakland/ San Leandro
- AC Transit Enhanced Bus/Bus Rapid Transit: Grand-MacArthur corridor
- BART Warm Springs Extension to San Jose
- Dumbarton Rail
- Ferry service expansions in Alameda and Berkeley

MTC Resolution No. 3866. Adopted in February 2010, the Transit Coordination Implementation Plan, which includes a regional Transit Connectivity Plan and Implementation Requirements, coordinates

public transportation services between public transit operators, including coordination of fares and schedules for all public transit systems within MTC's jurisdiction, and details a cohesive strategy for easing passengers' movement from one transit system to another.

MTC Resolution No. 4035. Adopted in May 2012, Resolution 4035 sets forth project selection policies and programming for the federal Surface Transportation Program (STP)/Congestion Mitigation and Air Quality (CMAQ) funding available to MTC for its programming discretion as part of the federal Transportation Improvement Program. Resolution 4035 established the One Bay Area Grant Program, which integrates the region's federal transportation program with California's climate law (Senate Bill 375) Sustainable Communities Strategy for the Bay Area by promoting transportation investments in Priority Development Areas.

North/South Split. State law (Section 188 of the Streets and Highway Code) requires that programming be balanced so that 60 percent of the capital outlay (see definition above) is spent in the 11 Southern counties, and 40 percent is spent in the North (45 counties). This balance must occur for the period July 1, 1989 to June 30, 1993, and for each subsequent five year period. This rule has a serious impact on the type of projects programmed in the North or the South. Rehabilitation and safety funds have historically tended to be spent roughly 60 percent in the north, and only 40 percent in the South, due to worse weather conditions and more mountainous roads in the North. In addition, engineering costs are relatively higher in the North than in the South. Furthermore, Caltrans' project support for locally funded projects, of which the North has a disproportionate share, is also included. Thus, funds for capacity increasing projects have historically been weighted towards the South, so that the overall balance remains 60 percent/40 percent.

Obligation. An action by an administrative agency approving the spending of money for a specific purpose to a specific grant recipient.

Pavement Management System (PMS). Required by Section 2108.1 of the Streets and Highways Code, any jurisdiction that wishes to qualify for funding under the STIP must have a PMS that is in conformance with the criteria adopted by the Joint City/County/State Cooperation Committee. At a minimum, the PMS must contain:

- An inventory of the arterial and collector routes in the jurisdiction that is reviewed and updated at least biennially;
- An assessment of pavement condition for all routes in the system, updated biennially;
- Identification of all sections of pavement needing rehabilitation or replacement; and
- Determination of budget needs for rehabilitation or replacement of deficient sections of pavement for the current biennial period, and for the following biennial period.

Certification is done by implementing jurisdiction and submittal to MTC. MTC then makes a finding of agreement with the certification and transmits the certification to the CTC with the RTIP.

Peak (Peak Period, Rush Hours). 1) The period during which the maximum amount of travel occurs. It may be specified as the morning (A.M.) or afternoon or evening (P.M.). 2) The period when demand for transportation service is the heaviest.

Principal Arterial. The functional classification system at the federal level defines principal arterials for rural areas, urbanized areas, and small urban areas. (Note: other definitions of principal arterials exist). In urbanized areas, the principal arterial system can be identified as unusually significant to the area in which it lies in terms of the nature and composition of travel. Principal arterials derive their importance from service to rural oriented traffic, but equally or even more importantly, from service for major movements within the urbanized area. The principal arterial system should carry the major portion of trips entering and

leaving the urban area, as well as the majority of through movements desiring to bypass the central city. In addition, significant intra-area travel, such as between major business districts and outlying residential areas, between major inner city communities, or between major suburban centers should be served by this system. Frequently, the principal arterial system will carry important intra-urban as well as intercity bus routes. Finally, this system in small urban and urbanized areas should provide continuity for all rural arterials which intercept the urban boundary. Because of the nature of the travel served by the principal arterial system, almost all fully and partially controlled access facilities will be part of this functional system. However, this system is not restricted to controlled access routes. The spacing of urban principal arterials will be closely related to the trip-end density characteristics of particular portions of the urban areas. The US Department of Transportation provides the guidance than 50-65 percent of the VMT should be accounted for on the principal arterial system.

Project Delivery Report. Government Code Section 14525.5 requires Caltrans to submit to the legislature by November 15 of each year a report on the delivery of all state highway projects in the adopted STIP which cost $1M or more and for which the department is the responsible agency for project development work (including some, but not all locally funded projects). The report must identify milestone dates by month and year for these projects, and must summarize the number of projects which met milestones and identify those that failed to meet one or more milestones. For those that failed, the report must explain the reasons for the delay and present a plan to resolve any problems and a new schedule for delivery. The Plan must also include an estimate of Caltrans' capital outlay project development staffing needs for the next fiscal year in order to delivery the adopted STIP. The Report must also include a determination of the portion of project development work that will be performed by Caltrans and the portion that will be "contracted out." This Plan is then assessed by the Legislative Analyst in its annual analysis of the Governor's proposed budget.

Project Study Report (PSR). Chapter 878 of Statutes 1987 requires that any capacity increasing project on the state highway system, prior to programming the STIP, have a completed PSR. The PSR must include a detailed description of the project scope and estimated costs. The intent of this legislation was to improve the accuracy of the schedule and costs shown in the STIP, and thus improve the overall accuracy of the estimates of STIP delivery and costs.

Proposed State Transportation Improvement Program (PSTIP). This seven-year program is based on the adopted STIP and the most recent Project Delivery Report. It may include additional schedule changes and/or cost changes, plus new projects that Caltrans proposed for the interregional road system, retrofit soundwalls, and toll bridge and aeronautics programs, as well as the intercity rail program. Caltrans may also propose, under specified conditions, alternative FCR projects to those proposed in the RTIPs; this is the only overlap with the RTIPs. The PSTIP is due to the CTC on 12/1 of odd numbered years.

Proposition 116. Passed by voters in June of 1990, this initiative sponsored by the Planning and Conservation League provides $1.99B in rail bonds, primarily to projects specified in the legislation. Guidelines for the implementation of the program were available in the Fall of 1990.

Public Transit (Mass Transit). Passenger transportation service, usually local in scope, that is available to any person who pays a prescribed fare. Operated on established schedules along designated routes or lines with specific stops and is designed to move relatively large numbers of people at one time. Examples include bus, ferry, light rail and rapid transit.

Public Transportation. Transportation service to the public on a regular basis using vehicles that transport more than one person for compensation, usually but not exclusively over a set route or routes from one fixed point to another. Routes and schedules may be determined through a cooperative arrangement. Subcategories include public transit service, and

paratransit service that are available to the general public.

Regional Transportation Improvement Program (RTIP). A list of proposed transportation projects submitted to the CTC by the regional transportation planning agency (for the Bay Area. MTC), as a request for state funding. The individual projects are first proposed by the CMAs, then evaluated and prioritized by the regional agency for submission to the CTC. The RTIP has a seven year planning horizon, and is updated every two years. MTC may only include projects in its RTIP that are first included in a CMP.

Regional Transportation Plan (RTP). A comprehensive 20-year plan for the region, updated every two years by the regional transportation planning agency (for the Bay Area, MTC). The RTP includes goals, objectives and policies, and recommends specific transportation improvements.

Ridesharing. Two or more persons traveling by any mode, including but not limited to, carpooling, vanpooling, taxipooling, jitney and public transit.

Regional Traffic Signalization and Operations Program (RTSOP). Administered by MTC, this program was created to fund traffic signalization projects that implement cost effective traffic control measures. The types of eligible projects include signal re-timing; upgrades of existing controllers to comply with AB 3418 and NTCIP; repair, replacement, installation, and improvement of hard-wire interconnect systems; and upgrade and improvements to traffic signal systems.

Senate Bill 45 (Kopp) (SB 45). In 1997, this legislation had a significant impact on the regional transportation planning and programming process, by amending the State Transportation Improvement Program (STIP) process. The statute delegated major planning decisions to the regional transportation planning agencies (RTPAs), requiring them to take a more active role in selecting and programming transportation projects and encouraged more decision-making through partnerships among stakeholders. It divided STIP into two sub-programs and designated 75 percent of funding to the region for the Regional Transportation Improvement Program (RTIP) and 25 percent of funding to the California Department of Transportation for the Interregional Transportation Improvement Program (ITIP). SB 45 changed the transportation funding structure; modified the transportation programming cycle, program components, and expenditure priorities; and required the development and implementation of transportation system performance measures.

Senate Bill 226 (Simitian) (SB 226). In 2011, the Office of Planning Research issued regulations to implement SB 226, which seeks to streamline environmental review for eligible infill development projects. These Infill Streamlining updates to the California Environment Quality Act Guidelines also contain the performance standards used to determine an infill project's eligibility for a streamlined review.

Senate Bill 375 (Steinberg) (SB 375). Adopted in October 2008, SB 375 requires California's MPOs to prepare a "sustainable communities strategy (SCS)" that demonstrates how the region will meet its greenhouse gas reduction target through integrated land use, housing and transportation planning.

Senate Bill 743 (Steinberg) (SB 743). Adopted in September 2013, SB 743 includes a series of amendments to the California Environmental Quality Act that streamline the environmental review process, encourage infill development, overhaul traditional impact analysis metrics, and exempt certain projects in transit priority areas. For the Congestion Management Program, it removed the sunset date for establishing the infill opportunity zones including related alternative level of service standard requirements.

Senate Bill 916 (Perata) (SB 916). As amended in June 2003, this bill required the supervisors of the counties of San Francisco, Alameda, Contra Costa, Marin, San Mateo, Santa Clara, and Solano to call a special election in March 2004 on Regional Measure 2 (RM2) authorizing a comprehensive Regional Traffic Relief Plan (RTRP). The voters in those counties passed the measure, which authorized a $1 toll surcharge to fund specified transportation projects and programs.

In addition, the bill required the Metropolitan Transportation Commission to adopt a regional transit connectivity plan. The latest plan highlights connectivity improvements at 21 regional transit hubs around the Bay Area.

Senate Bill 1474 (Kopp) (SB 1474). Passed in 1996, this bill requires the Metropolitan Transportation Commission (MTC) to adopt, in coordination with a regional transit coordinating council, rules and regulations to promote the coordination of fares and schedules for all public transit systems within its jurisdiction. See MTC Resolution No. 3866 regarding the Transit Coordination Implementation Plan.

Senate Bill 1636 (Figueroa) (SB 1636). Signed by the governor in 2002, this bill established "infill opportunity zones" (IOZs) to encourage transit supportive and infill developments. The statute exempted infill opportunity zones from the requirements to maintain level of service E. None of the local jurisdictions within Alameda County established or adopted infill opportunity zones by the statute's sunset period of December 2009. Senate Bill 743 instituted key changes to the CMP statute that support infill development, including lifting the sunset date on designating IOZs and directing the governor's Office of Planning and Research to develop new metrics for assessment of transportation impacts to replace the level of service measure.

Short Range Transit Plans (SRTP). A seven-year comprehensive plan required by federal and regional transportation funding agencies of all transit operators. The plans must define the operator's mission, analyze its past and current performance, and plan specific operational and capital improvements to realize its short-term objectives.

State Highway Operations and Protection Program (SHOPP) [Formerly called the Highway System Operations and Protection Plan (HSOPP)]. A program created by state legislation that includes state highway safety and rehabilitation projects, seismic retrofit projects, land and buildings projects, landscaping, some operational improvements, bridge replacement, and the minor program. SHOPP is a four year program of projects, adopted separately from the STIP cycle. The June 1990 gas tax increase partially funds the program, but it is primarily funded through the "old" 9 cent gas tax and federal funds. For the purposes of the Fund Estimate, a formula based on a pavement index and safety concerns is used to estimate an additional 3 years of the SHOPP program.

State Implementation Plan (SIP). State plan required by the Federal Clean Air Act of 1990 to attain and maintain national ambient air quality standards. It is adopted by local air quality districts and the State Air Resources Board.

State/Local Partnership. Originally created by SB 140, and subsequently funded by the passage of Proposition 111 by the voters in June of 1990, the State/Local Partnership provides state matching funds for locally funded and constructed highway and exclusive public mass transit guideway projects. $2 billion over ten years have been designated for this program. Eligible projects are defined by the legislation and clarified by guidelines published by the Caltrans Division of Local Streets and Roads. Applications are annually submitted to Caltrans (by June 30 for the following fiscal year), which administers the program. The amount of state match available in a given year is dependent upon the number of eligible applicants and the size of the appropriation to the program by the legislature during the budget process. The state match can not exceed 50 percent.

State Transit Assistance (STA). This program provides funding for transit and transportation planning. Fifty percent of the revenues transferred to the TP&D Account (see definition below) are appropriated to STA. STA apportionments to regional transportation planning agencies (MTC in the Bay Area) are determined by two formulas. 50 percent by populations and 50 percent by the amount of operator revenues (fares, sales tax, etc.) for the prior year. The Bay Area usually receives about 38 percent of the amount available for STA state-wide. STA funds may be used for transit capital or operating expenditures. Passage of

Proposition 117 disallows use of STA funds for streets and roads in the non-urban counties.

State Transportation Improvement Program (STIP). A list of transportation projects, proposed in RTIPs and the PSTIP, which are approved for funding by the CTC.

Sustainable Communities Strategy (SCS). Mandated by Senate Bill 375, it is an Integrated Transportation, Land Use and Housing Plan required to be developed by the 18 Metropolitan Planning Organizations in California to reduce greenhouse gas emissions. The SCS will be adopted as an element of the Regional Transportation Plan.

Traffic Systems Management (TSM) Program. A state-funded program that funds those projects which "increase the number of person trips on the highway system in a peak period, without significantly increasing the design capacity of the system, measured by vehicle trips, and without increasing the number of through traffic lanes". This program is funded outside of the STIP process, through direct application to Caltrans. The CTC programs the projects from a prioritized list submitted by Caltrans. Statute requires that priority be given to projects from counties with adopted CMPs.

Transit Capital Improvement Program (TCI). A state program, currently funded primarily from the TP&D account (see definition below) for transit capital projects and the STA program (see definition above). An annual program, all state funds must be matched 50 percent by local funds.

Transit Operators Coordinating Council (TOCC). A statutorily created committee of MTC that consists of the General Managers of the major transit operators in the region. It meets monthly to discuss matters of mutual concern and to advise MTC.

Transportation Control Measures (TCMs). A measure intended to reduce pollutant emissions from motor vehicles. Examples of TCMs include programs to encourage ridesharing or public transit usage, city or county trip reduction ordinances, and the use of cleaner burning fuels in motor vehicles. MTC has adopted specific TCMs, in compliance with the Federal and State Clean Air Acts that can be found in MTC Resolution No. 3758 and the Transportation Control Measure Plan for the State Clean Air Plan prepared by MTC in January 2006.

Transportation Demand Management (TDM). "Demand-based" techniques for reducing traffic congestion, such as ridesharing programs and flexible work schedules enabling employees to commute to and from work outside of the peak hours.

Transportation Improvement Program (TIP). A federally required document produced by the regional transportation planning agency (MTC in the Bay Area) that states the investment priorities for transit and transit-related improvements, mass transit guideways, general aviation and highways. The TIP is the MTC's principal means of implementing long-term planning objectives through specific projects.

Transportation Management Association (TMA). A consortium of business and industry (private sector) interests formed to help solve mutual transportation problems. A TMA is not in any form a publicly sponsored or coordinated agency or group.

Transportation Planning and Development Account (TP&D). A state account, funded by the sales tax on the new 9 cent gas tax and the diesel sales tax, that is the primary funding source for the TCI (see definition above) program.

Transportation System Management (TSM). A set of relatively low-cost techniques to relieve congestion without adding vehicle capacity to the transportation system. TSM techniques are numerous. Some are "demand-based" techniques such as ridesharing programs and flexible work schedules enabling employees to commute to and from work outside of the peak hours. (Sometimes the demand-based strategies are referred to as TDM). Other TSM measures are engineering-oriented, such as timing traffic signals to smooth the flow of traffic, and ramp metering, which regulates the entrance of vehicles onto a freeway, increasing the efficiency of the freeway.

Urban and Commuter Rail. A state funding program financed by the sales and bonds authorized by Proposition 108. Two additional bond measures to fund this program were rejected by voters in 1992 and 1994. All projects must be matched 50 percent by local funds. Projects are proposed through the CMP process to regional agencies, which then may include them in their RTIPs.

Urbanized Area. As defined by the Bureau of the Census, a population concentration of at least 50,000 inhabitants, generally consisting of a central city and the surrounding, closely settled, contiguous territory (suburbs). The boundary is based primarily on a population density of 1,000 people/mile, but also includes some less densely settled areas, as well as such areas as industrial parks and railroad yards, if they are within areas of dense urban development. The boundaries of urbanized areas, the specific criteria used to determine urbanized areas, or both, may change in subsequent censuses.

Vehicle Miles Traveled (VMT). Travel demand forecasting (modeling) is used to generate the average trip lengths for a region. The average trip length measure can then be used in estimating vehicle miles of travel, which in turn is used in estimating gasoline usage or mobile source emissions of air pollutants.

Vehicle Occupancy. The number of people aboard a vehicle at a given time; also known as auto or automobile occupancy when the reference is to automobile travel only.

Vehicle Trip. A one-way movement of a vehicle between two points.

Glossary of Acronyms

ABAG	Association of Bay Area Governments
AC Transit	Alameda-Contra Costa Transit District
ACCMA	Alameda County Congestion Management Agency
ACE	Altamont Commuter Express
ACTA	Alameda County Transportation Authority (1986 Measure B authority)
ACTAC	Alameda County Technical Advisory Committee
ACTIA	Alameda County Transportation Improvement Authority
ADA	Americans with Disabilities Act
ATG	Automobile Trip Generated
BAAQMD	Bay Area Air Quality Management District
BART	Bay Area Rapid Transit District
Caltrans	California Department of Transportation
CARB	California Air Resources Board
CBTP	Community Based Transportation Plan
CDT	Community Design Transportation
CEQA	California Environmental Quality Act
CIP	Capital Investment Program
CMAQ	Congestion Mitigation and Air Quality
CMP	Congestion Management Program
CTC	California Transportation Commission
CWTP	Countywide Transportation Plan
EIR	Environmental Impact Report
FWHA	Federal Highway Administration
GOA	Growth Opportunity Areas
GPA	General Plan Amendment
GRH	Guaranteed Ride Home Program
HCM	Highway Capacity Manual
HOT	High Occupancy Toll
HOV	High Occupancy Vehicle
GOA	Growth Opportunity Areas
JPA	Joint Powers Agreement
LAVTA	Livermore-Amador Valley Transportation Authority
LOS	Level of Service
MTC	Metropolitan Transportation Commission
MTS	Metropolitan Transportation System
NEPA	National Environmental Protection Agency
NOP	Notice of Preparation
O/D	Origin/Designation
PCI	Pavement Condition Index
PDA	Priority Development Areas
RTP	Regional Transportation Plan
RTIP	Regional Transportation Improvement Program
SCS	Sustainable Communities Strategy
SCTVA	Santa Clara Transportation Valley Authority
SFCTA	San Francisco County Transportation Authority
SIP	State Implementation Plan
STA	State Transit Assistance

STIP	State Transportation Improvement Program
STP	Surface Transportation Program
SWITRS	Statewide Integrated Traffic Record System
TASAS	Traffic Accident Surveillance and Analysis System
TAZ	Traffic Analysis Zones
TCM	Transportation Control Measures
TCRP	Transportation Congestion Relief Program
TDM	Travel Demand Management
TEP	Transportation Expenditure Plan
TFCA	Transportation Fund for Clean Air
TIP	Transportation Improvement Program
TLC	Transportation for Livable Communities
TMS	Transportation Management System
TOD	Transit Oriented Development
TOS	Transportation Operations System
V/C	Volume/Capacity
VMT	Vehicle miles traveled

APPENDIX C
NOISE IMPACT ANALYSIS

NOISE
IMPACT ANALYSIS

FOR

CITY OF BERKELEY
651 ADDISON STREET
MIXED-USE PROJECT

PREPARED FOR:
PMC
1440 BROADWAY, SUITE 1008
OAKLAND, CA 94612

PREPARED BY:

AMBIENT
AIR QUALITY & NOISE CONSULTING
5314 SHELATO WAY
CARMICHAEL, CA 95608
CONTACT: KURT LEGLEITER
TEL/FAX: 916.359.2700

DECEMBER 3, 2007

INTRODUCTION

This section discusses the existing noise setting, identifies potential impacts and proposes mitigation measures related to noise impacts for the proposed project. Specifically, this section analyzes potential noise impacts due to and upon development within the project site relative to applicable noise criteria and to the existing ambient noise environment, based on an acoustical study completed for the proposed project on November 10, 2005 by Charles M. Salter Associates, Inc.

EXISTING SETTING

FUNDAMENTALS OF ACOUSTICS

Noise is generally defined as sound that is loud, disagreeable, or unexpected. Sound, as described in more detail below, is mechanical energy transmitted in the form of a wave because of a disturbance or vibration.

Amplitude

Amplitude is the difference between ambient air pressure and the peak pressure of the sound wave. Amplitude is measured in decibels (dB) on a logarithmic scale. For example, a 65 dB source of sound, such as a truck, when joined by another 65 dB source results in a sound amplitude of 68 dB, not 130 dB (i.e., doubling the source strength increases the sound pressure by 3 dB). Amplitude is interpreted by the ear as corresponding to different degrees of loudness. Laboratory measurements correlate a 10 dB increase in amplitude with a perceived doubling of loudness and establish a 3 dB change in amplitude as the minimum audible difference perceptible to the average person (US EPA 1971).

Frequency

Frequency is the number of fluctuations of the pressure wave per second. The unit of frequency is the Hertz (Hz). One Hz equals one cycle per second. The human ear is not equally sensitive to sound of different frequencies. Sound waves below 16 Hz or above 20,000 Hz cannot be heard at all, and the ear is more sensitive to sound in the higher portion of this range than in the lower. To approximate this sensitivity, environmental sound is usually measured in A-weighted decibels (dBA). On this scale, the normal range of human hearing extends from about 10 dBA to about 140 dBA (US EPA 1971).

Characteristics of Sound Propagation and Attenuation

Noise can be generated by a number of sources, including mobile sources, such as automobiles, trucks and airplanes, and stationary sources, such as construction sites, machinery, and industrial operations. Noise generated by mobile sources typically attenuates at a rate between 3.0 to 4.5 dBA per doubling of distance. The rate depends on the ground surface and the number or type of objects between the noise source and the receiver. Mobile transportation sources, such as highways, hard and flat surfaces, such as concrete or asphalt, have an attenuation rate of 3.0 dBA per doubling of distance. Soft surfaces, such as uneven or vegetated terrain, have an attenuation rate of about 4.5 dBA per doubling of distance from the source. Noise generated by stationary sources typically attenuates at a rate of approximately 6.0 to 7.5 dBA per doubling of distance from the source (US EPA 1971).

Sound levels can be reduced by placing barriers between the noise source and the receiver. In general, barriers contribute to decreasing noise levels only when the structure breaks the "line of sight" between the source and the receiver. Buildings, concrete walls, and berms can all act as effective noise barriers. Wooden fences or broad areas of dense foliage can also reduce noise, but are less effective than solid barriers.

Noise Descriptors

The selection of a proper noise descriptor for a specific source is dependent upon the spatial and temporal distribution, duration, and fluctuation of the noise. The noise descriptors most often encountered when dealing with traffic, community, and environmental noise include the average-hourly noise level (in Leq) and the average-daily noise levels (in Ldn/CNEL). Common acoustical terms and descriptors are summarized in **Table 1**.

TABLE 1
COMMON ACOUSTICAL TERMS AND DESCRIPTORS

Descriptor	Definition
Ambient Noise Level	The composite of noise from all sources near and far. The normal or existing level of environmental noise or sound at a given location, typically defined by the L_{eq} level.
Noise	Sound that is loud, unpleasant, unexpected, or otherwise undesirable.
Decibel (dB)	A unit-less measure of sound on a logarithmic scale, which indicates the squared ratio of sound pressure amplitude to referenced sound pressure amplitude. The reference pressure is 20 micro-pascals.
A-Weighted Decibel (dBA)	An overall frequency-weighted sound level in decibels which approximates the frequency response of the human ear.
Energy Equivalent Noise Level (Leq)	The energy mean (average) noise level. The instantaneous noise levels during a specific period of time in dBA are converted to relative energy values. From the sum of the relative energy values, an average energy value (in dBA) is calculated.
Minimum Noise Level (Lmin)	The minimum instantaneous noise level during a specific period of time.
Maximum Noise Level (Lmax)	The maximum instantaneous noise level during a specific period of time.
Day-Night Average Noise Level (DNL or Ldn)	The 24-hour Leq with a 10 dBA "penalty" for noise events that occur during the noise-sensitive hours between 10:00 p.m. and 7:00 a.m. In other words, 10 dBA is "added" to noise events that occur in the nighttime hours to account for increases sensitivity to noise during these hours.
Community Noise Equivalent Level (CNEL)	The CNEL is similar to the Ldn described above, but with an additional 5 dBA "penalty" added to noise events that occur between the hours of 7:00 p.m. to 10:00 p.m. The calculated CNEL is typically approximately 0.5 dBA higher than the calculated Ldn.
Single Event Level (SEL)	The level of sound accumulated over a given time interval or event. Technically, the sound exposure level is the level of the time-integrated mean square A-weighted sound for a stated time interval or event, with a reference time of one second. Often also referred to as the Single Event Noise Exposure Level (SENEL).

Human Response to Noise

The human response to environmental noise is subjective and varies considerably from individual to individual. Noise in the community has often been cited as a health problem, not in terms of actual physiological damage, such as hearing impairment, but in terms of inhibiting general well-being and contributing to undue stress and annoyance. The health effects of noise in the community arise from interference with human activities, including sleep, speech, recreation, and tasks that demand concentration or coordination. Hearing loss can occur at the highest noise intensity levels. When

community noise interferes with human activities or contributes to stress, public annoyance with the noise source increases. The acceptability of noise and the threat to public well-being are the basis for land use planning policies preventing exposure to excessive community noise levels. Typical community noise levels are depicted in **Figure 1**.

Unfortunately, there is no completely satisfactory way to measure the subjective effects of noise or of the corresponding reactions of annoyance and dissatisfaction. This is primarily because of the wide variation in individual thresholds of annoyance and habituation to noise over differing individual experiences with noise. Thus, an important way of determining a person's subjective reaction to a new noise is the comparison of it to the existing environment to which one has adapted: the so-called "ambient" environment. In general, the more a new noise exceeds the previously existing ambient noise level, the less acceptable the new noise will be judged. Regarding increases in A-weighted noise levels, knowledge of the following relationships will be helpful in understanding this analysis:

- Except in carefully controlled laboratory experiments, a change of 1 dB cannot be perceived by humans.

- Outside of the laboratory, a 3-dB change is considered a just-perceivable difference.

- A change in level of at least 5 dB is required before any noticeable change in community response would be expected. An increase of 5 dB is typically considered substantial.

- A 10-dB change is subjectively heard as an approximate doubling in loudness and would almost certainly cause an adverse change in community response.

When evaluating noise impacts, based on the above relationships, it is generally recognized that an increase of greater than 3 dBA is considered potentially significant. However, increases in ambient noise levels need to also take into account the existing noise environment.

FUNDAMENTALS OF GROUNDBORNE VIBRATION

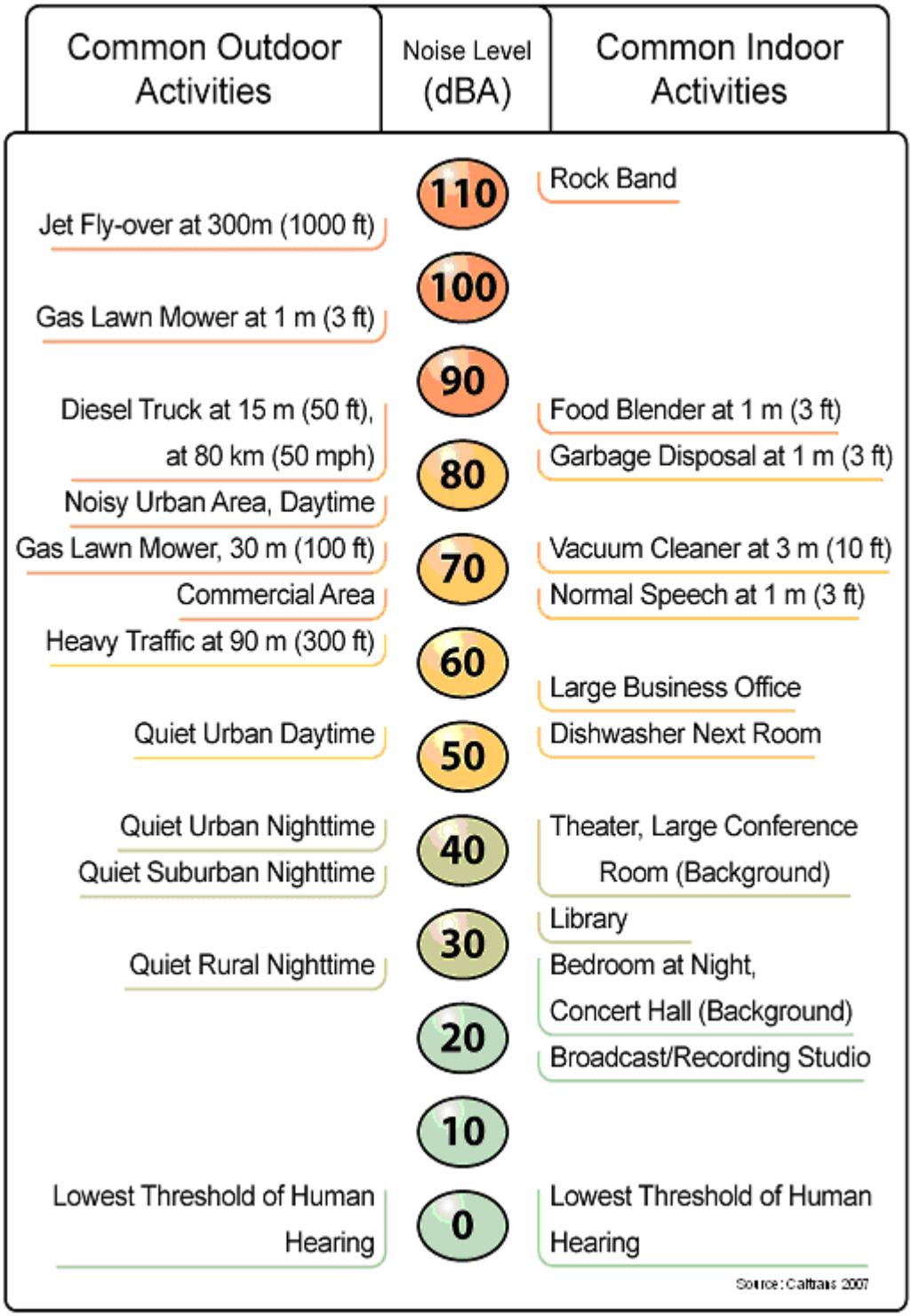
Sources of earth-borne vibrations include natural phenomena (earthquakes, volcanic eruptions, sea waves, landslides, etc.), or manmade causes (explosions, machinery, traffic, trains, construction equipment, etc.). Vibration sources may be continuous such as factory machinery, and transient, such as explosions. As is the case with airborne sound, earth-borne vibrations may be described by amplitude and frequency.

Vibration Descriptors

Vibration is an oscillatory motion which can be described in terms of the displacement, velocity, or acceleration. Because the motion is oscillatory, there is no net movement of the vibration element and the average of any of the motion descriptors is zero. Displacement is the easiest descriptor to understand. For a vibrating floor, the displacement is simply the distance that a point on the floor moves away from its static position. The velocity represents the instantaneous speed of the floor movement and acceleration is the rate of change of the speed. Although displacement is easier to understand than velocity or acceleration, it is rarely used for describing ground-borne vibration. Most transducers used for measuring ground-borne vibration use either velocity or acceleration. Furthermore, the response of humans, buildings, and equipment to vibration is more accurately described using velocity or acceleration.

Several descriptors can be used to quantify vibration amplitude. The peak particle velocity (PPV) is defined as the maximum instantaneous positive or negative peak of the vibration signal. PPV is often used in monitoring of blasting vibration since it is related to the stresses that are experienced by buildings. Although peak particle velocity is appropriate for evaluating the potential of building damage, it is not suitable for evaluating human response. It takes some time for the human body to respond to vibration signals. In a sense, the human body responds to an average vibration amplitude. Because the net average of a vibration signal is zero, the root mean square (rms) amplitude is used to describe the "smoothed" vibration

FIGURE 1
TYPICAL NOISE LEVELS



amplitude. The root mean square of a signal is the square root of the average of the squared amplitude of the signal. The average is typically calculated over a one-second period. The PPV and rms velocity are normally described in inches per second in the USA and meters per second in the rest of the world. Although it is not universally accepted, decibel notation is in common use for vibration. Decibel notation acts to compress the range of numbers required to describe vibration. Although not a universally accepted notation, the abbreviation "VdB" is used in this document for vibration decibels to reduce the potential for confusion with sound decibels.

Human Response to Ground-Borne Vibration

In contrast to airborne noise, ground-borne vibration is not a phenomenon that most people experience every day. The background vibration velocity level in residential areas is usually 50 VdB or lower, well below the threshold of perception for humans which is around 65 VdB. Most perceptible indoor vibration is caused by sources within buildings such as operation of mechanical equipment, movement of people or slamming of doors. Typical outdoor sources of perceptible ground-borne vibration are construction equipment, steel-wheeled trains, and traffic on rough roads. If the roadway is smooth, the vibration from traffic is rarely perceptible.

Figure 2 illustrates common vibration sources and the human and structural response to ground-borne vibration. In terms of human exposure, the range of primary interest is from approximately 50 VdB to 100 VdB. As depicted, the approximate threshold for human perception is 65 VdB. For "infrequent events" (i.e., fewer than 70 train events/day), the threshold for human annoyance within residential structures is approximately 80 VdB. Minor structural damage, such as cracks in plaster, can begin to occur at levels of approximately 100 VdB within fragile and historic buildings.

PROJECT AREA SETTING

The project site is bounded by the elevated portion of University Avenue on the north, Addison Street on the south, Third Street on the west, and the Union Pacific Railroad tracks on the east. Interstate 80 (I-80) is located approximately two-tenths of a mile west of the project site. The project site is located on the southwest corner of the intersection of Addison and Third Street. The area surrounding the project site includes a variety of different land uses from heavy manufacturing to boutique retailers along Fourth Street

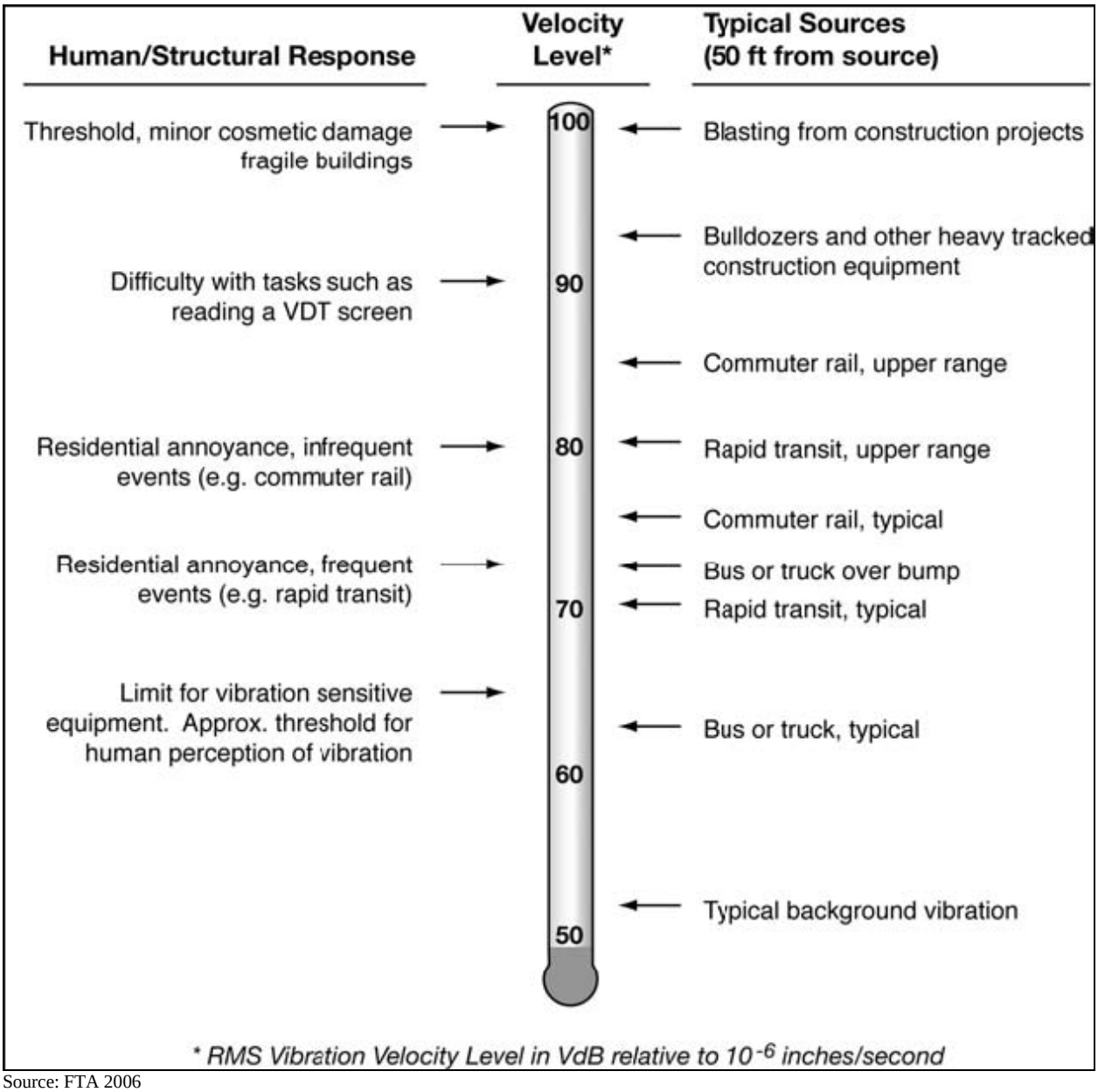
Although other noise sources occur in the vicinity, vehicular traffic on I-80 and rail activity are the primary sources of noise at and around the project site. Interstate 80 is heavily traveled and operates near its current capacity during peak traffic periods. Amtrak trains currently pass by the project site approximately 35 times per weekday and freight trains pass by the site on an irregular basis. To document existing ambient noise and groundborne vibration levels at the project site, both noise and vibration surveys were conducted at the project site by Charles M. Salter and Associates.

Ambient Noise Surveys

On-site acoustical measurements were conducted on August 26. 2005 through August 29. 2005. Two 96-hour meters were deployed to measure the noise over an extended period of time to compare the noise levels on weekdays with the noise levels on weekends. Meter 1 was located on the corner of Third Street and Addison Street at the setback of the proposed project eastern façade facing the railroad tracks. This façade is located approximately 50 feet from the centerline of the near track and 96 feet to the centerline of the far track. Meter 2 was located on Addison Street approximately 110 feet west of the centerline of the near railroad tracks. This meter represents the noise exposure along the southern project façade perpendicular to the railroad tracks. Over the four-day measurement, the Day/Night Average Sound Level (Ldn) was consistently 86 dBA at Meter 1. The Day/Night Average Sound Level at Meter 2 varied from 80 dBA to 83 dBA Ldn. In addition to the two continuous acoustical measurements conducted by Charles Salter and Associates, one 15-minute spot was conducted simultaneously to estimate the noise at the west façade facing away from the railroad tracks. The meter was located 18 feet above the ground, 5 feet

behind the building away from the tracks. The estimated DNL at this location would be two decibels lower than Meter 2 or Ldn 78 to 81 dBA (CSA 2005).

FIGURE 2
TYPICAL GROUND-BORNE VIBRATION LEVELS



Source: FTA 2006

Ambient Ground-Borne Vibration Surveys

On-site acoustical measurements were conducted on August 29, 2005 to quantify the ground-borne vibration at the project setback generated by Amtrak commuter train and freight train activity along the railroad. Two locations were selected at 50 feet and 100 feet from the centerline of the tracks to monitor vibration. The 50-foot measurement represents the vibration experienced at the proposed building setback. The 100-foot measurement simultaneously measured the decay of vibration when the distance was doubled (CSA 2005).

Based on the measurements conducted, Amtrak trains generate ground-borne vibration levels of 78 VdB at 50 feet from the centerline. At 100 feet from the centerline of tracks, this same event measured 70 VdB. Freight trains generate ground-borne vibration levels of 82 VdB at 50 feet from the centerline of the tracks. At 100 feet from the centerline of tracks, this same event measured 74 VdB (CSA 2005).

REGULATORY FRAMEWORK

State of California

The State of California regulates vehicular and freeway noise affecting classrooms, sets standards for sound transmission and occupational noise control, and identifies noise insulation standards and airport noise/land-use compatibility criteria. The *State of California General Plan Guidelines* (State of California 1998), published by the Governor's Office of Planning and Research (OPR), also provides guidance for the acceptability of projects within specific CNEL contours.

Title 24 of the California Code of Regulations establishes standards governing interior noise levels that apply to all new multifamily residential units (hotels, motels, apartments, condominiums, and other attached dwellings) in California. These standards require that acoustical studies be performed prior to construction at residential building locations where the existing exterior L_{dn} exceeds 60 dBA. Such acoustical studies are required to establish mitigation measures that will limit maximum L_{dn} noise levels to 45 dBA in any habitable room. Title 24 also specifies minimum values for the sound insulation afforded by interior partitions separating different dwelling units from each other and from interior common space.

City of Berkeley General Plan

The Environmental Management Element of the *Berkeley General Plan* establishes policies for the protection of the community from excessive noise. The City's General Plan provides guidance for the acceptability of projects within specific CNEL contours. The City's noise policies are established for guidance of efforts to implement the Berkeley General Plan Noise Element.

The City of Berkeley evaluates new project developments using the land use compatibility chart in the City's General Plan. For multi-family residential projects, noise levels, no more than 65 dBA L_{dn}/CNEL are considered "normally acceptable" without any special noise insulation requirements. Noise levels between 65 and 70 dBA L_{dn}/CNEL are considered "conditionally acceptable" and are subject to a noise study showing how noise can be reduced to normally acceptable levels with acceptable mitigation. Projects exposed to noise levels between 70 dB to 75 dBA L_{dn}/CNEL are considered "normally unacceptable" and require a detailed analysis of noise reduction requirements, which need to be included in the design. Noise levels above 75 dBA L_{dn}/CNEL are considered clearly unacceptable and new construction should generally not be undertaken. If new construction does proceed, a detailed analysis of noise reduction requirements is required and the noise insulation features included in the design (CSA 2005).

The City of Berkeley has also adopted a Noise Ordinance (Chapter 13.40 of the Berkeley Municipal Code), which identifies noise standards for various sources, specific noise restrictions, exemptions, and variances for sources of noise within the city. The Noise Ordinance applies to all noise sources with the exception of any vehicle that is operated upon any public highway, street or right-of-way, or to the operation of any off-highway vehicle, to the extent that it is regulated in the State Vehicle Code, and all other sources of noise

that are specifically exempted. The City's exterior noise ordinance standards are identified in **Table 3**. Interior noise standards for residential land uses are summarized in **Table 4**.

TABLE 3
EXTERIOR NOISE LIMITS – MULTI-FAMILY RESIDENTIAL DWELLINGS

Zone	Time Period	Noise Level (dBA)
R-1, R-2	7:00 a.m. - 10:00 p.m. 10:00 p.m. - 7:00 a.m.	55 45
R-3 and above	7:00 a.m. - 10:00 p.m. 10:00 p.m. - 7:00 a.m.	60 55
Commercial	7:00 a.m. - 10:00 p.m. 10:00 p.m. - 7:00 a.m.	65 60
Industry	Anytime	70

Levels not to be exceeded more than thirty minutes any hour.

TABLE 4
INTERIOR NOISE LIMITS - RESIDENTIAL

Zone	Time Period	Noise Level (dBA)
All	7:00 a.m. - 10:00 p.m. 10:00 p.m. - 7:00 a.m.	45 40

a. The noise standards are not to exceed specified levels for a cumulative period of more than five minutes in any hour; or
b. The noise standard plus five dB for a cumulative period of more than one minute in any hour; or
c. The noise standard plus ten dB or the maximum measured ambient, for any period of time.
If the measured ambient noise level differs from that permissible within any of the noise limit categories above, the allowable noise exposure standard shall be the ambient noise level. Correction for character of sound. In the event the alleged offensive noise, as judged by the noise control office(r) or his agent, contains a steady, pure tone such as a whine, screech, or hum, or is an impulsive sound such as hammering or riveting, or contains music or speech the standard limits shall be reduced by five dB.
Source: City of Berkeley Municipal Code (Ord. 5500-NS § 1 (part), 1982)

IMPACTS AND MITIGATION MEASURES

STANDARDS OF SIGNIFICANCE

The impact analysis provided below is based on the application of the following State CEQA Guidelines Appendix G thresholds of significance:

a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance or of applicable standards of other agencies?

b) Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?

c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?

d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?

e) For a project located within an airport land use plan area or, where such a plan has not been adopted, within two miles of a public airport or a public use airport, would the project expose people residing or working in the project area to excessive noise levels?

f) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?

The *CEQA Guidelines* do not define the levels at which temporary and permanent increases in ambient noise are considered "substantial." As discussed previously in this section, a noise level increase of 3 dBA is barely perceptible to most people, a 5 dBA increase is readily noticeable, and a difference of 10 dBA would be perceived as a doubling of loudness. Based on this information, temporary increases in noise levels of 10 dBA or more at sensitive uses due to construction activities would be substantial and therefore, significant. The following thresholds would apply to permanent increases in noise due to the operational characteristics of the proposed project:

- Less than 3 dBA: not significant.
- Between 3 dBA and 5 dBA: not significant if noise levels remain below the City of Berkeley Noise Ordinance standards; significant if the noise increase would meet or exceed the City of Berkeley Noise Ordinance standards.
- 5 dBA or greater: significant.

The *CEQA Guidelines* also do not define the levels at which ground-borne vibration levels would be considered significant. For this reason the Federal Transit Administration's recommended ground-borne vibration thresholds, as identified in the FTA's *Transit Noise and Vibration Impact Assessment* guidelines (2006), shall be used. According to the Noise and Vibration Assessment prepared for this project by Charles M. Salter Associates, train traffic along the UPRR would be considered "infrequent" (i.e., fewer than 70 events/day) (CSA 2005). In accordance with FTA-recommended criteria for the analysis of ground-borne vibration associated with "infrequent" events, predicted ground-borne vibration levels in excess of 80 VdB at proposed residences would be considered to have a significant impact (FTA 2006).

METHODOLOGY

Noise and vibration impacts attributable to the proposed project were evaluated based on an acoustic and vibration impact assessment prepared for the proposed project by Charles M. Salter Associates in November 2005. Predicted noise and ground-borne vibration levels were evaluated based on ambient

measurement data obtained at the project site. Noise measurements were conducted on August 26, 2005 through August 25, 2005. Ground vibration levels were measured on August 29, 2005. Specific noise sources evaluated in this section include vehicular traffic on area roadways and train traffic occurring along the adjacent Union Pacific Railroad (UPRR).

IMPACTS AND MITIGATION MEASURES

Short-term Exposure of Sensitive Receptors to Construction Noise

Impact 1 Short-term construction-generated noise levels could result in a substantial increase in ambient noise levels at nearby noise-sensitive land uses. This impact is considered ***potentially significant subject to mitigation*.**

Construction noise in any one particular area would be temporary and would include noise from activities such as excavations, site preparation, truck hauling of material, pouring of concrete, and use of power hand tools. Construction noise typically occurs intermittently and varies depending on the nature of the construction activities being performed. Noise generated by construction equipment, including excavation equipment, material handlers, and portable generators, can reach high levels for brief periods. The United States Environmental Protection Agency (US EPA) has found that the average noise levels associated with construction activities typically range from approximately 76 dBA to 84 dBA L_{eq}, with intermittent individual equipment noise levels ranging from approximately 74 dBA to more than 88 dBA for brief periods. **Table 5** lists typical uncontrolled noise levels generated by individual pieces of construction equipment at a distance of 50 feet.

Noise from localized point sources (such as construction sites) typically decreases by approximately 6 dBA with each doubling of distance from source to receptor. Given this noise attenuation rate and based on the noise levels presented in **Table 5**, outdoor receptors within approximately 800 feet of construction sites could experience average-hourly noise levels of greater than 60 dBA when on-site construction-related noise levels exceed approximately 85 dBA at the boundary of the construction site.

When noise levels generated by construction operations are being evaluated, activities occurring during the more noise-sensitive nighttime hours (i.e., 10 p.m. to 7 a.m.) are of increased concern. Because exterior ambient noise levels typically decrease during the nighttime hours as community activities (e.g., commercial activities, vehicle traffic) decrease, construction activities performed during these more noise-sensitive periods of the day can result in increased annoyance and potential sleep disruption for occupants of nearby residential dwellings. The proposed project does not include restrictions on the hours during which construction activities would occur. As a result, construction activities occurring during the more noise-sensitive nighttime hours could result in increased levels of annoyance and potential sleep disruption for occupants of nearby noise-sensitive land uses. As a result, noise-generating construction activities would be considered to have a **significant** short-term impact.

TABLE 5
TYPICAL CONSTRUCTION EQUIPMENT NOISE LEVELS

Equipment	Typical Noise Level (dBA Lmax) 50 feet from Source
Backhoe	80
Compactor	82
Dozer	85
Grader	85
Loader	85
Truck	88
Air Compressor	81
Concrete Mixer	85
Concrete Pump	82
Concrete Vibrator	76
Crane, Mobile	83
Generator	81
Impact Wrench	85
Jack Hammer	88
Paver	89
Pneumatic Tool	85
Pump	76
Roller	74
Saw	76
Sources: Federal Transit Administration 2006	

Mitigation Measures

MM 1 The following measures shall be implemented to reduce construction-generated noise levels:

- Construction activities (excluding activities that would result in a safety concern to the public or construction workers) shall be limited to between the hours of 7:00 a.m. and 10:00 p.m.

- Prior to issuance of a building permit, the applicant shall provide the City with the name and telephone number of the individual empowered to manage construction noise from the project. The individual's name, telephone number, and responsibility for noise management shall be posted at the project site for the duration of construction in a location easily visible to the public. The individual shall record all noise complaints received and actions taken in response, and submit this record to the project planner upon request.

- Construction equipment shall be properly maintained and equipped with noise-reduction intake and exhaust mufflers and engine shrouds, in accordance with manufacturers' recommendations. Equipment engine shrouds shall be closed during equipment operation.

- All equipment shall be turned off if not in use for more than 10 minutes.

- An information sign shall be posted at the entrance to each construction site that identifies the permitted construction hours and provides a telephone number to call and receive information about the construction project or to report complaints regarding excessive noise levels.

  Timing/Implementation: *Prior to and during construction.*

  Enforcement/Monitoring: *City of Berkeley.*

Significance After Mitigation

Implementation of the above mitigation measures would limit construction activities to the less noise-sensitive periods of the day. Use of mufflers would reduce individual equipment noise levels by approximately 10 dBA. With implementation of the above mitigation measures, this impact would be considered **less than significant**.

Short-term Exposure of Sensitive Receptors to Ground-borne Vibration

Impact 2 Exposure to construction-generated ground-borne vibration levels would not exceed applicable standards. This impact would be ***less than significant.***

Ground vibration spreads through the ground and diminishes in strength with distance. The effects of ground vibration can vary from no perceptible effects at the lowest levels, low rumbling sounds and detectable vibrations at moderate levels, and slight damage to nearby structures at the highest levels. At the highest levels of vibration, damage to structures is primarily architectural (e.g., loosening and cracking of plaster or stucco coatings) and rarely result in structural damage. For most structures, a peak particle velocity (ppv) threshold of 0.5 inches per second (i.e., approximately 102 VdB) is sufficient to avoid structure damage, with the exception of fragile historic structures or ruins. At the request of the U.S. Environmental Protection Agency the Committee of Hearing, Bio-Acoustics, and Bio-Mechanics (CHABA) have developed guidelines for safe vibration limits for ruins and ancient and/or historic buildings. For fragile structures, the CHABA recommends a maximum limit of 0.25 inches per second ppv. For the protection of fragile, historic, and residential structures, the California Department of Transportation recommends a more conservative threshold of 0.2 inches per second ppv, or roughly 94 VdB. This same threshold would represent the level at which vibrations would be potentially annoying to people in buildings (FTA 2006, Caltrans 2002).

Groundborne vibration levels associated with construction equipment are summarized in **Table 6**. Construction activities associated with the proposed development would likely require the use of various tractors, trucks, and jackhammers. Based on the vibration levels presented in **Table 6**, ground vibration generated by construction equipment would be less than 0.09 inches per second ppv (87 VdB) at 25 feet. Therefore, because ground vibration levels diminish in strength with increased distance from the source, predicted vibration levels at the nearest offsite structures would not be anticipated to exceed even the most conservative threshold of 0.2 inches per second ppv (i.e., approximately 94 VdB). Short-term groundborne vibration impacts would be considered **less than significant**.

TABLE 6
REPRESENTATIVE VIBRATION LEVELS FOR CONSTRUCTION EQUIPMENT

Equipment	Peak Particle Velocity at 25 Feet (in/sec ppv)	Approximate VdB at 25 feet
Large Tractors	0.089	87
Large Tractors	0.089	87
Loaded Trucks	0.076	86
Jackhammer	0.035	79
Small Tractors	0.003	58

Source: Caltrans 2002, FTA 2006

Increases in Ambient Noise Levels

Impact 3 Implementation of the proposed project would not result in substantial increases in ambient noise levels. This would be a ***less than significant*** impact**.**

Implementation of the proposed land uses would result in increased traffic volumes on some area roadways that could result in increases in traffic noise levels. Implementation of the proposed project is anticipated to generate approximately 700 additional vehicle trips per day on nearby roadways. Existing traffic volumes along area roadways typically average several thousand vehicles per day. Based on a comparison of baseline and baseline plus project traffic volumes, implementation of the proposed project would increase traffic volumes on area roadways by approximately 10 percent, or less.

Based on predicted traffic volumes obtained from the traffic analysis prepared for this project, implementation of the proposed project would result in predicted traffic noise level increases of less than 0.5 dBA along primarily affected roadways, including Addison Street, and 4th Street. Typically, a doubling of vehicle traffic is required before a noticeable increase (i.e., 3 dBA or greater) in roadway traffic noise levels would be anticipated to occur (FHWA 1971). Because the proposed project would not result in a doubling of vehicle traffic on area roadways, noticeable increases in traffic noise levels would not be anticipated to occur. As a result, this impact would is considered ***less than significant***.

Exposure of Sensitive Receptors to Excessive Noise Levels

Impact 4 Predicted noise levels at proposed residential land uses could exceed applicable City and State noise standards. As a result, this impact would be considered ***potentially significant, subject to mitigation*****.**

Future noise levels at the project site would continue to be dominated by vehicular traffic on I-80 and rail activity. As discussed previously, exterior-to-interior reduction of newer residential units is generally 17 to 30 dBA, and the existing noise levels at the site are range from around 77 dBA Ldn to 83 dBA Ldn. With this assumption, noise levels within the interior of project residential units would exceed the 45 dBA Ldn interior noise standard for multi-family uses. According to the Noise and Vibration Assessment prepared for this project by Charles M. Salter Associates, Inc., it would be necessary for the exterior façade of some of the units to be sound-rated in order to meet the 45 dBA Ldn interior noise standard (CSA 2005).

Based on the acoustical analysis prepared for this project by Charles M. Salter Associates, the east façade of the building facing the train tracks would be subjected to noise levels of 86 dBA Ldn during both the weekday and weekend periods. The west façade would be completed shielded from activity along the train tracks. The noise source affecting the west façade would be traffic along I-80, which is located approximately 750 feet west of the project. Predicted traffic noise levels were calculated by Charles M. Salter Associates, Inc. using the FHWA traffic noise prediction model and traffic volumes provided by the California Department of Transportation. Based on the modeling conducted, the predicted noise level at the western façade of the building would be 78 dBA Ldn (CSA 2005).

The acoustical analysis prepared by Charles M. Salter Associates included various recommendations to reduce exterior and interior noise levels. The sound rated window and wall requirements recommended by Charles M. Salter Associates to achieve the City and State's indoor noise standard are summarized in **Table 7**. It is important to note that these requirements are based on various building construction and design assumptions and actual requirements may vary, depending on final building design and construction techniques (CSA 2005).

TABLE 7
RECOMMENDED NOISE REDUCTION MEASURES[1]

Location	Window STC	Wall Construction
Interior Courtyard[2]	36	Single stud with 3-coat stucco exterior finish
West Façade	38	Single stud with 3-coat stucco exterior finish
North and South Facades	43	Staggered Stud with 3-coat stucco exterior finish
East Façade[3]	46	Double stud with 3-coat stucco exterior finish
Northwest Corner Units	43	
Southwest Corner Units	43	
Northeast Corner Units	46	
Southeast Corner Units	46	

1. Assumes: (1) all exterior wall cavities are filled with batt insulation and that two layers of gypsum board are provided on the interior face of the wall, (2) windows and exterior doors would comprise up to 25 percent of the exterior area in all rooms, (3) corner units facing the tracks would only be allowed a single window facing or perpendicular to the tracks.
2. Planting of shrubbery or specifying an acoustical plaster such as Pyrok on the courtyard walls to acoustically soften exterior noise levels within the courtyard is recommended.
3. If possible, bedrooms should not be located directly along the eastern façade.

Source: Charles M. Salter Associates, Inc. 2005

The proposed project also includes an exterior courtyard at the center of the building. Although plans have not been finalized, it is anticipated that the courtyard would be at the podium level above the garage. This courtyard would be shielded on all sides by the surrounding dwelling units that extend at least 30 feet above the courtyard level. The estimated noise reduction provided by the dwelling units could be up to 20 dB. Therefore the estimated noise level in this courtyard would be 66 dB Ldn. This noise level is considered "conditionally acceptable" by the City's Noise Element (CSA 2005).

Based on the acoustical analysis prepared for this project, predicted exterior noise levels would exceed the City's noise standard of 65 dBA Ldn. For this reason, this impact would be considered ***potentially significant, subject to mitigation***.

Mitigation Measures

The following mitigation measures shall be implemented:

a) Proposed multi-family residential dwellings shall comply with California Code Title 24 noise standards. An acoustical analysis shall be prepared to ensure that interior noise levels of multi-family residential dwellings would not exceed 45 dBA CNEL.

b) Residential dwelling units shall be equipped with mechanical heating, ventilation, and air conditioning (HVAC) systems so that windows can remain closed.

c) A disclosure statement shall be provided to perspective buyers to notify of vibration and noise from the train activity.

Timing/Implementation: *Implemented prior to issuance of building permits.*

Enforcement/Monitoring: *City of Berkeley.*

Significance After Mitigation

Implementation of the above mitigation measures would require subsequent noise analyses for proposed multi-family dwelling units, in accordance with Title 24 of the California Code, and that proposed residential dwelling units be equipped with central HVAC systems so windows can remain closed to maintain acceptable interior noise levels during inclement weather conditions. With mitigation, predicted interior noise levels of proposed dwelling units would be reduced to within "normally acceptable" levels (i.e., 45 dBA Ldn) and exterior noise levels within outdoor activity areas would be within "conditionally acceptable" levels. However, noise levels would still be perceived by occupants of proposed dwelling units, particularly those units located nearest the tracks. As a result, disclosure statements would be required to ensure that prospective tenants are made fully aware of potential impacts. With mitigation, this impact would be considered ***less than significant***.

Long-term Exposure of Sensitive Receptors to Ground-borne Vibration

Impact 5 Occupants of proposed dwelling units could be exposed to ground-borne vibration levels in excess of applicable standards. This impact would be ***potentially significant, subject to mitigation.***

Long-term operational activities associated with the proposed project would not involve the use of any equipment or processes that would result in potentially significant levels of ground vibration. Exposure to ground-borne vibration would be primarily associated with trains traveling on the adjacent UPRR. According to the *West Berkeley Circulation Master Plan, Draft Existing Conditions Report* (2007), approximately 70 trains per day currently travel along the UPRR, increasing to more than 100 trains/day by 2030 (WBCMP 2007). According to the FTA guidelines, the suggested maximum vibration criterion for "Frequent Events" (more than 70 train events per day) is 72 VdB at residential land uses.

Ground-borne vibration levels were measured by Charles M. Salter Associates at the nearest façade of the proposed building setback; as well as, at 100 feet from the centerline of the tracks. Measurements were conducted on August 29, 2005 over a period of 8 hours. Based on the measurements conducted, Amtrak trains generate ground-borne vibration levels of 78 VdB and 70 VdB at 50 and 100 feet from the track centerline, respectively. Freight trains generate ground-borne vibration levels of 82 VdB and 74 VdB at 50 and 100 feet from the centerline, respectively. .Because measured ground-borne vibration levels would exceed the FTA-recommended threshold of 72 VdB at onsite building setback locations, this impact is considered ***significant and subject to mitigation***.

Mitigation Measures

The following mitigation measures shall be implemented (CSA 2005):

a) Proposed multi-family residential dwellings shall comply with Federal Transit Administration's (FTA) recommended ground-borne vibration criteria. For "Frequent Events", defined by the FTA as more than 70 train events, vibration levels should not exceed 72 VdB at residential uses. Methods may include, but are not limited to, the use of deeper joists, shorter floor spans, and lally columns.

b) A disclosure statement shall be provided to perspective buyers to notify of vibration and noise from the train activity.

Timing/Implementation: *Implemented prior to issuance of building permits.*

Enforcement/Monitoring: *City of Berkeley.*

Significance After Mitigation

Implementation of the above mitigation measures would require engineering of proposed structures to achieve an acceptable level of 72 VdB at proposed residential structures. However, vibration would still be perceived by the residents in the units facing the tracks and possibly in units further away. As a result, disclosure statements would be required to ensure that prospective tenants are made fully aware of potential impacts. However, predicted ground-borne vibration levels would not exceed commonly applied criterion. With mitigation, this impact would be considered ***less than significant***.

CUMULATIVE IMPACTS AND MITIGATION MEASURES

Cumulative Traffic Noise

Impact 6 Implementation of the proposed project would not contribute to significant increases in future cumulative traffic noise levels. This is a ***less than significant*** impact.

As discussed in **Impact 3**, implementation of the proposed project would not result in a significant increase in traffic noise levels along area roadways. In addition, implementation of the proposed project would not include installation or operation of any major stationary sources of noise. Cumulative noise impacts would occur primarily as a result of increased traffic on local roadways due to the proposed project and other projects within the study area. However, as previously discussed, implementation of the proposed project would not result in a doubling of vehicle traffic on area roadways and, therefore, would not result in a noticeable increase (i.e., 3 dB or greater) in ambient noise levels. As development and associated traffic volumes increase in future years, the project's contribution to overall traffic noise levels are anticipated to decrease further. Because the proposed project would not result in a significant contribution to traffic noise levels, this impact would be considered ***less than significant***.

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[DRAFT]

10 November 2005

Chris Hudson
Hudson McDonald LLC
2140 Shattuck Avenue, Suite 302
Berkeley, CA 94704
510.548.1066

Subject: **Third Street Condominiums, Berkeley CA**
CSA Project No. 05-0407

Dear Chris:

We have completed our measurements for the subject project. This letter presents our findings and preliminary design recommendations to meet the City of Berkeley's Noise Element requirements. We understand that project will consist of one five-story building located between Interstate 80 and the Union Pacific Railroad, which are the two major sources of noise affecting the project. In summary, the City and State Indoor Noise Standard can be achieved by using sound-rated windows and exterior doors.

MEASUREMENTS

Noise – On 26 August 2005 through 29 August 2005, we conducted on-site acoustical measurements to quantify the existing noise environment at the project site. Two 96-hour meters were deployed to measure the noise over an extended period of time to compare the noise levels on weekdays with the noise levels on weekends. Meter 1 was located on the corner of Third Street and Addison Street at the setback of the proposed project eastern façade facing the railroad tracks. This façade is located approximately 50 feet from the centerline of the near track and 96 feet to the centerline of the far track.

Meter 2 was located on Addison Street approximately 110 feet west of the centerline of the near railroad tracks. This meter represents the noise exposure along the southern project façade perpendicular to the railroad tracks.

Over the four-day measurement, the Day/Night Average Sound Level (L_{dn}) was consistently 86 dBA at Meter 1. The DNL at Meter 2 varied from 80 dBA to 83 dBA.

In addition to these two continuous acoustical measurements, one 15-minute spot was conducted simultaneously to estimate the noise at the west façade facing away from the railroad tracks. The meter was located 18 feet above the ground, 5 feet behind the building away from the tracks. The estimated DNL at this location would be two decibels lower than Meter 2 or L_{dn} 78 to 81 dBA.

Vibration – On 29 August 2005, we conducted vibration measurements to quantify the ground-borne vibration at the project setback generated by Amtrak commuter train and freight train activity along the railroad. Two locations were selected at 50 feet and 100 feet from the centerline of the tracks to monitor vibration. The 50-foot measurement represents the vibration experienced at the proposed building setback. The 100-foot measurement simultaneously measured the decay of vibration when the distance was doubled.

Amtrak trains generate ground-borne vibration levels of 78 VdB at 50 feet from the centerline. At 100 feet from the centerline of tracks, this same event measured 70 VdB.

Freight trains generate ground-borne vibration levels of 82 VdB at 50 feet from the centerline of the tracks. At 100 feet from the centerline of tracks, this same event measured 74 VdB.

CRITERIA

Applicable criteria are contained in the Noise Element of the Berkeley General Plan, the California Building Code (CBC) and the Federal Transportation Association (FTA)

Noise Element – Policy 6.00 – "Establish standards for interior and exterior noise levels in accordance with the California Administrative Code (*now called the California Building Code*) and incorporate these standards into appropriate local ordinances".

Noise Element – Policy 6.01 – The City of Berkeley evaluates new project developments using the land use compatibility chart in the City's Noise Element. For multi-family residential projects, noise levels, no more than L_{dn} 65 dB, are considered "normally acceptable" without any special noise insulation requirements. Noise levels between L_{dn} 65 dB to 70 dB are considered "conditionally acceptable" and are subject to a noise study showing how noise can be reduced to normally acceptable levels with acceptable mitigation. Projects exposed to noise levels between L_{dn} 70 dB to 75 dB are considered "normally unacceptable" and require a detailed analysis of noise reduction requirements, which need to be included in the design. Noise levels above L_{dn} 75 dB are considered clearly unacceptable and new construction should generally not be undertaken. If new construction does proceed, a detailed analysis of noise reduction requirements is required and the noise insulation features included in the design.

California Building Code – Section 1208A states that the maximum acceptable interior noise level due to outdoor sources shall not exceed L_{dn} 45 dB in all habitable rooms for new multi-family housing developments.

Federal Transportation Association (FTA) Guidance Manual for Transit Noise and Vibration Impact Assessment – The FTA suggests that the ground-borne vibration velocity should not exceed 80 dB for infrequent events (fewer than 70 trains per day) and 72 dB for frequent events (greater more than 70 per day) to minimize potential vibration impacts.

ANALYSIS

Noise – The facades with exposure to the train tracks are subjected to noise levels in excess of L_{dn} 80 dB. On a weekday, there are 39 scheduled Amtrak trains that travel in both directions. In addition to these 39 trains, we measured on average an additional 14 freight trains. Of all train events, 13 events occurred during nighttime hours (between 10:00 p.m. to 7:00 a.m.) The resulting L_{dn} was 86 dB at the east façade facing the tracks. On the weekend, we measured 42 total trains (33 scheduled Amtrak and 9 freight). During the nighttime hours, 12 trains passed by the project site. The measured weekend L_{dn} at the east façade was also 86 dB.

The west façade would be completed shielded from activity along the train tracks. The noise source affecting this façade would be traffic along I-80 located approximately 750 feet west of the project. Using the FHWA traffic noise prediction model and traffic volumes provided by Caltrans, the L_{dn} from traffic noise is calculated to be 78 dB. This noise level was confirmed by our measurements in the field.

The project is exposed to an L_{dn} in excess of 75 dB. The City of Berkeley generally discourages new project development unless acoustical mitigation can be provided to meet the indoor noise standards. The following discussion describes these measures.

We understand that the designs of the homes have not yet been finalized. Therefore, for this analysis we assumed windows and exterior doors would comprise up to 25 percent of the exterior area in all rooms. Corner units facing the tracks would only be allowed a single window facing or perpendicular to the tracks.

Given these assumptions, Table 1 presents the sound rated window and wall requirements to achieve the City and State's indoor noise standard. For all exterior wall constructions, we have assumed that the stud cavities are filled with batt insulation and that two layers of gypsum board are provided on the interior face of the wall. Figure 1 graphically shows the locations of these windows.

Table 1: Required Window Sound Ratings

Location	Window STC	Wall Construction
Interior Courtyard	36	Single stud with 3-coat stucco exterior finish
West Façade	38	Single stud with 3-coat stucco exterior finish
North and South Facades	43	Staggered Stud with 3-coat stucco exterior finish
East Façade	46	Double stud with 3-coat stucco exterior finish
Northwest Corner Units	43	
Southwest Corner Units	43	
Northeast Corner Units	46	
Southeast Corner Units	46	

Currently the highest conventional sound-rated window available is STC 46 by Milgard. Therefore, the mitigation measures along the east façade have reached the technological limitations of noise reduction using practical construction methods. Attaining greater noise isolation from the window/wall assembly would require special construction

techniques and more custom products. If possible, bedrooms should not be located directly along the eastern façade.

The proposed project also includes an exterior courtyard at the center of the building. Although plans have not been finalized, we would expect the courtyard to be at the podium level above the garage. This courtyard would be shielded on all sides by the surrounding dwelling units that extend at least 30 feet above the courtyard level. The estimated noise reduction provided by the dwelling units could be up to 20 dB. Therefore the estimated noise level in this courtyard could be L_{dn} 66 dB. This noise level is considered "conditionally acceptable" by the City's Noise Element.

To further improve the noise environment in the courtyard, we recommend planting shrubbery or specifiying an acoustical plaster such as Pyrok on the courtyard walls to acoustically soften the courtyard. These treatments could help reduce noise build up from trains as well as residential noise such as people talking or children playing in the courtyard.

Vibration – The project site is exposed to infrequent train activity (less than 70 train events per day). According to the FTA guidelines, the suggested vibration criterion for infrequent events is a maximum vibration level of 80 VdB.

During our measurements, we measured both Amtrak commuter trains and freight train activity at the proposed façade setback and at 100 feet from the centerline of the tracks. All measured Amtrak trains were below the 80 VdB criterion and one freight train exceeded the FTA goal of 80 VdB at the façade setback. These measurements were conducted over the course of 8 hours. At 100 feet, all train vibration levels are below the suggested goal of 80 VdB.

It is possible that more freight trains could exceed the 80 VdB criterion at the facade setback. Therefore, mitigation is recommended for the first row of units facing the train tracks. The structural engineer should design the building in accordance to the method set forth by the Canadian National Building Code to minimize vibration amplification at the upper floors. This typically requires deeper joists and shorter floor spans. If necessary, a lally column may be installed at the midpoint of longer floor spans (i.e. at garages) to "split" the joist length. Also, the resonant frequency of the floor should exceed the controlling vibration frequency in the ground due to the train. For this site, the controlling frequency is 25 Hz. We are available to discuss this with your structural engineer.

While these recommendations help minimize vibration amplification, vibration will still be perceived by the residents in the units facing the tracks and possibly in units further away. We recommend that a full disclosure statement be included to notify perspective buyers of vibration and noise from the train activity.

This completes my comments on the subject matter. Please call me with any questions.

Sincerely yours,

CHARLES M. SALTER ASSOCIATES, INC.

Eric A. Yee
Principal Consultant

CMS/dg
P:\CSA_Projects\y2005\05-0407_MDT_Third Street Condos\19sept05_EAY_3rd st report.doc

C h a r l e s M S a l t e r A s s o c i a t e s I n c

Consultants in Acoustics & Audio/Visual System Design

130 Sutter Street, 5th Floor
San Francisco, CA 94104
Tel 415 397 0442
Fax 415 397 0454

FAX Transmittal

Date: 25 July 2008 Pages (including cover): 6

Name	*Company*	*FAX #*
Chris Hudson	**Hudson McDonald LLC**	510.548.1066

From: Eric A. Yee

Subject: **Third Street Condominiums, Berkeley CA**
CSA Project No. 05-0407

Chris,

Please review this draft report and comment as necessary.

BERKELEY MIXED USE STATION
BERKELEY, CALIFORNIA
ENVIRONMENTAL NOISE STUDY

14 July 2008

CSA Project No. 06-0624

Prepared for:

HUDSON MCDONALD LLC
Chris Hudson
2140 Shattuck Avenue, Suite 302
Berkeley, CA 94704

Prepared by:

CHARLES M. SALTER ASSOCIATES, INC.
Eric A. Yee, Principal Consultant
130 Sutter Street, Suite 500
San Francisco, CA 94104
Phone: (415) 397-0442

INTRODUCTION

This report summarizes our environmental noise study for the Berkeley Mixed-Use Station project in Berkeley, California. The purpose of the study is to quantify the existing and future noise environment at the proposed site, compare it with applicable City and State standards, and propose conceptual mitigation as necessary. For those readers who are not familiar with the fundamental concepts of environmental acoustics, please refer to Appendix A.

The site is located in the Berkeley Drayage area along the Pacific Union Railroad. The project site is currently a vacant lot; it is currently zoned for warehouse space. The developer intends to build a five-story building, which includes 94 apartments in four-stories above the first floor podium. In summary, noise levels would be reduced to City and State goals by incorporating sound rated windows and exterior facade construction into the building design. The windows must be closed to achieve a Day-Night Average Sound Level (DNL)[1] of 45 dB indoors. Therefore, the California Building Code also requires that a ventilation or air-conditioning system to provide a habitable interior environment.

APPLICABLE CRITERIA

Applicable criteria are contained in the Noise Element of the Berkeley General Plan, the California Building Code (CBC) and the Federal Transportation Association (FTA)

City of Berkeley General Plan

Noise Element – Policy 6.00 – "Establish standards for interior and exterior noise levels in accordance with the California Administrative Code (*now called the California Building Code*) and incorporate these standards into appropriate local ordinances".

Noise Element – Policy 6.01 – The City of Berkeley evaluates new project developments using the land use compatibility chart in the City's Noise Element.

For multi-family residential projects, noise levels, no more than DNL 65 dB, are considered "normally acceptable" without any special noise insulation requirements. Noise levels between DNL 65 dB to 70 dB are considered "conditionally acceptable" and are subject to a noise study showing how noise can be reduced to normally acceptable levels with acceptable mitigation. Projects exposed to noise levels between DNL 70 dB to 75 dB are considered "normally unacceptable" and require a detailed analysis of noise reduction requirements, which need to be included in the design. Noise levels above DNL 75 dB are considered clearly unacceptable and new construction should generally not be undertaken. If new construction does proceed, a detailed analysis of noise reduction requirements is required and the noise insulation features included in the design.

For commercial projects, noise levels, no more than DNL 70dB, are considered "normally acceptable" without any special noise insulation requirements. Noise levels between DNL 70 dB to 75 dB are considered "conditionally acceptable". Projects exposed to noise levels above DNL 75 dB are considered "normally unacceptable".

[1] Day-Night Average Sound Level (DNL)--A descriptor established by the U.S. Environmental Protection Agency to describe the average day-night level with a penalty applied to noise occurring during the nighttime hours (10 pm – 7 am) to account for the increased sensitivity of people during sleeping hours.

California Building Code (CBC)

The California Building Code[2] includes requirements for interior noise levels in habitable rooms of multi-family housing. In summary, the CBC requires an interior noise level no higher than a DNL of 45 dB. Projects exposed to an exterior DNL of 60 dB, or greater, require an acoustical analysis showing that the proposed design will limit interior levels to the prescribed allowable interior level. If windows must be closed to meet this requirement, then the "design for the structure must also specify a ventilation or air-conditioning system to provide a habitable interior environment."

Federal Transportation Association (FTA) Guidance Manual for Transit Noise and Vibration Impact Assessment

The FTA suggests that the ground-borne vibration velocity should not exceed 80 dB for infrequent events (fewer than 70 trains per day) and 72 dB for frequent events (greater more than 70 per day) to minimize potential vibration impacts.

NOISE ENVIRONMENT

The major sources of environmental noise at the site include train activity along the Union Pacific Railroad and to a lesser extent vehicular traffic along Interstate 80. To quantify the existing noise environment, we conducted two long-term 96-hour measurements and one short-term 15-minute "spot" measurement between the 26th and 29th of August, 2005. The short-term measurement was compared with the long-term measurements to determine how sound levels vary across the site.

The noise data gathered is based on current site conditions and rail volumes. The exact determination of future volumes is not possible because rail volumes vary day to day. PMC has provided a future rail volumes estimate to calculate the noise increase[3]. Given these volume projections, the on-site DNL is expected to increase by one decibel at all facades exposed to the rail line. To estimate future noise increase from Interstate 80, a 25 percent increase in volume has been assumed over the next ten years. This increase in volume would increase the DNL by one decibel. A summary of our measurements and future noise projections based on increased rail line activity may be found in Table 1.

Table 1: Existing Noise Levels

Location	Existing DNL	Future DNL
East Façade facing The Union Pacific Railroad	86	87
West Façade toward the Interstate 80 Freeway	76 to 82	77 to 83
North Façade toward elevated University Avenue	82 to 86	83 to 87
South Façade facing Addison	82 to 86	83 to 87

[2] California Code of Regulations, Title 24, Part 2, Appendix Chapter 1208A
[3] Correspondence 9 July 2008 – confirmed existing passenger traffic counts with Joel Cox (JCox@bart.gov) per Janet Palma's request; 34 Day Freight, 8 Night Freight, 40 Day Passenger, 4 Night Passenger.

Noise from train activity dominates the overall noise level at the entire project site. The project is setback approximately 50 feet from the centerline of the railroad tracks and 700 feet from the centerline of the freeway. Along the north and south facades, the noise level drops off up to four decibels depending on the distance to the train tracks.

ENVIRONMENTAL NOISE AND VIBRATION ANALYSES AND RECOMMENDATIONS

Noise

Based on our acoustical measurements and review of the project drawings, sound-rated windows would be required to achieve the State's DNL 45 dB indoor noise goal. Table 2 lists the Sound Transmission Class[4] (STC) window ratings by façade.

Table 2: Window STC Ratings[5]

Location	STC Rating
East façade overlooking the train tracks	46
West façade overlooking the freeway	38
West Facade interior courtyard	35
North and South façade within 150 feet of train tracks	46
North and South façade more than 150 feet from train tracks	45

Achieving an STC 46 rating with glazing assemblies can be accomplished using the following systems:

- St. Cloud and other window manufacturers produce various types of windows that have an STC 46 rating.
- Glass solarium with one set of glazing being laminated.
- Double row of structural glass block separated by 2-inches of air space.

All other sound rated windows are available commercially. The window STC rating should be of the entire assembly including the glass, frame, and sashes.

The exterior wall construction of the first floor units on the east facade should be two rows of 2x4 studs with two layers of gypsum board on the interior face and 3/4-inch thick plywood sheathing and cement plank on the exterior finish. Both cavities should be fully insulated. For the second through fifth floors, the east facade is a single loaded corridor that does not have any dwelling unit windows. The exterior facade wall at this location may be constructed as an insulated single stud wall with two layers of gypsum board on the interior face. The exterior facade may be built as standard three-coat stucco or any other exterior finish having a comparable weight.

[4] Sound Transmission Class (STC) — A single number used to compare walls, floor/ceiling assemblies, windows and doors for their sound insulating properties with respect to speech and small household appliance noise.

[5] STC ratings assume maximum window square footages on Sheet SK of the Schematic Design Package.

The exterior wall construction of walls facing the north and south facades should be two rows of 2x4 studs with three layers of gypsum board on the interior face and 1-inch thick plywood sheathing and cement plank on the exterior finish. Both cavities should be fully insulated.

The exterior wall construction along the west facade and the interior courtyard may be built as an insulated single stud with three-coat stucco or any other exterior finish having a comparable weight. The interior wall finish should consist of resilient channels and a single layer of gypsum board.

All residential units are exposed to a DNL greater than 60 dB. Since windows of these units must be closed to achieve an interior noise level of DNL 45 dB, the CBC requires the "design for the structure must also specify a ventilation or air-conditioning system to provide a habitable interior environment." This issue should be discussed with the mechanical engineer.

For retail and commercial spaces along the east façade, there is no State standard for maximum interior noise levels due to exterior noise sources. The City of Berkeley has Land Use Compatibility guidelines that suggest a noise level of DNL 86 dB would be considered "normally unacceptable" and require that an acoustical study be performed and noise measures be implemented into the design. The controlling noise sources are train horn blasts and train engine noise which occur through the day sporadically. Most of the time, outdoor noise levels are between 60 dB to 70 dB. These noise levels can be adequately reduced by standard dual glazed windows to provide a reasonably acceptable work environment. However, when trains pass by the project site, their noise could interfere with speech.

The acoustic measures to adequately reduce train noise could be very costly and may not be desired for activities that occur on average one minute per every hour. Instead, a disclosure statement should be provided by the owner to prospective commercial tenants stating that periodic train activity may generate noise levels that could briefly interfere with speech communication. The owner should also offer an optional acoustic upgrade to the storefront window system such as an interior storm window to those tenants who require greater noise reduction of train noise.

Vibration

The project site is currently exposed to infrequent train activity (less than 70 train events per day). According to the FTA guidelines, the suggested vibration goal for infrequent events is a maximum vibration level of 80 VdB. In the future, train volume could increase to frequent activity levels (exceeding 70 trains per day). According to the FTA guidelines, the suggested vibration goal for frequent events is a maximum vibration level of 72 VdB.

During our measurements, we measured both Amtrak commuter trains and freight train activity at the proposed façade setback and at 100 feet from the centerline of the tracks. All measured Amtrak trains were below the 80 VdB criterion and one freight train exceeded the current FTA goal of 80 VdB at the façade setback. These measurements were conducted over the course of 8 hours. At 100 feet, all train vibration levels are below the suggested goal of 80 VdB.

With the potential rail volume increase, all train activity at the proposed façade setback would exceed the more stringent 72 VdB goal. At 100 feet, only the freight activity would exceed the vibration goals.

Therefore, mitigation is recommended for the first row of units facing the train tracks to reduce amplification up the structure. The structural engineer should design the building in accordance to the method set forth by the Canadian National Building Code to minimize vibration amplification at the upper floors. This typically requires deeper, heavier joists and shorter floor spans. If necessary, a lally column may be installed at the midpoint of longer floor spans (i.e. at garages) to "split" the span length of the podium. Also, the resonant frequency of the floor should exceed the controlling vibration frequency in the ground due to the train. For this site, the controlling frequency is 25 Hz.

While these recommendations help minimize vibration amplification, vibration will still be perceived by the residents in the units facing the tracks and possibly in units further away. We recommend that a full disclosure statement be included to notify perspective buyers of vibration and noise from the train activity.

* * *

PROJECT SUMMARY

Unit Information

	SF per Unit	Unit Count	Total SF	Unit Ratio
Studio	588	11	6,468	5%
1 Bedroom Flat	787	92	72,404	44%
1 Bedroom Town House	1,037	3	3,111	1%
2 Bedroom Flat	1,144	82	93,808	39%
3 Bedroom Flat	1,350	16	21,600	8%
3 Bedroom Town House	1,536	7	10,752	3%
TOTAL		211	208,143	100%
Units per Typical Floor:		40		
Average Unit Size:			1,074	

Parking Information

City Parking Required (residential):	317
Total Parking Proposed (residential):	264
City Parking Deficit (residential):	53
City Parking Required (commercial):	0

Vehicle Parking Tabulation:

	Standard Stall (Tenant)	Standard Stall (Guest)	H/C Stall (Tenant)	H/C Stall (Guest)	Puzzle Lift (Tenant)
1st Floor	17	0	3	5	136
2nd Floor:	55	48	0	0	0
subtotals:	72	48	3	5	136
TOTAL:					**264**

Total Tenant Parking Provided:	211
Total Guest Parking Provided:	53
Required Bicycle Parking (short term):	14
Provided Bicycle Parking (short term):	14
Required Bicycle Parking (long term):	211
Provided Bicycle Parking (long term):	211

Gross Area Per Floor

	Building	Garage	Total
1st Floor:	16,494	46,811	63,305
2nd Floor:	17,335	45,013	62,348
3rd Floor:	46,970		
4th Floor:	46,970		
5th Floor:	46,970		
6th Floor:	46,970		
7th Floor:	46,026		
TOTAL:	267,735	91,824	359,559

Gross Area Information

Leasing/Lobby/Mail Room:	2,400
Amenity - Bike Workshop:	600
Amenity - Dog Spa	475
Amenity - Fitness	1,500
Amenity - 2nd Floor Clubroom:	1.465
Amenity - 7th Floor Clubroom:	822
Amenity - 7th Floor Homework Room:	384
Circulation/Auxillary(trash, storage, etc):	
Unit Total:	208,143
Building Total (without Garage):	

Garage Square Footage:

1st Floor (includes MEP & Maintenance, secondary Lobby):	46,811
2nd Floor(includes MEP, secondary Lobby):	45,013

Site Information:

Site Area:	98,775 SF	2.27 acres

Density:

	Units	Units per Acre
Maximum Density Allowed:	227	100
Density Proposed:	211	93

Open Space:

	Required	Proposed
Private Open Space:	8,440	
Common Open Space:	5,660	
Total:	14,100	

VICINITY MAP



PROJECT TEAM

DEVELOPER: ANTON DEVELOPMENT
1415 L STREET
SACRAMENTO, CA 95814
TREY TELLER
CTELLER@ANTON.CO
(916) 400-2072

ARCHITECT: TCA ARCHITECTS
801 SOUTH GRAND AVE, SUITE 1020
LOS ANGELES, CA 90017
TCA-ARCH.COM
(213) 553 1100

CIVIL: LUK AND ASSOCIATES
738 ALFRED NOBEL DRIVE
HERCULES, CA94547
LUKASSOCIATES.COM
(510) 724 3388

LANDSCAPE: THE GUZZARDO PARTNERSHIP INC.
181 GREENWICH STREET
SAN FRANCISCO, CA 94111
TGP-INC.COM
(415) 433 4672

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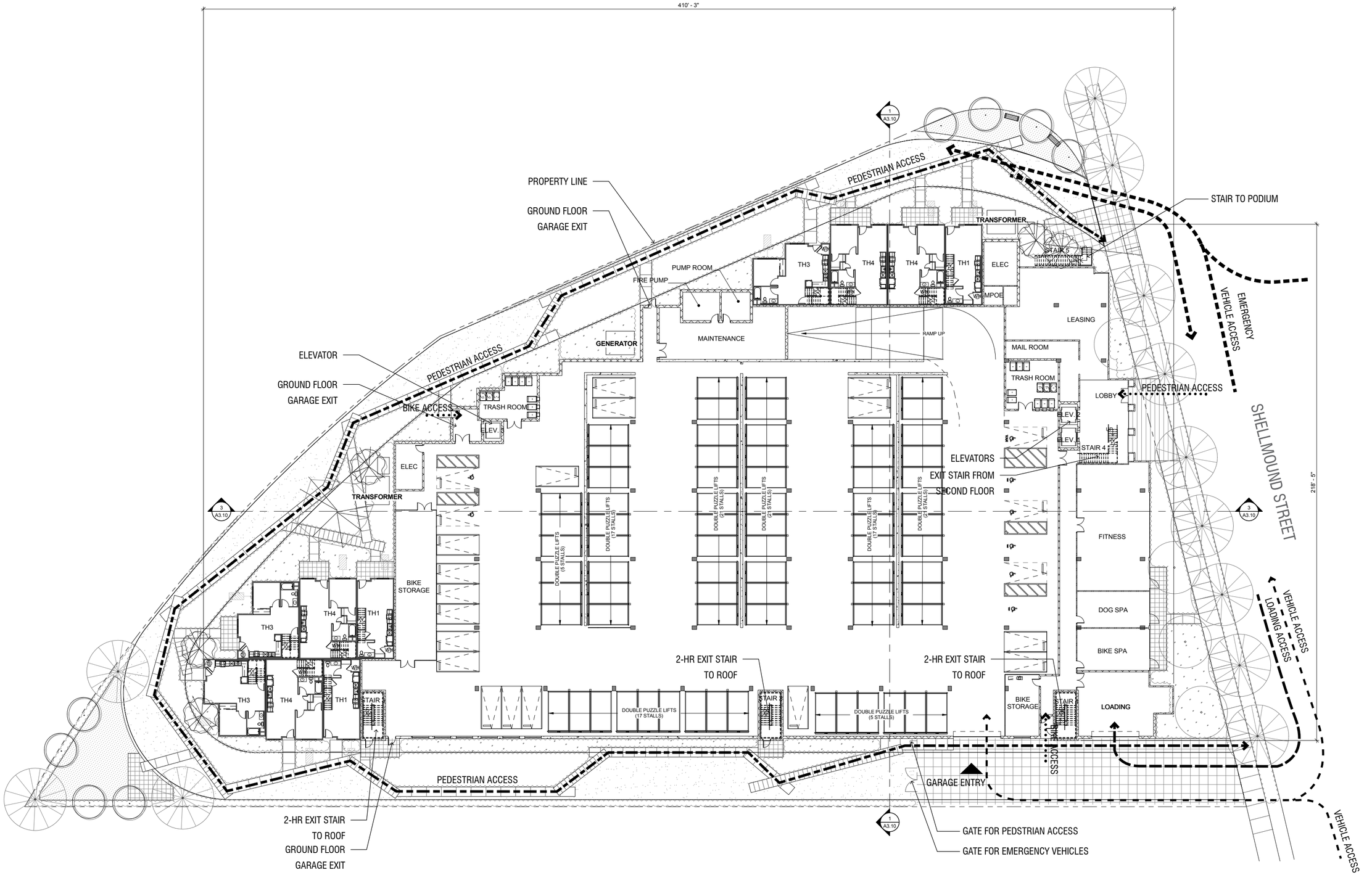

ANTON EVOLVE
6701 SHELLMOUND
EMERYVILLE, CA

TCA ARCHITECTS

Anton DEVELOPMENT COMPANY
TCA# 2015-021

PLANNING SCHEMATIC DESIGN
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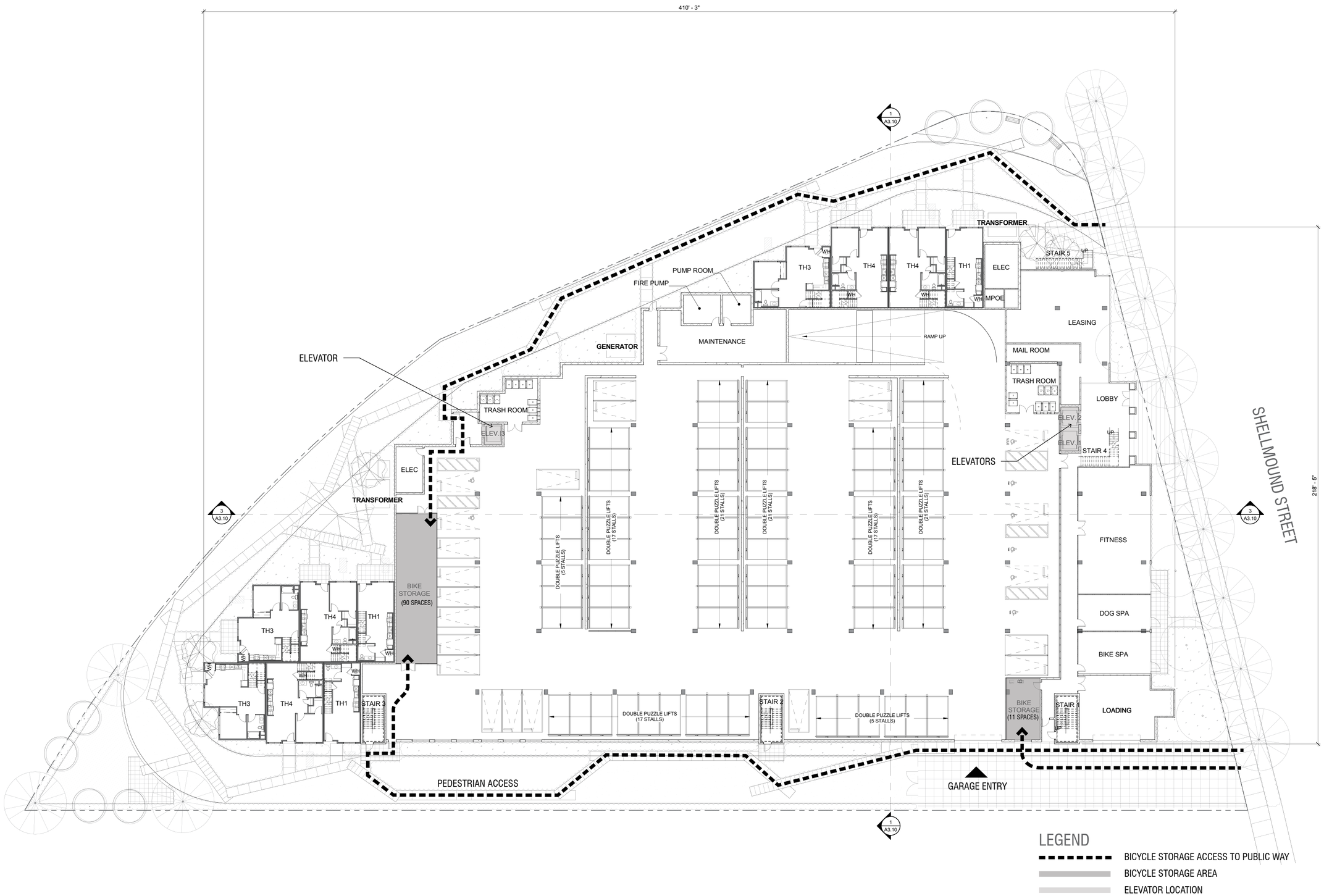
SITE, ACCESS AND CIRCULATION PLAN

A1.0



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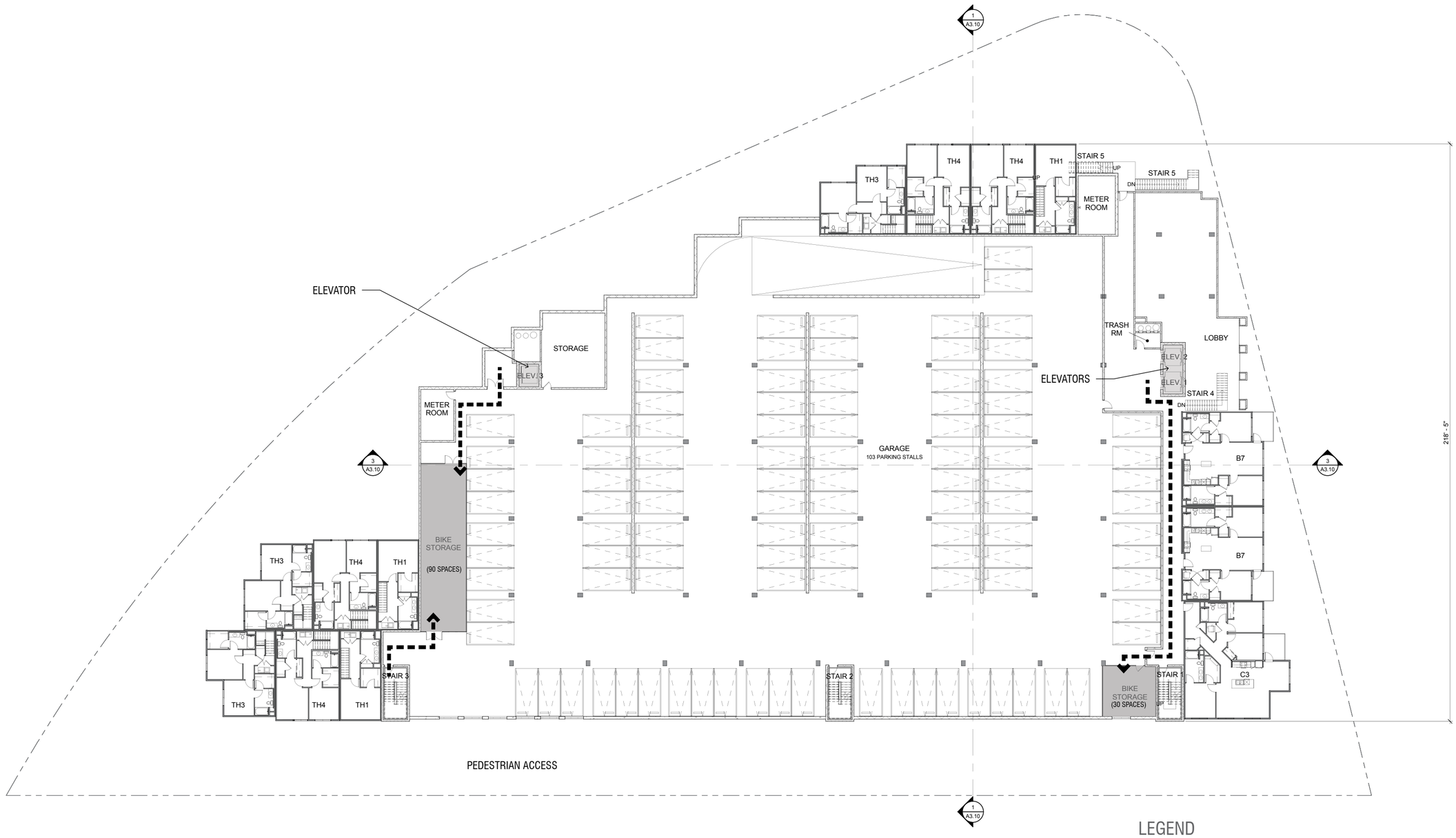
0' 16' 32' 64'

BICYCLE STORAGE ACCESS DIAGRAM - GROUND FLOOR

A1.1



LEGEND

- BICYCLE STORAGE ACCESS TO PUBLIC WAY
- BICYCLE STORAGE AREA
- ELEVATOR LOCATION

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BICYCLE STORAGE ACCESS DIAGRAM - SECOND FLOOR

A1.2

UNIT LEGEND

- 1-BEDROOM
- 3-BEDROOM



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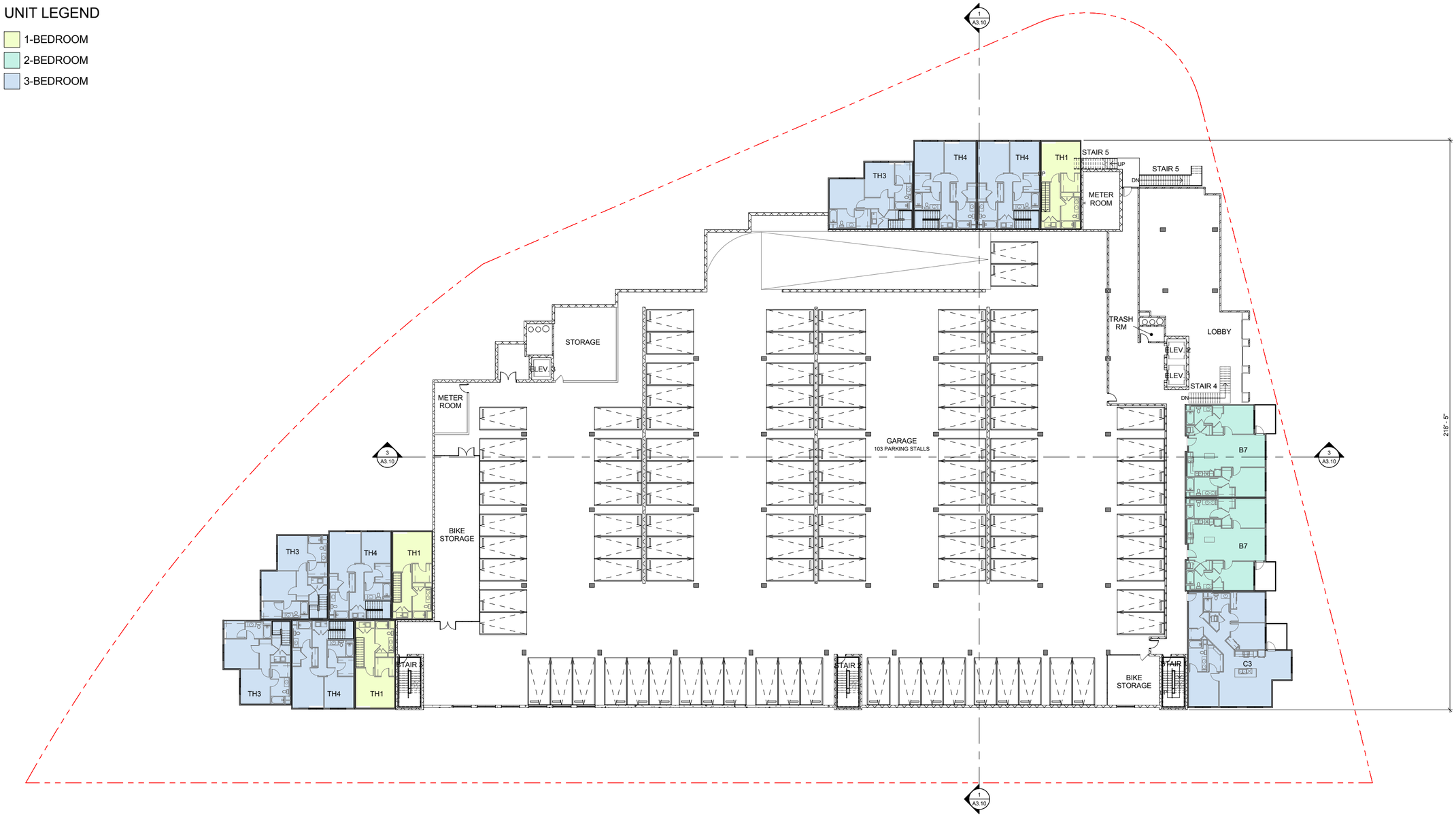
0' 16' 32' 64'

FIRST FLOOR PLAN

A2.1

UNIT LEGEND

- 1-BEDROOM
- 2-BEDROOM
- 3-BEDROOM



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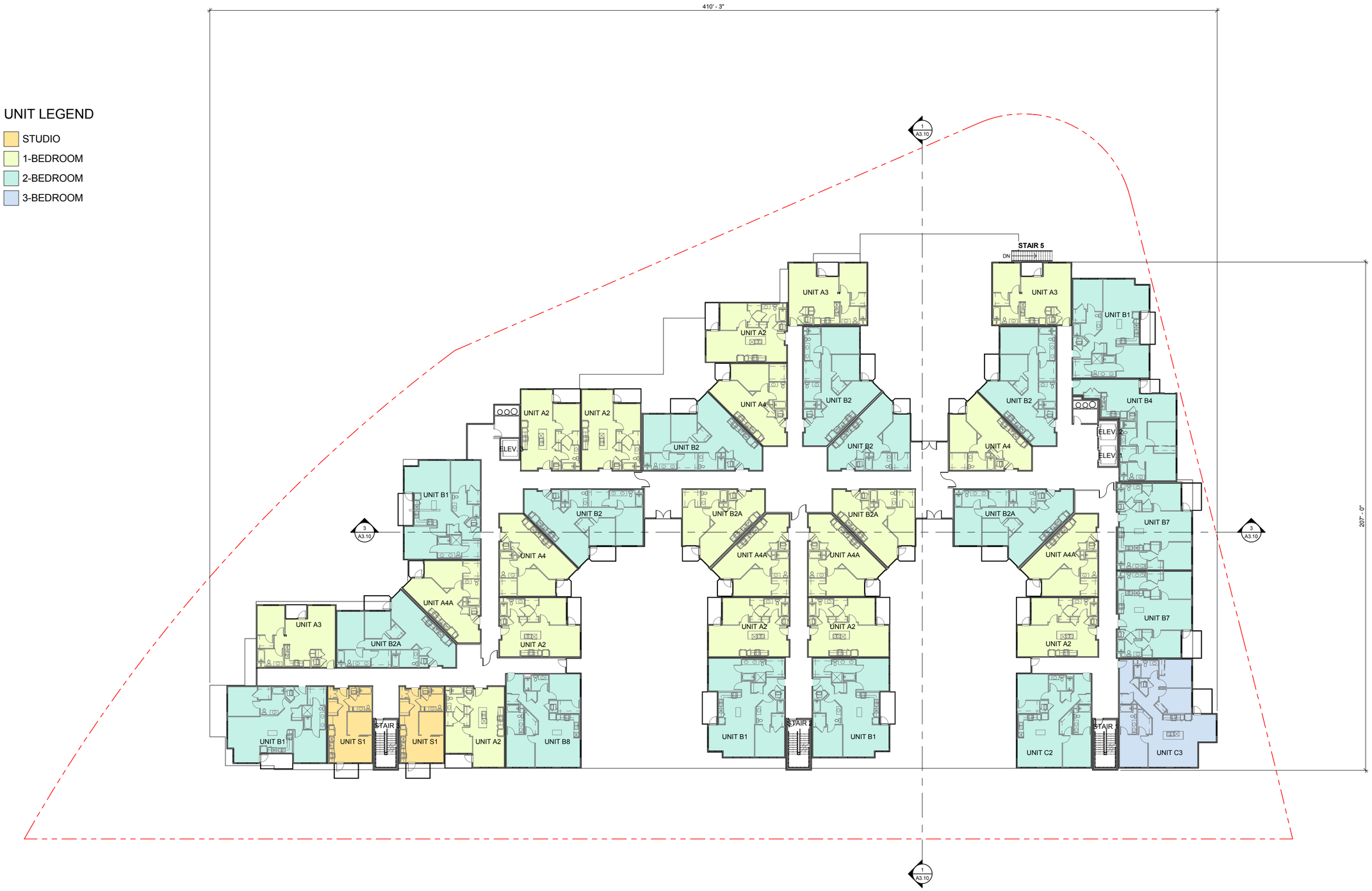
0' 16' 32' 64'

SECOND FLOOR PLAN

A2.2

UNIT LEGEND

- STUDIO
- 1-BEDROOM
- 2-BEDROOM
- 3-BEDROOM



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PLANNING SCHEMATIC DESIGN
JUNE 01 2015

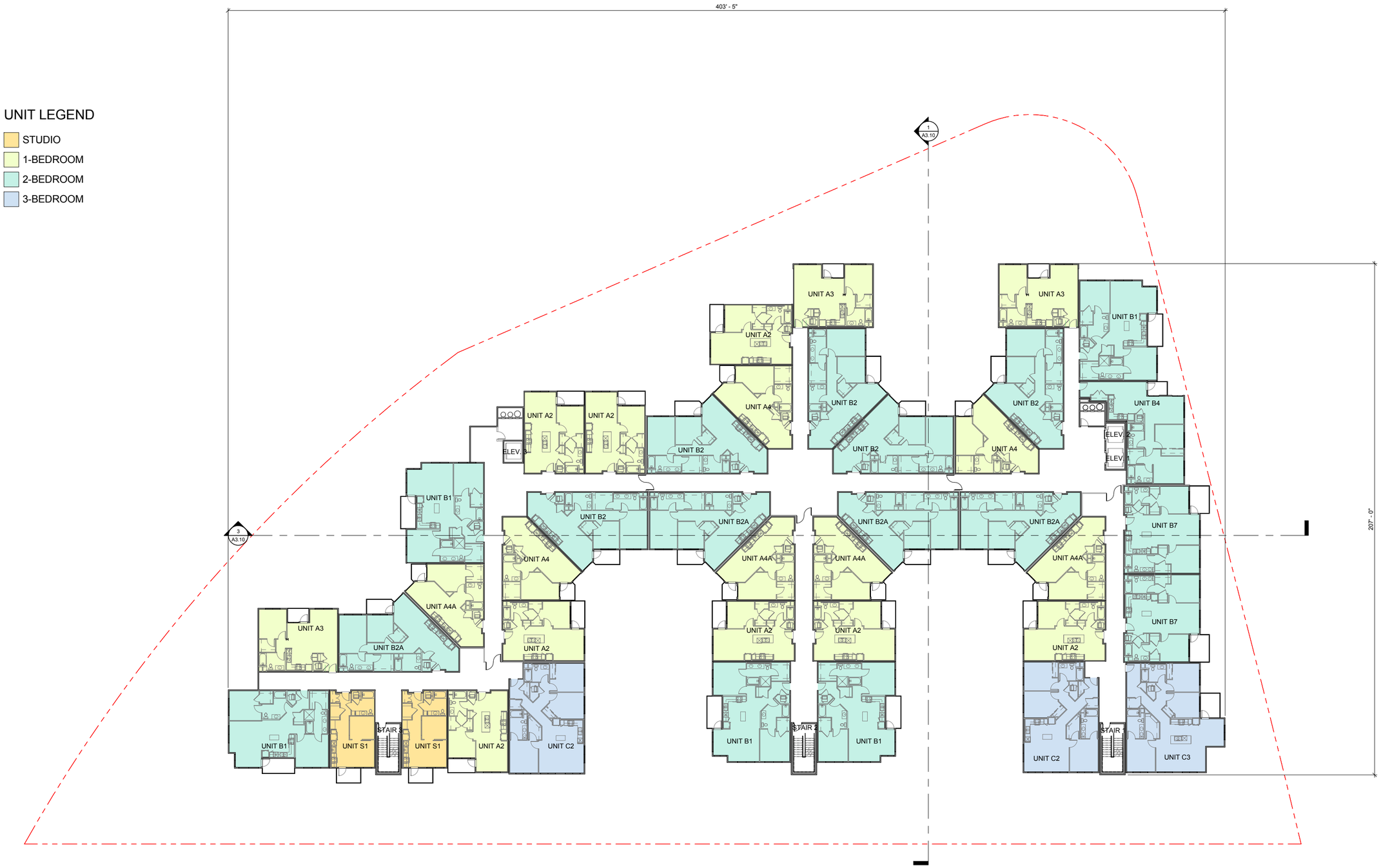
0' 16' 32' 64'

THIRD FLOOR PLAN

A2.3

UNIT LEGEND

- STUDIO
- 1-BEDROOM
- 2-BEDROOM
- 3-BEDROOM



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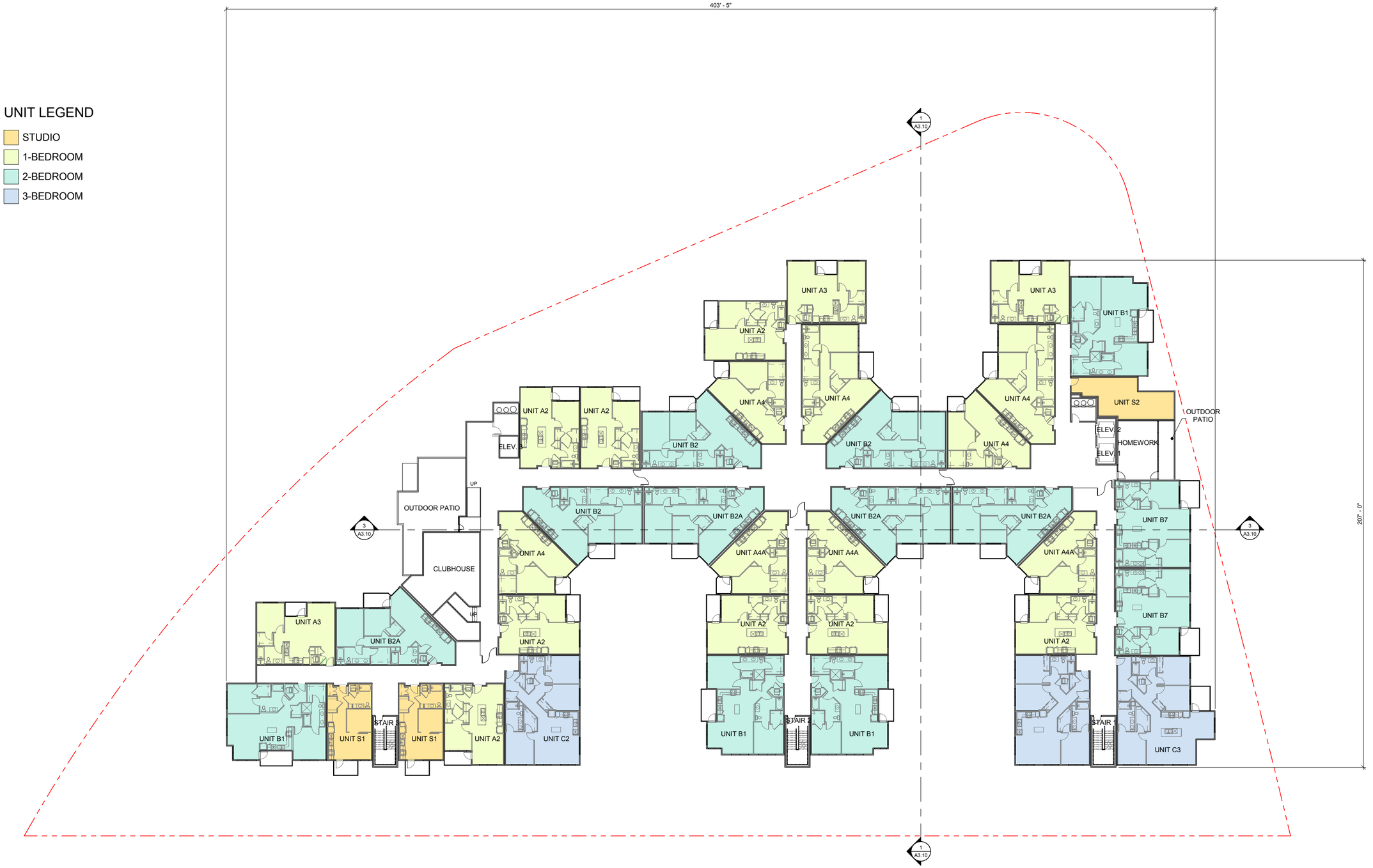
0' 16' 32' 64'

FOURTH (TYPICAL FIFTH THROUGH SIXTH) FLOOR PLAN

A2.4

UNIT LEGEND

- STUDIO
- 1-BEDROOM
- 2-BEDROOM
- 3-BEDROOM



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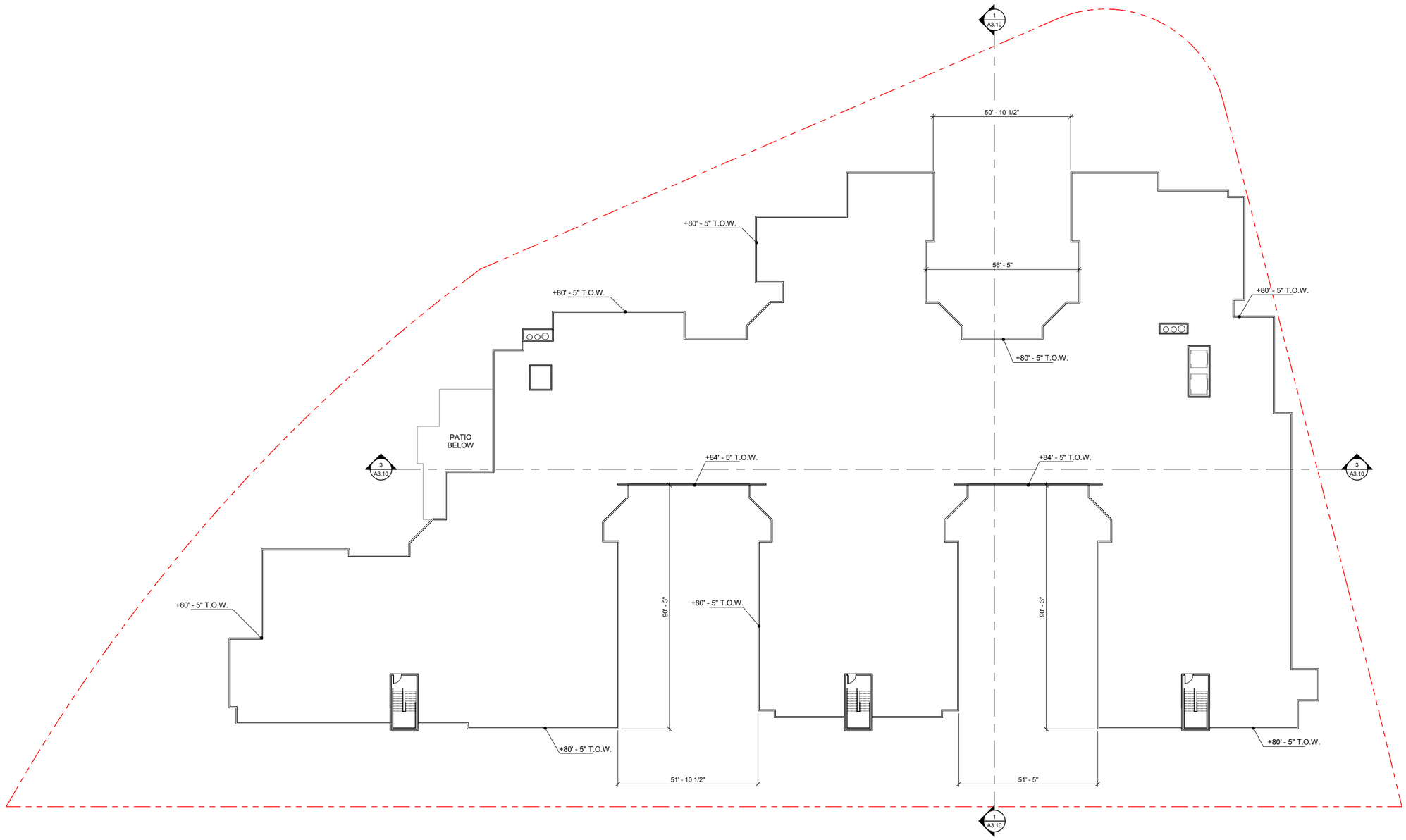
PLANNING SCHEMATIC DESIGN
JUNE 01 2015

0' 16' 32' 64'

SEVENTH FLOOR PLAN

A2.5



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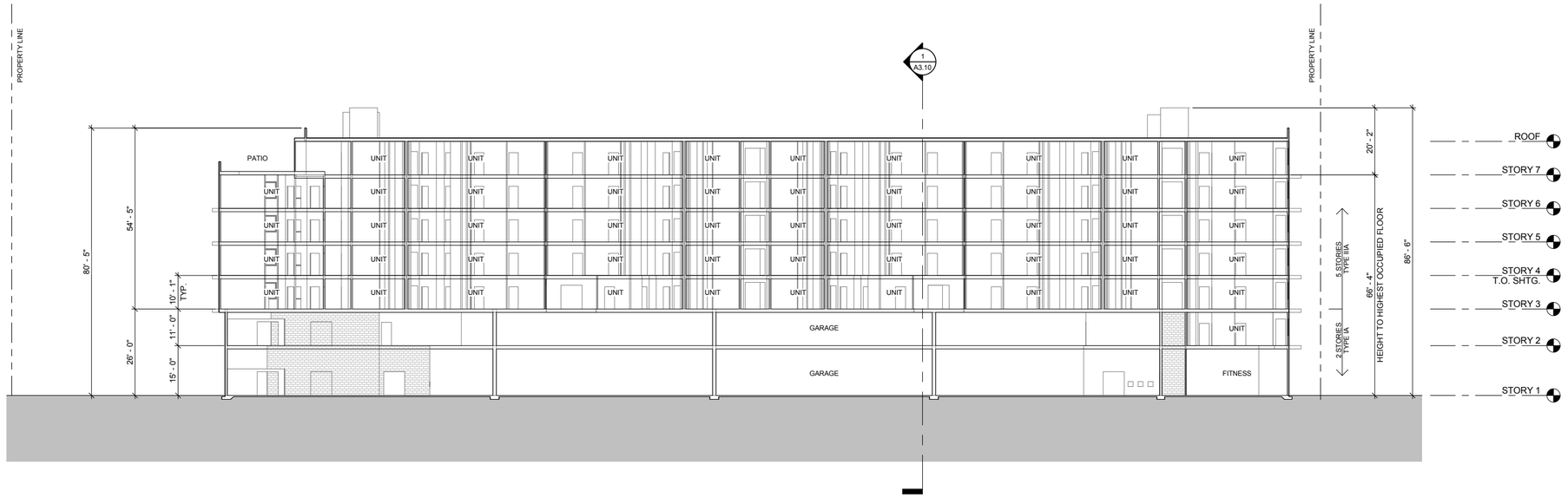
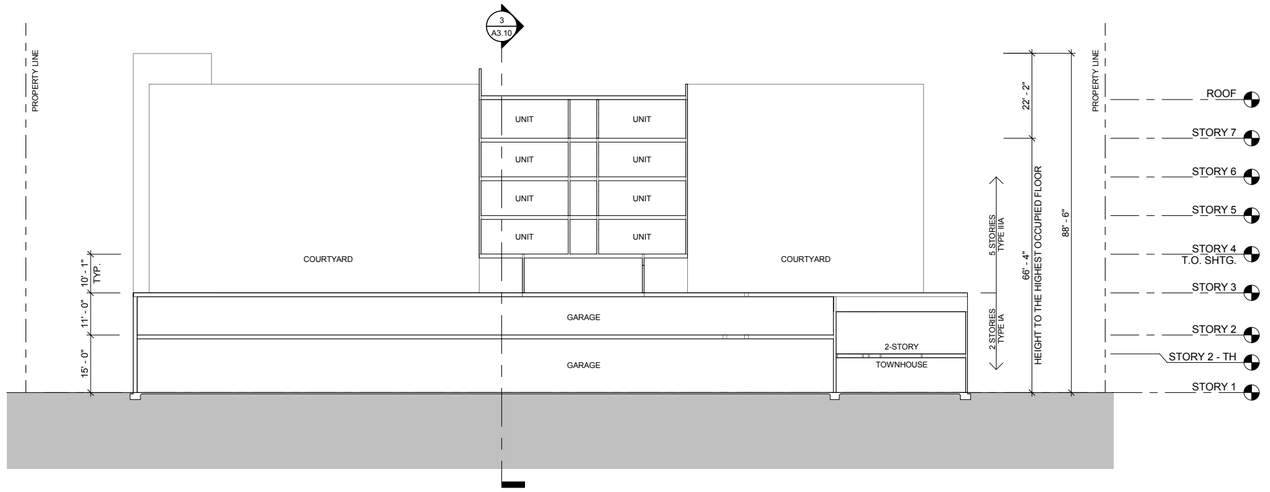
0' 16' 32' 64'

ROOF PLAN

A2.6



3 SECTION B-B
1/16" = 1'-0"



1 SECTION A-A
1/16" = 1'-0"

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EMERYVILLE, CA

TCA ARCHITECTS

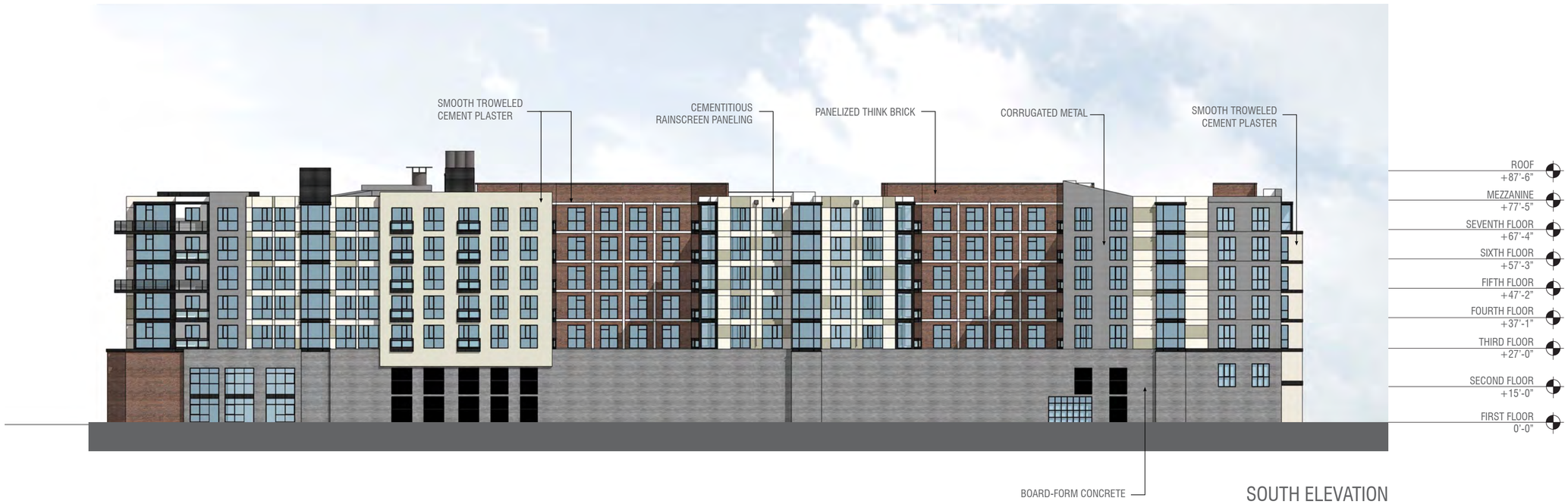
Anton DEVELOPMENT COMPANY
TCA# 2015-021

PLANNING SCHEMATIC DESIGN
JUNE 01 2015

0' 16' 32' 64'

BUILDING SECTIONS

A3.1



SOUTH ELEVATION



WEST ELEVATION

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TCA# 2015-021

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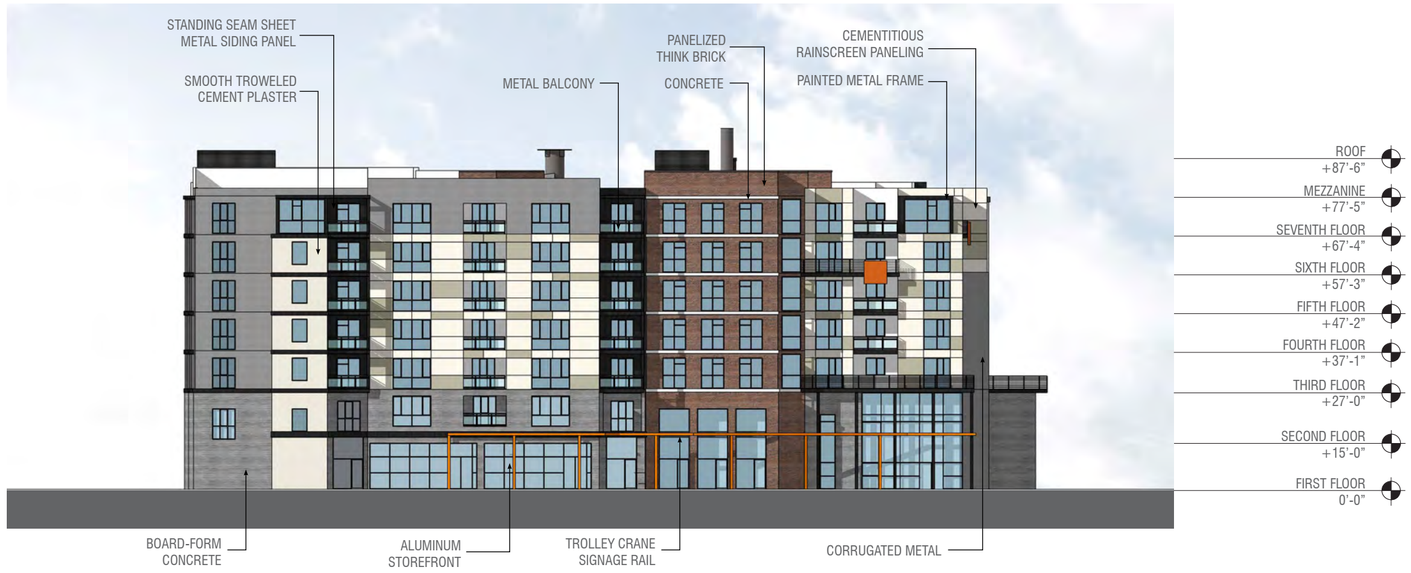
JUNE 01 2015

0' 16' 32' 64'

BUILDING ELEVATIONS



NORTH ELEVATION



EAST ELEVATION

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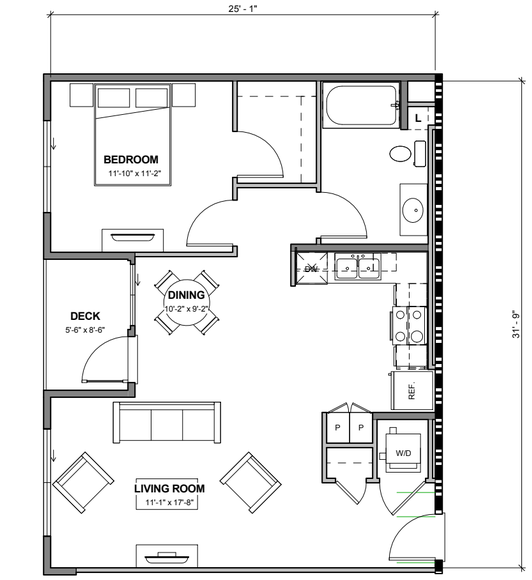
PLANNING SCHEMATIC DESIGN
JUNE 01 2015

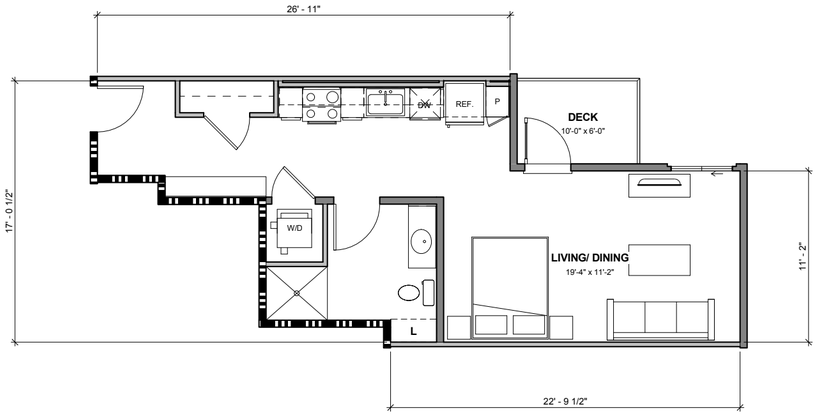
0' 16' 32' 64'

BUILDING ELEVATIONS



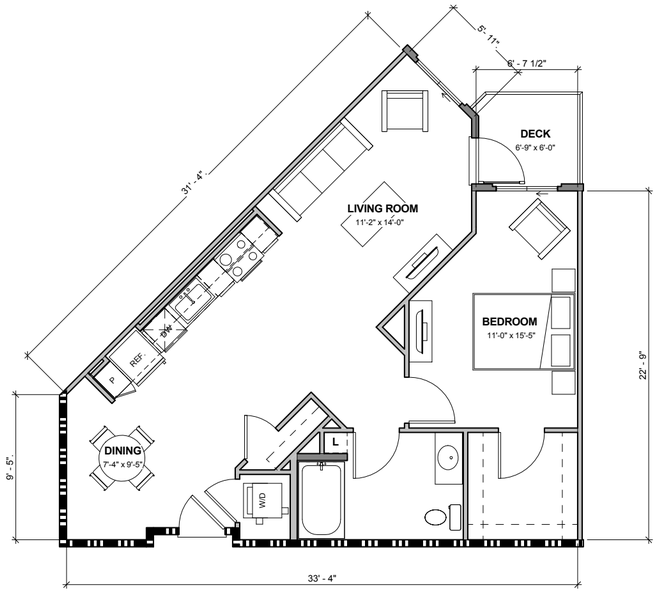
4 UNIT A3
1/4" = 1'-0"

AVERAGE S.F.
815 SF



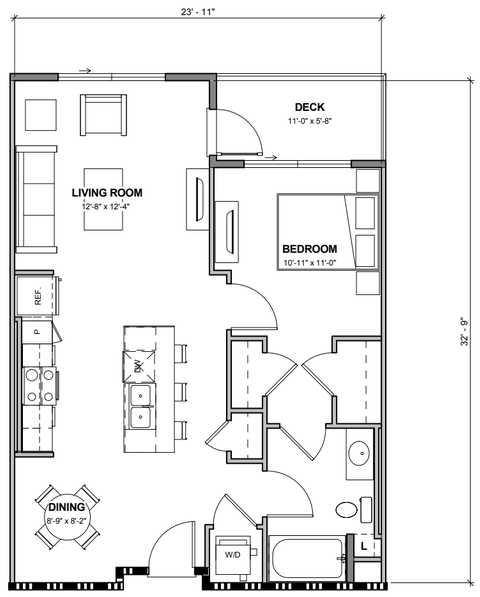
2 UNIT S2
1/4" = 1'-0"

AVERAGE S.F.
558 SF



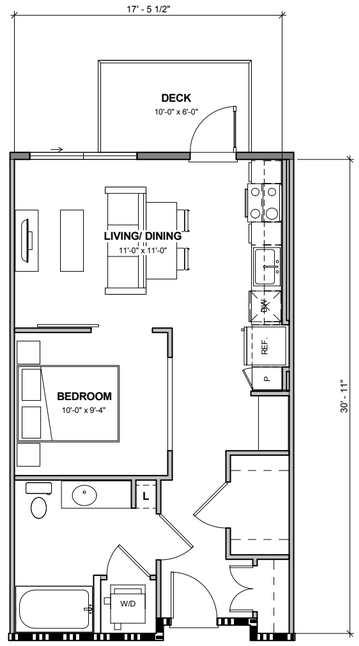
5 UNIT A4
1/4" = 1'-0"

AVERAGE S.F.
785 SF



3 UNIT A2
1/4" = 1'-0"

AVERAGE S.F.
763 SF



1 UNIT S1
1/4" = 1'-0"

AVERAGE S.F.
589 SF

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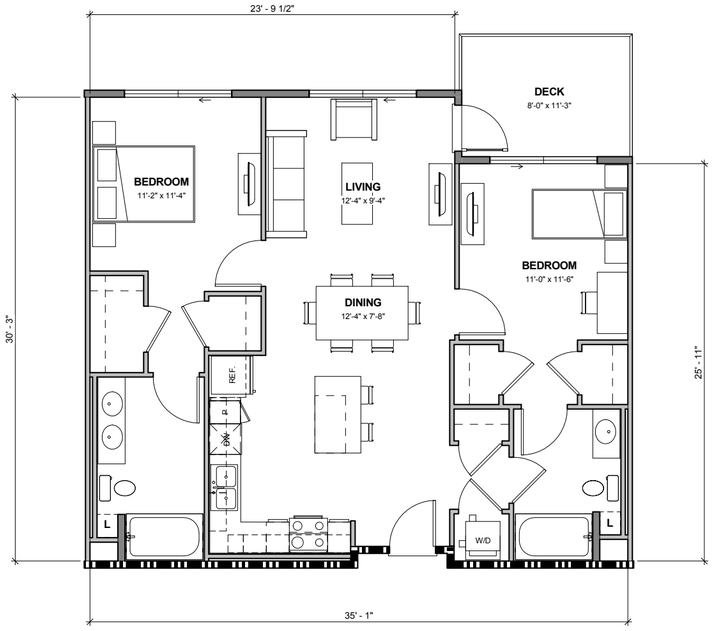
TCA# 2015-021

PLANNING SCHEMATIC DESIGN
JUNE 01 2015

0' 4' 8' 16'

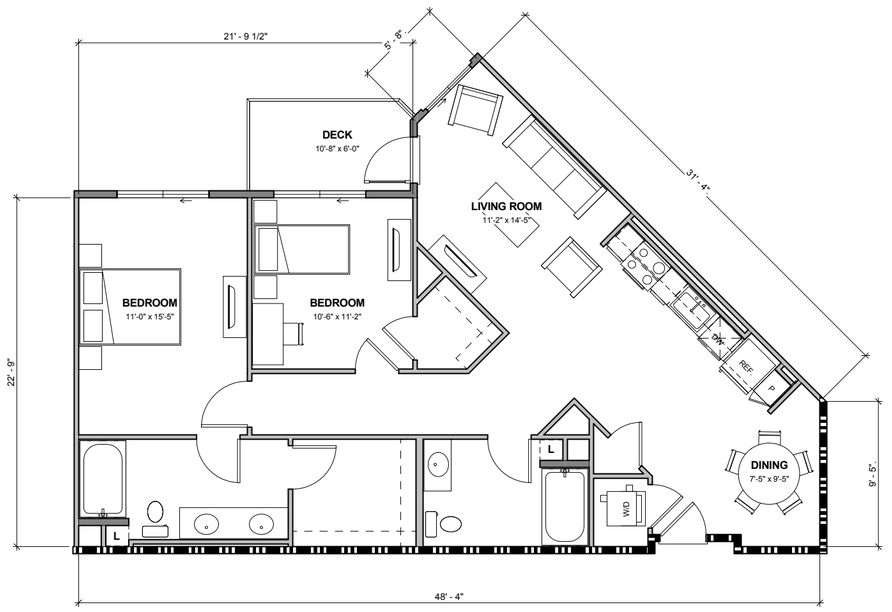
UNIT PLANS

A4.1



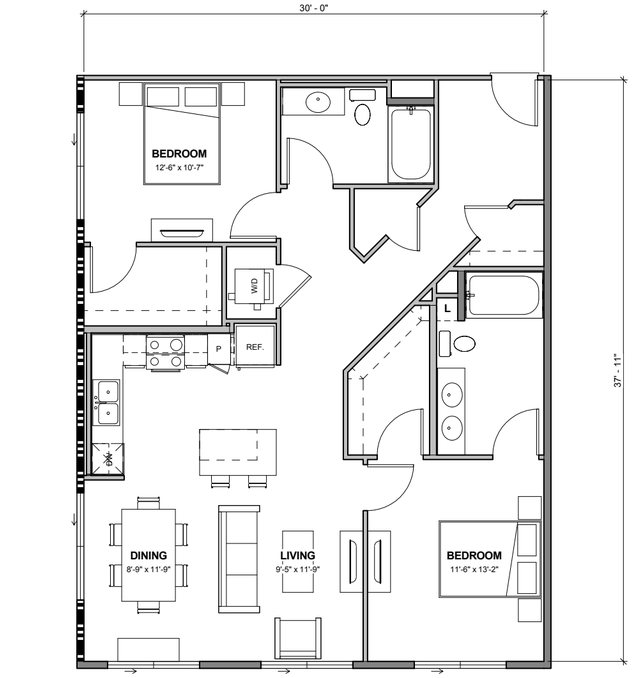
4 UNIT B7
1/4" = 1'-0"

AVERAGE S.F.
1067 SF



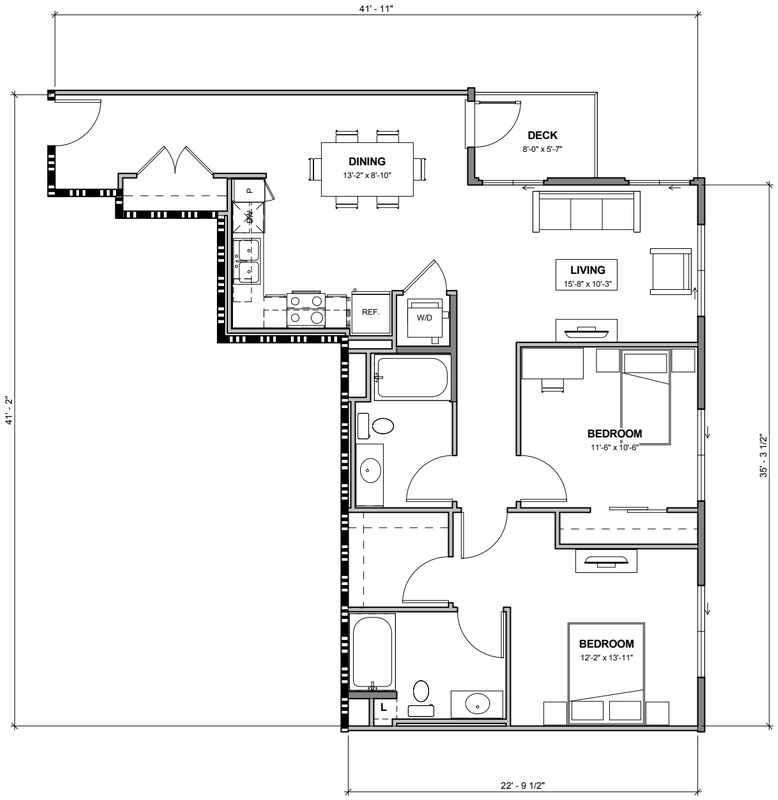
2 UNIT B2
1/4" = 1'-0"

AVERAGE S.F.
1141 SF



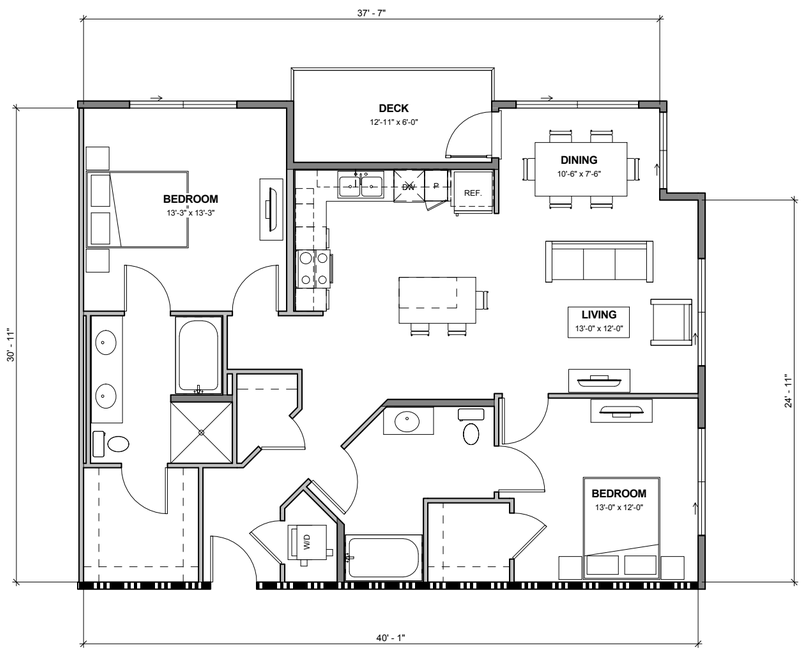
5 UNIT B8
1/4" = 1'-0"

AVERAGE S.F.
1200 SF



3 UNIT B4
1/4" = 1'-0"

AVERAGE S.F.
1133 SF



1 UNIT B1
1/4" = 1'-0"

AVERAGE S.F.
1238 SF

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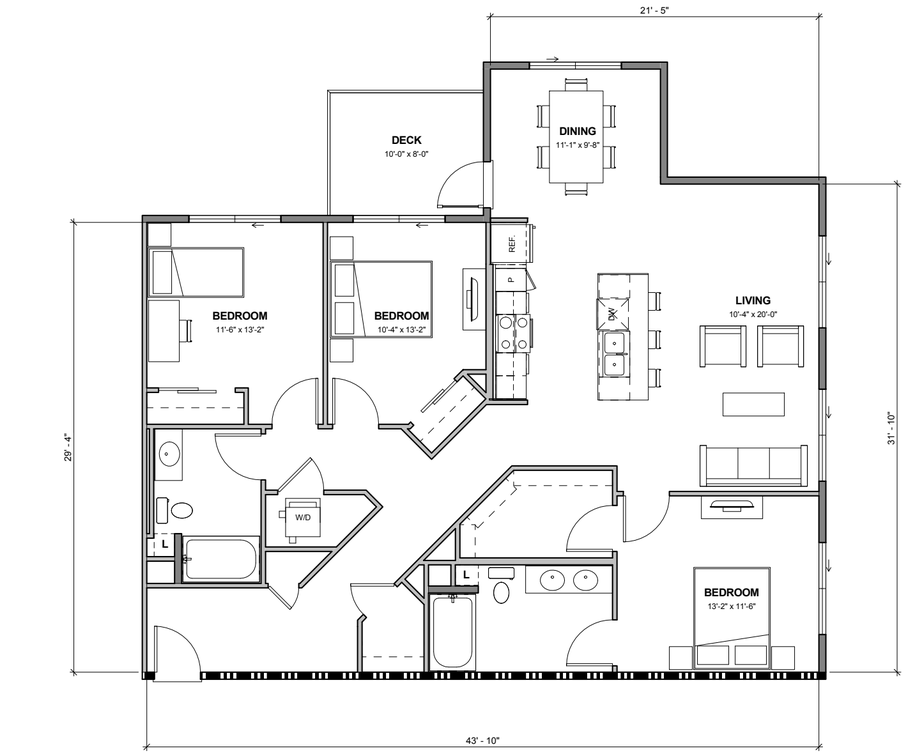
TCA# 2015-021

PLANNING SCHEMATIC DESIGN
JUNE 01 2015

0' 4' 8' 16'

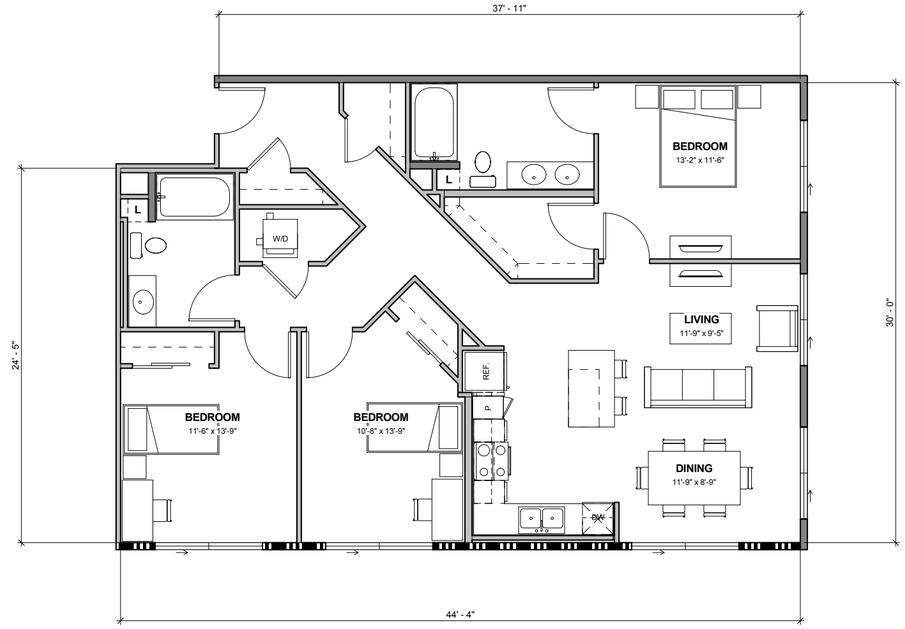
UNIT PLANS

A4.2



2 UNIT C3
1/4" = 1'-0"

AVERAGE S.F.
1502 SF



1 UNIT C2
1/4" = 1'-0"

AVERAGE S.F.
1348 SF

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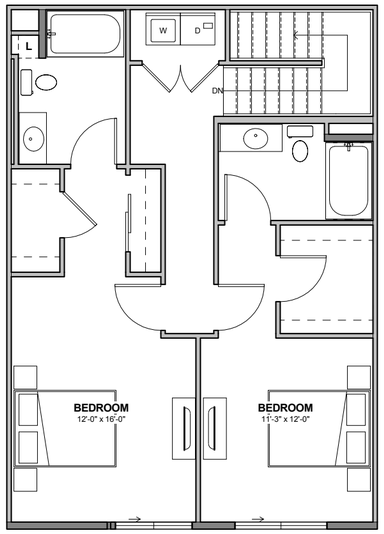
TCA# 2015-021

PLANNING SCHEMATIC DESIGN
JUNE 01 2015

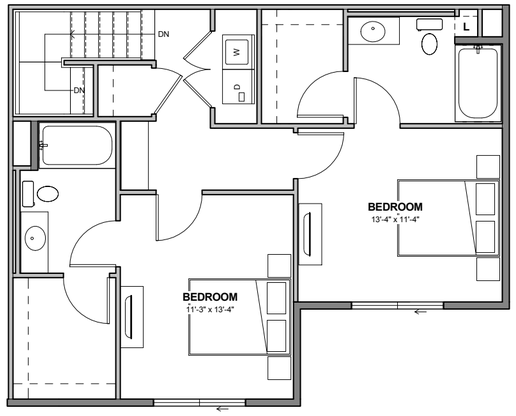
0' 4' 8' 16'

UNIT PLANS

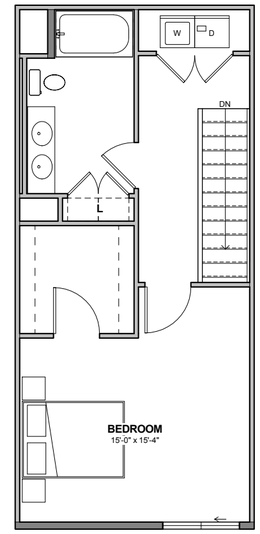
A4.3



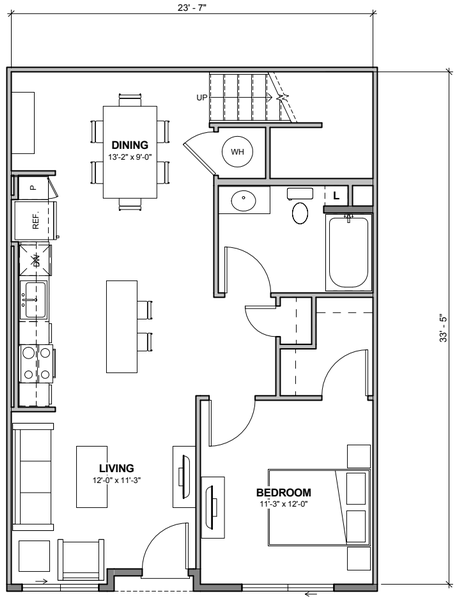
6 UNIT TH4-2ND FLR
1/4" = 1'-0"



4 UNIT TH3-2ND FLR
1/4" = 1'-0"

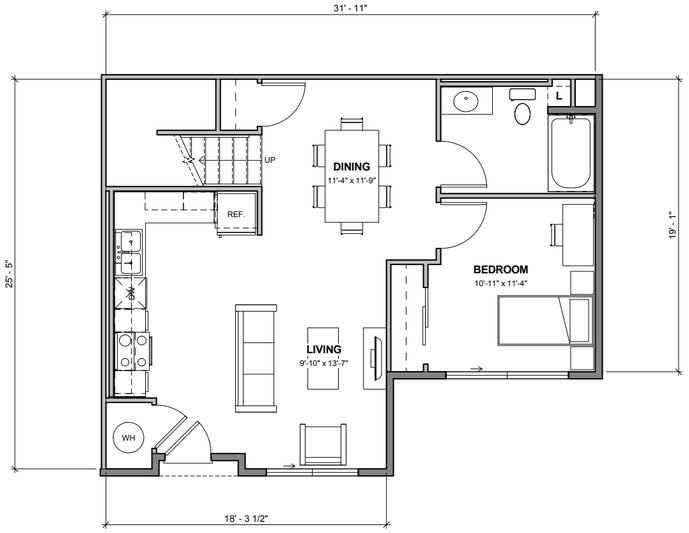


2 UNIT TH1-2ND FLR
1/4" = 1'-0"



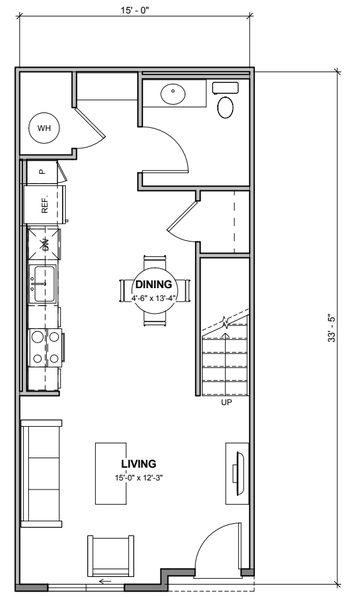
5 UNIT TH4-1ST FLR
1/4" = 1'-0"

AVERAGE S.F.
1589 SF



3 UNIT TH3-1ST FLR
1/4" = 1'-0"

AVERAGE S.F.
1483 SF



1 UNIT TH1-1ST FLR
1/4" = 1'-0"

AVERAGE S.F.
1037 SF

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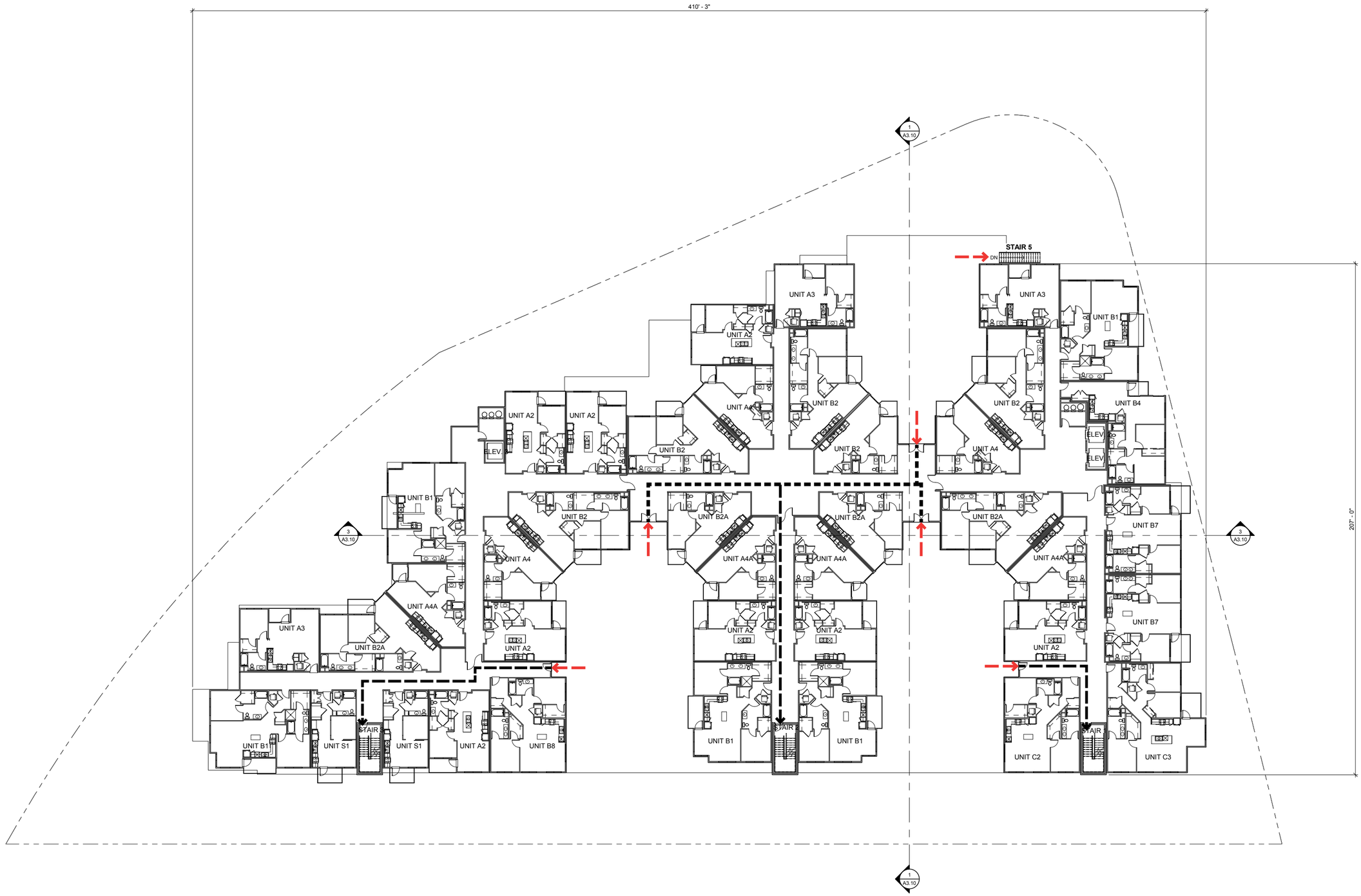
PLANNING SCHEMATIC DESIGN
JUNE 01 2015

0' 4' 8' 16'

UNIT PLANS



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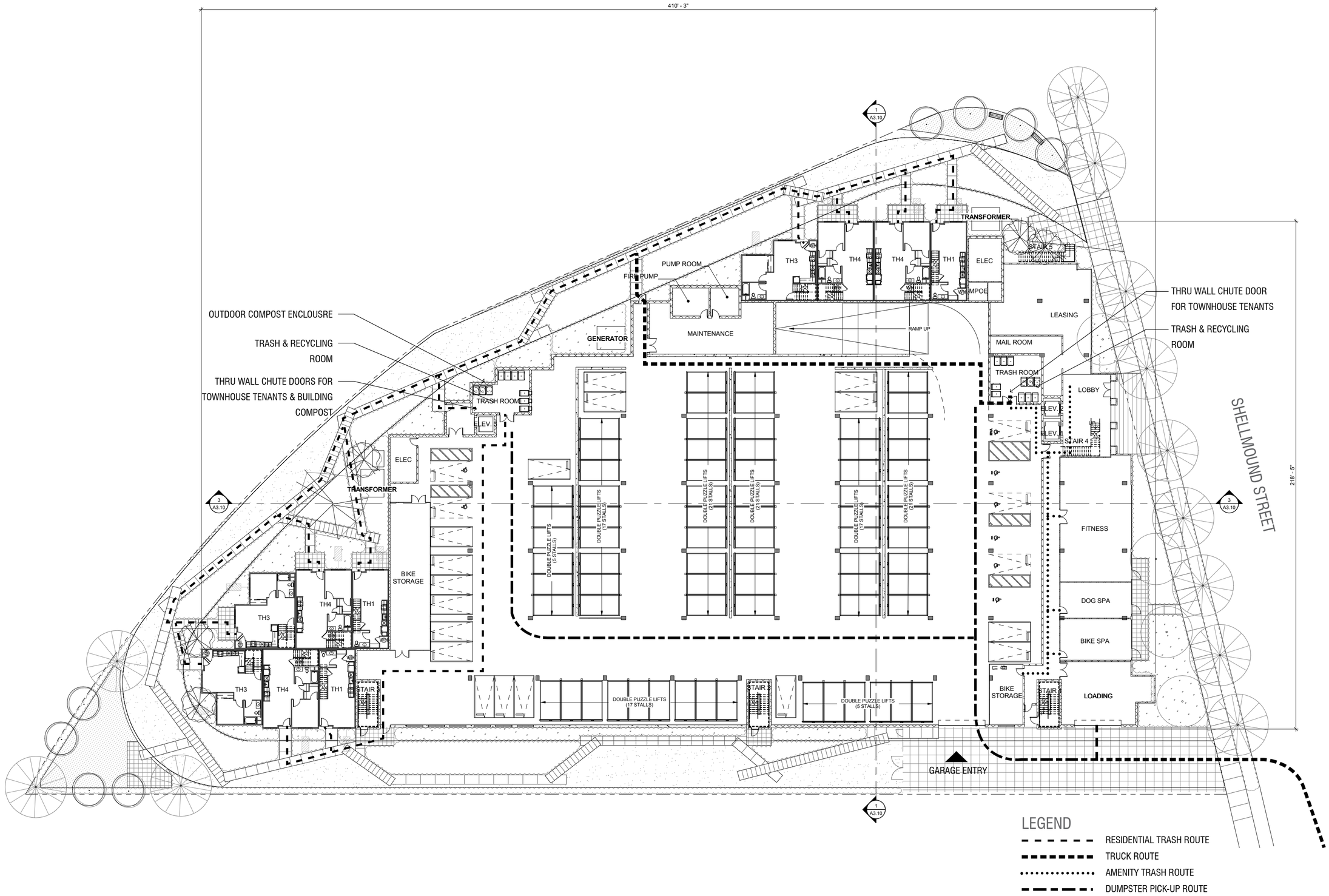
PLANNING SCHEMATIC DESIGN
JUNE 01 2015

0' 16' 32' 64'

PODIUM EXITING DIAGRAM

A5.2



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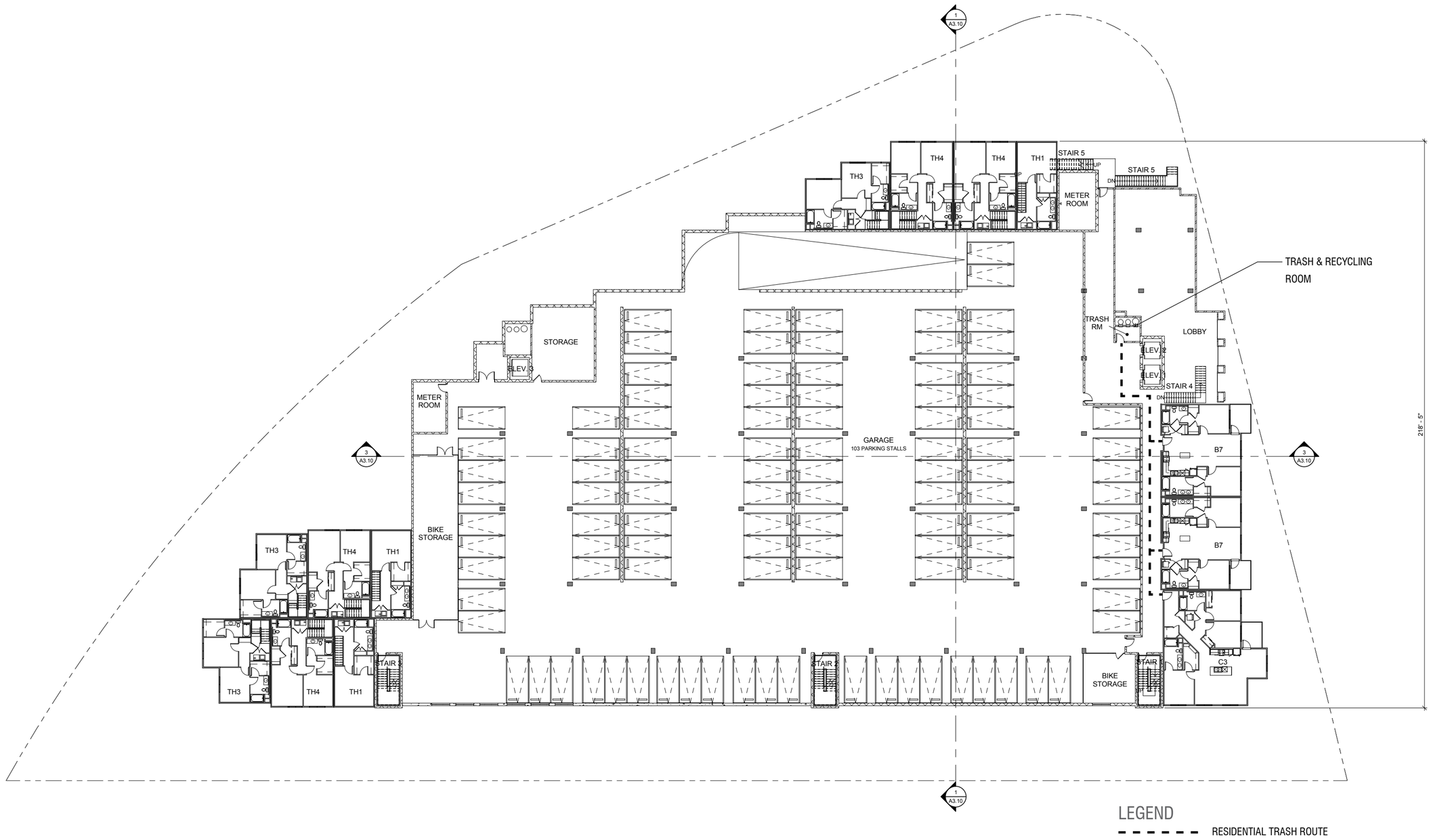
TCA# 2015-021

PLANNING SCHEMATIC DESIGN
JUNE 01 2015

0' 16' 32' 64'

TRASH SERVICE DIAGRAM - GROUND FLOOR

A5.3



LEGEND

RESIDENTIAL TRASH ROUTE

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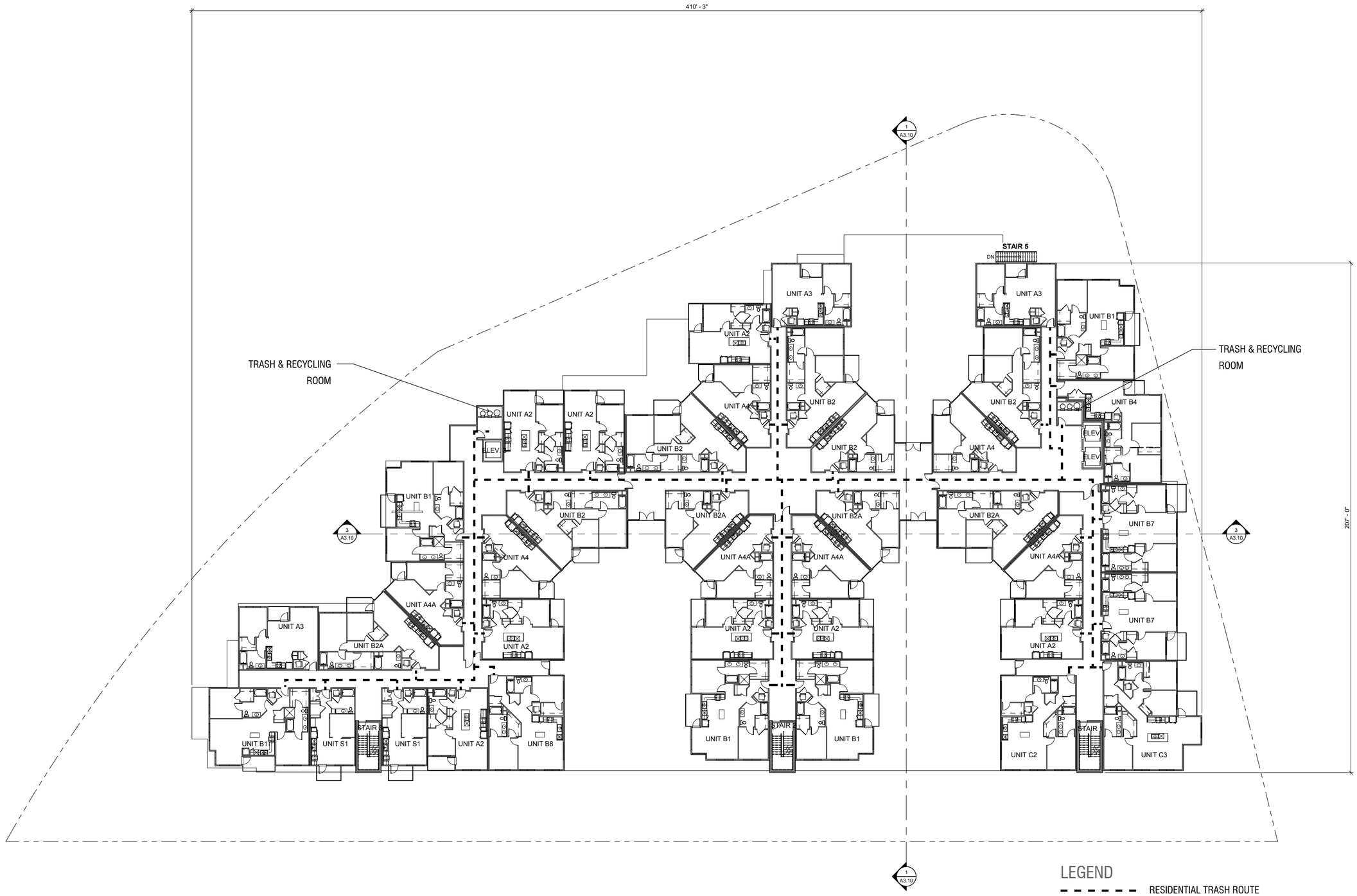
TCA# 2015-021

PLANNING SCHEMATIC DESIGN
JUNE 01 2015

0' 8' 16' 32'

TRASH SERVICE DIAGRAM - SECOND FLOOR

A5.4



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JUNE 01 2015

0' 8' 16' 32'

TRASH SERVICE DIAGRAM - THIRD FLOOR
(FOURTH - SEVENTH SIMILAR)

A5.5

LAYOUT NOTES

1. The Contractor shall verify all distances and dimensions in the field and bring any discrepancies to the attention of the Landscape Architect for a decision before proceeding with the work.
2. Contractor to take all necessary precautions to protect buildings and waterproof membranes from damage. Any damage caused by the Contractor or the Contractor's representatives during their activities shall be repaired at no cost to the Owner.
3. All written dimensions supersede all scaled distances and dimensions. Dimensions shown are from the face of building wall, face of curb, edge of walk, property line, or centerline of column unless otherwise noted on the drawings.
4. Walk scoring, expansion joints and paving shall be located as indicated on the Layout Plans, Landscape Construction Details, in the Specifications, or as field adjusted under the direction of the Landscape Architects.
5. All building information is based on drawings prepared by:
   TCA Architects
   1111 Broadway, Suite 1320
   Oakland, CA 94607
   PH: (510) 545–4222
   Contact: Sandy Chung
6. All site civil information is based on drawings prepared by:
   LUK & Associates
   738 Alfred Nobel Drive
   Hercules, CA 94547
   PH: (510) 724–3388
   Contact: Jackie Luk
7. The Contractor is to verify location of all on–site utilities before commencing with the work. The Contractor shall be responsible for the repair of any damage to utilities caused by the activities of the Contractor or the Contractor's representatives. Any utilities shown on Landscape Drawings are for reference and coordination purposes only.
8. All uplights are to be directed upward into the trees or objects they are intended to illuminate. Uplight positioning is subject to field modification by the Landscape Architect.
9. Protect all existing construction from damage. The Contractor shall be responsible for the repair of any damage to existing construction caused by the activities of the Contractor or the Contractor's representatives.
10. Expansion joints shall be located no less than 16' o.c. nor greater than 20' o.c. and/or as indicated on the Layout Plans, Landscape Construction Details, in Specifications, or as field adjusted under the direction of the Landscape Architect.

LAYOUT LEGEND

Ground Cover		Decomposed Granite Paving over Grass cell	
Stormwater Treatment Area		Rubberized Play Surface	
Pedestrian/Vehicular Concrete		Unit Paving in Podium	
Pedestrian/Vehicular Accent Paving		Cobble Mulch in Podium	
X / L–X Detail Number / Sheet Number	E.J.	Expansion Joint	
	S.A.D.	See Architect's Drawings	
Property Line	S.C.D.	See Civil Engineer's Drawings	
Center Line	S.E.D.	See Electrical Engineer's Drawings	
Phase Line	S.M.D.	See Mechanical Engineer's Drawings	
Match Line	S.P.D.	See Plumbing Engineer's Drawings	
Align	S.C.F.S	See Color and Finish Schedule	

- Street Light. S.E.D. and S.C.D.
- Pedestrian Scale Pole Light. S.E.D. See Color and Finish Schedule
- Bollard Light. S.E.D. See Color and Finish Schedule
- Uplight. S.E.D. See Color and Finish Schedule
- Trellis Downlight. S.E.D. See Color and Finish Schedule
- Wall Light. S.E.D. See Color and Finish Schedule
- Fire Hydrant S.C.D.
- Utility Boxes S.C.D.
- Below grade utilities as noted. S.C.D.
- Trash Receptacle. See Color and Finish Schedule
- Planter Pots. See Color and Finish Schedule
- Bench. See Color and Finish Schedule

FINE GRADING NOTES

1. The Landscape Contractor is responsible for fine grading and positive surface drainage in all landscape areas. The Contractor shall verify all rough grades in the field and bring any discrepancies to the attention of the Landscape Architect and Civil Engineer for a decision before proceeding with the work.
2. See Civil Engineer's drawings for road surface elevations, roadway sections, catch basins, and top of curb elevations. Top of curb elevations shown on Landscape drawings are for reference and coordination purposes only.
3. Earth mounds are shown diagrammatically for form and location. Shaping of mounds to be reviewed and approved in the field by the Landscape Architect.
4. Contractors are to exercise extreme care in back filling and compacting any excavation or trenching in areas previously compacted for other aspects of the work.
5. The Landscape Contractor shall remove from the site all debris and unsuitable material generated by the Contractor's operations.
6. Catch basins, area drains, planter drains, and perforated drain lines are to be connected to the storm drain system as specified in the Civil Engineer's plans. See Civil Engineer's drawings for all connections.
7. All catch basins and other drains are to be free of obstructions and maintained open and free running during and upon completion of the Contractor's work.
8. All on–grade areas to receive planting are to be received by the fine grading Contractor within a tenth of a foot of final grade. The Landscape Contractor shall rip compacted rough graded soil to a depth of 8 inches, then till in the soil amendment. Soil amendment shall be determined by an Agricultural Suitabilities Analysis conducted by a licensed soils laboratory upon sample(s) taken from the rough graded soil. This analysis shall be conducted and paid for by the General Contractor.
9. See structural soils report for recommendations on soil type, grading procedures, soil compaction, maximum allowable slopes, flatwork base material, etc.
10. Minimum paving slope to be 2% typically with a maximum cross slope of 2%. Minimum planting area slope to be 2% typically. Bring any discrepancies to the attention of the Landscape Architect for a decision prior to fine grading.
11. All slopes 2–½:1 and greater shall have jute mesh erosion control netting installed per manufacturer's specifications. Lap netting minimum 2'–0" and stake.
12. Grading shall be in conformance with all local codes and ordinances. Swales shall be a minimum of four (4) feet from all structures.
13. Grades to be constant and uniform between spot elevations.

FINE GRADING AND DRAINAGE LEGEND

+60.3	Spot Elevation
T.C. (60.6)	Top of Curb Elevation (from Civil Engineer's Drawings, verify)
T.C.I. (60.6)	Top of Curb Elevation Interpolated (from Civil Engineer's Drawings, verify)
+H.P. 61.2	Relative High Point
T.S. 61.25	Top of Step Elevation
B.S. 60.1	Bottom of Step Elevation
T.R. 61.25	Top of Ramp Elevation
B.R. 60.1	Bottom of Ramp Elevation
T.W. 63.4	Top of Wall Elevation
B.W. 60.4	Bottom of Wall Elevation. (Finish Grade of Soil or Paving)
T.F. 63.4	Top of Fence
T.P. 60.4	Top of Pilaster
AD 00.00	Area Drain w/Rim Elevation
□	On–Grade Paving: NDS 4" 910B (Brushed)
○	Lawn:NDS 10 Black Flat Top Drain Cover
○	Ground Cover Areas:NDS Spee–D–Basin and Grate, NDS #90 6" Atrium Grate, Black.
▧	On–Structure Topping Slab: specify cover to correspond with double body structural drain as specified by arch/plumb/structural
△	On–Structure Planter Drain: specify atrium cover to double body drain as specified by arch/plum/structural
◒	Downspout Adapter: 3" & 4" Universal Outlet w/4" spigot. NDS #1242 (verify that rain water leaders are tied into the landscape drain system and product type)
▣	Catch Basin See Civil Engineer's Drawings.
——→	Direction of Surface Water Flow
– – –→	Direction of Surface Water Flow in Swale (2% Minimum)
— ⁄ —	Grade Break (Ridge Line)
— — —	Subsurface Drainpipe: PVC SA34 by Acme Industries. (4"&6" dia.).
– · — · –	Perforated Drainpipe: PVC AS987 by Acme Industries 4".
◯	Diagrammatic 1' Contours

SHEET INDEX

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L2 Landscape Planting Notes and Legends
L3 Schematic Landscape At Grade Site Plan
L4 Schematic Landscape At Grade Plan Enlargements
L5 Schematic Landscape At Grade Sections
L6 Schematic Landscape On Structure Site Plan
L7 Schematic Landscape On Structure Plan Enlargements
L8 Schematic Landscape On Structure Sections
L9 Schematic Landscape Roof Deck
L10 Schematic Irrigation – At Grade
L11 Schematic Irrigation – On Structure
L12 Schematic Irrigation – Roof Deck
L13 Schematic Irrigation – Legend, Notes and Water Conservation Calculations
L14 Schematic Irrigation – Details
L15 Schematic Irrigation – Details and Watering Schedules
L16 Schematic Irrigation – Details and Watering Schedules
L17 Landscape Imagery
L18 Landscape Tree Disposition Plan

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TCA ARCHITECTS

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TCA# 2015-021

PLANNING SCHEMATIC DESIGN
JUNE 05 2015

THE GUZZARDO PARTNERSHIP INC.
Landscape Architects · Land Planners
181 Greenwich Street
San Francisco, CA 94111
T 415 433 4672
F 415 433 5003

LANDSCAPE NOTES AND LEGENDS

L1

PLANTING NOTES

THE FOLLOWING SIX (6) NOTES ARE FOR BIDDING PURPOSES ONLY

1. The contractor is required to submit plant quantities and unit prices for all plant materials as a part of the bid.
2. Assume 15 gallon plant for any unlabelled or un–sized tree; 5 gallon plant for any unlabelled or un–sized shrub; and 4" pots @ 12" o.c. (not flats) for any unlabelled ground cover. All planting beds, except for lawns, are to receive ground cover plant installation in addition to the shrubs and trees shown on the plans.
3. The planting areas shall be ripped to a depth of 8" to reduce compaction. The native subgrade soil shall be treated with 100 lbs of gypsum/1000 sf and leached to improve drainage and reduce the soil interface barrier. Contractor shall coordinate this work with other trades. This is subject to the final recommendations of the soils test (see below) and review by the Landscape Architect and the Owner.
4. All planting areas are to receive WM EARTHCARE HOMEGROWN COMPOST by WM EARTHCARE (510.563.4216; www.wmearthcare.com) at the rate of 6 cubic yards/1000 square feet, evenly tilled 6" deep into the soil to finish grade. This is subject to the final recommendations and review of the soils test (see below) by the Landscape Architect and the Owner.
5. Planting pits are to be backfilled with a mixture of 50% native soil and 50% amended native soil.
6. The General Contractor is to provide an agricultural suitabilities analysis for on–site rough graded soil and any imported topsoil. Recommendations for amendments contained in this analysis are to be carried out before planting occurs. Such changes are to be accompanied by equitable adjustments in the contract price if/when necessary. See specifications for testing procedure.
7. All work shall be performed by persons familiar with planting work and under supervisions of a qualified planting foreman.
8. Plant material locations shown are diagrammatic and may be subject to change in the field by the Landscape Architect before the maintenance period begins.
9. All trees are to be staked as shown in the staking diagrams.
10. All tree stakes shall be cut 6" above tree ties after stakes have been installed to the depth indicated in the staking diagrams. Single stake all conifers per tree staking diagram.
11. Plant locations are to be adjusted in the field as necessary to screen utilities but not to block windows nor impede access. The Landscape Architect reserves the right to make minor adjustments in tree locations after planting at no cost to the Owner. All planting located adjacent to signs shall be field adjusted so as not to interfere with visibility of the signs.
12. The Landscape Architect reserves the right to make substitutions, additions, and deletions in the planting scheme as felt necessary while work is in progress. Such changes are to be accompanied by equitable adjustments in the contract price if/when necessary and subject to the Owner's approval.
13. The contractor is to secure all vines to walls and columns with approved fasteners, allowing for two (2) years growth. Submit sample of fastener to Landscape Architect for review prior to ordering.
14. All planting areas, except lawns and storm water treatment zones (as defined by the civil engineer), shall be top–dressed with a 3" layer of recycled wood mulch, "Prochip" by BFI (408.888.7632; www.bfi.com)or equal. This shall include all pre–cast planter pots. Mulch shall be black in color. Submit sample to Landscape Architect for review prior to ordering. Hold all mulch six (6) inches from all plants where mulch is applied over the rootball.
15. All street trees to be installed in accordance with the standards and specifications of the City of Emeryville. Contractor to contact the city arborist to confirm plant type, plant size (at installation), installation detailing and locations prior to proceeding with installation of street trees. Contractor is to obtain street tree planting permit from the city, if a permit is required, prior to installation of street trees. Contractor is to consult with the Landscape Architect during this process.
16. Seasonal color is to be current and locally available. Plant material is to be selected by the Landscape Architect from a list of currently available stock provided by the Landscape Contractor prior to installation. Seasonal color to be 4" pots at 12" o.c. unless otherwise noted.
17. The lawn shall be sod or seeded (as noted) and consist of a drought tolerant hard fescue blend such as Pacific Sod "Medallion Dwarf with Bonsai", installed per manufacturer's recommendations and specifications. The mix shall consist of the following proportions of grass species: 100% Bonsai Double Dwarf fescue. Available through: Pacific Sod 800.542.7633
18. Trees planted in lawn areas shall not have lawn planted over the top of the rootball but shall have 12" diameter circle of lawn cut out for trimming purposes.
19. Plants shall be installed to anticipate settlement. See Tree and Shrub Planting Details.
20. All trees noted with 'deep root' and those planted within 5'–0" of concrete paving, curbs, and walls shall have deep root barriers installed per manufacturer's specifications. See specifications and details for materials, depth of material, and location of installation.
21. The Landscape Contractor shall arrange with a nursery to secure plant material noted on the drawings and have those plants available for review by the Owner and Landscape Architect within thirty (30) days of award of contract. The Contractor shall purchase the material and have it segregated and grown for the job upon approval of the plant material. The deposit necessary for such contract growing is to be born by the Contractor.
22. The project has been designed to make efficient use of water through the use of drought tolerant plant materials. Deep rooting shall be encouraged by deep watering plant material as a part of normal landscape maintenance. The irrigation for all planting shall be limited to the amount required to maintain adequate plant health and growth. Water usage should be decreased as plants mature and become established. The irrigation controllers shall be adjusted as necessary to reflect changes in weather and plant requirements.
23. The Landscape Contractor shall verify the location of underground utilities and bring any conflicts with plant material locations to the attention of the Landscape Architect for a decision before proceeding with the work. Any utilities shown on the Landscape drawings are for reference and coordination purposes only. See Civil Drawings.
24. The design intent of the planting plan is to establish an immediate and attractive mature landscape appearance. Future plant growth will necessitate trimming, shaping and, in some cases, removal of trees and shrubs as an on–going maintenance procedure.
25. Install all plants per plan locations and per patterns shown on the plans. Install all shrubs to ensure that anticipated, maintained plant size is at least 2'–0" from the face of building(s) unless shown otherwise on the plans. Refer to Plant Spacing Diagram for plant masses indicated in a diagrammatic manner on the plans. Refer to Plant Spacing Diagram for spacing of formal hedge rows.
26. Contractor to provide one (1) Reference Planting Area for review by Landscape Architect prior to installation of the project planting. The Reference Planting Area shall consist of a representative portion of the site of not less than 900 (nine hundred) square feet. Contractor to set out plants, in containers, in the locations and patterns shown on the plans, for field review by the Landscape Architect. The Reference Planting Area will be used as a guide for the remaining plant installation.
27. The Maintenance Period(s) shall be for 60 (sixty) days. Portions of the installed landscape of a project may be placed on a maintenance period prior to the completion of the project at the Owner's request and with the Owner's concurrence.
28. Contractor to verify drainage of all tree planting pits. See Planting Specifications. Install drainage well per specifications and Tree Planting Detail(s) if the tree planting pit does not drain at a rate to meet the specifications.
29. Contractor shall remove all plant and bar code labels from all installed plants and landscape materials prior to arranging a site visit by the Landscape Architect.
30. Geotech drainage board or approved equal is to be installed in all on–structure planters and all pre–cast planters/pots as shown in the drawings. Material available through: TWE Products, Orinda, CA 925.708.0549. All Geotech board shall be completed covered with filter fabric as shown in the drawings and per manufacturer's specifications.
31. All tree rootballs shall be irrigated by water jet during the sixty (60) day maintenance period established by specifications. This irrigation shall occur each time normal irrigation is scheduled.
32. The Landscape Contractor shall, as a part of this bid, provide for a planting allowance for the amount of $8,000.000 (Eight Thousand Dollars) to be used for supplying and installing additional plant material as directed by the Landscape Architect and approved by the Owner in writing. The unused portion of the alllowance shall be returned to the Owner at the beginning of the maintenance period.

PLANT PALETTE

TREES * 24" Box Standard Unless Noted Otherwise on Plans

KEY	SIZE	BOTANICAL NAME	COMMON NAME	COMMENTS
CER CAN	*	Cercis occidentalis	Western Redbud	
GEI PAR	*	Geijera parviflora	Australian Willow	
GIN BIL	*	Ginkgo biloba	Ginkgo	
LOP CON	*	Lophostemon confertus	Brisbane Box	
MEL NES	*	Melaleuca nesophila	Pink Melaleuca	
MEL QUI	*	Melaleuca quinquenervia	Paperbark Tree	
MET EXC	*	Metrosideros excelsa	New Zealand Christmas Tree	
OLE EUR	*	Olea europaea 'Fruitless'	Fruitless Olive	
QUE AGR	*	Quercus agrifolia	Coast Live Oak	
QUE SUB	*	Quercus suber	Cork Oak	
SHRUBS	*			
KEY	SIZE	BOTANICAL NAME	COMMON NAME	COMMENTS
1	5 *gal	Abelia 'Edward Goucher'	Glossy Abelia	36" O.C.
2	15 *gal	Acanthus mollis	Bears Breech	
3	5 *gal	Arbutus unedo	Strawberry Tree	
4	5 *gal	Bambusa oldhamii	Bamboo	
5	5 gal	Buxus m. j. 'Green Beauty'	Japanese Boxwood	
6	5 gal	Camellia h.'Shishi–Gashira'	Sasanqua Camellia	30" O.C.
7	5 gal	Clivia miniata	Kaffir Lily	18" O.C.
8	5 gal	Coleonema pulchrum	Breath of Heaven	
9	1 gal	Crocosmia h. 'Lucifer'	Montbretia	
10	5 gal	Dietes vegeta	Fortnight Lily	
11	1 gal	Erigeron karvinskianus	Santa Barbara Daisy	18" O.C.
12	5 gal	Escallonia exoniensis 'Frades'	Escallonia	
13	5 gal	Euphorbia characias	Euphorbia	
14	5 gal	Fatsia japonica 'Moseri'	Japanese Aralia	30" O.C.
15	5 gal	Fejoa sellowiana	Pineapple guava	
16	1 gal	Gernanium incanun	Cranesbill	
17	5 gal	Hebe 'Autumn Glory'	Autumn Glory Hebe	24" O.C.
18	1 gal	Hemerocallis hybrids	Evergreen Day Lily	24" O.C.
19	5 gal	Hydrangea macrophylla	Bigleaf Hydrangea	30" O.C.
20	5 gal	Hypericum moseranum	Shrubby Hypericum	30" O.C.
21	1 gal	Imperata c. 'Rubra'	Japanese Blood Grass	18" O.C.
22	5 gal	Lavatera thuringiaca	Lavatera	
23	1 gal	Leonotis leonuris	Lions Tail	36" O.C.
24	15 gal	Ligustrum japonicum	Japanese Privet	topiary
25	5 gal	Loropetalum chinensis	Loropetalum	green 36" O.C.
26	1 gal	Miscanthus transmorrisonensis	Evergreen miscanthus	
27	1 gal	Nepeta faassenii	Cat Mint	
28	5 gal	Nephrolepis cordifolia	Southern Sword Fern	24" O.C.
29	1 gal	Oenothera berlandieri	Mexican Evening Primrose	18" O.C.
30	1 gal	Pennisetum a. 'Hamelin'	Fountain Grass	
31	5 gal	Phormium cvs 'Gold Sword'	New Zealand Flax cvs	36" O.C.
32	5 gal	Pittosporum t. 'Variegata'	Variegated Pittosporum	
33	5 gal	Pittosporum t. 'Wheeler's Dwarf'	Wheelers Dwarf Pittosporum	30" O.C.
34	5 gal	Polygala dalmaisiana	Sweet–pea Shrub	
35	15 gal	Prunus c. 'Compacta'	Carolina Cherry Laurel	column
36	5 gal	Rhamnus alaternus	Italian Buckthorn	
37	5 gal	Rhaphiolepis indica 'Clara'	India Hawthorn	
38	5 gal	Rosa 'Sally Holmes'	Sally Holmes Rose	
39	5 gal	Rosemarinus o. 'Tuscan Blue'	Upright Rosemary	
40	15 gal	Solanum rantonnei	Paraguay Nightshade	standard
41	1 gal	Stipa gigantea	Giant Feather Grass	
42	5 gal	Strelitzia reginae	Bird of Paradise	
43	1 gal	Sutera cordata	Bacopa	18" O.C.
44	1 gal	Teucrium chamaedrys	Germander	
45	5 gal	Tibouchina urvilleana	Princess Flower	
46	5 gal	Viburnum p. t. 'Shasta'	Doublefile Viburnum	
47	5 gal	Viburnum suspensum	Sandankwa	
48	1 gal	Zantedeschia albomaculata	Spotted Calla	
49	15 gal	Griselinia littoralis	Griselinia	
50	5 gal	Camelia j. 'Mrs. D.W. Davis'	Camelia	
51	5 gal	Abutilon hybrid 'Moonchimes'	Chinese Bellflower	
52	15 gal	Dicksonia antarctica	Tasmanian Tree Fern	
53	15 gal	Rhapis excelsa	Lady Palm	36" O.C.
GROUNDCOVERS				
KEY	SIZE	BOTANICAL NAME	COMMON NAME	COMMENTS
AR	1 gal	Ajuga r. 'Jungle Green'	Carpet Bugle	12" O.C.
BC	1 gal	Bergenia crassifolia	Winter–blooming Bergenia	15" O.C.
CP	1 gal	Campanula portenschlagiana	Campanula	12" O.C.
CM	1 gal	Convolvulous mauritanicus	Ground Morning Glory	18" O.C.
FC	1 gal	Fragaria chiloensis	Wild Strawberry	12" O.C.
HC	1 gal	Hypericum calycinum	Creeping St. Johns Wort	24" O.C.
LL	1 gal	Lantana m. 'Lavender Swirl'	Lantana	30" O.C.
LM	1 gal	Liriope m. 'Majestic'	Lily Turf	12" O.C.
PN	flats	Potentilla neumanniana	Spring Cinquefoil	9" O.C.
RO	1 gal	Rosmarinus officinalis prostrata	Creeping Rosemary	15" O.C.
SM	1 gal	Scaevola 'Mauve Clusters'	Scaevola	15" O.C.
TJ	1 gal	Trachelospermum jasminoides	Star Jasmine	15" O.C.
VM	1 gal	Vinca Minor	Vinca	15" O.C.
VINES				
KEY	SIZE	BOTANICAL NAME	COMMON NAME	COMMENTS
CC	1 gal	Clytostoma callistegiodes	Violet Trumpet Vine	
CG	1 gal	Clematis m. 'Grandiflora'	Anemone Clematis	
HV	1 gal	Hardenbergia violacea	Happy Wanderer	
JP	1 gal	Jasminum polyanthum	Pink Jasmine	
PT	1 gal	Parthenocissus tricuspidata	Boston Ivy	
WS	5 gal	Wisteria sinensis	Chinese Wisteria	
FP	1 gal	Ficus Pumila 'Variegata'	Creeping Fig	

PLANT SPACING DIAGRAM

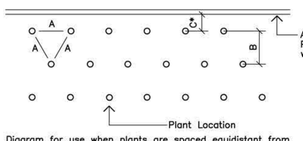


Diagram for use when plants are spaced equidistant from each other as in all ground cover plantings and massed shrub plantings

PLANT CALLOUT SYMBOL



PLANT QUANTITY DIAGRAM

SPACING 'A'	SPACING 'B'	SPACING 'C'	NO. OF PLANTS/SQUARE FOOT
6" O.C.	5.20"	2.60"	4.60
8" O.C.	6.93"	3.47"	2.60
9" O.C.	7.79"	3.90"	1.78
10" O.C.	8.66"	4.33"	1.66
12" O.C.	10.40"	5.20"	1.15
15" O.C.	13.00"	6.50"	0.74
18" O.C.	15.60"	7.80"	0.51
24" O.C.	20.80"	10.40"	0.29
30" O.C.	26.00"	13.00"	0.18
36" O.C.	30.00"	15.00"	0.12
48" O.C.	40.00"	20.00"	0.07
72" O.C.	62.35"	31.18"	0.04

See Plant Spacing Diagram for maximum triangular spacing 'A'. This chart is to be used to determine number of ground cover required in a given area and spacing between shrub massings. Where shrub massings are shown, calculate shrub mass areas before utilizing spacing chart to determine plant quantities.

* Where curb, sidewalk, adjacent planting bed or wall condition occurs, utilize spacing 'C' to determine plant distance from wall, sidewalk, adjacent planting bed or back of curb, where C=1/2 B.



CERCIS OCCIDENTALIS



QUERCUS SUBER



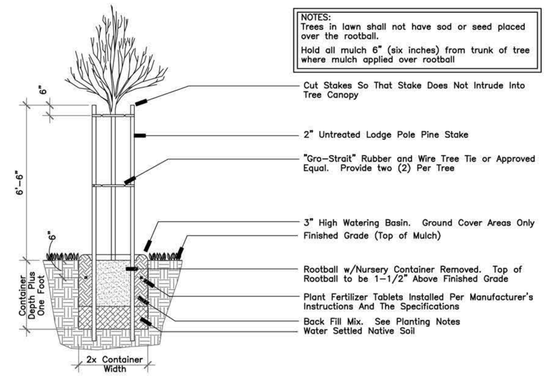
QUERCUS AGRIFOLIA



MELALEUCA NESOPHILA



OLEA EUROPA 'FRUITLESS'



Tree Staking Diagram

Not to Scale



Shrub Planting Detail

Not to Scale



GINKGO BILOBA



LOPHOSTEMON CONFERTUS

GEIJERA PARVIFLORA

MELALEUCA QUINQUENERVIA

ANTON EVOLVE
6701 SHELLMOUND
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TCA# 2015-021

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JUNE 05 2015

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LANDSCAPE PLANTING NOTES AND LEGENDS

L2



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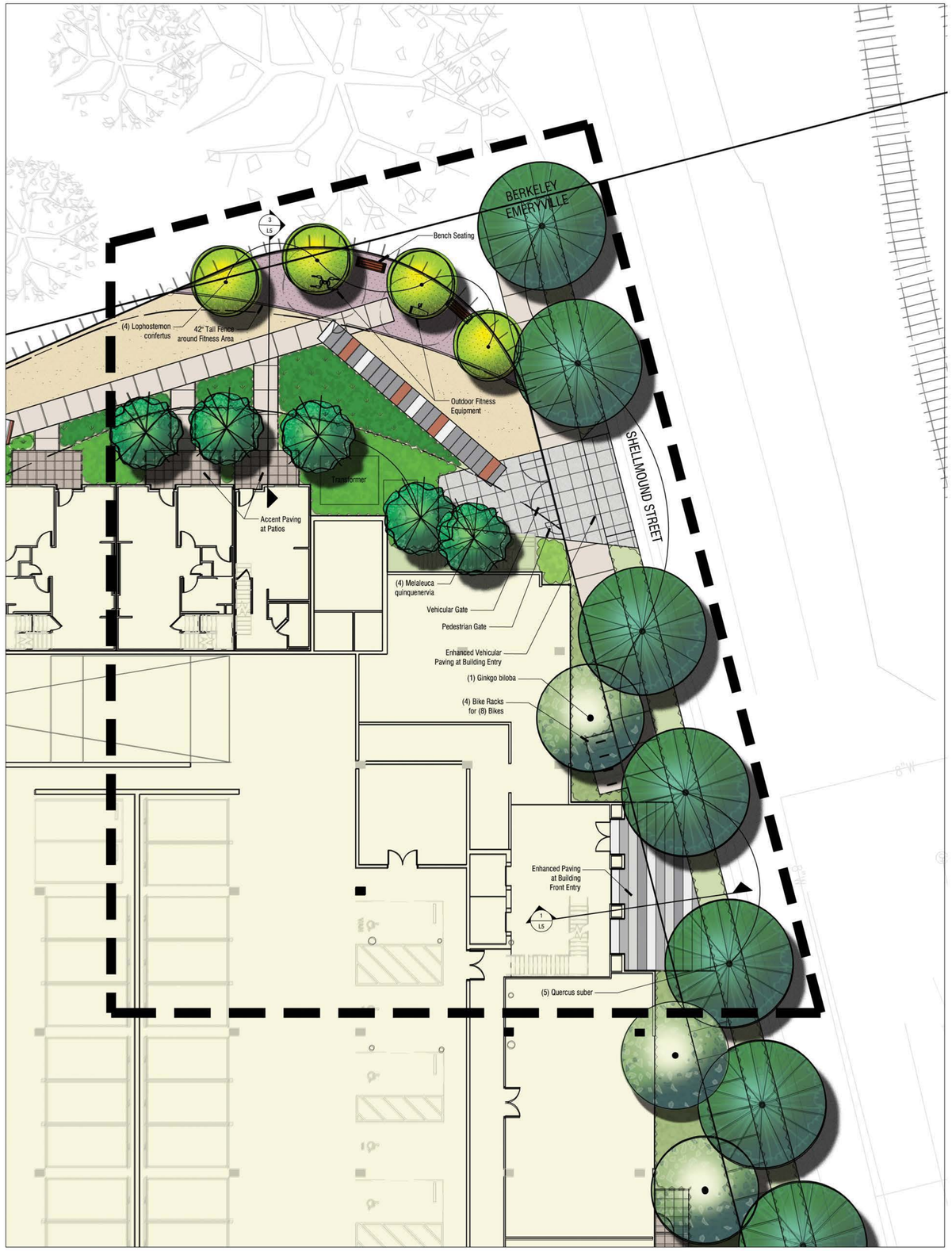
0 8 16 32

SCHEMATIC LANDSCAPE
AT GRADE
SITE PLAN

L3





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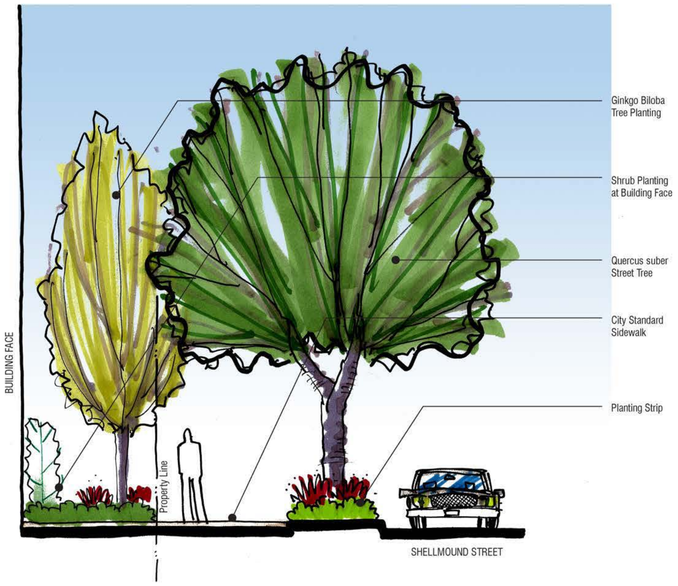
Scale: 1" = 10'-0"
0 5 10 20

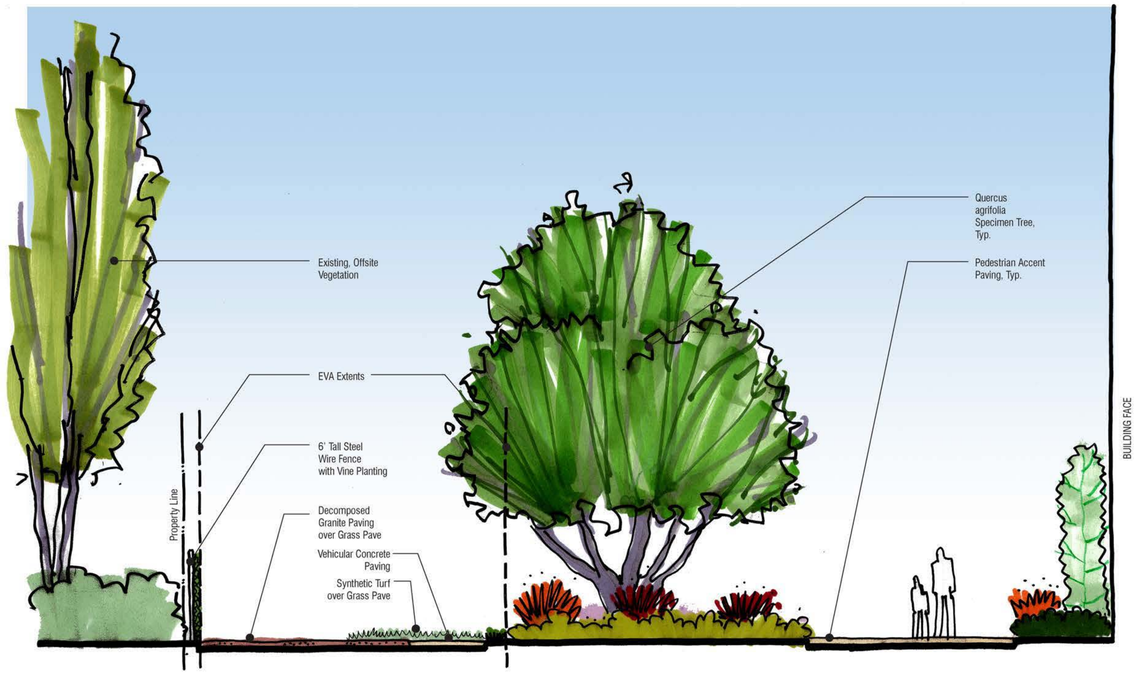
SCHEMATIC LANDSCAPE
AT GRADE
PLAN ENLARGEMENTS

L4



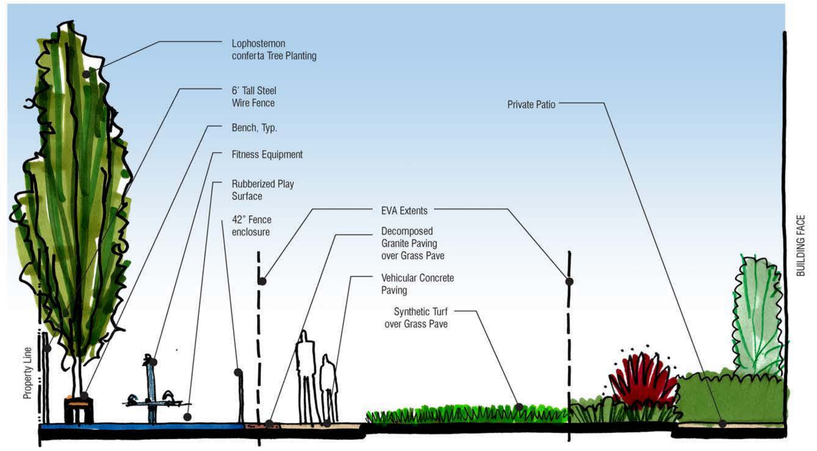
1 Section Through Shellmound Frontage

Scale: 1/4" = 1'-0"



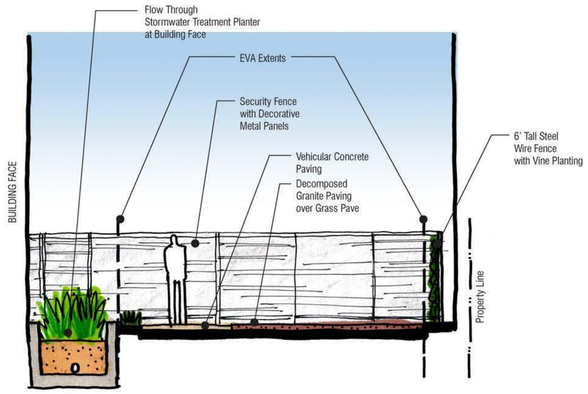
2 Section Through Western EVA

Scale: 1/4" = 1'-0"



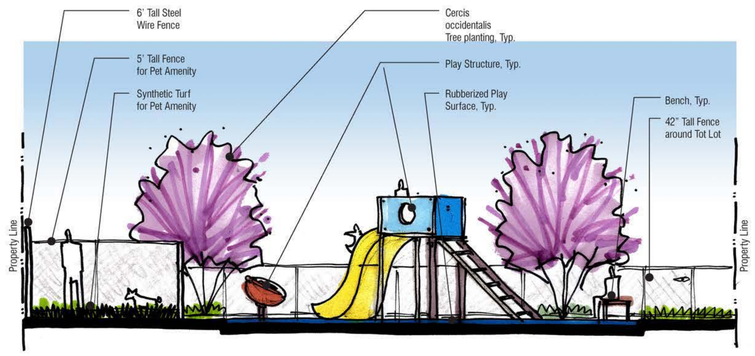
3 Section Through Northwestern EVA

Scale: 1/4" = 1'-0"



4 Section Through Eastern EVA

Scale: 1/4" = 1'-0"



5 Section Through Tot Lot and Dog Run

Scale: 1/4" = 1'-0"

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SCHEMATIC LANDSCAPE
AT GRADE
SECTIONS



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North

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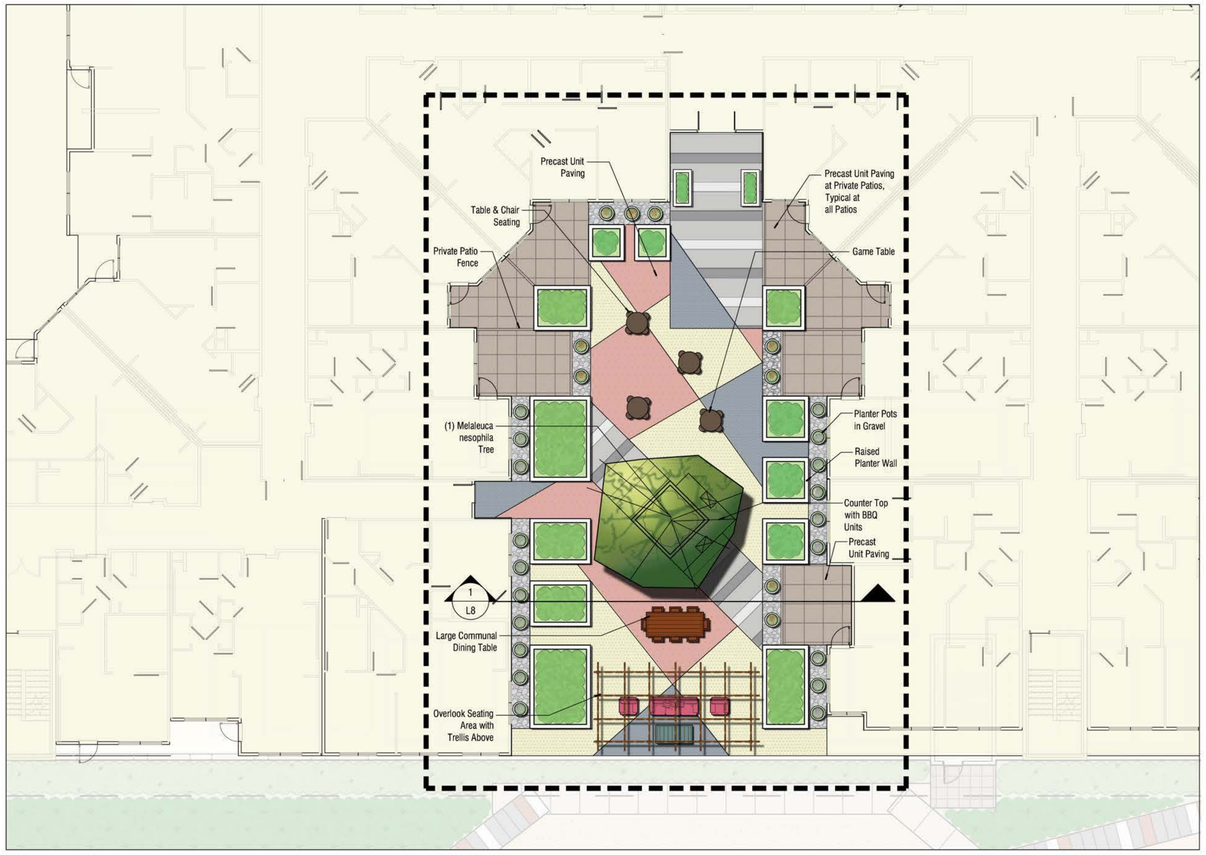
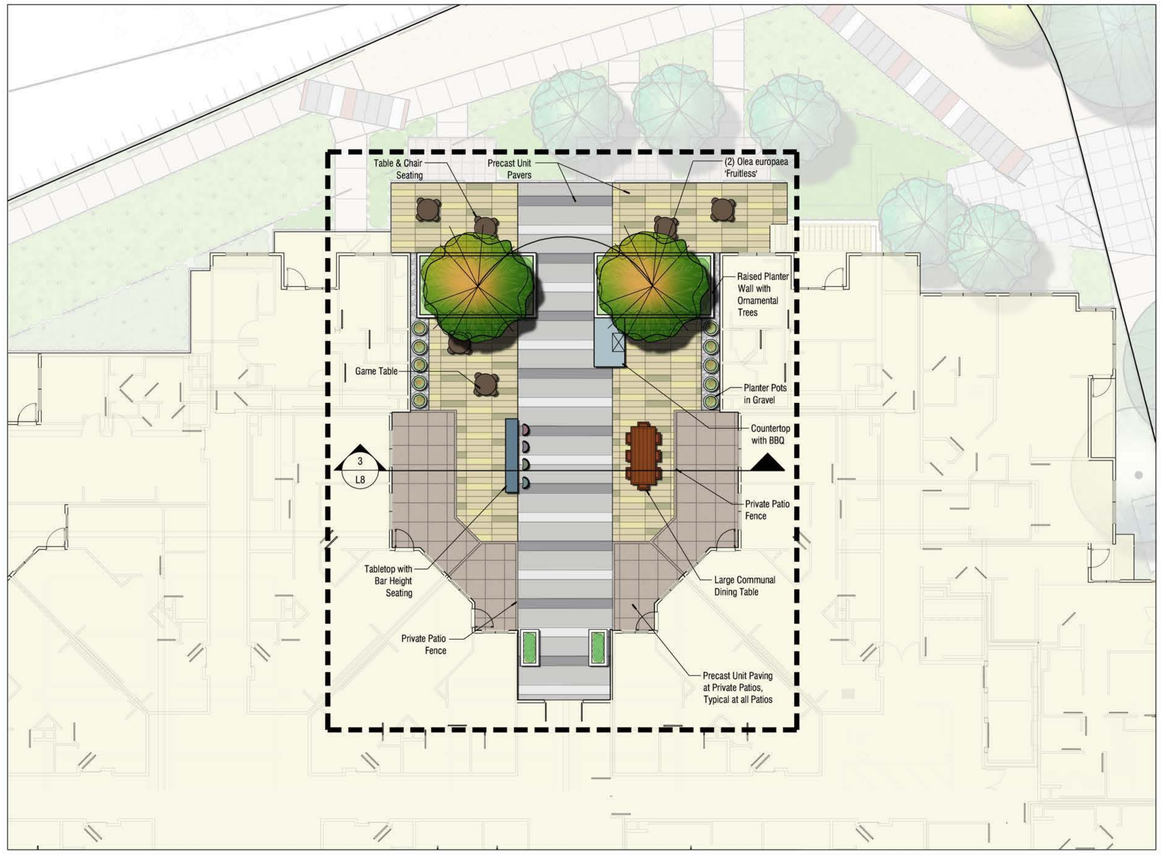
0 8 16 32

SCHEMATIC LANDSCAPE
ON STRUCTURE
SITE PLAN

L6



SOUTHWEST
COURTYARD



NORTHWEST
COURTYARD



SOUTHEAST
COURTYARD

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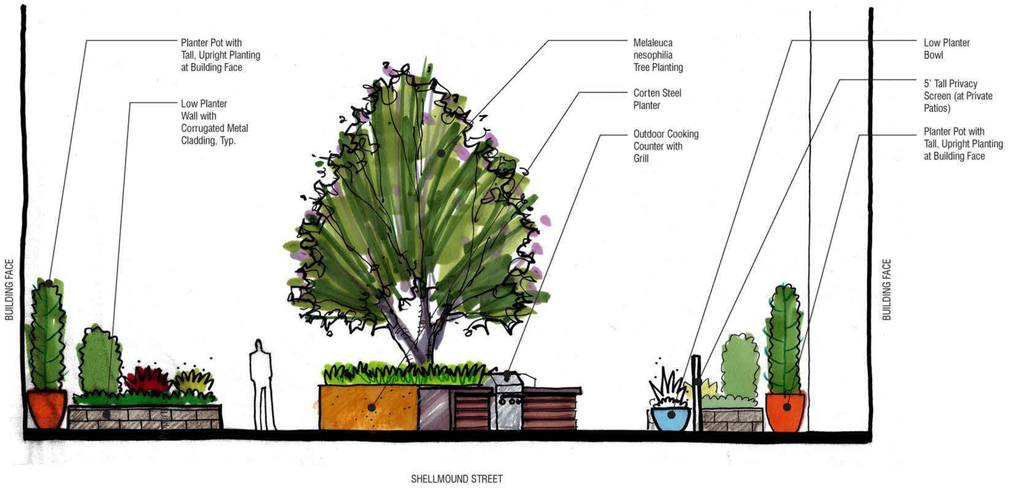
0 5 10 20

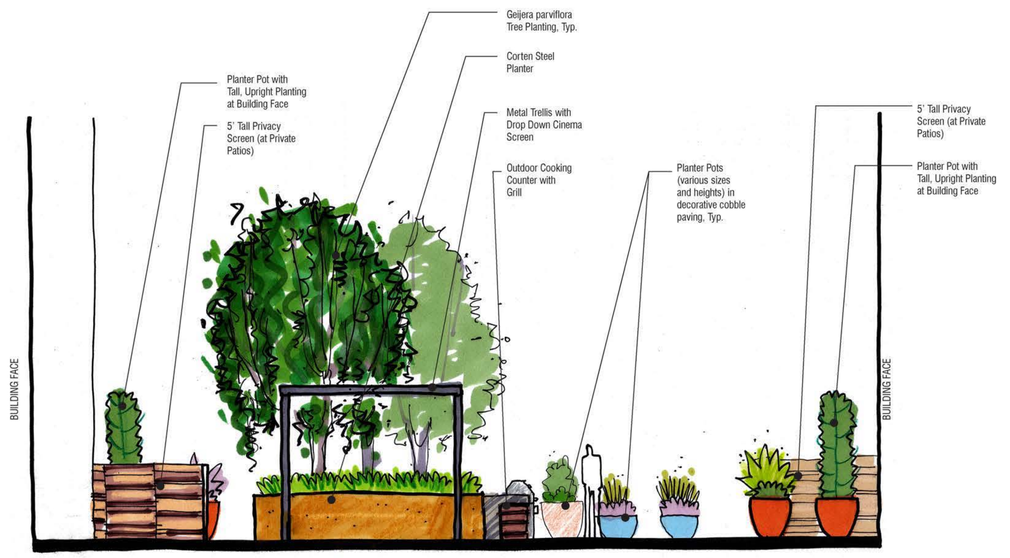
SCHEMATIC LANDSCAPE
ON STRUCTURE
PLAN ENLARGEMENTS

L7



1 Section Through Courtyard A

Scale: 1/4" = 1'-0"



2 Section Through Courtyard B

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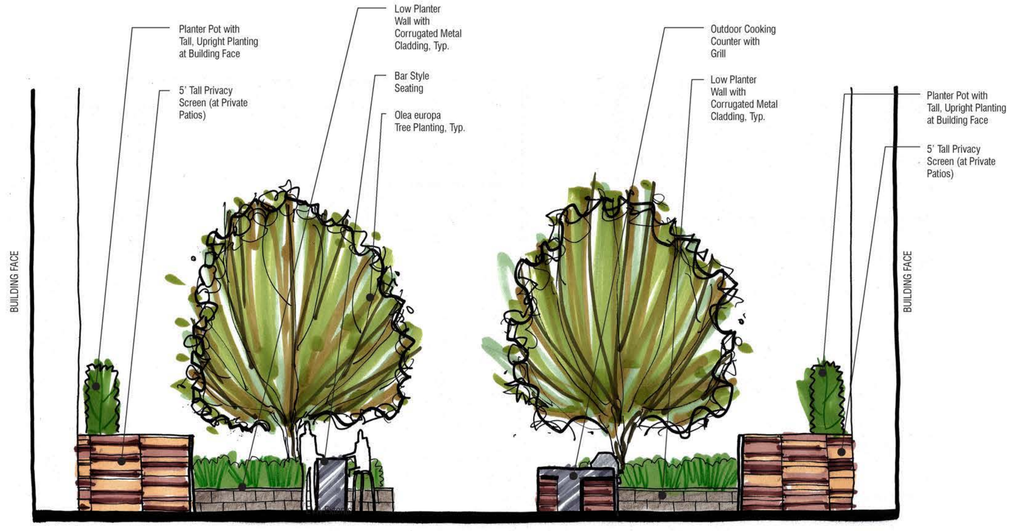

3 Section Through Courtyard C

Scale: 1/4" = 1'-0"

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PLANNING SCHEMATIC DESIGN
JUNE 05 2015

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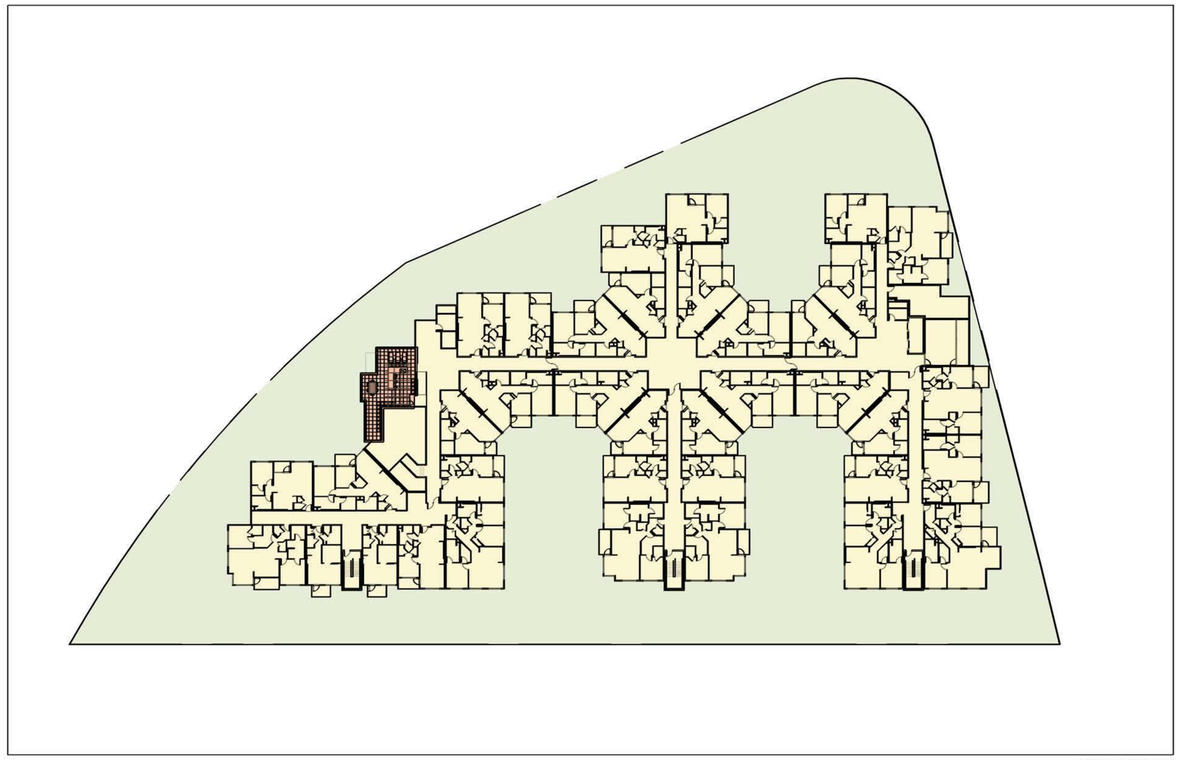
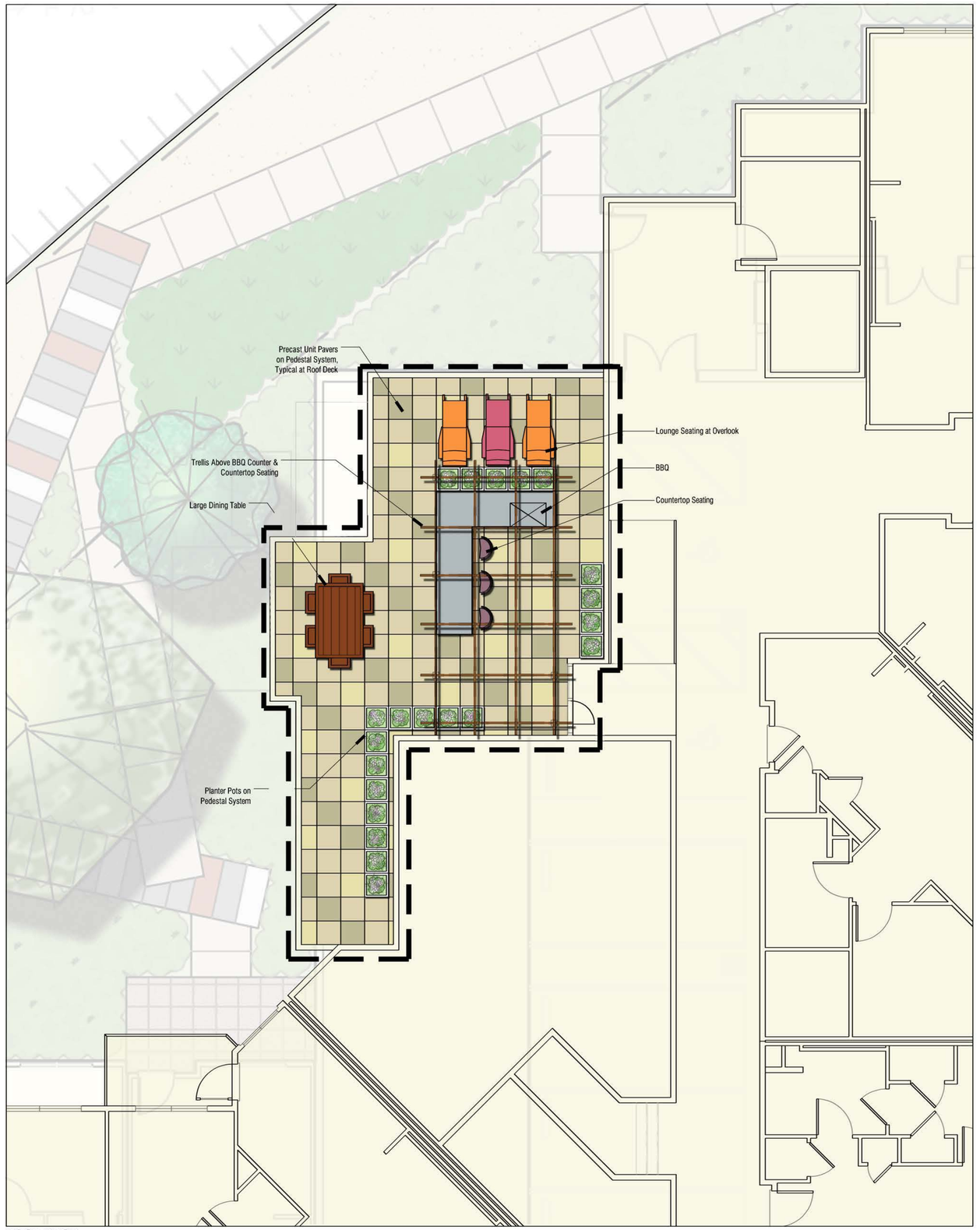
SCHEMATIC LANDSCAPE ON STRUCTURE SECTIONS

L8



ROOF DECK
LOCATION



ROOF DECK
ENLARGEMENT

ANTON EVOLVE
6701 SHELLMOUND
EMERYVILLE, CA

TCA ARCHITECTS

Anton DEVELOPMENT COMPANY
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PLANNING SCHEMATIC DESIGN
JUNE 05 2015

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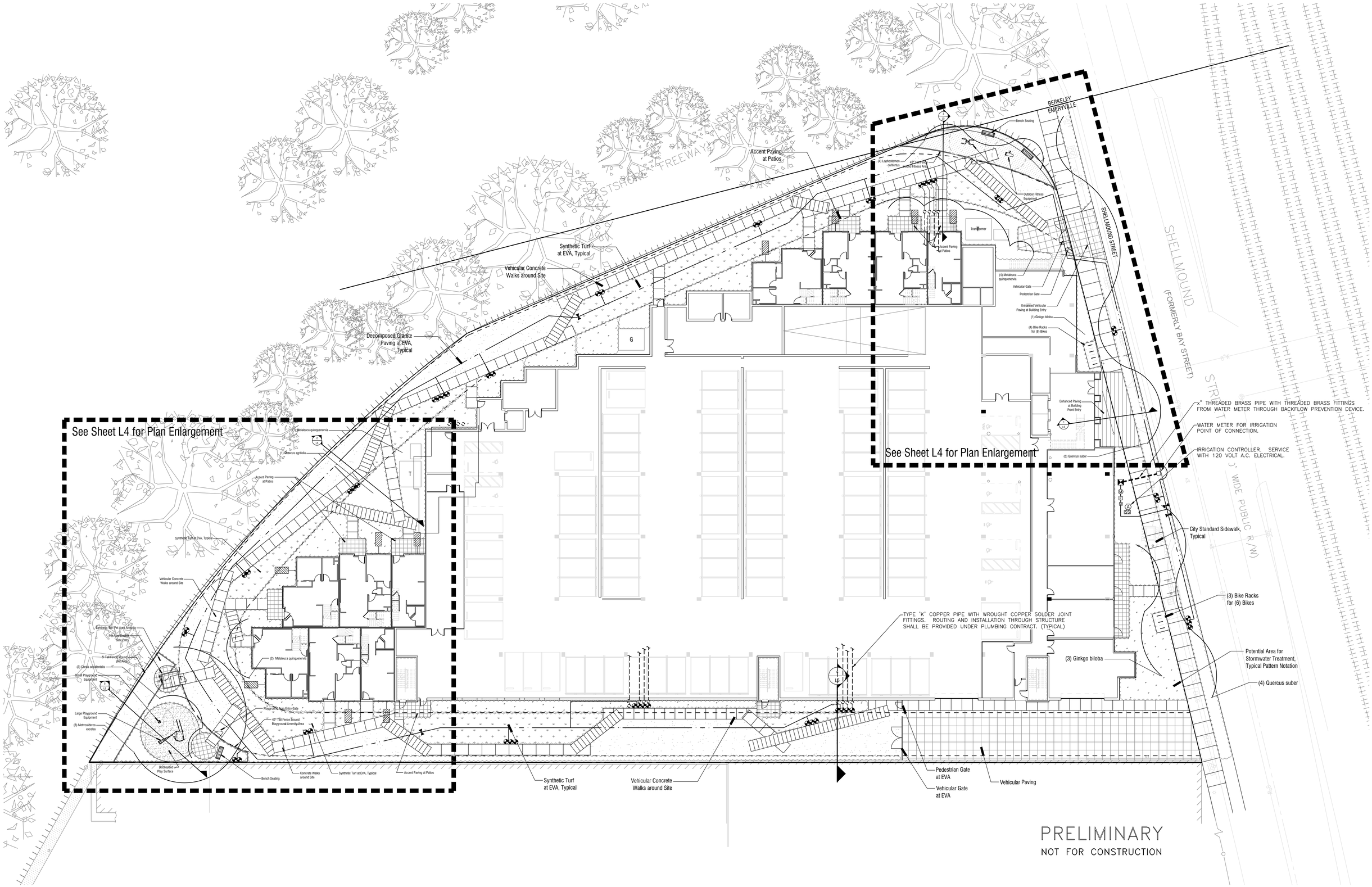
North

Scale: 1/4" = 1'-0"
0 4 8 16

SCHEMATIC LANDSCAPE
ROOF DECK
SITE PLAN

L9



ANTON EVOLVE
6701 SHELLMOUND
EMERYVILLE, CA

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Anton DEVELOPMENT COMPANY
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PLANNING SCHEMATIC DESIGN
JUNE 05 2015

DICKSON & ASSOCIATES, INC.
LANDSCAPE IRRIGATION
MARTY DICKSON, ASIC-PIC
TEL(530) 547-5515 FAX(530) 547-5513
P.O. BOX 415
PALO CEDRO, CALIFORNIA 96073
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Landscape Architects and Planners
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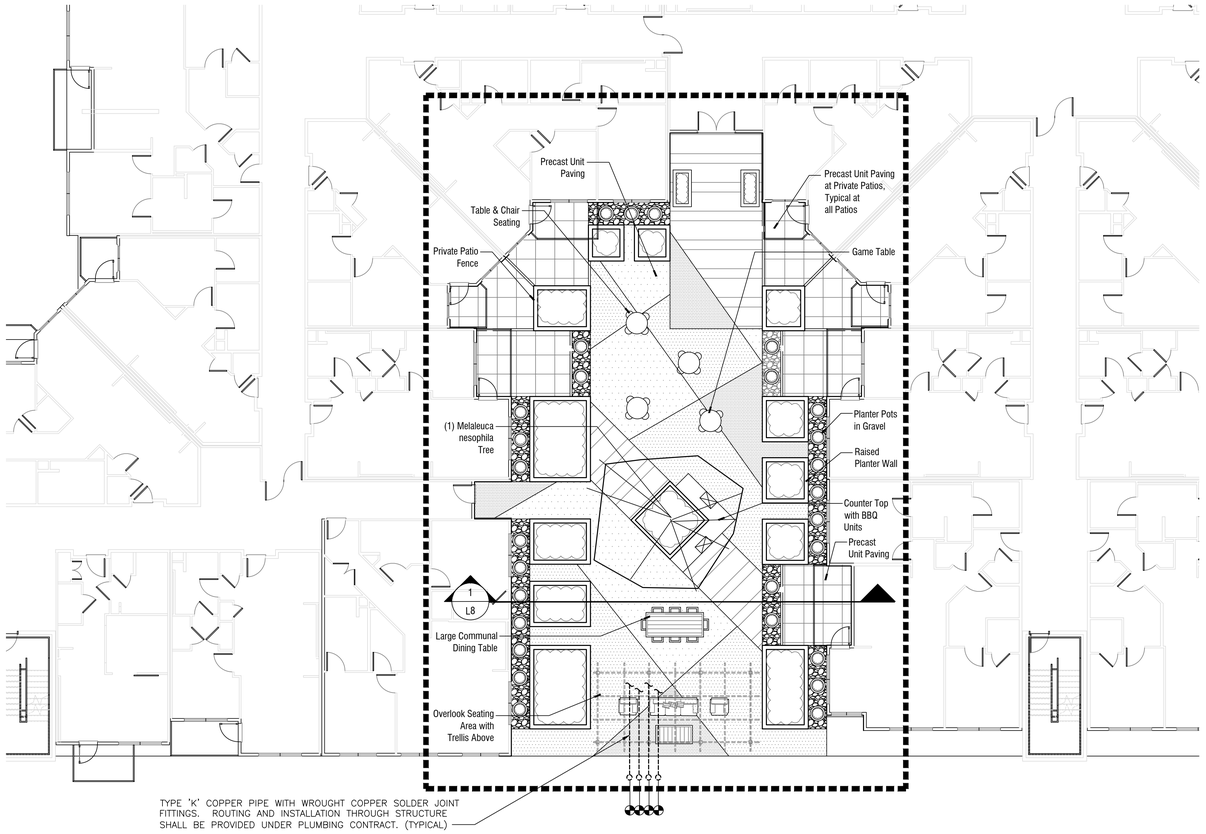
North

Scale: 1/16" = 1'-0"
0 8 16 32

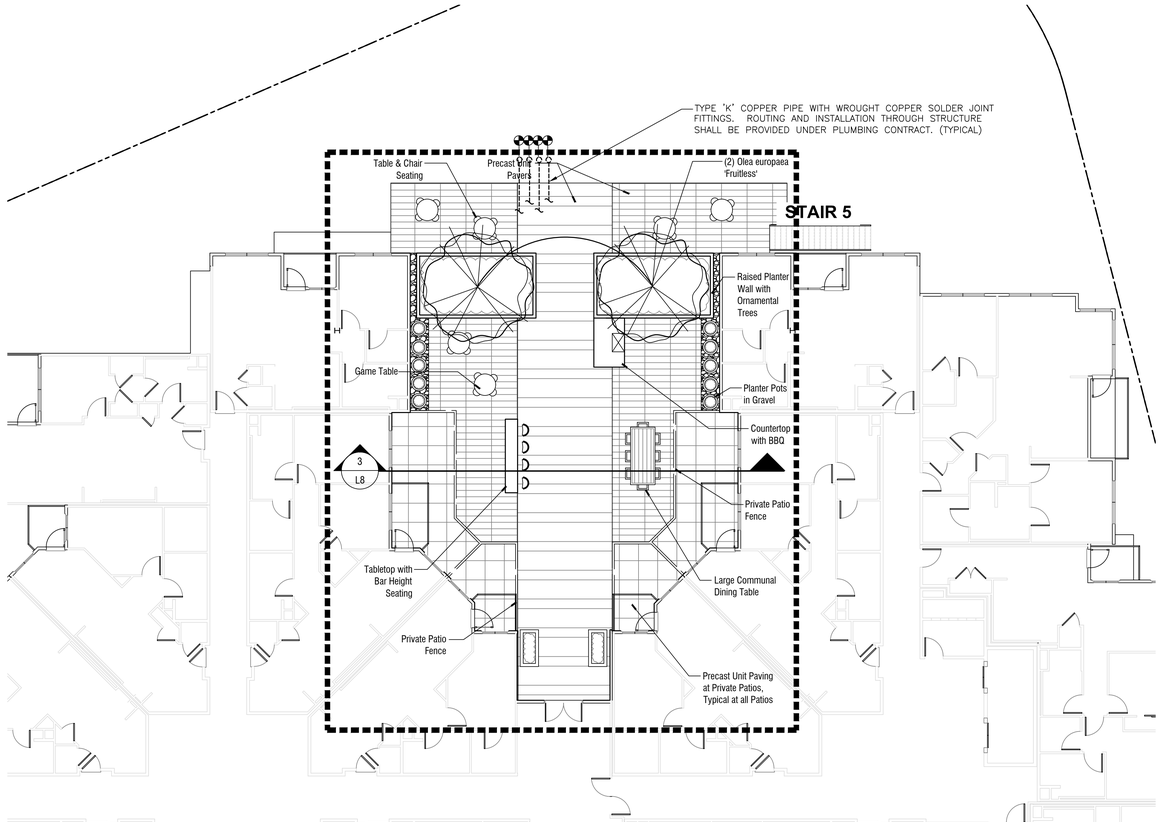
SCHEMATIC IRRIGATION-AT GRADE

L10

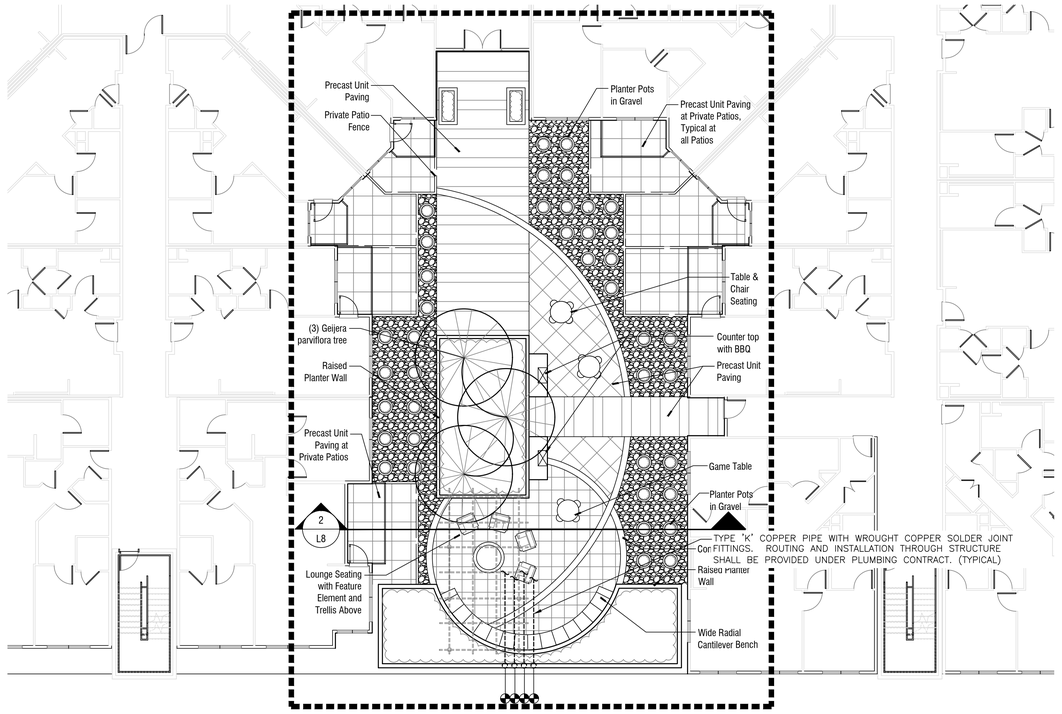
ANTON EVOLVE/A/JOB/15-604/ L10-IRR / L10 /SYMBOL SIZE: 16 /06-05-2015 CK



IRRIGATION PLAN – PODIUM ENLARGEMENT



IRRIGATION PLAN – PODIUM ENLARGEMENT



PRELIMINARY

NOT FOR CONSTRUCTION

IRRIGATION PLAN – PODIUM ENLARGEMENT

ANTON EVOLVE
6701 SHELLMOUND
EMERYVILLE, CA

TCA ARCHITECTS

Anton DEVELOPMENT COMPANY
TCA# 2015-021

PLANNING SCHEMATIC DESIGN
JUNE 05 2015

DICKSON & ASSOCIATES, INC.
LANDSCAPE IRRIGATION
MARTY DICKSON, ASIC-PIC
TEL(530) 547-5515 FAX(530) 547-5513
P.O. BOX 415
PALO CEDRO, CALIFORNIA 96073
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THE GUZZARDO PARTNERSHIP Inc.
Landscape Architects and Planners
181 Greenwich Street
San Francisco, CA 94111
T 415 433 4672
F 415 433 5003

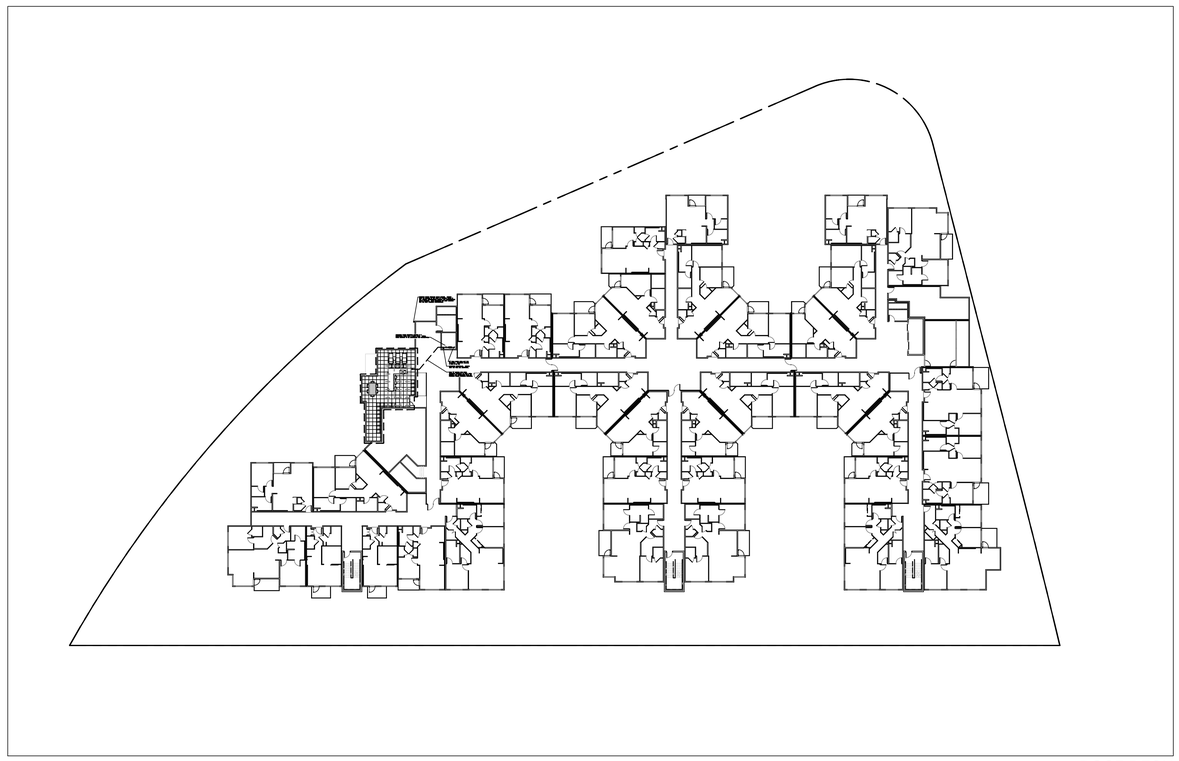
North

Scale: 1" = 10'
0 5 10 20

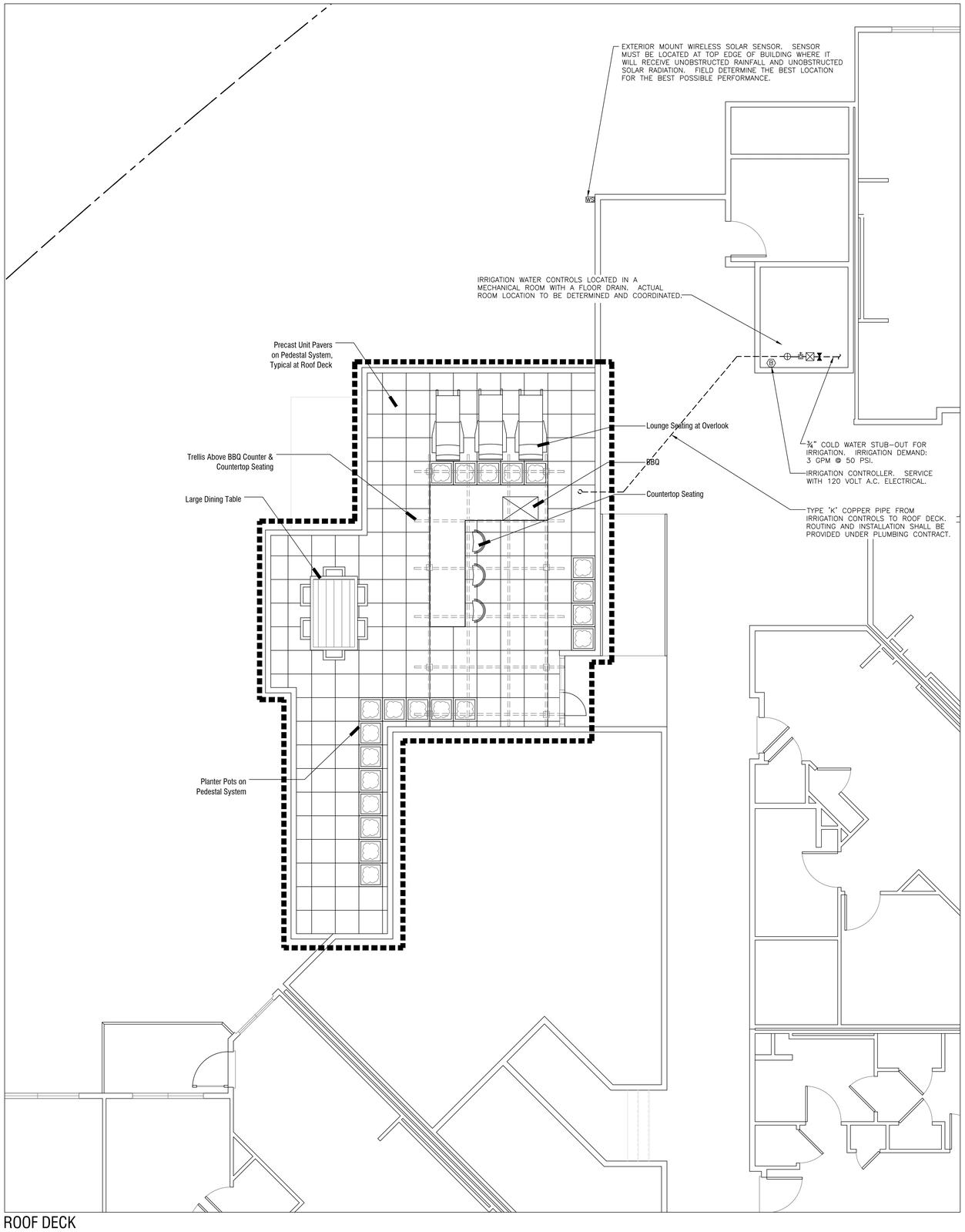
SCHEMATIC IRRIGATION-ON STRUCTURE

L11

ANTON EVOLVE/A/JOB/15-604/ L11-IRR / L11 /SYMBOL SIZE: 120 /06-05-2015 CK



ROOF DECK
LOCATION



ROOF DECK
ENLARGEMENT

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Landscape Architects and Planners
181 Greenwich Street
San Francisco, CA 94111
T 415 433 4672
F 415 433 5003

North

Scale: 1/4" = 1'-0"
0 4 8 16

SCHEMATIC IRRIGATION-
ROOF DECK

L12

IRRIGATION WATER CONSERVATION CALCULATIONS

City of Emeryville — Water Efficient Landscape Requirements

WATER EFFICIENT LANDSCAPE WORKSHEET

Project Address ANTON EVOLVE, 6701 SHELLMOUND Date 06-05-2015

Hydrozone Information Table

Hydro-zone	Hydrozone or Valve Number	Irrigation Method**	Hydrozone Area (Sq. Ft.)	Percent of Landscape Area
1	LOW SHRUB/GC	DRIP	9,900	60
2	MOD SHRUB/GC	DRIP	6,600	40
3				
4				
5				
6				
Total			16,500	100%

* Indicate the method of irrigation such as spray, rotor, bubbler, drip, etc.
If project has more than 6 hydrozones, duplicate this table on a separate sheet.

Maximum Applied Water Allowance Calculation
MAWA = 41.8 x 0.62 x [(0.7 x LA) + (0.3 x SLA)]
Insert your MAWA calculation in the space below:

41.8 x .62 x .7 x 16,500 = 299,330

Maximum Applied Water Allowance: 299,330 gallons per year.

Estimated Total Water Use Calculation

Hydrozone Number	Plant Water Use Type	Plant Factor (PF)	Hydrozone Area (HA) (Sq. Ft.)	PF x HA (Sq. Ft)
1	LOW	.3	9,900	2,970
2	MODERATE	.5	3,300	1,650
3				
4				
5				
			Sum of PF x HA:	4,620
6	SLA (if applicable)			

ETWU = 41.8 x 0.62 x [(Sum of (PF x HA) / IE] + SLA
Insert your ETWU calculation in the space below:

41.8 x .62 x (4,620/.9) = 133,035

Estimated Total Water Use: 133,035 gallons per year.

Comparison Between MAWA and ETWU
Difference between Maximum Applied Water Allowance and
Estimated Total Water Use (MAWA – ETWU): 166,295 gallons per year.

1

IRRIGATION NOTES

1. THESE IRRIGATION DRAWINGS ARE DIAGRAMMATIC AND INDICATIVE OF THE WORK TO BE INSTALLED. ALL PIPING, VALVES, ETC. SHOWN WITHIN PAVED AREAS IS FOR CLARITY ONLY AND ARE TO BE INSTALLED WITHIN PLANTING AREAS WHERE POSSIBLE. DUE TO THE SCALE OF THE DRAWINGS, IT IS NOT POSSIBLE TO INDICATE ALL OFFSETS, FITTINGS, SLEEVES, ETC., WHICH MAY BE REQUIRED. THE CONTRACTOR IS REQUIRED TO INVESTIGATE THE STRUCTURAL AND FINISHED CONDITIONS AFFECTING ALL OF THE CONTRACT WORK INCLUDING OBSTRUCTIONS, GRADE DIFFERENCES OR AREA DIMENSIONAL DIFFERENCES WHICH MAY NOT HAVE BEEN CONSIDERED IN THE ENGINEERING. IN THE EVENT OF FIELD DIFFERENCES, THE CONTRACTOR IS REQUIRED TO PLAN THE INSTALLATION WORK ACCORDINGLY BY NOTIFICATION AND APPROVAL OF THE OWNER'S AUTHORIZED REPRESENTATIVE AND ACCORDING TO THE CONTRACT SPECIFICATION. THE CONTRACTOR IS ALSO REQUIRED TO NOTIFY AND COORDINATE IRRIGATION CONTRACT WORK WITH ALL APPLICABLE CONTRACTORS FOR THE LOCATION AND INSTALLATION OF PIPE, CONDUIT OR SLEEVES THROUGH OR UNDER WALLS, ROADWAYS, PAVING, STRUCTURE, ETC., BEFORE CONSTRUCTION. IN THE EVENT THESE NOTIFICATIONS ARE NOT PERFORMED, THE CONTRACTOR SHALL ASSUME FULL RESPONSIBILITY FOR ALL REQUIRED REVISIONS.

2. THE CONTRACTOR SHALL EXERCISE CARE IN LOCATING PIPING AS TO NOT CONFLICT WITH OTHER UTILITIES. DO NOT INSTALL IRRIGATION PIPING PARALLEL TO AND DIRECTLY OVER OTHER UTILITIES.

3. THE INTENT OF THIS IRRIGATION SYSTEM IS TO PROVIDE THE MINIMUM AMOUNT OF WATER REQUIRED TO SUSTAIN GOOD PLANT HEALTH.

4. IT IS THE RESPONSIBILITY OF THE LANDSCAPE MAINTENANCE CONTRACTOR AND/OR OWNER TO PROGRAM THE IRRIGATION CONTROLLERS TO PROVIDE THE MINIMUM AMOUNT OF WATER NEEDED TO SUSTAIN GOOD PLANT HEALTH. THIS INCLUDES MAKING ADJUSTMENTS TO THE PROGRAM FOR SEASONAL WEATHER CHANGES, PLANT MATERIAL, WATER REQUIREMENTS, MOUNDS AND SLOPES, SUN, SHADE, AND WIND EXPOSURES.

5. AT THE END OF THE REQUIRED MAINTENANCE PERIOD OF THE CONTRACTOR, THE OWNER SHALL PROVIDE REGULAR MAINTENANCE OF THE IRRIGATION SYSTEM TO ENSURE THE EFFICIENT USE OF WATER. MAINTENANCE SHALL INCLUDE, BUT NOT BE LIMITED TO CHECKING, ADJUSTING, AND REPAIRING IRRIGATION EQUIPMENT AND CONTROL SYSTEM.

6. 120 VOLT A.C. (2.5 AMP DEMAND) ELECTRICAL SERVICE TO IRRIGATION CONTROLLER LOCATION TO BE PROVIDED UNDER ELECTRICAL CONTRACT WORK. IRRIGATION CONTRACTOR TO MAKE FINAL CONNECTION FROM ELECTRICAL STUB-OUT TO CONTROLLER AND PROVIDE PROPER GROUNDING PER CONTROLLER MANUFACTURER'S INSTRUCTIONS.

7. CONTROLLER SHALL HAVE ITS OWN GROUND ROD. THE GROUND ROD SHALL BE AN EIGHT FOOT LONG BY 5/8" DIAMETER U.L. APPROVED COPPER CLAD ROD. NO MORE THAN 6" OF THE GROUND ROD TO BE ABOVE GRADE. CONNECT #6 GAUGE WIRE WITH A U.L. APPROVED GROUND ROD CLAMP TO ROD AND BACK TO GROUND SCREW AT BASE OF CONTROLLER WITH APPROPRIATE CONNECTOR. THIS WIRE SHOULD BE AS SHORT AS POSSIBLE, AVOIDING ANY KINKS OR BENDING. GROUND ROD SHALL BE A MINIMUM OF EIGHT FEET (8') FROM IRRIGATION CONTROL WIRE BUNDLE.

8. IRRIGATION CONTROLLER TO HAVE ITS OWN INDEPENDENT 24 VOLT COMMON GROUND WIRE.

9. CONTRACTOR SHALL PROGRAM THE IRRIGATION CONTROLLER TO PROVIDE IRRIGATION TO ALL PLANTING WITHIN THE ALLOWED WATERING WINDOW OF TIME AS REQUIRED. THE CONTRACTOR SHALL CREATE CONTROLLER PROGRAMING THAT WILL NOT EXCEED THE MAXIMUM GALLONS PER MINUTE FLOW RATE STATED ON THE DRAWINGS, AND NOT EXCEED THE CAPACITY OF ANY MAIN LINE PIPING.

10. IRRIGATION CONTROL WIRES SHALL BE COPPER WITH U.L. APPROVAL FOR DIRECT BURIAL IN GROUND, SIZE #14-1. COMMON GROUND WIRE SHALL HAVE WHITE INSULATING JACKET. CONTROL WIRE SHALL HAVE INSULATING JACKET OF COLOR OTHER THAN WHITE. SPLICE SHALL BE MADE WITH 3M-DBR/Y-6 SEAL PACKS.

11. FLOW SENSOR CABLE SHALL BE A SOLID COPPER SHIELDED PAIR CABLE, SIZE #16. NO SPLICES ALLOWED.

12. INSTALL SPARE CONTROL WIRE OF A DIFFERENT COLOR ALONG THE ENTIRE MAIN LINE. LOOP 36" EXCESS WIRE INTO EACH SINGLE VALVE BOX AND INTO ONE VALVE BOX IN EACH GROUP OF VALVES. MINIMUM OF ONE SPARE WIRE PER CONTROLLER.

13. SPLICING OF 24 VOLT WIRES IS NOT PERMITTED EXCEPT IN VALVE BOXES. SEAL WIRE SPLICES WITH 3M-DBR/Y-6 SPLICE SEALING DEVICES OF SIZE COMPATIBLE WITH WIRE SIZE. LEAVE A 36" LONG, 1" DIAMETER COIL OF EXCESS WIRE AT EACH SPLICE AND A 36" LONG EXPANSION LOOP EVERY 100 FEET ALONG WIRE RUN. TAPE WIRES TOGETHER EVERY TEN FEET. TAPING WIRES IS NOT REQUIRED INSIDE SLEEVES.

14. PLASTIC VALVE BOXES ARE TO BE BLACK IN COLOR WITH BOLT DOWN, NON-HINGED COVER MARKED "IRRIGATION". BOX BODY SHALL HAVE KNOCK OUTS. MANUFACTURER SHALL BE CARSON INDUSTRIES.

15. INSTALL REMOTE CONTROL VALVE BOXES 12" FROM WALK, CURB, LAWN, HEADER BOARD, BUILDING, OR LANDSCAPE FEATURE. AT MULTIPLE VALVE BOX GROUPS, EACH BOX SHALL BE AN EQUAL DISTANCE FROM THE WALK, CURB. LAWN, ETC. AND EACH BOX SHALL BE 12" APART. SHORT SIDE OF RECTANGULAR VALVE BOXES SHALL BE PARALLEL TO WALK, CURB, ETC.

16. VALVE LOCATIONS SHOWN ARE DIAGRAMMATIC. INSTALL IN GROUND COVER/SHRUB AREAS WHERE POSSIBLE (NOT IN LAWN AREA).

17. THE REMOTE CONTROL VALVE SPECIFIED ON THE DRAWINGS IS A PRESSURE REDUCING TYPE. SET THE DISCHARGE PRESSURE AS FOLLOWS:
1. SINGLE OUTLET DRIP EMITTERS = 30 PSI
2. SUB-SURFACE DRIP EMITTERS = 30 PSI
3. MULTI-OUTLET DRIP EMITTERS = 30 PSI
4. TREE BUBBLERS = 35 PSI

18. THE IRRIGATION CONTRACTOR SHALL FLUSH AND ADJUST ALL SPRINKLER HEADS FOR OPTIMUM PERFORMANCE AND FLOW. THROTTLE THE FLOW CONTROL AT EACH VALVE TO OBTAIN THE OPTIMUM OPERATING PRESSURE FOR EACH SYSTEM.

19. LOCATE SINGLE OUTLET DRIP EMITTERS ON UP-HILL SIDE OF PLANT.

20. LOCATE BUBBLERS ON UP-HILL SIDE OF TREE.

21. INSTALL A VALCON 5000 SERIES SPRING LOADED CHECK VALVE BELOW THOSE BUBBLERS AND EMITTERS WHERE LOW HEAD DRAINAGE WILL CAUSE EROSION AND/OR EXCESS WATER.

22. WHERE IT IS NECESSARY TO EXCAVATE ADJACENT TO EXISTING TREES, THE CONTRACTOR SHALL USE ALL POSSIBLE CARE TO AVOID INJURY TO TREES AND TREE ROOTS. EXCAVATION IN AREAS WHERE TWO (2) INCH AND LARGER ROOTS OCCUR SHALL BE DONE BY HAND. TRENCHES ADJACENT TO TREE SHOULD BE CLOSED WITHIN TWENTY-FOUR (24) HOURS; AND WHERE THIS IS NOT POSSIBLE, THE SIDE OF THE TRENCH ADJACENT TO THE TREE SHALL BE KEPT SHADED WITH BURLAP OR CANVAS.

23. IRRIGATION CONTRACTOR TO NOTIFY ALL LOCAL JURISDICTIONS FOR INSPECTION AND TESTING OF INSTALLED BACKFLOW PREVENTION DEVICE.

24. PRESSURE TEST PROCEDURE. THE CONTRACTOR SHALL:
A. NOTIFY ARCHITECT AT LEAST THREE (3) DAY IN ADVANCE OF TESTING.
B. PERFORM TESTING AT HIS OWN EXPENSE.
C. CENTER LOAD PIPING WITH SMALL AMOUNT OF BACKFILL TO PREVENT ARCHING OR SLIPPING UNDER PRESSURE. NO FITTING SHALL BE COVERED.
D. APPLY THE FOLLOWING TESTS AFTER WELD PLASTIC PIPE JOINTS HAVE CURED AT LEAST 24 HOURS.
1. TEST LIVE (CONSTANT PRESSURE) AND QUICK COUPLER LINE HYDROSTATICALLY AT 125 PSI MINIMUM. LINES WILL BE APPROVED IF TEST PRESSURE IS MAINTAINED FOR SIX (6) HOURS. THE LINE WILL BE APPROVED OR NOT APPROVED AS SUCH RESULTS MAY INDICATE. THE CONTRACTOR SHALL MAKE TESTS AND REPAIRS AS NECESSARY UNTIL TEST CONDITIONS ARE MET.
2. TEST RCV CONTROLLED LATERAL LINES WITH WATER AT LINE PRESSURE AND VISUALLY INSPECT FOR LEAKS. RETEST AFTER CORRECTING DEFECTS.

25. THE SPRINKLER SYSTEM DESIGN IS BASED ON THE MINIMUM OPERATING PRESSURE SHOWN ON THE IRRIGATION DRAWINGS. THE IRRIGATION CONTRACTOR SHALL VERIFY WATER PRESSURE PRIOR TO CONSTRUCTION. REPORT ANY DIFFERENCE BETWEEN THE WATER PRESSURE INDICATED ON THE DRAWINGS AND THE ACTUAL PRESSURE READING AT THE IRRIGATION POINT OF CONNECTION TO THE OWNER'S AUTHORIZED REPRESENTATIVE.

26. IRRIGATION DEMAND: ___ GPM AT ___ PSI STATIC PRESSURE AT IRRIGATION POINT OF CONNECTION. FIELD VERIFY WATER PRESSURE PRIOR TO CONSTRUCTION. IF ACTUAL WATER PRESSURE DIFFERS FROM THE STATED PRESSURE CONTACT ARCHITECT FOR DIRECTION AND POSSIBLE REVISION.

27. PIPE THREAD SEALANT COMPOUND SHALL BE RECTOR SEAL T+2, CHRISTY'S ULTRA SEAL, OR APPROVED EQUAL.

28. SUB-SURFACE DRIP IRRIGATION AREAS MUST BE HAND WATERED TO INCREASE SOIL MOISTURE PRIOR TO PLANTING. AFTER PLANTING, THE SUB-SURFACE DRIP SYSTEMS MUST BE OPERATED ON A FREQUENT BASIS TO MAINTAIN SOIL MOISTURE CONTENT. DO NOT ALLOW SOIL TO DRY OUT. MAINTENANCE ROUTINE SHALL INCLUDE PROBING SOIL TO MONITOR MOISTURE CONTENT. USE CAUTION WHEN PROBING SOIL. DO NOT DAMAGE SUB-SURFACE DRIP TUBING.

29. RECORD DRAWINGS:
A. THE CONTRACTOR SHALL MAINTAIN IN GOOD ORDER IN THE FIELD OFFICE ONE COMPLETE SET OF BLACK LINE PRINTS OF ALL SPRINKLER DRAWINGS WHICH FORM A PART OF THE CONTRACT, SHOWING ALL WATER LINES, SPRINKLERS, VALVES, CONTROLLERS AND STUB-OUTS. IN THE EVENT ANY WORK IS NOT INSTALLED AS INDICATED ON THE DRAWINGS, SUCH WORK SHALL BE CORRECTED AND DIMENSIONED ACCURATELY FROM THE BUILDING WALLS.
B. ALL UNDERGROUND STUB-OUTS FOR FUTURE CONNECTIONS AND VALVES SHALL BE LOCATED AND DIMENSIONED ACCURATELY FROM BUILDING WALLS ON ALL RECORD DRAWINGS.
C. UPON COMPLETION OF THE WORK, OBTAIN REPRODUCIBLE PRINTS FROM ARCHITECT AND NEATLY CORRECT THE PRINTS TO SHOW THE AS-BUILT CONDITIONS.

IRRIGATION LEGEND

SYMBOL	MODEL NUMBER	DESCRIPTION
●	SL210	BOWSMITH SINGLE OUTLET EMITTER (1 GPH)
▲	ML210	BOWSMITH MULTI-OUTLET EMITTER (1 GPH PER OUTLET) (POTS ON ROOF DECK)
■	1401	RAIN BIRD BUBBLER (TREE)
□	RWS-B-C-1401	RAIN BIRD BUBBLER WITH DEEP WATERING BUBBLER ASSEMBLY AND CHECK VALVE (TREE)
	1" COMPACT 22 GPM	AMIAD FILTER WITH 155 MESH SCREEN (ROOF DECK)
	1" SUPER 31 GPM	AMIAD FILTER WITH 155 MESH SCREEN
△	SEE DETAIL	SINGLE OUTLET EMITTER FLUSH VALVE ASSEMBLY
	3200-1½"	SUPERIOR NORMALLY CLOSED MASTER CONTROL VALVE
	FSI-110-001-1"/P7162D-A	CREATIVE SENSOR TECHNOLOGY FLOW SENSOR WITH PAIGE SHIELDED COMMUNICATION CABLE
	ICV-FS-AS ADJ SERIES	HUNTER FILTER SENTRY PRESSURE ADJUSTABLE REMOTE CONTROL VALVE
	IBV-FS-AS ADJ SERIES	HUNTER FILTER SENTRY PRESSURE ADJUSTABLE BRASS REMOTE CONTROL VALVE (ROOF DECK)
	HQ-33DRC	HUNTER QUICK COUPLING VALVE
	T-113	NIBCO GATE VALVE (LINE SIZE)
	T-FCH-H-FIPT	TORO FLUSH VALVE (PIPE THREAD)
	T-YD-500-34	TORO AIR RELEASE & VACUUM RELIEF VALVE
	975XL2-1"	WILKINS REDUCED PRESSURE BACKFLOW ASSEMBLY (LEAD FREE) (ROOF DECK)
	975XL2-1¼"	WILKINS REDUCED PRESSURE BACKFLOW ASSEMBLY (LEAD FREE)
	IC-600-M	HUNTER I-CORE CONTROLLER (INTERIOR WALL MOUNT) (ROOF DECK)
WS	WSS	HUNTER WIRELESS SOLAR SYNC SENSOR AND SOLAR SYNC MODULE (ROOF DECK)
A	ICA6HU6-xx-SP/SOLSE/EMP-16/FAN-16	IMPERIAL TECHNICAL SERVICES CONTROLLER ASSEMBLY WITH HUNTER I-CORE CONTROLLER, STAINLESS STEEL TOP OPENING ENCLOSURE, SURGE PROTECTION, ENCLOSURE FAN, ENCLOSURE MOUNTING PAD, AND SOLAR SYNC WEATHER SENSOR. CONTACT ANDREW BOLT FOR ORDER, PURCHASE, AND WARRANTY. (209-404-1746)
SS	SOLAR SYNC-SEN	HUNTER SOLAR SYNC SENSOR (MOUNT ON SIDE OF CONTROLLER ENCLOSURE IN VANDAL RESISTANT ENCLOSURE)
		PRECIPITATION RATE
		CONTROLLER & STATION NUMBER
		APPROXIMATE FLOW (GPM)
		REMOTE CONTROL VALVE SIZE
		PLANT TYPE/WATER REQUIREMENT LH – LAWN/HIGH WATER LM – LAWN/MODERATE WATER LL – LAWN/LOW WATER SH – SHRUB & GROUNDCOVER/HIGH WATER SM – SHRUB & GROUNDCOVER/MODERATE WATER SL – SHRUB & GROUNDCOVER/LOW WATER TH – TREE/HIGH WATER TM – TREE/MODERATE WATER TL – TREE/LOW WATER
	MAIN LINE:	1120-SCHEDULE 40 PVC PLASTIC PIPE WITH SCHEDULE 40 PVC SOLVENT-WELD FITTINGS. 18" COVER.
	LATERAL LINE:	1120-SCHEDULE 40 PVC PLASTIC PIPE WITH SCHEDULE 40 PVC SOLVENT-WELD FITTINGS. 12" COVER.
	COPPER PIPE:	TYPE 'K' COPPER PIPE WITH WROUGHT COPPER SOLDER JOINT FITTINGS. ROUTING AND INSTALLATION THROUGH STRUCTURE SHALL BE PROVIDED UNDER PLUMBING CONTRACT.
	SUB-SURFACE DRIP BOUNDARY:	TORO DL2000 PC DRIPLINE (RGP-4-12). INSTALL AS DETAILED 12" O.C. SEE DRIP IRRIGATION DETAILS FOR TUBING LAYOUT, AND INSTALLATION METHODS. BOUNDARY DEFINES AREA FOR DRIPLINE TO BE CONNECTED TO ONE REMOTE CONTROL VALVE. SEE IRRIGATION PLANS. 4" COVER.
	SLEEVING:	1120-SCHEDULE 40 PVC PLASTIC PIPE. 18" COVER. 24" UNDER VEHICULAR PAVING.

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T 415 433 4672
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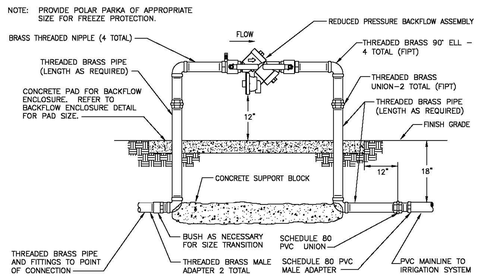
SCHEMATIC IRRIGATION - LEGEND, NOTES AND WATER CONSERVATION CALCULATIONS

L13

ANTON EVOLVE/A/JOB/15-604/ L10-RR / L13 /SYMBOL SIZE: NONE /06-04-2015 CK



REDUCED PRESSURE BACKFLOW ASSEMBLY
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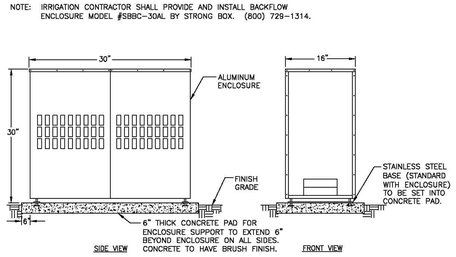
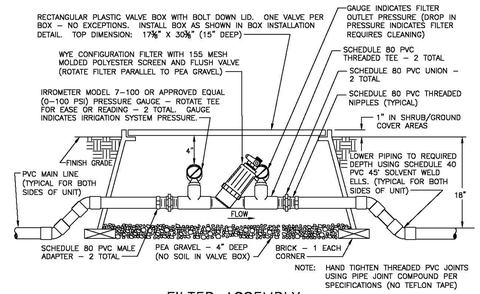


BACKFLOW PREVENTER ENCLOSURE
NOT TO SCALE



FILTER ASSEMBLY
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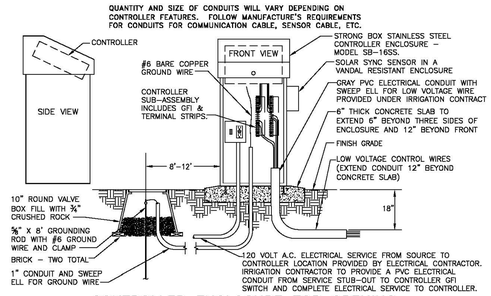
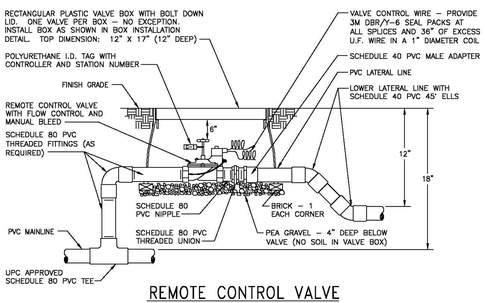
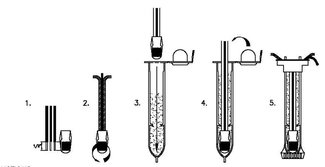


CONTROLLER ENCLOSURE TOP OPENING
NOT TO SCALE



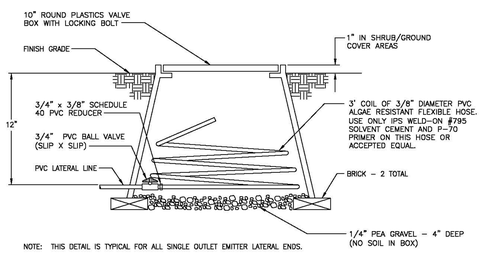
REMOTE CONTROL VALVE
NOT TO SCALE



INSTRUCTIONS:

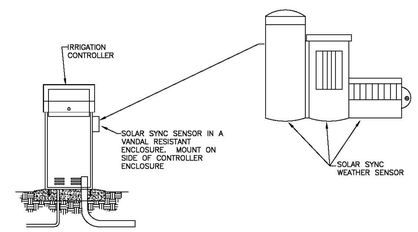
1. USE 3M–DBR/Y–6 WEATHER PROOF SPLICE.
2. STRIP WIRES APPROXIMATELY 1/2" (12.7 MM) TO EXPOSE WIRE.
3. TWIST CONNECTOR AROUND WIRES CLOCKWISE UNTIL HAND TIGHT, DO NOT OVERTIGHTEN.
4. INSERT WIRE ASSEMBLY INTO PLASTIC TUBE UNTIL WIRE CONNECTOR SNAPS PAST LIP IN BOTTOM OF TUBE.
5. PLACE WIRES WHICH EXIT TUBE IN WIRE EXIT HOLES AND CLOSE CAP UNTIL IT SNAPS.
6. INSPECT FINAL SPLICE ASSEMBLY TO BE SECURE AND FINISHED.

WEATHERPROOF SPLICE ASSEMBLY
NOT TO SCALE

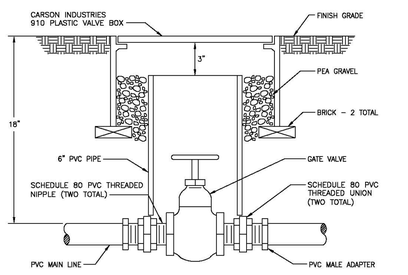


NOTE: THIS DETAIL IS TYPICAL FOR ALL SINGLE OUTLET EMITTER LATERAL ENDS.

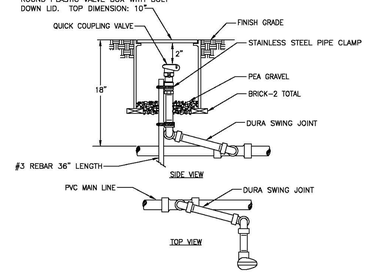
SINGLE OUTLET EMITTER LINE FLUSH VALVE
NOT TO SCALE



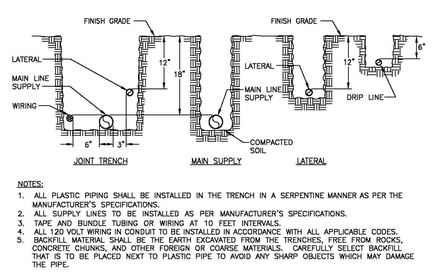
SOLAR SYNC SENSOR
NOT TO SCALE



GATE VALVE
NOT TO SCALE



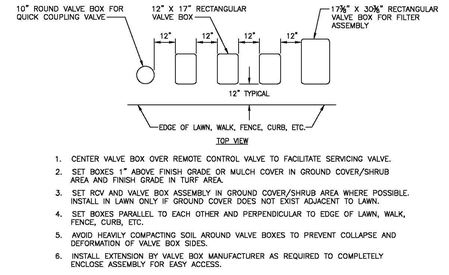
QUICK COUPLING VALVE
NOT TO SCALE



NOTES:

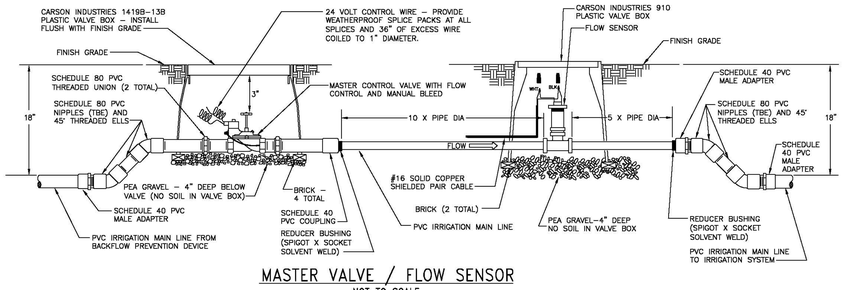
1. ALL PLASTIC PIPING SHALL BE INSTALLED IN THE TRENCH IN A SERPENTINE MANNER AS PER THE MANUFACTURER'S SPECIFICATIONS.
2. ALL SUPPLY LINES TO BE INSTALLED AS PER MANUFACTURER'S SPECIFICATIONS.
3. TAPE AND BUNDLE TUBING OR WIRING AT 10 FEET INTERVALS.
4. ALL 120 VOLT WIRING IN CONDUIT TO BE INSTALLED IN ACCORDANCE WITH ALL APPLICABLE CODES.
5. BACKFILL MATERIAL SHALL BE THE EARTH EXCAVATED FROM THE TRENCHES, FREE FROM ROCKS, CONCRETE CHUNKS, AND OTHER FOREIGN OR COARSE MATERIALS. CAREFULLY SELECT BACKFILL THAT IS TO BE PLACED NEXT TO PLASTIC PIPE TO AVOID ANY SHARP OBJECTS WHICH MAY DAMAGE THE PIPE.

TRENCHING DETAIL
NOT TO SCALE

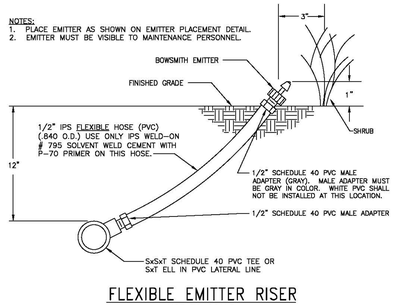


1. CENTER VALVE BOX OVER REMOTE CONTROL VALVE TO FACILITATE SERVICING VALVE.
2. SET BOXES 1" ABOVE FINISH GRADE OR MULCH COVER IN GROUND COVER/SHRUB AREA AND FINISH GRADE IN TURF AREA.
3. SET RCV AND VALVE BOX ASSEMBLY IN GROUND COVER/SHRUB AREA WHERE POSSIBLE. INSTALL IN LAWN ONLY IF GROUND COVER DOES NOT EXIST ADJACENT TO LAWN.
4. SET BOXES PARALLEL TO EACH OTHER AND PERPENDICULAR TO EDGE OF LAWN, WALK, FENCE, CURB, ETC.
5. AVOID HEAVILY COMPACTING SOIL AROUND VALVE BOXES TO PREVENT COLLAPSE AND DEFORMATION OF VALVE BOX SIDES.
6. INSTALL EXTENSION BY VALVE BOX MANUFACTURER AS REQUIRED TO COMPLETELY ENCLOSE ASSEMBLY FOR EASY ACCESS.

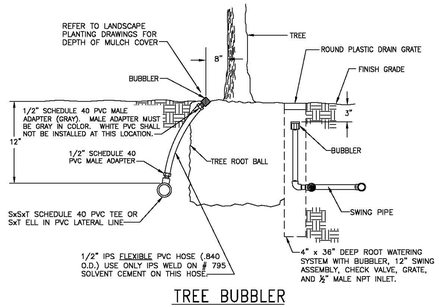
VALVE BOX INSTALLATION
NOT TO SCALE



MASTER VALVE / FLOW SENSOR
NOT TO SCALE



FLEXIBLE EMITTER RISER
NOT TO SCALE



TREE BUBBLER
NOT TO SCALE

PRELIMINARY
NOT FOR CONSTRUCTION

ANTON EVOLVE
6701 SHELLMOUND
EMERYVILLE, CA

TCA ARCHITECTS

Anton DEVELOPMENT COMPANY
TCA# 2015-021

PLANNING SCHEMATIC DESIGN
JUNE 05 2015

DICKSON & ASSOCIATES, INC.
LANDSCAPE IRRIGATION
MARTY DICKSON, ASIC–PIC
TEL(530) 547–5515 FAX(530) 547–5513
P.O. BOX 415
PALO CEDRO, CALIFORNIA 96073
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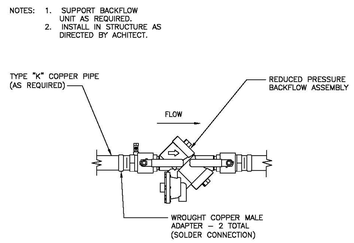
SCHEMATIC IRRIGATION-DETAILS

L14

IRRIGATION WATERING SCHEDULES

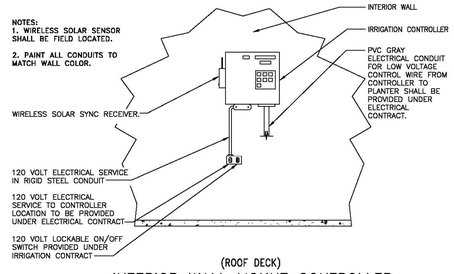
IN PROGRESS



(ROOF DECK)

REDUCED PRESSURE BACKFLOW ASSEMBLY

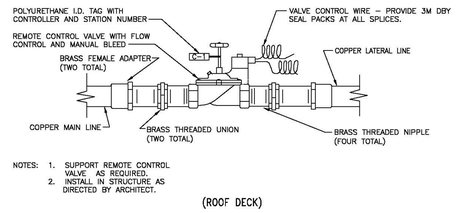
NOT TO SCALE



(ROOF DECK)

INTERIOR WALL MOUNT CONTROLLER

NOT TO SCALE



(ROOF DECK)

REMOTE CONTROL VALVE

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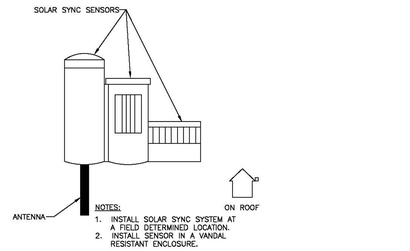

(ROOF DECK)

WIRELESS SOLAR SYNC SENSOR

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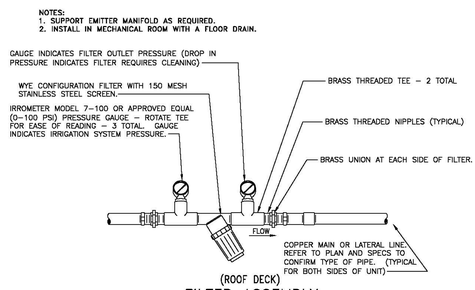
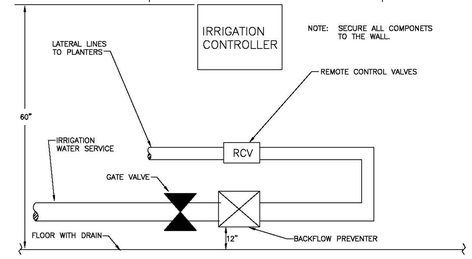


(ROOF DECK)

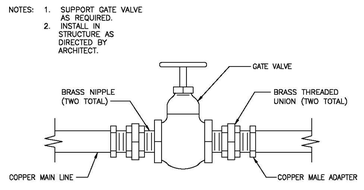
FILTER ASSEMBLY

NOT TO SCALE



IRRIGATION EQUIPMENT IN MECHANICAL ROOM

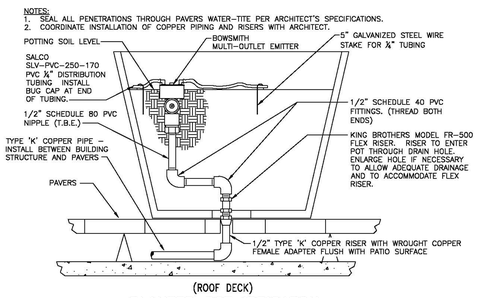
NOT TO SCALE



(ROOF DECK)

GATE VALVE

NOT TO SCALE



(ROOF DECK)

PLANTER POT IRRIGATON

NOT TO SCALE

PRELIMINARY

NOT FOR CONSTRUCTION

ANTON EVOLVE
6701 SHELLMOUND
EMERYVILLE, CA

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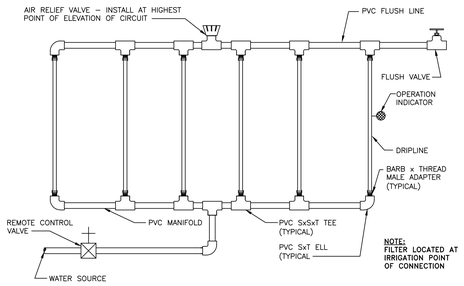
SCHEMATIC IRRIGATION-
DETAILS AND WATERING SCHEDULES

L15



SUB–SURFACE INSTALLATION LAYOUT
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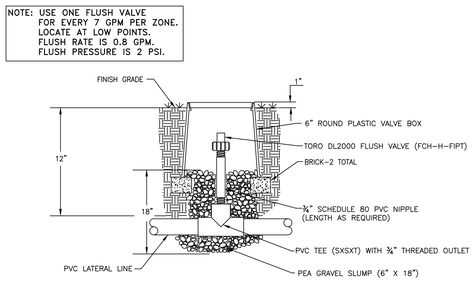
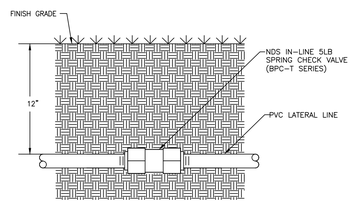
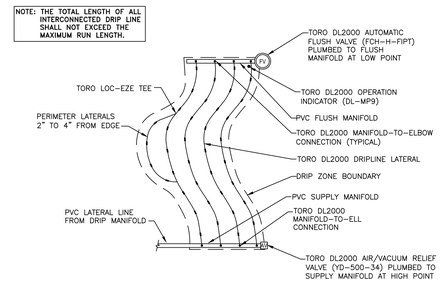


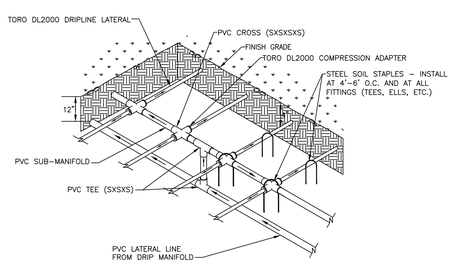
FLUSH VALVE AT PVC LATERAL
NOT TO SCALE



IN–LINE CHECK VALVE
NOT TO SCALE



ODD CURVES LAYOUT FOR SUB–SURFACE DRIP
NOT TO SCALE



SUB–MANIFOLD CENTER FEED
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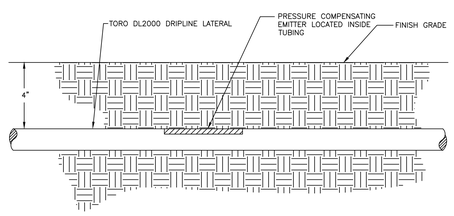
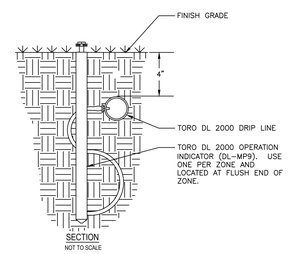
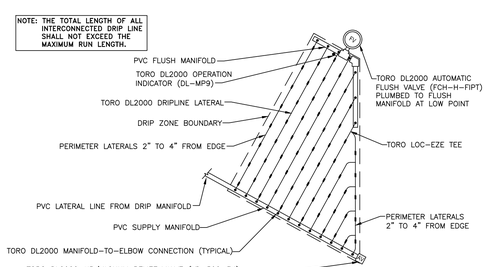


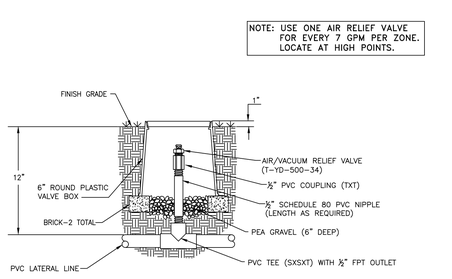
DRIP LINE DETAIL
NOT TO SCALE



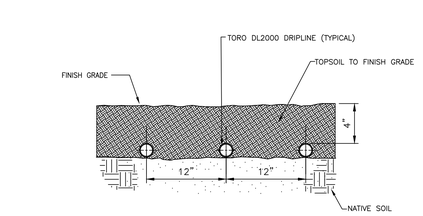
POP–UP OPERATION INDICATOR
NOT TO SCALE



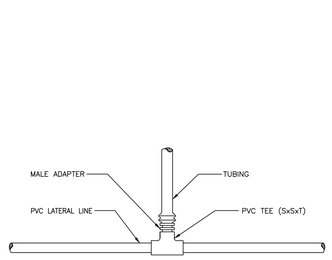
TRIANGULAR LAYOUT FOR SUB–SURFACE DRIP
NOT TO SCALE



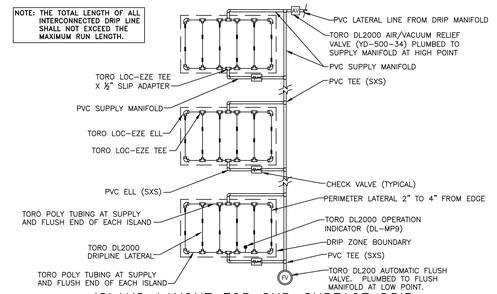
AIR/VACUUM RELIEF VALVE AT PVC LATERAL
NOT TO SCALE



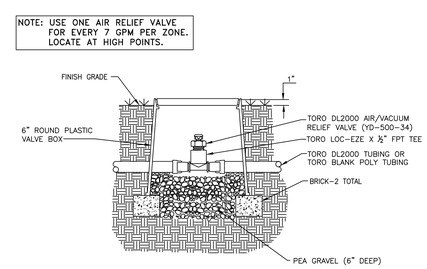
DRIPLINE SUB–SURFACE INSTALLATION 12" O.C.
NOT TO SCALE



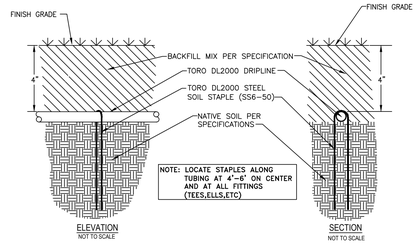
TUBING TO PVC CONNECTION
NOT TO SCALE



ISLAND LAYOUT FOR SUB–SURFACE DRIP
NOT TO SCALE



AIR/VACUUM RELIEF VALVE AT DRIP LINE PIPE
NOT TO SCALE



STEEL SOIL STAPLE
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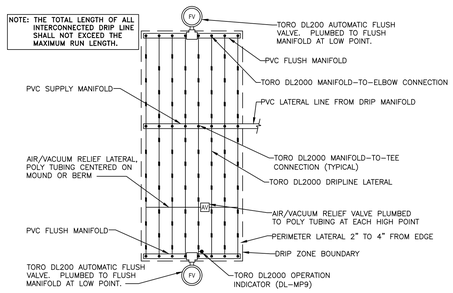

CENTER FEED LAYOUT FOR SUB–SURFACE DRIP
NOT TO SCALE

PRELIMINARY
NOT FOR CONSTRUCTION

ANTON EVOLVE
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EMERYVILLE, CA

TCA ARCHITECTS

Anton DEVELOPMENT COMPANY
TCA# 2015-021

PLANNING SCHEMATIC DESIGN
JUNE 05 2015

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T 415 433 4672
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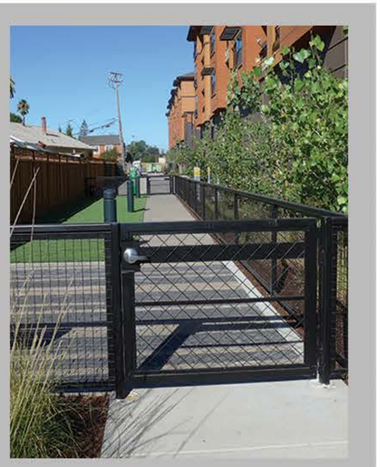
SCHEMATIC IRRIGATION-DETAILS

L16

ANTON EVOLVE/A/JOB/15–604/ L10–IRR / L16 /SYMBOL SIZE: NONE /06–05–2015 CK

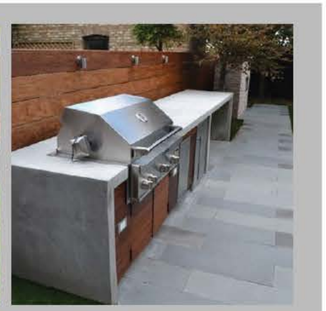
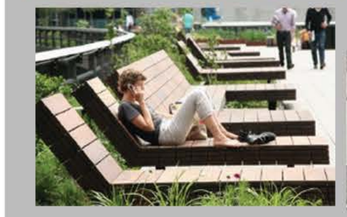








EVA/DOG RUN/TOT LOT/STREETSCAPE

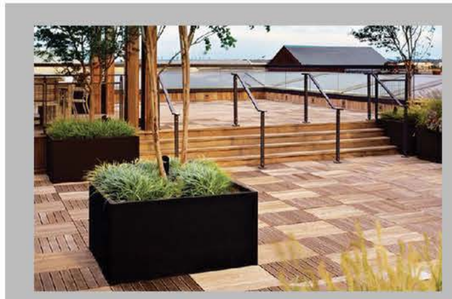




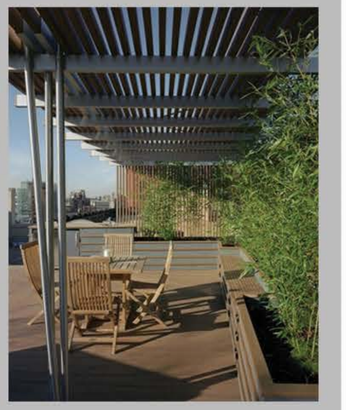




PODIUM COURTYARD






ROOF DECK

TREE PROTECTION/PRUNING NOTES

*These notes are supplement to the Tree Protection Notes provided by Arbor Resources on 06.05.15.

1. All trees designated to be preserved shall be verified by the Project Superintendent. This shall occur prior to the removal of any trees on-site.
2. Neighboring trees overhanging the site should be protected from site construction impacts in the same manner as existing on-site trees to be preserved.
3. Tree drip zone areas shall be protected with a 5' high chain link fence enclosure mounted on 2 inch diameter galvanized iron posts driven into the ground to a depth of at least 2 feet at no more than 10 foot spacing. The fence shall enclose the entire area under the dripline. Spray paint the top of the fence with bright orange paint before unrolling the fabric to ensure visibility of the barrier. In no case shall any vehicles or equipment be permitted to be stored within this enclosed area. Fence shall be erected before construction begins and remain in place until time for relocation.
4. No materials or topsoil shall be stored within the tree enclosure area.
5. No trenching within enclosure shall be permitted. Any tree roots encountered outside of the enclosure smaller than 2" shall be cut clean with the approved tree pruning tools and sealed with an approved fungicidal tree sealant. Tree roots 2" or larger shall not be cut. Route pipes into alternate location to avoid conflict. Any damaged or torn roots are to be root pruned and sealed with orange shellac.
6. No grading or trenching shall be permitted within the fenced zone or under the dripline except as specifically noted on the plans.
7. No soil sterilants shall be applied under pavement near existing trees.
8. Fertilizer and water soil injections must be done during April-May of the year of construction as well as the year after. These shall consist of Miller Nutrileaf 20-20-20 or equal at 5.5 pounds per 100 gallons of water or equivalent, or as recommended by the Arborist. This shall be applied to a depth of at least 18" and at a 20 degree angle toward the tree trunk at a rate of 10 gallons per inch of tree caliper.
9. Above ground surface runoff shall not be directed into the tree canopy area from adjacent areas.
10. A supplemental irrigation program is recommended at regular intervals (every three to four weeks) during the period in May 1 through Oct. 31. Irrigation is to be applied at or above the 'dripline' in an amount sufficient to supply approximately firteen gallons of water for each inch in trunk diameter.
11. Irrigation can be provide by means of a soil needle, 'soaker' or permeable hose. When using 'soaker' or permeable hose, water is to be run at low pressure, avoiding runoff/puddling, allowing the needed moisture to penetrate the soil to feeder root depths.
12. Periodic inspections by a qualified Arborist are recommended during construction activities, particularly as trees are impacted by trenching/grading operations. Any recommendations by the Arborist for maintaining the health of trees are to be implemented.
13. Tree Pruning Notes. All trees shall be pruned in compliance with the following industry standards:

    A. All specifications for working on protected trees shall be written and administered by a qualified arborist.

    B. All work on protected trees shall be in accordance with the industry Standard Practices for Tree Care Operations outlined in the ANSII A300-1995 and ANSI33-1994.

    C. All Specified tree work shall be designed to promote practices which encourage the preservation of tree structure and health, in accordance with the current Tree Pruning Guidelines (International Society of Arboriculture). An I.S.A. Certified Arborist or Tree Worker must be present at all times during pruning operations.

TREE DISPOSITION LEGEND

96 Existing Tree to be Remained

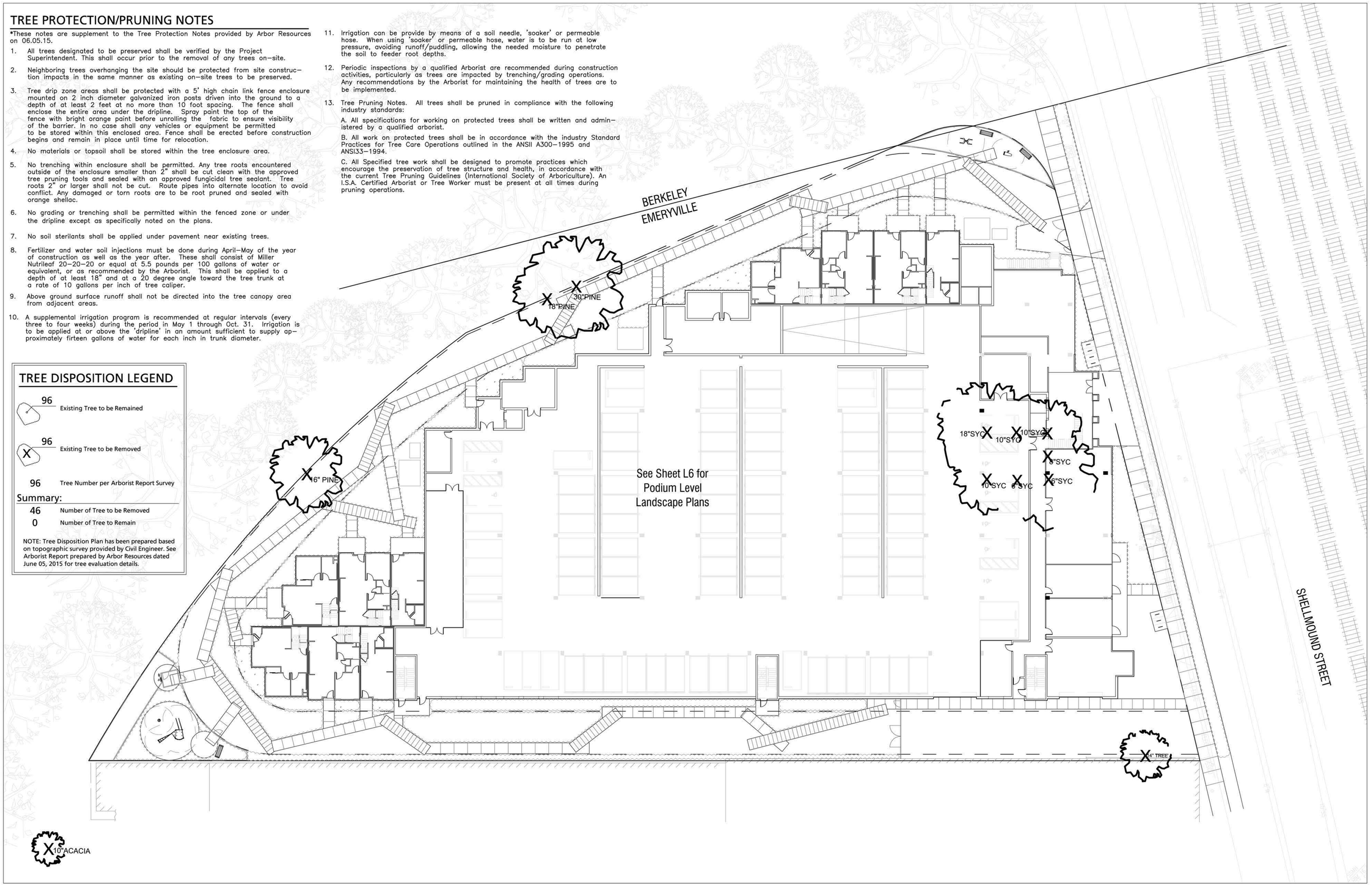
96 Existing Tree to be Removed

96 Tree Number per Arborist Report Survey

Summary:

46	Number of Tree to be Removed
0	Number of Tree to Remain

NOTE: Tree Disposition Plan has been prepared based on topographic survey provided by Civil Engineer. See Arborist Report prepared by Arbor Resources dated June 05, 2015 for tree evaluation details.



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EMERYVILLE, CA

TCA ARCHITECTS

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TCA# 2015-021

PLANNING SCHEMATIC DESIGN
JUNE 05 2015

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Landscape Architects • Land Planners
181 Greenwich Street
San Francisco, CA 94111
T 415 433 4672
F 415 433 5003

North

Scale: 1/16" = 1'-0"
0 8 16 32

LANDSCAPE
TREE DISPOSITION
PLAN

L18

Bay Area 2005 Ozone Strategy



Volume I

FINAL – ADOPTED
January 4, 2006

METROPOLITAN TRANSPORTATION COMMISSION

BAY AREA AIR QUALITY MANAGEMENT DISTRICT

Association of Bay Area Governments

BAY AREA

2005 OZONE STRATEGY

FINAL ADOPTED

JANUARY 4, 2006

BAY AREA
AIR QUALITY
MANAGEMENT
DISTRICT

939 Ellis Street
San Francisco, CA 94109
(415) 771.6000
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SUMMARY

The Bay Area Air Quality Management District (Air District or BAAQMD), in cooperation with the Metropolitan Transportation Commission (MTC) and the Association of Bay Area Governments (ABAG), has prepared the Bay Area 2005 Ozone Strategy. The Ozone Strategy is a roadmap showing how the San Francisco Bay Area will achieve compliance with the State one-hour air quality standard for ozone as expeditiously as practicable and how the region will reduce transport of ozone and ozone precursors to neighboring air basins.

Ozone conditions in the Bay Area have improved significantly over the years. Ozone levels – as measured by peak concentrations and the number of days over the State one-hour ozone standard – have declined substantially as a result of aggressive programs by the Air District, MTC and our regional, State and federal partners. This represents great progress in improving public health conditions for Bay Area residents. The 2005 Ozone Strategy provides useful background information on topics including the Bay Area's emission inventory, historical ozone trends and the implementation status of past control measures.

However, there is still a need for continued improvement to meet the State one-hour ozone standard. Accordingly, the Ozone Strategy describes how the Bay Area will fulfill California Clean Air Act (CCAA) planning requirements for the State one-hour ozone standard and transport mitigation requirements through the proposed control strategy. The control strategy includes stationary source control measures to be implemented through Air District regulations; mobile source control measures to be implemented through incentive programs and other activities; and transportation control measures to be implemented through transportation programs in cooperation with MTC, local governments, transit agencies and others. The Air District will continue to adopt regulations, implement programs and work cooperatively with other agencies, organizations and the public on a wide variety of strategies to improve air quality in the region and reduce transport to neighboring air basins.

The 2005 Ozone Strategy explains how the Bay Area plans to achieve these goals with regard to ozone, and also discusses related air quality issues of interest including our public involvement process, climate change, fine particulate matter, the Air District's Community Air Risk Evaluation (CARE) program, local benefits of ozone control measures, the environmental review process, national ozone standards and photochemical modeling.

The 2005 Ozone Strategy is a comprehensive document that describes the Bay Area's strategy for compliance with State one-hour ozone standard planning requirements, and is a significant component of the region's commitment to achieving clean air to protect the public's health and the environment.

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ABBREVIATIONS AND TERMINOLOGY

ABAG	Association of Bay Area Governments
AFM	All Feasible Measures
ARB	(California) Air Resources Board
ATCM	Airborne Toxic Control Measure
AQMD	Air Quality Management District
BAAQMD	Bay Area Air Quality Management District
BACM	Best Available Control Measures
BACT	Best Available Control Technology
BAR	Bureau of Automotive Repair
BARCT	Best Available Retrofit Control Technology
BART	Bay Area Rapid Transit District
BURDEN	Computer program that uses vehicle activity data along with EMFAC to calculate motor vehicle emissions
CAA	(Federal) Clean Air Act
CAP	Clean Air Plan (for State ozone standard)
CAPCOA	California Air Pollution Officers Association
CARE	Community Air Risk Evaluation program
CCAA	California Clean Air Act
CCOS	Central California Ozone Study
CEQA	California Environmental Quality Act
CFCs	Chlorofluorocarbons
CMA	Congestion Management Agency
CMAQ	Congestion Management and Air Quality (Improvement Program)
CMP	Congestion Management Program
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CTC	California Transportation Commission
DV	Design Value
DMV	(California) Department of Motor Vehicles
EIR	Environmental Impact Report
EMFAC	ARB model (including emission factors) to calculate motor vehicle emissions
EPA	(United States) Environmental Protection Agency
EPDC	Expected Peak Day Concentration
Fed. Reg.	Federal Register
FS	Further Study measure
HC	Hydrocarbons
HOV	High-Occupancy Vehicle
hp	Horsepower
I & M	(Motor Vehicle) Inspection and Maintenance Program (“Smog Check” program)

LEV	Low Emission Vehicle
LRT	Light Rail Transit
MAC	(BAAQMD) Modeling Advisory Committee
MPG	Miles Per Gallon
MS	Mobile Source measure
MTC	Metropolitan Transportation Commission
MTOS	Metropolitan Traffic Operations System
MVEB	Motor Vehicle Emissions Budget
NAAQS	National Ambient Air Quality Standards
NO_x	Oxides of Nitrogen
NOAA	National Oceanic and Atmospheric Administration
NSR	New Source Review
O_3	Ozone
OBD	On-Board Diagnostic program
OWG	(BAAQMD) Ozone Working Group
$PM_{2.5}$	Particulate Matter less than 2.5 microns in diameter
PM_{10}	Particulate Matter less than 10 microns in diameter
ppb	Parts per billion
pphm	Parts per hundred million
ppm	Parts per million
PSI	Pollutant Standard Index
RACC	Regional Agency Coordinating Committee
RACM	Reasonably Available Control Measure
RFG	Reformulated Gasoline
RFP	Reasonable Further Progress
RM2	Regional Measure 2
ROG	Reactive Organic Gases
RTP	Regional Transportation Plan
RVP	Reid Vapor Pressure (measure of gasoline volatility)
SIP	State Implementation Plan
SS	Stationary Source measure
TAC	Toxic Air Contaminant
TCMs	Transportation Control Measures
TDA	Transportation Development Act
TFCA	(BAAQMD) Transportation Fund for Clean Air
TIP	Transportation Improvement Program
TLC/HIP	(MTC) Transportation for Livable Communities / Housing Incentive Program
tpd	Tons per day
VMT	Vehicle Miles Traveled
VOC	Volatile organic compounds
ZEV	Zero Emission Vehicle

SECTION 1 - INTRODUCTION

The Bay Area Air Quality Management District (Air District or BAAQMD), in cooperation with the Metropolitan Transportation Commission (MTC) and the Association of Bay Area Governments (ABAG), has prepared the 2005 Ozone Strategy for the San Francisco Bay Area. The 2005 Ozone Strategy is a roadmap showing how the region will continue to make progress toward meeting the State one-hour ozone standard as expeditiously as practicable, and how the region will reduce transport of ozone and ozone precursors to neighboring air basins.

Ozone conditions in the Bay Area have improved significantly over the years. Ozone levels – as measured by peak concentrations and the number of days over the one-hour State standard – have declined substantially as a result of aggressive programs by the Air District, MTC and our regional, State and federal partners. This represents real progress in improving conditions affecting public health for Bay Area residents. However, the region has not attained yet the State one-hour ozone standard[1], and also must reduce pollution transported to downwind regions as required by the California Clean Air Act. Therefore, the region must continue its long-term progress in reducing ozone levels by reducing emissions of pollutants that form ozone. That is the objective of this 2005 Ozone Strategy.

OZONE HEALTH EFFECTS AND BACKGROUND

Ozone is the principal component of smog. It is highly reactive, and at high concentrations near ground level can be harmful to public health[2]. The San Francisco Bay Area air basin – consisting of all of Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo and Santa Clara counties, and the southern portions of Solano and Sonoma counties – periodically experiences ozone levels in excess of the standards.

Ozone is a highly reactive gas that can damage the tissues of the lungs and respiratory tract. High concentrations of ozone irritate the nose, throat and respiratory system and constrict the airways. Ozone also can aggravate other respiratory conditions such as asthma, bronchitis and emphysema. Repeated exposure to high ozone levels can make people more susceptible to respiratory infection and lung inflammation and permanently damage lung tissue. Children are most at risk, as they are active outdoors in the summer, when ozone levels are highest. Seniors and people with respiratory illnesses are also especially sensitive to ozone's effects. Even healthy adults, working or

[1] In April 2005, ARB established a new eight-hour average ozone standard of 0.070 ppm. The new standard is expected to take effect in 2006. ARB is currently working on designations and implementation guidance for the new standard. The one-hour state standard has been retained. Previously EPA adopted a new federal eight-hour standard of 0.08 ppm and after several years of litigation is currently finalizing planning requirements for the new standard including revocation of the federal one-hour ozone standard. The San Francisco Bay Area has not attained either the federal or State eight-hour standards, and will be taking action as necessary to address those standards as appropriate once the planning requirements have been established.

[2] While ground level ozone is a harmful air pollutant, ozone in the upper atmosphere is beneficial because it blocks the sun's harmful ultraviolet rays. The 2005 Ozone Strategy focuses on reducing ground level ozone only.

exercising outdoors during high ozone levels, can be affected. Ozone also damages trees, agricultural crops and other plants.

Ozone is not emitted directly from pollution sources. Instead, ozone is formed in the atmosphere through complex chemical reactions between hydrocarbons (or "reactive organic gases") and nitrogen oxides, in the presence of sunlight. Ozone levels are usually highest on hot, windless summer afternoons, especially in inland valleys. The main sources of hydrocarbons are motor vehicles and evaporation of solvents, fuels and other petroleum products. The main sources of nitrogen oxides are motor vehicles and combustion.

Ozone is a regional pollutant. Emissions of hydrocarbons and nitrogen oxides throughout the Bay Area contribute to ozone formation, and emissions in one part of the region can impact air quality miles away. Therefore, efforts to reduce ozone levels focus on reducing emissions of hydrocarbons and nitrogen oxides throughout the region.

STATE ONE-HOUR OZONE STANDARD

The State government has established ambient air quality standards (AAQS) for ground level ozone (and other air pollutants) that are intended to protect human health from adverse effects. Air quality standards define the maximum amount of a pollutant that can be present in outdoor air without harm to public health. The standards are generally set at levels low enough to protect even the most sensitive individuals in our communities. State standards are set by the California Air Resources Board (ARB). The California one-hour ozone standard is set at 0.09 parts per million (ppm). In April 2005, ARB established a new eight-hour average ozone standard of 0.070 ppm. ARB plans to retain the current one-hour State ozone standard and is currently working on designations and implementation guidance for the new eight-hour standard.

The Air District operates a network of air quality monitoring stations throughout the region to constantly monitor air quality conditions. Data from the air monitoring stations allow the Air District to determine whether the region meets ambient air quality standards and to track progress in improving air quality.

An exceedance of the State one-hour standard occurs if the average ozone concentration measured over a one-hour period at any Air District monitoring station is higher than the standard. In recent years, the State standard has been exceeded an average of 16 days per year.

Over time, as more research is conducted on ozone's health effects and more sophisticated analytical tools become available, scientists and health professionals learn more about ozone's effects and the concentrations that may be harmful. State law requires ARB to periodically review air quality standards to assure that they are sufficiently stringent to protect public health, particularly for those members of the public who are most sensitive to the effects of air pollution. Recent State legislation requires ARB, working with the State Office of Environmental Health Hazard Assessment to specifically consider exposure of and effects on infants and children when reviewing air quality standards.

PURPOSE AND ORGANIZATION OF THE 2005 OZONE STRATEGY

The most recent plan for the State ozone standard was the 2000 Clean Air Plan (or "2000 CAP"). With the 2005 Ozone Strategy the Air District is addressing the planning requirements for the State one-hour ozone standard.

Section 1 of the 2005 Ozone Strategy provides an introduction and general overview of the document. Section 2 addresses State one-hour ozone planning requirements and consists of the triennial update to the region's strategy to achieve the California one-hour ozone standard. Section 3 discusses various ozone-related air quality issues of concern to the Air District and the public. It also describes the environmental review process as well as the District's efforts to encourage and facilitate public involvement in the development of the ozone strategy. Appendices provide detail on the public involvement process, control measure review and evaluation process, control measure descriptions, further study measures, and other technical support information.

State Planning Requirements

Because the San Francisco Bay Area violates[3] the State one-hour ozone standard, the region is considered a nonattainment area for the State standard.[4] The California Clean Air Act requires regions that do not meet the State ozone standard to prepare plans for attaining the standard and to update these plans every three years. These plans must include estimates of current and future emissions of the pollutants that form ozone and a control strategy that includes "all feasible measures" to reduce these emissions. The plans must also include measures to reduce transport of air pollutants to downwind regions.

The first Bay Area plan for the State ozone standard was the 1991 Clean Air Plan. Subsequently, the Clean Air Plan was updated and revised in 1994, 1997, and 2000. Each of these triennial updates proposed additional measures to reduce emissions from a wide range of sources, including industrial and commercial facilities, motor vehicles, and "area sources" (scattered, individually small sources such as water heaters or paints and varnishes).

Section 2 of this 2005 Ozone Strategy is the latest triennial update to the Bay Area strategy to achieve the State one-hour ozone standard, including new control measures. The draft control measures (summarized in Section 2 and set forth in more detail in the appendices) are proposed to satisfy State ozone planning requirements.

[3] A violation is different than an exceedance. An exceedance is a day with a maximum ozone concentration that is higher than the standard. An exceedance does not necessarily cause a violation. A violation occurs when enough exceedances have occurred for the region to be considered not in attainment of the standard according to ARB methodology.

[4] Designating an area as nonattainment for a State standard indicates that air quality in that area violates the established State standard. Area designations for State standards are made using air quality data for the prior three year period. The highest measured value, excluding exceedances from "extreme concentration events" or "exceptional events," becomes the designation value. If the designation value is higher than the level of the State standard, the area is nonattainment.

Preparation of the Ozone Strategy and Public Involvement

The 2005 Ozone Strategy has been prepared by the Air District, in consultation with MTC and ABAG. The preparation of the 2005 Ozone Strategy has involved many methods of public involvement including extensive public outreach throughout which staff explained the ozone planning process and solicited input from the public. More detailed information on the public involvement process is provided in both Section 3 and Appendix A of this document. The Air District Board of Directors will consider adoption of the 2005 Ozone Strategy and, upon adoption, staff will transmit it to ARB for their review and approval.

Other Elements

The 2005 Ozone Strategy also includes several other elements that are not required to attain the State one-hour ozone standard, but are related to ozone control efforts and are being included to help the public understand the relationship between ozone planning and other environmental programs. The Air District implements numerous programs that are related in some way to ozone planning, or are otherwise of interest to the Air District and the public. The 2005 Ozone Strategy will discuss these related topics of interest, including:

- Public involvement process;
- Climate change programs to reduce greenhouse gas emissions;
- Fine particulate matter (PM), its sources and health effects, and programs to reduce fine PM emissions;
- Community Air Risk Evaluation (CARE) program;
- Local benefits of ozone control measures;
- National ozone standards, attainment status and related planning requirements;
- Photochemical modeling;
- Environmental review.

SECTION 2 - TRIENNIAL UPDATE OF STATE OZONE STRATEGY

INTRODUCTION

For over 15 years, the 1988 California Clean Air Act (CCAA), and subsequent amendments, have guided efforts throughout California to achieve State ambient air quality standards. This section of the 2005 Ozone Strategy for the San Francisco Bay Area addresses State ozone planning requirements of the CCAA (as amended).

CCAA PLANNING REQUIREMENTS

The basic goal of the CCAA is to achieve health-based State ambient air quality standards by the earliest practicable date. The CCAA requires regions that violate the State ozone standard to prepare attainment plans that identify a strategy to attain the standard. Regional air quality plans are required to achieve a reduction in district-wide emissions of 5 percent per year for ozone precursors (California Health and Safety Code Section 40914).[5] If an air district is unable to achieve a 5 percent annual reduction, the adoption of all feasible measures on an expeditious schedule is acceptable, as an alternate strategy (Sec. 40914(b)(2)).

California classifies ozone nonattainment areas based on their "expected peak day concentration," which is an ozone reading that the region should not exceed more than once per year, on average, excluding exceptional or extreme readings. Legal requirements vary according to the severity of a region's ozone problem. The Bay Area is subject to CCAA requirements for "serious" areas. (Secs. 40921.5(a)(2), 40919). The Bay Area's efforts to meet the applicable CCAA requirements for ozone include the following:

ALL FEASIBLE MEASURES

No non-attainment area in the state has been able to demonstrate a 5% reduction in ozone precursor pollutants each year. Consequently, most areas in the state, including the Bay Area, have opted to adopt “all feasible measures” as expeditiously as possible to meet the requirements of the CCAA. The CCAA does not define “feasible,” but the Health and Safety Code provides some direction to assist the District in making this determination. State law defines a related term, Best Available Retrofit Control Technology (BARCT), as “an emission limitation that is based on the maximum degree of reduction achievable, taking into account environmental, energy and economic impacts by each class or category of source.” (sec. 40406) And the ARB defines “all feasible measures” in the Transport Mitigation Regulation, Section 70600 *et seq,* Title 17 California Code of Regulations, as “air pollution control measures, including but not limited to emissions standards and limitations, applicable to all air pollution source categories under a district's authority that are based on the maximum degree of reductions achievable for emissions of ozone precursors, taking into account technological, social, environmental, energy and economic factors, including cost-effectiveness.”

[5] All references to Section numbers are for the California Health and Safety Code, unless otherwise noted.

TRANSPORT MITIGATION REQUIREMENTS

The CCAA requires ARB to periodically assess transport of ozone and ozone precursors from upwind to downwind regions, and to establish mitigation requirements for upwind districts (Sec. 39610). The CCAA also requires air districts to address transport mitigation requirements in the triennial updates to strategies to achieve the State ozone standard (Sec. 40912).

ARB first adopted transport mitigation requirements in 1990, amended them in 1993, and further strengthened them in 2003. ARB's 2003 amended Transport Mitigation Requirements are in Title 17, California Code of Regulations, Sections 70600 and 70601. The requirements for transport mitigation state that upwind districts "shall include sufficient emission control measures in their attainment plans for ozone…to mitigate the impact of pollution sources within their jurisdictions on ozone concentrations in downwind areas commensurate with the level of contribution." Specifically, the Bay Area is required to:

1) adopt and implement all feasible measures as expeditiously as practicable;
2) adopt and implement best available retrofit control technology (BARCT) on all existing stationary sources of ozone precursor emissions as expeditiously as practicable;
3) implement, by December 31, 2004, a stationary source permitting program designed to achieve no net increase in the emissions of ozone precursors from new or modified stationary sources that emit or have the potential to emit 10 tons or greater per year of an ozone precursor, which the Bay Area Air Quality Management District Board of Directors adopted on December 21, 2004; and
4) include measures sufficient to attain the state ambient air quality standard for ozone by the earliest practicable date within the North Central Coast Air Basin, that portion of Solano County within the Broader Sacramento Area, that portion of Sonoma County within the North Coast Air Basin, and that portion of Stanislaus County west of Highway 33 during air pollution episodes, provided that:
    a) the areas are likely to violate the State ozone standard,
    b) the areas are dominated by transport from the Bay Area, and,
    c) the areas are not affected by emissions of ozone precursors within their borders.

In addition, the Air District is required to consult with downwind districts, review the list of control measures in the most recently approved attainment plan (2000 Clean Air Plan), make a finding as to whether the list of control measures meets the requirements of Section 70600 (b) and include the finding in the proposed triennial plan revision.

All of the above transport mitigation and consultation process requirements are addressed in "Addressing Transport Requirements" of the "Control Strategy" chapter in Section 2 of this document.

OTHER REQUIREMENTS

In addition to requirements concerning all feasible measures and transport mitigation, the CCAA requires that strategies to attain the State ozone standard contain other elements, including the following:

Emissions inventory system (Sec. 40918(a)(5)). The Air District maintains an emissions inventory system. The emission inventory is included in the "Sources of Air Pollution – Emission Inventory" section of this document.

A permitting program designed to achieve no net increase in emissions from permitted sources with a potential to emit greater than 15 tons per year of a nonattainment pollutant or their precursors and to require the use of best available control technology (BACT) on new and modified sources with a potential to emit greater than 10 pounds per day (Sec. 40919(a)(2)). The Air District's permitting program, as spelled out in BAAQMD Regulation 2, Rule 2 — New Source Review — complies with the requirements of Health and Safety Code Section 40919(a)(2). Sufficient offsets have been provided for all permits that have been issued by the Air District. Furthermore, the Small Facility Banking account has sufficient credits to sustain withdrawals into the foreseeable future at the current withdrawal rate. The Air District's no net increase threshold was reduced to 10 tons per year to comply with transport mitigation requirements in December 2004.

Best available retrofit control technology (BARCT) on all existing permitted stationary sources (Sec. 40919(a)(3)). BARCT is implemented through the Air District's rule development, enforcement and permit review programs. Air District staff perform an assessment of BARCT requirements when proposing new rules or rule amendments and ARB reviews Air District rules and proposed rule amendments to insure that BARCT standards are implemented. Additionally, the Air District evaluates existing sources during the annual permit review process to ensure BARCT requirements are being met. Finally, the Air District, facility advisories, compliance assistance and enforcement programs help to make sure that BARCT standards in rules are being implemented.

Measures to achieve use of a significant number of low-emission vehicles in motor vehicle fleets (Sec. 40919(a)(4)). The proposed mobile source control measures Low Emission Vehicle Incentives and Green Contracting Ordinance address low emission vehicles and motor vehicle fleet emissions. TCMs 3 and 10 include clean fuel transit and school buses, respectively, and TCM 17 includes demonstration projects to promote low emission vehicles. The Air District's Transportation Fund for Clean Air, Carl Moyer and Low Emission School Bus programs provide funding for these TCMs.

Transportation control measures to substantially reduce the rate of increase in passenger vehicle trips and miles traveled per trip (Sec. 40918(a)(3)). It is expected that VMT and trips will grow at approximately 1.4% and 1.2% percent per year, respectively, a reduction from the previous rate of VMT and vehicle trip growth. These projected growth rates do not include the effects of the proposed TCMs; implementation of the 2005 Ozone Strategy TCMs are expected to result in even further reductions of past growth rates.

Indirect source and area source programs (Sec. 40918(a)(4)). TCM 15 — Local Land Use Planning and Development Strategies — addresses the indirect source requirement

by proposing a wide range of programs for promoting smart growth and reducing emissions through better coordination of land use and transportation planning. Management of area source emissions is addressed through existing Air District regulations, various proposed stationary source and mobile source control measures, and TCM 16 — Public Education/Intermittent Control Measures.

Regional public education programs (Sec. 40918(a)(6)). The Air District's "Spare the Air" public education program is aimed at curbing emissions from motor vehicles and other ozone precursor sources on days when weather conditions are conducive to high ozone levels. Other ongoing educational programs include the Bay Area Clean Air Partnership, Clean Air Cities and Counties, Clean Air Consortium, a youth campaign, a Speaker's Bureau, Smoking Vehicle Program and grassroots resource teams located throughout the Bay Area. The "Spare the Air Tonight" program is aimed at reducing emissions of particulate matter from woodburning during the winter.

An assessment of cost-effectiveness of proposed control measures (Sec. 40922). Cost-effectiveness is discussed in the Control Strategy section of this document.

Periodic requirements include the following:

An annual regulatory schedule (Sec. 40923). The Air District produces a regulatory schedule each December, listing regulatory measures scheduled or tentatively scheduled for consideration during the following year.

An annual progress report on control measure implementation and, every third year, an assessment of the overall effectiveness of the program (Sec. 40924). The Air District has submitted annual progress reports to ARB every year since 1993. Previous triennial assessments of overall plan effectiveness were submitted in 1994, 1997, and 2000. The 2005 Ozone Strategy provides the latest triennial assessment.

A review and update of the plan every three years to correct for deficiencies and to incorporate new data and projections (Sec. 40925). The 2005 Ozone Strategy incorporates new data and projections and updates the control strategy.

In addition, Health and Safety Code Section 40233 addresses TCMs in Bay Area ozone attainment plans. Section 40233 directs the Air District to estimate the quantity of emission reductions from transportation sources necessary to attain and maintain State and national ambient air quality standards. Section 40233 requires MTC to prepare and adopt a TCM plan to achieve that quantity of emission reductions. The TCM plan is then incorporated into the overall strategy for achieving the State ozone standard. The statute also requires MTC to develop and adopt a revised TCM plan whenever the Air District revises the emission reduction target.

The Air District and MTC complied with these requirements when preparing the first Bay Area plan for the State ozone standard, the 1991 Clean Air Plan, by adopting a TCM emission reduction target and plan in 1990. This triennial update to the strategy for the State ozone standard does not include a revised emission reduction target for transportation sources, and therefore, does not trigger a TCM plan revision.[6] The Air

[6] Under Health and Safety Code Section 40233, State law leaves to the Air District's discretion whether and when to revise the emission reduction target for transportation sources set in 1990.

District and MTC have, however, comprehensively reviewed and augmented the TCMs during preparation of the 2005 Ozone Strategy to maximize their effectiveness.

SOURCES OF OZONE PRECURSORS – EMISSION INVENTORY

Ozone is not emitted directly into the air we breathe. Instead, it is formed in the atmosphere through a complex series of photochemical reactions involving reactive organic gases (ROG) and nitrogen oxides (NO_X). Simply stated, in the presence of sunlight, oxygen (O_2) reacts with ROG and NO_X to produce ozone (O_3). There are literally millions of sources of ozone precursors in the Bay Area, including industrial and commercial facilities, motor vehicles, and consumer products such as household cleaners and paints. Even trees and plants produce ozone precursors. Sources of ozone precursors produced by human activity are called anthropogenic sources while natural sources, produced by plants and animals, are called biogenic sources. In the Bay Area, emissions from anthropogenic sources are higher than from biogenic sources.

The main sources of ROG are motor vehicles and evaporation of fuels, solvents and other petroleum products. NO_X is produced mainly through combustion, and the major sources are motor vehicles and combustion at industrial and other facilities. Figures 1 and 2 show the major sources of ozone precursors in 2005.

An emission inventory is a detailed estimate of air pollutant emissions from a range of sources in a given area, for a specified time period. Table 1 presents the emission inventory for ozone precursors, ROG and NO_X, for a typical summer day in the Bay Area in 2000, 2003 and 2005, and projections for 2010 and 2020. This inventory is referred to as a "planning inventory" because ozone levels are highest during the summer, and thus an estimate of typical summer emissions is needed for ozone planning purposes.

Anthropogenic sources can be broadly divided between stationary and mobile sources. Stationary sources can be further divided between point and area sources. Point sources are those that are identified on an individual facility or source basis, such as refineries and manufacturing plants. The Air District maintains a computer data base with detailed information on operations and emissions characteristics for nearly 4,000 facilities, with roughly 20,000 different sources, throughout the Bay Area. Data on the activity, seasonal variations, and hours of operation are collected at the process level from each facility. Parameters that affect the quantities of emissions are updated regularly. The emissions from general processes, such as combustion, are computed using generalized or specific emission factors. These factors are periodically reviewed and updated.

Area sources are stationary sources that are individually very small, but that collectively make a large contribution to the inventory. Many area sources do not require permits from the Air District, such as residential heating and the wide range of consumer products such as paints, solvents, and cleaners. Some facilities considered to be area sources do require permits from the Air District, such as gas stations and dry cleaners. Emissions estimates for area sources may come from the Air District's data base, be calculated by ARB using statewide data, or be calculated based on surrogate variables such as population.

In addition to anthropogenic sources, there are significant quantities of biogenic emissions from natural sources like plants and animals. Vegetation emits large amounts

of isoprene, terpenes and other organic compounds which are ozone precursors. Emission rates depend upon species, season, biomass density, time of day, local temperature, moisture and other factors. Total reactive organic gas emissions from natural sources in the Bay Area amounts to roughly 170 tons per day. Biogenic emissions are not included in the planning emissions inventory because they are not subject to control, but these emissions do contribute to ozone formation.

Mobile sources include on-road motor vehicles such as automobiles, trucks and buses, as well as off-road sources such as construction equipment; boats and ships, trains and aircraft; and small non-road engines including lawn and garden equipment. Estimates of on-road motor vehicle emissions include consideration of the number of vehicles and the fleet mix (vehicle type, model year, and accumulated mileage), miles traveled, ambient temperatures, vehicle speeds, and vehicle emission factors, as developed from comprehensive ARB testing programs. Some of these variables change from year to year, and the projections are based upon expected changes.

The on-road mobile source emission inventory includes motor vehicle activity assumptions provided by MTC based upon their regional travel demand model. In September 2003, MTC, the Air District and ARB reached an agreement on how the Bay Area's motor vehicle activity data would be used in the development of the Ozone Strategy and for federal transportation conformity emission budgets. ARB ran EMFAC 2002, version 2.2 (with April 2003 activity data) for the San Francisco Air Basin. In accordance with the agreement, MTC staff adjusted the EMFAC VMT data using growth rates developed from MTC's travel demand model data. The travel activity adjustments used in preparing the on-road mobile source inventory are the same as were used in the Transportation Air Quality Conformity Analysis for MTC's Transportation 2030. MTC's travel demand model utilizes regional demographic forecasts from ABAG's socio-economic and population projections, in this case, Projections 2003. The motor vehicle emissions estimates in Table 1 reflect this methodology and are based on ARB's latest emission factors (EMFAC 2002, version 2.2) and include the benefits of Enhanced Smog Check in the Bay Area.

Off-road mobile sources include boats, ships, trains, and aircraft, as well as garden, farm and construction equipment. Various methodologies are used for compilation of emissions for these mobile sources. Emission factors and methodologies for off-road mobile sources are calculated from information provided by ARB and EPA. Aircraft mix and activity data specific to each Bay Area airport were used in estimating airport emissions.

Future emissions of ROG and NOx will be considerably lower than the past and current inventory. Figures 3 and 4 show recent and future trends for ROG and NOx emissions, demonstrating that future emissions of ROG and NOx in the Bay Area will continue to decline in future years. These estimates provide further assurance that the region will continue to move towards attainment of the State one-hour ozone standard.

Figure 1: 2005 ROG Summer Emissions

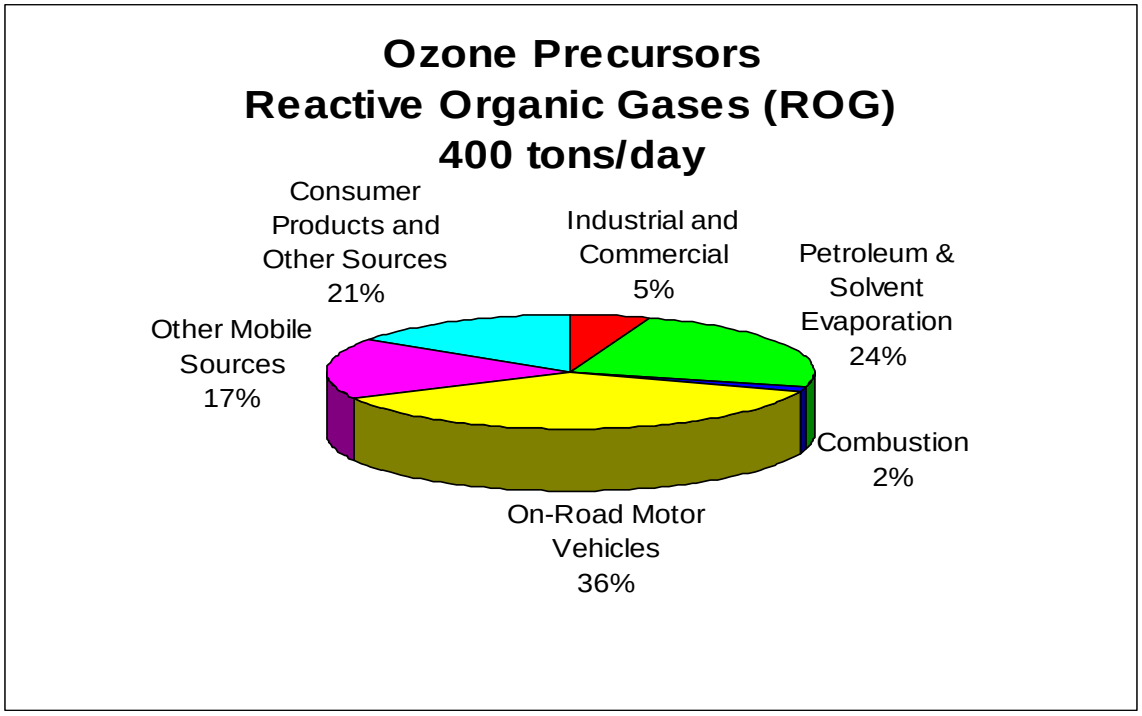


Figure 2: 2005 NOx Summer Emissions

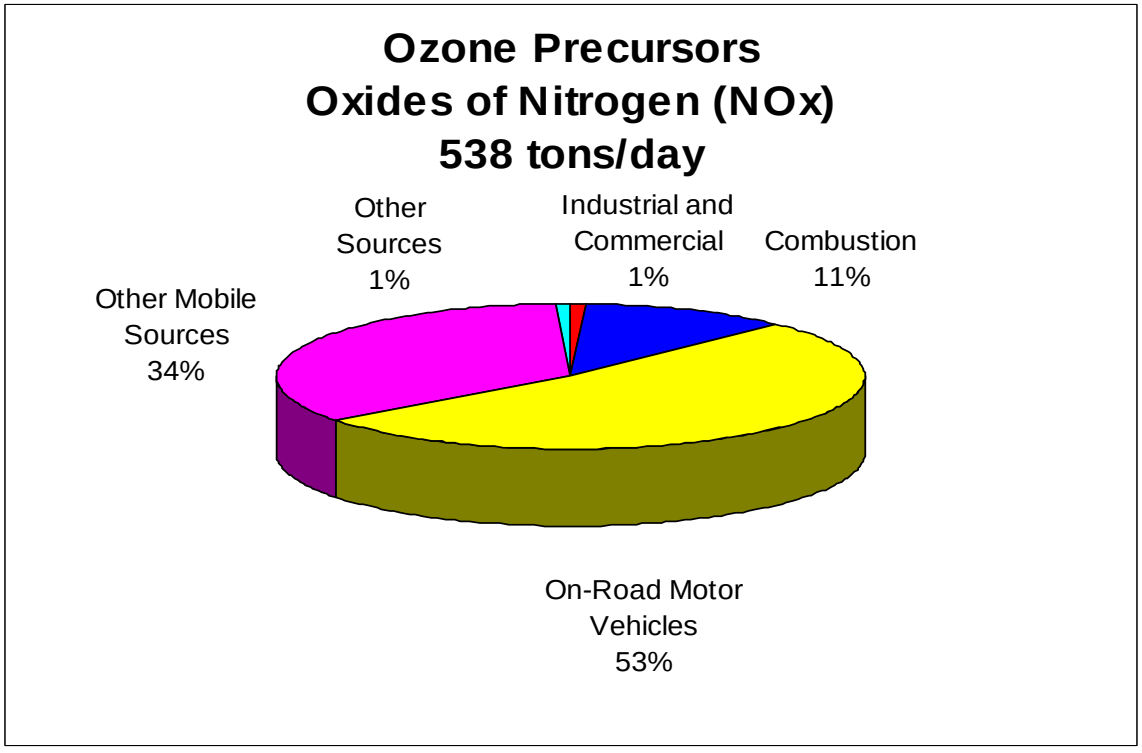


Table 1: Bay Area Baseline Emission Inventory Projections: 2000 – 2020
Planning Inventory (Tons/Day)

SOURCE CATEGORY	Reactive Organic Gases [4]					Oxides of Nitrogen [5]				
	2000	2003	2005	2010	2020	2000	2003	2005	2010	2020
INDUSTRIAL/COMMERCIAL PROCESSES										
PETROLEUM REFINING FACILITIES										
Basic Refining Processes	0.7	0.6	0.6	0.7	0.8	0.4	0.3	0.4	0.4	0.4
Wastewater (Oil-Water) Separators	5.3	4.0	3.6	1.7	2.0	--	--	--	--	--
Wastewater Treatment Facilities	0.1	0.2	0.2	0.2	0.3	--	--	--	--	--
Cooling Towers	1.7	0.4	0.5	0.5	0.6	--	--	--	--	--
Flares & Blowdown Systems	13.1	5.2	1.6	1.7	1.9	2.5	0.8	0.4	0.4	0.5
Other Refining Processes	0.3	0.3	0.3	0.3	0.4	--	--	--	--	--
Fugitives	5.3	1.9	1.9	2.0	2.4	--	--	--	--	--
Subtotal	**26.5**	**12.6**	**8.7**	**7.2**	**8.2**	**3.0**	**1.2**	**0.8**	**0.8**	**1.0**
CHEMICAL MANUFACTURING FACILITIES										
Coating, Inks, Resins & Other Facilitie	0.7	0.6	0.6	0.6	0.7	0.1	0.1	0.1	0.1	0.1
Pharmaceuticals & Cosmetics	0.9	0.8	0.9	0.9	1.0	1.9	1.8	1.8	2.0	2.3
Fugitives - Valves & Flanges	0.7	0.7	0.7	0.8	0.9	--	--	--	--	--
Subtotal	**2.3**	**2.1**	**2.2**	**2.3**	**2.6**	**1.9**	**1.8**	**1.9**	**2.0**	**2.4**
OTHER INDUSTRIAL/COMMERCIAL PROCESSES										
Bakeries	1.0	0.9	1.0	1.0	1.2	--	--	--	--	--
Cooking	1.0	1.1	1.1	1.2	1.3	--	--	--	--	--
Wineries & Other Food & Agr. Processes	1.3	1.1	1.2	1.2	1.5	--	--	--	--	--
Metallurgical & Minerals Manufacturing	0.3	0.2	0.2	0.3	0.3	1.0	1.0	1.0	1.0	1.2
Waste Management	2.6	2.8	2.9	3.0	3.1	--	--	--	--	--
Semiconductor Manufacturing	0.7	0.7	0.7	0.8	0.9	--	--	--	--	--
Fiberglass Products Manufacturing	0.4	0.4	0.4	0.4	0.4	--	--	--	--	--
Rubber & Plastic Products Manufacturing	0.4	0.5	0.5	0.5	0.6	--	--	--	--	--
Contaminated Soil Aeration	1.1	0.2	0.1	0.1	0.1	--	--	--	--	--
Other Industrial Commercial	1.4	1.3	1.4	1.5	1.6	0.1	0.1	0.1	0.1	0.1
Subtotal	**10.2**	**9.2**	**9.3**	**9.9**	**10.9**	**1.1**	**1.1**	**1.1**	**1.2**	**1.3**
PETROLEUM PRODUCT/SOLVENT EVAPORATION										
PETROLEUM REFINERY EVAPORATION										
Storage Tanks	3.6	3.8	3.9	4.2	4.8	--	--	--	--	--
Loading Operations	1.3	0.1	0.1	0.1	0.1	--	--	--	--	--
Subtotal	**4.9**	**3.8**	**4.0**	**4.2**	**4.9**	**--**	**--**	**--**	**--**	**--**

Table 1 (continued)
Bay Area Baseline [1] Emission Inventory Projections: 2000 – 2020
Planning Inventory [2] (Tons/Day) [3]

SOURCE CATEGORY	Reactive Organic Gases [4]					Oxides of Nitrogen [5]				
	2000	2003	2005	2010	2020	2000	2003	2005	2010	2020
FUELS DISTRIBUTION										
Natural Gas Distribution	0.5	0.5	0.6	0.6	0.7	--	--	--	--	--
Bulk Plants & Terminals	1.8	1.8	1.9	1.9	2.0	--	--	--	--	--
Gasoline Transport (Trucks)	3.3	3.4	3.4	3.6	3.8	--	--	--	--	--
Gasoline Filling Stations	15.4	10.0	7.9	6.6	6.3	--	--	--	--	--
Aircraft Fueling	3.0	3.0	3.0	3.0	3.0	--	--	--	--	--
Recreational Boat Fueling	0.9	0.9	1.0	1.0	1.1	--	--	--	--	--
Portable Fuel Container Spillage	18.5	11.9	7.6	5.0	5.0	--	--	--	--	--
Other Fueling	0.3	0.3	0.4	0.4	0.4	--	--	--	--	--
Subtotal	**43.7**	**31.8**	**25.7**	**22.1**	**22.3**	**--**	**--**	**--**	**--**	**--**
OTHER ORGANIC COMPOUNDS EVAPORATION										
Cold Cleaning	5.5	4.3	4.2	4.5	5.0	--	--	--	--	--
Vapor Degreasing	0.3	0.2	0.2	0.2	0.1	--	--	--	--	--
Handwiping	5.0	3.1	1.8	1.9	2.1	--	--	--	--	--
Dry Cleaners	0.1	0.1	0.1	0.1	0.1	--	--	--	--	--
Printing	5.7	3.8	3.9	4.0	4.3	--	--	--	--	--
Adhesives & Sealants	8.9	8.7	8.9	9.3	9.4	--	--	--	--	--
Structures Coating	26.1	25.6	25.5	26.6	28.3	--	--	--	--	--
Industrial/Commercial Coating	16.1	13.9	13.7	14.7	16.4	--	--	--	--	--
Storage Tanks	1.3	1.0	0.9	1.0	1.1	--	--	--	--	--
Lightering & Ballsting	1.3	1.7	1.8	2.0	2.5	--	--	--	--	--
Other Organics Evaporation	2.5	2.4	2.5	2.7	3.0	--	--	--	--	--
Subtotal	**72.8**	**64.8**	**63.3**	**66.8**	**72.3**	**--**	**--**	**--**	**--**	**--**
COMBUSTION - STATIONARY SOURCES										
FUELS COMBUSTION										
Domestic	2.3	2.3	2.4	2.4	2.6	9.1	8.3	8.5	8.9	9.4
Cogeneration	0.9	1.0	1.0	1.1	1.2	4.3	5.0	5.2	5.4	6.0
Power Plants	0.5	0.2	0.3	0.2	0.2	14.1	2.8	2.8	2.7	3.0
Oil Refineries External Combustion	0.4	0.4	0.4	0.5	0.5	24.4	16.5	14.0	14.8	16.3
Glass Melting Furnaces - Natural Gas	--	--	--	--	--	2.9	2.2	2.3	2.4	2.8
Reciprocating Engines	0.8	0.8	0.7	0.6	0.4	8.1	7.9	7.1	6.4	5.2
Turbines	0.1	0.1	0.1	0.1	0.1	1.6	1.7	1.7	1.8	2.0
Combustion at Landfills/Misc. Ext. Comb	1.1	1.0	1.0	1.1	1.2	17.2	17.6	18.0	19.1	21.1
Subtotal	**6.2**	**5.8**	**5.9**	**5.9**	**6.1**	**81.6**	**62.0**	**59.6**	**61.5**	**65.8**

Table 1 (continued)
Bay Area Baseline [1] Emission Inventory Projections: 2000 – 2020
Planning Inventory [2] (Tons/Day) [3]

SOURCE CATEGORY	Reactive Organic Gases [4]					Oxides of Nitrogen [5]				
	2000	2003	2005	2010	2020	2000	2003	2005	2010	2020
BURNING OF WASTE MATERIAL										
Incineration	0.1	0.1	0.1	0.1	0.1	0.3	0.4	0.4	0.4	0.4
Planned Fires	0.1	0.1	0.1	0.1	0.1	--	--	--	--	--
Subtotal	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.4**	**0.4**	**0.4**	**0.4**	**0.4**
Banked Emissions [6]	**0.0**	**11.2**	**11.2**	**11.2**	**11.2**	**0.0**	**8.1**	**8.1**	**8.1**	**8.1**
Alternative Compliance Allowance [7]	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**3.5**	**7.2**	**4.3**	**4.3**
Subtotal (District Jurisdiction)	**166.7**	**141.6**	**130.5**	**129.8**	**138.8**	**87.9**	**78.0**	**78.9**	**78.2**	**83.2**
COMBUSTION - MOBILE SOURCES										
ON-ROAD MOTOR VEHICLES										
Passenger Cars	112.6	91.2	72.1	42.1	20.2	97.6	80.6	62.0	34.4	13.5
Light Duty Trucks<6000lbs	51.2	44.7	38.6	28.1	17.9	66.3	56.7	45.5	28.6	14.0
Medium Duty Trucks 6001-8500 lbs	14.5	12.5	10.9	8.9	6.5	24.3	21.0	17.5	12.5	6.5
Light Heavy Duty Trucks 8501-14000lbs	7.4	4.9	3.9	2.8	2.4	9.2	9.3	9.0	7.3	4.4
Medium Heavy Duty Trucks 14001-33000lbs	5.9	5.1	4.6	3.3	1.9	34.1	33.4	31.4	22.5	9.0
Heavy Heavy Duty Trucks>33000 lbs	7.0	6.6	6.1	4.3	2.4	97.6	92.0	86.9	58.0	21.9
School/Urban Buses	2.2	2.2	2.2	2.1	2.0	21.5	21.1	20.2	20.1	17.1
Motor-Homes	1.1	1.0	0.8	0.6	0.2	2.5	2.3	2.0	1.9	1.3
Motorcycles	5.6	4.5	3.9	2.7	1.6	1.0	0.9	0.9	0.7	0.5
Subtotal	**207.5**	**172.6**	**142.9**	**94.8**	**55.1**	**354.1**	**317.3**	**275.4**	**185.9**	**88.1**
OFF-HIGHWAY MOBILE SOURCES										
Lawn and Garden Equipment	31.7	25.1	20.6	15.5	13.6	2.8	3.0	3.1	1.9	1.3
Transportation Refrigeration Units	0.9	0.9	0.8	0.7	0.4	4.5	4.6	4.1	3.5	2.3
Agricultural Equipment	1.3	1.2	1.1	0.8	0.4	9.2	8.3	7.7	6.1	3.5
Construction and Mining Equipment	10.6	10.7	9.1	6.4	4.5	91.7	91.1	81.8	62.9	43.1
Industrial Equipment	3.2	3.3	2.8	1.6	1.0	20.6	20.2	16.7	10.8	7.8
Light Duty Commercial Equipment	6.6	6.6	5.6	4.4	3.6	10.8	10.9	10.0	9.1	7.8
Trains	0.6	0.7	0.7	0.6	0.6	14.9	13.1	11.3	9.7	9.5
Off Road Recreational Vehicles	0.8	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1
Ships [8]	0.6	0.6	0.6	0.7	0.8	10.5	10.0	10.4	11.4	13.7
Commercial Boats	0.7	0.8	0.8	0.9	1.1	5.8	6.2	6.3	6.7	7.3
Recreational Boats	22.0	19.5	17.0	12.1	7.1	3.3	4.1	4.8	5.0	4.4
Subtotal	**79.1**	**69.5**	**59.2**	**43.7**	**33.2**	**174.3**	**171.5**	**156.3**	**127.1**	**100.7**

Table 1 (continued)
Bay Area Baseline [1] Emission Inventory Projections: 2000 – 2020
Planning Inventory [2] (Tons/Day) [3]

SOURCE CATEGORY	Reactive Organic Gases [4]					Oxides of Nitrogen [5]				
	2000	2003	2005	2010	2020	2000	2003	2005	2010	2020
AIRCRAFT										
Commercial Aircraft	2.9	2.1	2.4	3.1	4.8	14.4	13.9	15.9	20.8	25.8
General Aviation	0.9	0.8	0.8	0.9	0.9	0.3	0.3	0.4	0.5	0.6
Military Aircraft	4.2	3.4	3.4	3.5	3.5	4.8	4.9	4.9	5.0	5.1
Airport Ground Support Equipment	0.4	0.4	0.4	0.4	0.5	2.3	2.6	2.7	2.9	3.2
Subtotal	**8.3**	**6.7**	**7.0**	**7.8**	**9.8**	**21.8**	**21.8**	**23.9**	**29.2**	**34.7**
MISCELLANEOUS OTHER SOURCES										
Construction Operations	--	--	--	--	--	--	--	--	--	--
Farming Operations	--	--	--	--	--	--	--	--	--	--
Entrained Road Dust-Paved Roads	--	--	--	--	--	--	--	--	--	--
Entrained Road Dust-Unpaved Roads	--	--	--	--	--	--	--	--	--	--
Wind Blown Dust	--	--	--	--	--	--	--	--	--	--
Animal Waste	5.5	5.5	5.5	5.5	5.5	--	--	--	--	--
Agricultural Pesticides	1.1	1.3	1.2	1.1	1.1	--	--	--	--	--
Non-Agricultural Pesticides	0.3	0.2	0.2	0.2	0.2	--	--	--	--	--
Consumer Products(Excluding Pesticides)	52.2	49.1	46.9	48.9	51.9	--	--	--	--	--
Other Sources	4.9	10.7	6.8	6.9	6.9	2.7	5.9	3.8	3.8	3.8
Subtotal	**63.9**	**66.7**	**60.6**	**62.5**	**65.6**	**2.7**	**5.9**	**3.8**	**3.8**	**3.8**
GRAND TOTAL EMISSIONS	**526**	**457**	**400**	**339**	**302**	**641**	**594**	**538**	**424**	**310**

1 Inventory and projections assume implementation of all control measures adopted as of December 31, 2004, including Smog Check II for the Bay Area.

2 The planning inventory represents average summer day emissions. ABAG Projections 2003 were used to project future emissions from on-road motor vehicles. ABAG Projections 2002 was the regional population projections used for the reminder of the planning inventory.

3 Entries are rounded to nearest whole number, totals may not equal to sums of column entries.

4 Photochemically reactive organic compounds excludes methane and other non-reactives and roughly 170 tpd of ROG emissions from natural sources.

5 Oxides of nitrogen (nitric oxide and/or nitrogen dioxide), NOx as NO2.

6 Banked Emissions show the total current deposits in the District's emissions banking program as allowed by BAAQMD Regulation 2, Rules 2 and 4. These emissions were reduced (beyond regulations) and banked, but may be withdrawn from the bank and emitted in future years.

7 Surplus emissions, voluntarily reduced, available for alternative compliance with BARCT requirements of selected rules, as prescribed by State law and BAAQMD Regulation 2, Rule 9.

8 These estimates account for ship activities within three miles from Golden Gate Bridge. California Air Resources Board (ARB) is developing statewide emissions estimates from ocean-going vessels (OGVs) occurring within 100 nautical miles of the California coastline. The District will update the inventory when finalized data is available from ARB.

Figure 3: ROG Emissions Trend, 2000 – 2020

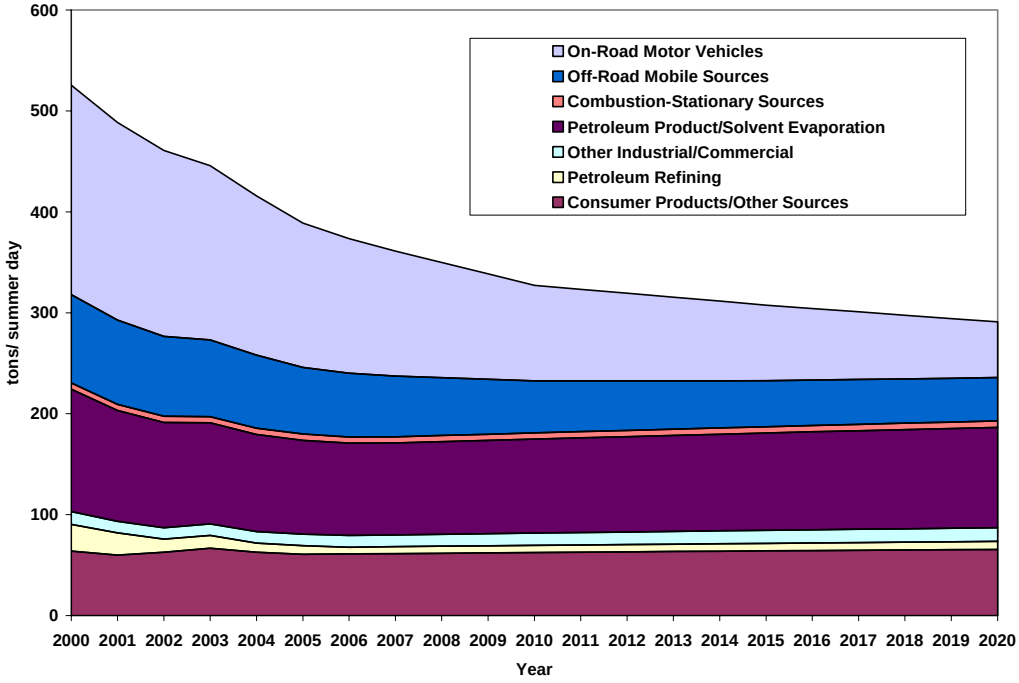
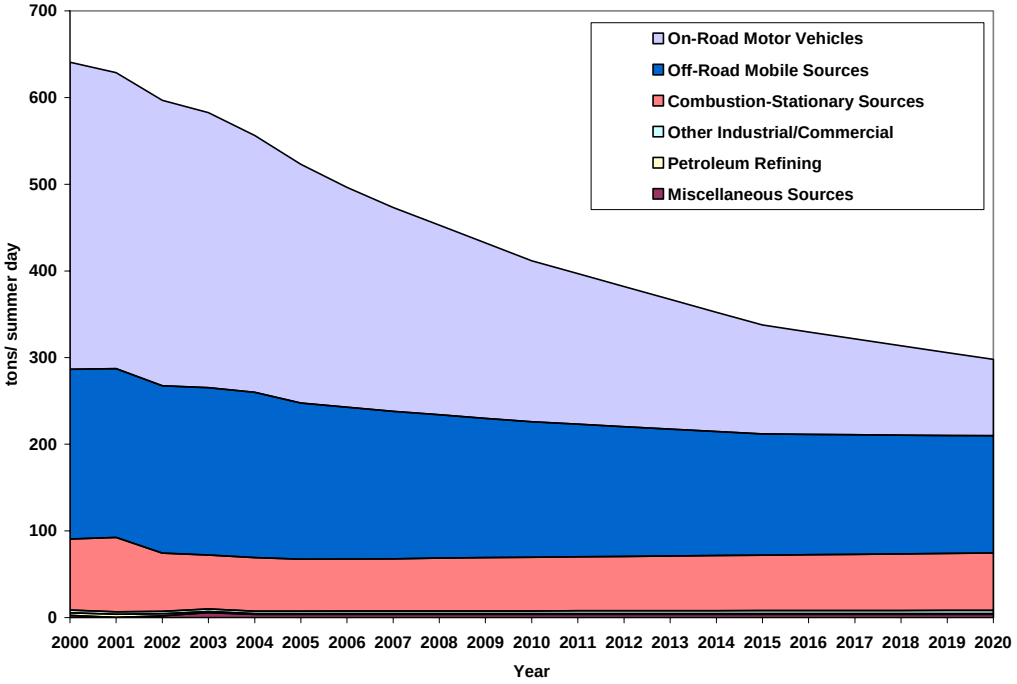


Figure 4: NOx Emissions Trend, 2000 – 2020



OZONE TRENDS

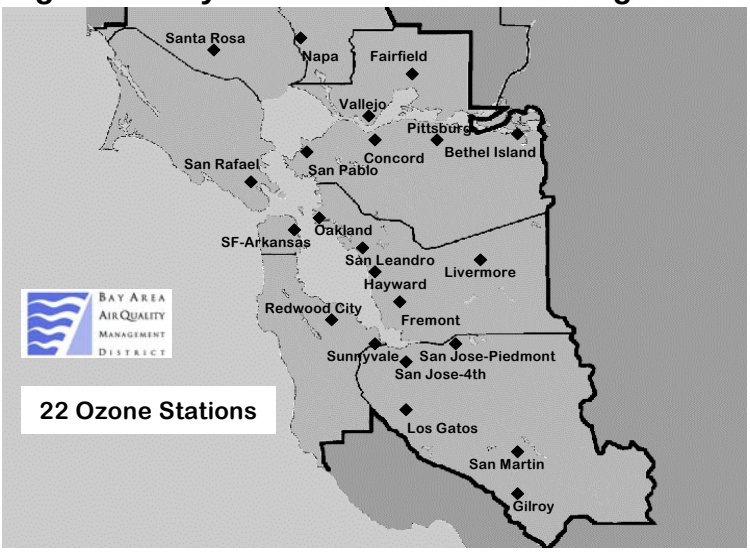
Health and Safety Code Section 40924(b)(1) requires the Air District to assess its progress toward attainment of the State ambient air quality standard for ozone during the most recent triennial period. The analysis in this section examines progress made during the triennial period, 2000[7] to 2002, and from 1988 (the base year) to 2004.

Monitoring Data

A very basic indicator of air quality trends is the number of days on which the region exceeded air quality standards. The Bay Area has an extensive network of monitoring stations to measure ambient air quality. There are 33 stations throughout the region that measure air quality conditions, 22 of which measure ozone. A map of the network is provided in Figure 5, "Air Monitoring Network." Ambient ozone levels are in compliance with the State standard more than 99% of the time. This analysis is focused on those days and hours when the standard has been exceeded.

Table 2 provides the number of exceedances of the State one-hour ozone standard at each monitoring station for 1985-2004. Figure 6 shows the number of days over the standard at any station for 1985-2004. Exceedances of the State ozone standard have diminished considerably since 1985. This improvement is due to substantial reductions in emissions of ozone precursors from stationary and mobile sources. For the three years considered in this triennial update, the Bay Area has had a fairly consistent number of exceedances of the State one-hour ozone standard. In 2000, the Bay Area recorded excesses of the State standard on 12 days. In 2001, the region recorded excesses of the State standard on 15 days. In 2002, the region recorded excesses of the State standard on 16 days.

Figure 5: Bay Area Ozone Air Monitoring Network



[7] Each yearly value presented in this analysis represents an average of the value for that year and for the previous two years. These running three-year averages are used in this analysis to smooth the fluctuations that occur on a year-to-year basis due to factors such as weather. For example, the triennial period of 1999 averages the data for the years 1997, 1998 and 1999.

Table 2: Bay Area Exceedances of the State 1-hr Ozone Standard by Monitoring Station, 1985 – 2004

STATIONS BY SUB-REGION	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04
North Counties																				
Santa Rosa	0	0	1	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	1	0
Sonoma	3	1	2	2	3	0	3	0	0	0	0	0								
Napa	3	0	6	1	2	0	3	0	2	0	4	0	0	3	4	0	1	1	2	0
Vallejo	5	0	6	5	2	2	2	1	3	2	6	5	1	3	4	0	0	1	2	1
San Rafael	1	0	1	1	0	0	0	0	0	0	0	2	1	0	2	0	0	0	0	0
Coast and Central Bay																				
San Francisco	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Richmond	0	0	0	2	1	0	0	0	2	0	0	0								
San Pablo													1	0	1	0	0	0	0	1
Oakland	1	0	1	1	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0
South Central Bay																				
Fremont	8	3	17	7	11	3	6	5	5	4	10	2	2	7	3	2	3	3	4	0
Hayward**	5	1	12	9	1	0	2	1	0	1	7	2	2	4	4	1	2	0	3	0
Mountain View***	2	1	16	13	6	1	3	1	2	0	2	3	1	2	7					
San Leandro	0	0	0	0	0	0	2	2	3	0	6	2	3	2	3	1	0	1	2	1
Redwood City	5	1	2	2	1	0	0	0	1	0	5	1	0	0	0	0	1	0	1	1
Eastern District																				
Concord	10	5	20	10	6	3	4	3	7	4	9	11	2	13	8	2	6	5	5	1
Pittsburg	3	1	14	8	5	4	0	3	4	3	8	5	0	4	2	1	2	4	0	0
Bethel Island	8	8	14	7	11	5	3	7	3	5	6	6	1	10	5	1	3	5	0	1
Livermore	21	20	10	21	9	8	17	14	7	5	20	22	3	21	14	7	9	10	10	5
Fairfield	4	0	9	3	4	1	3	3	3	2	10	5	0	9	9	1	3	4	0	1
Santa Clara Valley																				
San Jose****	12	12	23	12	10	4	6	3	3	2	14	5	0	4	3	0	2		4	0
Los Gatos	20	21	25	12	1	5	7	3	8	2	13	10	1	5	4	0	2	4	7	0
San Jose East	16	5	22	13	9	1		5	5	3	15	5	1	5	2	1	0	0	2	0
Gilroy*	18	5	19	23	10	5	5	12	6	3	10	15	1	10	3		3	6	6	0
San Jose-Burbank						5	0	1	4	1										
San Martin										5	14	18	0	15	7	4	7	8	9	0
Sunnyvale																0	0	0	4	1
District Days	45	39	45	41	22	14	23	23	19	13	28	34	8	29	20	12	15	16	19	7

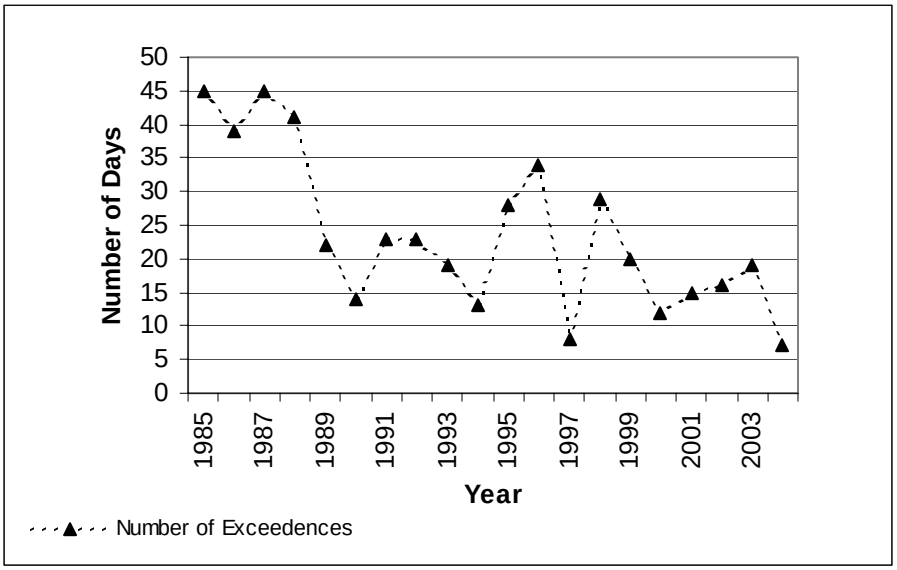
* Gilroy closed from 11/1/99 to 3/31/01

** Hayward closed from 4/96 to 8/23/96

*** Mountain View closed 12/3/99

****San Jose 4th St closed 4/30/02; reopened as San Jose Central 10/5/02

Figure 6: Exceedances of the State 1-hr Standard for Ozone in the Bay Area, 1985-2004



Peak Concentrations and Exposure

ARB guidance requires the use of three air quality indicators to assess the extent of air quality improvements achieved in the Bay Area: (1) Expected Peak Day Concentration, which is an estimate of the ozone concentration that would be exceeded once per year on average, (2) population-weighted exposure to ozone levels that exceed the State standard, and (3) area-weighted exposure to ozone levels that exceed the State standard. Each of these three indicators has been computed for the Bay Area, documenting changes from 1988 to 2002.

The hourly ozone levels recorded at Air District monitoring stations are used in this analysis, which focuses on those hours when the State standard[8] is exceeded. The following three air quality indicator analyses document significant progress toward improving the region's air quality:

Expected Peak Day Concentration

The Expected Peak Day Concentrations (EPDC) at Bay Area monitoring sites are listed in Table 3, from lowest to highest EPDC for 2002. Over the 14-year timeframe from 1988 to 2002, there has been an average annual reduction in EPDC of 1.4 percent. All the monitoring sites had lower EPDCs over this period with the exception of the monitoring site in San Leandro. While the San Leandro EPDC has increased slightly it is

[8] The calculation methodology assumes that an "exposure" occurs when a person experiences a one-hour ozone concentration outdoors that is greater than or equal to 9.5 pphm, the effective level of the State standard. The Population-Weighted Exposure and Area-Weighted Exposure consider both the level and duration of ozone concentrations above the State standard. The annual exposure is the sum of all the hourly exposures during the year. The results are presented as an average per exposed person or average per exposed unit land area.

still below the State one-hour standard. Overall, Table 3 shows steady improvement in reducing peak ozone concentrations.

From 1999 to 2002, the average annual reduction in EPDC was 3.1 percent. Over this shorter period, the EPDC fluctuates more dramatically ranging from an increase of 3.5 percent in Pittsburg to decreases of 6.2 percent in San Leandro and San Jose. Air quality trends, such as EPDC, have a tendency to fluctuate more over the short term because the number of ozone-conducive days may vary significantly from one year to the next and mask trends in the underlying potential for air pollution. One of the major factors influencing the number of ozone-conducive days in a year is weather – with high temperatures, strong inversions and relatively still air being major contributors.

Table 3: Expected Peak Day Concentrations

	Expected Peak Day Concentration (pphm)			Annual Percentage EPDC Change *	
Monitoring Site:	**1988**	**1999**	**2002**	**1999 to 2002**	**1988 to 2002**
San Francisco	7.4	5.9	5.7	-1.0	-1.6
Oakland	8.2	6.1	5.8	-1.9	-2.1
Richmond/San Pablo	8.3	8.0	6.9	-4.5	-1.2
San Rafael	9.3	8.5	7.0	-5.8	-1.8
Santa Rosa	8.7	8.6	7.1	-5.8	-1.3
Redwood City	9.7	7.1	7.9	3.4	-1.3
San Leandro	8.2	10.6	8.6	-6.2	0.4
Vallejo	10.9	9.8	8.7	-3.8	-1.5
San Jose	13.1	10.7	8.7	-6.2	-2.4
Napa	10.7	10.6	8.9	-5.4	-1.2
Mt. View/Sunnyvale	14.0	10.6	9.2	-4.5	-2.4
San Jose - East	14.7	10.9	9.6	-4.0	-2.5
Hayward	12.9	11.2	9.7	-4.5	-1.7
Fremont	13.2	10.7	9.8	-2.6	-1.8
Fairfield	11.1	12.2	10.4	-4.7	-0.4
Pittsburg	11.7	9.5	10.5	3.5	-0.7
Los Gatos	13.9	11.3	10.8	-1.4	-1.6
Bethel Island	11.1	11.7	10.9	-2.3	-0.2
Concord	12.8	12.7	11.3	-3.7	-0.8
Gilroy	14.2	11.3	11.5	0.7	-1.4
San Martin	**	12.5	12.1	-1.0	**
Livermore	14.5	14.3	12.5	-4.3	-1.0
Averages	**11.4**	**10.2**	**9.3**	**-3.1**	**-1.4**

* Percentage change results shown may differ slightly from percentage change calculated using displayed data points because of rounding for display purposes.
** The monitoring station at San Martin began collecting data on 4/30/1994; therefore, there is no 1988 or 1988 - 2002 annual percentage EPDC change data available for this site.

Population-Weighted Exposure to Ozone

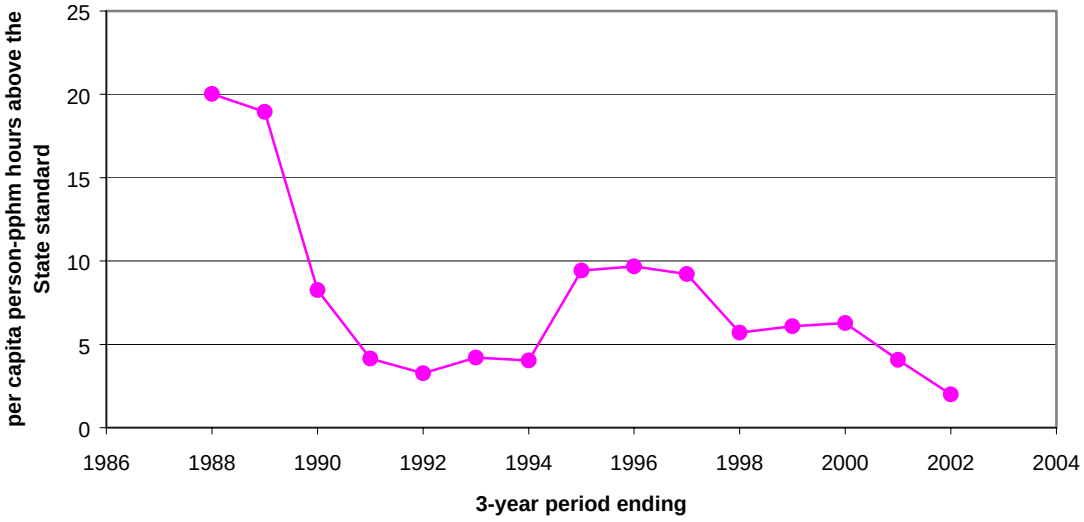
Data for peak ozone concentrations does not reflect how much of the Bay Area's population is exposed to high ozone levels. Population exposure provides a better indication of the extent and severity of ozone's impact on public health. Therefore, population-weighted exposure to ozone is another indicator used in assessing progress toward the State ozone standard. Table 4 shows that population-weighted exposure to unhealthful levels of ozone has decreased substantially everywhere in the Bay Area. The per capita exposure units (person-pphm-hours above 9.5 pphm/total population) show how many hours in a year each individual in a county is exposed to one pphm above the State ozone standard of 9.5 pphm. For example, a value of 5 pphm-hours might represent exposure for three hours at one pphm above the standard (i.e., 10.5 pphm) and one hour at 2 pphm above the standard (i.e., 11.5 pphm).

Population exposure to ozone in the Bay Area has decreased 90 percent on average between 1988 and 2002, as evidenced in Table 4 and Figure 7. From 1999 to 2002, the population exposure to ozone has declined 67 percent. The largest reduction in exposure to ozone from 1988 to 2002 occurred in Santa Clara County, with a 96 percent reduction.

Table 4: Population-Weighted Exposure to Ozone

	Per Capita Exposure (person-pphm-hours above 9.5 pphm/total population)			Percent Decrease	
County	**1988**	**1999**	**2002**	**1999 to 2002**	**1988 to 2002**
Alameda	18	7	3	54	83
Contra Costa	20	15	5	69	77
Marin	1	1	0	95	92
Napa	3	6	1	77	50
San Francisco	0	0	0	NA	NA
San Mateo	4	1	0	34	92
Santa Clara	48	7	2	71	96
Solano	8	10	2	84	80
Sonoma	1	1	0	81	83
Bay Area	**20**	**6**	**2**	**67**	**90**

Figure 7: Population Exposure to Unhealthy Ozone Levels in the Bay Area, 1988-2002



Area-Weighted Exposure to Ozone

The third indicator used in assessing progress toward the State ozone standard is area-weighted exposure to ozone. Reductions in area-weighted exposure are important because high ozone levels harm not only humans but also vegetation, animals, and most surfaces with which it comes in contact, such as architectural finishes and plastics. Table 5 indicates how many hours in a year each square kilometer in a county is exposed to one pphm above the State ozone standard. Table 5 shows that average Bay Area ozone exposure has decreased 82 percent from 1988 to 2002, and by 59 percent from 1999 to 2002.

Table 5: Area-Weighted Exposure to Ozone

	Area-Weighted Exposure (pphm-hours above 9.5 pphm / total km^2)			**Percent Decrease**	
County	**1988**	**1999**	**2002**	**1999 to 2002**	**1988 to 2002**
Alameda	41	19	10	47	75
Contra Costa	26	18	7	60	72
Marin	1	1	0	89	87
Napa	3	6	1	79	63
San Francisco	0	0	0	NA	NA
San Mateo	12	1	1	46	93
Santa Clara	54	12	6	49	88
Solano	12	11	3	77	79
Sonoma	1	2	0	82	77
Bay Area	**20**	**9**	**4**	**59**	**82**

IMPLEMENTED CONTROL MEASURES

The Air District has a long history of implementing control measures to reduce ozone precursor emissions from stationary, area, mobile and transportation sources. The Air District implements stationary source measures, and many area source measures, by adopting or amending Air District rules and regulations. Since the first Bay Area Clean Air Plan (prepared pursuant to the California Clean Air Act) was adopted in 1991, the Air District has adopted 55 rules and rule amendments to reduce ozone precursor emissions from stationary and area sources. Table 6 reports Air District rules adopted since 1991 and includes emission reductions.

Table 6: Air District ROG and NOx Rules Adopted Since 1991

District Regulation, Rule	Adoption Date	Emissions Reductions (tons/day)	
		ROG	NOx
SURFACE COATING AND SOLVENT USE			
COATINGS AND INK MANUFACTURING (b) Eliminate the small manufacturer exemption (c) Require reduced emissions from vat cleaning (Reg 8-35)	03/18/92	0.3-0.5	
ADHESIVES (a) Establish ROG limits for adhesives (b) Set transfer efficiency standards (c) Set standards for cleanup operations (Reg 8-51)	11/18/92	13.0	
AEROSPACE COATINGS (a) Set transfer efficiency standards (Reg 8-29)	02/03/93	0.02-0.03	
SURFACE COATING OF MISCELLANE-OUS METAL PARTS AND PRODUCTS (a) Set transfer efficiency standards (Reg 8-19)	02/03/93	0.06-0.13	
SURFACE COATING OF PLASTIC PARTS AND PRODUCTS (a) Set transfer efficiency standards (Reg 8-31)	02/03/93	negligible	

Table 6 (continued): Air District ROG and NOx Rules Adopted Since 1991

District Regulation, Rule	Adoption Date	Emissions Reductions (tons/day)	
		ROG	NOx
GRAPHIC ARTS PRINTING OPERATIONS (a) Lower ROG limits for fountain solutions (c) Lower ROG limits for inks (Reg 8-20)	10/06/93	1.3	
GENERAL SOLVENT AND SURFACE COATING (b) Modify mass emission limits (Reg 8-4)	06/01/94	unknown	
ELIMINATION OF COATINGS RULES ALTERNATIVE EMISSION CONTROL PLANS (a) Eliminate or modify AECP provisions in Reg. 8 Rules (Reg 8-12, 8-13, 8-14, 8-19, 8-23, 8-29, 8-30, 8-31, 8-32 & 8-38)	06/15/94	unknown	
SOLVENT AND SURFACE COATING (Reg 8-3)	05/15/96	unknown	
ADHESIVES (a) Establish ROG limits for adhesives (Reg 8-51)	06/05/96	6.0	
WOOD FURNITURE AND CABINET COATINGS (a) Establish ROG limits for coatings (b) Eliminate small user exemption (Reg 8-32)	06/19/96	5.8-6.5	
MOTOR VEHICLE AND MOBILE EQUIPMENT COATING & POLYESTER RESIN (Reg 8-45, 8-50)	11/06/96	unknown	
ADHESIVE AND SEALANT PRODUCTS (Reg 8-51)	11/06/96	unknown	

Table 6 (continued): Air District ROG and NOx Rules Adopted Since 1991

District Regulation, Rule	Adoption Date	Emissions Reductions (tons/day)	
		ROG	NOx
CAN AND COIL COATING (a) Lower ROG limits for some coatings (Reg 8-11)	11/19/97	0.35	
ADHESIVE AND SEALANT PRODUCTS (Reg 8-51)	01/07/98	unknown	
SEMICONDUCTOR MANUFACTURING (a) Abate emissions from positive photoresist operations (b) Abate emissions from solvent cleaning performed with coating-type applicators (Reg 8-30)	10/07/98	unknown	
ARCHITECTURAL COATINGS (Reg 8-3)	11/04/98	unknown	
SUBSTITUTE SOLVENTS USED FOR SURFACE PREPARATION / CLEAN-UP OF COATINGS (a) Set ROG / volatility limits for surface preparation solvents (b) Set ROG / volatility limits for clean-up solvents (Reg 8-16, 8-20 & 8-45)	Reg 8-16 adopted 09/16/98 Reg 8-20 adopted 03/03/99 Reg 8-45 adopted 01/09/99	2.9	
POLYSTYRENE, POLYETHYLENE AND POLYPROPYLENE MANUFACTURING (Reg 8-52)	07/09/99	0.3	
ADHESIVE AND SEALANT PRODUCTS (Reg 8-51)	05/02/01	unknown	
SURFACE COATING OF MARINE VESSELS (Reg 8-43)	04/18/01	unknown	
AQUEOUS SOLVENTS (Reg 8-16)	10/16/01	2.2	

Table 6 (continued): Air District ROG and NOx Rules Adopted Since 1991

District Regulation, Rule	Adoption Date	Emissions Reductions (tons/day)	
		ROG	NOx
ARCHITECTURAL COATINGS (Reg 8-3)	11/21/01	3.8	
ADHESIVE AND SEALANT PRODUCTS (Reg 8-51)	07/17/02	unknown	
SURFACE PREPARATION AND CLEAN-UP SOLVENTS (Reg 8-4, 14, 19, 31, 43)	10/16/02	2.1	
FUELS/ORGANIC LIQUIDS STORAGE AND DISTRIBUTION			
STORAGE OF ORGANIC LIQUIDS (c) Require better tank seals/more frequent inspections (g) Require emissions to be controlled during tank cleaning (Reg 8-5)	01/20/93	2.0-3.0	
ORGANIC CHEMICAL TERMINALS & BULK PLANTS (a) Reduce emission standard for non-gasoline bulk terminals and plants (Reg 8-6)	02/02/94	0.01	
GASOLINE DISPENSING FACILITIES (Reg 8-7)	11/17/99	3.8	
ORGANIC LIQUID STORAGE (h) Low emitting retrofits for slotted guide poles (Reg 8-5)	12/15/99	0.9	
GASOLINE DISPENSING FACILITIES (Reg 8-7)	11/06/02	unknown	
ORGANIC LIQUID STORAGE (Reg 8-5)	11/27/02	0.13	
REFINERY AND CHEMICAL PLANT PROCESSES			
PUMP AND COMPRESSOR SEALS AT REFINERIES AND CHEMICAL PLANTS (a) Require leakless seals (b) Adopt a more stringent leak definition (Reg 8-18)	03/04/92	6.5	

Table 6 (continued): Air District ROG and NOx Rules Adopted Since 1991

District Regulation, Rule	Adoption Date	Emissions Reductions (tons/day)	
		ROG	NOx
VALVES AND FLANGES AT REFINERIES AND CHEMICAL PLANTS (a) Require leakless valves (b) Improve inspection and maintenance requirements (c) Adopt a more stringent leak definition (Reg 8-22 & 8-25)	03/04/92	Emissions reduction included in above rule amendment.	
PRESSURE RELIEF DEVICES AT REFINERIES AND CHEMICAL PLANTS (a) Require venting to abatement devices and/or rupture disks with tell-tale indicators (Reg 8-28)	12/17/97 & 3/18/98	0.13	
EQUIPMENT LEAKS AT REFINERIES AND CHEMICAL PLANTS (b) Control of Fittings (Reg 8-18)	01/07/98	1.2	
EQUIPMENT LEAKS AT REFINERIES AND CHEMICAL PLANTS (Reg 8-18)	11/27/02	unknown	
PETROLEUM REFINERY FLARE MONITORING (Reg 12-11)	06/04/03	none	
LOW EMISSION REFINERY VALVES (Reg 8-18)	1/21/04	0.2	
PROCESS VESSEL DEPRESSURIZATION (Reg 8-10)	1/21/04	unknown	
REFINERY WASTEWATER (OIL-WATER) SEPARATORS (REG 8-8)	9/15/04	2.1	
PETROLEUM REFINERY FLARE CONTROL (Reg 12-12)	07/20/05	TBD	
COMBUSTION OF FUELS			
RESIDENTIAL WATER HEATING (a) Adopt NOx standards for new residential and commercial water heaters (Reg 9-6)	04/01/92		3.3

Table 6 (continued): Air District ROG and NOx Rules Adopted Since 1991

District Regulation, Rule	Adoption Date	Emissions Reductions (tons/day)	
		ROG	NOx
BOILERS, STEAM GENERATORS, AND PROCESS HEATERS (a) Adopt NOx controls similar to existing SCAQMD Rule 1146 (2) Smaller units (less than 100 MMBTU/hr.) (Reg 9-7)	09/16/92		14.9
NON-UTILITY RECIPROCATING ENGINES (a) Adopt NOx controls similar to existing SCAQMD Rule 1110.2 (Reg 9-8)	01/20/93		8.3
CONTROL OF EMISSIONS FROM STATIONARY GAS TURBINES (a) Adopt NOx controls similar to existing SCAQMD Rule 1134 (Reg 9-9)	05/05/93		7.0
BOILERS, STEAM GENERATORS, AND PROCESS HEATERS (a) Adopt NOx controls similar to existing SCAQMD Rule 1146 (1) Large units (100 MMBTU/hr. or larger) (Reg 9-10)	01/05/94		21.0
GLASS MANUFACTURING PLANT MELTING FURNACES (a) Adopt NOx controls similar to existing SCAQMD Rule 1117 (Reg 9-12)	01/19/94		1.2
ELECTRIC POWER GENERATING BOILERS (a) Adopt NOx controls based on add-on flue gas controls (Reg 9-11)	02/16/94		10.0-25.0
BOILERS, STEAM GENERATORS AND PROCESS HEATERS (Reg 9-10)	07/17/02		unknown
OTHER STATIONARY SOURCE CONTROL MEASURES			
ENHANCED COMPLIANCE THROUGH PARAMETRIC MONITORING (Reg 1)	10/07/98	unknown	unknown
SOLID WASTE DISPOSAL (Reg 8-34)	10/06/99	unknown	

Table 6 (continued): Air District ROG and NOx Rules Adopted Since 1991

District Regulation, Rule	Adoption Date	Emissions Reductions (tons/day)	
		ROG	NOx
PROHIBIT AERATION OF PETROLEUM CONTAMINATED SOIL (Reg 8-40)	12/15/99	2.7	
TOTAL EMISSION REDUCTIONS ACHIEVED		**58 – 60 tpd**	**66 – 81 tpd**

The Air District, in cooperation with partner regional and local agencies, continues to make progress in reducing ozone precursor emissions from stationary, area, mobile, and transportation sources. Progress occurs through various means, including adoption and implementation of Air District rules as noted above, implementation of Air District incentive programs and public education programs, and transportation planning and programming processes.

Stationary and Area Source Measures

The triennial update of the plan for the State ozone standard must report progress on implementing the control measures in the 2000 Clean Air Plan. Of the nine stationary source measures proposed in the 2000 Clean Air Plan, four were adopted (A1 Architectural Coatings, A5 Surface Preparation and Clean-Up Solvents, B2 Organic Liquid Storage, and C4 Process Vessel Depressurization), two are carried over in the control strategy in the 2005 Ozone Strategy (A21 Automobile Refinishing and A22 Wood Products Coating), and three are proposed for deletion (discussed below). Table 7 reports Air District rules adopted and implemented since 2000, with the associated emission reductions.[9]

[9] Note that some measures were included in the 2000 Clean Air Plan (for the State standard) and also in the 2001 Ozone Attainment Plan (for the national standard). Four measures in Table 7 were included only in the 2001 Ozone Attainment Plan. Even though these four measures were not included in the 2000 Clean Air Plan, they are included in Table 7 to provide a more complete picture of Air District rule development activity since 2000. Details on the history of Bay Area air quality planning for the national one-hour ozone standard can be found in Section 3 Other Issues.

Table 7: Air District Rules Adopted Since 2000

Control Measure (Reg. – Rule) Control Measure #[1]	Date Adopted	Emissions Reduced[2]
Architectural Coatings (Reg. 8-3) **A1**, SS-11	11/21/2001	3.8 tons/day
Organic Liquid Storage (Reg. 8-5) **B2**, SS-12	11/27/2002	0.1 tons/day
Surface Preparation and Clean-Up Solvents (Reg. 8-4, 13, 19, 31, 43) **A5**, SS-13	10/16/2002	2.1 tons/day
Aqueous Solvents (Reg. 8-16) SS-14	10/16/2001	2.2 tons/day
Petroleum Refinery Flare Monitoring (Reg. 12-11) SS-15	6/4/2003	none[3]
Low Emission Refinery Valves (Reg. 8-18) SS-16	1/21/2004	0.2 tons/day
Process Vessel Depressurization (Reg. 8-10) **C4,** SS-17	1/21/2004	unknown[4]
Refinery Wastewater (Oil-Water) Separators (Reg. 8-8), FS-9	9/15/2004	2.1 tons/day
10 Tons/Year No Net Increase Requirement (Reg. 2-2)	12/21/2004	unknown
Petroleum Refinery Flare Control (Reg. 12-12)	7/20/2005	unknown[3]
Total emission reductions		10.5 tons/day

1 Control Measure numbers in **bold** are from 2000 Clean Air Plan. Other control measure numbers are from the 2001 Ozone Attainment Plan.

2 All emissions are of ROG

3 The flare monitoring rule does not result in direct emission reductions although refineries did reduce flaring emissions substantially in response to the monitoring rule development and implementation. The flare control rule (Reg 12-12) will capture the emission reductions from flaring and make them enforceable.

4 The 2004 amendments greatly increase the number of refinery vessels subject to the rule requirements. Emission reductions have not been quantified.

Control Measures Proposed for Deletion

In some cases, control measures are not implemented through rules, either because: there are negligible emissions in the source category; there is negligible emissions reduction potential; it is found that prospective control technology is either infeasible or too costly; or because potential emissions reductions are captured under another control measure. Previous triennial updates have deleted control measures due to one or more of these reasons. If, in the future, more information becomes available which indicates the potential viability of these deleted control measures, they will be reevaluated for consideration as future control measures at that time.

Three stationary and area source control measures from the 2000 Clean Air Plan are proposed for deletion: control measures addressing VOC emissions from concrete coating (A-23); NO_x emissions from residential water heaters (D-8); and seasonal control

on cleaning of organic liquid storage tanks and wastewater separators and refinery shutdowns (G-3). The following is a summary evaluation of each of these control measures and the rationale for deletion:

- **A23: Concrete Coating Operations.** This measure was proposed because a review of the Air District's miscellaneous coatings inventory revealed a number of operations that coat concrete. At the time the 2000 CAP was developed, it appeared that some of these operations might be able to achieve emission reductions by using lower-VOC coatings and form release compounds. This control measure was evaluated again as part of the 2001 Bay Area Ozone Attainment Plan Reasonably Available Control Measure review. This review showed that emissions from concrete coating operations are currently less than 0.05 tons per day. Therefore, potential emission reductions from this control measure are de minimis.
- **D8: Improved Residential Water Heater Rule.** Residential water heaters are subject to the requirements of District Regulation 9, Rule 6: Nitrogen Oxide Emissions from Natural Gas Fired Water Heaters. The control measure recommended lower NO_x limits found in the comparable South Coast rule. In 1999, amendments to South Coast Rule 1121 established a 20 nanogram NO_x / joule of heat output standard effective in 2002 and a 10 nanogram / joule of heat output standard effective in 2005. These standards were described as technology forcing. The rule allowed manufacturers to pay a mitigation fee in lieu of meeting the 20 nanogram limit. On October 24, 2003, South Coast staff reported to the Stationary Source Committee of their Board on progress toward the new limits. All manufacturers paid a mitigation fee in lieu of meeting the interim rule limit. All four major manufacturers of water heaters were reported to be having difficulty meeting the final rule limit. The manufacturers cited competing federal requirements regarding safety and energy efficiency that they have had to meet for the national market. The competing requirements also affect NO_x levels. As a result, the manufacturers sought a delay in the effective date of the standard. Manufacturers are not be making water heaters to meet the 20 nanogram limit, and the feasibility of the 10 nanogram limit remains uncertain. On September 3, 2004, South Coast Rule 1121 was amended to delay the effective date of the 10 nanogram limit to various dates in 2006 through 2008, depending upon the size and design of the water heater.
- **G3: Seasonal Limitations on Organic Liquid Storage Tank and Wastewater Separator Cleaning and Refinery Shutdowns.** This measure would require that discretionary activities such as organic liquid storage tank cleaning, wastewater separator cleaning, and refinery unit shutdowns be controlled or conducted outside the summer ozone season. The 2001 Ozone Attainment Plan Reasonably Available Control Measure review also evaluated this control measure. This review found that refineries maximize production during the summer and schedule these activities at other times, so few emission reductions are likely during summer months. Also, amendments to Reg. 8-10: Process Vessel Depressurization adopted in January, 2004 achieve part of the emission reduction that would be produced by this measure. Amendments to Reg. 8-8: Wastewater (Oil-Water) Separators adopted in September 2004 achieve an additional portion. Finally, more stringent organic liquid storage tank cleaning requirements, which are currently being studied as part of 2001 Ozone Attainment Plan further study measure FS-10, would achieve yet another portion. These proposals will achieve these emissions reductions on a permanent basis, not

just seasonally. Any remaining emission reductions that could be achieved through seasonal prohibitions are de minimis.

Mobile Source Programs

Air District efforts to reduce emissions from mobile sources during the years 2001-03 have focused on incentive and education programs. The Air District's Transportation Fund for Clean Air (TFCA) program provides incentives for clean fuel buses, other clean air vehicle projects, retrofits and re-powers of on-road diesel engines, shuttle and feeder bus projects, ridesharing, bicycle facilities, smart growth, transit information and arterial management projects. The TFCA program also funds the Air District's Vehicle Buy Back program, the Smoking Vehicle program and the Spare the Air program. In coordination with the ARB, the Air District also administers the Carl Moyer program and the Lower Emission School Bus program. These programs are discussed in more detail in the Mobile Source Programs portion of the control strategy. Table 8 provides information on Air District mobile source programs during fiscal years 2000/01 - 2002/03.

Table 8: Funding and Emission Reductions from Incentive Programs

Fiscal Year	FY00/01		FY01/02		FY02/03	
Measure	Funding	Emission Reductions*	Funding	Emission Reductions*	Funding	Emission Reductions*
Smoking Vehicle	$508,490	36	$545,864	60	$522,008	61
Vehicle Buy Back	$2,326,588	643	$2,284,977	372	$3,753,850	582
Vehicle Incentive Program	$1,360,000	37	$1,311,000	42	$1,000,000	5
Spare the Air	$622,329	25	$649,426	20	$667,690	23
Lawnmower Buy Back	$125,000	5.3	$129,200	5.5	$158,800	6.7
Trip Reduction/Ridesharing	$3,028,770	268	$4,273,748	181	$5,932,746	239
Telecommuting	$41,496	2				
Smart Growth	$938,375	36	$550,000	13	$995,186	34
Arterial Management	$724,715	46	$1,899,000	62	$2,980,000	167
Bicycle Facilities	$2,368,051	78	$1,182,047	49	$3,470,763	123
Shuttle and Feeder Buses	$3,524,306	136	$3,369,273	111	$3,082,874	88
Transit Buses	$1,534,535	123	$3,921,396	248	$1,463,370	58
School Buses	$1,072,500	31	$3,920,000	80	$1,330,000	39
Natural Gas Vehicles	$4,734,000	267	$1,359,812	95	$2,846,153	129
Infrastructure for CNG	$895,544	N/A	$1,373,739	N/A	$375,615	N/A
Infrastructure for EV	$93,000	N/A	$9,000	N/A	$57,000	N/A
Lower Emission School Bus Program	$8,673,611	182	$4,238,607	89	$3,172,852	127
Carl Moyer Program	$4,340,000	2859	$1,570,344	906	$1,573,102	906
T O T A L	**$36,786,310**	**4,769**	**$32,458,233**	**2,328**	**$33,223,209**	**2,581**

* Emission reductions are total tons of ROG, NOx and PM combined over the life of the project.

Highlights from the Air District grants programs during FY 00/01, FY 01/02, and FY 02/03 include:

- 271 school buses purchased or retrofit
- 9,769 older vehicles retired through the Vehicle Buy-Back program
- 68 bicycle projects funded
- 37 shuttle projects funded
- 58 low emission vehicle projects funded through the Carl Moyer program

Transportation Control Measures

TCM implementation is ongoing, and significant progress was made during 2001-2003 in implementing the nineteen TCMs in the 2000 Clean Air Plan. The following discussion highlights significant TCM implementation efforts during the three-year period.

TCM 1: SUPPORT VOLUNTARY EMPLOYER-BASED TRIP REDUCTION PROGRAMS

- MTC continues to administer the Regional Ridesharing Program (trip reduction services were provided by RIDES for Bay Area Commuters during this period).
- Air District's Transportation Fund for Clean Air (TFCA) funds numerous regional and local voluntary ridesharing and trip reduction programs. TFCA funded approximately $17.8 million in trip reduction projects during FY 01/02 – 03/04. (Trip reduction category includes funding for transit use incentives (TCM 13), vanpool incentives (TCM 14), and educational programs (TCM 16)).
- Air District's Spare the Air Employer Program works with employers, cities and counties to provide assistance and tools to educate employees about air quality and commute alternatives.

TCM 3: IMPROVE AREAWIDE TRANSIT SERVICE

- In the 2003 Transportation Improvement Plan (TIP), MTC programmed $2.2 billion for public transit operations and capital expenses.
- AC Transit's enhanced rapid bus service on San Pablo Avenue started operation in 2003.
- MTC's Regional Express Bus program completed the purchase of 90 low emission buses, providing service on major commute corridors.
- TFCA funded approximately $6.6 million for clean-fuel transit buses during FY 01/02 – FY 03/04.
- In December 2001, MTC programmed $5 million in CMAQ funds, which were equally matched with local transportation and social service funds, to initiate the Low Income Flexible Transportation (LIFT) Program. The first round of LIFT funding supported 12 projects designed to implement projects identified in county plans. In December 2002, MTC programmed an additional 14 projects funded through a combination of Job Access and Reverse Commute funds ($3 million), STA funds and local social service funds. These projects funded expanded fixed route services, children's shuttles, vanpool services and car share services that directly serve low-income communities.

TCM 4: IMPROVE REGIONAL RAIL SERVICE

- BART extension to SF International Airport opened in June 2003.
- Caltrain Baby Bullet express service began in June 2004.
- Santa Clara VTA completed the first phase of the Tasman East Light Rail extension project in May 2001 with construction of a 1.9 mile segment from Baypointe Transfer Station to I-880 in Milpitas. The second phase of the Tasman East and the Capitol Light Rail Extension Projects began service in June 2004.

TCM 5: IMPROVE ACCESS TO RAIL & FERRIES

- TFCA funded $10.7 million for feeder bus and shuttle service to rail and ferries during FY 01/02 – FY 03/04.
- TFCA, TDA Article 3, and TEA-21 Enhancements funded bicycle access and bicycle storage facilities at BART, Caltrain, Muni, SCVTA LRT and AMTRAK stations. TFCA continued to fund attended bicycle parking at Palo Alto Caltrain and Downtown Berkeley BART stations and provided new funding at San Francisco Caltrain stations, and Fruitvale and Embarcadero BART stations.

TCM 6: IMPROVE INTERCITY RAIL SERVICE

- Five additional (for a total of twelve) Capitol trains began operation on weekdays between the Bay Area and Sacramento. Weekend service now includes nine roundtrips between Oakland and Sacramento.
- A third Altamont Commuter Express train began service between Stockton and San Jose in 2001.

TCM 7: IMPROVE FERRY SERVICE

- Since 2000, the Air District has provided approximately $3 million in Carl Moyer funds to purchase new, lower emission engines for 6 commuter ferries operating in the San Francisco Bay.
- In 2001, Golden Gate Transit initiated service of a new high-speed catamaran vessel, operating from Larkspur to San Francisco.
- In 2003, the Water Transit Authority's long-range plan to operate and expand comprehensive ferry service across San Francisco Bay was approved by the California Legislature.
- Vallejo Transit's Baylink began operation of a new high-speed low emission vessel in July 2004.

TCM 8: CONSTRUCT CARPOOL/EXPRESS BUS LANES ON FREEWAYS

- Since 2000, the following new HOV facilities were constructed: HOV lanes on SR 4 in eastern Contra Costa County, HOV lane from the Bay Bridge to I-80, HOV lane/flyover to the Bay Bridge toll plaza, HOV lane on I-880 northbound from West Grand Avenue to the Bay Bridge toll plaza, HOV lanes on I-680 southbound over Sunol, HOV lane on Hwy 101 between Bernal to Cochrane in Santa Clara County, HOV Lane on Hwy 101 between Wilfred to SR 12 in Sonoma County.
- In FY 02/03, TFCA provided funds for the construction of a park & ride lot in the City of Windsor.
- In 2003, MTC adopted the 2002 HOV Lane Master Plan Update for the Bay Area.

TCM 9: IMPROVE BICYCLE ACCESS & FACILITIES

- In FY 01/02 – FY 03/04, MTC funded over $21.2 million in bicycle and pedestrian projects through the TDA Article 3 program.
- TFCA funded $8.2 million in bicycle projects during FY 01/02 – FY 03/04, including bicycle routes, lanes, bridges and lockers.

TCM 10: YOUTH TRANSPORTATION

- In 2001, the Air District began implementing ARB's Lower Emission School Bus Program in the Bay Area. During FY 00/01 – FY 02/03, funding for the Bay Area totaled $8.2 million. All of the funding has been awarded, resulting in 172 low emission school buses in the Bay Area.
- In 2001, MTC committed up to $2 million in Low Income Flexible Transportation (LIFT) funds to support a 2-year pilot program to provide free bus passes for low-income students throughout AC Transit's service area. TFCA allocated $500,000 to support the program. TFCA also allocated $178,000 for student transit subsidies in Marin County.
- TFCA funded various programs at schools and universities, including transit pass subsidies, trip reduction and ridesharing services, transit information programs, and Safe Routes to School projects.

TCM 11: INSTALL FREEWAY/ARTERIAL METRO TRAFFIC OPERATIONS SYSTEM

- Freeway Service Patrols reduce incident related congestion and has expanded service to 80 vehicles, covering 450 miles of freeway.
- In 2003, ramp meters began operation on eastbound I-580 in Pleasanton, and at I-880/237 interchange.

TCM 12: IMPROVE ARTERIAL TRAFFIC MANAGEMENT

- TFCA has funded $6.7 million in signal prioritization and timing projects during FY 01/02 – FY 03/04.
- In FY 03/04, MTC programmed $1.2 million for signal retiming, and $250,000 in technical assistance to local jurisdictions to improve arterial operations.
- AC Transit's enhanced bus service on San Pablo Avenue started operation in 2003, relying on a number of arterial improvements to speed bus travel in the corridor.

TCM 13: TRANSIT USE INCENTIVES

- Over 80,000 Bay Area employees use pre-tax salary to pay for transit tickets. This service is provided by several vendors and annual sales through the Regional Transit Connection are approximately $36 million.
- TFCA awarded $365,000 for transit marketing projects in FY 02/03.
- VTA's EcoPass program continues to expand and now includes a residential component that provides transit passes for residents affiliated with housing developments. The EcoPass program currently includes 106 Employers and Residential Communities, and they represent about 120,000 employees and residents in Santa Clara County.
- Phase I of the TransLink® (universal fare card) program began in February 2002. More than 3,500 volunteers participated in a six-month pilot program in select stations and on select routes operated by six Bay Area transit

providers: AC Transit, BART, Caltrain, Golden Gate Transit, San Francisco MUNI and the Santa Clara VTA.

TCM 14: IMPROVE RIDESHARE/VANPOOL SERVICES AND INCENTIVES

- TFCA funds various vanpool incentive programs through the Regional Rideshare Program. The current vanpool fleet amounts to approximately 675 vans.
- In December 2002, MTC launched a regional on-line ridematching service.

TCM 15: LOCAL CLEAN AIR PLANS, POLICIES AND PROGRAMS

- In 2000, MTC created a new component of the Transportation for Livable Communities (TLC) program, the Housing Incentive Program (HIP), which provides incentives for the development of higher density housing near existing transit stations. Twenty-one cities have received HIP grants totaling $9 million.
- During FY 01/02 – FY 03/04, MTC funded 17 TLC planning projects totaling $911,000 and 12 capital projects totaling $9.5 million
- In December 2003, MTC reaffirmed their commitment to a tripling of TLC funding to $27 million/year for six years under the reauthorization of TEA-3.
- The Smart Growth Strategy/Regional Livability Footprint Project public workshops concluded in Spring 2002, and resulted in the development of a regionally approved Smart Growth Vision for the Bay Area. ABAG adopted policy-based demographic projections based on the Vision in March 2003. Population assumptions for the Regional Transportation Plan, Transportation 2030, are based on ABAG's Projections 2003.
- MTC created a new program for partnering with county Congestion Management Agencies (T-PLUS) to further the integration of transportation and land use decisions at the local level.
- In July 2000, AB 2864 created the Inter-Regional Partnership State Pilot Project, which was designed to develop, implement and evaluate incentive programs designed to change development patterns to improve the quality of life in the Bay Area and Central Valley by working to balance jobs and housing in the regions.

TCM 16: INTERMITTENT CONTROL MEASURE/PUBLIC EDUCATION

- Approximately 2,100 employers with over 1 million employees now participate in the Air District's Spare the Air program.
- Starting in 2003, the Air District partnered with Livermore Amador Valley Transit Authority to offer free service on all Spare the Air days. The program has continued in 2004. The Air District, BART and MTC funded a program to offer free morning commutes on BART on the first five weekday Spare the Air days between June 21 and Oct. 15, 2004. Free BART service was subsequently provided on September 7 and 8, 2004.
- In 2003, the Clean Air Consortium, comprised of 30 city and county agencies, formed to voluntarily curtail lawn and garden maintenance, painting, refueling and other polluting activities on Spare the Air Days.
- The Bay Area Clean Air Partnership (BayCAP) promotes voluntary actions to reduce emissions and meet the national ozone standard. In 2002, BayCAP undertook a comprehensive shuttles campaign to inventory existing

programs, provide coordination and assistance, and promote "best practices" among shuttle operators.

- Caltrans issues messages on freeway changeable message signs to cut down on high speed emissions by requesting that motorists observe the speed limit on Spare the Air days.

TCM 17: CONDUCT DEMONSTRATION PROJECTS

- TFCA has funded numerous clean fuel vehicle demonstration projects amounting to approximately $8.2 million during FY 01/02 – FY 03/04.
- All lanes on Bay Area bridges are now equipped for FasTrak electronic toll collections. In addition, all bridges have either one or two dedicated lanes for use exclusively by vehicles with FasTrak transponders.
- From 2000 through 2003, the Air District's Lawnmower Buyback programs resulted in approximately 1,200 – 1,300 gasoline-powered lawnmowers being exchanged for electric models each year. The program continued in 2004.
- In 2002, the Air District awarded $250,000 in Carl Moyer Infrastructure Demonstration funds for the development of a liquefied natural gas refueling station in Oakland. The Air District also awarded $57,000 to the Port of Oakland for a one-year demonstration of aqueous diesel fuel in Class 8 trucks.

TCM 18: TRANSPORTATION PRICING REFORM

- Regional Measure 2, a ballot measure to raise bridge tolls on state-owned Bay Area bridges by $1, was approved in March 2004 by Bay Area voters in seven (7) Bay Area counties. The additional toll revenue will raise an estimated $125 million each year to implement the Regional Traffic Relief Plan, a comprehensive strategy for addressing congestion in the transbay bridge corridors and enhancing the convenience and reliability of the Bay Area's public transit system.

TCM 19: PEDESTRIAN TRAVEL

- MTC's TLC program provides funding to assist pedestrian-friendly planning and projects (see TCM 15). TFCA also funded several pedestrian improvement projects (see TCM 20).
- MTC allocates TDA funds to pedestrian projects and provides incentives in the funding allocation process for capital improvements. About $6.5 million of TDA Article 3 funds in FY01/02 and over $67 million in the 2003 TIP were allocated to bicycle/pedestrian projects.
- The Regional Pedestrian Committee (formerly Pedestrian Safety Task Force) was established in early 2002 to provide support for pedestrian planning in five program areas: data analysis, technical assistance, educational programs, resource guide, and stable funding.

TCM 20: PROMOTE TRAFFIC CALMING

- MTC's TLC and the Air District's TFCA programs have funded numerous traffic calming projects. In FY 02/03, MTC awarded $2.6 million in TLC capital grants to traffic calming projects in Alameda, El Cerrito, East Palo Alto, and Vacaville. Since FY 00/01, approximately $1.7 million in TFCA regional funds have been awarded to traffic calming projects in the Bay Area.

CONTROL STRATEGY

The control strategy outlines a program for further reducing ozone precursor emissions in order to reduce ozone levels in the Bay Area and reduce transport to downwind regions. It is the central element of the 2005 Ozone Strategy.

The control strategy for the 2005 Ozone Strategy is to implement all feasible measures on an expeditious schedule in order to reduce emissions of ozone precursors. This is consistent with California Clean Air Act requirements in the Health and Safety Code and pollutant transport mitigation requirements in the California Code of Regulations.

This section describes the proposed strategy for further reducing ozone precursor emissions in order to reduce ozone levels in the Bay Area and reduce transport to downwind regions. A discussion of the process for identifying and evaluating potential control measures is followed by a description of the control strategy, which includes stationary source measures, mobile sources measures and transportation control measures. More detailed control measure descriptions are provided in the appendices.

Control Measure and Further Study Measure Development

To satisfy State requirements under the CCAA that the region adopt all feasible measures to reduce ozone precursor emissions, the Air District investigated a wide range of potential control measure ideas from many sources. Air District staff sought ideas for new sources to control, as well as ways to strengthen existing rules and programs. To identify potential control measures, the Air District:

- Participated in discussions as part of the Rule Development Managers subcommittee of the CAPCOA Engineering Managers Committee to develop a statewide “all feasible measures” list.
- Participated with staff from ARB, Yolo-Solano APCD, Sacramento Metropolitan AQMD, and San Joaquin Valley Unified APCD on a rule comparison project.
- Reviewed 39 suggested control measures developed by consultants for Sacramento Metropolitan AQMD.
- Investigated rules in other air districts throughout California.
- Investigated control measures and programs from plans in other districts and agencies, both within and outside the state.
- Considered comments and suggestions from the Ozone Working Group.
- Considered comments and suggestions from community meetings.
- Considered comments and suggestions from Air District Board members, Advisory Council members, and staff.

Additional detail on the Air District’s processes for identifying and evaluating potential control measures is provided in Appendix B, Control Measure Review and Evaluation Process.

MTC took the lead in evaluating transportation control measures, and MTC and the Air District worked together in revising the TCMs. This process is discussed below, in the TCM section of the control strategy.

In total, Air District staff considered 390 control measure suggestions, not including transportation control measure suggestions evaluated by MTC. In evaluating a control measure, staff considered a variety of factors, including:

- Technological feasibility of proposed controls;
- Emission inventory of the source category and total likely emission reductions from proposed controls;
- Cost-effectiveness in dollars per ton of emissions reduced;
- Enforceability, including whether emission reductions are real, quantifiable, permanent, enforceable, and surplus;
- Rate (and timing) of emissions reductions;
- Public acceptability, including interests and concerns of community members;
- Pollutant reduced (volatile organic compounds, nitrogen oxides or both);
- Any potential adverse environmental impacts;
- Socioeconomic impacts.

In some cases, not all of these elements could be analyzed from readily available information. For example, emissions data for some source categories or the emissions reduction potential of some control measure may be uncertain. In these cases, further study may be warranted if the other aspects of a suggested control, such as public acceptability and adverse environmental impacts appear positive. These measures are discussed further below, under Further Study Measures.

Of the 390 control measure suggestions considered, not including the transportation control measure suggestions evaluated by MTC, Air District staff made preliminary determinations and presented them for discussion at three Ozone Working Group meetings on January 6, 2004, January 20, 2004, and March 23, 2004. Finally, based on input from the Ozone Working Group and members of the public, and on further evaluation by Air District staff, the potential control measures were distilled down to the measures identified in Tables 9 and 12. (TCMs are summarized in Table 13.)

Addressing Transport Requirements

As noted above in the discussion of CCAA planning requirements, some of ARB's Transport Mitigation Requirements are also included among CCAA planning requirements for all nonattainment areas. To summarize the Transport Mitigation Requirements discussed above, the Air District must:

1. Adopt and implement all feasible measures.
2. Adopt and implement BARCT.
3. Adopt a no net increase permitting program for sources above 10 tons per year.
4. Include measures to attain the standard in specified downwind regions.

The 2005 Ozone Strategy addresses all of the above. The requirements to adopt all feasible measures, and implement BARCT on all existing stationary sources are necessary for the Bay Area to meet both attainment planning and transport mitigation requirements. These requirements are addressed in the control strategy as well as through Air District rule development and permitting processes. With respect to the no net increase requirement, the Air District adopted a 10 ton/year no net increase requirement for ozone precursors in District Regulation 2, Rule 2: New Source Review on December 21, 2004. Regarding measures sufficient to attain the State ozone

standard in specified transport areas, this is accomplished through the proposal to adopt all feasible measures as identified in the control strategy. As adoption of all feasible measures represents the most stringent control strategy that can be accomplished, this requirement is met with the approval of each triennial plan.

Regarding the consultation requirements in the transport mitigation requirements, the Air District has previously consulted with downwind districts, as discussed in Appendix A, and will conduct additional consultation meetings with downwind air districts.

Stationary and Area Source Measures

The following table outlines the stationary and area source measures proposed for the 2005 Ozone Strategy. Most of these control measures represent strengthening of existing Air District requirements, and would be adopted by amending existing Air District rules. SS-3, High Emitting Spray Booths would be adopted as a new Air District rule. More complete descriptions of the stationary source control measures are included in Appendix C.

Table 9: Proposed Stationary and Area Source Control Measures

CM #	BAAQMD Reg - Rule	Source Category	Description	Estimated ROG Reduction tons/day	Estimated NOx Reduction tons/day
Industrial – Commercial Processes					
SS-1	8-45	Auto Refinishing	Reduce VOC limits for some coating categories	0.7	
SS-2	8-20	Graphic Arts Operations	Reduce VOC limits for flexographic ink and clean up solvent	0.15	
SS-3		High Emitting Spray Booths	Require additional controls on spray booths that emit > 20 tons ROG/yr	0.5	
SS-4	8-50	Polyester Resin Operations	Reduce allowable monomer content for some types of polyester resins	0.3	
SS-5	8-32	Wood Coating Operations	Reduce VOC limits for some coating categories	0.68	
Petroleum Products Production and Distribution					
SS-6	12-12	Flares	Minimize flaring (ADOPTED 7/20/05)	TBD*	TBD*
SS-7	8-33, 39	Gasoline Bulk Terminals and Plants	Require automatic shutoff and backpressure monitors, set more stringent leak, emission standards	0.14	
SS-8	8-44, 46	Marine Loading Operations	Control additional cargoes, set more stringent leak standards and/or control housekeeping emissions (ADOPTED 12/7/05)	0.44	
SS-9	8-5	Organic Liquid Storage	Tighten existing requirements and/or control lower vapor pressure liquids	TBD*	
SS-10	8-28	Pressure Relief Devices	Improve enforceability of rule (ADOPTED 12/21/05)	0.001	

Table 9 (continued): Proposed Stationary and Area Source Control Measures

CM #	BAAQMD Reg - Rule	Source Category	Description	Estimated ROG Reduction tons/day	Estimated NOx Reduction tons/day
SS-11	8-8	Wastewater Systems	Control emissions from wastewater collection systems (ADOPTED 9/15/04)	2.1	
Combustion Processes					
SS-12	9-7	Industrial, Institutional and Commercial Boilers	Extend existing limits to smaller boilers and/or set a more stringent standard		0.5 – 1.0
SS-13	9-6, 7	Large Water Heaters and Small Boilers	Require new, small boilers and large water heaters to meet NOx limits		0.39
SS-14	9-9	Stationary Gas Turbines	Implement BARCT NO_x limits on existing turbines		1.2
Education Programs					
SS-15		Energy Conservation	Educate government, industry and the public in energy efficient choices	unknown	unknown

*TBD – emissions reductions to be determined

RULE DEVELOPMENT PROCESS

Most stationary source measures in the 2005 Ozone Strategy are implemented through the rule development process. The Bay Area Air District goes through a detailed process to adopt rules and regulations to impose standards on and limit emissions from Bay Area industry. The legal authority for these regulations and many of the requirements that establish the process are found in the California Health and Safety Code[10]. The Air District follows a set of guiding principles for the rule development program:

- Strengthen and refine our rules to do a better job of protecting the public health, environment and economy of the Bay Area
- Meet our environmental goals in the most efficient and effective manner
- Respect all different points of view and knowledge
- Identify every player with a stake in the outcome of our regulations
- Provide businesses maximum flexibility to meet air quality goals in a way that works best for them, allowing them to be cleaner at a lower cost

Air District staff take a number of steps to prepare a new rule or rule amendment for consideration by the Board of Directors. Following is a brief summary of the steps involved in developing a new or modified rule:

- **Internal Scoping Meeting** - staff conduct an internal meeting to discuss an identified air pollution problem, including divisions that may have relevant expertise. For example, the source test and laboratory departments in the Technical Services Division have input on appropriate test methods to create enforceable standards.
- **Technical Assessment Memorandum** - staff perform an analysis of the various options for addressing the problem, including technology available to achieve controls, cost effectiveness and potential environmental impacts. A technical assessment memorandum may precede or may be derived from a control measure.
- **Stakeholders Meetings** – staff conduct meetings with the affected businesses and other interested parties to discuss issues, exchange information, and ensure effective communication among the various parties. In some cases stakeholder meetings precede and assist in development of technical assessment memoranda. For example, for recent refinery further study measures, staff established technical workgroups consisting of representatives from the refineries, an environmental organization, Air District and CARB staff and other affected parties.
- **Initial Draft of the Proposed Rule** - if, after the technical assessment and stakeholders meetings, a new rule or rule amendment is warranted, the Air District, in consultation with the affected parties, develops a draft rule.
- **Workshops** - Air District staff conducts one or more public meetings for each new rule or rule modification so that all affected and interested parties can discuss, comment on, and ask questions about a proposed rule.
- **CEQA Determination** - as a draft rule is developed, a CEQA (California Environmental Quality Act) analysis is begun to determine whether a rule or rule amendment might have any adverse environmental impacts.

[10] See e.g. California Health and Safety Code § 40702, 40703, 40725 *et seq.*

- **Socioeconomic Impact Analysis** – staff researches and prepares cost estimates for implementation of the control strategy and calculates cost effectiveness on a dollars/ton of emissions reduced basis. An analysis of the socioeconomic impact of the rule proposal is prepared to assess the impact of the costs of the rule on the impacted industry and the Bay Area economy, including jobs.
- **Staff Report** – staff incorporate the results of the CEQA determination and socioeconomic analysis into a staff report. The staff report explains the technical basis for the rule. It contains emission estimates, a description of the industry, control requirements, as well as rule amendments, costs, incremental costs, impacts on Air District staff resources, and the rule development process, and makes legal findings necessary for rule adoption. Comments and responses on the rule proposal and on the CEQA analysis are also included.
- **Public Hearing** - staff present the rule or amendments to the Air District's Board of Directors at one of the Board's regularly scheduled meetings. These meetings are always open to the public, noticed 30 days in advance and anyone may comment on the proposed rule or amendments during the meeting. At the conclusion of the hearing, the Board decides whether to adopt the rule or amendments.

Subsequent to rule adoption by the Board, staff work to implement the rule by preparing inspection protocols, policies and procedures and issuing compliance advisories to notify affected parties of the rule and compliance dates. Staff also forward the rule to ARB and, if appropriate, prepare a State Implementation Plan (SIP) submittal to EPA.

ANNUAL REGULATORY AGENDA

For this strategy, control measures are scheduled according to expected time to complete the rule development process based on data needs and other technical factors, as well as the need for participation in the rule development process by affected and interested parties. The amount of potential emissions reductions is a primary factor in determining the schedule, as well as the public acceptability of control measures, with due consideration for cost effectiveness and any adverse environmental impacts. The schedule is as expeditious as practicable. Any particular control measure may be advanced or delayed based on information discovered in the rule development process or Air District staff allocation priorities. Also, during the rule development process, it may be determined that a measure may not provide sufficient emission reductions to warrant regulation or may not be cost effective.

Table 10 shows the proposed scheduled for regulation adoption during 2005, 2006 and 2007.

Table 10: Regulatory Agenda, 2005 - 2007

2005 Regulatory Agenda

CM #	Control Measure (Reg and Rule)	ER Potential
SS 6	Flares (Reg 12-12) (ADOPTED 7/20/05)	TBD
SS 8	Marine Loading Operations (Reg 8-44, 46) (ADOPTED 12/7/05)	0.44 tpd
SS 10	Pressure Relief Devices (Reg 8-28) (ADOPTED 12/21/05)	0.001

2006 Regulatory Agenda

CM #	Control Measure (Reg and Rule)	ER Potential
SS 2	Graphic Arts Operations (Reg 8-20)	0.15 tpd
SS 7	Gasoline Bulk Terminals and Bulk Plants (Reg 8-33, 39)	0.14 tpd
SS 9	Organic Liquid Storage (Reg 8-5)	TBD
SS 14	Stationary Gas Turbines (Reg 9-9)	1.2 tpd NOx
SS 15	Energy Conservation	unknown

2007 Regulatory Agenda

CM #	Control Measure (Reg and Rule)	ER Potential
SS 1	Auto Refinish Operations (Reg 8-45)	0.7 tpd
SS 3	High Emitting Spray Booths	0.5 tpd
SS 4	Polyester Resin Operations (Reg 8-50)	0.3 tpd
SS 5	Wood Products Coating (Reg 8-32)	0.68 tpd
SS 12	Industrial, Institutional and Commercial Boilers (Reg 9-7)	0.5 - 1.0 tpd NOx
SS 13	Large Water Heaters and Small Boilers (Reg 9-6, 7)	0.39 tpd NOx

* Emission Reduction, stated for VOC/ROG unless otherwise noted.

In addition to the control measures scheduled for adoption as listed above, two control measures from the 2001 Ozone Attainment Plan were adopted on January 21, 2004: amendments to Regulation 8, Rule 10: Process Vessel Depressurization and amendments to Regulation 8, Rule 18: Equipment Leaks. The amendments to Reg 8-10 require numerous additional refinery vessels to be controlled during depressurization. Emission reductions attributable to the new requirements have not yet been quantified. The amendments to Reg. 8-18 were calculated to reduce emissions of VOC/ROG by 0.2 tons/day. Additionally, amendments to Regulation 8, Rule 8 to reduce emissions from wastewater collection systems were adopted by the Air District Board of Directors on September 15, 2004. Further study of controls on refinery wastewater treatment systems was evaluated by staff and presented to the Air District Board of Directors on November 14, 2005, upon which the Board concluded that no further amendments to Reg. 8-8 were warranted at that time.

Mobile Source Programs

The term "mobile source," as used in the CCAA and by the Air District, refers collectively to vehicular sources and other non-stationary sources. Mobile sources are defined in the CCAA as self-propelled devices that may travel upon a highway, including automobiles, trucks, construction equipment, farm equipment, and off-road vehicles. "Non-vehicular" mobile sources, or "non-road" sources as they are defined in the federal Clean Air Act (CAA), include ships, boats, aircraft, locomotives, and lawn and garden equipment. Mobile sources are by far the largest sources of ozone precursors, as shown in the emission inventory, Table 1, and in Figures 1 and 2.

STATE AND NATIONAL MOBILE SOURCE PROGRAMS

The Air District does not have authority to regulate mobile sources. Mobile source regulatory authority is shared by the State and national governments. Hence, the State and national programs play a critical role in reducing air pollutant emissions from mobile sources.

Mobile source emissions are regulated by three general approaches: by establishing emission standards for equipment, by regulating the fuel used in the equipment, and through vehicle in-use performance standards. The federal CAA contains a special provision allowing California to set emission standards that are specific to the State. The California standards cover motor vehicles (including cars, motorcycles, and trucks), heavy industrial and construction equipment, off-highway vehicles such as dirt bikes and all-terrain vehicles, and lawn, garden and other utility engines. In California, these mobile sources are regulated primarily by the Air Resources Board (ARB). ARB is authorized to adopt standards, rules and regulations to achieve the maximum degree of emission reduction possible from vehicular and other mobile sources in order to accomplish the attainment of the State ambient air quality standards at the earliest practicable date.

Mobile source emissions are also controlled through fuel regulations. ARB adopts fuel specifications for motor vehicle fuels – gasoline, diesel and alternative fuels. The most current reformulated gasoline regulations went into effect on December 31, 2003, requiring Phase 3 reformulated gasoline standards and prohibiting the use of the fuel additive MTBE. Phase 3 Reformulated Gasoline (CaRFG3) regulations require refiners to produce gasoline that meets eight specifications to reduce air pollution from the gasoline used in motor vehicles. Recent amendments to the diesel fuel standards require that sulfur content of diesel fuel be reduced from the current 500 ppm to 15 ppm, beginning in June 2006.

Motor vehicle emissions are also controlled through in-use performance standards to ensure that the systems continue to operate properly. The State of California has had an inspection and maintenance (I&M) program since 1984 to test all on-road gasoline powered vehicles for compliance with the standards. The California Bureau of Automotive Repair (BAR) implements the I&M program. In 2002, AB 2637 (Cardoza) was signed into law and directed BAR to implement an Enhanced Area Smog Check Program in the urbanized regions of the San Francisco Bay Area. The program went into full effect in October 2003, and requires the use of a dynamometer to test the vehicle's emissions while in operation. In addition, the pass/fail cut points for emissions are more stringent for enhanced smog check areas and certain vehicles that tend to have higher emissions are directed to Test-Only stations.

The federal CAA prohibits all states, including California, from establishing emission standards for aircraft engines, new locomotive engines and new non-road engines less than 175 horsepower used in construction or farm equipment. Only EPA has authority to regulate these sources. EPA has promulgated regulations or otherwise established programs to control emissions from these important source categories. Gas turbines, used in almost all commercial aircraft, became subject to United Nations International Civil Aviation Organization (ICAO) NOx, hydrocarbons, CO and smoke standards in 1997.

In 1998, EPA adopted more stringent emission standards ("Tier 2" and "Tier 3") for NOx, hydrocarbons, and PM from new non-road diesel engines. This program includes the first set of standards for non-road diesel engines less than 50 hp, including marine engines in this size range. It also phases in more stringent "Tier 2" emission standards from 2001 to 2006 for all engine sizes and adds yet more stringent "Tier 3" standards for engines between 50 and 750 hp from 2006 to 2008.

In May 2004, as part of its Clean Diesel Programs, EPA finalized the Clean Air Non-road Diesel Rule, a comprehensive rule to reduce emissions from non-road diesel engines by integrating engine and fuel controls to optimize emission reductions. These fuel improvements will reduce PM from engines in the existing fleet of non-road equipment and makes it possible for engine manufacturers to use advanced emission control technologies.

State-established standards for motor vehicle engines and motor vehicles fuels have significant influence in reducing mobile source ozone precursor emissions in the Bay Area. Among mobile source categories, Passenger Cars and Light Duty Trucks are the two largest contributors to the ROG emission inventory and are also significant contributors to the NOx emission inventory. While federally established standards exist for these mobile source categories, ARB's more stringent regulations for new motor vehicle emission, reformulated gasoline and smog check are some of the most significant programs for reducing ozone precursor emissions in the Bay Area.

Other national and State programs which are also important in reducing ozone precursor emissions in the Bay Area include those aimed at off-road diesel construction equipment. Heavy Heavy Duty Diesel Trucks and Construction Equipment are the largest emitters of NOx in the Bay Area. ARB's diesel fuel regulations along with EPA's tiered emissions standards for non-road diesel engines will allow for significant emissions reductions over the next few years.

Table 11 below summarizes projected emissions reductions due to national and State-regulated mobile sources. Between 2005 and 2020, ROG emissions will experience a 111 ton per day decrease and NO_x emissions will experience a 232 ton per day decrease. Ninety eight percent of the ROG reduction will be in mobile sources regulated by ARB while over 87% of the NO_x reductions will be in mobile sources regulated by ARB.

Table 11: Mobile Source Emissions Reductions due to State (ARB) and National (EPA) Mobile Source Programs

SOURCE CATEGORY	Reduction 2005 to 2020	Reduction in ARB Regulated Sources	Reduction in EPA Regulated Sources
Reactive Organic Gases (tons/day)			
ON-ROAD MOTOR VEHICLES	87.8	87.8	0.0
OFF-HIGHWAY MOBILE SOURCES	26.0	20.8	5.2
AIRCRAFT (Emissions Increase)	-2.8	0.0	-2.8
Total Emissions Reductions	**111.0**	**108.6**	**2.4**
Oxides of Nitrogen (tons/day)			
ON-ROAD MOTOR VEHICLES	187.3	187.3	0.0
OFF-HIGHWAY MOBILE SOURCES	55.6	16.2	39.4
AIRCRAFT (Emissions Increase)	-10.8	0.0	-10.8
Total Emissions Reductions	**232.1**	**203.5**	**28.6**

Note: The following off-highway mobile sources are assumed to be EPA-regulated sources: Agricultural Equipment, Construction and Mining Equipment, Trains and Ships.

While emission reductions from all of ARB's ongoing and forthcoming mobile source programs may not be fully reflected in the emissions inventory, ARB's mobile source programs provide substantial emission reductions overall. A comprehensive list of ARB's mobile source programs follows below:

ARB PROGRAMS FOR ON-ROAD AND OFF-ROAD MOBILE SOURCES

Motor Vehicle and Engine Certification Program – Certifies new motor vehicles and engines for emission compliance before they are legal for sale, use, or registration in California. Certification is granted annually to individual engine families and is good for one model year. The following mobile sources are presently subject to ARB's emission certification: passenger cars (PC), light-duty trucks (LDT), medium-duty vehicles (MDV), on-road and off-road motorcycles (ONMC and OFMC, respectively), all-terrain vehicles (ATV), heavy-duty engines and vehicles (HDE and HDV, respectively), off-road heavy-duty diesel engine (OFHDDE) over 175 horsepower, small off-road engine (SORE) less than 25 horsepower, large spark-ignition engine (LSIE) greater than 25 horsepower, and spark-ignition marine engine (SIME).

Fuels Program – Adoption of standards, rules and regulations to achieve the maximum degree of emission reduction possible from vehicular and other mobile

sources in the following four categories: reformulated gasoline; diesel fuel; alternative gasoline fuels; and alternative diesel. ARB adopted a clean fuel regulation that became effective in January 2001. ARB conducts ongoing verification of alternative diesel fuel emission benefits.

Heavy-Duty Diesel In-Use Strategies Program – Reduces emissions from existing on- and off-road diesel engines, with a special emphasis on reducing particulate emissions through the following implementation programs: Retrofit Assessment and Implementation (solid waste collection vehicles and on-road heavy-duty public fleet vehicles); and Heavy-duty Testing and Field Support.

The Carl Moyer Program – Provides grants through participating air pollution control districts, including the Bay Area Air District, to cover the incremental cost of cleaner on-road, off-road, marine, and locomotive engines. Allocations to this program began in FY 1998/99.

Diesel Risk Reduction Program - Following diesel PM's identification as a toxic air contaminant in 1998, the ARB developed a plan to reduce emissions from diesel engines and vehicles. The program is made up of several strategies, like retrofits and control technology. Some of these strategies are part of other programs listed below.

Goods Movement Action Plan - Developed by the California Business, Transportation and Housing Agency and the California Environmental Protection Agency, the Goods Movement Action Plan is an effort to bring all stakeholders together to discuss and address the important issues regarding improving the movement of goods and reducing its environmental impacts in California. ARB staff has been developing a comprehensive emission reduction plan for goods movement, focusing on ports, rail yards, and major transportation corridors. ARB's comprehensive plan and the Goods Movement Action Plan will be finalized in early 2006 and both will be subject to a number of public workshops and hearings. The emission reduction plan will also be an essential component of California's effort to meet new federal air quality standards for ozone and fine particulate matter (PM2.5).

ARB PROGRAMS FOR ON-ROAD VEHICLES

Programs for Passenger Cars and Light Duty Vehicles

Low Emission Vehicle Program – Establishes improved emission reduction standards for automobiles. LEV II regulations are the most recent and are effective from 2004 through 2010. The new standards extend passenger car emission standards to heavier sport utility vehicles and pickup trucks (with gross vehicle weight up to 8,500 pounds) which formerly had been regulated under less-stringent emission standards.

On-Board Diagnostic (OBD) Program - OBD II systems monitor components in 1996 and newer vehicles less than 14,000 lbs to ensure that a vehicle remains as clean as possible over its entire life, and assists Smog Check repair technicians in diagnosing and fixing problems with the computerized engine controls. ARB is

currently developing OBD requirements for heavy-duty vehicles over 14,000 lbs.

On-Road Motorcycle Regulation - Standards adopted in December 1998. Apply to motorcycles with engines over 280cc manufactured for the 2004 model year and later.

Zero Emission Vehicle Program – Creates incentives to promote zero emission vehicles such as battery and fuel cell vehicles. Also certifies vehicles as such.

Climate Change Program – Requires reduction of greenhouse gas emissions from motor vehicles in California. The proposed regulation would be phased in between 2009 and 2014 and achieve CO_2 emission reductions of approximately 30%. New regulation adopted in September 2004 imposes stricter automobile engine standards to reduce greenhouse gas emissions beginning with the 2009 model year.

Smog Check – Operational in California since 1984, the Bureau of Automotive Repair tests all on-road gasoline powered vehicles for compliance with in-use standards. Since October 2003, the Bay Area has been subject to the Enhanced Area Smog Check Program, which tests vehicle emissions while the vehicle is running.

In-use Testing of Motor Vehicles - Tests in-use passenger cars and light duty vehicles for compliance with standards. In the event of violations, ARB works with the vehicle manufacturer to correct the problem, usually in the form of a recall or statewide repair. A protocol is being developed to test Heavy Duty Diesel Vehicles as well.

Smoking Vehicle Hotline - Contacts owners of reported smoking vehicles. Works in partnership with smoking vehicle programs in various districts.

California Hydrogen Highway - Program working toward a transition to a clean, hydrogen transportation economy in California

Carpool Lane Access - Allows single occupancy use of HOV lanes by zero-emission and alternative fuel vehicles.

Voluntary Accelerated Vehicle Retirement Program - Pays owners of eligible vehicles to voluntarily retire their older, higher-emitting vehicle.

Programs for Heavy Duty Vehicles

On-Road Heavy-Duty Diesel New Engine Program - Reduces emissions from new on-road heavy-duty diesel engines through emission control regulations and test procedures for these engines. Final approval for 2004 - 2005 and subsequent model year heavy-duty diesel engine standards were approved in 1999 and 2001.

Public Transit Bus Program - This program reduces criteria pollutant emissions and toxic air contaminants from urban buses. In October 2005, ARB aligned urban bus

standards for 2007-2009 with national standards for diesel truck engines.

School Bus Program - Provides criteria for the purchase of new school buses and retrofits of existing school buses to reduce particulate matter emissions and reduce school children's exposure to harmful diesel exhaust emissions. Proposition 40, approved by voters in 2002, provided allocation for this program for two years with distributions beginning in FY 2002/03.

Solid Waste Collection Vehicles - The proposed airborne toxic control measure for diesel particulate matter (PM) from on-road heavy-duty diesel-fueled residential and commercial solid waste collection vehicles is one in a series of rules designed to reduce diesel PM from most diesel-fueled heavy-duty vehicles in California.

South Coast Fleet Rules - In September 2005, ARB amended The Fleet Rules for Transit Agencies operating in the South Coast Fleet District, requiring transit agencies to follow the alternative-fuel path.

Diesel Engine Software Upgrade - ARB is working with the California Trucking Association (CTA) to get low oxides of nitrogen (NOx) software installed on every eligible, electronically-controlled engine registered in California.

Heavy Duty Vehicle Inspection Program – Inspection of trucks and buses for excessive smoke. In June 1998, ARB resumed the Heavy Duty Vehicle Inspection Program (roadside and unannounced inspections). In July 1998 ARB began the Periodic Smoke Inspection Program, where diesel and bus fleet operators are required to annually self-inspect their vehicles and repair those with excessive smoke emissions.

Border Inspection Program - ARB, in cooperation with the California Highway Patrol, will establish inspection protocols of heavy duty vehicles entering this state to ensure that each vehicle has a certified engine. While enforcement is expected to take place near California borders, the Bay Area will still benefit from this program.

Heavy-Duty Diesel Idling Control Measure – In July 2004, ARB adopted an idling control measure for heavy-duty diesel commercial motor vehicles, limiting idling to five minutes. In October 2005, this measure was extended to include trucks with sleeper cabs.

Idling Limits at Schools – Requires school buses and other heavy-duty diesel vehicles to turn off engines upon arriving at a school and prohibits restarting engines more than 30 seconds before departure from a school.

Mobile Source Emissions Reduction Credits - Allows for credit when emissions reductions from cars, buses or other mobile sources exceed those required by federal, State or local law. ARB provides guidelines, but each district can tailor guidelines.

ARB PROGRAMS FOR OFF-ROAD VEHICLES

Off-Road Mobile Sources Emission Reduction Program - Exhaust emission standards have been adopted by ARB and/or U.S. EPA for off-road engines included in the following categories: Small Spark-Ignition Off-Road Engines and Equipment Less Than 25 Horsepower (including Lawn and Garden Equipment, and Small Industrial Equipment); Off-Road Recreational Vehicles (including Motorcycles and All-Terrain Vehicles); Off-Road Compression Ignition (Diesel) Engines and Equipment; Off-Road Large Spark Ignition (Gasoline and LPG) Engines and Equipment 25 Horsepower and Greater (including Industrial Equipment, Forklifts, and Portable Generators); Airport Ground Support Equipment; Commercial Marine Vessels; and Recreational Marine (including Personal Water Craft, Ski boats, Inboards, and Outboards). Ultra-low sulfur diesel fuel is now required for harbor crafts, ferries, and in-state locomotives. A Memorandum of Understanding developed by ARB, Union Pacific Railroad and BNSF Railway became effective June 30, 2005 and is intended to reduce rail related emissions in California. At the December 2005 Board meeting, ARB will consider requiring low-sulfur fuel for marine auxiliary engines and cargo handling equipment.

Recreational Marine Engines – Reduces emissions of ROG and NOx for certain marine vessels with proposed regulations for other spark-ignition engines used in boats for propulsion. In 2001, all new outboards sold in California were required to meet the U.S. EPA 2006 emission levels. In 2002, ARB adopted regulations governing emissions for all 2003 model year and later inboard engines.

Portable Fuel Containers – Provides for the implementation of "spill-proof" portable refueling system (gas can) in order to reduce emissions associated with engine refueling spillage.

Aftermarket, Performance, and Add-On Parts Regulations - Regulates the installation of parts or modifications that are proven by their manufacturers and ARB not to increase vehicle emissions. This is an ongoing ARB program and includes certification of alternative fuel certified retrofit systems and verification of heavy-duty diesel retrofit device emission reduction systems. Regulations concerning certification procedures for all aftermarket part and conversion systems for off-road vehicles, engines and equipment became effective in September 2000.

ARB MOU with the Union Pacific and Burlington Northern Santa Fe Railroads – On June 30, 2005, ARB entered into a pollution reduction agreement with Union Pacific Railroad (UP) Railroad and Burlington Northern Santa Fe (BNSF) Railway. The agreement is expected to achieve a 20 percent reduction in locomotive diesel particulate matter emissions near 17 designated rail yards throughout the State. UP and BNSF have agreed to: phase out non-essential idling within 6 months and install idling reduction devices on California based locomotives within 3 years; identify and expeditiously repair locomotives with excessive smoke and ensure that at least 99 percent of locomotives operating in California pass smoke inspections; maximize the use of ultra low sulfur diesel fuel by January 1, 2007; conduct health risk assessments for 17 major rail yards and use these studies to identify risk reduction measures; and prepare a progress report on plans to implement feasible mitigation

measures at the 17 major rail yards. Participation from the Air District and local communities is an integral aspect of the MOU.

AIR DISTRICT MOBILE SOURCE PROGRAMS

The Air District does not have the authority to regulate mobile sources, but can take steps to reduce mobile source emissions by providing grants or incentives to encourage the use of cleaner vehicles and fuels. The Transportation Fund for Clean Air (TFCA) is an Air District grant program that funds both mobile source and transportation control measures implemented primarily by local public agencies. To fund these measures the State Legislature allows the Air District to impose a $4 surcharge on motor vehicle registration fees paid for vehicles registered in the District. Mobile source measures funded through the TFCA program include purchase or lease of clean fuel vehicles, primarily through the Vehicle Incentive Program (VIP), as well as engine retrofits and repowers. Another TFCA-funded program, the Vehicle Buy Back Program, accelerates the voluntary retirement of older, high emitting vehicles from the region's roadways by providing financial incentives to scrap them.

The Carl Moyer Program provides incentives that cover the incremental cost of cleaner heavy-duty engines with a primary focus of reducing NO_x emissions. Among the eligible projects are cleaner on-road, off-road, marine, locomotive and stationary agricultural pump engines, as well as forklifts, airport ground support equipment, and auxiliary power units. The Air District also has grant programs for low emission school buses and heavy-duty diesel PM_{10} filter retrofits.

The Air District also reduces mobile source emissions through the Spare the Air (STA) program. The STA program is an intermittent, voluntary control program in which the Air District encourages Bay Area residents, businesses and public agencies to reduce or postpone polluting activity on days when weather conditions are conducive to forming high ozone levels. STA advisories include recommendations to avoid discretionary driving, to use transit, carpooling, walking or cycling instead of driving alone, to link trips to avoid cold starts, and postpone refueling of vehicles.

In addition to State and federal regulations and Air District incentive and STA programs, the Ozone Strategy includes control measures that reduce emissions from on-road and off-road mobile sources. These control measures encourage the retirement of older, more-polluting equipment and the introduction of new, less-polluting equipment, or encourage operational changes (e.g. reduced idling) to reduce emissions. The measures would be implemented mainly through incentive programs and through development and promotion of model ordinances for cities and counties. Table 12 contains a summary of the proposed mobile source control measures, including their proposed implementation dates and estimates of the emission reductions they would achieve. While the focus of the Ozone Strategy is on reducing emissions of ozone precursors, many of the measures will also reduce emissions of fine particulate matter, and this additional benefit is noted as well. More detailed information on the control measures is available in Appendix C.

Table 12: Proposed Mobile Source Control Measures

Measure #	Source Category	Implementation Date	Estimated ROG Reduction (tpd)	Estimated NOx Reduction (tpd)
MS-1	Diesel Equipment Idling Model Ordinance	2006	0.13	1.96
MS-2	Green Contracting Model Ordinance	2006	N/A	N/A
MS-3	Low-Emission Vehicle Incentives	2005	0.03	0.6
MS-4	Vehicle Buy-Back Program	2005	0.48	0.31
Total			**0.64**	**2.87**

Transportation Control Measures

Motor vehicles are the largest source of ozone precursors in the Bay Area, and reducing these emissions is essential to regional efforts to attain the State ozone standard and reduce transport. Motor vehicle emissions have dropped substantially over the years thanks to State and national regulations on vehicles and fuels, and motor vehicle emissions are expected to continue to decrease in the future as the vehicle fleet becomes cleaner. TCMs play a critical role in complementing State and national regulatory efforts by reducing motor vehicle use.[11] TCMs also help achieve other goals, including improved mobility and reduced congestion.

CCAA TCM REQUIREMENTS

The California Clean Air Act (CCAA) emphasizes transportation control measures. CCAA legislative intent states that in developing attainment plans, air districts shall "focus particular attention on reducing the emissions from transportation and areawide emission sources." (Sec. 40910.) The CCAA specifically requires air districts to "adopt, implement and enforce transportation control measures." TCMs are defined as "any strategy to reduce vehicle trips, vehicle use, vehicle miles traveled, vehicle idling, or traffic congestion for the purpose of reducing motor vehicle emissions." (Sec. 40717.) TCMs must be sufficient to substantially reduce the rate of increase in vehicle trips and vehicle miles traveled. (Sec. 40918.) As noted previously in the discussion of CCAA legal requirements, Health and Safety Code Section 40233 lays out a process that was used for developing a TCM emission reduction target and TCM plan for the 1991 Clean Air Plan. The Air District and MTC in 1991 complied with the required process. Under the CCAA, revision to the TCM emission reduction target in subsequent planning cycles is discretionary. While the TCM emission reduction target has not been revised in subsequent plans, the TCMs have undergone extensive revision and expansion (as

[11] TCMs are distinguished from mobile source measures in that mobile source measures reduce vehicle *emission rates*, while TCMs reduce vehicle *use* by reducing vehicle trips and/or vehicle miles traveled.

described below) and represent the Bay Area's all feasible measures approach in compliance with State one-hour ozone standard planning requirements.

TCM DEVELOPMENT IN THE BAY AREA

The Bay Area has extensive experience with developing and implementing TCMs. The first regional plan prepared pursuant to the CCAA, the 1991 Clean Air Plan, included 23 TCMs to meet State planning requirements (State TCMs). Plan updates in 1994 and 1997 included revisions to the TCMs. The regional strategy for the State ozone standard now contains 19 TCMs that cover the full spectrum of transportation strategies, including:

- Bus transit
- Rail transit
- Ferry service
- Carpooling and vanpooling
- Bicycle and pedestrian enhancements
- Land use programs
- Pricing measures
- Traffic management
- Employer programs and youth programs
- Public education and episodic measures

The Air District, MTC and other regional and local partners have worked together over the years to develop one of the most comprehensive TCM plans to address the California ozone standard. This effort has continued during the preparation of the 2005 Ozone Strategy.

The control measure review and evaluation process included a thorough review of potential TCM enhancements (see Appendix B for more information). MTC and Air District staff considered a wide range of new or enhanced TCM programs, including:

- New initiatives deriving from the Smart Growth Strategy/Regional Livability Footprint Project and MTC's Transportation 2030 process;
- Input from the Ozone Working Group and community meetings;
- Input from cities, counties and other public agencies;
- Input from environmental, business and community groups;
- Suggestions from staff and Advisory Council members;
- Review of TCM programs in other regions.

All of the TCMs have been revised to reflect this input. The resulting TCMs take into consideration current fiscal and legal conditions but at the same time set an ambitious course for the future, particularly as additional revenues become available and land use changes occur over the long term.

TCMS IN THE CONTROL STRATEGY

The TCMs proposed for the 2005 Ozone Strategy are summarized in Table 13 and are described more fully in Appendix D. The TCMs are divided into Phases 1 and 2 to

reflect near-term and long-term implementation steps and benefits. Most projects in Phase 1 are either currently programmed or funding is otherwise expected to be available for full implementation. Some Phase 2 projects have substantial funding identified, while others are dependent on future funding sources. MTC estimated emission reductions for each phase. Phase 1 is defined as 2004-2006 and Phase 2 is defined as beyond 2006. 2015 was selected as an analysis year for emission reduction calculations, although many long-term TCM implementation steps will clearly occur before 2015, and continue beyond as well.

TCMs often have overlapping, complementary effects. For example, measures to enhance transit service, encourage development near transit, and improve bicycle and pedestrian safety all interact to make transit, walking and cycling more viable transportation options. Assumptions must be made about individual projects and programs when calculating emission reductions, but it is difficult to capture these synergistic effects.

TCMs have multiple benefits beyond air quality. In addition to reducing motor vehicle emissions, the projects and programs identified in the TCMs may improve mobility, especially for people with limited access to automobiles, and reduce traffic congestion. Other benefits include reduced gasoline consumption, reduced emissions of greenhouse gases, and reduced water pollution from urban runoff.

Table 13: Proposed Transportation Control Measures

TCM	Description	Implementing Agencies
TCM #1 SUPPORT VOLUNTARY EMPLOYER-BASED TRIP REDUCTION PROGRAMS	Phase 1 (2004 –2006): ■ Provide assistance to regional and local ridesharing organizations; advocate legislation to maintain and expand incentives (e.g., tax deductions/credits) ■ Provide assistance to employers, cities, counties: ▪ Assistance in developing/enhancing employer programs; recognition of outstanding programs ▪ Information and referral ▪ Employer networks	MTC, BAAQMD, CMAs, Cities, counties, MTC's Regional Rideshare Program, CMAs, MTC, BAAQMD
	Phase 2 (Beyond 2006): ■ Continue Phase 1 programs and enhance where feasible	Same as Phase 1
TCM #2 ADOPT EMPLOYER-BASED TRIP REDUCTION RULE	TCM deleted per Health and Safety Code Section 40929	N/A
TCM #3 IMPROVE LOCAL AND AREAWIDE BUS SERVICE	Phase 1 (2004 –2006): ■ Replace older transit buses with clean-fuel buses and retrofit existing diesel buses with diesel emission control technology ■ Sustain and expand the existing Regional Express Bus Program ■ Assist further planning work on enhanced bus and Bus Rapid Transit concepts ■ Sustain transit service to airports	MTC, Transit operators, BAAQMD MTC, Transit operators MTC, Transit operators MTC, Transit operators, Airports
	Phase 2 (Beyond 2006): ■ Restore local bus routes that were recently eliminated due to funding cutbacks ■ Implementation of new Enhanced Bus and Bus Rapid Transit services and additional Lifeline Transit services, and the expansion of Regional Express Bus Programs as funds become available	MTC, Transit operators MTC, Transit operators

TCM #4 UPGRADE AND EXPAND LOCAL AND REGIONAL RAIL SERVICE	Phase 1 (2004 –2006):	
	■ Implement MUNI Metro Third Street Light-Rail Project: light-rail extension to Bayview Hunters Point (Phase 1, initial operating segment)	MUNI
	■ Implement Caltrain Express/Rapid Rail Phase 1 ("Baby Bullet") to San Francisco	Caltrain
	■ Vasona Corridor light-rail extension from downtown San Jose to Winchester Boulevard in Campbell	SCVTA
	Phase 2 (Beyond 2006):	
	■ Extend BART to Warm Springs, BART/East Contra Costa Rail Extension, BART extension into Santa Clara County and an Oakland International Airport Connector	BART
	■ Implement MUNI Metro Third Street Light-Rail Project: light-rail transit extension to Chinatown (Phase 2, Central Subway)	MUNI
	■ Implement Caltrain Downtown Extension/ TransBay Terminal Replacement	Caltrain, TransBay Terminal JPA
	■ Implement Downtown/East Valley: Santa Clara/Alum Rock corridor and Capitol Expressway light-rail extension to Nieman Boulevard	SCVTA
	■ Implement Sonoma Marin Area Rail Transit District (SMART) commuter rail project	MTC, SMART
	■ Implement Capitol Corridor Phase 1 Intercity Rail Service: track capacity/frequency improvements from Oakland to San Jose designed to allow 16 daily round trips between Oakland and Sacramento/San Jose and Capitol Corridor Phase 2	AMTRAK/Capitol Corridor
	■ Implement Dumbarton Rail Corridor Phase 1 (diesel locomotive service connecting BART and Caltrain over a rebuilt Dumbarton rail bridge)	MTC, transit operators
	■ Implement Altamont Commuter Express (ACE) rail service expansion to 8 daily roundtrips	MTC, San Joaquin Regional Rail, Alameda and Santa Clara County CMAs

TCM #5 IMPROVE ACCESS TO RAIL & FERRIES	Phase 1 (2004 –2006): ■ Develop demonstration program for station car and bike station concepts at select regional transit centers ■ Determine long term funding needs for existing shuttles, encourage better coordination between shuttles and transit operators, and examine funding options for new and existing shuttles ■ Implement Safe Routes to Transit to improve bicycle and pedestrian access ■ Complete Regional Transit Connectivity Plan	 Transit operators, MTC, BAAQMD MTC MTC, Transit operators MTC
	Phase 2 (Beyond 2006): ■ Continue and expand successful concepts from Phase 1 including Safe Routes to Transit improvements ■ Develop a master plan for innovative secure bicycle storage strategies at key transit hubs ■ Implement most cost effective new shuttles where funding is available	 MTC, Transit operators MTC MTC, BAAQMD, Transit operators
TCM # 6 IMPROVE INTER-REGIONAL RAIL SERVICE	Phase 1 (2004 –2006): No significant changes in interregional rail service are anticipated during this phase	 N/A
	Phase 2 (Beyond 2006): ■ Implement additional interregional rail service in Capitol (Auburn - Sacramento - Oakland - San Jose) Corridor and track enhancements ■ Implement Altamont Commuter Express (ACE) rail service expansion to 8 daily roundtrips and track enhancements ■ Implement High Speed Rail Service between Los Angeles and the Bay Area	 Capitol Corridor JPB, Amtrak, MTC, Southern Pacific MTC, San Joaquin Regional Rail Commission, Alameda and Santa Clara County CMAs CA High Speed Rail Authority
TCM #7 IMPROVE FERRY SERVICE	Phase 1 (2004 –2006): ■ Conduct initial planning for new ferry service including: ▪ Berkeley ▪ Hercules ▪ Richmond ■ Compliment existing high-speed ferry service from Vallejo to San Francisco with a new low emission ferry	 WTA Vallejo Baylink Ferry

	Phase 2 (Beyond 2006):	
	■ Expand existing ferry service between: ▪ Oakland/Alameda and San Francisco	WTA
	■ Expand existing ferry service between: ▪ Larkspur and San Francisco	Golden Gate Ferry
	■ Implement new ferry service between: ▪ Berkeley/Albany and San Francisco ▪ South San Francisco and Oakland ▪ Richmond and San Francisco	WTA
	■ Implement new intermodal transit hub at Vallejo Ferry Terminal	City of Vallejo & Vallejo Baylink Ferry
	■ Expand berthing capacity at the San Francisco Ferry Terminal	WTA & Port of San Francisco
	■ Implement hydrogen fuel cell ferry demonstration project from Treasure Island to San Francisco	WTA
	■ Assist ferry operators in converting vessel engines to lower emission engines	Various ferry operators, MTC, BAAQMD
	■ Study and potentially implement new service between: ▪ Martinez to San Francisco ▪ Redwood City to San Francisco ▪ Antioch/Pittsburgh to San Francisco ▪ Oakland and San Francisco Airports	WTA
	■ Study and potentially implement new service between Port Sonoma and San Francisco	North Bay Ferry Company, Golden Gate Ferry, WTA
	■ Future study of ferry service expansion to Moffett Field	WTA
TCM #8 CONSTRUCT CARPOOL / EXPRESS BUS LANES ON FREEWAYS	Phase 1 (2004 –2006):	
	■ Expand existing HOV network, based on 2005 Transportation Improvement Program	Caltrans, MTC
	■ Implement new HOV to HOV lane connector at Rt 101/85 interchange in Mountain View	Caltrans, MTC
	■ Implement HOV support facilities such as park & ride lots at various locations	Caltrans, MTC, Transit operators

	Phase 2 (Beyond 2006): ■ Implement additional HOV lanes and support infrastructure identified in the Regional Transportation Plan. Special attention should be paid to express bus operations to maximize benefits for transit. Monitor and adjust occupancy requirements and hours of operation to maximize air quality and mobility benefits.	Caltrans, MTC
TCM #9 IMPROVE BICYCLE ACCESS AND FACILITIES	Phase 1 (2004 –2006): ■ Fund Regional Bike Plan and Safe Routes to Transit improvements ■ Continue TDA Article 3, TLC and TFCA funding for bike improvements ■ Develop on-line bicycle mapping tool as part of the regional 511 traveler information number ■ Promote Bike to Work Week / Day ■ Encourage local jurisdictions to develop safe and convenient bicycle lane and route networks, provide secure bike racks and storage, and require bicycle access and amenities as conditions of approval of development projects ■ Explore innovative bicycle programs, such as “station bike” or bike sharing programs at transit stations, downtowns and activity centers	MTC, Cities, Counties, CMAs MTC, BAAQMD MTC MTC Cities, Counties, MTC, Transit operators, BAAQMD Cities, Counties, MTC, Transit operators, BAAQMD
	Phase 2 (Beyond 2006): ■ Continue Phase 1 programs ■ Encourage public education about bicycle safety for both bicyclists and motorists	Same as Phase 1 MTC

TCM #10 YOUTH TRANSPOR-TATION	Phase 1 (2004 –2006):	
	■ Encourage walking and bicycling to school through the Safe Routes to Schools Program	MTC's Regional Rideshare Program, School districts, Cities and Counties
	■ Encourage carpooling among high school students with cars	MTC's Regional Rideshare Program, School districts
	■ Establish special carpool formation services for parents, students and staff at Bay Area elementary and secondary schools	MTC's Regional Rideshare Program, School districts
	■ Purchase new, cleaner or alternatively fueled school buses, replace old diesel school buses with cleaner engines or retrofit older school bus engines	BAAQMD, School districts
	■ Encourage shuttle programs to provide service to schools	MTC, BAAQMD, School districts
	■ Target Bay Area schools for greater participation in the Spare the Air program	BAAQMD, School districts
	Phase 2 (Beyond 2006):	
	■ Continue Phase 1 programs	Same as Phase 1
	■ Support transit ride discounts to youth and students	Transit operators
TCM #11 INSTALL FREEWAY TRAFFIC MANAGE-MENT SYSTEMS	Phase 1 (2004 –2006):	
	■ Integrate traffic management features into new freeway construction projects	Caltrans
	■ Maintain current level of Freeway Service Patrol	Caltrans, MTC
	■ Maintain 511 transit information service and improve and customer convenience	MTC, Caltrans
	Phase 2 (Beyond 2006):	
	■ Extend ramp metering in major freeway corridors	Caltrans
	■ Seek funding for full deployment of Caltrans' Traffic Operation System / Traffic Management Center project	Caltrans
	■ Expand FSP to other routes and times of the day	Caltrans
	■ Require traffic management elements in Caltrans freeway projects	Caltrans

TCM #12 ARTERIAL MANAGE-MENT MEASURES	Phase 1 (2004 –2006): ■ Maintain current technical assistance program for local jurisdictions that seek to retime signals, including the evaluation of bus priority treatments ■ Continue TFCA program to fund arterial management projects	 MTC BAAQMD
	Phase 2 (Beyond 2006): ■ Coordinate the timing of an additional 1,200 signals and continue updating timing plans ■ Work with bus operators to provide priority treatment along major bus routes	 Cities, Counties, Transit operators, CMAs Cities, Counties, Transit operators, CMAs
TCM #13 TRANSIT USE INCENTIVES	Phase 1 (2004 –2006): ■ Implement Translink® (universal fare card) on transit systems throughout the region ■ Implement improvements to the 511 transit information service ■ Encourage employers, transit operators, local governments and others to promote and expand employer-based transit subsidy programs like the Commuter Check and EcoPass programs ■ Improve signage at transit transfer hubs	 MTC, Transit operators MTC, Transit operators MTC's Regional Rideshare Program, transit agencies, Commuter Check Corps, employers MTC, Caltrans
	Phase 2 (Beyond 2006): ■ Deploy real-time transit arrival information ■ Increase passenger amenities at transit hubs and stops ■ Complete Alameda and Contra Costa County transit centers identified in AC Transit's *Comprehensive Service Plan*	 MTC, Transit operators MTC, Transit operators AC Transit

TCM #14 CARPOOL AND VANPOOL SERVICES AND INCENTIVES	Phase 1 (2004 –2006): ■ Maintain current programs of the Regional Ridesharing Program and increase efficiency in delivering services ■ Explore innovative concepts such as real-time ridematching using the internet ■ Explore possible provision of a regional incentive to increase ridesharing by implementing a demonstration project offering a cash incentive for new vanpools ■ Explore options for expanding medium-distance (15 – 30 miles) vanpools	 MTC's Regional Ridesharing Program MTC's Regional Ridesharing Program MTC's Regional Ridesharing Program MTC's Regional Ridesharing Program
	Phase 2 (Beyond 2006): ■ Maintain Phase 1 programs and enhance where feasible	 MTC's Regional Ridesharing Program

TCM #15 LOCAL LAND USE PLANNING AND DEVELOP-MENT STRATEGIES	Phase 1 (2004 –2006): MTC will: Implement its 5-point transportation and land use platform including a new planning grant program to fund station area plans around major transit facilities Continue implementing the TLC planning and capital grant programs and HIP program Continue providing "T-PLUS" funding to CMAs to promote community revitalization projects Utilize a Caltrans grant to examine opportunities for transit-oriented development along major transit corridors. Develop incentives and conditions to promote supportive land use policies around major new transit investments	MTC
	BAAQMD will: Continue to fund bicycle projects, traffic calming, shuttles, low emission vehicles, trip reduction programs and other clean air projects through the TFCA program Continue to provide technical assistance to local jurisdictions on air quality analyses in the environmental review process Continue to encourage cities and counties to reduce emissions from sources other than motor vehicles including lawn and garden equipment, woodstoves and fireplaces, and residential and commercial uses	BAAQMD
	ABAG will: Periodically monitor and update its Smart Growth demographic projections Promote multi-jurisdiction planning along select transit corridors to encourage transit-oriented development	ABAG
	Develop financial and other incentives and technical assistance to encourage innovative parking strategies such as reduced parking, parking fees, parking cash-out, shared parking and other parking programs	MTC, BAAQMD, ABAG in collaboration with cities and counties
	Pursue legislative changes to remove barriers and provide incentives for smart growth	MTC, BAAQMD, ABAG in collaboration with cities and counties
	Promote carsharing as a way to reduce parking requirements	MTC, BAAQMD, ABAG, cities and counties
	Monitor indirect source mitigation programs in other regions for Bay Area feasibility	BAAQMD
	Provide technical assistance to local government agencies	MTC, BAAQMD, ABAG
	Publicize noteworthy examples of local clean air plans, policies and programs, as well as endorse noteworthy development projects	BAAQMD, MTC, ABAG
	Study opportunities to promote location efficient mortgages (LEMs) to encourage home purchases near transit	MTC, BAAQMD, ABAG

	Phase 2 (Beyond 2006): ■ Continue the programs in Phase 1 and refine and expand them as appropriate	MTC, BAAQMD, ABAG in collaboration with cities and counties
TCM #16 PUBLIC EDUCATION / INTERMIT-TENT CONTROL MEASURES	Phase 1 (2004 –2006): ■ Continue Spare the Air notices to media, employers, public agencies and individuals, with an emphasis on ROG reductions, obeying freeway speed limits in electronic freeway signs and other outreach efforts	BAAQMD
	■ Continue to expand the Spare the Air employer network	BAAQMD
	■ Provide free morning commutes to all riders of participating Bay Area transit providers up to 5 non-holiday, weekday Spare the Air Days	BAAQMD, MTC and Transit operators
	■ Expand STA notices to add emphasis on ROG reductions, obeying freeway speed limits, and discouraging use of pleasure craft	BAAQMD
	■ Expand the Clean Air Consortium to include more cities and counties, as well as other public agencies	BAAQMD
	■ Target major commercial airports and their tenants for greater participation in the Spare the Air program	BAAQMD, Airports
	■ Increase coordination between the Bay Area's Spare the Air program with the San Joaquin Valley STA Program	BAAQMD, San Joaquin Valley STA Program
	■ Continue public education program on the proper maintenance and operation of motor vehicles to reduce air pollution	BAAQMD
	■ Continue the Bay Area Clean Air Partnership (BayCAP) shuttle project to inventory existing shuttle programs, provide coordination and assistance, and promote "best practices" among shuttle operators	BAAQMD
	■ Discourage the use of recreational watercraft on STA days	BAAQMD
	■ Continue gasoline-powered lawnmower buyback incentive programs	BAAQMD
	■ Educate the public about ways to maintain and operate motor vehicles to reduce air pollution	BAAQMD

	Phase 2 (Beyond 2006): ■ Continue Phase 1 programs and expand depending on effectiveness and resources available ■ Study effectiveness and costs of free transit on all Spare the Air days ■ Explore possible legislative approaches to formalize and strengthen episodic approaches	 BAAQMD BAAQMD, MTC and Transit operators BAAQMD, MTC
TCM #17 CONDUCT DEMON-STRATION PROJECTS	Phase 1 (2004 –2006): Promote demonstration projects to develop new strategies to reduce motor vehicle emissions. Potential projects include ▪ Low and zero emission vehicles and LEV refueling infrastructure ▪ Hydrogen fuel cell technology ▪ Gas cap replacement program for older cars ▪ Heavy duty diesel vehicle idling ▪ Refuse truck control technology ▪ Carsharing	 BAAQMD, MTC, Caltrans, FHWA
	Phase 2 (Beyond 2006): ■ Monitor Phase 1 projects and expand depending on effectiveness and resources available	 Same as Phase 1
TCM #18 IMPLEMENT TRANSPOR-TATION PRICING REFORM	Phase 1 (2004 –2006): ■ Advocate for legislative authority to develop and promote measures to discourage driving, such as: ▪ Higher bridge tolls ▪ Congestion pricing ▪ Gas tax increase ▪ Parking pricing	 BAAQMD, MTC, business community and other stakeholders
	Phase 2 (Beyond 2006): ■ Advocate for legislative authority to develop and promote revenue measures for: ▪ Continuation of Phase 1 elements ▪ High Occupancy Toll lanes ▪ Gas tax increase / VMT fees ▪ Taxes on diesel fuel ▪ Emissions-based vehicle registration fees ▪ Parking fees	 BAAQMD, MTC, business community and other stakeholders

TCM #19 IMPROVE PEDESTRIAN ACCESS AND FACILITIES	Phase 1 (2004 –2006):	
	■ Review and comment on general/specific plan policies to promote development patterns that encourage walking and circulation policies	BAAQMD, MTC, cities and counties
	■ Emphasize pedestrian travel and encourage amending zoning ordinances to include pedestrian-friendly design standards	BAAQMD, MTC, ABAG, cities and counties
	■ MTC will continue to: ▪ Fund local pedestrian improvement projects through the TLC program ▪ Support the Regional Pedestrian Committee and associated pedestrian safety programs ▪ Support Safe Routes to Schools	MTC
	■ TFCA program will continue to fund pedestrian improvement projects to reduce motor vehicle trips and emissions	BAAQMD
	Phase 2 (Beyond 2006):	
	■ Continue to identify and fund planning projects that enhance pedestrian movement in neighborhoods, downtowns and near transit stops	MTC, BAAQMD in collaboration with cities and counties
	■ Continue funding specific improvements through a variety of funding sources	MTC, BAAQMD in collaboration with cities and counties
	■ Continue to support Safe Routes to Schools	MTC, BAAQMD in collaboration with cities and counties
TCM #20 PROMOTE TRAFFIC CALMING MEASURES	Phase 1 (2004 –2006):	
	■ Implement traffic calming projects such as: ▪ Pedestrian-exclusive streets ▪ Residential and neighborhood traffic calming measures ▪ Arterial and major route traffic calming measures	MTC, BAAQMD, Cities, Counties
	■ Include traffic calming strategies in the transportation and land use elements of general and specific plans	MTC, BAAQMD, Cities, Counties
	■ Encourage area-wide traffic calming plans and programs	MTC, BAAQMD, Cities, Counties
	■ Include traffic calming strategies in capital improvements programs	MTC, BAAQMD, Cities, Counties
	Phase 2 (Beyond 2006):	
	■ Continue the programs in Phase 1 and refine and expand them as appropriate	N/A

EMISSION REDUCTIONS

A summary of emission reductions for stationary, area and mobile source measures is provided in Table 14 and a summary of emissions reductions for transportation control measures is provided in Table 15.

Table 14: Emission Reductions for Stationary, Area and Mobile Source Control Measures

#	Title	ROG Reductions (tons/day)	NOx Reductions (tons/day)
STATIONARY AND AREA SOURCE MEASURES			
Industrial - Commercial Processes			
SS 1	Auto Refinishing	0.7	
SS 2	Graphic Arts Operations	0.15	
SS 3	High Emitting Spray Booths	0.5	
SS 4	Polyester Resin Operations	0.3	
SS 5	Wood Products Coating	0.68	
Petroleum Products Distribution and Processing			
SS 6	Flares (ADOPTED 7/20/05)	TBD*	TBD*
SS 7	Gasoline Bulk Terminals and Plants	0.14	
SS 8	Marine Loading Operations (ADOPTED 12/7/05)	0.44	
SS 9	Organic Liquid Storage Tanks	TBD*	
SS 10	Pressure Relief Devices (ADOPTED 12/21/05)	0.001	
SS 11	Wastewater Systems (ADOPTED 9/15/04)	2.1	
Combustion Processes			
SS 12	Industrial, Institutional and Commercial Boilers		0.5 – 1.0
SS 13	Large Water Heaters and Small Boilers		0.39
SS 14	Stationary Gas Turbines		1.2
Education Programs			
SS 15	Energy Conservation	Unknown	Unknown
MOBILE SOURCE MEASURES			
MS 1	Diesel Equipment Idling Model Ordinance	0.13	1.96
MS 2	Green Contracting Model Ordinance	TBD*	TBD*
MS 3	Low-Emission Vehicle Incentives	0.03	0.6
MS 4	Vehicle Buy-Back Program	0.48	0.31

* TBD – Emission reductions to be determined

Table 15: Emission Reductions of Transportation Control Measures

#	Title	ROG Reductions (tons/day) 2006	NO_x Reductions (tons/day) 2006
TRANSPORTATION CONTROL MEASURES			
TCM 1	Support Voluntary Employer Based Trip Reduction Programs	0.53	0.57
TCM 3	Improve Local and Areawide Bus Service	0.42	1.13
TCM 4	Improve Regional Rail Service	0.23	0.21
TCM 5	Improve Access to Rail and Ferries	0.17	0.15
TCM 6	Improve Interregional Rail Service	0	0
TCM 7	Improve Ferry Service	0	0
TCM 8	Construct Carpool/Express Bus Lanes on Freeways	0	0
TCM 9	Improve Bicycle Access and Facilities	0.04	0.03
TCM 10	Youth Transportation	0.11	0.09
TCM 11	Install Freeway Traffic Management System	0.04	0.11-0.12
TCM 12	Arterial Management Measures	0.06-0.12	0.06-0.11
TCM 13	Transit Use Incentives	0.02-0.12	0.02-0.10
TCM 14	Carpool and Vanpool Services and Incentives	0.01	0.01
TCM 15	Local Land Use Planning and Development Strategies	0.09	0.14
TCM 16	Public Education/Intermittent Control Measures	1.9 *	2.0 *
TCM 17	Conduct Demonstration Projects	0	0
TCM 18	Transportation Pricing Reform	0	0
TCM 19	Improve Pedestrian Access and Facilities	0.04	0.02
TCM 20	Promote Traffic Calming	0	0

* Emissions reduction figures for TCM 16: Public Education/Intermittent Control Measures were calculated in tons per day based on emissions reduced on Spare the Air days, which occur approximately 7 days per year.

COST-EFFECTIVENESS ESTIMATES

Section 40922 of the CCAA requires an assessment of the cost-effectiveness of proposed control measures and a ranking of the control measures. Section 40913(b) requires a determination by the Air District Board that the Plan is a cost-effective strategy to achieve attainment of State standards by the earliest practicable date.

Cost-effectiveness can be estimated with confidence for some control measures where the source characteristics, pollution reduction technology, and economic factors are well known. Lacking any of these, the estimates are less certain. Best available estimates are provided in Table 16 below. In some cases, where uncertainties are great, the cost effectiveness is listed as “N/A.”

Transportation control measures are especially difficult to analyze for cost-effectiveness for a number of reasons. First, the effectiveness of TCMs is dependent upon people’s

travel choices, which are influenced by numerous factors and are often difficult to predict or measure. Second, the costs associated with each TCM may be significant, particularly if major capital investments and infrastructure improvements are included. Third, it is challenging to assign a cost to the emission reductions alone because TCMs are usually intended to meet multiple societal goals including congestion relief, mobility, safety, and other environmental and social benefits discussed in the section above. In addition, TCMs often have overlapping, complementary effects, and the rankings below cannot adequately reflect the synergistic outcomes of TCMs.

In calculating cost effectiveness for TCMs, assumptions were made about both emission reductions and costs for individual projects and programs. Cost effectiveness ratings for TCMs 3, 4, 5, 11, 12, 15 and 16 were calculated using specific project emission reduction and cost estimates as illustrative examples of each TCM. They do not include the fully array of potential transportation investments that could be funded under each TCM, and therefore may underestimate the impacts. Cost effectiveness ratings for TCMs 1, 9, 10, 13, 14 and 19 were assigned based upon a qualitative assessment of overall programmatic effectiveness. The remaining TCMs did not have emissions reduction or cost figures associated with their implementation; therefore, it was impossible to assign them cost effectiveness ratings.

Table 16: Cost Effectiveness Estimates

Measure		Ranking*	Cost Effectiveness
Stationary Source Measures			
SS 1	Auto Refinishing	2	Cost savings - $2,000 per ton
SS 2	Graphic Arts Operations	4	$800 per ton
SS 3	High Emitting Spray Booths	10	$5,500 per ton
SS 4	Polyester Resin Operations	4	$800 per ton
SS 5	Wood Products Coating	7	$2,000 - $3,700 per ton
SS 6	Flares (ADOPTED 07/20/05)	5	$800 - $1,600 per ton
SS 7	Gasoline Bulk Terminals and Plants	3	$700 per ton
SS 8	Marine Loading Operations (ADOPTED 12/7/05)	8	$2,800 per ton
SS 9	Organic Liquid Storage Tanks	N/A	TBD
SS 10	Pressure Relief Devices (ADOPTED 12/21/05)	12	$7,000 - $22,000 per ton
SS 11	Wastewater Systems (ADOPTED 9/15/04)	6	$1,900 - $2,400 per ton
SS 12	Industrial, Institutional and Commercial Boilers	9	$5,000 per ton
SS 13	Large Water Heaters and Small Boilers	1	Cost savings - $3,000 per ton
SS 14	Stationary Gas Turbines	11	$5,000 - $10,000 per ton
SS 15	Promote Energy Conservation	N/A	N/A

Table 16 (continued): Cost Effectiveness Estimates

Measure		Ranking*	Cost Effectiveness
Mobile Source Measures			
MS 1	Diesel Equipment Idling Ordinance	1	$500 per ton
MS 2	Green Contracting	N/A	N/A
MS 3	Low Emissions Vehicle Incentives	2	$5,000 per ton (Carl Moyer) $30,000 - $40,000 per ton (TFCA average)
MS 4	Vehicle Buy Back Program	3	$8,600 per ton
Transportation Control Measures			
TCM 1	Voluntary Employer Based Trip Reduction Programs	1	Good**
TCM 3	Improve Local and Areawide Bus Service	1	Good
TCM 4	Improve Regional Rail Service	1	Good
TCM 5	Improve Access to Rail and Ferries	1	Good
TCM 6	Improve Interregional Rail Service	N/A	N/A
TCM 7	Improve Ferry Service	N/A	N/A
TCM 8	Construct Carpool/Express Bus Lanes on Freeways	N/A	N/A
TCM 9	Improve Bicycle Access and Facilities	2	Medium**
TCM 10	Youth Transportation	2	Medium**
TCM 11	Install Freeway Traffic Management System	1	Good
TCM 12	Arterial Management Measures	1	Good
TCM 13	Transit Use Incentives	1	Good**
TCM 14	Carpool and Vanpool Services and Incentives	2	Medium**
TCM 15	Local Land Use Planning and Development Strategies	2	Medium
TCM 16	Public Education/Intermittent Control Measures	2	Medium
TCM 17	Conduct Demonstration Projects	N/A	N/A
TCM 18	Transportation Pricing Reform	N/A	N/A
TCM 19	Improve Pedestrian Access and Facilities	1	Good**
TCM 20	Promote Traffic Calming	N/A	N/A

Notes:

* Cost Effectiveness for Stationary Source, Mobile Source and Transportation Control Measures has been ranked separately.

TCM Cost Effectiveness has been rated in dollars per ton of ROG and NOx emissions reduced using the following rating system:

Good = $0 to $1M/ton
Medium = $1M to $2M/ton
Poor = over $2M/ton

** Denotes cost effectiveness is qualitative.

FURTHER STUDY MEASURES

Further study measures are measures for which insufficient information was available during the development of the control strategy to allow the agencies to commit to them as control measures. A measure may be proposed for further study because of a lack of emissions data on the source targeted, because the cost effectiveness of control may be questionable, or because technology to control the source may not have been adequately demonstrated. The 2005 Ozone Strategy commits the Air District to continue to evaluate the further study measures. However, the Ozone Strategy does not commit the Air District to continue evaluation of a measure if it is determined to be technically infeasible, not cost-effective, or inappropriate for any other reason, nor is the Air District committing, as part of this Strategy, to move forward with further study measure(s) deemed feasible as a result of the study unless and until the Air District specifically commits to the measure(s).

2000 Clean Air Plan Further Study Measures

The 2000 Clean Air Plan contained six further study measures. Two measures have been adopted by the Air District, two measures have negligible emissions reductions, one has been incorporated into the rule development process and one is ongoing. The following is an evaluation of each further study measure from the 2000 Clean Air Plan.

- **A3: Improved Aerospace Coating Rule.** BAAQMD Regulation 8, Rule 29 has less stringent standards than the corresponding South Coast rule for several categories of coatings, specifically fuel tank coating, surface preparation and cleanup solvent, paint stripping, PC board fabrication, strippers and maskants for electronic component fabrication, and high temperature adhesive bonding primer. Coating usage in several of these categories is so small that it would be subject to low usage exemptions under both the SCAQMD and BAAQMD rules. With the closure of Bay Area military bases and the transfer of much of United Airlines' maintenance work to facilities outside the Bay Area, aerospace coating VOC emissions are only 0.05 ton/day. Emission reductions from this measure would further reduce emissions by less than 0.01 tons per day. This is de minimis, and does not justify moving forward to propose a revised standard.
- **A6: Improved Surface Coating of Plastic Parts and Products Rule.** Plastic coating in the Bay Area is controlled by Reg 8, Rule 31: Surface Preparation and Coating of Plastic Parts and Products. The comparable South Coast Rule 1145: Plastic, Rubber and Glass Coatings, has two general limits for plastic coating and two for military applications. The general limits are 275 g/l VOC for one component coatings and 420 g/l for two component coatings. For military applications, the limits are 340 g/l VOC for one component coatings and 420 g/l for two component coatings. The Bay Area has one limit for all these applications, 340 g/l VOC. "One component" coatings are water based and achieve the 275 g/l standard in practice. Therefore, setting a 275 g/l standard in the Bay Area rule for one component coatings would not produce any emission reductions. The Bay Area rule, then, is more stringent as it requires 340 g/l VOC for all applications. Both rules have VOC limits for specialty coatings that vary, but the inventory of these specialty applications is insignificant. No facilities coat rubber products and only one coats glass products. The glass coating facility, a mirror manufacturer, is subject to permit conditions that limit VOC emissions, and emits less than 0.05 tons/day. Emissions reductions are de minimis, and would not justify rulemaking to establish a more stringent standard.

- **C7: Control of Emissions From Refinery Flares.** This further study measure was further iterated in further study measure FS-8 in the 2001 Ozone Attainment Plan. A study on flaring was released in December 2002. A technical workgroup was convened to discuss issues related to flare control. A flare control rule was adopted by the Air District Board of Directors on July 20, 2005.
- **C8: Draining of Liquid Products / Sumps and Pits.** This further study measure is also further study measure FS-9 in the 2001 Ozone Attainment Plan. The study recommended emissions controls on refinery wastewater collection systems. The measure has been adopted through amendments to Reg. 8-8: Wastewater (Oil-Water) Separators, approved by the Air District Board of Directors September 15, 2004.
- **F7: Easing of Administrative Requirements of Use of Lower Emitting Technology.** This further study measure has been implemented in several rules, and is considered as rule amendments are developed. There are constraints on easing recordkeeping and/or monitoring requirements imposed by EPA policies. However, regulatory elements such as leak detection and repair incentives to encourage self-monitoring and permit exemptions for low-emitting technologies can help drive user choices of equipment.
- **F8: Limitations on Solvents Based on Relative Reactivity.** This further study measure is ongoing. See further study measure FS 7.

2005 Ozone Strategy Further Study Measures

Further study measures will be evaluated as expeditiously as practicable. If the results of the study indicate that the measures are viable control measures, they will be considered for implementation as regulatory amendments or programmatically (on a schedule to be determined). Table 17 shows the proposed schedule for completion of the further study measures included in the 2005 Ozone Strategy. Descriptions of the further study measures are provided in Appendix E. The results of the further study measures will be reported to ARB and to the Air District Board of Directors.

Table 17: 2005 Ozone Strategy Further Study Measures

2005 Further Study Measures

FS #	Further Study Measure (existing Reg. and Rule, if any)*
FS 10	Refinery Wastewater Treatment Systems (Reg 8-8)

2006 Further Study Measures

FS #	Further Study Measure (existing Reg. and Rule, if any)*
FS 3	Commercial Charbroilers
FS 5	Food Product Manufacturing and Processing
FS 6	Livestock Waste
FS 9	Emissions from Cooling Towers
FS 13	Wastewater from Coke Cutting Operations
FS 15	Stationary Internal Combustion Engines (Reg 9-8)
FS 19	Free Transit on Spare the Air Days

2007 Further Study Measures

FS #	Further Study Measure (existing Reg. and Rule, if any)*
FS 1	Adhesives and Sealants (Reg 8-51)
FS 2	Architectural Coatings (Reg 8-3)
FS 4	Composting Operations
FS 7	Limitations on Solvents Based on Relative Reactivity
FS 8	Solvent Cleaning and Degreasing (Reg. 8-16)
FS 11	Vacuum Trucks
FS 12	Valves and Flanges (Reg. 8-18)
FS 14	NO_x Reductions from Refinery Boilers (Reg. 9-10)
FS 16	Encourage Alternative Diesel Fuels
FS 17	Mitigation Fee for Federal Sources
FS 18	Indirect Source Mitigation Program
FS 20	Episodic Measures

* Indicates a source already subject to an Air District rule. Further study will evaluate the potential for additional emission reductions.

SECTION 3 - OTHER ISSUES

INTRODUCTION

This section of the Ozone Strategy summarizes various topics related to the ozone planning process or other Air District programs. Members of the public have expressed particular interest in these topics during the planning process. Specifically, this section discusses:

- Public involvement processes that have supported the preparation of the 2005 Ozone Strategy
- Climate change and potential benefits of ozone control measures on reducing emissions of global warming gases
- Fine particulate matter (PM), diesel PM, and current and future programs to reduce PM emissions
- Community Air Risk Evaluation (CARE) Program
- Local benefits of ozone control measures
- National ozone standards
- Photochemical modeling
- Environmental review process

PUBLIC INVOLVEMENT PROCESS

Introduction

The Air District's public involvement program for the 2005 Ozone Strategy has been very extensive. It has included a variety of outreach techniques, including public presentations, technical work group meetings, community meetings, email notices, and an ozone planning website. These efforts comprise the Air District's broad community outreach program to achieve the following goals:

- Include all the diverse stakeholders in the planning process (industry, community groups, environmental groups, local governments, neighboring air districts, and concerned citizens)
- Address stakeholder needs, issues and concerns
- Provide timely and accurate information
- Enhance communication between the Air District and all of the stakeholders
- Build understanding and support for ozone planning and related air quality programs and projects

Ozone Working Group

During 2003-2004, the Air District, in cooperation with MTC and ABAG, convened a technical group called the Ozone Working Group (OWG) to help develop the Bay Area 2005 Ozone Strategy. The group was established as a way for members of the public and interested parties to be involved in all stages of the ozone planning process. All OWG meetings have been open to the public.

At OWG meetings, staff has presented updates on various aspects of the planning process, answered questions, and solicited discussion and public comment. Topics have included public involvement efforts, modeling, development and evaluation of control measures, regulatory and rule-making updates, MTC's Transportation 2030 process, and other items. OWG meetings are held approximately bi-monthly, during business hours, at MetroCenter in Oakland. OWG meetings are conducted by professional facilitators, with presentations primarily by Air District and MTC staff. OWG meeting notices are sent both via mail and email to environmental and community groups, business and industry groups, elected officials, local and regional agencies, State and federal agencies, neighboring air districts, and other interested parties.

Community Outreach Meetings

The Air District has also conducted community meetings to discuss the 2005 Ozone Strategy. The first round of community meetings occurred in September 2003. Community meetings were held in the evening at community centers in Rodeo, East Palo Alto, Richmond, East San Jose, West Oakland, and southeast San Francisco. The community meetings were intended to provide background information on ozone health effects and regulatory programs, and to solicit suggestions on potential control measures. The Rodeo and East Palo Alto meetings also included Supplemental Environmental Projects (SEP) on the agendas.

The second round of community meetings occurred in September and October 2004. These community meetings were held in the evening at public facilities in Petaluma, Richmond, San Jose, Oakland, San Francisco, Livermore and Martinez. The second round of community meetings also provided background information on ozone health effects and regulatory programs, updates on the ozone planning process, and solicited input of draft ozone control measures and further study measures. The 2004 meetings also included discussion of the Air Districts new Community Air Risk Evaluation (CARE) program.

Professional facilitators assisted with both rounds of community meetings, and Spanish translation was provided. Outreach for the meetings included: mail and email notices to elected officials, other local and regional public agencies, community, environmental and business groups, and other interested parties; web posting by the Air District and MTC; flyer distribution through local schools; coordination with local community groups to help publicize the meetings; notices to local cable access and local newspaper community calendars; and press releases.

In addition to the community meetings, Air District staff worked with community groups to conduct "pre-meetings." Pre-meetings served as training sessions in which staff met with community members to provide background information on ozone planning, answered questions, and otherwise helped participants prepare for the community meetings. Two such pre-meetings were held in Richmond and San Jose prior to the 2003 community meetings, and one pre-meeting was held in Richmond prior to the 2004 community meetings.

Board of Directors Policy & Advisory Committees

Board of Directors
The Air District is governed by a 22-member Board of Directors. State law provides that the number of representatives from each county is determined by that county's population. Currently, the counties of Marin, Napa, and Solano have one representative; Sonoma, and San Mateo have two representatives; San Francisco has three representatives; and Alameda, Contra Costa, and Santa Clara each have four representatives. Occasionally through this planning process, Air District staff has made presentations to the Board and Board Committees to update them on the planning process and to receive comments and guidance from them about the Bay Area 2005 Ozone Strategy. All meetings of the Board and Board Committees are open to the public.

Policy Committees
The Air District Board of Directors Executive Committee meets quarterly. Throughout this planning process, Air District staff has briefed the Executive Committee and received comments and guidance from them about the Bay Area 2005 Ozone Strategy. Air District staff has briefed the Air District Board of Directors Stationary Source Committee and received comments from them on proposed stationary source control measures and rule development activities. Air District staff has also made presentations to and received comments from the Air District Board of Directors Public Outreach Committee on public outreach conducted for this planning process. Meetings of all three committees are open to the public.

The Regional Agency Coordinating Committee (RACC) consists of elected officials representing the three regional agencies (MTC, ABAG and the Air District), and provides direction to staff on regional planning and smart growth strategies. Representatives of other agencies and interests may attend RACC meetings. RACC meets on a bi-monthly basis and meetings are open to the public. Throughout this planning process, the Bay Area 2005 Ozone Strategy has been a discussion item at RACC meetings, and Air District staff have briefed and received comments from the group.

Advisory Committees
The Air District Advisory Council and its various committees advise and consult with the Board of Directors and the Air Pollution Control Officer (APCO). Throughout the planning process, Air District staff has briefed the Advisory Council as a whole as well as the Air Quality Planning and Technical Committees, and received comments from them about the 2005 Ozone Strategy. All Advisory Council meetings are open to the public.

The Air District has hired consultants to conduct photochemical modeling and to analyze meteorology and emissions on high ozone days in the Bay Area in order to better understand ozone formation within the region and transport of emissions between the Bay Area and downwind neighbors. To oversee the work that consultants are doing and to give feedback on modeling issues and protocol, the Air District has convened a technical working group called the Modeling Advisory Committee (MAC). The MAC meets bi-monthly and its membership includes staff from the Air District, ARB, other air districts, MTC, members of the scientific community, business and environmental representatives, and other interested parties with technical expertise in ozone modeling.

CAPCOA Engineering Managers Rule Development Subcommittee

In 2003, the Rule Development Managers subcommittee of the California Air Pollution Control Officers Association (CAPCOA) Engineering Managers identified a list of all feasible measures to assist local air districts in ozone strategy development. In August 2003, the subcommittee identified 27 source categories and identified the most stringent existing rule applicable to the source category. Bay Area Air District staff participated in the discussions and analyzed each measure for applicability and feasibility for the Bay Area 2005 Ozone Strategy. Of the 27, the Air District has committed to control measure development in eight of the source categories, and six additional source categories were identified for further study. Bay Area rules were defined as the most stringent available for five source categories and equivalent to the most stringent available for the remaining categories. This process is described in more detail in Appendix A, Control Measure Review and Evaluation Process.

ARB Rule Comparison Working Group

In 2003 and early 2004, ARB convened a workgroup of staff from the Bay Area Air Quality Management District, Sacramento Metro Air Quality Management District, San Joaquin Valley Unified Air Pollution Control District, the Yolo-Solano Air Quality Management District and ARB to participate in a rule comparison project. The project compared the relative stringency of district rules regulating 11 source categories and compared each respective district rule to the most stringent in California in order to identify opportunities for emission reductions for each of the air districts. This workgroup first met in August 2003, and most work was coordinated through conference calls and

email correspondence. The project concluded in February 2004 with the development of a report including a rule comparison summary table. Based on this work, emission reduction opportunities were identified for the Bay Area in five source categories. Further study measures for five additional source categories were also identified. This process is described in more detail in Appendix A, Control Measure Review and Evaluation Process.

Interagency Consultations

In February 2004, the Sacramento Metropolitan AQMD provided the Bay Area Air District with a list of control measures suggestions from TIAX Consultants, developed at the request of the Sacramento District. TIAX developed a list of 30 stationary, mobile and transportation control measure suggestions based on the inventory for the Central California Ozone Study, in addition to 19 measures under state or federal authority. Some suggestions were incorporated into existing measures proposed to be included in the Ozone Strategy or helped to make proposed control measures more stringent. In July 2004, the Bay Area Air District submitted a summary of the control measure evaluations to the Sacramento District and conducted a follow-up meeting to discuss the analysis.

The Bay Area Air District has continued to communicate with neighboring air districts about the Bay Area's ozone planning process. In October 2004, the Bay Area Air District held a consultation meeting inviting comments from neighboring air districts on the draft control measures proposed for the Ozone Strategy, as required by Transport Mitigation regulations. All neighboring air districts were invited to participate, and comments were received from the Sacramento Metro Air Quality Management District, San Joaquin Valley Unified Air Pollution Control District, Monterey Bay Unified Air Pollution Control District, and Northern Sierra Air Quality Management District.

Workshops

Pursuant to the California Environmental Quality Act (CEQA), the Air District is preparing a Draft Environmental Impact Report (DEIR) to evaluate potential environmental impacts of the Bay Area 2005 Ozone Strategy. The Air District held a public scoping meeting on April 20, 2004 at MetroCenter Auditorium in Oakland. The purpose of the meeting was to identify the range of actions, alternatives, mitigation measures, and significant effects to be analyzed in depth in the DEIR.

On September 30, 2003, MTC held a Transportation Control Measure (TCM) Workshop at MetroCenter in Oakland. The TCM Workshop was intended to provide OWG participants and other interested parties with an opportunity to review MTC's progress on TCM evaluation and to suggest new transportation strategies for consideration. The TCM Workshop was open to the public.

2003-2004 Ozone Planning Website

Throughout the 2005 Ozone Strategy process, the Air District has maintained a webpage with specific links to ozone planning information, meeting notices and materials. Interested parties can easily learn more about the ozone planning process by visiting the 2003-2004 Ozone Planning website (http://www.baaqmd.gov/pln/plans/ozone/2003_04.asp), with a direct link from the Air

District's homepage (http://www.baaqmd.gov). The website includes detailed information about the Ozone Working Group, ozone modeling, the CEQA process and planning schedules. All OWG meeting materials can be downloaded through the website.

Rule Development

Separate from but closely related to the Ozone Strategy process, the Air District Rule Development program conducts public processes for the development of regulations to improve air quality and protect public health. The Air District's Rule Development program develops rules based on control measures and further study measures from air quality plans and strategies. The Air District also sometimes adopts rules that are not based on control measures in air quality plans. Rule Development workgroups meet to discuss technical aspects of proposed rules as they are being developed, and include representatives of industry, environmental groups and other stakeholders. Rule Development workshops and hearings also provide the public with opportunities to participate in and comment on Air District rule adoption.

Concurrent with the 2003-04 Ozone Strategy planning process, several technical workgroup meetings, workshops and public hearings were conducted as part of the Air District's rule development process. Rule development public processes were conducted for rules related to organic liquid storage tanks, wastewater separators, process vessel depressurization, equipment leaks, marine tank and marine vessel loading terminals, flare monitoring and refinery flares. All workshops and hearings are open to the public.

Outreach on the Draft 2005 Ozone Strategy and DEIR

The Air District conducted two public meetings to present, obtain input and receive public comment on the Draft 2005 Ozone Strategy and Draft EIR. An Ozone Working Group meeting was held on October 25, 2005, from 9:30-11:30am at the MetroCenter Auditorium in Oakland. An Ozone Strategy Community Meeting was held on October 26, 2005, from 6-8pm at the Richmond Memorial Auditorium in Richmond. Both meetings were open to the public and meeting notices were circulated to interested parties and posted on the Air District website.

Since the close of the public comment period on the Draft 2005 Ozone Strategy on November 9, 2005, staff have compiled public comments, drafted responses to comments, prepared the Proposed Final Bay Area 2005 Ozone Strategy and Proposed Final EIR, and released the documents for public review. The Air District Board of Directors will hold a public hearing to consider adoption of the Final 2005 Ozone Strategy and Final EIR at their December 21, 2005 meeting. Members of the public have been notified of these meetings and encouraged to attend and provide comment.

CLIMATE CHANGE

Continued warming threatens to potentially erode air quality improvements made in the Bay Area in the past 50 years and may make it more difficult for the region to meet ozone standards. This section on climate change is relevant to the 2005 Ozone Strategy because many of the proposed ozone strategy control measures have the additional benefit of also reducing harmful greenhouse gas emissions.

Background

The Earth's natural climate is constantly changing. However, the International Panel on Climate Change concludes that the global climate is currently changing at a rate unmatched in the past one thousand years and that this change is due to human activity. The last several years have been the hottest on record and the rise in temperature is closely correlated to human activities, primarily the combustion of fossil fuels that are altering the chemical composition of the atmosphere through the emission and buildup of greenhouse gases. Greenhouse gases allow the sun's ultraviolet radiation to penetrate the atmosphere and warm the Earth's surface, but prevent some of the infrared radiation emitted from the Earth to escape back into outer space thereby keeping the planet's surface warm. Higher concentrations of greenhouse gases magnify this effect and further increase surface temperature.

Emissions of carbon dioxide (CO_2) are the leading cause of global warming, with other air pollutants such as methane, nitrous oxide and hydrofluorocarbons also contributing. According to the California Energy Commissions, carbon dioxide concentrations, which ranged from 265 ppm to 280 ppm over the last 10,000 years, only began rising in the last two hundred years to current levels of 365 ppm, a 30% increase. California's CO_2 emissions in 1999 were approximately 356 million metric tons. In the last decade, transportation accounted for the largest portion of emissions, averaging 59% of total CO_2 emissions, followed by electricity generation at 16%, and industrial emissions of 12%.

In California, climate change indicators measured over the past 100 years such as air temperature, annual Sierra Nevada snow melt runoff, and sea level rise all indicate that California's climate is warming. Warming in the 21st century is expected to be much greater than in the 20th Century, with temperatures in the United States rising 5-9 degrees F. The climate change experienced in California so far has been gradual, as assumed in most climate change projections. However, paleoclimatological researchers, studying past changes in the climate system, are discovering that the Earth's climate has experienced sudden and violent shifts and that global warming may trigger thresholds resulting in dramatic changes in the climate.

Increased global warming is expected to result in more extreme precipitation and faster evaporation of water, disrupting water supplies, energy supply and demand, agriculture, forestry, natural habitat, outdoor recreation, air quality, and public health. Climate change affects public health because the higher temperatures result in more air pollutant emissions, increased smog, and associated respiratory disease and heart-related illnesses. According to one ARB report, 21 to 38% of the deaths occurring during a heat wave were attributed to elevated ozone and PM10 levels (Draft ARB Technical Support Document for Staff Proposal Regarding Reduction of Greenhouse Gas Emissions from Motor Vehicles, Climate Change Overview, July 21, 2004, pg 16-17).

Linkage to Existing Air District Programs

Certain chemical precursors, such as nitrogen oxides (NOx) and volatile organic compounds (VOCs), react in the atmosphere to produce ozone and ammonium nitrate (a form of particulate matter). NOx emissions have increased as a result of power generation processes for energy consumption. Higher temperatures increase precursor VOC emissions (from evaporation of petroleum-based products and from biogenic sources), and also increase photochemical reactions forming ozone.

Reports from the State and Territorial Air Pollution Program Administrators and the Association of Local Air Pollution Control Officials (STAPPA/ALAPCO), U.S. EPA, and other organizations highlight the co-benefits of "harmonizing" existing air quality rules, regulations, and programs that address criteria and toxic air pollutants with the goals of reducing greenhouse gas emissions. Existing District rules and programs are already reducing greenhouse gas emissions; those reductions can be quantified and documented. For example, programs to reduce vehicle miles traveled (VMT) and energy efficiency measures reduce NOx and PM emissions because they reduce emissions from fossil fuels and they also reduce emissions of greenhouse gases.

Statewide Programs

In response to growing concern about global warming, in July 2002, California legislation (AB 1493, Pavley) was enacted requiring ARB to adopt regulations that achieve the maximum feasible and cost-effective reduction in greenhouse gas emissions from on-road motor vehicles. In September 2004, ARB adopted regulations to control greenhouse gas emissions from passenger cars and light-duty trucks that will reduce emissions in 2009 model year and later vehicles. According to an ARB report, greenhouse gas emission reductions would be modest during the early phases of the regulation and would increase to 25 to 34% reduction in greenhouse gases by 2016 compared to a 2002 baseline (ARB Staff Report: Initial Statement of Reason for Proposed Rulemaking:, Public Hearing to Consider Adoption of Regulations to Control Greenhouse Gas Emissions from Motor Vehicles, August 6, 2004, pg. 116). Implementation of this regulation would result in modest initial costs that ARB anticipates would be more than offset by operating cost savings over the life of the vehicle due to improved fuel economy.

The California Climate Action Registry (the Registry) was established by State law as a non-profit voluntary registry for greenhouse gas (GHG) emissions. The purpose of the Registry is to help companies and organizations with operations in the state to establish GHG emissions baselines against which any future GHG emission reduction requirements may be applied. The Registry encourages voluntary actions to increase energy efficiency and decrease GHG emissions. Using any year from 1990 forward as a base year, participants can record their GHG emissions inventory. The State of California, in turn, will offer its best efforts to ensure that participants receive appropriate consideration for early actions in the event of any future state, federal or international GHG regulatory scheme. Registry participants include businesses, non-profit organizations, municipalities, state agencies, and other entities.

On June 1, 2005, Governor Schwarzenegger signed Executive Order #S-3-05 establishing greenhouse gas emissions reduction targets in California: by 2010, reduce greenhouse gas emissions to 2000 levels; by 2020, reduce greenhouse gas emissions

to 1990 levels; and by 2050, reduce greenhouse gas emissions to 80% below 1990 levels. To meet these targets, the Governor has directed Cal EPA to lead a Climate Action Team made up of representatives from the Business, Transportation and Housing Agency, the Department of Food and Agriculture, the Air Resources Board, the Energy Commission, and the Public Utilities Commission. The strategies currently being considered by the Climate Action Team include mandatory reporting of greenhouse gas emissions, a cap and trade program, and a voluntary emission reduction program. The team will submit a report to the Governor and the Legislature in January 2006 and bi-annually thereafter.

Ozone Strategy Control Measures

Various control measures in the 2005 Ozone Strategy will reduce greenhouse gas emissions as well as reduce emissions of ozone precursors. Although not quantified, many of the mobile source measures and transportation control measures proposed in this Ozone Strategy will also reduce greenhouse gas emissions from motor vehicles. Those control measures that result in reducing or eliminating motor vehicle trips, or more efficiently operating motor vehicles, would help reduce greenhouse gas emissions in addition to reducing ozone precursor emissions. TCMs in particular aim to reduce vehicle trips and vehicle miles traveled, and thus reduce emissions of ozone precursors and greenhouse gases. In addition, the proposed Energy Conservation control measure (SS15) would directly target greenhouse gases while also reducing emissions of ozone precursors. This measure would reduce emissions of criteria pollutants and greenhouse gas emissions through the voluntary adoption and enforcement of a model ordinance by local government agencies to reduce energy consumption, and through new District programs and enhancements to existing District regulations to promote energy efficiency.

Other Bay Area Programs

A growing number of cities and counties in the Bay Area are participating in activities to reduce greenhouse gas emissions and combat climate change. Four counties and 14 cities in the Bay Area participate in the International Council for Local Environmental Initiatives' (ICLEI) Cities for Climate Protection campaign. This program provides a framework for local governments to develop a strategic agenda to reduce global warming and air pollution emissions. The table below lists the cities and counties in the Bay Area that are among the 500 local government agencies throughout the world participating in ICLEI's program.

Bay Area Communities Participating in Cities for Climate Protection Campaign

Counties	Cities		
Marin	Berkeley	Petaluma	Santa Rosa
Sonoma	Cotati	Rohnert Park	Sebastopol
Santa Clara	Fairfax	San Anselmo	Sonoma City
San Francisco	Novato	San Francisco	Windsor
	Oakland	San Jose	

The Cities for Climate Protection program consists of five milestones to reduce greenhouse gas and air pollution emissions throughout a community. These include:

- Conduct a greenhouse gas emissions inventory and forecast to determine the sources and quantity of greenhouse gas emissions in the jurisdiction;
- Establish a greenhouse gas emissions reduction target;
- Develop an action plan with both existing and future actions which, when implemented, will meet the local greenhouse gas reduction target;
- Implement the action plan; and
- Monitor to review progress.

The Air District is directly participating in a number of activities in support of local initiatives to address climate change. The Air District is currently working with Sonoma County to develop a model to help Sonoma and other counties in the Bay Area develop action plans for reducing greenhouse gases. Phase 1 of this project develops guidelines for conducting greenhouse gas emission inventories and identifies strategies to reduce those emissions. Phase 2 of this project will help in the development of model climate protection programs or ordinances and integration of current air quality planning efforts with climate protection.

In October 2004, the Santa Clara County Board of Supervisors passed a resolution to form a partnership with the Air District to achieve the Cities for Climate Protection Program goals of reducing both greenhouse gas and air pollution emissions. The Air District has also been in contact with the City and County of San Francisco and Marin County to offer assistance in implementing climate change action plans adopted in these counties. In 2002, the Marin County Board of Supervisors adopted a resolution that recognizes both the gravity of global warming and the responsibility for local action. In June 2003, Marin County completed the first of the five Cities for Climate Protection milestones: an analysis of greenhouse gas emission levels. The County is currently working on the second milestone, developing an emissions reduction target. In addition, Marin County provided planning guidance on climate change in the Marin County General Plan.

In 2002, the San Francisco Board of Supervisors passed the Greenhouse Gas Emissions Reduction Resolution, committing the City and County of San Francisco to a greenhouse gas emission reduction goal of 20% below 1990 levels by the year 2012. In September 2004, San Francisco released its Climate Action Plan, which provides an inventory and reduction target of greenhouse gas emissions. The Plan also contains actions and implementation strategies to reduce greenhouse gas emissions from the transportation and solid waste sectors and through energy efficiency and renewable energy programs.

The Contra Costa County Board of Supervisors are also engaged in local efforts to reduce greenhouse gas emissions in Contra Costa County. Contra Costa County is taking a “best practices” approach to climate change issues by addressing fleet vehicle emissions, creating green building standards, improving energy efficiency, and by investing in businesses that do not harm human health and the environment.

Local initiatives to address climate change are also being pursued by the Sustainable Silicon Valley (SSV) Project, founded by the California Environmental Protection Agency, the Silicon Valley Leadership Group and the Silicon Valley Environmental Partnership. One element of the SSV program is the CO_2 Emissions Reduction Program. Public and private organizations in the counties of Santa Clara, San Mateo,

and Alameda Counties are invited to participate in SSV's program, including businesses, government, educational institutions, and non-governmental organizations.

Air District Programs

The Air District is also developing a website focusing on climate change issues. The website will provide an overview of climate change, describe the pollutants that cause it and the potential impacts of climate change on California and the Bay Area, and summarize current programs to address climate change. The website will also provide links to local programs addressing climate change and links to other resources on the topic.

The Air District is also developing an emission inventory of greenhouse gas emissions from stationary, area and mobile sources to help determine the sources of greenhouse gases in the region. This data will be very useful to regional stakeholders for determining the sources of GHGs in their jurisdictions and for beginning to set targets for emission reductions. In addition, the inventory will provide a baseline for the region against which future reduction efforts can be measured.

On June 1, 2005 the Air District Board of Directors committed the District to playing a lead role in addressing Climate Change by adopting a resolution establishing a Climate Protection Program and acknowledging the link between climate protection and existing Air District programs to reduce air pollution in the Bay Area.

As part of its Climate Protection Program, the Air District expects to undertake the following activities in the near term:

- Establish an Ad Hoc committee from the District's Board of Directors to direct Staff in developing the Climate Protection Program.
- Host a regional conference to help coordinate local climate protection initiatives and create guidance for new initiatives, such as a model ordinance.
- Sponsor a symposium to discuss climate change issues for the region.
- Provide technical assistance to local stakeholders and creating an information clearinghouse to assist local initiatives.
- Develop public education and outreach campaigns about climate protection, energy efficiency, and ways to reduce greenhouse gas emissions at home and in the workplace.

As part of its educational and outreach program on Climate Change, the Air District has developed a web site focusing on climate change issues. The website provides an overview of climate change, describing the pollutants that cause it and the potential impacts of climate change on California and the Bay Area, and summarizing current programs to address climate change. The website also provides links to local programs addressing climate change and links to other resources on the topic.

The Air District is also developing an emission inventory of greenhouse gas emissions from stationary, area and mobile sources to help determine the sources of greenhouse gases in the region. This data will be very useful to regional stakeholders for determining the sources of greenhouse gas emissions in their jurisdictions and for

beginning to set targets for emission reductions. In addition, the inventory will provide a baseline for the region against which future reduction efforts can be measured.

The Air District will continue to collaborate with local stakeholders on climate change issues through existing local initiatives in Sonoma County, Marin County, Silicon Valley, and Contra Costa County. The Air District will continue to interface with statewide entities like California Climate Action Registry and the Climate Action Team, in anticipation of statewide measures. The Air District will continue to evaluate its role in assisting local efforts to address climate change and how to most effectively address climate change on a regional level.

FINE PARTICULATE MATTER

Introduction and Health Effects

Particulate matter (PM) is a complex mixture of substances that includes elements such as carbon and metals; compounds such as nitrates, organics, and sulfates; and complex mixtures such as diesel exhaust and soil. PM can be emitted directly and can also be formed in the atmosphere through reactions between different pollutants. Fine particulate matter (PM10) refers to particles with an aerodynamic diameter of 10 microns or smaller. Ozone precursors can also be precursors to fine PM.

Exposure to PM10 aggravates a number of respiratory illnesses and may cause early death in people with existing heart and lung disease. PM10 includes the subgroup of finer particles with an aerodynamic diameter of 2.5 microns and smaller (PM2.5). These finer particles pose an increased health risk because they can deposit deep in the lungs and contain substances that are particularly harmful to human health.

Sources and Trends

The State and national governments have set ambient air quality standards for fine particulate matter. These standards define the maximum concentrations of particles that can be present in outdoor air without threatening the public's health. The Bay Area is unclassified for the national PM10 standard, and EPA recently designated the Bay Area as an attainment area for the national PM2.5 standard.

The Bay Area does not meet California PM10 standards, which are much stricter than the national standards. In June of 2002, the California Air Resources Board (ARB) adopted new, revised PM standards for outdoor air, lowering the annual PM10 standard from 30 µg/m3 to 20 µg/m3 and establishing a new annual standard for PM2.5 of 12 µg/m3. Any exceedence of these levels constitutes a violation of the standard. Currently, the California Clean Air Act does not require nonattainment regions to prepare plans for attainment of the state PM standards (as it does for ozone). However, recently enacted legislation (Senate Bill 656) specifies certain requirements for ARB and local air districts with regard to addressing PM emission reductions, as described below.

The Bay Area experiences its highest PM concentrations in the winter, especially during evening and night hours. Based on analysis of the chemical composition of airborne PM, the main sources of PM are combustion of fossil fuels, wood burning, airborne dust entrained by motor vehicles and construction, and cooking. Fine PM results almost entirely from the combustion of fossil fuels and wood. Woodburning results in about 20% of total PM emissions on an annual basis and approximately 30% of wintertime PM. Although fossil fuels are burned year-round, winter weather conditions convert much more of the NO_x produced into particulate ammonium nitrate, representing a large fraction of wintertime PM. Finally, the lower levels of solar radiation in the winter lead to stronger temperature inversions that are conducive to the buildup of particulate matter in ambient air near ground level.

Direct emissions from fossil fuel combustion by on-road motor vehicles, construction equipment, ships, planes, refineries and power plants constitute about 35% the Bay Area's PM2.5 on an annual basis. Secondary ammonium sulfate and ammonium nitrate,

formed from reactions in the atmosphere of nitrogen oxides and sulfur oxides from motor vehicle exhaust and other combustion processes, constitute another 30% of PM2.5.

In the Bay Area, exceedances of the 24-hour State PM10 standard were recorded 22 times in the last three-year period, and 12 exceedances of the 24-hour national PM2.5 standard were recorded in the last three years (see Table 18). In order to meet the 24-hour national PM2.5 standard, ninety-eight percent of measured days at every monitoring site, over the most recent three-year period, must record a 24-hour average less than 65 μg/m3. The Bay Area met the national 24-hour standard for 1999-01, through 2002-04.

Table 18: PM_{10} and $PM_{2.5}$ Statistics for the Bay Area, 1999-2004

	PM_{10} ($\mu g/m^3$)			$PM_{2.5}$ ($\mu g/m^3$)		
Year	Measured days over state std *	Max 24-hour (CA Std = 50)	Maximum Annual average (CA Std = 20)	Days over Fed 24-hr std	Maximum 24-hour (F Std = 65)	Max Annual Average (F Std = 15, CA Std = 12)
1999	12	114	28.7	5	91	16.0
2000	7	76	26.7	1	67	13.6
2001	10	109	28.9	5	108	12.6
2002	6	80	25.4	7	77	13.8
2003	6	58	24.8	0	56	11.8
2004	5	63	25.3	1	74	11.6

* PM10 is only sampled every sixth day. Actual days over standard can be estimated to be six times the numbers shown.

The Bay Area has seen significant reductions in PM10 levels since 1990, with peak concentrations down by approximately half and annual average values down by about one-third. Average ammonium nitrate values have dropped faster than PM10 as a whole. This reduction is likely due to reductions in NO_x emissions, and this represents an additional benefit of efforts to reduce NOx as an ozone precursor. Particles emitted from combustion of fossil fuels and wood have dropped faster than PM10 as a whole also. PM2.5 has only been measured since 1999, so quantitative trend analysis is currently not possible. However, because fine PM is almost completely combustion-related, it is likely that PM2.5 has been reduced at least as much as PM10.

Recent reductions in motor vehicle emissions resulting from stricter national and State standards have resulted in lower tailpipe PM emissions as well. Also, there have been reductions in secondary PM pollutants, which appear to be the result of NO_x and SO2 reductions. However, because of fine PM's health effects, the Air District continues to be concerned about PM emissions from sources such as motor vehicles, woodburning, and other combustion processes.

Diesel Particulate Matter

Diesel engines emit a complex mixture of air pollutants, with a major fraction consisting of particulate matter. These emissions include many carbon particles, as well as other gases that become PM as they cool and undergo chemical reactions. Overall, emissions from diesel engines are responsible for the majority of the potential airborne cancer risk in California. In 1998, ARB identified particulate emissions from diesel-fueled engines (diesel PM) as a toxic air contaminant (TAC) based upon its potential to cause cancer and other chronic adverse health effects. In 2000, ARB approved a comprehensive Diesel Risk Reduction Program to reduce diesel emissions from both new and existing diesel-fueled vehicles and engines. The Program aims to develop and implement specific statewide regulations designed to reduce diesel PM emissions and the associated health risk 75% by 2010 and 85% by 2020.

District PM Reduction Programs

The Air District implements a number of regulations and programs to reduce PM emissions. These include rules limiting direct PM emissions from open burning of agricultural and non-agricultural waste, controlling dust from earthmoving and construction/demolition operations, limiting emissions from various combustion sources such as cement kilns and furnaces, and reducing PM from composting and chipping activities. In addition, the Air District also enforces rules that limit indirect PM precursor emissions such as NOx from industrial and other combustion sources and VOCs from coatings and solvents, product manufacturing, solid waste landfills, and fuel storage, transfer and dispensing activities.

The Air District also administers programs that deal specifically with emissions from wood-burning appliances such as fireplaces, wood stoves and heaters. In 1998, the Air District, with stakeholder input, developed a model wood smoke ordinance for fireplaces and woodstoves as a guidance document for cities and counties to regulate sources of particulate matter in their communities. The model ordinance does not ban wood burning in fireplaces, but seeks to take advantage of new, cleaner technologies that have been developed to effectively reduce wood smoke pollution. Since the ordinance was promulgated, Air District staff have worked with health agencies and interested residents in the Bay Area to advocate for the adoption of the ordinance. To date, a woodsmoke ordinance has been adopted by 37 cities and seven counties in the region.

Air District programs to control motor vehicle emissions also represent a significant commitment to reducing PM. Heavy-duty diesel engines are a significant source of diesel particulate matter (PM10) in California. Through several incentive-based programs, the Air District offers grants to reduce particulate matter emissions from motor vehicles. For example, the District implements the Carl Moyer program to fund replacement of old, dirty diesel equipment with newer, cleaner technology. The Air District's Transportation Fund for Clean Air (TFCA) program funds repowers and retrofits of heavy-duty diesel engines in public fleets. In fall 2004, legislation was enacted which 1) significantly increases funding for the Carl Moyer Program, and provides a stable funding source through the year 2014, and 2) authorizes local air districts to impose an additional $2 per vehicle surcharge on motor vehicle registrations, to be used for projects to reduce emissions from heavy-duty vehicles and school buses, scrappage or repair of existing in-use vehicles, and agricultural sources. The new legislation will greatly increase the available funding to implement low-emission vehicle projects,

especially projects to reduce emissions of NO_X and particulate matter from heavy-duty diesel engines.

Another Air District grant program is the Low Emission School Bus Program in which the Air District provides funding to public school districts, private schools and private school busing contractors to purchase cleaner replacement school buses and to install particulate matter control devices on school buses with diesel engines manufactured since 1991. The Air District's TFCA program also funds school bus replacement and retrofit projects.

To reduce air pollution, the Air District also operates a vehicle buy-back program to provide financial incentives to remove the oldest and most polluting vehicles from our roadways. Currently, the Air District will pay $650 for an operating and registered 1985 and older vehicle, and vehicle dismantlers contracted by the Air District will scrap the vehicles. The vehicle buy-back program is a voluntary program that takes older vehicles off the road and is funded through the Air District's Transportation Fund for Clean Air.

In addition, the Air District's Smoking Vehicle Program began in December 1992 as a voluntary program for reporting smoking vehicles. Each year an average of 35,000 calls are received complaining about vehicles emitting excessive visible exhaust. The Air District sends letters to vehicle owners notifying them of the air quality consequences of smoking vehicles, warns them of the possibility of being cited, and encourages them to have their vehicle checked and repaired.

In 2004, the Air District launched a new program, the Community Air Risk Evaluation Program (CARE) that will help further the understanding of community level risk from air toxics in the Bay Area. The initial phase of the program is expected to last 2-3 years, and involves the development of a comprehensive gridded Bay Area air toxics inventory. This inventory will include stationary, area, and mobile sources and will provide new detailed information on diesel PM and other TACs. CARE will include the development of risk reduction measures for impacted communities. Community outreach and education are also important components of the CARE program. The CARE program is discussed in more detail below.

Discussion of PM benefits of Ozone Control Measures

While the 2005 Ozone Strategy is intended to reduce ozone precursor emissions and does not specifically address PM, many of the proposed control measures are expected have the additional benefit of helping to reduced overall PM and diesel PM emissions.

Several stationary source control measures will reduce PM emissions. The flare control measure (SS-6 Flares, adopted as Regulation 12, Rule 12 on July 20, 2005) will result in decreased PM emissions from a reduction in incineration. The control measures aimed at combustion processes (boilers, large water heaters and stationary gas turbines) primarily reduce NO_x emissions. NO_x emissions from stationary (and vehicular) source fuel combustion are precursors to nitrates, which comprise a significant portion of ambient PM10. Therefore, these NO_x measures will also lead to a reduction in PM.

All of the mobile source measures will help reduce PM emissions, with the diesel equipment idling ordinance measure (MS-1) and the low-emission vehicle incentives measure (MS-3) helping to reduce diesel PM in particular. All of the transportation

control measures, by reducing vehicle trips and vehicle miles traveled will have the additional benefit of reducing PM emissions from fossil fuel combustion and reentrained road dust.

SB 656

Senate Bill 656, sponsored by Senator Byron Sher, was enacted in 2003. SB 656 requires ARB, in consultation with local air districts, to develop and adopt a list of the most readily available, feasible, and cost-effective control measures that could be employed by ARB and the air districts to reduce PM10 and PM2.5. The goal of SB 656 is to ensure progress toward attainment of State and federal PM10 and PM2.5 standards. The list of control measures is to be based on rules, regulations, and programs existing in California as of January 1, 2004 to reduce emissions from new, modified, or existing stationary, area, and mobile sources. ARB approved the list of control measures in November 2004. The bill also requires air districts to review the ARB list and develop implementation schedules for feasible control measures appropriate for the respective air basins based on the nature and severity of local PM conditions. The implementation schedules are to be developed by prioritizing adoption and implementation based on the effect each control measure will have on public health, air quality, emission reductions, as well as each control measure's feasibility, cost-effectiveness, and appropriateness for the respective region.

District staff completed its evaluation of the 103 measures on the ARB list and the Air District Board of Directors approved the SB 656 PM Implementation Schedule for the Bay Area On November 16, 2005. District staff identified two control measures from the ARB list for new rulemaking: (1) combustion emissions from stationary and portable IC engines and (2) chain driven commercial broiling operations. Two other existing District programs were identified for amendment: the wood-burning public awareness program and the voluntary wood-burning curtailment program. An additional 10 items were identified for further study and evaluation. The remaining 89 items were found to have no Bay Area sources, insignificant potential emission reductions or are already being addressed through current district rules, programs, or the Draft 2005 Ozone Strategy.

COMMUNITY AIR RISK EVALUATION (CARE) PROGRAM

Toxic air contaminants (TACs) are an area of serious concern in the Bay Area. TACs are substances that are either known or suspected carcinogens or cause other non-carcinogenic health effects. The Air District has long been involved in the reduction of air toxics in the Bay Area through a number of different programs including the preconstruction review of new and modified sources (New Source Review); the Air District's Air Toxics "Hot Spots" program to identify industrial and commercial emitters of toxic air contaminants and to encourage reductions in these emissions; and air pollution control measures designed to reduce emissions from categories of sources of TACs. Many of the Air District's regulations and programs aimed at reducing TACs also can reduce emissions of ozone precursors.

In July 2004, the Air District initiated a new program to address air toxics in the region from a community perspective. The Community Air Risk Evaluation (CARE) program was launched to determine health risk associated with toxic air pollutants in the Bay Area. The program has been designed to evaluate and reduce health risks associated with toxic air pollution in the Bay Area. When completed, studies from the CARE

program will be tools the Air District can use to reduce toxic air pollution in areas with the highest health risk. The CARE program will address a variety of toxic air pollutants with an emphasis on diesel particulate matter, which is thought to be the major source of airborne cancer risk in California. The projected time frame for completion of the initial study phase of the CARE program is 2-3 years.

The Air District has formed a CARE Task Force to provide input to District staff throughout the term of the program. The Task Force will be composed of community and environmental representatives with experience working on air quality and/or health issues, representative of various sectors of the regulated community, representatives of academic institutions in fields relevant to CARE as well as public health experts.

The CARE program includes a public outreach component. In addition to the Task Force, Air District staff will conduct community meetings to provide health risk information, update Bay Area residents about the results of the CARE studies, and to receive public comment. Information on the CARE program will also continue to be posted on the Air District's website. Any future regulatory actions will also require public notices and public workshops to solicit public comment.

The CARE program includes a number of technical and analytical quality assurance aspects. For example, Air District staff are using a new Thermal Optical Carbon Analyzer to determine the ratio of organic carbon to elemental carbon from the Air District monitors' particulate matter filters. Such enhanced air monitoring will better determine the relative contribution of air pollution sources, including vehicles, industrial emissions and/or wood burning to ambient particulate levels.

A significant step in the CARE program involves the development of criteria pollutant and air toxics emission density maps for the nine-county Bay Area. The Air District will develop emission inventories that will be mapped on 2 km x 2 km grids of the region using geographic information system (GIS) software. The "gridded" emission inventory will include emissions data from the District's area and point source inventories as well as the on-road motor vehicle emission inventory.

The CARE program will include an evaluation of risk reduction opportunities as well as the development and implementation of a risk reduction plan. The CARE program will provide technical information, so that the Air District can focus on reducing toxic pollutants in areas with the highest health risk through incentives, grant program funding and regulatory controls.

LOCAL BENEFITS

Ground-level ozone is a regional air pollutant that affects public health in various locations in the nine-county Bay Area. The areas within our region that have historically exhibited higher local ozone levels include the Livermore-Amador Valley, Southern Santa Clara County and Eastern Contra Costa County. Demographically, these areas do not differ dramatically from the Bay Area as a whole, and residents in these areas tend to be of moderate to higher socio-economic levels. Reducing regional ozone formation will likely lead to lower localized ozone levels in these particular parts of the Bay Area. However, implementation of the proposed ozone control strategy will also

result in localized benefits to other Bay Area communities that reside in close proximity to sources of air pollution.

Communities near major stationary sources, like refineries and gasoline bulk terminals, tend to have higher percentages of minority and lower-income residents. These communities will benefit from new control measures focused on these sources, especially with regard to toxic air contaminants (TACs). Toxic organic chemicals are often controlled directly by local, State and federal rules and permits. TAC emissions can also be reduced indirectly through ozone control measures. In evaluating potential control measures for the 2005 Ozone Strategy, local community benefit was a consideration where ozone control measures additionally could reduce exposure of nearby residents to TACs. The majority of the petroleum products production and distribution stationary source control measures, such as those for flares, gasoline bulk terminals and plants, organic liquid storage tanks, pressure relief devices and wastewater systems, are examples of control measures that will result in such community benefits, as well as reducing regional emissions of ozone precursors.

Other stationary source measures aimed at reducing emissions from industrial and commercial processes will similarly have the additional benefit of reducing health risks to nearby residents. Control measures such as those for auto refinishing, graphic arts operations, polyester resin operations, and wood products coatings are aimed primarily at reducing emissions from smaller stationary sources, dispersed more evenly throughout the region. These sources are often located in light industrial areas, sometimes in close proximity to lower-income residential areas with sensitive receptors. Therefore, by reducing emissions from these sources, there will be an overall reduction in the health risk from toxics.

Increased particulate matter (PM) levels are highly correlated to areas with high traffic volumes, including freeways and heavily traveled roadways. Diesel PM is of particular concern because it has been identified by the California Air Resources Board as a toxic air contaminant. Sensitive receptors (residences, schools, hospitals, etc.) may be at higher risk of cancer and other adverse health effects if they are in close proximity to these roadways, as well as facilities with high volumes of diesel equipment such as ports and distribution centers. The 2005 Ozone Strategy's mobile source and transportation control measures should provide local benefit to these communities by reducing emissions of particulate matter and diesel PM.

NATIONAL OZONE STANDARDS

The 2005 Ozone Strategy describes how the San Francisco Bay Area will make progress toward the State one-hour ozone standard as expeditiously as practicable and how the region will reduce transport of ozone and ozone precursors to neighboring air basins. The 2005 Ozone Strategy is not intended to meet any requirements related to the national ozone standard or planning requirements; this chapter has been included for informational purposes only.

Background

The Bay Area has a complicated history with respect to national ozone standards. For many years, the region violated the national one-hour ozone standard. As significant

emission reductions from aggressive controls on stationary and mobile sources resulted in a substantial downward trend in ozone precursor emissions, the Bay Area enjoyed five years of low ozone levels in the early 1990's, and EPA redesignated the region as an attainment area in 1995. Following two years of very hot weather and numerous exceedances of the standard, EPA redesignated the region back to nonattainment status in 1998. Since that time, further emission reductions from ARB and Air District programs led to further progress and resulted in the region's achieving an attainment record for the national one-hour ozone standard. Recently, EPA has implemented a new national 8-hour ozone standard, and has revoked the national one-hour ozone standard.

Recent History of Bay Area Attainment Planning for the National One-hour Ozone Standard

Previous Bay Area elements of the State Implementation Plan (SIP) have included the 1982 Bay Area Air Quality Plan, the 1993 Redesignation Request and Maintenance Plan (amended 1994), and the 1999 Ozone Attainment Plan. The 2001 Ozone Attainment Plan is the most recent Bay Area portion of the SIP. The following is a brief summary of recent history of Bay Area planning efforts for the national one-hour ozone standard.

Redesignation to Attainment. EPA redesignated the Bay Area to attainment status for the one-hour national ozone standard on May 22, 1995. The agency did this because the Bay Area attained the ozone standard at the end of the 1992 ozone season (having three "clean" years – 1990, 1991 and 1992). The region maintained the standard in 1993 and 1994. At the same time EPA took action on the Bay Area's ozone redesignation, EPA also approved an Ozone Maintenance Plan submitted by the Air District, MTC and ABAG ("co-lead" agencies) in 1993 and revised in 1994.

Redesignation Back to Nonattainment. In the summers of 1995 and 1996, the Bay Area experienced a number of episodes of hot, stagnant weather. This led to exceedances of the one-hour standard. EPA received two petitions requesting redesignation of the Bay Area to nonattainment status. EPA determined that the "contingency measures" in the Maintenance Plan were not adequate to bring the region back into compliance with the standard and that the region's adopted and projected actions would not be sufficient to reestablish attainment of the standard.

EPA revoked the region's ozone attainment status. The final notice for the revocation (July 10, 1998) called for the region to submit three plan elements: (1) a 1995 emissions inventory for Volatile Organic Compounds (VOC) and Nitrogen Oxides (NOx), (2) an attainment assessment (an analysis, based on available information, showing the VOC and NOx reductions necessary for the region to re-attain the one-hour national ozone standard), and (3) a control strategy, comprised of control measures that provide sufficient emission reductions to attain the ozone standard.

1999 Ozone Attainment Plan. The co-lead agencies prepared the 1999 Ozone Attainment Plan to comply with these requirements. The 1999 Plan was submitted to EPA in August 1999.

The deadline EPA set for attaining the one-hour national ozone standard was November 15, 2000. The region continued to experience a few exceedances of the one-hour standard in 1999 and 2000. Emission reductions from control measures in the 1999

Ozone Attainment Plan were not sufficient to bring the Bay Area back into compliance in that timeframe.

In March 2001, EPA proposed to make a formal finding that the Bay Area had not attained the national one-hour ozone standard. EPA finalized the March notice on August 28, 2001. EPA's August 28, 2001 action approved some parts and disapproved other parts of the 1999 Plan.

EPA's finding that the region had failed to attain the one-hour standard established a requirement for a new ozone attainment plan. The new plan was required to be submitted by September 2002, and was required to show attainment of the one-hour standard by fall 2006.

The 2001 Ozone Attainment Plan. The co-lead agencies prepared the 2001 Ozone Attainment Plan to revise the elements of the 1999 Plan that EPA disapproved, and also added other elements triggered by the finding of failure to attain.

In July 2003, EPA proposed an interim final determination that the 2001 Plan corrected the deficiencies of the 1999 Plan and proposed approval of the 2001 Plan.

Finding of Attainment and Approval of the 2001 Ozone Attainment Plan. Following three years of low ozone levels (2001, 2002 and 2003), in October 2003, EPA proposed a finding that the Bay Area had attained the national one-hour standard and that certain elements of the 2001 Plan (attainment demonstration, contingency measures and reasonable further progress) were no longer required.

In April 2004, EPA made final the finding that the Bay Area had attained the one-hour standard and approved the remaining applicable elements of the 2001 Plan: emission inventory; control measure commitments; motor vehicle emission budgets; reasonably available control measures; and commitments to further study measures.

Revocation of the National One-hour Ozone Standard. EPA recently transitioned from the national one-hour standard to a more health protective 8-hour standard. In April 2004, EPA designated regions for the new national 8-hour standard (discussed below). The 8-hour standard took effect in June 2004. The one-hour standard was revoked on June 15, 2005.

National 8-hour Ozone Standard

In July 1997, EPA established a new national ozone standard. The new 8-hour standard became effective in June 2004. Defined as "concentration-based," the new national ozone standard is set at 85 parts per billion averaged over eight hours. The determination of whether a region attains the standard is based on the 3-year average of the annual 4th highest daily maximum 8-hour ozone concentration. The new national 8-hour standard is considered to be more health protective because it protects against health effects that occur with longer exposure to lower ozone concentrations.

In April 2004, EPA designated regions as attainment and nonattainment areas for the 8-hour standard. These designations took effect on June 15, 2004. EPA formally designated the Bay Area as a nonattainment area for the national 8-hour ozone

standard, and classified the region as “marginal” according to five classes of nonattainment areas for ozone, which range from marginal to extreme. Compliance with the standard is determined at each monitoring station using an average of the 4th highest ozone reading for three years. A violation at any monitoring station results in a nonattainment designation for the entire region because ozone is a regional pollutant. Monitoring data for the San Martin station for the years 2001, 2002 and 2003 show an average of the 4th highest ozone values of 86 parts per billion (one part per billion above the standard), hence the Bay Area’s “marginal” nonattainment classification. Marginal, nonttainment areas must attain the national 8-hour ozone standard by June 15, 2007.

While certain elements of Phase 1 of the 8-hour implementation rule are still undergoing legal challenge, EPA signed Phase 2 of the 8-hour implementation rule on November 9, 2005. It is not currently anticipated that marginal areas will be required to prepare attainment demonstrations for the 8-hour standard. Other planning elements may be required. The Bay Area plans to address all requirements of the national 8-hour standard in subsequent documents. In addition, in anticipation of the implementation rule, the Air District has continued to work in collaboration with ARB and other Northern California air districts through the Northern California Agencies SIP/Transport Working Group to address 8-hour planning requirements for other regions in Northern California.

PHOTOCHEMICAL MODELING

The Bay Area is not in attainment of the California one-hour ozone standard, but at present ARB is not requiring air districts to conduct photochemical ozone modeling as part of the plans for attaining the California one-hour ozone standard. Consequently, the 2005 Ozone Strategy does not include computer modeling to forecast future ozone levels. However, the Air District is committed to working with downwind air districts and ARB on developing and refining photochemical ozone modeling for northern and central California in order to evaluate transport of ozone and ozone precursors among air districts. These activities are important also because we expect ARB to require modeling for the State one-hour ozone standard in future plan updates once modeling capability and resources are available to conduct such modeling throughout the state. In addition, the Air District has continued to work in collaboration with ARB and other Northern California air districts through the Northern California Agencies SIP/Transport Working Group to address national 8-hour planning requirements for other regions in Northern California.

With the help of consultants, ARB, and members of our Modeling Advisory Committee (MAC), the Air District is developing a state-of-the-science photochemical ozone modeling system as a tool for future ozone planning for the Bay Area and for analyzing pollutant transport to downwind air basins. To date, the Air District has made significant progress in developing modeling results for recent periods of high ozone. This section provides an overview of our modeling progress and describes the Air District's future short-term objectives with respect to modeling ozone.

Background

Ozone is not emitted directly into the air, but rather is formed secondarily from other precursor pollutants through a series of complex chemical reactions that take place in the presence of sunlight. Important precursor emissions include ROG and NO_x. Further complicating the issue of understanding and reducing ozone is the fact that the chemical reactions that control ozone levels are nonlinear, which means that a reduction in precursor emissions under one set of background conditions could have a different effect on ozone than that same reduction with a different set of background conditions.

Previous modeling studies and analyses of observations have suggested that the production of ozone in the Bay Area is limited by the availability of ROG, which means ozone is most sensitive to reductions in ROG emissions. These studies further suggest that reductions in NO_x emissions will continue to produce smaller reductions in ozone until the total inventory of NO_x is significantly reduced. These studies also indicate that reductions in NOx emissions can increase ozone in areas near the source of those emissions. Previous studies have suggested that the air basins to the east and downwind of the Bay Area are more sensitive to NO_x reductions.

Because of these complexities, a computer modeling system is needed to link precursor emissions to ozone levels. The basic steps required for the computer modeling are as follows:

- Identify and collect a set of observations suitable for creating inputs to the modeling system and for evaluating the system's performance. This set of observations is used to form a database that includes meteorological

measurements both near the ground and aloft, day-specific activity data for determining emissions, and observations of ozone levels and levels of ozone precursor pollutants both near the ground and aloft. The observational database defines the historic period that is used for the modeling.

- For the historic period defined by the observations, apply a computer model to generate the meteorological inputs, such as winds and temperatures. Wind inputs are needed to specify how air pollution is transported within the Bay Area and throughout Central California; temperature inputs help determine the rates of atmospheric chemical reactions.

- For the historic period defined by the observations, apply a computer model to compile and assign emissions from all the various sources of air pollutants including cars and trucks, industrial sources, solvents, lawn mowers and many others.

- Using the meteorological inputs and the emissions inputs, apply a computer model to predict ozone levels. Field observations are used to evaluate the modeling system. If the modeling system is judged to be reliably representing the formation of ozone in the Bay Area and surrounding air basins, then the system can be used as a planning tool to predict future ozone levels given future growth and controls in the emissions of precursor pollutants.

Observations from the Field

The Central California Ozone Study (CCOS) was a large field study conducted during the summer of 2000. The study involved many sponsors and participants, with a budget of over $15 million for measuring meteorological parameters (e.g., temperature, winds), emissions (e.g. ROG, NO_x), and ozone concentrations throughout Central California. In addition, ARB and local air districts provided substantial in-kind contributions to the study. The CCOS field measurement program covered a domain that includes much of northern California, extending north of Redding, and all of central California, including the San Francisco Bay Area, and the Sacramento Area, and San Joaquin Valley. The study domain is similar to, but contained within, the domain used for modeling ozone shown in Figure 8. A summary report on the CCOS field operations has been completed and is available on-line: http://www.arb.ca.gov/airways/ccos/docs/ccosv3fdS0.zip.

The CCOS participants collected many special surface and upper-air meteorological and air quality measurements, in addition to the extensive permanent network of measurements that are routinely available. During the primary study period for CCOS, which extended from the beginning of July 2000 to the end of September 2000, there was one period, Monday July 31st, 2000, where ozone exceeded the national one-hour standard in the Bay Area. High ozone followed in the Sacramento Valley on August 1st and in the San Joaquin Valley on August 2nd (Table 19).

In general, one of the main problems with field studies is that, because the studies only occur during a limited window in time, the worst air quality episodes are often missed. One such episode occurred from July 11th to 12th in 1999. During this period, four sites in the Bay Area exceeded the national one-hour standard (Table 20). Because this was such an extreme event within the Bay Area and throughout Central California, these dates were also targeted for computer modeling. Since no special-study data were

collected during this period, the modeling relied on the extensive network of routinely collected field measurements. ARB routinely archives air quality data for the entire State and these data were used exclusively for 1999. ARB also collected and reformatted meteorological data from six different agencies within California for the 1999 episode. The Air District extensively reviewed and quality-assured these meteorological data.

Table 19: Observed High Ozone from July 31, 2000, to August 2, 2000, in Central California

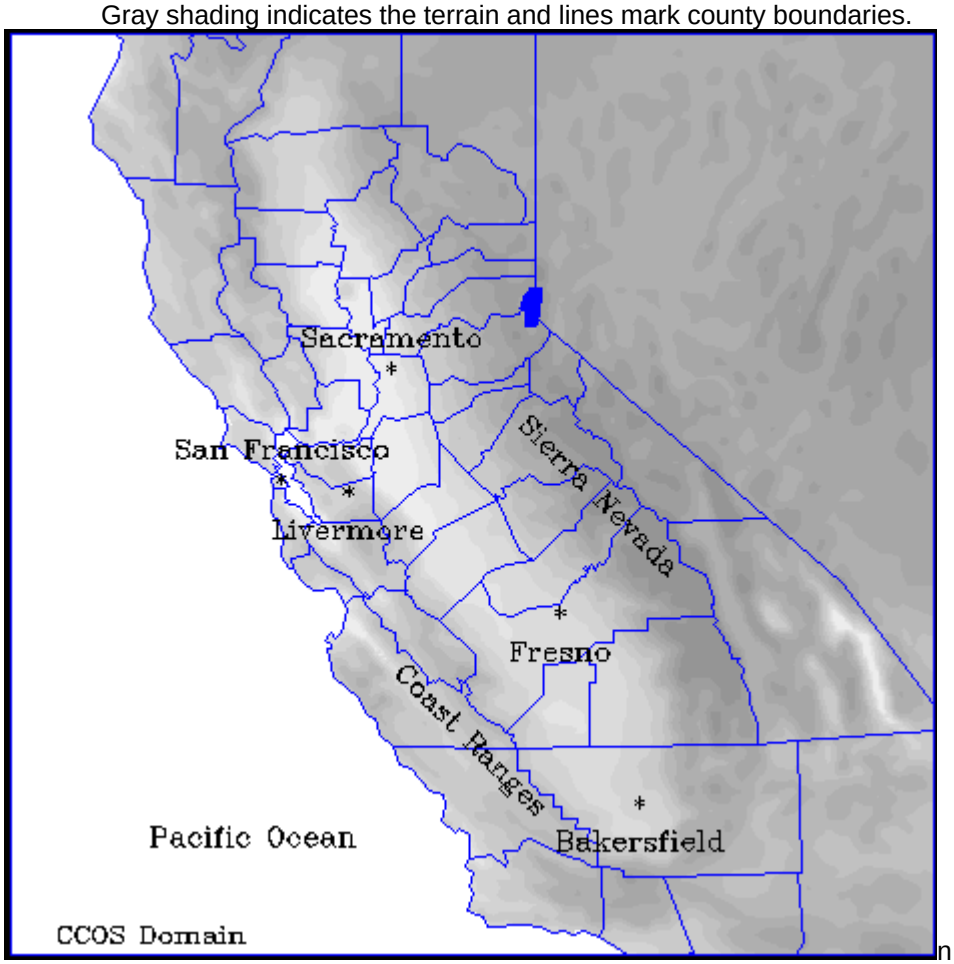
Day	7/31/2000								8/1/2000								8/2/2000							
Hour (PST)	12	13	14	15	16	17	18	19	12	13	14	15	16	17	18	19	12	13	14	15	16	17	18	19
SF Bay Area																								
Livermore - Old 1st	68	88	116	123	126	73	53	34	73	86	92	81	68	65	52	37	88	93	98	84	69	57	49	46
Sacramento																								
Sloughhouse		100	92	87	78	74	66	80	88	112	133	126	119	112	95	82	98	102	101	103	98	66	77	69
San Joaquin																								
Edison	115	110	106	94	81	74	38	19	113	109	93	102	102	96	83	73	129	151	139	121	76	51	45	39
Turlock	75	91	104	105	96	88	64	52	100	101	97	104	86	85	73	61	98	95	114	117	116	131	106	79
Modesto - 14th	74	87	94	90	84	81	60	41	80	84	99	87	94	91	70	53	90	94	95	113	131	128	85	64

Table 20: Observed High Ozone from July 11-12, 1999, in Central California

Day	7/11/1999								7/12/1999						
Hour (PST)	12	13	14	15	16	17	18	19	12	13	14	15	16	17	18
SF Bay Area															
Concord	113	115	126	120	126	99	102	81	134	156	149	129	104	93	99
Livermore	88	94	96	138	145	146	128	93	117	144	133	128	111	94	86
Fremont	79	111	133	117	101	66	43	14	93	98	90	88	80	73	59
San Martin	112	121	124	125	97	62	56	45	115	96	90	74	65	55	46
Sacramento															
Folsom	125	132	133	137	125	107	98	90	109	108	100	89	89	92	107
Vacaville	96	97	99	122	118	101	82	62	108	127	140	115	95	74	65
Auburn	85	90	91	93	111	133	118	112	89	93	90	89	99	95	82
Sacto - Del Paso	112	121	115	106	101	95	89	71	97	94	96	90	92	111	89
Sloughhouse	125	131	116	109	105	103	100	83	108	106	110	103	96	105	91
Roseville	108	120	128	128	119	108	100	81	96	90	82	78	78	81	108
Rocklin	99	115	128	123	119	111	105	92	99	96	85	79	80	82	104
San Joaquin															
Clovis	124	140	142	125	105	110	81	58	112	124	108	102	98	96	90
Fresno - 1st St	128	130	132	135	124	114	99	63	114	115	108	95	88	87	75
Tracy	84	94	91	97	97	97	95	94	102	106	117	118	132	121	113
Stockton - Hazelton	107	122	130	122	108	113	91	62	100	96	95	90	86	102	95
Merced	111	115	118	116	112	110	110	100	121	125	117	115	102	108	118

Figure 8: Central California Modeling Domain

Gray shading indicates the terrain and lines mark county boundaries.



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Description of the Meteorology

High ozone levels can occur on days with high temperatures and light winds. During the summer, when the sunlight is intense, ozone-conducive conditions result when the Pacific high-pressure system moves onshore and blocks the movement of weather systems into California and reduces the normal ventilating sea breeze. Two different kinds of high ozone days typically occur in the Bay Area: days with widespread ozone throughout the region and its surroundings, and days with high ozone only at isolated locations. The July 1999 days were found to fall into the first category (widespread ozone), whereas the summer 2000 period was found to belong in the second (isolated ozone). The Air District modeling study includes meteorological inputs for the July 1999 days and the July-August 2000 period, so both types of days will be represented.

Inventory of Pollutant Emissions

ARB, with assistance from the air districts and consultants, developed emissions inventories for all of Central California during each of the high-ozone periods described above. Separate, day-specific, modeling inputs were created for stationary point sources, for on-road motor vehicles, and for off-road vehicles and area-distributed

sources. There is also an emissions input for biogenic emissions, which include ROG from plants and trees and NO_x from soils, especially soils rich with nitrogen-containing fertilizers.

An important step in developing the modeling inventory is spatially distributing the emissions within the modeling grid. ROG emissions are found concentrated near urban centers and along roadways, but also in the foothills of the Sierra Nevada and Coast Ranges where some tree species are high emitters. NO_x emissions (reported as NO2) are highest along roadways since on-road motor vehicles are the largest source.

Computer Models Applied

The computer modeling required the application of a number of different models. The meteorological model applied for both the July 1999 and the July-August 2000 episodes was the MM5 model. The specific meteorological inputs applied for modeling the July 1999 episode were developed by ARB, while the inputs applied for modeling the July-August 2000 episode were developed by National Oceanic and Atmospheric Administration (NOAA), with assistance from the Air District.

The emissions processing of episode-specific emissions was conducted with the 1995 Emissions Modeling System (EMS-95), the same model used by ARB to generate emissions for past state implementation plans (SIPs)[12] in Central California. The EMFAC 2002 model was used to provide up-to-date emissions estimates of on-road motor vehicle emissions. The biogenic inventory estimates were generated by the ARB's BEGIS model, which includes the latest vegetation maps and updated algorithms for plant emissions. Area source emissions used the most recent available population and employment estimates.

The air quality model, the Comprehensive Air Quality Model with extensions (CAMx, version 4.03) was used to predict ozone, using inputs from the MM5 model and the EMS-95 model. All of the selected models have been, or are currently being, used nationally for various SIPs and/or regional regulatory analyses, and thus have been accepted by the EPA and many States for this purpose. CAMx uses the current best representation of photochemical reactions and it supports a suite of probing tools to conduct sensitivity studies and an analysis of processes within the model that can be used to help ensure the model is working correctly. The CAMx model was also used by ARB for modeling of the CCOS episodes.

Results to Date

The meteorological fields generated with MM5 were evaluated against wind, temperature, and humidity observations. For both the July 1999 and the July-August 2000 simulations, MM5 tended to underpredict temperatures in the Central Valley and overpredict moisture levels. Statistical performance criteria were defined and these were compared to statistics generated for meteorological simulations used for past air quality modeling efforts. For the July-August 2000 episode, the meteorological performance statistics within Central California suggested that performance was typical, while the

[12] A state implementation plan is a statewide plan to achieve national ambient air quality standards.

1999 performance was less successful, but still acceptable. For the Bay Area subregion, both simulations successfully represented important local flow patterns.

The modeling emissions inventory inputs are difficult to evaluate independently. However, an independent estimate of on-road motor vehicle emissions was available from a UC Berkeley study. That study used fuel sales, on-road measurements, and ambient pollutant ratios to derive emissions. In the Bay Area, the fuel-based method and EMFAC estimates agree to within about 25% for VOC and to within 10% for NO_x. In the San Joaquin Valley, the fuel-based estimates of both VOC and NO_x are higher by about 50%.

For assessing model performance for ozone predictions, EPA has developed a set of performance goals. The performance statistics for ozone predictions in the Bay Area from the CAMx model indicate that the model is meeting the performance goals on all Bay Area high ozone days. The model meets most performance goals for other regions as well. However, while the model captures the observed peaks in Sacramento, the model underpredicts on July 11, 1999, and on August 1, 2000. The model underpredicts peak ozone values in the San Joaquin Valley on July 12, 1999, and August 2, 2000.

Future Directions

The computer modeling work has produced reliable simulations of ozone production in the Bay Area and surrounding regions for most of the days and regions modeled. In the near future, the Air District expects to use the modeling system to:

- analyze the effects of reductions in Bay Area emissions on Bay Area ozone, and
- assess the impacts of ozone and ozone precursors transported between air basins on air quality in Central California.

These future modeling efforts will be focused on the national eight-hour ozone standard.

ARB has similar modeling efforts underway and has also modeled the July 1999 and the July-August 2000 episodes with results that are similar to the Air District's. ARB will also focus on modeling for the national eight-hour ozone standard. The Air District will coordinate with ARB and northern California air districts in this effort.

For the current modeling effort, we used multiple episodes and recent base years 1999 and 2000. Many improvements have been made in the emissions inventory modeling inputs. We expect that these updates and improvements will result in an improved modeling system compared to previous modeling efforts.

A technical report describing how the base-case modeling was conducted is available on the Air District’s website at the following address: http://www.baaqmd.gov/pln/plans/ozone/2003_modeling/baaqmdmodelingreport_jan05.pdf

ENVIRONMENTAL REVIEW

The 2005 Ozone Strategy is intended to and expected to benefit public health and the environment by reducing emissions of the air pollutants that form ozone. However, implementation of the proposed control measures could result in secondary environmental effects if, for example, any means used to reduce these emissions causes impacts to water, air quality, energy, hazards and hazardous materials, noise, public services and transportation. Therefore, the Air District, as the lead agency, has prepared an Environmental Impact Report (EIR) pursuant to the California Environmental Quality Act (CEQA).

APPENDICES

Appendix A – Public Involvement Process

Appendix B - Control Measure Review and Evaluation Process

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Appendix C - Stationary Source and Mobile Source Control Measure Descriptions

Appendix D - Transportation Control Measure Descriptions

Appendix E - Further Study Measure Descriptions

APPENDIX A - PUBLIC INVOLVEMENT PROCESS

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INTRODUCTION

The Air District's public involvement program for the 2005 Ozone Strategy has been very extensive. It has included a variety of outreach techniques, including public presentations, technical work group meetings, community meetings, email notices, and an ozone planning website. These strategies comprise the Air District's broad community outreach program to achieve the following goals:

- Include all the diverse stakeholders in the planning process (industry, community groups, environmental groups, local governments, neighboring air districts, and concerned citizens)
- Address stakeholder needs, issues and concerns
- Provide timely and accurate information
- Enhance communication between the Air District and all of the stakeholders
- Build understanding and support for ozone planning and related air quality programs and projects

OZONE WORKING GROUP

During 2003-2004, the Air District, in cooperation with MTC and ABAG, convened a technical group called the Ozone Working Group (OWG) to help develop the Bay Area 2005 Ozone Strategy. The group was established as a way for members of the public and interested parties to be involved in all stages of the ozone planning process. All OWG meetings have been open to the public.

At OWG meetings, staff has presented updates on various aspects of the planning process, answered questions, and solicited discussion and public comment. Topics have included public involvement efforts, modeling, development and evaluation of control measures, regulatory and rule-making updates, MTC's Transportation 2030 process, and other items. OWG meetings are held approximately bi-monthly, during business hours, at MetroCenter in Oakland. OWG meetings are conducted by professional facilitators, with presentations primarily by Air District and MTC staff.

All meeting notices, agenda and handouts for the Ozone Working Group can be downloaded at http://www.baaqmd.gov/pln/plans/ozone/2003_workgroup/index.asp

The following list provides details on each OWG meeting held, to date:

Meeting #1:
March 23, 2003, 10 a.m. – 12 p.m.
MetroCenter Auditorium, 101 8th Street, Oakland, CA

Agenda topics:

- Background
  - Ozone sources, health effects and trends
  - State and federal planning requirements
  - Components of an ozone plan/strategy
  - Current control measures & further study measures
  - Other outreach underway

- Public Involvement Process
  - Role of Ozone Working Group
  - Schedule and topics for future OWG meetings
  - OWG format, future meeting topics, location & time
  - Suggestions for additional outreach

Meeting materials:
- Ozone Fact Sheet
- Ozone Trends
- State & Natl. A.Q. Planning Requirements
- 2001 Plan Measure Status
- Community Outreach
- Potential Meeting Topics
- Ozone Strategy Draft Schedule

Meeting #2:
May 4, 2003, 2 p.m. – 4 p.m.
MetroCenter Auditorium, 101 8th Street, Oakland, CA

Agenda topics:
- Control Measures
  - Criteria for evaluating potential control measures
  - Summary of existing control measures, previous control measure suggestions, and current control measure suggestions
  - Suggestions for new/revised control measures

Meeting materials:
- Ozone Working Group March 27, 2003 meeting notes
- Control measure evaluation criteria
- Existing control measures and current status
- Prior stationary source control measure suggestions
- Transportation Control Measure Review Process
  - Attachment A – Federal TCMs (from 2001 Ozone Attainment Plan)
  - Attachment B – TCM Further Study Measures
  - Attachment C – Reasonably Available Control Measure evaluation for TCMs in 2001 Ozone Attainment Plan
  - Attachment D – TCMs in 2000 (State) Clean Air Plan
- Summary of control measure suggestions received to date
- Bay Area baseline emission inventory projections: 1995 – 2006

Meeting #3:
August 5, 2003, 9:30 a.m. – 11:30 a.m.
MetroCenter Auditorium, 101 8th Street, Oakland, CA

Agenda topics:
- Overview of Ozone Modeling
  - Summary of current ozone modeling
  - Q&A on ozone modeling presentation

- Control Measure Screening
  - Sources of suggested measures
  - Evaluation criteria
  - Suggested measures still under evaluation
  - Suggested measures already implemented
  - Suggested measures not passing screen
  - Suggested measures passing evaluation

Meeting materials:

- May 14 OWG meeting notes
- May 14 OWG responses to comments
- Modeling Overview
- Control Measure Evaluation Criteria
  - Stationary & Mobile Source measures
  - Transportation Control Measures
- Suggested Measures Still Under Evaluation
- Suggested Measures Already Implemented
- Suggested Measures not Passing Screen
- Suggested Measures Passing Evaluation
- Screening of TCMs

Meeting #4:
October 28, 2003, 9:30 a.m. – 11:30 a.m.
MetroCenter Auditorium, 101 8th Street, Oakland, CA

Agenda topics:

- Status Reports
  - Community meetings
  - Modeling
  - Existing refinery measures
  - TCM workshop
- Transportation, Land Use and Air Quality
  - Transportation 2030 Plan – smart growth and air quality goals
  - MTC's transportation and land use initiatives
- Control measure evaluation
  - Status report
  - Discussion / feedback on suggested measures

Meeting materials:

- August 5 OWG responses to comments
- Status report on community meetings
- Status report on existing refinery measures
- Status report on TCM workshop
  - Status report and agenda
  - Powerpoint presentation
- Transportation 2030 and the transportation and land use connection
  - T-2030: Key issues and preliminary strategies
  - T-2030: Revised goals
  - Transportation and land use initiatives
- Status report on control measure evaluation

Meeting #5:
January 6, 2004, 9 a.m. – 11 a.m.
MetroCenter Auditorium, 101 8th Street, Oakland, CA

Agenda topics:

- Status Reports
  - National 8-hour designations
  - Refinery measures
  - Transportation 2030
- Attainment of National one-hour Ozone Standard
  - Finding of attainment
  - Redesignation Request
  - Continuing ozone control efforts
- Control Measure Evaluation
  - Preliminary stationary, mobile and other source evaluations
  - Preliminary transportation control measures evaluations

Meeting materials:

- October 28 OWG responses to comments
- Attainment of national one-hour standard and redesignation requirements
- Control measures evaluations
  - Preliminary stationary, mobile and other source evaluations
  - Preliminary transportation control measure evaluations

Meeting #6:
January 20, 2004, 9 a.m. – 11 a.m.
MetroCenter Auditorium, 101 8th Street, Oakland, CA

Agenda topics:

- Control Measure Evaluation - Continued Discussion
  - Preliminary stationary, mobile and other source evaluations
  - Preliminary transportation control measure evaluations

Meeting materials:

- January 6 OWG meeting notes
- Control measures evaluations
  - Preliminary stationary, mobile and other source evaluations
  - Preliminary transportation control measure evaluations

Meeting #7:
March 23, 2004, 9:30 a.m. – 11:30 a.m.
MetroCenter Auditorium, 101 8th Street, Oakland, CA

Agenda topics:

- Status Reports
- Control Measure Evaluation
  - Revised stationary, mobile and other source evaluations
  - Revised transportation control measures evaluations
- Control Measure Descriptions

- Preliminary draft stationary, mobile and other source measures
- Preliminary draft transportation control measures

Meeting materials:

- January 20 OWG meeting notes
- Control measures evaluations
  - Revised stationary, mobile and other source evaluations
  - Revised transportation control measure evaluations
- Control Measure Descriptions
  - Preliminary draft stationary, mobile and other source measures
  - Preliminary draft transportation control measures

Meeting #8:
May 20, 2004, 9 a.m. – 11 a.m.
MetroCenter Auditorium, 101 8th Street, Oakland, CA

Agenda topics:

- Status Reports
  - National one-hour ozone standard – finding of attainment
  - National 8-hour ozone designation & classification
  - Ozone Strategy / CEQA process and schedule
  - Health & Safety Code Section 40233 – TCM emission reductions
  - Modeling
  - Rule development schedule
- Control Measure Descriptions
  - Preliminary draft stationary source measures
  - Preliminary draft mobile source measures
  - Preliminary draft transportation control measures
  - Preliminary draft further study measures

Meeting materials:

- March 23 OWG meeting notes
- Control measure descriptions
  - Cover memo
  - Preliminary draft stationary source measures
  - Preliminary draft mobile source measures
  - Preliminary draft transportation control measures
  - Preliminary draft further study measures

Meeting #9:
September 28, 2004, 9:30 a.m. – 11:30 a.m.
MetroCenter Auditorium, 101 8th Street, Oakland, CA

Agenda topics:

- Status Reports
  - Ozone Strategy and CEQA review - process and schedule
  - Rule development update
  - T2030 process and schedule
- Draft Ozone Control Measures
  - Draft stationary source measures

- Draft mobile source measures
- Draft transportation control measures
- Draft further study measures

Meeting materials:

- May 20 OWG meeting notes
- Draft Control Measure Descriptions
  - Cover memo
  - Summary of Draft Ozone Control Measures and Further Study Measures

Meeting #10:
October 25, 2005, 9:30 a.m. – 11:30 a.m.
MetroCenter Auditorium, 101 8th Street, Oakland, CA

Agenda topics:

- Status Reports
  - National 1-hr and 8-hr ozone standards
  - Ozone Strategy and EIR – process overview and schedule
  - Rule development update
  - Regional transportation planning update
  - ABAG Regional Smart Growth activities update
- Draft Ozone Strategy and DEIR
  - Draft Ozone Strategy Presentation
  - Q&A / Comments
  - Draft Environmental Impact Report Presentation
  - Q&A / Comments
- Air District Grants & Incentive Programs

Meeting materials:

- Summary of Draft Ozone Strategy and Draft EIR findings

OUTREACH METHODS FOR OZONE WORKING GROUP

Mailing to interested parties list

Ozone Working Group meeting notices are typically sent three weeks prior to the meeting date to the Air District's mailing list of over 900 recipients. The mailing list includes individuals from environmental and community groups, business and industry groups, elected officials, local staff, state and federal agencies, neighboring air districts, and other interested parties. MTC also mails OWG meeting notices to their mailing list of interested parties.

Web Postings

The Air District has an Ozone Planning webpage that provides extensive technical information, status reports, announcements and meeting notices. Information on the website regarding the 2005 Ozone Strategy is regularly updated. The website can be reached at http://www.baaqmd.gov/pln/plans/ozone.

The Air District also maintains a website specifically for the Ozone Working Group where all meeting notices, agenda and handouts can be downloaded. The website can be reached at http://www.baaqmd.gov/pln/plans/ozone/2003_workgroup/index.htm
MTC has also included web postings for OWG meetings and links to the Air District webpage from their webpage, http://www.mtc.ca.gov.

Email notices
The Air District maintains an Ozone Working Group email distribution list of over 100 individuals. The email distribution list includes prior meeting attendees and other interested parties. OWG meeting notices and other pertinent information about the ozone planning process has been disseminated through this email list. ABAG also maintains an email list for distributing OWG notices. ABAG's list primarily consists of city and county planning directors, city managers, county administrators and public health officials from their own database.

Log of OWG Notifications

Date	Notice/Document	How Distributed
3/5/03 mail and website	Ozone Working Group 1st meeting announcement distributed	BAAQMD, MTC, ABAG mailing lists; BAAQMD website
4/14/03	Email to Save the date for May 14th OWG meeting	Ozone Working Group email list
4/22/03	Ozone Working Group 2nd meeting notice	BAAQMD mailing list, MTC mailing list
5/2/03	Email announcing that agenda and handouts are available on OWG website for May 14th OWG meeting	Ozone Working Group email list
7/11/03	Ozone Working Group 3rd meeting notice	BAAQMD, MTC, ABAG mailing lists
7/14/03	Email reminder and meeting notice attachment for Aug 5th OWG meeting	Ozone Working Group email list
9/24/03	Email announcing TCM workshop	Ozone Working Group email list
10/3/03	Ozone Working Group 4th meeting notice	BAAQMD, MTC, ABAG mailing lists
10/7/03	Email reminder and meeting notice attachment for Oct 28th OWG meeting	Ozone Working Group email list
10/17/03	Email announcing that agenda and handouts are available on OWG website for Oct 28th OWG meeting	Ozone Working Group email list
12/12/03	Ozone Working Group 5th meeting notice	BAAQMD, MTC, ABAG mailing lists
12/16/03	Email reminder and meeting notice attachment for Jan 6th OWG meeting	Ozone Working Group email list
12/29/03	Email announcing that agenda and handouts are available on OWG website for Jan 6th OWG meeting	Ozone Working Group email list
1/8/04	Notice for control measure evaluation continued discussion at Jan 20th Ozone Working Group meeting	BAAQMD mailing lists and OWG, ABAG email list
1/15/04	Email announcing that agenda and handouts are available on OWG website for Jan 20th OWG meeting	Ozone Working Group email list
3/2/04	Ozone Working Group March 23rd Meeting notice	BAAQMD mailing lists and OWG, ABAG email list
3/16/04	Email announcing that agenda and handouts are available on OWG website for March 23rd OWG meeting	Ozone Working Group email list
5/5/04	Ozone Working Group May 20th Meeting notice	BAAQMD mailing lists and OWG, ABAG email list
5/14/04	Email announcing that agenda and handouts are available on OWG website for May 20th OWG meeting	Ozone Working Group email list

Date	Notice/Document	How Distributed
9/3/04	Email notification to OWG list about community meetings and posted Draft Control Measures	OWG email list
9/15/04	Ozone Working Group Sept 28th Meeting notice	BAAQMD mailing lists and OWG, ABAG email list
9/21/04	Email announcing that agenda and handouts are available on OWG website for Sept 28th OWG meeting	Ozone Working Group email list
9/9/05	Notification about availability of Draft 2005 Ozone Strategy for public review and two upcoming public meetings	BAAQMD mailing lists and OWG email list, ABAG email list
10/7/05	Notification about availability of DEIR for public review and two upcoming public meetings	BAAQMD mailing lists and OWG email list, ABAG email list
10/24/05	Email announcing that agenda and handouts are available on OWG website for Oct 25th OWG meeting	Ozone Working Group email list

COMMUNITY MEETINGS

The Air District has also conducted multiple rounds of community meetings to discuss the 2005 Ozone Strategy. The first round of community meetings occurred in September 2003. Community meetings were held in the evening at community centers in Rodeo, East Palo Alto, Richmond, East San Jose, West Oakland, and southeast San Francisco. The community meetings were intended to provide background information on ozone health effects and regulatory programs, and to solicit suggestions on potential control measures. The Rodeo and East Palo Alto meetings also included Supplemental Environmental Projects (SEP) on the agendas.

The second round of community meetings occurred in September and October 2004. These community meetings were held in the evening at public facilities in Petaluma, Richmond, San Jose, Oakland, San Francisco, Livermore and Martinez. The second round of community meetings also provided background information on ozone health effects and regulatory programs, updates on the ozone planning process, and solicited input of draft ozone control measures and further study measures. The 2004 meetings also included discussion of the Air Districts new Community Air Risk Evaluation (CARE) program.

The final community meeting occurred on October 26, 2005 in Richmond. This meeting provided background information on ozone health effects and regulatory programs, presented the Draft 2005 Ozone Strategy and DEIR and solicited public comments on these two documents. This community meeting also provided information on the new national 8-hour ozone standard by ARB staff as well as information on upcoming Air District grants and incentive programs.

In addition to the community meetings, Air District staff worked with community groups to conduct “pre-meetings.” Pre-meetings served as training sessions in which staff met with community members to provide background information on ozone planning,

answered questions, and otherwise helped participants prepare for the community meetings. Two such pre-meetings were held in Richmond and San Jose prior to the 2003 community meetings, and one pre-meeting was held in Richmond prior to the 2004 community meetings.

2003 Richmond Pre-meeting
Co-sponsored by the Community Health Initiative, Communities for a Better Environment, the West County Toxics Coalition, Contra Costa Health Services, and the Bay Area Air Quality Management District.

Wednesday, September 3, 2003, 6:00 p.m. – 8:00 p.m.
Nevin Community Center Auditorium, 598 Nevin Avenue, Richmond, CA

Agenda topics:

- Controlling Air Pollution
  - Why does the BAAQMD develop these plans?
  - What is an ozone attainment plan?
  - What is ozone; how is it formed; good ozone vs. bad ozone
  - Where does air pollution come from?
- What Types of Control Measures Are Included in an Ozone Plan and Who Has Authority Over What Sources
- The Rule making Process: Flare Case Study
- How residents can get involved (next steps)

Meeting materials:

- Ozone Sources, Plans and Controls Fact Sheet
- Existing Control Measures and Current Status
- How the Rulemaking Process Works at the Air District
- Ozone Planning – Technical Terms

2003 San Jose Pre-meeting
Informational pre- meeting conducted with community members and Silicon Valley Toxics Coalition.

Tuesday, September 16, 2003, 6:00 p.m. – 8:00 p.m.
Mayfair Community Center, 2039 Kammerer Avenue, San Jose, CA

Agenda topics:

- Health Effects of Ozone
- Background on Ozone Planning
- What Types of Control Measures Are Included in an Ozone Plan and Who Has Authority Over What Sources

Meeting materials:

- Ozone Sources, Plans and Controls Fact Sheet
- Existing Control Measures and Current Status
- How the Rulemaking Process Works at the Air District
- Ozone Planning – Technical Terms

2003 Community Meetings
All 2003 Community Meeting agendas and handouts can be downloaded at http://www.baaqmd.gov/pln/plans/ozone/2003_meetings/2003CommunityMeetings.asp

Each 2003 Community Meeting included the following agenda topics and meeting materials:

Agenda topics:

- Health Effects of Ozone
- Background on Ozone Planning
- Discussion of Potential New Ozone Control Measures
- Supplemental Environmental Projects (Rodeo and East Palo Alto only)
- Discussion on Potential Supplemental Environmental Projects (Rodeo and East Palo Alto only)

Meeting materials:

- Ozone Sources, Plans and Controls Fact Sheet
- Existing Control Measures and Current Status
- How the Rulemaking Process Works at the Air District
- Ozone Planning – Technical Terms
- Supplemental Environmental Projects (Rodeo and East Palo Alto only)

The following is a list of the 2003 Community Meeting dates and locations:

Rodeo Community Meeting
September 4, 2003, 6:30 p.m. – 8:30 p.m.
Rodeo Senior Center, 189 Parker Avenue, Rodeo, CA

East Palo Alto Community Meeting
Wednesday, September 10, 2003, 6:30 p.m. – 8:30 p.m.
East Palo Alto Senior Center, 560 Bell Street, East Palo Alto, CA

Richmond Community Meeting
Thursday, September 11, 2003, 6:30 p.m. – 8:30 p.m.
Nevin Community Center Auditorium, 598 Nevin Avenue, Richmond, CA

Oakland Community Meeting
Tuesday, September 16, 2003, 6:30 p.m. – 8:30 p.m.
Jubilee West Community Center, 1485 Chester, Oakland, CA

San Jose Community Meeting
Wednesday, September 24, 2003, 6:30 p.m. – 8:30 p.m.
Mayfair Community Center, 2039 Kammerer Avenue, San Jose, CA

San Francisco Community Meeting
Tuesday, September 30, 2003, 6:30 p.m. – 8:30 p.m.
Southeast Community College Facility, 1800 Oakdale Avenue, San Francisco, CA

2004 Richmond Pre-meeting
Co-sponsored by the Community Health Initiative, Pacific Institute, the West County Toxics Coalition, Contra Costa Health Services, and the Bay Area Air Quality Management District.

Monday, September 13, 2004, 5:00 - 7:00pm
Community Heritage Senior Apartments, 1555 Third Street, Richmond, CA

Agenda topics:

- Background
  - Why does the BAAQMD develop these plans?
  - What is an ozone strategy?
  - What is ozone; how is it formed; good ozone vs. bad ozone
  - Where does air pollution come from?
- What Types of Control Measures Are Included in an Ozone Plan and Who Has Authority Over What Sources
- The Rule making Process: Case Studies
- What Residents Can Expect from BAAQMD Community Meetings
- How residents can get involved

Meeting materials:

- Ozone Sources, Plans and Controls Fact Sheet
- Ozone Control Strategy – Technical Terms
- How the Rulemaking Process Works at the Air District
- CARE Program Fact Sheet

2004 Community Meetings
All 2004 Community Meeting agendas and handouts can be downloaded at http://www.baaqmd.gov/pln/plans/ozone/2003_meetings/2004CommunityMeetings.htm

Each 2004 Community Meeting included the following agenda topics and meeting materials:

Agenda topics:

- Ozone Background – Health Effects, Sources, and Planning Process
- Draft Ozone Control Measures
  - Overview of the Control Measure Evaluation and Review Processes
  - Draft Stationary Source Control Measures
  - Draft Mobile Source Control Measures
  - Draft Transportation Control Measures
- Draft Further Study Measures
- CARE Program
- Other Air Quality Issues or Concerns from the Community

Meeting materials:

- Ozone Sources, Plans and Controls Fact Sheet
- Summary of Draft Ozone Control Measures and Further Study Measures
- Glossary of Technical Terms
- CARE Program Fact Sheet

The following is a list of the 2004 Community Meeting dates and locations:

Petaluma Community Meeting
Wednesday, September 22, 2004, 6:30 p.m. – 8:30 p.m.
Petaluma City Council Chambers, 11 English Street, Petaluma, CA

Richmond Community Meeting
Thursday, September 23, 2004, 6:30 p.m. – 8:30 p.m.
Richmond City Council Chambers, 1401 Marina Way South, Richmond, CA

San Jose Community Meeting
Wednesday, September 29, 2004, 6:30 p.m. – 8:30 p.m.
San Jose City Council Chambers
801 N. First Street, San Jose, CA

Oakland Community Meeting
Thursday, September 30, 2004, 6:30 p.m. – 8:30 p.m.
Elihu Harris Building, 1st Floor Auditorium, 1515 Clay Street, Oakland, CA

San Francisco Community Meeting
Wednesday, October 13, 2004, 6:30 p.m. – 8:30 p.m.
California State Building, Milton Marks Conference Center, 455 Golden Gate Avenue
San Francisco, CA

Livermore Community Meeting
Thursday, October 14, 2004, 6:30 p.m. – 8:30 p.m.
Livermore City Council Chambers, 3575 Pacific Avenue, Livermore, CA

Martinez Community Meeting
Thursday, October 21, 2004, 6:30 p.m. – 8:30 p.m.
Contra Costa County Board of Supervisors Chambers, 651 Pine Street, Room 107, Martinez, CA

2005 Community Meeting
An evening community meeting on the Draft Ozone Strategy and Draft EIR was held at:
Richmond Memorial Auditorium
Wednesday, October 26, 2005, 6:00 p.m. – 8:00 p.m.
403 Civic Center Plaza, Richmond, CA

Agenda topics:

- Draft Ozone Strategy and DEIR
  - Draft Ozone Strategy Presentation
  - Q&A / Comments
  - Draft Environmental Impact Report Presentation
  - Q&A / Comments
- National 8-hr Ozone Standard (ARB staff)
  - Presentation
  - Q&A
- Air District Grants & Incentive Programs

- Other Air Quality Issues or Concerns from the Community

Meeting materials:
- Ozone Sources, Strategies and Controls Fact Sheet
- Summary of Draft Ozone Strategy and Draft EIR findings
- Glossary of Technical Terms
- National 8-hr ozone standard planning materials (ARB)
- Carl Moyer Program Fact Sheet

OUTREACH METHODS FOR COMMUNITY MEETINGS

The Ozone Strategy Community Meetings included a variety of outreach methods including:

Meeting Notice Mailed to Interested Parties:
The Air District keeps a mailing list of individuals and organizations that have expressed interest in air quality planning. That mailing list includes over 900 different interested individuals including representatives from environmental organizations, industry, community groups, local government, elected officials, other agencies, and concerned citizens.

For the 2003 Ozone Strategy community meetings, meeting notices were mailed out to this mailing list on July 30, 2003.

For the 2004 Ozone Strategy community meetings, meeting notices were mailed out to this mailing list on September 3, 2004.

For the 2005 Ozone Strategy community meeting, meeting notices were mailed out to this mailing list on October 13, 2005.

Meeting notices for the community meetings were also sent through ABAG and MTC's mailing lists of interested parties.

Meeting Notice Emails:
Email notices for the 2003 Ozone Strategy community meetings were sent to the Air District's email distribution list of elected officials, industry representatives, community and environmental groups, and other interested parties on the following dates:
- July 20, 2003
- August 6, 2003
- August 13, 2003
- August 14, 2003

Email notices for the 2004 Ozone Strategy community meetings were sent in September 2004 to the following email distribution lists:
- Ozone Working Group email distribution list
- ABAG's list of city, county and municipal government officials and employees
- County Health Officials

Email notices for the 2005 Ozone Strategy community meeting were sent in October 2005 to the following email distribution lists:

- Ozone Working Group email distribution list
- ABAG's list of city, county and municipal government officials and employees
- County Health Officials

Web Postings:
Both Air District and MTC created weblinks to the community meeting notice from their homepages, http://www.baaqmd.gov and http://www.mtc.ca.gov, respectively.

All Community Meeting agendas and handouts can be downloaded at http://www.baaqmd.gov/pln/plans/ozone/2003_meetings/index.htm

Meeting Notice Flyer Distribution:

For the 2003 Community Meetings, community representatives posted meeting notice fliers and distributed them among the neighborhoods. Almost 10,000 fliers, in English and Spanish, were distributed to announce the 2003 Community Meetings at the following community centers:

- Mayfair Community Center, 2039 Kammerer, San Jose, CA
- City of East Palo Alto, 2415 University Avenue, East Palo Alto, CA
- Ravenswood Family Health Center, 1798 Bay Road, East Palo Alto, CA
- Community Development Institute, 321 Bell St, East Palo Alto, CA
- East Palo Alto Senior Center, 560 Bell St, East Palo Alto, CA
- Olinder Community Center, 848 William, San Jose, CA
- Roosevelt Community Center, 901 E. Santa Clara St., San Jose, CA
- Contra Costa Health Services, 597 Center Avenue, Martinez, CA
- Contra Costa Health Services, 597 Center Avenue, Martinez, CA
- Neighborhood House of North Richmond, 305 Chesley Avenue, Richmond, CA
- Nevin Community Center, 598 Nevin, Richmond, CA
- West County Toxics Coalition, 1019 Macdonald, Richmond, CA
- Bayview-Hunters Point Community Advocates, 5021 Third Street, San Francisco, CA
- Literacy for Environmental Justice, 6220 Third Street, San Francisco, CA
- Bayview-Hunters Point Project Area Committee (PAC), 1800 Oakdale, Rm. 8, San Francisco, CA
- Bayview-Hunters Point Southeast Health Center, 2401 Keith St., San Francisco, CA
- Coalition for West Oakland Revitalization (CWOR), 2485 W. 14th Street, Oakland Army Base, Oakland, CA
- Chester St. Block Club Association, 343 Chester St, Oakland, CA
- Jubilee West, 1485 Chester St., West Oakland, CA

For the 2004 Community Meetings, fliers were distributed primarily through local public school districts and city offices. Fliers, in English and Spanish, were distributed to announce the 2004 Community Meetings at the following locations:

- Petaluma Public Schools
- Santa Rosa Junior College

- Petaluma Public Library
- Petaluma City Hall
- Petaluma Community Center
- West Contra Costa County Unified School District
- San Jose Unified School District
- Oakland Unified School District
- San Francisco Unified School District
- Livermore Valley Joint Unified School District
- Livermore City Hall, Library & Police Department
- Livermore Multi-Service Center
- Fantasy Books & Games in Livermore
- Martinez Unified School District
- Martinez City Hall and Police Department
- Contra Costa County Board of Supervisors Offices
- St. Catherine of Siena Catholic Church & Parish Hall
- St Catherine of Siena Elementary School

Media Outreach:

Community Calendars

For the 2003 Community Meetings, the following public access channels included the community meeting notice on their community calendars:

San Jose:	Civic Center TV/Cable Channel 37A Public Access Cable TV
Martinez:	Contra-Costa TV (CCTV) Public Access TV
Oakland:	KTOP/Cable Channel 10 Public Access Cable TV
Palo Alto:	Mid Peninsula Community Media Center (includes East Palo Alto)
SF:	SFG-TV/Access SF/Cable Channel 26 Public Access
Richmond:	KCRT / City of Richmond Public Access Cable TV

For the 2004 Community Meetings, the following public access channels and local community newspapers included the community meeting notice on their community calendars:

Petaluma:	Petaluma Community Access/Channel 28 Public Access Cable TV
	Petaluma Argus-Courier
	Santa Rosa Press Democrat
Richmond:	KCRT / City of Richmond Public Access Cable TV
	West County Times
San Jose:	Civic Center TV/Cable Channel 37A Public Access Cable TV
	Silicon Valley Community Newspaper Group: Campbell Reporter, Cupertino Courier, Los Gatos Weekly Times, Saratoga News, Sunnyvale Sun, Willow Glen Resident
	Times Newspaper Group: Almaden Times, Blossom Valley Times, Cambrian Times, Campbell Times, Evergreen Times, Santa Teresa Times, Willow Glen Times
	Exodus Newsmagazine
	Jewish Community News
	Alianza Metropolitan News
Oakland:	KTOP/Cable Channel 10 Public Access Cable TV
	KDOL TV/Cable Channel 27 Oakland Public Schools

	Oakland Tribune
	Alameda Publishing Corp.: Berkeley Tri-City Post, El Mundo, Oakland Post, Richmond Post, San Francisco Post
	Berkeley Voice
	Montclarion
	Oakland Metro Reporter
SF:	SFG-TV/Access SF/Cable Channel 26 Public Access
	Bay City News
	San Francisco Bay View
	San Francisco Independent
	San Francisco Metro Reporter/The Sun Reporter
	Potrero View, Sunset Beacon, Visitacion Valley Grapevine, West of Twin Peaks Observer, West Portal Monthly, Richmond Review, The New Fillmore, North Beach Beat/North Beach Journal, Marina Times
	San Francisco Bay Times
	El Mensajero
Livermore:	Tri-Valley Community Television (CTV30) Public Access TV
	Las Positas Express
	The Valley Times
	Tri-Valley Herald
	The Independent
Martinez:	Contra-Costa TV (CCTV) Public Access TV
	Martinez News Gazette

Press release

Thursday, October 7, 2004 – A press release entitled, "Air District Seeks Input on Measures to Reduce Summertime Smog" was sent to Livermore media as well as Bay City News to announce the October 14, 2004 Livermore Community Meeting.

Publications

"Air Currents" is a newsletter published by the Air District's Public Information and Outreach office. It covers Air District activities as well as other air quality issues of interest to industry, government agencies, and the general public. "Air Currents" has a subscription of about 3,750 and is also posted to the BAAQMD website. Articles on the ozone planning process have periodically appeared in "Air Currents," including the following:

- Spring 2003 – article on the ozone planning process kick-off
- Summer 2003 - article about the 2003 Community Meetings
- Spring/Summer 2004 – articles on the ozone planning update, national one-hour ozone standard finding of attainment, and national 8-hour ozone standard designation.

Published by MTC, "Transactions" is a monthly newsletter detailing transportation news for the nine-county San Francisco Bay Area. The Calendar section of "Transactions" provides a list of upcoming transportation-related meetings, and Ozone Working Group meetings are often listed. In the September 2004 issue, "Transactions" included reference to the 2004 Community Meetings and a link to the Air District's website.

Outreach to County Health Departments:
For the 2003 and 2004 Community Meetings, the Air District conducted outreach specifically to local County Health Departments to encourage their participation. In the both rounds of community meetings, the Air District sent an invitation letter to each County's Public Health Director, emails to health department staff, and followed up with phone calls requesting their attendance. At the community meetings, Public Health Department staff participation was particularly helpful during discussions of the health impacts of ozone and other air pollutants.

Staff from County Health Departments attended the following Community Meetings:
September 3, 2003 – Richmond Pre-Meeting
September 4, 2003 – Rodeo Community Meeting
September 10, 2003 – East Palo Alto Community Meeting
September 11, 2003 – Richmond Community Meeting
September 16, 2003 – Oakland Community Meeting
September 30, 2003 – San Francisco Community Meeting
September 23, 2004 – Richmond Community Meeting
October 13, 2004 – San Francisco Community Meeting
October 21, 2004 – Martinez Community Meeting

Public Presentations:
Staff from the District's Public Information & Outreach Division gave presentations about the 2003 Community Meetings at the following meetings:
February 6, 2003 - East Palo Alto Environmental Justice Resource Team
February 19, 2003 - Contra Costa County EJ Air Quality Working Group
April 24, 2003 - East Palo Alto Environmental Justice Resource Team

POLICY BOARDS AND COMMITTEES

Board of Directors
The Air District is governed by a 22-member Board of Directors. State law provides that the number of representatives from each county is determined by that county's population. Currently, the counties of Marin, Napa, and Solano have one representative; Sonoma, and San Mateo have two representatives; San Francisco has three representatives; and Alameda, Contra Costa, and Santa Clara each have four representatives. Occasionally through this planning process, Air District staff has made presentations to the Board and Board Committees to update them on the planning process and to receive comments and guidance from them about the Bay Area 2005 Ozone Strategy. All meetings of the Board and Board Committees are open to the public.

Dates of Board of Directors meetings and discussion topic(s):
October 20, 2004 – Ozone Strategy outreach update

Executive Committee
The Air District Board of Directors Executive Committee meets quarterly. Throughout this planning process, Air District staff has briefed the Executive Committee and received comments and guidance from them about the Bay Area 2005 Ozone Strategy. Meetings are open to the public.

Dates of Executive Committee meetings and discussion topic(s):
January 29, 2003 – Ozone planning schedule
April 30, 2003 – Modeling and public involvement process
July 30, 2003 – Status report on ozone planning; 2001 Ozone Attainment Plan and EPA 8-hr designations
October 29, 2003 – Status report on monitoring record for national ozone standards; photochemical modeling; public involvement; control measure evaluations
December 18, 2003 - Status reports on EPA proposed finding of attainment; EPA action on 2001 Ozone Attainment Plan; redesignation request requirements; control measure evaluations
June 30, 2004 – Control measure development; public outreach; and CEQA
September 29, 2004 – Ozone Strategy status update
November 29, 2004 – Ozone Strategy status update
February 4, 2005 – Ozone Strategy status update
March 30, 2005 – Ozone Strategy status update

Stationary Source Committee
The Air District Board of Directors Stationary Source Committee meets bi-monthly. Air District staff has briefed the Air District Board of Directors Stationary Source Committee and received comments from them on proposed stationary source control measures and rule development activities. Meetings are open to the public.

Dates of Stationary Source Committee meeting and discussion topic(s):
January 26, 2004 - Status report on 2001 Ozone Attainment Plan ozone control measures and further study measures; status report on identifying new ozone control measures
September 26, 2005 – Ozone Strategy status update

Public Outreach Committee
The Air District Board of Directors Public Outreach Committee meets bi-monthly. Air District staff has briefed the Air District Board of Directors Stationary Source Committee and received comments from them on proposed stationary source control measures and rule development activities. Meetings are open to the public.

Dates of Public Outreach Committee meeting and discussion topic(s):
April 26, 2004 - Status report on the public outreach to date for the Ozone Strategy and plans for community involvement and future input.

Metropolitan Transportation Commission Planning and Operations Committee
MTC's Planning and Operations committee (POC) meets monthly to consider matters relating to MTC plans, and oversees MTC's activities to make the existing transportation network operate more efficiently. Meetings are open to the public.

Dates of MTC POC meeting and discussion topic(s):
March 4, 2005 – Status report on the Ozone Strategy

Regional Agency Coordinating Committee
The Regional Agency Coordinating Committee (RACC) consists of elected officials representing the three regional agencies (MTC, ABAG and the Air District), and provides direction to staff on regional planning and smart growth strategies. Representatives of other agencies and interests may attend RACC meetings. RACC meets on a bi-monthly

basis and meetings are open to the public. Throughout this planning process, the Bay Area 2005 Ozone Strategy has been a discussion item at RACC meetings, and Air District staff have briefed and received comments from the group.

Dates of RACC meetings and discussion topic(s):
February 21, 2003 - Ozone planning schedule
April 18, 2003 - Modeling and public involvement process
June 20, 2003 – Status report on control measure evaluation, public involvement process, and modeling
September 19, 2003 – Status report on modeling, control measure evaluation, public involvement
November 21, 2003 - Status report on EPA proposed finding of attainment; OWG meeting; control measure evaluations; photochemical modeling
January 23, 2004 - Status report on redesignation requirements and continuing ozone planning and control efforts
March 19, 2004 – Status report on Ozone Strategy

Joint Policy Committee
The Joint Policy Committee (JPC) coordinates the regional planning efforts of the Association of Bay Area Governments (ABAG), the Bay Area Air Quality Management District (BAAQMD), and the Metropolitan Transportation Commission (MTC) and pursues implementation of the Bay Area's Smart Growth Vision as expressed in the Smart Growth Preamble and Policies and the Smart Growth Strategy / Regional Livability Footprint Project. The JPC meets monthly and all meetings are open to the public.

Dates of JPC meeting and discussion topic(s):
March 25, 2005 – Status report on the Ozone Strategy
November 23, 2005 – Draft Ozone Strategy presentation and discussion of its linkage to other regional planning concerns.

ADVISORY COMMITTEES

Advisory Council
The Air District Advisory Council and its various committees advise and consult with the Board of Directors and the Air Pollution Control Officer (APCO). Throughout the planning process, Air District staff has briefed the Advisory Council as a whole as well as the Air Quality Planning, Technical, Stationary Source and Public Outreach Committees to receive comments from them about the 2005 Ozone Strategy. All Advisory Council meetings are open to the public.

Dates of Advisory Council meetings and discussion topic(s):
March 12, 2003 – Ozone planning schedule and modeling presentation
November 12, 2003 - Status report on EPA proposed finding of attainment; photochemical modeling; public involvement; control measure evaluations
April 6, 2004 - Preliminary draft control measure descriptions
June 15, 2004 - Draft control measure descriptions
August 3, 2004 - Draft control measure descriptions
August 4, 2004 - Draft control measure descriptions
September 8, 2004 - Draft control measure descriptions

Modeling Advisory Committee
The Air District has hired consultants to conduct photochemical modeling and to analyze meteorology and emissions on high ozone days in the Bay Area in order to better understand ozone formation within the region and transport of emissions between the Bay Area and downwind neighbors. To oversee the work that consultants are doing and to give feedback on modeling issues and protocol, the Air District has convened a technical working group called the Modeling Advisory Committee (MAC). The MAC meets bi-monthly and its membership includes staff from the Air District, ARB, other air districts, MTC, members of the scientific community, business and environmental representatives, and other interested parties with technical expertise in ozone modeling.

Dates of MAC meetings:
May 23, 2002
July 11, 2002
September 11, 2002
October 30, 2002
December 18, 2002
January 21, 2003
February 25, 2003
March 25, 2003
April 29, 2003
June 10, 2003
August 14, 2003
September 16, 2003
October 21, 2003
October 27, 2003
December 4, 2003
February 10, 2004
March 16, 2004
June 3, 2004
July 20, 2004
September 15, 2004
November 17, 2004
January 11, 2005
March 22, 2005
May 24, 2005
August 9, 2005
October 18, 2005
December 15, 2005

CAPCOA ENGINEERING MANAGERS RULE DEVELOPMENT SUBCOMMITTEE MEETINGS

In 2003, the Rule Development Managers subcommittee of the California Air Pollution Control Officers Association (CAPCOA) Engineering Managers identified a list of all feasible measures to assist local Air Districts in ozone strategy development. In August 2003, the subcommittee identified 27 source categories and identified the most stringent existing rule applicable to the source category. Bay Area Air District staff participated in the discussions and analyzed each measure for applicability and feasibility for the Bay

Area Ozone Strategy. Of the 27, the Bay Area Air District has committed to control measure development in eight of the source categories, and six additional source categories were identified for further study. Bay Area rules were defined as the most stringent available for five source categories and equivalent to the most stringent available for the remaining categories. This process is described in more detail in Appendix A, Control Measure Review and Evaluation Process.

Dates of meetings:
January 14, 2003
March 4, 2003
August 20, 2003
September 2, 2003

ARB RULE COMPARISON WORKING GROUP

In 2003 and early 2004, ARB convened a workgroup of staff from the Bay Area Air Quality Management District, Sacramento Metro Air Quality Management District, San Joaquin Valley Unified Air Pollution Control District, the Yolo-Solano Air Quality Management District and ARB to participate in a rule comparison project. The project compared the relative stringency of district rules regulating 11 source categories and compared each district rules to the most stringent in California. This workgroup first met in August 2003, and most work was coordinated through conference calls and email correspondence. The project concluded in February 2004 with the development of a report including a rule comparison summary table. For the Bay Area Air District, emission reduction opportunities were identified for five source categories, and further study is proposed for five additional source categories. This process is described in more detail in Appendix A, Control Measure Review and Evaluation Process.

Dates of meetings:
August 27, 2003
October 24, 2003
November 5, 2003
February 3, 2004
February 17, 2004

INTERAGENCY CONSULTATIONS

In February 2004, the Sacramento Metropolitan AQMD provided the Bay Area Air District with a list of control measures suggestions from TIAX Consultants, developed at the request of the Sacramento District. TIAX developed a list of 30 stationary, mobile and transportation control measure suggestions based on the inventory for the Central California Ozone Study, in addition to 19 measures under state or federal authority. Some suggestions were incorporated into existing measures or helped to make proposed control measures more stringent. In July 2004, the Bay Area Air District submitted a summary of the control measure evaluations to the Sacramento District and conducted a follow-up meeting to discuss the analysis.

The Bay Area Air District has continued to communicate with neighboring air districts about the Bay Area's ozone planning process. In October 2004, the Bay Area Air

District held a consultation meeting inviting comments from the following neighboring air districts on the draft control measures proposed for the Ozone Strategy, as required by Transport Mitigation regulations:

- Northern Sonoma County Air Pollution Control District
- Monterey Bay Unified Air Pollution Control District
- Yolo-Solano Air Quality Management District
- Sacramento Metropolitan Air Quality Management District
- San Joaquin Valley Unified Air Pollution Control District
- Placer County Air Pollution Control District
- El Dorado County Air Quality Management District
- Feather River Air Quality Management District
- Amador County Air Pollution Control District
- Calaveras County Air Pollution Control District
- Northern Sierra Air Quality Management District
- Tuolomne County Air Pollution Control District
- Mariposa County Air Pollution Control District

Comments on the draft control measures proposed for the Ozone Strategy were received from the Sacramento Metropolitan Air Quality Management District, San Joaquin Valley Unified Air Pollution Control District, Monterey Bay Unified Air Pollution Control District, and Northern Sierra Air Quality Management District.

Dates of meetings:
February 18, 2004
July 29, 2004
October 7, 2004

PUBLIC WORKSHOPS

CEQA Scoping Meeting
Pursuant to the California Environmental Quality Act (CEQA), the Air District is preparing a Draft Environmental Impact Report (DEIR) to evaluate potential environmental impacts of the Bay Area 2005 Ozone Strategy. The Air District held a public scoping meeting in April 2004 to discuss the range of actions, alternatives, mitigation measures, and significant effects to be analyzed in the DEIR. The CEQA scoping meeting was open to the public.

Tuesday, April 20, 2004, 9:00 a.m. – 11:00 a.m.
Joseph P. Bort MetroCenter Auditorium, 101 8th Street, Oakland, CA

Agenda topics:
- CEQA and the Purpose of Scoping Meeting
- Ozone Strategy Overview
- Proposed Control Measure Descriptions
  - Preliminary draft stationary, mobile and other source measures
  - Preliminary draft transportation control measures
- Scope of Environmental Impact Report
  - Potential Environmental Impacts and Mitigation Measures

Meeting materials:

- Control Measure Descriptions
  - Preliminary draft stationary, mobile and other source measures
  - Preliminary draft transportation control measures

MTC TCM Workshop

In September 2003, MTC held a Transportation Control Measure (TCM) Workshop to provide Ozone Working Group participants and other interested parties with an opportunity to review MTC's progress on TCM evaluation and to suggest new transportation strategies for consideration. The TCM Workshop was open to the public.

Tuesday, September 30, 2003, 9:00 a.m. – 11:00 a.m.
Joseph P. Bort MetroCenter Auditorium, 101 8th Street, Oakland, CA

Agenda topics:

- Types of TCMs in current federal and state ozone plans
  - Further Study Measures in the 2001 Ozone Attainment Plan
- Suggestions for new TCMs from the public to date
- Background on calculating emission reductions from TCMs
- Preliminary evaluation results for selected measures
  - Emission reductions
  - Cost effectiveness
- Other TCM suggestions

OUTREACH ON THE DRAFT 2005 OZONE STRATEGY AND DEIR

The Air District conducted two public meetings to present, obtain input and receive public comment on the Draft 2005 Ozone Strategy and Draft EIR. An Ozone Working Group meeting was held on October 25, 2005, from 9:30-11:30am at the MetroCenter Auditorium in Oakland. An Ozone Strategy Community Meeting was held on October 26, 2005, from 6-8pm at the Richmond Memorial Auditorium in Richmond. Both meetings were open to the public and meeting notices were circulated to interested parties and posted on the Air District website.

Since the close of the public comment period on the Draft 2005 Ozone Strategy on November 9, 2005, staff have compiled public comments, drafted responses to comments, prepared the Proposed Final Bay Area 2005 Ozone Strategy and Proposed Final EIR, and released the documents for public review. The Air District Board of Directors will hold a public hearing to consider adoption of the Final 2005 Ozone Strategy and Final EIR at their December 21, 2005 meeting. Members of the public have been notified of these meetings and encouraged to attend and provide comment.

APPENDIX B - CONTROL MEASURE REVIEW AND EVALUATION PROCESS

INTRODUCTION

To satisfy all feasible measures requirements in developing the control strategy for the 2005 Ozone Strategy, the Air District investigated a wide range of potential control measure ideas from many sources. Air District staff sought ideas for new sources to control, as well as ways to strengthen existing rules and programs. To identify potential control measures, the Air District:

- Participated with staff from ARB, Yolo-Solano APCD, Sacramento Metropolitan AQMD, and San Joaquin Valley Unified APCD on a rule comparison project.
- Participated in discussions as part of the Rule Development Managers subcommittee to the CAPCOA Engineering Managers Committee to develop a statewide all feasible measures list.
- Reviewed suggestions developed by consultants for Sacramento Metropolitan AQMD.
- Investigated rules in other districts throughout California.
- Investigated control measures and programs from plans in other districts and agencies, both within and outside the state.
- Considered comments and suggestions from the Ozone Working Group.
- Considered comments and suggestions from community meetings.
- Considered comments and suggestions Air District Board members, Advisory Council members and staff.

RULE COMPARISON PROCESSES

In 2003 and early 2004, Air District staff participated in a rule comparison project with Robert Fletcher, Chief of the Planning and Technical Support Division at ARB, Lawrence Green, APCO of Yolo-Solano APCD, and staff from ARB, Sacramento Metropolitan AQMD and San Joaquin Valley Unified APCD. The project compared the relative stringency of district rules regulating 11 source categories, and compared each district's rules to the most stringent in California. The report on the results noted, "Rule comparisons can be very difficult to accomplish. While there are basic elements to regulating any industry, specific industrial facilities and inventories differ between districts, rules are developed and updated on different timelines, and guidance from ARB and EPA differ over time. Moreover, individual district SIP needs and commitments have dictated different schedules for rule development." In spite of the difficulties, the project did identify opportunities for realizing additional emissions reductions for each of the air districts. For the Bay Area Air District, emission reduction opportunities were identified for the following source categories:

- Boilers
- Turbines
- Auto Refinishing
- Organic Liquid Storage
- Graphic Arts Operations

The control strategy in Section 2 of the 2005 Ozone Strategy includes a control measure for each of these source categories.

In addition, further study measures are included for the following source categories:

- Stationary Internal Combustion Engines
- Adhesives
- Solvent Cleaning
- Degreasing
- Valves and Flanges

An investigation of the Can and Coil Coatings source category did not reveal the opportunity for emissions reductions in any district.

Also during 2003, the Rule Development Managers subcommittee of the CAPCOA Engineering Managers Committee identified a list of all feasible measures to assist districts in ozone strategy development. Air District staff participated in the discussions and analyzed each measure for applicability and feasibility for the 2005 Ozone Strategy. The CAPCOA subcommittee identified 27 source categories and identified the most stringent existing rule applicable to the source category. Of the 27, the Bay Area has committed to control measure development in the following source categories:

- Wood Products Coating
- Polyester Resin Operations
- High Emitting Spray Booths
- Large Water Heaters and Small Boilers
- Automotive Refinish Coatings
- Graphic Arts Operations
- Boilers, Steam Generators and Process Heaters
- Organic Liquid Storage Tanks

In addition, the following source categories were identified for further study:

- Fugitive Leaks and Releases from Petroleum Refineries and Chemical Plants
- Food Product Manufacturing and Processing
- Commercial Charbroilers
- Architectural Coatings
- Solvent Cleaning and Degreasing
- Adhesives and Sealants

The remaining source categories – hydrogen plant processing vents, organic liquid transfer operations, soil decontamination, solid waste disposal sites, aerospace coating, residential water heaters, wood flat stock coating, general solvent usage, glass coating, lime kilns, metal parts coating, and gasoline dispensing – are not recommended for control measures, either because existing Bay Area rules are already the most stringent available or because the existing inventory in the Bay Area or potential reductions are nonexistent or very small (de minimis).

Staff also analyzed measures suggested for the Bay Area by TIAX Consultants, developed at the request of the Sacramento Metropolitan AQMD. TIAX developed a list of 30 stationary, mobile and transportation control measure suggestions based on the inventory for the Central California Ozone Study, in addition to 19 measures under state

or federal authority. Some of the 30 suggested measures analyzed contained more than one suggestion. Some suggestions were duplicative of others, some were already being considered as control measures and some were rejected due to a de minimis emission reduction potential. However, some suggestions were incorporated into measures proposed in the 2005 Ozone Strategy or helped to make proposed control measures more stringent. The following measures suggested by TIAX have been incorporated into proposed control measures in the 2005 Ozone Strategy:

- Refinery Wastewater Systems
- Flares
- Organic Liquid Storage
- Graphic Arts Operations
- Gas Turbines
- Boilers, Steam Generators and Process Heaters
- Indirect Source Control Incentive Measure for Construction Equipment
- Gasoline Lawnmower Replacement
- Energy Conservation
- Airport Ground Support Equipment
- Grant Programs for Vehicle Fleets
- Heavy Diesel Engine Retrofits
- Large Water Heaters and Small Boilers
- Spare the Air Program Enhancements
- Community Design Program
- Construction Equipment Idling Ordinance
- Work Trip Reduction Program

In addition, the following measures suggested by TIAX are incorporated into Further Study Measures in the 2005 Ozone Strategy:

- NO_x from Petroleum Refinery Boilers, Steam Generators and Process Heaters
- Adhesives and Sealants (as part of the CARB rule comparison)
- Solvent Cleaning and Degreasing (as part of the CARB rule comparison)
- Architectural Coating Clean-up and Surface Preparation
- Indirect Source Control for Operational Impacts
- Agricultural Pump Engines
- Free Gas Caps
- Catalytic Converter Replacement Programs

The remaining suggestions from TIAX regarding semiconductor manufacturing, NO_x from electric utility boilers, incentives to speed up replacement of portable gasoline cans with CARB certified containers, clean air labeling, private fleet requirements, oil and gas production fugitives, and asphalt concrete plants, produced de minimis emissions reductions, were not found to be cost effective or are not within the Bay Area's legal jurisdiction.

OTHER SOURCES OF CONTROL MEASURE IDEAS

In addition to the rule comparison processes, the Air District examined potential control measures from other sources. Efforts included:

- A January 23, 2003 request for control measure suggestions posted on the Air District website and mailed to over 1000 individuals, organizations, agencies and businesses who had previously expressed interest in air quality planning.
- Formation of the Ozone Working Group to facilitate public participation in the ozone planning process. The OWG has met roughly bimonthly since March 2003. Staff presents updates, answers questions, and solicits input. Control measure evaluations and descriptions have been topics at most OWG meetings.
- Staff review of other California air district plans and plan support documentation, including the draft and final 2003 South Coast Air Quality Management Plan, the San Joaquin Valley Unified APCD Amended 2002 and 2005 Ozone Rate of Progress Plan, and draft control measure suggestions prepared by consultants for the Sacramento Metropolitan AQMD.
- Staff review of rules and regulations from other California districts, particularly the South Coast AQMD.
- Review of air quality plans from Houston, TX and Atlanta, GA.
- Review of control measure suggestions made for the 1999 and 2001 San Francisco Bay Area Ozone Attainment Plans (for the national one-hour ozone standard) and for the 2000 Clean Air Plan.
- Review of suggestions submitted by:
    - Cities, counties and other public agencies
    - Environmental and community groups
    - Business and industry groups
- Consideration of comments and suggestions from six community meetings held in September 2003.
- Review of suggestions from Air District Board members, Advisory Council members, and staff.

CONTROL MEASURE EVALUATIONS

Staff developed a database for control measure suggestions, and evaluated each suggestion made. In evaluating control measure suggestions, staff consider a variety of factors, including:

- Technological feasibility of proposed controls;
- Emission inventory of the source category and total likely emission reductions from proposed controls;
- Cost-effectiveness in dollars per ton of emissions reduced;
- Public acceptability, including interests and concerns of community members;
- Whether the emission reductions are real, quantifiable, permanent, enforceable, and surplus;
- Whether reduction is of volatile organic compounds or nitrogen oxides or both;
- Rate of emission reduction;
- Any potential adverse environmental impacts;
- Socioeconomic impacts

In some cases, not all of these elements could be ascertained from readily available information. For example, emissions data for some source categories or the emissions reduction potential of some control measure may be uncertain. In these cases, further study may be warranted if the other aspects of a suggested control, such as public acceptability and adverse environmental impacts appear positive. These measures are discussed under Further Study Measures.

Of the 390 control measure suggestions considered, not including the transportation control measure suggestions evaluated by MTC, Air District staff made preliminary determinations and presented them for discussion at three Ozone Working Group meetings on January 6, 2004, January 20, 2004, and March 23, 2004. The following table represents the findings of the evaluations:

Summary of Air District Evaluations of Potential Control Measures for the 2005 Ozone Strategy

Category	Category Definition	Number
Potentially Viable Measures	Measures that meet the evaluation criteria and are recommended for the control strategy.	45
Potentially Viable Measures (Transport)	Measures that primarily control NO_x and may have limited benefit for the Bay Area, but are included to reduce transport to other regions.	12
Measures Already Implemented	Measures that already have been adopted as District regulations or have been implemented through regional or State programs.	52
Measures Needing Further Study	Measures that meet some evaluation criteria, but that require further analysis to determine whether they are potentially viable.	36
Measures Needing Funding	Measures that meet some evaluation criteria, but that require funding in order to be implemented. These are mostly incentive measures, primarily for mobile sources	18
Measures Needing Legislation	Measures that meet some evaluation criteria, but that require State or federal legislation in order to be implemented.	9
Measures That Are Not Technically Feasible	Measures for which the necessary technology is not currently available or foreseen in the reasonable future.	7
Measure That Are Not Enforceable	Measures for which there is no clear enforcement mechanism.	5
Measures That Are Not Cost Effective	Measures that meet some evaluation criteria, but for which the emission reductions are so small and/or the implementation costs are so high that the measure would not likely be cost effective.	14
Measures With Negligible Emission Reductions or No Bay Area Sources	Measures with extremely low or no emissions reductions or for which no applicable facilities exist in the Bay Area.	86
Measures Under Jurisdiction of Other Agencies	Measures for which other federal, State or local agencies have regulatory authority. These are mostly measures related to mobile sources and consumer products.	93

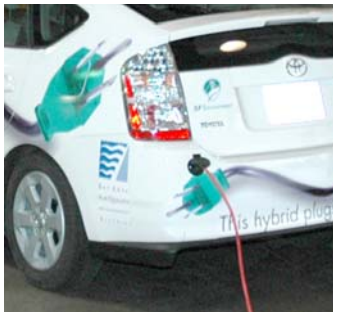
Note: Measures do not total 390 because they do not include all of the measures submitted by TIAX Consultants on behalf of the Sacramento AQMD, as discussed above. Those measures were received on Feb. 18, 2004, and were evaluated during Spring 2004.

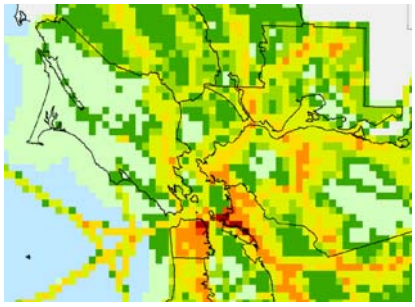
Finally, based on input from the Ozone Working Group and members of the public, and further evaluation by Air District staff, the potential control measures were distilled down to the measures identified in the control strategy. Duplicate and similar suggestions were combined into control measures for applicable source categories. Control measure ideas requiring additional analysis are proposed as further study measures.

Based upon the aforementioned evaluation criteria, the proposed control measures in the 2005 Ozone Strategy appear to be technically feasible, cost effective and able to produce at least a de miminis amount of emissions reductions based on available data. However, further investigation into Bay Area sources and conditions during the rule development process could alter any of the above preliminary findings.

Bay Area Air Quality Management District

Bay Area 2010 Clean Air Plan







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Adopted September 15, 2010

Association of Bay Area Governments

bcdc

Metropolitan Transportation Commission

Final
BAY AREA
2010 CLEAN AIR PLAN

Adopted September 15, 2010

BAY AREA AIR QUALITY MANAGEMENT DISTRICT

939 Ellis Street
San Francisco, CA 94109
(415) 771.6000
www.baaqmd.gov

Bay Area 2010 Clean Air Plan

Jack P. Broadbent	Executive Officer/Air Pollution Control Officer
Jean Roggenkamp	Deputy Air Pollution Control Officer
Jeffrey McKay	Deputy Air Pollution Control Officer
Brian Bunger	District Counsel
Henry Hilken	Director of Planning, Rules and Research
Dave Vintze	Manager of Air Quality Planning

PRINCIPAL CONTRIBUTORS:

David Burch	Principal Environmental Planner, Project Manager / Lead Author
Dan Belik	Rule Development Manager
David Fairley	Statistician
Alison Kirk	Senior Environmental Planner
Nadine Wilmot	Environmental Planner

ADDITIONAL CONTRIBUTORS:

Scott Beaver	Atmospheric Modeler
Brian Bateman	Director of Engineering
Damian Breen	Director of Strategic Incentives
Robert Cave	Senior Air Quality Specialist
Victor Douglas	Principal Air Quality Specialist
Julian Elliot	Senior Air Quality Engineer
Amir Fanai	Principal Air Quality Engineer
Guy Gimlen	Senior Air Quality Engineer
Todd Gonsalves	Assistant Counsel
Andrea Gordon	Senior Environmental Planner
William Guy	Assistant Counsel
Virginia Lau	Advanced Project Advisor
Sigalle Michael	Senior Environmental Planner
Phil Martien	Senior Advanced Project Advisor
Alan Miranda	Intern
Michael Murphy	Advanced Project Advisor
Eric Pop	Air Quality Specialist II
Saffet Tanrikulu	Manager of Research & Modeling
Ana Sandoval	Air Quality Program Manager
Eric Stevenson	Director of Technical Services
Abby Young	Principal Environmental Planner

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Acronyms and Terms

ABAG	Association of Bay Area Governments
ARB	(California) Air Resources Board
ATCM	Airborne Toxic Control Measure
BAAQMD	Bay Area Air Quality Management District
BACM	Best Available Control Measures
BACT	Best Available Control Technology
BAR	Bureau of Automotive Repair
BARCT	Best Available Retrofit Control Technology
BART	Bay Area Rapid Transit District
BCDC	Bay Conservation & Development Commission
CAA	(Federal) Clean Air Act
CAP	Clean Air Plan (for State ozone standard)
CAPCOA	California Air Pollution Officers Association
CARB	California Air Resources Board
CARE	Community Air Risk Evaluation program
CCAA	California Clean Air Act
CCOS	Central California Ozone Study
CEQA	California Environmental Quality Act
CMA	Congestion Management Agency
CMAQ	Congestion Management and Air Quality (Improvement Program)
CMP	Congestion Management Program
CO	Carbon Monoxide
CO_2	Carbon Dioxide
ECM	Energy & Climate Measure
EIR	Environmental Impact Report
EMFAC	CARB model (including emission factors) to calculate motor vehicle emissions
EPA	(United States) Environmental Protection Agency
EPDC	Expected Peak Day Concentration
FSM	Further Study Measure
GHG	Greenhouse Gas
HOV	High-Occupancy Vehicle
I & M	(Motor Vehicle) Inspection and Maintenance Program (“Smog Check”)

ISR	Indirect Source Review
JPC	Joint Policy Committee
LEV	Low Emission Vehicle
LUM	Land Use & Local Impact Measure
MSM	Mobile Source Measure
MTC	Metropolitan Transportation Commission
NAAQS	National Ambient Air Quality Standards
NH3	Ammonia
NO_x	Oxides of Nitrogen
NSR	New Source Review
O_3	Ozone
OBD	On-Board Diagnostic program
$PM_{2.5}$	Particulate Matter less than 2.5 microns in diameter
PM_{10}	Particulate Matter less than 10 microns in diameter
ppb	Parts per billion
pphm	Parts per hundred million
ppm	Parts per million
RACM	Reasonably Available Control Measure
RFP	Reasonable Further Progress
ROG	Reactive Organic Gases
RTP	Regional Transportation Plan
SIP	State Implementation Plan
SSM	Stationary Source Measure
TAC	Toxic Air Contaminant
TCMs	Transportation Control Measures
TDA	Transportation Development Act
TFCA	(BAAQMD) Transportation Fund for Clean Air
TIP	Transportation Improvement Program
TLC	(MTC) Transportation for Livable Communities Program
tpd	Tons per day
VMT	Vehicle Miles Traveled
VOC	Volatile organic compounds
ZEV	Zero Emission Vehicle

Executive Summary – Bay Area 2010 Clean Air Plan

Purpose of the CAP

The Bay Area 2010 Clean Air Plan (CAP) provides a comprehensive plan to improve Bay Area air quality and protect public health. The 2010 CAP has been prepared in close collaboration with the Air District's regional agency partners, and has been informed by extensive outreach to the public and interested stakeholders.

The CAP defines a control strategy that the Air District and its partners will implement to: (1) reduce emissions and decrease ambient concentrations of harmful pollutants; (2) safeguard public health by reducing exposure to air pollutants that pose the greatest health risk, with an emphasis on protecting the communities most heavily impacted by air pollution; and (3) reduce greenhouse gas (GHG) emissions to protect the climate.

The legal impetus for the CAP is to update the most recent ozone plan, the Bay Area 2005 Ozone Strategy, to comply with state air quality planning requirements as codified in the California Health & Safety Code. Although we have made steady progress in reducing ozone levels in the Bay Area, the region is designated as non-attainment for both the one-hour and eight-hour state ozone standards. In addition, emissions of ozone precursors in the Bay Area contribute to air quality problems in neighboring air basins. Under these circumstances, state law requires the CAP to include all feasible measures to reduce emissions of ozone precursors and to reduce transport of ozone precursors to neighboring air basins.

The Bay Area was recently designated as non-attainment for the national 24-hour fine particulate matter (PM2.5) standard, and will be required to prepare a PM2.5 State Implementation Plan (SIP) pursuant to federal air quality guidelines by December 2012. The 2010 CAP is not a SIP document and does not respond to federal requirements for PM2.5 or ozone planning. However, in anticipation of future PM2.5 planning requirements, the CAP control strategy also aims to reduce PM emissions and concentrations. In addition, U.S. EPA is currently reevaluating national ozone standards, and is likely to tighten those standards in the near future. The control measures in the CAP will also help in the Bay Area's continuing effort to attain national ozone standards.

A Multi-Pollutant Plan

In addition to updating the Bay Area's state ozone plan, the 2010 CAP will also serve as a multi-pollutant plan to protect public health and the climate. This effort to develop its first-ever multi-pollutant air quality plan is a voluntary initiative by the Air District. The Air District believes that an integrated and comprehensive approach to planning is

critical to respond to air quality and climate protection challenges in the years ahead. In its dual roles as an update to our state ozone plan and a multi-pollutant plan, the 2010 CAP addresses four categories of pollutants:

- Ground-level ozone and its key precursors, ROG and NOx;
- Particulate matter: primary PM2.5, as well as precursors to secondary PM2.5;
- Air toxics; and
- Greenhouse gases.

The major purpose for developing a multi-pollutant plan is to achieve the greatest possible public health benefit by reducing emissions, ambient concentrations, and public exposure across the four categories of air pollutants addressed in the 2010 CAP. In developing the CAP control strategy, the Air District has attempted to maximize co-benefits, while at the same time minimizing any potential trade-offs among pollutants.

Evaluating control measures on the basis of their potential to reduce multiple pollutants is complex, and little guidance or precedent is currently available. To address this issue, the Air District developed a Multi-Pollutant Evaluation Method (MPEM) which integrates the three core goals of the 2010 CAP: improving air quality, protecting public health, and protecting our climate. The MPEM analyzes how a given reduction (or increase) in emissions of each pollutant will affect ambient concentrations, population exposure, and health effects related to that pollutant. The MPEM then aggregates the impacts of each control measure on a multi-pollutant basis. Finally, the MPEM monetizes the value of the health and climate protection benefits for each control measure and expresses these benefits in dollar terms, in order to facilitate comparison of the relative benefit of the various control measures.

CAP Control Strategy

The proposed 2010 CAP control strategy builds on a solid foundation established by the 2005 Ozone Strategy, and previous ozone plans prepared in the 1991 to 2005 period. But the 2010 CAP also moves in new directions to address emerging challenges and opportunities. The 2010 CAP control strategy includes revised, updated, and new measures in the three traditional control measure categories: Stationary Source Measures, Mobile Source Measures, and Transportation Control Measures. In addition, the CAP identifies two new categories of control measures: Land Use and Local Impact Measures, and Energy and Climate Measures.

The draft control strategy proposes a total of 55 control measures, including:

- 18 Stationary Source Measures;
- 10 Mobile Source Measures;
- 17 Transportation Control Measures;
- 6 Land Use and Local Impact Measures; and
- 4 Energy and Climate Measures.

The 2010 CAP also describes 18 Further Study Measures, which will be further evaluated as potential control measures. In addition, the CAP includes a Leadership Platform. The Leadership Platform is intended to complement the control strategy by identifying policies and actions, such as legislation or adoption of regulations by other agencies, which will support or enhance the control measures identified in the CAP.

In sum, the Bay Area 2010 CAP provides a control strategy designed to:

- reduce emissions of ozone precursors, PM, air toxics, and greenhouse gases;
- continue progress toward attainment of state ozone standards;
- reduce transport of ozone precursors to neighboring air basins;
- protect public health by reducing population exposure to the most harmful air pollutants; and
- protect the climate.

Key Findings

In preparing the 2010 CAP, Air District staff analyzed air pollutant trends and the health risks associated with past levels and current levels of air pollution. Key findings of this analysis for the Bay Area can be summarized as follows:

- Bay Area air quality has improved significantly in recent decades. Ambient concentrations of - and population exposure to - harmful air pollutants, including ozone, PM, and air toxics, have all been greatly reduced.

- The improvement in air quality in recent decades has greatly reduced health effects related to air pollution.

- Premature deaths related to air pollution have declined by several thousand per year, from approximately 6,400 per year in the late 1980's to approximately 2,800 per year in 2008.

- The estimated lifetime cancer risk (over a 70-year lifespan) from all toxic air contaminants combined declined by 70 percent between 1990 and 2008, from approximately 1,330 cases per million people to approximately 405 cases per million.

- The improvement in air quality has extended average life expectancy in the Bay Area by approximately 6 months over the past two decades.

- In economic terms, the public health dividend of the improvement in air quality provides billions of dollars in benefits to the Bay Area each year.

Despite this progress, air pollution still has negative health impacts for many Bay Area residents. These effects include acute and chronic respiratory problems, asthma, cardiovascular effects, and premature mortality.

- Exposure to PM2.5 is by far the leading public health risk from air pollution in the Bay Area, accounting for more than 90% of premature mortality related to air pollution.

- Implementation of the proposed control measures in the 2010 CAP should result in approximately 85 fewer premature deaths per year in the Bay Area.

- Implementation of the proposed control measures in the 2010 CAP will, collectively, provide benefits with a monetary value in the range of $270 million to $1.5 billion per year, with a likely value on the order of $770 million per year, in terms of reduced medical costs, increased life expectancy, and reduced impacts of climate change.

- Roughly 80% of the estimated economic benefits from the CAP control measures can be attributed to reductions in PM2.5 (66% non-diesel PM2.5 and 14% diesel PM2.5). Reductions in greenhouse gases account for approximately 20% of the economic benefits.

- Although emissions and ambient concentrations of criteria pollutants and air toxics have been declining in the Bay Area, emissions and concentrations of greenhouse gases have been increasing in the Bay Area and elsewhere.

- Climate change due to increased emissions and concentrations of greenhouse gases is expected to result in an increase in the number of high heat days and wildfires in the Bay Area and adjacent areas. These impacts are likely to exacerbate air pollution and complicate efforts to attain air quality standards for ozone and PM.

- The control measures in the CAP will reduce emissions of greenhouse gases. Some CAP measures will directly reduce GHG emissions; many other measures will provide GHG reductions as a co-benefit.

- To provide a comprehensive plan that addresses multiple pollutants and protects public health and the climate, new types of control measures, such as the Land Use and Local Impact Measures and the Energy and Climate Measures, have been incorporated in the 2010 CAP control strategy.

Looking Forward

The 2010 CAP moves the Bay Area toward a new approach to air quality planning. The key goals defined in the CAP are to protect air quality, public health, and the climate. Despite impressive progress in improving Bay Area air quality in recent decades, we face significant challenges as we strive to achieve these goals in the future. The challenges include tighter air quality standards, limited resources, the dearth of new "low-hanging fruit" in terms of emissions control programs, future economic and population growth in the region, and the potential impacts of climate change and higher temperatures on air quality.

Under these circumstances, the multi-pollutant framework can provide a means to evaluate and balance competing objectives, maximize co-benefits from control strategies, improve the cost-effectiveness of programs to reduce emissions of criteria pollutants and greenhouse gases, and optimize the use of limited resources by the Air District, its partner agencies, and the regulated community.

Looking forward, the Air District will continue its efforts to achieve the CAP goals and to build its multi-pollutant planning capacity by:

- Developing an integrated emissions inventory that includes all pollutants;
- Developing an integrated air quality modeling platform;
- Enhancing the Multi-Pollutant Evaluation Method developed for the 2010 CAP to include a wider range of pollutants and health effects;
- Enhancing its capacities to measure and analyze ambient concentrations and population exposure in impacted communities;
- Developing better measurements of population exposure to pollutants on a region-wide basis;
- Evaluating the potential benefits, and considering the policy and technical issues, related to extending the risk-weighted multi-pollutant approach to programs such as stationary source permitting and New Source Review; and
- Better integrating strategies to reduce criteria pollutants and greenhouse gases.

The Air District elected to develop the 2010 CAP as a multi-pollutant plan as a matter of choice. However, future challenges are likely to make multi-pollutant planning a necessity in years to come. In addition to serving as a blueprint for the Bay Area, the Air District offers the 2010 CAP as an example of a multi-pollutant plan that other agencies can build upon to advance this concept.

Bay Area 2010 Clean Air Plan – Framing the Challenge

Protecting air quality in the San Francisco Bay Area air basin[1] is the core mission of the Bay Area Air Quality Management District (Air District). Clean air is fundamental to public health and to the high quality of life that makes the Bay Area a desirable place to live, work, and visit. In addition, good air quality:

- Supports healthy ecosystems, diverse flora and fauna, and productive agriculture;
- Provides economic benefits by stimulating human productivity, reducing health care costs, enhancing property values, and helping to attract investment and tourism; and
- Enhances the natural beauty of the Bay Area.

Despite the importance of good air quality, the fact is that we all breathe air pollution every day. There are millions of emissions sources in the Bay Area – oil refineries, manufacturers, dry cleaners, cars and trucks, construction equipment, lawn mowers, fireplaces, wood stoves, consumer products, and many other sources – that collectively emit many different types of air pollutants. And there are millions of receptors: all of us – children, teens, adults, and seniors - who inhale these emissions. Air pollution has a wide range of negative impacts on public health. Exposure to air pollutants can damage the pulmonary and cardio-vascular systems, and may cause or contribute to both acute and chronic health effects including bronchitis, asthma, stroke, and heart attack.

In an urban environment it is impossible to completely eliminate air pollution. But through a combination of strong laws, good planning, improved technology, strategic partnerships, and voluntary actions, we can greatly reduce air pollution and its negative impacts on public health and ecosystems.

Although we have made tremendous progress in improving air quality, today we face new challenges related to emissions of carbon dioxide (CO2) and other greenhouse gases (GHGs) that contribute to climate change.[2] Climate change presents many environmental and economic challenges for the Bay Area, not least of which is that it threatens to degrade air quality.

The air we breathe and the climate that supports us have no natural defenses. Just as we all deserve to breathe clean air, we all need to be part of the solution to protect our air quality and climate. We still have a great deal of work to do to improve Bay Area air

[1] The San Francisco Bay Area air basin consists of all of Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo and Santa Clara counties, and the southern portions of Solano and Sonoma counties.

[2] In the CAP, the term "climate change" is used in lieu of "global warming."

quality and protect the climate. But to put our challenges in perspective, it is important to first recognize that we have made great strides in reducing air pollution in the Bay Area.

Achievements

Air quality control is an incremental proposition - a marathon, not a sprint. The regulations and plans that the Air District and its partners have developed and implemented over the past several decades have served the region well, enabling us to make steady progress in improving air quality. Over the past 40 years, the Bay Area has made great strides in reducing emissions of air pollutants, as well as the health impacts related to public exposure to air pollutants. We have been able to accomplish this even as the region's population, vehicle fleet, vehicle miles of travel (VMT), and economic output have all increased sharply.

Nearly 40 years have passed since Congress adopted the federal Clean Air Act (CAA) of 1970. The CAA led to the establishment of standards for ambient concentrations of six "criteria" air pollutants: ozone (O3), carbon monoxide (CO), sulfur dioxide (SO2), nitrogen dioxide (NO2), lead, and particulate matter (PM).[3] Today, outdoor air in the Bay Area is much cleaner than it was 40 years ago. Air quality monitoring data shows that concentrations of each of the six criteria pollutants in the air we breathe have all been reduced by more than half in the Bay Area since the CAA was enacted.[4]

In 1970, the Bay Area frequently violated standards for ozone, particulate matter, carbon monoxide and lead, and violations often exceeded the standards by a wide margin. Thanks to aggressive state and regional regulatory programs for both stationary and mobile sources of emissions,[5] the Bay Area meets, or is close to meeting, current national air quality standards. In fact, for four of the six criteria pollutants - lead, carbon monoxide, sulfur dioxide, and nitrogen dioxide - the Bay Area is well below all existing standards. However, the Bay Area does not yet attain national ozone and PM2.5 standards, or the more stringent California standards for particulate matter and ozone. In addition to reducing ambient levels of criteria air pollutants, great progress has been made in reducing emissions of, and exposure to, toxic air contaminants. Although the effort is by no means complete, progress in improving Bay Area air quality has been impressive.

[3] The 1970 Clean Air Act identified six pollutants – ozone, PM, carbon monoxide, nitrogen dioxide, sulfur dioxide, and lead – as being particularly dangerous. It mandated that each be regulated based on concentration standards. These standards were based upon "criteria documents" – compendia of scientific information on the formation, concentrations, distribution, and health effects of the pollutants. Hence, these are referred to as "criteria pollutants."

[4] See Chapter 2 for more detailed data regarding Bay Area attainment status and air quality trends.

[5] In California, vehicle emission standards and fuel standards are established by the Air Resources Board.

So what does this improvement in air quality mean in terms of reducing health impacts related to air pollution? To answer this question, Air District staff performed an analysis to compare air pollution levels and population exposure from earlier decades to the pollution levels that prevail today, using the best available air quality monitoring data. The analysis then estimated how the improvement in air quality translates into reductions in key health impacts and the economic benefit of reducing these health impacts. The results of this analysis, summarized below, are presented in greater detail in Appendix A.

The analysis found significant reductions in each of the seven health impacts analyzed.[6] In economic terms, we estimate that improved Bay Area air quality provides health benefits with a value on the order of $25 billion per year. The benefit of the reduction in our health burden is most dramatic in relation to mortality; i.e., the reduction in the number of deaths caused by or related to air pollution. Premature mortality related to air pollution has decreased from approximately 6,400 per year in the late 1980's to approximately 2,800 per year in 2008. Also, the estimated lifetime cancer risk in the Bay Area from exposure to airborne toxics has been reduced by 70 percent from 1990 to 2008.

The reduction in mortality risk can be expressed in terms of increased life expectancy. Overall, due to a variety of factors including improved health care, reduced smoking, and cleaner air, Bay Area life expectancy has increased significantly in recent years. Data shows that Bay Area life expectancy has increased by almost 5 years, from 75.7 years in 1990 to 80.5 in 2006. Of the 5-year increase in life expectancy during this period, we estimate that improved air quality can be credited with extending average life expectancy in the Bay Area by 6 months.[7] Thus, the Air District analysis suggests that approximately 10% of the improvement in Bay Area average life expectancy over the 1990-2006 period can be attributed to cleaner air.

This is very good news, indeed. The bad news, however, is that current levels of air pollution in the Bay Area still cause or contribute to several thousand deaths and billions of dollars in health costs and social costs each year. We estimate that there are approximately 2,800 premature deaths in the Bay Area per year related to current air pollution levels, and that the vast majority of these deaths - more than 90% - are related to exposure to fine particulate matter (PM2.5).[8]

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[6] The health impacts included asthma emergency room visits, respiratory hospital admissions, cardio-vascular hospital admissions, chronic bronchitis, non-fatal heart attacks, cancer onset, and mortality.

[7] A recent study that looked at the benefits of reducing PM in 51 metro areas across the US found a direct correlation between reductions in PM concentrations and increased life expectancy. See Pope et al. "Fine Particulate Air Pollution and Life Expectancy in the United States." *New England Journal of Medicine*, January 22, 2009.

[8] For purposes of comparison, the total number of deaths from all causes in the Bay Area is about 45,000 per year, and the annual number of transportation-related deaths (primarily auto-related fatalities) in the Bay Area is 600 to 700.

So despite substantial and well-documented progress in reducing air pollution, we must continue to work to further improve air quality and to better protect public health. And even as we make progress in reducing air pollution, we face significant challenges that demand fresh thinking and new approaches.

Challenges

The Bay Area must plan today to meet the challenges that we will face in the years to come. Key factors that will influence future conditions include:

- Population and economic growth in the Bay Area;
- Development patterns: where and how we accommodate future growth;
- Changes in infrastructure, including our roadway and transit systems, goods movement systems, and high-speed rail;
- Technological change;
- Climate change;
- Potential local impacts from pollutants emitted by expanding economies in Asia; and
- Public awareness and action to support air quality and climate protection strategies.

Major challenges that we face in the realm of air quality and climate protection, and the opportunities that flow from these challenges, are summarized below.

Criteria Pollutant & Air Toxics Challenges

More stringent standards: Air quality standards are becoming progressively more stringent in response to epidemiological research that shows adverse health effects at lower pollution concentrations than previously known. To attain these increasingly stringent standards, air districts throughout California will need to pursue innovative strategies to complement our traditional, command-and-control, technology-based approach.

Protecting Impacted Communities: Recent health studies related to particulate matter and air toxics highlight the need to focus on reducing pollution exposures in the most heavily-impacted communities that bear the brunt of pollution from ports, freeways, and industry. Analysis performed for the Air District's CARE program indicates that mobile sources, including cars, trucks, and off-road equipment, account for most of the emissions and health risks in impacted communities. These sources are not under the regulatory jurisdiction of the Air District. Improving air quality in impacted communities will entail reducing emissions from all sources, especially heavy-duty vehicles and equipment. And it will require local governments to consider new approaches in land use decision-making.

Reducing PM: Fine particulate matter (PM2.5) is the pollutant that imposes the greatest public health burden on the Bay Area. Exposure to fine and ultrafine PM from motor vehicles endangers people who live or work in close proximity to freeways, ports, and goods movement corridors and facilities. Reducing PM emissions from diesel engines is essential, but we also need to decrease fine PM of all types, including wood smoke, in order to protect public health.

Diminishing returns: Aggressive efforts to reduce emissions from all sources have greatly reduced pollution levels. But we have picked the "low-hanging fruit" – it is becoming harder and harder to find regulations and other control measures that provide significant reductions in criteria pollutants. To make further progress, we will need to pursue new approaches.

Land Use Challenges

Our land use patterns and transportation infrastructure have a profound impact on air quality and population exposure to pollution. In the long run, where and how the Bay Area chooses to develop is likely to have as great or greater an impact on air quality, public health, and climate change than any rules or regulations that the Air District adopts.

Despite current economic challenges, the Bay Area will experience population growth and economic growth in the coming decades. If existing land use development patterns continue, this will result in a major increase in the number of motor vehicles competing for space on our roads, and additional pressure to build housing and commercial property on the periphery of the region, thus complicating our efforts to attain air quality standards and the State's climate protection goals. We need to find a way to accommodate growth through sustainable land use patterns.

Promoting focused development to create vibrant communities in core areas of the region is essential in order to reduce motor vehicle emissions and achieve our air quality and climate protection goals. However, *we must pursue focused development in a way that does not put people at risk from exposure to existing and/or new sources of pollution.*

Climate Protection / Greenhouse Gas Challenges

Climate change is the greatest environmental challenge of the 21st century. We need to radically reduce greenhouse gas emissions to attain the state's ambitious GHG reduction goals for the year 2050. Can the Bay Area find a way to slash greenhouse gas emissions per capita, while still maintaining a strong economy and high quality of life?

Climate change will exacerbate air pollution, and complicate our efforts to attain and maintain air quality standards. Higher temperatures may increase emissions of ozone precursors and ozone formation, eroding the progress that the region has made over the past 50 years of regulatory action.

Climate change has been implicated in increasing the number and severity of summer wildfires in California. Some of these fires have impacted the Bay Area, producing fine particle concentrations that exceed air pollution standards.

Emissions of carbon dioxide (CO2), the primary greenhouse gas, are a direct product of fossil fuel combustion. To protect our climate and avoid global warming, we must reduce combustion of fossil fuels (coal, petroleum products, natural gas, etc.). Recent research indicates that particulate matter from fires and vehicle exhaust contributes directly to global climate change in the form of black carbon, a soot-like substance that both absorbs radiation and diminishes the ability of snow and icepack to reflect radiation away from the earth's surface.

Opportunities

In responding to the challenges described above, the Bay Area has an opportunity to show the world that a diverse region can marshal its economic, political, and social assets to build a sustainable economy and communities that protect our environment and climate. Some of the key ways to achieve this are summarized below.

Attack root causes: To date, emission control strategies have often focused on the tail end of processes, for example by installing scrubbers on smoke stacks or catalytic converters on motor vehicle tail pipes. But we need to tackle the root causes of our air quality and climate challenges by pursuing greater efficiency in all sectors of our society and economy: industrial processes, power generation, motor vehicles and transportation, and design of our buildings and communities.

Promote focused development: We need to change the way in which we live, work, play, and get around. Linking land use, transportation, and air quality planning is a key long-term strategy to reduce emissions of criteria air pollutants, air toxics, and greenhouse gases. We must build public support for a robust Sustainable Communities Strategy [9] for the Bay Area (in response to SB 375) to promote land use, transportation and lifestyle changes that decrease motor vehicle travel and encourage less energy-intensive modes of transportation.

Reduce emissions from goods movement: Goods movement (trucking, rail, ports, etc.) is a major source of air pollution and greenhouse gases. Reducing emissions from the

[9] See discussion of SB 375 and Sustainable Communities Strategy in Chapter 4.

goods movement sector will provide benefits in reducing population exposure to air toxics in impacted communities.

Protect impacted communities: Improving air quality in impacted communities will require a comprehensive strategy and sustained collaboration between the Air District, local governments, health departments, community groups, industry, and other stakeholders.

Take personal responsibility: Each of us makes decisions every day that have a direct impact on our environment and our climate: how we travel, what we buy (or don't buy), the type of vehicle we drive, whether to light a fire in our fireplace. Taken together, these individual decisions have powerful impacts. In the final analysis, each of us has both a direct stake and a direct responsibility in protecting our environment and our climate.

Organization of the CAP

The CAP includes two volumes, plus appendices. Volume I consists of five chapters which present the overall framework of the plan. Chapter 1 explains the goals of the plan and innovative directions that the CAP pursues to address the challenges described above. Chapter 2 lays out the technical foundation for the plan, including air quality standards, Bay Area attainment status, emissions inventory data, trends in emissions and population exposure, and air quality modeling, and also provides a profile of each pollutant addressed in the CAP. Chapter 3 describes the context for this plan, summarizing existing Air District programs that provide the foundation for the CAP, as well as external plans and programs that complement the CAP. Chapter 4 provides an overview of the CAP control strategy and its rationale, and describes key policy issues that informed the development of the control strategy. Chapter 5 briefly summarizes key findings and outcomes of the CAP.

Volume I also includes the following appendices:

- Appendix A: Bay Area Health Burden from Air Pollution: Past & Present
- Appendix B: Public Outreach for the 2010 CAP
- Appendix C: State Air Quality Planning Requirements
- Appendix D: Ecosystem impacts of Air Pollution
- Appendix E: Photochemical Modeling
- Appendix F: Evaluation of Potential Control Measures
- Appendix G: Progress Toward 2010 CAP Performance Objectives

Volume II provides detailed descriptions of the 55 control measures that comprise the CAP control strategy, as well as Further Study Measures and the CAP Leadership Platform.

Chapter 1 – Scope & Purpose of 2010 CAP

The Bay Area 2010 Clean Air Plan (CAP) provides a comprehensive plan to improve air quality, protect public health, and protect the climate. The plan proposes a control strategy to reduce four types of air pollutants – ozone, particulate matter (PM), air toxics, and greenhouse gases – in a multi-pollutant framework. Chapter 1 describes the key goals and objectives of this plan, and the innovative approaches that the Air District employed in developing the 2010 CAP.

The 2010 CAP has been prepared in collaboration with the Air District's regional agency partners: the Association of Bay Area Governments (ABAG), the Bay Conservation and Development Commission (BCDC) and the Metropolitan Transportation Commission (MTC).

In developing the CAP, the Air District performed extensive outreach to the public and interested stakeholders, as described in Appendix B, including multiple rounds of public workshops in various locations throughout the Bay Area. The input provided by interested parties helped to inform the development of the CAP and the CAP control measures.

Update to State Ozone Plan

The legal impetus for the 2010 CAP is to update our most recent state ozone plan,[10] the Bay Area 2005 Ozone Strategy, in order to fulfill the requirements of the California Clean Air Act (CCAA) as codified in the California Health & Safety Code. The CCAA planning requirements, and how the 2010 CAP fulfills these requirements, are described in Appendix C. The key requirements can be summarized as follows:

- Report on progress in implementing the region's most recent plan to address state ozone standards, the *Bay Area 2005 Ozone Strategy;*
- Propose a control strategy that includes all feasible measures to reduce emissions of ozone precursors: reactive organic gases (ROG) and nitrogen oxides (NOx); and
- Reduce transport of ozone and ozone precursors to neighboring air basins.

Section 40914 of the Health & Safety Code requires that air district plans shall either be designed to achieve a reduction in emissions of 5% or more per year for each non attainment pollutant or its precursors, or the plan shall provide an alternative emission reduction strategy that includes all feasible control measures. To date, no air district in

[10] The 2010 CAP responds to planning requirements pursuant to state law only. The CAP does not address federal air quality planning requirements, and is not part of a SIP (State Implementation Plan) for federal air quality planning purposes.

the state has been able to demonstrate a 5% reduction in ozone precursors each year. As in the case of previous Bay Area ozone plans that address state air quality planning requirements, the control strategy for the 2010 CAP is based on the "all feasible measures" alternative.

2010 CAP Goals and Performance Objectives

The 2010 CAP is focused on three related goals of fundamental importance, namely to:

- Protect air quality;
- Protect public health; and
- Protect the climate.

To better define these goals and to measure progress toward their achievement, several performance objectives have been identified for the 2010 CAP.

Air Quality: For air quality performance objectives, the CAP seeks to attain the ambient air quality standards established by the California Air Resources Board (CARB) and the US Environmental Protection Agency (EPA), as summarized in Table 2-1.

Public Health: Two public health objectives have been identified for the CAP:

- Reduce PM2.5 exposure by 10% by 2015;[11] and
- Reduce diesel PM exposure by 85% by 2020

Climate Protection: The CAP performance objectives, consistent with the State of California's climate protection goals, are to:

- Reduce emissions of greenhouse gases (GHGs) to 1990 levels by 2020 and 40% below 1990 levels by 2035.[12]

The rationale for the CAP performance objectives is described in Chapter 5. Appendix G presents an analysis as to how well the CAP control strategy and other measures will achieve the CAP performance objectives.

New Directions in Air Quality Planning

To pursue the goals defined above, the 2010 CAP employs an integrated, multi-pollutant planning framework. This represents a departure from the traditional approach to air

[11] Since it is difficult to measure population exposure to PM, our analysis of progress in meeting the PM2.5 and diesel PM performance objectives uses emissions reductions as a surrogate for reducing population exposure.

[12] The goal of reducing GHG emissions to 1990 levels by 2020, established in AB 32, will require reducing 2009 emissions by 15%. The 2035 goal is a prorated target based upon the goal in the Governor's 2005 Executive Order S-3-05 to reduce GHGs emissions to 80% below 1990 levels by year 2050. The 2035 goal is the same as the goal expressed in MTC's *Transportation 2035* plan and ABAG's *Projections 2009*.

quality planning, embodied in state and federal guidelines, whereby plans are prepared to address a single pollutant, such as ozone or particulate matter (PM). Although the single-pollutant approach has been successful in reducing ambient ozone concentrations in the Bay Area and elsewhere, it suffers from several limitations. In particular, it does not directly consider:

- The co-benefits or trade-offs for control strategies that affect multiple pollutants;
- The range and severity of health effects of different pollutants (e.g. air toxics), and the potential health benefits of reducing the various pollutants; or
- The effects that control measures designed to reduce criteria pollutants may have in increasing or decreasing emissions of CO2 and other greenhouse gases that contribute to climate change.

Considering the limitations of the single-pollutant approach, there is growing recognition of the need to move in the direction of integrated, multi-pollutant air quality planning. The conceptual rationale for multi-pollutant planning was initially set forth in recommendations issued by the National Research Council (NRC), an arm of the National Academy of Sciences, in January 2004.[13] The NRC report advocated that air quality planning should employ a risk-based, multi-pollutant approach to address the major goals of the Federal Clean Air Act, including:

- Reduce concentrations of the six "criteria" pollutants: ozone, PM, SO2, PM, lead, NO2;
- Reduce exposure to air toxics; and
- Address ecosystem impacts related to criteria air pollutants, including acid deposition and stratospheric ozone depletion.[14]

In response to the NRC report, the US EPA Office of Air Quality Planning and Standards (OAQPS) has been investigating the multi-pollutant planning concept in recent years.[15] In May 2007, US EPA issued a call for states or regions interested in pursuing multi-pollutant pilot projects. Multi-pollutant pilot projects under the aegis of US EPA are currently under way in four areas: New York State, North Carolina, Detroit, and the St. Louis MO/IL metro area.

Although the NRC has provided the conceptual basis for multi-pollutant planning, there are currently no laws or regulations that require, or even directly encourage, the preparation of multi-pollutant plans. Nor are there any detailed guidelines available as to how to prepare such a plan.

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[13] *Air Quality Management in the United States*, National Research Council, January 2004.

[14] In terms of ecosystem impacts, the CAP focuses on the link between air quality and climate change. There are, however, a range of ecosystem impacts related to criteria pollutants, such as nitrogen deposition, acid rain, etc. An overview of these other ecosystems impacts is provided in Appendix D. The NRC report also notes that, ideally, multi-pollutant planning should address multiple media, including air quality, water quality, soil, etc.

[15] *The Multi-Pollutant Report: Technical Concepts & Examples,* U.S. EPA, July 2008.

The CAP as a Multi-Pollutant Plan

The Air District has chosen to develop the 2010 CAP as an integrated, multi-pollutant air quality plan in the belief that this is the best way to address the Bay Area's air quality and climate protection challenges. The sections below describe the rationale for multi-pollutant planning, the potential benefits of this concept, and how the Air District approached multi-pollutant planning for the CAP. Key findings from the Air District's multi-pollutant analysis are also discussed.

Scientific Rationale for Multi-Pollutant Planning

The scientific rationale for multi-pollutant planning is summarized below.

Shared chemistry and meteorology: Air pollutants share common precursor chemicals and interact with one another in the atmosphere in response to meteorology in complex ways. Similar atmospheric processes create, remove or transform multiple pollutants. A few examples of the complex interactions among air pollutants include the following:

- ROG and NOx act as precursors to formation of both ozone and PM, but the processes are different.[16]

- Benzene, 1-3 butadiene, acetaldehyde, and formaldehyde are air toxics with direct health effects, but they are also components of ROG and thus act as precursors to ozone and PM formation.

- Climate change and ozone are intertwined: higher temperatures related to climate change are expected to increase ozone formation; ozone, in turn, acts as a potent, albeit short-lived, greenhouse gas.

- PM has a complex role in terms of global warming. Black (elemental) carbon, also referred to as soot, is a component of PM that appears to accelerate the effects of climate change, such as melting of the polar ice caps. But other aerosol forms of PM such as organic carbon, sulfates and nitrates scatter light, and thus have a cooling effect. Dust particles (e.g. dust from agriculture and construction activities) that contribute to PM also have a cooling effect.

- Emissions of methane, one of the top GHGs, also contribute to increasing background levels of ozone at the global scale.[17] Thus, reducing methane

[16] In the Bay Area, where ozone formation is limited by the availability of ROG, air quality modeling suggests that reducing NOx may actually increase ozone levels, at least under certain conditions in the short term.

emissions can help to reduce both climate change and ground-level ozone concentrations.

Pollutants may have common emission sources: Many emission sources produce multiple air pollutants. For example, combustion of fossil fuels in motor vehicle engines emits ROG and NOx, which act as precursors to formation of ozone and PM; direct emissions of PM; air toxics such as diesel PM, benzene, 1-3 butadiene, and ammonia; as well as greenhouse gases, including significant quantities of CO2, and small amounts of methane. Thus, control measures to reduce emissions from these sources may provide reductions in multiple pollutants.

Multiple pollutants can interact in terms of health effects: From the standpoint of health effects, the interaction among pollutants can be *additive* (the simple sum of the individual effects of each pollutant, *synergistic* (whereby the combined effect is greater than the sum of the effect of each individual pollutant), or *antagonistic* (where the combined effect is less than the sum of the effect of each individual pollutant). Although more research is needed, there is evidence[18] that interaction among multiple pollutants can produce a combined effect that is greater than the simple additive outcome of each individual pollutant.

Policy Rationale for Multi-Pollutant Planning

Multi-pollutant planning also makes sense from the policy perspective. Since available resources are finite both for air quality regulators and for the regulated community, it is important to maximize the cost-effectiveness of pollution control programs. Developing an integrated control strategy that addresses multiple pollutants can optimize the cost-effectiveness of air quality regulations and plans. Multi-pollutant planning can also help to:

- Provide stakeholders and the public with a comprehensive analysis of key air quality issues, build support for strategies to address these issues, and help target resources where they will yield the greatest benefit;
- Maximize co-benefits and avoid trade-offs between the different pollutants;
- Analyze pollutants on the basis of their health risks, and design a control strategy to maximize reductions in health risks;
- Provide better justification for new control measures by analyzing the full range of pollutants reduced and the potential health benefit for proposed measures; and
- Integrate climate protection into air quality planning.

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[17] Seinfeld J.H. and S. N. Pandis, Atmospheric Chemistry and Physics: From Air Pollution to Climate Change, p. 246-249, John Wiley & Sons, Inc, New York, 1998. Also, Fiore et al, Linking ozone pollution and climate change: the case for controlling methane, Geophysical Research Letters, Vol. 29, No. 19, 2002.

[18] *Is There Evidence for Synergy Among Air Pollutants in Causing Health Effects?* Joe L. Mauderly and Jonathan M. Samet, Environmental Health Perspectives vol. 117, Number 1, January 2009.

A key rationale for multi-pollutant planning is to maximize co-benefits in reducing multiple pollutants and minimize any potential trade-offs. Control measures that reduce multiple pollutants provide desirable co-benefits. However, in some cases, a particular control measure or technology may reduce one or more pollutants, but at a cost of increasing emissions of some other pollutant(s). Analyzing control measures on a multi-pollutant basis provides a means to evaluate and minimize any potential trade-offs, and to determine whether a trade-off, if unavoidable, may nevertheless still provide a net air quality benefit.

Multi-Pollutant Issues and Challenges

Although multi-pollutant planning makes sense conceptually, it is inherently more complex than single-pollutant planning, especially in the absence of state or federal guidelines. Therefore, it presents a range of challenges from both the policy and technical perspective. These challenges include:

- The scope of multi-pollutant planning is not yet well-defined. In developing a multi-pollutant plan, where should one draw the line in terms of the range of pollutants, health effects, and ecosystem impacts to address?
- Do we have adequate technical knowledge and tools to allow us to plan on a multi-pollutant basis? (See Chapter 2)
- What does the science and health data tell us about the relative harmfulness of the different pollutants?
- How to develop an effective multi-pollutant control strategy?

Although multi-pollutant planning has conceptual appeal and practical value, it should not be seen as a panacea. In the final analysis, the effectiveness of any air quality plan depends upon identifying and implementing effective emission control measures. Multi-pollutant planning provides a broader lens through which to evaluate control measures, but the universe of potential control measures is not necessarily greatly expanded. Finding viable control measures that provide significant emission reductions remains a major challenge.

Air Pollutants Addressed in CAP

There are hundreds of air pollutants, with a multitude of known and suspected health effects. It would be neither technically or practically feasible to address every air pollutant in the CAP, so the Air District has chosen to focus on a manageable subset of pollutants, namely:

- Ground-level ozone and ozone precursors: ROG and NOx
- Particulate matter (PM): both directly-emitted PM and secondary PM
- Key air toxics, such as diesel PM and benzene, and
- The “Kyoto 6” greenhouse gases (GHGs)

The choice of pollutants to include was based primarily on which pollutants pose the greatest risk to public health and to the climate.[19] Ozone and PM were chosen because they are the two criteria air pollutants for which the Bay Area continues to exceed state and national air quality standards. PM was also chosen because it has been identified as a major cause of serious health effects.

The California Air Resources Board (CARB) has identified 191 air toxics. In addressing air toxics in the CAP, we focus on a small set of carcinogenic air toxics – benzene, 1,3-butadiene, formaldehyde, acetaldehyde, and diesel PM. Although just a small subset of the full spectrum of toxics, these toxic compounds were chosen because they account for approximately 95% of the estimated cancer risk from air toxics in the Bay Area.[20] Diesel PM is both a component of PM2.5 and also the Bay Area's leading airborne carcinogen.[21]

Greenhouse gases are included because they are the agents of climate change. There are many GHGs, but the CAP focuses on the "Kyoto 6" greenhouse gases. Three of these gases - CO_2, methane, and nitrous oxide – represent 99% of the known GHG potential of the Bay Area.[22]

Although they may share characteristics and interact in the atmosphere, the pollutants addressed in the CAP differ in fundamental ways. One of the differences relates to how pollutants are emitted or formed. For example, some pollutants, including many air toxics, are directly emitted. Others, such as ozone, are formed via photochemical processes in the atmosphere. And some, such as PM, are both directly emitted, as well as formed via secondary processes. As summarized in Table 1-1, the pollutants addressed in the 2010 CAP differ in terms of:

- Chemical composition and formation
- Time of year when highest concentrations occur
- Geographic scale (local, regional, global)
- Range and severity of health effects they cause
- Climate and ecosystem impacts

[19] For additional discussion regarding how the pollutants addressed in this plan were selected, see Section 1.3.1 of the MPEM Technical Document.

[20] In addition to carcinogenic risks, air toxics may have both acute (short-term) and chronic (long-term) non-cancer health effects. However, for purposes of this methodology, we have chosen to focus on toxic cancer risks only.

[21] See CARE *Phase I Findings and Policy Recommendations Related to Toxic Air Contaminants in the San Francisco Bay Area*, BAAQMD, September 2006, at www.baaqmd.gov/Divisions/Planning-and-Research/Planning-Programs-and-Initiatives/CARE-Program.aspx

[22] The other Kyoto 6 GHGs are hydroflourocarbons (HFCs), perflourocarbons (PFCs), and sulfur hexafluoride (SF_6). See additional discussion re: GHGs in Chapter 2.

Table 1-1 provides an overview of the key characteristics and impacts of the air pollutants addressed in the 2010 CAP.

Table 1-1. Pollutant summary table.

Pollutant	Constituents/ Precursors	Key Anthropogenic Sources	Scale of Impact	Peak Levels	Health Impacts	Other Impacts
Ozone	ROG	Mobile sources (cars) Evaporation of petroleum & solvents Consumer products	Regional & beyond	Summer	Aggravated asthma Acute bronchitis Chronic bronchitis Respiratory symptoms Decreased lung function Heart attacks Premature mortality	Property damage: tires, paints, building surfaces Damage to crops Nitrogen deposition to land & waterways
	NOx	Mobile sources (cars & trucks) Other combustion				
PM2.5	Direct emissions from combustion	Wood-burning Diesel engines Gasoline engines Burning natural gas Commercial cooking	Local & Regional	Winter	Aggravated asthma Respiratory symptoms Increase blood pressure Decreased lung function Heart disease Stroke Premature mortality	Regional haze Acid deposition Water pollution
	ROG	See ROG above				
	NOx	See NOx above				
	Ammonia (NH3)	Landfills, livestock, wastewater treatment, refineries				
	SO2	Petroleum refining Ships				
Air Toxics	Diesel PM Benzene 1,3 Butadiene Formaldehyde Acetaldehyde	Diesel engines Gasoline engines Construction equipment Ships & boats	Local	Year-Round	Acute non-cancer Chronic non-cancer Lung cancer Leukemia Premature mortality	Water pollution
Green House Gases	Carbon dioxide:CO2 Methane (CH4) Nitrous oxide (N2O) Hydroflourocarbons Perflourocarbons Sulfur hexafluoride	Fossil fuel combustion Mobile sources Industrial/commercial Electricity generation	Global	Year-Round	Potentially increase ozone levels Disease vectors Effects from prolonged heat waves	Climate change Rising sea levels Acidification of oceans Species extinction Drought Wildfires

Linking Air Pollution to Health Effects

Protecting public health is one of the key goals of the 2010 CAP. The fundamental linkage between reducing emissions of air pollutants and protecting public health is based on four key steps described below.

Emissions: Many different sources, both stationary (factories, refineries, etc.) and mobile (cars, trucks, locomotives, marine vessels, and farm and construction equipment) emit a wide variety of air pollutants. Identifying the key emission sources and developing strategies to reduce emissions of harmful pollutants (or their chemical precursors) from man-made or "anthropogenic" sources[23] is the first and most fundamental step to improve air quality.

Ambient Concentrations: This term refers to the level of pollutants that are measured in the air. Air quality standards for criteria pollutants are generally defined in terms of ambient concentration, as expressed in terms of either a *parts per million* ratio (e.g., the state 8-hour ozone standard is 0.070 parts per million) or a *mass per volume* basis (e.g., the national 24-hour PM2.5 standard is 35 $\mu g/m^3$). The relationship between emissions and ambient concentrations is complex and depends upon many factors, including meteorological conditions (temperature, wind speed and direction, vertical mixing, etc.) the ratio of precursor pollutants (e.g., the ROG to NOx ratio, in the case of ozone), and regional topography. Some pollutants, such as ozone, are regional in scale. In other cases, such as PM and air toxics, ambient concentrations can vary greatly within a small geographic area. The Air District performs sophisticated photochemical modeling to better understand the complex relationship between emissions and ambient concentrations. These emissions-concentrations relationships or "sensitivities" were quantified and used in the multi-pollutant evaluation method (MPEM) described below.

Population Exposure: Population exposure refers to the type and magnitude of exposure to pollution for a given individual or population cohort.[24] From the public health perspective, the key issue is not how much pollution is present in the air, but rather how many people are actually exposed to the pollution, and how much is taken into the body (dosage). Individual exposure to air pollution varies greatly depending upon where people live, work, and play. Activity patterns and lifestyle, such as how much time people are outside, or how much time they spend driving on busy roadways, vary greatly from person to person. The magnitude, frequency, duration, and route of exposure are all key factors in determining total exposure.

[23] In addition to anthropogenic sources, there are also natural or "biogenic" sources of some pollutants. For example, some species of trees and vegetation emit volatile organic compounds (VOC) that contribute to formation of ozone in the atmosphere.

[24] Inhalation is the primary means of population exposure. Other pathways of indirect exposure to air pollution include absorption through the skin and ingestion.

Just as individual exposure differs, so does the ability of our bodies to tolerate exposure to pollutants. From the standpoint of protecting public health, we are especially concerned about reducing population exposure for the most susceptible people, also called "sensitive populations," including children, pregnant women, seniors, and people with existing cardiovascular or respiratory conditions. Activity levels and body weight are also factors; when people, especially children, are exercising, they receive higher dosages relative to exposure.

Health Effects: Air pollution can cause or contribute to a wide range of health effects and illnesses, depending upon individual exposure to and tolerance for air pollution. Key health effects related to the air pollutants addressed in the 2010 CAP are summarized in Table 1-1.

Multi-Pollutant Evaluation Method

Because pollutants differ in terms of their emission sources, formation, health effects, and other factors, evaluating the benefit of potential control measures on a multi-pollutant basis is a challenging task. To address this issue, the Air District developed a multi-pollutant evaluation method (MPEM) for the 2010 CAP.[25]

The MPEM is based on the four links in the emissions to public health chain described above. For each control measure, the MPEM analyzes how the reduction (or increase) in emissions of each pollutant will affect ambient concentrations, population exposure, and changes in health effects related to each pollutant. The MPEM then monetizes the value of the health and climate protection benefits of each control measure in dollar terms in order to compare the relative benefits of the various control measures. The MPEM thus provides a tool that integrates the CAP goals of improving air quality, protecting public health, and protecting the climate.

For purposes of the 2010 CAP, the MPEM has been used to:

- Estimate the health and climate protection benefits, expressed in dollar terms, for individual control measures;
- Analyze trade-offs in the case of control measures that would increase one or more pollutants while reducing others;
- Estimate the aggregate benefit for the proposed CAP control strategy as a whole; and
- Evaluate the health burden associated with pollution levels in years past and compare that to the health burden in more recent years, as described in Appendix A.

[25] A more detailed description is provided in the *MPEM Technical Document* which is available on the District's website at www.baaqmd.gov/Divisions/Planning-and-Research/Plans/Clean-Air-Plans/Resources.aspx.

MPEM Caveats and Limitations

Although it includes key health effects, the MPEM does not fully consider all pollutants or all the benefits related to improving air quality. The MPEM excludes many air toxics, as well as criteria pollutants for which the Bay Area currently attains applicable standards: i.e., carbon monoxide (CO) and lead.[26] Nor does the MPEM include all potential health effects related to air pollution; only well-documented health effects are included. In addition, the MPEM, as currently designed, does not consider:

- Benefits of improvements in air quality beyond the boundaries of the Air District due to reduction in transport of Bay Area emissions to neighboring air basins;
- Economic benefits in terms of reduced damage to crops and other property (ozone damages tires, building surfaces, etc.), benefits in attracting tourism, the potential increase in property values due to improved air quality, etc.;
- How reducing emissions of air pollutants may provide other environmental benefits such as improving water quality or protecting ecosystems; or
- Co-benefits from control measures that provide enhanced transportation options, improved travel time, improvements in safety for bicyclists and pedestrians, reduced traffic accidents, reduced fuel or energy consumption, etc.

It is important to note that the MPEM provides a means of estimating the benefits of protecting public health and our climate *at this particular point in time*, based on our current understanding of pollutants and their health effects, the current Bay Area emission inventory, and current ambient concentrations. Had the Air District devised a version of the MPEM back in the 1970's or 1980's, when levels of ozone, carbon monoxide and air toxics were much higher than they are today, and the dangers of PM were little understood, the comparative values of different pollutants for purposes of a multi-pollutant comparison would likely have been different than what the MPEM tells us today. Similarly, looking forward, it is likely that the results of a multi-pollutant comparison two or three decades in the future will also tell a different story, in response to evolving science, progress in reducing the different pollutants in the intervening years, and other factors.

The MPEM by necessity incorporates many assumptions and approximations; these are described in the MPEM Technical Document. For example, for purposes of estimating population exposure to pollutants, the MPEM assumes "backyard" exposure; i.e., that people are at home and outside in their yards 24 hours a day, 7 days a week. Because the MPEM is a complex methodology, the estimates of social benefits that it generates are subject to considerable uncertainty. To address this uncertainty, Air District staff

[26] The Bay Area also attains State and national standards for NO2 and SO2. However, these pollutants are included in the MPEM because they act as precursors in secondary formation of PM.

performed a probability analysis of MPEM results.[27] The MPEM is intended primarily for purposes of comparing the relative dollar value of benefits across control measures. Although the methodology is a useful tool to help inform our decision-making, it should not be used as the sole arbiter of air quality rule-making or policy. With these caveats, key MPEM findings are presented below.

Valuation of Health Effects

Negative health effects related to air pollution impose direct costs to treat illness and disease, as well as indirect costs such as lost work days and diminished productivity. For the MPEM, the following values were used for key health endpoints.[28]

- Mortality: $6,900,000
- New cancer case: $1,750,000
- New chronic bronchitis case: $ 410,000
- Non-fatal heart attack: $ 84,100
- Hospitalization for respiratory/cardiovascular illness: $33,000-$44,000 per admission
- Asthma emergency room visits: $468 per incident
- Acute bronchitis episodes: $534, for a 6-day illness period
- Upper respiratory symptom days: $35 per day
- Lower respiratory symptom days: $22 per day
- Work loss days: daily median wage by county
- School absence days: $91 per day
- Minor restricted activity days: $61 per day

Valuation of Greenhouse Gas Reductions

The MPEM also considers the value of reducing greenhouse gas emissions. Assigning a value to GHG reductions is problematic, given that 1) climate change will have impacts both locally and at the global scale, 2) potential climate change impacts are very broad, including a wide array of health, ecosystem, social, and economic impacts, and 3) the full range and force of climate change impacts from GHGs emitted today will not be experienced until decades, or even centuries, into the future. To develop a credible estimate for the value of reducing GHGs, the Air District performed a literature review and selected the value of $28 per metric ton of GHG reduced (expressed in CO2-equivalent), as described in Section 5.3 of the *MPEM Technical Document*.

[27] District staff performed an uncertainty analysis based upon the Monte Carlo method to evaluate the MPEM calculations for each control measure, as described in the MPEM Probability Analysis which is posted on the 2010 CAP page on the District website: www.BAAQMD.gov.

[28] Valuations of health effects are explained in Section 5 in the MPEM Technical Document. See: www.baaqmd.gov/Divisions/Planning-and-Research/Plans/Clean-Air-Plans/Resources.aspx.

Relative Value of Emission Reductions Based on MPEM

The MPEM can be used to compare the benefit of reducing the various air pollutants, as shown in Table 1-2. For this exercise, the MPEM was used to calculate the value of reducing one ton of each pollutant or precursor that is included in the methodology. The relative weight for each pollutant was then determined, using ROG as the unit of comparison. Since studies show that PM is the predominant cause of air pollution-related mortality, as discussed below, and mortality has by far the highest value ($6.9 million) among the health endpoints used in the MPEM, it is not surprising that the MPEM-derived weighting factor for PM reductions is much higher than for the other pollutants analyzed. These weighting factors are instructive for purposes of comparing the value of reducing the various pollutants. They can also be used to calculate the weighted tons of emissions reduced by various control measures for purposes of comparing their overall air quality and climate protection benefit.

Table 1-2. Dollar value of reducing one ton per year of each pollutant using MPEM.

Pollutant	$$ Benefit: Reducing One Ton Per Year	Weighting Factor *
ROG	$4,800	1.0
NOx	$7,300	1.5
Diesel PM2.5	$459,300	96.1
Direct PM2.5 (no diesel)	$456,400	95.5
SO2	$37,900	7.9
Ammonia	$53,500	11.2
Acetaldehyde	$5,300 ($500 plus $4,800 as ROG)	1.1
Benzene	$ 12,000 ($7,200 plus $4,800 as ROG)	2.5
1,3-Butadiene	$30,200 ($25,400 plus $4,800 as ROG)	6.3
Formaldehyde	$ 6,000 ($1,100 plus $4,800 as ROG)	1.2
CO2 equivalent	$28	0.03

**Weighting factor: ROG = 1.0. The $ benefit/ton is divided by the ROG value of $4,800/ton to calculate weighting factor for each pollutant. For example, the value of SO2 reductions is $37,900; dividing this by $4,800 yields a weighting factor of 7.9 for SO2. The weighting for benzene, butadiene, formaldehyde, and acetaldehyde includes their effects both as air toxics, as well as components of ROG that contribute to formation of ozone and PM*.

Another way to assess the relative weight of the different pollutants is to compare the monetary benefit of reducing ambient concentrations of the various pollutants covered by the MPEM by 1%, as shown in Figure 1-1.[29]

[29] It should be noted that the relatively low value for (non-diesel) air toxics in Figure 1-1 is due in large part to our success in reducing air toxics over the past 25 years. Also, the greenhouse gas slice of the pie would be larger if a value higher than $28 per ton was ascribed to the value of reducing one reducing GHGs in the MPEM.

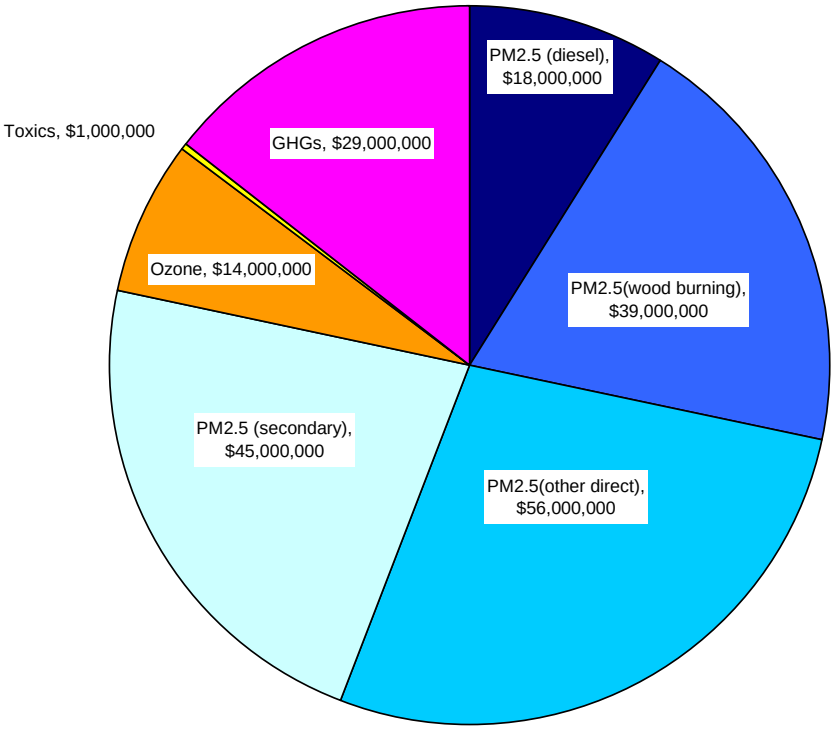

Figure 1-1. Social benefits of a 1% reduction of air pollutants in the Bay Area. The estimated social benefits are based on reductions of 1% of anthropogenic emissions, except for ozone. For ozone, the estimated benefit is based on a 1% reduction in exposures above 0.50 ppm.

Two key points about this pie chart are that (1) reducing PM accounts for roughly 80% of the total benefit and (2) diesel PM accounts for only about 20% of the total PM benefit.[30] The take-away message from Figure 1-1 is that, while reducing diesel PM is very important, we also need to continue, and strengthen, our efforts to reduce PM from wood smoke and other sources such as commercial cooking, and combustion of non-diesel fossil fuels, including gasoline and natural gas.

Protecting Public Health

Protecting public health is one of the core objectives of the 2010 CAP. The CAP is concerned with reducing pollution exposure throughout the region, but we place special

[30] Emissions of diesel PM are expected to decline significantly over the next decade in response to stringent CARB rules to control emissions from both on-road and off-road heavy-duty diesel engines.

emphasis on reducing population exposure and health impacts in the Bay Area communities that are most heavily impacted by air pollution.

From the standpoint of public health, air pollutants only become a problem when someone inhales or ingests the pollutant. The greatest risk occurs when a dense population is exposed to elevated concentrations of harmful pollutants, especially among the most sensitive members of that group: children, seniors, or people with pre-existing cardiac or respiratory problems.

Exposure to air pollution can cause a wide range of health effects, as summarized in Table 1-1, including short-term (acute) effects and long-term (chronic) effects, including asthma, bronchitis, cancer, heart attacks, and strokes. To protect public health, it is important to:

- Determine which pollutants are most harmful to public health;
- Identify where the greatest concentrations of people are exposed to the most harmful pollutants; and
- Develop and implement effective strategies to reduce population exposure to the most harmful pollutants.

Defining and documenting the relationship between air pollution and public health is a complex endeavor. It is very difficult to prove a direct causal relationship between pollution and any specific illness or health impact in a given individual. Even if it were possible to accurately measure exposure and dosage to various pollutants at the individual level, the body's response (or lack of response) can vary greatly depending upon the individual. In general, sensitive populations – children, elderly, and people with pre-existing heart or lung conditions – are at greatest risk from air pollution. Because the relationship between air pollution and illness is difficult to prove or measure on an individual level, researchers rely on epidemiological studies of various population groups to tease out the effects of air pollution on public health. Clarifying the link between air quality and public health is also difficult for the following reasons.

- There may be health effects associated with some pollutants (e.g., PM2.5) even at levels below the established air quality standards.
- The Air District's air quality monitoring network is designed primarily to measure ambient concentrations of criteria air pollutants for purposes of determining compliance with state and national ambient standards on a regional basis. However, ambient concentrations for pollutants such as PM2.5 and air toxics can vary significantly at a local scale.[31]

[31] Although the existing Bay Area monitoring network fully complies with all state and federal requirements, it does not provide accurate measurement of PM and air toxics at a fine-grained scale. The Air District conducts special local measurement studies to augment the regional monitoring network. Control measure LUM 6 in Volume II provides a discussion of how the Air District plans to further enhance air monitoring.

- It is difficult to measure population exposure to pollution, due to variation in personal activity patterns and ambient concentrations of pollution at a local scale, and in micro-environments such as vehicles, homes, schools, offices, and other buildings.
- There is still great uncertainty as to how different pollutants may interact (or not) in terms of their health effects. Depending on the specific combination of pollutants, they may interact in ways that are additive, synergistic, or antagonistic in terms of their health effects.
- It is difficult to separate the impact of air pollution from the many other factors that influence health, including lifestyle (diet, exercise habits, smoking, drinking), socio-economic variables, etc.

Nonetheless, a great deal of research has been performed to analyze the public health impacts of air pollution, and the analysis presented in this plan draws upon the best available studies, information, and methodologies.

Which Pollutants Pose the Greatest Risk?

As discussed in Appendix A, the Air District estimates that air pollution is associated with nearly 3,000 premature deaths per year in the Bay Area. Table 1-3 shows the estimated reduction in annual deaths in the Bay Area that would be achieved if all anthropogenic emissions of PM2.5 and air toxics, including diesel PM2.5, were eliminated,[32] and if ozone concentrations were reduced to 0.05 parts per million. The table divides diesel PM in two parts: mortality caused by diesel PM as a component of PM2.5, and mortality from diesel PM in its role as the leading carcinogenic toxic air contaminant in the region. The point estimate for annual deaths that would be avoided is 2,840 per year, with an 80% chance that the number is within the range of 1,140 to 5,060.

Table 1-3. Estimated reduction in annual deaths from elimination of anthropogenic PM2.5, ozone, and selected toxics.

	PM2.5		Ozone	Toxics (lung cancer)		Total
	Diesel (non-cancer)	Non-diesel		Diesel	Non-diesel	
Point estimate	325	2,370	60	75	10	2,840
Lower bound*	130	950	25	30	5	1,140
Upper bound*	600	4,200	105	135	20	5,060

[32] Reducing all anthropogenic $PM_{2.5}$ would mean reducing average annual Bay Area $PM_{2.5}$ concentrations from about 10.0 $\mu g/m^3$ to 3.5 $\mu g/m^3$.

* The probabilities of deaths being fewer than the lower bound or more than the upper bound are each 10%.

The data in Table 1-3 suggest several important points regarding the impact of air pollution, and the role of PM2.5 and diesel PM, on premature mortality.

The vast majority of premature deaths associated with air pollution - more than 90% - are related to exposure to fine particulate matter (PM2.5). Most of the deaths associated with PM2.5 are related to cardiovascular and respiratory problems.

Although PM emitted by diesel engines is the leading air toxic in the Bay Area, only 10-20% of PM-related deaths in the Bay Area are linked to diesel exhaust. Other types of PM, from sources such as wood smoke, cooking, burning other fossil fuels, and secondary formation of PM from precursors such as NOx, SO2, and ammonia, collectively account for most of the PM – and PM-related deaths - in the Bay Area.

To the extent that diesel PM does contribute to premature mortality, it is primarily due to its role as a component of PM2.5, in which it contributes to mortality related to heart attacks, emphysema and chronic bronchitis. Diesel PM appears to be associated with 4-5 times more deaths in its role as PM2.5 than in its role as a carcinogenic air toxin.

Lung cancer caused by exposure to air toxics appears to account for only a modest portion, on the order of 3%, of the total deaths related to air pollution in the Bay Area; and only a tiny fraction, on the order of one in a thousand, of overall cancer cases in the Bay Area. The estimated lifetime cancer risk from air toxics in the Bay Area is on the order of 400 cases per million.[33] This compares to the total lifetime cancer risk of approximately 400,000 cases per million from all causes.

The information presented above highlights the importance of reducing PM emissions and concentrations, because PM has been identified as the leading cause of mortality from air pollution, and a high cost is ascribed to premature mortality. However, it should be emphasized that there are also significant negative health and economic impacts related to ozone and air toxics. Although ozone and air toxics are not leading causes of premature mortality, a wide range of acute and chronic health effects are associated with exposure to elevated levels of these pollutants, causing very real impacts to thousands of Bay Area residents. Therefore, it is essential to continue our efforts to reduce ozone and air toxics in response to both public health imperatives and legal requirements.

[33] Estimate is based on concentrations of air toxics measured at Bay Area monitoring stations in 2008, multiplied by OEHHA cancer risk factors.

How the CAP Addresses Public Health

As described in Chapters 3, 4, and 5, the 2010 CAP addresses public health in many ways, including:

- Identifying public health protection as one of its three primary goals;
- Establishing numerical performance objectives for reducing population exposure to diesel PM and PM2.5;
- Developing the Multi-Pollutant Evaluation Method to estimate the health benefits of proposed control measures and express these benefits in dollar terms;
- Using the MPEM to determine which pollutants pose greatest health risk;
- Developing potential control measures to maximize the reduction in population exposure to air pollutants, both at the regional scale and in local communities;
- Building on the Air District's current programs to reduce population exposure in impacted communities, such as CARE and the Clean Air Communities Initiative, and proposing to strengthen and enhance these efforts in the CAP control strategy; and
- Including a new category entitled Land Use and Local Impacts Measures (LUMs) in the CAP control strategy. The key objective of the six LUMs is to address localized impacts of air pollution, and in particular to help local jurisdictions to pursue transit-oriented infill development in priority areas, while simultaneously protecting people from exposure to air pollution in these areas.

Protecting the Climate

The third key goal of the 2010 CAP is to reduce emissions of greenhouse gases (GHGs) to protect the climate within the multi-pollutant plan framework. Addressing GHGs in an air quality plan is a challenge because GHGs differ in major ways compared to traditional air pollutants.

- Climate change is global in scale, with an enormous range of impacts and a long time frame before the impacts of today's emissions will be fully experienced.
- GHG emissions dwarf the criteria pollutants and air toxics; emissions of GHGs typically outweigh the other pollutants on a mass basis by a factor of 1000 or more.
- The regulatory framework for GHGs is still a work in progress at the national and international level.

Despite these differences, there are compelling reasons from both the policy and the scientific perspective to address climate protection and GHGs in the CAP. The same emission sources are the primary contributors of both traditional air pollutants and GHGs; this provides a good opportunity to achieve co-benefits from control measures. Higher temperatures related to climate change can increase emissions of ozone precursors and intensify ozone formation, as discussed below. Also, reductions in some

criteria pollutants, such as black carbon (a component of PM), ROG, and carbon monoxide will help to decrease the "radiative forcing" that drives global warming. Conversely, some technologies to reduce emissions of traditional pollutants increase energy use or decrease fuel economy and thus generate additional CO2 emissions; therefore, it is important to identify, analyze, and attempt to mitigate trade-offs of this nature.

The Air District officially established a climate protection program in June 2005. Since then, the District has made climate protection a key element in its mission and moved aggressively to integrate climate protection into its core programs and plans, as discussed in Chapter 3. In September 2006 the State of California enacted ground-breaking climate protection legislation, the Global Warming Solutions Act (AB 32). In December 2008, CARB adopted a wide-ranging climate scoping plan pursuant to AB 32. The Air District is committed to using the full scope of its resources and authority to take actions within the Bay Area to help implement and complement the ARB scoping plan.

The range of impacts due to climate change is staggering, and most are beyond the direct scope of this plan. Nonetheless, it is essential that we address global warming in order to prevent, or at least reduce, potential negative impacts on air quality. Although it is difficult to predict how climate change at the global scale will impact air quality in the Bay Area, climate change has the potential to greatly exacerbate our air quality problems and undermine decades of progress in reducing criteria pollutants.

Impacts of Climate Change on Ozone Levels

There is irrefutable scientific evidence that the earth's atmosphere is getting hotter, that man-made emissions of carbon dioxide and other greenhouse gases are the primary cause of global warming, and that the effects of climate change are already being experienced in California and throughout the world.

Climate change is expected to have a direct and significant impact on ozone levels in the Bay Area and throughout the state. Simply stated, high temperatures lead to high ozone levels.
Bay Area emissions of CO2 and other GHGs contribute to climate change on the global scale; conversely, the Bay Area is impacted by emissions of GHGs from all parts of the world. Research suggests that global warming caused by world-wide emissions of GHGs could impact ozone levels through any and all of the following:

- higher temperatures;
- longer and more frequent heat waves;
- more frequent severe temperature spikes;
- increased length of the ozone season;
- increased VOC emissions from trees and other biogenic sources of VOCs, such as isoprene, and monoterpenes, due to higher temperatures;

- increased evaporative emissions of VOCs from storage tanks, solvents, motor vehicles, etc.
- change in ratio of VOC to NOx;
- increased atmospheric water vapor, higher humidity; and
- reduction in wind and vertical mixing that disperse pollutants

Potential Impacts on Bay Area Ozone Levels

Ozone monitoring data and the Air District's air quality modeling both show a strong correlation between extreme heat days and ozone exceedances. Air quality modeling by Air District staff suggests that an anticipated 2 degree Celsius increase in average temperatures predicted from climate change would set back progress in reducing ozone by a decade.[34] A separate study by UC Berkeley researchers using computer modeling to simulate the impact of higher temperatures on ozone levels in central California found that within the study domain, Bay Area ozone levels may be the most impacted by higher temperatures, and that parts of the Bay Area could experience an increase in ozone concentrations of nearly 10%.[35] An increase of this magnitude could cripple efforts to attain ozone standards in the Bay Area. As shown in Figure 1-2, the years in which the Bay Area has greater numbers of ozone exceedances correlate very closely with the years when the region experiences higher temperatures.

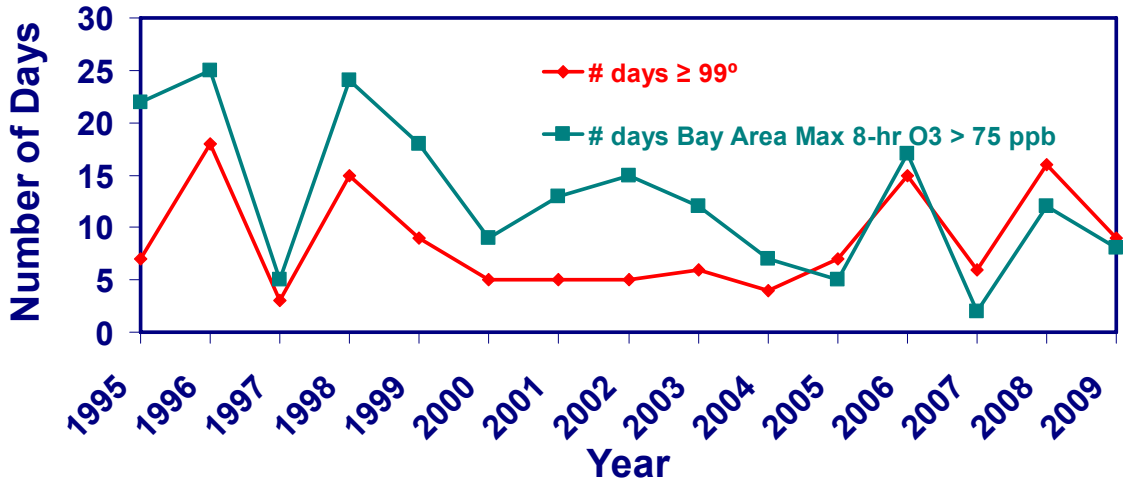

Figure 1-2. Correlation between # of high heat days and # of ozone exceedances in the Bay Area.

[34] See "The effects of climate change on emissions and ozone in Central California" by Su-Tzai Soong, Cuong Tran, David Fairley, Yiqin Jia, and Saffet Tanrikulu. Paper #590 presented in the 101st Annual Meeting, Air and Waste Management Association, June 24-26, 2008 Portland OR.

[35] Steiner, Allison et al. "Influence of future climate and emissions on regional air quality in California." Journal of Geophysical Research, Vol. 111. D183303, September 21, 2006.

The correlation between high heat and increased air pollution is at the heart of the Air District's commitment to climate protection. Figure 1-3 shows several potential scenarios for the number of high heat days per year in coming decades, representing anywhere from a 3-fold to a 10-fold increase over current levels. All these scenarios, even the "low-warming" scenario, would mean a great increase in the number of ozone exceedance days in the Bay Area.

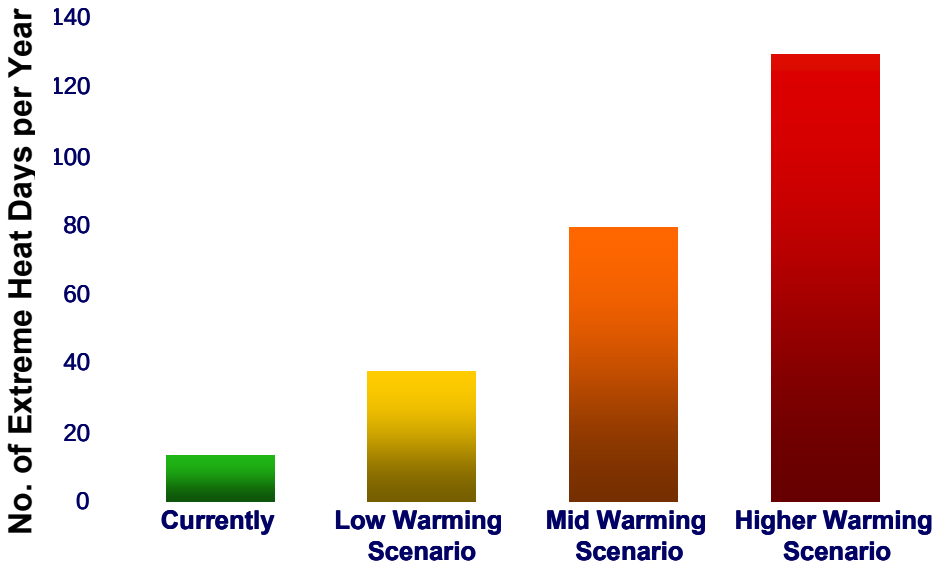

Figure 1-3. Number of extreme heat days per year projected for the San Francisco Bay Area: 2070-2099. **(Source: Union of Concerned Scientists, 2006)**

Impacts of Climate Change on PM and Air Toxics

Since benzene, 1,3-butadiene and some other air toxics are components of many VOCs, to the extent that those VOCs increase, so will these toxics. The potential impact of GHG emissions and climate change on other pollutants is still under investigation. However, climate change is likely to increase PM and other pollutants as well. For example, increased demand for air conditioning in buildings and vehicles may cause higher emissions of direct PM and PM precursors such as NOx and SO2 from power plants and vehicle engines.

Health Impacts Related to Climate Change

If climate change does, in fact, increase air pollution and impede efforts to attain ozone and PM standards in the Bay Area, this will have negative impacts on public health in years to come. But evidence suggests that climate change may already be degrading air quality and impacting public health in California and other western states due to an

increase in the number and severity of wildfires, as a result of changes in the timing and quantity of precipitation, and reduction in mountain snowpack.[36]

Increased wildfires, although episodic in nature, could prove to be one of the most dramatic impacts of global warming on air quality and public health, since large-scale fires can greatly increase population exposure to PM and other harmful pollutants. The outbreak of wildfires that swept across California in late June 2008 caused ambient concentrations of ozone and PM to soar to unprecedented levels.[37] A recent study found that the PM concentrations not only reached high levels, but that the PM released by these fires was much more toxic than the PM more typically present in the California atmosphere.[38] Acute episodes that combine high levels of PM with much more toxic PM could be especially dangerous to sensitive individuals with pre-existing lung conditions. In addition to these health effects, wildfires also release immense quantities of CO2 stored in trees and vegetation; thus, in an example of a negative feedback loop, fires provoked by global warming create yet more of the gases that exacerbate the problem.

Other impacts of climate change are also likely to have a negative effect on public health, including an increase in vector-borne diseases, and mortality directly caused by longer and more severe heat waves.

Addressing Climate Protection in the CAP

Although reducing greenhouse gas emissions to protect the climate is a key goal for this plan, the CAP is not intended to serve as a comprehensive regional climate protection plan. Instead, the CAP focuses on integrating climate protection into the control strategy to reduce criteria pollutants and air toxics. The CAP control strategy also proposes several new Energy & Climate Measures to reduce emissions of GHGs and mitigate the impacts of climate change.

Greenhouse gas emission inventory data and an analysis of GHG trends are provided in Chapter 2. Existing state, regional, and local efforts to protect the climate are briefly described in Chapter 3. The new Energy & Climate control measures, and other measures that help to reduce GHGs, are presented in Chapter 4. Chapter 5 summarizes how climate protection is addressed in the CAP.

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[36] Westerling, A. L., H. Hidalgo, D.R. Cayan, and T. Swetnam, 2006: Warming and Earlier Spring Increases Western US Forest Wildfire Activity, *Science*, 313: 940-943. This study found that large wildfire activity increased suddenly and markedly in the mid-1980s, with greater frequency of large wildfires, longer wildfire durations, and longer wildfire seasons. The study concluded that this is strongly associated with increased spring and summer temperatures and an earlier spring snowmelt.

[37] During the final week of June 2008, PM2.5 levels increased five or ten-fold compared to normal readings at several Bay Area monitoring stations.

[38] Wegesser et al. "California Wildfires of 2008: Coarse and Fine Particulate Matter Toxicity." *Environmental Health Perspectives* Volume 117, June 2009

Chapter 2 – Technical Foundation

Overview

Sound air quality planning requires a solid technical foundation. This chapter provides the technical underpinnings for the 2010 CAP. The first part of this chapter describes air quality standards and Bay Area attainment status for the various criteria pollutants, and provides an overview of the Air District's emissions inventories, as well as photo-chemical air quality modeling that has informed this plan. Profiles of each of the four major categories of air pollutants addressed in the CAP are provided in the remainder of this chapter. The profiles describe health impacts, emissions inventories, trends in ambient concentrations, and air quality modeling results, as appropriate, for:

- Ground-level ozone and ozone precursors: ROG [77] and NOx:
- Particulate matter (PM), both directly emitted and secondary PM
- Key air toxics, such as diesel PM and benzene
- The "Kyoto 6" greenhouse gases

Ambient Air Quality Standards and Bay Area Attainment Status

The federal Clean Air Act of 1970 directed US EPA to establish national ambient air quality standards (NAAQS), at a level to provide an adequate margin of safety to protect public health, for six air pollutants: ozone, carbon monoxide, sulfur dioxide, nitrogen dioxide, lead, and particulate matter. These six pollutants are commonly referred to as criteria pollutants because, in setting the NAAQS, US EPA develops a "Criteria Document" that summarizes the scientific evidence on the sources, concentrations, atmospheric dynamics, and health effects of a pollutant. After considering recommendations from an independent committee of experts – the Clean Air Science Advisory Committee (CASAC) - EPA staff presents a range of values for the standard, from which the EPA administrator selects the final standard. EPA is required to review and potentially revise the NAAQS every five years, in light of new scientific evidence.

The State of California also establishes air quality standards, referred to as "state standards" in this plan. State standards are determined by the California Air Resources Board (CARB), based on technical input from the Office of Environmental Health Hazard Assessment (OEHHA). In many cases, state standards are more stringent than national standards.

[77] The term ROG (reactive organic gases) is used interchangeably with the term VOC (volatile organic compounds). ROG / VOC include hundreds of reactive hydrocarbon compounds.

Air quality standards may be set for different time intervals, ranging from hourly averaged measurements to annual averages. There are multiple standards that apply to some pollutants, such as ozone and PM. Determining whether an air basin attains a given standard requires comparing monitored pollutant values, such as an hourly peak or annual average, with the standard. For purposes of determining whether an air basin attains a given air quality standard, a metric called the *design value* is calculated for each monitoring station. The way the design value is calculated depends upon how the standard is defined; i.e. the "form of the standard." An air basin (e.g., the Bay Area) generally meets the standard for a given pollutant only if the design values for all monitoring sites do not exceed the standard.

Ambient concentrations of all six of the criteria pollutants have been greatly reduced in the Bay Area over the past four decades. The Bay Area attains all national and state standards for four of the six criteria pollutants - lead, carbon monoxide, sulfur dioxide, and nitrogen dioxide. In fact, as shown by the design values in Table 2-1, Bay Area concentrations are well below (i.e., much cleaner than) current standards for these four pollutants. However, the Bay Area does not yet attain standards for ozone and PM.

The national 8-hour ozone standard was lowered to 0.075 ppm in March 2008. US EPA is currently reviewing this standard and considering reducing it to somewhere in the range of 0.060 to 0.070 ppm. It is likely that the Bay Area will be designated as non-attainment when US EPA sets the revised national 8-hour ozone standard and completes the process to designate the attainment status for each air basin under the new standard. The Bay Area does not yet attain the 0.070 ppm State 8-hour ozone standard.

There are national and state standards for both fine PM (PM2.5) and coarse PM (PM10). There are separate standards for annual average PM and for maximum 24-hour concentrations. In 2002, California adopted an annual PM2.5 standard, but the State has yet to adopt a short-term 24-hour PM standard. Recent monitoring data indicates that the Bay Area meets the state annual PM2.5 standard,[78] but the region does not attain the state annual and 24-hour standards for PM10.

The Bay Area attains the national 24-hour PM10 standard and the national annual PM2.5 standard, but violates the national 24-hour PM2.5 standard. The national 24-hour PM2.5 standard was tightened to 35 $\mu g/m^3$ in 2006. The Bay Area was designated as non-attainment for this standard on November 13, 2009. The Air District will be required to prepare a PM2.5 State Implementation Plan (SIP) by December 2012.

[78] Monitoring data shows that the Bay Area now complies with the State annual PM2.5 standard. However, because the region has not yet been re-designated as attainment for the State annual PM2.5 standard by CARB, the Bay Area is shown as non-attainment for this standard in Table 2-1.

Although there are national and state ambient air quality standards (AAQS) for the criteria pollutants, there are no AAQS for air toxics or greenhouse gases. Air toxics are regulated differently, as explained in the Air Toxics section below. Greenhouse gases are pollutants of a global nature. Although the State of California adopted the Global Warming Solutions Act (commonly referred to as AB 32) in 2006 to reduce emissions of greenhouse gases, the regulatory framework to address GHGs at the national and international level is still under development.

Table 2-1 summarizes current national and state standards, Bay Area attainment status, and Bay Area design values for the national standards for the six criteria pollutants.

Table 2-1. Standards for criteria pollutants, attainment status, and design values[a].

Pollutant	Averaging Time	California Standard[b]	Attainment Status	National Standard	Attainment Status	National Design Value[c] (2008)
Ozone	1-hour	0.09 ppm	N			
Ozone	8-hour	0.070 ppm	N	0.075 ppm – 3-yr average of 4th highest value	N[d]	0.081 ppm[e]
CO	1-hour	20 ppm	A	35 ppm – not to be exceeded > once per year	A	3.8 ppm
CO	8-hour	9 ppm	A	9 ppm – not to be exceeded > once per year	A	2.2 ppm
$PM_{2.5}$	24-hour			35 $\mu g/m^3$ – 3-year 98th percentile	N [f]	36 $\mu g/m^3$
$PM_{2.5}$	Annual	12 $\mu g/m^3$ – 3-year max	N	15 $\mu g/m^3$ – 3-year average	A	11.0 $\mu g/m^3$
PM_{10}	24-hour	50 $\mu g/m^3$	N	150 $\mu g/m^3$ [g]	U	78 $\mu g/m^3$
PM_{10}	Annual	20 $\mu g/m^3$	N			26 $\mu g/m^3$
SO2	1-hour	0.25 ppm	A			
SO2	24-hour	0.04 ppm	A	0.14 ppm – not to be exceeded > once per year	A	0.0101 ppm
SO2	Annual			0.030 ppm		0.0017 ppm
NO2	Annual	0.030 ppm	A	0.053 ppm	A	0.017 ppm
NO2	1-hour	0.18 ppm	A			0.073 ppm
Lead	Quarterly			1.5 $\mu g/m^3$	A	< 0.01 $\mu g/m^3$

* A = Attainment N = Non-Attainment U = Unclassified

[a] Design values are computed on a site-by-site basis. District design value is the highest design value at any individual monitoring site.

[b] California standards are nominally "not to be exceeded," but, other than for annual standards, in practice allow approximately 1 exceedance per year.

[c] The national design value is a statistic based on the monitored concentrations that can be compared with the corresponding standard. The standard is violated if the design value exceeds the standard.

[d] In June 2004, the Bay Area was designated as a marginal nonattainment area of the national 8-hour ozone standard. US EPA lowered the national 8-hour ozone standard from 0.080 to 0.075 PPM (or 75 ppb) in March 2008. US EPA is currently reviewing the 8-hour ozone standard, with a decision expected in July 2011.

[e] Preliminary data show the District's 2009 ozone design value as 0.078 ppm.

[f] US EPA tightened the national 24-hour PM2.5 standard from 65 to 35 μg/m^3 in 2006. The designation of the Bay Area as non-attainment for the 24-hr national PM2.5 standard became effective on December 14, 2009.

[g] The national 24-hour PM10 standard allows one exceedance per year over 3 years with every-day sampling. Because PM10 is sampled on a 1-in-6 day schedule, this means that, in practice, any exceedance would violate the standard.

BAAQMD Monitoring Network

The Air District's air monitoring program operates a network of 28 air monitoring stations to measure air quality levels in the Bay Area, as shown in Table 2-2. The monitoring network is designed to (1) provide the data required to determine the Bay Area's attainment status for both national and state ambient air quality standards; (2) provide air quality data to the public in a timely manner; and (3) support air pollution research and modeling studies. The monitoring network is evaluated and updated on a regular basis in response to changes in monitoring requirements, shifts in population, and other factors. The Air District revises its *Air Monitoring Network Plan* annually to describe changes and improvements to the monitoring network; this plan is available on the District web site. Table 2-2 shows the list of monitoring stations operated by the Air District in 2009.

Table 2-2. Bay Area monitoring stations and pollutants monitored in 2009.

Site	Location	Monitoring Objective *	Pollutants Monitored
1	Berkeley	Population Oriented, Source Impact	O_3, NO_2, SO_2, CO, HC, PM_{10}, $PM_{2.5cont}$, Toxics
2	Bethel Island	Regional Transport	O_3, NO_2, SO_2, CO, PM_{10}, Toxics
3	Concord	Population Oriented & Highest Concentration	O_3, NO_2, SO_2, CO, HC, PM_{10}, $PM_{2.5}$, Toxics
4	Crockett	Source Impact	SO_2, Toxics
5	Cupertino	Population Oriented & Source Impact	PM_{10cont}
6	Fairfield	Regional Transport	O_3
7	Fort Cronkhite	Background	Toxics
8	Fremont	Population Oriented	O_3, NO_2, CO, HC, PM_{10}, $PM_{2.5cont}$, Toxics
9	Gilroy	Population Oriented, Highest Concentration, & Regional Transport	O_3, $PM_{2.5cont}$
10	Hayward	Population Oriented & Regional Transport	O_3
11	Livermore	Highest Concentration	O_3, NO_2, CO, HC, PM_{10}, $PM_{2.5}$, $PM_{2.5cont}$, Speciated $PM_{2.5}$, Toxics
12	Los Gatos	Highest Concentration	O_3
13	Martinez	Source Impact	SO_2, Toxics
14	Napa	Population Oriented	O_3, NO_2, CO, PM_{10}, $PM_{2.5cont}$, Toxics

Table 2-2 (continued). Bay Area monitoring stations and pollutants monitored in 2009

Site	Location	Monitoring Objective *	Pollutants Monitored
15	Oakland	Population Oriented	O_3, NO_2, CO, $PM_{2.5cont}$, Toxics
16	Oakland West	Population Oriented	NO_2, SO_2, CO, $PM_{2.5cont}$, Toxics, Black Carbon
17	Pt Reyes	General Background	$PM_{2.5cont}$
18	Pt Richmond	Source Impact	H_2S
19	Redwood City	Population Oriented	O_3, NO_2, CO, PM_{10}, $PM_{2.5}$, $PM_{2.5cont}$, Toxics
20	Richmond 7th	Source Impact	SO_2, H_2S, Toxics
21	Rodeo	Source Impact	H_2S
22	San Francisco	Population Oriented	O_3, NO_2, SO_2, CO, HC, PM_{10}, $PM_{2.5cont}$, $PM_{2.5}$, Toxics
23	San Jose	Population Oriented & Highest Concentration	O_3, NO_2, CO, HC, PM_{10}, $PM_{2.5}$, $PM_{2.5cont}$, Speciated $PM_{2.5}$, Toxics, Black Carbon
24	San Martin	Highest Concentration	O_3
25	San Pablo	Population Oriented	O_3, NO_2, SO_2, CO, PM_{10}, Toxics
26	San Rafael	Population Oriented	O_3, NO_2, CO, PM_{10}, $PM_{2.5cont}$, Toxics
27	Santa Rosa	Population Oriented	O_3, NO_2, CO, PM_{10}, $PM_{2.5}$, Toxics
28	Vallejo	Population Oriented	O_3, NO_2, SO_2, CO, PM_{10}, $PM_{2.5}$, $PM_{2.5cont}$, Speciated $PM_{2.5}$, Toxics

* Explanation of Monitoring Objectives in Table 2-2:

Population Oriented: Monitor in areas with high population density.

Highest Concentration: Monitor in areas expected to have the highest concentrations.

Source Impact: Monitor downwind of major stationary sources, such as the five Bay Area oil refineries: Chevron, Shell, Tesoro, Conoco-Phillips, and Valero.

General Background: Monitor in area with no significant emissions from mobile, area, or industrial sources, in order to establish background concentrations.

Regional Transport: Monitor along boundaries with other air districts to measure concentrations of pollutants transported into and out of the Bay Area.

A map showing the 2009 Bay Area monitoring network is shown in Figure 2-1.

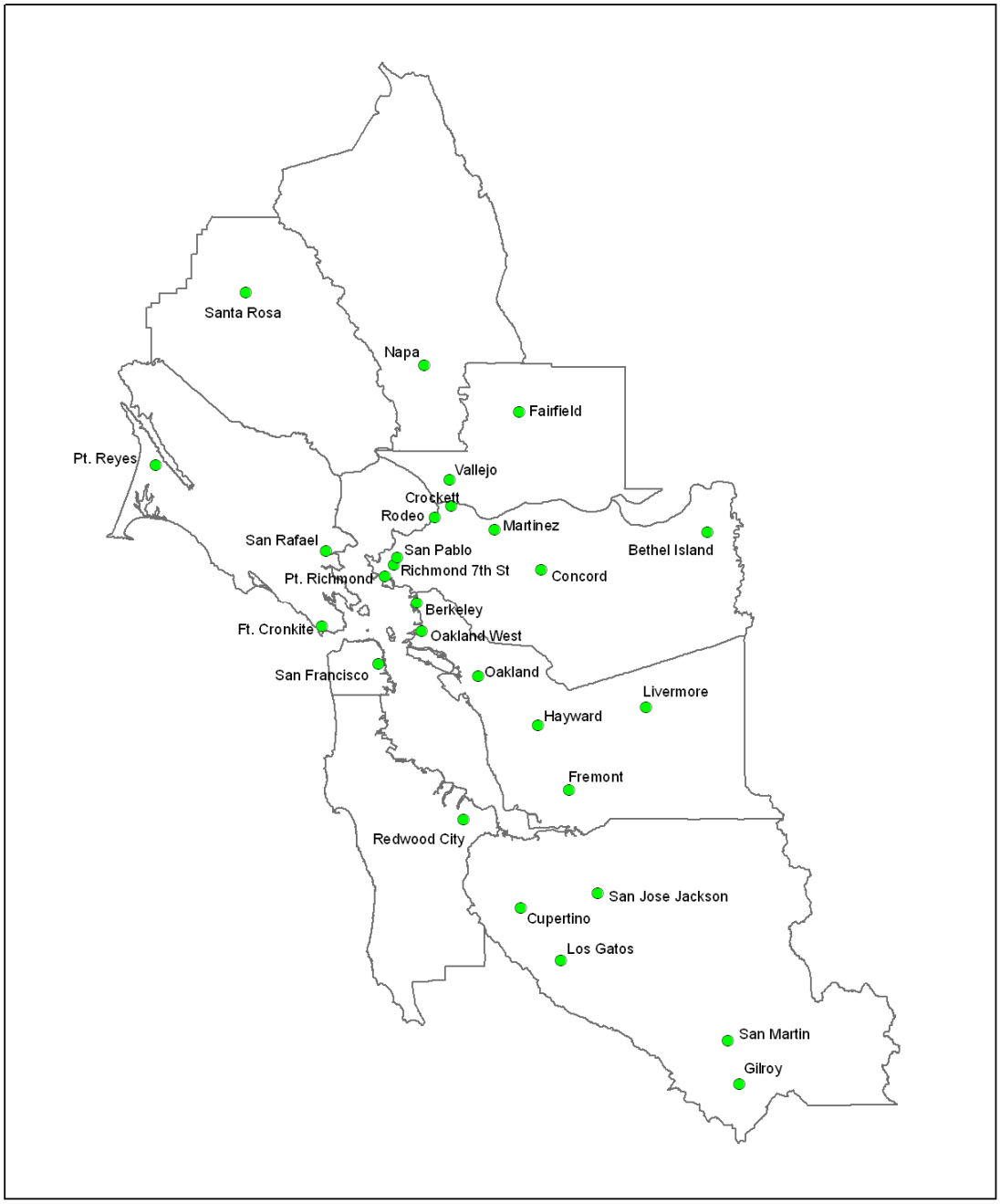

Figure 2-1. 2009 BAAQMD Air Monitoring Network.

Emission Sources

The major categories of emission sources are described in this section. For some pollutants, such as ROG, there are biogenic (natural) sources of emissions, as well as anthropogenic (man-made) sources. However, emissions inventories and control

strategies focus on anthropogenic emissions, since these are most readily subject to control.

The two most basic emission source categories of anthropogenic emissions are stationary sources and mobile sources. Stationary sources include both point sources and area sources. Point sources are those that are identified on an individual facility or source basis, such as refineries and manufacturing plants. For point sources, the District's inventories are based on a computer data base with detailed information on operations and emissions characteristics for nearly 4,000 facilities, with roughly 20,000 different sources, throughout the Bay Area. Data on the activity, seasonal variations, and hours of operation are collected at the process level from each facility. Parameters that affect the quantities of emissions are updated regularly. The emissions from general processes, such as combustion, are computed using generalized or specific emission factors.

Area sources are stationary sources that are individually small, but collectively make a significant contribution to the inventory. Many area sources do not require permits from the Air District, such as residential furnaces and water heaters, and consumer products including paints, solvents, and cleaners. However, some facilities considered to be area sources, such as gas stations, do require permits from the Air District. Emissions estimates for area sources may come from the Air District's data base, from CARB calculations based on statewide data, or from calculations based on surrogate variables such as population.

Mobile sources include on-road motor vehicles such as automobiles, trucks and buses, as well as off-road sources such as construction equipment; boats, ships, trains and aircraft; and small non-road engines including lawn and garden equipment. Estimates of on-road motor vehicle emissions include consideration of the number of vehicles and the fleet mix (vehicle type, model year, and accumulated mileage); miles traveled; ambient temperatures; vehicle speeds; and vehicle emission factors, as developed from Smog Check data, Caltrans vehicle counts, and CARB testing programs.

On-road motor vehicle emissions estimates are based on CARB's latest available emission factor model (EMFAC 2007, Version 2.3, November 2006). Bay Area emission factors incorporate projected growth in vehicle miles of travel (VMT) for the Bay Area developed by the Metropolitan Transportation Commission (MTC) from its travel demand model for the Transportation Air Quality Conformity Analysis of the Regional Transportation Plan 2030 (RTP 2030). MTC's travel demand model utilizes regional demographic forecasts from ABAG's socio-economic and population projections, in this case, Projections 2007.

Off-road mobile sources include boats, ships, trains, and aircraft, as well as garden, farm and construction equipment. Various methodologies are used for compilation of emissions for these mobile sources. Emission factors and methodologies for off-road

mobile sources are calculated from information provided by CARB and EPA. Aircraft mix and activity data specific to each Bay Area airport are used in estimating airport emissions.

Emissions Subject to Air District Control

The Air District has direct regulatory authority over stationary and certain area sources, which account for only a relatively small portion of the sources that comprise the Bay Area emissions inventory. This is especially true in the case of ROG and NOx, which are precursors to the formation of both ozone and secondary PM. In California, CARB establishes emissions standards for on-road and off-road vehicles, as well as vehicles fuels and consumer products. US EPA is responsible for establishing emission standards for ships, aircraft, and locomotives. Therefore, progress in reducing both emissions and concentrations in the Bay Area will depend to a great extent upon actions at the State and federal levels to reduce emissions from sources under their control.

In Figures 2-2 through 2-4 "District jurisdiction" includes stationary and area sources, such as factories, refineries, gas stations, commercial cooking, and wood-burning; "CARB jurisdiction" refers to on-road and off-road vehicles and equipment; and "Federal jurisdiction" includes ships, locomotives, and aircraft. In Figure 2-4, "Non-Regulated" emissions of PM2.5 include dust from construction and farming operations, dust from paved and unpaved roads, other geologic dust, and PM from wildfires.

Although it has no direct authority over motor vehicle emissions, the Air District does work, in partnership with MTC, ABAG, and other agencies, to implement programs to reduce motor vehicle travel and promote the use of clean vehicle technologies, as described in the Mobile Source Measures and the Transportation Control Measures components of the CAP control strategy.

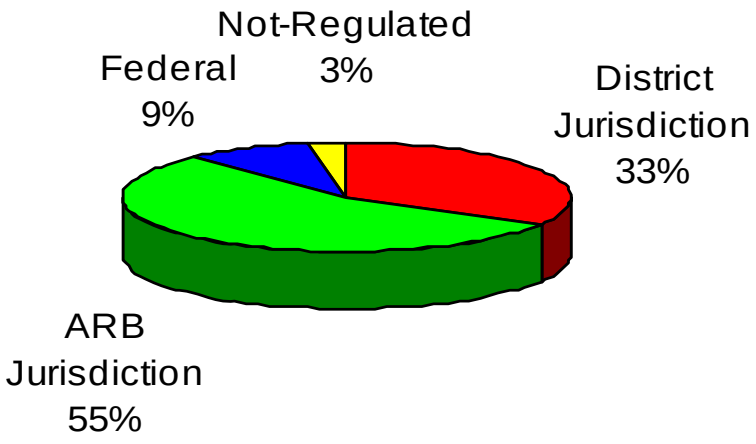

Figure 2-2. Reactive organic gases (ROG), 2009 annual average emissions (344 tons/day).

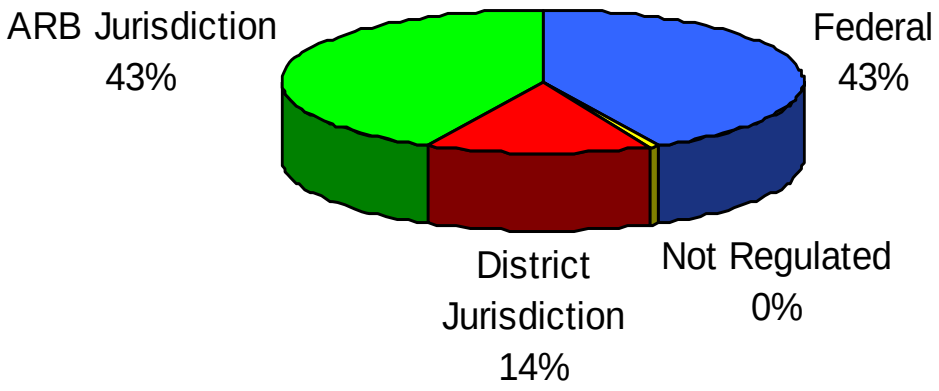

Figure 2-3. Oxides of nitrogen (NOx), 2009 annual average emissions (460 tons/day).

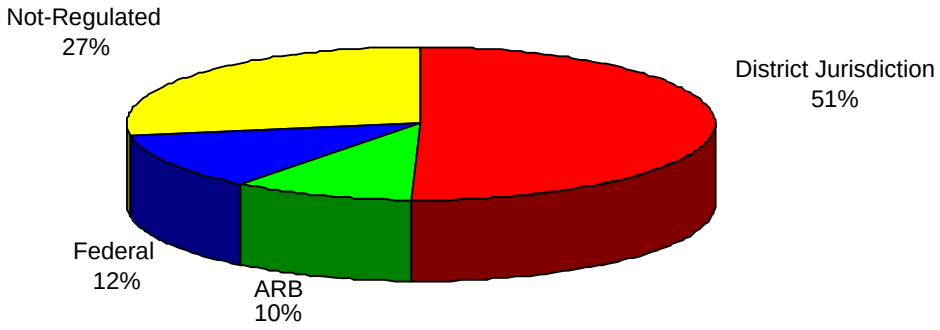

Figure 2-4. Directly emitted $PM_{2.5}$, 2009 annual average emissions (87 tons/day).

Emissions Inventories

Emissions inventories are essential tools for air quality planning. Inventories identify source categories and provide estimates of emissions from each source. Emissions inventories undergo constant refinement in order to reflect changes in emission factors (such as turnover in the vehicle fleet), economic and demographic trends, and rule-making activity. Emissions inventories are used to perform air quality modeling, to identify source categories where there may be opportunities for additional emission reductions, and to estimate potential emission reductions for control measures under consideration. Developing inventories and emission factors for all the pollutants addressed is one of the key technical prerequisites needed to prepare a multi-pollutant air quality plan.

The Air District develops and maintains detailed emissions inventories for a variety of pollutants, including ROG, NOx, PM2.5, and PM10. In recent years, the Air District has also developed an air toxics inventory, as well as an ammonia inventory (ammonia is a key precursor to secondary formation of PM). In November 2006, the Air District became the first air quality agency in the nation to develop a detailed regional greenhouse gas inventory; the GHG inventory was updated in December 2008.

Emissions inventories can be prepared for different seasons (summer or winter) or based on annual average emissions. For purposes of ozone planning, it is customary to use the summer emissions inventory, since this is when ozone exceedances normally occur. For PM planning, the winter emissions inventory is normally used, because PM exceedances typically occur during winter months. Since the 2010 CAP addresses both ozone and PM, Air District staff decided, after consulting with CARB air quality planning staff, to use the annual average inventory in order to avoid potential confusion related to differences between the summer and winter inventories.

Emissions inventories for the various pollutants are described in detail in the profiles of ozone, PM, air toxics, and greenhouse gases provided below. Overall, the emission inventories for criteria pollutants and air toxics have shown a steady downward trend in recent decades. This reflects the combined effect of state and regional programs to reduce emissions, including the Air District's regulations to reduce emissions from stationary sources, CARB programs to reduce emissions from mobile sources, and turnover in the motor vehicle fleet whereby older, high-emitting vehicles are replaced by new vehicles that meet stringent CARB emissions standards. Looking forward, emissions from motor vehicles will continue to decline on a per-mile basis, primarily due to turnover in the vehicle fleet, in combination with CARB regulations to reduce emissions from heavy-duty vehicles, as described in Chapter 3. However, this progress will be offset, at least in part, by continued growth in total vehicle travel in the region.

Whereas emissions of criteria pollutants and air toxics have been decreasing, emissions of CO2 and other greenhouse gases have been increasing, and would be projected to continue to increase under a "business as usual" scenario.

Photochemical Modeling

The Air District has extensive in-house photochemical modeling capabilities. The Air District applies photochemical models to simulate ozone, air toxics, and PM. Ozone modeling started in 1989, air toxics modeling in 2005, and PM modeling in 2008. Model applications and types of models used depend on a number of factors, including Air District needs, U.S. EPA and CARB requirements, staff expertise, availability of appropriate models, and the nature of the problems being investigated.

Although no air quality modeling was required to be performed for the 2010 CAP, results of the Air District's recent modeling work were used in developing the 2010 CAP. In particular, results of photochemical modeling were used for the first time to help evaluate the air quality and health impacts of emission control measures on a multi-pollutant basis. Modeling to show how changes in emissions of ozone precursors, PM, and toxics affect ambient concentrations of these pollutants was essential to the development of the Multi-Pollutant Evaluation Method (MPEM) described in Chapter 1.

In coming years, the Air District intends to develop the capacity to perform integrated "one atmosphere" air quality modeling for ozone, PM, toxics, and greenhouse gases. This will improve our multi-pollutant planning capabilities. Integrated modeling will require a modeling platform based upon unified, full-year, multi-pollutant emission inventories; a single modeling system; and full-year meteorological fields.[79]

Results of modeling performed for ozone, PM, wood smoke, and air toxics are briefly summarized in the respective pollutant profile sections below. A more detailed description of the Air District's modeling work is provided in Appendix E.

Profiles of Pollutants Addressed in the CAP

A profile of each of the four pollutant categories addressed in the CAP is provided below.

Ozone

Ozone (O3), a powerful oxidant, is harmful to public health at high concentrations near ground level.[80] Ozone can damage the tissues of the lungs and respiratory tract. High concentrations of ozone irritate the nose, throat, and respiratory system and constrict the airways. Ozone also can aggravate other respiratory conditions such as asthma, bronchitis, and emphysema, causing increased hospital admissions. Repeated exposure to high ozone levels can make people more susceptible to respiratory infection and lung inflammation and permanently damage lung tissue. Ozone can also have negative cardiovascular impacts, including chronic hardening of the arteries and acute triggering of heart attacks. Children are most at risk, as they tend to be active and outdoors in the summer, when ozone levels are highest. Seniors and people with respiratory illnesses are also especially sensitive to ozone's effects. Even healthy adults, working or exercising outdoors during high ozone levels, can be affected.

Ozone also damages leaf tissue in trees and other plants, and reduces yields of agricultural crops. [81] This reduces the ability of trees and plants to photosynthesize and produce their own food. Ozone can also cause substantial damage to a variety of materials such as rubber, plastics, fabrics, paint, and metals. Exposure to ozone

[79] The availability of modeling results that cover an entire year would eliminate the need to extrapolate episodic modeling results to the full year (as was done for the MPEM used in the 2010 CAP).

[80] While ground-level ozone is a harmful air pollutant, ozone in the upper atmosphere is beneficial because it blocks the sun's harmful ultraviolet rays. The 2010 Clean Air Plan addresses ground-level ozone only.

[81] In fact, the need to reduce damage to orchards in the Santa Clara Valley was a major factor in the creation of the Bay Area AQMD in 1955, when agriculture was still the backbone of the economy in the South Bay.

progressively damages both the functional and aesthetic qualities of materials and products, and shortens their life spans. Damage from ozone exposure can result in significant economic losses as a result of the increased costs of maintenance, upkeep, and replacement of these materials.

Ozone Dynamics

Ozone is not emitted directly from pollution sources. Instead, ozone is formed in the atmosphere through complex chemical reactions in the presence of sunlight between two types of precursor chemicals: hydrocarbons, often referred to as "reactive organic gases" (ROG), and nitrogen oxides (NOx). As air temperatures rise, the formation of ground-level ozone increases at an accelerated pace. Ozone levels are usually highest on hot, windless summer afternoons, especially in inland valleys.

Ozone is a regional pollutant. Emissions of ROG and NOx throughout the Bay Area contribute to ozone formation. Because emissions in one part of the region can impact air quality miles away, efforts to reduce ozone levels focus on reducing emissions of ROG and NOx throughout the region.

The relationship between ROG and NOx in ozone formation is complex; the ratio between the precursor pollutants influences how ozone forms. The Air District's ozone modeling indicates that the Bay Area is "ROG-limited" for ozone formation. This means that reducing ROG emissions will be more productive in reducing ozone, at least in the near term. However, modeling also suggests that large reductions in NOx emissions will be needed to achieve the steep ozone reductions required to attain the very stringent ozone standards.

A certain amount of ozone formation occurs naturally, even in the absence of anthropogenic emissions of ROG and NOx. This natural ozone is referred to as the "background level." Locally, background ozone appears to have increased, perhaps due to reductions in other pollutants: some air pollutants react with and eliminate ozone, sometimes reducing ambient concentrations.[82] Also, as discussed in Chapter 1, increasing emissions of methane at the global scale may be increasing background levels of ozone. In the recent past, ozone standards were roughly three times higher than background levels. Because ozone standards have been tightened, the standards are now less than twice the estimated background level, and may be reduced to even more stringent levels in the future.

Ozone formation in the Bay Area is strongly influenced by the location and strength of the Eastern Pacific High Pressure System. During the summer months, this system normally develops over the Pacific Ocean and travels towards the east. From time to time, depending upon its strength and route of travel, it blocks westerly airflow exiting

[82] For example, NO combines with O3 (ozone) to produce NO2 and O2.

the Bay Area into the Central Valley and develops meteorological conditions conducive to ozone production: light winds, high temperatures, sunny and clear sky conditions, and a shallow mixing layer. When these conditions occur in mid-summer, typically airflow from the core Bay Area penetrates into the Livermore Valley through the I-680 corridor from the north and various gaps along the East Bay ridge from the west, carrying polluted air and causing ozone exceedances. At other times, especially in early or late summer, airflow with a weaker westerly push that is unable to cross the East Bay ridge flows southward, causing ozone exceedances in the Santa Clara Valley. San Martin is frequently the exceedance site in the Santa Clara Valley under these conditions.

Sources of Ozone Precursors – Emissions Inventory

There are literally millions of sources of ozone precursors in the Bay Area, including industrial and commercial facilities, motor vehicles, and consumer products such as household cleaners and paints. Even trees and plants produce ozone precursors. Sources of ozone precursors produced by human activity are called "anthropogenic" while natural sources, produced by plants and animals, are called "biogenic". In the Bay Area, emissions from anthropogenic sources are higher than from biogenic sources.

The main sources of ROG emissions in the Bay Area are motor vehicles and evaporation of solvents, fuels and other petroleum products, as shown in Figure 2-5. The main sources of NOx are motor vehicles and combustion at industrial and other facilities, as shown in Figure 2-6.

The Bay Area annual average emission inventory for ozone precursors, ROG and NO_X is presented in Table 2-3.[83] The inventory is based upon CARB EMFAC 2007, Version 2.3 and reflects the effect of regulations adopted as of December 31, 2006. The inventories do not include additional emissions reductions from State or federal measures adopted since 2007 or CARB's "Pavley regulations" to reduce greenhouse gases from motor vehicles. Estimated emission reductions of ROG, NOx, and PM from CARB regulations not reflected in the current inventory are shown in Table 3-10.

[83] Summer and winter emissions inventories are provided in the "Base Year 2005 Emissions Inventory Summary Report" issued by BAAQMD in December 2008. See www.BAAQMD.gov

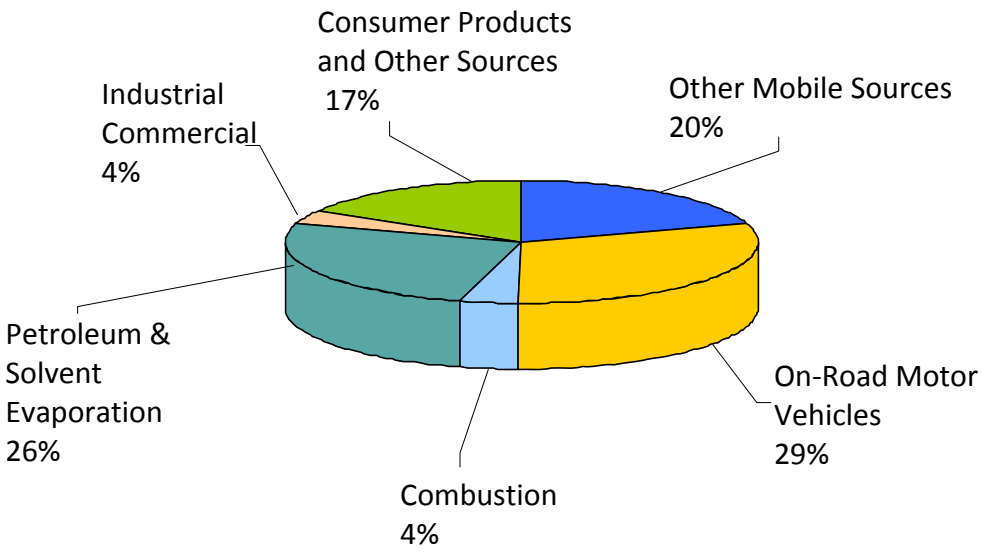

Figure 2-5. ROG anthropogenic emissions by source, 2009.

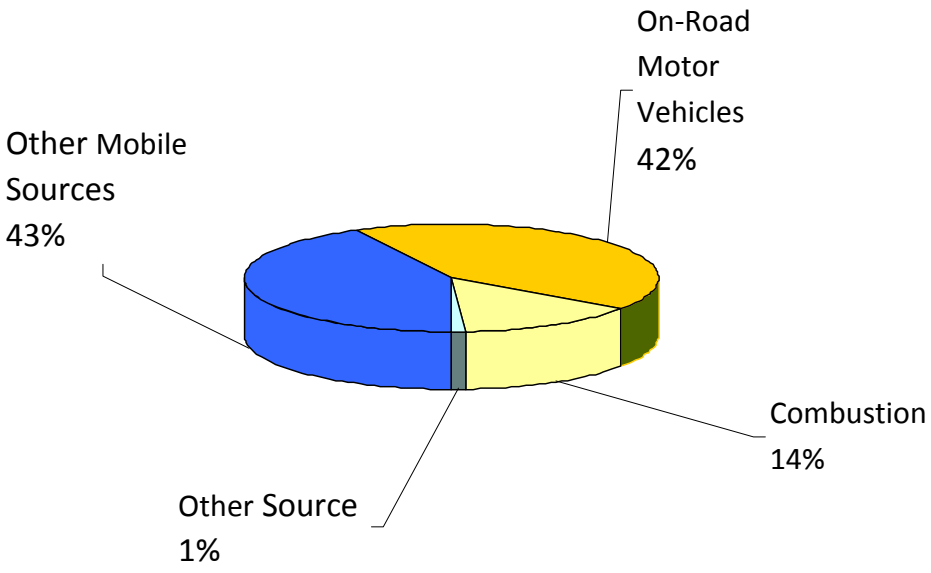

Figure 2-6. NOx emissions by source, 2009.

Table 2-3. Bay Area inventory 2005-2020, ROG & NO_x.

Bay Area Baseline [1] Emission Inventory Projections: 2005 - 2020										
Annual Average Inventory [2] (Tons/Day) [3]										
	Reactive Organic Gases [4]					Oxides of Nitrogen [5]				
SOURCE CATEGORY	**2005**	**2009**	**2012**	**2015**	**2020**	**2005**	**2009**	**2012**	**2015**	**2020**
INDUSTRIAL/COMMERCIAL PROCESSES										
PETROLEUM REFINING FACILITIES										
Basic Refining Processes	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3
Wastewater (Oil-Water) Separators	1.9	0.9	0.9	0.9	1.0	--	--	--	--	--
Wastewater Treatment Facilities	0.1	0.1	0.1	0.1	0.1	--	--	--	--	--
Cooling Towers	2.2	2.2	2.3	2.4	2.5	--	--	--	--	--
Flares & Blowdown Systems	0.8	0.8	0.8	0.9	0.9	0.2	0.2	0.2	0.2	0.3
Other Refining Processes	0.1	0.2	0.2	0.2	0.2	--	--	--	--	--
Fugitives	0.6	0.6	0.7	0.7	0.7	--	--	--	--	--
Subtotal	**5.8**	**5.0**	**5.1**	**5.3**	**5.5**	**0.5**	**0.5**	**0.6**	**0.6**	**0.6**
CHEMICAL MANUFACTURING FACILITIES										
Coating, Inks, Resins & Other Facilities	0.3	0.3	0.3	0.3	0.3	0.1	0.1	0.1	0.1	0.1
Pharmaceuticals & Cosmetics	0.7	0.7	0.7	0.7	0.7	1.5	1.6	1.7	1.7	1.9
Fugitives – Valves & Flanges	0.7	0.7	0.7	0.8	0.8	--	--	--	--	--
Subtotal	**1.6**	**1.6**	**1.7**	**1.7**	**1.9**	**1.6**	**1.7**	**1.7**	**1.8**	**2.0**
OTHER INDUSTRIAL/COMMERCIAL PROCESSES										
Bakeries	0.9	1.0	1.0	1.0	1.1	--	--	--	--	--
Cooking	1.3	1.2	1.3	1.3	1.3	--	--	--	--	--
Wineries & Other Food & Agr. Processes	1.5	1.5	1.6	1.7	1.9	--	--	--	--	--
Metallurical & Minerals Manufacturing	0.2	0.2	0.2	0.2	0.2	0.1	0.2	0.2	0.2	0.2
Waste Management	5.6	5.8	5.8	5.9	6.0	--	--	--	--	--
Semiconductor Manufacturing	0.3	0.3	0.3	0.3	0.3	--	--	--	--	--
Fiberglass Products Manufacturing	0.3	0.3	0.3	0.3	0.4	--	--	--	--	--
Rubber & Plastic Products Manufacturing	0.3	0.3	0.3	0.4	0.4	--	--	--	--	--
Contaminated Soil Aeration	0.1	0.1	0.1	0.1	0.1	--	--	--	--	--
Other Industrial Commercial	0.8	0.8	0.9	0.9	1.0	--	--	--	--	--
Subtotal	**11.2**	**11.5**	**11.8**	**12.1**	**12.6**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**

Table 2-3 (continued). Bay Area inventory 2005-2020, ROG & NO_x.

	Reactive Organic Gases [4]					Oxides of Nitrogen [5]				
SOURCE CATEGORY	**2005**	**2009**	**2012**	**2015**	**2020**	**2005**	**2009**	**2012**	**2015**	**2020**
COMBUSTION - STATIONARY SOURCES										
FUELS COMBUSTION										
Domestic	9	9.3	9.6	9.8	10.3	14.4	14.9	15.2	15.6	16.2
Cogeneration	1.4	1.4	1.5	1.5	1.6	4.1	4.2	4.2	4.3	4.6
Power Plants	--	0.1	0.1	0.1	0.1	1.7	2.2	2.2	2.3	2.5
Oil Refineries External Combustion	0.5	0.5	0.5	0.5	0.6	13.7	14.2	14.7	15.1	15.9
Glass Melting Furnaces - Natural Gas	--	--	--	--	--	1.4	1.4	1.5	1.6	1.7
Reciprocating Engines	0.8	0.7	0.6	0.5	0.4	7.7	7.1	6.8	6.5	5.9
Turbines	0.1	0.1	0.1	0.1	0.1	1.6	1.6	1.6	1.7	1.8
Landfill/Cement Plant Combustion	1.2	1.3	1.3	1.4	1.4	16.7	15.3	15.8	16.3	17.1
Subtotal	**13**	**13.3**	**13.6**	**13.9**	**14.5**	**61.2**	**60.9**	**61.9**	**63.2**	**65.6**
BURNING OF WASTE MATERIALS										
Incineration	0.1	0.1	0.1	0.1	0.1	0.3	0.3	0.3	0.3	0.3
Planned Fires	0.3	0.3	0.3	0.3	0.4	0.2	0.2	0.2	0.2	0.2
Subtotal	**0.4**	**0.4**	**0.4**	**0.4**	**0.4**	**0.4**	**0.4**	**0.4**	**0.5**	**0.5**
Banked Emissions 6	**0**	**9.5**	**9.5**	**9.5**	**9.5**	**0**	**7.2**	**7.2**	**7.2**	**7.2**
Alternative Compliance Allowance 7	**0**	**0**	**0**	**0**	**0**	**0**	**4.9**	**4.9**	**4.9**	**4.9**
Subtotal (District Jurisdiction)	**120.2**	**124.4**	**125.3**	**127.1**	**130.5**	**63.8**	**75.8**	**77**	**78.4**	**80.9**
COMBUSTION-MOBILE SOURCES										
ON-ROAD MOTOR VEHICLES										
Passenger Cars	66.3	45.1	33.2	25.6	18.6	52.4	35.4	26	19.3	12.5
Light Duty Trucks<6000lbs	41.3	33.6	29.2	25.4	20.5	50.4	36.9	29.8	23.9	16.5
Medium Duty Trucks 6001-8500 lbs	6	5	4.7	4.5	4.1	11.7	8.7	7.3	6.1	4.4
Light Heavy Duty Trucks 8501-14000lbs	5.2	4	3.4	3	2.5	12	10.2	8.8	7.9	6.6
Medium Heavy Duty Trucks 14001-33000lbs	4.4	3.2	2.4	1.9	1.3	31.7	26.3	20.8	15.9	10.1
Heavy Heavy Duty Trucks>33000 lbs	5.3	4.2	3.3	2.6	1.8	56.1	45.7	34.8	26	16.9
School/Urban Buses	1.2	1.1	1.1	1.1	1.1	16.4	16	15.8	15	14.1
Motor-Homes	0.4	0.3	0.2	0.2	0.1	1.3	1.1	1	0.8	0.5
Motorcycles	8.4	7.5	7	6.9	6.9	1.9	2	2	2.1	2.1
Subtotal	**138.5**	**103.9**	**84.6**	**71.0**	**56.6**	**233.7**	**182.3**	**146.3**	**116.9**	**83.7**

Table 2-3 (continued). Bay Area inventory 2005-2020, ROG & NO_x.

	Reactive Organic Gases[4]					Oxides of Nitrogen[5]				
SOURCE CATEGORY	**2005**	**2009**	**2012**	**2015**	**2020**	**2005**	**2009**	**2012**	**2015**	**2020**
OFF-HIGHWAY MOBILE SOURCES										
Lawn and Garden Equipment	19.5	16.5	15.1	14	12.9	2.9	2.4	2.3	2.2	2.2
Transportation Refrigeration Units	2.4	1.7	1.1	0.8	0.8	4.6	5.1	5.7	5.6	5.6
Agricultural Equipment	1.6	1.3	1	0.8	0.5	7.4	6.2	5.2	4.2	2.7
Construction and Mining Equipment	12.2	9.8	8.4	7.3	5.7	72.9	62.9	54.5	45.1	30.7
Industrial Equipment	3.7	2.6	2.1	1.8	1.6	20.7	15.6	12.8	10.6	8.3
Light Duty Commercial Equipment	7	5.7	4.8	4	3.3	7.9	7.1	6.5	5.6	4.4
Trains	1.1	1	1	1	1.1	13.8	11.9	12.8	13.1	13.8
Off Road Recreational Vehicles	1	0.8	0.8	0.9	1	0.1	--	--	--	0.1
Ships[8]	1.8	2.1	2.3	2.5	2.9	41.3	47	51.8	57.1	67.2
Commercial Boats	3	2.8	2.5	2.2	2.1	24.7	22.1	20	17.2	16.2
Recreational Boats	18.3	16.7	15.8	15.3	15.1	3.6	4.1	4.1	4.1	4.3
Subtotal	**71.6**	**60.8**	**54.9**	**50.5**	**47.1**	**199.8**	**184.4**	**175.7**	**164.9**	**155.4**
AIRCRAFT										
Commercial Aircraft	1.9	2.9	3.6	4.2	5.1	12.1	18.9	21.3	22.3	24.3
General Aviation	0.7	0.7	0.7	0.8	0.8	0.2	0.4	0.4	0.5	0.5
Military Aircraft	3.3	3.3	3.4	3.4	3.4	4.9	4.9	5	5	5.1
Airport Ground Support Equipment	0.9	1	1	1.1	1.2	3.8	4.1	4.3	4.5	4.9
MISCELLANEOUS OTHER SOURCES										
Construction Operations	--	--	--	--	--	--	--	--	--	--
Farming Operations	--	--	--	--	--	--	--	--	--	--
Entrained Road Dust-Paved Roads	--	--	--	--	--	--	--	--	--	--
Entrained Road Dust-Unpaved Roads	--	--	--	--	--	--	--	--	--	--
Wind Blown Dust	--	--	--	--	--	--	--	--	--	--
Animal Waste	5.5	5.5	5.5	5.5	5.5	--	--	--	--	--
Agricultural Pesticides	0.8	0.8	0.8	0.8	0.8	--	--	--	--	--
Non-Agricultural Pesticides	0.2	0.2	0.2	0.2	0.2	--	--	--	--	--
Consumer Products(Excluding Pesticides)	45.2	46.7	47.9	49.1	51.2	--	--	--	--	--
Other Sources	4	3.6	3.6	3.7	3.7	2.2	2	2	2	2
Subtotal	**55.6**	**56.8**	**58**	**59.2**	**61.3**	**2.2**	**2**	**2**	**2**	**2**
GRAND TOTAL EMISSIONS	**393**	**354**	**331**	**317**	**306**	**521**	**473**	**432**	**394**	**357**

Notes for Table 2-3

1. Inventory and projections are based upon CARB EMFAC 2007, Version 2.3 and assume implementation of all control measures adopted as of December 31, 2006, including Smog Check II for the Bay Area.
2. The annual average inventory represents average day emissions. ABAG Projections 2007 were used to project future emissions from on-road motor vehicles and for the regional population projections used for the planning inventory.
3. Entries are rounded to nearest whole number, totals may not equal to sums of column entries.
4. A photochemically reactive organic compound excludes methane and other non-reactives and roughly 160 tpd of ROG emissions from natural sources.
5. Oxides of nitrogen (nitric oxide and/or nitrogen dioxide), NOx as NO2.
6. Banked Emissions show the total current deposits in the District's emissions banking program as allowed by BAAQMD Regulation 2, Rules 2 and 4. These emissions were reduced (beyond regulations) and banked, but may be withdrawn from the bank and emitted in future years.
7. Surplus emissions, voluntarily reduced, available for alternative compliance with BARCT requirements of selected rules, as prescribed by State law and BAAQMD Regulation 2, Rule 9.
8. California Air Resources Board (CARB) has recently developed statewide emissions estimates for ocean-going vessels (OGVs) occurring within 100 nautical miles of the California coastline. As a result, these emissions are substantially higher than those reported in the previous version of the inventory published in the 2005 Ozone Strategy, which accounted for ship activities within three miles of the Golden Gate Bridge.

Trends in ROG and NOx Emissions

Emissions of ROG and NOx have both been greatly reduced in recent decades. However, ROG emissions have been reduced much faster than NOx. Since the early 1980's, ROG emissions have been reduced by about 75%, compared to about 50% for NOx. This reflects the fact that in the 1970-2000 period CARB focused on reducing emissions from light-duty vehicles; light-duty vehicles are a major source of ROG emissions, whereas heavy-duty vehicles are the primary source of NOx emissions. Since diesel engines currently account for more than half (57%) of total NOx emissions in the Bay Area, CARB regulations to reduce emissions of NOx (and PM) from heavy-duty diesel engines, as described in Chapter 3, will be very beneficial in reducing ozone levels.

As shown in Figures 2-7 and 2-8, emissions of ROG and NOx in the Bay Area are projected to continue to decline in future years. These projections reflect the impact of regulations in place as of December 31, 2006. More recent regulations, as well as control measures identified in this CAP, will further reduce emissions in the future.

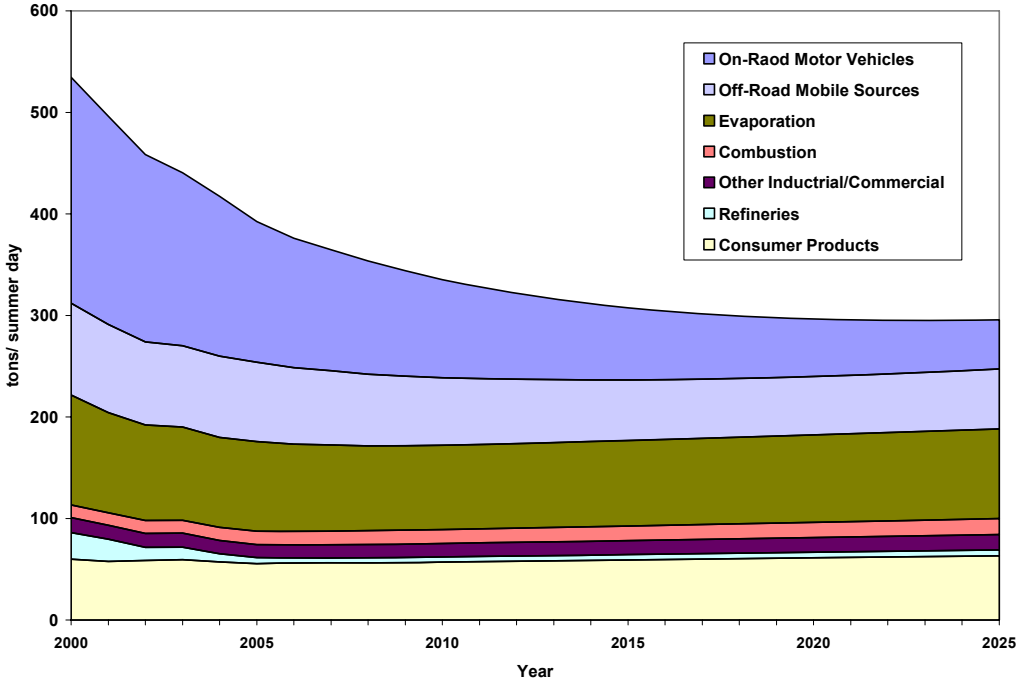

Figure 2-7. Annual average ROG emissions trend: 2000-2025.

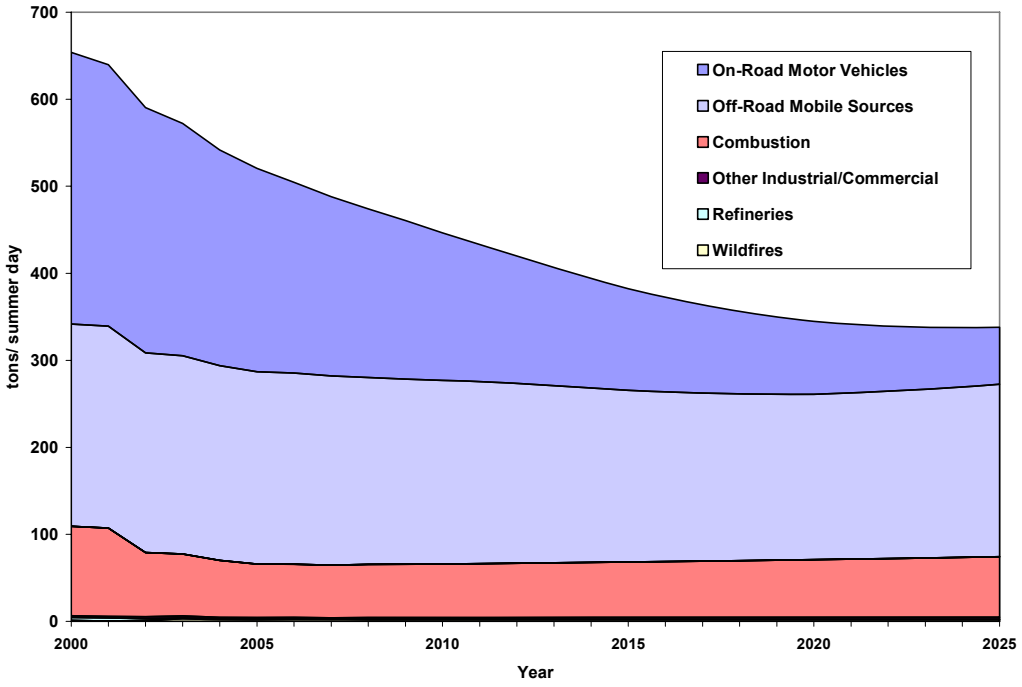

Figure 2-8. Annual average NOx emissions trend: 2000-2025.

In addition to anthropogenic sources of ozone precursors, there are significant quantities of biogenic emissions of ROG from natural sources like plants and animals. Vegetation emits large amounts of isoprene, terpenes, and other organic compounds that act as ozone precursors. Emission rates depend upon species, season, biomass density, time of day, local temperature, moisture and other factors. Total ROG emissions from natural sources in the Bay Area amounts to roughly 105 tons per day on an annual average basis (160 tpd in the summer inventory). Biogenic emissions are not included in the planning emissions inventory because they are generally not subject to control, but these emissions do contribute to ozone formation, and are therefore included in ozone modeling. As discussed in the section on climate change in Chapter 1, higher temperatures due to global warming are likely in increase biogenic emissions of ROG, which will contribute to increased ozone formation.

Trends in Ozone Concentrations

Health and Safety Code Section 40924(b)(1) requires the Air District to assess its progress toward attainment of the California ambient air quality standard for ozone during the most recent triennial period. The analysis in this section examines progress made in the period 2006-08 from the base years 1986-88 and from 1997-99.

Monitoring Data

A basic indicator of air quality trends is the number of days that the region exceeded air quality standards. Table 2-4 shows the annual number of exceedances of the current 0.09 ppm California 1-hour ozone standard at each ozone monitoring station for the 1987-2009 period.

Figure 2-9 shows the annual number of days over the standard at any station during the same period. The figure shows large fluctuations in the numbers of exceedances from year to year. Note, for example, that between 1996 and 1998 the number of exceedances drops from 45 to 10 and then rises to 29. Most of this short-term variation is weather-related. Ozone exceedances only occur on hot, relatively stagnant days, the number of which can vary dramatically from one summer to the next. Variations in the weather can obscure trends in exceedances resulting from changes in emissions of ozone precursors.

Averaging across several years reduces the weather-related "noise." The 3-year moving average in Figure 2-9 shows a relatively steady downtrend in exceedances, from an average of 20 or more exceedance days per year prior to 1990 to about 10 days in the past few years.

Table 2-4. Number of days exceeding the California 1-hour ozone standard by monitoring site 1987-2008.

Stations by Sub-Region	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09
Northern																							
Benicia																					0	2	
Napa	6	1	2	0	3	0	2	0	4	0	0	3	4	0	1	1	2	0	0	1	0	1	1
San Rafael	1	1	0	0	0	0	0	0	0	2	1	0	2	0	0	0	0	0	0	0	0	0	0
Santa Rosa	1	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	1	0	0	0	0	0	0
Vallejo	6	5	2	2	2	1	3	2	4	5	1	3	4	0	0	1	2	1	0	0	0	1	2
Central																							
Hayward	12	9	1	0	2	1	0	1	7	2	2	4	4	1	2	0	3	0	0	2	0	1	4
Oakland	0	1	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0			0	0
Redwood City	2	2	1	0	0	0	1	0	5	1	0	0	0	0	1	0	1	1	0	0	0	0	0
San Francisco	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
San Leandro	0	0	0	0	2	2	3	0	6	2	3	2	3	1	0	1	2	1	1	0	0	0	
Richmond/San Pablo	0	2	1	0	0	0	2	0	0	0	1	0	1	0	0	0	0	1	0	0	0	0	0
Eastern																							
Bethel Island	14	7	11	5	3	7	3	5	6	6	1	10	5	1	3	5	0	1	0	9	0	4	2
Concord	20	10	6	3	4	3	7	4	9	11	2	13	8	2	6	5	5	1	1	7	1	3	2
Fairfield	9	3	4	1	3	3	3	2	10	5	0	9	9	1	3	3	0	1	0	3	0	2	2
Livermore	26	21	9	8	17	14	7	5	20	22	3	21	14	5	9	10	10	5	6	13	2	5	8
Pittsburg	14	8	5	4	0	3	4	3	8	5	0	4	2	1	2	4	0	0	0	2	1	1	

Table 2-4 (continued). Number of days exceeding the California 1-hour ozone standard by monitoring site 1987-2008.

Stations by Sub-Region	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09
Southern																							
Fremont	17	7	11	3	6	5	5	4	10	2	2	7	3	2	3	3	4	0	1	4	0	1	4
Los Gatos	25	12	1	5	7	3	8	2	13	10	1	5	4	0	2	4	7	0	3	7	0	2	3
Mt View/ Sunnyvale	16	13	6	1	2	1	2	0	2	3	1	2	7		0	0	4	1	1	3	0	0	
San Jose	23	12	10	4	6	3	3	2	14	5	0	4	3	0	2	0	4	0	1	5	0	1	0
San Jose - East	22	13	9	1		5	5	3	15	5	1	5	2	1	0	0	2	0	1				
Gilroy	19	23	10	5	5	11	6	3	10	15	1	10	3		3	6	6	0	0	4	0	1	1
San Martin					7	17	9	5	14	18	0	15	7	4	7	8	9	0	2	7	1	2	4
Total Days	**47**	**41**	**22**	**14**	**23**	**29**	**24**	**13**	**30**	**45**	**10**	**29**	**20**	**12**	**15**	**16**	**19**	**7**	**9**	**18**	**4**	**9**	**11**

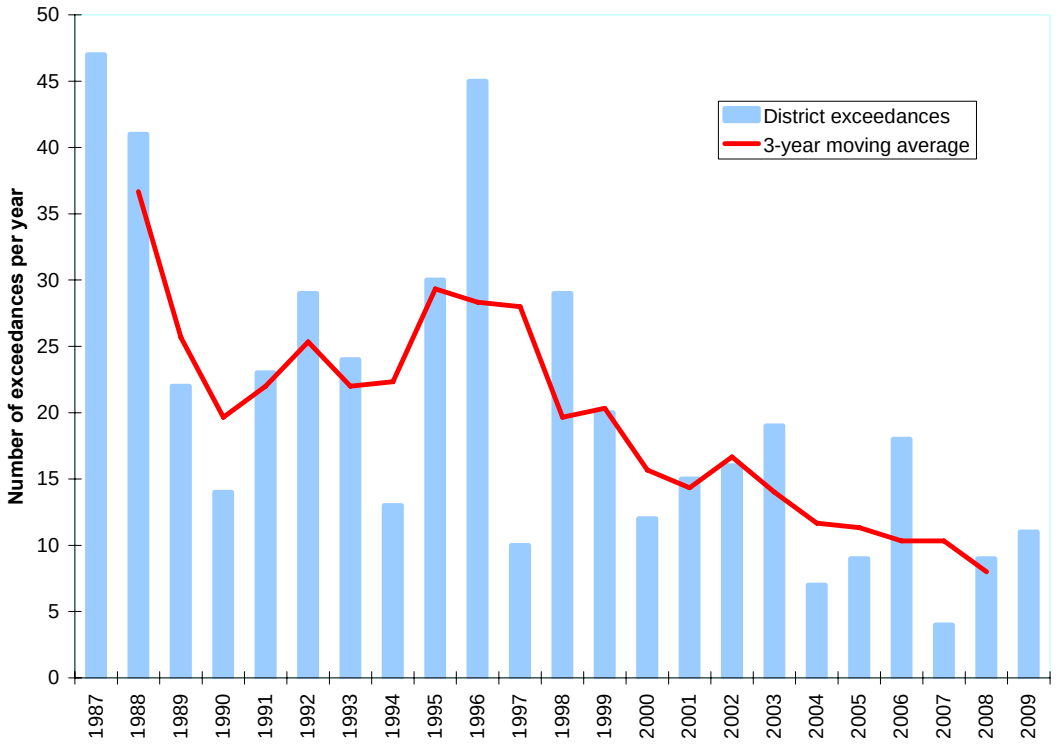

Figure 2-9. Annual Bay Area days exceeding the 0.09 ppm state 1-hour ozone standard at any monitoring station: 1987-2009.

Figure 2-10 shows Bay Area trends relative to the current State 8-hour standard (0.70 ppm), with reductions in exceedances similar to those seen in Figure 2-9 above.

Peak Ozone Concentrations and Exposure

CARB guidance requires the calculation of three air quality indicators to assess the extent of air quality improvements within an air basin: (1) Expected Peak Day Concentration (EPDC), which is an estimate of the ozone concentration that would be exceeded once per year on average, (2) population-weighted exposure to ozone levels that exceed the state standard, and (3) area-weighted exposure to levels that exceed the state standard.

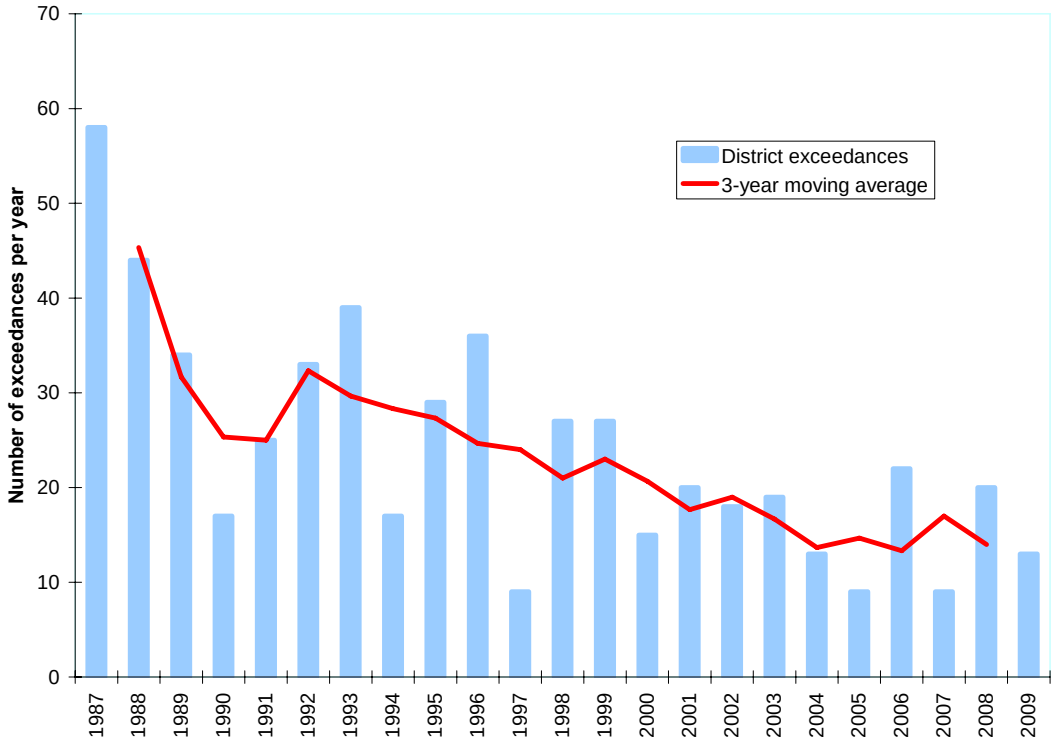

Figure 2-10. Annual Bay Area days exceeding the 0.070 ppm state 8-hour ozone standard at any monitoring station: 1987-2008.

Expected Peak Day Ozone Concentrations

The EPDC for the State 1-hour ozone standard at Bay Area monitoring sites are listed in Table 2-5 for 1986-88, 1997-99, and 2006-08. Also shown are annual percentage reductions. Table 2-6 presents this data for the 8-hour ozone standard. There was an average annual reduction in 1-hour ozone of 1.1% per year across all Bay Area sites between 1986-88 and 2006-08, and a reduction of 1.0% per year in 8-hour ozone, with total reductions of 19% and 18% respectively. No site shows an increase in ozone over this period, indicating that progress is region-wide. During the period from 1997 through 2008, the reduction was 1.0% per year for 1-hour ozone and 0.8% per year for 8-hour ozone, indicating that progress has continued in recent years.

The progress has not been uniform, however. As the tables show, there were substantial reductions in the southern areas, including Los Gatos and Gilroy, sites that once registered some of the District's highest values. There was progress in the north also. In the central area, the progress is mixed, but at locations where there has been little reduction since the late 1990s, ozone values actually meet the standard. In the eastern areas there have also been reductions, but long-term progress has been slower. At the Air District's design value site in Livermore reductions have averaged 0.8% per year, which is on the order of 1 ppb per year, since the late 1990s.

State ozone standards in essence require that there be no more than one exceedance per year at any monitoring site. Since the EPDC is an estimate of the ozone concentration that would be exceeded once per year, a site whose EPDC is less than 95 ppb could be considered to meet the 1-hour standard, and a site whose EPDC is less than 71 ppb could be considered to meet the State 8-hour standard. Between 1986-88 and 2006-08, the number of sites meeting the 1-hour standard increased from 4 to 9, and the number meeting the 8-hour standard increased from 4 to 8.

Table 2-5. Expected peak day concentrations for 1-hour max ozone at Bay Area sites: 1986-2008.

	Expected Peak Day Concentration (ppb)			Annual Percentage Change in EPDC*	
Monitoring Site:	**1986-88**	**1997-99**	**2006-08**	**97-99 to 06-08**	**86-88 to 06-08**
Northern					
Napa	107	106	88	-2.1	-1.0
San Rafael	93	85	74	-1.5	-1.2
Santa Rosa	87	86	72	-1.9	-0.9
Vallejo	109	98	83	-1.8	-1.4
Central					
Hayward	129	112	96	-1.7	-1.4
Redwood City	97	71	74	0.4	-1.3
Richmond/ San Pablo**	83	80	68	-1.8	-1.0
San Francisco	74	59	59	0.0	-1.1
Eastern					
Bethel Island	111	117	108	-0.9	-0.2
Concord	128	127	109	-1.7	-0.8
Fairfield	111	122	103	-1.8	-0.4
Livermore	145	143	123	-1.7	-0.8
Pittsburg	117	95	96	0.1	-1.0
Southern					
Fremont	132	107	93	-1.5	-1.7
Los Gatos	139	113	106	-0.7	-1.4
Mt View/ Sunnyvale***	140	106	94	-1.4	-2.0
San Jose	131	107	100	-0.7	-1.3
Gilroy	142	113	101	-1.2	-1.7
San Martin Airport		125	110	-1.4	
Average	**117**	**104**	**95**	**-1.0**	**-1.1**

* Percentage change results shown may differ slightly from those calculated using displayed data points because of rounding for display purposes.

** Monitoring site moved from Richmond to San Pablo in 1997.

*** Site moved from Mountain View to Sunnyvale in 2000.

Table 2-6. Expected peak day concentrations for 8-hr max ozone at Bay Area sites 1986-2008.

	Expected Peak Day Concentration (ppb)			Annual Percentage Change in EPDC*	
Monitoring Site:	**1986-88**	**1997-99**	**2006-08**	**97-99 to 06-08**	**86-88 to 06-08**
Northern					
Napa	85	80	70	-1.4%	-1.0%
San Rafael	69	60	58	-0.3%	-0.9%
Santa Rosa	68	63	58	-0.9%	-0.7%
Vallejo	85	72	67	-0.8%	-1.2%
Central					
Hayward	102	88	78	-1.3%	-1.3%
Redwood City	71	56	61	1.0%	-0.8%
Richmond/ San Pablo**	65	63	56	-1.4%	-0.8%
San Francisco	59	50	51	0.3%	-0.7%
Eastern					
Bethel Island	103	101	92	-1.1%	-0.6%
Concord	101	102	91	-1.2%	-0.6%
Fairfield	99	101	84	-2.1%	-0.9%
Livermore	112	111	95	-1.8%	-0.8%
Pittsburg	99	81	82	0.1%	-0.9%
Southern					
Fremont	98	73	69	-0.7%	-1.7%
Los Gatos	111	91	86	-0.6%	-1.2%
Mt View/ Sunnyvale***	104	74	71	-0.5%	-1.9%
San Jose	107	77	76	-0.1%	-1.7%
Gilroy	113	91	87	-0.6%	-1.3%
San Martin Airport		100	90	-1.1%	
Average	92	81	75	-0.8%	-1.0%

* Percentage change results shown may differ slightly from those calculated using displayed data points because of rounding for display purposes.
** Monitoring site moved from Richmond to San Pablo in 1997.
*** Site moved from Mountain View to Sunnyvale in 2000.

Population-Weighted Exposure to Ozone

Peak ozone concentrations reflect potential population exposure in areas with the highest ozone levels, but not the exposure of the Bay Area's population as a whole. Therefore, population-weighted exposure to high ozone concentrations is another indicator used to assess progress in reducing public exposure to ozone on a per-capita region-wide basis.

Population-weighted exposure is computed by estimating hourly ozone concentrations for each census tract in the Bay Area based on the hourly values actually measured at Air District monitoring sites. Concentrations are estimated by averaging ozone from nearby monitors inversely weighted by distance to the tract. For each census tract, for each hour where its estimated ozone exceeds the standard, the estimated amount by which the ozone level exceeds the standard is multiplied by the population of the tract. These values are summed across all hours for a year for each tract, and then for all tracts in each county. The result is divided by the population of the county. The result is per capita exposure, specifically person-ppm-hours above the standard.[84]

Table 2-7 shows population-weighted exposures for 1986-88, 1997-99 and 2004-06 for Bay Area counties in relation to the state 1-hour ozone standard. Also shown are the total decreases in exposure between these periods. Population exposure decreased from an average of 19 to 2 person-ppm-hours above the standard per year from 1986-88 to 2006-2008, for an overall reduction of 88%. Today, no county experiences an average of more than 4 person-ppm-hours above the standard per year.

Table 2-7. Population-weighted exposure to ozone exceeding the state one-hour standard in the Bay Area.

	Per Capita Exposure (person-ppm-hours above 95 ppb/total population)			Percent Decrease*	
County	86-88	97-99	06-08	86-88 to 06-08	97-99 to 06-08
Alameda	18	7	2	87	64
Contra Costa	22	17	4	80	75
Marin	0	1	0	NA	100
Napa	3	6	1	73	88
San Francisco	0	0	0	NA	NA
San Mateo	3	0	0	98	79
Santa Clara	46	7	4	91	42
Solano	8	9	2	78	80
Sonoma	1	1	0	88	88
Bay Area	**19**	**6**	**2**	**88**	**64**

* Values for per capita exposure are rounded to the nearest whole number. Percentage decrease is based on unrounded data.

Figure 2-11 shows the Bay Area per-capita population exposure to ozone by year, and also a 3-year moving average. Exposures vary dramatically from year to year, but the 3-year average shows progress toward reduced exposure.

[84] This is sometimes termed "backyard" exposure because it assumes that everyone is at home and outside every hour that ozone exceeds the standard. While there are obvious limitations to this measure, it may be reasonable for children, who are often at or near home, and frequently outside, at times when ozone exceeds the standard.

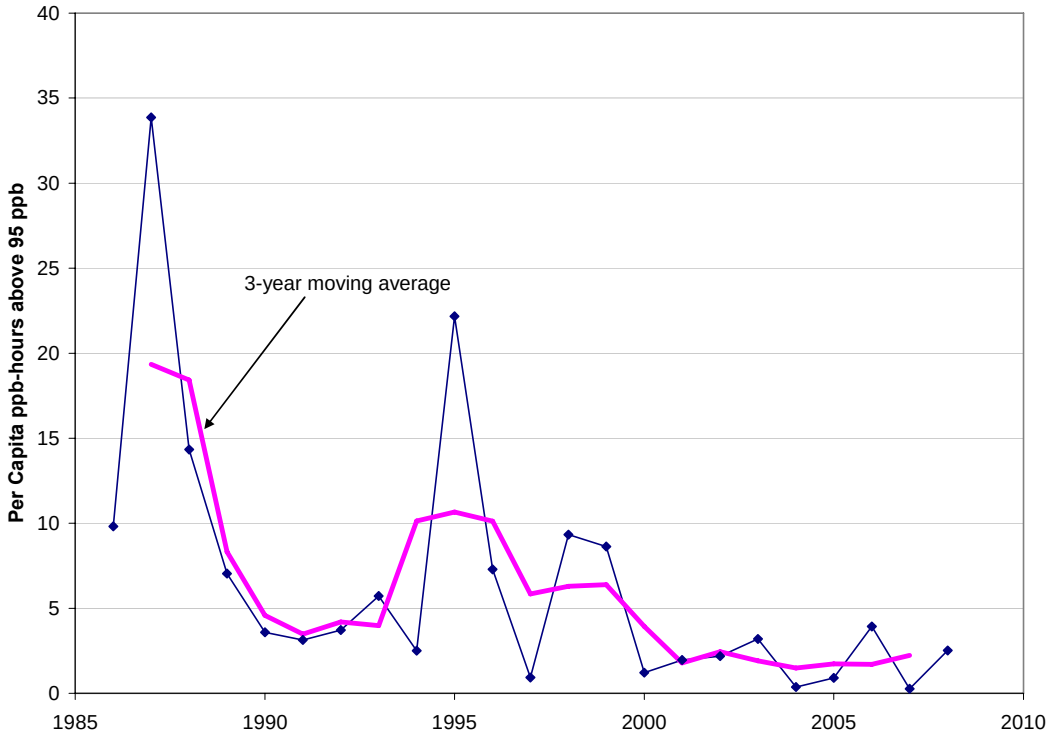

Figure 2-11. Average per-capita population exposure to ozone levels exceeding the 0.09 ppm state 1-hour standard in the Bay Area, 1986-2008.

Area-Weighted Exposure to Ozone

The third indicator used in assessing progress in reducing exposure to ozone is area-weighted exposure. This is calculated similarly to population-weighted exposure, except with census tract area replacing census tract population.

Reductions in area-weighted exposure are important because high ozone levels harm not only humans but also vegetation, other animals, and most surfaces with which it comes in contact, such as architectural finishes, tires, and plastics. Table 2-8 shows the average km^2-ppm-hours above the state standard for each county and the District as a whole. The trends and exposure patterns among counties are quite similar to population-weighted exposures. The table shows reductions similar to those in Table 2-7, with area-weighted exposure dropping 84% since 1986-88 and 64% since 1997-99.

Table 2-8. Area-weighted exposure to ozone in the Bay Area, 1986-2008.

	Area-Weighted Exposure (km^2-ppm-hours above 95 ppb/total km^2)			Percent Decrease*	
County	86-88	97-99	04-06	86-88 to 06-08	97-99 to 06-08
Alameda	40	19	8	80	58
Contra Costa	27	20	6	77	69
Marin	1	1	0	100	100
Napa	3	6	1	72	85
San Francisco	0	0	0	NA	NA
San Mateo	12	1	1	93	45
Santa Clara	52	13	6	88	51
Solano	12	11	2	79	77
Sonoma	1	2	0	85	88
Bay Area	**20**	**9**	**3**	**84**	**64**

* Values for area-weighted exposure are rounded to the nearest whole number. Percentage decrease is based on unrounded data.

Summary of Key Ozone Modeling Findings

Photochemical modeling, as described in Appendix E, was used to estimate the impacts of NOx and VOC emissions reductions on ozone concentration for the Bay Area and its neighboring ozone non-attainment regions. Reducing Bay Area emissions of NOx and VOC by 40% resulted in significant reductions of up to 15 ppb for Bay Area 8-hour ozone levels. The impacts of reductions in precursor emissions transported from the Bay Area were much smaller than the local impacts of the Bay Area emissions. Reducing the Bay Area emissions by 40% benefited the downwind Sacramento and San Joaquin Valley non-attainment areas by only 1-3 ppb reduced relative to the 8-hour ozone level.

Summary of Key Modeling Findings: Impacts of Climate Change on Ozone

Photochemical modeling was used to estimate the impacts of a 2 degree Celsius increase in Bay Area temperatures on regional ozone levels. This increase in global average temperature is estimated by the Intergovernmental Panel on Climate Change (IPCC) to occur by 2050. Higher temperatures related to global warming are expected to promote ozone formation through several mechanisms, including an increase in biogenic emissions of ozone precursors (ROG). The model indicated Bay Area maximum 8-hour ozone levels would increase by about 8 ppb during ozone exceedance days. Assuming the simulated scenario is reasonable, increased ozone levels due to climate change may offset at least 10 years of ozone emissions control efforts in the Bay Area between now and 2050.

Particulate Matter

Particulate matter (PM) is a mixture of suspended particles and liquid droplets (aerosols). PM includes elements such as carbon and metals; compounds such as nitrates, organics, and sulfates; and complex mixtures such as diesel exhaust, wood smoke, and soil. Unlike the other criteria pollutants, which are individual chemical compounds, particulate matter is the total of all particles in the air in a certain size range. PM is both directly emitted (referred to as direct PM or primary PM) and also formed in the atmosphere through reactions among different pollutants (this is referred to as indirect or secondary PM).

As discussed both in Chapter 1 and below, compelling evidence suggests that fine PM is the most harmful of all air pollutants in the Bay Area in terms of its impact on public health. Significant progress has been made to enhance our technical understanding of PM, including improved monitoring and enhanced modeling capabilities. However, because the shift in focus toward PM is relatively recent, efforts to analyze and control PM still lag behind pollutants such as ozone and carbon monoxide.

One of the challenges in devising strategies to reduce PM is that scientists are still working to determine the relative risk associated with the many types and sources of particles that comprise PM. Better information in this regard will help us understand where to focus our efforts in order to get the greatest benefit in reducing health risks associated with PM. Nevertheless, our best knowledge to date suggests that fine particles themselves are harmful, irrespective of composition.

In addition to its negative health effects, PM is also a prime cause of regional haze. Research is still on-going, but PM emissions also have implications for global warming. PM aerosols can help to reduce (or mask) the full effect of global warming by scattering sunlight. But black carbon or soot, a component of PM, appears to contribute significantly to global warming.

PM Health Effects

A large and growing body of scientific evidence indicates that both short-term and long-term exposure to fine particles can cause a wide range of health effects, including: aggravating asthma and bronchitis; causing visits to the hospital for respiratory and cardio-vascular symptoms, and contributing to heart attacks and deaths.

Breathing PM has long been understood as a health hazard.[85] Although PM was designated as one of the criteria pollutants in the original 1970 federal Clean Air Act, in recent years many epidemiological studies have drawn increased attention to the health

[85] The London fogs of the early 1950s that killed thousands of people were primarily caused by PM from coal, which led to the banning of coal burning within the city.

risks associated with PM. In fact, as discussed in Appendix A, the number of deaths in the Bay Area associated with current PM levels likely exceeds the number of deaths from motor vehicle accidents. Reducing PM emissions can reduce mortality and increase average life span.[86]

Although the epidemiological evidence that shows a strong correlation between elevated PM levels and public health effects is very well-documented, scientists are still working to understand the precise biological mechanisms through which PM damages our health. A recent study by researchers at the University of Michigan suggests that PM may harm our bodies by a combination of 1) increasing blood pressure and 2) triggering a response which causes inflammation that can stiffen and damage blood vessels.[87]

PM Standards and Attainment Status

PM is often characterized on the basis of particle size. Ultra-fine PM includes particles less than one micron in diameter. Fine PM consists of particles 2.5 microns or less in diameter. PM10 consists of particles 10 microns or less in diameter. TSP (total suspended particulates) includes suspended particles of any size.

The 1970 Clean Air Act initially established PM standards for TSP only. Subsequently, scientific evidence pointed to small particles as posing the most serious health threat. Therefore, in 1987, the TSP standard was replaced with a PM10 standard – one that regulated particles less than 10 microns in diameter. In 1997, the PM10 standard was augmented by a PM2.5 standard: i.e., particles less than 2.5 microns in diameter.

PM standards and Bay Area attainment status are shown in Table 2-1. Both national and state PM standards have been tightened since 2000. However, to date, researchers have not been able to identify a clear threshold below which there are no health effects from exposure to fine PM. This suggests that PM2.5 standards may be further tightened in the future.

PM Dynamics

PM chemistry and formation is complex and variable. PM concentrations vary considerably both in composition and spatial distribution on a day-to-day basis and on a seasonal basis, due to changes in weather and emissions. The Bay Area experiences its

[86] For example, a recent study of nationwide scope found that reducing fine PM results in significant and measurable improvements in human health and life expectancy**.** Pope, C. Arden III et al. "Fine Particulate Air Pollution and Life Expectancy in the United States." New England Journal of Medicine, January 22, 2009. Volume 360:376-386. No. 4.

[87] See Robert Brook et al. "Insights into the Mechanism and Mediators of the Effects of Air Pollution Exposure on Blood Pressure and Vascular Function in Healthy Humans" Hypertension: Journal of the American Heart Association, July 29, 2009.

highest PM concentrations in the winter; exceedances of the 24-hour national PM2.5 almost always occur in the November through February period. High PM2.5 episodes are typically regional in scale, impacting multiple Bay Area locations. During other seasons, by contrast, Bay Area PM2.5 tends to be low thanks to the area's natural ventilation system. Thus, on an annual average basis, the Bay Area's PM2.5 levels are among the lowest measured in major U.S. metropolitan areas.

Consecutive stagnant and clear winter days are typically prerequisites for development of PM2.5 episodes. The lower levels of solar radiation (sunlight) in the winter lead to stronger temperature inversions; these inversions are conducive to the buildup of PM in ambient air near ground level, especially ultrafine particles, which can remain airborne for a number of days. Winter is also when the most residential wood burning occurs; in some parts of the Bay Area, wood smoke accounts for the majority of airborne PM2.5 during high PM episodes.

Secondary PM2.5 levels are likewise only elevated during the winter months. Cool weather is conducive to the formation of ammonium nitrate. Ammonium nitrate is the main type of secondary PM2.5 in winter months, contributing an average of about 35% of total PM2.5 under peak PM conditions. This semi-volatile PM2.5 component is stable in its solid form only during the cooler winter months. Although the contribution of ammonium sulfate is relatively low (averaging 1-2 $\mu g/m^3$) it accounts for approximately 10% of total PM2.5 on an annual average basis. In the Bay Area, geological dust contribute only modestly to PM2.5 concentrations, but it accounts for a significant portion of PM10, as shown in Figures 2-12 and 2-13.

Chemical mass balance[88] analysis shows that both fossil fuels and biomass (primarily wood) combustion sources are prevalent PM2.5 contributors for all seasons. The biomass combustion contribution to peak PM2.5 levels is about 3-4 times higher in winter than the other seasons, as confirmed by isotopic carbon (^{14}C) analysis. The increased winter biomass combustion sources reflect increased levels of wood burning during the winter season.

[88] Chemical mass balance (CMB) analysis is a methodology in which a computer model is used to apportion ambient PM2.5 collected on filters over 24-hour periods at monitoring sites around the Bay Area to a set of source categories. Each filter was analyzed for a range of chemical species. The same species were measured in special studies of emissions from various sources, such as motor vehicles and wood burning. The CMB model finds the mix of these source measurements that best matches the ambient sample, chemical species by chemical species.

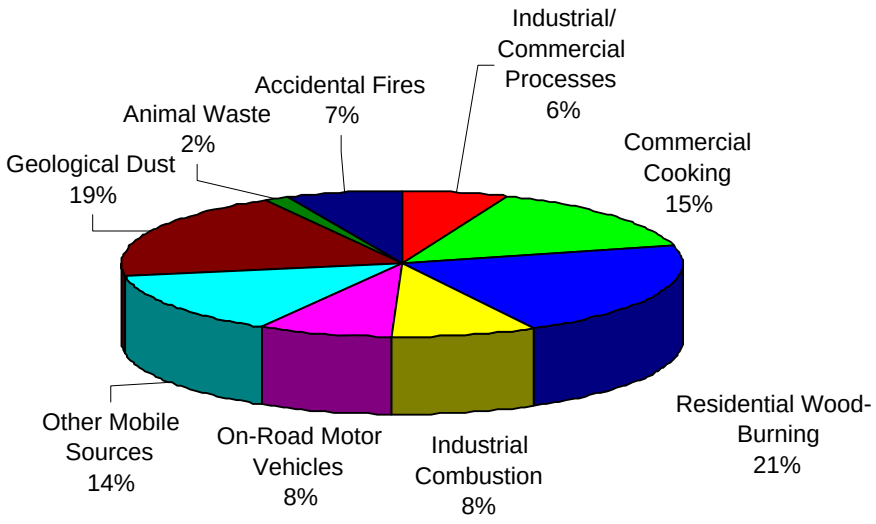

Figure 2-12. Direct PM2.5 emissions by source, annual average, 2009 (87 tons/day).

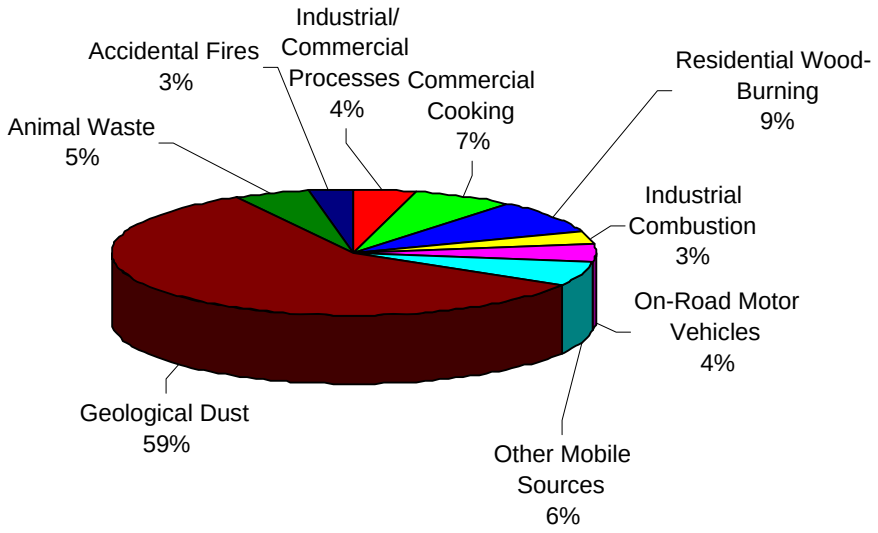

Figure 2-13. Direct PM_{10} emissions by source, annual average, 2009 (214 tons/day).

As in the case of ozone, the PM2.5 levels that occur on a given day are strongly influenced by the prevailing weather. The relationship between the weather and PM2.5 levels was analyzed using a statistical technique known as cluster analysis to find groups of days exhibiting similar conditions. Cluster analysis was applied to 10 years of measurements to determine winter weather patterns associated with elevated Bay Area PM2.5 levels.

Cluster analysis found that a single weather pattern accounted for most 24-hour PM2.5 episodes in the Bay Area. PM2.5 exceedances in the Bay Area usually occurred after 2-4 consecutive days of PM2.5 buildup under a high pressure system. These conditions occur when a high pressure system moves over Central California in winter months, resulting in sunny days and clear, cold nights with little wind. Such conditions are highly conducive to formation of ammonium nitrate, a key component of secondary PM2.5, in the Central Valley. As dense cold air converges on the Central Valley floor, this increases air pressure in the Central Valley, causing air to flow westward through the Carquinez Strait and into the Bay Area, thereby transporting ammonium nitrate PM2.5 from the Central Valley to the Bay Area. When ammonium nitrate transported from the Central Valley to the Bay Area combines with PM2.5 emitted or formed within the Bay Area, this can result in elevated PM levels in the Bay Area, especially in the eastern parts of the region closest to the Central Valley.

Ultra-Fine Particles

The smaller the particle, the more easily it can evade the body's filtration system, penetrate deep into the lungs and enter the bloodstream. Research in recent years suggests that "ultra-fine" particles, those less than 1.0 micron in diameter, may actually pose the most serious threat to public health.[89] Internal combustion engines are a major source of ultrafine PM. Engines powered by gasoline, diesel, and natural gas all emit a large fraction of particles in the ultrafine size range. Studies in southern California have found elevated counts of ultrafine particles near freeways. Numerous studies have shown increased incidence of respiratory and cardiovascular disease near heavily traveled roadways.

Because of their small size, ultrafine particles account for just a small fraction of total PM mass (less than 10%); however, they make up the vast majority of particles by number. In addition, ultrafine particles have a much higher surface area per mass than larger particles; therefore, they act as carriers for other agents such as trace metals and organic compounds that collect on their surface. Despite these concerns, research on the health impacts of ultra-fine particles is still evolving, and no ambient air quality standards for ultra-fine PM have been established as yet. Existing state and national PM standards are based on mass (weight) concentrations in the air, rather than the number of airborne particles.

[89] See Chapter 11 (Ultrafine Particles) in the 2007 South Coast Air Quality Management Plan.

Diesel Particulate Matter

Diesel engines emit a complex mixture of air pollutants, with a major fraction consisting of fine PM. These emissions include many carbon particles, as well as gases that become PM as they cool and undergo chemical reactions. Diesel emissions account for roughly one-sixth of total emissions of carbonaceous PM2.5 in the Bay Area.

Emissions of diesel PM pose a risk to public health in the Bay Area in two ways: 1) as a component of PM2.5, which has been implicated in increased premature mortality, and 2) as the leading carcinogenic toxic air contaminant. As discussed in the Air Toxics Trends section below, diesel PM emissions are responsible for the majority of cancer risk from air pollution in the Bay Area. However, analysis performed in the course of developing the Air District's multi-pollutant evaluation method shows that the risk of death from diesel particles in their role as a component of PM2.5 is roughly an order of magnitude greater than the risk they pose as carcinogens. In other words, even if diesel particles were not carcinogenic, the risk they pose as PM2.5 would be still be very large.

Sources of PM Emissions

Particulate matter is both directly emitted, as well as formed indirectly from precursor chemicals, such as ROG, NOx, and ammonia (NH3). Direct PM2.5 emissions in the Bay Area are produced by a wide variety of sources, both man-made and natural, but dominated by a few. About half of Bay Area PM2.5 is directly emitted from combustion, i.e., burning fossil fuels, wood, other vegetative matter; or cooking. This PM2.5 is mostly composed of organic carbon compounds, and also soot containing pure carbon. Sea salt from the ocean contributes another 10% on an annual basis.

Combustion of fossil fuels in all types of engines produces direct emissions of PM. In addition to direct PM from engine combustion, motor vehicles also 1) contribute to secondary formation of PM by emitting NOx, and 2) create PM by means of tire and brake wear. Reducing emissions of diesel PM from heavy-duty engines is a priority of CARB and the Air District because diesel PM is a carcinogenic toxic air contaminant.

Light-duty and medium-duty vehicles (8,500 pounds gross vehicle weight or less) emit very little PM on a per-mile basis. However, light and medium-duty vehicles currently account for more than half of the total emissions of both PM2.5 and PM10 from on-road vehicles in the region. PM emissions from heavy-duty vehicles are expected to decrease significantly over the next decade in response to recent CARB regulations pursuant to its Diesel Risk Reduction Program. With emissions from heavy-duty vehicles projected to decline and total vehicle miles of travel (VMT) from light and medium-duty vehicles projected to increase, PM emissions from light and medium-duty vehicles are expected to account for roughly 80% of direct emissions of PM2.5 and PM10 from on-road vehicles in the Bay Area by 2020.

Table 2-9 shows the detailed Bay Area inventory of annual average direct PM2.5 and PM10 emissions, with base year 2005 projected trough 2020.[90] The inventory is based upon CARB EMFAC 2007, Version 2.3 and reflects the effect of regulations adopted as of December 31, 2006. The inventories do not include additional emission reductions from State or federal measures adopted since 2007 or CARB's "Pavley regulations" to reduce greenhouse gases from motor vehicles. Estimated emission reductions of ROG, NOx, and PM from CARB regulations not reflected in the current inventory are shown in Table 3-10.

Major sources of direct PM2.5 and PM10 emissions are shown in Figures 2-12 and 2-13, respectively. Geological dust, which includes road dust, construction dust, and windblown dust, accounts for a relatively modest fraction of PM2.5 (19%), but a very large portion of PM10 (59%). There is still considerable uncertainty regarding the inventory of geological dust. The Air District is working with CARB in a collaborative effort to improve PM emissions inventory estimates statewide and in the Bay Area. Inventory estimates are under review for a variety of sources, including road dust and commercial cooking.

[90] Summer and winter emissions inventories are provided in the "Base Year 2005 Emissions Inventory Summary Report" issued by BAAQMD in December 2008. See www.BAAQMD.gov

Table 2-9. Bay Area inventory 2005-2020, PM10 & $PM_{2.5}$.

Bay Area Baseline Emission Inventory Projections : 2005 – 2020 (1)										
Annual Average Inventory (2) in Tons/Day (3)										
	Particulate Matter< 10 microns (4)					Particulate Matter< 2.5 microns (4)				
SOURCE CATEGORY	2005	2009	2012	2015	2020	2005	2009	2012	2015	2020
INDUSTRIAL/COMMERCIAL PROCESSES										
PETROLEUM REFINING FACILITIES										
Basic Refining Processes	0.82	0.85	0.88	0.9	0.95	0.49	0.51	0.53	0.54	0.57
Wastewater (Oil-Water) Separators	--	--	--	--	--	--	--	--	--	--
Wastewater Treatment Facilities	--	--	--	--	--	--	--	--	--	--
Cooling Towers	0.16	0.17	0.17	0.18	0.19	0.15	0.16	0.16	0.17	0.18
Flares & Blowdown Systems	--	--	--	--	--	--	--	--	--	--
Other Refining Processes	0.06	0.06	0.06	0.06	0.07	--	--	--	--	--
Fugitives	--	--	--	--	--	--	--	--	--	--
Subtotal	1.05	1.09	1.12	1.15	1.21	0.69	0.71	0.73	0.76	0.8
CHEMICAL MANUFACTURING FACILITIES										
Coating, Inks, Resins & Other Facilities	0.11	0.12	0.12	0.13	0.14	0.07	0.07	0.08	0.08	0.09
Pharmaceuticals & Cosmetics	0.39	0.41	0.44	0.46	0.49	0.39	0.41	0.43	0.45	0.49
Fugitives - Valves & Flanges	--	--	--	--	--	--	--	--	--	--
Subtotal	0.5	0.53	0.56	0.58	0.63	0.45	0.48	0.51	0.53	0.57
OTHER INDUSTRIAL/COMMERCIAL PROCESSES										
Bakeries	--	--	--	--	--	--	--	--	--	--
Cooking	13.7	13.92	14.24	14.43	15.06	12.8	13	13.3	13.48	14.06
Wineries & Other Food & Agr. Processes	0.5	0.5	0.5	0.51	0.51	0.32	0.32	0.32	0.33	0.33
Metallurgical & Minerals Manufacturing	4.23	4.49	4.69	4.91	5.27	2.86	3.02	3.15	3.29	3.53
Waste Management	1.13	1.19	1.22	1.24	1.28	0.32	0.34	0.35	0.35	0.37
Semiconductor Manufacturing	--	--	--	--	--	--	--	--	--	--
Fiberglass Products Manufacturing	--	--	--	--	--	--	--	--	--	--
Rubber & Plastic Products Manufacturing	--	--	--	--	--	--	--	--	--	--
Contaminated Soil Aeration	--	--	--	--	--	--	--	--	--	--
Other Industrial Commercial	1.12	1.15	1.19	1.23	1.3	0.5	0.51	0.53	0.55	0.58
Subtotal	20.71	21.3	21.89	22.36	23.47	16.83	17.23	17.7	18.04	18.92

Table 2-9 (continued). Bay Area Emissions Inventory 2005-2020, PM10 & PM2.5.

SOURCE CATEGORY	Particulate Matter< 10 microns (4)					Particulate Matter< 2.5 microns (4)				
	2005	2009	2012	2015	2020	2005	2009	2012	2015	2020
COMBUSTION - STATIONARY SOURCES										
FUELS COMBUSTION										
Domestic	19.73	20.43	21	21.59	22.61	19.04	19.72	20.27	20.84	21.82
Cogeneration	0.82	0.86	0.89	0.92	0.98	0.81	0.85	0.88	0.91	0.97
Power Plants	0.26	0.41	0.42	0.44	0.48	0.26	0.41	0.42	0.43	0.48
Oil Refineries External Combustion	1.7	1.77	1.82	1.88	1.97	1.7	1.77	1.82	1.88	1.97
Glass Melting Furnaces - Natural Gas	--	--	--	--	--	--	--	--	--	--
Reciprocating Engines	0.34	0.3	0.28	0.26	0.22	0.33	0.29	0.27	0.25	0.22
Turbines	0.14	0.15	0.16	0.16	0.17	0.14	0.15	0.15	0.16	0.17
Landfill/Cement Plant Combustion	2.03	2.1	2.17	2.24	2.35	2.03	2.1	2.17	2.23	2.34
Subtotal	25.02	26.02	26.73	27.48	28.78	24.31	25.28	25.98	26.71	27.97
BURNING OF WASTE MATERIAL										
Incineration	0.07	0.07	0.07	0.08	0.08	0.09	0.09	0.1	0.1	0.1
Planned Fires	0.41	0.42	0.43	0.45	0.46	0.38	0.4	0.41	0.42	0.44
Subtotal	0.5	0.52	0.54	0.55	0.57	0.48	0.49	0.51	0.52	0.54
Banked Emissions (5)	0	0.3	0.3	0.3	0.3	0	0.2	0.2	0.2	0.2
Alternative Compliance Allowance (6)	0	0	0	0	0	0	0	0	0	0
Subtotal (District Jurisdiction)	47.78	49.76	51.14	52.42	54.96	42.76	44.39	45.63	46.76	49
COMBUSTION - MOBILE SOURCES										
ON-ROAD MOTOR VEHICLES										
Passenger Cars	3.05	3.22	3.38	3.55	3.82	1.72	1.84	1.93	2.03	2.2
Light Duty Trucks<6000lbs	2.42	2.64	2.83	3.01	3.3	1.53	1.73	1.88	2.02	2.23
Medium Duty Trucks 6001-8500 lbs	0.56	0.62	0.68	0.74	0.82	0.36	0.42	0.47	0.52	0.59
Light Heavy Duty Trucks 8501-14000lbs	0.2	0.18	0.18	0.17	0.18	0.14	0.12	0.11	0.11	0.11
Medium Heavy Duty Trucks 14001-33000lbs	0.82	0.75	0.67	0.6	0.52	0.72	0.65	0.58	0.51	0.43
Heavy Duty Trucks>33000 lbs	2.33	1.73	1.33	1.01	0.68	2.05	1.5	1.12	0.83	0.52
School/Urban Buses	0.33	0.33	0.33	0.33	0.33	0.29	0.29	0.29	0.29	0.29
Motor-Homes	--	--	--	--	--	--	--	--	--	--
Motorcycles	0.08	0.08	0.07	0.06	0.06	--	--	--	--	--
Subtotal	9.81	9.58	9.49	9.5	9.72	6.87	6.6	6.44	6.36	6.42

Table 2-9 (continued). Bay Area Emissions Inventory 2005-2020, PM10 & PM2.5.

SOURCE CATEGORY	Particulate Matter< 10 microns (4)					Particulate Matter< 2.5 microns (4)				
	2005	2009	2012	2015	2020	2005	2009	2012	2015	2020
OFF-HIGHWAY MOBILE SOURCES										
Lawn and Garden Equipment	0.35	0.32	0.31	0.3	0.31	0.34	0.32	0.3	0.3	0.31
Transportation Refrigeration Units	0.51	0.43	0.34	0.21	0.08	0.49	0.42	0.33	0.21	0.08
Agricultural Equipment	0.44	0.36	0.3	0.23	0.13	0.43	0.35	0.29	0.22	0.13
Construction and Mining Equipment	4.4	3.7	3.18	2.52	1.6	4.29	3.62	3.1	2.46	1.57
Industrial Equipment	0.67	0.57	0.48	0.37	0.25	0.66	0.56	0.47	0.37	0.24
Light Duty Commercial Equipment	0.71	0.69	0.67	0.61	0.53	0.7	0.68	0.66	0.61	0.53
Trains	0.32	0.28	0.29	0.3	0.32	0.31	0.27	0.29	0.29	0.31
Off Road Recreational Vehicles	--	--	--	--	--	--	--	--	--	--
Ships (7)	3.12	3.55	3.92	4.32	5.08	3.05	3.47	3.82	4.21	4.96
Commercial Boats	1.11	1.01	0.92	0.8	0.75	1.09	0.99	0.89	0.78	0.74
Recreational Boats	1.04	1.28	1.51	1.77	2.26	1.04	1.28	1.5	1.76	2.26
Subtotal	12.68	12.19	11.91	11.44	11.32	12.42	11.94	11.68	11.22	11.12
AIRCRAFT										
Commercial Aircraft	0.1	0.11	0.11	0.12	0.14	0.09	0.1	0.11	0.12	0.14
General Aviation	--	--	--	--	--	--	--	--	--	--
Military Aircraft	0.27	0.27	0.27	0.28	0.28	0.27	0.27	0.27	0.27	0.28
Airport Ground Support Equipment	0.12	0.13	0.14	0.15	0.16	0.1	0.1	0.11	0.11	0.12
Subtotal	0.5	0.52	0.54	0.56	0.59	0.47	0.49	0.5	0.52	0.55
MISCELLANEOUS OTHER SOURCES										
Construction Operations	26.96	27.32	28.71	30.15	32.62	2.69	2.73	2.87	3.01	3.26
Farming Operations	1.21	1.21	1.21	1.21	1.21	0.18	0.18	0.18	0.18	0.18
Entrained Road Dust-Paved Roads	72.14	76.51	79.82	83.39	89.48	10.82	11.48	11.98	12.51	13.43
Entrained Road Dust-Unpaved Roads	12.57	13.07	13.44	13.82	14.48	1.26	1.31	1.34	1.38	1.45
Wind Blown Dust	6.54	6.54	6.54	6.54	6.54	1.15	1.15	1.15	1.15	1.15
Animal Waste	11.15	11.15	11.15	11.15	11.15	1.39	1.39	1.39	1.39	1.39
Agricultural Pesticides	--	--	--	--	--	--	--	--	--	--
Non-Agricultural Pesticides	--	--	--	--	--	--	--	--	--	--
Consumer Products(Excluding Pesticides)	--	--	--	--	--	--	--	--	--	--
Other Sources	6.95	6.38	6.38	6.38	6.39	6.25	5.74	5.74	5.74	5.75
Subtotal	137.54	142.17	147.26	152.64	161.87	23.75	23.98	24.65	25.37	26.6

Table 2-9 (continued). Bay Area Emissions Inventory 2005-2020, PM10 & PM2.5.

SOURCE CATEGORY	Particulate Matter< 10 microns (4)					Particulate Matter< 2.5 microns (4)				
	2005	2009	2012	2015	2020	2005	2009	2012	2015	2020
Biogenics	--	--	--	--	--	--	--	--	--	--
Subtotal	--	--	--	--	--	--	--	--	--	--
Total Emissions	208.32	213.92	220.04	226.27	238.16	86.27	87.22	88.7	90.02	93.49
GRAND TOTAL EMISSIONS	208.32	214.22	220.34	226.57	238.46	86.27	87.42	88.9	90.22	93.69

1. Inventory and projections are based upon CARB EMFAC 2007, Version 2.3 and assume implementation of all control measures adopted as of December 31, 2006, including Smog Check II for the Bay Area.
2. The Annual Average inventory represents emissions on an average day. ABAG Projections 2007 were used to project future emissions from on-road motor vehicles and for the regional population projections used for the planning inventory.
3. Entries are rounded to nearest whole number, totals may not equal to sums of column entries.
4. Table shows directly emitted PM only. Figures do not include secondary PM10 such as ammonium nitrate and ammonium sulfate
5. Banked Emissions show the total current deposits in the District's emissions banking program as allowed by BAAQMD Regulation 2, Rules 2 & 4. These emissions were reduced (beyond regulations) and banked, but may be withdrawn from the bank and emitted in future years.
6. Surplus emissions, voluntarily reduced, available for alternative compliance with BARCT requirements of selected rules, as prescribed by State law and BAAQMD Regulation 2, Rule 9.
7. CARB has recently developed statewide emissions estimates for ocean-going vessels occurring within 100 nautical miles of the California coastline. As a result, these emissions are substantially higher than those reported in the previous version of the inventory published in the 2005 Ozone Strategy, which accounted for ship activities within three miles of the Golden Gate Bridge.

Figure 2-14 provides a breakdown of Bay Area ammonia emissions by source. Ammonia is a key precursor to secondary PM, as it combines with NOx to form ammonium nitrate and combines with SOx to form ammonium sulfate.

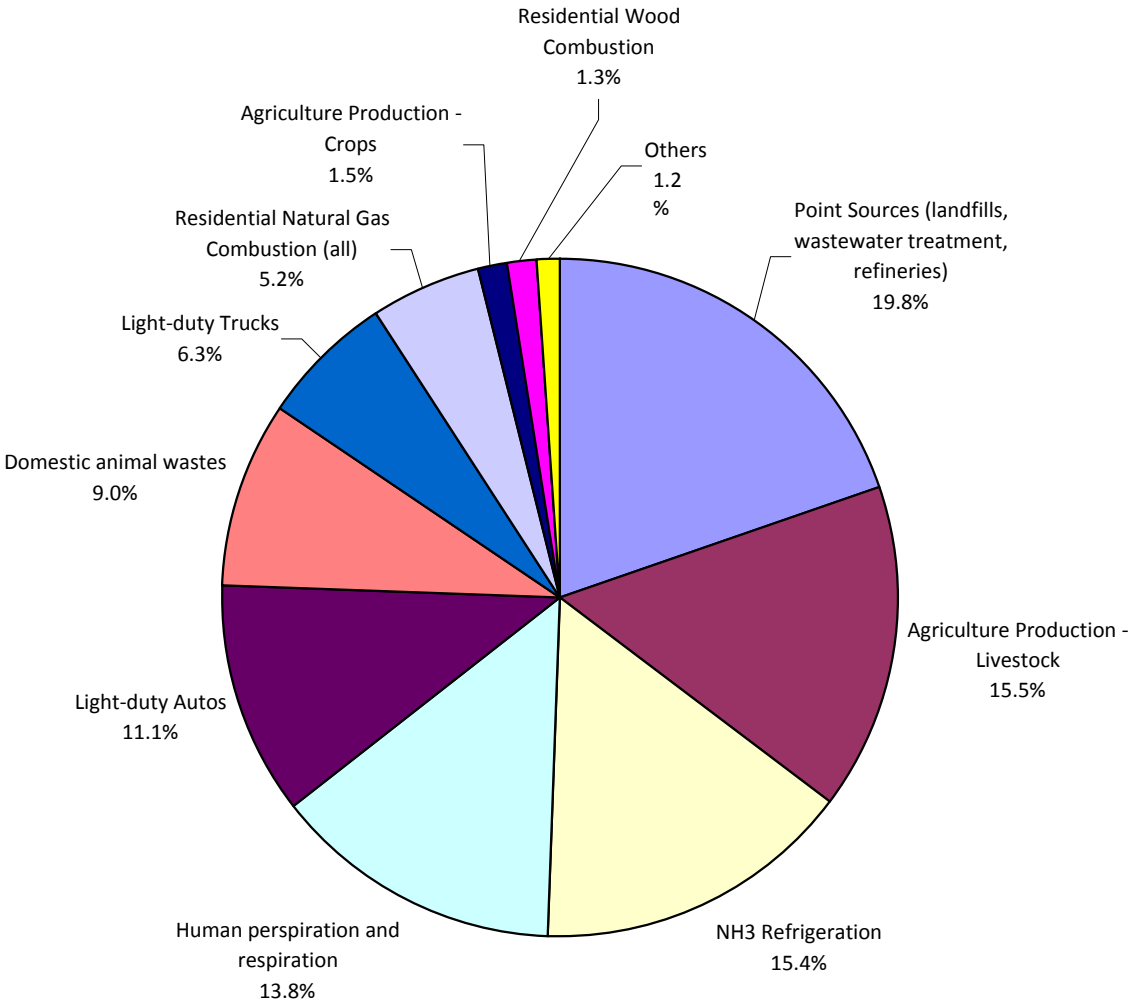

Figure 2-14. Annual average ammonia emissions by source, 2008 (52 tons/day).

Source Contributions to Ambient PM Concentrations

Ambient PM2.5 derives both from direct emissions and secondary compounds created in the atmosphere. Determining the relative contributions of various sources of direct PM2.5 emissions and PM2.5 precursors to total PM concentrations is complex. To estimate the overall contribution of various sources, we combine emissions inventory data with the results of chemical mass balance (CMB) analysis, the latter providing

information on the relative contributions from source categories contributing to primary and secondary PM.

In analyzing PM sources there may be discrepancies between the estimated PM emissions inventory and ambient PM concentrations estimated from CMB analysis. For example, the emissions inventory lists road and windblown dust as significant sources, whereas chemical mass balance analysis shows such dust to be a very small contributor on ambient filters. There are several likely reasons, a primary one being that what gets emitted does not necessarily stay airborne to be sampled. Thus, larger PM2.5 particles – those nearly 2.5 microns in diameter such as the bulk of geological dust – tend to settle out relatively quickly, whereas smaller particles – those less than 1 micron in diameter including combustion-related PM2.5 – can stay airborne for days.

Figure 2-15 shows estimated contributions to both primary and secondary annual average PM2.5 by source.[53] The contributions in Figure 2-15 differ from those in Figure 2-12 in a number of respects: Sea salt constitutes about 11% of Bay Area PM2.5, but is not included in the Emissions Inventory. Emissions of NOx from motor vehicles contribute significantly to secondary PM2.5, namely ammonium nitrate; because of this, the overall contribution of motor vehicles to PM2.5 concentrations is considerably larger than their direct emissions alone. Similarly, refineries emit significant amounts of SO2, so that their contribution to ammonium sulfate is significant. A key point is that most Bay Area anthropogenic PM2.5 derives from combustion – either wood (biomass) burning, or combustion of fossil fuels.

[53] See report entitled *Sources of Bay Area Fine Particles*. www.baaqmd.gov/~/media/Files/Planning%20and%20Research/Particulate%20Matter/PM_Report.ashx

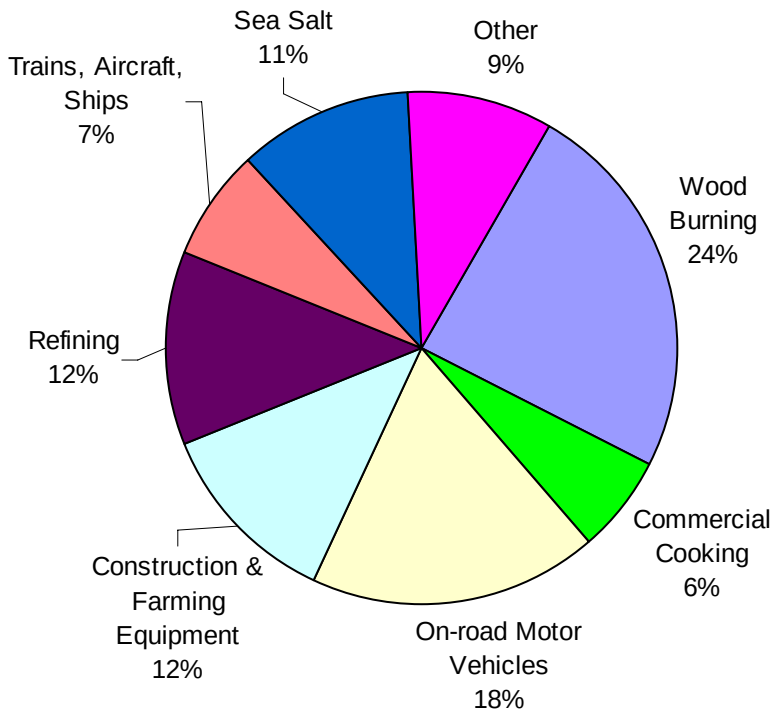

Figure 2-15. Estimated contributions to annual PM2.5 concentrations in the Bay Area.

Figure 2-16 is similar to Figure 2-15, except that it shows the relative contributions to peak PM2.5 concentrations; those relevant for the national 24-hour PM2.5 standard. In the Bay Area, the highest PM2.5 occurs in the wintertime. Wood burning represents a large portion of the total. Wood burning is primarily residential wood fires, but also includes wildfires and prescribed burns. Figure 2-16 shows wood-burning as contributing roughly one-third of peak PM2.5 concentrations. However, on certain days and in certain locations, wood-burning can account for more than half of total ambient PM2.5. Another large portion of winter PM2.5 is ammonium nitrate deriving from NOx and ammonia. Thus, on-road motor vehicles are also a large contributor because they are the principal source of NOx emissions.

In addition to directly emitted PM, emissions of PM precursors such as NOx, ammonia, and sulfur dioxide contribute to the formation of secondary PM. Combustion of fossil fuels produces NOx, which combines with ammonia[54] in the atmosphere to form ammonium nitrate, and sulfur dioxide (SO2), which combines with ammonia to form ammonium sulfate. These secondary compounds constitute another one-third of Bay Area PM2.5 on an annual basis and approximately 40-45% during winter peak periods.

[54] As shown in Figure 2-14, the leading sources of ammonia emissions in the Bay Area include livestock, ommercial refrigeration (wineries, breweries, and cold storage warehouses), human respiration and perspiration, domestic animal waste, and motor vehicles.

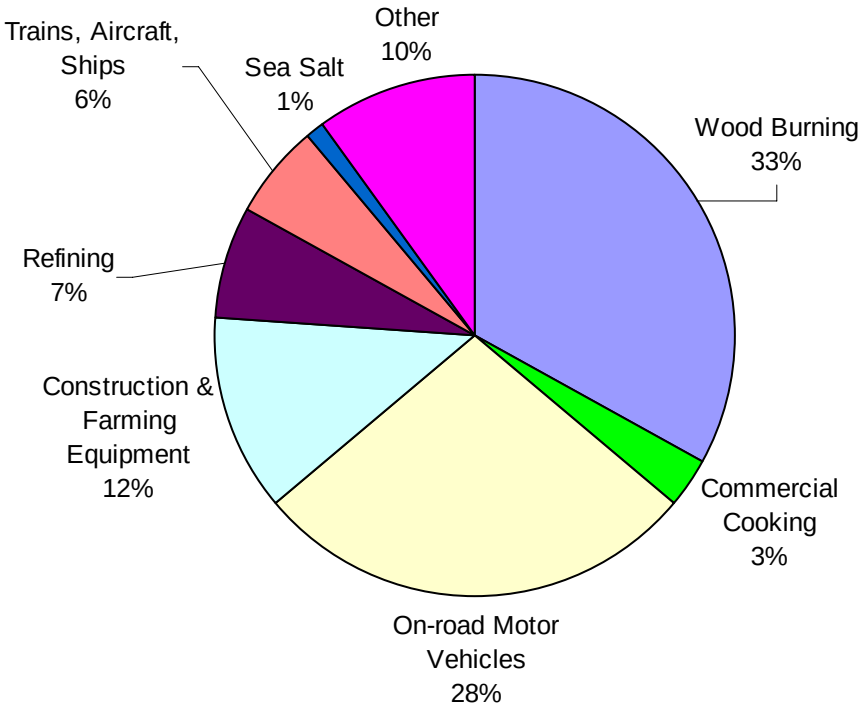

Figure 2-16. Estimated contributions to peak PM2.5 concentrations in the Bay Area

In recent years, as industrial production and air pollution have increased in China and other Asian countries, researchers have been investigating the possible impact of Asian emissions in terms of ambient air quality and deposition in North America. More research is needed in this area. However, preliminary analysis suggests that while there may be substantial transport of PM from Asia, most of it apparently passes far above the Bay Area, continuing eastward where some may be deposited on the slopes of the Sierras.[55]

Trends in Monitored PM Concentrations

The Bay Area has achieved significant reductions in PM concentrations since 1990 but continues to exceed several PM standards. Figure 2-17 shows trends relative to the standards.

[55] Chin, M., Diehl, T., Ginoux, P., Malm, W., 2007. Intercontinental transport of pollution and dust aerosols: implications for regional air quality. Atmos. Chem. Phys. 7, 5501–5517

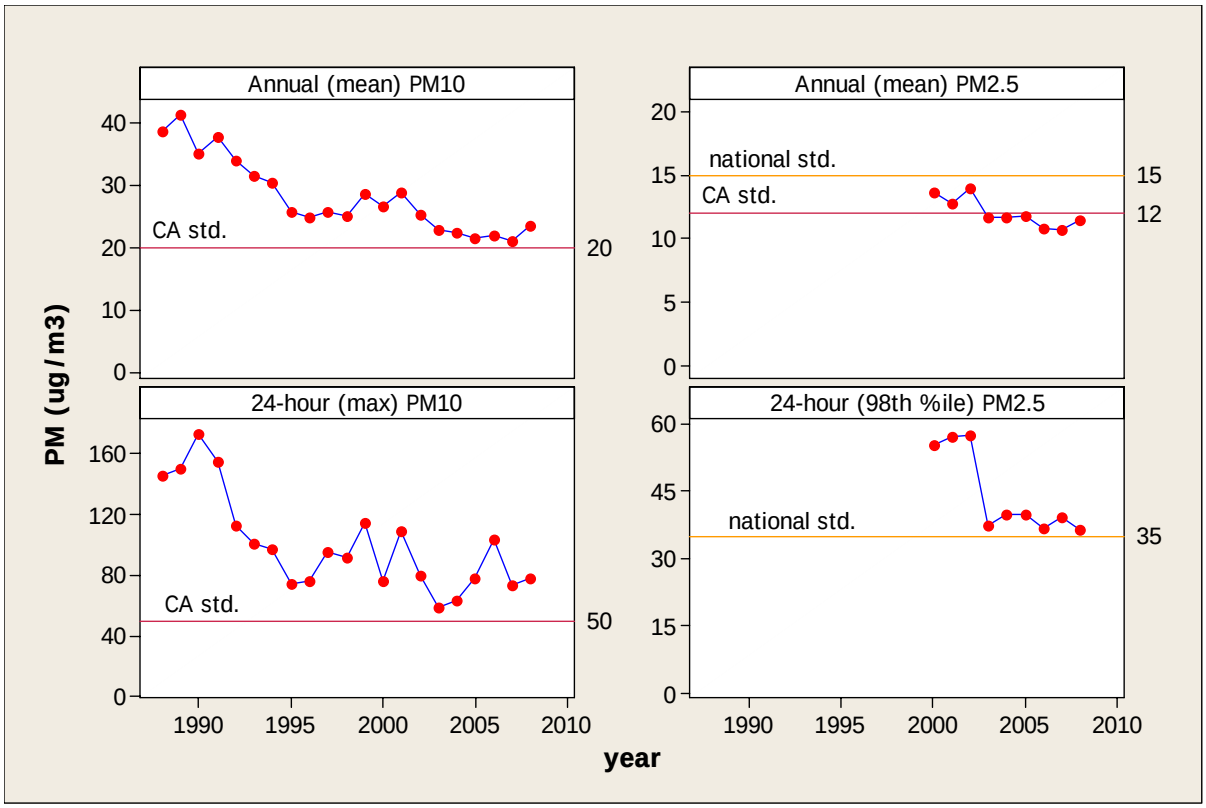

Figure 2-17. Bay Area PM trends relative to national and California standards.

The Bay Area's peak 98th percentile values, which serve as the basis for determining attainment of the national 24-hour $PM_{2.5}$ standard, were just over the national 35 µg/m^3 standard in 2008. Given the continued reductions in emissions of both primary PM2.5 and also its secondary precursors, the standard may be met in a few years. The Bay Area continues to violate state PM10 standards by a considerable margin, however.

The Bay Area has seen significant reductions in PM10 levels since 1990; peak concentrations have declined by approximately half and annual average values have declined by about one-third. PM2.5 has only been measured since 1999, so quantitative trend analysis is currently limited. However, it is likely that PM2.5 has been reduced at least as much as PM10.[56] Analysis of ambient PM10 measurements shows that ammonium nitrate values have dropped faster than PM10 as a whole. This reduction is likely due to reductions in NO_x emissions, which have decreased significantly since 1990; reducing secondary PM represents an additional benefit of reducing NOx as an ozone precursor.

[56] Fine PM is almost completely combustion-related, whereas geological dust, for which emissions appear to be increasing, and marine air, which is trendless, are both more prevalent among the coarse (larger) PM10 particles.

Summary of Key PM Modeling Findings

Photochemical modeling was used to estimate the impacts of reducing PM and its precursor emissions for the Bay Area and its neighboring PM nonattainment regions. Reducing primary (directly-emitted) PM2.5 emissions in the Bay Area provided far greater reductions in ambient Bay Area PM2.5 levels than reducing Bay Area secondary PM2.5 precursor emissions. Of the precursor emissions reductions simulated (ammonia, NOx, VOC, and sulfur-containing compounds), Bay Area ammonia reductions were most effective in reducing PM concentrations. The ammonia emissions reductions lowered Bay Area ammonium nitrate PM2.5 levels only for relatively cold winter days favoring ammonium nitrate buildup. (Ammonium nitrate PM2.5 tends to evaporate faster than it forms at temperatures above around 60 degrees Fahrenheit.) Combined NOx and VOC emissions reductions for the Bay Area were relatively ineffective. NOx emissions reductions were relatively ineffective because ammonium nitrate PM2.5 formation involves the relatively slow and incomplete conversion of NOx to nitric acid. Reducing Bay Area sulfur-containing PM precursor emissions typically had a small impact on Bay Area ambient PM2.5 levels. Under certain conditions, however, reducing Bay Area sulfur-containing emissions did provide around 1 $\mu g/m^3$ reduced Bay Area PM2.5 level.

Photochemical simulations were also performed with zero Bay Area anthropogenic emissions to gauge the impacts of transported PM2.5 and precursors. Significant amounts of both primary and secondary PM2.5 were transported into the Bay Area. On days when the Bay Area exceeded the 24-hour PM2.5 standard, transported primary PM2.5 levels averaged as high as 8 $\mu g/m^3$ and transported secondary PM2.5 levels averaged as high as 13 $\mu g/m^3$. The largest transport impacts for both primary and secondary PM2.5 occurred along the eastern boundary of the Bay Area.

Summary of Modeling Findings: Impact of Wood Smoke Reductions on PM

Locally-emitted wood smoke accounts for approximately one-third of PM2.5 levels on days when Bay Area PM levels exceed the national 24-hr PM2.5 standard. Preliminary wood smoke simulations have suggested that the wood smoke rule may have been effective at reducing ambient wood smoke levels by 50-75 percent at key PM2.5 monitoring locations. This conclusion, however, assumes 100% compliance with the wood smoke rule, which may not have occurred. The largest reductions in wood smoke PM2.5 levels were simulated for the locations having peak wood smoke levels; these locations often were not near any monitor. Therefore, reductions of population exposure to wood smoke resulting from the rule may be significantly greater than indicated by the monitoring data. Multiple, consecutive no-burn days may provide the

added benefit of reducing both fresh wood smoke emissions, as well as smoke carried over from prior days.

Air Toxics

Air toxics (often referred to as "toxic air contaminants") are a class of pollutants that include hundreds of individual airborne chemical species hazardous to human health. A number of these are common in urban environments. Reducing emissions of air toxics and population exposure to these chemicals is a key priority for the Air District.

Air Toxics Health Effects

Air toxics can cause or contribute to a wide range of health effects, including acute (short-term) health effects, such as eye and throat irritation; chronic (long-term) non-cancer effects, such as neurological damage, hormone disruption, and developmental defects; and cancer. CARB has identified 191 air toxics, including diesel particulate matter (diesel PM) and environmental tobacco smoke.

Unlike criteria pollutants which are subject to ambient air quality standards, air toxics are primarily regulated at the individual emissions source level based on risk assessment. Human outdoor exposure risk associated with an individual air toxic species is calculated as its ground-level concentration multiplied by an established unit risk factor for that species. Total risk due to air toxics is the sum of the individual risks associated with each species.

The Air District's cancer-risk-weighted emissions inventory, developed based upon OEHHA health risk estimates, shows that a small subset of air toxics account for approximately 95% of the total cancer risk from air pollutants in the Bay Area, as illustrated in Figure 2-18. This cancer risk is estimated at several hundred cases per million in many parts of the Bay Area, and higher in certain communities most impacted by diesel emissions, as discussed in the Air Toxics Trends section below. Diesel PM alone accounts for roughly 85% of this risk.[57]

Diesel particulate matter has been shown to be a lung carcinogen in occupational health studies[58] and is also a respiratory irritant. Mobile sources, especially heavy-duty diesel engines in trucks, construction equipment, locomotives, and ships, account for most of the cancer risk associated with air toxics in the Bay Area, as shown in Figure 2-19.

[57] Unlike most other air toxics, diesel PM cannot be measured directly because no accepted measurement method currently exists. Therefore, the concentration estimates for diesel PM have been made using elemental carbon measurements collected via the IMPROVE method or using a PM-based exposure method.

[58] See "Health Risk Assessment for Diesel Exhaust," Chapter 6.2. Office of Environmental Health Hazard Assessment, California Environmental Protection Agency, May 1998.

Benzene, present in gasoline vapors and also a byproduct of combustion, has been classified as a human carcinogen and is associated with leukemia. 1,3-butadiene, produced from motor vehicle exhaust and other combustion sources, has also been associated with leukemia. Reducing 1,3-butadiene also has a co-benefit in reducing the air toxic acrolein.[59]

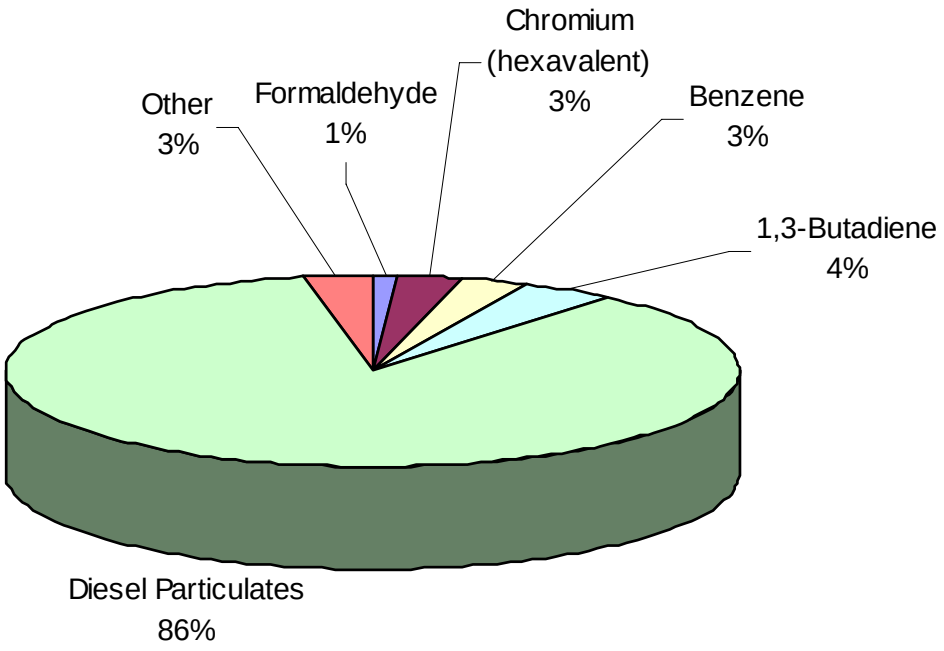

Figure 2-18. Cancer-risk weighted emission estimates for the San Francisco Bay Area.

Acetaldehyde and formaldehyde are emitted from fuel combustion and other sources and formed photo-chemically in the atmosphere from other compounds. Both compounds have been found to cause nasal cancers in animal studies; both are also associated with skin and respiratory irritation. Human studies for carcinogenic effects of acetaldehyde are sparse but, in consideration of animals studies, sufficient to support classification as a probable human carcinogen. Formaldehyde has been associated with nasal sinus cancer and nasopharyngeal cancer, and possibly with leukemia.

Air Toxics Emissions Inventory

[59] Acrolein, which is emitted directly in combustion processes and chemically produced from 1,3-butadiene in the atmosphere, has been associated with both chronic and acute health effects [OEHAA, EPA REF], including respiratory aliments, decreased respiratory function, and eye irritation.

Through the Air District's Community Air Risk Evaluation (CARE) program (described in Chapter 3), estimates of air toxics emissions in 2005 were compiled within the Bay Area for all major source categories: stationary permitted (point); other stationary, non-point; on-road mobile; and off-road mobile sources. The point source category includes industrial emissions from sources such as refineries, power plants and landfills, which are required to provide annual updates to the BAAQMD on their toxic emissions. The non-point area source category includes emissions from sources such as dry-cleaners, gasoline dispensing facilities, and lawn and garden equipment. The on-road mobile source category includes emissions from cars and trucks on freeways and roadways. The off-road mobile source category includes emissions from sources such as ships, trains, and construction equipment.

The air toxics emission inventories for on-road and areas sources were compiled following a "top-down" approach, beginning with total organic gases (TOG) and PM10 emissions estimated at the county level. Air toxics emissions for both on-road and area sources are estimated from chemical speciation of TOG and PM10, using source-specific speciation profiles to transform TOG and PM emissions into emissions of individual air toxics. These estimates were combined with the existing point source inventory of air toxics emissions. The mass-based emissions were converted to toxicity-weighted emissions for cancer, chronic, and acute risks using available cancer unit risk (UR) factors and non-cancer reference concentrations (RfC) for the inhalation exposure pathway.

An inventory showing the major sources of key air toxics is provided in Table 2-10. [60] The emissions shown in this table are raw numbers; that is, the data has not been weighted based upon health risk.

Figure 2-19 shows cancer-risk-weighted air toxics emissions by source category.

[60] The District is in the process of preparing a toxic inventory that will estimate toxics emissions in future years, but the future year inventory was not available in time for inclusion in the Draft CAP.

Table 2-10. Bay Area air toxics inventory for the year 2005.

Annual Average Emissions in pounds/day (not risk-weighted)						
SOURCE CATEGORY	BENZENE	DPM	1,3-BUTADIENE	FORMALDEHYDE	ACETALDEHYDE	HEXAVALENT CHROMIUM
PETROLEUM REFINING	133.2		3.8	37.4	3.3	0.02
OTHER INDUSTRIAL PROCESSES	50.3		0.04	64.6	8.3	0.06
ORGANIC COMPOUNDS EVAPORATION	316.9		0.00	5.4	14.9	
COMBUSTION – STATIONARY SOURCES	385.6	522.2	3.5	3003.4	1751.2	0.01
OFF-ROAD MOBILE SOURCES	3,072.1	15,441.7	830.8	6,490.3	5,875	0.32
ON-ROAD MOBILE SOURCES	6,310.7	7,465.4	1,321.3	4,741.9	3,505.6	0.29
MISCELLANEOUS			126.3			1.05
TOTAL EMISSIONS	10,269	23,429	2,286	14,343	11,158	1.74

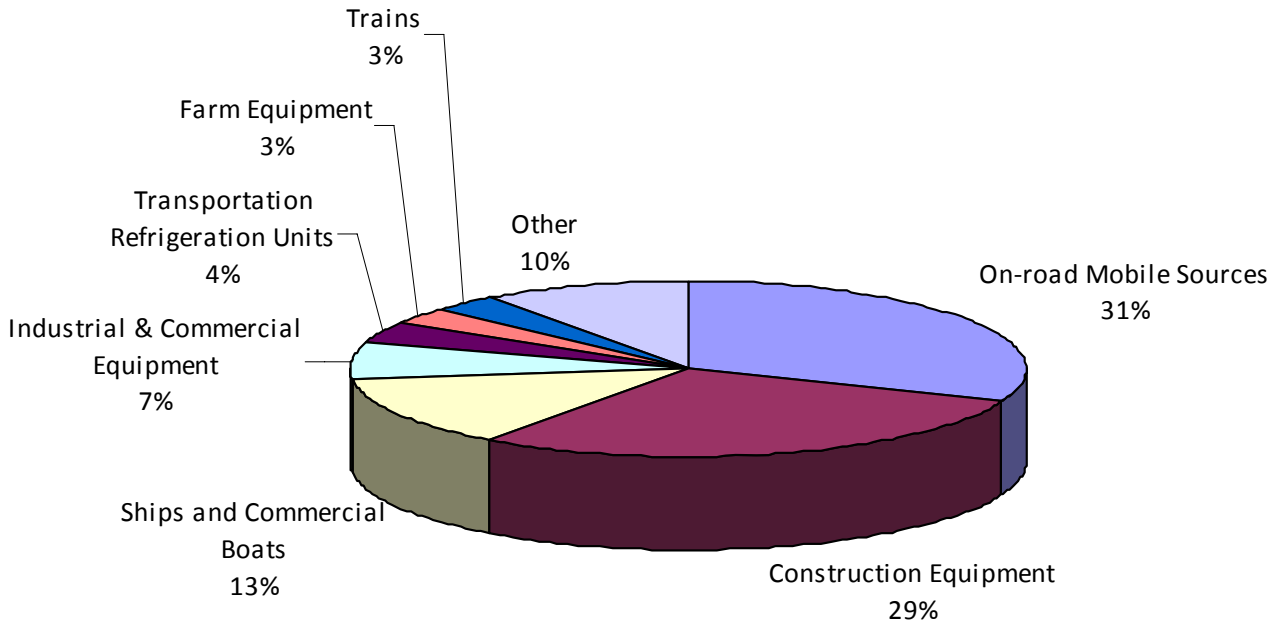

Figure 2-19. Cancer-risk-weighted air toxics emissions by source category.

Air Toxics Trends

The Air District and CARB have monitored selected air toxics in the San Francisco Bay area since the late 1980s. By analyzing trends in the air toxics monitoring data, the Air District estimates that between 1990 and 2005 there was about a 7 percent reduction per year in the cancer risk from air toxics.[61] The health risks of 1,3-butadiene and benzene have been reduced by about 78 percent and 83 percent, respectively, between 1990 and 2005.

As shown in Figure 2-20, using OEHHA cancer risk factors,[62] the estimated lifetime cancer risk (over a 70-year lifespan) from all air toxics combined declined from 1,330 cases per million in 1990 to 405 cases per million people in 2008. This represents a 70 percent drop between 1990 and 2008.

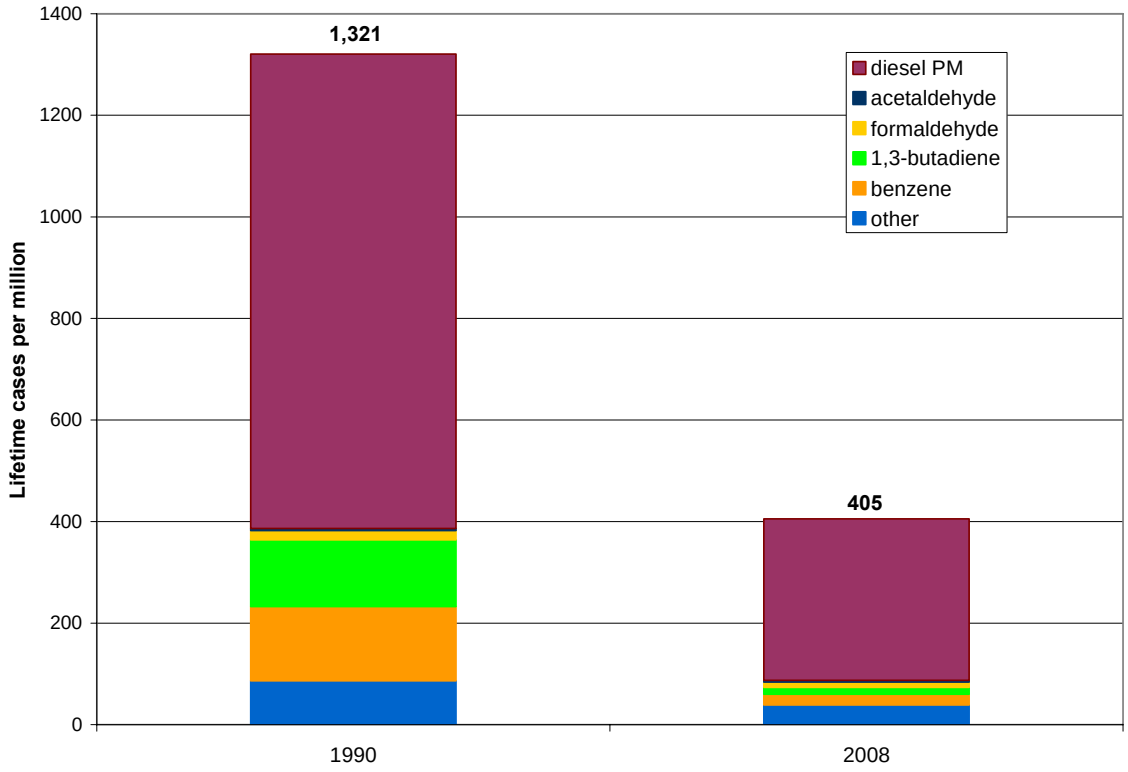

Figure 2-20. Cancer risk-weighted toxics emissions trends.

[61] Similar trends estimates are available from CARB (CARB Almanac, 2009).
[62] See Appendix A of May 2009 OEHHA document: Technical Support Document for Cancer Potency Factors. www.oehha.ca.gov/air/hot_spots/2009/AppendixA.pdf

Summary of Key Air Toxics Modeling Findings

Six air toxics species were simulated over the Bay Area. Five of the species were estimated to account for the bulk of total air toxics cancer risk in the Bay Area: acetaldehyde; benzene; 1,3-butadiene; diesel PM; and formaldehyde. The sixth species, acrolein, was believed to be the ambient toxic with the most serious non-cancer health effects. Over 80% of the Bay Area population-weighted cancer risk derived from diesel PM. The highest simulated annual average diesel PM concentration (10-12 $\mu g/m^3$) was located over West Oakland, extending toward Emeryville and along both sides of the eastern span of the Bay Bridge. The second highest (8-10 $\mu g/m^3$) locations were over an area southeast of downtown Oakland, Alameda, and the Transbay District/Rincon Hill areas in San Francisco. Cancer risk was used to define six impacted communities [63] within the Bay Area: Concord; eastern San Francisco; western Alameda County; Redwood City and East Palo Alto; Richmond and San Pablo; and San Jose. (See impacted communities map in Figure 3-2.) These six impacted communities accounted for nearly half of the total Bay Area population-weighted lifetime cancer risk for sensitive groups (those under 18 or over 64 years of age).

Air Toxics Programs at the National and State Level

There are both national and state programs to regulate air toxics. US EPA regulates air toxics (using the term “hazardous air pollutants” or HAPs) pursuant to Title III, Section 112(b) of the 1990 Clean Air Act Amendments.[64] California's program to reduce exposure to air toxics was established by the Toxic Air Contaminant Identification and Control Act via AB 1807 in 1983, and the Air Toxics "Hot Spots" Information and Assessment Act via AB 2588 in 1987. Under AB 1807, CARB and OEHHA determine if a substance should be formally identified as a toxic air contaminant in California. CARB assesses the potential for human exposure to a substance and OEHHA evaluates the health effects.

The AB 1807 program was amended in 1993 by AB 2728, which required the CARB to identify the 189 federal hazardous air pollutants as air toxics. AB 2588 supplements the AB 1807 program, by requiring a statewide air toxics inventory, notification of people exposed to a significant health risk, and facility plans to reduce these risks. In 1992, the "Hot Spots" Act was amended by Senate Bill 1731 which required facilities that pose a significant health risk to the community to reduce their risk through a risk management plan.

[63] See *Applied Method for Developing Polygon Boundaries for CARE Impacted Communities* (December 2009) available at www.baaqmd.gov/Divisions/Planning-and-Research/CARE-Program/CARE-Documents.aspx.

[64] For more details on the 1990 CAAA, see http://www.epa.gov/air/caa/.

District Programs to Reduce Air Toxics

Two programs comprise the backbone of the Air District's air toxics reduction program for stationary sources: New Source Review for Air Toxics and the Air Toxics Hot Spots Program.

New Source Review: Pursuant to Regulation 2, Rule 5, new or modified emissions sources are required to perform health risk screening analysis for air toxics and utilize Best Available Control Technology to reduce emissions of air toxics.

Air Toxics Hot Spots Program: This is a state program implemented by regional air districts in California. Pursuant to Assembly Bill 2588 (1987) and Senate Bill 1731 (1992), facilities are required to provide information about their air toxics emissions, and facilities that pose a significant risk are required to develop and implement site-specific risk reduction plans and audits.

In addition to these core air toxics programs, the Air District seeks to reduce population exposure to air toxics through a variety of rules and programs which are described in Chapter 3, including the CARE program, the Clean Air Communities Initiative, and grant and incentives programs.

Greenhouse Gases

Greenhouse gases that cause climate change are an entirely different type of pollutant than criteria pollutants or air toxics. Climate change and atmospheric warming are global in scale, both in terms of causes and effects. The scientific consensus is clear that climate change poses enormous risks on a worldwide basis. Climate change is expected to have profound impacts on both the natural and man-made systems that sustain us. The range of potential impacts includes reduction in agricultural and forestry productivity, changes in human demographics and migration, reduced water supply, acidification of oceans, changes in natural habitat, extinction of species and loss of biodiversity, more powerful or more frequent hurricanes and cyclones, etc.

As discussed in Chapter 1, climate change poses a direct threat to air quality and public health in the Bay Area. Anticipated impacts include sea level rise (threatening coastal areas, the bay and the delta, as well as key infrastructure), reduced Sierra snowpack (vital to our water supply), increased wildfires, and higher levels of air pollution.

There are dozens of greenhouse gases (GHGs), but a handful of these gases are the primary agents of climate change. For purposes of the CAP, we consider the six GHGs

described below, often referred to as the "Kyoto Six."[65] These are the GHGs included in the District's *Source Inventory of Bay Area Greenhouse Gas Emissions* described below, and also included in the CAP *Multi-Pollutant Evaluation Methodology*.

Carbon Dioxide (CO2) is released to the atmosphere when fossil fuels (oil, gasoline, diesel, natural gas, and coal), solid waste, and wood or wood products are burned.

Methane (CH4) is emitted during the production and transport of coal, natural gas, and oil. Methane emissions also result from the decomposition of organic waste in municipal solid waste landfills and the raising of livestock.

Nitrous oxide (N2O) is emitted during agricultural and industrial activities, as well as during combustion of solid waste and fossil fuels.

Hydrofluorocarbons (HFCs), ***perfluorocarbons*** (PFCs), and ***sulfur hexafluoride*** (SF6), are generated in a variety of industrial processes. Although these gases are small in terms of their absolute mass, they are potent agents of climate change as expressed by their global warming potential.

Global Warming Potential

Each greenhouse gas differs in its ability to absorb heat in the atmosphere; this is often referred to by the term "radiative forcing" or *global warming potential* (GWP). The GWP of the Kyoto 6 GHGs is shown in Table 2-11. Greenhouse gas emissions are often expressed in terms of carbon dioxide equivalents (CO2e), in which each gas is weighted by its GWP.

Table 2-11. Global warming potentials (GWPs) for greenhouse gases.

Greenhouse Gas	Global Warming Potential
CO2	1
Methane (CH4)	21
N2O	310
HFCs/PFCs	90- 11,700
SF6	23,900

There is great variation in terms of the emissions of each GHG on a mass basis, as well as in their GWP. Even though other GHGs absorb much more heat on a molecule per molecule basis, CO2 emissions dominate the Bay Area GHG inventory, accounting for

[65] These six gases were recognized as the leading GHGs in the Kyoto protocol of 1997. They are considered the primary GHGs by many national and international institutions, including U.S. EPA and the Intergovernmental Panel on Climate Change (IPCC).

91.4% of total GHGs on a GWP-weighted basis, because the amount of CO2 emitted is so enormous.

GHGs Not Addressed in CAP

There are a number of other greenhouse gases or agents that are not addressed in the CAP. The reasons that these GHGs were not included are explained below.

Chloroflourocarbons (CFCs) and **hydrochloroflourocarbons** (HCFCs) are pollutants that deplete stratospheric ozone. Because these emissions are covered under the *Montreal Protocol on Substances that Deplete the Ozone Layer* (1989), they are not included in the Kyoto Protocol.

Water vapor is a naturally occurring greenhouse gas which accounts for a large percentage of the total greenhouse effect. However anthropogenic emissions of water vapor do not contribute significantly to the change of atmospheric water vapor concentration. Therefore, *IPCC Guidelines* do not deal with water vapor as an anthropogenic GHG.

Ozone acts as a greenhouse gas that contributes to climate change, in addition to its role as a criteria air pollutant. Thus, reductions in emissions of ozone precursors (ROG and NOx) will provide an important co-benefit in reducing total GHG emissions.

Carbon Monoxide (CO) has been identified as an important indirect greenhouse gas. An increase in CO emissions alters atmospheric chemistry so as to increase concentrations of methane, which is a potent GHG.

Black Carbon, a key component of fine PM, may also contribute significantly to climate change. The IPCC notes a small effect from fossil fuel–based black carbon, but some researchers have suggested that the impact has been underestimated (Hansen and Nazarenko 2004; Jacobson 2001).[66] In the United States, diesel emissions account for more than half of the black carbon (CARB, 2007). In the Bay Area, combustion of wood and gasoline also contribute significantly to black carbon concentrations. As in the case of ozone, reducing emissions of black carbon may provide an important co-benefit in terms of climate protection.

Bay Area GHG Inventory and GHG Emissions Trends

In November 2006 the BAAQMD became the first air district in the nation to develop a detailed GHG emissions inventory. The Bay Area GHG inventory was updated in

[66] Hansen, J., and L. Nazarenko, 2004: Soot climate forcing via snow and ice albedos. *Proceedings of the National. Academy of Sciences*, 101, 423-428. Also see Jacobson, M. Z., Strong radiative heating due to mixing state of black carbon in atmospheric aerosols, *Nature, 409*, 695-697, 2001.

December 2008; minor revisions were also made in January 2010. The Air District's greenhouse gas inventory only includes GHGs that are emitted within the Bay Area, as well as GHGs emitted in the production of electricity that is imported to the region. The inventory does not include GHGs associated with other goods or products that are imported into the region. If GHGs from imported goods were included, the region's actual GHG footprint would be considerably larger.

Greenhouse gas emissions have been increasing on a regional, statewide, national, and global scale for many decades. Under "business as usual" conditions – that is, absent some combination of regulatory, policy, land-use, and/or market-based changes - Bay Area GHG emissions would be expected to continue to increase at an average rate of approximately 1.4 percent per year in the future due to population growth, economic expansion, and other factors.

Figure 2-21 shows the current Bay Area inventory by source category. The industrial/ commercial and the transportation sectors combined account for over 70% of GHG emissions in the Bay Area inventory.

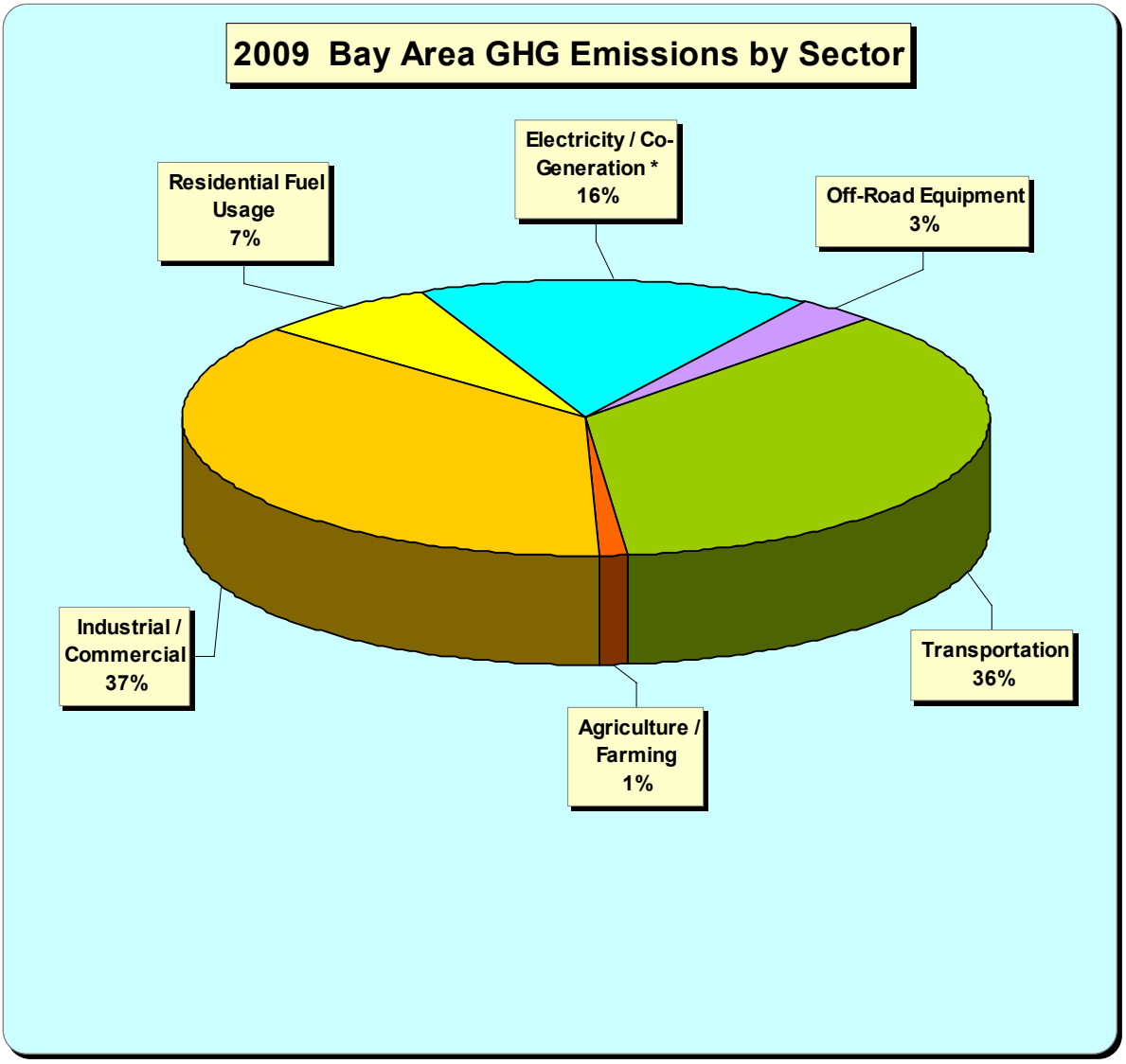

Figure 2-21. Bay Area GHG emissions by source category.

The latest Bay Area GHG inventory shown in Table 2-12 reflects regulatory programs that were in place as of 2007.[67]

[67] The benefits of CARB's GHG regulation for motor vehicles adopted in 2004, the "Pavley regulations" (AB 1493) to reduce emissions of GHGs from motor vehicles, are not included in Table 2-12. This regulation had been on hold, pending U.S. EPA approval of a waiver required under the terms of the federal Clean Air Act. The waiver was finally approved in June 2009. However, CARB has not yet updated its emission factors to incorporate the projected benefits of AB 1493.

Table 2-12. Bay Area greenhouse gas emission inventory projections for 2005-2020 (million metric tons CO2 equivalent).

SOURCE CATEGORY	Year 2005	Year 2009	Year 2012	Year 2015	Year 2020
INDUSTRIAL/ COMMERCIAL					
Oil Refineries					
Refining Processes	3.4	3.5	3.6	3.7	3.9
Refinery Make Gas Combustion	4.7	4.9	5.0	5.2	5.4
Natural Gas and Other Gases Combustion	4.8	5.0	5.1	5.3	5.5
Liquid Fuel Combustion	0.1	0.1	0.1	0.1	0.1
Solid Fuel Combustion	1.0	1.0	1.1	1.1	1.1
Waste Management					
Landfill Combustion Sources	0.0	0.0	0.0	0.0	0.0
Landfill Fugitive Sources	1.2	1.2	1.2	1.2	1.2
Composting/POTWs	0.4	0.4	0.4	0.4	0.4
Other Industrial/ Commercial					
Cement Plants	0.9	0.9	0.9	0.9	1.0
Commercial Cooking	0.1	0.1	0.1	0.1	0.2
ODS Substitutes/Nat. Gas Distrib./Other	3.6	5.2	6.3	7.5	9.4
Reciprocating Engines	0.6	0.6	0.6	0.7	0.7
Turbines	0.4	0.4	0.4	0.4	0.4
Natural Gas- Major Combustion Sources	1.6	2.5	2.6	2.7	2.8
Natural Gas- Minor Combustion Sources	8.8	9.2	9.5	9.9	10.4
Coke Coal	1.0	1.0	1.1	1.1	1.2
Other Fuels Combustion	0.3	0.4	0.4	0.4	0.4
Subtotal	32.8	36.3	38.4	40.6	44.2
RESIDENTIAL FUEL USAGE					
Natural Gas	6.4	6.6	6.8	6.9	7.2
LPgas/Liquid Fuel	0.2	0.2	0.2	0.2	0.2
Solid Fuel	0.1	0.2	0.2	0.2	0.2
Subtotal	6.7	6.9	7.1	7.2	7.5
ELECTRICITY/ CO-GENERATION					
Co-Generation	5.5	5.5	5.7	6.0	6.4
Electricity Generation	2.8	3.1	3.2	3.3	3.5
Electricity Imports	6.8	7.3	7.6	7.9	8.3
Subtotal	15.1	15.8	16.5	17.2	18.3
OFF-ROAD EQUIPMENT					
Lawn and Garden Equipment	0.1	0.1	0.1	0.1	0.1
Construction Equipment	1.7	1.9	1.9	2.0	2.2
Industrial Equipment	0.7	0.8	0.8	0.9	1.0
Light Commercial Equipment	0.2	0.2	0.3	0.3	0.3
Subtotal	2.8	3.0	3.2	3.3	3.6

Table 2-12 (continued). Bay Area greenhouse gas emission inventory projections for 2005-2020 (million metric tons CO2 equivalent).

SOURCE CATEGORY	Year 2005	Year 2009	Year 2012	Year 2015	Year 2020
TRANSPORTATION					
Off-Road					
Locomotives	0.1	0.1	0.1	0.1	0.1
Ships	0.7	0.8	0.8	0.9	1.0
Boats	0.6	0.6	0.5	0.5	0.6
Commercial Aircraft	1.8	2.0	2.1	2.3	2.6
General Aviation	0.2	0.2	0.2	0.3	0.3
Military Aircraft	0.5	0.5	0.5	0.5	0.5
On-Road					
Passenger Cars/Trucks up to 10,000 lbs	26.6	27.1	27.9	29.0	30.9
Medium/Heavy Duty Trucks > 10,000 lbs	3.3	3.3	3.4	3.5	3.7
Urban, School and Other Buses	0.8	0.8	0.8	0.8	0.9
Motor-Homes and Motorcycles	0.2	0.2	0.2	0.2	0.2
Subtotal	34.8	35.6	36.7	38.1	40.7
AGRICULTURE/ FARMING					
Agricultural Equipment	0.2	0.2	0.2	0.2	0.2
Animal Waste	0.6	0.6	0.6	0.6	0.6
Soil Management	0.3	0.3	0.3	0.3	0.3
Biomass Burning	0.0	0.0	0.0	0.0	0.0
Subtotal	1.1	1.1	1.1	1.1	1.1
GRAND TOTAL EMISSIONS	**93.4**	**98.7**	**103.0**	**107.5**	**115.4**

Chapter 3 – Planning Context

This chapter provides the policy and planning context for the CAP. The 2010 Clean Air Plan builds on many other plans and programs, including existing and new Air District initiatives, as well as plans developed and implemented by other agencies. This chapter describes:

- Progress in implementing the Bay Area 2005 Ozone Strategy;
- Key Air District programs and initiatives that are linked to the CAP;
- External plans and programs that complement the CAP; and
- State and federal emission reduction programs.

Implementation of the Bay Area 2005 Ozone Strategy

The 2010 CAP updates the Air District's most recent state ozone plan, the 2005 Ozone Strategy. The 2005 Ozone Strategy laid out a comprehensive plan to reduce emissions of ozone precursors, including 15 Stationary Source Measures (SSMs), four Mobile Source Measures (MSMs), and 20 Transportation Control Measures (TCMs). The Air District and its partner agencies have taken action to implement the control measures in the 2005 Ozone Strategy, as summarized below. SSMs have been implemented through the Air District's rule development process. MSMs and TCMs have been implemented through a wide range of mechanisms, including partnerships, grants, and public outreach and education.

In addition, the 2005 Ozone Strategy identified 20 Further Study Measures (FSMs). These FSMs were not a formal part of the control strategy, but the Air District did make a commitment to evaluate these measures further to determine whether they could be developed into formal control measures. Several FSMs were in fact developed into formal measures and adopted as rules, as discussed below.

Stationary Source Measures in the 2005 Ozone Strategy

Table 3-1 shows the outcome of Stationary Source Measures identified in the 2005 Ozone Strategy. Of the 15 stationary measures, 13 have been adopted.

Table 3-1. Implementation of stationary source measures in 2005 ozone strategy.

Control Measure (Reg. – Rule) 2005 Ozone Strategy Control Measure #	Date Adopted	Emissions Reduced (tons per day)	
		ROG	NOx
SSM 1: Auto Refinishing (8-45)	12/3/08	3.7	
SSM 2: Graphic Arts Operations (8-20)	11/19/08	1.65	
SSM 3: High-Emitting Spray Booths [1]			
SSM 4: Polyester Resin Operations (8-50)	12/02/09	0.15	
SSM 5: Wood Coating Operations (8-32)	8/5/09	0.45	
SSM 6: Petroleum Refinery Flares (12-12) [2]	7/20/05	Unknown	
SSM 7: Gasoline Bulk Terminals/Plants (8-33 & 39)	4/15/09	0.07	
SSM 8: Marine Loading Operations (8-44)	12/7/05	0.44	
SSM 9: Organic Liquid Storage (8-5)	10/18/06	0.03	
SSM 10: Pressure Relief Devices (8-28) [3]	12/21/05	0.001	
SSM 11: Wastewater Systems (8-8)	9/15/04	2.1	
SSM 12: Boilers (9-7)	7/30/08		3.8
SSM 13: Residential Water Heaters (9-6)	11/7/07		2.5
SSM 14: Stationary Gas Turbines (9-9)	12/6/06		0.43
SSM 15: Promote Energy Conservation [4]	NA		
Total Emission Reductions		8.59	6.73

[1] SSM 3 is proposed for deletion, as discussed below.

[2] Regulation 12, Rule 12 reduces emissions or ROG, NOx, PM and SOx.

[3] The amendments to SSM 10 increase monitoring, inspection and reporting requirements to ensure that any significant release is detected, measured and controlled, thereby reducing potential exposure in nearby communities.

[4] SSM 15 has been reconfigured as ECM 1 in the 2010 CAP.

SSM 3 (High Emitting Spray Booths) is proposed for deletion. Analysis by Air District staff indicates that due to the adoption of other control measures (SSM-1 and SSM-5), plant closures and voluntary reductions, the potential emissions reductions from this measure are de minimis; therefore further rule development is not warranted at this time.

SSM 15 (Promote Energy Conservation), which was not proposed to be adopted as an Air District rule, has been implemented primarily through the District's Climate Protection Program. SSM 15 has been reconfigured and incorporated into measure ECM 1 in the 2010 CAP control strategy.

Additional Rules Adopted Since 2005

In addition to rules adopted pursuant to the Stationary Source Measures in the 2005 Ozone Strategy, the Air District has adopted or amended a number of other rules since

2005, as shown in Table 3-2. Several of these rules had been included as Further Study Measures (FSMs) in the 2005 Ozone Strategy. The additional actions include:

- Rules to reduce emissions of air toxics, including Regulation 2, Rule 5, New Source Review for Toxic Air Contaminants; as well as Regulations 11-16 and 8-17, both of which apply to dry cleaning operations
- Rules to require that agricultural feed lots (large confined animal sources) of a certain size obtain permits and mitigate their emissions;
- Rules to reduce emissions of PM pursuant to SB 656, including stationary internal combustion engines (Reg. 9-8), commercial broiling operations (Reg. 6-2), and residential wood-burning devices (Reg. 6-3).

Table 3-2. Additional rules adopted in 2005-2009 period.

Control Measure (Reg. – Rule) 2005 Ozone Strategy Control Measure #	Date Adopted	Emissions Reduced (tons per day)	
		ROG	NOx
FSM 2: Architectural Coatings (8-3)	7/1/09	5.4	
FSM 3: Commercial Broiling Operations (6-2) [1]	12/5/07	0.09	
FSM 15: Stationary IC Engines (9-8)	7/25/07		9.6
New Source Review / Toxic Air Contaminants (2-5)	6/15/05	Unknown	
Petroleum Refinery Flares (12-12) [2]	4/5/06	Unknown	
Large Confined Animal Sources (1, 2-1, 2-10)	7/19/06	Unknown	
Wood-burning Devices (6-3)	7/9/08	unknown	
Dry Cleaning Operations (11-16, 8-17)	3/4/09	unknown	
Total emission reductions		5.49	9.6

[1] In addition to reducing PM, Reg. 6-2 also reduces ROG emissions generated by cooking meat, thus helping to reduce ozone.

[2] Amendments to Reg. 12, Rule 12 were adopted on April 5, 2006 (in addition to the rule, first adopted on 7/20/05 pursuant to SSM 6.)

The PM rules described above were identified in the PM Implementation schedule adopted by the Air District Board of Directors in November 2005 in response to Senate Bill 656. SB 656 required CARB, in consultation with local air districts, to develop and adopt a list of the most feasible and cost-effective control measures that could be employed by CARB and local air districts to reduce PM10 and PM2.5. The bill required air districts to review the CARB list and develop implementation schedules for feasible PM control measures based on their local PM conditions. In response to SB 656, the Air District adopted the three PM rules listed above.

Implementation of Mobile Sources Measures in the 2005 Ozone Strategy

Table 3-3 summarizes implementation actions and progress in implementing the Mobile Source Measures in the Bay Area 2005 Ozone Strategy.

Table 3-3. Implementation of mobile source measures in 2005 ozone strategy.

Mobile Source Measures			
CM #	**Source Category**	**Description**	**Status**
MSM-1	Diesel Equipment Idling Model Ordinance	Reduce emissions from the idling of diesel equipment	BAAQMD has entered into an MOU with CARB and began implementing a Mobile Source Compliance Program in late 2009 to help enforce CARB diesel idling rules, with objective of establishing an ongoing presence in communities highly impacted by diesel truck traffic. BAAQMD provided approximately $47 million in grants to reduce diesel emissions in the 2005-2009 period.
MSM-2	Green Contracting Model Ordinance	Develop and promote a model ordinance to help local government agencies to encourage contractors to use clean vehicles, equipment and fuels.	BAAQMD provided grants to Sonoma and Marin Counties, and the Town of Hillsborough for development of local ordinances. This measure has been replaced by the new Mobile Sources Measures in the 2010 CAP.
MSM-3	Low Emission Vehicle Incentives	Encourage the purchase of new low-emission vehicles to reduce emissions from existing vehicles.	Between 2005 and 2009, BAAQMD awarded approximately $47 million in grants for the purchase of low-emission vehicles, cleaner engines and retrofit devices for transit buses, school buses, garbage trucks, public and private fleets. Reductions realized estimated at 0.04 tons per day (tpd) of ROG and 0.4 tpd of NOx.
MSM-4	Vehicle Buy Back Program	Accelerate the retirement of older, high emitting vehicles from the region's roadways by providing incentives to scrap them.	Between 2005 and 2008 BAAQMD provided incentives to retire approximately 20,500 passenger vehicles model year 1987 and older for a total cost of approximately $20 million. Reductions realized estimated at 1.03 tons per day (tpd) of ROG and 0.55 tpd of NOx.

Implementation of Transportation Control Measures in the 2005 Ozone Strategy

Table 3-4 summarizes implementation actions and progress in implementing the Transportation Control Measures in the Bay Area 2005 Ozone Strategy.

Table 3-4. Implementation of transportation control measures in 2005 ozone strategy.

CM#	Name/Source Category	Description	Implementation
TCM- 1	Support Voluntary Employer Based Trip Reduction Programs	Support and encourage voluntary efforts by Bay Area employers to promote the use of commute alternatives by their employees	BAAQMD has provided grants for 511 Regional Rideshare Program, Marin video-conferencing, Spare the Air employer program, Guaranteed Ride Home Programs in San Francisco, Solano, Napa, and West Contra Costa, other employer-based programs in San Ramon, West and East Contra Costa, Alameda, San Mateo. MTC is the primary funding source for the annual Bike To Work Day promotion.
TCM- 2	Adopt Employer Based Trip Reduction Rule (Deleted)	Deleted	Deleted per Health & Safety Code Section 40717.9.
TCM-3	Improve Local and Area wide Bus Service	Reduce motor vehicle trips, vehicle miles traveled, and mobile source.	MTC funded three express bus projects: Richmond Bridge, East Bay North, and East Bay South; and the Lifeline Transportation Program. BAAQMD provided grants for Tri-Delta, Muni, Napa, and LAVTA transit; and to improve bicycle parking at BART stations. Also, new Intermodal and Park & Ride lots opened in Petaluma, Windsor and Cotati (MTC/BAAQMD funded).
TCM-4	Upgrade and Expand Local and Regional Rail Service	Reduce motor vehicle trips vehicle miles traveled and mobile source emissions	MTC funded Third Street Light Rail Project (Phase 1), Caltrain Express/Rapid Rail Phase I, SCVTA Vasona light rail extension (adds 8 new stations and 5.3 miles), and the Oakland Airport Connector.
TCM-5	Improve Access To Rail and Ferries	Reduce motor vehicle trips, vehicle miles traveled and mobile source emissions by reducing auto trips	BAAQMD funded shuttle projects to connect to rail and ferry stations connecting Caltrain, Samtrans, SFO, SCVTA, West Berkeley, PresidGO, Mid-Day Menlo Park, UCSF, Ace Trains to Stoneridge Business Park and Dublin/Pleasanton BART, and from Benicia Industrial Park to Vallejo ferry.
TCM-6	Improve Inter-Regional Rail Service	Reduce motor vehicle travel and emissions for longer distance interregional trips	See TCM-5 for shuttles funded by BAAQMD connecting Ace Train, Caltrain. BAAQMD funded 4 locomotive engines for passenger service. Plans ongoing to improve and expand service underway (MTC funded).

Table 3-4 (continued). Implementation of transportation control measures in 2005 ozone strategy.

CM#	Name/Source Category	Description	Implementation
TCM-7	Improve Ferry Service	Reduce emissions from Transbay auto trips, which tend to be longer in length, and will also reduce auto traffic in highly congested bridge corridors	BAAQMD funded 11 ferry engine repower projects. MTC and WETA have ongoing plans to improve and expand ferry service
TCM-8	Construct Carpool/ Express Bus Lanes on Freeways	Reduce mobile source emissions by encouraging high occupancy vehicles	MTC funded new regional express bus service; completed HOV lanes on SR 87 in Santa Clara, 1-880/237 and 85/101, 580 in Alameda and I-80 in Solano. MTC funded ramp meters completed on 101 in San Mateo and under construction on 101 in Marin.
TCM-9	Improve Bicycle Access and Facilities	Reduce mobile source emissions by encouraging cycling	MTC adopted Resolution 3765 to encourage routine accommodation of cyclists and pedestrians in projects funded by MTC regional discretionary funds. MTC has provided funding ($8 million per year) via regional bicycle/pedestrian program. MTC and BAAQMD have funded 511 BikeMapper (part of 511 Rideshare). BAAQMD provided grants for bicycle parking or lanes in every Bay Area county. MTC has allocated $27 million from the first funding cycle of the new Federal transportation bill towards a regional bicycle program.
TCM-10	Youth Transportation	Reduce motor vehicle travel and mobile source emissions related to the transportation of youth and students for school and other activities	BAAQMD provided grants for clean school buses throughout region, including San Ramon, Lafayette, Milpitas, River Delta School District, West Sonoma, Pleasant Hill. BAAQMD subsidized transit passes for students in Sonoma and Marin Counties and San Ramon. MTC has allocated $10 million from the first funding cycle of the new Federal transportation bill towards a public outreach effort, including a focus on youth education.
TCM-11	Install Freeway Traffic Management System	Reduce emissions produced by stop and go congestion	MTC, CHP and Caltrans sponsor ongoing Freeway Service Patrols. MTC has allocated $105 million from the first funding cycle of the new Federal transportation bill towards the Freeway Performance Initiative.
TCM-12	Arterial Management Measures	Reduce vehicle idling and acceleration	Completed projects funded by BAAQMD include: San Tomas Expressway, Matilda in Sunnyvale, Lawrence Expressway, McDowell/Baywood in Petaluma, 14th Street arterial in Alameda County, Mowry, Stevenson, Blacow in Fremont, Light Rail Controller Upgrade Project in San Jose, and on Constitution Way/Lincoln in City of Alameda.

Table 3-4 (continued). Implementation of transportation control measures in 2005 ozone strategy.

CM#	Name/Source Category	Description	Implementation
TCM-13	Transit Use Incentives	Programs to increase transit use and reduce vehicle emissions	MTC funded Translink on AC Transit, BART, Golden Gate Transit, MUNI and other systems, and real-time transit info on Muni and BART. (See also TCM-3 for intermodal and Park & Ride facilities and TCM-1, TCM-16.)
TCM-14	Carpool and Vanpool Services and Incentives	Reduce motor vehicle emissions	MTC ongoing funding for 511 Regional Rideshare and rideshare short-term vanpool subsidy and "start-up" incentive subsidy. See also TCM-1.
TCM-15	Local Land Use Planning And Development Strategies	Reduce motor vehicle use and emissions by promoting land use patterns and new development that facilitate walking, bicycling and transit use	Via FOCUS, regional agencies have implemented partnership with local jurisdictions to define priority development areas (PDAs). In June 2008, MTC in partnership with AC Transit launched TransLink® for TOD, offering residents of select transit-oriented development (TOD) complexes around the East Bay unlimited free travel on AC Transit's local and transbay buses during a one-year pilot program. In 2009, MTC awarded $1.8 million in Station Area Planning Grants to six jurisdictions along the Sonoma-Marin Area Rail Transit (SMART) corridor. In addition, MTC has allocated $85 million from the first funding cycle of the new Federal transportation bill towards the Transportation for Livable Communities Program to support PDAs. See also TCM-3 thru TCM-7, TCM-17, 19 and 20.
TCM-16	Public Education / Intermittent Control Measures	Educate the public about air quality in the Bay Area	BAAQMD funded Spare the Air notices, webpage, banner, advertisements, and free transit rides; transit marketing in Sonoma; transit and bicycle marketing in Petaluma. MTC has allocated $10 million from the first funding cycle of the new Federal transportation bill towards a public education effort (see TCM-10)
TCM-17	Conduct Demonstration Projects	Promote demonstration projects to develop innovative approaches to reduce mobile source emissions	BAAQMD and MTC funded PATH demonstration of electronic bicycle lockers at Pleasant Hill BART Station. MTC funded Alameda County CMA Dynamic Ridesharing pilot projects. BAAQMD funded the Travel Choice program pilots in Fruitvale and the City of Alameda. This program was then implemented in Berkeley and San Leandro. BAAQMD funded the SF County Telecommute Pilot Project. See also TCM-15.

Table 3-4 (continued). Implementation of transportation control measures in 2005 ozone strategy.

CM#	Name/Source Category	Description	Implementation
TCM-18	Implement Transportation Pricing Reform	Improving air quality and addressing persistent congestion issues	MTC developed a regional High Occupancy Toll (HOT) lane network proposal included in T2035 regional transportation plan. MTC developed a best parking practices manual and technical resources to assist local governments in revising parking policies. San Francisco is studying congestion pricing and market-based parking pricing.
TCM-19	Improve Pedestrian Access and Facilities	Making pedestrian travel safer, more convenient and more attractive will promote walking, reduce the need to use autos, and therefore reduce mobile source emissions	MTC adopted Resolution 3765 to encourage routine accommodation of cyclists and pedestrians in projects funded by MTC regional discretionary funds. MTC has provided funding ($8 million per year) via regional bicycle/pedestrian program. BAAQMD funded Pedestrian Access projects in Suisun City, Bayview Gateway in SF, and Sunnyvale, and multi-use trails in Morgan Hill, Sebastopol, Suisun, Livermore, Mountain View, American Canyon, Contra Costa, Antioch, and Marin.
TCM-20	Promote Traffic Calming Measures	Reduce motor vehicle emissions	Palo Alto, Menlo Park, Mountain View and Cotati all have plans or studies ongoing. San Francisco has installed curb bulbs, median refuges, lighted crosswalks, ladder crosswalks, and fluorescent yellow crossing signs. Also see TCM 15 re: Station Area Planning Grants and Transportation for Livable Communities Program.

Status of Further Study Measures in the 2005 Ozone Strategy

Table 3-5 summarizes implementation actions and progress in implementing the Further Study Measures in the Bay Area 2005 Ozone Strategy.

Table 3-5. Status of further study measures in 2005 ozone strategy.

Further Study Measures					
FSM # (Reg #)	**Source Category**	**Description**	**Status**		
FSM-1 (8-51)	Adhesives and Sealants	Reduce VOC limits for architectural adhesives	Staff recommendation: Retain as FSM 1 in 2010 CAP.		
FSM-2 (8-3)	Architectural Coatings	Reduce VOC limits from architectural coatings	Adopted 7/1/09	5.4 tpd ROG	
FSM-3 (6-2)	Commercial Cooking Equipment	Reduce NOx and particulate from charboilers	Adopted 12/05/07	0.09 tpd VOC, 0.55 tpd PM10	
FSM-4	Composting Operations	Limit emissions of both VOC and ammonia	Staff recommendation: Retain as FSM 15 in 2010 CAP.		
FSM-5	Food Product Manufacturing and Processing	Reduce VOC limits for food-processing facilities that emit more than 440 pounds/month of organic compound emissions	Staff recommendation: Delete from Further Study Measures due to insufficient emissions reductions to warrant further action.		
FSM-6	Livestock Waste	Reduce emissions of particulate, ammonia (which forms aerosol particulate matter) and VOC	Staff recommendation: Develop into control measure SSM 3 for the 2010 CAP.		
FSM-7 (8-3 & 8-32)	Limitation on Solvents Based on Relative Reactivity	Consider replacing VOC limits in certain rules, measured in mass VOC per volume of product, with limits based on the relative contribution to ozone formation of each of the organic species that make up the VOC of a product.	Staff recommendation: Retain, with revisions, as FSM 2 in 2010 CAP.		
FSM-8 (8-16)	Solvent Cleaning and Degreasing	Reduce VOC limits	Staff recommendation: Retain as FSM 3 in 2010 CAP.		
FSM-9	Emission from Cooling Towers	Reduce organic emission limits	Staff recommendation: Retain as FSM 4 in 2010 CAP.		
FSM-10 (8-8)	Refinery Wastewater Treatment Systems	Reduction in ROG from refinery wastewater systems	Results of this FSM reported to Board of Directors 11/16/2005. No further action		
FSM-11	Vacuum Trucks	Reduce VOC emissions	Staff recommendation: Develop into control measure SSM 5 for the 2010 CAP.		
FSM-12 (8-18)	Valves and Flanges	Reduce emissions from valves and flanges typically found at refineries and chemical plants.	Staff recommendation: Retain as FSM 5 (Equipment Leaks) in 2010 CAP. More stringent standards for oil and gas production to be considered under SSM 4: Natural Gas Production and Distribution.		

Table 3-5 (continued). Status of further study measures in 2005 ozone strategy.

FSM # (Reg #)	Source Category	Description	Status		
FSM-13	Wastewater from Coke Cutting Operations	Reduce VOC emissions from coke cutting wastewater.	Staff recommendation: Retain as FSM 6 in 2010 CAP.		
FSM-14 (9-10)	NOx Reduction from Refinery Boilers	Reduce NOx emissions from refinery boilers.	Staff recommendation: Develop into control measure SSM 10 for the 2010 CAP. District staff is currently developing rule amendments.		
FSM-15 (9-8)	Stationary IC Engines	Reduce NOx limits for IC engines, reduce secondary particulate matter	Adopted 7/25/07		9.6 tpd NOx
FSM-16	Encourage Alternative Diesel Fuels	Exploration of the potential air quality benefits of using biodiesel fuel in place of conventional petroleum diesel	BAAQMD has awarded approximately $5.4 million in grants for emulsified diesel fuel in shipping and shore power projects. These projects are ongoing.		
FSM-17	Mitigation Fee for Federal Sources	Mitigation Fee Program, adopted into the South Coast AQMD's 2003 AQMP, but not yet implemented, would charge an air quality impact fee to sources pre-empted from State and local air district authority under the federal Clean Air Act	Staff recommendation: Delete as FSM due to lack of clear authority for local air districts to impose fees on these sources (ships, aircraft, locomotives).		
FSM-18	Indirect Source Mitigation Program	Reduce emissions from development projects that generate vehicle trips and thus indirectly cause air pollutant emissions	Staff recommendation: Develop into control measure LUM 2 for the 2010 CAP.		
FSM-19	Free Transit on Spare the Air Days	Reduce motor vehicle emissions by providing free transit service on STA days.	Free Transit on Spare the Air (STA) Days was implemented for three years and discontinued when funding ran out. Staff recommendation: Delete this FSM in the 2010 CAP due to lack of funding.		
FSM-20	Episodic Measures	Episodic measures are measures implemented only at times when pollution levels are projected to exceed air quality standards.	District continues to implement the Spare the Air (STA) program. STA is evolving to promote clean air choices on an everyday basis. The District's 2009 Summer slogan was "Any ride is worth sharing" (aimed at reducing ozone precursors from motor vehicles). The 2009 Winter campaign was "Check before you burn" and promoted awareness of the wood-burning rule to reduce PM. Both campaigns reduce emissions on an episodic basis.		

Air District Programs that Provide Foundation for the CAP

The 2010 CAP is rooted in long-standing core Air District programs, including air quality monitoring; regulation, permitting and enforcement of stationary sources; public outreach and education; and grants and incentives. In addition to these core programs, the Air District has developed new programs and initiatives in recent years to respond to the challenges of protecting public health and protecting our climate. The CAP control strategy described in Chapter 4 incorporates and reinforces the new initiatives underway at the Air District. The section below highlights the Air District's recent efforts in several key areas, including:

- Reducing health risks in impacted communities;
- Reducing emissions from seaports and the goods movement sector;
- Reducing wood-burning and wood smoke; and
- Reducing emissions of greenhouse gases and protecting the climate.

Reducing Health Risks in Impacted Communities

Protecting public health is a fundamental part of the Air District's mission and one of the key objectives of the 2010 CAP. The Air District strives to reduce public health impacts from air pollution throughout the Bay Area, by means of the New Source Review program and the Air Toxics Hot Spots program which are briefly described in Chapter 2. However, because it is clear that certain parts of the region experience higher levels of pollution than others, the Air District has developed several programs that focus on reducing health risks in disproportionately impacted communities. The Air District established the Community Air Risk Evaluation (CARE) program in 2004. In 2009 the District expanded upon the CARE program by creating the Clean Air Communities Initiative (CACI). The overall goal of these programs is to identify the communities most impacted by air pollution, and to develop and implement comprehensive strategies to reduce these impacts. Both programs are described below.

Clean Air Communities Initiative

The Clean Air Communities Initiative encompasses a multi-faceted effort to reduce health risks in impacted communities and to minimize the effects of land use and transportation decisions on cumulative air quality impacts. Certain communities are exposed to high levels of air toxics, especially diesel PM, resulting in elevated health risks. Addressing land use and transportation is critical to solving this problem because on-road and off-road motor vehicles are the largest source of diesel PM and other air toxics, and because land use decisions influence not only transportation patterns but also local exposures to these pollutants. CACI brings a wide range of tools and resources to bear on this important issue, as depicted in Figure 3-1, including regulations and guidance, air quality monitoring, public outreach and community dialogue, targeted

grants funding, enforcement of diesel air toxics control measures, and collaboration with county health departments and other local agencies.

The CARE program, described below, provides the foundation for the Clean Air Communities Initiative.

Community Air Risk Evaluation (CARE) Program

In 2004 the Air District initiated the Community Air Risk Evaluation (CARE) program to evaluate and reduce health risks associated with local exposures to air toxics in the Bay Area. The program examines air toxics emissions from point sources, area sources and on-road and off-road mobile sources with an emphasis on reducing population exposure to diesel exhaust. CARE combines technical analysis, outreach to impacted communities, and policy mechanisms to reduce emissions and health risks in those communities. The main objectives of the program are to:

- Characterize and evaluate potential cancer and non-cancer health risks associated with exposure to air toxics from both stationary and mobile sources throughout the Bay Area.
- Assess potential exposures to sensitive receptors including children, senior citizens, and people with respiratory illnesses.
- Identify significant sources of air toxics emissions and prioritize use of resources to reduce air toxics in the most highly impacted areas (i.e., priority communities).
- Develop and implement strategies - such as grants, guidelines, or regulations - to achieve cleaner air for the public and the environment, focusing initially on priority communities.

To help guide this program, the Air District formed a CARE Task Force composed of representatives from impacted communities, business, local public health agencies, and research institutions. The CARE program also includes a robust public outreach component. Air District staff conducts community meetings to provide health risk information, update Bay Area residents about the results of the CARE studies, and to receive public comment.

The technical analysis portion of the CARE program includes an assessment of the sources of air toxics emissions, modeling and monitoring to estimate concentrations of air toxics, and an assessment of exposures and health risks. Information derived from the technical analyses is used to focus emission reduction strategies in areas with high air toxics exposures and high density of sensitive populations.

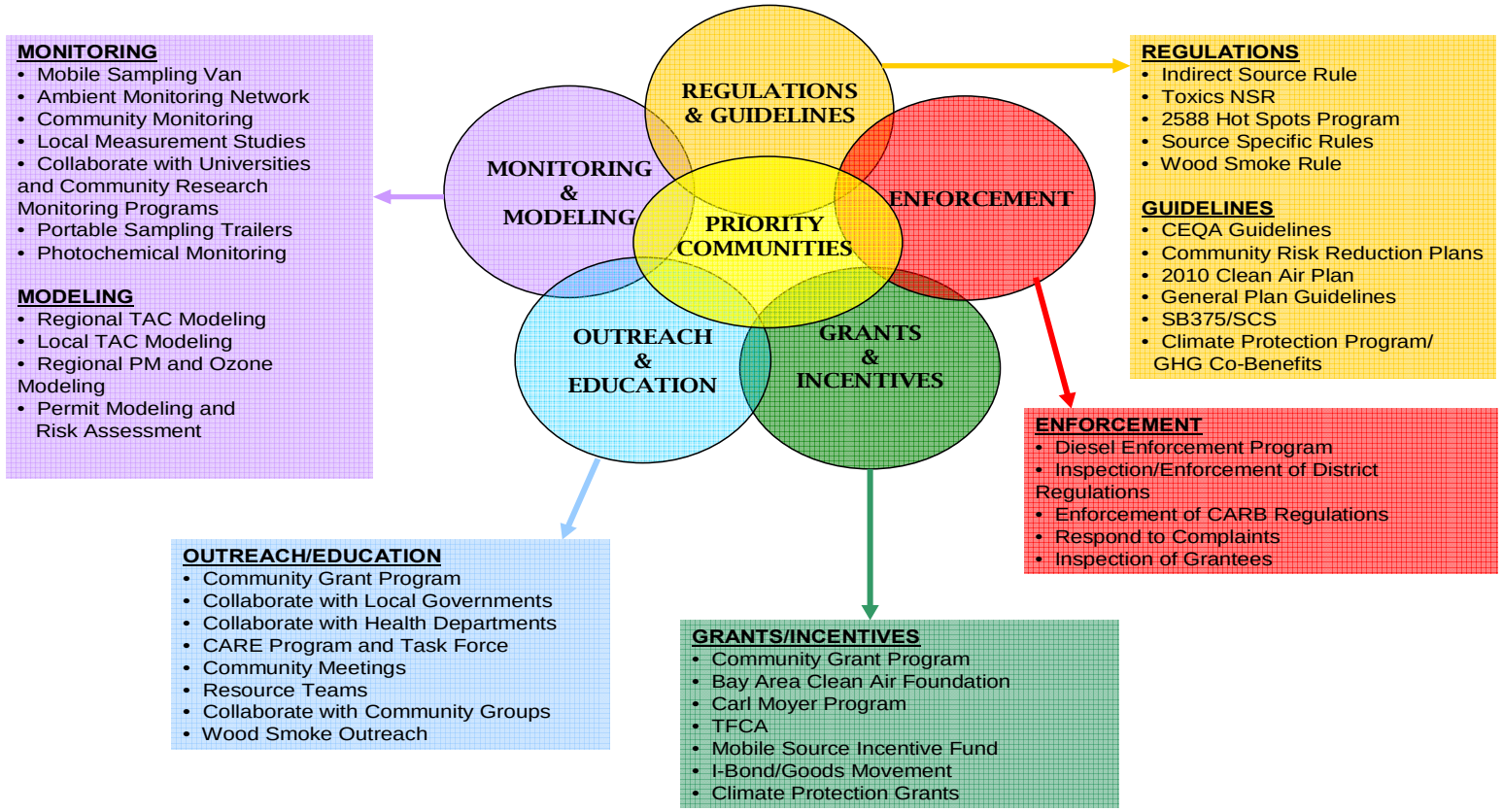

Figure 3-1. Clean Air Communities Initiative.

The Air District first developed a preliminary emissions inventory of air toxics for year 2000 that includes emissions from individual point source facilities, area sources, on-road mobile sources, and off-road sources (e.g., construction equipment, ships, and aircraft). This initial inventory was updated to include the most recent 2005 emission data as shown in Figures 2-18 and 2-19 in Chapter 2. The air toxics emission data was combined with demographic and health statistics data to create risk-weighted emissions maps to help the District identify communities with significant exposures that would most benefit from mitigation strategies, such as Air District grant programs.

The Air District also performed photochemical modeling to estimate pollutant concentrations and risks from diesel PM and other key air toxics, both locally and for the entire Bay Area, as described in Appendix D. This modeling was used to refine the identification of impacted communities where reductions in emissions and exposure are most needed. Six priority communities have been identified based on the following criteria: high exposure of youth and seniors to air toxics, high emissions of air toxics, and low income. The priority communities are shown in Figure 3-2.

In an example of local-scale modeling, the Air District partnered with CARB, the Port of Oakland, and the Union Pacific Railroad to estimate the health risks from diesel exhaust in West Oakland. Final results of the comprehensive health risk assessment (HRA) were made available in December 2008. The HRA found that residents of West Oakland are exposed to diesel PM concentrations that are almost three times higher than the average background diesel PM in the Bay Area. The findings of the HRA confirm findings of the CARE Program that there are certain parts of the Bay Area – such as West Oakland – where emission reductions are especially critical.

Through the Clean Air Communities Initiative, the Air District is focusing comprehensive emission reduction strategies in these communities. The Air District also is partnering with local governments in these areas to prepare community risk reduction plans, in order to allow a community-wide approach to reducing cumulative impacts of air toxics. As noted, these local air quality problems are often closely linked with land use and transportation decisions. The community risk reduction plans will provide a tool to support infill development, while protecting residents from high levels of pollution.

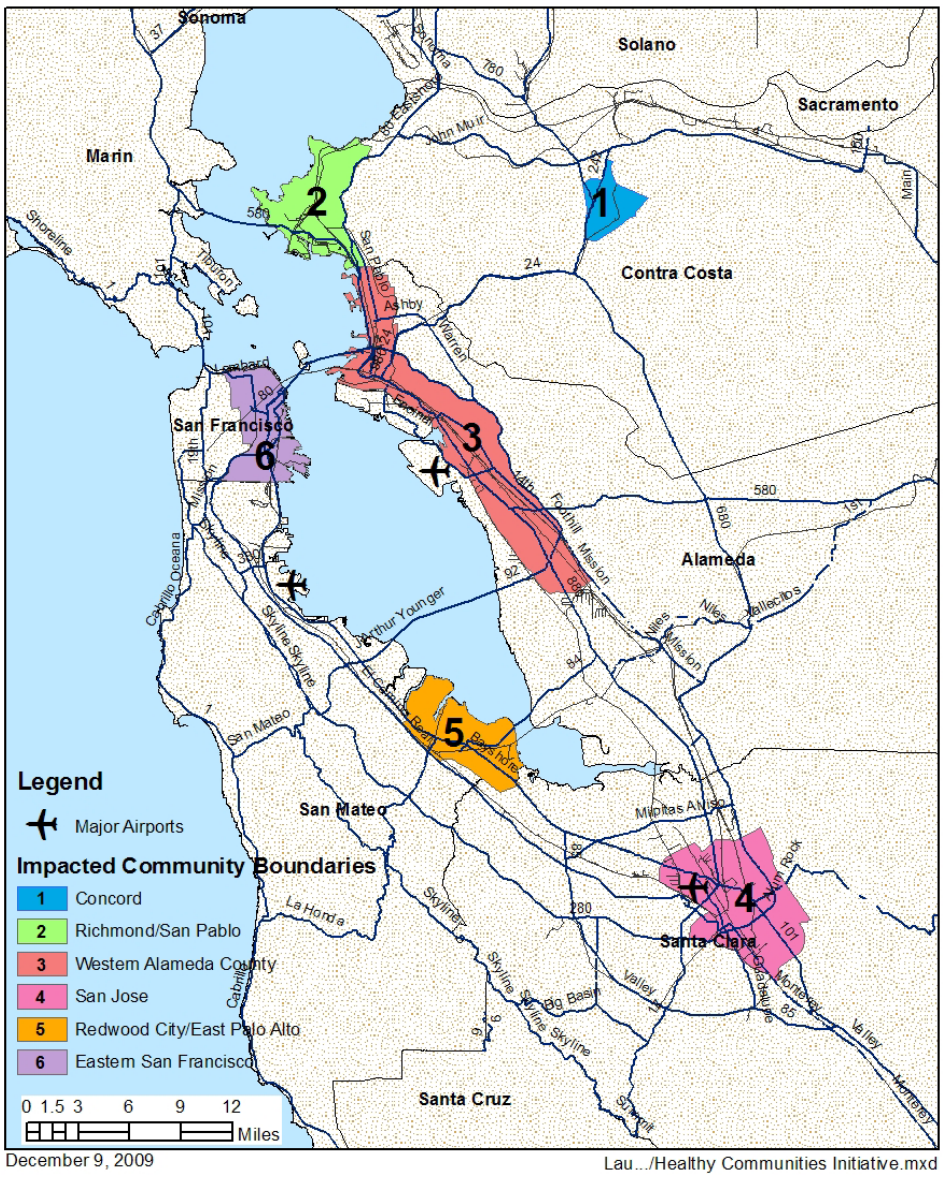

Figure 3-2. CARE impacted community boundaries.

Grant and Incentive Programs

The Air District operates several programs that provide grants and incentives for projects to provide "surplus" emissions reductions; i.e. reductions in advance of, or over and above, regulatory requirements or standards. Key grant programs are summarized in Table 3-6.

The District awarded a total of $186 million in external grants during a five-year period covering FY 03/04 through FY 08/09. In aggregate, these projects provided estimated

emission reductions of 1,522 tons of ROG, 12,482 tons of NOx, 1,136 tons of PM, and 763,473 tons of CO2 over the lifetime of these projects.

Table 3-6. Grant funding programs & eligible project types.

Grant Program	Eligible Equipment/Projects
Transportation Fund for Clean Air	• Shuttles • Ride-Sharing • Bicycle Facilities • Bicycle Facilities/ Lockers • Smart Growth • Arterial Management
Carl Moyer Program	• On-road Heavy-Duty Vehicles • Off-Road • Marine Engines • Shorepower for Ships • Locomotives • Agricultural
Goods Movement Diesel Emission Reduction Program	• Drayage Trucks • Other Trucks • Shorepower for Ships • Cargo Handling Equipment • Locomotives • Marine Engines
Low Emission School Bus Program	• School Buses
Alternative Fuel and Advanced Technology Program	• Trucks, Buses, and Light-Duty Vehicles • Alternative Fuel Infrastructure

One of the most direct and tangible ways to reduce emissions and exposures in impacted communities is to replace or retrofit dirty engines and vehicles that operate in these communities. The Air District has made a commitment to target its grant funds to projects in impacted communities. Table 3-7 summarizes lifetime emission reductions and funding awarded for projects in CARE impacted communities in the past five

funding cycles. During this five-year period, approximately 48% of Air District grant funds have been directed to these communities.

Table 3-7. Grants provided to projects in impacted communities: FY 03/04 – FY 08/09.

Project Type	ROG Reduced	NOx Reduced	PM Reduced	CO2 Reduced (1)	Funding Amount
Clean Light-Duty Vehicles	5.93	4.17	11.55	0	$834,750
Ridesharing	33.77	24.93	18.93	23,636	$1,836,000
Arterial Mgmt/Signal Timing	8.97	9.37	3.18	5,871	$2,176,731
Smart Growth	22.24	19.02	24.80	258,185	$2,396,811
Bicycle Facilities	13.06	11.03	4.80	8,790	$1,889,922
Shuttles	37.92	90.68	28.46	81,978	$9,626,342
Transit Buses (2)	0.00	81.12	0.00	0	$528,750
School Buses	7.67	52.54	2.22	579	$1,179,641
On-Road Trucks (3)	5.89	1,071.32	167.72	28,152	$32,932,424
Off-Road Trucks (2)	11.63	169.84	8.18	0	$1,195,564
Marine Engines (2)	511.77	6,024.87	367.53	0	$27,991,629
Locomotive Engines (2)	22.38	586.05	10.67	0	$5,786,366
Total	**681.23**	**8,144.94**	**648.04**	**407,191**	**$88,374,930**

Notes

Emission reductions show estimated tons reduced over the life of the projects funded.

1. All emission reductions shown in short tons, except for CO2, which are shown in metric tons.
2. CO2 data is not available for this project type.
3. Data includes TFCA, Carl Moyer Program, and Goods Movement heavy-duty on-road truck projects

Table 3-8 summarizes lifetime emission reductions and funding awarded for projects in other (non-impacted community) areas.

Reducing Emissions from Seaports and Goods Movement

Goods movement is a major source of emissions in the CARE impacted communities and major freeway corridors. Therefore, reducing emissions from seaports and the goods movement sector has been another major focus of Air District efforts in recent years. To provide a technical foundation, the Air District has developed detailed emissions inventories for each of the five Bay Area seaports.[68] Much of the emission reduction effort has been directed at the Port of Oakland, since this port handles by far the

[68] Bay area seaports include the ports of Oakland, Richmond, Redwood City, Benicia, and San Francisco.

greatest volume of goods and is located in proximity to the impacted community of West Oakland as well as the City of Alameda.

Table 3-8. Grants provided to non-impacted communities: FY 03/04 - FY 08/09.

Project Type	ROG Reduced	NOx Reduced	PM Reduced	CO2 Reduced (1)	Funding Amount
Clean Light-Duty Vehicles	1.44	0.82	0.00	0	$726,309
Ridesharing	288.09	304.84	178.80	273,244	$21,864,450
Arterial Mgmt/Signal Timing	166.20	162.17	57.44	5,150	$9,482,540
Smart Growth	42.15	30.70	14.46	7,053	$3,570,393
Bicycle Facilities	88.45	72.41	32.33	9,513	$12,871,293
Shuttles	85.76	102.84	44.46	31,443	$15,992,301
Transit Buses	14.34	603.01	16.74	9,216	$4,010,229
School Buses (2)	0.48	8.85	2.13	0	$324,750
Natural gas infrastructure (2)	1.10	1.55	0.30	0	$1,440,452
EV infrastructure (3)	0.00	0.00	0.00	0	$269,173
On-Road Trucks (4)	13.29	434.82	31.56	20,663	$11,759,793
Off-Road Trucks (2)	107.26	1,267.46	50.27	0	$12,537,234
Marine Engines (2)	22.01	1,265.88	56.14	0	$2,473,822
Agriculture Engines (2)	10.62	91.20	3.28	0	$336,472
Total	**841.19**	**4,346.55**	**487.91**	**356,282**	**$97,659,211**

Notes

* Emission reductions show estimated tons reduced over the life of the projects funded.

1. CO2 reductions are shown in metric tons.
2. CO2 data is not available for this project type.
3. Emission reductions data is not available for this project type.
4. Data includes TFCA and Carl Moyer Program heavy-duty truck projects.

To develop a comprehensive approach to reducing emissions from port operations, the Port of Oakland, in partnership with the Air District, the West Oakland Environmental Indicators Project, and representatives from the maritime industry, developed the Maritime Air Quality Improvement Plan (MAQIP). The MAQIP was adopted by the Port Commission in April 2009, with the overall goal of protecting the health of local residents and workers by reducing their exposure to diesel PM.

The Air District and the Port of Oakland have developed a joint work program that includes outreach to the regulated community to ensure compliance with state and federal regulations; securing authorization to enforce CARB rules and regulations; and cooperating to identify and implement specific projects such as replacement and retrofit

of drayage trucks, shore power (dockside electrification) for ships, vessel speed reduction, and development of a "marine highway" between the Port of Oakland, and the Ports of West Sacramento and Stockton to help reduce on-road truck traffic between these ports.
The Port and its partners anticipate achieving the Plan's main goal through industry compliance with regulations adopted by CARB. The bulk of the needed emission reductions at the Port will occur in 2010 as ships use low-sulfur fuel and drayage trucks are equipped with diesel particulate filters. Additional benefits will be achieved by 2015 as engines in cargo-handling equipment and harbor craft are either replaced or retrofitted, and ships begin using shore power while at berth.

The Air District's Green Ports Initiative will be a significant part of the success of the MAQIP. Under this initiative, the Air District is committing resources for a robust program of financial incentives for early compliance and a joint enforcement program with ARB. The Air District is also undertaking additional air pollution monitoring and developing more refined predictive modeling of health impacts in West Oakland. These efforts will assist with future refinements of the MAQIP.

The Air District and its partners - CARB, US EPA, the Port of Oakland, and local stakeholders - have been making a concerted effort to reduce emissions from the approximately 2,000 to 3,000 drayage trucks that serve the Port of Oakland and constitute a major source of diesel emissions in West Oakland. Using a combination of funding from the District's Transportation Fund for Clean Air (TFCA) program, the Port, State Goods Movement bond funds, and federal stimulus funds, a total of $22 million in grant funding was awarded to port truckers from March through December 2009. Also, approximately $4.5 million in additional State Goods Movement bond funding was added to this effort in January 2010, resulting in a $26.5 million total program to address port drayage truck emissions.

These funds have been used to install retrofit devices on 1,123 trucks to reduce emissions of PM and NOx, as well as to replace 205 old trucks with new trucks that meet stringent emissions standards. This project reduces approximately 0.3 tons of diesel particulate emissions daily at the Port of Oakland and over 14 tons of DPM annually.

Mobile Source Compliance Plan

Enforcement of mobile source regulations has traditionally been under the purview of CARB. However, CARB's diesel PM air toxic control measures (ATCMs) allow air districts to enforce them. In fall 2009 the Air District initiated a Mobile Source Compliance Plan (MSCP) based on a Memorandum of Understanding (MOU) between the Air District and CARB which defines the roles and responsibilities of each agency. The Air District is the first air district in the state to enter into a comprehensive mobile source enforcement partnership agreement with CARB.

The MSCP lays out the Air District's comprehensive strategy for enforcement of specified CARB ATCMs and related mobile source statutes and/or agreements. The goal of the MSCP is to reduce diesel PM health risk in impacted communities, with special focus on the Port of Oakland and West Oakland, using a robust enforcement program. The initial focus of the MSCP was to provide a strong enforcement presence at the Port of Oakland to ensure compliance with the January 1, 2010 Drayage Truck Rule (DTR) compliance deadline. By implementing the MSCP, the Air District will not only provide leadership on mobile source enforcement, but most important, will reduce diesel PM exposures and improve air quality for the communities we serve.

The MSCP is a key element in implementing the Clean Air Communities Initiative and the CARE program, as well as other efforts to reduce emissions from ports and goods movement.

Reducing PM from Wood Smoke

Although the Air District has been working hard to reduce exposure to diesel PM, particulate matter from wood-burning also poses health risks for Bay Area residents. Wood smoke is a major component of PM in the Bay Area, especially on winter days when exceedances of the 24-hour PM2.5 standard are most likely to occur. Reducing emissions from wood-burning is therefore a key component of the Air District's efforts to reduce PM levels in the Bay Area. The Air District has been implementing and strengthening its efforts to reduce wood smoke over the past two decades, as described below.

Public education and voluntary compliance were the early foundation of the Air District's efforts to reduce wood-burning. The District began implementing its *Winter Spare the Air* program in 1991, requesting that Bay Area residents voluntarily curtail wood-burning on days when an exceedance of PM standards is forecast.

In 1998, the Air District developed a model wood smoke ordinance for fireplaces and woodstoves as a guidance document for cities and counties to regulate sources of particulate matter in their communities. The model ordinance promotes the use of cleaner technologies that have been developed to effectively reduce wood smoke pollution. District staff have worked with health agencies and interested residents in the Bay Area to advocate for the adoption of the ordinance. To date, wood smoke ordinances have been adopted by 40 Bay Area cities and eight counties which encompass a large percentage of the region's population.

In 2006, US EPA significantly strengthened the national 24-hour PM2.5 standard, reducing the standard from 65 to 35 $\mu g/m^3$. Recognizing the need to more aggressively reduce PM from wood smoke, especially on days when the region is likely to exceed the

standard, the Air District adopted a rule (and amended Regulation 5: Open burning) to limit wood-burning in July 2008, as described below. In addition, the Air District enhanced and expanded its wood smoke public outreach and education program, and lowered the threshold for when to issue *Winter Spare the Air Alerts* to conform to the national standard.

Summary of Wood-Burning Rule

Key provisions of Regulation 6, Rule 3 include the following:

- Prohibits operation of any indoor fireplace, fire pit, wood or pellet stove or fireplace insert on specific days during the winter when the District forecasts that PM2.5 levels may exceed the 35 $\mu g/m^3$ national 24-hour PM2.5 standard. The rule provides limited exemptions from this provision for households whose sole source of heat is a wood-burning device, or in the event of an interruption in gas or electrical service. Regulation 5: Open burning prohibits outdoor recreational fires during periods of elevated PM2.5 levels
- Prohibits excessive visible emissions from wood-burning devices.
- Requires cleaner burning technology (EPA Phase II certified wood-burning device, pellet stove, or other approved device) when wood-burning devices are sold, resold or installed.
- Requires cleaner burning technology (EPA Phase II certified wood-burning device, pellet stove, or other approved device) if wood-burning devices are permitted for installation in new building construction and remodels.
- Prohibits the burning of garbage, non-seasoned wood, plastics and other inappropriate types of materials.
- Requires labeling and disclosure of the moisture content on wood sold for use within the boundaries of the District, including instructions on how to dry wood that has moisture content greater than 20 percent by weight.
- Requires a label on packages of wood and other solid fuels (such as pressed logs and pellets) instructing the user to check local air quality status before burning these products.

Promoting Compliance with the Wood-Burning Rule

The Air District conducted an energetic public education and outreach campaign regarding wood smoke in winters 2008/09 and 2009/10. The campaign focused on educating the public about the requirements of the rule, how to comply, and why it is important to curtail wood-burning to protect public health. The *Winter Spare the Air Alert* advertising and outreach campaign utilized TV, print, billboard, radio, direct mail, public events, door-to-door canvassing and the Air District website. The Air District's "No Burn" phone line received over 500,000 calls in 2008/2009. In 2009/10, the Air District included both English and Spanish on the "No Burn" phone line. Nearly 400,000

calls were received; 39% of the callers used the Spanish option. There were also 117,000 subscribers for email or phone AirAlerts.

For the 2009/2010 season, public outreach to educate Bay Area residents about the health effects of wood smoke and how to comply with the rule were again the primary focus the wood smoke reduction program. Over 10,270 wood smoke information packets were sent out to Bay Area residents to provide information about the wood smoke rule and 254 reminder letters were sent to residences that received violation warning letters from the previous winter. The public could enter wood smoke complaints either online through the website or by phone; 2,355 wood smoke complaints were entered into the system.

The Air District also made several changes to improve the effectiveness of the program in 2009/2010. For example, the District issued *Winter Spare the Air Alerts* the day before the effective date in order to provide the public and the media with more advanced warning. The District also focused its enforcement efforts in areas with high wood-burning rates and public complaints.

As the Air District develops more experience and information regarding the wood smoke rule, additional refinements or enhancements may be considered to the wood smoke reduction program. Potential revisions are described in Further Study Measure 12 in CAP Volume II.

Results of 2008/09 Wood Smoke Reduction Program

The Air District has performed surveys of Bay Area residents every winter for the past five years to monitor trends in residential wood-burning. The surveys performed in winter 2008/09 found that Bay Area residents reduced wood-burning on both STA and non-STA days. Survey findings, corroborated by on-the-ground monitoring, indicate that the overall reduction in wood-burning was on the order of 33% in 2008/09 compared to the average over the prior three years. These findings suggest that the wood smoke rule, in combination with the Air District's public outreach and education efforts, had a very significant impact in the first year of implementation.

Results of 2009/10 Wood Smoke Reduction Program

The Air District continued and expanded its survey program during winter 2009-10 to gauge the on-going effectiveness of the wood smoke reduction program and to develop a better understanding of the impact in reducing wood burning within the Bay Area. The 2009/10 survey data revealed that 63% of the respondents were aware that the District prohibits wood burning on certain nights. Support for the Wood Burning Regulation remained strong at 71%.

The 2009/10 season enforcement program included inspection patrols covering all Bay Area counties for curtailment or visible emissions (opacity) violations. Over 300 violations were documented. Warning letters were issued for the first violation, for the second, a Notice of Violation was issued which assesses a $400 penalty. Eight Notices of Violations were issued, seven for violations of the mandatory curtailment provision and one for excessive visible emissions violation.

BAAQMD Climate Protection Program

As explained in Chapter 1, there is a strong connection between global warming, ozone formation and public health. Therefore, the Air District has made reducing GHGs and protecting the global climate an integral part of its mission. Since establishing a formal climate protection program in June 2005, the Air District has worked to integrate climate protection into all its core functions and initiated innovative climate protection programs. Some of the Air District's key climate protection programs and activities are summarized below.

- The Air District was the first local air district in the nation to develop a detailed regional greenhouse gas emissions inventory (November 2006; updated in December 2008).

- In November 2006, the Air District convened the first-ever Bay Area-wide summit on climate protection. The event was attended by over 500 local leaders from government, education, youth, business, research and the non-profit community and set the stage for wide-spread collaboration and action. A second summit was convened in May 2009 for over 400 local government planners and elected officials.
- In December 2007, the Air District awarded $3 million in grants to 53 local projects to reduce GHG emissions. The innovative grant program is funding such activities as the development of local climate action plans; seed funding for municipal energy officers; innovative approaches such as financing residential and commercial solar power through property tax bills; renewable energy programs; and youth-based projects. With this grant program, the Air District became the one of the largest climate protection funders in the nation to date.

- In May 2008 the Air District imposed a cost-recovery fee on stationary sources of greenhouse gases in the region to defray the costs of the Air District's climate protection work related to stationary sources. Industrial facilities and businesses currently subject to Air District permit requirements pay a fee of $0.048 per metric ton of greenhouse gas emissions.

- The Air District launched the Greenhouse Gas Reduction Grant Program in 2009, using $4.4 million in funds generated by a settlement between the California Attorney General's Office and ConocoPhillips for projects that reduce GHG emissions

in the communities nearest the ConocoPhillips refinery: Rodeo, Crockett, Hercules and Pinole. Grants will be used to fund energy efficiency, cool roofs and onsite renewable energy projects on public facilities.

- The Air District created and implemented a $4^{th}/5^{th}$ grade curriculum on climate protection. The *Protect Your Climate* curriculum contains 16 lessons that address the science and causes of climate change and ways for students to take action. Through various activities, students learn how to reduce greenhouse gas emissions from energy, waste, and transportation uses in their daily lives. Since the curriculum was first piloted in 2007-2008, over 40 classrooms and 1,000 students across the nine Bay Area counties have participated in the program.

- The Air District convened a series of workshops for local governments to provide them with complete data sets and training on how to prepare a local GHG emissions inventory.

- The Air District developed a web portal, in conjunction with the Institute for Local Government, to share information and facilitate local government action regarding best practices to reduce GHGs: www.baaqmd.gov/climateplanning.

- The Air District led the development of an historic white paper for the California Air Pollution Control Officers' Association (CAPCOA) that lays out how local land use and development projects could address GHG mitigation under CEQA. Air District staff also collaborated on a CAPCOA resource document on addressing GHGs in local general plans.
- Air District staff has proposed to establish significance thresholds for GHG emissions in its update of the District's CEQA Guidelines.

In addition, the Air District works closely with its regional agency partners – the Metropolitan Transportation Commission (MTC), the Association of Bay Area Governments (ABAG), the Bay Conservation and Development Commission (BCDC) – along with the local governments, business groups, community organizations, and other stakeholders to develop new ways to reduce emissions of GHGs in the Bay Area and protect the climate.

External Plans that Complement the 2010 CAP

The 2010 CAP will not function in a vacuum. Rather, it is intended to be part of an interlocking set of complementary plans that together provide an integrated air quality, land use, transportation, and climate protection strategy for the Bay Area.

Land Use and Transportation Plans

In combination with the FOCUS program, MTC's recently adopted *T2035* regional transportation plan, ABAG's *Projections 2009*, and BCDC's Bay Plan amendments, the CAP is intended to help lay the groundwork for an effective Bay Area Sustainable Communities Strategy pursuant to SB 375 in the 2013 time frame and beyond, as discussed in Chapter 4.

FOCUS

FOCUS is a regional incentive-based development and conservation strategy for the Bay Area. FOCUS unites the efforts of ABAG, MTC, BCDC, and the Air District into a single program that encourages future growth in areas near transit and within the communities that surround the San Francisco Bay. Promoting future development in these areas provides a variety of housing and transportation choices for all residents, while helping to enhance existing neighborhoods and reduce emissions of air pollutants and GHGs by decreasing motor vehicle use. One of the key elements of FOCUS is the partnership between the regional agencies and local governments to identify Priority Development Areas where future growth should be encouraged and Priority Conservation Areas which should be protected from development.

Transportation 2035 Regional Transportation Plan

In April 2009 MTC adopted the Transportation 2035 regional transportation plan to guide regional transportation investments over the next 25 years. T2035 defined a set of performance targets under the rubric of "Three E's" – Economy, Environment, and Equity. In analyzing how well various investment scenarios would perform relative to the performance targets, MTC concluded that, while the way we invest transportation dollars in the region is very important, we will need to make major changes in land use patterns and make use of pricing policies to manage travel demand in order for the region to make significant progress toward the environmental targets related to reducing vehicle miles of travel (VMT), and emissions of PM and greenhouse gases.

Projections 2009

In August 2009 ABAG issued its most recent biennial population and employment forecasts: *Projections and Priorities 2009: Building Momentum*. ABAG forecasts that that Bay Area population will increase by 1.7 million people over the next 25 years, and that the region will add 1.6 million new jobs and 600,000 housing units. *Projections and Priorities 2009* incorporates the same environmental performance targets as MTC's T2035 plan.

San Francisco Bay Plan Amendments

BCDC administers the *San Francisco Bay Plan*, which guides development on and around the shoreline of the Bay Area. BCDC staff is developing proposed amendments to the Bay Plan to update its policies addressing sea level rise, with the objective of directing development away from low-lying shoreline areas vulnerable to flooding. The proposed amendments are intended to support the region's FOCUS development and conservation strategy by ensuring we do not develop in ways that increase threats to public safety from flooding. The amendments will also outline a process for developing a regional adaptation strategy for areas vulnerable to sea level rise. The strategy will identify ways to integrate adaptation to climate change with the region's GHG reduction efforts.

SB 375

Recognizing the importance of integrating land use, transportation, and climate protection planning, the State of California adopted Senate Bill 375 in fall 2008. SB 375 calls for major metropolitan areas throughout California to develop and implement integrated land use and transportation plans, known as "Sustainable Communities Strategies" or SCS, to achieve greenhouse gas reduction targets established by CARB. The first Bay Area SCS must be developed and adopted by 2013. Development of the SCS is the primary responsibility of ABAG and MTC; however, the Air District will also play an important role in the development of the Bay Area SCS.

Climate Protection Plans

The District's climate protection program described above is intended to work in conjunction with CARB's AB 32 Scoping Plan to reduce greenhouse gases, as well as local Climate Action Plans adopted by many Bay Area cities and counties.

CARB's AB 32 Climate Scoping Plan

In September 2006, Governor Schwarzenegger signed the Global Warming Solutions Act (California Health and Safety Code, § 38500, *et seq*., commonly referred to as "AB32") establishing a statewide target of reducing greenhouse gas emissions to 1990 levels by 2020. This Act required CARB to prepare a scoping plan to lay out how the state will achieve these reductions. The AB 32 Scoping Plan, approved by the CARB Board in December 2008, sets forth the main strategies California will pursue to meet its 2020 climate protection goal.

The Scoping Plan has a range of actions, summarized in Table 3-9, which include direct regulations, alternative compliance mechanisms, monetary and non-monetary incentives, voluntary actions, and market-based mechanisms such as a "cap-and-trade" system. The recommended measures were developed to reduce greenhouse gas emissions from key sources and activities while improving public health, promoting a

cleaner environment, preserving natural resources, and ensuring that the impacts of the reductions are equitable and do not disproportionately impact low-income and minority communities.

Most of the measures in the Scoping Plan will be implemented through the rulemaking processes at CARB or other agencies, including local air districts. Discrete Early Actions are expected to be adopted and implemented in the 2010 through 2012 time frame.

District Role in Implementing the CARB Scoping Plan

The Air District is prepared to assist in the implementation of the AB 32 Scoping Plan. Local air districts already implement and enforce stationary source regulations for criteria pollutants, so they are well-positioned to play this role for stationary source regulations that address GHG emissions. Not only are local air districts familiar with the individual facilities and their compliance history, but information contained in district permits can be used to confirm the accuracy of greenhouse gas emissions reported by sources subject to CARB mandatory reporting requirements.

Table 3-9. Recommended AB 32 Scoping Plan greenhouse gas reduction measures.

Recommended Reduction Measures	Estimated Year 2020 GHG Reductions *
California Light-Duty Vehicle Greenhouse Gas Standards	31.7
Energy Efficiency: buildings, appliances, solar water heating, etc.	26.3
Renewables Portfolio Standard (33% by 2020)	21.3
Low Carbon Fuel Standard	15
Regional Transportation-Related GHG Targets pursuant to SB 375	5
Vehicle Efficiency Measures	4.5
Goods Movement: Electric shore power at Ports & System-Wide Efficiency Improvements	3.7
Million Solar Roofs	2.1
Medium/Heavy Duty Vehicles: Aerodynamic Efficiency & Vehicle Hybridization	1.4
High Speed Rail	1.0
Industrial Measures: Refinery Measures, Energy Efficiency	0.3
Industrial Measures: Oil and Gas Extraction and Transmission	1.1
High Global Warming Potential Gas Measures	20.2
Sustainable Forests	5.0
Recycling and Waste (landfill methane capture)	1.0
Additional Reductions Necessary to Achieve the Cap	34.4
TOTAL REDUCTIONS COUNTED TOWARDS 2020 TARGET	**174**
Other Recommended Measures:	
State Government Operations	1.2
Local Government Operations	TBD
Green Buildings	26
Recycling and Waste: Mandatory Commercial Recycling & other measures	9
Water Sector Measures	4.8
Methane Capture at Large Dairies	1.0
Other Recommended Measures Subtotal	**42**

* GHG reductions are expressed in terms of million metric tons CO2-equivalent per year

The Air District will also continue to play a role in assisting local governments in contributing to the GHG reduction goals related to regional transportation and land use and energy efficiency, as described in the Transportation Control Measures, Land Use & Local Impacts Measures, and Energy and Climate Measures in the CAP control strategy.

Joint Policy Committee Climate Actions

Four regional agencies— BAAQMD, MTC, ABAG and BCDC – coordinate on climate change and other issues through the Joint Policy Committee (JPC). In May 2009, the JPC approved a set of 6 joint actions that the regional agencies will implement in 2009-10 to provide climate leadership for the Bay Area. Working together, the regional agencies will:

1. Begin to develop the Sustainable Community Strategy (SB 375). (ABAG/MTC)
2. Design and adopt an Indirect Source Review regulation. (Air District)
3. Develop and advance climate-friendly regional parking policies. (MTC)
4. Provide support for a coordinated public/private regional plan for electric vehicles. (Air District /MTC)
5. Design and implement a regional solar installation/energy efficiency financing program for existing residential/commercial buildings. (ABAG)
6. Coordinate a regional/local approach to climate adaptation. (BCDC/ABAG)

In addition, to help align and coordinate the many climate plans and initiatives underway in the Bay Area, the JPC in fall 2009 established a coordinating group made up of staff from key public, private and community stakeholders. This group, under the name of *Climate Bay Area,* will endeavor to ensure complementary action, reduce duplication, and bring resources to the common problems confronting all Bay Area climate efforts.

Local Government Actions

According to the AB 32 Scoping Plan, local governments are expected to reduce GHG emissions by 5 million metric tons through transportation and land use changes. In addition, local governments will play a key role in implementing many of the strategies contained in the Scoping Plan, such as energy efficient building codes, local renewable energy generation, and recycling programs. Fortunately, local governments in the Bay Area have led the nation in taking action to reduce greenhouse gas emissions. To date, 85 local jurisdictions had completed GHG emissions inventories for their communities, and 23 of these jurisdictions have completed comprehensive climate action plans. Additional jurisdictions are preparing to complete such plans in the near future.

Local governments will play a critical role in climate protection efforts in California. Local governments have primary authority over land use decisions. As discussed in Chapter 4, changes in land use to promote mixed-use, infill development in areas that

are well-served by transit are a critical element of the CAP control strategy. To help support local efforts in this direction, and lay the groundwork for successful implementation of SB 375 in the Bay Area, the CAP control strategy includes several Transportation Control Measures and Land Use and Local Impacts Measures to promote focused land use and complementary transportation and parking policies.

Local governments also have the power to adopt building codes that exceed the energy efficiency requirements of the state's Title 24. Many local governments are innovators, testing new technologies or developing new approaches to achieving energy efficiency and emission reductions. For example, the City of Berkeley's innovative "Berkeley First" program offers low-interest financing to help home owners to cover the upfront cost of installing solar panels via property tax assessments. (The Air District provided a Climate Protection Grant to help fund this program.) The CAP will support local efforts to promote energy efficiency by means of the Energy and Climate Measures in the CAP control strategy.

State and National Mobile Source Programs

The state and federal governments are responsible for regulating emissions from mobile sources. Mobile source emissions are regulated by three basic approaches: by establishing emission standards for equipment, by regulating the fuel used in the equipment, and through vehicle in-use performance standards, such as the Inspection and Maintenance or "Smog Check" program. In California, mobile sources are regulated primarily by CARB. Under a provision of the federal Clean Air Act, CARB is authorized to adopt standards, rules and regulations to achieve the maximum degree of emission reduction possible from vehicular and other mobile sources in order to attain air quality standards at the earliest practicable date. The California standards cover motor vehicles (cars, motorcycles and trucks), heavy industrial and construction equipment, off-highway vehicles (dirt bikes and all-terrain vehicles) and lawn, garden and other utility engines. US EPA is responsible for regulating emissions from locomotives, ships and aircraft.

CARB standards for motor vehicle engines and fuels have great impact in reducing emissions of ozone precursors and other pollutants in the Bay Area. Among mobile source categories, passenger cars and light-duty trucks are the two largest contributors to the ROG emission inventory and are also significant contributors to the NOx emission inventory. CARB's Low Emission Vehicle (LEV) program has greatly reduced emissions of ROG and NOx throughout the state. The LEV I regulations reduced emissions in model year 1994-2003 vehicles. The more stringent LEV II program took effect in model year 2004, and will continue to provide major air quality benefits in future years.

State and federal regulations on off-road diesel construction equipment are also important in reducing ozone precursor emissions in the Bay Area. In 1998, US EPA adopted more stringent "Tier 2" and "Tier 3" emission standards for ROG, NOx, and PM

from new non-road diesel engines. This program includes the first set of standards for non-road diesel engines less than 50 hp, including marine engines in this size range. The Tier 2 standards were phased in for all engine sizes from 2001 to 2006. The yet more stringent Tier 3 standards for engines between 50 and 750 hp were phased in from 2006 to 2008. EPA's tiered emissions standards for non-road diesel engines, along with CARB's in-use fleet and diesel fuel regulations will provide significant emissions reductions over the next decade.

The federal Clean Air Act directs US EPA to establish emission standards for aircraft engines, new locomotive engines and new non-road engines less than 175 horsepower used in construction or farm equipment. EPA has promulgated regulations or otherwise established programs to control emissions from these important source categories. Gas turbines, used in almost all commercial aircraft, became subject to United Nations International Civil Aviation Organization standards for ROG, NOx, CO and smoke in 1997.

The emission inventories provided in Table 2-3 (ROG and NOx) and Table 2-9 (PM) include the benefit of regulation that had been adopted by December 31, 2006. Since that date, CARB has been adopting additional regulations on mobile sources to implement the 2007 State Implementation Plan (SIP). Table 3-10 provides projected emission reductions of ROG, NOx and PM2.5 in the Bay Area from CARB regulations adopted since 2007. Because CARB rulemaking is ongoing, further emission reductions from measures described in the 2007 SIP are expected through future rulemaking. The ROG reductions will come primarily from on-road sources and consumer products. Most of the NOx reductions will come from CARB regulations on-road and off-road heavy-duty engines; these regulations will also require major reductions in diesel PM emissions, thus providing significant public health benefits.

Table 3-10. Projected Bay Area emission reductions from adopted 2007 state strategy measures (tons per day).

New SIP Measures	ROG		NOx		PM2.5	
	2014	2020	2014	2020	2014	2020
Passenger Vehicles	**4.8**	**3.6**	**--**	**--**	**--**	**--**
Smog Check Improvements (partial)	1.9	1.6	--	--	--	--
Modifications to Reformulated Gasoline Program	2.9	2.0	--	--	--	--
Heavy-Duty Trucks	**2.1**	**0.8**	**23.4**	**9.6**	**1.5**	**0.5**
Cleaner In-Use Heavy-Duty Trucks	2.1	0.8	23.4	9.6	1.5	0.5
Off-Road Equipment	**1.5**	**1.7**	**5.9**	**10.6**	**1.4**	**1.1**
Cleaner In-Use Off-Road Equipment (over 25hp)	1.5	1.7	5.9	10.6	1.4	1.1
Emission Reductions from Adopted New Measures	**8**	**6**	**29**	**20**	**3**	**2**

Source: CARB

In addition to tailpipe emission standards, mobile source emissions are also controlled through fuel regulations. CARB adopts fuel specifications for motor vehicle fuels: gasoline, diesel, alternative gasoline fuels, and alternative diesel. The most current gasoline regulations - the Phase 3 Reformulated Gasoline standards - went into effect on December 31, 2003, requiring lower evaporative compounds and prohibiting the use of the fuel additive MTBE. As of June 2006, the sulfur content in diesel fuel was reduced from 500 ppm to 15 ppm. The low sulfur content enables after-combustion exhaust abatement devices, such as diesel particulate filters, to operate at high levels of efficiency. CARB also conducts ongoing verification of alternative diesel fuel emission benefits.

More recently, CARB and the California Energy Commission have been developing regulations and incentive programs to lower the carbon content of fuels and transition California to renewable substitutes for gasoline and diesel in order to reduce emissions of greenhouse gases from mobiles sources. The centerpiece of this effort is the Low Carbon Fuel Standard (LCFS) Program adopted by CARB in April 2009 pursuant to the AB 32 and the Governor's Executive Order S-01-07. The LCFS, which goes into effect in 2011, calls for a reduction of at least 10 percent in the carbon content of California's transportation fuels by 2020.

Motor vehicle emissions are also controlled through in-use performance standards to ensure that the systems continue to operate properly. The State of California's Inspection and Maintenance (I&M) program operated by the California Bureau of Automotive Repair (BAR) since 1984, tests light-duty on-road gasoline powered vehicles

every other year. An enhanced program which requires the use of a dynamometer to test the vehicle's emissions simulating on-road conditions began in the Bay Area in October 2003.

Although emission reductions from CARB and US EPA mobile source regulations and programs may not yet be fully reflected in the emissions inventory, these measures are expected to provide substantial emission reductions overall. A comprehensive summary of CARB's mobile source programs is provided below.

State Programs for Passenger Cars & Light-Duty Vehicles

Smog Check: Operational in California since 1984, the Bureau of Automotive Repair tests all on-road gasoline powered vehicles for compliance with in-use standards. Since October 2003, the Bay Area has been subject to the Enhanced Area Smog Check Program, which tests vehicle emissions while the vehicle is running.

In-Use Testing of Motor Vehicles: Tests in-use passenger cars and light duty vehicles for compliance with standards. In the event of violations, CARB works with the vehicle manufacturer to correct the problem, usually in the form of a recall or statewide repair. A protocol is being developed to test Heavy Duty Diesel Vehicles as well.

Voluntary Accelerated Vehicle Retirement Program: Pays owners of eligible vehicles to voluntarily retire their older, higher-emitting vehicle.

Low Emission Vehicle Program: Establishes improved emission reduction standards for automobiles. LEV II regulations are the most recent and are effective from 2004 through 2010. The new standards extend passenger car emission standards to heavier sport utility vehicles and pickup trucks (with gross vehicle weight up to 8,500 pounds) which formerly had been regulated under less-stringent emission standards.

On-Board Diagnostic (OBD) Program: OBD II systems monitor components in 1996 and newer vehicles less than 14,000 lbs to ensure that a vehicle remains as clean as possible over its entire life, and assists Smog Check repair technicians in diagnosing and fixing problems with the computerized engine controls. ARB is currently developing OBD requirements for heavy-duty vehicles over 14,000 lbs.

On-Road Motorcycle Regulation: Standards adopted in December 1998. Apply to motorcycles with engines over 280cc manufactured for the 2004 model year and later.

Zero Emission Vehicle Program: Creates incentives to promote zero emission vehicles such as battery and fuel cell vehicles. Also certifies vehicles as such.

California Hydrogen Highway: Program working toward a transition to a clean, hydrogen transportation economy in California.

HOV Lane Access: Allows single occupancy use of HOV lanes by zero-emission and alternative fuel vehicles.

Climate Change Emission Control Regulations: Pursuant to AB 1493 (Pavley), CARB regulation will require reduction of CO2 emissions from motor vehicles in California of approximately 30% between 2009 and 2014. CARB regulation adopted in September 2004 has been on hold pending approval of necessary waiver by US EPA. The waiver was finally approved by EPA in June 2009, so the CARB program should now be able to move forward to implement CO2 vehicle emission standards.

State Programs for Heavy-Duty On-Road & Off-Road Mobile Sources

Diesel Risk Reduction Program: After identifying diesel PM as a toxic air contaminant in 1998, CARB developed a comprehensive plan to reduce emissions from diesel engines and vehicles. In 2000 CARB approved a Diesel Risk Reduction Program (DRRP) to reduce diesel emissions from both new and existing diesel-fueled vehicles and engines. The DRRP established a goal of reducing diesel PM emissions, and the associated health risk, 75% by 2010 and 85% by 2020. In addition, recognizing that aggregate emissions from goods movement (shipping, cargo-handling, rail, truck, etc.) are a major source of diesel PM emissions the ARB Board approved a statewide *Emission Reduction Plan for Ports and Goods Movement* in April 2006. These programs are already having a beneficial impact; analysis of the carbon in ambient PM2.5 in the Bay Area suggests that diesel emissions have been cut substantially since 2000. The DRRP is made up of several strategies, including retrofits and control technology. Some of these strategies are part of other programs listed below.

Heavy-Duty Diesel In-Use Strategies Program: Reduces emissions from existing on- and off-road diesel engines, with a special emphasis on reducing particulate emissions through the following implementation programs: Retrofit Assessment and Implementation (solid waste collection vehicles and on-road heavy-duty public fleet vehicles); and Heavy-duty Testing and Field Support.

On-Road Heavy-Duty Diesel New Engine Program: Reduces emissions from new on-road heavy-duty diesel engines through emission control regulations and test procedures for these engines. The final tier of standards which bring truck emissions to near-zero levels become effective in 2010.

Heavy Duty Vehicle Inspection Program: Inspection of trucks and buses for excessive smoke. In June 1998, CARB resumed the Heavy Duty Vehicle Inspection Program

(roadside and unannounced inspections). In July 1998 CARB began the Periodic Smoke Inspection Program, where diesel and bus fleet operators are required to annually self-inspect their vehicles and repair those with excessive smoke emissions.

Diesel Engine Software Upgrade: CARB is working with the California Trucking Association (CTA) to get low NOx software installed on every eligible, electronically-controlled engine registered in California. The Air District requires the software upgrades as a condition for receiving heavy-duty vehicles grants from the Carl Moyer Program and the Transportation Fund for Clean Air.

Public Transit Bus Program: This program reduces criteria pollutant emissions and toxic air contaminants from urban buses. In October 2005, CARB aligned urban bus standards for 2007-2009 with national standards for diesel truck engines.

Solid Waste Collection Vehicles: This airborne toxic control measure for diesel PM from on-road heavy-duty diesel-fueled residential and commercial solid waste collection vehicles is one in a series of rules designed to reduce diesel PM from most diesel-fueled heavy-duty vehicles in California.

Heavy-Duty Diesel Idling Control Measure: In July 2004, CARB adopted an idling control measure for heavy-duty diesel commercial motor vehicles, limiting idling to five minutes. In October 2005, this measure was extended to include trucks with sleeper cabs.

Idling Limits at Schools: Requires school buses and other heavy-duty diesel vehicles to turn off engines upon arriving at a school and prohibits restarting engines more than 30 seconds before departure from a school.

The Carl Moyer Program: Provides grants through participating air pollution control districts, including the Bay Area Air District, to cover the incremental cost of cleaner on-road, off-road, marine, and locomotive engines.

Border Inspection Program: CARB, in cooperation with the California Highway Patrol, will establish inspection protocols of heavy duty vehicles entering this state to ensure that each vehicle has a certified engine. While enforcement is expected to take place near California borders, the Bay Area will still benefit from this program.

State Programs for Off-Road Vehicles & Equipment

Off-Road Mobile Sources Emission Reduction Program: Exhaust emission standards have been adopted by CARB and/or U.S. EPA for off-road engines included in the following categories: Small Spark-Ignition Off-Road Engines and Equipment Less Than 25 Horsepower (including Lawn and Garden Equipment, and Small Industrial Equipment);

Off-Road Recreational Vehicles (including Motorcycles and All-Terrain Vehicles); Off-Road Compression Ignition (Diesel) Engines and Equipment; Off-Road Large Spark Ignition (Gasoline and LPG) Engines and Equipment 25 Horsepower and Greater (including Industrial Equipment, Forklifts, and Portable Generators); Airport Ground Support Equipment; Commercial Marine Vessels; and Recreational Marine (including Personal Water Craft, Ski boats, Inboards, and Outboards). Ultra-low sulfur diesel fuel is now required for harbor crafts, ferries, and in-state locomotives. In December 2005 CARB adopted low-sulfur fuel standards for marine auxiliary engines and cargo handling equipment.

Recreational Marine Engines: Reduces emissions of ROG and NOx for certain marine vessels with proposed regulations for other spark-ignition engines used in boats for propulsion. In 2001, all new outboards sold in California were required to meet the U.S. EPA 2006 emission levels. In 2002, CARB adopted regulations governing emissions for all 2003 model year and later inboard engines.

ARB MOU with the Union Pacific and Burlington Northern Santa Fe Railroads: In June 2005 CARB entered into a Memorandum of Understanding (MOU) with Union Pacific Railroad (UP) Railroad and Burlington Northern Santa Fe (BNSF) Railway. The agreement is expected to achieve a 20 percent reduction in locomotive diesel particulate matter emissions at 17 major rail yards throughout the State, including five in the Bay Area. UP and BNSF agreed to phase out non-essential idling within 6 months and install idling reduction devices on California based locomotives within 3 years; identify and expeditiously repair locomotives with excessive smoke; ensure that at least 99 percent of locomotives operating in California pass smoke inspections; maximize the use of ultra low sulfur diesel fuel by January 1, 2007; conduct health risk assessments for 17 major rail yards and use these studies to identify risk reduction measures; and prepare a progress report on plans to implement feasible mitigation measures at all 17 rail yards. Participation from the Air District and local communities is an integral aspect of the MOU.

Chapter 4 – Overview of CAP Control Strategy

The control strategy is the heart of the Bay Area 2010 Clean Air Plan. It describes specific measures and actions that the Air District and its partners will implement to improve air quality, protect public health, and protect our climate. This chapter includes:

- A description of the scope and underlying rationale of the control strategy;
- A summary of the specific control measures that comprise the overall strategy;
- A discussion of key themes that are embedded in the strategy;
- Estimates of emissions reductions and cost-effectiveness for control measures; and
- A description of how the control strategy will be implemented.

As discussed in Appendix B, the control strategy has been developed pursuant to the "all feasible measures" provisions of Section 40914 of the California Health & Safety Code. The control strategy includes 55 measures which are described in detail in Volume II. The control measures that comprise the CAP control strategy are divided into five categories which are discussed below. This includes the three categories used in prior plans - Stationary Source Measures, Mobile Source Measures, and Transportation Control Measures - as well as two new control measure categories: Land Use & Local Impacts Measures, and Energy & Climate Measures.

In developing the control strategy for the 2010 CAP, Air District staff reviewed control measures in other air quality plans throughout California and elsewhere in the U.S., and solicited suggestions from Air District staff, staff of regional agency partners, members of the public, and diverse stakeholder groups. Staff also reviewed emissions inventory data and existing Air District rules and programs to identify emission reduction opportunities. As described in Appendix F, staff analyzed control measures based on the evaluation criteria set forth in the Health & Safety Code, as well as their potential to reduce the range of pollutants addressed in this plan.

Scope and Rationale

The CAP control strategy is designed as an integrated strategy to:

- Reduce emissions and transport of ozone precursors by developing a control strategy that includes all feasible measures to fulfill air quality planning requirements pursuant to the California Health & Safety Code;
- Reduce emissions of other pollutants, including particulate matter (PM), key air toxics, and key greenhouse gases, in addition to ozone precursors;

- Help to forge a multi-agency partnership to combat climate change by developing a regional strategy to address land use, transportation, and air quality.

The control strategy seeks to maximize co-benefits from control measures that reduce ozone precursors, and also to include additional measures that focus on reducing PM, air toxics, and GHGs. Most control measures proposed in the CAP will reduce ozone precursors along with other pollutants. However, the proposed control strategy does include several measures that are focused on reducing PM, air toxics, and/or greenhouse gases, while providing little or no direct ozone benefit.

Although the Air District has clear authority to regulate emissions from stationary sources, its regulatory power is very limited in some areas that have great impact on air quality, such as mobile sources, land use decision-making, energy-efficiency standards for building, etc. Therefore, in developing the control strategy, staff identified the full range of tools and resources available to the Air District, both regulatory and non-regulatory, and applied the most appropriate ones in crafting each measure. Implementation of each control measure will rely on some combination of the following:

- Adoption and enforcement of rules to reduce emissions from stationary sources, area sources, and indirect sources;
- Revisions to the Air District's permitting requirements for stationary sources;
- Enforcement of CARB rules to reduce emissions from heavy-duty diesel engines;
- Allocation of grants and other funding by the Air District and/or partner agencies;
- Promotion of best policies and practices that can be implemented by local agencies through guidance documents, model ordinances, etc.;
- Partnerships with local governments, other public agencies, the business community, non-profits, etc.;
- Public outreach and education;
- Enhanced air quality monitoring;
- Development of land use guidance and CEQA guidelines, and Air District review and comment on Bay Area projects pursuant to CEQA; and
- Leadership and advocacy.

Overview of CAP Control Strategy

The proposed 2010 CAP control strategy proposes a total of 55 control measures in five categories, including:

- 18 measures to reduce emissions from stationary and area sources
- 10 mobile source measures
- 17 transportation control measures

- 6 land use and local impact measures
- 4 energy and climate measures

In addition, to complement the formal control measures outlined above, a total of 18 Further Study Measures, as well as a Leadership Platform, are proposed.

Figure 4-1 provides an overview of the CAP plan framework.

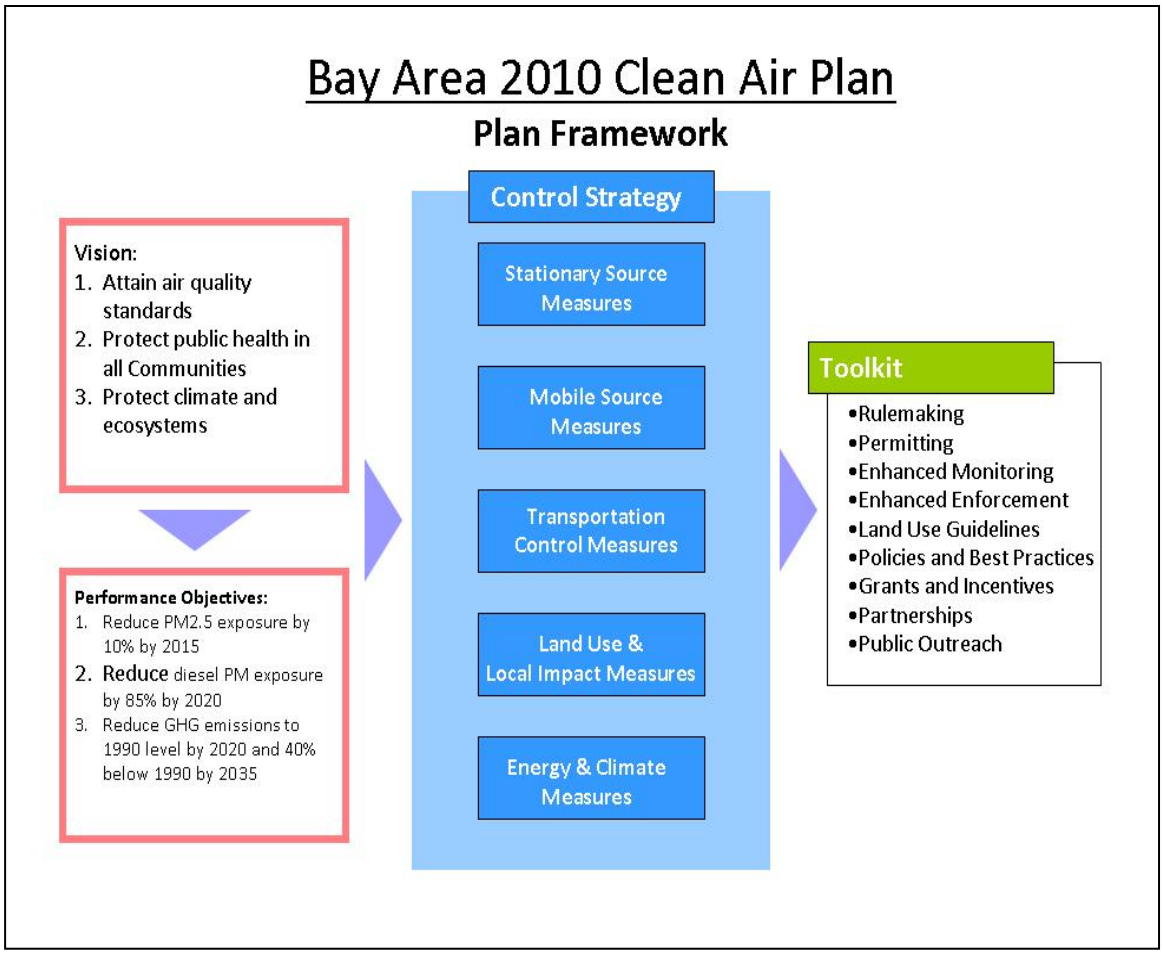

Figure 4-1. 2010 CAP Framework.

A brief summary of each category of control measures is provided in the section below. Detailed descriptions of the CAP control measures, FSMs, and Leadership Platform are provided in CAP Volume II. An overview of the control strategy and discussion of several key themes that run through the strategy are provided below.

Stationary Source Measures (SSMs) are measures that the Air District adopts and enforces pursuant to its authority to control emissions from stationary sources of air pollution such as manufacturing facilities, refineries, dry cleaners, auto body shops, gas

stations, etc. Since the adoption of its first state ozone plan in 1991, the Air District has adopted or amended 68 rules to reduce emissions from stationary sources; in aggregate, these rules have reduced ROG emissions by 70-72 tons per day and NOx emissions by 108-123 tons per day.

A total of 18 SSMs are proposed in the 2010 CAP control strategy to enhance the Air District's regulatory program and ensure that the Bay Area remains in the forefront in controlling emissions from stationary sources. The proposed SSMs will provide reductions in emissions of ozone precursors, direct PM and PM precursors, air toxics, and greenhouse gases. The SSMs are briefly summarized in Table 4-1.

Mobile Source Measures (MSMs) are measures that reduce emissions by accelerating the replacement of older, dirtier vehicles and equipment through programs such as the Air District's Vehicle Buy-Back and Smoking Vehicle Programs, and promoting advanced-technology vehicles that reduce emissions of criteria pollutants and/or greenhouse gases. Since CARB is responsible for establishing statewide motor vehicle emissions standards and fuel specifications, implementation of the 10 MSMs relies heavily upon incentive programs, such as the Carl Moyer Program and the Transportation Fund for Clean Air, to achieve voluntary emission reductions in advance of, or in addition to, CARB requirements. The MSMs are briefly summarized in Table 4-2.

Table 4-1. Stationary and area source measures.

Number	Title	Description
SSM 1	Metal Melting Facilities	Limit emissions of organic compounds, fine particulates, toxic compounds, and odors from foundry operations and metal melting facilities.
SSM 2	Digital Printing	Establish VOC limits or control requirements for inkjet, electro-photographic and other digital printing technologies.
SSM 3	Livestock Waste	Establish management practices to reduce ROG, ammonia, PM, GHG.
SSM 4	Natural Gas Processing and Distribution	Reduce emissions of VOCs and methane from natural gas production facilities.
SSM 5	Vacuum Trucks	Require carbon or other control technology on vacuum trucks to reduce emissions of VOCs.
SSM 6	General Particulate Matter Weight Rate Limitation	Reduce particulate weight limitation as a function of exhaust gas volume and/or as a function of process weight rate.
SSM 7	Open Burning	Further limit agricultural burning of some crops to be burned on a given day to reduce VOCs, NOx, and PM.
SSM 8	Coke Calcining	Reduce SOx emissions from coke calcining.
SSM 9	Cement Kilns	Further limit NOx and SOx from cement production and reduce toxic emissions.
SSM 10	Refinery Boilers and Heaters	Further reduce NOx emissions from refinery boilers, heaters, and steam generators.
SSM 11	Residential Fan Type Furnaces	Reduce allowable NOx limits for residential furnaces.
SSM 12	Space Heating	Establish NOx limits for industrial and commercial space heating.
SSM 13	Dryers, Ovens, Kilns	Establish NOx limits for industrial dryers, ovens, and kilns.
SSM 14	Glass Furnaces	Reduce NOx limits for glass furnaces.
SSM 15	Greenhouse Gases in Permitting – Energy Efficiency	Consider greenhouse gas (GHG) emissions during permitting of new or modified stationary sources. This may include (1) adopting GHG CEQA significance threshold for stationary sources, and (2) requiring GHG reduction measures in ministerial permits.
SSM 16	Revise Regulation 2, Rule 2: New Source Review	Amend Reg. 2, Rule 2 to address the District's anticipated non-attainment status of the 24-hour PM2.5 National Ambient Air Quality Standard.
SSM 17	Revise Regulation 2, Rule 5: New Source Review for Air Toxics	Implement more health-protective District permitting requirements in Regulation 2, Rule 5, New Source Review of Toxic Air Contaminants based on revisions to OEHHA risk factors and methodologies. For Priority CARE Communities, track the toxicity-weighted emissions from all sources in the identified communities.
SSM 18	Revise Air Toxics "Hot Spots" Program	Revise the District's Air Toxics Hot Spots program to incorporate more stringent risk reduction requirements from existing sources.

Table 4-2. Mobile source measures.

Mobile Source Control Measures (On-Road Light Duty Vehicles)		
Number	**Title**	**Description**
MSM A-1	Promote Clean, Fuel Efficient Light & Medium-Duty Vehicles	Expand the use of Super Ultra-low Emission (SULEV) and Partial - Zero emission (PZEV) light-duty passenger vehicles and trucks within the Bay Area.
MSM A-2	Zero Emission Vehicles and Plug-in Hybrids	Expand the use of Zero Emission (ZEV) and Plug-in Hybrid (PHEV) passenger vehicles and light-duty trucks within the Bay Area, working in partnership with the Bay Area Electric Vehicle Corridor coalition.
MSM A-3	Green Fleets (Light, Medium & Heavy-Duty Vehicles)	Develop a green fleet certification component of the Bay Area Green Business program, promote best practices for green fleets, and evaluate existing grant programs to ensure incentive funding is directed towards fleets and vehicles that meet stringent fuel economy standards.
MSM A-4	Replacement or Repair of High-Emitting Vehicles	Enhance the Air District's Vehicle Buy Back program to increase participation from car owners; e.g., via higher cash payments and/or increased marketing. Consider including motorcycles in the VBB programs, or other potential enhancements, e.g. implementing a vehicle repair program. Pursue improvements to the Air District's Smoking Vehicle program.
Mobile Source Control Measures (On-Road Heavy Duty Vehicles)		
MSM B-1	HDV Fleet Modernization	Provide incentives to accelerate the replacement or retrofit of on-road heavy-duty diesel engines in advance of requirements for the CARB in-use heavy-duty truck regulation.
MSM B-2	Low NOx Retrofits for In-Use Engines	Provide cash incentives to install retrofit devices that reduce NOx emissions from MY 1994-2006 heavy-duty engines. Continue requiring software updates to engine control modules in model year 1993-1998 diesel trucks as a condition of all heavy duty vehicle retrofit grants.
MSM B-3	Efficient Drive Trains	Encourage development and demonstration of hybrid drive trains for medium- and heavy-duty vehicles, in partnership with CARB, CEC and other existing programs.
Mobile Source Control Measures (Off-Road Equipment)		
MSM C-1	Construction and Farming Equipment	Reduce emissions from construction and farming equipment by 1) cash incentives to retrofit construction and farm equipment with diesel particulate matter filters or upgrade to a Tier III or IV off-road engine; 2) work with CARB, CEC and others to develop more fuel efficient off-road engines and drive-trains; 3) work with local communities, contractors and developers to encourage the use of renewable alternative fuels in applicable equipment.
MSM C-2	Lawn & Garden Equipment	Reduce emissions from lawn and garden equipment through voluntary retirement and replacement programs.
MSM C-3	Recreational Vessels	Reduce emissions from recreational vessels through voluntary retirement and replacement programs.

Transportation Control Measures (TCMs) are strategies to reduce vehicle trips, vehicle use, vehicle miles traveled, vehicle idling, or traffic congestion for the purpose of reducing motor vehicle emissions. The draft Control Strategy includes 17 TCMs to improve transit service; encourage walking, bicycling, and transit use; improve efficiency of the regional transit and roadway systems; support focused growth; and develop and implement pricing strategies. The TCMs for the 2010 Clean Air Plan were developed by reviewing the 2005 Ozone Strategy measures, and modifying and expanding them based on new investment and policy decisions and public input. In particular, the TCMs have been updated to reflect the policy and investment decisions made in MTC's regional transportation plan, *Transportation 2035: Change in Motion*.

The TCMs are organized into five categories:

- Improve Transit Services
- Improve System Efficiency
- Encourage Sustainable Travel Behavior
- Support Focused Growth
- Implement Pricing Strategies

New TCMs have been added to:

- Emphasize the importance of "smart driving" and the need to reduce high-speed driving (TCM C-5)
- Encourage parking policies that will help to reduce motor vehicle travel (TCM E-2)
- Advocate that the Air District and its regional agency partners join forces to develop a regional transportation pricing strategy (TCM E-3)

In preparing the Transportation 2035 Plan, MTC defined performance objectives related to the "Three E's" – Economy, Environment, and Equity – and evaluated how various investment and policy scenarios would perform relative to these objectives. MTC concluded that implementation of innovative pricing and land use policies will be the most effective means of achieving the T2035 objectives.[136] Transportation pricing and parking policies are both potentially potent tools to reduce motor vehicle use, while also generating revenues that can be used to support alternative transportation modes. The plan includes TCM E-1 (value pricing), TCM E-2 (parking), and TCM E-3 (other pricing measures). TCM E-3 calls for the Bay Area regional agencies to join forces to establish a regional pricing task force to define goals, evaluate transportation pricing policy options, develop a recommended regional transportation pricing strategy, and pursue implementation of the strategy. The TCMs are briefly summarized in Table 4-3.

[136] See MTC Transportation 2035 Plan, pages 21-30.

Table 4-3. Transportation control measures.

Number	Title	Description
TCM A-1	Improve Local and Areawide Bus Service	Improve transit by providing new Express Bus or Bus Rapid Transit on major travel corridors, funding the replacement of older and dirtier buses, and implementing Transit Priority Measures on key transit routes.
TCM A-2	Improve Local and Regional Rail Service	Improve rail service by sustaining and expanding local and regional rail services and by providing funds to maintain rail-cars, stations, and other rail capital assets.
TCM B-1	Implement Freeway Performance Initiative	Improve the performance and efficiency of freeway and arterial systems through operational improvements, including implementing the Freeway Performance Initiative, the Arterial Management Program, and the Bay Area Freeway Service Patrol.
TCM B-2	Improve Transit Efficiency and Use	Improve transit efficiency and use through continued operation of 511 Transit, and full implementation of TransLink® fare payment system and the Transit Hub Signage Program.
TCM B-3	Bay Area Express Lane Network	Introduce roadway pricing on Bay Area highways through the implementation of an express lane network, also known as a High Occupancy Toll (HOT) lane network.
TCM B-4	Goods Movement Improvements and Emission Reduction Strategies	Improve goods movement and reduce emissions from diesel equipment through implementation of the Bay Area's Trade Corridors Improvement Fund (TCIF) projects and various funding programs to replace or retrofit diesel equipment.
TCM C-1	Support Voluntary Employer-Based Trip Reduction Program	Support voluntary employer trip-reduction programs through the implementation of the 511 Regional Rideshare Program and Congestion Management Agency rideshare programs, the Spare the Air Program, encouraging cities to adopt transit benefit ordinances, and supporting Bay Area shuttle service providers.
TCM C-2	Implement Safe Routes to Schools and Safe Routes to Transit	Facilitate safe routes to schools and transit by providing funds and working with transportation agencies, local governments, schools, and communities to implement safe access for pedestrians and cyclists.
TCM C-3	Promote Rideshare Services and Incentives	Promote rideshare services and incentives through the implementation of the 511 Regional Rideshare Program and Congestion Management Agency rideshare programs including marketing rideshare services, operating rideshare information call center and website, and providing vanpool support services.
TCM C-4	Conduct Public Outreach and Education	Educate the public about the air quality, environmental, and social benefits of carpooling, vanpooling, taking public transit, biking, walking, and telecommuting, through the Spare the Air campaign and Transportation Climate Action Campaign.
TCM C-5	Promote Smart Driving/Speed Moderation	Educate the public about the air quality and climate protection benefits of reducing high-speed driving and observing posted speed limits.

Table 4-3 (continued). Transportation control measures.

Number	Title	Description
TCM D-1	Improve Bicycle Access and Facilities	Expand bicycle facilities serving transit hubs employment sites, educational and cultural facilities, residential areas, shopping districts, and other activity centers.
TCM D-2	Improve Pedestrian Access and Facilities	Provide funding for projects to improve pedestrian access to transit hubs, employment sites, educational and cultural facilities, residential areas, shopping districts, and other activity centers.
TCM D-3	Support Local Land Use Strategies	Promote land use patterns, policies, and infrastructure investments that support mixed-use, transit-oriented development that reduce motor vehicle dependence and facilitate walking, bicycling and transit use.
TCM E-1	Value Pricing Strategies	Implement value pricing (congestion pricing) on Bay Bridge; consider expanding value pricing to other Bay Area toll bridges to manage travel demand during congested periods. Measure may also include value pricing in the City of San Francisco.
TCM E-2	Parking Pricing and Management Strategies	Promote policies to implement market-rate pricing of parking facilities, reduce parking requirements for new development projects, parking "cash-out", unbundling of parking in residential and commercial leases, shared parking at mixed-use facilities, etc.
TCM E-3	Implement Transportation Pricing Reform	Develop a regional transportation pricing strategy that includes policy evaluation and implementation. Pricing policies to be evaluated include gasoline taxes, bridge tolls, congestion pricing, parking pricing, HOT lanes, VMT or carbon fees, pay-as-you-drive insurance, etc.

Land Use and Local Impacts Measures (LUMs) are a new category of measures designed to (1) promote mixed-use, compact development to reduce motor vehicle travel and emissions, and (2) ensure that we plan for focused growth in a way that protects people from exposure to air pollution from stationary and mobile sources of emissions. Building on the Air District's CARE program and Clean Air Communities Initiative, this component of the Control Strategy puts a special emphasis on the need to monitor and reduce population exposure to hazardous pollutants in communities that are most heavily impacted by emissions. The measures in this category draw upon the full range of tools available to the Air District, including rulemaking, notably development of a new indirect source review rule; revised CEQA guidelines and enhanced CEQA review by the Air District; working with local jurisdictions to encourage and assist them in developing Community Risk Reduction Plans to reduce population exposure to air toxics and PM; providing incentives to reduce emissions from heavy-duty diesel equipment; targeted enforcement of CARB diesel control rules; land use guidance; and enhanced air quality monitoring. The LUMs are briefly summarized in Table 4-4.

Table 4-4. Land use and local impacts measures.

Land Use and Local Impact Control Measures		
Number	**Title**	**Description**
LUM 1	Goods Movement	Reduce diesel PM and GHG emissions from goods movement in the Bay Area through targeted enforcement of CARB diesel ATCMs in impacted communities, partnerships with ports and other stakeholders, increased signage indicating truck routes and anti-idling rules, shifts in freight transport mode, shore-side power for ships, and improvements in the efficiency of engine drive trains, distribution systems (roadways, logistic systems) and land use patterns.
LUM 2	Indirect Source Review Rule	Develop an indirect source review rule to reduce construction and vehicular emissions associated with new or modified land uses.
LUM 3	Enhanced CEQA Program	1) Develop revised CEQA guidelines and thresholds of significance and 2) expand District review of CEQA documents.
LUM 4	Land Use Guidelines	Provide guidance to local governments re: 1) air quality and greenhouse gases in General Plans, and 2) how to address and mitigate population exposure related to land use development.
LUM 5	Reduce Risk in Impacted Communities	Establish a system to track cumulative health risks from all emissions sources in impacted communities (as identified by the District's CARE program) in order to monitor progress in reducing population exposure.
LUM 6	Enhanced Air Quality Monitoring	Expand monitoring program to provide better local air quality monitoring data in impacted communities.

Energy and Climate Measures (ECMs) are a new category of measures designed to reduce ambient concentrations of criteria pollutants, reduce emissions of CO2, and protect our climate by:

- Promoting energy conservation and energy efficiency in homes, schools, and commercial and industrial buildings;
- Promoting renewable forms of energy production, such as solar panels and solar thermal;
- Reducing "urban heat island" effects by increasing reflectivity of roofs and parking lots, in order to decrease energy consumption by air conditioning, reduce evaporative emissions from motor vehicles, and help offset temperature increases associated with global warming; and
- Promoting the planting of (low-VOC emitting) trees in order to reduce biogenic emissions from trees, lower air temperatures, provide shading to reduce energy use, and absorb CO2 and other air pollutants.

The ECMs are briefly summarized in Table 4-5.

Table 4-5. Energy and climate measures.

Energy and Climate Control Measures		
Number	**Title**	**Description**
ECM 1	Energy Efficiency	Provide 1) education to increase energy efficiency; 2) technical assistance to local governments to adopt and enforce energy- efficient building codes; and 3) incentives for improving energy efficiency at schools.
ECM 2	Renewable Energy	Promote distributed renewable energy generation (solar, micro wind turbines, cogeneration, etc.) on commercial and residential buildings, and at industrial facilities
ECM 3	Urban Heat Island Mitigation	Mitigate the "urban heat island" effect by promoting the implementation of cool roofing, cool paving, and other strategies.
ECM 4	Tree-Planting	Promote planting of low-VOC-emitting shade trees to reduce urban heat island effects, save energy, and absorb CO2 and other air pollutants.

These new Energy & Climate measures are proposed in recognition of the fact that promoting energy efficiency, renewable energy, and green building standards are essential for purposes of both air quality and climate protection. However, the Air District has very limited direct regulatory authority in the area of energy or building standards. A well-defined regulatory structure is already in place via regulations and programs developed by the California Energy Commission, the California Public Utilities Commission, and other entities, and California has the most stringent energy efficiency standards in the nation. Energy efficiency and renewable energy use in the buildings sector also play a major role in the AB 32 Scoping Plan. Therefore, in crafting energy and climate measures for the CAP, the challenge is to identify where gaps may exist in the current structure and how the Air District can play a useful role in this arena within the constraints of its authority and resources.

The four ECMs focus on promoting voluntary action, largely by local governments, to adopt best practices and model policies to further energy conservation. The Air District can play an important role in facilitating the spread of best practices, for example, by drawing on the experience gained from projects funded by the District's Climate Protection Grant Programs. The District can also build on its relationships with the local planning community, via CEQA commenting, supporting the development of local climate action plans, and other activities, to promote these measures at the local level.

The ECMs focus on reducing GHG emissions and offsetting anticipated temperature increases related to global warming; this will have the effect of mitigating ozone increases that would occur with increased temperatures. To the extent that these measures are successful in reducing energy use, they will also contribute to reducing emissions of pollutants such as NOx, PM, and air toxics.

Further Study Measures: In reviewing potential control measures for the CAP, District staff identified 18 potential measures that appear to have merit but are not yet ready to

be included as formal control measures. These measures have been included as further study measures (FSMs), as described in CAP Volume II. Measures have been classified as FSMs for a variety of reasons, including lack of emissions data for the targeted source, uncertainty as to the cost-effectiveness of a measure, or because the proposed control technology has not been adequately demonstrated. By designating measures as FSMs, the District commits to continue to evaluate these measures. However, the District makes no commitment to actually adopt or implement any FSM as a control measure unless and until a given measure has been demonstrated to be feasible pursuant to the control measure evaluation criteria specified in the Health & Safety Code. The FSMs are briefly summarized in Table 4-6.

Table 4-6. Further study control measures.

Further Study Measures		
Number	**Title**	**Description**
FSM 1	Adhesives and Sealants	Research the emission inventory for this source category, reconcile discrepancies with the inventories of other districts in the State, and determine if some VOC limits found in South Coast Rule are feasible in the Bay Area.
FSM 2	Reactivity in Coating and Solvents	Consider replacing VOC limits in certain rules, measured in mass VOC per volume, with limits based on the relative contribution to ozone formation of each of the organic species that make up the VOC content of a product.
FSM 3	Solvent Cleaning and Degreasing Operations	Consider reducing VOC emissions from solvent cleaning and degreasing operations based on CARB's statewide study.
FSM 4	Emissions from Cooling Towers	Research ways to reduce VOC emissions from cooling towers in refineries.
FSM 5	Equipment Leaks	Research ways to reduce VOC emissions from equipment leaks through remote sensing technologies and other methods.
FSM 6	Wastewater from Coke Cutting	Review coke cutting operations to determine if emissions reductions can be achieved from the resulting wastewater.
FSM 7	SO2 from Refinery Processes	Review refinery processes to identify opportunities to reduce SO2 emissions.
FSM 8	Reduce Emission from LPG, Propane, Butane, and other Pressurized Gases	Reduce emissions of LPG, propane, butane and other pressurized organic gases by requiring tanks and relief valves to be gas tight, prohibiting venting during tank filling, and establishing a leakage allowance for hoses.
FSM 9	Greenhouse Gas Mitigation in BACT and TBACT Determinations	Consider flexibility in BACT/TBACT determinations in order to reduce secondary green house gas (GHG) emissions from abatement devices.
FSM 10	Further Reductions from Commercial Cooking Equipment	Consider reducing emissions from commercial wok cooking, and solid fueled cooking devices such as wood-fired pizza ovens.

Table 4-6 (continued). Further study control measures.

Number	Title	Description
FSM 11	Magnet Source Rule	Explore the viability of developing a magnet source rule to reduce mobile source emissions from facilities such as airports, seaports, warehouses, distribution centers, shopping centers, and other facilities that generate mobile source emissions of criteria air pollutants, toxic air contaminants and greenhouse gases.
FSM 12	Wood Smoke	Study the impacts of existing Air District rules regarding wood burning and open burning, in order to develop more effective methods to implement, promote, enforce, and possibly expand, existing rules.
FSM 13	Energy Efficiency and Renewable Energy	Review the results of ECM1 and ECM 2 in 2010 CAP, and consider potential enhancements to promote energy efficiency and renewable energy.
FSM 14	Winery Fermentation	Review emissions generated by fermentation at wineries to determine if reductions in VOC emissions can be achieved.
FSM 15	Composting Operations	Review emissions generated by composting operations and consider reductions in emissions from composting.
FSM 16	Vanishing Oils and Rust Inhibitors	Research VOC emissions reductions from vanishing oils and rust inhibitors.
FSM 17	Ferry System Expansion	Work with MTC and the Water Emergency Transportation Authority to ensure that expansion of the regional ferry network will provide the greatest possible air quality benefit.
FSM 18	Greenhouse Gas Fee	Evaluate the idea of adopting a GHG fee on stationary sources to promote energy efficiency and reduce GHG emissions.

Leadership Platform: Some of the most potentially beneficial measures to improve air quality will require action by other agencies such as CARB or US EPA, or adoption of new legislation. Therefore, the CAP also includes a Leadership Platform, summarized in Table 4-7, which identifies policies and actions by other entities to complement the CAP control strategy.[137] The control measures that these actions would complement are identified in parentheses.

[137] The Leadership Platform is intended to help define the District's priorities for legislation and advocacy over the term of the CAP. However, it is not intended to preempt or supplant the Legislative Agenda that the District's Board of Directors defines each year.

Table 4-7. CAP leadership platform.

#	Advocacy Area	Actions
1	Cleaner Vehicles & Equipment	1. Advocate for more enforcement by CARB in Bay Area of diesel air toxics control measures and snap-idle inspection program. (MSM A-1) (LUM 1) 2. Support major revisions to the Smog Check program to improve its performance, such as using on-board diagnostics and remote sensing technologies to diagnose and repair vehicle emission malfunctions more quickly. (MSM A-4) 3. Support improvements to existing Smog Check program: older vehicles and newer high-mileage vehicles should be checked annually; also test for exhaust particulate matter (PM). (MSM A-4) 4. Support a motorcycle SmogCheck program. (MSM A-4) 5. Advocate for CARB to allow BAAQMD to include motorcycles and heavy-duty trucks in VAVR. (MSM A-4) 6. Support the phase out of new and in-use two-stroke engines. (MSM C-2, C-3) 7. Support public sector light- and heavy-duty green fleets. (MSM A-2) 8. Seek an on-going source of funding to provide incentives to reduce emissions from light-duty off-road equipment, such as lawn & garden and recreational watercraft. (MSM C-2, C-3)
2	Land Use/Building Standards	1. Support legislation to expand “parking cash-out.” (TCM E-2) 2. Support enforcement of “parking cash-out.” (TCM E-2) 3. Support legislation to require un-bundling of parking in leases. (TCM E-2) 4. Advocate for local building code requirements to exceed Title 24 requirements for commercial & residential multi-family housing to meet “cool roof” standards. (ECM 3) 5. Advocate for local zoning ordinances for “cool paving” standards and adding shade trees when existing parking lots undergo re-surfacing; also require shade trees in new lots. (ECM 3, 4) 6. Encourage CARB to provide credits for local government land use actions that can be used in GHG cap & trade system.
3	Pricing & Tax Policy	1. Support congestion pricing to reduce motor vehicle emissions. (TCM B-3, E-1) 2. Support a regional parking fee for privately owned lots, more cash-out incentives. (TCM E-2) 3. Support mileage-based vehicle and registration and/or license fees. (TCM E-3) 4. Support gas taxes or fees, and/or floor price for gasoline & diesel. (TCM E-3) 5. Support “pay as you drive” insurance. (TCM E-3) 6. Support cash incentives for the purchase of fuel efficient vehicles “feebates.” (TCM E-3) 7. Support container fees at Ports. (LUM 1)

Table 4-7 (continued). CAP leadership platform.

#	Advocacy Area	Actions
4	Trip Reduction / Alternative Modes	1. Support legislation to empower air districts and local governments to adopt employer-based trip reduction requirements. (TCM C-1) 2. Support legislation to expand incentives for employer-based trip reduction programs, such as tax deductions and credits. (TCM C-1) 3. Encourage local governments to replicate San Francisco Commute Benefits Ordinance (allow employees to purchase transit passes with pre-tax $$). (TCM C-1) 4. Advocate for more diverse ways to measure Level of Service (LOS) than solely based on vehicle service volume to capacity ratios. (TCM D-1, D-2)
5	Other	1. Advocate with Caltrans and CHP for better enforcement of speed limits on freeways. (TCM C-5)

Key Themes Embedded in CAP Control Strategy

The CAP control strategy described above is wide-ranging and ambitious. To further explain the underlying rationale for the control strategy, we discuss in this section several key themes that are embedded in the strategy, including:

- Efficiency
- Reducing motor vehicle emissions
- Land use and community design
- Transportation pricing
- Goods movement

Efficiency

To date, most pollution control efforts have focused on reducing smokestack or tailpipe emissions, primarily by means of installing emission control devices. However, to address today's air quality and climate challenges, we need to address the root causes of air pollution and greenhouse gas emissions by analyzing energy consumption and emissions of air pollutants on a cradle-to-grave basis, promoting efficiencies, and making fundamental changes in fuels and/or production processes.

Incomplete combustion of fossil fuels results in emissions of ROG, NOx, PM, and air toxics.[138] To date, emissions of these pollutants have been reduced primarily by installing abatement devices on smokestacks and motor vehicle engines. Although this approach has generally been effective in reducing emissions of air pollutants, it does not

[138] NOx emissions result from combustion in the presence of nitrogen. NOx emissions have been reduced by using abatement devices or by reducing combustion temperatures.

address fundamental causes. Moreover, emission control devices often consume energy or affect efficiency, and thus may indirectly increase CO2 emissions.

CO2, the principal greenhouse gas, presents an entirely new problem. Unlike the pollutants discussed above which are emitted as byproducts of incomplete combustion, emissions of carbon dioxide are the direct and unavoidable product of complete combustion of fossil fuels. We cannot reduce emissions of CO2 simply by installing emission control devices. Ensuring more complete combustion, which might work to reduce ROG, PM, and air toxics, will increase CO2 emissions.

The most fundamental solution to reduce emissions of criteria pollutants, air toxics, and CO2 is to reduce the amount of fossil fuels that we burn. Thus, we need to make our vehicles, our buildings, and our production processes more efficient, and we need to find alternative ways to produce energy that do not rely on fossil fuels.

To attain our greenhouse gas and air quality goals, we need to pursue efficiency in all sectors, including:

- Energy generation and transmission
- Community design and building design
- Goods movement and distribution
- Motor vehicles propulsion systems
- Transportation infrastructure and systems

In addition to improving air quality, promoting efficiency and reducing energy consumption provides economic benefits in the form of cost savings and increased productivity. The concept of promoting efficiency is integrated into the CAP control strategy, and is expressed most directly in SSM 5, MSM A-1, MSM B-3, TCMs B-1 through B-4, and ECMs 1 and 3.

Reducing Motor Vehicle Emissions

Motor vehicles and other mobile sources are the primary source of ROG, NOx, air toxics, and greenhouse gas emissions in the Bay Area, as well as substantial contributors of PM emissions.

The CAP control strategy includes a comprehensive set of measures to reduce emissions from mobile sources. Overall, the CAP measures are based on the idea that we need to:

- Drive cleaner
- Drive smarter
- Drive less

Driving Cleaner

Driving cleaner – that is, reducing tailpipe emissions via technological controls - has been the primary strategy to improve air quality over the past several decades. Fleet-wide emission rates decline as older, more-polluting vehicles are replaced by newer, cleaner ones that meet more stringent emissions standards. The CAP includes Mobile Source Measures to accelerate the retirement or retrofit of older vehicles and to encourage the introduction of new, advanced technology vehicles, especially vehicles that use alternative (non-fossil) fuels, including electric vehicles and plug-in hybrid vehicles. These measures will help to reduce emissions of criteria pollutants and greenhouse gases from motor vehicles.

Driving Smarter

There are many easy, low-tech ways that we can reduce emissions by driving smarter, as described in TCM C-5. We can greatly reduce emissions of air pollutants and greenhouse gases and improve fuel economy by keeping tires properly inflated and vehicles well maintained, and by practicing sensible driving habits such as avoiding hard accelerations and braking.

Speed moderation is perhaps the most important aspect of smart driving. Emission rates of ROG, NOx, PM, and CO2 all increase significantly at high speed. As shown in Figure 4-2, emission factors for all these pollutants are lowest in the range of 35 mph to 50 mph. A vehicle driven at 75 mph consumes approximately 40% more fuel and emits 35% more emissions than one driven at 60 mph. Approximately 60% of Bay Area driving (VMT) takes place on the freeway system and, according to Caltrans data, 34% of freeway driving occurs at speeds in excess of 65 mph. Observing posted speed limits can have a major impact in reducing emissions, conserving energy, decreasing expenditures on gasoline and diesel, and saving lives by reducing traffic accidents.

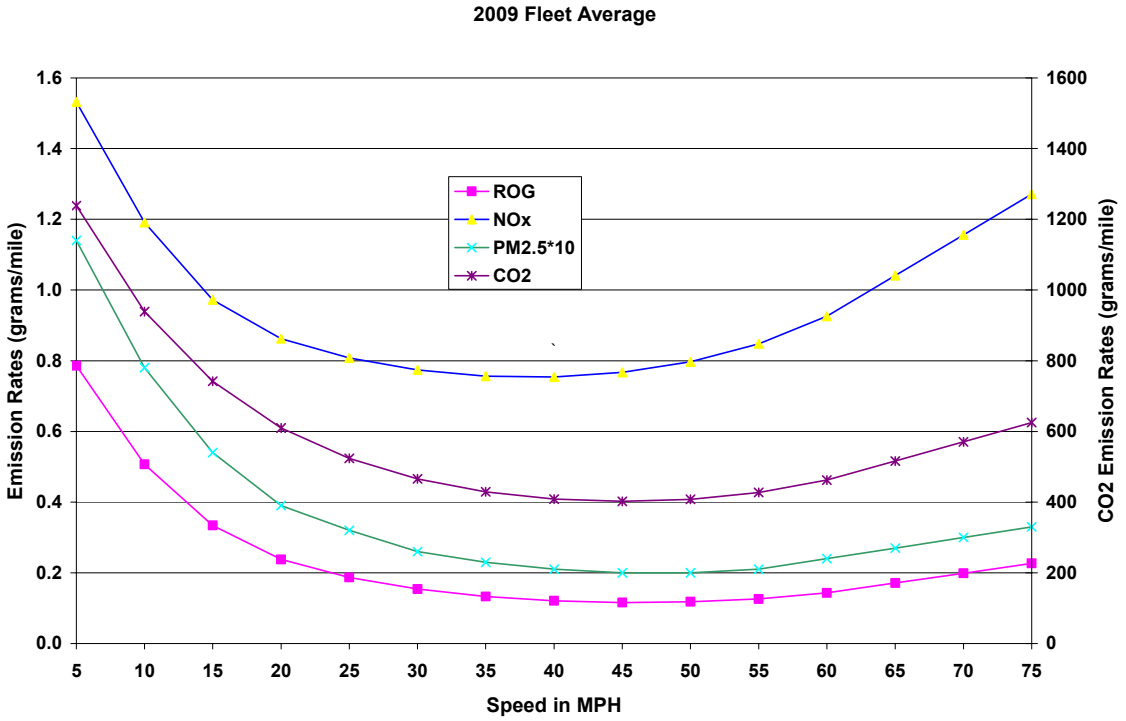

Figure 4-2. Emission rates vs. speed. Note: PM2.5 emission rates have been multiplied by a factor of 10 so as to best fit on the y-axis using the scale provided.

Driving Less

California has the most stringent motor vehicle tailpipe emission standards in the world. This accounts for much of our air quality progress to date. But it also means that once older vehicles have been replaced by new ones, and all the vehicles on the road meet these stringent standards, it will be difficult to squeeze more emissions reductions out of the Bay Area fleet. Motor vehicles will likely continue to be the primary source of air pollution in the future, so it will be imperative to continue to reduce motor vehicle emissions. Simply put, this means that we will need to drive less in the years to come to continue to improve air quality and protect our climate. However, experience to date shows that this will be difficult to accomplish. Reducing motor vehicle use will require an integrated strategy based on revising land use patterns, transportation pricing, providing viable alternatives to auto use, and public education.

VMT and Vehicle Ownership

Considerable effort is being invested at both the State and regional level to better integrate land use, transportation, air quality, and climate planning. Much of this effort is focused on the need to reduce the amount that we drive, often expressed by the term *vehicle miles of travel* (VMT). As shown in Figure 4-3, vehicle ownership and VMT have

both doubled since 1970, and vehicle ownership and VMT have both increased significantly faster than population.

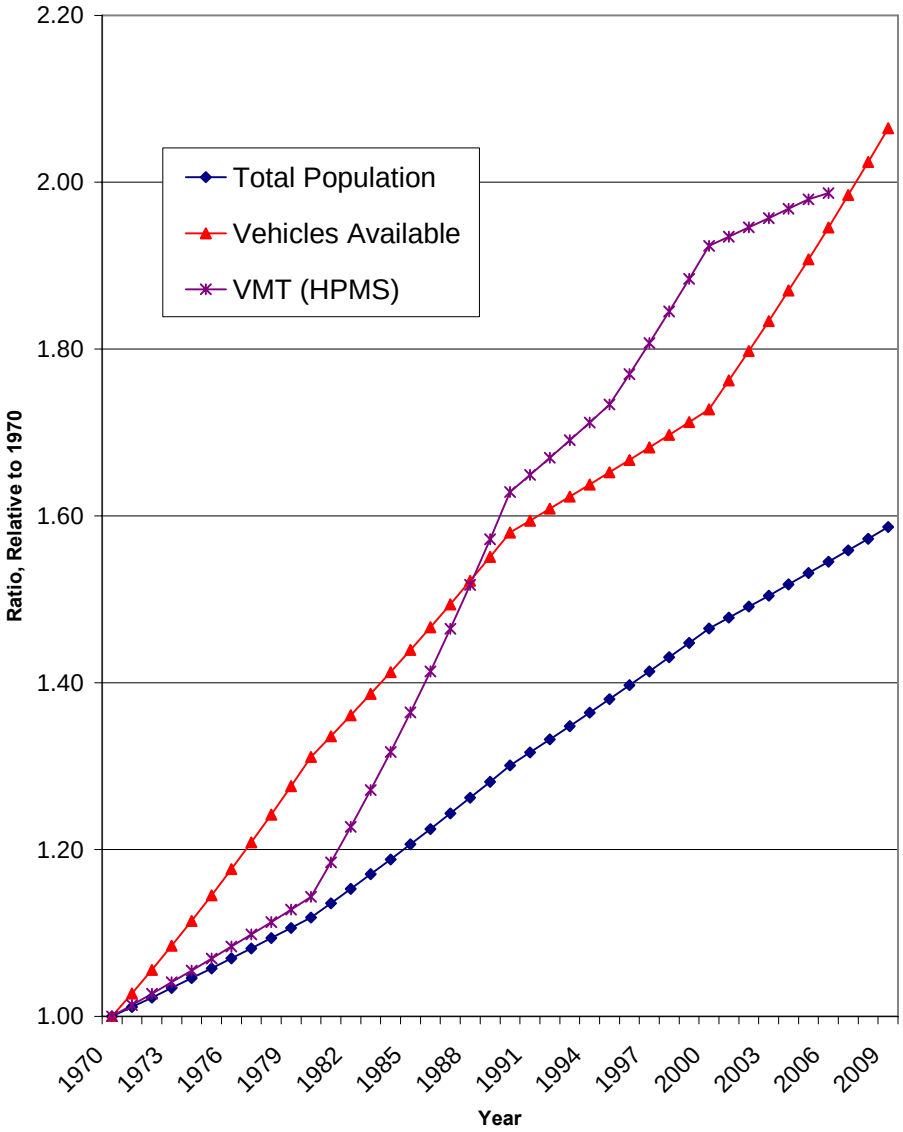

Figure 4-3. Growth in Bay Area population and motor vehicle use: 1970-2009.

This trend is expected to continue in the future. MTC forecasts that vehicle ownership and vehicle miles of travel (VMT) will both increase by approximately 30% in Bay Area [139] over the next 25 years; this is slightly faster than the rate of increase in population. An increase of this magnitude will translate into 1.25 million more vehicles driving an

[139] See MTC Travel Forecasts for Transportation 2035 Vision Analysis (November 2007). Per capita vehicle ownership is projected to increase from 638 per 1000 persons to 650 vehicles per 1000 persons by 2030. Household vehicles in Bay Area will increase from 4.33 million to 5.69 million by year 2030, an increase of 31.5% in 30 years.

additional 40 million miles per day on our already-congested roadways. This projected growth in vehicle ownership and VMT will lead to a wide range of negative impacts: more emissions of criteria pollutants and greenhouse gases, pressure to make costly investments to expand the roadway network and the supply of parking, increased water and noise pollution, and urban heat island effects that contribute to ozone formation.

A wide range of policies, many of which have been incorporated in the 2010 CAP control strategy, are proposed to reduce VMT. However, reducing motor vehicle ownership is rarely discussed as a means to reduce VMT, let alone as a legitimate objective in its own right. Yet there are good reasons to focus on reducing vehicle ownership, both on its own merits and as one of the most effective ways to reduce VMT.

- Motor vehicles can and do pollute even when they are not in use. On hot summer days, diurnal evaporative emissions from parked cars account for a significant amount of ROG, the key ozone precursor in the Bay Area.[140]
- Vehicle ownership rates are a strong predictor of VMT. Research indicates that at least 80% of the difference in VMT per household can be traced to differences in household vehicle ownership rates.[141]
- Once someone makes an investment to purchase and insure a motor vehicle, that vehicle generally becomes their default mode of transportation. In fact, having invested the money to purchase a car, it makes perfect economic sense for the owner to use the vehicle in order to maximize his or her return on that investment.

Even a modest reduction in vehicle ownership could provide significant benefit. For example, if the projected rate of increase in vehicle ownership could be reduced by 10% (i.e., from 1% per year to 0.9% per year) this would prevent the addition of 125,000 more vehicles on Bay Area roads in the coming decades. The potential benefits of reducing vehicle ownership include:

- Reduced VMT and reduced tailpipe emissions;
- Reduced evaporative emissions of ROG which contribute to ozone formation on hot days;
- Reduced need for parking, thus freeing space for other uses and helping to reduce urban heat island impacts (see control measure ECM 3);
- Reduced traffic congestion;
- Increased transit ridership, and thus a better return on capital investment in transit;
- Reduced roadway maintenance costs;
- Less need to expand the region's roadway network;

[140] In the Bay Area, diurnal evaporation accounts for 18.8 tons of ROG on a typical summer day. This represents 15% of the estimated 126.0 tons of ROG per day emitted by on-road motor vehicles (EMFAC2007, November 2006) and approximately 5% of the total ROG inventory.

[141] "Location Efficiency: Neighborhood and Socio-Economic Characteristics Determine Auto Ownership and Use" John Holtzclaw et al, *Transportation Planning and Technology*, March 2002

- Better water quality (due to reduction in run-off of pollution from non-point sources);
- Reduced household transportation costs;[142] this could be especially beneficial for low-income households, for whom vehicle ownership costs may represent a major burden.[143]

The objective of reducing vehicle ownership is not to be punitive or to actively discourage any one from owning a car; on an individual level, motor vehicle ownership can provide important economic and social benefits. Rather, the objective is to create communities where people have a viable choice as to whether they want to own a vehicle or not. This requires fostering policies and conditions that make it possible, or even more advantageous, for people to choose a reduced-car or car-free option.

The CAP control strategy includes a number of measures to help reduce the need for vehicle ownership, such as promoting infill, mixed-use development (TCM D-3); improving transit service and efficiency (TCMs A-1, A-2, and B-2); promoting other modes including walking and bicycling (TCM D-1 and D-2); promoting ride-sharing and car-sharing (TCM C-3); and implementing transportation pricing strategies (TCMs E-1, E-2, and E-3).

Land Use and Community Design

There is a growing recognition in the Bay Area and beyond that current land use patterns, and the transportation infrastructure needed to serve those land uses, are core causes of some of our most fundamental problems, including air quality, water quality, climate change, high energy consumption, reliance on imported oil, and public health and fitness. A key long-term solution is to channel future growth into vibrant urban communities where goods and services are close at hand, and people have a range of viable transportation options.

To a great extent, community design dictates individual travel mode. For people who live (and/or work) in low-density, car-oriented development, the motor vehicle is often the only viable transportation option. In such situations, even the most robust strategy to promote alternative modes of travel can have, at best, only a very modest effect. In contrast, compact communities with a mix of land uses make it much easier to walk, cycle, or take transit for at least some daily trips.

[142] On average, Bay Area household spend approximately 15% of household income on transportation. A November 2009 Urban Land Institute study entitled "Bay Area Burden" documents that on average Bay Area residents who live in the urban core spend significantly less on transportation than people who live in outlying parts of the region.

[143] Low-income Bay Area households spend 27% of their income on transportation; compared to 11% for high- income households. See MTC's Equity Analysis Report for T2035: Appendix E, Table E-2.

Focused growth needs to address *where we work* as well as where we live. Over the past 40 years, Bay Area job growth has increasingly migrated to suburban areas. The percentage of jobs located in core business districts that are well-served by transit has declined significantly. Today, the central business districts of San Francisco, Oakland, and San Jose collectively account for only 10% of total regional employment.[144] This suggests that policies to promote job growth in core areas well served by transit should be an important part of a comprehensive land use strategy to reduce VMT and emissions of air pollutants.

In addition to reduced air pollution, the benefits of focused development include reduced infrastructure costs, protection of open space and agricultural land, and encouraging vibrant communities with a strong retail tax base. Bay Area regional agencies are collaborating with local governments to promote infill development and identify priority development areas through the FOCUS program described in Chapter 3. But a stronger effort will likely be needed to build consensus in support of a sustainable plan for future Bay Area development in response to SB 375.

Senate Bill 375

Recognizing the importance of integrating land use, transportation, and climate protection planning, the State of California adopted SB 375 in fall 2008. SB 375 mandates that major metropolitan areas throughout California develop and implement integrated land use and transportation plans, known as "Sustainable Communities Strategies" or SCS, to achieve greenhouse gas reduction targets established by CARB. Programs to reduce on-road GHG emissions to meet SB 375 requirements will also result in reductions in ozone precursors, fine PM and air toxics.

The first Bay Area SCS must be developed and adopted by 2013. Development of the SCS is the primary responsibility of ABAG and MTC. However, the Air District can also play an important role in the development of the Bay Area SCS. The Air District for many years has worked with cities and counties on air quality issues, providing technical information and policy guidance, In addition, the Air District enjoys a strong working relationship with its regional agency partners; can exercise policy levers that influence new development, such as its CEQA guidelines and a forthcoming indirect source review regulation; and can provide technical expertise to ensure that the region and local jurisdictions pursue focused development in a way that protects public health.

Promoting Focused Development and Protecting Public Health

Promoting focused development in core areas of the region is essential in order to reduce emissions of criteria pollutants, air toxics and greenhouse gases from motor

[144] See March 2009 issue of *Urbanist*, published by the San Francisco Planning & Urban Research Association (SPUR).

vehicles, and thus achieve our air quality and climate protection goals. However, there is a potential tension, at least in the short term, between promoting focused development and protecting public health. Some areas that are well-suited for focused infill development, including areas designated as "priority development areas" by the region's FOCUS program, are in close proximity to heavily traveled roadways, industry, distribution centers, and ports. As a result, these areas currently experience high levels of emissions and/or population exposure to air pollutants on a localized level. To address this tension, Bay Area regional agencies and local governments will need to work together to nurture infill development that provides long-term benefits to the region as a whole, without exposing residents of the infill areas to undue exposure and health risk.

This issue was a key concern in developing the CAP control strategy. Building on the CARE program and the District's Clean Air Communities Initiative described in Chapter 3, the control strategy established the new category of Land Use and Local Impacts measures, as described above, to address this issue. See additional discussion in the "Reducing Impacts of Air Toxics in Local Communities" section in Chapter 5.

Pricing Strategies

While land use and community design are critical solutions over the long term, these strategies will take time to implement. To reduce motor vehicle emissions in the near term, pricing strategies are potentially the most effective tool. Motor vehicle travel imposes a variety of costs on society, including air pollution, that are not fully reflected in the price that drivers currently pay to own and operate a vehicle. There is widespread agreement among economists and planners that pricing policies could be a powerful means to reduce hidden subsidies that increase motor vehicle use, as well as to encourage more efficient use of our transportation systems.

There are a wide range of potential pricing policies and mechanisms, as described in TCM E-3. Both the conceptual framework and the technical capabilities to implement pricing measures are available, and real world examples have been successfully implemented for many pricing mechanisms. There are, however, significant differences among potential pricing policies in terms of their impacts on motor vehicle use and vehicle emissions, their socio-economic impacts, their revenue-generating potential, and their degree of political acceptability.

Pricing measures have, in fact, been indentified as important elements in Bay Area air quality and transportation plans for the past two decades, but relatively little progress has been achieved to date. No single agency has the resources and authority to develop and implement a pricing strategy on its own. The real challenge is how to develop and execute a clear strategy to implement transportation pricing in the Bay Area. As noted above, TCM E-3 calls for the Bay Area regional agencies to join forces to establish a regional pricing task force to develop a recommended regional transportation pricing

strategy and pursue implementation of the strategy. Forging support to implement transportation pricing policies will require political leadership, public outreach, and education, strategies to minimize impacts on low-income households, and coordination among the Bay Area's regional agencies and local jurisdictions.

Reducing Emissions from New Development

Although the Air District has no direct authority over land use decisions, the District can play an important role in helping to reduce the air quality and climate change impacts of new development and protect public health in impacted communities by means of indirect source review, CEQA, and guidelines for local land use plans (see LUMs 2, 3, and 4), as discussed below.

CEQA and Land Use Guidelines

The Air District is developing proposed revised guidelines and thresholds of significance for lead agencies to use in reviewing the air quality and greenhouse gas impacts of new projects under the California Environmental Quality Act (CEQA). The guidelines are intended to ensure that the appropriate level of environmental review occurs and that meaningful mitigation measures are implemented to reduce a project's emissions of criteria pollutants, air toxics, and greenhouse gases by:

- Adding the first-ever significance thresholds for GHGs;
- Adding a new threshold for localized PM2.5 impacts;
- Adding a new threshold for cumulative air toxics impacts;
- Recommending preparation of Community Risk Reduction Plans; and
- Recommending preparation of greenhouse gas reduction plans.

Air District staff will work closely with local agencies to help them implement the CEQA guidelines, and provide training and support in the use of the guidelines.

Indirect Source Review Regulation

Pursuant to Health & Safety Code Section 40716, air districts in California have authority to regulate emissions from indirect sources. The term "indirect source" refers to development that attracts or generates motor vehicle trips, such as housing, office parks, shopping centers, universities. As described in LUM 2, Air District staff will develop a proposal, for consideration by the District's Board of Directors, to adopt and implement an indirect source review regulation in order to reduce emissions associated with new or modified land use development. The rule may also achieve co-benefits by reducing emissions of greenhouse gases. The measure is intended to encourage projects to be sited, designed, and constructed so as to reduce construction and

operating emissions from motor vehicles as well as area sources, such as fireplaces, heating and cooling, and landscape maintenance equipment. In developing the ISR regulation, the Air District will work with its regional agency partners and local agencies to ensure that the regulation will serve to complement and support regional focused growth development programs.

Reducing Emissions from the Goods Movement Sector

Goods movement, a key function of the regional transportation system, is a critical component of the Bay Area economy. Nearly 40 percent of the region's economic output is in manufacturing, freight transportation, and the warehouse and distribution businesses, and goods movement accounts for over 10 percent of regional employment. The Port of Oakland is one of the nation's busiest container ports. Although cargo volumes are currently down due to the economic recession, projections show cargo volumes at the Port and throughout the region and state will grow significantly over the next 20 years. The Port of Oakland also plays an important role in supporting the state's agricultural sector, providing the primary means of transporting produce from the Central Valley to the Pacific Rim.

Despite its economic contributions, the goods movement sector is a significant source of air pollution, primarily PM and NOx. Exposure to diesel emissions from goods movement impacts the health of residents near ports, rail yards, distribution centers, and roads with high truck volumes. Diesel engines directly emit fine PM, and their NOx emissions contribute to formation of ozone and secondary PM2.5.

The 2010 CAP proposes a comprehensive strategy to reduce emissions and population exposure to diesel emissions, based upon the following principles:

- Promote greater efficiency and/or mode shift in order to move freight with less energy and fewer environmental impacts;
- Promote the use of the cleanest, most efficient mode of transportation (alternative fuels/ hybrid technologies);
- Ensure that any conventional vehicles and equipment used in goods movement are equipped with the most effective emission control systems available;
- Ensure that all vehicles and equipment used in goods movement are fully compliant with applicable State or federal regulations; and
- Encourage local land use decisions that do not expose sensitive populations to high levels of diesel emissions.

The CAP goods movement strategy will be implemented through a combination of actions. Key elements of the implementation include the following:

- Providing grants and incentives for the use of clean heavy-duty vehicles, as described in MSMs B-1, B-2, and B-3, and TCM B-4;

- Improving goods movement infrastructure in key corridors, as described in TCM B-4;
- Reducing local population exposure to diesel exhaust through enforcement, signage, and other measures described in LUM 1; and
- Pursuing partnerships with key stakeholders and promoting best practices to enhance efficiency and reduce emissions, as discussed in LUM 1.

Emission Reductions, Costs, and Benefits

Air District staff developed estimated emission reductions and implementation / compliance costs for the CAP control measures, as described below.[145] Per the requirements of the Health & Safety Code Section 40922, staff calculated the cost-effectiveness of control measures based upon reductions in ozone precursors (ROG and NOx). In addition, staff used the MPEM (described in Chapter 1) to estimate the public health and climate protection benefits of CAP control measures in monetary terms.

Emission Reductions: Air District staff estimated the emission reductions for all categories of control measures. In addition to ROG, NOx, and direct emissions of PM2.5, emission reductions were estimated, wherever possible, for SO2 and ammonia (precursors to secondary PM2.5 formation), the five air toxics addressed in the CAP, and the "Kyoto 6" greenhouse gases (CO2, methane, N2O, etc.).[146] Emission reductions could not be estimated for several control measures, either because the measure would not directly reduce emissions (e.g., LUM 5, LUM 6) or because additional analysis will be required during the rule development process (SSM 1, SSM 2, SSM 15, SSM 16, SSM 17, SSM 18).

Emissions reduction estimates for TCMs were calculated using CARB's most recent emissions inventory model, EMFAC2007, operating in the "BURDEN" mode. The BURDEN mode produces detailed reports on mobile source, on-road emissions at the county, air basin, and regional level, distributed by 13 distinct "speed bins" based upon time of day, which were forecast as a part of the Transportation 2035 travel forecasts.

The task of estimating emission reductions was complicated by the fact that the various control measures address a wide range of emissions sources and rely upon a diverse set of implementation mechanisms. In addition, many of the measures, especially measures that address land use, transportation pricing, and energy and climate, will rely heavily on partnerships and collaboration with other stakeholders, and/or preparation of guidance documents; it is difficult to quantify the emissions reductions for these measures. Because of these uncertainties, staff used relatively conservative emission

[145] MTC staff played a major role in developing emission reduction and cost estimates for the Transportation Control Measures.
[146] For some types of control measures, emission factors were not available for all pollutants.

reduction assumptions, so as not to over-estimate the reductions that the plan can deliver.

Analysis Years: Emissions reductions were estimated for years 2012 and 2020. The year 2012 was selected in order to evaluate the impact of control measures over the short-term, three-year horizon of the plan. However, because some measures will take longer to implement, 2020 was also selected to analyze longer term emissions reductions.

Costs: Many of the challenges in estimating emission reductions described above also apply in trying to estimate implementation costs for the various control measures. The types of the potential costs vary greatly among the measures. For stationary source measures, costs are based on the compliance cost to regulated industries. For many of the mobile source measures, costs are based on anticipated grants and incentives awarded by District programs and/or the incremental cost of cleaner, advanced-technology vehicles. For transportation control measures, there are various types of costs, depending upon the measure: e.g., capital costs to expand transit; costs to operate pubic outreach and information programs; or potential user fees as in the case of TCMs B-3, E-1, E-2, and E-3. It should also be noted that some measures that promote energy efficiency or the use of fuel-efficient engine technologies may provide significant user savings over the life of a project, which may offset or exceed the initial capital investments.

To provide additional information on cost impacts, the District also commissioned the preparation of a report entitled *Bay Area 2010 Clean Air Plan: Socio-Economic Analysis* to evaluate the potential impacts of control measures on regulated industries, public agencies, Bay Area households, and the regional economy as whole. Key findings of this report, which is available on the Air District website, include the following:

- The CAP control strategy as a whole will have a net positive economic impact on the Bay Area.
- Some regulated industries would potentially experience economic impacts if proposed rules are adopted, but compliance costs for proposed stationary source measures would not be deemed significant, based on the threshold defined in the report.
- The CAP control measures would not impose significant costs or unfunded mandates on local governments in the Bay Area.

For the proposed control measures that will be adopted as rules by the Air District Board of Directors, such as the stationary source measures and the Indirect Source Review regulation, additional analysis regarding potential costs and socio-economic impacts will be developed during the rule-making process for each measure.

Benefits: Evaluation of control measures has traditionally focused on the cost-effectiveness of measures in reducing ozone precursors, by dividing compliance costs by the tons of ROG and NOx reduced. However, for purposes of this plan, the Air District

also evaluated control measures on the basis of their potential to reduce multiple pollutants. In addition, using the multi-pollutant evaluation method (MPEM) described in Chapter 1, certain benefits of the various control measures have also been estimated; i.e., their potential to reduce negative health impacts, including premature mortality, and impacts related to climate change. It should be noted, however, that the MPEM does not fully consider all benefits related to improving air quality. Nor does the MPEM include other co-benefits for certain measures such as improved mobility, reduced traffic congestion, enhanced safety for pedestrians and bicyclists, reduced water pollution, etc.[147]

The 2010 CAP breaks new ground in attempting to quantify the benefits of control measures in monetary terms. From the standpoint of policy-making, Air District staff believes that it makes sense to consider health and climate protection benefits, in addition to compliance costs, in the evaluation of control measures.

The Air District estimates that, summing the benefits of the individual control measures, the control strategy as a whole will provide health and climate protection benefits with a monetary value in the range of $270 million to $1.5 billion per year, with a likely value on the order of $770 million per year. Roughly 80% of the estimated economic benefits from the CAP control measures can be attributed to reductions in PM2.5 (66% non-diesel PM2.5 and 14% diesel PM2.5). Reductions in greenhouse gases account for approximately 20% of the economic benefits.

As discussed in Chapter 1, there is uncertainty involved in the assumptions and methods incorporated in the MPEM. To address this issue, Air District staff has performed a MPEM Probability Analysis[148] to evaluate the uncertainty in the estimated benefits calculated by the MPEM. The Probability Analysis is used to find a range of likely values for each control measure and for the CAP control strategy as a whole, and to determine whether the differences in the estimated benefits of the various control measures are statistically significant. As described in the Probability Analysis, for each variable or parameter, a set of 1,000 values was simulated according to the appropriate distribution, resulting in 1,000 vectors of simulated parameter values. The methodology is designed so that, even though there may be considerable uncertainty in the estimated "bottom line" benefit for each of the control measures, it is possible to determine with confidence that the benefit for one measure is significantly greater than the benefit of

[147] The MPEM does not include all pollutants or all health effects, nor the benefits of improvements in air quality beyond the boundaries of the Air District due to reduced emissions in the Bay Area. Nor does it consider economic benefits such as reduced damage to agricultural crops and to property (tires, building surfaces, paints, etc.), the benefit of clean air for property values, tourism, ecosystems protection, water quality etc. Finally, the MPEM does not include the potential co-benefits of transportation measures such as improved transit service, reduced traffic accidents, etc.

[148] The MPEM Probability Analysis is available on the Resource and Technical Documents tab of the 2010 CAP web page at www.baaqmd.gov/Divisions/Planning-and-Research/Plans/Clean-Air-Plans/Resources.aspx.

another measure. An example comparing two control measures is provided in Section 6.1 of the Probability Analysis.

Summary of Emission Reductions, Costs, and Benefits: Table 4-8 shows the estimated emission reductions for ROG, NOx, PM2.5, and greenhouse gases (CO2-e), as well as:

- the estimated annual cost of each measure
- the cost-effectiveness in reducing ozone precursors (ROG & NOx reductions combined)
- the weighted cost-effectiveness based on MPEM weighting factors[149]
- estimated annual benefit in reducing health and climate-related impacts, and
- the ratio of estimated benefit to estimated cost

A more detailed version of this table which also shows estimated emission reductions for other pollutants, including ammonia, SO2, benzene, butadiene, acetaldehyde, formaldehyde, and methane is provided on the Resource and Technical Documents tab of the 2010 CAP web page.

[149] The weighted multi-pollutant cost-effectiveness is calculated by multiplying the estimated emission reductions for each pollutant by the MPEM weighting factor shown in Table 1-2, and then dividing the annual weighted emission reductions by the annual cost of the control measure.

Table 4-8. Emission reduction, cost, and benefit summary table.

DRAFT CONTROL STRATEGY EMISSIONS REDUCTIONS (tons per day)			ROG	NOx	PM2.5	CO2-e (See note #11)	Cost/Yr	C-E for ROG & NOx	Weighted Multi-Pollutant C-E	$ Benefit/Yr from MPEM
Stationary Source Measures		***Notes***								
SSM1	Metal Melting Facilities	2								
SSM2	Digital Printing	2								
SSM3	Livestock Waste		0.3000			65	$1,200,000	$11,000	$1,500	$1,126,000
SSM4	Natural Gas Processing	1,4	0.3000			120				$1,636,000
SSM5	Vacuum Trucks		6.0000				$21,900,000	$10,000	$10,000	$10,459,000
SSM6	General PM Weight Rate Limitation	1			0.2870					$47,811,000
SSM7	Open Burning		0.0400	0.0100	0.0900					$15,089,000
SSM8	Coke Calcining	1					$5,700,000		$760	$35,993,000
SSM9	Cement Kilns	1		4.3800			$2,800,000	$1,800	$1,100	$11,641,000
SSM10	Refinery Boilers & Heaters	1		2.9000						$7,709,000
SSM11	Residential Fan Type Furnaces	7		4.2000			$5,000,000	$3,300	$2,100	$11,163,000
SSM12	Large Space Heating	7		1.2000			$6,833,333	$15,600	$10,200	$3,191,000
SSM13	Dryers, Ovens, Kilns	1		0.2000			$570,000	$7,800	$5,100	$532,000
SSM14	Glass Furnaces			0.3800			$760,000	$5,500	$3,600	$1,197,000
SSM15	GHG in Permitting - Energy Efficiency	2								
SSM16	Revise Reg 2 Rule 2 NSR	2								
SSM17	Revise Reg 2 Rule 5 NSR TAC	2								
SSM18	Changes to Toxic Hot Spots Program	2								
	Stationary Source Subtotal		6.640	13.270	0.377	184.800				$147,547,000

Table 4-8 (continued). Emission reduction, cost, and benefit summary table.

DRAFT CONTROL STRATEGY EMISSIONS REDUCTIONS (tons per day)			ROG	NOx	PM2.5	CO2-e (See note #11)	Cost/Yr	C-E for ROG & NOx	Weighted Multi-Pollutant C-E	$ Benefit/Yr from MPEM
Mobile Source Measures		***Notes***								
MSM A-1	Promote Clean Fuel Efficient Vehicles		0.0500	0.0300	0.0050	0.0001	$10,000,000	$342,000	$48,000	$1,005,000
MSM A-2	Zero Emissions Vehicles & Plug-In Hybrids		0.0100	0.0100	0.0050	0.0001	$14,400,000	$1,973,000	$78,000	$883,000
MSM A-3	Green Fleets		0.0200	0.0200	0.0200	0.0002	$550,000	$38,000	$800	$3,422,000
MSM A-4	Reduce High-Emitting Vehicles		4.3700	2.0600	0.0200	44.1425	$333,000	$140	$80	$17,279,000
MSM B-1	HDV Fleet Modernization		0.1000	5.0000	0.0330	0.6390	$58,333,000	$31,000	$9,300	$30,042,000
MSM B-2	Software/Catalytic Convertors			0.9900			$12,500,000	$35,000	$23,000	$2,632,000
MSM B-3	Efficient Drive Trains		0.0100	0.2900	0.0095	0.2274	$6,667,000	$61,000	$13,300	$2,374,000
MSM C-1	Construction & Farming Equipment		0.0400	0.7200	0.0190		$2,400,000	$9,000	$2,200	$5,149,000
MSM C-2	Lawn & Garden Equipment		0.0400	0.0090	0.0060	0.0008	$2,000,000	$112,000	$8,700	$94,000
MSM C-3	Recreational Vessels		0.0600	0.0090	0.0090	0.4156	$1,000,000	$40,000	$2,900	$1,632,000
	Mobile Source Subtotal		4.700	9.138	0.127	45.426				$64,511,000
Transportation Control Measures		***Notes***								
TCM A-1	Improve Local & Area-Wide Bus Service		0.0279	0.0316	0.0010	23	$340,433,000	$15,670,000	$1,018,000	$617,000
TCM A-2	Improve Local & Regional Rail Service	3	0.1386	0.1520	0.0280	516	$1,200,000,000	$11,315,000	$165,000	$12,430,000
TCM B-1	Implement Freeway Performance Initiative		0.9216	3.3150	0.1190	2,451	$51,667,000	$33,000	$1,500	$54,387,000

Table 4-8 (continued). Emission reduction, cost, and benefit summary table.

DRAFT CONTROL STRATEGY EMISSIONS REDUCTIONS (tons per day)			ROG	NOx	PM2.5	CO2-e (See note #11)	Cost/Yr	C-E for ROG & NOx	Weighted Multi-Pollutant C-E	$ Benefit/Yr from MPEM
Transportation Control Measures		***Notes***								
TCM B-2	Improve Transit Efficiency & Use		0.0039	0.0045	0.0003	6.13	$25,667,000	$8,377,000	$296,000	$152,000
TCM B-3	Bay Area Express Lane Network		0.8603	1.3617	0.2750	1,892	$108,000,000	$133,000	$3,400	$70,685,000
TCM B-4	Goods Movement Improvements	1	0.5850	4.8175	0.0613	4,045	$40,000,000	$20,000	$700	$82,172,000
TCM C-1	Voluntary Employer Trip Reduction		0.0761	0.0943	0.0040	97	$3,600,000	$88,000	$4,100	$2,240,000
TCM C-2	Safe Routes to School and Transit		0.0084	0.0082	0.0004	8.18244	$13,333,000	$3,361,000	$172,000	$211,000
TCM C-3	Promote Rideshare Services		0.0837	0.1051	0.0080	153	$5,667,000	$125,000	$4,000	$3,808,000
TCM C-4	Public Outreach and Education		0.0200	0.0200	0.0020	40.42	$4,333,333	$297,000	$7,600	$981,000
TCM C-5	Smart Driving/Speed Moderation		0.0744	0.1683	0.0090	180	$1,000,000	$11,000	$400	$3,753,000
TCM D-1	Improve Bicycle Access and Facilities		0.0037	0.0041	0.0002	4.44	$1,500,000	$527,000	$24,000	$110,000
TCM D-2	Improve Pedestrian Access and Facilities		0.0028	0.0020	0.0001	1.76	$40,000	$23,000	$1,500	$49,000
TCM D-3	Support Local Land Use Strategies		0.2418	0.3111	0.1450	873.63	$5,866,667	$29,000	$400	$36,598,000
TCM E-1	Value Pricing Strategies		0.0000	0.0105	0.0030	9.87	$26,000,000	$6,784,100	$107,300	$733,000
TCM E-2	Parking Pricing & Management Strategies		0.1800	0.1882	0.0164	294	$1,478,171,000	$10,996,900	$354,000	$7,268,000
TCM E-3	Implement Transportation Pricing Reform		0.1152	0.1204	0.0105	188	$471,143,000	$5,478,100	$165,000	$5,561,000
	TCM Subtotal		3.343	10.714	0.683	10,783.543				$281,755,000

Table 4-8 (continued). Emission reduction, cost, and benefit summary table.

DRAFT CONTROL STRATEGY EMISSIONS REDUCTIONS (tons per day)			ROG	NOx	PM2.5	CO2-e (See note #11)	Cost/Yr	C-E for ROG & NOx	Weighted Multi-Pollutant C-E	$ Benefit/Yr from MPEM
Land Use Measures		***Notes***								
LUM1	Goods Movement		0.0120	1.7188	0.2207	2,561	$1,449,000	$2,000		$65,101,000
LUM2	Indirect Source Review Rule		0.3020	0.2441	0.1076	340	$1,412,000	$7,100	$100	$52,864,000
LUM3	Enhanced CEQA Program	1	0.4400	0.3500	0.1600	447				$76,216,000
LUM4	Land Use Guidelines		0.0774	0.0810	0.0070	139				$2,805,000
LUM5	Reduce Risk in Impacted Communities	2								
LUM6	Enhanced Air Quality Monitoring	2								
	LUM Subtotal		0.831	2.394	0.495	3,487.504				$196,986,000
Energy and Climate Measures		***Notes***								
ECM1	Energy Efficiency	1	0.05	0.52		543.06	-$20,086,000	-$97,000	-$1,100	$65,906,000
ECM2	Renewable Energy	1	0.000004	0.000049		0.056488	$11,392,000	$584,159,000	$6,273,000	$6,000
ECM3	Urban Heat Island Mitigation		0.002	0.025		30	-$39,649,000	-$4,023,000	-$42,600	$3,137,000
ECM4	Tree Planting		0.0050	0.072000		76	$71,049,000	$2,528,000	$27,000	$9,093,000
	ECM Subtotal		0.0570	0.6170		649.5099				$78,142,000
Total for All Measures			15.5718	36.1334	2.0611	15,151				$768,942,000

Notes:

1. These emission reductions are estimates for year 2020. No information available for year 2012.
2. At this time, emission reductions cannot be determined for this control measure.
3. Emission reductions and costs are for year 2020.
4. Control Measure SSM-4 presents emission reductions as a range between 6 and 9 TOG. The most conservative reduction is represented here.
5. Unable to calculate costs for this measure.
6. CO2-e includes the "Kyoto 6" greenhouse gases (including CO2, methane, and N2O) weighted by their global warming potential.
7. Estimated NOx reductions for this measure represent reductions that will be achieved upon full implementation of the measure. Full implementation is not anticipated until year 2030 or 2040.

Implementing the CAP Control Strategy

Stationary source measures in the 2010 CAP, along with LUM 2 (Indirect Source Review Regulation), will be developed and adopted through the District's rule development process, as described below. The other types of control measures (MSMs, TCMs, LUMs, and ECMs) will be implemented via a variety of mechanisms, including partnerships, grants and incentives, public outreach, developing guidance documents for local agencies, etc. The specific mechanisms for each control measure are specified in the "Implementation Actions" section of the control measures descriptions provided in Volume II.

Progress in implementing the MSMs, TCMs, LUMs, and ECMs will depend upon the availability of resources among the many parties who have a role in implementing the control measures, as well as success in further enhancing existing partnerships among regional agencies, local governments, the business community, community groups, and other stakeholders. In particular, significant resources will be needed on the part of the Air District and/or other partners to implement measures such as an indirect source review regulation, an enhanced CEQA program, land use guidelines for local agencies, urban heat island mitigation, and assisting local governments in the development of Community Risk Reduction Plans and climate action plans.

Summary of the Air District's Rule Development Process for Stationary Source Measures

The Air District goes through a detailed process to adopt rules and regulations to impose standards on and limit emissions from stationary and area sources in the Bay Area. The legal authority for these regulations and many of the requirements that establish the process are found in the California Health and Safety Code.[83] The Air District follows a set of guiding principles for the rule development program:

- Strengthen and refine rules to do a better job of protecting the public health, environment and economy of the Bay Area
- Meet environmental goals in the most efficient and effective manner
- Respect all different points of view and knowledge
- Identify stakeholders with an interest in the outcome of our regulations
- Provide businesses maximum flexibility to meet air quality goals in a way that works best for them, allowing them to be cleaner at a lower cost

Air District staff undertakes a rigorous process to prepare a new rule or rule amendment for consideration by the Board of Directors. Following is a brief summary of the steps involved in developing a new or modified rule:

[83] See e.g. California Health and Safety Code § 40702, 40703, 40725 *et seq.*

- **Internal Scoping Meeting**: Staff conducts an internal meeting to discuss an identified air pollution problem, including divisions that may have relevant expertise. For example, the source test and laboratory departments in the Technical Services Division have input on appropriate test methods to create enforceable standards.
- **Technical Assessment Memorandum**: Staff performs an analysis of the various options for addressing the problem, including technology available to achieve controls, cost effectiveness, and potential environmental impacts. A technical assessment memorandum may precede or may be derived from a control measure.
- **Stakeholders Meetings:** Staff conducts meetings with the affected businesses and other interested parties to discuss issues, exchange information, and ensure effective communication among the various parties. In some cases stakeholder meetings precede and assist in development of technical assessment memoranda.
- **Initial Draft of the Proposed Rule:** After technical assessment, stakeholders meetings, and consultation with affected parties, if staff determines that a new rule or rule amendment is warranted, the District develops a draft rule.
- **Workshops**: Staff conducts one or more public meetings for each new rule or rule modification so that all affected and interested parties can discuss, comment on, and ask questions about a proposed rule.
- **CEQA Determination:** As a draft rule is developed, a CEQA (California Environmental Quality Act) analysis is prepared to determine whether a rule or rule amendment might have any adverse environmental impacts.
- **Socioeconomic Impact Analysis:** Staff researches and prepares cost estimates for implementation of the control strategy and calculates cost effectiveness on a dollars/ton of emissions reduced basis. An analysis of the socioeconomic impact of the rule proposal is prepared to assess the impact of the costs of the rule on the impacted industry and the Bay Area economy, including jobs.
- **Staff Report:** The results of the CEQA determination and socioeconomic analysis are incorporated into a staff report. The staff report explains the technical basis for the rule. It contains emission estimates, a description of the industry, control requirements, as well as rule amendments, costs, incremental costs, impacts on Air District staff resources, and the rule development process, and makes legal findings necessary for rule adoption. Comments and responses on the rule proposal and on the CEQA analysis are also included.
- **Public Hearing:** Staff presents the rule or amendments to the Air District's Board of Directors at one of the Board's regularly scheduled meetings. These meetings are always open to the public, and notice is provided 30 days in advance. Anyone may comment on the proposed rule or amendments during the meeting. At the conclusion of the hearing, the Board decides whether to adopt the rule or amendments.

Subsequent to rule adoption by the Board, staff implements the rule by preparing inspection protocols, policies, and procedures and issuing compliance advisories to notify affected parties of the rule and compliance dates. Staff also forward the rule to CARB and, if appropriate, prepare a State Implementation Plan (SIP) submittal to EPA.

Rule Adoption Schedule

Table 4-9 shows the proposed schedule for rule adoption during 2010, 2011, and 2012. Factors that were considered in developing this schedule include the estimated emission reduction benefit of each measure, the potential of measures to reduce localized health risks and impacts, the expected amount of time required to complete the rule development process for each measure based on data needs and other technical factors, as well as the need for participation in the rule development process by affected and interested parties.

Consistent with the CAP's emphasis on protecting public health, the proposed rule adoption schedule places high priority on developing regulations that reduce emissions of PM 2.5, as well as air toxics in impacted communities.

The schedule is as expeditious as practicable. Any particular control measure may be advanced or delayed based on information discovered in the rule development process or Air District staff allocation priorities. Also, during the rule development process, it may be determined that a measure may not provide sufficient emission reductions to warrant regulation or may not be cost effective.

Table 4-9. Rule adoption schedule, 2010-2012.

2010 Regulatory Agenda		
CM #	Control Measure (Regulation and Rule)	ER Potential
SSM 1	Metal Melting Facilities	TBD PM [1]
SSM 5	Vacuum Trucks	6.0 tpd ROG
SSM 6	General Particulate Matter (Reg. 6-1)	2.87 PM
SSM 9	Cement Kilns	4.38 tpd NOx [2]
SSM 10	NOx from Petroleum Refinery Boilers and Heaters (Reg. 9-10)	2.9 tpd NOx
SSM 17	New Source Review for Toxic Air Contaminants (Reg. 2-5)	n/a [4]

2011 Regulatory Agenda		
CM #	Control Measure (Regulation and Rule)	ER Potential
SSM 4	Natural Gas Production and Distribution (Reg. 8-37)	0.3 – 0.4 tpd ROG [3]
SSM 7	Open Burning	0.04 ROG
SSM 8	Petroleum Coke Calcining	2.6 tpd SO2
SSM 11	NOx from Residential Fan Furnaces (Reg. 9-4)	4.2 tpd NOx
SSM 12	NOx from Large Residential and Commercial Space Heating	1.2 tpd NOx
SSM 18	Air Toxics Hot Spots	TBD
LUM 2	Indirect Source Review Rule	0.3 ROG, 0.24 NOx, 0.47 PM10 [2]

Table 4-9 (continued). Rule adoption schedule, 2010-2012.

2012 Regulatory Agenda		
CM #	Control Measure (Regulation and Rule)	ER Potential
SSM 2	Digital Printing	TBD ROG
SSM 3	Livestock Waste	0.3 tpd ROG [3]
SSM 13	NOx from Dryers, Ovens and Kilns	0.2 tpd NOx
SSM 14	NOx from Glass Furnaces (Reg. 9-12)	0.38 tpd NOx
SSM 15	GHG in Permitting	n/a [4]
SSM 16	New Source Review for PM2.5	n/a [4]

1 Control Measure would also reduce toxic air contaminants.
2 Control Measure would also reduce toxic air contaminants, SOx and PM.
3 Control Measure would also reduce methane, a potent greenhouse gas.
4 New Source Review and permitting decisions mitigate emissions from future sources; consequently, no reductions from baseline are projected.

Chapter 5 – Summary and Looking Forward

The 2010 CAP updates the state ozone plan for the Bay Area and also applies a multi-pollutant framework to develop an integrated control strategy to:

- Attain air quality standards;
- Protect public health; and
- Protect the climate.

This chapter summarizes how the CAP fulfills the goals and objectives described in Chapter 1.

Updating the Bay Area's State Ozone Plan

The 2010 CAP serves as the triennial update to the Bay Area ozone plan for state air quality planning purposes, pursuant to the requirements of the California Health & Safety Code. Key requirements are that the plan must include all feasible control measures and must mitigate the transport of ozone and its precursors to neighboring air basins. A complete description of state air quality planning requirements and how the 2010 CAP fulfills all requirements is provided in Appendix C, State Air Quality Planning Requirements.

CAP Performance Objectives

As described in Chapter 1, the CAP defines numerical performance objectives related to the goals of protecting public health and protecting the climate. The CAP performance objectives are as follows:

- Reduce PM2.5 exposure by 10% by 2015
- Reduce diesel PM exposure by 85% by 2020
- Reduce GHG emissions to 1990 levels by 2020 and 40% below 1990 by 2035

PM2.5 performance objective: The PM2.5 performance objective is based on the estimated reduction in ambient PM2.5 concentrations needed to achieve the federal 24-hour PM2.5 standard. Air District staff believes that this health-based standard is the most appropriate benchmark to use as the basis for the PM2.5 performance objective. However, analysis performed for the CAP, as discussed both in Chapter 1 and in Appendix A, points to PM2.5 as the air pollutant that poses the greatest health risk to Bay Area residents. Furthermore, epidemiological research suggests that there may be health effects from PM2.5 levels below the current federal standards. Therefore, Air District staff recognize the need to make all feasible efforts to reduce PM emissions and exposure to the greatest extent possible.

Diesel PM performance objective: In the case of the diesel PM objective, EPA and CARB set emissions standards for most diesel engines, including trucks, buses, construction equipment, harbor craft, etc. For the past decade, CARB has been adopting and implementing ambitious air toxics control measures (ATCMs) to reduce emissions from all types of diesel engines, both new and existing, with a goal of reducing diesel PM by 85% by 2020. To implement recent changes in State law intended to address the current severe economic recession, CARB has modified compliance timelines for the construction equipment diesel ATCM (i.e., the in-use off-road diesel vehicle regulation). CARB is currently also considering changes to the requirements for in-use on-road trucks and further changes to the in-use off-road diesel vehicle regulation, to account for emission reductions occurring due to the current economic downturn. However, none of the recent or proposed changes to the in-use off-road and in-use on-road regulations would result in fewer reductions of diesel PM by 2020. Combined diesel emissions from all sources should still ultimately be reduced by 85%, although achievement of this objective may not occur by 2020. Nevertheless, the Bay Area should still see a very significant reduction in diesel PM emissions.

In support of the desired 85% reduction of diesel PM emissions by 2020, the Air District will continue to aggressively implement its effort to reduce diesel PM emissions and exposure via enhanced monitoring and analysis of impacted communities, targeted enforcement of CARB regulations in impacted communities, and targeting its grant programs to projects in impacted communities.

GHG performance objective: The CAP GHG performance objective is based on state goals articulated in AB 32 and the Governor's Executive Order S-3-05. The analysis described in Appendix G indicates that additional measures will be needed to achieve the CAP GHG performance objective, beyond the measures defined and quantified in the CARB AB 32 Scoping Plan and the 2010 CAP. The additional reductions may be obtained via some combination of future actions at the state level, the Sustainable Communities Strategy that will be developed by Bay Area regional agencies in cooperation with local governments pursuant to SB 375, local climate action plans, future Air District actions, and voluntary actions by Bay Area residents and businesses. All these efforts will be vitally important in reducing the region's GHG emissions, but their potential impact cannot yet be quantified.

How CAP Performs Relative to Performance Objectives: Air District staff performed an analysis, described in Appendix G, as to how well the CAP, in combination with state measures to reduce these pollutants, will achieve these performance objectives. [84] This analysis finds that the Bay Area will reach the performance objective to reduce PM2.5

[84] Since it is difficult to accurately measure population exposure to PM, our analysis of progress in meeting the PM2.5 and diesel PM performance objectives uses emissions reductions as a surrogate for reducing population exposure.

by 10% by 2015, but that it will fall short of the diesel PM and the greenhouse gas reduction objectives.

Multi-Pollutant Planning

Chapter 1 presented the rationale for the Air District's decision to expand the scope of the 2010 CAP as a multi-pollutant plan. Because little or no guidance is yet available on how to prepare a multi-pollutant plan, the Air District grappled with fundamental questions about the scope and content of such a plan. Nonetheless, the effort to devise a multi-pollutant plan did yield tangible results and achievements, including:

- Development, for the first time, of an integrated control strategy to reduce ozone, PM, air toxics, and greenhouse gases in the Bay Area;
- Evaluation of co-benefits and trade-offs among pollutants in analyzing potential control measures; and
- Development of a powerful analytic tool, the Multi-Pollutant Evaluation Method (MPEM), to compare the relative benefits of reducing the various pollutants, and to estimate in dollar terms the health and climate protection benefits of each control measure.

Multi-Pollutant Planning: Future Enhancements and Directions

In developing the Multi-Pollutant Evaluation Method and preparing the CAP, the District made use of the best technical data and tools at its disposal: emissions inventory data, monitoring data, air quality modeling results, and public health data. The effort to develop a multi-pollutant plan and create the MPEM helped Air District staff to understand both the strengths and limitations of its current tools and information, and to identify areas for future improvements.[85]

The experience of developing a multi-pollutant plan should provide on-going benefit to the Air District in the years to come. Developing a multi-pollutant plan has motivated Air District staff to analyze air quality issues from a broader perspective, and to consider, if not yet fully resolve, the many technical and policy issues that multi-pollutant planning raises. From this perspective, the process of developing the plan has been just as valuable as the plan itself. Ideally, the 2010 CAP can serve as a platform for introducing a multi-pollutant perspective into the full spectrum of Air District programs and the District's overall approach to air quality and climate protection. For example, looking forward, the Air District may explore the idea of applying a multi-pollutant framework in programs such as stationary source permitting, New Source Review, and Best Available Control Technology (BACT). However, any move in this direction would

[85] Plans to develop an integrated platform for multi-pollutant air quality modeling are described in Appendix E. Potential enhancements to the MPEM are described in Section 6 of the MPEM Technical Document (June 2009).

require serious analysis of the technical and policy implications, and would likely entail revisions in state and federal laws and guidelines.

The Bay Area 2010 Clean Air Plan represents an effort to demonstrate that multi-pollutant planning is both feasible and worthwhile. The Air District hopes that this plan provides a useful example that other agencies, including US EPA, CARB, and other air districts, can build upon to advance the multi-pollutant approach to air quality planning.

Protecting Public Health

Protecting public health is a core element of the Air District's mission, and a key objective of the 2010 CAP. The CAP builds upon on-going Air District efforts to identify and protect impacted communities through the CARE program and Clean Air Communities Initiative. Key ways that public health is addressed in the CAP include:

- Developing a control strategy to reduce PM, air toxics, and greenhouse gases, in addition to ozone;
- Establishing numerical performance objectives for reducing population exposure to PM2.5 and diesel PM;
- Developing a Multi-Pollutant Evaluation Method to quantify the health benefits of potential control measures and express these benefits in monetary terms;
- Analyzing the overall health burden of air pollution on Bay Area residents, and comparing the past burden to the current burden;
- Comparing the health benefit of reducing the various air pollutants, to help guide policy-making;
- Explaining how climate change threatens to increase air pollution and damage public health;
- Emphasizing reductions in population exposure and health impacts, both at the regional scale and in localized communities, in developing the measures that comprise the CAP control strategy;
- Prioritizing measures that will provide the greatest public health benefit in the rule-making calendar for stationary source measures; and
- Creating a new category of Land Use & Local Impact Measures. These measures focus on reducing local exposures, recognize the need for additional monitoring and risk assessment in impacted communities, and highlight the need to protect public health as the region promotes focused development.

The Importance of Reducing PM

As discussed in Chapter 1 and in Appendix A, exposure to PM2.5 poses the greatest public health risk from air pollution in the Bay Area. There has been a great deal of focus in recent years on the need to reduce emissions of diesel PM. However, analysis of the relative health risk associated with air pollutants in the Bay Area highlights the importance of reducing emissions and ambient concentrations of types of fine

particulate matter, including direct emissions of PM2.5, as well as precursors that contribute to the secondary formation of PM2.5. Residential wood-burning is a major source of PM in winter months. The Air District's program to reduce residential wood-burning in winter months, described in Chapter 3, is an important means of reducing PM concentrations and population exposure to wood smoke, and a critical element of the effort to attain state and national PM standards.

Because of the health risks related to PM, measures that reduce PM have been given high priority in the implementation schedule for CAP control measures. The CAP control strategy includes several measures to further reduce direct PM emissions from stationary sources, including SSM 6 to increase the stringency of the general PM weight rate limitation, SSM 7 to amend the open burning regulation, and SSM 16 to amend the New Source Review rule to reduce PM. In addition, many of the other SSMs, such as SSM 8 (coke calcining) and SSM 9 (cement kilns), will reduce emissions of NOx, SO2, or ammonia, which are precursors to the secondary formation of PM.

In terms of reducing PM from mobile sources, the Air District already operates the Vehicle Buy-Back Program to accelerate the retirement of old vehicles, and the Smoking Vehicle Program, as well as grant programs such as the Carl Moyer Program and Low Emission School Bus Program. The District will continue to operate and enhance these programs, as described in the Mobile Source Measures in the CAP control strategy. In addition, the Air District will help to enforce CARB regulations to reduce emissions from heavy-duty easel engines by means of its Mobile Source Compliance Program described in Chapter 3.

All TCMs in the CAP that reduce motor vehicle travel should also reduce PM emissions. Measures in the CAP that should be especially effective in reducing PM emissions from mobile sources include MSMs A-4, B-1, B-2, B-3, and C-1, as well as TCM B-4 and LUM 1, both of which address goods movement. Development of a new Indirect Source Review regulation (see LUM 2), as well as the District's revised CEQA guidelines (see LUM 3), which establish thresholds of significance for local PM2.5 impacts, will provide important mechanisms to limit PM emissions from new development.

The CAP also describes several Further Study Measures, including FSM 7 (to reduce SO2 from refinery processes), FSM 10 (commercial cooking), FSM 11 (magnet source measure), and FSM 12 (wood smoke), all of which may provide opportunities for additional PM reductions.

Reducing Impacts of Air Toxics in Local Communities

The Air District and its partners must also continue to reduce population exposure to air toxics to protect public health. Reducing local impacts of air pollutants in the most heavily impacted communities, especially those communities identified by the CARE program, will continue to be a major focus of Air District efforts in the years to come.

Reducing diesel PM must continue to be a high priority. Analysis performed for the Air District's CARE program indicates that diesel PM is by far the leading air toxic in the Bay Area in terms of cancer risk, both at the regional scale and in the most impacted communities. Recent regulations to reduce emissions from heavy-duty diesel engines in trucks, cargo-handling equipment, construction machinery, and other equipment will greatly reduce emissions of diesel PM over the next 5-10 years. Building on regulations adopted pursuant to CARB's Diesel Risk Reduction Program, the Air District will work with all concerned stakeholders, including regional agencies, local cities, community groups, county health officers, and industry to analyze potential risks and develop effective mitigation measures to reduce population exposure to diesel PM and other air toxics.

As described in Chapter 3, the Air District has been striving to protect public health in recent years through programs such as the CARE Program, the Clean Air Communities Initiative, and the Goods Movement Emission Reduction Program to reduce emissions from port drayage trucks. Building on these efforts, the CAP control strategy includes measures to reduce population exposure to PM and to air toxics, and emphasizes the need to improve the Air District's ability to track cumulative risks in impacted communities and to enhance air quality monitoring capabilities at the local scale.

Protecting public health in impacted communities is a complex issue. Most of the health risk in these communities is due to emissions from mobile sources generated by freeways and major arterials, ports, distribution centers, etc. The region's transportation and goods movement infrastructure is well established and cannot easily be relocated. Although CARB regulations will greatly reduce emissions from diesel engines over the next 5-10 years, some of the benefit of these regulations may be offset by the projected increase in goods movement activity, as well as the overall volume of motor vehicle traffic, in future years. Reducing emissions and exposures in impacted communities will require a sustained effort based upon promoting cleaner and more efficient vehicles and equipment, ensuring full compliance with regulations to reduce emissions from mobile sources, sound land use planning and site-design, and site-specific mitigation measures.

In conjunction with proposed revisions to its CEQA Guidelines, the Air District is encouraging local governments to develop Community Risk Reduction Plans. Such plans are potentially one of the most effective ways to reduce overall health risk in impacted communities, because they provide an opportunity to develop a comprehensive strategy to reduce population exposure and health risk on a community-wide basis, while taking account of local needs and priorities regarding community development.

Protecting the Climate

Protecting the climate is another key objective of the 2010 CAP. There are many compelling reasons to protect the climate and combat global warming, but from the standpoint of the Air District's mission, the primary reason is to protect our hard-won improvements in air quality. The CAP addresses climate protection by:

- Explaining that air quality and climate change are closely related, and that higher temperatures are expected to exacerbate air quality problems;
- Incorporating the State of California GHG reduction targets in the CAP performance objectives;
- Including the estimated social benefit of GHG emissions reductions in the Multi-Pollutant Evaluation Method; and
- Considering the potential reduction (or increase) of GHG emissions, and their estimated monetary value, in evaluating the benefits of CAP control measures.

Protecting air quality is the Air District's core mission. From this perspective, the best way to protect air quality and the climate is to develop control measures that simultaneously reduce both traditional air pollutants as well as greenhouse gases. All measures in the CAP control strategy that reduce fossil fuel consumption by decreasing motor vehicle use, by promoting the use of fuel-efficient vehicles, or by other means of improving energy efficiency, should help to reduce GHG emissions.

In addition, many measures in the control strategy will have the additional benefit of reducing short-lived climate forcers, such as black carbon, methane and hydroflourocarbons (HFCs). For example, measures that reduce fine PM, by limiting burning and by reducing diesel PM, will also reduce the production of black carbon. The lifespan of these climate forcers in the atmosphere is relatively short (days to weeks, compared to over 100 years for CO2), so they do not accumulate in the atmosphere like CO2 does. However, because they are potent GHGs with high global warming potential, reducing emissions of these short-lived climate forcers can have an immediate impact in terms of reducing global warming.

The CAP also proposes control measures that will help to reduce GHG emissions from stationary sources, including

- SSM 3: Livestock Waste (methane)
- SSM 4: Natural Gas Processing & Distribution (methane)
- SSM 15: Greenhouse Gases in Permitting (CO2)

In addition, the CAP contains new Energy and Climate Measures, including two measures to reduce GHGs from the energy sector, and two measures that focus on offsetting or mitigating temperature increases.

- ECM 1: Energy Efficiency (CO2)
- ECM 2: Renewable Energy (CO2)

- ECM 3: Urban Heat Island Mitigation
- ECM 4: Tree-planting

The CAP also includes two important measures that will reduce emissions of greenhouse gases from new development: CEQA Guidelines and Indirect Source Review. Finally, the CAP includes, as a further study measure (FSM 18), the concept of levying a greenhouse gas fee on stationary source to promote energy efficiency and reduce GHG emissions.

CEQA Guidelines: As described in LUM 3, the Air District expects to issue revised CEQA Guidelines in 2010, including new and revised thresholds of significance. The current staff proposal includes new thresholds of significance for greenhouse gas emissions; if adopted, the proposed GHG thresholds would be the most comprehensive and stringent thresholds of any air district in California, and would place the Bay Area at the forefront of the effort to reduce GHG emissions from new development.

Indirect Source Review (ISR) Regulation: As described in LUM 2, the CAP includes a measure to develop and implement an Indirect Source Review regulation to reduce emissions of criteria pollutants from new development. This regulation is expected to provide reductions in GHG emissions as a co-benefit. The ISR regulation will be developed in consultation with regional agencies partners, local governments, and other interested stakeholders. Whereas the CEQA guidelines will rely on implementation by local lead agencies, the ISR regulation would be implemented by the Air District as the lead agency, and would be structured to complement the CEQA Guidelines.

In addition to reducing GHGs through the CAP control strategy, the Air District will continue to facilitate the implementation of the state's AB 32 Scoping Plan. The District will contribute to the implementation of AB 32 in the following ways:

- Using its experience and expertise in regulation and rule enforcement to help CARB implement AB 32 climate measures that target GHGs from stationary sources;
- Working with regional agencies and cities and counties to promote land use development that minimizes energy use and motor vehicle travel; and
- Encouraging actions by local government and other Bay Area stakeholders to facilitate implementation of AB 32 by organizing meetings such as the Air District's 2006 and 2009 regional climate protection summits; providing incentives, such as the Climate Protection Grant Program; and providing technical expertise, such as its local government GHG inventory workshop series.

Looking Forward

Clean air, healthy communities, and a stable climate are essential to the continued vitality and economic strength of the Bay Area. As the Air District's first multi-pollutant plan, the 2010 Clean Air Plan provides a comprehensive strategy to improve air quality, protect public health in all Bay Area communities, and protect the climate. The CAP

anticipates and responds to the challenges and opportunities that the Bay Area will face in coming years, emphasizing the need to promote energy efficiency, to reduce motor vehicle use, and to promote focused development as key long-term solutions.

The 2010 CAP is designed to complement a broader set of plans and programs adopted and implemented by CARB, US EPA, regional agency partners, and local governments, as well as voluntary actions on the part of the business community, non-profit organizations, and Bay Area residents. Successful implementation of the CAP control strategy will require internal and external resources, public support, and partnerships and collaboration among many agencies and stakeholders.

To fulfill its objectives of attaining air quality standards, protecting public health, and protecting the climate, the Air District will implement the CAP control strategy; enhance its multi-pollutant planning capabilities; continue and expand its efforts to reduce health risk in impacted communities; engage local governments and stakeholders to promote focused development in a way that protects public health; and refine and strengthen its efforts to reduce emissions of greenhouse gases.

To build upon this plan in future years, the Air District will continue its efforts to achieve the CAP goals and to build its multi-pollutant planning capacity by:

- Developing an integrated emissions inventory that includes all pollutants;
- Developing an integrated air quality modeling platform;
- Enhancing the Multi-Pollutant Evaluation Method developed for the 2010 CAP to include a wider range of pollutants and health effects;
- Enhancing its capacities to measure and analyze ambient concentrations and population exposure in impacted communities;
- Developing better measurements of population exposure to pollutants on a region-wide basis;
- Evaluating the potential benefits and policy and technical issues related to extending the risk-weighted multi-pollutant approach to programs such as stationary source permitting and New Source Review; and
- Better integrating strategies to reduce criteria pollutants and greenhouse gases.

The Air District elected to develop the 2010 CAP as a multi-pollutant plan as a matter of choice. However, future challenges are likely to make multi-pollutant planning a necessity in years to come. In addition to serving as a blueprint for the Bay Area, the Air District offers the 2010 CAP as one example of a multi-pollutant plan that other agencies can build on to advance this concept.

Chapter 6 – Source Documents

BAAQMD documents

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Appendix A – Bay Area Air Pollution Burden: Past & Present

Analysis of trends in monitoring data shows that in recent decades Bay Area air quality has improved dramatically. This has been accomplished even as regional population, the number of motor vehicles and miles driven, and the value of the region's economic production have grown significantly. Our progress in improving air quality is due to a comprehensive program to reduce emissions from both stationary and mobile sources of air pollutants.

The purpose of this analysis is to estimate the health and social impacts of air pollution in the Bay Area today compared with the earliest period for which reliable ambient air quality measurements were available. To facilitate comparison between earlier years and today, we have calculated the benefit of pollutant reductions based upon the current Bay Area population. That is, the health burden is analyzed as if today's population were exposed to the pollution levels that prevailed in earlier years, and then compared that to the health burden associated with current air pollution levels.

The good news is that exposure to unhealthy concentrations of local air pollutants in the Bay Area - ozone, particulate matter (PM), and air toxics - and hence their health effects, have been reduced by more than half since the 1970 Clean Air Act was enacted.[86] However, despite this progress, a variety of health effects, including premature mortality, are still associated with exposure to air pollution in the Bay Area today, and these health effects result in direct and indirect economic impacts to the region that are valued in billions of dollars per year.

Methodology

The analysis presented here is based upon a methodology which is described in detail in the Air District's *Multi-Pollutant Evaluation Method Technical Document* (MPEM).[87] The MPEM by necessity incorporates many assumptions and approximations; these are described in the *MPEM Technical Document*. For example, for purposes of estimating population exposure to pollutants, the MPEM assumes "backyard" exposure; i.e., that people are at home and outside in their yards 24 hours a day, 7 days a week. Because the MPEM is a complex methodology, the estimates of social benefits that it generates

[86] By contrast, emissions of greenhouse gases that contribute to global warming have increased significantly during this period. However, after years of steady increase, emissions of greenhouse gases should begin to decline in California in coming years as a result of AB 32 and regulations that will be adopted to implement the Air Resources Board's AB 32 Climate Change Scoping Plan.

[87] See Draft Multi-Pollutant Evaluation Method Technical Document at www.baaqmd.gov/Divisions/Planning-and-Research/Plans/Clean-Air-Plans/Resources.aspx.

are subject to considerable uncertainty. To address this uncertainty, Air District staff performed a probability analysis of MPEM results.[88]

Air Toxics

The air toxic health effects considered here are limited to cancer. The Air District and CARB began regular air toxics monitoring in the late 1980s. However, some toxics such as formaldehyde and acetaldehyde were not monitored until several years later. Except for diesel PM, estimates were made of the annual mean for the earliest year available and for 2008.

Diesel PM, the air toxic with the greatest health impact, cannot presently be measured directly. Indirect estimates were made for recent years using elemental carbon measurements for various Air District sites. For earlier years, Coefficient of Haze measurements[89] were used. The Addendum below presents details of which toxics were considered and how the risks were calculated.

Ozone

The Air District has monitored ozone since the 1950s and since 1968 has had a spatially dense set of ozone measurements. These measurements were used to estimate population exposure for 2008 and what the exposure would have been if the ozone levels had not been reduced since 1970. For purposes of this analysis, we assumed that ozone health effects occurred for hourly ozone concentrations at or above 50 parts per billion (ppb), but not below.

$PM_{2.5}$

$PM_{2.5}$ consists of many components, some man-made, some natural. The health burden of $PM_{2.5}$ was based on the amount of anthropogenic (man-made) $PM_{2.5}$, subtracting natural background $PM_{2.5}$ (sea salt, windblown dust, etc.) which is estimated to average about 3 micro-grams per cubic meter ($\mu g/m^3$). $PM_{2.5}$ has been measured routinely only since 1999. To estimate $PM_{2.5}$ concentrations prior to 1999, other PM measurements made since the late 1980s and early 1990s were used to approximate $PM_{2.5}$ concentrations in 1990. The Addendum provides details of how this was done.

[88] District staff performed an uncertainty analysis based upon the Monte Carlo method to evaluate the MPEM calculations for each control measure, as described in the MPEM Probability Analysis which is posted on the 2010 CAP page on the District website: www.BAAQMD.gov.

[89] Coefficient of Haze (COH) was a measurement of PM that is highly correlated with elemental carbon (EC). A regression relation was established between COH measurements and EC from the few Air District sites with simultaneous measurements of both.

Diesel PM is a key component of $PM_{2.5}$ and warrants separate treatment. Therefore, anthropogenic $PM_{2.5}$ is divided into diesel PM and non-diesel PM. Diesel PM cannot be measured directly, but is approximated from other measurements. See the Addendum below for details.

Health Summary

Figure A-1 shows the number of cases of selected health effects that are related to population exposure to current Bay Area air pollution levels (2008, labeled "now") compared to the estimated number of cases that would have occurred if the quantifiable air quality improvements had not been made (labeled "then"). The “then” data is based on the earliest data available – 1970 for ozone, and the late 1980s for toxics and PM.

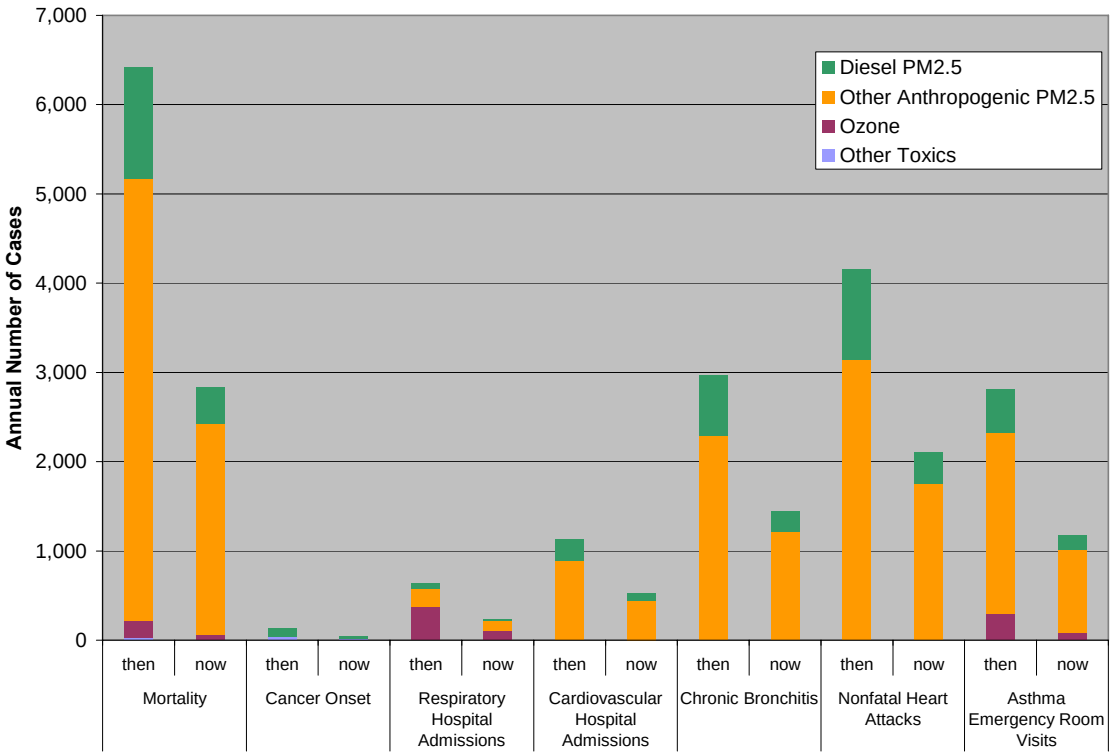

Figure A-1. Incidence of selected health effects among Bay Area residents from air pollution today versus without air quality improvements. "Then" is 1970 for ozone, and the late 1980s for toxics and PM2.5. "Now" is 2008.

Table A-1 shows the reduction in the estimated number of annual cases; i.e., the difference between “then” and “now” for each of the health effects shown in Figure A-1. Table A-1 provides the “best estimate” as well as the lower bound (10th

percentile) and upper bound (90th percentile) for an 80% confidence interval. The range of values is provided in Table A-1 in order to emphasize that all the health effects figures provided in this analysis are estimates; the numbers in this analysis are intended to convey a sense of overall trends and relative magnitudes, but they are not precise figures.

Table A-1. Reductions in annual cases, "then" to "now" including an 80% confidence interval.

	Mortality	Cancer Onset	Respiratory Hospital Admissions	Cardiovascular Hospital Admissions	Chronic Bronchitis	Nonfatal Heart Attacks	Asthma Emergency Room Visits
Best Estimate	3,600	90	200	700	1,900	2,700	1,400
10th Percentile	1,400	40	100	500	600	1,300	900
90th Percentile	6,400	170	300	900	3,000	3,800	1,900

Figure A-1 shows that the annual numbers of health effects associated with exposure to air pollutants in the Bay Area has dropped dramatically, by more than half. Of particular interest, premature mortality related to air pollution has decreased from an estimated 6,400 per year to an estimated 2,800 per year. For purposes of comparison, the total number of annual deaths in the Bay Area is about 45,000, and the annual number of transportation-related deaths in the Bay Area is 600 to 700.

Life expectancy is widely regarded as an indicator of the overall health of a given population. Life expectancy measures the average number of years a baby born today would live given the present distribution of age-specific probabilities of death. Premature mortality is a measure of unfulfilled life expectancy. The reduction in mortality risk as shown in Figure A-1 and Table A-1 can be expressed in terms of increased life expectancy. Over the past 20 years, Bay Area life expectancy has increased by almost 5 years, from 75.7 in 1990 to 80.5 today, due to a variety of factors. Of the overall increase in life expectancy during this period, we estimate that the improvements in air quality can be credited with extending average life expectancy in the Bay Area by 6 months. Thus, approximately 10% of the improvement in Bay Area average life expectancy over the past decade and a half can be attributed to cleaner air. (See Addendum below for details.)

The vast majority of the mortality risk related to air pollution is correlated with exposure to fine particulate matter ($PM_{2.5}$), shown as the combination of diesel $PM_{2.5}$ and other anthropogenic $PM_{2.5}$ in Figure A-1. Several robust epidemiological studies have shown that $PM_{2.5}$ concentrations in a given area affect the death rate. The studies are based on data sets where the health and health-relevant information for a set of people from different areas has been collected for an extended period. These records allow the estimation of mortality rates for various areas, where the rates are adjusted for key factors such as age, gender, smoking, and obesity. The adjusted death rate for each

area is compared with the average PM concentrations in the area, showing clear correlations.

After reviewing the literature, we use a risk factor based on the assumption that every 1.0 $\mu g/m^3$ reduction in $PM_{2.5}$ concentration results in a 1% reduction in mortality rate for individuals over 30 years old.[90] For the MPEM, the change in premature mortality from $PM_{2.5}$ was calculated by estimating the percentage change in mortality from a given change in $PM_{2.5}$ concentration and applying that to the annual deaths to persons over 30 years old. Currently, Bay Area $PM_{2.5}$ concentrations average about 9.5 $\mu g/m^3$, or about 6.5 $\mu g/m^3$ above natural background levels. Thus, we estimate that total elimination of anthropogenic $PM_{2.5}$ would reduce the death rate by about 6.5% for those over 30, or about 2,800 deaths per year.

Although research is still on-going to determine the precise biological mechanisms through which $PM_{2.5}$ is associated with increased mortality, it appears that cardiovascular problems, such as heart attacks, are the leading cause (EPA 2009). Although diesel PM is the leading air toxic in the Bay Area, it should be noted that perhaps only 10-20% of these PM-related deaths are linked to diesel exhaust. Other sources of PM, such as wood smoke, cooking, and secondary formation of PM from precursors such as NOx, SO2, and ammonia, collectively account for most of the ambient PM, and PM-related mortality, in the Bay Area. To the extent that diesel PM does contribute to premature mortality, it appears to be primarily due to the mechanisms mentioned above. Cancer accounts for a smaller number of total deaths related to air pollution. The total annual number of cancer deaths, including lung cancer, related to exposure to diesel PM in the Bay Area, is approximately 80-90 per year. Thus, mortality related to exposure to fine PM (including diesel particles) appears to be associated much more with cardiovascular problems than with cancer.

Summary of Costs and Disbenefits

Air pollution imposes costs on society in terms of public health, the environment, and the economy. Approximations can be made for the direct costs of treatment for pollution-related health effects, as well as indirect costs based upon people's willingness to pay to avoid those health effects. Table A-2 presents a list of health effects and the estimated dollar value of these effects on a per-case basis. For greenhouse gases, we use an estimate of $28 per metric ton of CO2-equivalent emitted for the overall social cost of anticipated impacts of climate change. Chapter 5 of the MPEM Technical Document provides more detailed explanations for these cost estimates.

[90] The key study serving as the basis of our estimate is the *Expanded expert judgment assessment of the concentration-response relationship between $PM_{2.5}$ exposure and mortality*, prepared for OAQPS-EPA by Industrial Economics Inc, September 21, 2006. A summary of this study is provided in Roman, HA et al., *Environ. Sci. Tech.* 2008, *42*, 2268-2274.

Figure A-2 summarizes the figures for health burden associated with exposure to ozone, $PM_{2.5}$, and air toxics, and also the social cost of GHG emissions. The cost estimates in Figure A-2 are based upon individual case values shown in Table A-1. Note that the data in Figure A-2 is based upon a wider range of health effects than the subset of health effects portrayed in Figure A-1 above. In each case, estimates for the earliest reliable period are compared with the present. The data in Figure A-2 indicates that, in aggregate, annual health and social costs have declined by roughly 50%, from approximately $50 billion to approximately $24 billion per year. It should be emphasized that the numbers in Figure A-2 are estimates only; they should not be seen as precise values. Nonetheless, we can conclude with a high degree of confidence that the benefits of air pollution reductions run in the billions of dollars annually.

Table A-2. Estimated dollar value per case for key health effects related to Bay Area air pollution.

Health Effect	Unit Value (Cost per Incident, 2009 dollars)
Mortality (all ages)	$6,900,000
Chronic Bronchitis Onset	$409,189
Respiratory Hospital Admissions	Age 65 < : $35,228 Age 65 > : $33,375
Cardiovascular Hospital Admissions	Age 65 < : $43,889 Age 65 > : $38,759
Non-Fatal Heart Attacks	$84,076
Asthma Emergency Room Visits	$468
Acute Bronchitis Episodes	$534, for a 6 day illness period
Upper Respiratory Symptom Days	$35
Lower Respiratory Symptom Days	$22
Work Loss Days	Daily Median Wage by County ($168 to $243)
School Absence Days	$91
Minor Restricted Activity Days	$61
Cancer	$1,750,000
Greenhouse Gases	$28 per metric ton ($CO_2$ equivalent)

In contrast to ozone, PM, and air toxics, emissions of GHGs have risen steadily since 1980. The estimated costs presented in Figure A-2 are a few billion dollars a year, but this represents a median estimate, not an upper bound. The potential effects from global warming could be catastrophic.

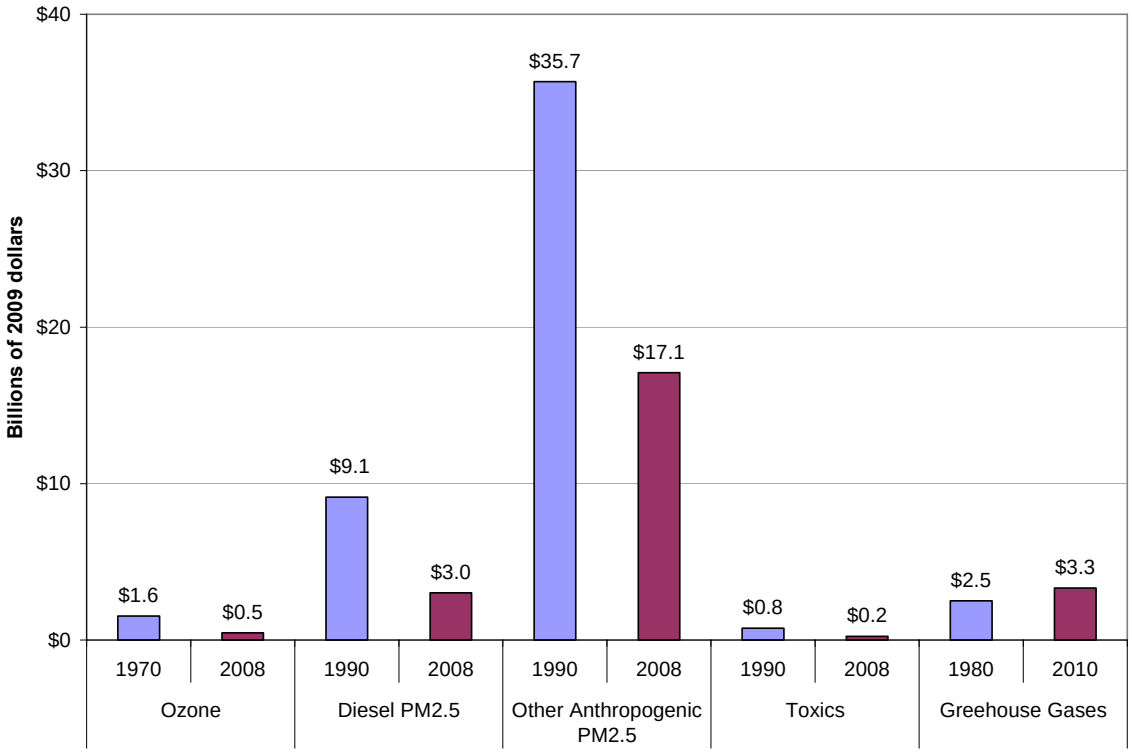

Figure A-2. Estimated current annual health and other social costs of Bay Area air pollution: prior years compared to 2008.

Summary of Key Findings

The analysis described in this appendix indicates that, due to improved air quality in the Bay Area, annual health effects, and the related social and economic cost of these health effects, have declined by at least 50% over the past several decades. The estimated number of premature deaths related to air pollution in the Bay Area decreased from approximately 6,400 per year in 1990 to about 2,800 per year in 2008. The reduction in premature mortality related to air pollution over the past two decades has contributed to an increase in average life expectancy. We estimate that improved air quality has extended average life expectancy on the order of six months per Bay Area resident. However, despite this substantial progress, Bay Area residents continue to experience significant health effects from exposure to air pollution. These health effects impose on-going costs to the individuals who experience these impacts and to the region as a whole.

Additional detail describing the methodology used in this analysis is provided in the Addendum below.

Addendum to Appendix A

Air Toxics

Table A-3 shows the estimated annual means for the carcinogenic toxics that the Air District or CARB measures. These are annual, District-wide means. The earliest available means are presented along with the means for 2008 (or the most recent available year).

The table also shows the cancer risk factors and the lifetime risks from each of the toxics. To facilitate comparison, the arithmetic mean for each toxic was linearly interpolated or extrapolated to 1990. We assume exposure is spatially constant, that is, that all Bay Area residents are exposed to the mean concentration of each toxic. The lifetime risk from these 1990 concentrations is shown in the table compared with the risk for 2008. The reductions in risk are shown in the last column. With the exception of carbon tetrachloride,[91] the reductions are statistically significant. The overall reduction in risk has been 69%, i.e., two-thirds.

Table A-3. Estimated annual mean values of carcinogenic toxics & lifetime risk factors.

	1st year	Most recent year	Estimated Annual Bay Area Mean (μg/m^3)		Lifetime Risk per million per ug/m3	Lifetime Risk per million Bay Area Residents		
Compound			Earliest	2008		1990	2008	Reduction
Diesel	1987	2008	3.50	1.06	300.0	933.2	318.0	66%
Benzene	1987	2008	1.80	0.23	29.0	146.1	20.9	86%
1,3-butadiene	1989	2008	0.37	0.04	170.0	131.5	14.0	89%
Formaldehyde	1996	2008	2.11	1.37	6.0	18.2	10.1	44%
Acetaldehyde	1996	2008	0.84	0.69	2.7	4.5	3.4	25%
Carbon tetrachloride	1987	2006	0.10	0.10	42.0	27.0	26.2	3%
Methylene dichloride	1987	2006	0.83	0.31	1.0	2.6	1.1	59%
Perchloroethylene	1987	2008	0.39	0.02	5.9	13.1	0.7	95%
PAHs (risk-weighted)	1995	2004	0.15	0.09	1320.0	0.2	0.1	57%
Hexavalent chromium	1991	2006	0.28	0.07	150000.0	43.3	10.9	75%
Lifetime cancer risk	1990	2006				1318.7	405.3	69%

Figure A-3 compares lifetime cancer risk from air toxics in the Bay Area for 1990 versus 2008 on a cases per million population basis. The estimated number of lifetime cases has declined from approximately 1,300 per million people to approximately 400 per million, a decrease of roughly 70% over this relatively short time period.

[91] The use of carbon tetrachloride was banned in the United States in 1996. It has a long atmospheric residence time. Thus, the concentrations experienced in the Bay Area derive from a persistent global background.

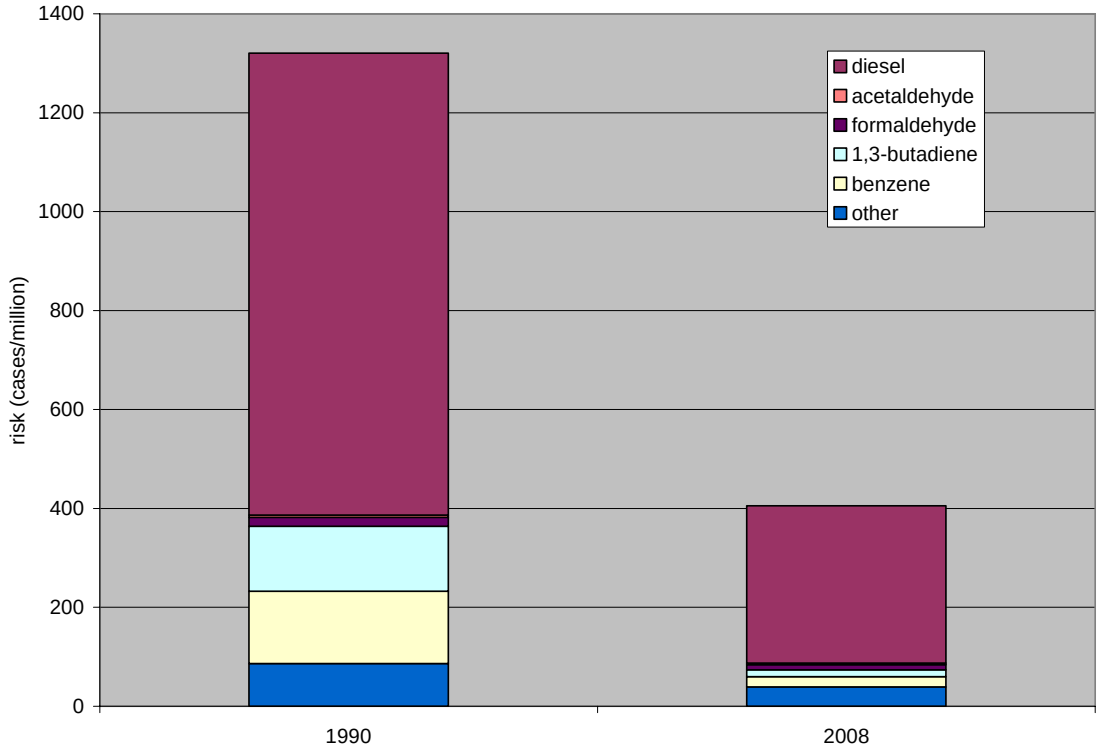

Figure A-3. Lifetime cancer risk per million people from air toxics in the Bay Area: 1990 versus 2008.

Ozone

For this analysis, 50 ppb was used as the ozone health effects threshold; that is, we assume that health effects may occur above 50 ppb.[92] Daily maximum 1-hour ozone values were interpolated to each census tract and any excess above 50 ppb was multiplied times the (year 2000) population for the tract. This was done for every year from 1968 to 2008. Five-year annual averages of these values were computed for 1968-1972 and 2004-2008, and the results summed for each county. The MPEM health effects were then calculated using present population data.

Figure A-4 shows the results. Overall, there has been a significant reduction in the health burden related to ozone. This includes an estimated reduction of 134 deaths per year, from 193 in the 1968-72 period to 59 in the 2004-08 period. There is still a substantial impact from ozone today, but exposure to high concentrations has been reduced by more than two-thirds since 1970. Compared to an annual cost of less than

[92] The decision to use an ozone health effects threshold of 50 ppb is based on several health studies. In their ozone health benefit analysis, Ostro et al. (2006) stated "…no clear threshold for effects has been reported…" They used their estimate of 40 ppb for ozone background as their threshold. In this analysis for the 2010 CAP, we use a somewhat higher concentration at the upper end of background ozone levels.

$500 million for the 2004-2008 period, the impact of ozone in the 1968-72 period would have been almost $1.6 billion for today's population in 2009 dollars.

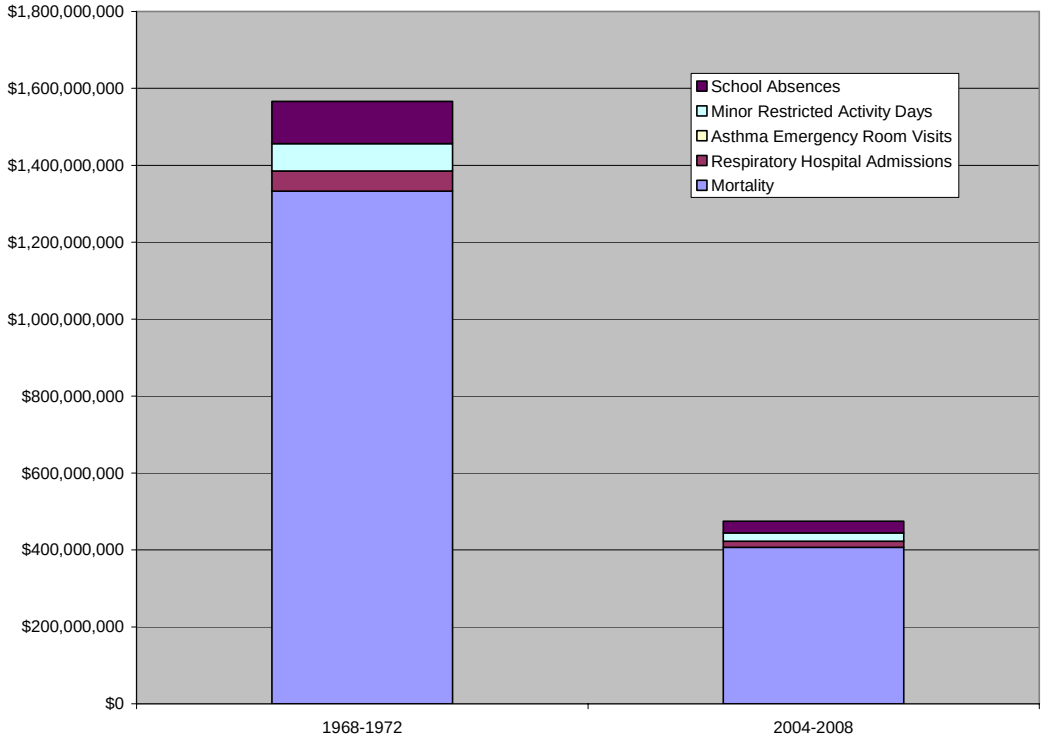

Figure A-4. Estimated health burden from exposure of Bay Area residents to ozone: 1968-72 v. 2004-08.

$PM_{2.5}$

This section explains how we analyzed the trend in anthropogenic $PM_{2.5}$. Estimating $PM_{2.5}$ trends is more complex than analyzing ozone and toxics trends for several reasons. Total $PM_{2.5}$ has been measured routinely only since 1999, so analyzing $PM_{2.5}$ trends prior to 1999 required using other measurements. Analysis of $PM_{2.5}$ is also complicated by the fact that it consists of many components, some man-made, some natural. Thus, we need to analyze the various components, as explained below. And finally, diesel PM, one of the key components of $PM_{2.5}$, cannot be measured directly; as explained in the Diesel $PM_{2.5}$ section below, it must therefore be estimated using elemental carbon as a proxy.

In what follows, we attempt to estimate $PM_{2.5}$ trends since the late 1980s by analyzing the trends in the major components of $PM_{2.5}$ – nitrate, sulfate and carbonaceous $PM_{2.5}$. Nitrate and sulfate have been measured since the early 1990s. Coefficient of Haze (COH), a key measurement which is well-correlated with total carbon, was measured for decades; however, COH measurements ended in 2002. We also have PM10

measurements starting in 1987. $PM_{2.5}$ trends are equivalent to the average of trends in its components.

Table A-4 summarizes the trend information available for these different PM components. Because the PM2.5 measurements have only been available since 1999, whereas the COH measurements were unavailable after 2002, the table shows Bay Area mean concentrations for three periods: (A), the earliest available 5-year periods for PM_{10}, sulfate and nitrate, and parallel years for COH; (B), the earliest 3-year period for $PM_{2.5}$; and (C), the most recent data available. Averages were either 3- or 5-year, a longer period chosen to compensate for fewer data points.

Table A-4. Annual Bay Area mean concentrations (µg/m3 except coefficient of haze units for COH) for various PM measurements in 3 periods.

	Period			Annual Reduction %	
	A	B	C	A to B	B to C
	1988-92	2000-02			
COH	3.81	1.46		8.4%	
		2000-02	2004-08		
total carbon		6.39	5.24		3.9%
	1990-94	2000-02	2003-07		
PM10 nitrate	2.91	1.75	1.41	5.5%	5.2%
	1991-95	2000-02	2003-07		
PM10 sulfate	1.96	1.86	1.60	0.7%	3.7%
	1988-92	2000-02	2003-07		
PM10	31.41	22.57	19.21	3.0%	4.0%
		2000-02	2006-08		
PM2.5		11.94	9.47		3.8%

The last two columns show annual reductions.[93] Consider the reductions from period B to period C first, because $PM_{2.5}$ measurements are available as a benchmark. During this time, there was a reduction in $PM_{2.5}$ of 3.8% per year. This is a lower bound for the annual reduction in anthropogenic $PM_{2.5}$, however, because a fraction of the $PM_{2.5}$ is natural background. Thus, for example, if the background $PM_{2.5}$ were 3 $\mu g/m^3$ then the reduction in anthropogenic $PM_{2.5}$ would have been from 11.94 – 3 to 9.47 – 3 or 5.2%.

The major components of $PM_{2.5}$ – nitrate, sulfate and carbonaceous $PM_{2.5}$ – were all reduced by similar amounts from B to C, as was PM_{10}. Note that both sulfate and carbon have natural background: the former from marine air, the latter from forest fires

[93] Computed as follows: If x1 is the concentration in period A and x2 is the concentration in period B and there are y years between them, then the annual reduction was calculated by 1-(x2/x1)^(1/y). For example, PM2.5 went from x1 = 11.94 to x2 = 9.47 in 6 years (2001 to 2007), so the annual reduction is 1-(9.47/11.94)^(1/6) = .0379, or about 3.8%.

and secondary biogenic carbonaceous $PM_{2.5}$. Nitrate, with little natural background was reduced by a larger amount. Thus, the anthropogenic part of these components was reduced by more than 3.8%, consistent with the result for $PM_{2.5}$ as a whole.

The annual nitrate reductions from period A to period B were also around 5% per year, but there was little reduction in sulfate. The 3% annual reduction in PM_{10} was somewhat less than the 4% annual reduction since 2000. But the annual reduction in COH was large, 8.4% annually. Considered as a surrogate for carbonaceous $PM_{2.5}$, it suggests there were major reductions in this component.

Combining this information suggests that the assumption that anthropogenic $PM_{2.5}$ was reduced by 4% per year from 1990 through 2000 is, if anything, somewhat conservative.

To estimate natural background, we have measurements from two coastal national parks – Point Reyes and Redwood, in northern California. Mean annual $PM_{2.5}$ measurements were 5.5 $\mu g/m^3$ for Point Reyes and 3 $\mu g/m^3$ for Redwood National Park from data for 2005-06. At least 1 $\mu g/m^3$ of the difference is a greater Point Reyes ship component.

Taking the lower figure, 3 $\mu g/m^3$, as an estimate of natural background $PM_{2.5}$ and assuming that the reduction in anthropogenic $PM_{2.5}$ was 4% per year, this suggests the 1990 Bay Area mean $PM_{2.5}$ concentration from anthropogenic sources was about 14 $\mu g/m^3$.

Currently, the Bay Area mean $PM_{2.5}$ concentration is about 9.5 $\mu g/m^3$, so the anthropogenic component is about 6.5 $\mu g/m^3$ or somewhat less than half of what it was in 1990. Figure A-5 shows the estimated impact in dollars of $PM_{2.5}$ for 1990 and 2008. The figure is dominated by the costs of mortality; premature mortality is valued at $6.9 million per case, as explained in Chapter 5 of the MPEM Technical Document. Annual estimated deaths in 1990 were 6,200, dropping to about 2,800 annually in 2008.

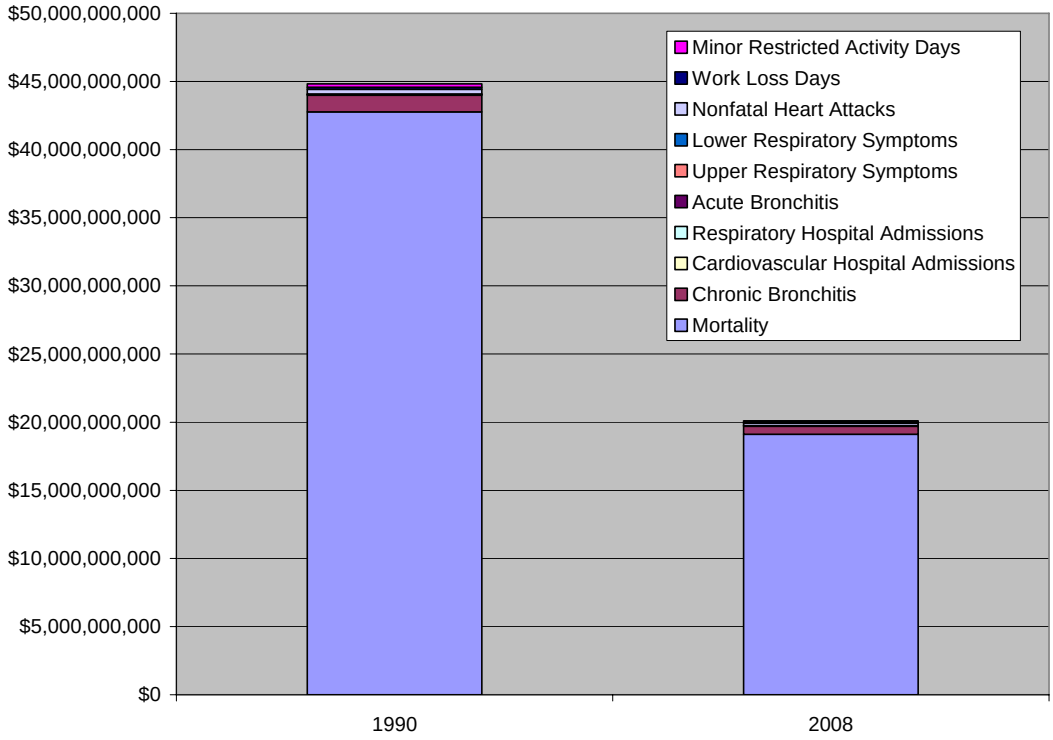

Figure A-5. Estimated annual health burden from PM2.5 exposure of Bay Area residents, 1990 vs. 2008.

Diesel $PM_{2.5}$

Diesel $PM_{2.5}$ cannot be measured directly. Soot, or elemental carbon (EC), is the main constituent, and this has been measured. Roughly 70% of diesel PM is EC and roughly 70% of EC derives from diesel. Thus, to a first approximation, EC concentrations are an estimate of diesel concentrations.

The District has made extensive EC measurements since mid-2004. Figure A-6 shows annual means for site-years with sufficient data in each quarter. Overall, EC concentrations average about 1 $\mu g/m^3$ in populated areas. Point Reyes measurements, from a network of National Park sites, are close to zero, indicating that marine background EC concentrations are very low.

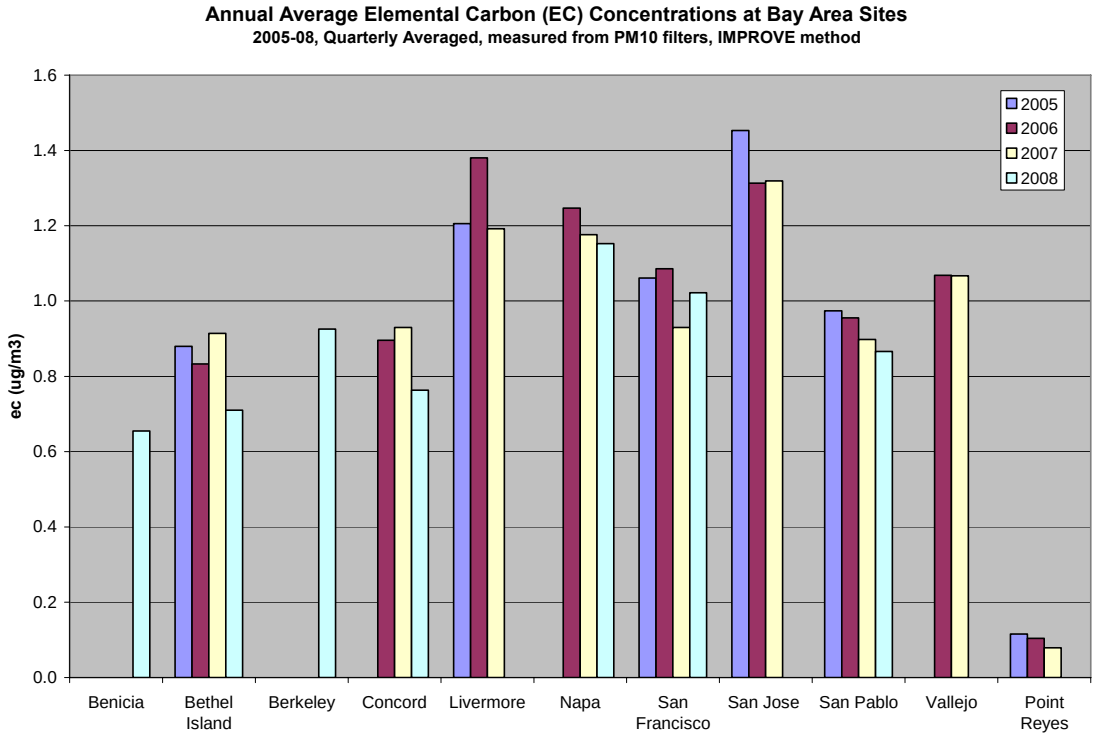

Figure A-6. Annual mean elemental carbon concentrations at Bay Area sites, 2005-08.

There is also data from the toxics modeling conducted for the CARE program, which included diesel. An analysis of concentrations for 2005 yielded a population-weighted diesel concentration of 1.3 $\mu g/m^3$.

To combine these to produce a single estimate, we note that the modeled estimate has the advantage of representing the Bay Area population, but is based on December and July, not the full year. Also, uncertainties in emissions and the modeling process itself cause significant uncertainties in the concentration estimates.

To provide an estimate of earlier diesel concentrations we rely on long-term measurements made with COH instruments. COH measurements are well-correlated with EC as noted earlier. An analysis comparing the measurements at several sites yielded a composite formula: EC = 0.75*COH.

District COH measurements have been collected for many years, with an extensive set commencing in 1967-68. These measurements continued through 2003, when COH monitoring was terminated for most District sites. There were 7 sites with measurements for most of the period and these were used to establish trends.

Figure A-7 shows annual COH means for these sites for years when sufficient data were available. Also shown with a thicker line is a 3-year moving average of these sites. The figure shows an increase in COH from the mid-1970s through 1990 then, starting in

1990, a steady downward trend. The reduction from 1990 to 2003 was large – a factor of 3 - with average COH reduced from 4.0 to 1.3. Applying the formula, this suggests a reduction in EC from 0.75*4 = 3 μg/m^3 to 0.75*1.3 = 1 μg/m^3. Thus, we conclude that average diesel concentrations were reduced from 3 μg/m^3 to 1 μ g/m^3 between 1990 and 2000.

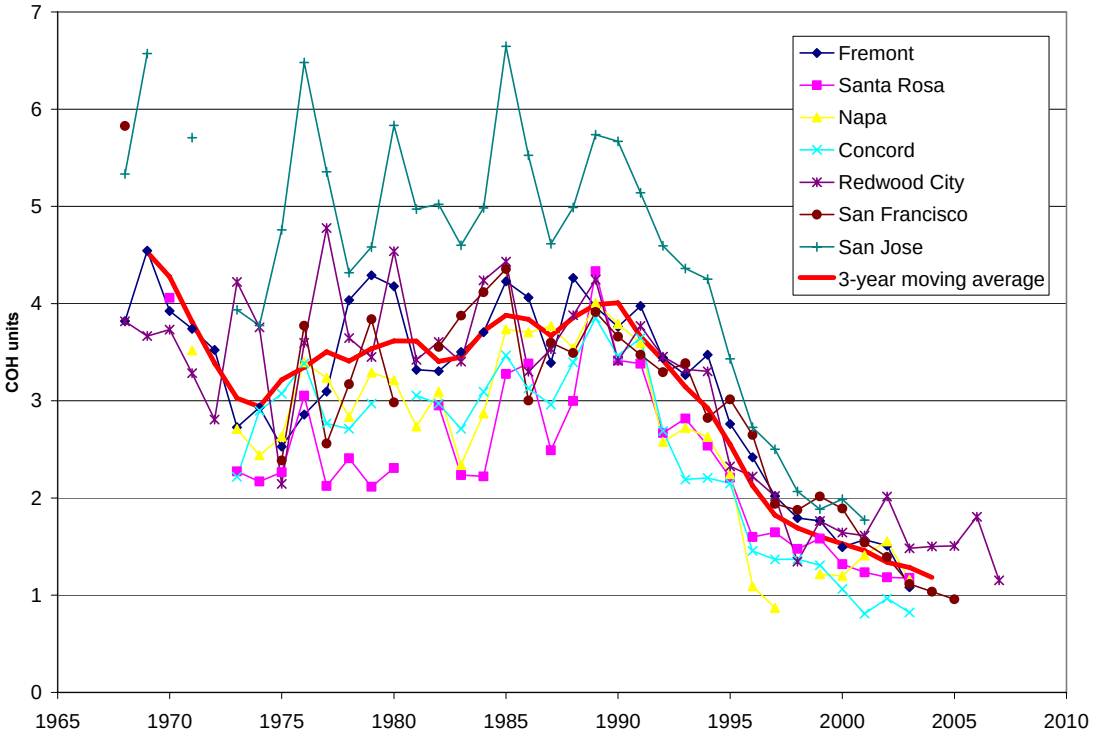

Figure A-7. Annual mean COH measurements for site-years with sufficient data in each quarter. A 3-year moving average is computed from all the measurements within a window of year y-1 to year y+1.

These estimates contain uncertainties. COH is not perfectly correlated with EC which, in turn, is not equal to diesel exhaust. Nevertheless, we believe that the estimates are a reasonable first approximation. For the burden analysis we assume that the current average diesel contribution is 1 μg/m^3 out of the anthropogenic total of 6.5 μg/m^3, and its 1990 contribution was 3 μg/m^3 out of an anthropogenic total of 14 μg/m^3.

Life Expectancy

Figure A-1 above shows that without the air quality improvements that have occurred over the last few decades, there would have been 6,400 deaths per year due to air pollution versus the current 2,800. But this difference would not necessarily be reflected in the raw death rate, because the lower probability of death from air

pollution would cause people to live longer, resulting in an older population. Life expectancy can more accurately express the difference in raw death rates. This section compares Bay Area life expectancy today with that of 1990, and what part the reduction in air pollution may have played.

Computing life expectancies requires population and death data by age. We used individual California mortality data from 1989 through 2007. From this the number of deaths by age of Bay Area residents for 1989-91 and 2005-07 was compiled. Age-specific population data was available from the California Department of Finance. Combining these, and using the National Center for Health Statistics approach,[94] we estimated the probability of death at each age for 1990 and 2006.

Figure A-8 shows the results on a log scale. The probability of death has been reduced from 1990 to 2006 at every age. The population-weighted reduction is 40%, so that the probability of dying at a given age today is about 60% of what it was in 1990.

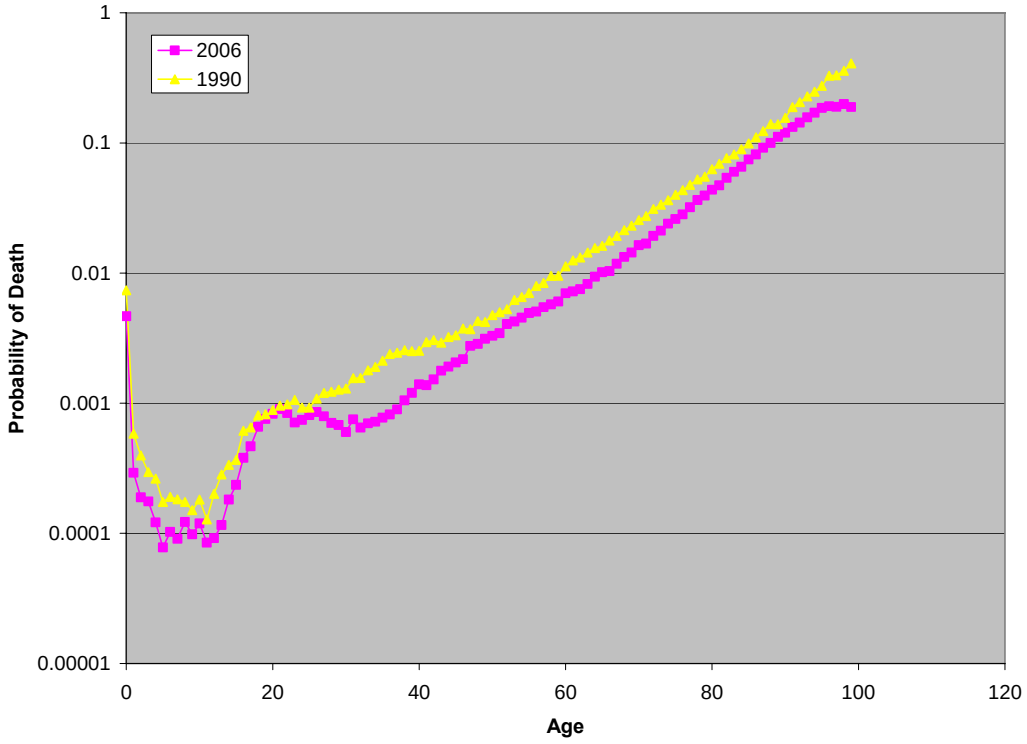

Figure A-8. Probability of death among Bay Area residents, 1990 and 2006. 3-year average deaths vs. population by age.

[94] Arias E. United States life tables, 2000. National vital statistics reports; vol 51 no 3. Hyattsville, Maryland: National Center for Health Statistics. 2002.

These probabilities can be translated into life expectancy. For example, starting with a population group of 100,000, the probabilities of death at each age are applied and the survivors live to the next age and so on. Totaling the number of life-years and dividing by 100,000 yields the life expectancy, the average number of life-years lived.

For 1990, Bay Area life expectancy was 75.7 years. By 2006 it had increased to 80.5 years. How much of this improvement was due to reductions in $PM_{2.5}$? Using CARB's $PM_{2.5}$ factor of 1% reduction in mortality for each 1 $\mu g/m^3$ reduction in $PM_{2.5}$ (CARB 2008), the increment in the probability of death from anthropogenic $PM_{2.5}$ dropped from 15% in 1990 to 6.7% in 2006, a reduction of 8.3%.

This factor is specifically for those 30 and older, and for non-accidental mortality. So the number of deaths by age for this group for 2005-2007 was computed. Multiplying the death rate for this group by 1.083 results in a drop in life expectancy to 80.0, or 6 months. Thus, Bay Area residents can expect to live 6 months longer because of the reductions in $PM_{2.5}$ since 1990.

References

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Appendix B – Public Outreach for the Bay Area 2010 CAP

Air District staff reached out to inform and engage the general public, as well as key stakeholders, about the 2010 Clean Air Plan (CAP) throughout the plan development process. At the outset of the process, staff designed a public outreach strategy to foster sustained engagement and dialogue with a wide range of stakeholders in developing the Plan. Staff identified the following goals to guide CAP public outreach and engagement:

- *Inform* a wide range of stakeholders and members of the public about the scope and schedule of the plan and opportunities for comment.
- *Provide opportunities* for members of the public and stakeholders to offer input on the plan and outreach process.
- *Educate* the public about air quality and why the Air District and the CAP are relevant, by emphasizing the connection between air quality and health outcomes, and explaining the potential benefits of multi-pollutant planning focused on reducing health risk.
- *Engage impacted communities and multilingual communities* in developing the Plan.
- *Promote transparency* throughout the CAP preparation process.
- *Foster buy-in, ownership, and acceptance* of the Plan.

Public outreach for the CAP took place in three phases: introduction to the CAP and the planning process, development of the control strategy, and presentation of the draft and final plan. Primary outreach mechanisms utilized include the CAP website; notices sent to the CAP e-mail list serve; and CAP public workshops and community meetings and the associated materials and comment summaries that staff prepared. Additionally, in the interests of implementing the goals above, staff developed materials and outreach mechanisms to support education and outreach to Air District constituents for whom English is not the primary language, with a focus on Chinese, Vietnamese, and Spanish speakers. Additional outreach took place for the environmental review process and consultation with other air districts. A description of the full range of outreach mechanisms employed over the course of the CAP planning process is provided below.

CAP Web Pages - The CAP pages on the Air District's website features a description of the plan goals and purpose, regulatory framework, meeting schedule, meeting notices and materials, and key technical documents. Technical documents include multi-pollutant planning methodology and key analyses in regard to pollutant emissions and concentrations, exposure, health outcomes, costs, and pollutant weighting factors underlying the plan control strategy. The website has been used primarily to alert the public to meetings and workshops and to post meeting materials and CAP documents

for public review prior to each workshop. The main CAP web page is at: www.baaqmd.gov/Divisions/Planning-and-Research/Plans/Clean-Air-Plans.aspx.

E-mail and paper mail database - The database was compiled from an existing outreach database, updated to reflect the most current information for contacts, augmented with additional health, NGO, and regulatory agency contacts, and converted to the extent possible from snail mail addresses to e-mail in keeping with the Air District's interest in reducing waste. It consists of approximately 1075 e-mail contacts with an additional 179 snail mail contacts, representing regional and state regulatory agencies, staff from other air districts, transportation agencies (including CMAs), environmental and health advocates and professionals, community members, representatives from regulated industries, local governments, and others. The list is refreshed and added to by meeting attendance lists and requests received via e-mail and the CAP website. The database was used to notify the public of meetings dates and locations, and to alert the public to meeting materials and planning and CEQA documents posted on the CAP website.

Outreach to Multilingual Communities – Air District staff developed a CAP informational FAQ sheet to educate and inform members of the public about how the CAP relates to air quality and health. The FAQ was translated into Spanish, Chinese, and Vietnamese languages, posted on the CAP website, and distributed at public meetings and workshops. Staff developed and maintained a phone response system in order to respond to any questions from Chinese, Spanish, and Vietnamese language speakers about the CAP. Directions for accessing this system in each of these languages were included on all CAP e-mails and workshop/meeting notices.

Public Workshops and Community Meetings - The Air District held public workshops and meetings at locations throughout the Bay Area during the CAP planning process to facilitate dialogue and collect input on the proposed control strategy and Plan. All meetings were held at accessible locations and in close proximity to transit, whenever possible. Notice of each meeting was provided at least three weeks in advance on the District website and by e-mail and snail mail to the CAP contact database. Public comments received during meetings were recorded, compiled in summaries of public comments and District responses, and posted on the CAP website for public review. As of February 2010, 14 public workshops and community meetings have been held by Air District staff at key intervals throughout the CAP planning process. A table summarizing CAP public workshops and meetings is provided in Table B-1.

Additional public workshops will be held after the release of the draft CAP.

Table B-1. Public workshops on Bay Area 2010 Clean Air Plan.

	Description and Purpose	Date and Location	Attendance
Introduction to the CAP planning process	Kick-off workshop	July 15, 2008 - Oakland	35
	Fall 2008 community meetings	October 6, 2008 - West Oakland *	16
		October 8, 2008 - San Jose *	6
		October 21, 2008 - Petaluma	8
		October 23, 2008 - Pleasanton	7
		October 27, 2008 - San Leandro *	14
		November 15, 2008 - San Francisco * Bayview Opera House	42
Control Strategy Development	Public Workshop: • All Feasible Measures Review / Call for control measure ideas	January 28, 2009 - Oakland	50
	Public Workshops: • Preliminary Control Measures • Draft control measure review • 2005 Ozone Strategy Implementation Update	April 27 2009 - Redwood City	22
		April 29, 2009 - Oakland	23
		April 30, 2009 - Petaluma	11
	Public Workshop: • Multi-pollutant Methodology	June 11, 2009 - Oakland	37
	Public Workshops: • Draft Control Strategy	September 2, 2009 - Mountain View	12
		September 3, 2009 - Oakland	38
	Draft Clean Air Plan	April 6, 2010 - Petaluma	
		April 7, 2010 – Santa Clara	
		April 8, 2010, - Oakland	
	CEQA Scoping Meetings	September 2, 2009 - Mountain View l	12
		September 3, 2009 Oakland	38

*These meetings were held in Community Air Risk Evaluation (CARE) impacted communities to address the District's CARE program and the CAP, with the aim of soliciting input on the CAP planning process from communities most directly impacted by air pollution.

In addition to formal workshops and community meetings, staff made presentations about the CAP to interested stakeholders in other venues as opportunities arose. These presentations were made, often upon request, in order to build partnerships, increase understanding of the scope of objectives of the CAP, and solicit feedback on innovative aspects of the CAP.

Staff pursued opportunities to make presentations about the CAP in other venues, including:

- Richmond resource team meeting, September 25, 2008.
- CAPCOA Engineering Managers symposium, June 16, 2009
- US EPA conference call, July 23, 2009
- California Council for Environmental and Economic Balance:
  - July 13, 2009 and October 6, 2009
- Contra Costa Council: September 4, 2009
- CAPCOA Planning Managers symposium, September 30, 2009
- Urban Heat Island Mitigation Conference, September 21, 2009

Consultation with Neighboring Air Districts: Air District staff held two conference calls to solicit input on the CAP control strategy on September 1, 2009 and September 15, 2009, as described in transport mitigation section in Appendix C.

Collaboration with Regional Agencies: The CAP was developed in collaboration and consultation with MTC, ABAG, and BCDC, the Air District's regional agency partners. MTC staff and ABAG staff provided important input to the Transportation Control Measures, and MTC staff played a key role in developing emission reduction and cost estimates for the TCMs. In addition, the CAP was informed by regional agency plans, including *Transportation 2035: Change in Motion* and *Projections and Priorities 2009*.

Air District Staff made presentations about the CAP at the following regional agency meetings:

Joint Policy Committee:
November 7, 2008
September 18, 2009
March 19, 2010

MTC Planning Committee:
May 8, 2009
July 10, 2009
March 12, 2010

The Draft CAP will be presented to the MTC Planning Committee on March 12, 2010 and to the Joint Policy Committee on March 19. 2010.

Reports to Air District Board of Directors and Board Committees: District staff provided several briefings to the Board of Directors and Board Committees in the course of developing the draft CAP.

BAAQMD Executive Committee:
September 26, 2008
June 29, 2009

BAAQMD Climate Protection Committee:
October 8, 2009

BAAQMD Board of Directors:
September 16, 2009
August 4, 2010
September 1, 2010

CEQA Review: Pursuant to the California Environmental Quality Act (CEQA), the Air District prepared and issued a Notice of Preparation (NOP) and Initial Study (IS) and held two public scoping meetings on September 2 in Mountain View at the Mountain View City Hall and on September 3 at the Metro Center Auditorium in Oakland. The purpose of these meetings was to identify the range of actions, alternatives, mitigation measures, and significant effects to be analyzed in depth during the environmental review. The public comment period for the NOP ended on September 21, 2009.

Appendix C – State Air Quality Planning Requirements

For the past 20 years, the 1988 California Clean Air Act (CCAA), along with subsequent amendments, as codified in the California Health & Safety Code, has guided efforts throughout California to achieve State ambient air quality standards. The basic goal of the CCAA is to achieve health-based State ambient air quality standards by the earliest practicable date. The CCAA requires regions that violate the State ozone standard to prepare attainment plans that identify a strategy to attain the standard. Regional air quality plans are required to achieve a reduction in district-wide emissions of 5 percent per year for ozone precursors (California Health & Safety Code Section 40914).[95] If an air district is unable to achieve a 5 percent annual reduction, adopting a control strategy that includes all feasible measures on an expeditious schedule is acceptable, as an alternate strategy (Sec. 40914(b)(2)).

California classifies ozone nonattainment areas based on their "expected peak day concentration," which is an ozone reading that the region should not exceed more than once per year, on average, excluding exceptional or extreme readings. Legal requirements vary according to the severity of a region's ozone problem. The Bay Area is subject to CCAA requirements for "serious" areas. (Secs. 40921.5(a)(2), 40919).

This Appendix describes CCAA air quality planning requirements and how the Bay Area 2010 Clean Air Plan (CAP) fulfills all requirements.

All Feasible Measures

No non-attainment area in the state has been able to demonstrate a 5% reduction in ozone precursor pollutants each year. Consequently, air districts throughout the state, including the Bay Area, have opted to adopt “all feasible measures” as expeditiously as possible to meet the requirements of the CCAA. The CCAA does not define “feasible,” but the Health and Safety Code provides some direction to assist the District in making this determination. Sec. 40406 defines a related term, Best Available Retrofit Control Technology (BARCT), as “an emission limitation that is based on the maximum degree of reduction achievable, taking into account environmental, energy and economic impacts by each class or category of source.” CARB defines “all feasible measures” in the Transport Mitigation Regulation, Section 70600 *et seq,* Title 17 California Code of Regulations, as “air pollution control measures, including but not limited to emissions standards and limitations, applicable to all air pollution source categories under a district's authority that are based on the maximum degree of reductions achievable for emissions of ozone precursors, taking into account technological, social, environmental,

[95] All references to Section numbers are for the California Health and Safety Code, unless otherwise noted.

energy and economic factors, including cost-effectiveness." Section 40922(a) requires an assessment of the cost effective of each proposed control measure, including a ranking of measures from the least cost-effective to the most cost-effective. Section 40922(b) lists additional criteria that air districts should consider in reviewing potential control measures, including technological feasibility, total emission reduction potential, the rate of reductions, public acceptability, and enforceability.

The process by which the Air District reviewed and evaluated potential control measures in relation to these criteria is described in Appendix F. An overview of the 2010 CAP control strategy is provided in Volume I, Chapter 4; detailed descriptions of control measures are provided in CAP Volume II.

Transport Mitigation Requirements

The CCAA requires CARB to periodically assess transport of ozone and ozone precursors from upwind to downwind regions, and to establish mitigation requirements for upwind districts (Sec. 39610). The CCAA also requires air districts to address transport mitigation requirements in the triennial updates to strategies to achieve the State ozone standard (Sec. 40912).

CARB first adopted transport mitigation requirements in 1990, amended them in 1993, and further strengthened them in 2003. CARB's 2003 amended Transport Mitigation Requirements are in Title 17, California Code of Regulations, Sections 70600 and 70601. The requirements for transport mitigation state that upwind districts "shall include sufficient emission control measures in their attainment plans for ozone…to mitigate the impact of pollution sources within their jurisdictions on ozone concentrations in downwind areas commensurate with the level of contribution." Specifically, the Bay Area is required to:

1) adopt and implement all feasible measures as expeditiously as practicable;

2) adopt and implement best available retrofit control technology (BARCT) on all existing stationary sources of ozone precursor emissions as expeditiously as practicable;

3) implement, by December 31, 2004, a stationary source permitting program designed to achieve no net increase in the emissions of ozone precursors from new or modified stationary sources that emit or have the potential to emit 10 tons or greater per year of an ozone precursor; and

4) include measures sufficient to attain the state ambient air quality standard for ozone by the earliest practicable date within the North Central Coast Air Basin, that portion of Solano County within the Broader Sacramento Area, that portion of Sonoma County within the North Coast Air Basin, and that portion of

Stanislaus County west of Highway 33 during air pollution episodes, provided that:

a) the areas are likely to violate the State ozone standard,
b) the areas are dominated by transport from the Bay Area, and,
c) the areas are not affected by emissions of ozone precursors within their borders.

The 2010 CAP addresses all of the above requirements. The 2010 CAP control strategy, together with the Air District rule development and permitting processes, address the requirement to adopt all feasible measures, including measures sufficient to attain the State ozone standard in specified transport areas, and to implement BARCT on all existing stationary sources. With respect to the "no net increase" requirement, the Air District adopted a 10 ton/year no net increase requirement for ozone precursors in District Regulation 2, Rule 2: New Source Review on December 21, 2004. As adoption of all feasible measures represents the most stringent control strategy that can be accomplished, this requirement is met with the approval of each triennial plan.

In addition, the Air District is required to consult with downwind districts, review the list of control measures in the most recently approved attainment plan (in this case, Bay Area 2005 Ozone Strategy), make a finding as to whether the list of control measures meets the requirements of Section 70600 (b) and include the finding in the proposed triennial plan revision.

To fulfill this consultation requirement, the Air District consulted with downwind air districts to ensure that the CAP control strategy includes all feasible measures. The Air District hosted conference calls with downwind air districts on September 1 and September 15, 2009 to solicit comments and suggestions on the preliminary CAP control strategy. Air District staff also made presentations on the CAP to the CAPCOA (California Air Pollution Control Officers Association) Engineering Managers on June 16, 2009 and to the CAPCOA Planning Managers on September 20, 2009.

Other Requirements

In addition to requirements concerning all feasible measures and transport mitigation, the CCAA requires that strategies to attain the State ozone standard contain other elements, including the following:

Emissions inventory system (Sec. 40918(a)(5)). The Air District maintains an emissions inventory system. The emission inventory is included in the "Sources of Air Pollution – Emission Inventory" section of this document.

A permitting program [Sec. 40919(a)(2)] designed to achieve no net increase in emissions from permitted sources with a potential to emit greater than 15 tons per year of a nonattainment pollutant or their precursors and to require the use of best available control technology (BACT) on new and modified sources with a potential to emit greater than 10 pounds per day. The Air District's permitting program, as spelled out in BAAQMD Regulation 2, Rule 2 — New Source Review — complies with the requirements of Health and Safety Code Section 40919(a)(2). Sufficient offsets have been provided for all permits that have been issued by the Air District. Furthermore, the Small Facility Banking account has sufficient credits to sustain withdrawals into the foreseeable future at the current withdrawal rate. The Air District's no net increase threshold was reduced to 10 tons per year to comply with transport mitigation requirements in December 2004.

Best available retrofit control technology (BARCT) on all existing permitted stationary sources [Sec. 40919(a)(3)]. BARCT is implemented through the Air District's rule development, enforcement and permit review programs. Air District staff perform an assessment of BARCT requirements when proposing new rules or rule amendments and ARB reviews Air District rules and proposed rule amendments to insure that BARCT standards are implemented. Additionally, the Air District evaluates existing sources during the annual permit review process to ensure BARCT requirements are being met. Finally, the Air District issues facility advisories, and implements compliance assistance and enforcement programs help to ensure compliance with BARCT standards in rules.

Measures to achieve use of a significant number of low-emission vehicles in motor vehicle fleets [Sec. 40919(a)(4)]. Proposed mobile source control measures MSM A-1, MSM A-2, and MSM A-3 promote the use of low-emission vehicles to reduce motor vehicle fleet emissions. TCM A-1 addresses clean fuel transit and school buses. The Air District's Transportation Fund for Clean Air, Carl Moyer and Low Emission School Bus programs provide funding for projects to promote the purchase and use of low-emission vehicles.

Transportation control measures (TCMS) to substantially reduce the rate of increase in passenger vehicle trips and miles traveled per trip [Sec. 40918(a)(3)]. Pursuant to Sections 40233 and 40717, each TCM must include the following:

- A schedule for implementation
- Identification of potential implementing agencies
- Procedures for monitoring the effectiveness of and compliance with the measures in the plan; and

In addition, Section 40233 directs the Air District to estimate the quantity of emission reductions from transportation sources necessary to attain and maintain State and national ambient air quality standards. Section 40233 requires MTC to prepare and adopt a TCM plan to achieve the specified quantity of emission reductions. The TCM plan is then incorporated into the overall strategy for achieving the State ozone

standard. The statute also requires MTC to develop and adopt a revised TCM plan whenever the Air District revises the emission reduction target.

The Air District and MTC complied with the requirements of Section 40233 when preparing the first Bay Area plan for the State ozone standard, the 1991 Clean Air Plan, by adopting a TCM emission reduction target and plan in 1990. Section 40233 leaves it to the Air District's discretion as to whether and when to revise the emission reduction target for transportation sources set in 1990. This triennial update to the strategy for the State ozone standard does not include a revised emission reduction target for transportation sources, and therefore, does not trigger a TCM plan revision. The Air District and MTC have, however, comprehensively reviewed and augmented the TCMs during preparation of the 2010 CAP to maximize their effectiveness.

Indirect source and area source programs [Sec. 40918(a)(4)] Several measures in the 2010 CAP are intended to reduce emissions from indirect sources. LUM 2 calls for the District to develop an indirect source review regulation pursuant to Section 40716. LUM 3 describes updated CEQA guidelines that should also help to reduce emissions from new indirect sources of emissions. Also, TCM D-3 includes actions by the District and partner agencies to promote focused development that should also reduce emissions from indirect sources. Management of area source emissions is addressed through existing Air District regulations for ROG in Regulation 8 and NOx in Regulation 9. In addition, PM is addressed by Regulation 6, including the District's wood smoke rule (Reg. 6, Rule 3, adopted in July 2008) and complementary wood smoke public education program.

Regional public education programs [Sec. 40918(a)(6)] The Air District administers several public education programs that encourage the public to reduce air pollution both year round and on an episodic basis. The Air District's "Spare the Air" public education program, described in TCM C-4, is aimed at curbing emissions from motor vehicles and other ozone precursor sources on days when weather conditions are conducive to high ozone levels. The *Winter Spare the Air* program, described in Chapter 3, complements the regulatory Wood Burning program that reduces emissions of particulate matter from wood burning. Other ongoing educational programs include grassroots resource teams located throughout the Bay Area; a Smoking Vehicle Assistance Program; outreach and presence at public events throughout the year; a suite of youth education programs including the Clean Air Challenge, Cool the Earth and Protect Your Curriculum; and a Speakers Bureau that delivers talks on air quality to a variety of audiences throughout the region.

An assessment of cost-effectiveness of proposed control measures (Sec. 40922). Information regarding cost-effectiveness CAP control measures is provided in Chapter 4 of CAP Volume I.

Periodic requirements include the following:

An annual regulatory schedule (Sec. 40923). The Air District produces a regulatory schedule each December, listing regulatory measures that may be scheduled for adoption or amendment during the following year. A proposed regulatory schedule for years 2010 through 2012 is provided Chapter 4 of the 2010 CAP.

An annual progress report on control measure implementation and, every third year, an assessment of the overall effectiveness of the program (Sec. 40924). The Air District has submitted annual progress reports to CARB nearly every year since 1993. Previous triennial assessments of overall plan effectiveness were submitted in 1994, 1997, 2000, and 2005. The latest triennial assessment is provided in Chapter 3 of the 2010 CAP.

A review and update of the plan every three years to correct for deficiencies and to incorporate new data and projections (Sec. 40925). The 2010 CAP incorporates new data and projections and updates the control strategy.

Appendix D – Ecosystem Impacts of Air Pollution

In addition to impacts on human health, air pollutants can also have impacts on the terrestrial and aquatic ecosystems and the flora and fauna that sustain human life. In many cases, air pollutants such as reactive organic gases (ROG), nitrogen oxides (NOx), sulfur dioxide (SO2), ammonia (NH3), and particulate matter (PM) are ultimately deposited on land and water, where they cause a variety of impacts. Air pollutants can be deposited directly onto the surface of a water body, or they can be deposited on to land and then carried to water bodies through run-off.

This appendix summarizes some of the key ecosystem impacts of air pollution, including damage to crops and vegetation, acid deposition, and eutrophication of waterways. As shown in the table below, multiple pollutants may contribute to each specific impact, and certain pollutants, such as NOX and NH3, may cause multiple impacts.

	Impacts on Terrestrial Systems		Impacts on Aquatic Systems		
	Damage to Crops & Vegetation	Deposition on Land	Acidification	Eutrophication	Water Pollution
ROG	X				
NOx	X	X	X	X	
SO2			X		
NH3		X	X	X	
PM & metals					X

Reactive Nitrogen

Concern about climate change has drawn attention to the consequences of human intervention in the carbon cycle. However, the impact of human intervention in another system of fundamental importance, the nitrogen cycle, has received much less attention. Reactive nitrogen (Nr) is one of the major causes of ecosystems impacts discussed below, including ozone damage to plants, acid deposition on land and on water, nitrogen deposition on land, and eutrophication of water bodies. Human activities produce five times more reactive nitrogen per year than natural processes (EPA Science Advisory Board 2009). The use of synthetic fertilizers is the leading source of anthropogenic Nr, but combustion of fossil fuels in motor vehicles, power plants and other sources is also a major source of Nr.

Nitrogen in its pure form is an inert (non-reactive) gas. However, nitrogen is chemically reactive and exists in many reactive forms. The reactive nitrogen compounds can have beneficial uses, such as fertilizer to increase crop production, but they can also be

harmful to ecological systems. Once in a reactive form, nitrogen is easily transported between air, water, and soils in a process known as the "nitrogen cascade." This cascade is very complex, extending from initial emissions through atmospheric transport and chemical transformations; dry-deposition and wet-deposition; and downstream effects that involve plants, animals, fungi, and bacteria interacting in myriad ways. The primary forms of Nr that are released as air pollutants are NH3, NOx, and N2O.

Because it can move so easily from the atmosphere into soils and waterways, and back again, a single nitrogen-containing molecule can have a series of impacts on the environment. While airborne in the form of NOx, reactive nitrogen contributes to formation of ozone in the lower atmosphere, causing respiratory ailments in humans and damaging vegetation. NOx, NH3, and N2O may fall to the surface and contribute to acid deposition, pollution of groundwater and surface water, and eutrophication of estuaries and coastal ecosystems.

Ozone

Ozone is formed by a chemical reaction between ozone precursors, ROG and NOx, in the presence of sunlight. Emissions of these precursors are produced by a wide range of sources and processes, including combustion of fossil fuels, industrial processes, evaporative emissions from fuel tanks, and chemical solvents. Elevated concentrations of ozone can damage agricultural crops, trees and other forms of vegetation. Ozone oxidizes plant tissue, which reduces photosynthesis and interferes with the ability of sensitive plants to produce and store food. Impacts include:

- premature leaf loss, and reduced leaf and root weight;
- increased susceptibility to certain diseases, insects, other pollutants, competition and harsh weather;
- damage to the appearance of urban vegetation, as well as vegetation in national parks and recreation areas; and
- reduced forest growth and crop yields,[96] potentially impacting species diversity in ecosystems.

Acid Deposition and Acidification

Acidification can occur when nitric acid and sulfuric acid are deposited into aquatic or terrestrial ecosystems. When SO2 and NOx are emitted from power plants, motor vehicles, and other sources, they can be transported long distances by prevailing winds, reacting in the atmosphere with water, oxygen, and other chemicals, and eventually falling to earth in the form of dust, acid rain or snow.

When nitric and sulfuric acids are deposited into waterways, such as rivers, streams,

[96] Ozone damage to orchards in the Santa Clara Valley was a major factor in the creation of the Bay Area AQMD in 1955, when agriculture was still the backbone of the economy in the South Bay.

lakes or marshes, the impact of the increased acid on the ecosystem depends on the sensitivity of the water body. Generally, this sensitivity is highest when the soil in the watershed has a limited capacity to neutralize acidic compounds (referred to as "buffering capacity"). In areas where buffering capacity is low, acid rain releases aluminum from soils into lakes and streams. Aluminum is highly toxic to many species of aquatic organisms. [97] Increased concentrations of CO2 in the atmosphere, the primary cause of climate change, also causes acidification of ocean waters, because the CO2 absorbed by oceans dissolves to create carbonic acid. This increased acid content impedes the ability of some marine life to develop shells and skeletal structures.

On land, acid deposition can damage trees, especially at higher elevations, where exposure to acid-heavy clouds and mist is greater. The ability of a forest to cope with acid deposition depends on the buffering capacity of its soil. Acid dissolves and removes the nutrients in forest soils before trees and other plants can use them to grow. At the same time, acid rain causes the release of substances that are toxic to trees and plants, such as aluminum, into the soil. Acid rain is not a problem for water bodies in the Bay Area. However, because SO2 and NOx can travel great distances in the atmosphere before their deposition, pollution emitted in the Bay Area may impact ecosystems in downwind areas, including the Sierra Nevada. According to a National Parks Service report,[98] acid rain and snow is not as serious a problem in the Sierra Nevada as in the eastern U.S. or the Colorado Rockies. However, many high-elevation Sierra lakes have low buffering capacity, so it is important to minimize any future acid deposition.

Nitrogen Deposition on Land

Deposition of reactive nitrogen on land acts as an unintended fertilizer which can have impacts on terrestrial flora and fauna. Of the 225 plant species in California listed as threatened or endangered by the state or federal government, 101 are exposed to levels of nitrogen suspected of causing ecological disruption (CEC 2006). In areas where Nr is deposited on nutrient-poor soil, this can fuel the expansion of invasive, non-native species that choke out native plants. As the flora changes, animal species that depend on the native vegetation may be adversely impacted.

The case of the Bay Checkerspot Butterfly, which has been on the federal endangered species list since 1987, provides an example of the impact of reactive nitrogen on diversity of native flora and fauna. The Checkerspot depends on native grasses, such as plantain, that grow on nutrient-poor serpentine soils. The serpentine ecosystem provides food for both the larval and adult stages of the butterfly. Edgewood Natural Preserve in San Mateo County historically supported a healthy population of Checkerspots. However, nitrogen deposition from vehicles on Interstate 280, which is

[97] "Acid Deposition Impacts on Aquatic and Terrestrial Ecosystems", http://www.epa.gov/acidrain/effects/surface_water.html

[98] See http://www.nature.nps.gov/air/Pubs/pdf/techInfoEpaDeposition.pdf

adjacent and upwind to the Preserve, has allowed the aggressive, non-native grasses, such as Italian rye grass, to crowd out native grass species in recent years. [99] As a result of habitat reduction, the Checkerspot population at Edgewood is in jeopardy.

Nitrogen Deposition in Water Bodies

When excessive nutrients are introduced to a water body, through fertilizer run-off, atmospheric deposition of nitrogen compounds, or wastewater discharge, this can stimulate excessive plant growth (often referred to as algal blooms), which can in turn degrade water quality. Algal blooms can reduce oxygen content of water, damaging other water-based organisms. This process is called eutrophication. NOx emissions from power plants and motor vehicle exhaust contribute to eutrophication. San Francisco Bay is somewhat protected from the impacts of eutrophication due to the high sediment content of the Bay, which filters out sunlight and impedes phytoplankton growth. However, periodic elevated levels of algal growth (such as "red tides") do occur in the Bay and could become a more serious problem if deposition of excess nutrients is not kept in check. In addition, more than half the nitrogen that fuels algae growth in Lake Tahoe is a result of atmospheric deposition.[100] Thus, emissions of nitrogen compounds in the Bay Area may also contribute to the loss of clarity in Lake Tahoe, a prime aesthetic, recreational, and tourism asset for both California and Nevada.

Other Impacts on Water Systems

According to the San Francisco Estuary Institute's Regional Monitoring Program, although some contaminants are reduced from peak levels seen in earlier decades, the level of contamination in the Bay today is high enough to impair the health of the ecosystem. Pollutants found in waterways increase, or bioaccumulate, through the food chain. Beginning with their ingestion in the water by filter feeders such as clams and oysters, these pollutants eventually make their way up through fish to marine mammals and humans.

Tidal marshes and vegetated areas on the shoreline help prevent the degradation of water quality from non-point source pollution by filtering out contaminants, intercepting run-off, dampening wave action, and reducing bank erosion. However, the ability of marshlands to perform these critical services decline if the health of marsh habitats is compromised.

Deposition of particulate matter, including heavy metals, may also have negative

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[99] Weiss, Stuart, *Final Report on NFWF Grant for Habitat Restoration at Edgewood Natural Preserve*, *San Mateo County*, CA; October, 2002.

[100] See Suzanne Bohan, "Nitrogen Overdose: Element quietly rivaling CO2 as a global climate threat." *Oakland Tribune,* August 12, 2007.
www.creeksidescience.com/files/oaklandtribune_nitrogen_12aug07.pdf

impacts on the Bay and other water bodies. Tire wear is a significant source of zinc, and brake pad wear is a significant source of copper (Stolzenbach 2006). Copper from brake pad wear is washed into streams, rivers and coastal waters where it is toxic to aquatic organisms such as phytoplankton, that serve as the foundation of the food chain, thus affecting the health of entire ecosystems. Elevated copper levels may also be one of the factors contributing to the decline of salmon populations.[101]

Climate Change

In addition to ecosystem impacts from air pollution, climate change due to increasing levels of greenhouse gases in the atmosphere is expected to cause a wide range of detrimental impacts to Bay Area ecology. These impacts will be most damaging to sensitive ecosystems that do not have the ability to rapidly adapt to a changing environment.

When the earth's average temperature changes, even only to a slight degree, it can cause major changes to weather patterns and ecosystems. The Bay Area is already experiencing the impacts of climate change. Examples of ecosystem impacts of climate change include the following.

- Sea levels have risen by as much as seven inches along the California coast over the last century. Rising sea levels may alter, or even submerge, existing wetlands.
- Less winter precipitation is falling as snow, and snow is melting earlier in the year, causing water shortages.
- Spring is arriving earlier, which alters the timing of natural cycles.
- Wildfires are becoming more frequent and intense due to dry seasons that start earlier and end later. This can cause a wide range of direct and indirect ecosystems impacts.
- Higher summer temperatures are causing an increase in ground-level ozone (smog) formation. Higher ozone levels mean more damage to vegetation and crops.

A changing climate will mean warmer temperatures and less rainfall for most of the Bay Area. Plant species that require cooler, moister environments will either migrate to higher elevations or move north if they are able; if they are unable to migrate, they will simply disappear. This may cause assemblages of species that depend on each other for survival, such as broadleaf forests, to break up as stronger species are able to migrate. It is estimated that statewide, up to 1,300 species (two-thirds of California's endemic flora) will either disappear or be greatly reduced from their current ranges.[102] When

[101] For discussion regarding the impact of copper from brake pads on water bodies, see http://www.suscon.org/bpp/#

[102] See: *Taking the Heat* in Bay Nature: Exploring Nature in the San Francisco Bay Area, Jan-March 2009. http://baynature.org/articles/jan-mar-2009/taking-the-heat/taking-the-heat

native plants die out, they are often replaced by weedier replacements that can evolve and adapt quickly.

The Bay Conservation and Development Commission expects sea level in the Bay Area to rise by approximately 4.6 feet by the end of the 21st century. This will inundate most of the Bay's coastal wetlands, leaving very little buffer zone between rising tides and storm waters and the built environment. A wide range of both migratory and resident species, such as the California Tiger Salamander, depend upon San Francisco Bay wetlands for nesting, breeding, and feeding. Loss of these wetlands would be a major blow, particularly to the more specialized, or exotic native species. Generalist species which are more capable of adapting to rapid environmental change, such as crows, raccoons, skunks and coyotes, are likely to increase in numbers.

Recent research has linked increased wildfires in the west to warmer springs and earlier melting of the sierra snowpack, both symptoms of climate change. In recent years, California is experiencing longer, more intense fire seasons, with more destructive fires. Most of the native plants in the California wild lands depend upon intermittent drought and seasonal burning. These species drop seeds which lay dormant in the soil until a wildfire uncovers them and allows them to germinate. With more frequent forest fires, native plants may not have enough time to grow and set seed. A loss of native plant life due to increase occurrence of wildfires could lead to an invasion of more generalist, weedier species.

How the 2010 CAP Helps to Protect Ecosystems

The Bay Area 2010 CAP provides a multi-pollutant control strategy to reduce emissions and ambient concentrations of ozone precursors (ROG and NOx); directly-emitted PM, as well as PM precursors (ROG, NOx, SO2, and NH3); key air toxics; and key greenhouse gases (CO2, methane, N2O). The primary focus of the CAP is to reduce air pollution in order to protect public health. However, ecosystem protection is another important co-benefit of the CAP.

It is beyond the scope of this analysis to directly measure how the anticipated emission reductions from CAP control measures will prevent or mitigate the ecosystem impacts described in this appendix. However, by reducing emissions of ROG, NOx, NH3, SO2, PM, and CO2, the CAP will help to protect the health of terrestrial and aquatic ecosystems and native flora and fauna in the Bay Area, as well as in downwind areas, such as the Central Valley and the Sierra Nevada. It is likely that the emission reductions from the 2010 CAP control strategy will play only a modest role in directly reducing ecosystem impacts. However, for the reasons described in this appendix, the issue of how to reduce the ecosystem impacts of air pollution merits additional attention in future air quality planning efforts.

Sources:

Bay Conservation & Development Commission. Maps of projected sea level rise: www.bcdc.ca.gov/planning/climate_change/index_map.shtml

Creekside Science Center: http://www.creeksidescience.com/nitrogen.html

Reactive Nitrogen in the United States; An Analysis of Inputs, Flows, Consequences, and Management Options, August 2009. U.S. Environmental Protection Agency Science Advisory Board, Integrated Nitrogen Committee

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US EPA website: http://www.epa.gov/acidrain/effects/surface_water.html

Stolzenbach, Keith D., Southern California Environmental Report Card 2006.

Water Quality Control Plan for the San Francisco Bay Basin. www.swrcb.ca.gov/sanfranciscobay/basin_planning.shtm

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Appendix E – Photochemical Modeling

Although no air quality modeling was required to be performed for the 2010 CAP, results of the Air District's recent air quality modeling helped to inform the development of the CAP. A brief overview of the Air District's modeling and key findings were summarized in CAP Chapter 2. This appendix provides a more detailed description of the Air District's recent modeling work.

BAAQMD Modeling History and Scope

From 1989 to 2006, the Air District's photochemical modeling effort mostly focused on the preparation of the State Implementation Plans for national ozone standards. Because the Bay Area is currently classified as a marginal non-attainment area for national 8-hour ozone standard, the Air District is not required to use photochemical models for attainment demonstration. However, the Air District is committed to continue working with neighboring districts and CARB to study regional ozone transport through the use of photochemical models.

The Bay Area also does not attain the national 24-hour PM2.5 standard. Since a significant percentage of PM2.5 is formed via chemical processes of precursor pollutants affected by sunlight, U.S. EPA is expected to require the use of photochemical models for attainment demonstration in the preparation of the State Implementation Plan for this pollutant. Photochemical modeling is not currently required for demonstrating attainment for State standards.

There are no federal or State requirements to perform photochemical air toxics modeling. The Air District added photochemical air toxics modeling capabilities to its program in 2005 to investigate the nature of toxic concentrations over the entire Bay Area and in sub-regions. Air toxics simulations prior to this date were limited to permit evaluation.

Other applications of photochemical modeling at the Air District include:

- better understanding of ozone and particulate matter formation in the Bay Area;
- assessing the benefit of various proposed and adopted emission control measures;
- weighing alternative emissions control strategies for future planning;
- estimating human exposure to pollutants and associated health impacts;
- analyzing potential impacts of land use development; and

- providing modeling support to District programs and functions such as permit evaluation, rule development, grants and incentives, climate protection, and the CARE Program.

Through the use of photochemical models, the Air District participates in collaborative regional air quality study efforts such as the Central California Ozone Study (CCOS) and the California Regional Particulate Air Quality Study (CRPAQS). Collaborators include U.S. EPA, CARB, the National Oceanic and Atmospheric Administration (NOAA), universities, and neighboring districts, especially the San Joaquin Valley Air Pollution Control District and the Sacramento Metropolitan Air Quality Management District.

Modeling Methodology

An air quality model estimates pollutant concentrations by accounting for pollutant transport, mixing and chemical transformation in the atmosphere, and removal through deposition to the ground. There are two state-of-the-science air quality models that are publicly available and are used by the Air District: U.S. EPA's Community Multiscale Air Quality (CMAQ) model and Environ International Corporation's Comprehensive Air Quality Model with extensions (CAMx). Both of these models are capable of handling multiple pollutants, including ozone, toxics and PM.

Currently, the Air District uses CAMx for simulating ozone and TACs, and CMAQ for simulating PM2.5. In the future, the Air District plans to use CMAQ as the primary model for simulating all three pollutants and CAMx as a back-up model.

Emissions inventory and meteorological inputs to these models are prepared using several specialized computer programs. The anthropogenic emissions input is prepared using U.S. EPA's Sparse Matrix Operator Kernel Emissions (SMOKE) program. The biogenic emissions input is prepared using CARB's Biogenic Emissions Inventory - Geographic Information System (BEIGIS) program. The meteorological input is prepared using the Penn State University/National Center for Atmospheric Research Mesoscale Model version 5 (MM5). These computer programs, along with documentation, are publicly available.

To prepare the anthropogenic emissions inventory input, county-level, source-specific, daily total emissions data are allocated spatially to a predefined grid over the modeling domain. Emissions are then further distributed to each hour of the day and chemically speciated for modeling. Biogenic vegetation emissions are estimated based on leaf area index and ambient temperatures of each grid cell at each hour.

MM5 is applied to simulate hourly wind speed and direction, temperatures, humidity, and solar radiation values needed for the air quality model simulations. Observations are injected in the model to minimize the difference between simulations and observations.

Both meteorological and photochemical models are applied over a relatively large domain to capture the regional impact of meteorology and air quality. For most Bay Area ozone and PM modeling, the domain covers all of Central California and portions of northern California, extending from Redding in the north to the Mojave Desert in the south and from the Pacific Ocean in the west to the Sierra Nevadas in the east.

The Air District has been applying both the CMAQ and CAMx models following the guidelines of U.S. EPA and CARB. Both air quality models and the meteorological model are routinely evaluated against observations using U.S. EPA's and the CARB's model evaluation criteria. Simulations are repeated using various physics and chemistry options of the models until they meet the model evaluation criteria of both U.S. EPA and CARB. Once model performance is deemed satisfactory, the models can be used to evaluate the effects of potential emission reductions.

Ozone Modeling Simulations

This section summarizes results of the Air District's most recent ozone modeling. The Air District used CAMx to simulate two ozone episodes occurring in 1999 and 2000. The 1999 episode was a two-day episode that occurred on July 11 and 12. The maximum 8-hour observed ozone concentrations reached 116 and 122 ppb, respectively, at Concord on these days. The 2000 episode was a three-day episode that occurred from July 31 through August 2. The maximum 8-hour observed ozone concentrations reached 89, 76 and 84 ppb, respectively, at Livermore on these three days. CARB classified the five days included in these two episodes as transport days from the Bay Area to the Central Valley.[103]

The modeling domain for ozone is the Central California Ozone Study (CCOS) domain shown in Figure E-1. First, CAMx was applied for the base case. Model performance met CARB and US EPA modeling criteria. Daily maximum 8-hr ozone levels were somewhat overestimated for some regions, including the Bay Area, and somewhat underestimated for others. These small discrepancies, however, were within accepted tolerances. Next, combined anthropogenic NOx and VOC emissions reductions of 40% were simulated for the Bay Area, Sacramento, and the San Joaquin Valley separately. This level of emissions reduction was discussed at the CARB Northern California SIP/Transport Meeting as representing the maximum feasible statewide emissions controls between 2000 and 2024. This predicted level of emissions reductions includes projected CARB mobile source regulations in combination with other measures.

[103] See "Ozone Transport: 2001 Review" prepared by CARB staff, April, 2001.

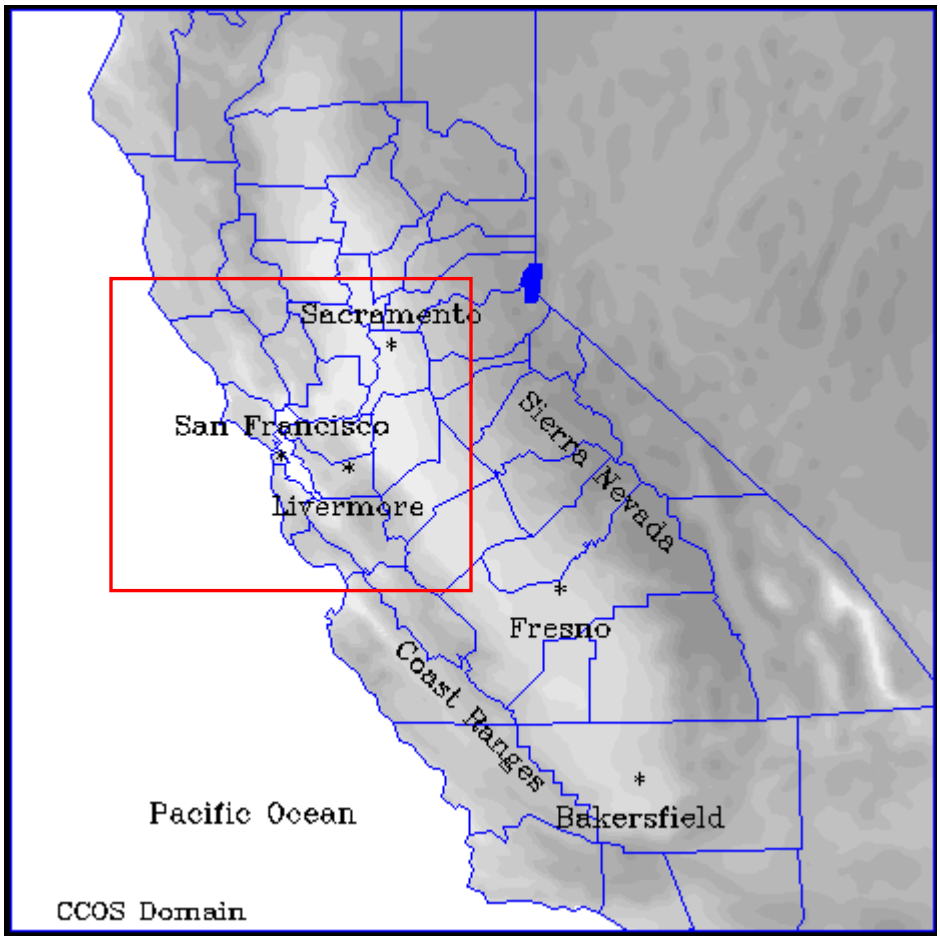

Figure E-1. Ozone and PM2.5 modeling domain (entire figure). Wood smoke modeling domain (inner domain shown in red).

Table E-1 shows the simulated and observed maximum 8-hour average ozone concentrations in the Bay Area, Sacramento, central San Joaquin Valley, and southern San Joaquin Valley. In the simulations with reduced Bay Area anthropogenic emissions, the Bay Area maximum 8-hour ozone levels decreased 13 and 15 ppb for July 11 and 12, and 3, 7 and 5 ppb for July 31 – August 2, 2000, respectively.

Table E-1. Simulated and observed 8-hour maximum ozone concentrations in the Bay Area, Sacramento, and the central and southern San Joaquin Valley. Also shown is the impact of 40% anthropogenic emission reductions on ozone.

July 11, 1999				
	SFB	SAC	C SJV	S SJV
Observation	116	123	123	97
Simulation	126	110	102	83
Simulation with 40% emissions reduction in:				
Bay Area	113	108	101	83
Sacramento	124	100	101	83
San Joaquin Vly	125	109	93	76

July 31, 2000				
	SFB	SAC	C SJV	S SJV
Observation	89	89	103	95
Simulation	105	103	101	100
Simulation with 40% emissions reduction in:				
Bay Area	102	102	99	98
Sacramento	103	97	100	100
San Joaquin Vly	105	103	93	93

July 12, 1999				
	SFB	SAC	C SJV	S SJV
Observation	122	106	109	77
Simulation	135	121	99	84
Simulation with 40% emissions reduction in:				
Bay Area	120	120	99	84
Sacramento	135	109	99	84
San Joaquin Vly	133	120	89	80

August 1, 2000				
	SFB	SAC	C SJV	S SJV
Observation	76	108	109	104
Simulation	107	114	111	96
Simulation with 40% emissions reduction in:				
Bay Area	100	111	109	95
Sacramento	106	105	109	95
San Joaquin Vly	106	114	103	89

August 2, 2000				
	SFB	SAC	C SJV	S SJV
Observation	84	107	106	112
Simulation	93	102	114	98
Simulation with 40% emissions reduction in:				
Bay Area	88	100	112	97
Sacramento	92	96	113	98
San Joaquin Vly	93	102	104	95

Results in Table E-1 give typical mid-summer episodic representations of the relative importance of transport. When Bay Area anthropogenic emissions were reduced, Sacramento and San Joaquin Valley maximum 8-hour ozone levels showed reductions of 1-3 ppb. When anthropogenic emissions were reduced in Sacramento or the San Joaquin Valley, Bay Area maximum 8-hour ozone levels decreased by 1-2 ppb.

In summary, photochemical modeling was used to estimate the impacts of NOx and VOC emissions reductions on ozone concentrations for the Bay Area and its neighboring ozone nonattainment regions. Reducing Bay Area emissions by 40% resulted in significant reductions of up to 15 ppb for Bay Area 8-hour ozone levels. The impacts of reductions in precursor emissions transported from the Bay Area were much smaller than the local impacts of the Bay Area emissions. Reducing the Bay Area emissions by 40% benefited the downwind Sacramento and San Joaquin Valley nonattainment areas by only 1-3 ppb reduced relative to the 8-hour ozone level.

Simulations re: Impacts of Climate Change on Ozone

As discussed in Chapter 1, higher temperatures related to global warming are expected to promote ozone formation through several mechanisms. One major factor is an increase in biogenic emissions of ozone precursors (ROG). The Air District performed simulations to estimate how increased temperatures may affect Bay Area ozone levels. According to the Intergovernmental Panel on Climate Change (IPCC), the current rate of accumulation of greenhouse gases is expected to increase the global average temperature 2 degrees Celsius by 2050.

For the purpose of this modeling, anthropogenic emissions of ozone precursors were held constant, ambient temperature was increased 2 degrees Celsius, biogenic emissions were estimated using the increased temperature, and the simulations described in the Ozone Modeling Simulations section were repeated. The 2 degree increase in temperature increased biogenic emissions by about 20 percent and the maximum 8-hour ozone levels by about 8 ppb in the Bay Area. The uncertainty in these results is large because emissions are constantly changing and the scientific community's understanding of the effect of global changes in emissions and temperatures on regional air quality is still developing. The Bay Area may respond to climate change differently than other parts of the world. Also, changes in temperatures may be accompanied with significantly changing Bay Area wind patterns, which play an important role in ozone formation.

In summary, photochemical modeling was used to estimate the impacts of a 2 degree Celsius increase in Bay Area temperatures on regional ozone levels. The model indicated Bay Area maximum 8-hour ozone levels would increase by about 8 ppb during ozone exceedance days. Assuming the simulated scenario is reasonable, increased ozone levels due to climate change may offset at least 10 years of ozone emissions control efforts in the Bay Area between now and 2050.[104]

[104] See "The effects of climate change on emissions and ozone in Central California" by Su-Tzai Soong, Cuong Tran, David Fairley, Yiqin Jia, and Saffet Tanrikulu. Paper #590 presented in the 101st Annual Meeting, Air and Waste Management Association, June 24-26, 2008 Portland OR.

PM2.5 Modeling Simulations

PM2.5 simulations were performed with the CMAQ model for four months (December-January, 2000-01 and 2006-07). The modeling domain (Figure E-1) included the Bay Area and the entire Central Valley to account for the impact of inter-basin transport. The model was applied on 4-km horizontal grids.

The base case simulation was validated against measurements to ensure that results adequately represented PM2.5 levels in the Bay Area and Delta regions. Simulation results for a typical Bay Area exceedance day, January 4, 2001, are shown in Figure E-2 as an example. This day exhibited light surface-level winds in the Central Valley that entered the Bay Area from the east. The PM2.5 that accumulated around all urban source areas in the modeling domain was composed mainly of primary PM2.5. Most low-lying inland locations were affected by PM2.5 as well, but were usually dominated by secondary PM2.5. Secondary PM2.5 levels were especially high deeper into the San Joaquin Valley, where considerable air mass aging occurred due to lack of ventilation. PM2.5 accumulated in a relatively thin layer near the surface in low-lying valley areas throughout the modeling domain under very stable atmospheric conditions. A plume of PM2.5 downwind of Central California formed over the Pacific Ocean.

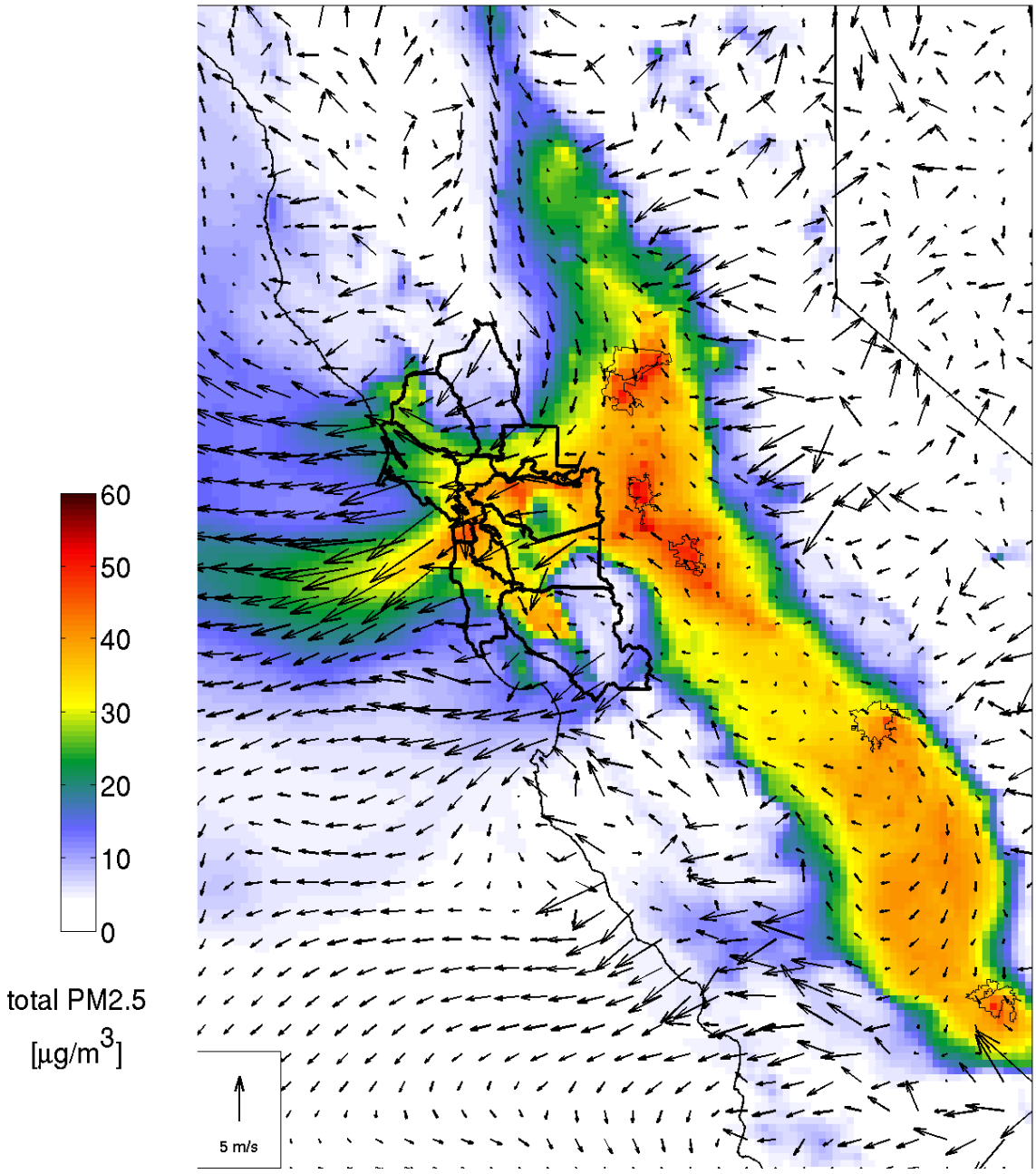

Figure E-2. PM2.5 simulation results for January 4, 2001. Spatial distribution for 24-hour PM2.5 level shown with color scale and 24-hour winds shown with arrow length proportional to speed and pointing along the direction of air flow. Bay Area counties, California boundaries, and city limits for Sacramento, Stockton, Modesto, Fresno, and Bakersfield are shown as black lines.

Figure E-3 shows the spatial distribution of simulated primary and secondary PM2.5 concentrations around the Bay Area. These results were averaged across the 52 simulated days for which measured Bay Area 24-hour PM2.5 levels exceeded 35 µg/m^3. For most of these episodic days, light winds flowed through the Bay Area from the east,

and Central Valley conditions were near calm. Primary PM2.5 levels were elevated mainly in and around major Bay Area cities, including Oakland, San Francisco and San Jose; near industrial facilities and highways along the Carquinez Strait; at Travis AFB; and Santa Rosa. Secondary PM2.5, present mostly as ammonium nitrate, was not localized near the sources of its precursor emissions, NO_x and ammonia. Rather, secondary PM2.5 was regionally elevated. A sharp gradient existed, with very high secondary PM2.5 levels in the Central Valley decreasing westward through the Bay Area.

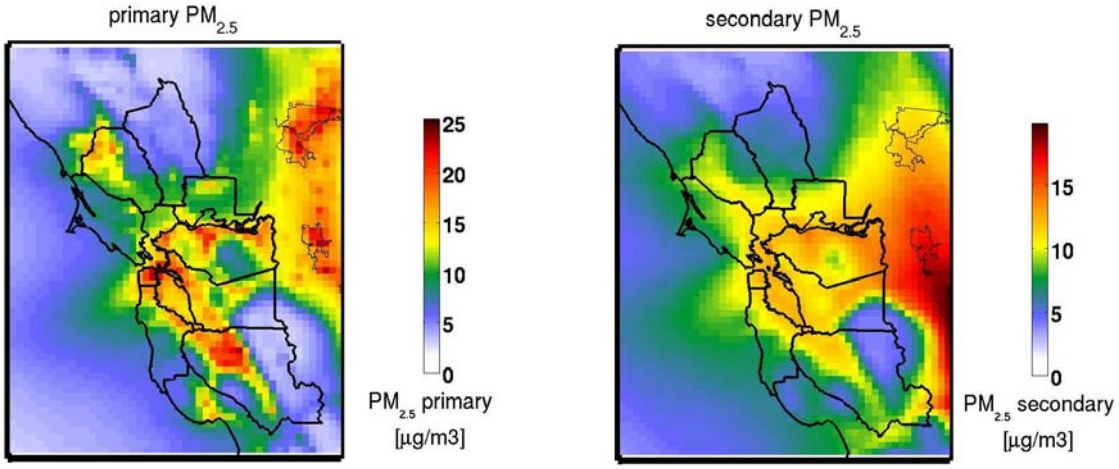

Figure E-3. Spatial distribution of simulated 24-hr primary and secondary PM2.5 levels averaged across the 52 simulated days for which measured Bay Area 24-hr PM2.5 level exceeded 35 µg/m^3. Bay Area counties and the California coastline are drawn using thick black lines. City limits for Sacramento and Stockton are drawn using thin black lines.

Around San Francisco and San Jose, PM2.5 levels were dominated by primary (directly-emitted) PM. For other areas affected by PM episodes, such as the eastern, northern, and southern Bay Area and also the Delta, primary and secondary PM2.5 levels were comparable. Both primary and secondary build-up were required for exceedances to occur in these locations.

PM2.5 sensitivity simulations were performed by reducing emissions at different regions of the modeling domain relative to the base case. First, Bay Area emissions reductions of 20% were simulated for the following five classes of chemical species: NO_x and VOC combined; gaseous sulfur species; ammonia; directly emitted PM; and these four classes combined, comprising all anthropogenic emissions. These reductions were simulated for one episode each from the 2000-01 and 2006-07 winter seasons. Reducing the directly-emitted PM reduced peak PM2.5 levels nearly ten times more effectively than reducing the secondary PM precursors. Reducing primary PM emissions by 20% typically reduced primary PM2.5 levels by 12-20% depending on location, with an

average around 16%. Reductions of directly emitted PM were most effective near the PM emissions sources where primary PM2.5 levels were highest. Reducing ammonia emissions by 20% was the most effective of the secondary PM2.5 precursor emissions reductions. Reducing combined NO_x and VOC emissions by 20% was relatively ineffective (0-1%). Reducing sulfur-containing PM precursor emissions by 20% typically had a small impact on Bay Area ambient PM2.5 levels. Under certain conditions, however, reductions of sulfur-containing emissions reduced ambient PM2.5 levels by around 1 $\mu g/m^3$.

Also investigated was the impact of sources outside of the Bay Area on the Bay Area's PM2.5 concentrations by zeroing out the Bay Area's anthropogenic emissions and repeating the above (base case) simulations. Simulated concentrations were averaged across 52 days for which the Bay Area's maximum 24-hour PM2.5 levels were observed to exceed 35 $\mu g/m^3$. Significant amounts of both primary and secondary PM2.5 were found in the Bay Area even when Bay Area anthropogenic emissions were zeroed out. Primary PM2.5 levels were as high as 8 $\mu g/m^3$. Secondary PM2.5 concentrations were as high as 13 $\mu g/m^3$ along the eastern boundary of the Bay Area and about 5-8 $\mu g/m^3$ elsewhere.

In summary, photochemical modeling was used to estimate the impacts of reducing PM and its precursor emissions for the Bay Area and its neighboring PM nonattainment regions. Reducing Bay Area primary (directly emitted) PM2.5 emissions provided far greater reductions in ambient Bay Area PM2.5 levels than reducing Bay Area secondary PM2.5 precursor emissions. Of the precursor emissions reductions simulated, Bay Area ammonia reductions were most effective. The ammonia emissions reductions lowered ammonium nitrate PM2.5 levels only for relatively cold winter days favoring ammonium nitrate buildup. (Ammonium nitrate PM2.5 tends to evaporate faster than it forms at temperatures above around 60 degrees Fahrenheit.) Combined NOx and VOC emissions reductions for the Bay Area were relatively ineffective. NOx emissions reductions were relatively ineffective because ammonium nitrate PM2.5 formation involves the relatively slow and incomplete conversion of NOx to nitric acid. Reducing Bay Area sulfur-containing PM precursor emissions typically had a small impact on Bay Area ambient PM2.5 levels. Under certain conditions, however, reducing Bay Area sulfur-containing emissions did provide around 1 $\mu g/m^3$ reduced Bay Area PM2.5 level. Photochemical simulations were also performed with zero Bay Area anthropogenic emissions to gauge the impacts of transported PM2.5 and precursors. Significant amounts of both primary and secondary PM2.5 were transported into the Bay Area. During Bay Area PM2.5 24-hr exceedance days, transported primary PM2.5 levels averaged as high as 8 $\mu g/m^3$ and transported secondary PM2.5 levels averaged as high as 13 $\mu g/m^3$. The largest transport impacts for both primary and secondary PM2.5 occurred along the eastern boundary of the Bay Area.

Wood Smoke PM2.5 Simulations

Chemical Mass Balance (CMB) analysis has estimated that approximately one-third of Bay Area ambient PM2.5 mass during 24-hour PM2.5 exceedance days is wood smoke from household wood burning.[105] The Air District adopted a wood smoke rule (Regulation 6, Rule 3) in 2008 to reduce wood-burning emissions throughout the region. The wood-smoke rule was first implemented during the 2008-09 winter, during which 11 Spare the Air ("no burn") periods were issued. Simulations using the CAMx model were applied over the Bay Area and surrounding regions (see red box in Figure E-1) to determine the effectiveness of the rule to reduce ambient wood-smoke levels.

The modeling period included 8 of the 11 Spare the Air periods during the winter of 2008-09. Bay Area wood-smoke levels were simulated with and without wood-burning restrictions during these periods. Without burning restrictions during these Spare the Air periods, the simulations indicated that peak wood-smoke levels of up to 10-20 $\mu g/m^3$ would have occurred over the areas that generally have high wood-burning emissions. For many of the remaining populated locations within the Bay Area, wood-smoke levels would have been around 5 $\mu g/m^3$. Peak benefits of the wood-smoke rule were around 10 $\mu g/m^3$ of reduced wood smoke. The 24-hour wood-smoke levels (averaged midnight to midnight) were not reduced to zero for two main reasons. First, the burning restrictions did not begin until noon of the Spare the Air days. Second, carried over wood smoke from previous days still impacted the Bay Area during the Spare the Air periods. Because the burning restrictions reduced carry over, enhanced benefits may be achieved for multiple, consecutive Spare the Air calls. Two consecutive Spare the Air calls during 2008-09 provided the largest simulated reductions of wood-smoke levels.

Maximum simulated benefits of the wood-smoke rule occurred for areas that generally have the highest wood-smoke levels. Often, the areas most heavily impacted by wood smoke are away from the monitoring locations. Simulated wood-smoke levels for the eight simulated Spare the Air days would have averaged around 11, 7, 5, 3, and 3 $\mu g/m^3$ for the Concord, San Jose, San Francisco, Vallejo, and Livermore monitoring locations, respectively, without the burning restrictions. Preliminary wood-smoke simulations suggest that the wood-smoke rule may have been effective at reducing ambient wood smoke levels by 50-75 percent at key PM2.5 monitoring locations. However, this finding is based on an assumption of 100% compliance with the wood-smoke rule, which may not have occurred.

[105] Chemical mass balance (CMB) analysis is a methodology in which a computer model is used to apportion ambient PM2.5 collected on filters over 24-hour periods at monitoring sites around the Bay Area to a set of source categories. Each filter was analyzed for a range of chemical species. The same species were measured in special studies of emissions from various sources, such as motor vehicles and wood burning. The CMB model finds the mix of these source measurements that best matches the ambient sample, chemical species by chemical species. See report entitled *Sources of Bay Area Fine Particles*.
www.baaqmd.gov/~/media/Files/Planning%20and%20Research/Particulate%20Matter/PM_Report.ashx

In summary, locally-emitted wood smoke accounts for approximately one-third of Bay Area PM2.5 levels during 24-hr PM2.5 exceedance days. The largest reductions in wood-smoke PM2.5 levels were simulated for the locations that generally have the highest peak wood-smoke levels. These locations often are not near any monitor. Therefore, reductions of population exposure to wood smoke resulting from the rule may be significantly greater than indicated by the monitoring data. Multiple, consecutive no-burn days may provide the added benefit of reducing both fresh and carried-over wood-smoke levels.

Air Toxics Modeling

Air toxics species are either directly emitted into the atmosphere from their sources (primary toxics) or are formed through chemical transformation of other pollutants (secondary toxics). Atmospheric oxidants play an important role in the chemical transformation, which is closely related to ozone photochemistry. Therefore, photochemical models provide additional information over engineering models that either ignore secondary toxics formation or estimate secondary toxics concentrations with a simplified chemical mechanism.

Six toxics species were simulated for the air toxics modeling. Five of the species were estimated to account for the bulk of total air toxics cancer risk in the Bay Area: acetaldehyde; benzene; 1,3-butadiene; diesel PM; and formaldehyde. The sixth species, acrolein, was believed to be the ambient toxic with the most serious non-cancer health effects. Air toxics risk assessment required estimates of annual average levels for these six species. Simulations were performed on a 1-km horizontal grid over the Bay Area. Air toxics emissions inventories were estimated for the base year 2005. Because secondary toxics chemistry is very computationally-intensive, toxics simulations were performed for one week in summer and one week in winter, with the exception of diesel PM. To estimate annual average toxics concentrations for these species, the Air District averaged the concentrations obtained for these two weeks. Diesel PM concentrations were simulated for one summer month and one winter month; the average of these two months was used to estimate annual average diesel PM concentrations.

The modeled toxics levels compared reasonably well with ambient measurements. Simulated diesel PM levels were compared against elemental carbon levels measured on filters from the District's routine PM monitoring network. The five other simulated air toxics species were compared against VOC canister measurements taken from about 20 locations throughout the Bay Area. Annual average toxics concentrations were then calculated as averages of the July and December model results. The annual average concentrations for each toxics species were multiplied by their respective unit risk factors and overlaid on Bay Area population data to calculate population-adjusted risk.

Cancer risk was used to define six impacted communities [106] within the Bay Area: Concord; eastern San Francisco; western Alameda County; Redwood City and East Palo Alto; Richmond and San Pablo; and San Jose. These six impacted communities accounted for nearly half of the total Bay Area population-weighted lifetime cancer risk for sensitive groups (those under 18 or over 64 years of age).

Future Directions in Air Quality Modeling

The Air District recognizes that synergies and trade-offs exist in regulating ozone, PM, air toxics, and greenhouse gases. This was the primary reason that the Air District chose to pursue a multi-pollutant approach in developing the 2010 CAP. The results of modeling performed separately for ozone, PM2.5, and air toxics, which are described in the respective sections above, provided critical information used in developing the Air District's MPEM. For purposes of future air quality plans, however, the multi-pollutant framework would benefit greatly from the results of integrated, multi-pollutant modeling performed on a full-year basis. Performing simulations that cover an entire year will enable the Air District to enhance the accuracy of the existing MPEM by eliminating the need to extrapolate episodic modeling results to the full year (as was done for the MPEM used in the 2010 CAP).

Integrated modeling will require a unified modeling platform. The crucial elements of such a platform are: unified, full-year, multi-pollutant emission inventories; a single modeling system; and full-year meteorological fields, as described below.

One key input required for multi-pollutant modeling is a single, comprehensive emissions inventory accounting for all pollutants of interest and their precursors. Currently, relatively independent (though non-conflicting) inventories are used for modeling each pollutant type. Using a single, multi-pollutant emissions inventory, the effects of various proposed control strategies could be evaluated using the same input emissions data. One prerequisite to facilitate full-year modeling is to develop year-round inventories that account for all pollutant types in each season of the year. Traditionally, PM2.5 modeling has focused on the winter months, whereas ozone modeling has focused on the summer months. Year-round inventories for ozone and PM2.5 will facilitate direct estimation of their respective cumulative impacts on public health and evaluation of emission reduction strategies.

The Air District is also moving toward using a single, unified modeling system for all pollutant types. As discussed above, the CMAQ model currently is used for photochemical PM2.5 modeling, whereas CAMx is used for ozone and air toxics

[106] See *Applied Method for Developing Polygon Boundaries for CARE Impacted Communities* (December 2009) available at www.baaqmd.gov/Divisions/Planning-and-Research/CARE-Program/CARE-Documents.aspx.

modeling. Previous experience has demonstrated that secondary PM2.5 chemistry is better handled by CMAQ, whereas Bay Area ozone episodes are better represented by CAMx. Both models employ a “one atmosphere" approach in which similar physics and chemistry formulations are used to relate changes in emissions to changes in ambient pollutant levels. However, comparison of results from these two modeling systems may not always be directly achievable. Discrepancies may arise because of differences in their numerical algorithms. Use of a single modeling system will help avoid the potential for mathematical artifacts to bias the evaluation of a control strategy across multiple pollutants. The Air District is currently investigating the optimization of CMAQ for all modeling applications.

A final aspect of multi-pollutant modeling is developing meteorological fields that are necessary to drive year-round air quality simulations. Current modeling practices evaluate the effectiveness of emissions controls on PM2.5 and ozone only when elevated levels occur. This approach may place greater weight on acute health impacts over chronic health impacts. A year-round multi-pollutant approach, on the other hand, will ensure that acute and chronic health impacts are weighted appropriately when analyzing potential control measures. The Air District is developing meteorological simulations to match all periods that will be represented in the multi-pollutant, year-round emissions inventories described above.

Appendix F – Evaluation of Potential CAP Control Measures

This appendix summarizes the review of potential control measures for the Bay Area 2010 Clean Air Plan (CAP) performed by Air District staff. Tables providing details about staff review of specific control measures are posted on the web page for the 2010 CAP at: www.baaqmd.gov/Divisions/Planning-and-Research/Plans/Clean-Air-Plans.aspx.

Background

Pursuant to California Health & Safety Code Section 40914, the Bay Area 2010 Clean Air Plan is required to include all feasible control measures to reduce region-wide emissions for each nonattainment pollutant (e.g., ozone precursors). To identify feasible measures for the 2010 CAP, Air District staff reviewed and evaluated 844 potential control measures compiled from a variety of sources.[107] Air District staff sought ideas for new control measures, as well as ways to strengthen existing rules and programs. Sources of potential measures included ideas submitted by the public and Air District staff, other California air district control measures contained in recently-adopted air quality plans, as well as air quality plans from metropolitan areas outside of California. In addition, staff reviewed measures that had previously been considered and rejected during preparation of the Bay Area 2005 Ozone Strategy, to see if the rationale for rejecting a measure at that time is still valid for purposes of the 2010 CAP. The 844 measures reviewed included:

- 368 measures from recently-adopted air quality attainment plans.
- 390 measures from the 2005 Ozone Strategy control measure review process.
- 39 measures suggested by the public.
- 47 measures suggested by Air District staff.

Staff reviewed stationary source, area source, mobile source, and transportation control measures from the following plans:

California Air Quality Attainment Plans

- 2007 Air Quality Management Plan (May 2007, South Coast AQMD)
- Sacramento Regional 8-Hour Ozone Attainment And Reasonable Further Progress Plan (Draft January 2009, Sacramento Metropolitan AQMD)
- 2007 Ozone Plan (April 30, 2007, San Joaquin Valley Unified APCD)
- 2008 Air Quality Management Plan (August 2008, Monterey Bay Unified APCD)

[107] Air District staff and staff of the Metropolitan Transportation Commission (MTC) collaborated in evaluating transportation control measures for the 2010 CAP.

- 2007 Clean Air Plan (August 2007, Santa Barbara APCD)
- Eight-Hour Ozone Attainment Plan For San Diego County (May 2007, San Diego APCD)
- Ventura County 2007 Air Quality Management Plan (May 13, 2008, Ventura APCD)

Out of State Air Quality Attainment Plans

- Houston-Galveston-Brazoria regional SIP (April 2010)
- New York SIP for Ozone (8-Hour NAAQS) Attainment Demonstration for NY Metro Area (August 9, 2007)
- Proposed Maintenance Plan for Southeast Michigan (February 2009)
- Draft Chicago 8-Hour Ozone Attainment Demonstration and Maintenance Plan (December 2008)
- Proposed Georgia's State Implementation Plan for the Atlanta 8-Hour Ozone Nonattainment Area (March 29, 2009)

Control Measure Framework and Evaluation Criteria

Potential control measures were reviewed and evaluated as described below and as summarized in Table F-1. Potential measures were initially screened to identify and eliminate measures that have been either implemented and completed by the Air District, or implemented within the Air District's jurisdiction by the Air Resources Board, US EPA, or another agency.

Remaining measures were evaluated according to the criteria specified in California Health & Safety Code Section 40922, namely:

- Cost-effectiveness
- Technological feasibility
- Total emission reduction potential
- Rate of reduction
- Public acceptability
- Enforceability

In addition to the criteria specified in the California Health & Safety Code, control measures were also evaluated based upon their potential to reduce:

- Emissions of PM, air toxics, greenhouse gases (in addition to ozone precursors), and
- Population exposure to pollutants in one or more of the "impacted communities" identified in the District's CARE program

In reviewing measures based on the evaluation criteria described above, some measures were eliminated for the reasons shown in Table F-1 below.

Measures that are recommended for inclusion in the 2010 CAP fall into three categories:

- Measures incorporated in one of the five control measure categories:
  - Stationary Source Measures
  - Mobile Source Measures
  - Transportation Control Measures
  - Land Use & Local Impact Measures
  - Energy & Climate Measures
- Further Study Measures: This category includes measures which appear to have merit but require more research and information to determine if they are viable for implementation. These measures will be further evaluated, but are not proposed as formal control measures at this time.
- Measures incorporated in draft CAP Leadership Platform: Staff is proposing to include a Leadership Platform in the 2010 CAP to encourage actions by other agencies and/or potential legislation that would be beneficial for air quality. Some potential measures have been included in the draft Leadership Platform.

Please note that Table F-1 indicates that 347 of the potential measures reviewed have been incorporated in the 55 proposed CAP control measures. The reason that these numbers do not match is due to (1) duplication or overlap among the potential measures reviewed, (2) the fact that many of the proposed CAP control measures incorporate multiple actions that have been combined within a single measure. For the same reason, 39 of the potential measures reviewed have been incorporated into the 17 proposed Further Study Measures.

Table F-1. Outcome of all feasible measures review.

Category	Category Definition	# of Measures
Already Implemented by the Air District		219
Already Implemented by Another Agency	Measures that have already been implemented through State, Federal, or regional programs.	116
Measures Deemed Not Feasible	De minimus or no sources exist in the Bay Area.	62
	Not cost-effective.	11
	Not publicly acceptable.	10
	Not applicable to this plan.	13
	Not technologically feasible.	3
	Not enforceable.	3
	Other.	9
	Subtotal: Measures deemed not feasible:	111
Total # Potential Measures Not Incorporated into Draft Control Strategy		**446**
Incorporated into Draft Control Strategy: Stationary Source Measures	Measures implemented through District rule-making: industrial /commercial processes, stationary combustion, petroleum products processing and distribution, and area sources.	45
Incorporated into Draft Control Strategy: Mobile Source Measures	Measures to reduce emissions from on-road and off-road mobile sources by means of cleaner engines or fuels.	76
Incorporated into Draft Control Strategy: Transportation Control Measures	Measures to reduce motor vehicle emissions by reducing vehicle use or traffic congestion.	171
Incorporated into Draft Control Strategy: Land Use and Local Impact Measures	Land use measures to reduce motor vehicle travel and decrease human exposure to air pollutants.	41
Incorporated into Draft Control Strategy: Energy and Climate Measures	Measures to reduce energy use, promote renewable energy sources, and reduce urban heat island effects.	14
Total # Potential Measures Recommended to be Incorporated into Draft Control Strategy		**347**
Included as Further Study Measures	Measures which meet some evaluation criteria but require further analysis to determine if they are potentially viable.	39
Included in Draft Leadership Platform	Measures which will be pursued through advocacy and partnerships as part of the Leadership Platform.	12
Total # Potential Measures Included as Further Study Measures or in Leadership Platform		**51**

Appendix G – Progress Toward 2010 CAP Performance Objectives

Overview

In addition to striving to attain applicable standards for criteria air pollutants, the 2010 Clean Air Plan defines numerical performance objectives related to the plan's goals of protecting public health and protecting our climate. The performance objectives focus on three pollutants: particulate matter less than 2.5 microns (PM2.5), diesel particulate matter (DPM), and greenhouse gases (GHGs). The performance objectives are as follows:

- Reduce PM2.5 exposure by 10% by 2015
- Reduce diesel PM exposure by 85% by 2020
- Reduce GHG emissions to 1990 levels by 2020 and 40% below 1990 by 2035

This appendix analyzes the extent to which the CAP control strategy and related efforts will achieve these objectives. For purposes of this analysis, estimates of anticipated emissions reductions were based on the following:

- implementation of control measures described in the 2010 CAP;
- estimated benefit of rules and measures adopted by the Air District between 2006 and 2009, which are not reflected in the base year 2005 emission inventory;
- expected benefits from recent State actions and current proposed regulations, including air toxics control measures (ATCMs) to reduce emissions from diesel engines, and greenhouse gas measures included in the CARB AB 32 Scoping Plan.

This analysis does not include potential emissions reductions from efforts such as climate action plans that have been developed by many Bay Area cities and counties, or the Sustainable Communities Strategy that will be developed for the Bay Area in response to SB 375 by 2013, or other voluntary, independent actions by Bay Area governments, residents and businesses. These efforts will be vitally important in reducing the region's GHG emissions, but accurately quantifying their effects is not practicable at this time.

Methodology

This analysis relies on the Air District's 2005 baseline emission inventory for PM2.5 and the base year 2007 inventory for greenhouse gases. The baseline and projected inventories for PM and for GHGs are provided in Table 2-9 and 2-12, respectively, in Chapter 2. The baseline emission levels were projected into the future to establish a

trend line for future emissions in the absence of additional regulations. Air District staff developed expected benefits from recent state actions and current proposed regulations, as well as the estimated benefits of the proposed control measures in the 2010 CAP. Estimates of benefits from Air District actions since 2005 (or 2007 in the case of GHG emissions) were also developed. The sum of these actions represents the progress towards the performance objectives.

The analysis accounts for emission reductions projected to occur with the implementation of control measures either already adopted or proposed for adoption by the Air District or CARB. Air District measures included herein are the proposed 2010 CAP measures; Regulations 6, Rules 2 and 3; and GHG strategies implemented through local grant programs. CARB measures include the air toxics control measures (ATCMs) adopted as part of the statewide Diesel Risk Reduction Program and the GHG reduction measures included in the AB 32 Scoping Plan, as adopted in December 2008. Estimates of emission reductions for these measures are taken from published staff reports, or in the case of the proposed 2010 CAP measures, from the Air District staff analysis provided in control measure write-ups in Volume II and summarized in Table 4-8 in Chapter 4.

The performance objectives for PM2.5 and diesel PM are expressed in terms of reductions in population exposure to these pollutants; this is the clearest metric for estimating the benefits of reduced pollution. The Air District does not yet have available methodologies to reliably perform an analysis of reduction in regional population exposure. Therefore, this analysis uses expected reductions in emissions as a surrogate for reduction in population exposure. That is, it is assumed that a given reduction in emissions of PM2.5 or diesel PM will yield a corresponding reduction in population exposure to these pollutants. For diesel PM, the assumption of a one-to-one correspondence between reductions in emissions and exposures is consistent with the approach taken by CARB in the risk reduction plan for diesel emissions.

The Air District has inventory and modeling efforts underway to better evaluate future reductions in ambient concentrations and population exposure of Bay Area residents to PM2.5 and diesel PM. The results of these studies will be made available in the years ahead.

PM2.5

The CAP performance objective is to reduce PM2.5 exposure by 10% by 2015. Direct emissions of PM2.5 are estimated to increase from 86 tons per day in 2005 from all sources to 90.2 tons per day in 2015. A ten percent reduction, equivalent to 9.0 tons per day, is needed to meet the performance objective. As shown in Table G-1, a combination of control measures adopted by the Air District between 2006 and 2009, adopted and proposed State regulations, and the proposed 2010 CAP control measures

are expected to achieve reductions in direct emissions of PM2.5 of 9.2 tons per day. Figure G-1 plots this data on a graph. Additional reductions in PM2.5 are expected to occur as secondary sources of PM2.5, such as oxides of nitrogen and sulfur, are further controlled; however, estimates of these benefits have not been included in this analysis.

Table G-1. PM2.5 performance objective. (Estimated emissions in tons/day)

Projected 2015 PM2.5 Emissions	90.7
Total Reductions needed 2015	- 9.0
Reductions from Air District Measures 2006-2009	2.2 *
Reductions from State Regulations	5.9
Reductions from 2010 CAP	1.1
Total Reductions	**9.2**

* The emission reduction from Air District measures adopted between the 2006-2009 period is based on adoption of Regulation 6, Rule 2 to reduce emission from charbroilers in restaurants and Regulation 6, Rule 3 to reduce emissions from residential wood-burning.

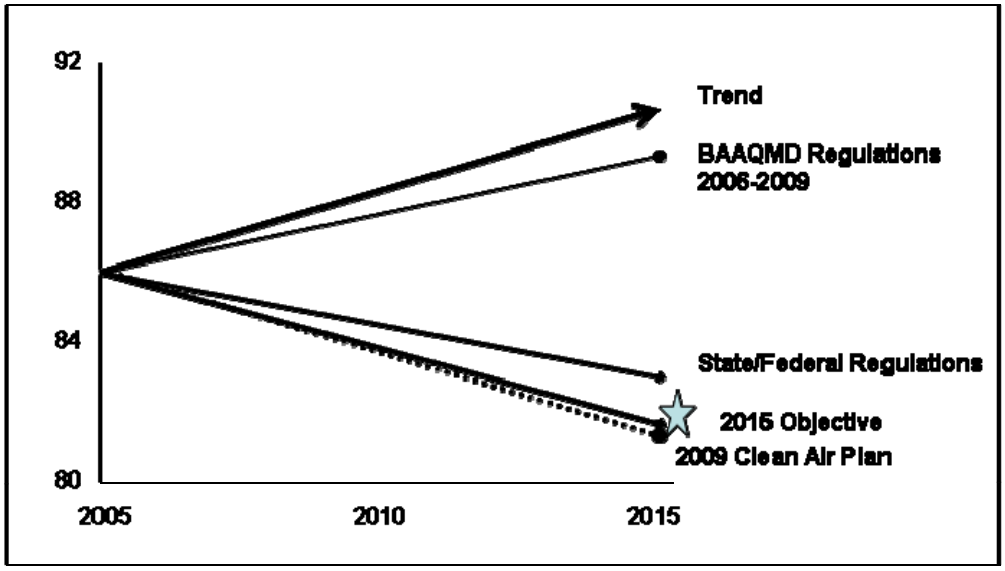

Figure G-1. PM2.5 Performance objective. (Estimated emissions in tons/day)

Diesel PM

The CAP performance objective is by 2020 to reduce diesel PM exposure by 85% from levels experienced in the year 2000.. For the purposes of this analysis, District staff have assumed a one-to-one relationship between reductions in emissions and exposure. Emissions of diesel PM are estimated to have been 14.8 tons per day in 2000 from all sources. An 85 percent reduction of 12.6 tons per day is needed to meet the

performance objective. As shown in Table G-2, Air District staff estimates that a combination of control measures adopted between 2006 and 2009, adopted and proposed State regulations and the proposed 2010 CAP control measures will achieve 7 tons per day. Figure G-2 plots this data on a graph.

Table G-2. Diesel PM performance objective. (Estimated emissions in tons/day)

BASELINE DPM Emissions	14.8
Total Reductions needed 2020	- 12.6
Reductions from Air District Measures 2006-2009	<0.1
Reductions from State Regulations	6.4
Reductions from 2010 CAP	0.6
Total Reductions	**7.0**

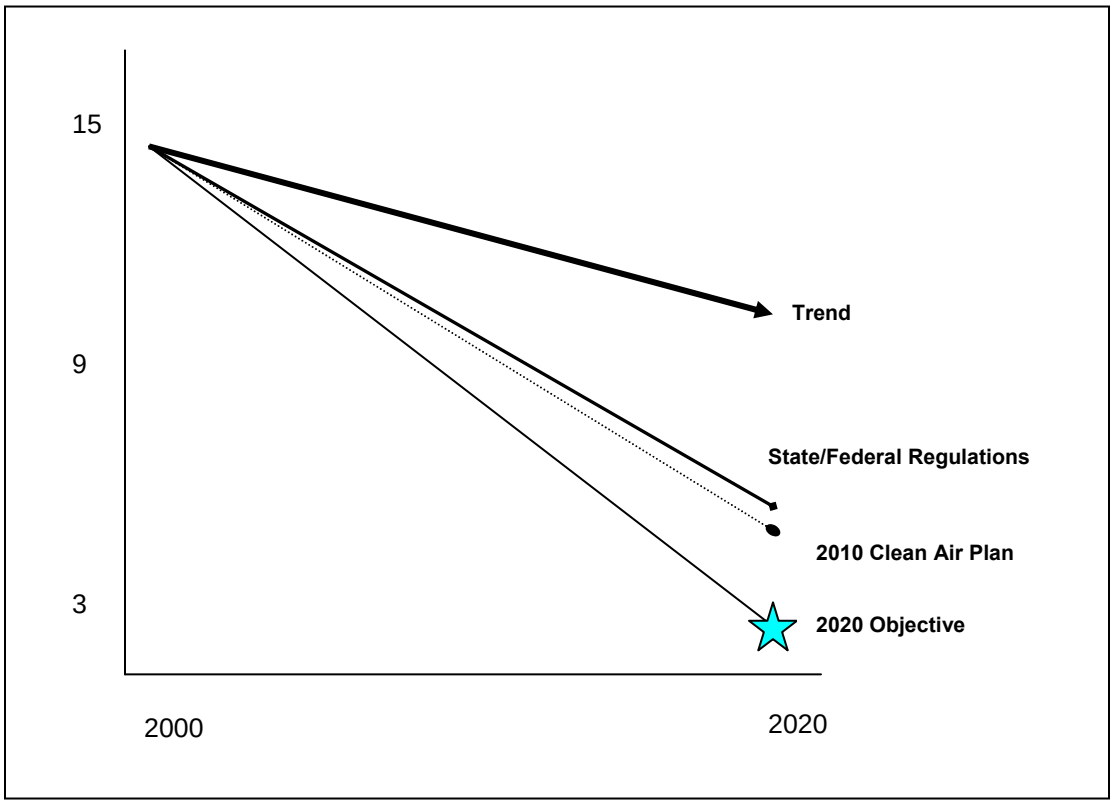

Figure G-2. Diesel PM Performance Objective. (Estimated emissions in tons/day)

Greenhouse Gases

The CAP performance objective is to reduce GHG emissions to 1990 levels by 2020 and 40% below 1990 by 2035. This corresponds with GHG reduction goals established by the State of California. Emissions of GHG in 1990 have been estimated at 273,910 tons per day, and have been projected to increase to 385,650 tons per day in 2020.[108] To meet the performance objectives there will need to be reductions of 111,740 tons by 2020 and 221,306 tons by 2035. As shown in Table G-3, Air District staff estimates that a combination of control measures adopted between 2006 and 2009, adopted and proposed State regulations and the proposed 2010 CAP control measures will achieve 87,980 tons per day in reductions by 2020. It is not possible at this time to predict GHG reductions in the 2020-2035 period. However, if the GHG reductions during the 2010-2020 period continue on the same trajectory through 2035, then GHG reductions would reach 117,000 tons per day by 2035, which is slightly below 1990 levels. Figure G-3 plots this data on a graph.

Table G-3. Greenhouse gases performance objective. (Estimated emissions in tons/day)

Estimated 1990 Levels	273,910
Projected 2020 Levels	385,650
Total reductions needed 2010-2020	111,740
Total reductions needed 2010-2035	221,310
Reductions from Air District Measures 2006-2009	1,230
Reductions from State Regulations through 2020	71,740
Reductions from 2010 CAP through 2020	15,010
Total Reductions through 2020	**87,980**
Additional projected reductions: 2021-2035	29,110
Total Reductions through 2035	**117,000**

[108] For purposes of this analysis, GHG emissions are expressed in terms of short tons (2000 lbs.), not metric tons.

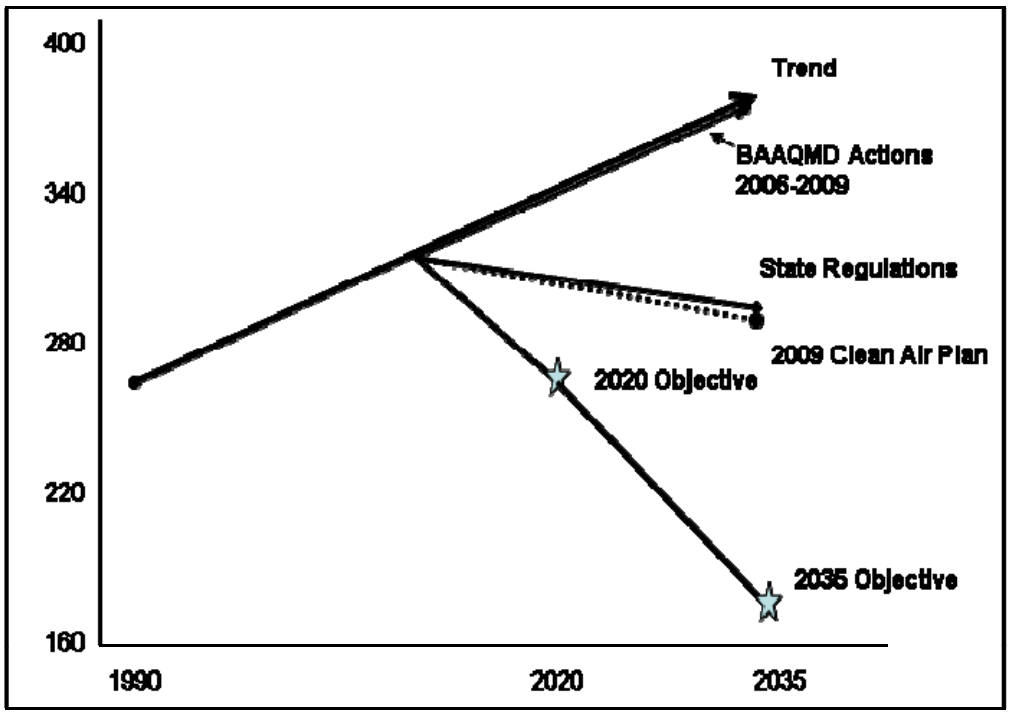

Figure G-3. Greenhouse gases performance objective. (Estimated emissions in 1,000 tons/day)

Discussion of Findings

Our analysis finds that anticipated emissions reductions will enable the Bay Area to reach the performance objective to reduce PM2.5 10% by 2015, but that we will fall short of the diesel PM and the greenhouse gas reduction objectives.

In the case of the diesel PM objective, EPA and CARB set emissions standards for most diesel engines, including trucks, buses, construction equipment, harbor craft, etc. For the past decade, CARB has been adopting and implementing ambitious ATCMs to reduce emissions from all types of diesel engines, both new and existing, with a goal of reducing diesel PM by 85% by 2020. To implement recent changes in State law intended to address the current severe economic recession, CARB has modified compliance timelines for the construction equipment diesel ATCM (i.e., the in-use off-road diesel vehicle regulation). CARB is currently also considering changes to the requirements for in-use on-road trucks and further changes to the in-use off-road diesel vehicle regulation, to account for emission reductions occurring due to the current economic downturn. However, none of the recent or proposed changes to the in-use off-road and in-use on-road regulations would result in fewer reductions of diesel PM by 2020. Combined diesel emissions from all sources should still ultimately be reduced by 85%, although achievement of this objective may not occur by 2020. Nevertheless, the Bay Area should still see a very significant reduction in diesel PM emissions.

In support of the desired 85% reduction of diesel PM emissions by 2020, the Air District will continue to aggressively implement its effort to reduce diesel PM emissions and exposure via enhanced monitoring and analysis of impacted communities, targeted enforcement of CARB regulations in impacted communities, and targeting its grant programs to projects in impacted communities.

The CAP GHG performance objectives goals are based on state goals articulated in AB 32 and Governor's Executive Order S-3-05. This analysis demonstrates that additional measures will be needed to achieve the GHG targets, beyond the measures defined and quantified in the CARB AB 32 Scoping Plan and the 2010 CAP. The additional reductions may be obtained through some combination of State actions that have not yet been fully defined, the Sustainable Communities Strategy that will be developed by Bay Area regional agencies in cooperation with local governments by year 2013, local climate action plans, future Air District actions, and voluntary actions by Bay Area residents and businesses.

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California Public School Directory

Search Results

Search Criteria: Public Schools; District - Emery Unified; Status - Active/Pending

1 - 3 of 3 schools (click on the County Name, District Name, or School heading links to re-sort the results)

CDS Code	County Name	District Name	Select School name below for details	Status	Zip Code
01611686090492	Alameda	Emery Unified	Anna Yates Elementary	Active	94608-3643
01611680132746	Alameda	Emery Unified	Emery Secondary	Active	94608-3142
01611680119933	Alameda	Emery Unified	Emeryville Preschool Students	Active	94608-2132

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New Search | Download Results | Download a tab delimited file of these results to your computer. .

Submitting Corrections

All corrections must be routed through the LEA CDS coordinator. Below are links to resources for LEA CDS coordinators for submitting corrections.

- OPUS-CDS Web Application
  Application used by authorized LEA CDS coordinators to notify the CDE of updates to the Public School Directory. A user name and password is required to access this application.
- OPUS-CDS Application and Resources
  Access the OPUS-CDS Web application, as well as useful information for using this application.

Resources

- California School Directory Revision History
- Schools & Districts
  Access information on CDS Codes, CDS-related forms, school code assignments, and district reorganizations.
- Educational Resources Catalog
  Obtain printed and electronic copies of the California Public School Directory and other publications from the CDE's Publications Office.
- Public School Database (downloadable)
  Downloadable file of California public schools and districts.
- County Offices of Education (COE)
  Obtain links to all COE Web sites.
- Search for public schools nationwide (Outside Source) on the National Center for Educational Statistics (NCES) Web site.
- Search for private schools nationwide (Outside Source) on the National Center for Educational Statistics (NCES) Web site.
- DataQuest
  Access a variety of data for the state, counties, districts, and public schools.

Questions: CDS Administration | cdsadmin@cde.ca.gov | 916-327-4014

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California Department of Education
1430 N Street
Sacramento, CA 95814



California School Directory

School: LePort Schools, Emeryville

County	Alameda
Located within the boundaries of this public school district	Alameda Unified
School	LePort Schools, Emeryville
CDS Code	01 61119 6148738
Low Grade	K
High Grade	6
School Email	emeryville@leportschools.com
Phone Number	(510) 915-9967
NCES/Federal School ID	
School Address	6460 Hollis St., Ste. A Emeryville, CA 94608-1028 Yahoo Map
Mailing Address	6460 Hollis St., Ste. A Emeryville, CA 94608-1028
Administrator(s)	Sarina Weinstein Other sweinstein@leportschools.com
Status	Active
School Type	Elementary School (Private)

Back New Search

Only private schools with six or more students that filed a private school affidavit appear in this listing.

NOTE: INCLUSION OF PRIVATE SCHOOLS IN THIS DIRECTORY SHOULD NOT BE INTERPRETED AS AN ENDORSEMENT OR CERTIFICATION OF ANY SORT BY ANY STATE ENTITY OR AGENCY (excluding nonpublic, nonsectarian schools (NPS) that are certified by the California Department of Education to provide special education services to public education students).

For private school information and instructions on submitting updates, please visit the Private School Affidavit Web page. For general inquiries, please send an e-mail to privateschools@cde.ca.gov.

Go to the Private Schools web page for downloadable private school data.

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Questions: CDS Administration | cdsadmin@cde.ca.gov | 916-327-4014

California Department of Education
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California Public School Directory

Search Results

Search Criteria: Public Schools; District - Berkeley Unified; Zip Code includes '94710'; Status - Active/Pending

1 - 3 of 3 schools (click on the County Name, District Name, or School heading links to re-sort the results)

CDS Code	County Name	District Name	Select School name below for details	Status	Zip Code
01611430122697	Alameda	Berkeley Unified	REALM Charter High	Active	94710-2026
01611430122689	Alameda	Berkeley Unified	REALM Charter Middle	Active	94710-2026
01611436090187	Alameda	Berkeley Unified	Rosa Parks Environmental Science Magnet	Active	94710-2389

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- Public School Database (downloadable)
  Downloadable file of California public schools and districts.
- County Offices of Education (COE)
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- Search for public schools nationwide (Outside Source) on the National Center for Educational Statistics (NCES) Web site.
- Search for private schools nationwide (Outside Source) on the National Center for Educational Statistics (NCES) Web site.
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Questions: CDS Administration | cdsadmin@cde.ca.gov | 916-327-4014

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California Department of Education
1430 N Street
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California Private and Nonpublic, Nonsectarian School Directory

Search Results

Search Criteria: Private and Nonpublic, Nonsectarian School; County - Alameda; Zip Code includes '94710'; Status - Active

1 - 5 of 5 schools (click on the County Name, District Name, or School heading links to re-sort the results)

CDS Code	County Name	Within the boundaries of	Select School name below for details	NPS*	Status	Zip Code
01611436989784	Alameda	Berkeley Unified	Black Pine Circle School		Active	94710-2091
01611436130207	Alameda	Berkeley Unified	Center for Early Intervention on Deafness (CEID)	Yes	Active	94710-2642
01611436900757	Alameda	Berkeley Unified	Ecole Bilingue De Berkeley		Active	94710-2718
01611436139273	Alameda	Berkeley Unified	Global Montessori International School		Active	94710-2709
01611437045552	Alameda	Berkeley Unified	Via Center	Yes	Active	94710-2248

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* 'Yes' indicates that the school is a certified Nonpublic, Nonsectarian School (NPS).

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Only private schools with six or more students that filed a private school affidavit appear in this listing.

NOTE: INCLUSION OF PRIVATE SCHOOLS IN THIS DIRECTORY SHOULD NOT BE INTERPRETED AS AN ENDORSEMENT OR CERTIFICATION OF ANY SORT BY ANY STATE ENTITY OR AGENCY (excluding nonpublic, nonsectarian schools (NPS) that are certified by the California Department of Education to provide special education services to public education students).

For private school information and instructions on submitting updates, please visit the Private School Affidavit Web page. For general inquiries, please send an e-mail to privateschools@cde.ca.gov.

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Questions: CDS Administration | cdsadmin@cde.ca.gov | 916-327-4014

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California Department of Education
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STATE OF CALIFORNIA
ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF ENVIRONMENTAL HEALTH HAZARD ASSESSMENT
SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT OF 1986

CHEMICALS KNOWN TO THE STATE TO CAUSE CANCER OR REPRODUCTIVE TOXICITY
JUNE 6, 2014

The Safe Drinking Water and Toxic Enforcement Act of 1986 requires that the Governor revise and republish at least once per year the list of chemicals known to the State to cause cancer or reproductive toxicity. The identification number indicated in the following list is the Chemical Abstracts Service (CAS) Registry Number. No CAS number is given when several substances are presented as a single listing. The date refers to the initial appearance of the chemical on the list. For easy reference, chemicals which are shown underlined are newly added. Chemicals or endpoints shown in strikeout were placed on the Proposition 65 list on the date noted, and have subsequently been removed.

Chemical	Type of Toxicity	CAS No.	Date Listed
A-alpha-C (2-Amino-9H-pyrido [2,3-b]indole)	cancer	26148-68-5	January 1, 1990
Acetaldehyde	cancer	75-07-0	April 1, 1988
Acetamide	cancer	60-35-5	January 1, 1990
Acetazolamide	developmental	59-66-5	August 20, 1999
Acetochlor	cancer	34256-82-1	January 1, 1989
Acetohydroxamic acid	developmental	546-88-3	April 1, 1990
2-Acetylaminofluorene	cancer	53-96-3	July 1, 1987
Acifluorfen sodium	cancer	62476-59-9	January 1, 1990
Acrylamide	cancer	79-06-1	January 1, 1990
Acrylamide	developmental, male	79-06-1	February 25, 2011
Acrylonitrile	cancer	107-13-1	July 1, 1987
Actinomycin D	cancer developmental	50-76-0	October 1, 1989 October 1, 1992
AF-2;[2-(2-furyl)-3-(5-nitro-2-furyl)] acrylamide	cancer	3688-53-7	July 1, 1987
Aflatoxins	cancer	---	January 1, 1988
Alachlor	cancer	15972-60-8	January 1, 1989
Alcoholic beverages, when associated with alcohol abuse	cancer	---	July 1, 1988
Aldrin	cancer	309-00-2	July 1, 1988
All-trans retinoic acid	developmental	302-79-4	January 1, 1989
~~Allyl chloride~~ Delisted October 29, 1999	~~cancer~~	~~107-05-1~~	~~January 1, 1990~~
Alprazolam	developmental	28981-97-7	July 1, 1990
Altretamine	developmental, male	645-05-6	August 20, 1999
Amantadine hydrochloride	developmental	665-66-7	February 27, 2001
Amikacin sulfate	developmental	39831-55-5	July 1, 1990
2-Aminoanthraquinone	cancer	117-79-3	October 1, 1989
p-Aminoazobenzene	cancer	60-09-3	January 1, 1990
o-Aminoazotoluene	cancer	97-56-3	July 1, 1987

4-Aminobiphenyl (4-amino-diphenyl)	cancer	92-67-1	February 27, 1987
1-Amino-2,4-dibromo-anthraquinone	cancer	81-49-2	August 26, 1997
3-Amino-9-ethylcarbazole hydrochloride	cancer	6109-97-3	July 1, 1989
2-Aminofluorene	cancer	153-78-6	January 29, 1999
Aminoglutethimide	developmental	125-84-8	July 1, 1990
Aminoglycosides	developmental	---	October 1, 1992
1-Amino-2-methylanthraquinone	cancer	82-28-0	October 1, 1989
2-Amino-5-(5-nitro-2-furyl)-1,3,4-thiadiazole	cancer	712-68-5	July 1, 1987
4-Amino-2-nitrophenol	cancer	119-34-6	January 29, 1999
Aminopterin	developmental, female	54-62-6	July 1, 1987
Amiodarone hydrochloride	developmental, female, male	19774-82-4	August 26, 1997
Amitraz	developmental	33089-61-1	March 30, 1999
Amitrole	cancer	61-82-5	July 1, 1987
Amoxapine	developmental	14028-44-5	May 15, 1998
Amsacrine	cancer	51264-14-3	August 7, 2009
~~tert-Amyl methyl ether~~ Delisted December 13, 2013	~~developmental~~	~~994-05-8~~	~~December 18, 2009~~
Anabolic steroids	female, male	---	April 1, 1990
Analgesic mixtures containing phenacetin	cancer	---	February 27, 1987
Androstenedione	cancer	27208-37-3	May 3, 2011
Angiotensin converting enzyme (ACE) inhibitors	developmental	---	October 1, 1992
Aniline	cancer	62-53-3	January 1, 1990
Aniline hydrochloride	cancer	142-04-1	May 15, 1998
o-Anisidine	cancer	90-04-0	July 1, 1987
o-Anisidine hydrochloride	cancer	134-29-2	July 1, 1987
Anisindione	developmental	117-37-3	October 1, 1992
Anthraquinone	cancer	84-65-1	September 28, 2007
Antimony oxide (Antimony trioxide)	cancer	1309-64-4	October 1, 1990
Aramite	cancer	140-57-8	July 1, 1987
Areca nut	cancer	---	February 3, 2006
Aristolochic acids	cancer	---	July 9, 2004
Arsenic (inorganic arsenic compounds)	cancer	--	February 27, 1987
Arsenic (inorganic oxides)	developmental	---	May 1, 1997
Asbestos	cancer	1332-21-4	February 27, 1987
Aspirin (NOTE: It is especially important not to use aspirin during the last three months of pregnancy, unless specifically directed to do so by a physician because it may cause problems in the unborn child or complications during delivery.)	developmental, female	50-78-2	July 1, 1990
Atenolol	developmental	29122-68-7	August 26, 1997
Auramine	cancer	492-80-8	July 1, 1987

Auranofin	developmental	34031-32-8	January 29, 1999
Avermectin B1 (Abamectin)	developmental	71751-41-2	December 3, 2010
Azacitidine	cancer	320-67-2	January 1, 1992
Azaserine	cancer	115-02-6	July 1, 1987
Azathioprine	cancer	446-86-6	February 27, 1987
Azathioprine	developmental	446-86-6	September 1, 1996
Azobenzene	cancer	103-33-3	January 1, 1990
Barbiturates	developmental	---	October 1, 1992
Beclomethasone dipropionate	developmental	5534-09-8	May 15, 1998
Benomyl	developmental, male	17804-35-2	July 1, 1991
Benthiavalicarb-isopropyl	cancer	177406-68-7	July 1, 2008
Benz[a]anthracene	cancer	56-55-3	July 1, 1987
Benzene	cancer	71-43-2	February 27, 1987
Benzene	developmental, male	71-43-2	December 26, 1997
Benzidine [and its salts]	cancer	92-87-5	February 27, 1987
Benzidine-based dyes	cancer	---	October 1, 1992
Benzodiazepines	developmental	---	October 1, 1992
Benzo[b]fluoranthene	cancer	205-99-2	July 1, 1987
Benzo[j]fluoranthene	cancer	205-82-3	July 1, 1987
Benzo[k]fluoranthene	cancer	207-08-9	July 1, 1987
Benzofuran	cancer	271-89-6	October 1, 1990
Benzophenone	cancer	119-61-9	June 22, 2012
Benzo[a]pyrene	cancer	50-32-8	July 1, 1987
Benzotrichloride	cancer	98-07-7	July 1, 1987
Benzphetamine hydrochloride	developmental	5411-22-3	April 1, 1990
Benzyl chloride	cancer	100-44-7	January 1, 1990
Benzyl violet 4B	cancer	1694-09-3	July 1, 1987
Beryllium and beryllium compounds	cancer	---	October 1, 1987
Betel quid with tobacco	cancer	---	January 1, 1990
Betel quid without tobacco	cancer	---	February 3, 2006
2,2-Bis(bromomethyl)-1,3-propanediol	cancer	3296-90-0	May 1, 1996
Bis(2-chloroethyl)ether	cancer	111-44-4	April 1, 1988
N,N-Bis(2-chloroethyl)-2-naphthylamine (Chlornapazine)	cancer	494-03-1	February 27, 1987
Bischloroethyl nitrosourea (BCNU) (Carmustine)	cancer	154-93-8	July 1, 1987
Bischloroethyl nitrosourea (BCNU) (Carmustine)	developmental	154-93-8	July 1, 1990
Bis(chloromethyl)ether	cancer	542-88-1	February 27, 1987
Bis(2-chloro-1-methylethyl)ether, technical grade	cancer	---	October 29, 1999
~~Bisphenol A (BPA)~~ Delisted April 19, 2013	~~developmental~~	~~80-05-7~~	~~April 11, 2013~~
Bitumens, extracts of steam-refined and air refined	cancer	---	January 1, 1990
Bracken fern	cancer	---	January 1, 1990
Bromacil lithium salt	developmental	53404-19-6	May 18, 1999
Bromacil lithium salt	male	53404-19-6	January 17, 2003
Bromate	cancer	15541-45-4	May 31, 2002
Bromochloroacetic acid	cancer	5589-96-8	April 6, 2010

Bromodichloromethane	cancer	75-27-4	January 1, 1990
Bromoethane	cancer	74-96-4	December 22, 2000
Bromoform	cancer	75-25-2	April 1, 1991
1-Bromopropane (1-BP)	developmental, female, male	106-94-5	December 7, 2004
2-Bromopropane (2-BP)	female, male	75-26-3	May 31, 2005
Bromoxynil	developmental	1689-84-5	October 1, 1990
Bromoxynil octanoate	developmental	1689-99-2	May 18, 1999
Butabarbital sodium	developmental	143-81-7	October 1, 1992
1,3-Butadiene	cancer	106-99-0	April 1, 1988
1,3-Butadiene	developmental, female, male	106-99-0	April 16, 2004
1,4-Butanediol dimethanesulfonate (Busulfan)	cancer	55-98-1	February 27, 1987
1,4-Butanediol dimethanesulfonate (Busulfan)	developmental	55-98-1	January 1, 1989
Butylated hydroxyanisole	cancer	25013-16-5	January 1, 1990
Butyl benzyl phthalate (BBP)	developmental	85-68-7	December 2, 2005
~~n-Butyl glycidyl ether~~ Delisted April 4, 2014	~~male~~	~~2426-08-6~~	~~August 7, 2009~~
beta-Butyrolactone	cancer	3068-88-0	July 1, 1987
Cacodylic acid	cancer	75-60-5	May 1, 1996
Cadmium	developmental, male	---	May 1, 1997
Cadmium and cadmium compounds	cancer	---	October 1, 1987
Caffeic acid	cancer	331-39-5	October 1, 1994
Captafol	cancer	2425-06-1	October 1, 1988
Captan	cancer	133-06-2	January 1, 1990
Carbamazepine	developmental	298-46-4	January 29, 1999
Carbaryl	cancer	63-25-2	February 5, 2010
Carbaryl	developmental, female, male	63-25-2	August 7, 2009
Carbazole	cancer	86-74-8	May 1, 1996
Carbon black (airborne, unbound particles of respirable size)	cancer	1333-86-4	February 21, 2003
Carbon disulfide	developmental, female, male	75-15-0	July 1, 1989
Carbon monoxide	developmental	630-08-0	July 1, 1989
Carbon tetrachloride	cancer	56-23-5	October 1, 1987
Carbon-black extracts	cancer	---	January 1, 1990
Carboplatin	developmental	41575-94-4	July 1, 1990
N-Carboxymethyl-N-nitrosourea	cancer	60391-92-6	January 25, 2002
Catechol	cancer	120-80-9	July 15, 2003
Ceramic fibers (airborne particles of respirable size)	cancer	---	July 1, 1990
Certain combined chemotherapy for lymphomas	cancer	---	February 27, 1987
Chenodiol	developmental	474-25-9	April 1, 1990
Chloral	cancer	75-87-6	September 13, 2013
Chloral hydrate	cancer	302-17-0	September 13, 2013
Chlorambucil	cancer	305-03-3	February 27, 1987

Chlorambucil	developmental	305-03-3	January 1, 1989
~~Chloramphenicol~~ Delisted January 4, 2013	~~cancer~~	~~56-75-7~~	~~October 1, 1989~~
Chloramphenicol sodium succinate	cancer	982-57-0	September 27, 2013
Chlorcyclizine hydrochloride	developmental	1620-21-9	July 1, 1987
Chlordane	cancer	57-74-9	July 1, 1988
Chlordecone (Kepone)	cancer	143-50-0	January 1, 1988
Chlordecone (Kepone)	developmental	143-50-0	January 1, 1989
Chlordiazepoxide	developmental	58-25-3	January 1, 1992
Chlordiazepoxide hydrochloride	developmental	438-41-5	January 1, 1992
Chlordimeform	cancer	6164-98-3	January 1, 1989
Chlorendic acid	cancer	115-28-6	July 1, 1989
Chlorinated paraffins (Average chain length, C12; approximately 60 percent chlorine by weight)	cancer	108171-26-2	July 1, 1989
p-Chloroaniline	cancer	106-47-8	October 1, 1994
p-Chloroaniline hydrochloride	cancer	20265-96-7	May 15, 1998
~~Chlorodibromomethane~~ Delisted October 29, 1999	~~cancer~~	~~124-48-1~~	~~January 1, 1990~~
Chloroethane (Ethyl chloride)	cancer	75-00-3	July 1, 1990
1-(2-Chloroethyl)-3-cyclohexyl-1-nitrosourea (CCNU) (Lomustine)	cancer	13010-47-4	January 1, 1988
1-(2-Chloroethyl)-3-cyclohexyl-1-nitrosourea (CCNU) Lomustine)	developmental	13010-47-4	July 1, 1990
1-(2-Chloroethyl)-3-(4-methyl-cyclohexyl) -1-nitrosourea (Methyl-CCNU)	cancer	13909-09-6	October 1, 1988
Chloroform	cancer	67-66-3	October 1, 1987
Chloroform	developmental	67-66-3	August 7, 2009
Chloromethyl methyl ether (technical grade)	cancer	107-30-2	February 27, 1987
3-Chloro-2-methylpropene	cancer	563-47-3	July 1, 1989
1-Chloro-4-nitrobenzene	cancer	100-00-5	October 29, 1999
4-Chloro-*o*-phenylenediamine	cancer	95-83-0	January 1, 1988
Chloroprene	cancer	126-99-8	June 2, 2000
2-Chloropropionic acid	male	598-78-7	August 7, 2009
Chlorothalonil	cancer	1897-45-6	January 1, 1989
p-Chloro-*o*-toluidine	cancer	95-69-2	January 1, 1990
p-Chloro-*o*-toluidine, strong acid salts of	cancer	---	May 15, 1998
5-Chloro-*o*-toluidine and its strong acid salts	cancer	---	October 24, 1997
Chlorotrianisene	cancer	569-57-3	September 1, 1996
Chlorozotocin	cancer	54749-90-5	January 1, 1992
~~Chlorsulfuron~~ Delisted June 6, 2014	~~developmental, female, male~~	~~64902-72-3~~	~~May 14, 1999~~
Chromium (hexavalent compounds)	cancer	---	February 27, 1987
Chromium (hexavalent compounds)	developmental, female, male	---	December 19, 2008
Chrysene	cancer	218-01-9	January 1, 1990
C.I. Acid Red 114	cancer	6459-94-5	July 1, 1992
C.I. Basic Red 9 monohydrochloride	cancer	569-61-9	July 1, 1989

C.I. Direct Blue 15	cancer	2429-74-5	August 26, 1997
C.I. Direct Blue 218	cancer	28407-37-6	August 26, 1997
C.I. Disperse Yellow 3	cancer	2832-40-8	February 8, 2013
C.I. Solvent Yellow 14	cancer	842-07-9	May 15, 1998
Ciclosporin (Cyclosporin A; Cyclosporine)	cancer	59865-13-3 79217-60-0	January 1, 1992
Cidofovir	cancer, developmental, female, male	113852-37-2	January 29, 1999
Cinnamyl anthranilate	cancer	87-29-6	July 1, 1989
Cisplatin	cancer	15663-27-1	October 1, 1988
Citrus Red No. 2	cancer	6358-53-8	October 1, 1989
Cladribine	developmental	4291-63-8	September 1, 1996
Clarithromycin	developmental	81103-11-9	May 1, 1997
Clobetasol propionate	developmental, female	25122-46-7	May 15, 1998
Clofibrate	cancer	637-07-0	September 1, 1996
Clomiphene citrate	cancer	50-41-9	May 24, 2013
Clomiphene citrate	developmental	50-41-9	April 1, 1990
Clorazepate dipotassium	developmental	57109-90-7	October 1, 1992
Cobalt metal powder	cancer	7440-48-4	July 1, 1992
Cobalt [II] oxide	cancer	1307-96-6	July 1, 1992
Cobalt sulfate	cancer	10124-43-3	May 20, 2005
Cobalt sulfate heptahydrate	cancer	10026-24-1	June 2, 2000
Cocaine	developmental, female	50-36-2	July 1, 1989
Coconut oil diethanolamine condensate (cocamide diethanolamine)	cancer	---	June 22, 2012
Codeine phosphate	developmental	52-28-8	May 15, 1998
Coke oven emissions	cancer	---	February 27, 1987
Colchicine	developmental, male	64-86-8	October 1, 1992
Conjugated estrogens	cancer	---	February 27, 1987
Conjugated estrogens	developmental	---	April 1, 1990
Creosotes	cancer	---	October 1, 1988
p-Cresidine	cancer	120-71-8	January 1, 1988
Cumene	cancer	98-82-8	April 6, 2010
Cupferron	cancer	135-20-6	January 1, 1988
Cyanazine	developmental	21725-46-2	April 1, 1990
Cycasin	cancer	14901-08-7	January 1, 1988
Cycloate	developmental	1134-23-2	March 19, 1999
~~Cyclohexanol~~ Delisted January 25, 2002	~~male~~	~~108-93-0~~	~~November 6, 1998~~
Cycloheximide	developmental	66-81-9	January 1, 1989
Cyclopenta[cd]pyrene	cancer	27208-37-3	April 29, 2011
Cyclophosphamide (anhydrous)	cancer	50-18-0	February 27, 1987
Cyclophosphamide (anhydrous)	developmental, female, male	50-18-0	January 1, 1989
Cyclophosphamide (hydrated)	cancer	6055-19-2	February 27, 1987
Cyclophosphamide (hydrated)	developmental, female, male	6055-19-2	January 1, 1989
Cyhexatin	developmental	13121-70-5	January 1, 1989
Cytarabine	developmental	147-94-4	January 1, 1989
Cytembena	cancer	21739-91-3	May 15, 1998

D&C Orange No. 17	cancer	3468-63-1	July 1, 1990
D&C Red No. 8	cancer	2092-56-0	October 1, 1990
D&C Red No. 9	cancer	5160-02-1	July 1, 1990
D&C Red No. 19	cancer	81-88-9	July 1, 1990
Dacarbazine	cancer	4342-03-4	January 1, 1988
Dacarbazine	developmental	4342-03-4	January 29, 1999
Daminozide	cancer	1596-84-5	January 1, 1990
Danazol	developmental	17230-88-5	April 1, 1990
Dantron (Chrysazin; 1,8-Dihydroxyanthraquinone)	cancer	117-10-2	January 1, 1992
Daunomycin	cancer	20830-81-3	January 1, 1988
Daunorubicin hydrochloride	developmental	23541-50-6	July 1, 1990
2,4-D butyric acid	~~developmental~~, male	94-82-6	June 18, 1999
DDD (Dichlorodiphenyl-dichloroethane)	cancer	72-54-8	January 1, 1989
DDE (Dichlorodi-phenyldichloroethylene)	cancer	72-55-9	January 1, 1989
DDT (Dichlorodi-phenyltrichloroethane)	cancer	50-29-3	October 1 , 1987
o,p'-DDT	developmental, female, male	789-02-6	May 15, 1998
p,p'-DDT	developmental, female, male	50-29-3	May 15, 1998
DDVP (Dichlorvos)	cancer	62-73-7	January 1, 1989
Demeclocycline hydrochloride (internal use)	developmental	64-73-3	January 1, 1992
~~2,4-DP (dichloroprop)~~ Delisted January 25, 2002	~~developmental~~	~~120-36-5~~	~~April 27, 1999~~
N,N'-Diacetylbenzidine	cancer	613-35-4	October 1, 1989
2,4-Diaminoanisole	cancer	615-05-4	October 1, 1990
2,4-Diaminoanisole sulfate	cancer	39156-41-7	January 1, 1988
4,4'-Diaminodiphenyl ether (4,4'-Oxydianiline)	cancer	101-80-4	January 1, 1988
2,4-Diaminotoluene	cancer	95-80-7	January 1, 1988
Diaminotoluene (mixed)	cancer	---	January 1, 1990
Diazepam	developmental	439-14-5	January 1, 1992
Diazoaminobenzene	cancer	136-35-6	May 20, 2005
Diazoxide	developmental	364-98-7	February 27, 2001
Dibenz[a,h]acridine	cancer	226-36-8	January 1, 1988
Dibenz[a,j]acridine	cancer	224-42-0	January 1, 1988
Dibenz[a,h]anthracene	cancer	53-70-3	January 1, 1988
7H-Dibenzo[c,g]carbazole	cancer	194-59-2	January 1, 1988
Dibenzo[a,e]pyrene	cancer	192-65-4	January 1, 1988
Dibenzo[a,h]pyrene	cancer	189-64-0	January 1, 1988
Dibenzo[a,i]pyrene	cancer	189-55-9	January 1, 1988
Dibenzo[a,l]pyrene	cancer	191-30-0	January 1, 1988
Dibromoacetic acid	cancer	631-64-1	June 17, 2008
Dibromoacetonitrile	cancer	3252-43-5	May 3, 2011
1,2-Dibromo-3-chloropropane (DBCP)	cancer	96-12-8	July 1, 1987
1,2-Dibromo-3-chloropropane (DBCP)	male	96-12-8	February 27, 1987
2,3-Dibromo-1-propanol	cancer	96-13-9	October 1, 1994

Dichloroacetic acid	cancer	79-43-6	May 1, 1996
Dichloroacetic acid	developmental, male	79-43-6	August 7, 2009
p-Dichlorobenzene	cancer	106-46-7	January 1, 1989
3,3'-Dichlorobenzidine	cancer	91-94-1	October 1, 1987
3,3'-Dichlorobenzidine dihydrochloride	cancer	612-83-9	May 15, 1998
1,1-Dichloro-2,2-bis(*p*-chlorophenyl)ethylene (DDE)	developmental, male	72-55-9	March 30, 2010
1,4-Dichloro-2-butene	cancer	764-41-0	January 1, 1990
3,3'-Dichloro-4,4'-diaminodiphenyl ether	cancer	28434-86-8	January 1, 1988
1,1-Dichloroethane	cancer	75-34-3	January 1, 1990
Dichloromethane (Methylene chloride)	cancer	75-09-2	April 1, 1988
Dichlorophene	developmental	97-23-4	April 27, 1999
1,2-Dichloropropane	cancer	78-87-5	January 1, 1990
1,3-Dichloro-2-propanol (1,3-DCP)	cancer	96-23-1	October 8, 2010
1,3-Dichloropropene	cancer	542-75-6	January 1, 1989
Dichlorphenamide	developmental	120-97-8	February 27, 2001
Diclofop-methyl	cancer	51338-27-3	April 6, 2010
Diclofop methyl	developmental	51338-27-3	March 5, 1999
Dicumarol	developmental	66-76-2	October 1, 1992
Dieldrin	cancer	60-57-1	July 1, 1988
~~Dienestrol~~ Delisted January 4, 2013	~~cancer~~	~~84-17-3~~	~~January 1, 1990~~
Diepoxybutane	cancer	1464-53-5	January 1, 1988
Diesel engine exhaust	cancer	---	October 1, 1990
Diethanolamine	cancer	111-42-2	June 22, 2012
Di(2-ethylhexyl)phthalate (DEHP)	cancer	117-81-7	January 1, 1988
Di(2-ethylhexyl)phthalate (DEHP)	developmental, male	117-81-7	October 24, 2003
1,2-Diethylhydrazine	cancer	1615-80-1	January 1, 1988
Diethylstilbestrol (DES)	cancer	56-53-1	February 27, 1987
Diethylstilbestrol (DES)	developmental	56-53-1	July 1, 1987
Diethyl sulfate	cancer	64-67-5	January 1, 1988
Diflunisal	developmental, female	22494-42-4	January 29, 1999
~~Diglycidyl ether~~ Delisted April 4, 2014	~~male~~	~~2238-07-5~~	~~August 7, 2009~~
Diglycidyl resorcinol ether (DGRE)	cancer	101-90-6	July 1, 1989
Dihydroergotamine mesylate	developmental	6190-39-2	May 1, 1997
Dihydrosafrole	cancer	94-58-6	January 1, 1988
Di-isodecyl phthalate (DIDP)	developmental	68515-49-1/ 26761-40-0	April 20, 2007
Diisononyl phthalate (DINP)	cancer	---	December 20, 2013
Diisopropyl sulfate	cancer	2973-10-6	April 1, 1993
Diltiazem hydrochloride	developmental	33286-22-5	February 27, 2001
3,3'-Dimethoxybenzidine (*o*-Dianisidine)	cancer	119-90-4	January 1, 1988
3,3'-Dimethoxybenzidine dihydrochloride (*o*-Dianisidine dihydrochloride)	cancer	20325-40-0	October 1, 1990
3,3'-Dimethoxybenzidine-based dyes metabolized to 3,3'-dimethoxybenzidine	cancer	---	June 11, 2004
N, N-Dimethylacetamide	developmental, male	127-19-5	May 21, 2010

4-Dimethylaminoazobenzene	cancer	60-11-7	January 1, 1988
trans-2-[(Dimethylamino)methyl-imino]-5-[2-(5-nitro-2-furyl)vinyl]-1,3,4-oxadiazole	cancer	55738-54-0	January 1, 1988
7,12-Dimethylbenz(a)anthracene	cancer	57-97-6	January 1, 1990
3,3'-Dimethylbenzidine (ortho-Tolidine)	cancer	119-93-7	January 1, 1988
3,3'-Dimethylbenzidine-based dyes metabolized to 3,3'-dimethylbenzidine	cancer	---	June 11, 2004
3,3'-Dimethylbenzidine dihydrochloride	cancer	612-82-8	April 1, 1992
Dimethylcarbamoyl chloride	cancer	79-44-7	January 1, 1988
1,1-Dimethylhydrazine (UDMH)	cancer	57-14-7	October 1, 1989
1,2-Dimethylhydrazine	cancer	540-73-8	January 1, 1988
2,6-Dimethyl-N-nitrosomorpholine	cancer	1456-28-6	February 8, 2013
Dimethyl sulfate	cancer	77-78-1	January 1, 1988
Dimethylvinylchloride	cancer	513-37-1	July 1, 1989
N,N-Dimethyl-*p*-toluidine	cancer	99-97-8	May 2, 2014
Di-*n*-butyl phthalate (DBP)	developmental, female, male	84-74-2	December 2, 2005
Di-*n*-hexyl phthalate (DnHP)	female, male	84-75-3	December 2, 2005
m-Dinitrobenzene	male	99-65-0	July 1, 1990
o-Dinitrobenzene	male	528-29-0	July 1, 1990
p-Dinitrobenzene	male	100-25-4	July 1, 1990
3,7-Dinitrofluoranthene	cancer	105735-71-5	August 26, 1997
3,9-Dinitrofluoranthene	cancer	22506-53-2	August 26, 1997
1,3-Dinitropyrene	cancer	75321-20-9	November 2, 2012
1,6-Dinitropyrene	cancer	42397-64-8	October 1, 1990
1,8-Dinitropyrene	cancer	42397-65-9	October 1, 1990
Dinitrotoluene (technical grade)	female, male	---	August 20, 1999
Dinitrotoluene mixture, 2,4-/2,6-	cancer	---	May 1, 1996
2,4-Dinitrotoluene	cancer	121-14-2	July 1, 1988
2,4-Dinitrotoluene	male	121-14-2	August 20, 1999
2,6-Dinitrotoluene	cancer	606-20-2	July 1, 1995
2,6-Dinitrotoluene	male	606-20-2	August 20, 1999
Dinocap	developmental	39300-45-3	April 1, 1990
Dinoseb	developmental, male	88-85-7	January 1, 1989
Di-*n*-propyl isocinchomeronate (MGK Repellent 326)	cancer	136-45-8	May 1, 1996
1,4-Dioxane	cancer	123-91-1	January 1, 1988
Diphenylhydantoin (Phenytoin)	cancer	57-41-0	January 1, 1988
Diphenylhydantoin (Phenytoin)	developmental	57-41-0	July 1, 1987
Diphenylhydantoin (Phenytoin), sodium salt	cancer	630-93-3	January 1, 1988
Direct Black 38 (technical grade)	cancer	1937-37-7	January 1, 1988
Direct Blue 6 (technical grade)	cancer	2602-46-2	January 1, 1988
Direct Brown 95 (technical grade)	cancer	16071-86-6	October 1, 1988
Disodium cyanodithioimido-carbonate	developmental	138-93-2	March 30, 1999
Disperse Blue 1	cancer	2475-45-8	October 1, 1990
Diuron	cancer	330-54-1	May 31, 2002

Doxorubicin hydrochloride (Adriamycin)	cancer	25316-40-9	July 1, 1987
Doxorubicin hydrochloride (Adriamycin)	developmental, male	25316-40-9	January 29, 1999
Doxycycline (internal use)	developmental	564-25-0	July 1, 1990
Doxycycline calcium (internal use)	developmental	94088-85-4	January 1, 1992
Doxycycline hyclate (internal use)	developmental	24390-14-5	October 1, 1991
Doxycycline monohydrate (internal use)	developmental	17086-28-1	October 1, 1991
Emissions from combustion of coal	cancer	---	August 7, 2013
Emissions from high-temperature unrefined rapeseed oil	cancer	---	January 3, 2014
Endrin	developmental	72-20-8	May 15, 1998
Environmental tobacco smoke (ETS)	developmental	---	June 9, 2006
Epichlorohydrin	cancer	106-89-8	October 1, 1987
Epichlorohydrin	male	106-89-8	September 1, 1996
Epoxiconazole	cancer	135319-73-2	April 15, 2011
Ergotamine tartrate	developmental	379-79-3	April 1, 1990
Erionite	cancer	12510-42-8/ 66733-21-9	October 1, 1988
Estradiol 17B	cancer	50-28-2	January 1, 1988
Estragole	cancer	140-67-0	October 29, 1999
Estrogens, steroidal	cancer	---	August 19, 2005
Estrogen-progestogen (combined) as menopausal therapy	cancer	---	November 4, 2011
Estrone	cancer	53-16-7	January 1, 1988
Estropipate	cancer, developmental	7280-37-7	August 26, 1997
Ethanol in alcoholic beverages	cancer	---	April 29, 2011
Ethinylestradiol	cancer	57-63-6	January 1, 1988
Ethionamide	developmental	536-33-4	August 26, 1997
Ethoprop	cancer	13194-48-4	February 27, 2001
Ethyl acrylate	cancer	140-88-5	July 1, 1989
Ethyl alcohol in alcoholic beverages	developmental	---	October 1, 1987
Ethylbenzene	cancer	100-41-4	June 11, 2004
~~Ethyl tert-butyl ether~~ Delisted December 13, 2013	~~male~~	~~637-92-3~~	~~December 18, 2009~~
Ethyl dipropylthiocarbamate	developmental	759-94-4	April 27, 1999
Ethyl-4,4'-dichlorobenzilate	cancer	510-15-6	January 1, 1990
Ethylene dibromide	cancer	106-93-4	July 1, 1987
Ethylene dibromide	developmental, male	106-93-4	May 15, 1998
Ethylene dichloride (1,2-Dichloroethane)	cancer	107-06-2	October 1, 1987
Ethylene glycol monoethyl ether	developmental, male	110-80-5	January 1, 1989
Ethylene glycol monoethyl ether acetate	developmental, male	111-15-9	January 1, 1993
Ethylene glycol monomethyl ether	developmental, male	109-86-4	January 1, 1989
Ethylene glycol monomethyl ether acetate	developmental, male	110-49-6	January 1, 1993
Ethyleneimine (Aziridine)	cancer	151-56-4	January 1, 1988

Ethylene oxide	cancer	75-21-8	July 1, 1987
Ethylene oxide	female	75-21-8	February 27, 1987
Ethylene oxide	developmental, male	75-21-8	August 7, 2009
Ethylene thiourea	cancer	96-45-7	January 1, 1988
Ethylene thiourea	developmental	96-45-7	January 1, 1993
~~2-Ethylhexanoic acid~~ Delisted December 13, 2013	~~developmental~~	~~149-57-5~~	~~August 7, 2009~~
Ethyl methanesulfonate	cancer	62-50-0	January 1, 1988
Etodolac	developmental, female	41340-25-4	August 20, 1999
Etoposide	cancer	33419-42-0	November 4, 2011
Etoposide	developmental	33419-42-0	July 1, 1990
Etoposide in combination with cisplatin and bleomycin	cancer	---	November 4, 2011
Etretinate	developmental	54350-48-0	July 1, 1987
Fenoxaprop ethyl	developmental	66441-23-4	March 26, 1999
Fenoxycarb	cancer	72490-01-8	June 2, 2000
Filgrastim	developmental	121181-53-1	February 27, 2001
Fluazifop butyl	developmental	69806-50-4	November 6, 1998
Flunisolide	developmental, female	3385-03-3	May 15, 1998
Fluorouracil	developmental	51-21-8	January 1, 1989
Fluoxymesterone	developmental	76-43-7	April 1, 1990
Flurazepam hydrochloride	developmental	1172-18-5	October 1, 1992
Flurbiprofen	developmental, female	5104-49-4	August 20, 1999
Flutamide	developmental	13311-84-7	July 1, 1990
Fluticasone propionate	developmental	80474-14-2	May 15, 1998
Fluvalinate	developmental	69409-94-5	November 6, 1998
Folpet	cancer	133-07-3	January 1, 1989
Formaldehyde (gas)	cancer	50-00-0	January 1, 1988
2-(2-Formylhydrazino)-4-(5-nitro-2-furyl)thiazole	cancer	3570-75-0	January 1, 1988
Fumonisin B_1	cancer	116355-83-0	November 14, 2003
Furan	cancer	110-00-9	October 1, 1993
Furazolidone	cancer	67-45-8	January 1, 1990
Furmecyclox	cancer	60568-05-0	January 1, 1990
Fusarin C	cancer	79748-81-5	July 1, 1995
Gallium arsenide	cancer	1303-00-0	August 1, 2008
Ganciclovir	cancer, developmental, male	82410-32-0	August 26, 1997
Ganciclovir sodium	developmental, male	107910-75-8	August 26, 1997
Gasoline engine exhaust (condensates/extracts)	cancer	---	October 1, 1990
Gemfibrozil	cancer	25812-30-0	December 22, 2000
Gemfibrozil	female, male	25812-30-0	August 20, 1999
Glass wool fibers (inhalable and biopersistent)	cancer	---	July 1, 1990
Glu-P-1 (2-Amino-6-methyldipyrido [1,2- a:3',2'-d]imidazole)	cancer	67730-11-4	January 1, 1990
Glu-P-2 (2-Aminodipyrido [1,2-a:3',2'-d]imidazole)	cancer	67730-10-3	January 1, 1990

Glycidaldehyde	cancer	765-34-4	January 1, 1988
Glycidol	cancer	556-52-5	July 1, 1990
Goserelin acetate	developmental, female, male	65807-02-5	August 26, 1997
Griseofulvin	cancer	126-07-8	January 1, 1990
Gyromitrin (Acetaldehyde methylformylhydrazone)	cancer	16568-02-8	January 1, 1988
Halazepam	developmental	23092-17-3	July 1, 1990
Halobetasol propionate	developmental	66852-54-8	August 20, 1999
Haloperidol	developmental, female	52-86-8	January 29, 1999
Halothane	developmental	151-67-7	September 1, 1996
HC Blue 1	cancer	2784-94-3	July 1, 1989
Heptachlor	cancer	76-44-8	July 1, 1988
Heptachlor	developmental	76-44-8	August 20, 1999
Heptachlor epoxide	cancer	1024-57-3	July 1, 1988
Herbal remedies containing plant species of the genus Aristolochia	cancer	---	July 9, 2004
Hexachlorobenzene	cancer	118-74-1	October 1, 1987
Hexachlorobenzene	developmental	118-74-1	January 1, 1989
Hexachlorobutadiene	cancer	87-68-3	May 3, 2011
Hexachlorocyclohexane (technical grade)	cancer	---	October 1, 1987
Hexachlorodibenzodioxin	cancer	34465-46-8	April 1, 1988
Hexachloroethane	cancer	67-72-1	July 1, 1990
2,4-Hexadienal (89% trans, trans isomer; 11% cis, trans isomer)	cancer	---	March 4, 2005
Hexafluoroacetone	developmental, male	684-16-2	August 1, 2008
Hexamethylphosphoramide	cancer	680-31-9	January 1, 1988
Hexamethylphosphoramide	male	680-31-9	October 1, 1994
Histrelin acetate	developmental	---	May 15, 1998
Hydramethylnon	developmental, male	67485-29-4	March 5, 1999
Hydrazine	cancer	302-01-2	January 1, 1988
Hydrazine sulfate	cancer	10034-93-2	January 1, 1988
Hydrazobenzene (1,2-Diphenylhydrazine)	cancer	122-66-7	January 1, 1988
Hydrogen cyanide (HCN) and cyanide salts (CN salts)	male	---	July 5, 2013
1-Hydroxyanthraquinone	cancer	129-43-1	May 27, 2005
Hydroxyurea	developmental	127-07-1	May 1, 1997
Idarubicin hydrochloride	developmental, male	57852-57-0	August 20, 1999
Ifosfamide	developmental	3778-73-2	July 1, 1990
Iodine-131	developmental	10043-66-0	January 1, 1989
Imazalil	cancer	35554-44-0	May 20, 2011
Indeno[1,2,3-cd]pyrene	cancer	193-39-5	January 1, 1988
Indium phosphide	cancer	22398-80-7	February 27, 2001
IQ (2-Amino-3-methylimidazo [4,5-f] quinoline)	cancer	76180-96-6	April 1, 1990
Iprodione	cancer	36734-19-7	May 1, 1996

Iprovalicarb	cancer	140923-17-7 140923-25-7	June 1, 2007
Iron dextran complex	cancer	9004-66-4	January 1, 1988
Isobutyl nitrite	cancer	542-56-3	May 1, 1996
Isoprene	cancer	78-79-5	May 1, 1996
Isopyrazam	cancer	881685-58-1	July 24, 2012
~~Isosafrole~~ Delisted December 8, 2006	~~cancer~~	~~120-58-1~~	~~October 1, 1989~~
Isotretinoin	developmental	4759-48-2	July 1, 1987
Isoxaflutole	cancer	141112-29-0	December 22, 2000
Kresoxim-methyl	cancer	143390-89-0	February 3, 2012
Lactofen	cancer	77501-63-4	January 1, 1989
Lasiocarpine	cancer	303-34-4	April 1, 1988
Lead	developmental, female, male	---	February 27, 1987
Lead and lead compounds	cancer	---	October 1, 1992
Lead acetate	cancer	301-04-2	January 1, 1988
Lead phosphate	cancer	7446-27-7	April 1, 1988
Lead subacetate	cancer	1335-32-6	October 1, 1989
Leather dust	cancer	---	April 29, 2011
Leuprolide acetate	developmental, female, male	74381-53-6	August 26, 1997
Levodopa	developmental	59-92-7	January 29, 1999
Levonorgestrel implants	female	797-63-7	May 15, 1998
Lindane and other hexachloro-cyclohexane isomers	cancer	---	October 1, 1989
Linuron	developmental	330-55-2	March 19, 1999
Lithium carbonate	developmental	554-13-2	January 1, 1991
Lithium citrate	developmental	919-16-4	January 1, 1991
Lorazepam	developmental	846-49-1	July 1, 1990
Lovastatin	developmental	75330-75-5	October 1, 1992
Lynestrenol	cancer	52-76-6	February 27, 2001
Malonaldehyde, sodium salt	cancer	24382-04-5	May 3, 2011
Mancozeb	cancer	8018-01-7	January 1, 1990
Maneb	cancer	12427-38-2	January 1, 1990
Marijuana smoke	cancer	---	June 19, 2009
Me-A-alpha-C (2-Amino-3-methyl-9H-pyrido[2,3-b]indole)	cancer	68006-83-7	January 1, 1990
Mebendazole	developmental	31431-39-7	August 20, 1999
Medroxyprogesterone acetate	cancer	71-58-9	January 1, 1990
Medroxyprogesterone acetate	developmental	71-58-9	April 1, 1990
Megestrol acetate	cancer	595-33-5	March 28, 2014
Megestrol acetate	developmental	595-33-5	January 1, 1991
MeIQ (2-Amino-3,4-dimethyl-imidazo[4,5-f]quinoline)	cancer	77094-11-2	October 1, 1994
MeIQx (2-Amino-3,8-dimethyl-imidazo[4,5-f]quinoxaline)	cancer	77500-04-0	October 1, 1994
Melphalan	cancer	148-82-3	February 27, 1987
Melphalan	developmental	148-82-3	July 1, 1990

Menotropins	developmental	9002-68-0	April 1, 1990
Mepanipyrim	cancer	110235-47-7	July 1, 2008
Meprobamate	developmental	57-53-4	January 1, 1992
Mercaptopurine	developmental	6112-76-1	July 1, 1990
Mercury and mercury compounds	developmental	---	July 1, 1990
Merphalan	cancer	531-76-0	April 1, 1988
Mestranol	cancer	72-33-3	April 1, 1988
Metam potassium	cancer	137-41-7	December 31, 2010
Methacycline hydrochloride	developmental	3963-95-9	January 1, 1991
Metham sodium	cancer	137-42-8	November 6, 1998
Metham sodium	developmental	137-42-8	May 15, 1998
Methanol	developmental	67-56-1	March 16, 2012
Methazole	developmental	20354-26-1	December 1, 1999
Methimazole	developmental	60-56-0	July 1, 1990
Methotrexate	developmental	59-05-2	January 1, 1989
Methotrexate sodium	developmental	15475-56-6	April 1, 1990
5-Methoxypsoralen with ultraviolet A therapy	cancer	484-20-8	October 1, 1988
8-Methoxypsoralen with ultraviolet A therapy	cancer	298-81-7	February 27, 1987
2-Methylaziridine (Propyleneimine)	cancer	75-55-8	January 1, 1988
Methylazoxymethanol	cancer	590-96-5	April 1, 1988
Methylazoxymethanol acetate	cancer	592-62-1	April 1, 1988
Methyl bromide, as a structural fumigant	developmental	74-83-9	January 1, 1993
Methyl carbamate	cancer	598-55-0	May 15, 1998
Methyl chloride	developmental	74-87-3	March 10, 2000
Methyl chloride	male	74-87-3	August 7, 2009
3-Methylcholanthrene	cancer	56-49-5	January 1, 1990
5-Methylchrysene	cancer	3697-24-3	April 1, 1988
4,4'-Methylene bis(2-chloroaniline)	cancer	101-14-4	July 1, 1987
4,4'-Methylene bis(N,N-dimethyl) benzenamine	cancer	101-61-1	October 1, 1989
4,4'-Methylene bis(2-methylaniline)	cancer	838-88-0	April 1, 1988
4,4'-Methylenedianiline	cancer	101-77-9	January 1, 1988
4,4'-Methylenedianiline dihydrochloride	cancer	13552-44-8	January 1, 1988
Methyleugenol	cancer	93-15-2	November 16, 2001
Methylhydrazine and its salts	cancer	---	July 1, 1992
2-Methylimidazole	cancer	693-98-1	June 22, 2012
4-Methylimidazole	cancer	822-36-6	January 7, 2011
Methyl iodide	cancer	74-88-4	April 1, 1988
Methyl isobutyl ketone	cancer	108-10-1	November 4, 2011
Methyl isobutyl ketone (MIBK)	developmental	108-10-1	March 28, 2014
Methyl isocyanate (MIC)	developmental, female	624-83-9	November 12, 2010
~~Methyl isopropyl ketone~~ Delisted April 4, 2014	~~developmental~~	~~563-80-4~~	~~February 17, 2012~~
Methyl mercury	developmental	---	July 1, 1987
Methylmercury compounds	cancer	---	May 1, 1996
Methyl methanesulfonate	cancer	66-27-3	April 1, 1988
Methyl n-butyl ketone	male	591-78-6	August 7, 2009
2-Methyl-1-nitroanthraquinone (of uncertain purity)	cancer	129-15-7	April 1, 1988

N-Methyl-N'-nitro-N-nitrosoguanidine	cancer	70-25-7	April 1, 1988
N-Methylolacrylamide	cancer	924-42-5	July 1, 1990
N-Methylpyrrolidone	developmental	872-50-4	June 15, 2001
α-Methyl styrene (alpha-Methylstyrene)	cancer	98-83-9	November 2, 2012
~~α-Methyl styrene~~ Delisted April 4, 2014	~~female~~	~~98-83-9~~	~~July 29, 2011~~
Methyltestosterone	developmental	58-18-4	April 1, 1990
Methylthiouracil	cancer	56-04-2	October 1, 1989
Metiram	cancer	9006-42-2	January 1, 1990
Metiram	developmental	9006-42-2	March 30, 1999
Metronidazole	cancer	443-48-1	January 1, 1988
Michler's ketone	cancer	90-94-8	January 1, 1988
Midazolam hydrochloride	developmental	59467-96-8	July 1, 1990
Minocycline hydrochloride (internal use)	developmental	13614-98-7	January 1, 1992
Mirex	cancer	2385-85-5	January 1, 1988
Misoprostol	developmental	59122-46-2	April 1, 1990
Mitomycin C	cancer	50-07-7	April 1, 1988
Mitoxantrone hydrochloride	developmental	70476-82-3	July 1, 1990
Molinate	developmental, female, male	2212-67-1	December 11, 2009
MON 4660 (dichloroacetyl-1-oxa-4-azaspiro(4,5)-decane)	cancer	71526-07-3	March 22, 2011
MON 13900 (furilazole)	cancer	121776-33-8	March 22, 2011
3-Monochloropropane-1,2-diol (3-MCPD)	cancer	96-24-2	October 8, 2010
Monocrotaline	cancer	315-22-0	April 1, 1988
5-(Morpholinomethyl)-3-[(5-nitrofurfuryl-idene)-amino]-2-oxazolidinone	cancer	139-91-3	April 1, 1988
MOPP (vincristine-prednisone-nitrogen mustard-procarbazine mixture)	cancer	113803-47-7	November 4, 2011
Mustard Gas	cancer	505-60-2	February 27, 1987
MX (3-chloro-4-(dichloromethyl) 5-hydroxy-2(5H)-furanone)	cancer	77439-76-0	December 22, 2000
Myclobutanil	developmental, male	88671-89-0	April 16, 1999
Nabam	developmental	142-59-6	March 30, 1999
Nafarelin acetate	developmental	86220-42-0	April 1, 1990
Nafenopin	cancer	3771-19-5	April 1, 1988
Nalidixic acid	cancer	389-08-2	May 15, 1998
Naphthalene	cancer	91-20-3	April 19, 2002
1-Naphthylamine	cancer	134-32-7	October 1, 1989
2-Naphthylamine	cancer	91-59-8	February 27, 1987
Neomycin sulfate (internal use)	developmental	1405-10-3	October 1, 1992
Netilmicin sulfate	developmental	56391-57-2	July 1, 1990
Nickel (Metallic)	cancer	7440-02-0	October 1, 1989

Nickel acetate	cancer	373-02-4	October 1, 1989
Nickel carbonate	cancer	3333-67-3	October 1, 1989
Nickel carbonyl	cancer	13463-39-3	October 1, 1987
Nickel carbonyl	developmental	13463-39-3	September 1, 1996
Nickel compounds	cancer	---	May 7, 2004
Nickel hydroxide	cancer	12054-48-7; 12125-56-3	October 1, 1989
Nickelocene	cancer	1271-28-9	October 1, 1989
Nickel oxide	cancer	1313-99-1	October 1, 1989
Nickel refinery dust from the pyrometallurgical process	cancer	---	October 1, 1987
Nickel subsulfide	cancer	12035-72-2	October 1, 1987
Nicotine	developmental	54-11-5	April 1, 1990
Nifedipine	developmental, female, male	21829-25-4	January 29, 1999
Nimodipine	developmental	66085-59-4	April 24, 2001
Niridazole	cancer	61-57-4	April 1, 1988
Nitrapyrin	cancer	1929-82-4	October 5, 2005
Nitrapyrin	developmental	1929-82-4	March 30, 1999
Nitrilotriacetic acid	cancer	139-13-9	January 1, 1988
Nitrilotriacetic acid, trisodium salt monohydrate	cancer	18662-53-8	April 1, 1989
5-Nitroacenaphthene	cancer	602-87-9	April 1, 1988
~~5-Nitro-*o*-anisidine~~ Delisted December 8, 2006	~~cancer~~	~~99-59-2~~	~~October 1, 1989~~
o-Nitroanisole	cancer	91-23-6	October 1, 1992
Nitrobenzene	cancer	98-95-3	August 26, 1997
Nitrobenzene	male	98-95-3	March 30, 2010
4-Nitrobiphenyl	cancer	92-93-3	April 1, 1988
6-Nitrochrysene	cancer	7496-02-8	October 1, 1990
Nitrofen (technical grade)	cancer	1836-75-5	January 1, 1988
2-Nitrofluorene	cancer	607-57-8	October 1, 1990
Nitrofurantoin	male	67-20-9	April 1, 1991
Nitrofurazone	cancer	59-87-0	January 1, 1990
1-[(5-Nitrofurfurylidene)-amino]-2-imidazolidinone	cancer	555-84-0	April 1, 1988
N-[4-(5-Nitro-2-furyl)-2-thiazolyl] acetamide	cancer	531-82-8	April 1, 1988
Nitrogen mustard (Mechlorethamine)	cancer	51-75-2	January 1, 1988
Nitrogen mustard (Mechlorethamine)	developmental	51-75-2	January 1, 1989
Nitrogen mustard hydrochloride (Mechlorethamine hydrochloride)	cancer	55-86-7	April 1, 1988
Nitrogen mustard hydrochloride (Mechlorethamine hydrochloride)	developmental	55-86-7	July 1, 1990
Nitrogen mustard N-oxide	cancer	126-85-2	April 1, 1988
Nitrogen mustard N-oxide hydrochloride	cancer	302-70-5	April 1, 1988
Nitromethane	cancer	75-52-5	May 1, 1997
2-Nitropropane	cancer	79-46-9	January 1, 1988
1-Nitropyrene	cancer	5522-43-0	October 1, 1990
4-Nitropyrene	cancer	57835-92-4	October 1, 1990

N-Nitrosodi-*n*-butylamine	cancer	924-16-3	October 1, 1987
N-Nitrosodiethanolamine	cancer	1116-54-7	January 1, 1988
N-Nitrosodiethylamine	cancer	55-18-5	October 1, 1987
N-Nitrosodimethylamine	cancer	62-75-9	October 1, 1987
p-Nitrosodiphenylamine	cancer	156-10-5	January 1, 1988
N-Nitrosodiphenylamine	cancer	86-30-6	April 1, 1988
N-Nitrosodi-*n*-propylamine	cancer	621-64-7	January 1, 1988
N-Nitroso-N-ethylurea	cancer	759-73-9	October 1, 1987
3-(N-Nitrosomethylamino)-propionitrile	cancer	60153-49-3	April 1, 1990
4-(N-Nitrosomethylamino)-1-(3-pyridyl)1-butanone	cancer	64091-91-4	April 1, 1990
N-Nitrosomethylethylamine	cancer	10595-95-6	October 1, 1989
N-Nitroso-N-methylurea	cancer	684-93-5	October 1, 1987
N-Nitroso-N-methylurethane	cancer	615-53-2	April 1, 1988
N-Nitrosomethylvinylamine	cancer	4549-40-0	January 1, 1988
N-Nitrosomorpholine	cancer	59-89-2	January 1, 1988
N-Nitrosonornicotine	cancer	16543-55-8	January 1, 1988
N-Nitrosopiperidine	cancer	100-75-4	January 1, 1988
N-Nitrosopyrrolidine	cancer	930-55-2	October 1, 1987
N-Nitrososarcosine	cancer	13256-22-9	January 1, 1988
o-Nitrotoluene	cancer	88-72-2	May 15, 1998
Nitrous oxide	developmental, female	10024-97-2	August 1, 2008
Norethisterone (Norethindrone)	cancer	68-22-4	October 1, 1989
Norethisterone (Norethindrone)	developmental	68-22-4	April 1, 1990
Norethisterone acetate (Norethindrone acetate)	developmental	51-98-9	October 1, 1991
Norethisterone (Norethindrone) /Ethinyl estradiol	developmental	68-22-4/ 57-63-6	April 1, 1990
Norethisterone (Norethindrone)/Mestranol	developmental	68-22-4/ 72-33-3	April 1, 1990
Norethynodrel	cancer	68-23-5	February 27, 2001
Norgestrel	developmental	6533-00-2	April 1, 1990
Ochratoxin A	cancer	303-47-9	July 1, 1990
Oil Orange SS	cancer	2646-17-5	April 1, 1988
Oral contraceptives, combined	cancer	---	October 1, 1989
Oral contraceptives, sequential	cancer	---	October 1, 1989
Oryzalin	cancer	19044-88-3	September 12, 2008
Oxadiazon	cancer	19666-30-9	July 1, 1991
Oxadiazon	developmental	19666-30-9	May 15, 1998
Oxazepam	cancer	604-75-1	October 1, 1994
Oxazepam	developmental	604-75-1	October 1, 1992
~~p,p'-Oxybis(benzenesulfonyl hydrazide)~~ Delisted December 13, 2013	~~developmental~~	~~80-51-3~~	~~August 7, 2009~~
Oxydemeton methyl	female, male	301-12-2	November 6, 1998
Oxymetholone	cancer	434-07-1	January 1, 1988
Oxymetholone	developmental	434-07-1	May 1, 1997
Oxytetracycline (internal use)	developmental	79-57-2	January 1, 1991

Oxytetracycline hydrochloride (internal use)	developmental	2058-46-0	October 1, 1991
Oxythioquinox (Chinomethionat)	cancer	2439-01-2	August 20, 1999
Oxythioquinox (Chinomethionat)	developmental	2439-01-2	November 6, 1998
Paclitaxel	developmental, female, male	33069-62-4	August 26, 1997
Palygorskite fibers (> 5μm in length)	cancer	12174-11-7	December 28, 1999
Panfuran S	cancer	794-93-4	January 1, 1988
Paramethadione	developmental	115-67-3	July 1, 1990
Penicillamine	developmental	52-67-5	January 1, 1991
Pentachlorophenol	cancer	87-86-5	January 1, 1990
Pentobarbital sodium	developmental	57-33-0	July 1, 1990
Pentosan polysulfate sodium	cancer	---	April 18, 2014
Pentostatin	developmental	53910-25-1	September 1, 1996
Phenacemide	developmental	63-98-9	July 1, 1990
Phenacetin	cancer	62-44-2	October 1, 1989
Phenazopyridine	cancer	94-78-0	January 1, 1988
Phenazopyridine hydrochloride	cancer	136-40-3	January 1, 1988
Phenesterin	cancer	3546-10-9	July 1, 1989
Phenobarbital	cancer	50-06-6	January 1, 1990
Phenolphthalein	cancer	77-09-8	May 15, 1998
Phenoxybenzamine	cancer	59-96-1	April 1, 1988
Phenoxybenzamine hydrochloride	cancer	63-92-3	April 1, 1988
Phenprocoumon	developmental	435-97-2	October 1, 1992
o-Phenylenediamine and its salts	cancer	95-54-5	May 15, 1998
Phenyl glycidyl ether	cancer	122-60-1	October 1, 1990
~~Phenyl glycidyl ether~~ Delisted April 4, 2014	~~male~~	~~122-60-1~~	~~August 7, 2009~~
Phenylhydrazine and its salts	cancer	---	July 1, 1992
o-Phenylphenate, sodium	cancer	132-27-4	January 1, 1990
o-Phenylphenol	cancer	90-43-7	August 4, 2000
Phenylphosphine	~~developmental~~ male	638-21-1	August 7, 2009
PhiP(2-Amino-1-methyl-6-phenylimidazol[4,5-b]pyridine)	cancer	105650-23-5	October 1, 1994
Pimozide	developmental, female	2062-78-4	August 20, 1999
Pioglitazone	cancer	111025-46-8	April 18, 2014
Pipobroman	developmental	54-91-1	July 1, 1990
Pirimicarb	cancer	23103-98-2	July 1, 2008
Plicamycin	developmental	18378-89-7	April 1, 1990
Polybrominated biphenyls	cancer	---	January 1, 1988
Polybrominated biphenyls	developmental	---	October 1, 1994
Polychlorinated biphenyls	cancer	---	October 1, 1989
Polychlorinated biphenyls	developmental	---	January 1, 1991
Polychlorinated biphenyls (containing 60 or more percent chlorine by molecular weight)	cancer	---	January 1, 1988
Polychlorinated dibenzo-*p*-dioxins	cancer	---	October 1, 1992
Polychlorinated dibenzofurans	cancer	---	October 1, 1992
Polygeenan	cancer	53973-98-1	January 1, 1988
Ponceau MX	cancer	3761-53-3	April 1, 1988

Ponceau 3R	cancer	3564-09-8	April 1, 1988
Potassium bromate	cancer	7758-01-2	January 1, 1990
Potassium dimethyldithiocarbamate	developmental	128-03-0	March 30 1999
Pravastatin sodium	developmental	81131-70-6	March 3, 2000
Prednisolone sodium phosphate	developmental	125-02-0	August 20, 1999
Primidone	cancer	125-33-7	August 20, 1999
Procarbazine	cancer	671-16-9	January 1, 1988
Procarbazine hydrochloride	cancer	366-70-1	January 1, 1988
	developmental		July 1, 1990
Procymidone	cancer	32809-16-8	October 1, 1994
Progesterone	cancer	57-83-0	January 1, 1988
Pronamide	cancer	23950-58-5	May 1, 1996
Propachlor	cancer	1918-16-7	February 27, 2001
1,3-Propane sultone	cancer	1120-71-4	January 1, 1988
Propargite	cancer	2312-35-8	October 1, 1994
Propargite	developmental	2312-35-8	June 15, 1999
beta-Propiolactone	cancer	57-57-8	January 1, 1988
Propoxur	cancer	114-26-1	August 11, 2006
Propylene glycol mono-*t*-butyl ether	cancer	57018-52-7	June 11, 2004
Propylene oxide	cancer	75-56-9	October 1, 1988
Propylthiouracil	cancer	51-52-5	January 1, 1988
Propylthiouracil	developmental	51-52-5	July 1, 1990
Pulegone	cancer	89-82-7	April 18, 2014
Pymetrozine	cancer	1233112-89-0	March 22, 2011
Pyridine	cancer	110-86-1	May 17, 2002
Pyrimethamine	developmental	58-14-0	January 29, 1999
Quazepam	developmental	36735-22-5	August 26, 1997
Quinoline and its strong acid salts	cancer	---	October 24, 1997
Quizalofop-ethyl	male	76578-14-8	December 24, 1999
Radionuclides	cancer	---	July 1, 1989
Reserpine	cancer	50-55-5	October 1, 1989
Residual (heavy) fuel oils	cancer	---	October 1, 1990
Resmethrin	cancer	10453-86-8	July 1, 2008
Resmethrin	developmental	10453-86-8	November 6, 1998
Retinol/retinyl esters, when in daily dosages in excess of 10,000 IU, or 3,000 retinol equivalents. (NOTE: Retinol/retinyl esters are required and essential for maintenance of normal reproductive function. The recommended daily level during pregnancy is 8,000 IU.)	developmental	---	July 1, 1989
Ribavirin	developmental	36791-04-5	April 1, 1990
Ribavirin	male	36791-04-5	February 27, 2001
Riddelliine	cancer	23246-96-0	December 3, 2004
Rifampin	developmental, female	13292-46-1	February 27, 2001

~~Saccharin~~ Delisted April 6, 2001	~~cancer~~	~~81-07-2~~	~~October 1, 1989~~
~~Saccharin, sodium~~ Delisted January 17, 2003	~~cancer~~	~~128-44-9~~	~~January 1, 1988~~
Safrole	cancer	94-59-7	January 1, 1988
Salted fish, Chinese-style	cancer	---	April 29, 2011
Secobarbital sodium	developmental	309-43-3	October 1, 1992
Selenium sulfide	cancer	7446-34-6	October 1, 1989
Sermorelin acetate	developmental	---	August 20, 1999
Shale-oils	cancer	68308-34-9	April 1, 1990
Silica, crystalline (airborne particles of respirable size)	cancer	---	October 1, 1988
Sodium dimethyldithiocarbamate	developmental	128-04-1	March 30 1999
Sodium fluoroacetate	male	62-74-8	November 6, 1998
Soots, tars, and mineral oils (untreated and mildly treated oils and used engine oils)	cancer	---	February 27, 1987
Spirodiclofen	cancer	148477-71-8	October 8, 2010
Spironolactone	cancer	52-01-7	May 1, 1997
Stanozolol	cancer	10418-03-8	May 1, 1997
Sterigmatocystin	cancer	10048-13-2	April 1, 1988
Streptomycin sulfate	developmental	3810-74-0	January 1, 1991
Streptozocin (streptozotocin)	developmental, female, male	18883-66-4	August 20, 1999
Streptozotocin (streptozocin)	cancer	18883-66-4	January 1, 1988
Strong inorganic acid mists containing sulfuric acid	cancer	---	March 14, 2003
Styrene oxide	cancer	96-09-3	October 1, 1988
Sulfallate	cancer	95-06-7	January 1, 1988
Sulfasalazine (salicylazosulfapyridine)	cancer	599-79-1	May 15, 1998
Sulfasalazine (salicylazosulfapyridine)	male	599-79-1	January 29, 1999
Sulfur dioxide	developmental	7446-09-5	July 29, 2011
Sulindac	developmental, female	38194-50-2	January 29, 1999
Talc containing asbestiform fibers	cancer	---	April 1, 1990
Tamoxifen and its salts	cancer	10540-29-1	September 1, 1996
Tamoxifen citrate	developmental	54965-24-1	July 1, 1990
Temazepam	developmental	846-50-4	April 1, 1990
Teniposide	developmental	29767-20-2	September 1, 1996
Terbacil	developmental	5902-51-2	May 18, 1999
Terrazole	cancer	2593-15-9	October 1, 1994
Testosterone and its esters	cancer	58-22-0	April 1, 1988
Testosterone cypionate	developmental	58-20-8	October 1, 1991
Testosterone enanthate	developmental	315-37-7	April 1, 1990
3,3′,4,4′-Tetrachloroazobenzene	cancer	14047-09-7	July 24, 2012
2,3,7,8-Tetrachlorodibenzo-*p*-dioxin (TCDD)	cancer	1746-01-6	January 1, 1988
2,3,7,8-Tetrachlorodibenzo-*p*-dioxin (TCDD)	developmental	1746-01-6	April 1, 1991
1,1,1,2-Tetrachloroethane	cancer	630-20-6	September 13, 2013
1,1,2,2-Tetrachloroethane	cancer	79-34-5	July 1, 1990

Tetrachloroethylene (Perchloroethylene)	cancer	127-18-4	April 1, 1988
p-a,a,a-Tetrachlorotoluene	cancer	5216-25-1	January 1, 1990
Tetracycline (internal use)	developmental	60-54-8	October 1, 1991
Tetracyclines (internal use)	developmental	---	October 1, 1992
Tetracycline hydrochloride (internal use)	developmental	64-75-5	January 1, 1991
Tetrafluoroethylene	cancer	116-14-3	May 1, 1997
Tetranitromethane	cancer	509-14-8	July 1, 1990
Thalidomide	developmental	50-35-1	July 1, 1987
Thioacetamide	cancer	62-55-5	January 1, 1988
4,4'-Thiodianiline	cancer	139-65-1	April 1, 1988
Thiodicarb	cancer	59669-26-0	August 20, 1999
Thioguanine	developmental	154-42-7	July 1, 1990
Thiophanate methyl	female, male	23564-05-8	May 18, 1999
Thiouracil	cancer	141-90-2	June 11, 2004
Thiourea	cancer	62-56-6	January 1, 1988
Thorium dioxide	cancer	1314-20-1	February 27, 1987
Titanium dioxide (airborne, unbound particles of respirable size)	cancer	---	September 2, 2011
Tobacco, oral use of smokeless products	cancer	---	April 1, 1988
Tobacco smoke	cancer	---	April 1, 1988
Tobacco smoke (primary)	developmental, female, male	---	April 1, 1988
Tobramycin sulfate	developmental	49842-07-1	July 1, 1990
Toluene	developmental	108-88-3	January 1, 1991
	~~female~~	~~108-88-3~~	~~August 7, 2009~~
Toluene diisocyanate	cancer	26471-62-5	October 1, 1989
o-Toluidine	cancer	95-53-4	January 1, 1988
o-Toluidine hydrochloride	cancer	636-21-5	January 1, 1988
~~para-Toluidine~~ Delisted October 29, 1999	~~cancer~~	~~106-49-0~~	~~January 1, 1990~~
Toxaphene (Polychlorinated camphenes)	cancer	8001-35-2	January 1, 1988
Toxins derived from *Fusarium Moniliforme (Fusarium verticillioides)*	cancer	---	August 7, 2009
Treosulfan	cancer	299-75-2	February 27, 1987
Triadimefon	developmental, female, male	43121-43-3	March 30, 1999
Triamterene	cancer	396-01-0	April 18, 2014
Triazolam	developmental	28911-01-5	April 1, 1990
S,S,S-Tributyl phosphorotrithioate (Tribufos, DEF)	cancer	78-48-8	February 25, 2011
Tributyltin methacrylate	developmental	2155-70-6	December 1, 1999
Trichlormethine (Trimustine hydrochloride)	cancer	817-09-4	January 1, 1992
Trichloroacetic acid	cancer	76-03-9	September 13, 2013
Trichloroethylene	cancer	79-01-6	April 1, 1988
Trichloroethylene	developmental, male	79-01-6	January 31, 2014
2,4,6-Trichlorophenol	cancer	88-06-2	January 1, 1988

1,2,3-Trichloropropane	cancer	96-18-4	October 1,1992
Trientine hydrochloride	developmental	38260-01-4	February 27, 2001
Triforine	developmental	26644-46-2	June 18, 1999
~~1,3,5-Triglycidyl-s-triazinetrione~~ Delisted December 13, 2013	~~male~~	~~2451-62-9~~	~~August 7, 2009~~
Trilostane	developmental	13647-35-3	April 1, 1990
Trimethadione	developmental	127-48-0	January 1, 1991
2,4,5-Trimethylaniline and its strong acid salts	cancer	---	October 24, 1997
Trimethyl phosphate	cancer	512-56-1	May 1, 1996
Trimetrexate glucuronate	developmental	82952-64-5	August 26, 1997
2,4,6-Trinitrotoluene	cancer	118-96-7	December 19, 2008
Triphenyltin hydroxide	cancer	76-87-9	July 1, 1992
Triphenyltin hydroxide	developmental	76-87-9	March 18, 2002
~~Tris(aziridinyl)-*p*-benzoquinone (Triaziquone)~~ Delisted December 8, 2006	~~cancer~~	~~68-76-8~~	~~October 1, 1989~~
Tris(1-aziridinyl)phosphine sulfide (Thiotepa)	cancer	52-24-4	January 1, 1988
Tris(2-chloroethyl) phosphate	cancer	115-96-8	April 1, 1992
Tris(2,3-dibromopropyl)phosphate	cancer	126-72-7	January 1, 1988
Tris(1,3-dichloro-2-propyl) phosphate (TDCPP)	cancer	13674-87-8	October 28, 2011
Trp-P-1 (Tryptophan-P-1)	cancer	62450-06-0	April 1, 1988
Trp-P-2 (Tryptophan-P-2)	cancer	62450-07-1	April 1, 1988
Trypan blue (commercial grade)	cancer	72-57-1	October 1, 1989
Unleaded gasoline (wholly vaporized)	cancer	---	April 1, 1988
Uracil mustard	cancer	66-75-1	April 1, 1988
	developmental, female, male		January 1, 1992
Urethane (Ethyl carbamate)	cancer	51-79-6	January 1, 1988
	developmental		October 1, 1994
Urofollitropin	developmental	97048-13-0	April 1, 1990
Valproate (Valproic acid)	developmental	99-66-1	July 1, 1987
Vanadium pentoxide (orthorhombic crystalline form)	cancer	1314-62-1	February 11, 2005
Vinblastine sulfate	developmental	143-67-9	July 1, 1990
Vinclozolin	cancer	50471-44-8	August 20, 1999
	developmental		May 15, 1998
Vincristine sulfate	developmental	2068-78-2	July 1, 1990
Vinyl bromide	cancer	593-60-2	October 1, 1988
Vinyl chloride	cancer	75-01-4	February 27, 1987
4-Vinylcyclohexene	cancer	100-40-3	May 1, 1996
4-Vinyl-cyclohexene	female, ~~male~~	100-40-3	August 7, 2009

4-Vinyl-1-cyclohexene diepoxide (Vinyl cyclohexene dioxide)	cancer	106-87-6	July 1, 1990
Vinyl cyclohexene dioxide (4-Vinyl-1-cyclohexene diepoxide)	female, ~~male~~	106-87-6	August 1, 2008
Vinyl fluoride	cancer	75-02-5	May 1, 1997
Vinyl trichloride (1,1,2-Trichloroethane)	cancer	79-00-5	October 1, 1990
Warfarin	developmental	81-81-2	July 1, 1987
Wood dust	cancer	---	December 18, 2009
2,6-Xylidine (2,6-Dimethylaniline)	cancer	87-62-7	January 1, 1991
Zalcitabine	cancer	7481-89-2	August 7, 2009
Zidovudine (AZT)	cancer	30516-87-1	December 18, 2009
Zileuton	cancer, developmental, female	111406-87-2	December 22, 2000
~~Zineb~~ Delisted October 29, 1999	~~cancer~~	~~12122-67-7~~	~~January 1, 1990~~

Date: June 6, 2014

STATUS OF RESEARCH ON POTENTIAL MITIGATION CONCEPTS TO REDUCE EXPOSURE TO NEARBY TRAFFIC POLLUTION

August 23, 2012

California Environmental Protection

Air Resources Board

Introduction

Air Resources Board (ARB) staff has prepared this document to provide information on scientific research that has been conducted on various building-related and site mitigation concepts suggested as potentially effective approaches for reducing the traffic-related exposures of those living near high traffic roadways. While it provides useful information for consideration of potential mitigation approaches, this paper is not intended as guidance for any specific project, and does not provide a methodology for determining appropriate mitigation measures for purposes of compliance with the California Environmental Quality Act. This review looked only at the current status of air pollution research, and does not address other potential community benefits of the concepts, such as the aesthetic and noise reduction benefits of adding vegetation or sound walls.

The State's current set-back requirement for schools (500 feet [ft]; PRC 21151.8) and the ARB's recommendations on siting for housing and other sensitive uses (e.g., 500 ft from major roadways and 1000 ft from busy distribution centers and rail yards; ARB 2005a) are intended to help protect the public from exposure to traffic emissions. Such emissions have been associated with a variety of serious health impacts in epidemiological studies, including exacerbation of respiratory and cardiovascular diseases and conditions, increased asthma and bronchitis in children, and increased risk of premature death. Traffic pollutant concentrations near high traffic roadways have been found to be 2 to 10 times higher than levels at a distance from the roadways. Also, recent studies have shown elevated traffic pollutant levels at greater distances from the roadway than previously measured.

ARB and the U.S. EPA continue to adopt increasingly stringent regulations limiting emissions from vehicles of all types, which have substantially reduced, and will continue to reduce, vehicle emissions. However, recently adopted regulations have compliance dates extending as far as 2025 for full implementation, and fleet turnover to zero or near-zero technologies will take 20 to 30 years. New reductions in vehicle emissions are improving regional air quality throughout California, including near roadways. As the ARB and the air districts work to reduce emissions from diesel PM and other pollutants, the impact of proximity will also be reduced. However, the differential exposure to high air pollution near high traffic roadways compared to other locations makes the siting of housing in those locations a continuing health concern. Recognizing that unhealthful levels of air pollution is a long term problem, ARB is funding research to identify advanced technologies to further reduce vehicle emissions, to better understand traffic related air pollution exposures, and to explore the benefits of high efficiency filtration in California homes.

As communities plan for more compact development, the potential health impacts of infill projects will need to be considered. Infill development can reduce urban sprawl and has other potential health and environmental benefits. It also has the potential to increase exposure to traffic pollution due to the proximity of the infill areas to established traffic routes.

Status of Research on Traffic Exposures and Health Impacts

Measurements of air pollutants near roadways show a consistent finding of elevated levels based on proximity. Black carbon, often used as an indicator of diesel exhaust, and ultrafine particles (particles less than 0.1 microns in size), which are emitted in very high numbers from vehicles, are often 2 to 10 times (or more) higher near roadways and freeways (Zhu et al., 2002a, 2002b, 2006; Kuhn et al., 2005; Westerdahl et al., 2005; Ntziachristos et al., 2007; Kozawa et al., 2009a). Concentrations of PM2.5 (particles 2.5 microns or less in diameter) near busy roadways can be about 20% higher than levels at a distance (Zhu et al., 2002a; Kim et al., 2004; Janssen et al., 2001). Nitrogen oxides also are elevated near roadways, usually about 2 to 3 times the levels measured at a distance from the roadway (Kim et al., 2004; Singer et al., 2004; Kozawa et al., 2009a; Durant et al., 2010).

Previous studies of near roadway pollutant levels showed that concentrations of pollutants emitted from vehicles were highest right at the roadway and decreased substantially in the first 300-500 feet from the roadway (Zhu et al., 2002b; Knape 1999). These results were consistent with health studies that showed a stronger association of health impacts for those living within 300-500 ft of the roadway compared to those living farther than 500 ft from the roadway (Brunekreef et al., 1997; Venn et al., 2001; English et al., 1999). More recent studies have shown a somewhat longer plume of increased pollutant concentrations farther from the roadway. Using data collected mostly during the day and near roadways, a meta-analysis of many studies found that for almost all pollutants, elevated levels of pollutants caused by the increased contributions from roadways returns to background levels at 160 - 570 meters (m; 525 – 1870 ft; Karner et al., 2010). The range of distances needed to reach background is usually a result of local meteorological conditions, which can vary significantly; however, a more constant observation is a steep concentration gradient observed closest to the roadway, within 500 ft, with a more gradual and extended decline at further distances. Another meta-analysis found that the “spatial extent of impact” of motor vehicles can extend up to 400 m (1312 ft) for black carbon and particles and 500 m (1640 ft) for nitrogen dioxide (NO_2; Zhou and Levy 2007). Levels of traffic pollutants near roadways vary due to many factors, including traffic type and density, wind direction and speed, local and roadway topography, and time of day and season (Zhu et al., 2004; Kuhn et al., 2005; Moore et al., 2007; Ning et al., 2007; Hu et al., 2009; Kozawa et al., 2009a, 2009b).

In a major 2008 review of the scientific literature by the Health Effects Institute (HEI), proximity to busy roadways was found to be associated with a variety of adverse health impacts, the strongest association being exacerbation of asthma, with others including asthma onset in children, impaired lung function, and increased heart disease (HEI, 2010). More recent studies have added to the list of effects and heightened concern regarding exposure to traffic emissions. Respiratory and cardiovascular effects seen in these studies include an increased risk of new-onset chronic obstructive pulmonary disease (Andersen et al., 2010), a faster progression of atherosclerosis in those living within 100 m of highways in Los Angeles (Künzli et al., 2010), increased risk of

premature death from circulatory disease (Jerrett et al., 2009), and increased incidence of new heart disease (Kan et al., 2008). Other effects include increased risk of low birth weight (Brauer et al., 2008; Llop et al., 2010) and increased risk of pre-term delivery (Wilhelm and Ritz, 2003; Wilhelm et al., 2011) for mothers living very near heavy traffic, lower immune function in post-menopausal women living within 150 m of arterial roads (Williams et al., 2009), and increased risk of Type 2 diabetes in post-menopausal women (Krämer et al., 2010).

Children appear to be particularly vulnerable to the adverse effects of traffic emissions. Epidemiological studies have found significant associations of children living near high traffic areas with decreased lung function (Brunekreef et al., 1997; Gauderman et al., 2007), increased medical visits and hospital admissions for childhood asthma (English et al., 1999; Lin et al., 2002), increased wheezing (Venn et al., 2001), and increased childhood asthma and bronchitis (Kim et al., 2004; Gauderman et al., 2005; McConnell et al., 2006), including development of new asthma cases (McConnell et al., 2010; Gehring et al., 2010). Children living near busy roadways are especially likely to experience elevated exposures because they would also play outdoors in the neighborhood and typically would attend nearby schools. Their higher breathing rates per unit of body mass relative to adults (Adams, 1993) and their developing immune, neurological, and respiratory systems make them especially susceptible to impacts from air pollution.

ARB's recommendation to avoid siting sensitive land uses such as new housing within 500 ft of busy roadways was based on the traffic exposure and health studies completed as of 2005. More recent studies confirm the relationship, and indicate that in some situations an elevated risk extends well past 500 ft. A few studies have measured elevated pollutant levels at distances well beyond 1000 ft (305 m; Karner et al., 2010; Zhou and Levy, 2007). For example, Hu and colleagues (2009) found that in the pre-dawn hours in Los Angeles, elevated ultrafine particle number concentration, nitric oxide, and particle-bound polycyclic aromatic hydrocarbons extended at least 1200 m (3937 ft) downwind of the freeway and did not reach background levels until a distance of 2600 m (8530 ft). More importantly, results from the Southern California Children's Health Study on the association of residential distance to traffic and lung function development, performed in the same general location as the Hu et al. study, found adverse health effects in children living as far as 1500 m (4921 ft) from roads (Gauderman et al., 2007). These are not unique findings; in the HEI (2010) report mentioned above, the authors noted that studies showed that people living up to 500 m (1640 ft) from heavy traffic are most at risk from the health effects of traffic pollution.

Status of Research on Mitigation Concepts

Various building and site mitigation approaches have been suggested as potential means to reduce exposure to traffic pollution near roadways. A review by ARB staff found that there has been limited study of most of these approaches. Building measures examined include high efficiency filtration for residences through either central, in-duct type filtration or portable air cleaners; and external building design

measures, such as locating the air intakes for ventilation systems on the opposite side of the building from outdoor sources, reducing the size and number of openable windows on the side of the building nearest the outdoor sources, or housing people in tall buildings. Site mitigation measures examined include the use of sound walls and vegetation as barriers. These measures are all assessed further below. Studies of elevated and below-grade roadways and freeway caps (also called freeway decks, lids or covers), which are covers over a sunken roadway that produce a road tunnel, also were reviewed, but studies were limited and results variable, and these measures are not feasible or are impractical for most new housing developments. Traffic measures such as those to reduce vehicle miles traveled also were considered; most such measures are typically integrated into roadway and community planning for regional benefits.

Building-related Measures: Filtration

No single building-related measure has been identified as adequate to reduce entry of pollutants from nearby roadways to the extent expected from set-back under common conditions. However, the use of high efficiency filtration appears to be relatively effective in most circumstances, as discussed below. It is especially appropriate for new homes because new homes in California must have mechanical ventilation systems [CCR 2008, Title 24, Section 150(o)], and those systems purposely pull outdoor air into the home that often is not filtered at all or is poorly filtered. High efficiency filtration also appears useful in existing homes without mechanical ventilation as discussed below. Mechanical ventilation systems and the Code requirement are discussed further in the Addendum at the end of this paper.

Background for Filtration

Outdoor-generated pollutants enter and leave buildings through three primary mechanisms: mechanical ventilation systems, which actively draw in outdoor air through an intake vent and distribute it throughout the building; natural ventilation (opening of doors or windows), which is the typical ventilation mode for most homes and small commercial buildings in California; and infiltration, which is the passive entry of unfiltered, outdoor air through small cracks and gaps in the building shell. Both natural ventilation and infiltration allow unfiltered air into the building and reduce the effectiveness of any filtration device.

Filter efficiency is rated using several scales, the most common of which is the Minimum Efficiency Reporting Value (MERV) rating system (ASHRAE 52.2-2007 as cited in EPA 2009). Flat fiberglass filters are the most common filters used in residential heating and air systems, and are rated at only MERV 1 to 4; they remove only a portion of the largest particles in the airstream that passes through the filter. MERV 5 to 8 filters are medium efficiency filters that remove some additional types of particles such as mold spores and cat and dog dander, but they still do not remove the finer particles produced on roadways. MERV 9 to 12 filters begin to remove particles smaller than PM2.5. Higher efficiency MERV 13 to 16 filters are rated to remove a portion of the ultrafine and submicron particles emitted from vehicles. True HEPA (high efficiency particle

arrestance) filters (equivalent to MERV 17 to 20) remove 99.97% to 99.999% of particles less than 0.3 microns, but these generally have not been available for residential applications. High efficiency filters associated with central heating, ventilating and air conditioning (HVAC) systems must be carefully selected to assure the mechanical system can handle the increased airflow resistance. Additional information on MERV ratings, the size particles they remove, and typical applications are provided in Table 1 in the Addendum at the end of this paper.

High Efficiency Filtration with Mechanical Ventilation

Because mechanical ventilation has not been used in residential buildings until recently, there has been limited assessment of its impact on entry of particles and other pollutants into homes. However, a few recent studies of homes and schools have shown that high efficiency filtration in mechanical ventilation systems can be effective in reducing levels of incoming outdoor particles. In a seven-home study in northern California, Bhangar et al. (2010) found that the two homes with active filtration in a mechanical system had a notably lower portion of indoor particles from outdoors when the systems were on (filtration active) than when they were turned off (no filtration). In a modeling study of Korean residential units with mechanical ventilation, Noh and Hwang (2010) found that filters rated lower than MERV 7 were insufficient for reducing contaminants that enter through the ventilation filter, and concluded that filters should exceed MERV 11. In a school pilot study, a combination of MERV 16 filters used as a replacement for the normal panel filter in the ventilation system and in a separate filtration unit reduced indoor levels of outdoor-generated black carbon, ultrafine particles and PM2.5 by 87% to 96% in three southern California schools (SCAQMD, 2009). Use of the MERV 16 panel filter alone in the HVAC system achieved average particle reductions of nearly 90%. In a study of a single school in Utah, indoor submicron particle counts were reduced to just one-eighth of the outdoor levels in a building with a mechanical system using a MERV 8 filter (Parker et al., 2008). The investigators noted that the building shell and other mechanical system components appeared to play a significant role in the submicron particle removal as well.

These findings are similar to those from earlier studies of mechanically ventilated office buildings (e.g., Jamriska et al., 2000; Fisk et al., 1998). Fisk et al. (2000) concluded that use of higher efficiency filters instead of normal filters can reduce indoor numbers of submicron particles by 90% and that there is evidence of a large rate of removal of submicron indoor particles by processes (e.g., deposition) other than ventilation and filtration.

Because most of the studies discussed above were conducted in buildings with few or no indoor sources of submicron particles, the measured efficiencies of filters for reducing indoor concentrations of submicron particles from all sources may be overestimated. Many other studies have identified activities such as unvented cooking, cigarette smoking, and use of unvented gas appliances as indoor sources of submicron particles (ARB, 2005b, studies cited). These would only be removed by filtration to the extent the indoor air is re-circulated through the filters.

High Efficiency Portable Air Cleaning Devices

Portable or stand-alone air cleaners are generally not as capable as in-duct air cleaners and those associated with mechanical ventilation systems for cleaning large areas such as an entire home (Consumer Reports, 2007). However, when they are appropriately sized for the space to be treated, and when they use high efficiency or HEPA filters, portable air cleaners can significantly reduce particles in the treated area and serve as an adjunct to other pollutant reduction measures (Hacker and Sparrow, 2005; Shaughnessy et al., 1994; Shaughnessy and Sextro, 2006; Skulberg et al., 2005; Ward et al., 2005). In the pilot study conducted in three southern California schools (discussed above), a large stand-alone air cleaner with MERV 16 filters reduced black carbon, ultrafine particles and PM2.5 counts by 90% or more, and PM2.5 mass by 75%, when the HVAC system was not running (SCAQMD, 2009). Barn et al. (2008) found median removal efficiencies of 55% to 65% for PM2.5 from fires and wood burning by a HEPA air cleaner in 21 winter homes and 17 summer homes. In other work, Fisk et al. (2002) estimated an 80% reduction in outdoor fine mode particles with stand-alone air cleaners using filters in the MERV 11 to 13 range.

Because new California homes are now required to have mechanical ventilation, stand-alone air cleaners are less relevant to the assessment of measures for new California home construction. However, highly efficient portable air cleaners may be useful in reducing indoor exposure to pollutants in existing homes that do not have mechanical ventilation, and in homes that use bathroom exhaust type mechanical ventilation systems, which by their design cannot incorporate filtration of the incoming air because the supply air enters through leakage points throughout the building.

Removal of Gaseous Pollutants

There are limited options for effective removal of gaseous pollutants such as volatile organic chemicals, or VOCs, and NO_2 in central systems, and although the number and variety of technologies are increasing, there has been only limited research to date on their effectiveness. However, a few studies have examined the effectiveness of stand-alone filtration technologies intended to remove gaseous pollutants from the airstream (Shaughnessy and Sextro, 2006). The most comprehensive study was conducted by Chen et al. (2005), who tested the initial performance of 15 air cleaners with a mixture of 16 representative VOCs in a chamber study. Sorption filtration (e.g., activated carbon) removed some but not all VOCs (light and very volatile gases such as aldehydes and dichloromethane were not well removed). However, devices that included sorption media such as activated alumina impregnated with potassium permanganate showed better VOC removal efficiencies. In the schools study discussed above, the stand-alone unit used in one of the schools included charcoal sorbent for removal of gaseous pollutants; it removed 52% of the benzene indoors and 15% of total VOCs when operated with the HVAC turned off (SCAQMD, 2009). In a children's daycare center in Finland, Partti-Pellinen et al. (2000) found that up to 50% to 70% of nitrogen oxides could be removed by chemical filtration using a combination of charcoal, aluminum oxide and potassium permanganate, while another study found about 50% NO_2 removal by a HEPA air cleaner with large quantities of carbon in the adsorption bed, but little or no removal by other types of air cleaners (Shaughnessy et al., 1994).

Results from these studies show effectiveness for some technologies but are not conclusive due to their limited number and scope, including a relative lack of real world measurements. Additionally, some investigators have found that some filters re-emit VOCs that have been removed over time, or emit reaction products from the matter collected on the filter (Daisey and Hodgson, 1989; Fisk, 2007; Destaillats et al., 2011; Hyttinen et al., 2006, 2007).

Limitations of High Efficiency Filtration

Although they can substantially reduce indoor concentrations of pollutants, mechanical filtration systems alone are insufficient to fully protect occupants from particles and other emissions from nearby roadways, for several reasons.

- First, most people tend to open their windows or doors at least part of each day (Offermann, 2009; Phillips et al., 1990), and such natural ventilation involves no filtration of incoming air and can diminish any pollutant reductions attained through the use of the mechanical system. The effectiveness of high efficiency filtration in homes whose occupants open their doors and windows regularly has not been quantified.
- Second, as higher MERV filters are used, greater attention must be paid to the increased air flow resistance that occurs with some filter types; mechanical system motors must be sufficiently sized to accommodate the air flow needs.
- Third, studies have shown that homeowners are not provided with sufficient information regarding use and maintenance of their central HVAC systems, or do not read and follow instructions for maintaining their filters (EPA, 2009; Offermann, 2009). Filtration is only effective if filters are well-fitted and are replaced or maintained according to the manufacturer's recommendations, and duct leakage is minimized (Thatcher et al., 2001; Wallace et al., 2004). Older (aged) filters have been associated with increased irritant health symptoms and decreased work performance in studies of filtration maintenance in workplaces (Clausen, 2004; Seppänen and Fisk, 2002; Wargocki et al., 2004).
- Finally, as discussed above, gaseous pollutants are not removed by most particle filters, and the technologies for VOC removal in residential applications are limited and still evolving.

Expected Benefits of High Efficiency Filtration

High efficiency filtration has been used in homes and schools only recently, and there is a range of highly variable building characteristics, filtration technologies, and occupant behaviors that determine the effectiveness of high efficiency filters in reducing the overall levels of pollutants indoors. Accordingly, it is difficult to accurately quantify the actual reduction in particulate matter that would be achieved by introducing high efficiency filtration on a widespread basis across the population of California homes and schools. For example, while filters with a MERV 16 rating remove more than 95% of particles from 0.3 to 3 microns in diameter, only those particles in the airstream actually passing through the filter are removed. Factors that determine the fraction of particles removed from the air in a building include the airflow rate through the unit, the amount

of time that the system is “on”, the extent to which windows and doors are opened, and other factors. While results from the studies conducted in homes and schools to date appear promising, those studies usually limited the opening of windows and doors or followed other specific protocols. Thus, although a substantial reduction in particles would be expected, the reduction that would be realized across the wide variety of conditions in California homes and schools cannot be confidently estimated.

Two kinds of programs are currently being implemented that will provide critical information needed to help confirm and quantify the effectiveness of high efficiency filtration. First, ARB is funding two key studies of high efficiency filtration in homes. Second, several local air quality management districts and school districts are implementing programs to install high efficiency filtration devices in a substantial number of schools in California, and collecting data regarding the performance of the filtration units. These are discussed below.

ARB’s Planned High Efficiency Filtration Research

ARB is funding a project entitled “Reducing In-Home Exposure to Air Pollution” to measure the exposure reduction and energy use of combinations of mechanical ventilation and filtration systems in order to identify compatible, low-energy systems that are effective at reducing indoor exposures to indoor, and incoming outdoor, pollutants. The study will be conducted by Drs. Brett Singer and Iain Walker of Lawrence Berkeley National Laboratory. The investigators plan to evaluate 15 current and new systems, and test seven of the most promising systems in a test home near a major roadway in an area with high ambient ozone and PM2.5 levels. They will measure fine and ultrafine particles, ozone, VOCs, NO_2 and black carbon, both indoors and outdoors, along with energy consumption and the performance of systems as filters age. This project is needed because new California homes are now required to have mechanical ventilation as discussed above, and the most widely used, low energy mechanical ventilation systems, bathroom exhaust systems, do not filter the incoming air; hence, the occupants’ indoor exposure to outdoor air pollutants can potentially increase with these systems.

ARB is also funding a second study entitled “Benefits of High Efficiency Filtration to Children with Asthma”. Dr. Deborah Bennett from the University of California at Davis will conduct this 4-year study of 200 children with asthma in Fresno and Riverside to quantify the exposure and asthma reduction benefits of high efficiency filtration in their homes. One intervention group will have high efficiency filters or filtration systems installed in their homes’ central heating and air conditioning systems. The second group will have high efficiency portable air cleaners placed in the child’s bedroom and in the main living area. Filters with a MERV rating of 15 or higher will be used. Improvements in asthma symptoms will be evaluated in a randomized cross-over design, with each participant receiving high efficiency air filtration for a year and no filtration for a year, allowing the investigators to identify the improvements related to the air filtration. During the control periods, “sham” filters with little or no particle removal capability will be used. Half of the homes with portable air cleaners will also have filters that remove ozone and VOCs. The extent to which particulate matter (PM10, PM2.5

and ultrafine particles), ozone, black carbon, and nitrogen oxides are reduced will be measured. Key asthma health endpoints will also be examined, including unplanned utilization of the healthcare system for asthma-related illness, short-term medication use, symptom diaries, peak exhaled flow, spirometry and exhaled nitric oxide.

Current Programs Using High Efficiency Filtration

Several programs have been completed or are underway in the State to install and/or test high efficiency filters, primarily in schools, to reduce exposures to pollutants from heavy traffic and/or port-related emissions. Since 2008, the South Coast Air Quality Management District (SCAQMD) has approved $3 million for installation of high efficiency air filtration devices in a total of 18 schools and one community center in the Long Beach and Los Angeles Unified School Districts, San Bernardino and the Boyle Heights area (Kwon, 2012). SCAQMD also has agreed to oversee implementation of a program to utilize $5.4 million in settlement funds to install and maintain high performance air filtration devices at about 47 schools in Wilmington and San Pedro. Installation of the filtration devices was scheduled to begin in summer 2012. Detailed site assessments of the schools are underway prior to installation in order to determine the best filtration device for each classroom and to facilitate assessment of actual improvements in classroom air.

Also, the Bay Area Air Quality Management District (BAAQMD) is conducting a school air filtration project in five schools for about $300,000 (Smith, 2012). In 2010, a contractor completed installation of high efficiency air filtration equipment at five elementary schools located in the Bay View Hunters Point neighborhood of San Francisco. The filtration equipment is designed to reduce exposure inside the schools to particles from outdoor sources, as well as indoor-based particles such as some allergens. Initial monitoring results indicate that there has been a substantial reduction of particulate matter (up to about 50% to 75% for PM2.5 and higher for very small particles) inside the classrooms as a result of the newly installed high performance filters (IQAir, 2012).

To date, these programs appear successful, but overall cost, changes to the operation of the classrooms' central HVAC systems (such as running the system continuously rather than allowing it to switch on and off based on temperature needs) and other considerations (noise, drafts) may reduce the feasibility of the current technologies for use in all classrooms and require further refinements. However, because of the similarities of schools to homes with mechanical ventilation systems, one would expect comparable reductions in particle levels from high efficiency HVAC filtration in new and retrofitted homes.

Cost of High Efficiency Filtration

About a dozen companies offer high efficiency filtration devices incorporated into, or suitable for, residential mechanical ventilation systems, and most offer just one or two models. The devices are rated from MERV 11 to 16, plus several are true HEPA filters (equivalent to about MERV 17 to 20). Initial costs range from about $200 to $2800 for a

very high end system; however, most cost less than $500. This range does not include installation, although in a new home the added cost over the installation of the mechanical system itself would be expected to be minimal. Annual filter replacement and/or maintenance cost ranges from about $25 to $255 per year, depending on MERV rating, number of filter changes needed per year, and whether the system includes a carbon filter for VOCs (which increases the cost of filter replacement, as these typically need to be replaced several times per year).

For existing homes and those that are renovated and do not have a mechanical ventilation system, either higher efficiency filters in the central heating and air system or portable high efficiency filtration devices could be used. High efficiency filters for central systems that can accept them cost about $20. However, the increased airflow resistance may cause the central system to be less efficient. Effective, high efficiency portable units range in purchase cost from about $200 to $1250 depending on the size of the room or space to be treated and the specific technologies included (e.g., MERV rating and charcoal or other VOC removal filters) and would typically not involve any installation costs. Replacement filters and maintenance range from about $75 to $500 per year, again depending on the types of filters included and how dirty the air is, which would determine the frequency of filter changes needed. To adequately treat the living areas of most homes (e.g., bedrooms, family room, living room), two or more portable units may be needed.

External Building Design Measures

Moving Air Intakes

Research focused on assessing external building design measures is generally not readily available. Locating air intakes for mechanical ventilation systems on the opposite side of the building from the nearby outdoor source and prevailing wind direction seems logical. However, the reduction of pollutant entry in such a case would depend on the distance of the intake from the outdoor source, the consistency of the prevailing wind direction, and any local geographical or structural objects that might produce wind turbulence or eddies near the building and the air intake. One particle expert has noted that moving the intake would likely only be beneficial when the outdoor source is very near the intake and the intake is moved fairly far away; otherwise, because particles tend to disperse quickly and particle plumes “flow” around buildings, elevated particle concentrations around the building will be fairly consistent (Thatcher, 2010). This view appears at least partially substantiated by an Australian study that found that the concentration of submicron particles was consistently high and relatively undiluted around a building that was within 15 m of the roadway (Morawska et al., 1999). However, because this option has received little scientific study, and because all new California homes are required to use mechanical ventilation, which will often include a supply air intake, this option warrants further study to determine whether there are conditions under which strategic placement of air intakes might provide some benefits.

Reducing Openable Windows

Reducing the size and number of openable windows on the side of the building nearest the outdoor source would likely do little to reduce entry of particles and other pollutants into homes. Furthermore, this potential measure may not be acceptable to homeowners, who often open windows to take advantage of the breeze, from which the benefit arises primarily from opening windows on the prevailing wind side of the building. Windows opened only on the opposite side may result in little air movement in the home. In regions of the State where window opening currently replaces air conditioning in the summer evening and nighttime periods, there could be substantial energy and cost penalties for the increased use of mechanical air conditioning to cool the home. Additionally, increased indoor air stagnation and condensation may occur, which can result in mold issues. Thus, for all of these reasons, this option does not appear practical for single family dwellings. This measure might be acceptable in multi-family dwellings, depending on the specific building design and the ventilation systems used. However, inclusion of a sufficient number of windows (even if unopenable) would allow more daylight into the building, which would reduce energy use for indoor lighting and provide the satisfaction and efficiency benefits that accompany daylighting (Heschong Mahone Group, 2003a, 2003b).

Taller Buildings

Housing people in taller buildings has also been suggested as a possible exposure reduction measure. However, one of the few relevant studies of multi-story buildings near busy roadways found that vertical differences in fine and ultrafine particle concentrations outside buildings with 9 to 26 stories were not significant and can be highly variable, depending on other local sources and local meteorological conditions (Morawska et al., 1999). A second study, conducted in New York, found significant decreases for outdoor black carbon and non-volatile polycyclic aromatic hydrocarbons for floors 6 to 32 during the non-heating season only (Jung et al., 2011). Additionally, floors 3 to 5 showed the highest median outdoor concentrations for all pollutants measured, although the trend was not statistically significant and the elevated pollutants were believed to come from nearby rooftop exhausts. Thus, multi-story housing may reduce exposure in some situations but requires further research to determine conditions under which tall buildings might provide a reliable approach to reduce exposure near busy roadways.

Site-related Measures

The primary site-related measures reviewed by ARB staff were sound walls and vegetation barriers.

Sound Walls

Sound walls appear to reduce pollutant concentrations near the roadway; near-road concentrations (within 15-20 m [49-66 ft]) have shown reductions up to about 50% (Ning et al., 2010; Baldauf et al., 2008; Bowker et al., 2007; Hagler et al., 2012). However, in some studies higher levels of pollution were seen behind the barrier and at a distance from the sound walls and roadways, although in some of these studies the higher levels

appear related to other sources of pollution (Ning et al., 2010; Bowker et al., 2007; Hagler et al., 2010; Baldauf et al., 2008). In one of the few field measurement studies of sound walls, conducted along two southern California freeways, Ning et al. (2010) found that concentrations at farther distances (about 80 to 100 m from the roadway) were typically greater for the portions of the roads with sound walls, and background levels behind sound walls were not reached until 250 to 400 m as compared to 150 to 200 m without sound walls. Modeling and tracer studies (Heist et al., 2009; Finn et al., 2009) showed that barriers reduced air pollution downwind of the barrier, although in some cases trapping of pollution and increased levels on the road would occur (Hagler et al., 2011; Finn et al., 2009). Nearby buildings and structural barriers can also affect the attenuation and dispersion of pollution from roadways, but results vary with different meteorological conditions (Bowker et al., 2007; Hagler et al., 2010; Hagler et al., 2012).

Vegetation Barriers

Results for vegetation alone are more variable than those for sound walls. Vegetation can remove some gaseous pollutants by uptake or absorption, and particles are removed primarily by interception (impaction or physical adherence; Nowak et al., 2006; Fujii et al., 2008; Smith, 1990; Pardyjak et al., 2008; Baldauf et al., 2008). However, particles can be resuspended, apparently even at very low wind speeds (Fujii et al., 2008; Smith, 1990). Vegetation may restrict dispersion and increase concentrations on-road in street canyons with closer spacing of trees, particularly in low wind conditions (Gromke, 2011; Gromke and Ruck, 2007, 2009; Buccolieri et al., 2009). Another study has further shown the complexity of the effects of vegetation; investigators found different results depending on particle size and wind speed, and a non-linear increase of particle removal with increased leaf area density, which varies by tree species and season (Steffens et al., 2012). Gaps in vegetation barriers can have a significant negative impact on their effectiveness (Hagler et al., 2012), which needs to be addressed in future California research because California roadside vegetation tends to be less dense than that in the eastern U.S., where most previous field studies have been conducted. Also, some types of vegetation can trigger asthma and allergy attacks, and some emit reactive VOCs that contribute to the formation of ozone.

Sound Walls and Vegetation Combined

A combination of sound walls and vegetation appears to be more effective than either one alone. The two used together have been shown to disperse pollutants more consistently and to greater distances than either alone, with up to about a 60% reduction in near roadway levels (Baldauf et al., 2008; Bowker et al., 2007). While sound walls alone and sound walls combined with vegetation show promise, the increase in concentrations on-road and at a distance seen in some studies can increase exposures of others in the population and thus redistributes, rather than removes, pollutants. Additionally, the complexity of pollutant movement under varying conditions makes accurate prediction of exposure reduction difficult. Specific conditions under which sound walls and vegetation can reliably and consistently reduce exposures to air pollution have not been identified, especially in California.

Reduction of Indoor-generated Pollutants to Reduce Overall Exposure

Particles, NO_2 and other pollutants emitted by vehicles and other outdoor sources also have indoor sources that can produce higher indoor concentrations at times (ARB, 2005b, Section 2, and sources cited). Therefore, a reduction in indoor emissions and exposures can reduce the overall health impact of exposure to outdoor pollutants because the total exposure (indoor plus outdoor) to those pollutants experienced by the building occupants would be reduced. A number of studies have identified unvented cooking, cigarette smoking, the use of unvented gas appliances, burning of candles and incense, and woodburning as indoor sources of fine and ultrafine particles (Bhangar et al., 2010; ARB, 2005b; Fortmann et al., 2001; Wallace, 1996; Wallace, 2005; Wallace et al., 2008). High fine and ultrafine particle counts have been measured from such indoor sources. In homes with such sources, average indoor concentrations and occupants' personal exposures to fine and ultrafine PM are dominated by those indoor sources. Thus, measures to reduce indoor sources can help to significantly reduce occupants' peak and overall daily exposures to key pollutants emitted from both traffic and indoor sources.

Summary of Research Review

ARB has developed and adopted increasingly stringent regulations limiting emissions from passenger cars, trucks and buses, which have substantially reduced, and will continue to reduce, vehicle emissions. However, recently adopted regulations have compliance dates extending as far as 2025 for full implementation, and fleet turnover to zero or near-zero technologies will take 20 to 30 years. The set-back of buildings from high traffic roadways remains the most certain approach for preventing the residual health risk from traffic pollution exposures for those living closest to the roadways because it distances them from the highest pollutant concentrations. Research conducted since the publication of ARB's recommendations in 2005 further supports the use of set-back.

There are two mitigation measures that can be effective for exposure reduction. Increased filtration of air and reduction of indoor pollution sources potentially can reduce the overall pollution burden in homes. These measures warrant consideration especially in light of recent studies showing that the pollutant plumes at times can extend beyond 1000 ft (305 m) from the roadway. For most residential applications near busy roadways, high efficiency (MERV 13 to 16, or higher) pleated particle filters would generally be considered the most effective approach to filtration because they can remove the very small particles emitted by motor vehicles without emitting ozone, formaldehyde, or other harmful byproducts. Based on a limited number of studies, such high efficiency filtration has been shown to reduce indoor PM2.5 and ultrafine particle levels by up to 90% relative to incoming outdoor levels when doors and windows are kept mostly closed. Purchase costs for high efficiency filtration devices or systems that are compatible with residential mechanical ventilation systems (which are now required

in new residential construction in California) range from $200 up to $2800, but most are available for under $500. Because Title 24 now requires mechanical ventilation for new residential construction, enhanced filtration can help avoid increased exposures to outdoor pollutants that may occur. The use of high efficiency air filters in central heating and air systems or stand-alone air cleaning devices can also reduce exposures in existing homes and homes that use certain types of mechanical ventilation systems that cannot accommodate central filtration.

While research shows that high efficiency filtration can be effective, it has several limitations. Filtration cannot remove all incoming outdoor pollutants because of normal building leakage and the fact that most people open windows and doors at least a portion of the day, allowing entry of unfiltered air. Additionally, not all pollutants are filtered by the filter media. Moreover, studies show irregular homeowner maintenance of filters and central systems, and regular maintenance is critical for effective removal of pollutants. ARB is funding two studies that should help further identify the approximate reduction in exposure that high efficiency filtration can provide in homes. High efficiency filtration is already being used or is planned for use in over 70 schools in California; these programs should provide comparable information for high efficiency filtration in classrooms.

The benefits are less clear for most of the other potential mitigation measures examined. Studies have shown that the use of sound walls alone, or sound walls and vegetation together, can reduce near roadway concentrations by about 50% and 60%, respectively. However, the extent of exposure reduction is quite variable under different conditions of meteorology and topography, and increased levels of pollutants can occur on-road and at a distance from the roadway. Thus, unlike the situation with filtration, pollutants are primarily redistributed rather than removed; while individuals living near the roadway would benefit, those traveling on the road or living at a distance could experience elevated exposures at times. The effectiveness of vegetation alone is even more variable, and has not been well-quantified. Furthermore, vegetation with low allergenic potential and low reactive VOC formation needs to be identified and tested, and other limitations of vegetation as a pollution barrier need to be better understood. Research is needed that identifies the specific conditions under which sound walls and vegetation can consistently provide a reliable exposure reduction benefit with limited disbenefits. In particular, California field studies are needed because of the significant differences in California meteorology, building practices, and flora from those of the eastern U.S.

The limited studies conducted to date on other potential mitigation concepts are not promising, although further research may identify situations in which they are generally effective. Placement of air intakes on the side of the building opposite the roadway may make little difference in terms of exposure, due to rapid particle movement around buildings. Locating windows only on the side of the building opposite the roadway reduces indoor daylighting, air circulation and cooling, and may do little to reduce exposure. Finally, taller buildings do not necessarily experience substantially reduced pollutant levels at higher floor levels, depending on local meteorology and other nearby

sources of pollution. However, further research on placement of air intakes and housing in taller buildings may identify conditions under which these measures reliably reduce exposures. Research is warranted on these measures and the measures discussed above as effective or showing promise in order to further identify cumulative measures that together can assure sufficient exposure reduction and health protection for those living near busy roadways.

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ADDENDUM

Current California Building Code Requirements

Section 150(o) of Title 24 of the California Code of Regulations (CCR 2008) requires mechanical ventilation in all new residential construction in California built after January 1, 2010. Section 150(o) allows the requirement to be met through a variety of system types (CEC 2010). "Exhaust only" type systems increase the entry of unfiltered outdoor air through leakage points in the building shell and can result in negative pressure indoors, thus increasing the possibility of backdrafting of combustion emissions from gas water heaters, fireplaces and other combustion appliances. These are the most widely used systems in California. "Supply systems" typically use a small motor to bring outdoor air in through a ducted supply and can include high efficiency filters to filter the air as it is brought in, prior to circulation of the air throughout the home. Combination (supply and exhaust) systems are available, with some linked to the central heating and air system; these include filtration of incoming outdoor air. However, the Code requires only a MERV 6 air filter (an increase to MERV 8 is proposed in the 2012 revisions to Title 24), which does not remove the smaller particles emitted by vehicles which are the particles of greatest concern. In future construction, the type of mechanical system used in new homes will have a major impact on the entry of outdoor pollutants indoors − if filtration is not included or is weak, indoor exposures to outdoor pollutants likely will increase.

Table 1. MERV Ratings*

MERV Rating	Average Particle Size Efficiency (PSE), microns – % Removal			Typical Controlled Contaminant or Material Sources (ASHRAE 52.2)	Typical Building Applications
	0.3-1.0	**1.0-3.0**	**3.0-10.0**		
1-4			<20%	**> 10 Microns** Textile Fibers Dust Mites, Dust, Pollen	Window AC units Common Residential Minimal Filtration
5			20-35	**3.0 to 10.0 Microns** Cement Dust, Mold Spores, Dusting Aids	Industrial Workplace Better Residential Commercial
8			>70		
9		<50	>85	**1.0 to 3.0 Microns** Legionella, Some Auto Emissions, Humidifier Dust	Hospital Laboratories Better Commercial Superior Residential
12		>80	>90		
13	<75	>90	>90	**0.3 to 1.0 Microns** Bacteria, Droplet Nuclei (sneeze), Most Tobacco Smoke, Insecticide Dust	Superior Commercial Smoking Lounge Hospital Care General Surgery
16	>95	>95	>95		
17**	≥ 99.97			**<0.3 Microns (HEPA/ULPA filters)**** Viruses, Carbon Dust, Fine Combustion Smoke	Clean Rooms Carcinogenic & Radioactive Matls., Orthopedic Surgery
18**	≥ 99.99				
19, 20**	≥ 99.999				

* Adapted from EPA 2009; originally from ANSI/ASHRAE Standard 52.2-2007.
** Not part of the official ASHRAE Standard 52.2 test, but added by ASHRAE for comparison purposes.

CARL T. JONES CORPORATION

Engineering Assessment of the Impact of the

Proposed Trammel Crow Residential Building

on Radio Station KVTO

Introduction

Trammel Crow Residential is proposing to construct a residential high-rise building approximately 150 meters south of the broadcast antenna shared by AM stations KFRC, San Francisco, California and KVTO, Berkeley, California. Trammel Crow Residential has retained the firm of Hammett and Edison, Inc. to evaluate the impact of the proposed structure on the operation of the two radio stations and to evaluate possible safety and interference issues that may be posed by construction of the building in close proximity to two relatively high-power broadcast stations.

This office has been retained by Urban Radio III, L.L.C. ("Urban Radio"), licensee of Station KVTO, to review the engineering report prepared by Hammett and Edison, Inc. ("the Hammett and Edison Report" or "the Report") and, based on the information contained in the report, and the additional polar plots of the perturbed patterns provided by Hammett and Edison, to recommend the maximum building height that would result in acceptable distortion of the KVTO non-directional radiation pattern.

Of primary concern to the radio station is the potential for the building to materially alter the station's coverage through perturbation of its non-directional pattern, potentially

resulting in a loss of its listeners in the affected areas. In addition, Urban Radio is concerned with the safety issues that may result from construction of the building in such close proximity to the two radio stations. This report provides an assessment of the potential impact of the proposed construction and a recommended maximum building height, as well as a discussion of the safety issues posed by the construction.

Maximum Building Height

Based on analyses of modeling results for buildings ranging in height from one to twelve stories, the Hammett and Edison Report concludes that: 1) the impact on KVTO is the deciding factor in determining a maximum building height due to the shorter wavelength at the KVTO operating frequency of 1400 kHz; 2) the effects of the building increase dramatically for building heights between seven and twelve stories; and 3) the proposed building would have to be limited in height to no greater than nine stories in order for there to be no significant impact on the operation of the station.

The impact of the proposed building on the KVTO pattern is summarized in the graph of Figure 2 in the Report. The graph shows the maximum expected pattern perturbation as a function of proposed building height. From the graph, the maximum perturbation in the pattern (maximum null depth) for the recommended maximum height of 90 feet (9 stories), is predicted to be 19.5% of the unperturbed radiation value. This is equivalent to a power reduction in the affected direction from 1000 watts to 650 watts. This is clearly a material impact.

In reviewing Figure 2 of the Report, it is also clear that minimal impact to the KVTO pattern will occur for building heights of less than 40 feet, acceptable perturbation levels are predicted for overall building heights up to 60 feet.[1] At 60 feet the predicted maximum perturbation is 5%. A 5% perturbation is the threshold used by most cellular and PCS companies when determining whether or not a cellular/PCS tower, located in close proximity to an AM station, would require detuning treatment to mitigate the expected pattern distortion.

Polar plots of the perturbed patterns are shown in Figures 1, 2 and 3 for building heights of 80, 90 and 100 feet, respectively. As demonstrated in the polar plots, at these building heights, substantial pattern distortion is expected to occur. Although the overall efficiency of the resulting perturbed pattern is reduced with increasing building height, the reduction is minimal and this is not considered to be a significant factor.

The polar plots of Figures 1, 2 and 3, and the FCC's soil conductivity map were used to establish distance to the predicted 0.5 mV/m daytime service contour for the perturbed and unperturbed patterns. The population within the unperturbed contour and each of the three perturbed contours was determined based on the 2000 United States Census. Comparison of the populations within each contour shows a net loss in population,

[1]In the Hammett and Edison Report, the NEC model of the proposed residential building height is based on the assumption of 10 feet per story. Because the height per story can vary for differing designs and uses and because there may be additional structures on the roof of the building that add to the overall height, this report will refer to overall height of the building and not the number of stories.

increasing with increasing building height, for each of the perturbed patterns, ranging from 45,000 to 102,000 persons.

Safety Issues

The Hammett and Edison Report provides NEC predicted values of the expected electromagnetic fields within the frame building model. Mark Neumann of Hammett and Edison has confirmed that the predicted field values in the Report were calculated for a building height of 90 feet and include the contribution from both stations. The predicted magnetic field of 1.5 A/m is close to the Maximum Permissible Exposure (MPE) limit for uncontrolled environments such as a residential building. Because the NEC model of the building cannot take into account the complex nature of all of the conducting and reradiating structures that comprise the building and the electrical and mechanical systems within the building, the uncertainty with this type of prediction is high and consequently the prediction error margin is large. The predicted magnetic field is 96 % of the MPE, assuming that KVTO is the sole contributor; and 92 % of the MPE, assuming that KFRC is the sole contributor. Given the uncertainty of the modeled prediction of field strength, it is not possible to say with any certainty that the fields would be below the MPE should a 90 foot building be constructed. It is believed that the electromagnetic fields for a building height of 60 feet or less will be considerably lower, thereby providing a greater margin of safety for the residents.

The standard published by the Institute of Electrical and Electronic Engineers (IEEE), IEEE Standard C95.1-1999, is one of the primary sources used by the FCC in establishing regulations regarding human exposure to radiofrequency energy. The IEEE Standard, in addition to specifying MPE's for electric and magnetic fields, also establishes a maximum contact current for persons coming into contact with conducting objects that are immersed in a RF field. The maximum permissible contact current is 45 milliamperes for uncontrolled environments. If there is a chance that residents or maintenance personnel would come into contact with conducting objects that are electrically connected to the metal structure of the building, or objects such as copper plumbing or electrical wires that consist of long vertical runs, then the levels of contact current should be evaluated. Again, increased building height increases the likelihood that the contact current MPE will be exceeded.

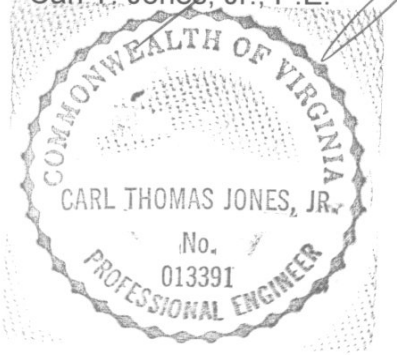
Conclusion

A review of the results and conclusions contained in the Hammett and Edison Report indicates that the proposed Trammel Crow residential building has the potential to materially adversely impact the KVTO operation dependant on the ultimate height of the building. Although the report recommends a maximum height of 90 feet, it is my opinion, as discussed above, that this height will result in substantial distortion of the KVTO pattern and some loss of listenership within the KVTO protected daytime service contour. Based on the modeling results summarized in the graph of Figure 2 of the Hammett and Edison

Report, it is recommended that the building, including all appurtenances, be no greater than 60 feet in height in order to maintain maximum pattern distortion at or below 5%.

Regarding the safety of residents and maintenance personnel living and working within the proposed residential building, the Hammett and Edison Report predicts levels of magnetic fields that are just under the MPE for uncontrolled environments. Given the uncertainty associated with the prediction methods, it cannot be stated with confidence that the actual fields will be below the MPE. Further, additional studies should be performed to evaluate contact currents with respect to the MPE contained in the IEEE Standard. It is my opinion that the electric and magnetic fields and contact currents will be reduced substantially should the building height be limited to 60 feet.

Carl T. Jones, Jr., P.E.



550 Kearny Street
Suite 800
San Francisco, CA 94108
415.896.5900 phone
415.896.0332 fax
www.esassoc.com

Technical Memorandum

TO: Jean Eisberg, AICP
Urban Planning Partners, Inc.
505 17th Street, 2nd Floor
Oakland, CA 94612

FROM: Charles Bennett
Environmental Science Associates
550 Kearny Street, Suite 800
San Francisco, CA 94108

DATE: March 24, 2014

SUBJECT Wind Evaluation,
6701 Shellmound Street
Emeryville, California
ESA 140070

I. The Project

Project Site

The project site is a generally flat, approximately 2.3-acre, triangular parcel (Assessor's Parcel Number 49-1490-2) bounded by Interstate-80 to the west, to the north by the Ashby Avenue exit off-ramp from I-80, by Shellmound Street to the east, and by various 2 to 4-story developments to the south. Caltrans owns the I-80 right-of-way and the setback of the Ashby Avenue exit off-ramp at the north and west edges of the project site. The setbacks between the project and the Ashby Avenue exit off-ramp are landscaped with eucalyptus trees.

Project Building

The project would be a single 7-story building with a roof height of 74 feet. The first two floors would house the garage and provide a podium for the five residential floors, which are organized around a central core from which residential units radiate northward and southward, leaving plazas on the north side open to the north and plazas on the south side open to the south.

The project proposes demolishing two existing structures on the property and removing trees along Shellmound Street and elsewhere on the site. The existing trees within the Caltrans off-ramp right-of-way would remain.

Vehicular entrances from Shellmound Street would be located at both the north and south ends of the property, although the south entrance would be the project's main entrance. A fire access lane would surround the building.

II. Wind Impact Thresholds

Buildings that are much taller than their surroundings can intercept winds that would otherwise pass over a site and then redirect them down to ground level as well as intensify them, resulting in wind speeds and wind turbulence that makes otherwise desirable pedestrian walkways and open spaces unpleasant or unsafe.

The CEQA Guidelines do not address effects of building projects on wind, and the State of California does not have established criteria for evaluating a project's wind effects. Potential changes in wind conditions in public areas that result from the existence of tall buildings are not regulated within the City of Emeryville's General Plan or Zoning Regulations. However the City of Oakland has established criteria for determining the acceptability of wind conditions that might exist, which indicates a significant impact would occur if the project results in winds exceeding 36 miles per hour (mph) for a total of more than 1 hour during daylight hours during the year. Similarly, criteria wind speeds established in the City of San Francisco use an "equivalent" wind speed, which involves a speed adjustment to account for turbulence in the wind. The equivalent speed criterion is 36 mph as the threshold not to be exceeded for more than one hour of the year.

For purposes of this CEQA analysis, the wind criteria developed for San Francisco and Oakland are considered suitable guidelines for evaluating potentially hazardous wind conditions in publically accessible areas within Emeryville. This analysis therefore considers a project to have a potentially significant wind impact if it results in winds that exceed 36 mph for a total of more than one hour per year and that occur in public areas, such as sidewalks, rather than in private open spaces.

III. Existing Wind Conditions

Emeryville is located within the Northern Alameda and Western Contra Costa Counties climatological subregion of the Bay Area Air Basin. This climatological subregion extends from the City of Richmond to San Leandro and is bound by the San Francisco Bay on the west and the Oakland-Berkeley Hills on the east. In this area, marine air that travels through the Golden Gate and across San Francisco, as well as through the San Bruno Gap, is a dominant weather factor. Although in the vicinity of this bayfront site, the flow of air remains generally westerly, the Oakland-Berkeley Hills eventually cause the flow to split off towards the north and south.

Wind measurements taken at the old U.S. Naval Air Station at Alameda, located approximately four miles south-southwest from the project site, show that winds from the west and north-northwest are the most frequent and strongest winds during all seasons. Of the 16 wind directions measured at the Alameda Naval Air Station, nine directions - centered on the west (46%), north-northwest (22%) and south-southeast (14%) - comprise the most frequent occurrences. All other wind directions occur less than 19% of the time. Calm conditions (which include the directional breakdowns stated above) occur during 8% of annual observations. Average wind speeds vary from season to season with the highest average winds occurring during summer and the lowest average winds during winter months. However, strongest peak winds occur in winter, when speeds of over 50 mph have been recorded. Except during storms, the highest wind speeds are in the mid-afternoon and the lowest are in the early morning. At night, especially in winter, cooling temperatures on land result in light offshore (northeasterly and easterly) winds from the East Bay hills toward San Francisco.

Existing Wind Conditions on the Project Site

Wind tunnel testing was conducted for the proposed Emeryville Bay Street Site B project in 2006 and 2007 to assess the potential for that project to result in wind hazard conditions in public areas on the site and vicinity. Although the Site B project was not constructed, the research and wind testing for Site B, which is approximately a half mile south of the Project site, clearly showed that the wind speeds in very open areas (such as parking lots) of Site B and vicinity are relatively close to the wind hazard criterion, primarily due to the frequent, strong west winds that approach the site over the open waters of the Bay. However, the 2006 and 2007 studies found that these existing winds in very open areas of that site, although close, typically do not meet or exceed that wind hazard criterion.

Given the location and its open exposure to the same frequent, strong west winds that approach over the open waters of the Bay, the existing winds on the Project site should be similarly close to the wind hazard criterion. However, the Project site has some wind protection from the eucalyptus trees in the Caltrans I-80 right-of-way and setback of the Ashby Avenue exit off-ramp at the north and west edges of the site. Although these trees cannot reduce wind speeds substantially, they do provide a small but real reduction in wind speeds at ground level and up to the height of the tree canopies, as well.

Given that existing winds in open areas of the Project site typically would not reach or exceed that wind hazard criterion, and given that the eucalyptus trees at the north and west edges of the Project site provide further, real reductions in wind speeds up to the height of the tree canopies, it is reasonable to conclude that the existing wind conditions do not exceed the wind hazard criterion.

III. Potential Project Wind Effects

The site is exposed to the prevailing winds, both under the regularly recurring daily and seasonal wind conditions and in storms. This exposure, and the nature of the stronger winds, such as the north-northwest, west, and south-southeast winds that occur, mean that it may be possible that the building can intercept and redirect these strong winds to ground level and cause wind hazards in public areas.

Experience with potential wind effects of buildings of similar heights, 7-story buildings with a roof height of 74 feet, shows that such buildings can redirect and accelerate winds that would otherwise pass overhead and bring those winds down to ground level. If approaching strong winds can winds strike a broad face of a building head-on, then strong and turbulent winds can be generated at ground level.

Effects under West Winds

However, the proposed project has a generally triangular shape in plan view, and presents its smallest face to the west and, at 74 ft high, it would be fully exposed to the predominant wind from the west. This orientation and building shape allows the wind to flow around to the north of the building, along its highly articulated northwest façade, and to the south, between the building and its southern neighbor. The articulation of the northwest façade would presents a narrow face to the wind and limits the ability of the west façade to redirect wind down to ground level.

The separation of the building into a solid 2-story garage-podium that supports articulated residential floors, further isolates flows of wind down the building façade, since most of those flows will strike the podium rather than reach ground level.

Effects under North-Northwest and South-Southeast Winds

Because the building would stand well above the nearby trees and the building to the south, it would be exposed to the strong north-northwest and south-southeast winds that would strike the northwest and south façades of the building nearly head-on. However, the articulation of both façades limits their ability to redirect these strong winds downward, and the podium further isolates flows by intercepting them at the third floor, rather than allowing them to reach ground level. This wind attenuating effect would occur for both the north-northwest winds that strike the northwest façade and the south-southeast winds that strike the south façade of the building.

Conclusions

Existing winds in open areas of the Project site typically do not reach or exceed the wind hazard criterion and, because the eucalyptus trees at the north and west edges of the site provide further, real reductions in wind speeds up to the height of the tree canopies, it is reasonable to conclude that the existing wind conditions do not exceed the wind hazard criterion.

The proposed Project's generally triangular shape and orientation reduce its exposure to strong west winds. This orientation and building shape allow the wind to flow around the building, and the building's highly articulated façade limits its ability to redirect wind down to ground level. Placing the articulated residential floors atop a solid 2-story podium further isolates flows of wind down the building façade, since most of those wind flows will strike the podium rather than reach ground level.

Given these elements of the building design and placement, wind exposure, and a building site that offers some real, if minor, wind protection, it is reasonable to conclude that the building will not result in hazardous wind conditions in public areas around the project building and on general public sidewalks along Shellmound Street.



City of Emeryville
Climate Action Plan
November 2008

Environment Equity Economy

Acknowledgements

City of Emeryville Climate Change Task Force Members:

Council Members
- Ruth Atkin
- Nora Davis

Residents
- Deborah Badhia
- Sam Foushee
- Spencer Green
- Pat Hooper
- Jeffrey Koch
- ARobin Orden
- John Scheuerman

Emery Unified School District Board Member
- Cheryl Webb

Emeryville Chamber of Commerce Member
- Denise Pinkston

Emeryville Planning Commission Member
- Gail Donaldson

City Staff - Key Supporting
- Patrick O'Keeffe, City Manager
- Maurice Kaufman, Public Works Director
- Miroo Desai, Senior Planner
- Edmund Suen, Finance Director
- Rebecca Sylvester, Police Service Technician
- Michael Mahoney, Public Works Superintendant
- George Orrego, Assistant Fire Chief

City Staff - Lead and Contact for the Plan:
- Peter Schultze-Allen, Environmental Analyst, Public Works

ICLEI – Cities for Sustainability - Staff
- Timothy Burroughs (former)
- Micah Lang
- Brooke Lee
- Jonathan Strunin
- Ayrin Zahner

StopWaste.org - Staff
- Debra Kaufman
- Teresa Eade
- Wes Sullens

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Appendix A – Implementation Table

Appendix B – Baseline Inventory Report (December 2006, Revised August 2008)

Executive Summary

The debate is over. The overwhelming scientific consensus is that human-induced climate change is among the most pressing environmental and social problems facing this generation and those to come.

The time to act is now. Never in the past 1000 years has the planet warmed at a faster rate than during the 20th century, and the most recent decade has been the warmest ever on record. Allowing this trend to continue could result in decreased agricultural output, increased catastrophic weather events such as forest fires, drought and floods and displacement of entire populations due to rising sea levels.

The City of Emeryville must do its part. Although the United States accounts for a mere 4% of the world's population, it produces 20.4% of the world's greenhouse gases, according to Table No. 1 on page 5. The City of Emeryville released an estimated 178,832 tons of carbon dioxide equivalent (CO_2e) in 2004 and, if steps are not taken to achieve reductions, is projected to emit 33% more in 2020. However, in March of 2006 the City of Emeryville pledged to take action against this destructive trend by passing a resolution to join more than 230 U.S. local governments and 770 local governments worldwide in ICLEI's Cities for Climate Protection® (CCP) campaign. In so doing, Emeryville committed to ICLEI's 5-Milestone methodology for combating global warming. In December of 2006, the City approved the baseline inventory report from ICLEI and established a Climate Change Task Force to develop a Climate Action Goal and Plan. Then on May 1st, 2007, the City of Emeryville committed to reducing community-wide greenhouse gas emissions by 25% below 2004 levels by 2020.

Summary of Proposed Actions:

Community-Wide	Affected Sector
Increase Transit Oriented Development	New Development Projects
Adopt a Green Building and Bay-Friendly Ordinance	New Development Projects
Enhance Transportation Demand Management Conditions	New Development Projects
New Pedestrian, Cycling and Transit Programs & Incentives	All Sectors
Increase Transit Service and Ridership	All Sectors
Commercial and Residential Energy Conservation Ordinances	Existing Buildings and Homes
Develop and Incentivize Local Renewable Energy Production	All Sectors
Conserve Potable Water and Develop Rainwater Usage	All Sectors
Reduce 2004 Landfilled Waste Tonnage by 50% by 2020	All Sectors

Government Operations

GB/BFL for buildings and landscapes

Fleet changes – fuel and vehicle types

Reduce 2004 Landfilled Waste Tonnage by 50% by 2020

Environmentally Preferable Purchasing

Alternative Transportation Incentives/Initiatives

Background: The Alameda County Climate Protection Project

In June 2006 eleven local governments in Alameda County, CA committed to becoming members of ICLEI – Local Governments for Sustainability (ICLEI) and participating in the **Alameda County Climate Protection Project (ACCPP)**. The participating jurisdictions include:

Alameda	Berkeley	Newark	San Leandro
Alameda County	Emeryville	Oakland	Union City
Albany	Hayward	Piedmont	

The project was launched by ICLEI in partnership with the Alameda County Waste Management Authority & Recycling Board (StopWaste.Org) and the Alameda County Conference of Mayors. In committing to the project, the jurisdictions embarked on an ongoing, coordinated effort to reduce the emissions that cause global warming, improve air quality, reduce waste, cut energy use and save money. Toward that end, ICLEI and StopWaste.Org assisted each participating jurisdiction to conduct a baseline greenhouse gas emissions inventory, set a community-wide emissions reduction target, and develop a climate action plan that consists of polices and measures that, when implemented, will enable each jurisdiction to meet its target.

A model climate action plan was developed for use by the 11 participating local governments to create tailored climate action plans for their communities. Its purpose is to save participants' time and resources by providing a useful action plan format, background information on the science and impacts of global warming, and detailed suggestions on the types of policies that municipalities can implement to achieve the desired emissions reductions. In developing this resource, ICLEI relied on the expertise of StopWaste.Org staff as well as the experiences of the nationwide network of ICLEI member cities, each of which is working toward similar climate protection goals.

About Alameda County, California

Alameda County is a metropolitan region of the San Francisco Bay Area. The 2005 census estimates the County's population at 1.45 million, the 7th most populous county in the State of California. Like other metropolitan areas, inhabitants of the county and the cities therein contribute to the problem of global warming, while also holding immense potential to contribute to the solution. The energy consumed and the waste produced within the county's boundaries result in thousands of tons of heat-trapping greenhouse gas emissions. But, as is evidenced by the widespread municipal involvement in the Alameda County Climate Protection Project, the local government participants are firmly committed to building on existing efforts to reduce the emissions that cause global warming.

Regional governments and nations across the world can only manage what they measure. The first step in managing greenhouse gas emissions, therefore, is to establish an inventory of those emissions. Below is a chart of global greenhouse gas emissions, which includes the amount of short tons of carbon dioxide equivalent (tons CO_2e) that is generated worldwide, within the United States, the State of California, and in Alameda County. For context, California is the 16th largest emitter in the world - if it were considered a country of its own - second only to Texas in the US. Per capita emissions in California, however, are among the lowest in the US. Further, emissions in Alameda County are significantly less than the California average.

Table (1) World Greenhouse Gas Emissions Scenarios

Locations	GHG – Tons of CO_2e per year	Percent of World GHG Emissions	Percent of U.S.A Emissions	Percent of California Emissions
World (2000)	33,712,900,000	100.0%		
United States (2000)	6,871,700,000	20.4%	100%	
California (2004)	542,184,000	1.6%	7.9%	100.0%
ACCPP Region (2005) [1,2,3]	5,710,393		0.083%	1.105%
ACCPP Governments (2005)	80,532			0.015%

Source: (2000) World and United States emissions from World Resources Institute – Climate Analysis Indicators tool (http://cait.wri.org/). (2004) California emissions from California Energy Commission (http://www.energy.ca.gov/2006publications/CEC-600-2006-013/CEC-600-2006-013-SF.PDF). Figures exclude land use related emissions.

Note: All units in this report are reported in short tons (tons). When source data is found in metric tonnes (MT or tonnes) to convert it into short tons (tons) a conversion factor of 1.102 short ton per metric ton is applied.

Per Capita Fast Facts

2000 Worldwide per capita GHG emissions	**5 tons CO_2e**
2004 US per capita GHG emissions	**23 tons CO_2e**
2004 California per capita GHG emissions	**17 tons CO_2e**

Additional source: 2004, U.S.A. GHG Emissions from EPA (http://www.epa.gov/climatechange/emissions/downloads06/06ES.pdf)

Fast Facts	*Alameda County*	*Emeryville*[5]
Population (2005):	**1.45 Million**	**8,650**
Number of Employees (2005)		**20,000**
Number of Autos (2000):	**4.5 Million**	**4000**
Annual Electricity Usage per Capita (2004):	**6,738 kWh**	
Annual Natural Gas Usage per Capita (2004):	**330 therms**	
Annual Water Usage per Capita (2004):	**46,000 gallons**	
Average Waste per person (2004):	**1.03 tons**	
Average Waste per Business[6] (2004) :	**35.0 tons**	**24.0 tons**
Average Waste Diversion Rate (2004):	**60%**	**64%**
Per capita GHG emissions[4]:	**5.86 tons CO_2e**	

Source: StopWaste.org and City of Emeryville

[1] Data includes the 10 cities in the ACCPP only (Alameda City, Albany, Berkeley, Emeryville, Hayward, Newark, Oakland, Piedmont, San Leandro and Union City).
[2] The Baseline year is 2005 for all cities, except for Albany and Emeryville which inventoried 2004 emissions.
[3] GHG emissions for ACCPP cities are based on ICLEI GHG Emissions Protocol for Local Governments, which includes end use energy, transportation and waste sector within city boundaries. World and U.S.A emissions are based on national GHG inventories which additionally include fugitive emissions, industrial process emissions, and other modes of transportation.
[4] Based on the emissions inventories conducted for the 11 participating local governments.
[5] Per Capita data for the City of Emeryville is not applicable in a predominantly commercial city.
[6] Average Business Waste calculated on estimated 600 businesses with 90% of 2004's 16,000 MSW tons

About the Sponsor: StopWaste.Org

This Alameda County Climate Protection Project was financially sponsored by StopWaste.Org in an effort to support its member agencies in building a region that is continually progressing toward environmentally and economically sound resource management. StopWaste.Org is a public agency formed in 1976 by a Joint Exercise of Powers Agreement among the County of Alameda, each of the fourteen cities within the county, and two sanitary districts. The agency serves as the Alameda County Waste Management Authority and the Alameda County Source Reduction and Recycling Board. In this dual role StopWaste.Org is responsible for the preparation and implementation of the County Integrated Waste Management Plan and Hazardous Waste Management Plan as well as the delivery of voter approved programs in the areas of waste reduction, recycled product procurement, market development and grants to non-profit organizations, to help the County achieve its 75% waste diversion goal.

Key program areas in which StopWaste.Org provides technical and financial assistance to its member agencies include:

→ Business recycling and waste prevention services through the StopWaste Partnership
→ Organics programs, including residential and commercial food waste collection and the promotion of Bay-Friendly Landscaping and gardening
→ Green building and construction and demolition debris recycling
→ Market development
→ Education and outreach, including schools recycling.

As is demonstrated in this document, many of StopWaste.Org's program areas dovetail nicely with municipal efforts to reduce greenhouse gas emissions. While the agency's charge to reduce the waste stream in Alameda County may seem external to traditional emissions reduction strategies, it is working closely with ICLEI in an ongoing way to illustrate the emissions benefits of waste reduction and recycling. Indeed, StopWaste.Org and ICLEI have compiled results in this report that show practices such as residential and commercial recycling and composting, buying recycled products, green building and Bay-Friendly Landscaping play an important role in a local government's emission mitigation strategy. In fact, climate change mitigation can be seen as an umbrella under which the agency's programs play a substantial role.

About ICLEI and the Cities for Climate Protection Campaign

ICLEI's mission is to improve the global environment through local action. The Cities for Climate Protection® (CCP) campaign is ICLEI's flagship campaign designed to educate and empower local governments worldwide to take action on climate change. ICLEI provides resources, tools, and technical assistance to help local governments measure and reduce greenhouse gas emissions in their communities and their internal municipal operations.

ICLEI's CCP campaign was launched in 1993 when municipal leaders, invited by ICLEI, met at the United Nations in New York and adopted a declaration that called for the establishment of a worldwide movement of local governments to reduce greenhouse gas emissions, improve air quality, and enhance urban sustainability. The CCP campaign achieves these results by linking climate change mitigation with actions that improve local air quality, reduce local government operating costs, and improve quality of life by addressing other local concerns. The CCP campaign seeks to achieve significant reductions in U.S. greenhouse gas emissions by assisting local governments in taking action to reduce emissions and realize multiple benefits for their communities.

ICLEI uses the performance-oriented framework and methodology of the CCP campaign's 5-Milestones to assist U.S. local governments in developing and implementing harmonized local approaches for reducing global warming and air pollution emissions, with the additional benefit of improving community livability. The milestone process consists of:

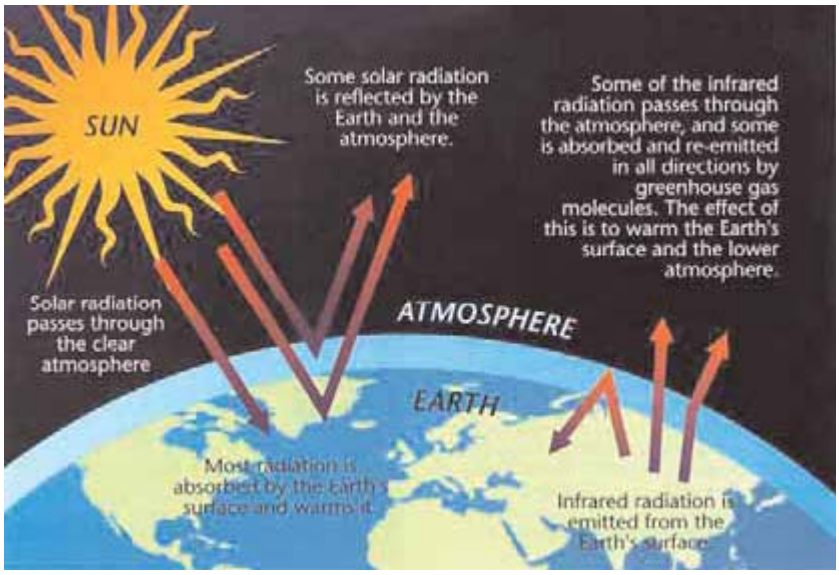
- Milestone 1: Conduct a baseline emissions inventory and forecast
- Milestone 2: Adopt an emissions reduction target
- Milestone 3: Develop a Climate Action Plan for reducing emissions
- Milestone 4: Implement policies and measures
- Milestone 5: Monitor and verify results

1. Introduction

1.1 Introduction to Climate Change Science

The Earth's atmosphere is naturally composed of a number of gases that act like the glass panes of a greenhouse, retaining heat to keep the temperature of the Earth stable and hospitable for life at an average temperature of 60ºF. Carbon dioxide (CO_2) is the most prolific of these gases. Other contributing gases include methane (CH_4), nitrous oxide (NO_2), ozone (0_3) and halocarbons. Without the natural warming effect of these gases the average surface temperature of the Earth would be around 14ºF.

Figure (1) The Greenhouse Gas Phenomenon



Source: US Environmental Protection Agency

However, recently elevated concentrations of these gases in the atmosphere have had a de-stabilizing effect on the global climate, fueling the phenomenon commonly referred to as global warming. The global average surface temperature increased during the 20th century by about 1°F. According to NASA scientists, the 1990s were the warmest decade of the century, and the first decade of the 21st century is well on track to be another record-breaker. The years 2002, 2003, 2004 and 2005, along with 1998, were the warmest five years since the 1890s, with 2005 being the warmest year in over a century.

Scientific Facts and Projections:

- The atmospheric concentration of carbon dioxide (CO_2) during the last two decades has increased at the rate of 0.4% every year.
- Current CO_2 concentrations are higher than they have been in the last 420,000 years, and according to some research, the last 20 million years.
- About three-quarters of the CO_2 emissions produced by human activity during the past 20 years are due to the burning of fossil fuels.

Source: The Intergovernmental Panel on Climate Change

The climate and the atmosphere do not react in a linear fashion to increased greenhouse gases. That is to say that you cannot simply predict the specific degree of warming that each ton of carbon dioxide emitted from a power plant or a vehicle's tailpipe will cause. The Earth's climate has a number of feedback loops and tipping points that scientists fear will accelerate global warming beyond the rate at which it is currently occurring. For example, as CO_2 emissions have increased in recent human history, the oceans have been absorbing a significant portion of these gases, but as the oceans become more permeated with CO_2, scientists anticipate they will reach a saturation point, after which each ton of anthropogenically emitted CO_2 will have a more substantial impact.[5] Another example of this compounding can be found in the polar ice caps. Ice is highly reflective and acts effectively like a giant mirror, reflecting the sun's rays back into space. As the planet warms and some of this ice melts away, a darker land or ocean surface is revealed. This darker surface tends to absorb more heat, accelerating the speed at which the planet warms with each ton of greenhouse gas emitted. As these examples illustrate, the stakes are high, and there is no time to lose in the fight against global warming.

1.2 Effects & Impacts of Climate Change

Global Impacts

In addition to causing an increase in average global surface temperature, rising levels of greenhouse gases have a destabilizing effect on a number of different micro-climates, conditions and systems. According to the Intergovernmental Panel on Climate Change, surface temperatures are on course to increase by between 2.5 and 10.5ºF by the year 2100, with regions in the northern parts of North America and Asia heating by 40% above the mean increase.[6] The increase in the temperature of the oceans is projected to accelerate the water cycle, thereby increasing the severity and rate of both storms and drought, which, along with decreased snow pack, could disrupt ecosystems, agricultural systems and water supplies.

Snow cover has decreased by 10% in the last forty years. Average sea levels have raised between 1/3 and 2/3 of a foot over the course of the 20th century and are projected to rise by at least another 1/3 of a foot and up to almost three feet by the year 2100. These coastal infringements on such a large scale could lead to not only significant environmental and ecosystem disturbances, but also major population displacement and economic upheaval.[7]

Local Impacts

While climate change is a global problem influenced by an array of interrelated factors, climate change is also a local problem with serious impacts foreseen for California, the Bay Area and Emeryville.

***Sea level rise*:** According to the Union of Concerned Scientists, the sea level in the State of California is expected to rise up to 12 inches of the next hundred years. The Pew Center on Climate Change has reported that this would result in the erosion of beaches, bay shores and river deltas, marshes and wetlands and increased salinity of estuaries, marshes, rivers and aquifers.[8]

[5] Intergovernmental Panel on Climate Change (IPCC) Third Assessment Report: "Climate Change 2001: The Scientific Basis."
[6] Intergovernmental Panel on Climate Change (IPCC) Third Assessment Report: "Climate Change 2001: The Scientific Basis."
[7] Intergovernmental Panel on Climate Change (IPCC) Third Assessment Report: "Climate Change 2001: The Scientific Basis."
[8] Neumann, James E. for the Pew Center on Global Climate Change. "Sea Level Rise & Global Climate Change: A Review of Impacts to the US Coasts." February 2000.

This increased salinity has the potential to damage or destroy crops in low-lying farmlands. Infrastructure at or near sea level, such as harbors, bridges, roads and even the San Francisco International and Oakland International Airports are at risk of damage and destruction.

The San Francisco Bay Area Conservation Commission has modeled the impact of a sea level rise of 3 feet (approx 1 meter) on the San Francisco Bay Area. As shown in Figure (2), areas such as the Oakland Airport would be under water as well parts of Alameda, San Leandro, Hayward, Union City, Fremont and Newark, including sections of Interstate 880.

Figure (2) San Francisco Bay Area Land areas Affected by a 1-meter Sea Level Rise



Source: San Francisco Bay Area Conservation Commission

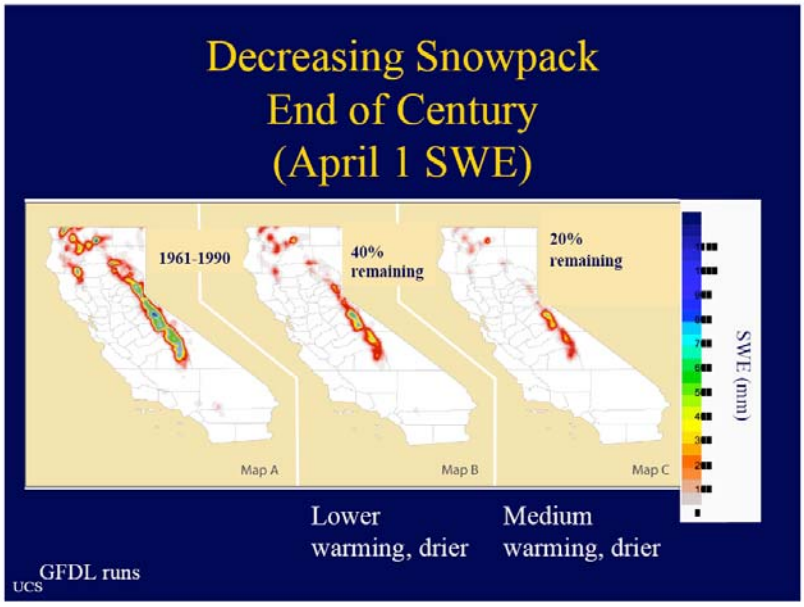
***Natural disasters*:** Climate models predict a 4ºF temperature increase in the next 20 to 40 years, with an increase in the number of long dry spells, as well as a 20-30% increase in precipitation in the spring and fall. More frequent and heavier precipitation cause flooding and mudslides, which would incur considerable costs in damages to property, infrastructure and even human life. Heavy rains during the winter of 2005 offer a glimpse of the potential costly and disruptive effects of such precipitation.

In addition, the increase of wildfires due to continued dry periods and high temperatures is another expected impact of continued climate change. In these conditions, fires burn hotter and spread faster. During 2003, there were 14 reported fires in California which were enhanced due to Santa Ana winds and very low levels of humidity. The estimated damage costs were over $2 Million.

Impacts on water: Water quality and quantity are also at risk as a result of changing temperatures. With warmer average temperatures, more winter precipitation will fall in the form of rain instead of snow, shortening the winter snowfall season and accelerating the rate at which the snowpack melts in the spring. Not only does such snow melt increase the threat for spring flooding, it will decrease the Sierras' capacity as a natural water tower, resulting in decreased water availability for agricultural irrigation, hydro-electric generation and the general needs of a growing population.

The decrease in snow-pack is particularly relevant in the State of California and the Bay Area, as the Sierra snow-pack provides approximately 80% of California's annual water supply, and it is the origin of the Tuolumne River, the primary source of water for the San Francisco regional water system. Figure (3) was provided by the Union of Concern Scientists for the California Climate Action Team Report (2006).

Figure (3) Decreasing Snowpack in California



Source: Union of Concern Scientists

***Impacts on plants and vegetation*:** Native plants and animals are also at risk as temperatures rise. Scientists are reporting more species moving to higher elevations or more northerly latitudes in response. Increased temperatures also provide a foothold for invasive species of weeds, insects and other threats to native species. The increased flow and salinity of water resources could also seriously affect the food web and mating conditions for fish that are of both of economic and recreational interest to residents. In addition, the natural cycle of plant's flowering and pollination, as well as the temperature conditions necessary for a thriving locally adapted agriculture could be affected, with perennial crops such as grapes taking years to recover.

In California, the impacts of climate change on agriculture are estimated to be $30 billion by the Farm Bureau, mostly due to changes in chill hours required per year for cash crops.

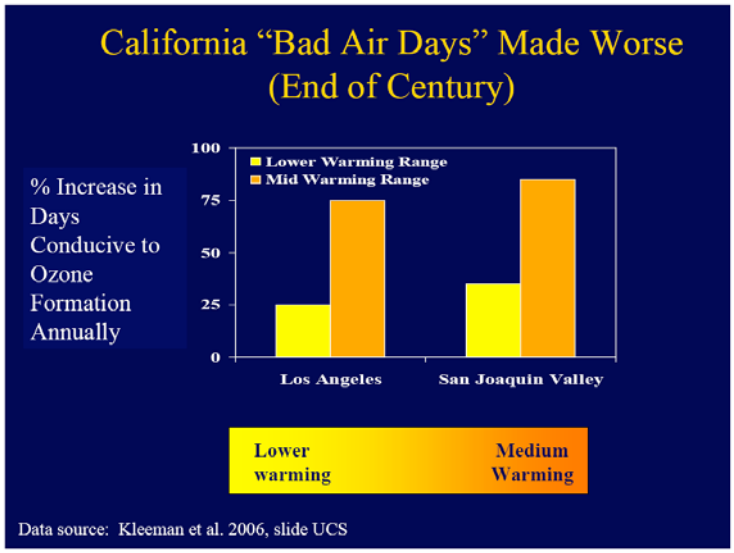
***Public health impact*:** Warming temperatures and increased precipitation can also encourage mosquito-breeding, thus engendering diseases that come with mosquitoes, such as the West Nile

Virus, a disease of growing concern in our region. Heat waves are also expected to have a major impact on public health and be a determinant factor of mortality. According to the IPCC (2004), the summer mortality rates will double by half by 2050 due to hot weather episodes.

Increased temperatures also pose a risk to human health when coupled with high concentrations of ground-level ozone and other air pollutants, which may lead to increased rates of asthma and other pulmonary diseases. Furthermore, anticipated increases in the number and severity of hot days place significant portions of the population, particularly the elderly, young, those already sick, and people who work outdoors, at risk for heat-stroke.

The incidence of bad air days in California's urban areas has increased, mostly in hot summer days. On long, hot, stagnant days, ground level ozone can build up to levels that violate federal and state health-based standards. In the summer of 2006, the Bay Area Air Quality Management District (BAAQMD) registered 11 Spare the Air days and exceeded the California 1-hour standard for ozone (set at 90 ppb) 18 times.

Figure (4) California Bad Air days



Source: Union of Concern Scientists

Given that climate change has local repercussions and effects on weather, water resources, ecosystems, public health, infrastructural stability and economic vitality, local governments have a vested interest in mitigating the amount of greenhouse gases being produced by their communities.

1.3 Action Being Taken on Climate Change

International Action

As evidence of climate change has mounted, groups at the international, federal, state and local level have responded with ways to confront the impending threat. The United Nations Framework Convention on Climate Change (UNFCC) leads international efforts to investigate and combat climate change. Recognizing the problem of potential global climate change, the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP) established the Intergovernmental Panel on Climate Change (IPCC) in 1988 to assess on a comprehensive, objective, open and transparent basis the scientific, technical and socio-economic information relevant to understanding the scientific basis of risk associated with human-induced

climate change, its potential impacts and options for adaptation and mitigation, releasing it's most recent assessment in 2007.[9]

In 1997, 10,000 international delegates, observers and journalists gathered in Kyoto, Japan to participate in the drafting and adoption of the Kyoto Protocol, requiring industrialized nations to reduce their collective greenhouse gas emissions 5.2% below 1990 levels. As of January 2007, 162 countries have ratified the Protocol, with the United States and Australia most notably absent from the list. Additionally, since 1995 the annual Conference of the Parties (COP) has met to discuss action and implementation to combat climate change, with the most recent COP, COP-12, being held in Nairobi in 2006.

State and Federal Action

Though adequate attention and action related to combating climate change has been lacking at the federal level, California has taken significant steps at the state level. California has been leading the charge on combating climate change through legislation:

Senate Bill 1078 Sher, 2002 – Established a Renewable Portfolio Standard requiring electricity providers to increase purchases of renewable energy resources by 1% per year until they have attained a portfolio of 20% renewable resources.

Assembly Bill 1493 Pavley, 2002 – Requires the State Air Resources Board to develop and adopt regulations that achieve the maximum feasible reduction of greenhouse gases from vehicles primarily used for non-commercial transportation by January 2005.

Senate Bill 1771 Sher, 2000 – Requires the California Energy Commission (CEC) to prepare an inventory of the state's greenhouse gas emissions, to study data on global climate change, and to provide government agencies and businesses with information on the costs and methods for reducing greenhouse gases. It also established the California Climate Action Registry to serve as a certifying agency for companies and local governments to quantify and register their greenhouse gas emissions for possible future trading systems.

AB 32 Núñez & Pavley, 2006 – Institutes a mandatory limit on greenhouse gas emissions -- reducing emissions in California to 1990 levels by the year 2020, or 25% below forecasted levels. The bill also directs the California Air Resources Board (CARB) to establish a mandatory reporting system to track and monitor emission levels and requires CARB to develop various compliance options and enforcement mechanisms.

On June 1, 2005, Governor Schwarzenegger signed Executive Order #S-3-05 establishing a greenhouse gas reduction target of reducing emissions to 2000 levels by 2010, to 1990 levels by 2020 and 80 percent below 1990 levels by 2050. In April 2006, the California Climate Action Team released its Report to Governor Schwarzenegger and the State Legislature, outlining recommendations and strategies to achieve those reductions.

Local Action

A great deal of work is being done at the local level on climate change as well. ICLEI—Local Governments for Sustainability has been a leader both internationally and domestically for more than ten years, representing over 770 local governments around the world. ICLEI was launched in the United States in 1995 and has grown to more than 230 cities and counties providing national leadership on climate protection and sustainable development. In June 2006, ICLEI launched the California Local Government Climate Task Force as a formal mechanism to provide ongoing input and collaboration into the State of California's climate action process. ICLEI also works in conjunction with the U.S. Conference of Mayors to track progress and implementation of the U.S. Mayors Climate Protection Agreement, launched in 2005, which more than 376 mayors have

[9] Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report: "Climate Change 2007"

signed to date pledging to meet or beat the Kyoto Protocol emissions reduction target in their own communities. By the end of 2006, Alameda County mayors from Emeryville, San Leandro, Oakland, Pleasanton, Newark, Hayward, Freemont, Dublin, Berkeley, and Albany signed the U.S. Mayors Climate Protection Agreement.

Climate Protection Efforts by the City of Emeryville

The City of Emeryville has taken several actions on Climate Change in recent years:

On September 7 1999, Council Member Harper asked and received the blessing of the Emeryville City Council to sign onto the "Mayor and Local Official Statement on Global Warming" through the organization "Cities for Climate Protection."

On June 5, 2005, in San Francisco at the United Nations World Environment Day proceedings, the City of Emeryville signed on as a charter member of the United Nations World Environmental Accords - the smallest city in the world to do so. The Accords ask the participating jurisdictions to take one of the 21 action steps each year; the Cities will be evaluated on their voluntary actions in 2012 by the United Nations at a follow-up conference. One of the key action steps of the Accords is to set a goal of reducing green house gas emissions by 25% by 2030 and developing a system to track Greenhouse Gas (GHG) emissions.

Emeryville has already taken many steps toward increasing energy efficiency, reducing air pollution, and reducing solid waste. Examples include:

- Brownfield Redevelopment - Extensive programs since 1996 resulting in urban in-fill projects and reducing the need for urban sprawl. As of 2008 this redevelopment created: 2,290 new residential units for 3,500 residents of which 719 were affordable; and 3.6 million square feet of new commercial space and 800,000 square feet of new retail space creating 8,400 new jobs
- Establishment of the EPA-award-winning Emery-Go-Round: in 2007 shuttled 1.2 million riders between the MacArthur BART station and the City and growing 8% per year.
- Requiring new City Buildings and Landscapes to be LEED Silver Certified and Bay-Friendly Verified
- Reducing building permit fees for single family home solar installations.
- Installing Solar PV panels on the Civic Center roof.
- Requiring vegetated stormwater treatment in all new developments, cleaning the bay, reducing the heat island effect in the City, reducing energy use for cooling and increasing CO2 uptake by plants.
- Increasing Street tree planting standards for new developments ensuring the long-term health of more trees in the City.
- Implementing environmental purchasing decisions such as switching to recycled content copy paper in many City buildings. This practice benefits the community by incentivizing business practices that conserve resources, reduce emissions, and reduce waste.
- Working with the Emeryville Chamber of Commerce to get 21 businesses in Emeryville to "Go Green" and become certified green businesses over since 2003.
- Working with "SmartLights" of the East Bay Energy Watch program to reduce energy use in the lighting of commercial properties in the City.
- Adopting StopWaste.Org's Multi-Family Green Building Guidelines which serve to reduce greenhouse gas emissions by keeping construction and demolition debris out of landfills and increasing energy efficiency in buildings.
- Converting traffic signal lights to more energy efficient LED lamps.
- Requiring new developments to rate their projects using the green building scoring

systems from StopWaste.Org and the United States Green Building Council (USGBC)

- Implementing residential food scrap recycling. Currently approximately 20% percent of households in the single family neighborhoods participate, thereby diverting 9 of tons of food scraps in 2006 from the landfill to a composting facility.
- Requiring landscapes in new developments and city projects to use locally produced compost and mulch partially made of feedstocks from municipal sources.
- Equipping the City Corporation Yard with motion occupancy sensors and energy efficient lighting. These steps save the City money, and reduce the emissions that cause global warming. The Senior Center also received rebate funds for the replacement of the old boiler. Other City facilities are also being considered for lighting retrofits.
- Installing Emeryville's first bike boulevard, adding more bike lanes and building the first phases of the Emeryville Greenway, an urban Rail-to-Trail project, encouraging more people to travel by bike and on foot reducing vehicle emissions.
- Educating the residents of Emeryville at each years Earth Day event in Temescal Creek Park about environmental issues that face the City and the planet.
- Adopting the "Eco Food-ware" ordinance requiring disposable food packaging to be recyclable or compostable for all food prepared in the City and reduce plastic litter washing out to the Bay and ocean.
- Working with the East Bay Green Corridor Partnership to increase the availability of green-collar jobs and green job training
- Starting in 2007, the City has contracted with California Youth Energy Services each summer to give local high school students energy conservation job skills and retrofit existing Emeryville homes with energy conserving devices.
- Joint Bio-Energy Institute - Partnering with UC Berkeley, the Lawrence Berkeley Laboratory and the City of Berkeley, Amyris and others creating 360 green jobs in Emeryville.

2. Emissions Inventory

2.1 Reasoning, Methodology & Model

The City of Emeryville's inventory was conducted by ICLEI in partnership with staff from the municipality. The purpose of the baseline emissions inventory is to determine the levels of greenhouse gas emissions that Emeryville emitted in its base year, 2004.

ICLEI's Cities for Climate Protection inventory methodology allows local governments to systematically estimate and track greenhouse gas emissions from energy and waste related activities at the community-wide scale and those resulting directly form municipal operations. The municipal operations inventory is a subset of the community-scale inventory.

Once completed, these inventories provide the basis for creating an emissions forecast and reduction target, and enable the quantification of emissions reductions associated with implemented and proposed measures.

2.1.1 ICLEI's Emissions Analysis Software

To facilitate local government efforts to identify and reduce greenhouse gas emissions, ICLEI developed the Clean Air and Climate Protection (CACP) software package with Torrie Smith Associates. This software estimates emissions derived from energy consumption and waste generation within a community. The CACP software determines emissions using specific factors (or coefficients) according to the type of fuel used. Emissions are aggregated and reported in terms of carbon dioxide equivalent units, or CO_2e. Converting all emissions to carbon dioxide equivalent units allows for the consideration of different greenhouse gases in comparable terms. For example, methane is twenty-one times more powerful than carbon dioxide in its capacity to trap heat, so the model converts one ton of methane emissions to 21 tons of CO_2e.

The emissions coefficients and methodology employed by the software are consistent with national and international inventory standards established by the Intergovernmental Panel on Climate Change (1996 Revised IPCC Guidelines for the Preparation of National GHG Emissions Inventories), the U.S. Voluntary Greenhouse Gas Reporting Guidelines (EIA form1605), and, for emissions generated from solid waste, the U.S. EPA's Waste Reduction Model (WARM).

The CACP software has been and continues to be used by over 250U.S. local governments to reduce their greenhouse gas emissions. However, it is worth noting that, although the software provides City of Emeryville with a sophisticated and useful tool, calculating emissions from energy use with precision is difficult. The model depends upon numerous assumptions, and it is limited by the quantity and quality of available data. With this in mind, it is useful to think of any specific number generated by the model as an approximation rather than an exact value.

2.1.2 Inventory Sources and Data Collection Process

An inventory of greenhouse gas emissions requires the collection of information from a variety of sectors and sources. For community electricity and natural gas data, ICLEI consulted Pacific Gas & Electric Company (PG&E) and Alameda Power & Telecom[10]. The Metropolitan Transportation Commission (MTC), Bay Area Air Quality Management District (BAAQMD), and Bay Area Rapid Transit (BART) served as sources of transportation data. Solid waste data was gathered from StopWaste.Org, Waste Management, Inc., Alameda County Industries, Republic Services, Inc. and the U.S. Environmental Protection Agency (U.S. EPA). City of Emeryville staff person, Peter Schultze-Allen, was instrumental in providing data on municipal operations.

[10] Exclusively for the City of Alameda

These data were entered into the software to create a community emissions inventory and a municipal emissions inventory. The community inventory represents all the energy used and waste produced within Emeryville and its contribution to greenhouse gas emissions. The municipal inventory is a subset of the community inventory, and includes emissions derived from internal government operations.

There are two main reasons for completing separate emissions inventories for community and municipal operations. First, the government is committed to action on climate change, and has a higher degree of control to achieve reductions in its own municipal emissions than those created by the community at large. Second, by proactively reducing emissions generated by its own activities, the City of Emeryville government takes a visible leadership role in the effort to address climate change. This is important for inspiring local action in Emeryville, as well as for inspiring other communities.

Emeryville's inventory is based on the year 2004. When calculating Emeryville's emissions inventory, all energy consumed in Emeryville was included. This means that, even though the electricity used by Emeryville residents is produced elsewhere, this energy and emissions associated with it appears in Emeryville's inventory. The decision to calculate emissions in this manner reflects the general philosophy that a community should take full ownership of the impacts associated with its energy consumption, regardless of whether the generation occurs within the geographical limits of the community.

2.2 Alameda County Inventory Results

The results for the Alameda County GHG emissions inventory are shown in the following table (2) and figure (5):

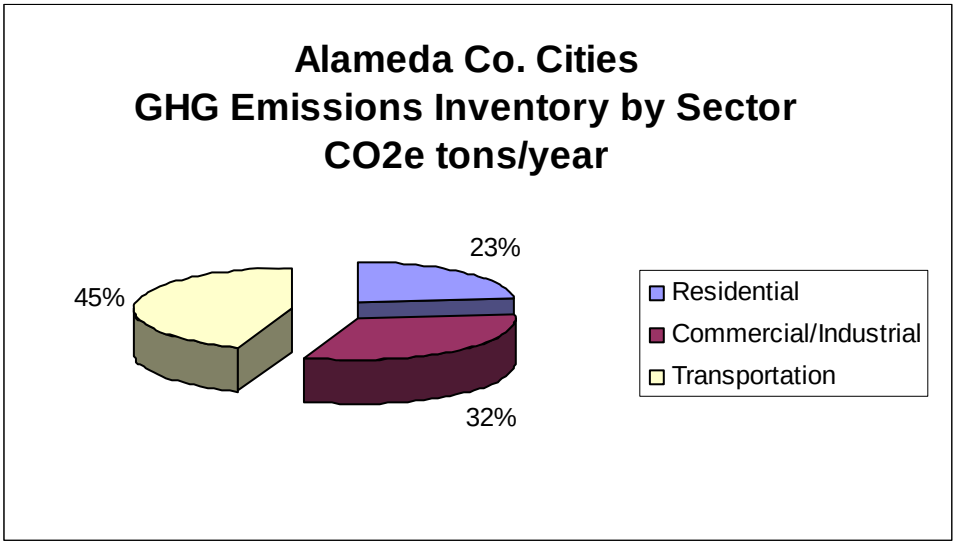
Table (2) GHG Emissions Inventory Results in Alameda County

GHG Emissions Community Inventory Alameda County, CA[1]	**Total CO_2e short tons/year**
	Baseline year[2]
Residential	1,316,481
Commercial/Industrial	1,853,776
Transportation	2,540,136
TOTAL	5,710,393
Households	356,707
Population	974,905
PERCAPITA GHG Emissions (Per capita CO_2e tons/year)	5.86

[1] The above data includes 10 cities (Alameda City, Albany, Berkeley, Emeryville, Hayward, Newark, Oakland, Piedmont, San Leandro and Union City).

[2] The Baseline year is 2005 for all cities, except for Albany and Emeryville which inventoried 2004 emissions. For the presentation of results, data for all cities is included.

Figure (5) GHG Emissions Inventory Results in Alameda County



Source: CACP output

Table (2) and Figure (5) above shows the County's total greenhouse gas emissions from all major sources for the year 2005. The year 2005 was the baseline for all cities except for Albany and Emeryville who used 2004. The County of Alameda is emitting approximately 5,710,393 tons of CO_2e from the residential, commercial/industrial, and transportation sectors. Burning fossil fuels in vehicles and for energy use in buildings and facilities is a major contributor to the County's greenhouse gas emissions. Fuel consumption in the transportation sector is the single largest source of emissions, contributing 45% of total emissions. The residential and commercial/industrial sectors represent emissions that result from electricity and natural gas used in both private and public sector buildings and facilities.

2.3 Emeryville Inventory Results

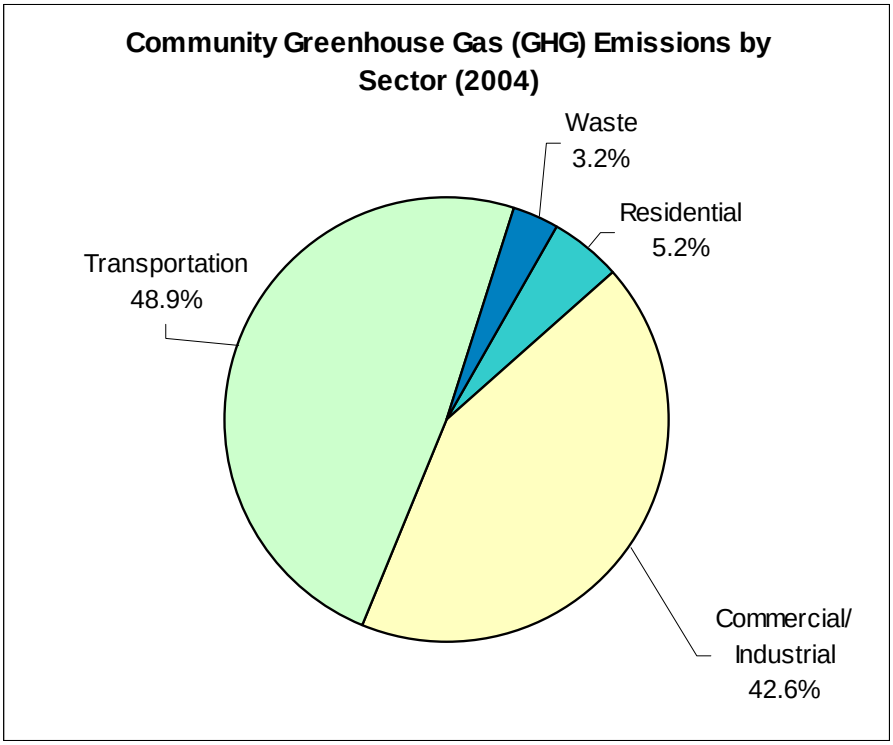
The results below represent the City of Emeryville's completion of the first milestone of ICLEI's CCP campaign. The inventory was first done in 2006 and then updated with Highway emissions in August of 2008. The inventory described below includes those highway emissions.

2.3.1 Community Emissions Inventory Summary – 2004

Table (3) Community Emissions Summary

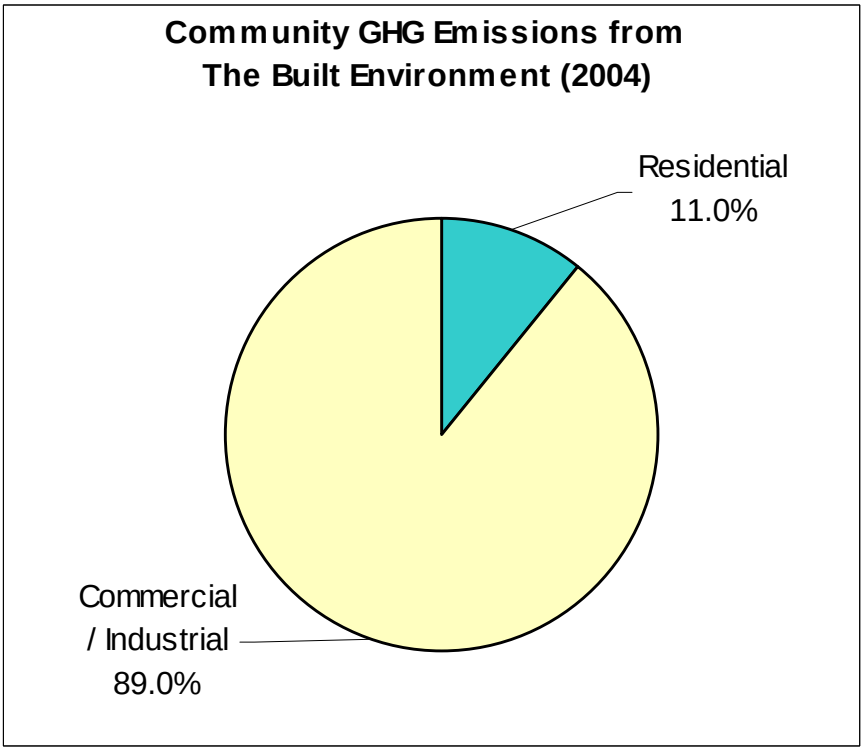
2004 Community Emissions by Sector	Residential	Commercial/ Industrial	Transportation	Waste	TOTAL
CO_2e (metric tons)	9,380	76,204	87,447	5,801	178,832
Percentage of Total CO_2e	5.2%	42.6%	48.9%	3.2%	100.0%
Energy Use (MMBtu)	160,562	1,267,105	262,451	0	1,690,118

Figure (6) Community Emissions by Sector



2.3.2 Community Emissions Inventory Detail – 2004

Figure (7) Community Emissions – Built Environment

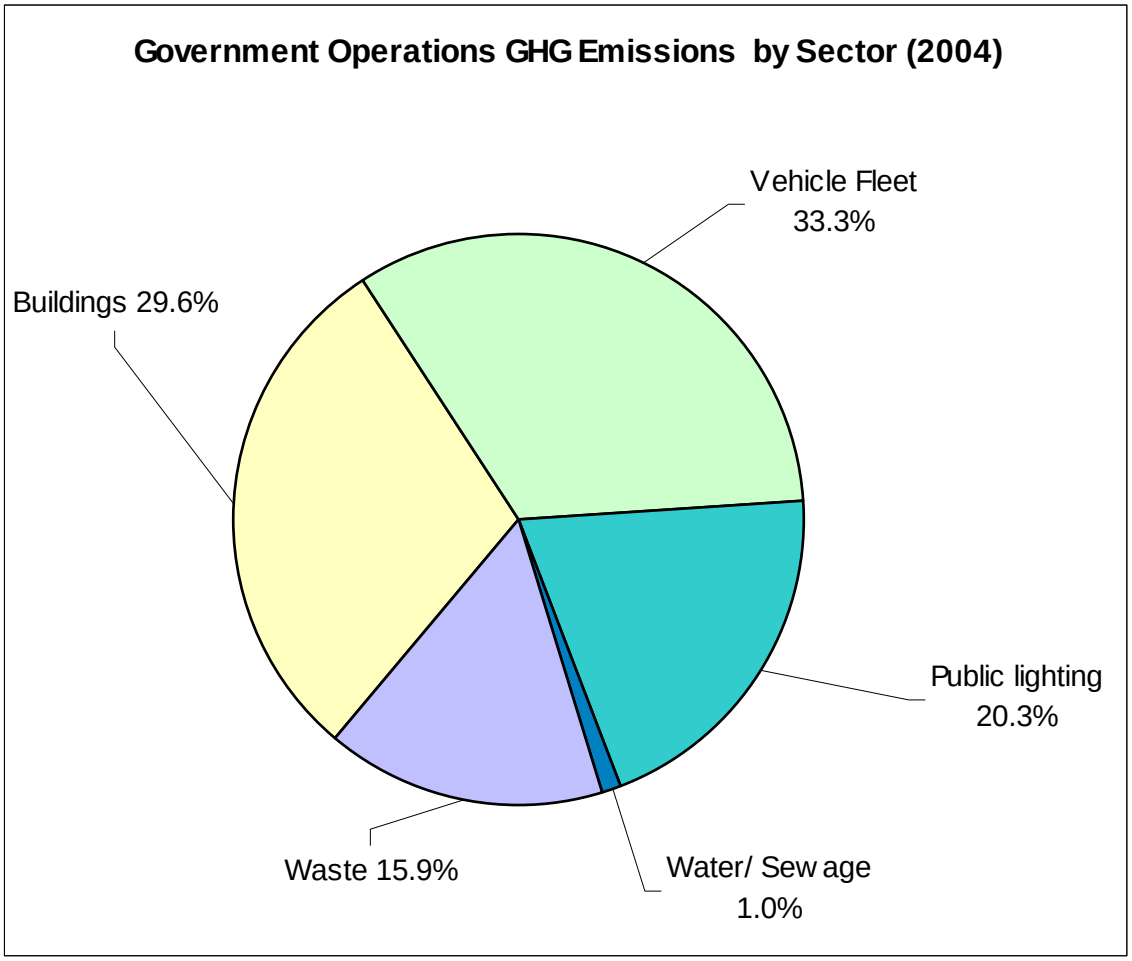


2.3.3 Government Emissions Inventory Summary 2004

Table (4) Government Emissions

Government Emissions 2004	Buildings	Vehicle Fleet	Public Lighting	Water/ Sewage	Waste	TOTAL
CO2e (metric tons)	395	444	271	13	212	1,335
% of Total CO2e	29.6%	33.3%	20.3%	1.0%	15.9%	100.0%
MMBtu	6,633	5,713	4,137	195	-	16,678
Cost ($)	$169,608.00	$118,974.00	$136,974.00	$7,801.00	-	433,357

Figure (8) Government Emissions by Sector



3. Forecast for Greenhouse Gas Emissions – 2020

Table 5 shows the projected new development in the City of Emeryville (taken from the City's draft General Plan - Land Use section.) The row headings are described below:

A. Approved Projects. This includes the various projects that have been approved or are under construction as of November 2007. This development includes 907 housing units and 1.3 million square feet of non-residential space.

B. Gross New Development. This value results from application of average assumed intensities to change areas. Approximately 2,930 housing units and 3.0 million square feet of non-residential space will be added.

C. Existing Development Lost Due to Redevelopment. This value reflects existing underutilized properties that will be replaced by new uses.

D. Net New Development. This reflects the total of the three above categories, and represents the expected development during the life of the General Plan.

E. Existing Development. This reflects existing development, as of November 2007.

F. City at 2030. Totaling net new development and existing development results in the General Plan development potential at 2030. This will result in an increase of approximately 3,800 housing units, a 70 percent increase in the existing population of 9,727 to 16,500, and 2.5 million square feet of total non-residential space, an increase of 21% over 2007 levels.

Table (5) General Plan Development Potential at 2030, by Land Use (draft)

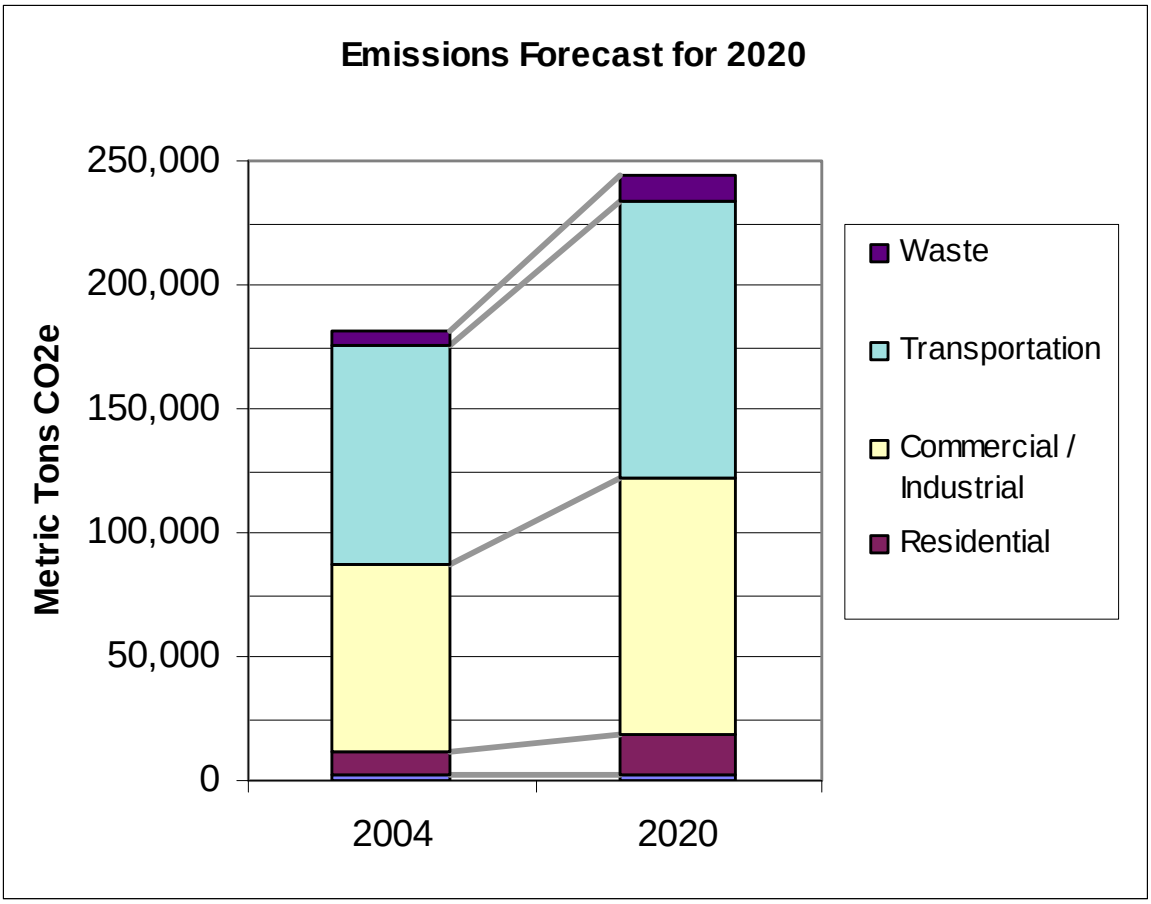
	Residential (units)	Retail (SF)	Hotel (SF)	Office[1] (SF)	Industrial (SF)
A. Approved Development	907	34,461	0	1,313,000	0
B. Gross New Development	2,930	1,075,400	324,600	1,569,700	76,200
C. Existing Lost Due to Redevelopment	70	468,598	14,375	509,740	855,377
D. Net New Development (A+B-C)	3,767	641,263	310,225	2,372,960	-779,177
E. Existing Development	5,988	2,441,660	464,500	4,852,118	4,132,675
F. City at 2030 (D+E)	9,755	3,082,923	774,725	7,225,078	3,353,499

[1]Office includes R&D development.

From 2004 to 2020, under a business-as-usual scenario, the City of Emeryville's emissions will grow by approximately 32.6% from 178,832 to 237,101 metric tons CO2e[11]. To illustrate the potential emissions growth based on projected trends in energy use, driving habits, job growth, and population growth from the baseline year going forward, ICLEI conducted an emissions forecast for the year 2020. Figure 9 and Table 6 show the results of the forecast. A variety of different reports and projections were used to create the emissions forecast.

[11] Transportation growth rates calculated for this forecast assume a base year of 2005, and would be slightly different from 2004.

Figure (9) Community Emissions Forecast



Residential Forecast Methodology

For the residential sector, ICLEI calculated the compounded annual population growth rate[12] between 2005 and 2020, using population projections from Emeryville's draft General Plan. This growth rate (3.444%) was used to estimate average annual compound growth in energy demand. From the Emeryville General Plan, ICLEI estimated that the City's population will be 13,300 in 2020[13].

Commercial / Industrial Forecast Methodology

Analysis contained within "California Energy Demand 2008-2018: Staff Revised Forecast[14]," a report by the California Energy Commission (CEC), shows that commercial floor space and the number of jobs have closely tracked the growth in energy use in the commercial sector. Using job growth projections from the draft Emeryville General Plan, ICLEI calculated that the compounded annual growth in energy use in the commercial sector between 2005 and 2020 will be 1.99%.[15]

[12] Compounded annual growth rate= ((2020 population/2005 population)^(1/15))-1

[13] The General Plan provides population predictions for 2030. To estimate 2020 population, ICLEI used 2000 Census data and assumed an equal growth rate every five years between 2000 and 2030.

[14] http://www.energy.ca.gov/2007publications/CEC-200-2007-015/CEC-200-2007-015-SF2.PDF

[15] The Emeryville General Plan states that 10,000 new jobs will be added by 2030. ICLEI estimated the 2007 number of jobs by assuming a constant growth between 2005 and 2010 from ABAG jobs forecast data and added 10,000 to

Transportation Forecast Methodology

For the transportation sector, projected growth in energy demand was obtained from the CEC 2008 energy demand forecast referenced above. The recently passed federal Corporate Average Fuel Economy standards and the state of California's pending tailpipe emission standards could significantly reduce the demand for transportation fuel in Emeryville. An analysis of potential fuel savings from these measures at a scale that would be useful for the purpose of this report has not been conducted, nor would such an analysis produce a true business-as-usual estimation. Regardless of future changes in the composition of vehicles on the road as a result of state or federal rulemaking, emissions from the transportation sector will continue to be largely determined by growth in vehicle-miles-traveled (VMT). In their report, "Transportation Energy Forecasts for the 2007 Integrated Energy Policy Report," the CEC projects that on-road VMT will increase at an annual rate of 1.51% per year through 2020[16]. This is the number that was used to estimate emission growth in the transportation sector for the Emeryville forecast.

Waste Forecast Methodology

As with the residential sector, the primary determinate for growth in emissions in the waste sector is population. Therefore, the compounded annual population growth rate for 2005 to 2020, which is 3.444%[17] (as calculated from the draft Emeryville General Plan), was used to estimate future emissions in the waste sector.

Table 6 – *Community Emissions Growth Projections by Sector*

Community Emissions Growth Forecast by Sector	2004	2020	Annual Growth Rate	Percent Change from 2004 to 2020
Residential	9,380	15,587	3.444%	66.2%
Commercial / Industrial	76,204	102,407	1.990%	34.4%
Transportation (incl. 2005 State Hwy data)	87,447	109,467	1.509%	25.2%
Waste	5,801	9,640	3.444%	66.2%
TOTAL	**178,832**	**237,101**	**--**	**32.6%**

As Table 6 shows, emissions from the residential and waste sectors will experience a 66.2% increase. Emeryville can dramatically reduce these emissions by ensuring energy and water efficiency standards are met in new residential developments and promoting recycling and composting across the City.

The Municipal operations of the City are not expected to grow in any significant manner, so the business as usual emissions are projected to remain roughly the same. This is reflected in Table 7.

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estimate 2030 jobs (30,668). This was then prorated in the same manner as population projections to estimate 2020 jobs (27,065).

[16] Report available at: http://www.energy.ca.gov/2007publications/CEC-600-2007-009/CEC-600-2007-009-SF.PDF. Compounded Annual growth rate for 2005-2020 is calculated from Table 4 on page 12. In light of recent fuel cost increases, the calculation assumes high fuel cost scenario.

[17] Ibid

4. Greenhouse Gas Emissions Reduction Target

A reduction target provides a tangible goal for Emeryville's emissions reduction efforts. Our emissions reduction target represents a percentage by which the community aims to decrease emissions, below the 2004 baseline, by 2020.

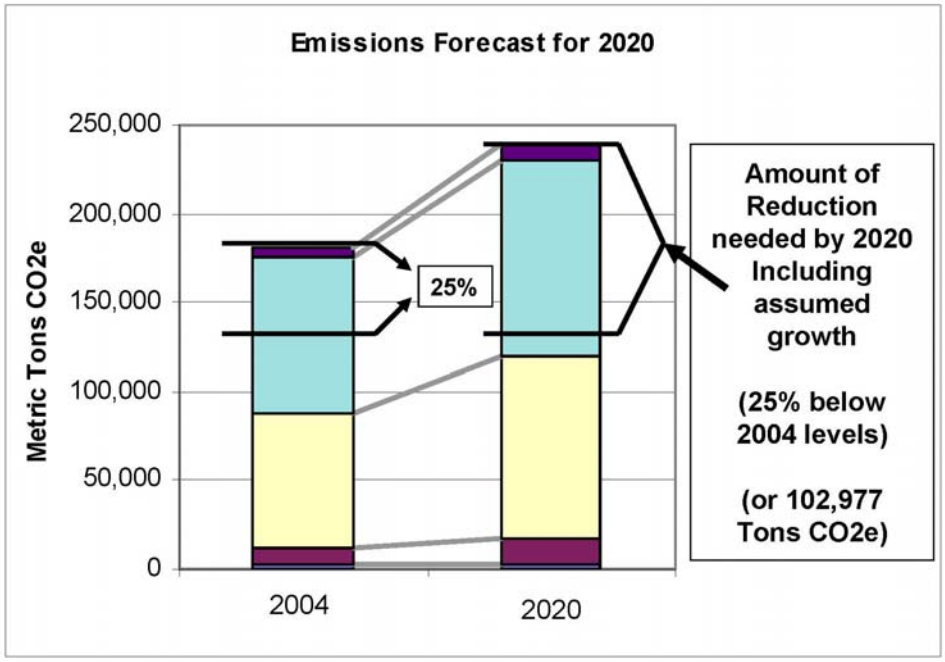
Many factors were considered when selecting Emeryville's reduction target. We strove to choose a target that is both aggressive and achievable given local circumstances. Emeryville's residential and commercial redevelopment is occurring at a rapid level, which provides the City with both challenges and opportunities for climate change actions.

Table (7) Emeryville Emissions Summary

	Community-wide	Government Operations
Base year	2004	2004
Quantity of CO_2e emissions in base year (tons)	178,832	1,335
Target year	2020	2020
Business-as-usual projection of CO_2e emissions in 2020 (tons)	237,101	1,335
Percent CO_2e reduction targeted by target year relative to base year (%)	25%	25%
Quantity of CO_2e reduction targeted relative to base year (tons)	102,977	284

Source: CACP Model Output

Figure (10) Emission Reduction Target Summary



5. Summary of Existing Emissions Reduction Measures

Table (8) Emeryville's Emissions Summary

	Community Analysis	Government Operations Analysis
Base year	2004	2004
Quantity of CO_2e emissions in base year (tons)	178,832	1,335
Target year	2020	2020
Business-as-usual projection of CO_2e emissions in 2020 (tons)	237,101	1,335
Percent CO_2e reduction targeted by target year relative to base year (%)	25%	25%
Quantity of CO_2e reduction targeted relative to base year (tons)	102,977	333
Quantity of CO_2e reduction achieved to date (tons)	0[1]	50[2]
Percent of CO_2e reduction target achieved to date (%)	0%[1]	7%[2]
Quantity of CO_2e reduction pending to reach target (tons)	102,977	284

Source: CACP Model Output

[1] Until the next emissions inventory is performed, it is not possible to accurately estimate the community emission reductions to date.

[2] The Municipal emission reductions to date were estimated from the new programs that have occurred since the end of 2004: solar pv system on City Hall, the police bike patrol program, the lighting retrofit at the Corp Yard, the boiler replacement at the Senior Center, compost and recycling improvements at City facilities and new fleet vehicles with better emissions.

6. Proposed Emissions Reduction Measures & Policies

Based on careful consideration of the emissions reductions needed to achieve our stated targets, the distribution of emissions revealed in our emissions inventory, existing priorities and resources, and the potential costs and benefits of various potential emissions reduction projects, Emeryville has identified a set of emissions reduction measures that should be set into motion as soon as possible. An implementation table prioritizing the measures with costs and scheduling for each measure is attached as Exhibit A. The actions are divided into the following sectors/measure types: transportation, energy efficiency, renewable energy, and solid waste management[18]. Within each of these categories, the measures are further divided into the measures that affect community-wide emissions and measures that affect the emissions that result from municipal operations.

Summary of Proposed Actions:

Community-Wide	Affected Sector
Increase Transit Oriented Development	New Development Projects
Adopt a Green Building and Bay-Friendly Ordinance	New Development Projects
Enhance Transportation Demand Management Conditions	New Development Projects
New Pedestrian, Cycling and Transit Programs & Incentives	All Sectors
Increase Transit Service and Ridership	All Sectors
Commercial and Residential Energy Conservation Ordinances	Existing Buildings and Homes
Develop and Incentivize Local Renewable Energy Production	All Sectors
Conserve Potable Water and Develop Rainwater Usage	All Sectors
Reduce 2004 Landfilled Waste Tonnage by 50% by 2020	All Sectors

Government Operations

GB/BFL for buildings and landscapes

Fleet changes – fuel and vehicle types

Reduce 2004 Landfilled Waste Tonnage by 50% by 2020

Environmentally Preferable Purchasing

Alternative Transportation Incentives/Initiatives

The emissions that result from municipal facilities and operations account for less than 1% percent of Emeryville community-wide emissions. That being said, measures taken to reduce municipal emissions show that the city's elected officials and staff are committed to action on climate change and to inspiring action in both our community and neighboring communities. Emeryville is proud of the emissions reduction efforts implemented to date and is committed to building on those efforts by increasing fleet fuel efficiency, reducing solid waste, and increasing energy efficiency and conservation in municipal buildings.

[18] Waste Management is used in the broader sense to include, waste reduction, recycling, composting and final disposal activities.

6.1 Community-wide Energy and Transportation/Land-Use Measures

Table (9) Proposed Community-wide Energy & Transportation/Land-use Measures
(Source – CAPPA software from ICLEI and WARM model from EPA)

Measure ID#	Measure	CO2e (metric tons)	% towards goal
C58	Transit Oriented Development	17,640	18.00%
C16	Require Green Building for New Construction	10,511	10.73%
C29	Energy Efficiency Education Targeted at Residents	7,514	7.67%
C32	Water Conservation Ordinance	5,341	5.45%
C30	Promote Green Building Through Loans & Incentives	5,256	5.36%
C44	Education on Low-carbon Transportation Options	3,985	4.07%
C23	Require Energy Efficiency Retrofit at Time of Sale	3,757	3.83%
C17	Strict Commercial Energy Code	3,504	3.58%
C22	Energy Efficiency Retrofits of Existing Facilities	3,504	3.58%
C47	Bus Rapid Transit for Emery-Go-Round and AC Transit	3,466	3.54%
C28	Energy Efficiency Education Targeted at Business	3,325	3.39%
C38	Reflective Roofing	2,346	2.39%
C52	Expand Carshare	2,317	2.36%
C18	Strict Residential Energy Code	2,254	2.30%
C19	Offer Loans for Residential Energy Efficiency Improvements	2,254	2.30%
C10	High Efficiency Water Heaters	2,185	2.23%
C21	Energy Efficient Affordable Housing	1,503	1.53%
C36	Low-Maintenance Landscaping	1,480	1.51%
C57	Provide Free High School Bus Passes	1,002	1.07%
C36	Lighting Occupancy Sensors	958	0.98%
C20	Low-income Home Weatherization	881	0.90%
C27	Efficient Lighting Retrofits - T12 lamps to T-8 lamps	821	0.84%
C11	Increase Chiller Efficiency	817	0.83%
C31	Green Business Programs	665	0.68%
C39	Install Solar Photovoltaic (PV) Energy	656	0.67%
C51	Increase BART & AMTRAK Ridership	639	0.65%
C5	Energy Efficient Refrigerators	556	0.57%
C46	Increase Emery-Go-Round Ridership	556	0.57%
C48	Parking Cashout	450	0.46%
C40	Install Solar Hot Water through incentives	390	0.40%
C34	Water Saving Shower Heads	377	0.39%
C1	Energy Efficient Computers	365	0.37%
C2	Energy Efficient Computer Monitors	340	0.35%
C13	HVAC Fan Upgrades	331	0.34%
C14	HVAC Maintenance Tune-ups	317	0.32%
C50	Increase AC Transit Ridership	278	0.28%
C56	Provide Bicycles for Daily Trips	262	0.27%
C8	Energy-Efficient Dish Washers	252	0.26%
C45	Bicycling Paths and Facilities	243	0.25%

C12	Increase Boiler Efficiency	222	0.23%
C6	Energy Efficient Vending Machines	199	0.20%
C37	Green Roofs	196	0.20%
C53	Promote Carpooling and Vanpooling	187	0.19%
C15	Switch Electric Heat to Natural Gas	185	0.19%
C9	Efficient Clothes Washers	172	0.18%
C54	Promote Telecommuting	172	0.18%
C60	Parking and Lane Incentives for Hybrid Vehicles	164	0.17%
C59	Use Hybrid Vehicles - (all sectors)	164	0.17%
C4	Energy Efficient Copiers	150	0.15%
C63	Increase Urban Forest	126	0.13%
C49	Walking Friendly Environments	122	0.12%
C42	Electric Vehicle Charging Stations on Parking Structures	119	0.12%
C61	Use Smaller Fleet Vehicles	92	0.09%
C43	Integrate Bicycles and Transit	81	0.08%
C3	Energy Efficient Printers	74	0.08%
C25	Energy Efficient Exit Signs	54	0.06%
C62	Plant Trees to Shade Buildings	41	0.04%
C33	Water Saving Faucets	38	0.04%
C24	Compact Fluorescent Light Bulb (CFL) Distribution	35	0.04%
C35	High Efficiency Toilets	25	0.03%
C7	Energy Efficient Water Coolers	24	0.02%
C41	Use Wind Energy	20	0.02%
	Sub Total from CAPPA Software	95,961	97.99%
	Waste Measures – See Section 6.3 below (WARM model)	16,766	
	TOTAL TONS REDUCED	112,727	

6.2 Government Energy and Transportation Measures

Table (10): Proposed Government Energy and Transportation Measures
(Source – CAPPA software from ICLEI and WARM model from EPA)

Measure ID #	Measure	CO2e (metric tons)	% of goal
G21	Use Solar Photovoltaic (PV) Energy	65.61	23.12%
G12	Require Green Building for New Construction	26.28	9.26%
G13	Energy Efficiency Retrofits of Existing Facilities	21.90	7.72%
G28	Increase BART & AMTRAK Transit Ridership by employees	16.80	5.92%
G32	Hybrid Vehicles - City Fleet	16.45	5.80%
G22	Use Solar Heat for Public Swimming Pool	15.74	5.55%
G36	Establish/Expand Recycling Programs	13.15	4.63%
G17	Lighting Occupancy Sensors	11.49	4.05%
G35	Fuel Efficient Vehicles for Parking Enforcement	10.55	3.72%
G18	Low-Maintenance Landscaping	9.87	3.48%

G27	Increase Emery-Go-Round Ridership by employees	7.31	2.58%
G25	Police on Bicycles	7.08	2.50%
G16	LED Traffic Signals	4.73	1.67%
G20	Reflective Roofing	4.69	1.65%
G26	Parking Cashout	4.50	1.58%
G8	Increase Chiller Efficiency	4.09	1.44%
G38	Plant Trees to Shade Buildings	4.07	1.44%
G19	Green Roofs	3.92	1.38%
G33	Use Smaller Fleet Vehicles	3.69	1.30%
G7	High Efficiency Water Heaters	3.64	1.28%
G29	Carsharing program for fleet vehicles	3.45	1.22%
G11	HVAC Maintenance Tune-ups	3.17	1.12%
G4	Energy Efficient Copiers	3.00	1.06%
G37	Reuse or Recycling of Construction Materials	2.98	1.05%
G23	Install Solar Hot Water	1.92	0.68%
G1	Energy Efficient Computers	1.83	0.64%
G2	Energy Efficient Computer Monitors	1.70	0.60%
G10	HVAC Fan Upgrades	1.65	0.58%
G3	Energy Efficient Printers	1.48	0.52%
G9	Increase Boiler Efficiency	1.11	0.39%
G14	Energy Efficient Exit Signs	1.09	0.38%
G15	LED Street Lights	1.05	0.37%
G5	Energy Efficient Refrigerators	0.93	0.33%
G30	Promote Telecommuting	0.86	0.30%
G34	Retire Old or Underused Fleet Vehicles	0.75	0.26%
G24	Bicycling Paths and Facilities	0.46	0.16%
G31	Provide Bicycles for Daily Trips	0.45	0.16%
G6	Energy Efficient Water Coolers	0.41	0.14%
	Sub Total from CAPPA Software	285	
	Waste Measures – see Section 6.4 below (WARM model)	50	
	TOTAL TONS REDUCED	335	

6.3 Community-wide Solid Waste Reduction Measures

Table (11): Proposed Community-wide Solid Waste Reduction Measures

Reduce Landfilled Waste in half by 2020 over 2004 levels by:
Increasing participation in commercial recycling/reuse programs for paper, cardboard, metal, glass and plastics – rigid and film.
Participating in StopWaste.Org's audit and technical assistance program
Encouraging businesses to participate in the County Green Business program
Increasing participation in residential recycling programs
Educating residents and businesses about the benefits of Bay-Friendly Landscaping and Gardening
Increasing participation in commercial and residential food waste collection program (for composting).
Revising franchise language as franchises are renegotiated to include language that maximizes diversion (see StopWaste.Org for best practices)
Considering incentives for waste reduction such as new rate structures for refuse and discards collection that credit diversion and allow for reduced rate composting/recycling services for businesses and residents.

6.4 Government Solid Waste Reduction Measures

Table (12): Proposed Government Solid Waste Reduction Measures

Reduce Landfilled Waste in half by 2020 over 2004 levels by:
Implementing a duplex copying/printing policy in municipal office buildings
Reducing Landscape Waste in City landscapes by implementing StopWaste.Org's *Bay-Friendly Landscaping* Program. Include practices such as: Increase on-site composting and mulching of municipal plant debris, using compost as a soil amendment, mulch for weed suppression, including the use of drip irrigation systems, a diverse plant pallet to resist pests, and reducing turf and sheared hedges.
Increasing recycling and composting in municipal facilities
Adopting policies that support reduced waste (and which support other environmental priorities) including the following: Environmental purchasing policy 75% Diversion Goal Construction &Demolition materials recycling ordinance Civic Bay-Friendly/Green Building Ordinance Residential green building resolution Consider mandatory residential & commercial recycling/composting ordinance
Revising franchise language as franchises are renegotiated to include language that maximizes diversion (see StopWaste.Org for best practices)



EMERYVILLE GENERAL PLAN

Draft Environmental Impact Report

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Executive Summary

This Draft Environmental Impact Report (EIR) evaluates the potential impacts of the proposed City of Emeryville General Plan.[1] The proposed Plan was developed in response to policy direction provided by the City Council and the Planning Commission as well as community concerns identified through an extensive public participation and outreach program, including newsletters, community workshops and public meetings in 2005-2009. The City of Emeryville is the "lead agency" for this EIR, as defined by the California Environmental Quality Act (CEQA). As the lead agency, the City is required to evaluate the potential effects of the Plan in an EIR.

An EIR is intended to inform decision-makers and the general public of the potential significant environmental impacts of a proposed project. No mitigations are identified. Impacts have either been addressed through new General Plan policies or are significant and unavoidable. The EIR also evaluates reasonable alternatives to the proposed project that may reduce or avoid one or more significant environmental effects. These alternatives must include a "No Project" alternative that represents the result of not implementing the project and a range of reasonable alternatives to the project, which would feasibly attain most of the basic objectives but would avoid or substantially lessen any of the significant effects of the project.[2] Based on the alternatives analysis, an environmentally superior alternative is identified.

This EIR is a program EIR that examines the potential effects resulting from implementing designated land uses and policies in the proposed General Plan. The impact assessment evaluates the General Plan as a whole and identifies the broad, regional effects that may occur with its implementation. As a programmatic document, this EIR does not assess site-specific impacts. In order to place many of the proposed General Plan policies into effect, the City would adopt or approve specific actions, such as zoning regulations, zoning map amendments, design guidelines, development impact fees, specific plans, capital improvement programs, development projects, that would be consistent with the policies and implementation measures of the Plan and therefore reflected in this EIR. Any future development project made possible by the General Plan will be subject to individual, site-specific environmental review, as required by State law. Project-level environmental review will need to focus on project-scale impacts. Cumulative and citywide impacts (such as traffic), would not need to be evaluated, provided the data and assumptions used in this EIR remain current and valid.

[1] Throughout this document, the term "proposed Emeryville General Plan" is used interchangeably with "General Plan," "proposed Plan" or the "proposed project."

[2] CEQA Guidelines 15126.6(a)

E.1 PROPOSED PROJECT

The City of Emeryville is located on the east shore of San Francisco Bay in Alameda County. It is bordered by the City of Berkeley to the north, the City of Oakland to the east and south, and the San Francisco Bay to the west.

The proposed Emeryville General Plan is intended to replace the existing General Plan, which was last updated in 1987 and revised in 1993. The General Plan is comprised of goals, policies, a land use diagram, and other graphic figures and maps (e.g. open space systems, a transportation network, and public facilities) to guide future development within the city's boundaries, through the year 2030.

The Plan includes the seven elements required by State law, including Land Use, Transportation/ Circulation, Housing, Open Space, Conservation, Noise, and Safety. It also includes two optional elements, Sustainability and Urban Design. The Housing Element is being updated separately in 2009 and is not part of the current General Plan revision, so is not analyzed in this Draft EIR.

KEY PRINCIPLES OF THE PROPOSED GENERAL PLAN

Ten key principles emerged through the public input process, as the General Plan took shape. Maps and policies in the General Plan are structured around these key principles.

1 **A cohesive city of distinctive districts and livable neighborhoods.** Emeryville's growth is shaped—through land use, urban form, and design—to create a tapestry of distinctive districts, and neighborhoods with a full complement of uses and easy access to parks, stores, and other amenities of everyday living.

2 **A connected place.** The General Plan fosters new connections—for automobiles, pedestrians, and bicyclists—between the western and eastern halves of the city; better connections to the Peninsula; and new and safe pedestrian and bicycle linkages to the San Francisco Bay.

3 **Enhanced and connected open space network and green streets.** The General Plan outlines strategies for an expanded public realm, building on the strength and connectivity of the city's greenways, with a range of new parks, plazas, community commons, and recreational paths.

4 **A walkable, fine-grained city, emphasizing pedestrians.** A fine-grained pattern of blocks and streets is a fundamental prerequisite of a walkable and accessible city; the General Plan promotes walkability through encouragement of active uses, creation of smaller parcels/blocks and inter-connections as large sites are redeveloped, and improved sidewalks, pathways, and streetscapes.

5 **A diversity of transportation modes and choices.** The General Plan fosters and provides incentives for alternative transportation modes, including transit, car/vanpooling, bicycling, walking, and telecommuting.

6 **A vibrant, urban community.** Reflecting its strategic location in the heart of the Bay Area, Emeryville will continue as a vibrant community, with cultural offerings, and urban amenities.

7 **A diverse, balanced, and inclusive community.** The General Plan embraces physical, social, and economic diversity, and strengthens the community with facilities and programs such as the Center of Community Life and a cultural center in the Park Avenue district.

8 **A balance of regional and local amenities.** Given its location, Emeryville will remain a regional destination. However, the City will balance retail uses that draw visitors from throughout the region, with stores and amenities that serve neighborhood needs, while ensuring fiscal health and sustainable economy.

9 **Sustainability and innovation, with respect for the past.** The Emeryville community strives to live within means that do not compromise the ability of future generations in Emeryville to enjoy a livable, healthy, and vibrant city. The Plan encourages redevelopment of contaminated land as a healthy and cost-effective way of improving the local environment, use of "green" construction techniques, and a lifestyle with low ecological impacts upon energy consumption, climate, and the natural environment.

10 **An imageable and memorable city.** Foster high-quality new construction of exceptional design while preserving and enhancing the best of existing buildings and neighborhoods. Foster a dramatic skyline of slender and elegant high rise buildings stepping down to low-rise buildings in the older residential neighborhoods. Enhance experience of entering Emeryville with attractive and appropriate streetscape improvements along major regional and city arterials.

These themes and the policies proposed to implement them are described in greater detail in Chapter 2: Project Description of this EIR.

ESTIMATED BUILDOUT OF THE PROPOSED GENERAL PLAN

Full development under the proposed General Plan is referred to as "buildout." Although the proposed General Plan applies a 20-year planning horizon, the Plan is not intended to specify or anticipate when buildout will actually occur; nor does the designation of a site for a certain use necessarily mean the site will be built or redeveloped with that use in the next 20 years. The Land Use Element of the proposed General Plan provides a more detailed analysis of General Plan buildout. Table ES-1 summarizes buildout for the proposed General Plan by population, housing units, households, and jobs.

Residential Development

Approximately 5,988 housing units (5,570 households) currently exist in Emeryville, as of 2008. The proposed General Plan is intended to accommodate approximately 3,800 additional housing units, resulting in about 9,800 housing units (9,310 households) at buildout. This infill residential development will consist of medium-, medium-high and high-density housing, developed as stand-alone structures or part of mixed-use developments.

Buildout Population

The Emeryville Planning Area will accommodate a population of approximately 16,600 people at buildout, an increase of about 71 percent over the 2008 estimated population of 9,727. Over a 20-year period, this represents an average annual growth rate of 2.7 percent, a slightly higher rate than that experienced between 1990 and 2005, which was about 2.2 percent.

Buildout Employment

Emeryville will accommodate approximately 30,000 total jobs at buildout, an increase of approximately 46 percent. This represents just under 10,000 new jobs over the 20-year planning period, for an average annual growth rate of 1.9 percent. In comparison, the City's job base increased by the same percentage (46 percent) during the 15-year period between 1990 and 2005.

Table ES-1: Population, Housing Units, and Households at Buildout

	Existing	*Buildout (2030)*[1]	*Percent Change*	*Annual Growth Rate*
Population[2]	9,727	16,600	71	2.7%
Housing Units	5,988	9,800	64	2.5%
Households[3]	5,570	9,310	67	2.6%
Jobs	20,552[4]	30,000	46	1.9%

1. Buildout population rounded to nearest hundred; employment rounded to nearest thousand.
2. Buildout population was calculated assuming 1.79 persons per household.
3. Households are estimated as 95 percent of the total housing units, assuming a 5 percent vacancy rate.
4. 2008 existing jobs calculated using ABAG projections for 2005 and 2010 employment.

Source: Department of Finance 2008; ABAG Projections 2007; City of Emeryville, 2008; and Dyett & Bhatia, 2008.

E.2 ALTERNATIVES TO THE PROPOSED GENERAL PLAN

The following alternatives are described and evaluated in this EIR:

- *Alternative 1: The Mixed Use City*. The Mixed-Use City Alternative permits a range of residential and non-residential uses (office, retail and other commercial) throughout much of the city. At buildout, this alternative would result in somewhat fewer housing units and residents, but more jobs, compared with the proposed General Plan.
- *Alternative 2: Neighborhood Centers.* The Neighborhood Center Alternative creates new residential neighborhoods as well as neighborhood-serving activity nodes, comprised of residential, retail, and public uses. Compared with the proposed General Plan at buildout, this alternative would result in more housing units and residents, but fewer jobs.
- *No Project Alternative.* The No Project Alternative assumes continuation of land use development under the 1993 General Plan and the current Zoning Ordinance (which implements the General Plan). Compared with the proposed General Plan at buildout,

the No Project Alternative would result in fewer housings units and residents and slightly fewer jobs.

Table ES-2 summarizes key characteristics of the resident and worker populations at buildout (2030) under the proposed General Plan and each of the EIR alternatives. A detailed comparison of alternatives and associated impacts is provided in Chapter 4: Alternatives of this EIR.

Table ES-2: Comparison of Buildout of the Proposed General Plan and Alternatives[1]

	Existing	*Proposed General Plan*	*Alternative 1*	*Alternative 2*	*No Project*
Housing Units	5,988	9,800	8,900	11,700	7,500
Households[2]	5,570	9,300	8,500	11,100	7,100
Population[3]	9,727	16,600	15,200	19,900	12,700
Employed Residents	5,800	11,600	10,600	13,900	8,900
Jobs[4]	20,552	30,000	33,000	28,000	29,000
Jobs/Employed Residents Ratio	3.5	2.6	3.1	2.0	3.3

1. Projections rounded to the nearest hundred or thousand (jobs).
2. Households calculated as 95% of housing units (assumes 5% vacancy rate).
3. Population calculated at 1.79 persons per household.
4. 2008 jobs calculated from annual growth rate assumed by ABAG for 2005-2010: 1.5%

Source: Dyett & Bhatia, 2008.

E.3 SUMMARY OF IMPACTS & ENVIRONMENTALLY SUPERIOR ALTERNATIVE

Table ES-3 presents the summary of the proposed General Plan impacts identified in the EIR and the proposed General Plan policies that reduce these impacts. Because many of the Plan's policies are designed to avoid or minimize impacts, the Plan is self-mitigating with respect to most of the impacts identified in the EIR. However, in the issue areas of transportation, noise, air quality, and cultural resources, significant unavoidable impacts are identified. Even with mitigation, these impacts would not be reduced to levels that are not significant. Detailed discussions of the impacts and proposed policies that would reduce impacts are in Chapter 3. The significance of each impact with implementation of the proposed General Plan policies is also shown in Table ES-3. The level of significance is determined by comparing the impact to the significance criteria described in Chapter 3.

Based on the comparative analysis in Chapter 4 of this Draft EIR, and setting aside the No Project alternative (as provided by CEQA), the proposed General Plan is identified as the environmentally superior alternative. This determination is based on the fact that the proposed General Plan minimizes impacts while achieving the goals and guiding principles developed by the General Plan Steering Committee. In particular, the proposed Project focuses development at key nodes and around transit hubs, and improves the balance of job and residential growth, lessening the strain on public facilities. Since all new development in the city will result from infill

development—the redevelopment of existing sites—each alternative expects development on the same set of sites. Therefore, impacts are no different for many issue areas, including biological resources, hydrology, and geology. For the topics where significant impacts have been identified—traffic, noise, air quality, and cultural resources—differences between the alternatives and the proposed General Plan are negligible in a program EIR.

Table ES-3: Summary of Impacts and Proposed General Policies that Reduce the Impact

#	*Impact*	*Proposed General Policies and Actions that Reduce the Impact*	*Significance*	*Mitigation*
3.1	Land Use and Housing			
3.1-1	The proposed General Plan would not physically divide any established communities, and would increase connectivity both locally and regionally.	LU-P-2, LU-P-3, LU-P-18, LU-P-19, T-P-2, T-P-9, T-P-33	Beneficial	None Required
3.1-2	Changes in land uses under the proposed General Plan may result in the displacement of a minimal number of houses, businesses, and/or people.	LU-P-32, LU-P-33	Less than Significant	None Required
3.1-3	Changes in land uses proposed by the General Plan would conflict with existing local and regional plans and zoning ordinances.	LU-A-1, LU-A-3, LU-A-4, LU-A-5	Less than Significant	None Required
3.1-4	New urban development may be incompatible with adjacent, existing land uses.	LU-P-1, LU-P-8, LU-P-8A, LU-P-26, CSN-P-32, CSN-P-34, CSN-P-35, CSN-P-41, CSN-P-42	Less than Significant	None Required
3.2	Traffic, Circulation, and Parking			
3.2-1	Increased motor vehicle traffic between the existing condition and future (2030) with General Plan conditions would result in unacceptable level of service (LOS) at 10 study intersections. One is in Berkeley; one is in Oakland; the remaining eight are in Emeryville (two are State Highways).	T-P-3, T-P-5, T-P-7, T-P-22, T-P-28, T-P-30, T-P-32, T-P-33, T-P-34, T-P-35 T-P-36, T-P-37, T-P-38, T-P-39, T-P-45, T-P-47, T-P-48, T-P-49, T-P-50, T-P-52, T-P-55, T-P-60, T-P-61, T-P-62, T-P-63	Significant and Unavoidable	No feasible mitigation measures have been identified
3.2-2	Increased motor vehicle traffic between the existing condition and future (2030) with General Plan conditions would contribute traffic to freeway segments that are expected to operate at unacceptable level of service (LOS).	T-P-5, T-P-28, T-P-30, T-P-32, T-P-33, T-P-34, T-P-35, T-P-36, T-P-37, T-P-38 T-P-39, T-P-42A, T-P-49, T-P-60, T-P-61, T-P-62, T-P-63	Significant and Unavoidable	No feasible mitigation measures have been identified
3.2-3	Increased motor vehicle traffic and increased congestion with the General Plan would result in increased transit travel times on transit corridors.	T-P-30, T-P-40, T-P-40A, T-P-44	Significant and Unavoidable	No additional (beyond General Plan policies) mitigation measures have been identified

Table ES-3: Summary of Impacts and Proposed General Policies that Reduce the Impact

#	*Impact*	*Proposed General Policies and Actions that Reduce the Impact*	*Significance*	*Mitigation*
3.2-4	Increased transit ridership with the General Plan would result in overcrowding on the Emery Go-Round and AC Transit bus transit systems.	T-P-26, T-P-28, T-P-29, T-P-30, T-P-31, T-P-33, T-P-35, T-P-35A	Less than Significant	None Required
3.2-5	The General Plan would increase the number pedestrians and bicyclists on the roadways citywide, which could overload existing sidewalks, pedestrian paths and non-motorized multi-use paths, and bicycle parking, and could add pedestrians and bicyclists to locations with unsafe conditions.	T-P-3, T-P-8, T-P-9, T-P-10 T-P-11, T-P-12, T-P-13, T-P-14, T-P-15, T-P-18, T-P-19, T-P-20, T-P-21, T-P-22, T-P-23, T-P-24, T-P-28, T-P-32, UD-P-4, UD-P-11, UD-P-12 UD-P-16, UD-P-17, UD-P-18, UD-P-19 UD-P-20, UD-P-21, UD-P-22, UD-P-23 UD-P-24, UD-P-27, UD-P-32, UD-P-39 UD-P-40, UD-P-41, UD-P-43, UD-P-44, UD-P-47, UD-P-49, UD-P-53, UD-P-54, UD-P-63, UD-P-68	Less than Significant	None Required
3.2-6	Implementation of the proposed General Plan would result in increased demand for motor vehicle parking.	T-P-45, T-P-46, T-P-47, T-P-48 T-P-49, T-P-50, T-P-52, T-P-54, T-P-55	Less than Significant	None Required
3.3	Hazardous Materials, Toxics, and Safety			
3.3-1	New development under the proposed General Plan could disturb and release contaminated soil during demolition, construction, or transportation of excavated material, or release contaminated groundwater which could expose construction workers, the public, or the environment to adverse conditions related to hazardous materials.	CSN-P-32, CSN-P-35	Less than Significant	None Required
3.3-2	New development under the proposed General Plan could disturb and release hazardous structural and building components (i.e., asbestos, lead, PCBs, USTs, and ASTs) during demolition and construction phases and could expose construction workers, the	CSN-P-33, CSN-P-34	Less than Significant	None Required

Table ES-3: Summary of Impacts and Proposed General Policies that Reduce the Impact

#	*Impact*	*Proposed General Policies and Actions that Reduce the Impact*	*Significance*	*Mitigation*
	public, or the environment to adverse conditions related to hazardous materials handling.			
3.3-3	New development under the proposed General Plan could release to the environment, through improper handling or storage, hazardous materials used onsite during construction activities (i.e., fuels, lubricants, solvents).	CSN-P-7	Less than Significant	None Required
3.3-4	New development under the proposed General Plan could include uses that would handle hazardous materials, and could cause an adverse effect on the environment or the public including any nearby schools through accidental upset or through emissions from operations.	CSN-P-36, CSN-P-37	Less than Significant	None Required
3.4	Biological Resources			
3.4-1	New development under the proposed General Plan could result in substantial adverse effects, either directly or through habitat modifications, on special status species.	CSN-P-17, CSN-P-18, CSN-P-19, CSN-P-20, CSN-P-21	Less than Significant	None Required
3.4-2	New development under the proposed General Plan could have adverse effects on nesting birds and nesting raptors.	CSN-P-17, CSN-P-18, CSN-P-21	Less than Significant	None Required
3.4-3	New development under the proposed General Plan could result in filling of wetlands and other waters, including open water associated with San Francisco Bay.		Less than Significant	None Required
3.4-4	New development under the proposed General Plan could result in harm to or removal of street trees.	UD-P-46	Less than Significant	None Required

Table ES-3: Summary of Impacts and Proposed General Policies that Reduce the Impact

#	*Impact*	*Proposed General Policies and Actions that Reduce the Impact*	*Significance*	*Mitigation*
3.5	Hydrology and Flooding			
3.5-1	Construction activities for new development under the proposed General Plan would generate loose and erodible soils that, if not properly managed, could result in substantial erosion or siltation. Inadvertent release of fuels or other chemicals used during construction could affect water quality.	CSN-P-7, CSN-P-30	Less than Significant	None Required
3.5-2	New development under the proposed General Plan could require dewatering during construction activities. Discharge of the extracted water, if polluted, would cause an adverse water quality impact.		Less than Significant	None Required
3.5-3	New development under the proposed General Plan could change existing drainage patterns, which could increase the volume of stormwater runoff resulting in erosion and flooding affecting the existing stormwater drainage system.	CSN-P-9, CSN-P-10, CSN-P-11 CSN-P-15, CSN-P-38, CSN-P-39	Less than Significant	None Required
3.5-4	Proposed improvements to Temescal Creek could cause a temporary water quality impact from construction, however, it would result in long term water quality improvements.		Beneficial	None Required
3.5-5	New development under the proposed General Plan could be subject to flooding.		Less than Significant	None Required
3.6	Geology and Soils			
3.6-1	New development under the proposed General Plan could generate loose and erodible soils during construction activities that, if not properly managed, could result in substantial erosion.	CSN-P-31	Less than Significant	None Required

Table ES-3: Summary of Impacts and Proposed General Policies that Reduce the Impact

#	*Impact*	*Proposed General Policies and Actions that Reduce the Impact*	*Significance*	*Mitigation*
3.6-2	New development under the proposed General Plan could be subject to fault rupture, severe ground shaking, or liquefaction capable of causing injury and/or structural damage.	CSN-P-28, CSN-P-29, CSN-P-31	Less than Significant	None Required
3.6-3	New development under the proposed General Plan could be subject to settlement due to compressive soils or settlement/uplift as a result of expansive soils.		Less than Significant	None Required
3.7	Noise			
3.7-1	New development under the proposed General Plan would potentially expose existing noise-sensitive uses to construction-related increases in ambient noise.	CSN-P-46	Less than Significant	None Required
3.7-2	New development under the proposed General Plan would contribute to a noticeable increase in the ambient noise level along some major roads, which would impact nearby existing and proposed residential receptors	CSN-P-44, CSN-P-46, LU-P-26, T-P-5, T-P-40	Significant and Unavoidable	No programmatic mitigation measures are feasible and site-specific measures shall be identified during CEQA review of specific development proposals made to the City
3.7-3	New development under the proposed General Plan could result in the exposure of persons to, or generation of, excessive ground-borne vibration or ground-borne noise levels.	LU-P-26, T-P-40	Less than Significant	None Required
3.8	Cultural Resources			
3.8-1	New development under the proposed General Plan has the potential to disrupt undiscovered archaeological resources.	CSN-P-25, CSN-P-27	Less than Significant	None Required

Table ES-3: Summary of Impacts and Proposed General Policies that Reduce the Impact

#	*Impact*	*Proposed General Policies and Actions that Reduce the Impact*	*Significance*	*Mitigation*
3.8-2	New development under the proposed General Plan within previously developed areas of the City has the potential to impact sites of local historic importance.	CSN-P-22, CSN-P-23, CSN-P-24, CSN-P-26, CSN-P-27	Significant and Unavoidable	No programmatic mitigation measures are feasible and site-specific measures shall be identified during CEQA review of specific development proposals made to the City
3.8-3	New development under the proposed General Plan could adversely affect unidentified paleontological resources.		Less than Significant	None Required
3.9	Air Quality			
3.9-1	New development under the proposed General Plan would increase population in the area at a rate greater than that assumed in regional air quality planning and, therefore, conflict with the implementation of the Bay Area Ozone Strategy.	CSN-P-1, CSN-P-2, CSN-P-3, CSN-P-4, CSN-P-5, LU-P-2, LU-P-3, LU-P-4, LU-P-7, LU-P-26, T-P-2, T-P-3, T-P-5, T-P-7, T-P-8, T-P-9, T-P-12, T-P-13, T-P-14, T-P-15, T-P-16, T-P-17, T-P-18, T-P-19, T-P-21, T-P-22, T-P-23, T-P-24, T-P-25, T-P-26, T-P-27, T-P-28, T-P-29, T-P-30, T-P-31, T-P-32, T-P-33, T-P-40, T-P-41, T-P-42, T-P-43, T-P-44, T-P-47, T-P-50, T-P-51, T-P-52, T-P-64, T-P-65, T-P-66	Significant and Unavoidable	No programmatic mitigation measures are feasible and site-specific measures shall be identified during CEQA review of specific development proposals made to the City
3.9-2	New development under the proposed General Plan would be consistent with the Transportation Control Measures (TCMs) in the 2005 Bay Area Ozone Strategy.	T-P-2, T-P-3, T-P-7, T-P-8, T-P-12, T-P-13, T-P-14, T-P-15, T-P-16, T-P-17, T-P-18, T-P-19, T-P-21, T-P-45, T-P-46, T-P-61, T-P-62, CE-P-1, CE-P-3, CE-P-4, CE-P-5	Less than Significant	None Required
3.9-3	New development under the proposed General Plan would create fugitive dust and other criteria pollutant emissions generated by construction and	CSN-P-3, CSN-P-4, CSN-P-5	Less than Significant	None Required

Table ES-3: Summary of Impacts and Proposed General Policies that Reduce the Impact

#	*Impact*	*Proposed General Policies and Actions that Reduce the Impact*	*Significance*	*Mitigation*
	demolition activities that would result in health and nuisance type impacts in the immediate vicinity of construction sites.			
3.9-4	The proposed General Plan could expose sensitive receptors to substantial pollutant concentrations.	CSN-P-3, CSN-P-5, LU-P-26	Less than Significant	None Required
3.9-5	New development under the proposed General Plan could expose substantial numbers of people to objectionable odors.	CSN-P-6	Less than Significant	None Required
3.10	Public Services and Utilities			
3.10-1	New development under the proposed Emeryville General Plan will increase the demand for school facilities.	PP-P-14, PP-P-15, PP-P-16, PP-P-17, PP-P-18, PP-A-7	Less than Significant	None Required
3.10-2	New development under the proposed General Plan may increase the demand for water beyond available distribution capacity/available through existing EBMUD entitlements.	CSN-P-11, CSN-P-12, CSN-P-13, CSN-P-14, CSN-P-15, CSN-P-16, PP-A-12, CSN-A-3	Less than Significant	None Required
3.10-3	New development may exceed wastewater treatment capacity of the East Bay Municipal Utility District (EBMUD), requiring construction of new wastewater treatment facilities, expansion of existing facilities or implementation of programs and policies to further reduce inflow and infiltration (I/I) of storm water into the city's wastewater collection system and private sewer laterals during wet weather events.	PP-P-24	Less than Significant	None Required
3.10-4	New development under the proposed General Plan would cause an increase in waste generation, but would be served by a landfill with sufficient	CSN-P-33, CSN-P-36, ST-P-2, ST-P-3, ST-P-4, ST-P-7, ST-A-1, ST-A-2, ST-A-3	Less than Significant	None Required

Table ES-3: Summary of Impacts and Proposed General Policies that Reduce the Impact

#	*Impact*	*Proposed General Policies and Actions that Reduce the Impact*	*Significance*	*Mitigation*
	permitted capacity to accommodate the project's solid waste disposal needs.			
3.10-5	New development in the proposed General Plan requires police and fire protection services that exceed current staffing and facilities.	PP-P-22, PP-P-23, PP-A-11, CSN-A-9, CSN-A-10	Less than Significant	None Required
3.11	Parks and Recreation			
3.11-1	Future development according to the proposed General Plan will increase the ratio of parkland per 1,000 residents and meet the City's goal of 3 acres of parkland per 1,000 new residents.	PP-P-1, PP-P-2, PP-P-3, PP-P-4, PP-P-5, PP-P-6, PP-P-7, PP-P-8, PP-P-9, PP-P-12, PP-P-13, PP-A-1, PP-A-2, PP-A-4, PP-A-9	Beneficial	None Required
3.11-2	Future development according to the proposed General Plan will reduce the overall deterioration of parks or other recreational facilities, although the phasing of parkland development and residential growth may have interim impacts on existing parkland.	PP-P-3, PP-P-11	Less than Significant	
3.11-3	The construction or expansion of recreational facilities may have an adverse physical effect on the environment.	PP-P-10, PP-PA-3, PP-A-8	Less than Significant	
3.12	Visual Resources			
3.12-1	Future proposed development in Emeryville has the potential to affect scenic vistas to the San Francisco Bay and Berkeley-Oakland hills.	UD-P-4, UD-P-5 UD-P-6, UD-P-8, UD-P-19, UD-P-20, UD-P-22, UD-P-27, UD-P-28, UD-P-29, UD-P-30, UD-P-32, UD-P-34, UD-P-35, UD-A-6	Less than Significant	None Required
3.12-2	New development and redevelopment activities may have the potential to change the visual character of Emeryville, particularly where incompatibilities with existing development in scale and/or character may exist.	UD-P-1, UD-P-3, UD-P-10, UD-P-11, UD-P-12, UD-P-13, UD-P-14, UD-P-15, UD-P-16, UD-P-17, UD-P-18, UD-P-21 UD-P-23, UD-P-24, UD-P-25, UD-P-36, UD-P-37, UD-P-38, UD-P-39, UD-P-42, UD-P-45,	Beneficial	None Required

Table ES-3: Summary of Impacts and Proposed General Policies that Reduce the Impact

#	*Impact*	*Proposed General Policies and Actions that Reduce the Impact*	*Significance*	*Mitigation*
		UD-P-46, UD-P-48, UD-P-49, UD-P-52, UD-P-53, UD-P-54, UD-P-58, UD-P-58, UD-P-59, UD-P-60, UD-P-61, UD-P-62, UD-P-63, UD-P-64, UD-P-65, UD-P-66, UD-A-1, UD-A-2, UD-A-3, UD-A-4, UD-A-7, UD-A-8, UD-A-9, UD-A-10		
3.12-3	Development under the proposed General Plan has the potential to adversely affect visual resources in the short-term during periods of construction by blocking or disrupting views.		Less than Significant	None Required
3.13	Energy and Greenhouse Gases			
3.13-1	New development under the proposed General Plan may increase total energy consumption.	LU-P-7, LU-P-18, T-P-3, T-P-7, T-P-9, T-P-10, T-P-17, T-P-18, T-P-21, T-P-22, T-P-24, T-P-29, T-P-30, T-P-31, T-P-32, T-P-33, T-P-34, T-P-35, T-P-36, T-P-47, T-P-50, T-P-51, T-P-52, T-P-64, T-P-66, UD-P-30, UD-P-58, UD-P-61, UD-P-66, CE-P-3, ST-P-1, ST-P-6, ST-P-8, T-A-7, T-A-8, T-A-11, T-A-12, T-A-13, T-A-14, T-A-15, T-A-16, T-A-18, UD-A-1, CSN-A-1, CSN-A-16, ST-A-1, ST-A-2, ST-A-3, ST-A-4, ST-A-5, ST-A-6, ST-A-7	Significant Cumulative Impact, Project Contribution Not Cumulatively Considerable	None Required
3.13-2	New development under the proposed General Plan may require the construction of additional energy infrastructure facilities, the construction of which could cause significant environmental effects.	ST-P-7, UD-P-23, UD-P-26	Less than Significant	None Required
3.13-3	Implementation of the proposed General Plan would increase total carbon dioxide equivalent emissions in the City compared to existing conditions.	UD-P-21, UD-P-57, CSN-P-1, CSN-P-2, CSN-P-5, ST-P-2, ST-P-4, ST-P-9, ST-P-12, ST-P-13	Significant Cumulative Impact, Project Contribution	None Required

Table ES-3: Summary of Impacts and Proposed General Policies that Reduce the Impact

#	*Impact*	*Proposed General Policies and Actions that Reduce the Impact*	*Significance*	*Mitigation*
			Not Cumulatively Considerable	
3.13-4	New development under the proposed General Plan may conflict with applicable energy efficiency and GHG reduction policies or standards, such as the Emeryville Climate Action Plan.		Less than Significant	None Required

1 Introduction

This Program Environmental Impact Report (EIR) has been prepared on behalf of the City of Emeryville in accordance with the California Environmental Quality Act (CEQA). This chapter outlines the purpose of and overall approach to the preparation of the EIR on the proposed Emeryville General Plan. The City of Emeryville is the lead agency responsible for ensuring that the proposed General Plan complies with CEQA.

1.1 PURPOSE OF EIR

The EIR on the proposed General Plan has three purposes:

- To help the City of Emeryville meet CEQA requirements for analysis of environmental impacts by including a complete and comprehensive programmatic evaluation of the physical impacts of the proposed General Plan and its alternatives.
- To inform residents of Emeryville and members of the City Council and Planning Commission of the environmental impacts prior to the Commission and Council taking action on the Plan. This information will assist City officials in reviewing and adopting the proposed Plan.
- To assist local decision-makers in determining appropriate amendments to Emeryville's land use regulations and other implementation actions, based on a balanced assessment of the environmental impacts of the proposed General Plan.

The EIR also identifies further measures that decision-makers may want to incorporate into the General Plan or implementation programs to minimize environmental effects.

The proposed General Plan consists of policies and proposals to guide the future growth of the City of Emeryville. This Draft EIR evaluates the potential impacts of the adoption of the proposed Plan. This EIR will also be used as a reference for subsequent environmental review of specific plans, infrastructure improvements, zoning amendments, impact fees and development proposals.

CEQA requires that the agency with the primary responsibility over the approval of a project (the lead agency) evaluate the potential impacts of the project in an EIR. The City is required to prepare an EIR on the General Plan in order to provide the City Council, as the ultimate decision maker, with an informational document for use in evaluating the proposed Plan. After adoption, the EIR will serve the additional function of providing direction to the City in implementation of the new Plan. No mitigations are identified. Impacts have either been addressed through new General Plan policies or are significant and unavoidable. The "No Project Alternative" discusses the result of not implementing the proposed General Plan or any of the alternatives. An environmentally superior alternative is also identified as part of the alternatives analysis to inform decision-makers on this project.

This Draft EIR will be used by Emeryville residents, elected officials, and City staff during the public review process. The Draft EIR and Final EIR, which includes responses to public comments received during the 45-day comment period, will be certified by the Emeryville City Council prior to consideration of the proposed Emeryville General Plan. The proposed Plan and the EIR have been prepared concurrently and policies in the proposed Plan take into consideration the EIR discussion of impacts.

1.2 GENERAL PLAN PROCESS & PUBLIC INVOLVEMENT

The General Plan update was initiated in March 2005. In order for the General Plan to accurately address community needs and values, a comprehensive public process of obtaining the input of residents, businesses, and property owners as well as City officials was central to the update process. This involved the sharing of information and ideas between elected and appointed officials, City staff, the planning consultants, and residents. The General Plan and Zoning Update Steering Committee, made up of approximately 16 residents, business owners, advocates, and elected officials, met almost monthly to guide the process and make recommendations to decision makers; these meetings were open and noticed to the public, and were also televised.

The first major step in the process was the preparation of the *Opportunities and Challenges* report, in the fall of 2005. The *Opportunities and Challenges* report provides baseline information on existing conditions in the city, focusing on its physical environment and built form. It also describes opportunities, challenges, and preliminary planning issues to be considered in the General Plan.

The next step was the preparation and consideration of the *Alternatives Concepts* report, which was prepared in November 2006. The *Alternative Plans* illustrates a range of options for key elements to guide future development and address goals, such as livability, connectivity, open space, and walkability. Ideas for the City's future were presented in the form of schematic land use and urban forms alternatives informed by comments received from other public forums, and by technical studies conducted. The *Alternative Plans* represent a probable range of choices for the General Plan.

Following the alternatives phase, a *Preferred Plan* report was prepared in March 2008. The *Preferred Plan* contains the key components—land use, building heights, parks and open space, circulation, and city structure—that provide the basis for the proposed General Plan.

Community workshops were held at key points during the Update process: a visioning workshop in May 2005, an alternatives assessment in November 2006, a workshop for youth in April 2006, and a decision-maker study session/open house for preferred plan development in March 2008. Meetings with City Council and the Planning Commission also were held to brief them on Plan concepts and solicit comments. A newsletter, containing a citywide survey, was distributed to organizations and individuals, including City residents, property owners, and business owners. Stakeholders representing a range of issues were interviewed in order to ascertain more detailed information and ideas. Finally, a project website provided draft documents and resources

pertaining to the General Plan throughout the process. The proposed General Plan reflects the desires, the decisions, and the work of the public.

The Draft General Plan was circulated for public review, and presented at an open house event on February 7, 2009. The proposed General Plan will be considered by the Planning Commission and City Council at public hearings following public review of this Draft EIR. If adopted, the proposed Plan will become the City's new General Plan. As such, it will guide future land use decision-making in the City, unless amended or until a subsequent General Plan is adopted.

1.3 EIR APPROACH AND ASSUMPTIONS

The proposed Plan EIR is a Program EIR, defined in the CEQA Guidelines Section 15168 as: "...an EIR which may be prepared on a series of actions that can be characterized as one large project and are related either: (1) Geographically; (2) As logical parts in the chain of contemplated actions; (3) In connection with the issuance of rules, regulations, plans, or other general criteria to govern the conduct of a continuing program; or (4) As individual activities carried out under the same authorizing statutory or regulatory authority and having generally similar environmental impacts which can be mitigated in similar ways."

Program EIRs can be used as the basic, general environmental assessment for an overall program of projects developed over a 20-year planning horizon. A Program EIR has several advantages. First, it provides a basic reference document to avoid unnecessary repetition of facts or analysis in subsequent project-specific assessments. Second, it allows the lead agency to look at the broad, regional impacts of a program of actions before its adoption and eliminates redundant or contradictory approaches to the consideration of regional and cumulative impacts.

As a Program EIR, this document focuses on the overall effects of the proposed General Plan in the Planning Area, using results of development assumptions on opportunity sites. Individual development projects will continue requiring individual environmental assessment, where these projects are consistent with the proposed General Plan land use designations. The project-level environmental review will need to focus on project-scale impacts; cumulative and citywide impacts (such as traffic), would not need to be evaluated, provided the data and assumptions used in this EIR remain current and valid.

The nature of general plans is such that many proposed policies are intended to be general, with details to be later determined during implementation. Thus, many of the impacts and can only be described in general or qualitative terms. In order to place many of the proposed General Plan policies into effect, the City would adopt or approve specific actions, such as zoning regulations, zoning map amendments, design guidelines, development impact fees, specific plans, capital improvement programs, development projects, that would be consistent with the policies and implementation measures of the Plan and therefore reflected in this EIR.

CEQA mandates that lead agencies adopt mitigation monitoring and reporting programs for projects identified as having significant impacts where mitigation measures have been identified. Mitigation monitoring and reporting programs are intended to ensure compliance during project

implementation. These programs provide the additional advantages of providing staff and decision-makers with feedback as to the effectiveness of mitigation measures, as well as the experience and information to shape future mitigation measures. No mitigation measures are identified in this EIR.

The proposed General Plan is intended to be self-mitigating, in that the policies and programs of the proposed Plan are designed to mitigate environmental impacts. This EIR clearly shows how the impacts of future development in Emeryville will be mitigated through implementation of the policies and programs of the proposed Plan. Any residual impact after implementation of these proposed policies and programs is measured against the significance criteria established for each impact area. The significance criteria is an identifiable quantitative, qualitative, or performance level of a particular environmental effect in which non-compliance indicates that the effect is significant.

This EIR represents the best effort to evaluate the potential environmental effects of the proposed General Plan given its long-term planning horizon. It can be anticipated that conditions will change; however, the assumptions used are the best available at the time of preparation and reflect existing knowledge of patterns of development and travel patterns.

The General Plan EIR is based on the following key assumptions:

- *Full Implementation.* This EIR assumes that all policies in the proposed General Plan will be fully implemented and all development will be consistent with the proposed General Plan Land Use Diagram. Key elements of the proposed General Plan include the designation of mixed-use areas, additional neighborhood centers and neighborhood-serving retail, development of TOD and enhanced livability through improvements to pedestrian connectivity and added open spaces.
- *Buildout in 2030.* This EIR assumes that buildout of the proposed General Plan will occur by 2030. It is understood that development under the proposed General Plan will be incremental and timed in response to market conditions. For a full explanation and projection of buildout, see Section 2.4.

1.4 ISSUES ADDRESSED IN THE EIR

The issues evaluated in this EIR were determined during the initial phase of the project. A Notice of Preparation (NOP) for the EIR on the Emeryville General Plan was circulated in January 2006 and the City received comments during a 30-day review period. The NOP is in Appendix A of this EIR. These comments, along with input received during public workshops and meetings helped to identify the major planning and environmental issues and concerns in the General Plan and helped establish the framework and focus of the environmental analysis.

The first step toward completion of this Draft EIR was the initial analysis of the environmental setting. This analysis compiled specific information on the current conditions, the characteristics of the City, and the major issues it faces. Information on the environmental setting provides background regarding relevant issues and is used to evaluate potential impacts. Based on the

initial analysis of the environmental setting, as well as the NOP comments and public meetings, the following issues are analyzed in this EIR:

- Land Use
- Population and Housing
- Transportation and Parking
- Hazardous Materials
- Biological Resources
- Hydrology and Flooding
- Geology, Soils, and Seismicity
- Noise
- Cultural Resources
- Air Quality
- Public Services and Utilities
- Parks, Open Space, and Recreation
- Visual Resources
- Energy and Climate Change

Each potential impact is addressed in Chapter 3: Settings, Impacts, and Mitigation Measures.

1.5 ORGANIZATION OF EIR

The Draft EIR is organized into the following main chapters following the Introduction:

- *Chapter 2: Project Description.* This chapter includes a detailed description of the proposed General Plan. The Land Use Diagram, the proposed land use classification system, open space and resource protection policies and programs, and buildout estimates are presented.
- *Chapter 3: Settings, Impacts, and Mitigation Measures.* This chapter analyzes the environmental impacts of the proposed General Plan. Impacts are organized by major topic. Each topic area includes a description of the environmental setting, significance criteria, and impacts. No mitigation measures have been identified in this EIR. Policies in the proposed General Plan that would avoid or reduce the impacts are also discussed.
- *Chapter 4: Analysis of Alternatives.* This chapter compares the impacts of the proposed General Plan with land use alternatives including a No Project Alternative and two alternatives that include varying amounts of new development.
- *Chapter 5: CEQA Required Conclusions.* Chapter 5 provides a summary of significant environmental impacts, including unavoidable, irreversible, growth-inducing, and cumulative impacts.

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2 Project Description

The project analyzed in this EIR is the proposed Emeryville General Plan. A city's general plan has been described as its constitution for development; it establishes the framework within which decisions on how to grow, provide public services and facilities, and protect and enhance the environment must be made. The proposed Plan is intended to address growth and development in the coming decades; although the Plan does not specify or anticipate when buildout will actually occur, a horizon of 2030 is assumed for planning purposes.

Under California Government Code §65300 et seq., cities are required to prepare a general plan that establishes policies and standards for future development, housing affordability, and resource protection for the entire planning area. By law, a general plan must be an integrated, internally consistent statement of city policies. Section 65302 requires that the general plan include the following seven elements: Land Use, Circulation, Housing, Conservation, Open Space, Noise, and Safety. (Note that this EIR does not include the Housing Element update, completed under a separate schedule.) Additional elements may be included in the general plan as well, at the discretion of the City. Optional elements in the proposed Emeryville General Plan include Urban Design and Sustainability. All elements have equal weight, and no one element supersedes another.

This project description provides the basis for the environmental analysis in Chapter 3. The chapter provides background information regarding the regional location of Emeryville's Planning Area, General Plan purpose and objectives, policy development process, key themes and components of the proposed General Plan including buildout, and a summary of General Plan policies and implementation. Additional details are provided in the Plan itself.

2.1 REGIONAL LOCATION AND LOCAL SETTING

REGIONAL LOCATION

The City of Emeryville is located on the east shore of San Francisco Bay in Alameda County. It is bordered by the City of Berkeley to the north and the City of Oakland to the east and south. Interstate 80 passes through Emeryville, running north from the Bay Bridge, while Interstate 580 passes just to its south. The city is largely flat and is distinguished by a peninsula created in the 1960s that extends just over one mile into the Bay. Figure 2.1-1 depicts the city's regional location.

PLANNING BOUNDARIES

The City of Emeryville encompasses approximately 1.2 square miles of land area. The General Plan planning boundaries coincide with Emeryville's city limits, as shown in Figure 2.1-2.

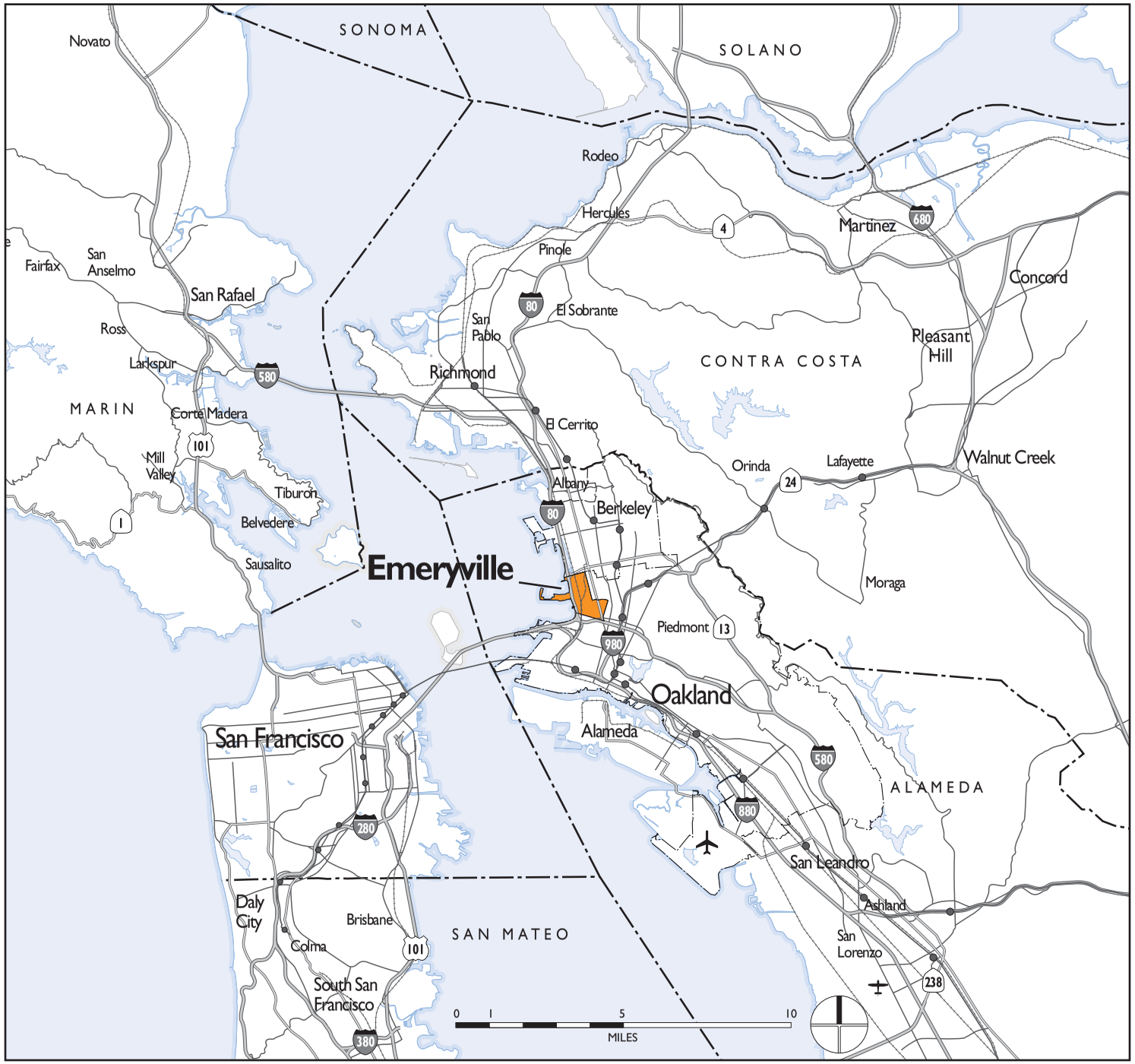


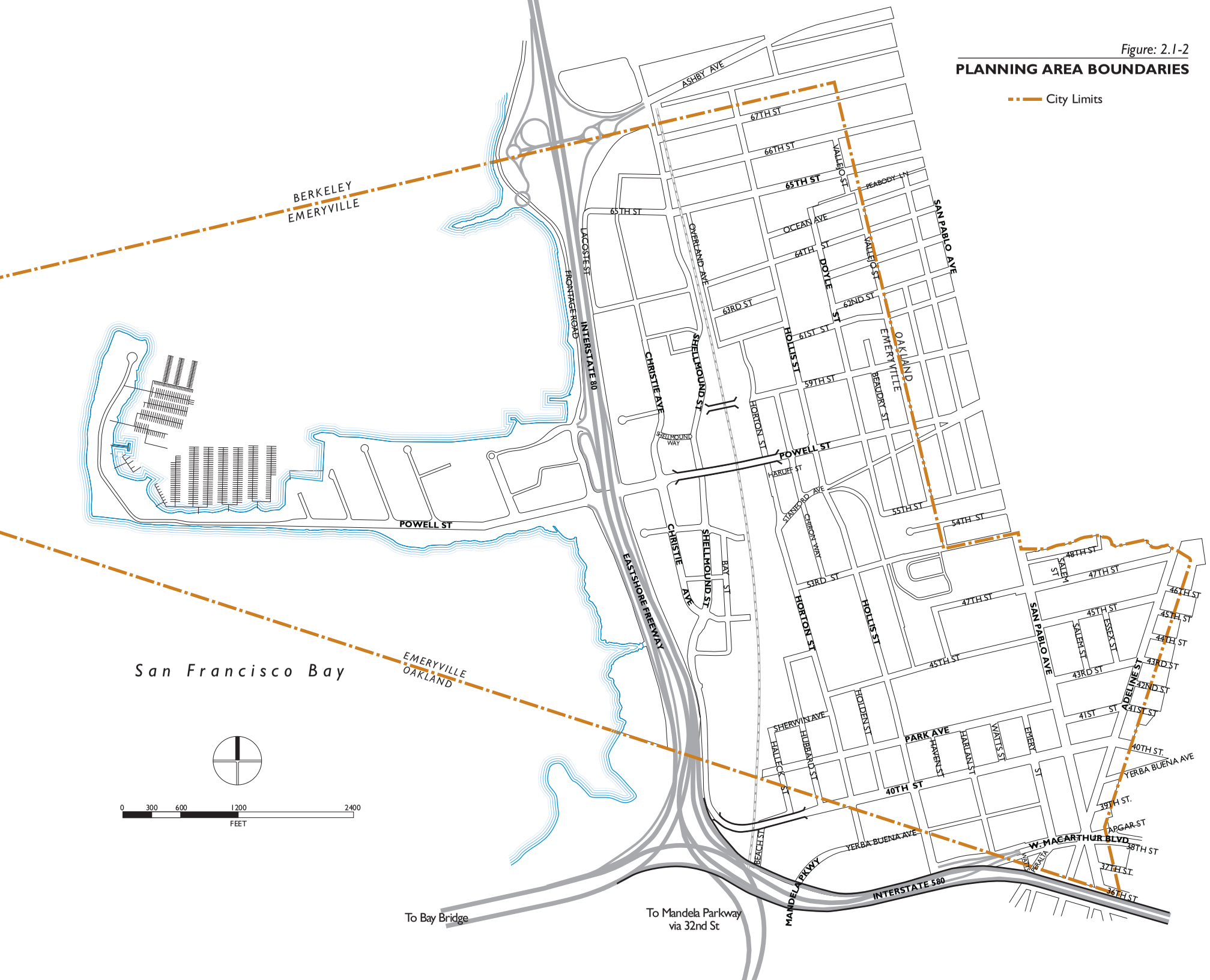
Figure 2.1-1

REGIONAL LOCATION

Figure: 2.1-2

PLANNING AREA BOUNDARIES

City Limits



2.2 PURPOSE AND OBJECTIVES OF THE PROPOSED GENERAL PLAN

CEQA Guidelines §15124(b) require a description of project purpose and objectives.

PLAN PURPOSE

The proposed Emeryville General Plan is intended to respond directly to changes experienced in Emeryville since the preparation of the current General Plan (adopted in 1987 and revised in 1993), and to the growth projected for the city in coming decades. The proposed General Plan, which establishes a long-range planning framework and policies to 2030, will replace the City's existing General Plan.

The General Plan update was initiated to take a comprehensive look at where the city is and to create a vision of what Emeryville should be like in 2030. Some areas of the city may change very little in this timeframe, and others may change dramatically. The General Plan update focuses on community needs, neighborhood character and urban design, sustainability, and mixed-use development. Lastly, it responds to resident preferences about where different land uses such as housing, shopping, industry and public facilities should be located and how City resources should be used to achieve the Plan's goals.

The General Plan integrates plans and programs adopted since 1993, when the last General Plan was adopted. These include the North Hollis Urban Design Program, Park Avenue District Plan, San Pablo Avenue Revitalization Urban Design Plan, and South Bayfront Design Guidelines.

PLAN OBJECTIVES

The General Plan presents several key objectives based on input by key stakeholders, other members of the public and City staff. They are to:

- Outline a vision for Emeryville's long-term physical and economic development that reflects the aspirations of the community;
- Provide strategies and specific implementing actions that will allow this vision to be accomplished;
- Establish a basis for judging whether specific development proposals and public projects are in harmony with Plan policies and standards;
- Allow City departments, other public agencies, and private developers to design projects that will enhance the character of the community, preserve and enhance critical environmental resources, and minimize hazards; and
- Provide the basis for establishing and setting priorities for detailed plans and implementing programs, such as the Zoning Ordinance, Design Guidelines, the Capital Improvements Program, facilities plans, and redevelopment and area plans.

2.3 THE PROPOSED GENERAL PLAN

GUIDING PRINCIPLES

Based on the planning objectives that were established, ten guiding principles are listed in the plan. The Emeryville General Plan is intended to create a city with the following characteristics:

1. **A cohesive city of distinctive districts and livable neighborhoods.** Emeryville's growth is shaped—through land use, urban form, and design—to create a tapestry of distinctive districts, and neighborhoods with a full complement of uses and easy access to parks, stores, and other amenities of everyday living. Development intensities are designed to maximize accessibility to amenities, and provide transition in scale and height to lower-density neighborhoods.
2. **A connected place.** The General Plan fosters new connections—for automobiles, pedestrians, and bicyclists—between the western and eastern halves of the city; better connections to the Peninsula; and new and safe pedestrian and bicycle linkages to the San Francisco Bay. The Plan also seeks to provide more transportation choices. Protecting vistas of the San Francisco Bay and the East Bay Hills will visually connect the city with the surrounding region.
3. **Enhanced and connected open space network and green streets.** The General Plan outlines strategies for an expanded public realm, building on the strength and connectivity of the city's greenways, with a range of new parks, plazas, community commons, and recreational paths. Open space is strategically located to maximize accessibility and building forms are organized to ensure that sunlight reaches streets and parks. Many more trees along streets and enhanced landscaping will provide a greener city.
4. **A walkable, fine-grained city, emphasizing pedestrians.** The General Plan establishes that all of Emeryville will be easily traversed on foot. A fine-grained pattern of blocks and streets is a fundamental prerequisite of a walkable and accessible city; the General Plan promotes walkability through encouragement of active uses, creation of smaller parcels/blocks and inter-connections as large sites are redeveloped, and improved sidewalks, pathways, and streetscapes. Where larger buildings may be appropriate, these shall be constructed with smaller footprints to preserve views and ensure pedestrian access. Where appropriate, in people-intensive places—such as retail, office, and residential districts—pedestrians will have priority over automobiles, and buildings shall be articulated and designed to visually engage and offer comfort to pedestrians.
5. **A diversity of transportation modes and choices.** The General Plan fosters and provides incentives for alternative transportation modes, including transit, car/vanpooling, bicycling, walking, and telecommuting. Residents will be able to access stores, offices, the waterfront, or regional transit networks without needing a car. Land uses capitalize on Amtrak, AC Transit, and Transbay bus lines, and proximity to BART, and are integrated with the Emery Go-Round that extends to within walking distance of most locations. Bicycle paths link housing, activity centers, and recreational amenities, and are buffered where feasible from automobiles to further safety.

6. **A vibrant, urban community.** Reflecting its strategic location in the heart of the Bay Area, Emeryville will continue as a vibrant community, with cultural offerings, and urban amenities. Active gathering spaces will be encouraged, and streets designed for pedestrian comfort, walking, and enjoyment. Higher intensities will support a range of amenities while furthering regional goals of promoting infill development, supporting transit, and curtailing sprawl. Emeryville will maintain its small-town ambiance through civic engagement, accessible government, and amenities and services for appropriate future residential and worker populations.

7. **A diverse, balanced, and inclusive community.** The General Plan embraces physical, social, and economic diversity, and strengthens the community with facilities and program such as the Center for Community Life and a cultural center in the Park Avenue district. The Plan supports increased residential development to provide a more balanced use mix, sufficient concentration of residents/office workers, increased support for local-serving amenities, and opportunities for more workers to live in the city and enjoy shorter commutes, while recognizing that the City's employment primacy is likely to remain, given its history as an employment center. The Plan furthers a variety of housing types and emphasizes family-friendly housing, and linkages to Emeryville's school system to promote the success of its youth and to encourage new residents to actively contribute to the community.

8. **A balance of regional and local amenities.** Given its location, Emeryville will remain a regional destination. However, the City will balance retail uses that draw visitors from throughout the region, with stores and amenities that serve neighborhood needs, while ensuring fiscal health and sustainable economy. The General Plan emphasizes development of pedestrian oriented and scaled, rather than auto-oriented, districts, and policies to ensure that development provides benefit for the local community, and small, often local, businesses are viable.

9. **Sustainability and innovation, with respect for the past.** The Emeryville community strives to live within means that do not compromise the ability of future generations in Emeryville to enjoy a livable, healthy, and vibrant city. The Plan encourages redevelopment of contaminated land as healthy and cost-effective way of improving the local environment, use of "green" construction techniques, and a lifestyle with low ecological impacts upon energy consumption, climate, and the natural environment. The City will interweave the future and the past, while respecting the scale, character, and use of the historical Doyle and Triangle neighborhoods and other districts.

10. **An imageable and memorable city.** Foster high-quality new construction of exceptional design while preserving and enhancing the best of existing buildings and neighborhoods. Foster a dramatic skyline of slender and elegant high rise buildings stepping down to low-rise buildings in the older residential neighborhoods. Enhance experience of entering Emeryville with attractive and appropriate streetscape improvements along major regional and city arterials. Collectively, these elements serve to foster Emeryville's steadfastness as a vibrant, connected, livable community, and a rising signature city from afar and within.

GENERAL PLAN LAND USE DIAGRAM

The land use framework of the General Plan is illustrated in the General Plan Land Use Diagram (Figure 2.3-1), which is a graphic representation of the themes and policies in the Plan. It designates the proposed general location, distribution, and extent of land uses through buildout, which is anticipated to be by 2030. The classifications are meant to be broad enough to give the City flexibility in implementation, but clear enough to provide sufficient direction to carry out the goals of the General Plan. Density/intensity standards and building heights are regulated separately from land use to establish a cohesive urban form of the city. The Diagram is to be used and interpreted only in conjunction with the text and other figures contained in the proposed General Plan.

The legend of the General Plan Land Use Diagram includes the land use classifications described in Table 2.3-1, which represent an adopted component of the Plan.

Figure: 2.3-1

GENERAL PLAN LAND USE DIAGRAM

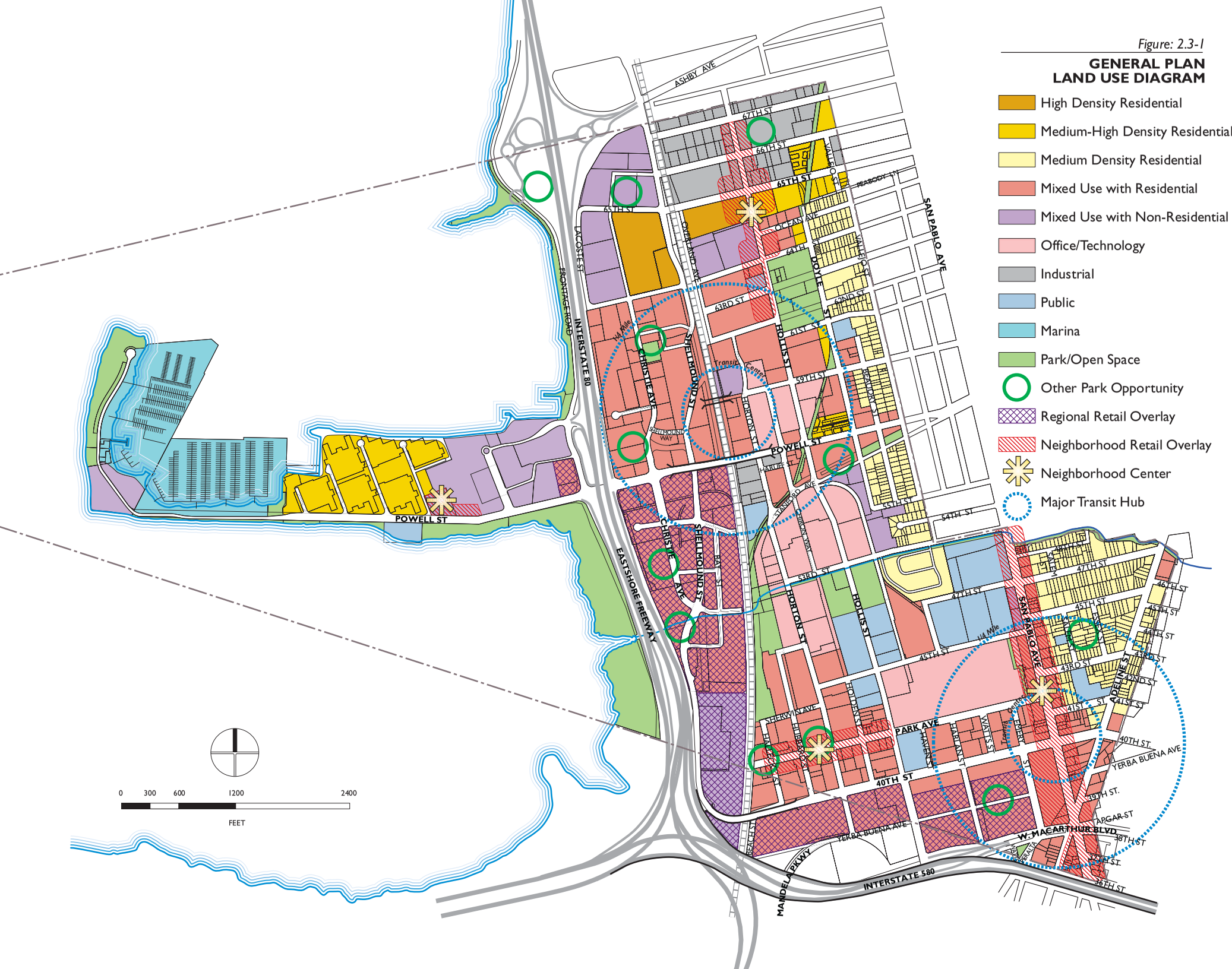


Table 2.3-1: Land Use Classifications

Land Use	*Description*
High Density Residential	Mid- or high-rise residential development, generally at sites with FARs greater than 2.5. Small-scale businesses, offices, retail, services, and other commercial uses are permitted on the ground floor.
Medium High Density Residential	Residential development generally at maximum FARs ranging from 0.8 to 1.9. Incidental retail uses that serve the neighborhood are also permitted.
Medium Density Residential	Residential development at FARs less than 0.8. Single family detached and attached housing. Multifamily housing types may be a conditional use, as specified in the Zoning Ordinance. Incidental retail uses that serve the neighborhood are also permitted.
Mixed Use with Residential	One or more of a variety of residential and nonresidential uses, including but not limited to offices, retail and hotels. On larger sites, a mix of residential and non-residential uses is required; on smaller sites, a single use may be permitted.
Mixed Use with Non-Residential	One or more of a variety of nonresidential uses, including but not limited to offices, retail and hotels. On larger sites, more than one use is required; on smaller sites, a single use may be permitted.
Office/Technology	Administrative, financial, business, professional, medical and public offices, research and development, biotechnology, and media production facilities. Warehousing and distribution facilities and retail are permitted as ancillary uses only, subject to limitations established in the Zoning Ordinance.
Industrial	A range of industrial and high technology uses, including light manufacturing, repair, testing, printing, service commercial, and biotechnology uses. West of Hollis Street, north of 65th Street, general manufacturing uses are permitted. East of Hollis Street, light industrial uses are permitted, but new general manufacturing uses are not. Existing general manufacturing uses can continue as conforming uses with performance standards for noise, air quality, and truck traffic, to safeguard adjacent residential uses. Unrelated retail and commercial uses that could be more appropriately located elsewhere in the city are not permitted, except for offices, subject to appropriate standards, and in Neighborhood Retail Overlay areas (i.e., North Hollis).
Public	A variety of public and quasi-public uses, including government offices; fire and police facilities; schools; community services; transit stations and ancillary facilities.
Parks/Open Space	Parks, recreation facilities, and greenways for the general community, and open space for habitat conservation (e.g. Emeryville Crescent State Marine Reserve).
Marina	Marinas, limited retail, and recreation facilities and restaurants with a waterfront orientation.
Regional Retail Overlay	This overlay is intended to reflect sites that are appropriate for retail uses that serve as a regional draw. Stores can be small in size (such as at Bay Street) or large (such as IKEA). For sites with this overlay, 100 percent of the building area can be retail, while the uses in the underlying classification are also permitted.

Land Use	*Description*
Neighborhood Retail Overlay	This designation is intended for four neighborhood centers, and is intended for stores and restaurants/cafes that serve the local community. Establishments shall generally be smaller sized, lending themselves to the pedestrian-oriented nature of the centers; however larger establishments (such as supermarkets), that serve the local community and are designed appropriately with a pedestrian orientation are also permitted. For sites with Neighborhood Retail overlay, retail and eating and drinking establishments can comprise up to 100 percent of the building area. Furthermore, a majority of the ground floor use, and a significant portion of the frontage along any public street, shall be devoted to such retail or other active uses (such as restaurants and cafés).

Summary of Density and Intensity

The General Plan establishes intensity standards for various locations in Emeryville, not by land use type. Figure 2.3-2 shows maximum floor area ratios (FAR) permitted in each area, Figure 2.3-3 shows maximum residential densities, and Figure 2.3-4 shows maximum building heights.

Figure: 2.3-2

MAXIMUM FLOOR AREA RATIOS

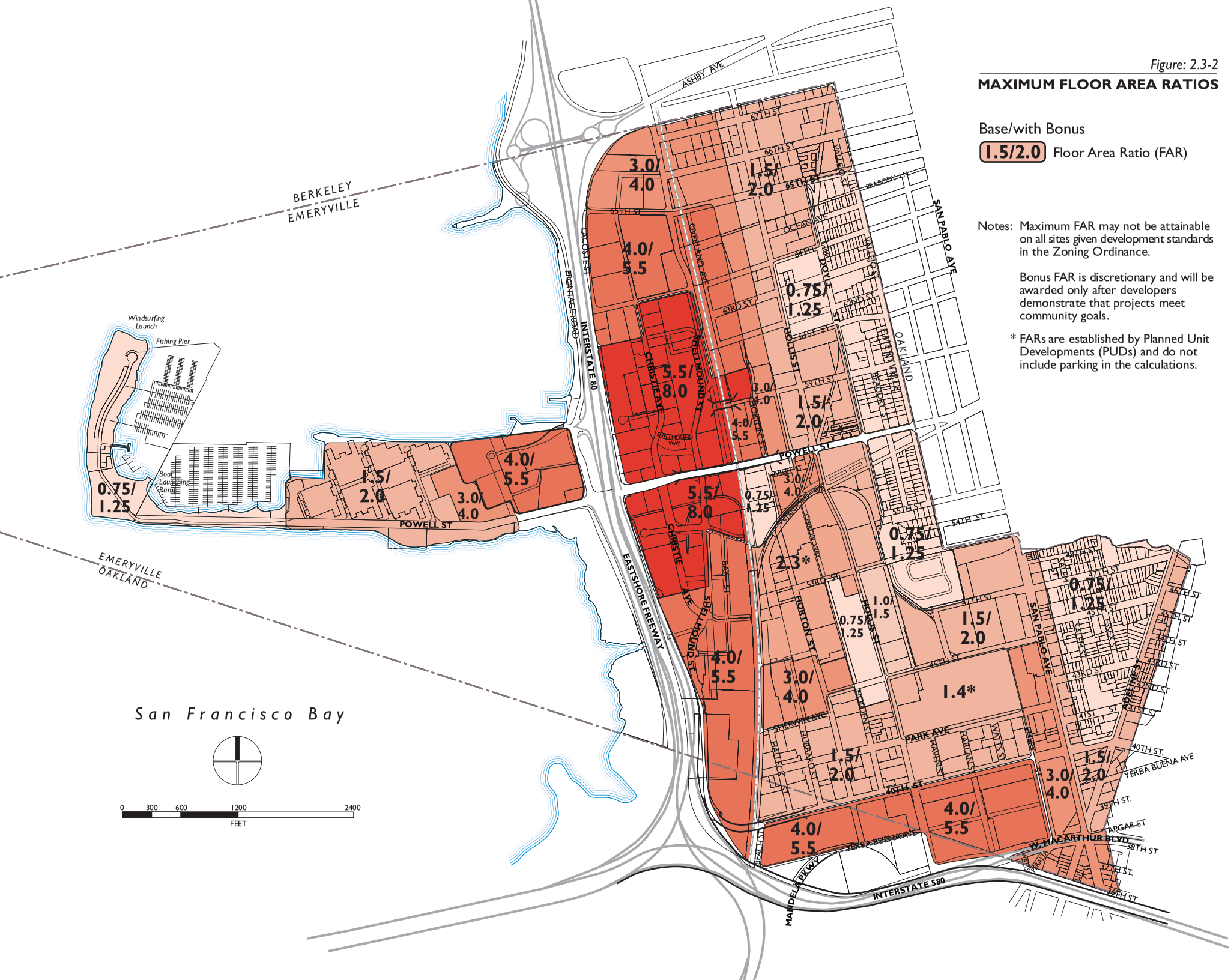


Figure: 2.3-3

MAXIMUM RESIDENTIAL DENSITIES

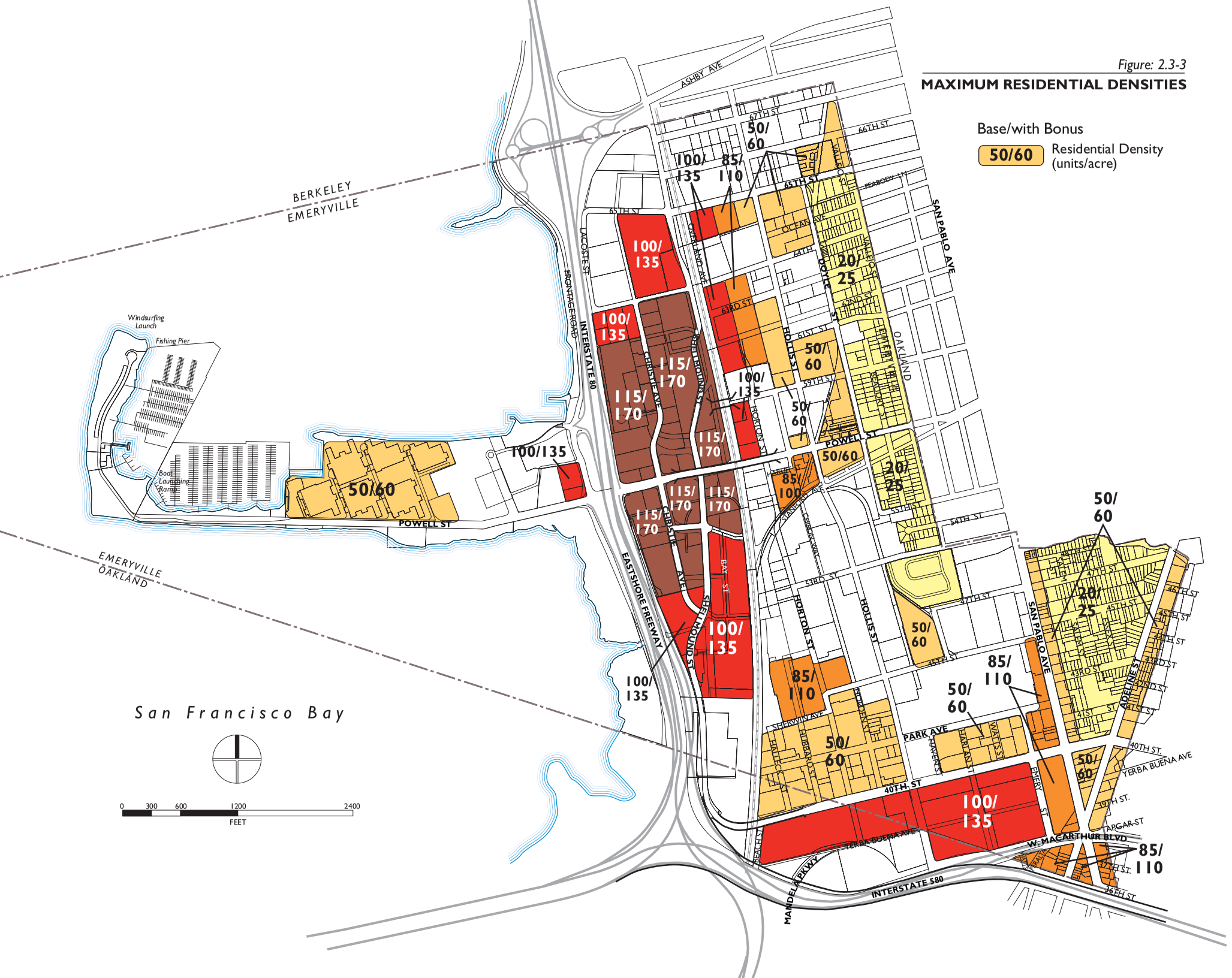
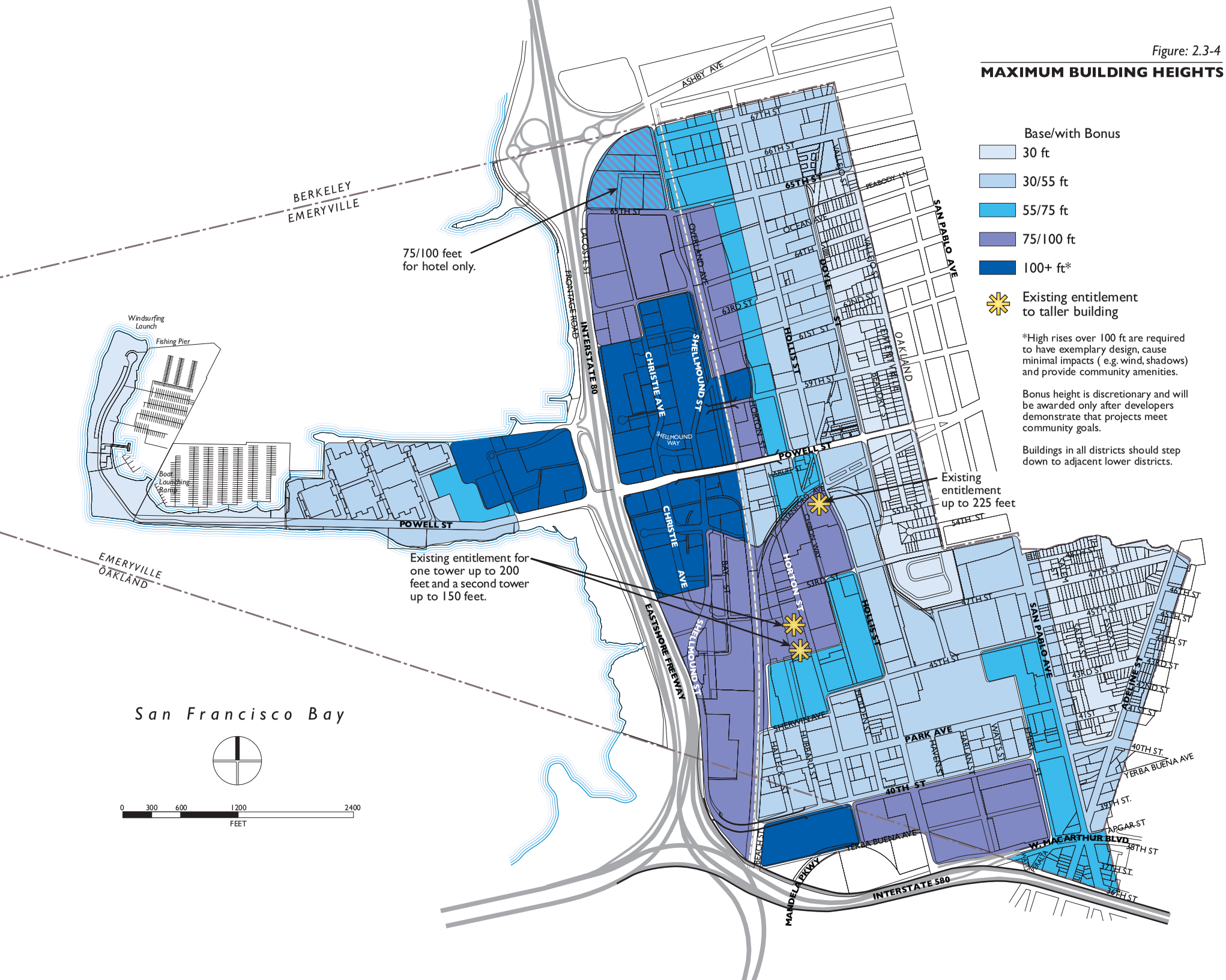


Figure: 2.3-4

MAXIMUM BUILDING HEIGHTS



2.4 GENERAL PLAN BUILDOUT

Full development under the proposed General Plan is referred to as "buildout." Although the proposed General Plan applies a generally 20-year planning horizon, the Plan is not intended to specify or anticipate when buildout will actually occur; nor does the designation of a site for a certain use necessarily mean the site will be built or redeveloped with that use within the planning horizon. This section describes the implications of the proposed General Plan buildout in terms of acreage, future population, housing units, and jobs.

METHODOLOGY

In order to estimate potential buildout, the Plan makes several assumptions. A set of opportunity sites have been identified for redevelopment; these include vacant and underutilized sites, as well as sites with proposed or approved projects. In general, sites have been projected to develop at 80 percent of their maximum potential, as a reasonable estimate of development that can be expected under the Plan. Assumed densities and intensities are consistent with the designations in the Figure 2.3-2 and Figure 2.3-3. Finally, this analysis assumes a distribution of uses within the Mixed-Use with Residential designation: roughly 60-65 percent residential and 30-35 office and retail.

LAND USE ACREAGE

Table 2.4-1 shows the buildout acreage of the General Plan Land Use Diagram.

Table 2.4-1: General Plan Land Use Acreage at Buildout

Land Use	*Acres*	*Percent*
Mixed Use with Residential	233.2	35
Mixed Use Non-Residential	75.3	11
Subtotal Mixed Use	*308.5*	*46*
Medium-Density Residential	63.8	10
Medium-High Residential	34.2	5
High-Density Residential	14.6	2
Subtotal Residential	*112.7*	*17*
Park/Open Space	68.8	10
Marina	57.3	9
Office/Technology	55.0	8
Public/Quasi-Public	33.5	5
Industrial	28.0	4
Total	663.7	100

Source: Dyett & Bhatia, 2008.

RESIDENTIAL BUILDOUT

Buildout Population

Table 2.4-2 summarizes buildout for the proposed General Plan by population, housing units, and households. The Emeryville Planning Area will accommodate a population of approximately 16,600 people at buildout, an increase of about 71 percent over the 2008 estimated population of 9,727. Over a 20-year period, this represents an average annual growth rate of 2.7 percent, a higher rate than that experienced between 1990 and 2005, which was about 2.2 percent annually.

Table 2.4-2: Population, Housing Units, and Households at Buildout

	Existing	*Buildout (2030)*[1]	*Percent Change*	*Annual Growth Rate*
Population[2]	9,727	16,600	71	2.7%
Housing Units	5,988	9,800	64	2.5%
Households[3]	5,570	9,310	67	2.6%

1. Buildout population rounded to nearest hundred; employment rounded to nearest thousand.

2. Buildout population was calculated assuming 1.79 persons per household.

3. Households are estimated as 95 percent of the total housing units, assuming a 5 percent vacancy rate.

Source: Department of Finance 2008; ABAG Projections 2007; City of Emeryville 2008; and Dyett & Bhatia, 2008.

Residential Development

As shown in Table 2.4-2, approximately 5,988 housing units (5,570 households) currently exist in Emeryville. The proposed General Plan is intended to accommodate over 4,100 additional housing units, resulting in approximately 9,800 housing units (9,310 households) at buildout. This infill residential development will consist of medium-, medium-high and high-density housing, developed as stand-alone structures or part of mixed-use developments.

EMPLOYMENT

As shown in Table 2.4-3, Emeryville will accommodate approximately 30,000 jobs at buildout, an increase of approximately 46 percent. This projection represents the sum of existing jobs, the loss of jobs due to redevelopment, and the net new jobs expected as a result of new development. This total includes just under 10,000 new jobs over the 20-year planning period, for an average annual growth rate of 1.9 percent. In comparison, the City's job base increased by the same percentage (46 percent) during the 15-year period between 1990 and 2005.

Table 2.4-3: Jobs per Employed Residents Ratios

	Existing (2008)[1]	*Buildout*[2]
Jobs	20,552	30,000[3]
Employed Residents	5,565	11,600[4]
Ratio (Jobs/Employed Resident)	3.7	2.6

1. 2008 existing data estimated using ABAG projections for 2005 and 2010.
2. Projected jobs calculated based on the following assumptions: office: 275 sq ft/employee; retail: 450 sq ft/employee; hotel: 550 sq ft/employee; and industrial: 1,500 sq ft/employee.
3. Jobs at buildout rounded to the nearest thousand.
4. Employed residents at buildout were calculated using the ratio assumed by ABAG for Alameda County for 2030 (70% of population)

Source: ABAG Projections 2007; Dyett & Bhatia: 2008.

Jobs/Housing Balance

A city's jobs to employed residents ratio would be 1:1 if the number of jobs in the city equaled the number of employed residents. In theory, such a balance would eliminate the need for commuting. More realistically, a balance means that in-commuting and out-commuting are matched, leading to efficient use of the transportation system, particularly during peak hours. The current jobs per employed residents ratio in Emeryville is 3.7, which means that there are nearly four times as many jobs as employed residents and that Emeryville must receive workers from outside the city. At buildout, the proposed General Plan will add more population than jobs, such that the jobs per employed resident ratio should decrease to 2.6. Although this still represents a much higher ratio compared with nearby cities, it does reflect a substantial improvement toward a more balanced city.

2.5 KEY POLICY DIRECTION

Policy direction for each of the proposed General Plan elements is described in this section.

LAND USE ELEMENT

Land Use

The land use policies in the proposed General Plan are the heart of the Plan. The Plan outlines greater integration and mix of uses, balancing employment, residential, cultural, destination, and local retail uses. The Plan enhances livability and quality of life for the increasing residential population with new parks and open spaces, neighborhood and mixed-use centers, and a variety of public and private amenities to support urban lifestyles in a walkable environment. Preservation of the existing residential neighborhoods, retention of existing industrial districts, and promotion of a mix of housing types in new residential developments, support a diverse range of existing and future residents.

Height and Intensity

The General Plan establishes intensity standards for various parts of Emeryville. Proposed base development intensities (FAR) in the General Plan range from 0.75 to 5.5, modulated to provide diversity, as well as high intensities in selected locations. Intensities are low in the eastern residential neighborhoods and the western end of the peninsula, gradually increasing to the highest values at the Powell Street/Christie Avenue core area. Figure 2.3-4 identifies maximum building heights permitted under the proposed General Plan. The first number refers to the base maximum height value, while the second number represents the maximum value permitted with discretionary bonus allowance. Heights greater than 100 feet are only permitted in selected locations and for buildings that meet specific criteria, such as minimal impacts on public views, wind, and shadows, adequate separation from other tall buildings, and exemplary design, and/or provide public amenities, through a discretionary review and approval process. Bonus height and floor-area may be awarded after developers demonstrate that projects provide certain community amenities.

Economic Development

While any new development within the redevelopment areas that enhances property values will lead to greater revenues that can be spent on public improvements, development also creates a need for services that must be provided by the City's General Fund. In particular, residential development has the highest need for services on a per square foot basis. Thus, the Plan ensures a balance of uses that provide revenue for continued enhancement of the community, while ensuring high quality of services to the community. In order to do so, the City will continue to pursue development that generates ongoing revenues, in particular hotel and retail uses. The City supports local small businesses as well as the retention and recruitment of high-tech industries.

TRANSPORTATION ELEMENT

The Transportation Element pursues a strategy to expand the street grid and enhance alternative transportation options, allowing for more connectivity and walkability between jobs, shopping and other activity centers. To ensure a balanced, multi-modal transportation network—also known as "complete streets"—the General Plan organizes streets and other transportation facilities according to typologies that consider the context and prioritize travel modes for each street. This General Plan departs from conventional thinking by eliminating the traditional Level of Service (LOS) methodology and replacing it with an alternative Quality of Service (QOS) standard, to be developed, that optimizes travel by all modes of transportation, not just vehicle travel. The Plan supports efforts that minimize vehicle miles traveled.

Street System

Private developments and major public infrastructure projects will provide adequate rights-of-way for all modes of transportation. Traffic calming and other neighborhood traffic management techniques will be implemented to enhance the quality of life within existing neighborhoods and to discourage through-traffic on bicycle boulevards and local streets. The City will establish equal priority to bicycles and public transit (and discourage through-traffic by other modes) on streets

in the vicinity of the Amtrak station that are designated as both Transit Streets and Bicycle Boulevards.

Walking and Bicycling

The Plan proposes several policies to improve pedestrian and bicycle circulation. Off-road paths and mid-block connections are identified, either exclusively for pedestrians or shared with bicyclists or all modes of travel. Additionally, on-road bike lanes, signed bike routes, and Bicycle Boulevards—a street classification on which bicycles have priority, and which may or may not have bike lanes—are defined in the Element. Pedestrian priority zones are delineated in areas where high-levels of pedestrian activity are anticipated, such as around transit stations, neighborhood centers, and retail areas. Key Green Streets are proposed to connect parks and open spaces and new grade-separated crossings that span the railroad and freeway are proposed to improve overall connectivity.

Public Transit

Public transit to BART, Amtrak, and regional destinations, as well as transit within Emeryville for residents, workers, and visitors is promoted under the proposed Plan. Elements such as bus shelters, benches, and traveler information systems are encouraged to make transit a more safe and convenient option. The Plan identifies transit streets where public transportation has priority through features such as traffic signal priority, bus queue jump lanes at intersections, and exclusive transit lanes. The Plan supports the continuation of subsidized transit within Emeryville and to regional destinations, such as BART, and will work with local transit agencies to improve service reliability and frequency within, to and from Emeryville.

The City also supports Transit-Oriented Development with reduced parking requirements, and amenities to encourage transit use and increase pedestrian comfort around the Major Transit Hubs at the Amtrak station and the 40th Street and San Pablo Avenue intersection.

Parking

Flexible parking standards combined with parking pricing of public spaces, work to ensure that appropriate parking supplies are provided and that revenue is generated to offset some of the parking costs. Policies focus on providing sufficient parking for businesses and residents, while protecting adjacent neighborhoods and the environment, and using parking management as a means of encouraging the use of alternative modes of transportation to the automobile. Public garages will be provided strategically, in locations convenient and proximate to destinations. Policies also support flexible parking standards to reflect demand, pricing strategies, parking benefit districts, shared parking between uses, and innovative technologies such as parking lifts and automated parking, to reduce land area devoted to parking.

Goods Movement

Policies in this section support the movement of goods and also seek to reduce the impacts of truck operations on city streets and adjacent land uses. Truck freight movement will be

accommodated between the freeway system and Emeryville's regional shopping destinations along 40th and Shellmound streets, consistent with the typologies described in this chapter. Existing truck routes are located along San Pablo Avenue, Hollis Street, and Powell Street.

Transportation Demand Management

Transportation demand management (TDM) refers to a comprehensive strategy to reduce driving by promoting alternatives such as public transit, carpooling, bicycling, walking, and telecommuting through many of the policies described above. Additional measures include encouraging carpooling and vanpooling, car- and bicycle-sharing, and telecommuting or flexible work scheduling.

PARKS, OPEN SPACE, PUBLIC FACILITIES AND SERVICES ELEMENT

The General Plan addresses two main issues concerning open space provisions: a shortage of park and recreation space, and a lack of accessibility, since most of the existing parkland is concentrated along the shoreline on the western portion of the city. The Plan proposes several different park types to accommodate the needs of present and future residents, workers, and visitors and to create a cohesive network of open spaces.

Parks and Open Space

Two large parks, north and south of Powell Street, are proposed to provide playing fields and other active uses, such as children's play structures and recreation activities, possibly along with passive recreation. Public pocket parks, plazas, tot lots, community gardens and other small open spaces throughout the city will improve residents' access to open space nearer their homes. Two greenways will traverse the city, one north-south and the other east-west. To the extent possible these will be off-street linear parks with pedestrian and bicycle paths, small gathering places, and recreational facilities. Green Streets are also established, creating connections between destination points and provided additional linear open spaces characterized by trees and plantings, wide sidewalks, pedestrian pathways, and public art.

Schools and Education

Policies in the Plan seek to create an environment in which children and youth can flourish and become contributing members of society. The foundation of this vision is a strong and active partnership among the City, School District, and all segments of the community. The Emeryville Center of Community Life—which will consolidate three schools, and house facilities for arts, performances, meetings, community programs and services, recreation, and administration—represents one of the major capital improvement projects supported under the Plan. For young children, the General Plan supports childcare facilities that are affordable and accessible for families, and provide safe, educational, and high-quality services.

Public Services and Facilities

In terms of other public facilities, the Plan supports police and fire services that are responsive to citizens' needs to ensure a safe and secure environment for people and property in the community. As the city continues to grow, the Plan calls for timely response to all emergencies. In addition, the Plan supports utilities and infrastructure systems that provide safe, reliable, and adequate services. The City will continue to work with Pacific Gas & Electric and the East Bay Municipal Utility District to provide adequate utility services to residents and businesses.

URBAN DESIGN ELEMENT

The Urban Design Element seeks to enhance livability by emphasizing the public realm—streets and public spaces; fine-grained development, connectivity between districts; a vital and active street life; sunlight penetration into streets and open space. The Plan identifies a city structure composed of a vibrant, intense, and pedestrian-oriented core, augmented with parks and connected by greenways and green streets, and a diversity of building types and scales.

Areas and Districts

Variation in development scale and character reinforce the identity of individual districts and foster a variety of options for living and working. Careful transitions between densities, design typologies, and districts, create a varied, but coherent urban form.

A high-intensity mixed-use core will be located near Powell Street and Christie Avenue, and built to the street edge to foster a vibrant pedestrian-oriented district. A pedestrian and bicycle-friendly mixed-use district will be developed in North Hollis, consistent with the policies and guidelines defined in the North Hollis Area Urban Design Program. A more urban character will be established for the East Bay Bridge district, by replacing surface parking with structured parking, developing taller buildings, a more continuous street façade with pedestrian activity at the ground level, and increased development intensity.

The older existing residential neighborhoods will be preserved under the Plan. Likewise, the overall scale and uses of the industrial district will be preserved. The Park Avenue District Plan will continue to guide development in the Park Avenue district, honoring its unique civic, arts, and cultural amenities. The San Pablo Avenue Urban Design Plan will continue to be used to improve landscaping, and streetscape design and guide development in the San Pablo Avenue district.

Street Grid, Connections, and Views

The Plan proposes an integrated pattern of streets, pedestrian paths, and bike routes through a fine-grain street grid that enables efficient movement throughout the city. New development will be required to extend the street grid or pedestrian connections wherever possible. The Plan establishes Pedestrian Priority Zones in regional and neighborhood centers, around schools, parks, and active frontage streets that encourage retail, restaurants, hotel lobbies, and offices along the ground level of busy commercial areas with high volumes of pedestrian activity. In terms of views, visual distinction and safety will be prioritized in the design of bridges and

undercrossings, and public views of the San Francisco Bay and the East Bay hills will be protected and enhanced.

Skyline and Building Bulk

The Plan seeks to create a varied skyline with the tallest buildings at the Powell Street/Christie Avenue area, with a gradual transition to lower building heights to the north and south, and to a greater degree to the mid- to lower-scale development to the east. The Plan seeks to maximize sky exposure and sunlight in public places. Bulky and monolithic buildings shall be prevented through vertical and horizontal articulation, as well as volumetric building development standards. It also calls for implementation of Design Guidelines to achieve these goals and implement policies.

Streetscapes and Building-to-Street Interface

Streets are envisioned as an extension of Emeryville's open space network providing opportunities to linger, stroll, and gather. Development along streets should provide a rich visual experience that is engaging to pedestrians, is unobstructed by parking facilities, and contributes to street life, vitality, and safety.

Neighborhood Centers

The Plan establishes neighborhood centers as focal nodes for local services and amenities, and that project the character and identity of their surrounding districts. Neighborhood centers will be accessible from multiple access points, pedestrian pathways, and through-streets. Street-level uses should reinforce neighborhood center streets and allow a vertical mix of a diverse range of land uses including offices, hotels and residential uses compatible with neighborhood center functions. Developments adjacent to neighborhood centers parks or plazas should create an integrated and memorable relationship of architecture and open space.

Identity and Gateways

The proposed Plan seeks to capture Emeryville's identity through physical design to distinguish Emeryville for the community and its visitors. High-quality design and construction will build on existing historical architectural features, while creating new signature places. The Plan calls for visual gateways at key entry points to the city, continued investment in the citywide public art program, and sign regulations that create an identity without dominating city and district appearance.

CONSERVATION, SAFETY, AND NOISE ELEMENT

The Conservation, Safety, and Noise Element prioritize public health and safety, by maintaining high-quality natural resources and protecting the community from natural and manmade hazards, and impacts from noise sources.

Conservation

Air Quality

The Plan seeks to improve local ambient air quality levels to help meet regional attainment status and contain low levels of air pollutants. Projects will be required to implement air quality mitigations, such as TDM measures, buffer distances, and dust abatement, where significant air quality impacts are identified. At a municipal level, the Plan calls for clean fuels and vehicles in the City's long-range capital expenditure plans, to replace and improve the existing fleet of gasoline and diesel powered vehicles.

Water

Water quality is maintained and conservation efforts encouraged through the protection of existing resources and increased use of recycled water. Public education, best management practices, source control, and site design programs will continue to be implemented under the proposed General Plan to reduce pollutants in stormwater runoff. The Plan promotes the incorporation of rainwater harvesting methods in development projects and allows homeowners to divert untreated rainwater for non-potable uses.

Habitat

Policies to preserve and protect biological resources—particularly around the Emeryville Crescent—are identified. The Plan seeks to protect special status wildlife species and plant species, and supports habitats and open spaces within Emeryville that are within the City's control. The Plan encourages the incorporation of native plants into landscape plans and the preservation of mature trees.

Cultural Resources

The Plan supports the protection and integration of cultural resources into future development. Policies encourage developers to reuse existing buildings and buildings façades and discourage the inappropriate demolition or alteration of historic or architecturally significant resources.

Safety

Safety policies call for the protection of life, natural environment, and property from natural and manmade hazards due to seismic activity, hazardous material exposure or flood damage.

Policies regulate development to ensure adequate mitigation of safety hazards on sites having a history or threat of seismic dangers, erosion, subsidence, or flooding. This includes geotechnical investigation in areas where geologic conditions or soil types are susceptible to liquefaction; appropriate siting for businesses that use, store, process, or dispose of hazardous materials in such areas; and soil erosion control measures during construction. The Plan continues to support the retrofit of remaining potentially hazardous structures, such as unreinforced masonry buildings.

The Plan enforces regulation of local and State laws regarding the production, use, storage, and transportation of hazardous materials and waste; requires former commercial and industrial sites to be cleaned up prior to reuse; and calls for the abatement of lead-based paint and asbestos prior to structural renovation or demolition.

In terms of fire and emergency safety measures, the proposed Plan continues to require the City to specify minimum water pressure flows to ensure adequate flow in the event of a fire. It identifies San Pablo Avenue, Hollis Street, and Interstate-80 as evacuation routes in case of emergency.

Noise

Noise policies protect life, natural environment, and property from manmade hazards due to excessive noise exposure. Occupants of existing and new buildings should be protected from exposure to excessive noise, particularly adjacent to Interstate-80 and the railroad. A noise study and mitigation measures shall be required for all projects that have noise exposure levels greater than "normally acceptable" levels. These mitigations may include installation of double-paned or soundproof windows, setbacks, and/or screening. Site design, building design, hours of operation, and other techniques should be used to control noise sources.

SUSTAINABILITY ELEMENT

The purpose of sustainability in Emeryville—and its incorporation throughout the General Plan—is to take responsibility for the urban development and population growth projected during the planning period and their potential impact on the environment. By implementing sustainable design measures and policies, Emeryville can reduce its contribution to global climate change, minimize its reliance on foreign oil and other fossil-fuel sources, and decrease consumption of natural resources. The very same policies that dictate more sustainable development also enhance quality-of-life and public health: increased energy efficiency, waste diversion and reduction, mixed land uses, convenient access to parks and open spaces, alternative transportation networks, local and organic food sources, stormwater management, and other initiatives central to the Plan.

Policies in the Sustainability Element build on existing City efforts as part of the Climate Action Plan, which focuses on waste, land use/transportation, and energy. In addition, the City has already made great strides in the areas of browfield remediation, stormwater management, local transit through the Emery Go-Round, and through its participation in the Urban Environmental Accords. Policies in other elements of the General Plan are often inherently helping to achieve sustainability objectives. New policies in this Element include support for green building (construction and demolition), Bay-Friendly landscaping, energy retrofits, municipal purchasing of environmentally friendly products and services, organic and local food systems, and public education initiatives to support sustainability goals in the city.

2.6 GENERAL PLAN IMPLEMENTATION

OVERVIEW

The proposed General Plan provides specific policy guidance for implementation of plan concepts in each of the Plan elements and establishes a basis for coordinated action by the City. The policies in each element of the Plan provide details that will guide program development. The General Plan Implementation Program (Chapter 8 of the Plan) describes, in general terms, the responsibilities for implementation. It also outlines specific implementation actions that will be initiated after adoption. The Implementation Program will be updated as often as deemed necessary to ensure that it reflects the City's implementation and strategic priorities. The following two sections describe department responsibilities and the major implementation strategies, namely the Zoning Ordinance, Design Guidelines, and Capital Improvements Program.

RESPONSIBILITIES

Implementing the General Plan will involve the City Council, the Planning Commission, other City boards and commissions, and City departments. The City also will need to consult with Alameda County departments, adjacent cities, and other public agencies about implementation proposals that affect their respective areas of jurisdiction. The principal responsibilities that City officials and staff have for Plan implementation are briefly summarized below; details on their powers and duties are documented in the Emeryville Municipal Code.

City Council

The City Council is responsible for the overall management of municipal affairs; it acts as the legislative body and is responsible for adoption of the General Plan and any amendments to it. The City Council appoints the City Manager who is their key staff administrator and has overall responsibility for the day-to-day implementation of the Plan. The City Manager also serves as the Executive Director of the Emeryville Redevelopment Agency. The City Council also appoints the Planning Commission and other boards and commissions established under the Municipal Code.

The City Council's role in implementing the General Plan will be to set implementation priorities and approve the Zoning Map and the Updated Zoning Ordinance, consistent with the General Plan, and a Capital Improvement Program and budget to carry out the Plan. The City Council also acts as the Redevelopment Agency and, in this capacity, will help finance public facilities and improvements needed to implement the Plan. The Council also approves certain development projects consistent with the General Plan.

Planning Commission

The Planning Commission is responsible for preparing and recommending adoption or amendment of the General Plan, zoning and subdivision ordinances and other regulations, resource conservation plans, and programs and legislation needed to implement the General Plan. The Planning Commission may also prepare and recommend adoption of specific plans,

neighborhood plans or special plans, as needed for Plan implementation. The Planning Commission also approves most major development projects requiring use permits and design review.

Planning and Building Department

The Planning and Building Department has primary responsibility for administering the laws, regulations and requirements that pertain to the physical development of the City. Tasks include administering planning and building permit procedures, providing public information, performing building and code enforcement inspections, maintaining complete public records on planning and building projects and issuing necessary permits, certificates, approvals and enforcement citations.

Specific duties related to General Plan implementation include preparing zoning and subdivision ordinance amendments, design guidelines, reviewing development applications, conducting investigations and making reports and recommendations on planning and land use, zoning, subdivisions, design review, development plans and environmental controls. The Planning and Building Department will have a lead role in implementing the policies of the Land Use and Parks, Open Space, and Public Facilities elements. Finally, the Department will have the primary responsibility for preparing the annual report on the General Plan. (These reporting requirements are described in Chapter 1 of the General Plan.)

City Attorney

The City Attorney is retained by the City Council and Redevelopment Agency to act as the legal advisor and administrator of the legal affairs of the City and Agency.

The City Attorney renders legal advice to the Council, Redevelopment Agency, City Manager, Department Heads, and all City officials on matters of law pertaining to official activities. The City Attorney represents the City and Agency in litigation and reviews all legal documents, including ordinances, resolutions, leases, contracts, and deeds, and approves each as to form. The City Attorney's Office also negotiates development agreements with private parties on behalf of the City Council and Redevelopment Agency.

Finance Department

The Finance Department is responsible for managing all financial aspects of City and Redevelopment Agency operations. The Department handles all accounting; oversees the annual audit; tracks and accounts for all revenues received by the City and Redevelopment Agency; bills regularly for Business License accounts; and processes purchasing, accounts payable, and payroll. The Department is responsible for preparation and management of the Annual Budget and Annual Financial Report. The Department also complies with a host of State and Federal requirements involving filing of reports and information regarding City/Agency finances. The Department manages all of the City/Agency cash, handles investments under the investment policy adopted by the City, and handles bond financing and assessment district financial management.

Economic Development and Housing Department

The Economic Development and Housing Department coordinates programs and projects of the Emeryville Redevelopment Agency. These responsibilities include redevelopment-financed projects, brownfields remediation programs, business development, "Art in Public Places" program, and infrastructure improvements. Housing programs include assistance to local businesses and a full service housing rehabilitation program to maintain and improve the housing stock available to low to moderate income residents. This department also has substantial implementation responsibilities for the Housing Element of the General Plan, in addition to the Land Use Element.

Public Works Department

The Public Works Department consists of four divisions: Administration, Engineering, Environmental, and Maintenance. The Department is responsible for designing, inspecting, and managing City's Capital Improvement Projects, including City's parks, sidewalk and street reconstructions/constructions, street lights, traffic signals, storm drains and sanitary sewer. The Department will take the lead in the implementation of many of the General Plan's sustainability initiatives. It will also have specific implementation responsibilities for portions of the Land Use, Circulation, and Conservation and Natural Environment elements, as well as redesign of streets in accordance with the Design Guidelines.

Community Services Department

The Community Services Department is responsible for managing the City's parks and recreation programs as well as senior services and child care. The Community Services Department will have responsibility over the programming of parks and open spaces, and coordinate with the Emery Unified School District and School Board to develop the Emeryville Center for Community Life.

Police and Fire Departments

Within the City, responsibility for public safety is assigned to the Police and Fire departments. The Police Department is responsible for preventing crime and maintaining law and order. The Emeryville Fire Department aims to educate the public, prevent fires, and respond to all emergencies in the city. These departments are responsible for implementing public safety policies described in the Conservation and Natural Environment and Parks, Open Space, and Public Facilities elements.

Emery Unified School District

The Emery Unified School District, led by the elected School Board, manages the public schools in the city. Together, the District and the City are pursuing the development of the Center of Community Life, which will consolidate the public schools in addition to a range of community services and facilities.

Emeryville Transit Management Association

The Emeryville Transit Management Association operates the Emery Go-Round free shuttle service. The Emery Go-Round provides service within Emeryville and between the MacArthur BART Station and the city. The shuttle system is funded through property taxes on local businesses. The Transit Management Association will continue to be responsible for operating the Emery Go-Round as its mission expands to serve residents in addition to employees, as called for in the General Plan. The TMA also coordinates the car share program and other transportation services.

Other Boards and Committees

The City has established a number of other boards and committees, some of which will be involved in Plan implementation in their respective areas of expertise. These may include the AC Transit/Emeryville Liaison Committee, Transportation Committee, Bicycle/Pedestrian Advisory Committee, City/Schools Committee, Housing Committee, Marina Committee, Public Safety Committee, Public Works Committee, and Emeryville Education and Youth Services Advisory Committee. The General Plan does not envision any substantive change in the responsibilities assigned to these boards and committees. They will be administering new or amended regulations adopted pursuant to Plan policies, and their actions will need to be consistent with the General Plan.

THE PLAN, THE REGULATORY SYSTEM AND CAPITAL IMPROVEMENTS

The City will use a variety of regulatory mechanisms and administrative procedures to implement the General Plan. Under California law, Emeryville is required to have the Zoning Ordinance be consistent with the General Plan. In fact, the consistency requirement is the keystone of Plan implementation. Without a consistency requirement, there is no assurance that Plan policies will be implemented and that environmental resources earmarked for protection in the Plan will be preserved. Other regulatory mechanisms, including subdivision approvals, building and housing codes, capital improvement programs, and environmental review procedures also will be used to implement Plan policies. All project approvals must be found to be consistent with the General Plan.

Zoning Regulations

The City's Zoning Ordinance will translate plan policies into specific use regulations, development standards and performance criteria that will govern development on individual properties. The General Plan establishes the policy framework, while the Zoning Ordinance prescribes standards, rules and procedures for development. The Zoning Map will provide more detail than the General Plan Land Use Diagram.

Regulations for zoning districts will be established as part of the comprehensive zoning update being undertaken concurrently with the General Plan update. The use regulations and development standards for existing zoning districts will need to be amended to conform to Plan policies. The City will bring both the Zoning Ordinance and the Zoning Map into conformance with the General Plan. When the General Plan is amended in the future, the Zoning Ordinance

and Zoning Map also may need to be amended to maintain consistency between the Plan and zoning. As an implementation tool of the proposed General Plan, the Zoning Ordinance is cover

Subdivision Regulations

No subdivision of land may be approved under California law and the City's Subdivision Regulations unless its design and proposed improvements are found to be consistent with the General Plan. Update of the City's Subdivision Regulations (contained in Title 9 of the Municipal Code) to conform to the updated General Plan policies is underway.

Building and Housing Codes

No building permit may be issued under California law (Gov. Code Section 65567) unless the proposed development is consistent with the General Plan and conforms to the policies of the General Plan as a whole.

Capital Improvements Programming

The Five-Year Capital Improvements Program (CIP) is the infrastructure funding plan for the city. It includes a list of public works projects that the City intends to design and construct in coming years. As a capital plan, the CIP represents one-time expenditures, as opposed to ongoing funding for operations expenses. The General Plan has identified a range of capital outlays that will be implemented and funded through the CIP.

3.1 Land Use and Housing

This section presents the environmental setting and impact analysis on land use in the Emeryville General Plan.

ENVIRONMENTAL SETTING

PHYSICAL SETTING

Land Use Evolution

Before the colonization of the area by Spain in 1776, the Emeryville area was the site of extensive Native American settlements. Mudflats rich with clams and rocky areas with oysters, plus fishing, hunting, and acorns from the local oak trees, provided a rich and easily exploited food source for the residents. They would dispose of their clam and oyster shells in a single place, over time creating a huge mound—the Emeryville Shellmound.

After settlement by Europeans, Emeryville became a city in its own right, largely through the efforts of businessman Joseph S. Emery who started a stonework contracting business in San Francisco. In 1859, Emery purchased a 185-acre tract of land north of Oakland and began to develop projects in the area. A community began to develop around the Emery Tract, and the town of Emeryville was officially incorporated in 1896, taking the name of its founder.

In 1871 Emery financed the construction of the San Pablo Avenue Horse Cart Railroad, which connected Oakland to Emeryville. He was also one of the primary builders of the California-Nevada Railroad, which began in Oakland, crossed the burgeoning Emery Tract, and terminated in Orinda. Emeryville soon became a city of big industrial enterprises and rail terminals. Successive years saw further consolidation of industry, including the paint factory of Sherwin-Williams and Shell Development, the research arm of Shell Oil Company. Residential areas remained confined to small portions at the city's eastern edge, bordering Oakland. As the city built out, bay fill was considered viable for creating new land. The Emeryville Peninsula was created in the 1960s by filling shallow water areas.

In the 1970s Emeryville's landscape began to change once again as some of the city's older industries had already begun to move to the suburbs or close up shop altogether. The city's first major residential development—the 1,249-unit Watergate Apartments—was completed in 1971. In the mid 1970s, parks and a 500-berth marina were created by filling in 12 additional acres of the San Francisco Bay to create a small boat harbor. Multi-story office buildings rose between the Eastshore Freeway and San Francisco Bay.

With vacant warehouse and industrial space becoming available, Emeryville began to see the development of a community of artists who converted several of the buildings into live/work space. In 1984, the city's second major housing development—the high-rise Pacific Park Plaza—

was completed. Between them, Watergate and Pacific Park Plaza more than doubled the city's population, from 2,681 in 1970 to 5,740 in 1990.

As large tracts of industrial land—originally built at low intensities and supporting many fewer workers per acre of land than contemporary businesses—have continued to be redeveloped, Emeryville's transformation over the past two decades has been dramatic, with substantial increases in employment and population. The city's evolution continues to this day. The sections below evaluate Emeryville's recent and current development trends.

Existing Land Use

Emeryville's land use transformation over the past 20 years has been extensive. Formerly dominated by manufacturing and distribution, the city is now marked by ever increasing development of office, regional retail, and high-density residential land uses, as well as mixed-use developments. Almost entirely built out, with little to no vacant land, Emeryville's growth has primarily been through redevelopment of existing land uses and rehabilitation of older buildings.

Existing land use data is provided as of 2005, the most recent data available when the Notice of Preparation for the project was issued. Previously an industrial town, the city is no longer dominated by a single land use. Around half of the developable land in the City—that is, excluding roads, highways, and other rights-of-way—is in Commercial (36 percent) or Industrial (14 percent) use, and just under a quarter (21 percent) is used for housing. Much of the land identified as commercial, however, is devoted to surface parking lots. The remainder of the city is in Public use (seven percent), Parks and Open Space (seven percent), or a mix of uses (seven percent). Only around 40 acres, or seven percent of the land, is vacant. Specific acreages for each land use are shown in Table 3.1-1. (Land attributed to roads and rights-of-ways are not included in the table.)

Table 3.1-1: Existing Land Use Distribution (2005)

	Acres	*Percent*
Commercial	222.0	36
Residential	126.2	21
Industrial	87.5	14
Mixed Use	48.0	8
Public	45.7	7
Parks and Open Space	44.7	7
Vacant/ Unassigned	40.8	7
Total	615.1	100

Source: Dyett & Bhatia, 2008; Metroscan; City of Emeryville, 2005.

Almost all of the Bayfront and freeway edge area west of the railroad tracks has been redeveloped in the past 30 years. Much of this space is devoted to retail and office uses in large-scale

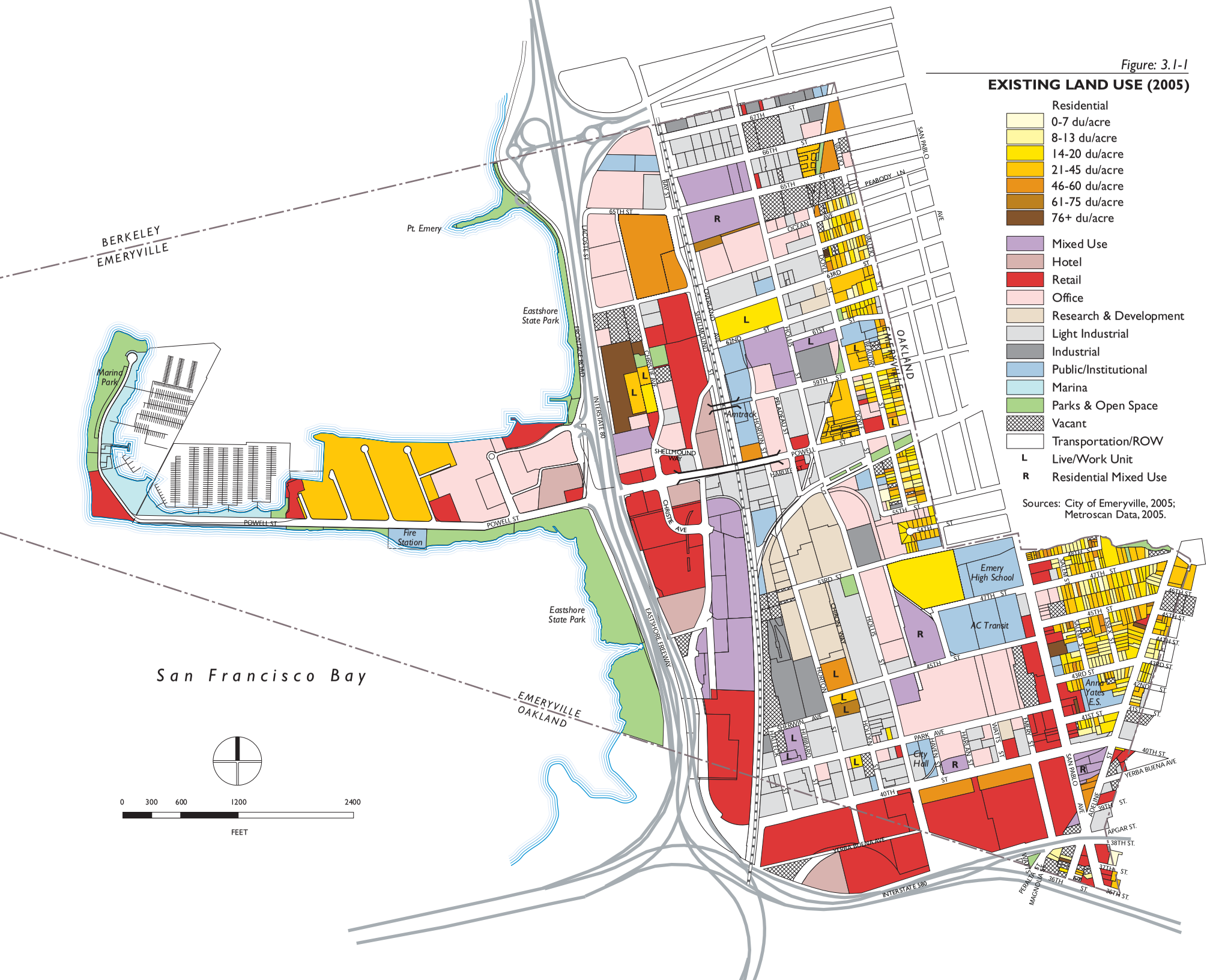
developments, such as Bay Street, IKEA, the Public Marketplace, and Powell Street Plaza, which serve a regional clientele. Almost no industrial uses remain in this area. Residential developments in this area are few in number, but large in size and high in density. In total, they comprise about 2,750 housing units—half of the housing in the city.

Development to the east of the railroad is more diverse in use, scale, and age. Industrial, office, and residential uses are geographically closer to one another. Parcel and building sizes generally diminish towards the east, where pre-war structures are supplemented with new residential and commercial construction. Two large corporate campuses—Novartis and Pixar—dominate the area south of Powell Street while the southern edge of the city is marked by "big box" retail. Emeryville's public schools and much of its locally-oriented retail businesses lie along or near San Pablo Avenue, a major boulevard and state route which connects Emeryville with Oakland and Berkeley. In the eastern residential neighborhoods, east of Doyle Street and San Pablo Avenue, the Triangle and Doyle Street neighborhoods are composed of lower density homes.

Because Emeryville is largely flat, topography does not play a factor in the city's land use pattern. Transportation corridors, however, do split the city into several sub-districts. The main divisions are I-80 and the railroad, and to a smaller extent, Powell Street. I-580 separates Emeryville from Oakland along the southern city limits, although a portion of the area north of I-580 is in Oakland.

Figure: 3.1-1

EXISTING LAND USE (2005)



Residential

As of 2008, Emeryville had an estimated population of 9,727 living in approximately 5,988housing units, according to the Department of Finance. An overwhelming proportion—88 percent—of the housing units in the city are multifamily. Multifamily residential developments range from the 320-foot tall Pacific Park Plaza development to just over 500 units in small (2-4 unit) structures. The city's housing stock also includes over 600 single-family units, consisting of both detached and attached housing units. Half of the housing units in Emeryville are located west of the railroad tracks, almost entirely in large-scale multifamily developments. All of the housing on the Peninsula is located in the Watergate Condominium complex. The remainder of Emeryville's housing is distributed evenly throughout the eastern part of the city, with the Doyle and Triangle neighborhoods predominantly residential in nature.

Office and Research & Development

Office is the dominant non-residential use in Emeryville, followed closely by industrial, retail, and mixed-use space. Around one-third of the 3.3 million square feet of office space in Emeryville is located on the Peninsula in the four Watergate office towers. The rest of the city's office space is distributed throughout North and South Hollis, with notable concentrations along Christie Avenue and Park Avenue.

Most of the research and development space in Emeryville—750,000 out of 970,000 square feet—is provided by Novartis. Pixar's campus is classified as office space.

Industrial

Industrial uses once dominated Emeryville and they still constitute the most non-residential built square feet in the city, although that position has been slipping as manufacturing and warehouses are converted into other uses. Ninety-two percent of this industrial space is located between the railroad and the eastern residential neighborhoods, concentrated either along Hollis Street or at the western end of Park Avenue. The city's industrial businesses concentrate on light manufacturing, such as a coffee roaster, and warehousing. One of the largest pieces of industrial land in Emeryville, the Sherwin-Williams complex located east of the railroad and north of Park Avenue, is expected to be redeveloped within the life of the new General Plan.

Retail and Hotel

The retail category includes any commercial use where purchases of goods or services can be made, including stores, gas stations, and restaurants. The 1.5 million square feet of retail in Emeryville is mostly regionally-oriented and located on Shellmound and 40th streets, visible and accessible from I-580 and I-80. These large-scale regional shopping centers include Bay Street, Powell Street Plaza, the Public Marketplace, IKEA, and the East Bay Bridge center. The only significant concentration of retail uses away from Shellmound Street and 40th Street is along San Pablo Avenue, which hosts service businesses like banks and cafes. Almost no purely retail uses (just 6,000 square feet) are located north of Powell Street and east of the railroad tracks, although some retail is available within mixed-use structures.

Three of Emeryville's hotels are located in the Bayfront area, with a fourth on the Peninsula. These national chain hotels are laid out similarly: high-rises, between seven and 13 stories in height, with on-site surface parking. The city's four hotels have a total of 930 rooms between them.

Mixed-Use Developments

Mixed-use developments, for the purposes of discussion here, are those with more than one type of use on the same parcel. In Emeryville, mixed-use configurations include multifamily residences above retail, industrial uses with live/work space for artists, and office space mixed with retail or industrial uses. Together, they make up seven percent of the city's land area and, excluding residential portions of the developments, 12 percent of its non-residential building space.

Public and Institutional

Public land, as well as privately-owned educational facilities such as Ex'pression College, makes up around eight percent of Emeryville's land. Civic uses—City Hall, police and fire stations, public services, and other City-owned land—take up just four percent of Emeryville's land. Educational uses, which include the land owned by Emery Unified School District and several private institutions, take up less than 15 acres. With the exception of Ex'pression College and public safety facilities, all of the active civic and educational land uses in the city are located in its southeastern quarter.

Major Development Projects and Trends

In recent years, a large portion of Emeryville has been redeveloped, with new land uses replacing vacant lots or low-valuation sites. This process continues today, with around 10 approved projects in progress as of February 2009, and an additional seven projects proposed.

Recent Development

Since the adoption of the last General Plan, new construction has occurred throughout the city. New development has also been concentrated in the area south of 40th Street and on large parcels along Hollis Street. Some other notable centers of development are in northeastern Emeryville along the Greenway—a linear park in development that follows a former railroad right-of-way diagonally through the city—and on San Pablo Avenue between Park Avenue and 47th Street.

Residential Trends

Since 2000, approximately 1,700 new housing units have been developed in Emeryville, representing nearly 30 percent of the total housing stock. These residential developments come in several forms: large high-density structures—such as EmeryBay Club & Apartments Phase II and Bridgecourt Apartments; residences within small and large mixed-use developments—such as Bay Street and Glaushaus; industrial rehabilitations and loft-style housing units along the future route of the Greenway—such as 1401 Park Avenue and Oliver Lofts, respectively.

In contrast, virtually no new single-family detached homes are being constructed, although single-family attached homes have been built as part of some new developments. The reasons for this are likely the high price of available land—enhanced by the relatively large amount of land that single-family homes require relative to other residential uses—and the overall lack of vacant land in Emeryville.

Non-Residential Trends

Recent non-residential developments have transformed 115 acres of land, or 22 percent of the citywide non-residential total, and added 3.86 million square feet of commercial and industrial building space, or 38 percent of the city's current supply. Office and retail have dominated recent projects, together accounting for just over half of new non-residential building floor space. Office and lab development has included the expansion of Novartis and the development of Emery Station, both phased campus-style developments. Retail development has come in several forms: big box stores on large sites—such as IKEA and the East Bay Bridge Center (partially in Oakland); walkable retail—such as Bay Street's retail component and the Promenade on San Pablo Avenue; and, increasingly, smaller neighborhood-serving retail establishments as part of residential mixed-use projects—including in Andante and the Courtyards at 65th Street.

Approved and Under Construction Development

Approved and under construction development projects, as of November 2007, are included in the buildout analysis. At that time, just over 900 housing units were in development in Emeryville, which would increase the city's existing supply by 18 percent. These projects are mostly sited along the edges of the city, with three of them located in both Emeryville and Oakland. In terms of non-residential development, 1.3 million square feet of office development was approved or under construction, as of November 2007, and 34,000 square feet of retail development.

Since November 2007, several new projects have entered and moved through the development pipeline. Several mixed-use with residential developments have been approved or proposed, including Papermill and 39th and Adeline projects, which together would add 169 units, eight live/work/flex units, and 1,000 sq ft of retail. Potential major office, lab, retail, and other mixed-use projects include the redevelopment of Marketplace, the construction of the Transit Center, and Emery Station Greenway, which could add nearly 250,000 sq ft of lab space, residential, retail, and public parking. Finally, the Emeryville Center for Community Life and Emeryville Arts Center represent a potential expansion of public education, community, and arts facilities, and the Doyle Hollis Park is under construction.

Existing Densities and Intensities

Much of Emeryville is developed at a low-to-moderate level of intensity, with a scattering of commercial buildings that have an FAR above 2.0 and residential structures that exceed 60 units per acre. Very generally, the highest intensity properties in the city are located on the Peninsula and north of Powell Street.

There are very few low density residential uses in the city, with most of the housing to the west of Doyle Street built at moderate densities. 90 percent of housing in Emeryville is built at or above 20 units per acre. Even some single-family homes—which are typically built at five to seven units per acre in many suburbs—are at or above 20 units per acre due to their small parcel sizes.

The city's highest density housing is largely within a few developments. Pacific Park Plaza has 99 dwelling units per acre, Emeryville senior housing has 84 units per acre, and Emery Bay Club & Apartments has 70 units per acre.

Trends in Density and Intensity of Development

Based on recent and approved projects, non-residential intensities in Emeryville are on the increase. Recent hotel, office, and retail developments have all been built at higher than average FARs. Furthermore, the continued addition of buildings to the Novartis and Pixar campuses will greatly increase the overall intensity of the city.

Meanwhile, the residential density of the city will be increasing somewhat in the near future. Purely residential developments are becoming denser, with approved projects averaging more than 60 units per acre. Even so, while Emeryville has several mid-rise and one high-rise residential structure, the highest attained residential densities are actually quite low given the heights of these buildings.

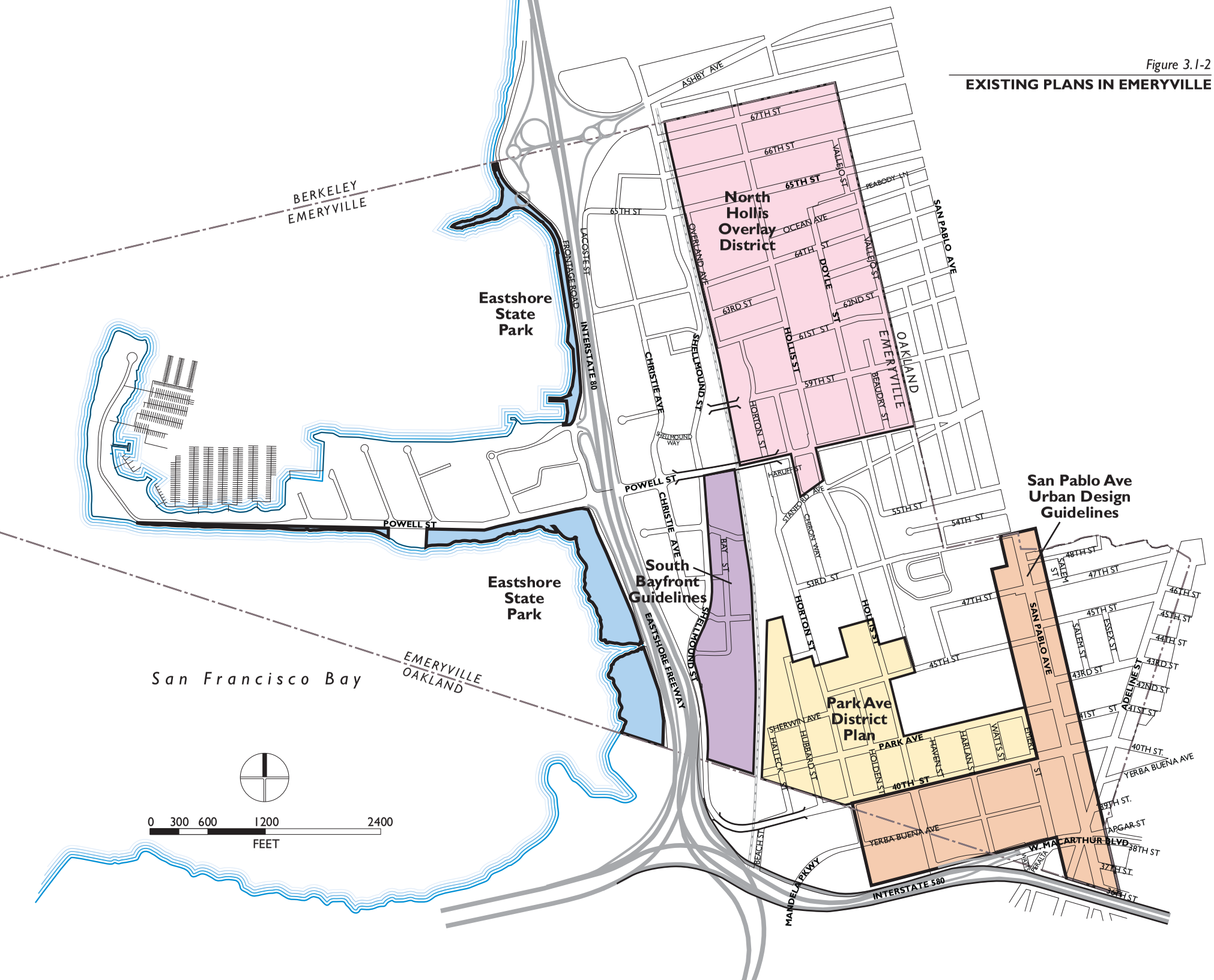
REGULATORY SETTING

Current Land Use Plans

Land use in Emeryville is affected by several City plans as well as the master plan for the Eastshore State Park. The jurisdictions of these plans can be seen in Figure 3.1-2.

Figure 3.1-2

EXISTING PLANS IN EMERYVILLE



1987 General Plan (updated 1993)

The current General Plan was adopted in 1987. An update in 1993 changed the plan from an information-based document into a series of objectives and recommended policies. These objectives are broken down into subgroups that reflect six of the seven elements required by the State—land use, circulation, open space, noise, conservation, and safety. The Housing Element is separate. State law requires all elements to be consistent with one another.

The citywide goals laid out in the 1993 Plan update are to:

- Provide services and facilities for Emeryville's citizens.
- Encourage a land use pattern in which a variety of uses are intermingled in a compatible fashion.
- Establish a circulation system allowing for the free movement of persons and goods to, from, and within the city while avoiding an over-accommodation to vehicles at the expense of land use and pedestrian movement.
- Improve the quality and livability of the city by seeking development [that is] visually sympathetic to its surroundings and urban character.
- Encourage land uses which strengthen the tax base while respecting the natural, scenic, and historic resources of the city.

The 1993 Plan's specific land use objectives are to:

- Create a major activity center in the Bay Area with new office, commercial and high-tech industries and new housing of all types, replacing obsolete, incompatible, and low-intensity prior uses.
- Create a living and working environment which protects and enhances existing development, while providing new amenities and facilities for an expanded workforce and residential population.

Emeryville Zoning Ordinance

Emeryville's Zoning Ordinance contains nine base land use districts. The City maintains a map-based system of building intensity (FAR) and building height regulations. The Zoning Ordinance contains only two residential districts—Medium Density Residential and High Density Residential. While the residential densities available by right are moderately high (reaching 20 units per acre for Medium and 45 units per acre for High), none of the districts permit multifamily housing type by right, but rather require a Conditional Use Permit (CUP) for this. Similarly, much higher development densities are available in both districts (35 and 108 units per acre for Medium and High Density respectively) under the CUP system. The maximum permitted building height on the zoning map is 95 feet, which may be increased to 175' with a CUP. This limit has been exceeded numerous times, including by such developments as Pacific

Park Plaza (320 feet) and the Watergate office and hotel development to the west of I-80, as well as approved plans for Novartis. The proposed General Plan includes height limits so height variances will not be possible and any deviation will require a General Plan amendment.

North Hollis Area Urban Design Program

This plan was implemented through the North Hollis Overlay Zone. It covers the northeast corner of the city—north of Powell Street and east of the railroad, also including the block south of Powell between Hollis and Peladeau. This plan calls for infill residential uses that complement the existing neighborhood and stimulate use of the Greenway; the discouragement of through-traffic; a balance of automobile access with other transportation modes; sufficient public parking; and private development that enhances the character and pedestrian improvements of the area.

San Pablo Avenue Urban Design Plan

This plan outlines a phased strategy for the development of San Pablo Avenue into an active, attractive, neighborhood retail center. The document targets land uses for three phases of catalyst projects, establishes goals for public circulation and streetscape improvements, and design guidelines for new development along and near the avenue. The plan particularly calls for at least 1,000 market-rate residential units in the area and an "anchor" retail store, such as a supermarket. Much of the plan, which was written around 1990, has already been implemented although its guidelines should still be applicable for future development along San Pablo Avenue and through the East Bay Bridge Center.

South Bayfront Design Guidelines

These development guidelines from 1997 cover the South Bayfront district, the area south of Powell Street between the railroad and Shellmound Street. The plan lays out eight high-level site design principles for the development of the district and presents three development concepts which follow these guidelines. Each concept includes a set of possible land uses, building configurations, and circulation patterns. Much of the South Bayfront has already been developed with these guidelines in mind.

Park Avenue District Plan

Adopted in August 2006, the Park Avenue District Plan establishes incentives and development guidelines toward the creation of a vibrant, mixed-use district. District-wide urban design policies seek to preserve architecturally significant buildings, maintain the existing small-lot pattern, and promote walkable and attractive places. More specifically the plan calls for sidewalks punctuated with landscaping and street furniture and unencroached by utilities; signage describing locations of historic structures, routes, and the Greenway; and visually distinct crosswalk treatment to give character to the district and ensure pedestrian safety. Along Park Avenue in particular, the Plan specifies wider sidewalks, corner bulbouts at key intersections, and bicycle racks on every block; it also encourages shared parking and allocated spaces for public parking.

Eastshore State Park General Plan

This plan covers the new state park that runs from Oakland to Richmond, which includes the waterfront in Emeryville both north and south of the Peninsula. The park is envisioned as a seamlessly connected ribbon of recreational and natural habitat areas.

For the sections of the State Park within Emeryville, the plan designates the shoreline south of the Peninsula as a preservation area, and the rest of the park within Emeryville as a conservation area; there are no recreational sections of the park within Emeryville. Public access to preservation areas is restricted, while conservation areas permit passive recreation. Consequently, the plan calls for:

- Restricting access to the shoreline south of the Peninsula, perhaps with a fence (though not on the south side of Powell Street).
- Creating a non-paved trail along the eastern section of the Peninsula in a way that connects with the existing paved section of the Bay Trail.
- Installing a vista point and a bird blind on the Peninsula, overlooking the tidal marsh of the southern shoreline.
- Providing parking for up to 20 vehicles, preferably through a combination of on-street parking and lot sharing, or through a new on-site lot if necessary.

Plans from Surrounding Jurisdictions

Two area plans in Berkeley and two redevelopment plans in Oakland immediately abut the borders of Emeryville. In addition, several regional bodies have plans that affect the Emeryville community.

Berkeley Waterfront Plan (adopted 1986)

This plan covers the area of Berkeley from the railroad to the Bay shoreline. This plan is to some degree superseded by the newer Eastshore State Park master plan. Its relevance to Emeryville is also limited by the inability of the land between I-80 and the shoreline to accommodate any development other than a shoreline path and beach improvements.

Its main importance for the General Plan update is its call for the cities of Berkeley, Albany and Emeryville to establish a joint sub-regional growth management system to minimize traffic congestion in the plan area by phasing development. This strategy is suggested due to concern that capacity along I-80 is limited and excessive development in these three cities could decline levels of service on the highway below "D," the City of Berkeley's minimum acceptable level. Given the limited scope of development proposed for Berkeley's Waterfront area in the plan, the main threat to service levels on the highway is seen as traffic from development in Emeryville and Albany. This plan is over twenty years old, however, so the assumptions embedded in this strategy may have changed significantly.

West Berkeley Area Plan (adopted 1993)

This plan's jurisdiction covers the area north of the Emeryville city limits between the railroad and San Pablo Avenue. Land use in West Berkeley, as of July 1998, included light manufacturing and wholesaling along the border with Emeryville, with the rest of the area between the city limits and Ashby Avenue containing a combination of that industrial and commercial uses. No residential uses are in the area south of Heinz Avenue, and none are permitted south of Dwight Way. Most of the property in West Berkeley is developed at an intensity below 1.0 FAR. The Plan and the West Berkeley district are currently undergoing evaluation for zoning changes and possible Plan amendments. The City is working with stakeholder groups to identify opportunities and challenges.

In its current form, the West Berkeley plan seeks to maintain the mix of land uses, buildings, and people in the area to prevent it from becoming excessively redeveloped or gentrified. It does so by designating small areas where certain use categories are emphasized in order to ensure an overall mix of land uses. Specific policies called for in the plan which are of interest to Emeryville include:

- Create new streets that link to Ashby Avenue from the north.
- Study the feasibility of a consolidated parking structure around 7th Street and Ashby Avenue.
- Investigate the development of a light rail line on San Pablo Avenue.
- Maintain the boundaries of the mixed-use/light industrial zone and prohibit retail uses within it. Offices are allowed in this zone, but only up to 25 percent of a building's floor area, and residential uses are not permitted.
- Encourage a node form of intense commercial development at designated intersections. The nodes closest to Emeryville are Ashby Avenue at 7th Street and at San Pablo Avenue. The nodes should be provided with consolidated parking, be the focus of pedestrian improvements, require retail as the ground floor use, and encourage neighborhood retail.
- Promote extensive tree planting along major streets, focusing on long-lived and drought-resistant trees, and encourage the retention of existing trees in front yards in residential areas.

To implement the plan's land use policies, Berkeley has zoned all of the area between the Emeryville city limits and Ashby Avenue as mixed-use/light industrial, except for the strip along San Pablo Avenue, which is designated as general commercial. The general commercial zone is applied to the north side of Ashby Avenue, as well.

Oakland General Plan Land Use and Transportation elements (1998)

The strategic map of Oakland's General Plan designates the area to the southwest of Emeryville, as well as portions of San Pablo Avenue around Emeryville, as some of the city's key areas for growth and change. The triangular area between I-580 and Peralta Street is considered a

"Housing and Business Mix Area," where both uses are allowed and neither dominates. Recommended policies of interest to Emeryville include:

- Improving the appearance of San Pablo Avenue.
- Targeting the Golden Gate neighborhood (east of Emeryville) for blight abatement, façade and streetscape improvements, and business attraction activities.
- Designating the MacArthur BART station—the one nearest to Emeryville—as a transit-oriented district.

Redevelopment Plan for West Oakland (2003)

This plan for the Oakland Redevelopment Agency designates the area between the Emeryville city limits, Peralta Street, and I-580 for regional commercial land uses, and the area east of Peralta Street as far north as 40th Street as mixed-typology housing. Development activities that are pertinent to Emeryville include:

- Create a pedestrian-friendly commercial corridor along San Pablo Avenue and a pedestrian-friendly environment along Adeline Street.
- In the Hoover/West MacArthur area (to the southeast of Emeryville), impose a five year moratorium starting in 2003 on the use of redevelopment funds for the construction of new affordable rental housing, due to the existing over-concentration of low-income housing in the area.
- Promote mixed-use and high-density infill residential developments on San Pablo Avenue between 27th and 32nd streets. Use funds to revitalize the commercial uses in this area, supporting new developments that include a mix of uses or public green space.
- Any development project in the area that costs over $250,000 must direct at least one percent of its total development cost to on-site public art.

Redevelopment Plan for Broadway/MacArthur/San Pablo (2000, amended 2007)

This plan for the Oakland Redevelopment Agency covers two areas, one of which is immediately adjacent to the City of Emeryville: the Golden Gate neighborhood, stretching from the Emeryville city limits to San Pablo Avenue between 53rd and 67th streets. A five-year implementation plan for the San Pablo subarea lays out actions to take place between 2004 and 2009, mainly capital improvement campaigns and support for business development and retention in the area. A commercial façade improvement program, tenant improvement program, and street light upgrades on San Pablo Avenue are in place. In the second portion of the Redevelopment Area, near the MacArthur BART Station, a mixed-use project has been approved to include: up to 675 units of housing (including 90 to 113 below market rate units), 34,000 square feet of commercial space, 5,000 square feet of community space, a replacement parking structure for BART, new public streets, and the renovation of the existing BART Station entry plaza.

Other Agencies

Bay Conservation and Development Commission (BCDC)

BCDC regulates new development within the first 100 feet inland from the San Francisco Bay shoreline in order to ensure as much public access to the Bay as possible. This jurisdiction includes substantial changes to land use, building construction or remodeling, and subdivision of property, as well as Bay fill and structures over the Bay. BCDC authored The San Francisco Bay Plan in 1969 to protect and preserve the bay through regional efforts and defines its jurisdiction and major strategies. Key initiatives that pertain to Emeryville include: developing maritime ports, water-related industries, and waterfront parks and recreation facilities; maintaining wildlife refuges in baylands; and encouraging private shoreline development.

For the purposes of the updated General Plan, the BCDC's power of review would mainly affect any changes to land uses or structures on the Peninsula and any redevelopment of I-80's Ashby Avenue interchange. (Note: By statute Watergate and Trader Vic's are regulated only to mean high tide, not 100 feet, and the entire marina is included in BCDC jurisdiction, even beyond 100 feet inland.)

Association of Bay Area Governments (ABAG)

ABAG is the regional association of governments that covers Emeryville. While ABAG's land use policy framework does not have any legal powers, it represents the overarching goals of the region. In 2002, ABAG prepared a regional "Smart Growth" strategy, which is reflected in ABAG's projections for Emeryville and the region. ABAG's strategy calls for a significant share of the Bay Area's growth to be accommodated in the inner urban ring rather than in any greenfield portions of the region, especially in areas that are easily accessed via transit. Development in Emeryville is likely to exceed ABAG's growth projections over the next 20 years, thereby supporting regional smart growth objectives.

Transportation Agencies

For a description of transportation agencies that may have influence over land use, including the Metropolitan Transportation Commission (MTC), Alameda County Congestion Management Agency (ACCMA), and Bay Area Air Quality Management District (BAAQMD), see Section 3.2: Transportation.

IMPACT ANALYSIS

SIGNIFICANCE CRITERIA

A significant impact would occur with full implementation of the proposed Emeryville General Plan if it would do one or more of the following:

- Physically divide an established community;

- Displace substantial numbers of existing housing or people, necessitating the construction of replacement housing elsewhere;
- Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project adopted for the purpose of avoiding or mitigating an environmental effect;
- Create land use incompatibilities between proposed development and existing neighborhoods; or
- Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance to non-agricultural use;

Changes in land use are not, in and of themselves, environmental impacts. Land use changes are impacts only relative to the prior use of the site (e.g., conversion of open space or farmland, an irreplaceable resource, or displacement of homes) or the surrounding usage and character (i.e., division of an established community).

METHODOLOGY & ASSUMPTIONS

This analysis considers current and proposed General Plan policies and goals, existing and proposed land use conditions within Emeryville, and applicable regulations and guidelines.

The impact analysis considered full buildout to mean 80 percent of the maximum buildout potential of the proposed General Plan, although the actual number of parcels that undergo land use changes may be lower.

The total development potential for 2030 under the proposed General Plan would result in increased development of residential units as well as retail, hotel, and office square feet. High-tech uses, including research and development, and biotechnology uses, are permitted in the Office/Technology land use designation. The development potential is described in Table 3.1-2. The General Plan also includes an additional 26 acres of park land, an increase of 116 percent for a total of 49 acres. Parks and open space are described in greater detail in Section 3.11.

Table 3.1-2: General Plan Development at 2030, by Land Use

	Residential (units)	*Retail (SF)*	*Hotel (SF)*	*Office (SF)*	*Industrial (SF)*
A. Approved Development	907	34,461		1,313,000	
B. Gross New Development	2,930	1,075,400	324,600	1,569,700	76,200
C. Loss of Existing Due to Redevelopment	-70	-468,598	-14,375	-509,740	-855,377
D. Net New Development (A+B+C)	3,767	641,263	310,225	2,372,960	-779,177
E. Existing Development	5,988	2,441,660	464,500	4,852,118	4,132,675
F. City at 2030 (D+E)	9,800	3,083,000	775,000	7,225,000	3,353,000
Percent Change from Existing to 2030 Build-Out	63%	26%	67%	49%	-19%

Note: Office includes R&D development. Residential buildout rounded to nearest hundred; non-residential to nearest thousand

Source: Dyett & Bhatia, 2008. (Approved Development as of November 2007; Existing Development as of 2005.)

The Land Use Diagram, as shown in the Chapter 2: Project Description, Figure 2.3-1, designates the proposed location, distribution, and extent of activities that may take place throughout the city. Land use classifications—shown as color/graphic patterns on the diagram—allow for a range of activities within each classification.

SUMMARY OF IMPACTS

The proposed General Plan does not physically divide any established community. Rather, by providing better connectivity both locally and regionally, the plan provides more linkages within Emeryville and between surrounding communities.

Existing neighborhoods are designated as areas of stability and the plan does not anticipate major changes in intensity and character to these areas. While construction of proposed improvements could temporarily disrupt neighborhoods and businesses, completed improvements are expected to contribute to a vital living and working environment.

Redevelopment caused by new permitted land uses or different densities may remove a very small amount of housing in the North Hollis district and southern portion of the San Pablo Avenue corridor, but the overall proposed plan will significantly increase the number of housing units in Emeryville such that any displaced residents will be able to find accommodation in the same area. To the extent that any development activity of the Redevlopment Agency results in the removal of housing, State redevelopment law requires replacement of like type of housing within the city.

Similarly, while some businesses, may be displaced during redevelopment, the additional commercial and retail space added by the Plan will accommodate relocation within the same area.

The proposed 2030 General Plan will be the guiding document in Emeryville. Adopted policies, plans, programs, the zoning code, and other implementing tools will be amended to conform to the adopted General Plan. The proposed General Plan does not contain provisions that conflict with local district plans.

Proposed development would be sensitive to existing land uses, and all new land uses are expected to be compatible with each other. Compatibility with existing industrial uses will be mitigated through proposed General Plan policies.

No agricultural lands exist in Emeryville, so there is no conversion of farmland in the plan.

Cumulative Impacts

Concurrent implementation of the proposed General Plan and forecast development of residential and employment land uses in the region would result in increased pressure on water supply resources, which are currently expected to require rationing during a multi-year drought cycle. Forecast population and employment growth would result in increased pressure on fire and police services. In addition, increased congestion due to population and employment growth will pose an additional challenge in providing timely fire and police services.

IMPACTS AND MITIGATION MEASURES

Impact

3.1-1 The proposed General Plan would not physically divide any established communities, and would increase connectivity both locally and regionally. *(Beneficial)*

The proposed General Plan does not physically divide any established community. Rather, by providing better connectivity both locally and regionally, the plan provides more linkages within Emeryville and between surrounding communities.

The following proposed General Plan policies aim at increasing connectivity within Emeryville.

Applicable Proposed General Plan Policies

LU-P-2 The Powell/Christie/Shellmound/I-80 interchange area will be developed into a compact but high-intensity regional transit hub. This hub will include a retail core, with stores, restaurants, and hotels; a financial and commercial center, creating a daytime work population; and a residential neighborhood, providing vitality during non-work hours.

LU-P-3 The northern (north of Powell) and southern halves of the Powell/Christie core area shall be integrated and connected, and the district shall be walkable, with small blocks, pedestrian-oriented streets, and connections to surroundings.

LU-P-18 The area around the Amtrak station shall be developed with transit-supportive uses, through measures such as reduced parking requirement, incorporation of public parking in developments, and accounting for transit proximity when considering height and FAR bonuses.

LU-P-19 The reuse of the Sherwin Williams site shall includes a mix of residential and nonresidential uses with ample open space, centered on an extension of the Emeryville Greenway connecting Horton Landing Park and the Park Avenue District.

T-P-2 The design, construction, operation, and maintenance of city streets shall be based on a "complete streets" concept that enables safe, comfortable, and attractive access and travel for pedestrians, bicyclists, motorists, and transit users of all ages and abilities.

T-P-2 Additional connections across the railroad and freeway shall be provided as noted in Figures 3-1 through 3-6.

T-P-9 Sidewalks shall be provided on both sides of all streets; pedestrian connections between new and existing development is required.

T-P-33 The City will advocate for frequent, direct transit service to all points in Emeryville, especially between the east and west sides of town.

Mitigation Measures

None required.

Impact

3.1-2 Changes in land uses under the proposed General Plan may result in the displacement of a minimal number of houses, businesses, and/or people. *(Less than Significant)*

Generally, existing residential uses were classified in the General Plan as areas of stability, meaning that they would not undergo significant land use changes under the proposed General Plan. However, the proposed General Plan does estimate that approximately 70 existing housing units could be lost due to redevelopment, in the North Hollis district and southern portion of the San Pablo Avenue corridor. In addition, because the Plan is long-range in nature, it is possible that some residential uses may convert to higher density residential or mixed uses. However, the overall proposed plan will significantly increase the number of housing units, with the net new

housing development reaching 3,767 units, indicating that any displaced residents would be able to find new accommodation in Emeryville.

Similarly, while some businesses may be displaced during redevelopment, the additional office (2,372,960 net new square feet) and retail space (641,263 net new square feet) added by the Plan will accommodate relocation within Emeryville.

The following proposed General Plan policies aim at encouraging businesses to remain in Emeryville.

Applicable Proposed General Plan Policies

LU-P-32 The City will encourage development of existing Emeryville businesses with the objective of retaining and expanding employment opportunities and strengthening the tax base. Provide assistance to existing businesses that may be displaced by new development to relocate in Emeryville.

LU-P-33 The City will work with existing Emeryville businesses, Chamber of Commerce, and others to address the City's economic needs and stimulate growth.

Mitigation Measures

None required.

Impact

3.1-3 Changes in land uses proposed by the General Plan would conflict with existing local and regional plans and zoning ordinances. *(Less than Significant)*

Since a General Plan updates policies and land use designations for future development, by its nature it is often inconsistent with existing regulations. These existing regulations will need to be updated, to effectively implement the new General Plan. Amendments may also be needed from time to time to conform to State or federal law passed since adoption, and to eliminate or modify policies that may become obsolete or unrealistic due to changed conditions.

In addition to its General Plan, Emeryville maintains plans for some areas within the City to tailor appropriate development standards and policies to the individual character of neighborhoods. These plans are described in the regulatory setting and are shown in Figure 3.1-2. Although these plans do not necessarily address all of the topics required by State law for general or specific plans, they must be consistent with the General Plan. The proposed General Plan is generally consistent with these existing district plans.

Implementation of the various policies is described in detail of Chapter 8 of the proposed General Plan. The Planning and Building Department has primary responsibility for administering the

laws, regulations and requirements that pertain to the physical development of the City. Tasks include administering planning and building permit procedures, providing public information, performing building and code enforcement inspections, maintaining complete public records on planning and building projects and issuing necessary permits, certificates, approvals and enforcement citations.

Specific duties related to General Plan implementation would include preparing zoning and subdivision ordinance amendments, design guidelines, reviewing development applications, conducting investigations and making reports and recommendations on planning and land use, zoning, subdivisions, design review, development plans and environmental controls. Implementation of the various policies in the proposed General Plan is described in detail of Chapter 8 of the proposed General Plan.

The City's Zoning Ordinance will translate plan policies into specific use regulations, development standards and performance criteria that will govern development on individual properties. The Zoning Ordinance will ultimately prescribe standards, rules and procedures for development, and the Zoning Map will provide more detail than the General Plan Diagram.

Given that the proposed General Plan does not conflict with district plans, and that preparation of amendments where required is detailed in the proposed Plan, conflicts with existing local and regional plans and zoning ordinances is expected to have a less than significant impact.

Proposed General Plan Actions that Reduce the Impact

LU-A-1 Update the Zoning Ordinance:

- Base zoning districts
- Overlay and special districts
- FAR bonus criteria
- Use regulations and classifications
- Supplemental standards
- Subdivisions
- Administrative Procedures

LU-A-3 Prepare, update, and implement specific or area plans

LU-A-4 Prepare and update Design Guidelines

LU-A-5 Update the Capital Improvements Program

Mitigation Measures

None required.

Impact

3.1-4 New urban development may be incompatible with adjacent, existing land uses. *(Less than Significant)*

Land use compatibility describes a state in which a land use exists and functions without creating a nuisance, hazardous, or unhealthy condition with adjacent land uses. Compatible land uses could include, for example, residential neighborhoods next to parks, industrial complexes next to airports, or professional offices next to commercial businesses. Incompatible land uses are generally considered to create conflict with other uses (due to increased noise, traffic, visual impacts, or air pollution), such as residential neighborhoods next to heavy industrial uses, or elementary schools next to airports.

The intent of the Emeryville General Plan is to create a mixed use urban area that accommodates additional residential, office, retail, and hotel uses in a previously industrial area. These uses are compatible if building scale and character are consistent, pedestrian connections are provided, and auto-oriented uses are limited. Sections *3.3: Hazardous Materials and Toxics* and *3.7 Noise* will further address nuisance, hazardous, or unhealthy conditions.

Uses within areas designated for mixed-use development are expected to be compatible with one another because proposed General Plan policies establish requirements for compatible development. Due to Emeryville's industrial history and the desire to maintain some industrial use, in some instances residential uses are allowed adjacent to or concurrent with industrial uses. These uses are generally assumed to be existing rather than new, but are accounted for in proposed General Plan policies, which require that zoning in these areas include performance measures that ensure health and safety compatibility. Redeveloped industrial land will require sufficient remediation, as described in proposed General Plan policies.

Given the policies in the proposed General Plan, the decrease in industrial uses and increase in compatible uses, the impact of new development on land use compatibility is expected to be less than significant.

The following proposed General Plan policies ensure compatible development within Emeryville.

Proposed General Plan Policies that Reduce the Impact

LU-P-1 Land uses will be consistent with the Land Use Classifications and the Land Use Diagram.

LU-P-8 Live/work uses will be permitted in all land use designations except Office/ Technology, Public, Parks/Open Space, and Marina. In the Industrial district west

of Hollis Street, only "heavy" live/ work—involving, for example, manufacturing, welding, or assembly—will be permitted.

LU-P-8A Zoning performance measures will ensure health and safety compatibility for industrial uses bordering residential uses.

LU-P-26 If new residential buildings are proposed adjacent to freeways and railroad tracks impacts of these corridors, including noise, vibration, and air pollution, should be considered during site planning. Noise, vibration, and air pollution shall be mitigated to the extent possible.

CSN-P-32 Prior to reuse, development sites will be remediated, according to relevant State and federal regulations.

CSN-P-34 The City requires abatement of lead-based paint and asbestos prior to structural renovation or demolition, and compliance with all State, Federal, Occupational Safety and Health Administration, Bay Area Air Quality Management District, Alameda County, and local rules and regulations.

CSN-P-35 Development on sites with known contamination of soil and groundwater shall be regulated to ensure that construction workers, future occupants, and the environment as a whole, are adequately protected from hazards associated with contamination.

CSN-P-41 Occupants of existing and new buildings should be protected from exposure to excessive noise, particularly adjacent to Interstate-80 and the railroad.

CSN-P-42 Developers shall reduce the noise impacts of new development on adjacent properties through appropriate means (e.g. double-paned or soundproof windows, increasing setbacks, etc).

Mitigation Measures

None required.

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3.2 Transportation

This section of the EIR evaluates potential transportation impacts resulting from implementation of the proposed Emeryville General Plan 2030 (General Plan). Impacts are evaluated based upon a comparison between existing conditions and future conditions (year 2030) with the proposed General Plan. The General Plan scenario is also compared against a no growth scenario for year 2030 (No Growth).

ENVIRONMENTAL SETTING

PHYSICAL SETTING

The circulation network serving Emeryville consists of roadways, transit, bicycle and pedestrian facilities. A description of travel characteristics, major transportation facilities and existing travel conditions is provided in the *Emeryville General Plan 2030: Existing Conditions, Opportunities and Challenges Report*; a summary of those key travel characteristics is included in this section.

Travel Characteristics

Journey to work data gathered by the U.S. Census Bureau provides a means of estimating the prevalence of particular transportation modes, or mode split, in a given community. While the journey to work is only one aspect of travel patterns, it is important to understand because commute trips make up the bulk of the traffic during the busiest time of day, the "p.m. peak hour" (rush hour), which largely determines the types of transportation changes that are typically proposed.

Table 3.2-1 summarizes the journey to work data from the U.S. Census. Based on the 2000 U.S. Census, the majority of Emeryville's employed residents commute to work outside of the city.[1] Of the residents that commute to work outside of the city, about 60 percent drive alone, compared to the Bay Area average of 68 percent. About 77 percent of the in-commuters to the city drive alone.

City residents who commute to work outside the city use transit at double the rate of workers commuting into Emeryville (40 percent for Emeryville residents, versus 20 percent for workers commuting to Emeryville). This is influenced by the substantial proportion of residents that are employed in San Francisco, Berkeley or Oakland (the top destinations), which can be easily accessed by public transportation from Emeryville. On the other hand, workers commuting to Emeryville tend to drive to work at higher rates. This is likely due to a lack of transit options at the home end of the trip, trip linkage needs (to run errands), and the availability of free parking by many employers in Emeryville.

Walking and biking to work was substantially higher for those who both live and work in Emeryville than the Bay Area average (32 percent in Emeryville, versus 4 percent in the Bay Area). This is influenced by Emeryville's small size and flat terrain, which make walking and bicycling relatively easy for those who live close to their workplace. In addition, the city has a high rate of

[1] Twenty-eight (28) percent of Emeryville's working residents were employed in Emeryville, of the 72 percent who worked elsewhere, Oakland, San Francisco, and Berkeley were top destinations.

workers who work at home or telecommute: 25 percent in Emeryville, compared with just 4 percent in the region as a whole.

Table 3.2-1: Journey to Work by Mode of Travel

	Emeryville Residents			
Mode	*Work in Emeryville*	*Out-Commuters*	*In-Commuters*	*Bay Area Average*
Work at Home	25 %	n/a	n/a	4 %
Drive Alone	37 %	60 %	77 %	68 %
Transit/Carpool/Other	6 %	40 %	20 %	24 %
Walk	28 %	0.1 %	2 %	3 %
Bicycle	4 %	0.7 %	1 %	1 %

Source: U.S. Census, 2000.

Motor Vehicle Circulation

Emeryville is located in the geographical center of the Bay Area and at the confluence of many of the region's major transportation corridors, primarily I-80 and I-580. The high levels of traffic on Emeryville roadways are due in large part to trips generated by surrounding cities accessing the freeways or trips traveling through on San Pablo Avenue. A large portion of the traffic in Emeryville is also due to nonresident employees and shoppers because Emeryville is a regional job and shopping destination.

The City of Emeryville has barriers to east-west circulation due to the I-80 freeway and the railroad tracks. Streets with the highest average daily traffic (ADT) are those that provide east/west connections across the railroad or provide access to I-80 and I-580 or serve as a parallel route to the freeway. These streets include:

- Powell Street, the east/west roadway providing access to Interstate 80, and the Powell-Christie loop roadway system;
- 40th Street, the east/west roadway providing access to regional shopping destinations, the MacArthur BART station, and to points in Oakland;
- 65th Street, the east/west roadway providing access between San Pablo Avenue and areas east of the railroad tracks to areas west of the railroad tracks
- Frontage Road, a parallel roadway to I-80;
- San Pablo Avenue, a north-south highway (SR 123) operated by Caltrans and a parallel route to the I-80 freeway;
- Shellmound Street, the north-south roadway between the I-80 freeway and the railroad tracks providing access to regional shopping destinations and linking 40th Street to the I-80 freeway via Powell Street and to Aquatic Park in Berkeley, north of Emeryville;
- Christie Avenue, the north-south roadway that parallels Shellmound Street from the Powell-Christie loop system north to 65th Street; and

- Hollis Street, the north-south roadway between the railroad tracks and San Pablo Avenue that provides access to employment destinations in Emeryville and to West Berkeley (north of Emeryville) and West Oakland (south of Emeryville).

Motor Vehicle Level of Service

Level of Service (LOS) is a qualitative assessment of perceived traffic conditions by motorists. LOS generally reflects driving conditions such as travel time and speed, freedom to maneuver, and traffic interruptions. LOS uses quantifiable traffic measures such as average speed, intersection control delay, and volume-to-capacity ratio to determine driver satisfaction. LOS is reported for individual intersections and is designated by a range of letters – "A" represents the most favorable conditions (free flow) and "F" represents the least favorable conditions (jammed with excessive delays). Table 3.2-2 describes the characteristics of each LOS designation for motor vehicle traffic. For purposes of this EIR, intersection and freeway segment LOS was analyzed per the procedures in the Highway Capacity Manual.

Since automobile travel has been the dominant form of transportation, level of service has traditionally been measured for vehicles, with minimal regard to bicycle, pedestrian, and transit conditions. This bias unintentionally but inherently ignores overall mobility and conditions for non-auto road users and perpetuates a system that focuses on expanding auto capacity. A key goal of the proposed Emeryville General Plan 2030 is to ensure the accommodation of multiple travel modes on the existing street network. In order to accomplish this goal, it may be necessary to resist implementing vehicle capacity expansions in key areas where pedestrian conditions would suffer from additional traffic lanes.

The 1987 General Plan utilized LOS D as the desired standard for travel during the peak hours. The proposed Emeryville General Plan 2030 removes LOS as a standard for automobiles. An alternative "Quality of Service" standard that optimizes travel by all transportation modes would then need to be developed and used to measure transportation performance. This standard may result in increased vehicle congestion to balance accommodation of other modes. Since the QOS has not yet been prepared, it is not evaluated in this EIR.

Table 3.2-2 Qualitative Description of Level of Service

Level of Service	*Driver's Perception*
A / B	LOS A / B are characterized by light congestion. Motorists are generally able to maintain desired speeds on two and four lane roads and make lane changes on four lane roads. Motorists are still able to pass through traffic-controlled intersections in one green phase. Stop-controlled approach motorists begin to notice absence of available gaps.
C	LOS C represents moderate traffic congestion. Average vehicle speeds continue to be near the motorist's desired speed for two and four lane roads. Lane change maneuvers on four lane roads increase to maintain desired speed. Turning traffic and slow vehicles begin to have an adverse impact on traffic flows. Occasionally, motorists do not clear the intersection on the first green phase.
D	LOS D is characterized by congestion with average vehicle speeds decreasing below the motorist's desired level for two and four lane roads. Lane change maneuvers on four lane roads are difficult to make and adversely affect traffic flow like turning traffic and slow vehicles. Multiple cars must wait through more than one green phase at a traffic signal. Stop-controlled approach motorists experience queuing due to a reduction in available gaps.

E	LOS E is the lowest grade possible without stop-and-go operations. Driving speeds are substantially reduced and brief periods of stop-and-go conditions can occur on two and four lane roads and lane changes are minimal. At signalized intersections, long vehicle queues can form waiting to be served by the signal's green phase. Insufficient gaps on the major streets cause extensive queuing on the stop-controlled approaches.
F	LOS F represents stop-and-go conditions for two and four lane roads. Traffic flow is constrained and lane changes minimal. Drivers at signalized intersections may wait several green phases prior to being served. Motorists on stop-controlled approaches experience insufficient gaps of suitable size to cross safely through a major traffic stream.

Source: Fehr & Peers and 2000 Highway Capacity Manual

Intersections

Signalized intersection traffic conditions and resulting LOS are determined using the Transportation Research Board's Highway Capacity Manual (HCM) – Special Report 209, (Chapter 16) methodology. This operations analysis uses various intersection characteristics (such as traffic volumes, lane geometry, and signal phasing) to estimate the control delay per vehicle. Control delay is the portion of the total delay attributed to signal operations and includes initial deceleration, queue move up time, stopped delay, and acceleration delay. Using this methodology, the LOS for a signalized intersection is based on the control delay per vehicle measured in seconds. Table 3.2-3 summarizes the relationship between delay and LOS.

All-way stop-controlled and side-street stop-controlled intersections are evaluated using the HCM – Special Report 209 (Chapter 17) methodologies. Operations are defined by the average control delay per vehicle (measured in seconds) for each stop-controlled movement. This incorporates delay associated with deceleration, acceleration, stopping, and moving up in the queue. For side-street stop-controlled intersections, the delay reported in this study is represented for the worst-case minor approach. For all-way stop-controlled intersections the level of service is represented by the average control delay for the whole intersection.

Table 3.2-3: Intersection Level of Service Criteria

Level of Service	*Signalized Intersection Control Delay per Vehicle (Seconds)*	*Stop-controlled Intersection Control Delay per Vehicle (Seconds)*
A	≤ 10.0	≤ 10.0
B	>10.0 and ≤ 20.0	>10.0 and ≤ 15.0
C	>20.0 and ≤ 35.0	>15.0 and ≤ 25.0
D	>35.0 and ≤ 55.0	>25.0 and ≤ 35.0
E	>55.0 and ≤ 80.0	>35.0 and ≤ 50.0
F	>80.0	>50.0

Source: Highway Capacity Manual, 2000.

Freeway Segments

The location where the freeway mainline and an on- or off-ramp intersect is called a ramp junction. A ramp junction is an area where vehicles compete for space as they either merge onto the freeway or diverge from the freeway. In merge areas, upstream traffic competes with vehicles entering the freeway from the on-ramp, and in diverge areas exiting vehicles compete with vehicles continuing on the freeway in the outside lane. These freeway segments are typically evaluated using the HCM – Special Report 209 (Chapter 25) methodologies. This method considers peak hour traffic volumes, free-flow speeds, percentage of heavy vehicles, and the number of travel lanes, as well as the interaction between the merge and diverge areas and the freeway mainline. These factors are used to determine vehicle density, measured in passenger cars per mile per lane.

The freeway segments considered in this study operate at capacity for multiple hours of the day, and vehicle queues extend well beyond the limits of the study area during much of the peak periods. As a result, the HCM methodology does not yield a meaningful result because the inputs do not capture the full extent of the freeway congestion. Under these conditions an alternative method for defining the project's impact to freeway traffic was needed. The volume-to-capacity calculation is used as a secondary (quantifiable) measurement to judge differences in operating conditions with different traffic volumes for the peak hour. The capacities of the study freeway segments were obtained from the 1985 HCM per the Alameda County Congestion Management Agency (ACCMA) requirements. The capacity of 2,000 vehicles per hour per lane was selected as an appropriate approximation of freeway capacity through Emeryville. This capacity is commonly used to estimate freeway capacity and is consistent with previous analyses performed in Emeryville, Oakland, and Berkeley. Table 3.2-4 summarizes the relationship between volume-to-capacity ratios (V/C) and LOS for freeway segments.

Table 3.2-4: Freeway Segment Level of Service Definitions

Level of Service	*Traffic Conditions*	*Upper V / C Threshold*
A	Little or no congestion	0.60
B	Small amount of traffic congestion	0.70
C	Average traffic congestion	0.80
D	High traffic congestion	0.90
E	Very high traffic congestion	1.00
F	Oversaturated, stop-and-go conditions	>1.00

Source: Alameda County Congestion Management Agency and Highway Capacity Manual, 1985.

Existing Daily Vehicle Miles Traveled

The proposed General Plan includes a policy that "encourages development that minimizes Vehicle Miles Traveled (VMT)" (Policy T-P-5). To measure the effectiveness of the General Plan by this measure, average VMT was estimated per trip. This particular measure was used because of the unique characteristics of Emeryville and the effect of the General Plan on these characteristics, particularly the ratio of jobs to employed residents and the mix of retail and non-retail jobs. The ACCMA model was used to determine the average VMT for Emeryville's external trips and internal trips. External trips are defined as those that either begin or end outside the city

limits. Internal trips are those with both an origin and destination within the city limits. Emeryville's overall average VMT per trip can then be estimated by a weighted average of the average VMT for external trips and for internal trips using the percentage of internalization as the weighted factor. This measurement will illustrate the changes likely to occur as Emeryville evolves into a community that provides more work, living, and recreational opportunities; thus, minimizing the need for travel to/from other areas of the Bay Area.

Existing Daily VMT per trip is presented in Table 3.2-5. Daily VMT for internal and external trips were estimated using the Alameda County Congestion Management Agency model for the Year 2005. The balance of internal and external trips was estimated based on the ratio of internal to external trip generation for existing weekday PM peak hour trips. The method for estimating existing weekday PM peak hour trip generation is discussed in the Travel Demand Forecasting sub-section of the Impact Summary section. The Bay Area average VMT per Trip was calculated based on total daily VMT and total daily vehicle trips reported by the Metropolitan Transportation Commission (MTC) for the San Francisco Bay Area.

Table 3.2-5: Existing Vehicle Miles Traveled per Trip Generated in Emeryville

Location	*VMT per Trip*
Emeryville	6.5
Bay Area	8.4

Sources: Alameda County Congestion Management Agency 2005 Model, 2005; Metropolitan Transportation Commission for the San Francisco Bay Area, 2006; and, Fehr & Peers, 2009.

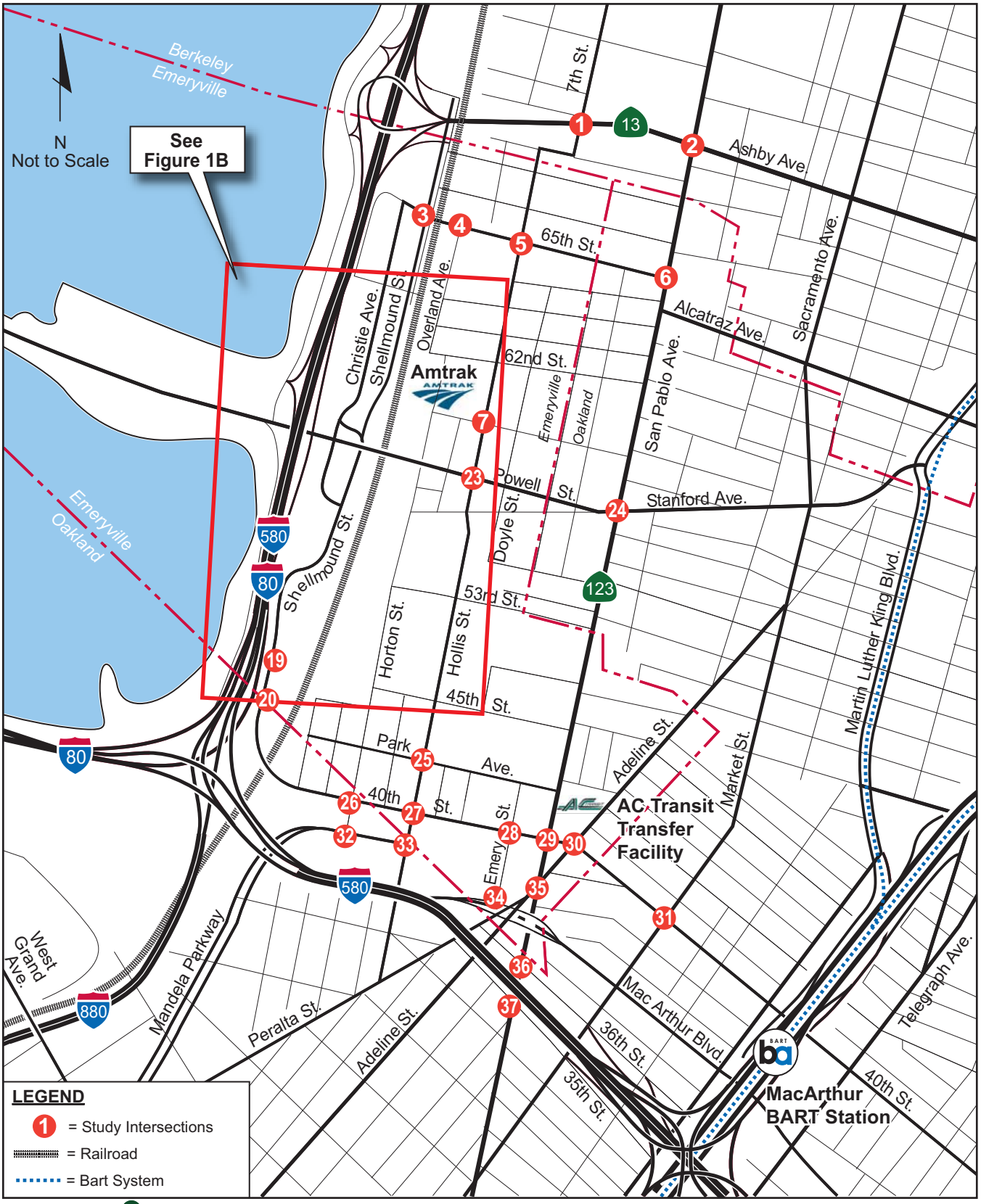
Existing Intersection Operations

Study intersection locations are presented on Figure 3.2-1. These intersections were chosen as those most likely to be potentially impacted by future development, based on a review of intersections evaluated in previous traffic studies in Emeryville. Based on recent analyses conducted in the City of Emeryville, the majority of intersections in the City currently operate at acceptable service levels during the weekday AM peak hour and are projected to do so into the future (except for the Powell Street/Christie Avenue intersection which past studies predict would operate at a deficient LOS E in 2030). Past studies show that the more significant traffic congestion occurs during the weekday PM and Saturday peak hours. So, the analysis focuses on these periods of congestion and not the AM peak hour.

This intersection analysis was completed for the weekday PM peak period (4:00 to 6:00 PM) and the Saturday peak period (2:00 to 4:00 PM). Intersection counts were conducted in January and February 2007 on clear days with area schools in normal session. The peak period intersection turning movement data were collected at the 37 intersections listed below. Saturday afternoon peak period intersection turning movement data were collected at the 22 intersections shown in ***bold italics***:

1. Ashby Avenue/7th Street
2. Ashby Avenue/San Pablo Avenue
3. 65th Street/Shellmound Street/Overland Ave.
4. 65th Street/Overland Avenue
5. 65th Street/Hollis Street
6. 65th Street/San Pablo Avenue
7. 59th Street/Hollis Street
8. I-80 Hook Ramps/Frontage Road
9. Powell Street/Frontage Road
10. Powell Street/I-80 Eastbound Ramps
11. Powell Street/Christie Avenue
12. Shellmound Way/Christie Avenue
13. Shellmound Way/Shellmound Street
14. Powell Street/New Project Driveway
(Future conditions only)
15. Christie Avenue/Shellmound Street
16. Christie Avenue/Powell Plaza
17. Ohlone Street/Shellmound Street
18. Bay Street/Shellmound Street
19. IKEA Exit/Shellmound Street
20. IKEA Entrance/Shellmound Street
21. Christie Avenue/Bay Street
22. Ohlone Street/Bay Street
23. Powell Street/Hollis Street
24. Stanford Street/San Pablo Avenue
25. Park Avenue/Hollis Street
26. 40th Street/Horton Street
27. 40th Street/Hollis Street
28. 40th Street/Emery Street
29. 40th Street/San Pablo Avenue
30. 40th Street/Adeline Street
31. 40th Street/Market Street
32. Mandela Pkwy/Horton Street
33. Yerba Buena Avenue/Hollis Street
34. MacArthur Boulevard/Emery Street
35. Adeline Street/San Pablo Avenue
36. 36th Street/San Pablo Avenue
37. 35th Street/San Pablo Avenue

From the collected data, Fehr & Peers derived the one hour during each count period with the highest measured traffic volumes. Existing peak-hour traffic volumes at the study intersections are provided in Appendix B.



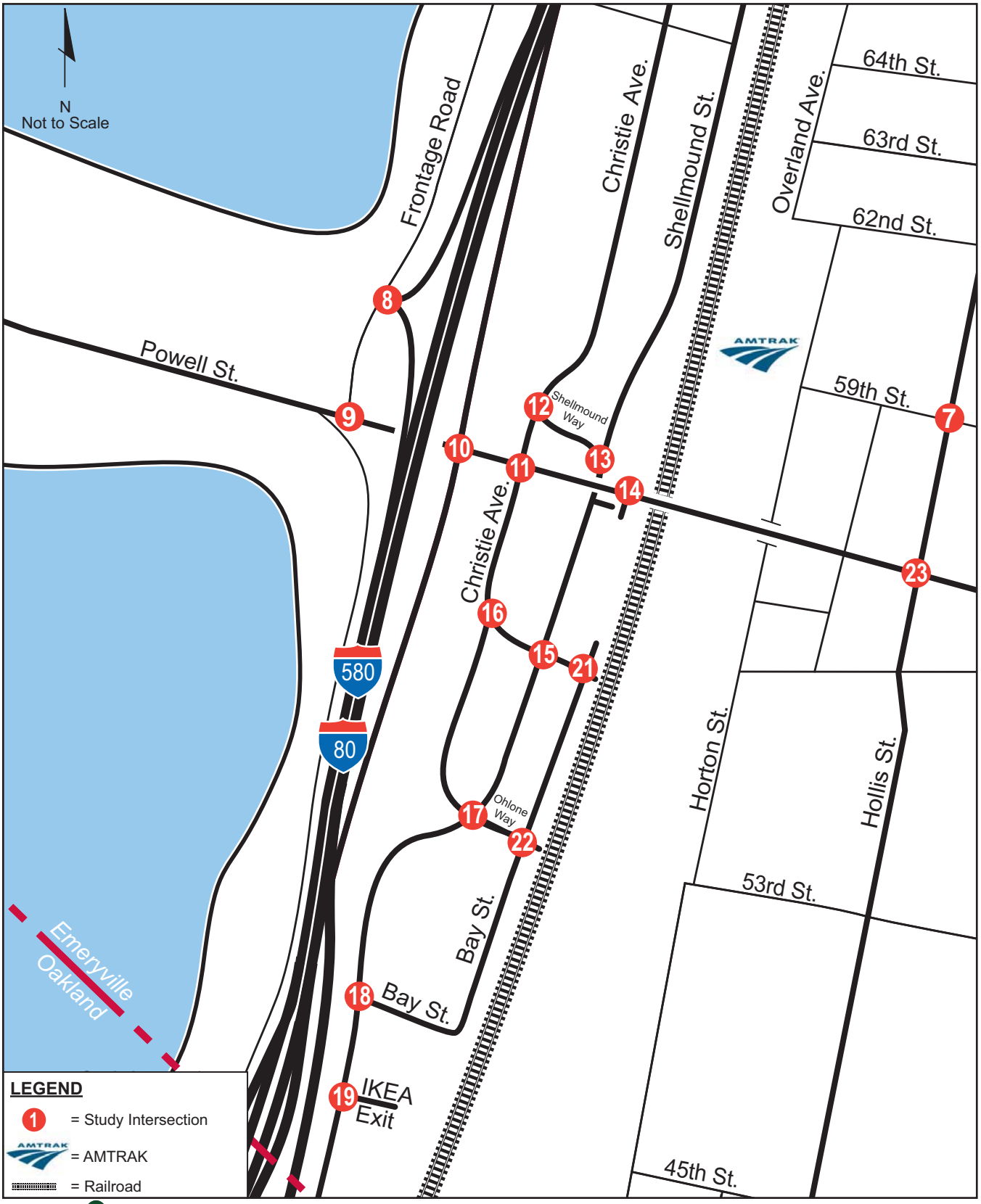
Emeryville General Plan

FEHR & PEERS
TRANSPORTATION CONSULTANTS

January 2009
WC05-2173_StudyInt

STUDY INTERSECTIONS

Figure 3.2-1a



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STUDY INTERSECTIONS

Figure 3.2-1b

Table 3.2-6: Intersection Level of Service, Existing (2007) Conditions

Intersection	*Traffic Control*[1]	*Peak Hour*	*Existing Conditions*	
			Delay[2] *(sec)*	*LOS*[3]
Ashby Avenue/7th Street	Signal	PM SAT	47.8 27.0	D C
Ashby Avenue/San Pablo Avenue	Signal	PM SAT	45.1 29.1	D C
65th Street/Shellmound Street[4]	Signal	PM	30.7	C
65th Street/Overland Avenue[4]				
65th Street/Hollis Street	Signal	PM	21.4	C
65thStreet/San Pablo Avenue	Signal	PM	13.5	B
59th Street/Hollis Street	Signal	PM	12.4	B
I-80 Westbound Ramps/Frontage Road	Signal	PM SAT	36.0 15.3	D B
Powell Street/Frontage Road	Signal	PM SAT	18.1 21.3	B C
I-80 Eastbound Ramps/Powell Street	Signal	PM SAT	**73.1** 45.9	**E** D
Powell Street/Christie Avenue	Signal	PM SAT	37.5 **72.3**	D **E**
Christie Avenue/Shellmound Way	Signal	PM SAT	11.0 18.3	B B
Shellmound Street/Shellmound Way	Signal	PM SAT	20.6 14.2	C B
Powell Street/Site B Entrance[5]	N A.	PM SAT	N A. N A.	N A. N A.
Christie Avenue/Shellmound Street	Signal	PM SAT	33.6 32.8	C C
Christie Avenue/Powell Plaza	Signal	PM SAT	11.2 11.6	B B
Shellmound Street/Ohlone Way	Signal	PM SAT	22.7 16.8	C C
Bay Street/Shellmound Street	Signal	PM SAT	7.9 13.6	A B
Shellmound Street/IKEA Exit	Signal	PM SAT	4.7 15.0	A B

Shellmound Street/IKEA Entrance	Signal	PM SAT	8.4 12.2	A B
Christie Avenue/Bay Street	AWSC	PM SAT	7.5 8.7	A A
Bay Street/Ohlone Way	Signal	PM SAT	8.3 11.3	B B
Powell Street/Hollis Street	Signal	PM SAT	50.6 26.1	D C
Stanford Avenue/San Pablo Avenue	Signal	PM SAT	37.2 30.0	D C
Hollis Street/Park Street	Signal	PM	12.0	B
40th Street/Horton Street	Signal	PM	36.3	D
40th Street/Hollis Street	Signal	PM SAT	30.2 30.5	C C
40th Street/Emery Street	Signal	PM SAT	24.7 27.3	C C
40th Street/San Pablo Avenue	Signal	PM SAT	41.1 39.7	D D
40th Street/Adeline Street	Signal	PM	11.9	B
40th Street/Market Street	Signal	PM	18.9	B
Mandela Parkway/Horton Street	AWSC	PM	**42.2**	**E**
Yerba Buena Avenue/Hollis Street	AWSC	PM	12.4	B
West MacArthur Boulevard/Emery Street	Signal	PM	10.3	B
Adeline Street/San Pablo Avenue	Signal	PM	18.0	B
36th Street/San Pablo Avenue	Signal	PM	13.2	B
35th Street/San Pablo Avenue	Signal	PM	28.1	C

Note: **Bold** indicates unacceptable operations (LOS E or worse based on City's current LOS criteria).

1. AWSC = all-way stop-controlled intersection; Signal = signalized intersection.
2. Average intersection control delay reported for signalized and all-way stop-controlled intersections. Delay in seconds calculated using the 2000 Highway Capacity Manual.
3. LOS = Level of Service
4. These signals are interconnected and function as one intersection, their LOS and delay is combined.
5. This intersection does not currently exist and would be constructed with the Site B development.

Source: Fehr & Peers, 2009.

The majority of intersections operate at LOS D or better during the PM and Saturday peak hours, as shown in Table 3.2-6. The intersection calculation worksheets are available for review at Emeryville City Hall located at 1333 Park Avenue. Three (3) intersections operate at LOS E or LOS F during either peak hour:

- I-80 Eastbound Ramps/Powell Street (PM);
- Mandela Parkway/Horton Street (PM); and,
- Powell Street/Christie Avenue (Saturday).

Existing Freeway Operations

Existing traffic volumes were obtained from the Alameda County Congestion Management Agency. Using the peak-hour volumes and theoretical freeway peak-hour capacities, the volume-to-capacity was calculated and the LOS identified. The inputs and results are shown in Table 3.2-6. Locations operating at LOS F include I-80 and I-580 through Emeryville. While some freeway segments listed in Table 3.2-6 indicate acceptable operations, observations indicate that most freeway segments in the vicinity of Emeryville operate at congested levels due to complex merge, diverge, and weave characteristics.

Table 3.2-7: Freeway Peak-Hour Volume-To-Capacity and LOS Summary Existing Conditions

Freeway Segment	*Direction*	*Lanes*	*Theoretical Capacity*[1]	*AM Peak Hour*			*PM Peak Hour*		
				Existing Volume[2]	*V/C*	*LOS*	*Existing Volume*[2]	*V/C*	*LOS*
I-80 North of SR13/ Ashby Avenue	EB	4	7,800	8,010	**1.03**	**F**	6,740	0.86	D
	WB	4	7,800	6,250	0.80	D	8,110	**1.04**	**F**
I-80 between SR/13 Ashby Avenue – Powell Street	EB	4	7,800	8,040	**1.03**	**F**	6,870	0.88	D
	WB	4	7,800	6,460	0.83	D	8,560	**1.10**	**F**
I-80 between West of I-580	EB	6	11,700	3,820	0.33	A	9,940	0.85	D
	WB	6	11,700	8,730	0.75	C	6,120	0.52	B
I-80 Bay Bridge	EB	5	9500	5,680	0.60	C	12,790	**1.35**	**F**
	WB	5	9500	11,210	**1.18**	**F**	7,690	0.81	D
I-580 between SR 123/San Pablo Avenue – SR 24	EB	5	9,500	4,810	0.51	B	8,220	0.87	D
	WB	5	9,500	8,610	0.91	E	7,000	0.74	C
I-880 South of I-80	NB	3	5,850	3,600	0.62	C	3,710	0.63	C
	SB	3	5,850	3,870	0.66	C	3,640	0.62	C
I-980 between I-880 – SR 24/I-580	EB	2	3,800	2,160	0.57	B	2,970	0.78	D
	WB	3	5,700	4,200	0.74	C	3,120	0.55	B
SR 24 between I-580 – Caldecott Tunnel[3]	EB	2	4,000	3,520	0.88	D	8,260	**1.03**	**F**
	WB	4	8,000	8,760	**1.10**	**F**	5,010	**1.25**	**F**

1. Capacities in vehicles per hour (vph) from ACCMA model for regular, non-HOV lanes.
2. Source: Alameda Congestion Management Agency, 2005 PM Peak Hour Model, v. P07 – non-HOV volumes. Note these volumes are rounded to the nearest ten.
3. These capacities are valid during the AM peak hour. During the PM peak hour, the middle bore of the Caldecott Tunnel is reversed, giving 2 lanes/8,000 vph of capacity to the EB direction and 2 lanes/4,000 vph capacity to the WB direction.

Source: Fehr & Peers, 2009.

Public Transit

Several public transit options serve the city, including the Emery Go-Round shuttle to the MacArthur BART station, the 72 Rapid Bus on San Pablo Avenue, several other AC Transit bus routes, and commuter trains at the Amtrak station. Amtrak also operates buses between Emeryville and San Francisco, but non-train passengers are not allowed to ride those buses. There are two transit hubs in Emeryville including the Amtrak station and the San Pablo Avenue/40th Street intersection. These locations serve multiple transit options and provide convenient transfer points between options.

- AC Transit provides regular bus service within Alameda and portions of Contra Costa counties. Buses operate on varying headways (period of time between buses) of 10 to 60 minutes during weekdays and weekends. Routes include direct service to the San Francisco Transbay Bus Terminal, MacArthur BART, and Downtown Oakland.
- Emery Go-Around is a privately funded free bus service that provides connections between major retail, residential, hotel, college, and employment centers and the MacArthur BART station. Buses operate on weekdays and weekends on varying headways of generally 10 to 12 minutes during weekday commute hours.
- Amtrak provides frequent inter-regional and intra-regional travel to destinations throughout California and the West Coast, including destinations along the Capitol Corridor, a frequent commuter rail service between Sacramento and San Jose. The Emeryville Amtrak station is a staffed station with trains operating on weekdays and weekends.

Key characteristics of transit service in Emeryville are that:

- Much of the City is within walking distance of at least one transit line, providing a typical degree of transit coverage in the core Bay Area cities;
- Emery Go-Round provides excellent service to/from the MacArthur BART station for commuters, but the service is not designed for local travel within Emeryville for non-commute trips;
- Local service is frequent for casual transit use, with intervals of 10 to 60 minutes, depending on the time of day;
- Local service is generally reliable except for routes through the Powell-Christie loop system and along San Pablo Avenue where vehicle congestion can cause buses to bunch;
- A gap in the transit service exists for east-west travel because 40th Street is the only corridor that has regular transit service through Emeryville;
- All routes are accessible to wheelchair passengers; and
- Bicycles are allowed on AC Transit and Amtrak trains.

Pedestrian Circulation

The City's pedestrian network consists of sidewalks, multi-use paths, and street crossings. Emeryville has many areas that seem especially conducive to walking for recreation and transportation, particularly in the neighborhoods east of the railroad tracks and north of 40th Street, such as Park Avenue District, the Hollis Street corridor, the San Pablo Avenue corridor, and the Doyle Street Greenway. Even in these areas there are large blocks such as the Pixar and Novartis campuses that act as barriers to walking, and there are some areas of Emeryville that have no sidewalks.

Sections of the city between the I-80 freeway and the railroad tracks are characterized by long north-south blocks and limited east-west connections, particularly over the freeway and railroad barriers. The City has invested in east-west connections such as the 40th Street Bridge across the railroad tracks and the pedestrian bridge at the Amtrak station. Pedestrian enhancements of

existing east-west connections include Powell Street under the I-80 freeway and 65th Street across the railroad tracks. The City is currently in design for another pedestrian bridge across the railroad tracks at the Bay Street shopping district. A freeway crossing is being planned at 65th Street and the proposed General Plan calls for a railroad crossing north of Powell Street. The City has also commissioned studies to improve the existing pedestrian crossing of the Powell Street Bridge.

In California, it is legal for pedestrians to cross any street, except at unmarked locations between immediately adjacent signalized crossings or where crossing is expressly prohibited. Marked crossings reinforce the location and legitimacy of a crossing. In pedestrian-friendly cities, crossing locations are treated as essential links in the pedestrian network.

The Bay Trail, a regional pedestrian and bicycle route that will eventually encircle San Francisco Bay, passes through Emeryville. The proposed General Plan encourages the development of spur trails along the Emeryville Crescent and the peninsula, following environmental assessment and appropriate mitigations, as necessary.

Bicycle Circulation

The size, topography, and climate of Emeryville make it an ideal city for bicycling. Bicycles are a convenient means of transportation for short trips, especially those less than two miles in length. According to the U.S. Department of Transportation, one-quarter of all trips in this country are under one mile; about 40 percent of all trips are two miles or shorter. The City of Emeryville has endorsed policies to encourage bicycling as a form of transportation and has implemented changes to roadways for bicyclists. Given that 28 percent of Emeryville's working population is employed in Emeryville, a comprehensive citywide bikeway network and support facilities, such as bicycle parking at employment locations and other destinations, has greatly increased the mode share of bicycling as a form of transportation in Emeryville.

Constraints to bicycling in Emeryville are similar to constraints for motor vehicle and pedestrian traffic, in that east-west circulation is limited and large blocks limit bicycle connectivity. Bicycling and motor vehicle conflicts also occur in the Powell/Christie Loop system because of the dual right-turn lanes and shared left/through lanes which make it difficult for cyclists and drivers to distinguish right-of-way. The existing bikeway network in Emeryville consists of the following routes[2]:

- Class I bicycle paths;
- Class II bicycle lanes;
- Class III bicycle routes; and
- Bicycle Boulevards.

[2] Class I bikeways are separated from motor vehicle traffic, as in the case of an off-street path along the bay frontage and may be shared with pedestrians. Class II bikeways are located on streets and allow bicyclists to utilize a separate lane of travel, usually 5 to 6 feet wide, separated from motor vehicle traffic by a 6-inch white stripe, and include bike lane stencils and signs. Class III bikeways are designated by signs and in some cases a shared-use arrow; cyclists share the travel lane with motor vehicle traffic on these routes. Bicycle Boulevards are modified Class II or III routes in which cars are allowed but bicycles have priority.

REGULATORY SETTING

The City of Emeryville has jurisdiction over all City streets and City-operated traffic signals, while the Cities of Berkeley and Oakland have jurisdiction over local roadway outside the City limits. The California Department of Transportation (Caltrans) has jurisdiction over state facilities including I-80, I-580, SR-24, SR-13 (Ashby Avenue), and SR 123 (San Pablo Avenue). Caltrans also has jurisdiction over on- and off-ramp intersections with local streets such as the traffic signals that control access to and from I-80 at Powell Street. Transit agencies with operations within the City limits are Emeryville Go-Around, AC Transit, and Amtrak.

California Department of Transportation

Caltrans recommends a target LOS at the threshold between LOS C and LOS D for their facilities. If the location under existing conditions operates worse than the appropriate target LOS, then the existing LOS should be maintained.

Alameda County Congestion Management Agency

ACCMA requires that the proposed project impact on the Metropolitan Transportation System (MTS) be addressed. The MTS system in and around Emeryville includes I-80, I-580, SR-24, SR 13 (Ashby Avenue), Powell Street, and SR 123 (San Pablo Avenue).

Metropolitan Transportation Commission

The majority of federal, state, and local financing available for transportation projects is allocated at the regional level by the MTC, the transportation planning, coordinating, and financing agency for the nine-county Bay Area. The current regional transportation plan, known as Transportation 2030, was adopted by MTC on February 23, 2005. Transportation 2030 specifies a detailed set of investments and strategies throughout the region from 2005 through 2030 to maintain manage and improve the surface transportation system. The Plan specifies how anticipated federal, state, and local transportation funds will be spent in the Bay Area during the next 25 years. Most of this "committed funding" will go toward protecting the region's existing transportation infrastructure.

Bay Area Air Quality Management District

The Bay Area Air Quality Management District (BAAQMD) is the regional agency with the authority to develop and enforce regulations for the control of air pollution throughout the Bay Area. The Clean Air Plan is BAAQMD's plan for reducing the emissions of air pollutants that lead to ozone. BAAQMD has also published CEQA Guidelines for the purpose of evaluating the air quality impact of projects and plans. One of the criteria that the Guidelines describe is that plans, including General Plans, must demonstrate reasonable efforts to implement transportation control measures (TCM) included in the Clean Air Plan that identify local governments as the implementing agencies. Table 3.9-4 in Section 3.9: Air Quality, lists the transportation policies identified in the proposed General Plan that are consistent with the TCM recommended by BAAQMD to reduce vehicle trips and miles. On-road motor vehicles are the largest source of air pollution in the Bay Area. To address the impact of vehicles, the California Clean Air Act requires air districts to adopt, implement, and enforce TCM.

IMPACT ANALYSIS

SIGNIFICANCE CRITERIA

Impacts of buildout of the proposed General Plan would be significant if they:

- Cause an increase in traffic that is substantial in relation to the existing traffic load and capacity of the street system (i.e., result in a substantial increase in either the number of vehicle trips, the V/C ratio for freeways, or congestion at intersections);
- Exceed, either individually or cumulatively, an LOS standard established by the county Congestion Management Agency (AACMA) or City of Emeryville for designated roads or highways;
- Substantially increase hazards due to a design feature (i.e., sharp curves or dangerous intersections);
- Result in inadequate emergency access;
- Result in inadequate parking capacity; or
- Conflict with adopted policies, plans, or programs supporting alternative transportation.

Based on the transportation impact criteria used in previous environmental documents for the City, the above general significance criteria are interpreted as follows in evaluating the proposed General Plan:

Intersection Impact Criteria (City Intersections)

The City's current level of service standard is LOS D. Based on existing CEQA and City of Emeryville standards, the project would have a significant impact on traffic if one of the following conditions occurs due to the addition of project traffic.

1. The addition of project traffic degrades an intersection currently operating at LOS D or better to LOS E or LOS F.
2. The addition of project traffic degrades intersections currently operating LOS E to F.
3. The addition of project traffic causes the average vehicle delay to increase by more than four seconds at an intersection operating at LOS E or LOS F.

Freeway Impact Criteria

The project would have a significant impact on traffic if one of the following conditions occurs due to the addition of project traffic.

1. The addition of project traffic causes a freeway segment's operation (based on vehicle density) to degrade from LOS E or better to LOS F.

2. At locations where the freeway segment's operations cannot be calculated because vehicle densities are outside the density calculation parameters, the addition of project trips causes a five percent change in the volume-to-capacity calculation.

Design Review Considerations

A roadway design impact is considered significant when:

1. A project introduces a design feature that presents safety concerns.

Emergency Access Impact Criteria

An emergency vehicle access impact is considered to be significant if it would:

1. Provide inadequate design features to accommodate emergency vehicle access and circulation; or
2. Cause a substantial decrease in travel speeds on primary emergency response routes such that emergency vehicles would be significantly delayed.

Pedestrian Impact Criteria

A pedestrian impact is considered significant if it would:

1. Disrupt existing pedestrian facilities;
2. Interfere with planned pedestrian facilities; or
3. Creates inconsistencies with adopted pedestrian system plans, guidelines, policies or standards.

Bicycle Impact Criteria

A bicycle impact is considered significant if it would:

1. Disrupt existing bicycle facilities;
2. Interfere with planned bicycle facilities;
3. Conflict or create inconsistencies with adopted bicycle system plans, guidelines, policies or standards; or
4. Not provide secure and safe bicycle parking in adequate proportion to anticipated demand.

Transit Impact Criteria

A transit impact is considered significant if it would:

1. Result in development that is inaccessible to transit riders.

METHODOLOGY & ASSUMPTIONS

Three scenarios are evaluated for purposes of this EIR:

- Existing (2007) Conditions, which represents transportation conditions in 2007;
- Future (2030) Conditions with Emeryville General Plan 2030 (General Plan), representing a future scenario if the Draft General Plan land uses are implemented; and

- Future (2030) Conditions with No Growth (No Growth), representing a future scenario if growth in regional trips occurred along with reasonably foreseeable development adjacent to Emeryville as well as development that has already been approved in Emeryville, but no additional growth in Emeryville.

Impacts are assessed based upon comparison between existing (2007) conditions and future with General Plan (Year 2030). Impacts are also assessed between future with No Growth conditions (Year 2030) and future with General Plan (Year 2030) conditions.

Planned Transportation Changes

The Draft General Plan balances all travel modes by organizing streets and other transportation facilities according to "typologies" which consider context and prioritize travel modes for each street. The transportation system is shown by mode on Figure 3.2-2 (Street System), Figure 3.2-3 (Transit System), Figure 3.2-4 (Pedestrian System), Figure 3.2-5 (Bay Trail), and Figure 3.2-6 (Bicycle System).

Assumptions were also made regarding site access for the Gateway and Bay Street Site B development sites including the addition a fourth leg to the Christie Avenue/Shellmound Street intersection with the Gateway site, and a new signalized intersection on Powell Street (east of Christie Avenue) with access to Site B. As noted in Figure 3.2-2, Christie Avenue is shown to extend from Powell Street through the existing Powell Street Plaza site to Shellmound Street opposite Ohlone Way. The north end of Christie Avenue is shown to extend north of 65th Street to 66th Street where it would terminate. For this EIR, the new Christie Avenue alignment is assumed to be two-way consistent with the overall Christie Avenue and Shellmound Street corridors.

Figure 3.2-2

STREET SYSTEM

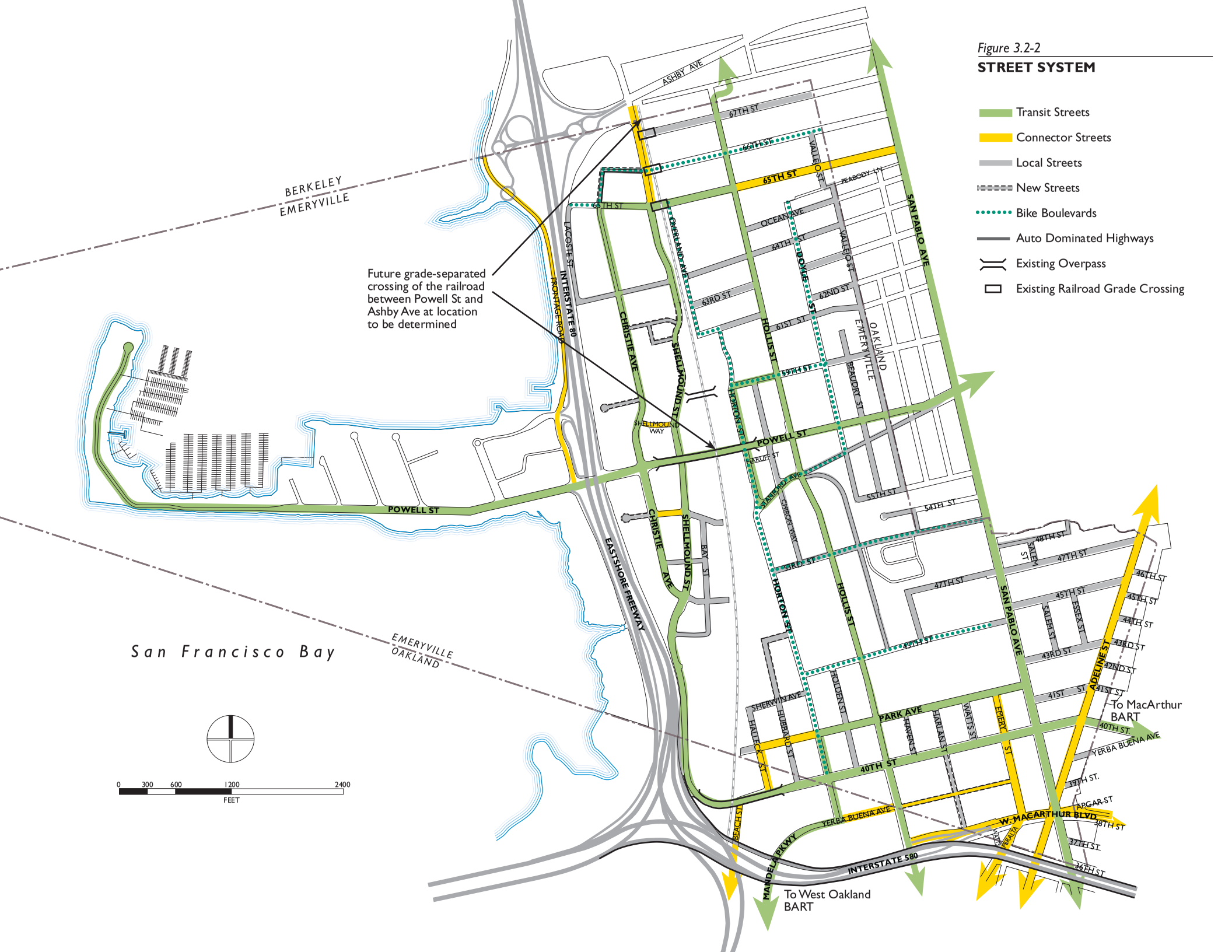


Figure 3.2-3

TRANSIT SYSTEM

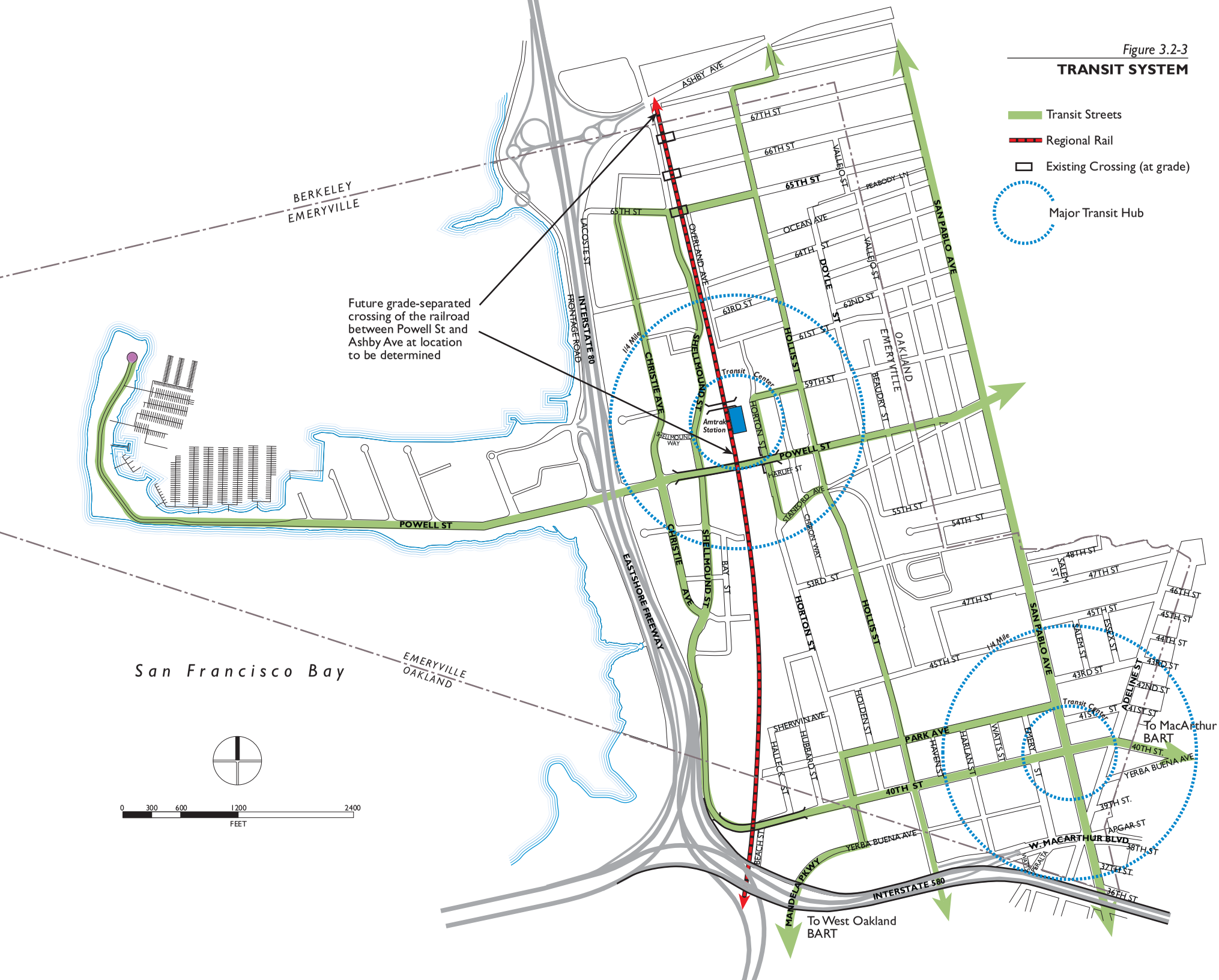


Figure 3.2-4

PEDESTRIAN SYSTEM

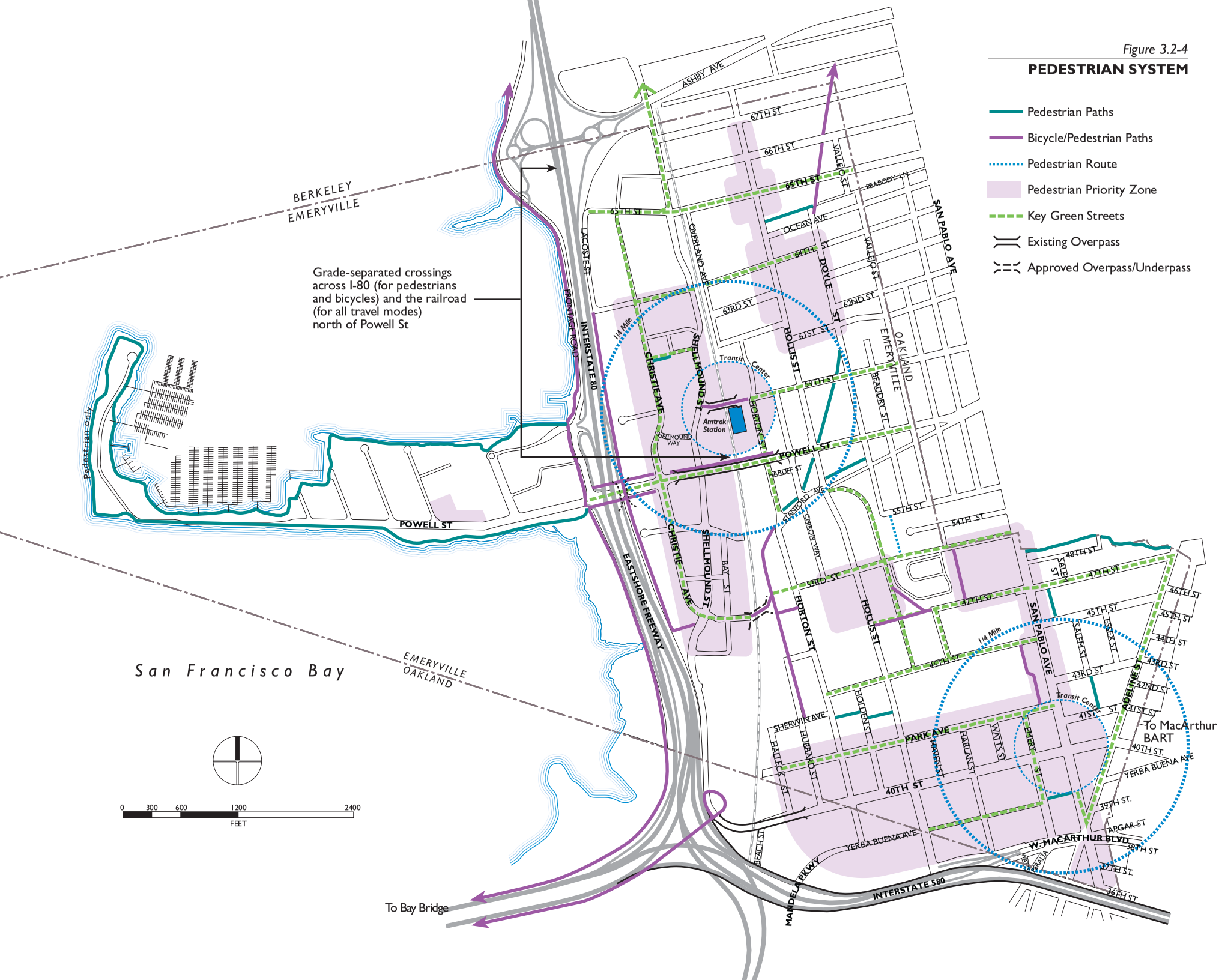


Figure 3.2-5

BAY TRAIL

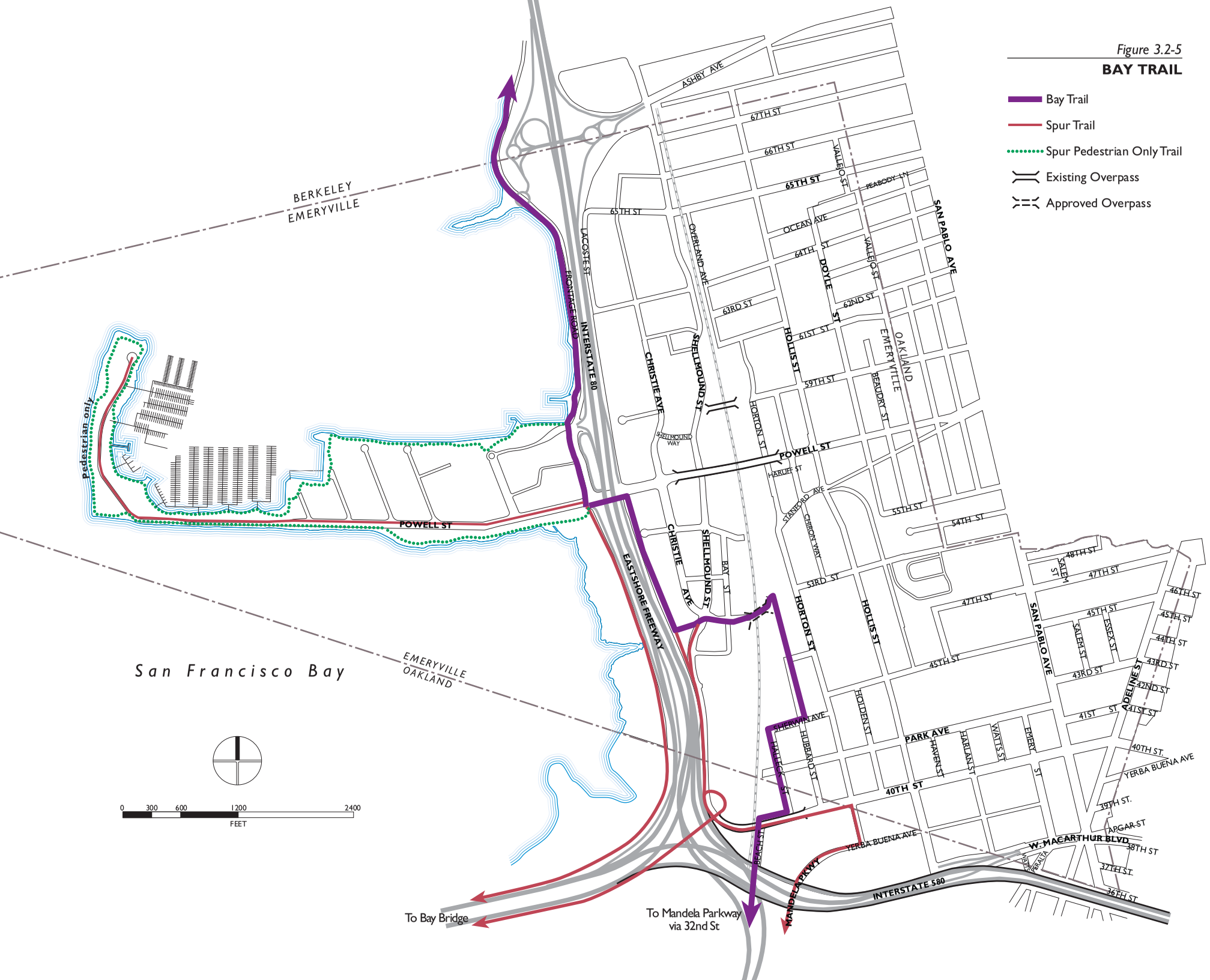
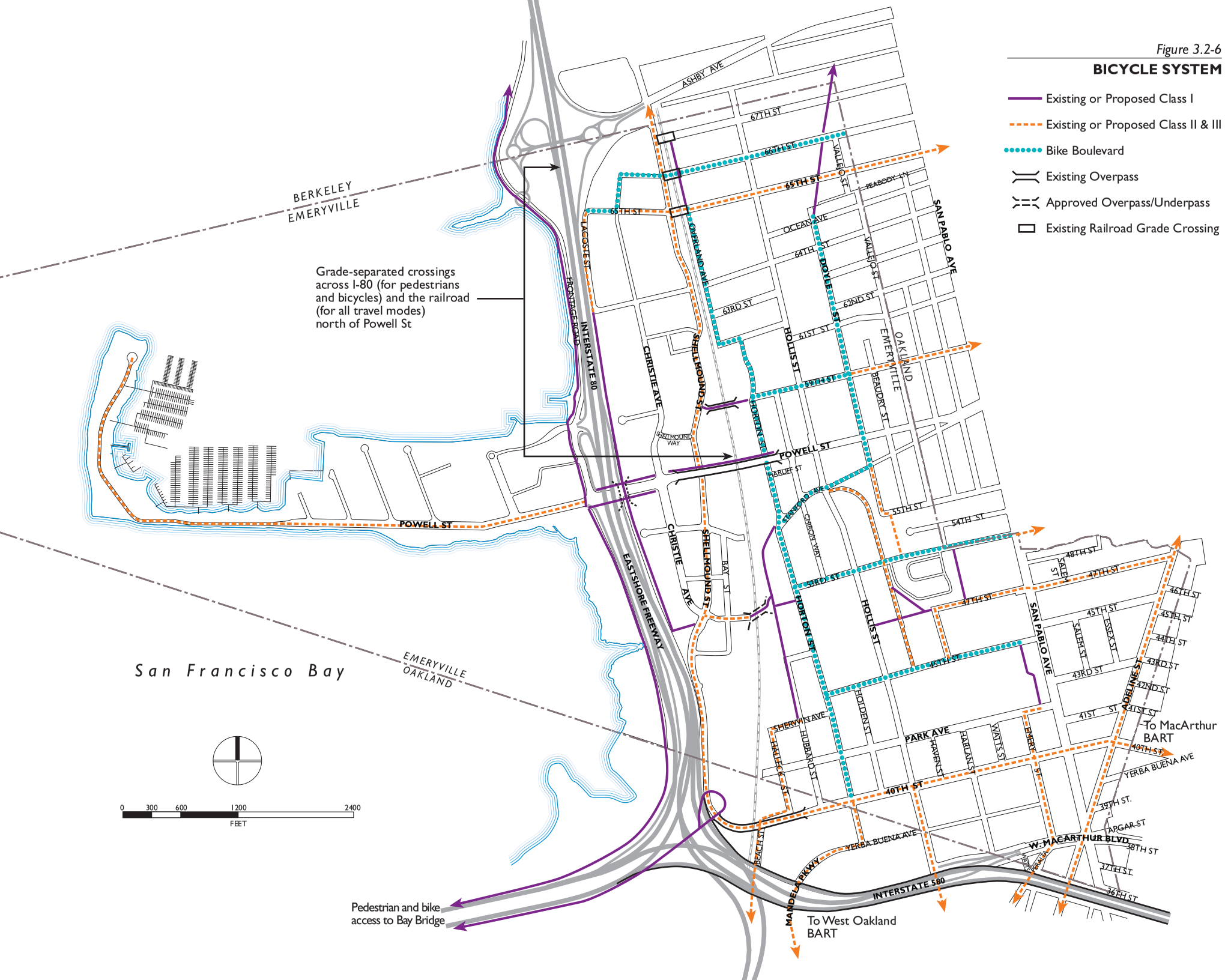


Figure 3.2-6

BICYCLE SYSTEM



Travel Demand Forecasting

City of Emeryville's Traffix database was updated to provide improved city-wide travel demand forecasting as part of continued planning efforts to address transportation infrastructure needs and assist in the update of the City's General Plan. The database uses the traditional 4-step model to forecast vehicle trips. The process begins with the mode choice step and the trip generation step, which involves estimating the number of vehicle trips that would occur with the proposed General Plan. The mode choice step is the tool for reducing vehicular trips as discussed in the Trip Generation section below. The third step is distributing the vehicular trips to various internal and external gateways, followed by assigning the vehicle trips to the roadway network. The trip generation step is the most complex piece of the trip forecasting methodology in this analysis due to the unique characteristics of Emeryville and the plans for its continued redevelopment.

Trip Generation

The database includes vehicle trip generation that is based on the trip rates published in *Trip Generation*, a publication of the Institute of Transportation Engineers (ITE) (7th Edition, 2003). The publication derives average trip rates by land use type for daily and peak hour travel demand. Many of the studies used in the publication were conducted in suburban locations that do not exhibit the urban form that is present in Emeryville and will be more prevalent in 2030 with the General Plan buildout.

Previous versions of the Emeryville Traffix database included reductions for alternative mode use (typically 5 percent), but no reductions for internalization i.e., vehicle trips that stay within Emeryville. The database did account for vehicle trip reductions for retail and restaurant pass-by trips (see Table 3.2-8). These are vehicle trips that are already on the roadway that pass-by the site being studied. Retail and restaurant pass-by trip reductions are based on the *Trip Generation Handbook* (2nd Edition, 2004). The updated Traffix database retains the same retail and restaurant pass-by reductions, but includes updates to internalization and alternative mode use reductions.

Table 3.2-8: Vehicular Trip Reductions for Retail and Restaurant Pass-by Trips

Retail Type	*Peak Hour*	*Reduction*
Shopping Center	PM	30%
	SAT	15%
Restaurant	PM	40%
	SAT	40%

Source: Trip Generation Handbook (2nd Ed.), ITE, 2004.

Alternative mode use was estimated using the latest Census data from the Year 2000. Table 3.2-9 presents the vehicular trip reductions for alternative mode use. While these values reflect commute trips, they were also applied to non-work trips because insufficient data is available with respect to mode share for non-work trips in Emeryville.

Table 3.2-9: Vehicular Trip Reductions for Alternative Mode Use

Mode	*Reduction*
Transit	11%
Walk & Bike	4%

Note: These values represent a weighted average of all work trips to, from, and in Emeryville.

Sources: US Census, 2000; and Fehr & Peers, 2009.

The citywide internalization reduction is the result of an analysis of the 4Ds, a methodology for estimating travel demand impacts from land-use and urban design changes. The methodology uses a set of elasticity factors that relate a neighborhood's built environment characteristics and regional accessibility to the amount of vehicular travel generated in the neighborhood. These factors are used to compute the percentage change in vehicle trips resulting from different land-use plans and urban designs. The method's name derives from the four factors used to characterize the built environment and regional accessibility: density of each land use (i.e., dwelling units per acre), diversity of land use types (i.e., balance of housing and jobs), design of the transportation network (i.e., sidewalk coverage), and destinations (i.e., regional connectivity of the transportation network) or the 4Ds. The methodology has been developed by Fehr & Peers under contract to Criterion Planners/Engineers for use in Criterion's INDEX models, including the U.S. EPA version known as Smart Growth INDEX and is presented in the technical memorandum *Index ® 4D Method: A Quick-Response Method of Estimating Travel Impacts from Land-Use Changes* (October 2001).

The 4Ds method uses land use data (provided by Dyett & Bhatia) for existing Year 2007 conditions and future Year 2030 conditions. The percentage change in internalization is based on comparing the future (2030) land use scenarios to the existing (2007) land use characteristics. Internalization is presented in Table 3.2-10.

Table 3.2-10: Internalization Results

Scenario	*Internalization Estimate*
Existing	30%
2030 No Growth Scenario	31%
2030 General Plan	37%

Source: Fehr & Peers, 2009.

Using available traffic and land use data, about 30 percent of Emeryville's vehicle trip generation remains within the city limits. The 4Ds analysis results indicate that the internalization will increase to about 31 percent in the future (2030) No Growth alternative. Implementation of the General Plan will increase the internalization to about 37 percent.

Table 3.2-11 summarizes the trip generation estimates for the General Plan and the No Growth scenarios. Although the General Plan (Project) produces more trips when compared to the No Growth condition, the former shows more variation in non-vehicular trips on weekdays. The General Plan is projected to reduce the proportion of vehicle trips in each time period category and, in turn, to increase the proportion of transit and/or walking and biking trips. The trip generation shown in Table 3.2-10 is predicated on the Emery Go-Round and AC Transit providing similar service headways as today.

Table 3.2-11: Net Change in Citywide Trip Generation Compared to Existing Conditions

Mode	*Time Period*	*Existing Conditions*	*Increase from Existing Conditions for Scenario*	
			No Growth	*General Plan*
Automobile	Weekday	133,000	27,500	61,000
	Weekday PM	11,410	2,950	5,650
	Saturday Afternoon	9,130	1,760	4,470
Transit	Weekday	19,700	4,700	10,400
	Weekday PM	2,030	430	870
	Saturday Afternoon	1,600	230	690
Walk/Bike (excludes walking or biking to/from transit)	Weekday	10,800	2,800	6,200
	Weekday PM	1,090	250	510
	Saturday Afternoon	940	190	410

Source: Fehr & Peers, 2009.

Trip Distribution

The distribution of vehicular trips to locations external to city was based on an analysis of the Alameda County Congestion Management Agency model at the development of the Traffix database several years ago. The set of external vehicular trip distribution in the Traffix database was verified during the update process. The Traffix database was updated to reflect trip distribution where both a trip origin and trip destination was assumed to be in Emeryville. This was accomplished by calculating trip internalization for each Traffic Analysis Zone (TAZ) using the previously referenced factors and then balancing the distribution of that traffic between the City's TAZs so that each trip origin matched a trip destination within the City.

Trip Assignment

Each trip link (TAZ and gate) is assigned one or more paths in the Traffix database. The model then computes the number of trips on each path and calculates the total number of trips at each movement at each study intersection.

The internal trips that have both a trip start and trip end in the same zone were not assigned to the roadway network. These trips are highly prone to be non-motorized because each zone is only a few blocks wide and because Emeryville is a relatively pedestrian-friendly and bike-friendly city, especially within the designated TAZs, and the city is planning to improve its walk-ability and bike-ability through the General Plan.

With the culmination of trip assignment, the Traffix database was used to generate traffic volume forecasts so that future roadway impacts resulting from implementation of the City's proposed General Plan can be determined.

SUMMARY OF IMPACTS

This section describes the potential impacts on the transportation system resulting from buildout of the land uses described in the proposed Emeryville General Plan 2030.

Motor Vehicle Circulation

Emeryville has been transformed from an industrial center to a thriving hub of high-tech jobs, regional shopping destinations, and quality urban housing. Being located in the geographical center of the Bay Area and at the confluence of many of the region's major transportation corridors, Emeryville is well positioned to foster a sustainable community with great connectivity to the region that surrounds it. Emeryville's central location and high connectivity also serve through trips (trips with neither an origin nor destination in Emeryville).

Through traffic on surface streets represents about 34 percent of all vehicle trips entering and exiting Emeryville. These trips are concentrated on the major corridors through Emeryville including Powell Street via the Powell Street interchange and Frontage Road, and San Pablo Avenue through the City. Through traffic also uses to some extent 40th Street/Shellmound Street and Hollis Street as alternatives to the freeway system.

Poor intersection operations, discussed in a subsequent section, will generate substantial vehicle queues that increase travel time along the San Pablo Avenue corridor and through the Powell Street / Christie Avenue loop system including Christie Avenue, Shellmound Street, and Powell Street.

Future Vehicle Miles Traveled

Daily VMT for trips originating and/or ending in Emeryville were estimated using the Alameda County Congestion Management Agency model for the Year 2035. The balance of internal and external trips was estimated based on the ratio of internal to external trip generation as determined through the trip mode choice and generation, distribution, and assignment process.

The results are summarized in Table 3.2-12 and show that the VMT per trip originating and/or ending in Emeryville will reduce from 6.5 miles to 6.0 miles in 2030 with the General Plan, representing an eight percent reduction over current conditions for Emeryville-related VMT. The eight percent reduction achieved by Emeryville is in contrast to the two percent increase in Bay Area VMT per Trip expected to occur by 2030. Emeryville VMT is expected to be about 30% less than the Bay Area VMT with the General Plan.

Table 3.2-12: Vehicle Miles Traveled per Trip

Location Scenario	*Year*	*VMT per Trip*
Emeryville Existing	2005	6.5
Emeryville with No Growth	2030	6.5
Emeryville with General Plan	2030	6.0
Bay Area	2005	8.4
Bay Area	2030	8.6

Sources: Alameda County Congestion Management Agency 2005 Model, 2005; Metropolitan Transportation Commission for the San Francisco Bay Area, 2006; and, Fehr & Peers, 2009.

Future (2030) Intersection Operations

Traffic forecasts at the study intersections were derived for two future scenarios including:

- Future (2030) Conditions with General Plan, representing a future scenario if the Draft General Plan is implemented along with regional trips and foreseeable development adjacent to Emeryville; and

- Future (2030) Conditions with No Growth, representing a future scenario if growth in regional trips occurred along with reasonably foreseeable development adjacent to Emeryville as well as development that has already been approved in Emeryville, but no additional growth in Emeryville.

LOS was calculated at each study intersection (shown in Figure 3.2-1 and Table 3.2-13). The intersection traffic forecasts and associated lane geometries used to calculate LOS are provided in Appendix B. The LOS results are shown in Table 3.2-13 for the weekday PM and Saturday afternoon peak hours. The intersection calculation worksheets are available for review at Emeryville City Hall located at 1333 Park Avenue.

Significant impacts would occur at nine (9) study intersections because operations would deteriorate from acceptable LOS D or better (per 1987 General Plan) under existing conditions to an LOS E or F under future conditions with the General Plan:

- Ashby Avenue/San Pablo Avenue (PM, Saturday) – Berkeley
- 65th Street/Shellmound Street (PM only)
- 65th Street/Overland Avenue (PM Only)
- I-80 Eastbound Ramps/Powell Street (Saturday only)
- Powell Street/Christie Avenue (PM)
- Christie Avenue/Shellmound Street/Ohlone Way (PM, Saturday)
- Powell Street/Hollis Street (PM only)
- 40th Street/Horton Street (PM only)
- 40th Street/San Pablo Avenue (PM, Saturday)

Two locations that currently operate below acceptable conditions would further deteriorate due to the General Plan, increasing delay by more than 4 seconds, resulting in significant impacts.

- Powell Street/Christie Avenue (Saturday)
- Mandela Parkway/Horton Street (PM only) – Oakland

As described in the environmental setting of this section, the proposed General Plan identifies Quality of Service (QOS) as the standard to optimize travel by all modes, in place of LOS. Since the QOS methodology has not yet been developed, it is not evaluated in this EIR.

Table 3.2-13: Intersection Level of Service, Future (Year 2030) Conditions

Intersection	*Traffic Control*[1]	*Peak Hour*	*Existing Conditions*		*2030 No Growth Alternative*		*2030 General Plan*	
			Delay[2] *(sec)*	*LOS*[3]	*Delay*[2] *(sec)*	*LOS*[3]	*Delay*[2] *(sec)*	*LOS*[3]
Ashby Avenue/7th Street	Signal	PM	47.8	D	51.0	D	53.7	D
		SAT	27.0	C	28.5	C	29.9	C
Ashby Avenue/San Pablo Avenue	Signal	PM	45.1	D	**69.1**	**E**	**82.9**	**F**
		SAT	29.1	C	**55.6**	**E**	**55.7**	**E**
65th Street/Shellmound Street[4] 65th Street/Overland Avenue[4]	Signal	PM	30.7	C	52.9	D	**58.8**	**E**
65th Street/Hollis Street	Signal	PM	21.4	C	41.0	D	43.4	D
65thStreet/San Pablo Avenue	Signal	PM	13.5	B	15.6	B	16.4	B
59th Street/Hollis Street	Signal	PM	12.4	B	13.6	B	15.6	B
I-80 Westbound Ramps/Frontage Road	Signal	PM	36.0	D	36.0	D	37.8	D
		SAT	15.3	B	16.6	B	18.5	B
Powell Street/Frontage Road	Signal	PM	18.1	B	19.1	B	17.4	B
		SAT	21.3	C	21.4	C	21.9	C
I-80 Eastbound Ramps/Powell Street	Signal	PM	**73.1**	**E**	**73.1**	**E**	**74.5**	**E**
		SAT	45.9	D	46.2	D	**66.0**	**E**
Powell Street/Christie Avenue	Signal	PM	37.5	D	39.7	D	**60**	**E**
		SAT	**72.3**	**E**	**75.9**	**E**	**156**	**F**
Christie Avenue/Shellmound Way	Signal	PM	11.0	B	11.0	B	20.6	C
		SAT	18.3	B	18.1	B	22.7	C
Shellmound Street/Shellmound Way	Signal	PM	20.6	C	20.6	C	24.8	C
		SAT	14.2	B	15.8	B	23.3	C
Powell Street/Site B Entrance[5]	Signal	PM	N A.	N A.	N A.	N A.	5.3	A
		SAT	N A.	N A.	N A.	N A.	5.8	A
Christie Avenue/Shellmound Street	Signal	PM	33.6	C	33.6	C	36.9	D
		SAT	32.8	C	33.6	C	19.4	B
Christie Avenue/Powell Plaza	Signal	PM	11.2	B	11.2	B	11.2	A
		SAT	11.6	B	11.6	B	8.6	A
Shellmound Street/Ohlone Way	Signal	PM	22.7	C	24.8	C	**83**	**F**
		SAT	16.8	C	17.7	B	**250**	**F**
Bay Street/Shellmound Street	Signal	PM	7.9	A	7.9	A	11.4	B
		SAT	13.6	B	13.6	B	13.6	B

Intersection	*Traffic Control*[1]	*Peak Hour*	*Existing Conditions*		*2030 No Growth Alternative*		*2030 General Plan*	
			Delay[2] *(sec)*	*LOS*[3]	*Delay*[2] *(sec)*	*LOS*[3]	*Delay*[2] *(sec)*	*LOS*[3]
Shellmound Street/IKEA Exit	Signal	PM	4.7	A	4.7	A	5.3	A
		SAT	15.0	B	15.0	B	15.0	B
Shellmound Street/IKEA Entrance	Signal	PM	8.4	A	8.4	A	9.3	A
		SAT	12.2	B	12.2	B	12.2	B
Christie Avenue/Bay Street	AWSC	PM	7.5	A	7.9	A	28.0	C
		SAT	8.7	A	9.5	A	28.3	C
Bay Street/Ohlone Way	Signal	PM	8.3	B	44.3	D	29.8	C
		SAT	11.3	B	42.7	D	37.6	D
Powell Street/Hollis Street	Signal	PM	50.6	D	**63.7**	**E**	**86.8**	**F**
		SAT	26.1	C	26.6	C	31.9	C
Stanford Avenue/San Pablo Avenue	Signal	PM	37.2	D	39.0	D	47.2	D
		SAT	30.0	C	31.4	C	34.2	C
Hollis Street/Park Street	Signal	PM	12.0	B	13.6	B	49	D
40th Street/Horton Street	Signal	PM	36.3	D	40.9	D	**91.8**	**F**
40th Street/Hollis Street	Signal	PM	30.2	C	37.8	D	45.3	D
		SAT	30.5	C	31.0	C	33.2	C
40th Street/Emery Street	Signal	PM	24.7	C	25.7	C	32.3	C
		SAT	27.3	C	29.3	C	39.0	D
40th Street/San Pablo Avenue	Signal	PM	41.1	D	53.4	D	**56.7**	**E**
		SAT	39.7	D	41.8	D	**57.7**	**E**
40th Street/Adeline Street	Signal	PM	11.9	B	13.1	B	26.0	C
40th Street/Market Street	Signal	PM	18.9	B	19.5	B	25.2	C
Mandela Parkway/Horton Street	AWSC	PM	**42.2**	**E**	**68.2**	**F**	**159.6**	**F**
Yerba Buena Avenue/Hollis Street	AWSC	PM	12.4	B	13.0	B	15.4	C
West MacArthur Boulevard/Emery Street	Signal	PM	10.3	B	13.9	B	15.2	B
Adeline Street/San Pablo Avenue	Signal	PM	18.0	B	24.0	C	29.3	C
36th Street/San Pablo Avenue	Signal	PM	13.2	B	14.3	B	21.4	C
35th Street/San Pablo Avenue	Signal	PM	28.1	C	33.4	C	35.7	D

Note: **Bold** indicates unacceptable operations (LOS E or worse based on City's current LOS criteria).

1. AWSC = all-way stop-controlled intersection; Signal = signalized intersection.
2. Average intersection control delay reported for signalized and all-way stop-controlled intersections. Delay in seconds calculated using the 2000 Highway Capacity Manual.
3. LOS = Level of Service
4. These signals are interconnected. Since these two intersections function as one, their LOS and delay is combined.
5. This intersection does not currently exist and would be constructed with the Project.

Source: Fehr & Peers, 2009.

Future (2030) Freeway Operations

Traffic forecasts at the study freeway segments are shown on Table 3.2-14 (AM) and Table 3.2-15 (PM) along with the volume-to-capacity calculations. As noted in the table, eastbound I-80 and eastbound SR-24 are expected to operate at unacceptable levels in 2030 under either the No Growth or the General Plan alternatives. While some freeway segments listed in Table 3.2-14 and Table 3.2-15 indicates acceptable operations, the freeway system in the vicinity of Emeryville is expected to operate at congested levels due to complex merge, diverge, and weave characteristics.

Table 3.2-14: Freeway Segment LOS Summary – Year 2035 AM Peak Hour

Freeway Segment	*Direction*	*Lanes*	*Theoretical Capacity*[1]	*2035 No Growth*			*2035 With General Plan*		
				AM Volume[2]	*V/C*	*LOS*	*AM Volume*[2]	*V/C*	*LOS*
I-80 North of SR13/ Ashby Avenue	EB	4	7,800	8,410	**1.08**	**F**	8,530	**1.09**	**F**
	WB	4	7,800	10,900	**1.40**	**F**	11,080	**1.42**	**F**
I-80 between SR/13 Ashby Avenue – Powell Street	EB	4	7,800	8,140	**1.04**	**F**	8,140	**1.04**	**F**
	WB	4	7,800	10,440	**1.34**	**F**	10,600	**1.36**	**F**
I-80 between West of I-580	EB	6	11,700	10,150	0.87	D	10,180	0.87	D
	WB	6	11,700	4,960	0.42	B	5,000	0.43	B
I-80 Bay Bridge	EB	5	9,500	15,710	**1.65**	**F**	15,810	**1.66**	**F**
	WB	5	9,500	7,530	0.79	D	7,590	0.80	D
I-580 between SR 123/San Pablo Avenue – SR 24	EB	5	9,750	6,100	0.63	C	6,140	0.63	C
	WB	5	9,750	9,930	**1.02**	**F**	10,060	**1.03**	**F**
I-880 South of I-80	NB	3	5,850	5,130	0.88	D	5,230	0.89	D
	SB	3	5,850	4,940	0.84	D	5,000	0.85	D
I-980 between I-880 – SR 24/I-580	EB	2	3,800	2,570	0.68	C	2,570	0.68	C
	WB	3	5,700	4,940	0.87	D	4,940	0.87	D
SR 24 between I-580 – Caldecott Tunnel[3]	EB	4	8,000	6,360	0.79	D	6,440	0.81	D
	WB	4	8,000	11,770	**1.47**	**F**	11,920	**1.49**	**F**

NOTE: **Bold** indicates unacceptable operations under ACCMA LOS standards.

1. Capacities in vehicles per hour (vph) from ACCMA model for regular, non-HOV lanes.
2. Source: Alameda Congestion Management Agency, 2005 PM Peak Hour Model, v. P07 – non-HOV volumes. Note these volumes are rounded to the nearest ten.
3. These capacities assume the construction of the fourth bore of the Caldecott Tunnel.

Source: Fehr & Peers, 2009.

Table 3.2-15: Freeway Segment LOS Summary – Year 2035 PM Peak Hour

Freeway Segment	*Direction*	*Lanes*	*Theoretical Capacity*[1]	*2035 No Growth*			*2035 With General Plan*		
				PM Volume[2]	*V/C*	*LOS*	*PM Volume*[2]	*V/C*	*LOS*
I-80 North of SR13/ Ashby Avenue	EB	4	7,800	10,760	**1.38**	**F**	10,910	**1.40**	**F**
	WB	4	7,800	9,360	**1.20**	**F**	9,580	**1.23**	**F**
I-80 between SR/13 Ashby Avenue – Powell Street	EB	4	7,800	10,760	**1.38**	**F**	10,890	**1.40**	**F**
	WB	4	7,800	8,390	**1.08**	**F**	8,390	**1.08**	**F**
I-80 between West of I-580	EB	6	11,700	7,380	0.63	C	7,440	0.64	C
	WB	6	11,700	11,060	0.95	E	11,100	0.95	E
I-80 Bay Bridge	EB	5	9,500	10,080	**1.06**	**F**	10,200	**1.07**	**F**
	WB	5	9,500	16,450	**1.73**	**F**	16,530	**1.74**	**F**
I-580 between SR 123/San Pablo Avenue – SR 24	EB	5	9,750	9,420	0.97	E	9,510	0.98	E
	WB	5	9,750	8,240	0.84	D	8,350	0.86	D
I-880 South of I-80	NB	3	5,850	4,360	0.75	C	4,490	0.77	D
	SB	3	5,850	5,140	0.88	D	5,230	0.89	D
I-980 between I-880 – SR 24/I-580	EB	2	3,800	2,860	0.75	C	2,860	0.75	C
	WB	3	5,700	4,310	0.76	D	4,310	0.76	D
SR 24 between I-580 – Caldecott Tunnel[3]	EB	4	8,000	10,600	**1.32**	**F**	10,720	**1.34**	**F**
	WB	4	8,000	8,850	**1.11**	**F**	9,040	**1.13**	**F**

NOTE: **Bold** indicates unacceptable operations under ACCMA LOS standards.

1. Capacities in vehicles per hour (vph) from ACCMA model for regular, non-HOV lanes.
2. Source: Alameda Congestion Management Agency, 2005 PM Peak Hour Model, v. P07 – non-HOV volumes. Note these volumes are rounded to the nearest ten.
3. These capacities assume the construction of the fourth bore of the Caldecott Tunnel.

Source: Fehr & Peers, 2009.

Public Transit

As Emeryville has transformed, much of its development has been built to be transit supportive and these developments fund a private transit system (Emery Go-Round) that provides free bus service from Emeryville to the McArthur BART Station. Being located in the geographical center of the Bay Area with a staffed Amtrak station that serves San Francisco and within short distance of the MacArthur BART, the Bay Bridge, Berkeley, and Downtown Oakland and at the confluence of many of the region's major transportation corridors, Emeryville is well positioned to foster a sustainable community with great connectivity to the region that surrounds it.

Improved transit service and connections to/from/through Emeryville are essential to providing a competitive alternative to the automobile. Emeryville and the surrounding areas could not support the development of the Project if all the new residents, employees, and shoppers use private automobiles. Emeryville will need to invest in dedicated transit infrastructure if the prominence of transit is expected to continue and to grow.

Pedestrian and Bicycle Circulation

Biking and walking will be vital to the continued success of Emeryville. Emeryville's efforts through the General Plan will result in the city fostering a more walkable, bikable, and ultimately, a more attractive city. These attributes will foster the sense of destination for those who live, recreate, and do business in Emeryville.

Implementation of the General Plan will have a beneficial impact on pedestrian and bicycle circulation and access. The General Plan would encourage bicycle and pedestrian access by placing complementary uses (housing, shopping, offices, transit facilities) within walking or bicycling distance of each other, and by providing a relatively fine-grained system of local streets and access ways.

Alameda County Congestion Management Agency MTS Roadway Analysis (non-CEQA Discussion)
This section outlines the ACCMA roadway analysis, which considers the impact of the Project on freeways, major arterials, and other major roadways in Alameda County. Main items of discussion include the geographic scope of the ACCMA roadway analysis, the analysis method, and the results for 2015 and 2035. Impacts to the transit system, including BART and AC Transit, are discussed above.

ACCMA does not have a policy for determining a threshold of significance for Level of Service for the Land Use Analysis Program of the Congestion Management Program (CMP). Professional judgment should be applied to determine the significance of project impacts (Please see chapter 6 of the 2003 CMP for more information). In addition, the adopted 2003 CMP requires the use of the 1985 Highway Capacity Manual for freeway capacity standards.

As requested by the ACCMA in previous analyses in Emeryville, freeway and surface street segments in Emeryville and other areas of Alameda County were analyzed:

- I-80/I-580 (3 segments)
- I-580 (1 segment)
- I-880 (3 segments)
- I-980 (1 segment)
- SR 24 (1 segment)
- SR 13/Ashby Avenue (2 segments)
- Powell Street (2 segments)
- San Pablo Avenue (4 segments)

The ACCMA model was used to forecast 2015 and 2035 traffic volumes on the MTS roadway system. The forecasts for the MTS system differ from the intersection forecasts previously discussed because the land use data sets used for the intersection forecasts and the MTS forecasts are different. The intersection forecasts, which are used to assess project traffic impacts on City of Emeryville intersections, are based on land use data developed by the City of Emeryville, which differs from the data in the ACCMA model. Also, the MTS roadway analysis reports the outputs of the ACCMA model directly on a roadway segment level rather than intersection turning movement. Due to the differences in the land use data and future volume development, the results from the two analyses (intersection and roadway segment) are not directly comparable.

The results of the ACCMA model were used to forecast the No Project condition for 2015 and 2035. Project trips were manually distributed to the MTS roadway segments (including both freeways and surface streets) identified above using the project trip distribution previously discussed. The distribution of project trips onto the MTS segments results in the With Project volumes for 2015 and 2035.

Operations of the MTS freeway and surface street segments were assessed based on V/C calculations. For freeway segments, a per-lane capacity of 2,000 vehicles per hour was used. This capacity is consistent with the 2003 and 2004 Congestion Management Plan documents. For surface streets, a per-lane capacity of 800 vehicles per hour was used. Roadway segments with a V/C ratio greater than 1.0 are assigned LOS F.

The MTS AM and PM peak hour roadway segment analysis under 2015 and 2035 conditions are summarized and on file at Emeryville City Hall, 1333 Park Avenue. The addition of General Plan trips would cause the LOS on some MTS segments to decrease from LOS E to LOS F or cause the volume-to-capacity calculation to increase by more than three percent at locations already at LOS F. Comparing the 2035 No Growth and scenario to the 2035 General Plan scenario, the impacted corridors are limited to Powell Street and San Pablo Avenue. These finding is consistent with the intersection analysis which identified poor intersection operations along both San Pablo Avenue and Powell Street. Refer to the General Plan Policies described in the next sections for ways in which the General Plan will minimize automobile traffic to the greatest extent possible.

IMPACTS AND MITIGATION MEASURES

Impact 3.2-1 Increased motor vehicle traffic between the existing condition and future (2030) with General Plan conditions would result in unacceptable level of service (LOS) at study intersections. *(Significant and Unavoidable)*

Buildout of the land uses envisioned in the Emeryville General Plan would result in significant impacts at the following ten (10) study intersections:

- Ashby Avenue/San Pablo Avenue
- 65th Street/Shellmound Street
- 65th Street/Overland Avenue
- I-80 Eastbound Ramps/Powell Street
- Powell Street/Christie Avenue

- Powell Street/Hollis Street
- Shellmound Street/Christie Avenue/Ohlone Way
- 40th Street/Horton Street
- 40th Street/San Pablo Avenue
- Mandela Parkway/Horton Street

Proposed General Plan Policies that Reduce the Impact

T-P-3 A "Quality of Service" standard that seeks to optimize travel by all transportation modes shall be developed and used to measure transportation performance. The City does not recognize "Level of Service" (LOS) as a valid measure of overall transportation operations, and sets no maximum or minimum acceptable LOS levels, with the exception of streets that are part of the regional Congestion Management Agency network. (These streets may change, but as of 2008 include San Pablo Avenue, Frontage Road, and Powell and Adeline streets). LOS shall not be used to measure transportation performance in environmental review documents or for any other purpose unless it is mandated by another agency over which the City has no jurisdiction (such as Caltrans, Berkeley, Oakland, and the Congestion Management Agency), and then it shall only be used for the purposes mandated by that agency.

T-P-5 The City encourages development that minimizes Vehicle Miles Traveled (VMT).

T-P-7 Additional connections across the railroad and freeway shall be provided as noted in Figures 3-1 through 3-6 in the General Plan.

T-P-22 Safe, secure, and convenient short- and long-term bicycle parking shall be provided near destinations for all users, including commuters, residents, shoppers, students, and other bicycle travelers. Retail businesses in regional retail areas are encouraged to provide valet bicycle parking.

T-P-28 The City will develop and implement transit stop amenities such as pedestrian pathways approaching stops, benches, traveler information systems, shelters, and bike racks to facilitate transit stops as place-making destinations and further the perception of transit as an attractive alternative to driving.

T-P-30 The City supports transit priority on Transit Streets through features such as traffic signal priority, bus queue jump lanes at intersections, exclusive transit lanes, and other techniques as appropriate, with adjustments to technology as conditions change.

T-P-32 The City supports Transit-Oriented Development with reduced parking requirements, and amenities to encourage transit use and increase pedestrian comfort around the Major Transit Hubs at the Amtrak station and the 40th Street/San Pablo Avenue intersection.

T-P-33 The City will advocate for frequent, direct transit service to all points in Emeryville, especially between the east and west sides of town.

T-P-34 The City encourages Amtrak to allow local travel on Amtrak buses that provide service from Downtown San Francisco to the Emeryville Station.

T-P-35 The City will advocate for AC Transit to provide frequent, direct, two-way service between downtown San Francisco and various points within Emeryville.

T-P-36 The City will investigate and implement, if appropriate, fixed guideway transit systems, such as streetcars or personal rapid transit (PRT).

T-P-37 The City supports a new BART line in the East Bay that includes service to Emeryville along the existing regional rail corridor with a stop at Powell Street.

T-P-38 The City will advocate (in the short term) for BART to rename the MacArthur BART station to "North Oakland/Emeryville" to more accurately reflect the station's market area and to help promote awareness of transit service to Emeryville.

T-P-39 The City supports an additional transbay tube that provides for direct commuter rail service between Sacramento and San Francisco via Emeryville.

T-P-45 Quality of life and business viability will be promoted by maintaining an adequate supply of parking to serve growing needs, while avoiding excessive supplies that discourage transit ridership and disrupt the urban fabric.

T-P-47 The City supports parking supply and pricing as a strategy to encourage use of transit, carpools, bicycles, and walking.

T-P-48 Flexible parking standards are encouraged that reflect calculated parking demand for proposed land uses and that allow for appropriate offsets to reduce parking demand and encourage walking, bicycling, carpooling, and transit use.

T-P-49 Employers are encouraged to offer "parking cash out", whereby employees who choose not to drive are offered the cash value of any employee parking subsidy, to be used towards commuting to work by other means.

T-P-50 The City supports public parking strategies, such as variable pricing for on-street and off-street public parking and public use of private garages, to maintain a parking space utilization goal of 85 percent.

T-P-52 The City supports shared parking between multiple uses to the extent possible, and will encourage private property owners to share their underutilized off-street parking resources with the general public.

T-P-55 Development will be required to "unbundle" parking spaces from lease payments and condominium purchases, so that property lessees and buyers can choose whether to pay for parking spaces.

T-P-60 The City will work with local, regional and state agencies, the Chamber of Commerce, and the Transportation Management Association, as well as employers and residents, to encourage and support programs that reduce vehicle miles traveled, such as preferential carpool parking, parking pricing, flexible work schedules, and ridesharing.

T-P-61 Employers in large new developments will be required to implement comprehensive TDM programs for their employees and customers.

T-P-62 The City supports and encourages the expansion of car-sharing programs in Emeryville.

T-P-63 The City supports and encourages conveniently located child care services with flexible hours.

General Plan policies call for extensive expansion of alternative transportation (biking, walking, and transit) in Emeryville, supporting a highly mixed-use urban environment. Because the city is fully built out, undertaking automobile capacity expansion is not feasible without acquiring additional right of way, which will impact existing homes and businesses, and because new bikeways, transit lanes, and sidewalks will compete for the same right of way, compromise the City's ability to expand alternative modes. Expanding automobile capacity is also a disincentive to promoting alternative modes. Therefore, no mitigations are feasible.

Furthermore, as of April 2009, the State of California Office of Planning and Research has proposed to expand traffic analysis beyond an analysis of level of service standards and instead to encompass more holistic measures, which could include VMT[3]; the proposed General Plan will reduce per capita VMT, even though congestion will result in some locations.

Mitigation Measures

No feasible mitigation measures have been identified. **(SU)**

Impact 3.2-2 Increased motor vehicle traffic between the existing condition and future (2030) with General Plan conditions would contribute traffic to freeway segments that are expected to operate at unacceptable level of service (LOS). *(Significant and Unavoidable)*

Buildout of the land uses envisioned in the Emeryville General Plan would result in additional automobile traffic on the freeway system in the vicinity of Emeryville. The freeway system is

[3] See proposed amendments to CEQA Guidelines Appendix G by the State Office of Planning and Research, April 2009: http://www.opr.ca.gov/index.php?a=ceqa/index.html

expected to operate at unacceptable levels for much of the morning and evening peak periods whether or not the General Plan is implemented.

The General Plan identifies several goals and policies to promote and enhance transit use in an effort to minimize the need for automobiles and reduce automobile emissions.

Proposed General Plan Policies that Reduce the Impact

T-P-5	The City encourages development that minimizes Vehicle Miles Traveled (VMT).
T-P-28	The City will develop and implement transit stop amenities such as pedestrian pathways approaching stops, benches, traveler information systems, shelters, and bike racks to facilitate transit stops as place-making destinations and further the perception of transit as an attractive alternative to driving.
T-P-30	The City supports transit priority on Transit Streets through features such as traffic signal priority, bus queue jump lanes at intersections, exclusive transit lanes, and other techniques as appropriate, with adjustments to technology as conditions change.
T-P-32	The City supports Transit-Oriented Development with reduced parking requirements, and amenities to encourage transit use and increase pedestrian comfort around the Major Transit Hubs at the Amtrak station and the 40th Street/San Pablo Avenue intersection.
T-P-33	The City will advocate for frequent, direct transit service to all points in Emeryville, especially between the east and west sides of town.
T-P-34	The City encourages Amtrak to allow local travel on Amtrak buses that provide service from Downtown San Francisco to the Emeryville Station.
T-P-35	The City will advocate for AC Transit to provide frequent, direct, two-way service between downtown San Francisco and various points within Emeryville.
T-P-36	The City will investigate and implement, if appropriate, fixed guideway transit systems, such as streetcars or personal rapid transit (PRT).
T-P-37	The City supports a new BART line in the East Bay that includes service to Emeryville along the existing regional rail corridor with a stop at Powell Street.
T-P-39	The City supports an additional transbay tube that provides for direct commuter rail service between Sacramento and San Francisco via Emeryville.
T-P-42A	The City will work with Caltrans and the City of Berkeley to develop improvements to the Ashby Interchange.

T-P-49 Employers are encouraged to offer "parking cash out", whereby employees who choose not to drive are offered the cash value of any employee parking subsidy, to be used towards commuting to work by other means.

T-P-60 The City will work with local, regional and state agencies, the Chamber of Commerce, and the Transportation Management Association, as well as employers and residents, to encourage and support programs that reduce vehicle miles traveled, such as preferential carpool parking, parking pricing, flexible work schedules, and ridesharing.

T-P-61 Employers in large new developments will be required to implement comprehensive TDM programs for their employees and customers.

T-P-62 The City supports and encourages the expansion of car-sharing programs in Emeryville.

T-P-63 The City supports and encourages conveniently located child care services with flexible hours.

Despite these policies, the freeway system in the city's vicinity will be congested, whether the General Plan is implemented or not. Emeryville is located in the geographic heart of the Bay Area, at the crossroads of regional transportation systems. Promoting development within the Bay Area core area is a central regional objective[4] and an objective of the State as well[5].

Mitigation Measures

No feasible mitigation measures have been identified. (**SU**)

Impact 3.2-3 Increased motor vehicle traffic and increased congestion with the General Plan would result in increased transit travel times on transit corridors. *(Significant and Unavoidable)*

Increased vehicle traffic with the General Plan would result in increased intersection congestion as described under Impact 3.2-1. That congestion would affect several transit corridors, increasing travel times and disrupting the ability of the bus routes using these corridors to maintain reliable headways (time interval between arrivals). The traffic congested areas include:

- San Pablo Avenue corridor
- 40th Street through the San Pablo Avenue area

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[4] See http://www.abag.org/planning/smartgrowth/whatisSG.html, " ..smart growth is development that revitalizes central cities and older suburbs, supports and enhances public transit, promotes walking and bicycling, and preserves open spaces and agricultural lands. Smart growth is not no growth; rather, it seeks to revitalize the already-built environment…"

[5] See, for example, *Climate Change, the California Environmental Quality Act, and General Plan Updates: Straightforward Answers to Some Frequently Asked Questions,* California Attorney General's Office, March 6, 2009, which states that local jurisdictions should in General Plan updates " …[promote] higher density development that focuses growth within existing urban areas; policies and programs to facilitate and increase biking, walking, and public transportation that reduce vehicle miles traveled …"

- 65th Street across the railroad tracks
- Hollis Street through the Powell Street area
- Powell Street corridor
- Powell Street/Christie Avenue loop system
- Shellmound Street corridor

To promote transit as a practical alternative to the automobile; consistent, reliable, and frequent transit service with high frequency headways (such as ten (10) minutes or better) is critical. Potential dedicated transit facilities at highly congested areas would maintain on-time performance and provide a service (for example 5 to 10 minute headways) that would add an additional 4,300 daily riders beyond what this EIR assumed. Likewise, an unreliable service caused by poor on-time performance will likely shift about 1,500 transit riders to other travel modes such as the automobile which in turn would cause greater levels of congestion, further reducing the effectiveness of transit. The General Plan identifies several goals and policies to promote and enhance transit use in an effort to minimize the need for automobiles and reduce automobile emissions.

Proposed General Plan Policies that Reduce the Impact

T-P-30 The City supports transit priority on Transit Streets through features such as traffic signal priority, bus queue jump lanes at intersections, exclusive transit lanes, and other techniques as appropriate, with adjustments to technology as conditions change.

T-P-40 The City supports grade-separated crossings and other appropriate measures to mitigate the impacts of increased rail traffic on Emeryville, including noise, air pollution, and traffic disruption.

T-P-40A The City will undertake a study to enhance transit mobility, including feasibility of transit-only lanes (dedicated, peak-hours only/shared with automobiles at other times, or converted from parking lanes to transit-only during peak hours), especially along congested transit streets, and potentially in the form of a high-frequency loop that would provide walking access from most of the city, and connect major destinations within Emeryville and to BART

T-P-44 The City will establish equal priority to bicycles and public transit (and discourage through-traffic by other modes) on streets in the vicinity of the Amtrak station that are designated as both Transit Streets and Bicycle Boulevards.

The General Plan includes policies to support transit and relieve congestion along transit routes; however, because implementation feasibility of transit-only lanes will be evaluated in more detailed studies and the effect of these policies is not fully known, the impact would remain significant.

Mitigation Measures

No additional (beyond General Plan policies) mitigation measures have been identified. (**SU**)

Impact 3.2-4 Increased transit ridership with the General Plan would result in overcrowding on the Emery Go-Round and AC Transit bus transit systems. *(Less than Significant)*

Buildout of the General Plan would increase in transit ridership by about 900 riders during the weekday PM peak hour and 700 riders during the Saturday afternoon peak hour. For a typical weekday, about 8,700 additional riders would use transit, increasing daily transit ridership on Emery Go-Round to about 12,000 riders. This number represents a 300 percent increase in ridership on the Emery Go-Round. Many of these riders would use Emery Go-Round to also access the MacArthur BART station or AC Transit routes.

Proposed General Plan Policies that Reduce the Impact and Enhance Transit Service

T-P-26 Existing public transit to BART, Amtrak, and regional destinations will be supported, and transit within Emeryville for residents, workers, and visitors will be promoted.

T-P-28 The City will develop and implement transit stop amenities such as pedestrian pathways approaching stops, benches, traveler information systems, shelters, and bike racks to facilitate transit stops as place-making destinations and further the perception of transit as an attractive alternative to driving.

T-P-29 Transit stops will be sited at safe, efficient, and convenient locations, and located appropriately within the right of way.

T-P-30 The City supports transit priority on Transit Streets through features such as traffic signal priority, bus queue jump lanes at intersections, exclusive transit lanes, and other techniques as appropriate, with adjustments to technology as conditions change.

T-P-31 The City will continue to support free and/or subsidized transit for both local travel within the City and travel to the regional hubs located at the Amtrak Station, the MacArthur BART station, and San Pablo Avenue at 40th Street.

T-P-33 The City will advocate for frequent, direct transit service to all points in Emeryville, especially between the east and west sides of town.

T-P-35 The City will advocate for AC Transit to provide frequent, direct, two-way service between downtown San Francisco and various points within Emeryville.

T-P-35A The City will support the expansion of the Emery Go-Round to accommodate workers, residents, visitors, as the city grows.

Mitigation Measures

No mitigation measures would be required. Increased transit ridership would be a beneficial effect of the proposed General Plan. General Plan policies support the expansion of transit services to meet increased demand.

Impact 3.2-5 The General Plan would increase the number pedestrians and bicyclists on the roadways citywide, which could overload existing sidewalks, pedestrian paths and non-motorized multi-use paths, and bicycle parking, and could add pedestrians and bicyclists to locations with unsafe conditions. *(Less than Significant)*

The General Plan relies on walking and bicycling to access transit and replace short automobile trips within Emeryville. With General Plan growth, about 15,800 additional pedestrians and bicyclists would use the City's transportation system during the typical weekday. About 8,700 of these would also access transit.[6] Biking and walking will be vital to the continued success of Emeryville. Emeryville's efforts through the General Plan will result in the City fostering a more walkable, bikable, and ultimately, a more attractive city. These attributes will foster the sense of destination for those who live, recreate, and do business in Emeryville. The General Plan would encourage bicycle and pedestrian access by placing complementary uses (housing, shopping, offices, transit facilities) within walking or bicycling distance of each other, and by providing a relatively fine-grained system of local streets and access ways.

Proposed General Plan Policies that Reduce the Impact and Encourage Bicycle and Pedestrian Trips

T-P-3 A "Quality of Service" standard that seeks to optimize travel by all transportation modes shall be developed and used to measure transportation performance. The City does not recognize "Level of Service" (LOS) as a valid measure of overall transportation operations, and sets no maximum or minimum acceptable LOS levels, with the exception of streets that are part of the regional Congestion Management Agency network. (These streets may change, but as of 2008 include San Pablo Avenue, Frontage Road, and Powell and Adeline streets). LOS shall not be used to measure transportation performance in environmental review documents or for any other purpose unless it is mandated by another agency over which the City has no jurisdiction (such as Caltrans, Berkeley, Oakland, and the Congestion Management Agency), and then it shall only be used for the purposes mandated by that agency.

T-P-8 The pedestrian circulation system shall be as set forth in Figure 3-2 and based on the typologies described in this chapter.

T-P-9 Sidewalks shall be provided on both sides of all streets; pedestrian connections between new and existing development is required.

[6] These estimates do not include automobile drivers who would drive to their destination and then walk to a building. Nor, does it include regional shoppers who would drive to the area (such as Bay Street) and then shop at multiple stores.

T-P-10 The city will plan, upgrade, and maintain pedestrian crossings at intersections and mid-block locations by providing safe, well-marked crosswalks with audio/visual warnings, bulb-outs, and median refuges that reduce crossing widths.

T-P-11 Pedestrian routes will be provided across large blocks, pursuing creative options if necessary such as purchasing private alleys, designating pathways through buildings, and acquiring public access easements.

T-P-12 Establish Pedestrian Priority Zones in Neighborhood Centers, around schools, and in other locations as indicated in Figure 3-2, where wider sidewalks, street lighting, crosswalks, and other pedestrian amenities are emphasized. Link these zones to adjacent land uses to ensure that building frontages respect pedestrians and truck loading takes place on adjacent streets wherever possible.

T-P-13 Walking will be encouraged through building design and ensure that automobile parking facilities are designed to facilitate convenient pedestrian access within the parking area and between nearby buildings and adjacent sidewalks. Primary pedestrian entries to nonresidential buildings should be from the sidewalk, not from parking facilities.

T-P-14 Safe pedestrian walkways that link to streets and adjacent bus stops will be required of new development.

T-P-15 The City will require new development to minimize the number and width of curbcuts for vehicle traffic to reduce vehicle conflicts with pedestrians.

T-P-18 Safe and direct pedestrian access to Aquatic Park and the peninsula will be provided and maintained.

T-P-19 The City will develop the bicycle circulation system set forth in Figure 3-4 and based on the typologies described in this chapter.

T-P-20 The City's preferred Bay Trail route through Emeryville is set forth in Figure 3-3, including the main trail between Frontage Road in Berkeley and Mandela Parkway in Oakland, and spur trails to the Marina along Powell Street and to the Bay Bridge along both sides of Interstate 80.

T-P-21 On-street bike routes in the City's Bicycle and Pedestrian Plan shall be designated as either Class II (bike lanes) or Class III (signed routes without lanes), as appropriate. These designations are not part of the General Plan and may be changed as circumstances dictate.

T-P-22 Safe, secure, and convenient short- and long-term bicycle parking shall be provided near destinations for all users, including commuters, residents, shoppers, students,

and other bicycle travelers. Retail businesses in regional retail areas are encouraged to provide valet bicycle parking.

T-P-23 A numbered bike route system with destination signs, consistent with the regional bike route numbering system shall be developed and implemented with clear signage to bicycle boulevards.

T-P-24 Bicycling will be promoted through public education, including the publication of literature concerning bicycle safety and the travel, health and environmental benefits of bicycling.

T-P-28 The City will develop and implement transit stop amenities such as pedestrian pathways approaching stops, benches, traveler information systems, shelters, and bike racks to facilitate transit stops as place-making destinations and further the perception of transit as an attractive alternative to driving.

T-P-32 The City supports Transit-Oriented Development with reduced parking requirements, and amenities to encourage transit use and increase pedestrian comfort around the Major Transit Hubs at the Amtrak station and the 40th Street/San Pablo Avenue intersection.

UD-P-4 New development will be required to extend the street grid or pedestrian connections wherever possible.

UD-P-11 A pedestrian and bicycle-friendly mixed-use district will be developed in North Hollis, consistent with the policies and guidelines defined in the North Hollis Area Urban Design Program.

UD-P-12 In South Hollis, new development shall provide rights-of-way and greater set-backs where open space and pedestrian connections are planned. Building façades and entries should be oriented toward the Greenway, new open spaces, and the proposed Center of Community Life.

UD-P-16 Streetscape improvements and greater intensity of development will be emphasized to improve the connection between the southwestern portion of the San Pablo Corridor district and the rest of Emeryville to the north.

UD-P-17 Pedestrian character and safety will be enhanced through landscaping and streetscape improvements in the Triangle and Doyle Street Districts.

UD-P-18 The San Pablo Avenue Urban Design Plan will continue to be used to improve landscaping, and streetscape design and guide development in the San Pablo Corridor district.

UD-P-19 The street grid shall be extended as redevelopment on larger sites occurs.

UD-P-20 Full or partial public street closures by private development shall be prohibited. Where a street closure to vehicular traffic is necessary for public projects, as called for in this General Plan, access for pedestrians and bicycles should still be maintained.

UD-P-21 The City shall maintain and enhance an integrated pattern of streets, pedestrian paths, and bike routes through a fine-grain street grid that enables efficient movement throughout the city.

UD-P-22 Opportunities to extend the street grid through internal connections in large-parcel developments should be considered. Single-point access to new development should be avoided.

UD-P-23 The City shall establish Pedestrian Priority Zones in Regional and Neighborhood Centers, around schools, parks, and in other locations as indicated in Figure 5-3. While wider sidewalks, street lighting, bulbed crosswalks, and other pedestrian amenities should be employed throughout the city, they are prioritized in these locations.

UD-P-24 Pedestrian Priority Zones shall be linked to adjacent land uses to ensure that building frontages respect pedestrians and truck loading takes place on adjacent streets wherever possible.

UD-P-27 Visual distinction and safety shall be prioritized in the design of bridges and undercrossings.

UD-P-32 Bulky and monolithic buildings shall be prevented through:

- Vertical articulation, such as step backs at higher floors, and less floor area as heights increase to reduce the apparent bulk of buildings.
- Horizontal articulation, such as varied setbacks, recessions/projections, change in materials, and building transparency, especially in Pedestrian Priority Zones.

UD-P-39 Neighborhood structure and pedestrian scale development should be prioritized. The scale and character of existing neighborhoods should be maintained to ensure connectivity and continuity of street design within each district.

UD-P-40 Minimize pavement widths (curb to curb) to the minimum necessary to ensure traffic flow and safety, to discourage speeding through neighborhood centers and residential areas, and to prioritize pedestrian and bicycle movement.

UD-P-41 Sidewalks shall be safe, comfortable, and accessible for pedestrians.

UD-P-43 Curb cuts shall be minimized to emphasize continuous, unbroken curb lengths.

UD-P-44 Long blocks shall be minimized to allow for ease of pedestrian connectivity.

UD-P-47 A design framework for streetscapes shall be established by district and/or citywide.

UD-P-49 Cohesive streetscape improvements to streets in neighborhood centers, and designated Green Streets are a priority.

UD-P-53 Generous sidewalks, and bikeways or bike lanes along greenways shall be required. Curbside parking and local vehicular access when greenways share right-of-ways with streets shall be permitted.

UD-P-54 Pedestrian-scaled street lighting, street furniture, and undergrounded utilities along greenways shall be required.

UD-P-63 Ground floor uses should be emphasized to facilitate pedestrian use, with standards for building frontage, fenestration, and entries.

UD-P-68 The pedestrian environment shall be enhanced with multiple neighborhood access points, through-streets, and pedestrian pathways.

Mitigation Measures

No mitigation measures would be required. Implementation of the proposed General Plan will have a beneficial impact on pedestrian and bicycle circulation and access.

Impact 3.2-6 Implementation of the proposed General Plan would result in increased demand for motor vehicle parking. *(Less than Significant)*

Buildout of the General Plan would require a substantial investment in off-street parking facilities to reduce the demand for on-street parking and to serve the driving public and to support the economic viability of the proposed development.

Proposed General Plan Policies that Reduce the Impact

The following proposed policies and programs would reduce this impact to a less than significant level by reducing demand through travel demand management programs, and requiring development provide an adequate, yet minimal supply of parking.

T-P-45 Quality of life and business viability will be promoted by maintaining an adequate supply of parking to serve growing needs, while avoiding excessive supplies that discourage transit ridership and disrupt the urban fabric.

T-P-46 Public garages will be provided strategically, in locations convenient and proximate to eventual destinations.

T-P-47 The City supports parking supply and pricing as a strategy to encourage use of transit, carpools, bicycles, and walking.

T-P-48 Flexible parking standards are encouraged that reflect calculated parking demand for proposed land uses and that allow for appropriate offsets to reduce parking demand and encourage walking, bicycling, carpooling, and transit use.

T-P-49 Employers are encouraged to offer "parking cash out", whereby employees who choose not to drive are offered the cash value of any employee parking subsidy, to be used towards commuting to work by other means.

T-P-50 The City supports public parking strategies, such as variable pricing for on-street and off-street public parking and public use of private garages, to maintain a parking space utilization goal of 85 percent.

T-P-52 The City supports shared parking between multiple uses to the extent possible, and will encourage private property owners to share their underutilized off-street parking resources with the general public.

T-P-54 The City supports the expansion of the Residential Permit Parking (RPP) program to ensure adequate parking availability in residential areas, recognizing the need for adequate parking to support neighborhood businesses.

T-P-55 Development will be required to "unbundle" parking spaces from lease payments and condominium purchases, so that property lessees and buyers can choose whether to pay for parking spaces.

Mitigation Measures

No mitigation measures would be required. General Plan policies provide for public and private parking facilities to meet anticipated demand from new development.

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3.3 Hazardous Materials, Toxics, and Safety

This section analyzes the effect of the City of Emeryville General Plan Update on hazardous materials, toxics and safety. It includes a definition of hazardous materials and wastes, an overview of existing contaminated sites within the planning area, a summary of the regulatory framework, and discussion of impacts and mitigation measures.

ENVIRONMENTAL SETTING

HAZARDOUS MATERIALS

Definitions

Materials and waste may be considered hazardous if they are poisonous (toxicity), can be ignited by open flame (ignitability), corrode other materials (corrosivity), or react violently, explode or generate vapors when mixed with water (reactivity). The term "hazardous material" is defined in law as any material that, because of quantity, concentration, or physical or chemical characteristics, poses a significant present or potential hazard to human health and safety or to the environment.[1] In some cases, past industrial or commercial uses on a site can result in spills or leaks of hazardous materials and petroleum to the ground, resulting in soil and groundwater contamination. Federal and state laws require that soils having concentrations of contaminants such as lead, gasoline, or industrial solvents that are higher than certain acceptable levels must be handled and disposed as hazardous waste during excavation, transportation, and disposal. The California Code of Regulations (CCR), Title 22, §66261.20–24 contains technical descriptions of characteristics that would cause a soil to be classified as a hazardous waste. The use of hazardous materials and disposal of hazardous wastes are subject to numerous laws and regulations at all levels of government (see Regulatory Framework below).

Regional Setting

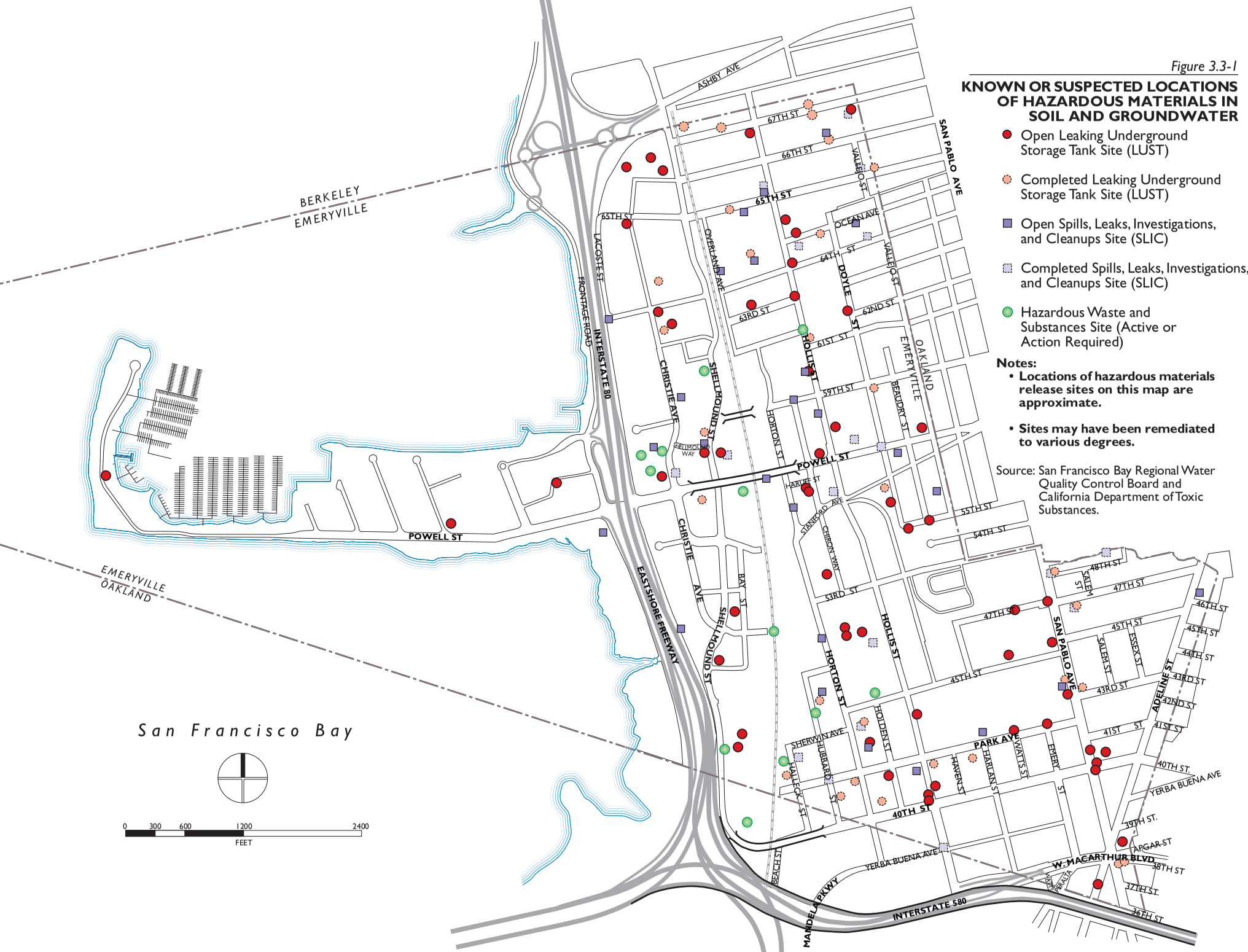
The City of Emeryville includes a mix of uses and includes many areas with a high concentration of historical industrial and manufacturing activities. These areas have been largely converted or will be converted to other uses, such as office, commercial retail, and residential. Hazardous material use, storage, transport, and hazardous waste generation within the city can pose hazards to the public health through improper handling or storage. As a result of the historical industrial use, substantial groundwater and soil contamination is present in many locations throughout the city. The presence of contamination can potentially restrict future development of property and require specialized construction practices. Buffer zones around facilities that use or generate substantial quantities of hazardous material or wastes can avoid land use incompatibility issues in the future.

[1] State of California, Health and Safety Code, Chapter 6.95, Section 25501(o).

Areas where historic or ongoing activities have resulted in the known or suspected release of hazardous materials to soil and groundwater, as identified by the California Department of Toxic Substances (DTSC) and San Francisco Bay Regional Water Quality Control Board (RWQCB), are shown in Figure 3.3-1. These sites are designated as either Leaking Underground Storage Tank (LUST) sites; Spills, Leaks, Investigations, and Cleanups (SLIC) sites; or Hazardous Waste and Substances Sites from the DTSC (see Table 3.3-1 for DTSC sites and Appendix C for RWQCB sites). In addition, there are parcels within the city with residual contamination that are subject to institutional controls or use restrictions based on requirements of either, the RWQCB, DTSC, or the Alameda County Department of Environmental Health (ACDEH).

Figure 3.3-1

KNOWN OR SUSPECTED LOCATIONS OF HAZARDOUS MATERIALS IN SOIL AND GROUNDWATER



- Open Leaking Underground Storage Tank Site (LUST)
- Completed Leaking Underground Storage Tank Site (LUST)
- Open Spills, Leaks, Investigations, and Cleanups Site (SLIC)
- Completed Spills, Leaks, Investigations, and Cleanups Site (SLIC)
- Hazardous Waste and Substances Site (Active or Action Required)

Notes:

- **Locations of hazardous materials release sites on this map are approximate.**
- **Sites may have been remediated to various degrees.**

Source: San Francisco Bay Regional Water Quality Control Board and California Department of Toxic Substances.

Table 3.3-1: EnviroStor Database of Hazardous Waste and Substances Sites

Site / Facility Name	*Site Type*	*Cleanup Status*	*Status Date*	*Address Description*
63RD Street Trunk Sewer Project	VC	No Further Action	9/28/2000	63rd Street
Bay Street Extension	VC	Certified / Operation & Maintenance - Land Use Restrictions	7/9/1997	64th & Powell Streets
BRE Gateway Development	VC	Inactive - Action Required	10/6/2008	5801, 5855 and 5857 Christie Avenue
City of Emeryville Redevelopment Agency	HWNO	Inactive		4650 Shellmound St
Cypress Freeway/Bikeway Project	VC	Active	7/30/1999	Maritime to Shellmound Street
EBMUD	VC	Certified	6/20/1996	4300 Eastshore Highway
Elementis Pigments	VC	Refer: Other Agency	6/25/1998	4650 Shellmound Street
Emeryville Marketplace	SR	Certified / Operation & Maintenance - Land Use Restrictions	11/7/1995	BTW 64th & Powell St on N & S, by HWY 80
IKEA (Former Barbary Coast)	SR	Certified / Operation & Maintenance - Land Use Restrictions	9/19/2000	4300 Eastshore Highway
Interstate Highway 80/Emeryville	VC	Certified	5/1/2007	Interstate 80
Myers Drum - Emeryville	SR	Certified / Operation & Maintenance - Land Use Restrictions	5/11/2001	4500 Shellmound Street
Pacific Gas & Electric CO- Emeryville	VC	Certified / Operation & Maintenance - Land Use Restrictions	11/14/1998	4525 Hollis Street
Powell Street Plaza	SR	Refer: Other Agency	5/10/1994	5500 Eastshore Highway
Shellmound Street	VC	Certified / Operation & Maintenance - Land Use Restrictions	10/1/1996	4300 Eastshore Highway

Table 3.3-1: EnviroStor Database of Hazardous Waste and Substances Sites

Site / Facility Name	*Site Type*	*Cleanup Status*	*Status Date*	*Address Description*
Shellmound Venture Project	VC	Certified / Operation & Maintenance - Land Use Restrictions	4/17/1998	Shellmound Street
Sherwin Williams	SR	Active	2/23/2006	1450 Sherwin Avenue
South Bay Front Site B	VC	Active	11/1/2005	1525-1535 Powell St & 5760-5770 Shellmound St
South Bayfront Project	VC	Certified / Operation & Maintenance - Land Use Restrictions	8/22/2000	4650, 5500, & 5600 Shellmound Street
Southern Pacific Right-of-way Emeryville	SR	Active	1/11/2005	West of 4525 Hollis Street
Technichem INC	HWNO	Active		4245 Halleck St
Technichem, INC.	SR	Active	6/4/2008	4245 Halleck St
Transo/La Coste Site	SR	No Further Action	2/21/1995	1600 64th Street/6401 Bay Street
UPRR Parcel D	VC	Refer: Other Agency	12/28/2007	North of Sherwin Avenue and Halleck St
Westinghouse Electric CO - Emeryville	VC	Active	10/28/2005	5899 Peladeau St

VC – Voluntary Cleanup

SR – State Response

HWNO – Haz Waste – Non-Operating

Source: DTSC, 2008.

REGULATORY FRAMEWORK

Hazardous Materials and Waste Handling

The California Environmental Protection Agency (Cal EPA), DTSC regulates the generation, transportation, treatment, storage, and disposal of hazardous waste. State and federal laws require detailed planning to ensure that hazardous materials are properly handled, used, stored, and disposed of, and in the event that such materials are accidentally released, to prevent or to

mitigate injury to health or the environment. These laws require hazardous materials users to prepare written plans, such as Hazard Communication Plans and Hazardous Materials Business Plans. Laws and regulations require hazardous materials users to store these materials appropriately and to train employees to manage them safely. A number of agencies participate in enforcing hazardous materials management requirements, including DTSC, the RWQCB and the ACDEH.

Throughout Alameda County, a Hazardous Materials Management Plan must be prepared and submitted to the County by businesses that use or store certain quantities of hazardous materials. The Federal Resource Conservation and Recovery Act of 1976 (RCRA) established a "cradle-to-grave" regulatory program for governing the generation, transportation, treatment, storage and disposal of hazardous waste. Under RCRA, individual states may implement their own hazardous waste programs in lieu of RCRA as long as the state program is at least as stringent as Federal RCRA requirements. In California, the DTSC regulates the generation, transportation, treatment, storage, and disposal of hazardous material waste. The hazardous waste regulations establish criteria for identifying, packaging, and labeling hazardous wastes; dictate the management of hazardous waste; establish permit requirements for hazardous waste treatment, storage, disposal, and transportation; and identify hazardous wastes that cannot be disposed of in landfills.

Hazardous Materials Transportation

The United States Department of Transportation regulates hazardous materials transportation on all interstate roads. Within California, the state agencies with primary responsibility for enforcing federal and state regulations and for responding to transportation emergencies are the California Highway Patrol (CHP) and the California Department of Transportation (Caltrans). Together, federal and state agencies determine driver-training requirements, load labeling procedures, and container specifications. Although special requirements apply to transporting hazardous materials, requirements for transporting hazardous waste are more stringent, and hazardous waste haulers must be licensed to transport hazardous waste on public roads.

Soil and Groundwater Contamination

In Alameda County, remediation of contaminated sites is generally performed under the oversight of DTSC, the RWQCB, and/or the ACDEH and/or the City. At sites where contamination is suspected or known to occur, the project sponsor is required to perform a site investigation and draw up a remediation plan, if necessary. For typical development projects, site remediation is completed either before or during the construction phase of the project.

Site remediation or development may also be subject to regulation by other agencies. For example, if dewatering of a hazardous waste site were required during construction, subsequent discharge to the sewer system could require a permit from the East Bay Municipal Utility District (EBMUD), and discharge to the storm water collection system could require an NPDES permit from the RWQCB.

Fuel Storage Tanks

State laws governing underground storage tanks (USTs) and above ground storage tanks (ASTs) specify requirements for permitting, monitoring, closure, and cleanup. Regulations set forth construction and monitoring standards for existing tanks, release reporting requirements, and closure requirements. Generally speaking, the ACDEH is the local agency designated to permit and inspect USTs and to implement applicable regulations. The ACDEH also works in conjunction with the Emeryville Fire Department. A closure plan for each UST to be removed must be prepared and submitted to the County prior to tank removal. ASTs standards and requirements are relatively similar to USTs however the main difference revolves around inspection of operation and the ability to visually detect leaks early on.

EPA Brownfields Program

In 1995, the US EPA initiated a program to help states, communities, and others to redevelop abandoned contaminated land. The program provides grants that support revitalization efforts by funding environmental assessment, cleanup, and job training activities. The City of Emeryville has benefited from the program, which has helped revitalize an area that industry abandoned during the 1970s. As of 2004, more than 10 sites totaling 180 acres have been targeted for cleanup and redevelopment. Initially, the EPA grant money was used to produce a Geographic Information System (GIS) database showing soil and groundwater contamination, assessment findings, planning issues, land use/zoning concerns, and property ownership for the city using available information from over 500 city properties. Some of the results of the data gathering efforts under the program have helped to assess the extent of groundwater contamination throughout the city. The contamination in groundwater was found to be more limited in vertical extent than previously suspected and is limited to the shallow water-bearing zones.

Worker Safety

Occupational safety standards exist in federal and state laws to minimize worker safety risks from both physical and chemical hazards in the work place. The California Division of Occupational Safety and Health (Cal OSHA) and the federal Occupational Safety and Health Administration are the agencies responsible for ensuring worker safety in the workplace.

Cal OSHA assumes primary responsibility for developing and enforcing standards for safe workplaces and work practices. At sites known to be contaminated, a Site Safety Plan must be prepared to protect workers. The Site Safety Plan establishes policies and procedures to protect workers and the public from exposure to potential hazards at the contaminated site.

Emergency Response

California has developed an emergency response plan to coordinate emergency services provided by federal, state, and local government and private agencies. Responding to hazardous materials incidents is one part of this plan. The plan is administered by the State Office of Emergency Services (OES), which coordinates the responses of other agencies, including Cal EPA, CHP, the Department of Fish and Game, the RWQCB, and the local fire department. The Emeryville Fire Department provides first response capabilities, if needed, for hazardous materials emergencies within the city.

Toxic Air Contaminants

Toxic air contaminants (TACs) are airborne substances capable of causing short- and/or long-term adverse human health effects. TACs are emitted from a variety of common sources, including gasoline stations, automobiles, dry cleaners, industrial operations, and truck, train, and automobile traffic. Future development under the General Plan could result in sensitive receptors (i.e., residents, open space users) being located near these sources. Health risks are evaluated through an approach that involves estimating emissions and hazards, then evaluating the risk of exposure. Because TACs are airborne, they are discussed in greater detail in the Air Quality section of this document.

Structural and Building Components

Asbestos

Similar to federal laws, state laws and regulations also pertain to building materials containing asbestos. Inhalation of airborne fibers is the primary mode of asbestos entry into the body, making friable (easily crumbled) materials the greatest health threat. These existing laws and regulations prohibit emissions of asbestos from asbestos-related manufacturing, demolition, or construction activities; require medical examinations and monitoring of employees engaged in activities that could disturb asbestos; specify precautions and safe work practices that must be followed to minimize the potential for release of asbestos fibers; and require notice to federal and local governmental agencies prior to beginning renovation or demolition that could disturb asbestos.

Polychlorinated Biphenyls (PCBs)

PCBs are organic oils that were formerly placed in many types of electrical equipment, including transformers and capacitors, primarily as electrical insulators. Years after widespread and commonplace installation, it was discovered that exposure to PCBs may cause various health effects, and that PCBs are highly persistent in the environment.

In 1979, the U.S. EPA banned the use of PCBs in most new electrical equipment and began a program to phase out certain existing PCB-containing equipment. The use and management of PCBs in electrical equipment is regulated pursuant to the Toxic Substances Control Act (TSCA), 15 U.S.C. § 2601 et seq. Regulations generally require labeling and periodic inspection of certain types of PCB equipment and set forth detailed safeguards to be followed in disposal of such items.

Lead and Lead-Based Paint

Pursuant to California Code of Regulations, Title 22 Section 66261.24, waste soil containing lead is classified as hazardous if the lead exceeds a total concentration of 1,000 parts per million (ppm) and a soluble concentration of 5 ppm.

IMPACT ANALYSIS

SIGNIFICANCE CRITERIA

Implementation of the proposed General Plan would have a potentially significant impact if it would:

- Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials;
- Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment;
- Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school;
- Include hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, create a significant hazard to the public or the environment;
- Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan;
- For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area; or
- Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands.

METHODOLOGY & ASSUMPTIONS

The analysis considered proposed changes and current conditions in the proposed General Plan area, and applicable regulations and guidelines. The proposed General Plan would promote development and growth within Emeryville and its associated Planning Area. Consideration is given to potential historic industrial activities affecting future construction workers and occupants, specifically from soil and groundwater conditions in the project area, in addition to an analysis of potential impacts to future occupants that may result from continuing nearby industrial activities that involve hazardous materials.

SUMMARY OF IMPACTS

The proposed General Plan Update would include the growth and expansion of the city with new residential, commercial, retail, and other non-residential land uses. These new land uses would either replace existing uses or represent a change from a former land use. It is assumed that hazardous materials use would be associated with all land uses to some extent. Where new construction is required, the presence of previous releases of hazardous materials can potentially represent a hazard to the public and workers if disturbed. Similarly if hazardous materials are present within existing structural materials (i.e., asbestos, PCBs, lead-based paint), they can also

become potential hazards if demolition activities are not conducted according to established protocols. Hazardous materials use during construction activities can also be a potential hazard through accidental upset conditions. Finally, the operational phase of proposed new uses can be a potential hazard through accidental upset conditions or improper handling, storage, or disposal. These potential impacts are discussed in more detail below.

There are significance criteria listed above that do not affect the General Plan and therefore, are not discussed further in this EIR. The proposed changes to the General Plan would not affect the ability of rescue vehicles to respond to any emergencies and therefore, would have no impact on the City's emergency response or evacuation plans. Additionally, there is no airport or airstrip within two miles of the City of Emeryville and therefore, there would be no related impact. Finally, the City of Emeryville is located in and surrounded by a developed urban area that is not subject to wildland fires.

IMPACTS AND MITIGATION MEASURES

Impact

3.3-1 New development under the proposed General Plan could disturb and release contaminated soil during demolition, construction, or transportation of excavated material, or release contaminated groundwater which could expose construction workers, the public, or the environment to adverse conditions related to hazardous materials. *(Less than Significant)*

Contaminated Soils and Groundwater: Future development within the Planning Area could include excavation for installation of utilities, building foundations, subterranean development, or for regrading purposes. Disturbance of subsurface soils and groundwater at locations that may have been previously contaminated by prior uses could further disperse existing contamination into the environment and expose construction workers or the public to contaminants.

If significant levels of hazardous materials in excavated soils should go undetected, health and safety risks to workers and the public could occur. Exposure to hazardous materials could cause various short-term and/or long-term health effects. Possible health effects could be acute (immediate, or of short-term severity), chronic (long-term, recurring, or resulting from repeated exposure), or both. Acute effects, often resulting from a single exposure, could result in a range of effects from minor to major, such as nausea, vomiting, headache, dizziness, or burns. Chronic exposure could result in systemic damage or damage to organs, such as the lungs, liver, or kidneys. Health effects would be specific to each hazardous material.

Contamination could also be encountered at any of the identified LUST or SLIC sites or at some other unidentified location where contamination may be present. It is not uncommon to encounter unexpected conditions once groundbreaking activities commence.

There are numerous established protocols available that minimize the potential exposure to workers, the public and the environment. OSHA requirements help protect workers and the environment from exposure to released hazardous materials. In addition, proposed General Plan

policies listed below require that environmental investigations and any required cleanup are conducted prior to construction of new development or redevelopment. These investigations would be able to confirm the presence of hazardous materials in subsurface materials and provide recommendations in coordination with the local overseeing agency to remediate the contamination, if necessary, to safe levels.

Proposed General Plan Policies that Reduce the Impact

CSN-P-32 Prior to reuse, former residential, commercial and industrial sites will be cleaned up, according to relevant State and federal regulations. .

CSN-P-35 Development on sites with known contamination of soil and groundwater shall be regulated to ensure that construction workers, future occupants, and the environment as a whole, are adequately protected from hazards associated with contamination.

Adherence to established local and state regulations, as well as the proposed General Plan policies listed above, ensure the potential impact is less than significant.

Mitigation Measures

None required.

Impact

3.3-2 New development under the proposed General Plan could disturb and release hazardous structural and building components (i.e., asbestos, lead, PCBs, USTs, and ASTs) during demolition and construction phases and could expose construction workers, the public, or the environment to adverse conditions related to hazardous materials handling. *(Less than Significant)*

As discussed above, some of the existing buildings at the project site may contain asbestos, lead-based paint, and/or PCBs.

Asbestos

When disturbed, such as through demolition activities for construction purposes, asbestos fibers can become airborne causing adverse health affects to workers and potentially the public. Asbestos fibers are very small and once inhaled can become lodged into air passageways of the lung eventually causing respiratory complications.

Asbestos could be encountered during structural demolition of the existing buildings and may require containment and disposal. Based on the age of the buildings within the Project Area, it is very likely that some asbestos containing materials (ACMs) are present. Affected buildings would need appropriate abatement of identified asbestos prior to demolition or renovation. ACMs are regulated both as a hazardous air pollutant under the Clean Air Act and as a potential worker safety hazard under the authority of Cal-OSHA. The Bay Area Air Quality Management District (BAAQMD) is vested by the California legislature with authority to regulate airborne pollutants,

including asbestos, through both inspection and law enforcement. The renovation or demolition of buildings containing asbestos would require retaining contractors who are licensed to conduct asbestos abatement work and notifying the BAAQMD ten days prior to initiating construction and demolition activities.

Section 19827.5 of the California Health and Safety Code, adopted January 1, 1991, requires that local agencies not issue demolition or alteration permits until an applicant has demonstrated compliance with notification requirements under applicable federal regulations regarding hazardous air pollutants, including asbestos.

Lead and Lead-based Paint

Demolition and renovation work could create exposure to lead-based paint (LBP) present in building structures. Dust generating activities that include removal of walls, sanding, welding, and material disposal could produce airborne quantities of lead-laden material. These materials could expose workers and persons in close proximity, including occupants of offsite locations. The Project Area contains buildings with painted surfaces, such as drywall, ceilings, and exterior stucco, which could contain LBP.

LBP could be separated from building materials during any demolition processes. Separated paint can be classified as a hazardous waste if the lead content exceeds 1,000 ppm and would need to be disposed of accordingly. Additionally, lead-based paint chips can pose a hazard to workers and adjacent sensitive land uses. Both the federal and California OSHAs regulate all worker exposure during construction activities that impact LBP. Interim Final Rule found in 29 CFR Part 1926.62 covers construction work where employees may be exposed to lead during such activities as demolitions, removal, surface preparation for re-painting, renovation, clean up and routine maintenance. The OSHA-specified method of compliance includes respiratory protection, protective clothing, housekeeping, hygiene facilities, medical surveillance, training, etc.

PCB-containing Materials

PCB-containing materials may be present within the existing structures in the Project Area. As a known carcinogen, exposure to PCBs through inadvertent disturbance could cause adverse health effects. The detection of significant concentrations of PCBs indicates the former use and/or storage of PCBs at the project site. Demolition of these structures could disturb these materials and expose workers or the public to adverse effects. Similar to the concerns of ACMs, an initial survey to determine the presence of PCBs would need to be conducted for a specific site followed by implementation of appropriate measures to handle any materials with PCBs.

Underground Storage Tanks

There are documented USTs within the Project Area. Prior to UST regulations that were established in the 1980's, USTs were commonly installed without any documented record. Therefore, additional undocumented USTs may be encountered during future demolition and grading activities. If encountered, an older UST could expose workers or the public to adverse health effects.

Overall, existing protocols and regulations for demolition of hazardous building materials would address the potential impacts of exposure from asbestos, LBP, PCBs, and USTs. Pre-demolition surveys by licensed contractors are required to sample building materials prior to demolition and if present, include the recommendations for an abatement plan. Abatement must be conducted by licensed contractors who would appropriately protect the workers and the public through personal protective equipment for workers, isolation of work areas, and use of appropriate waste containment. All hazardous waste is required to be transported and disposed of at a licensed disposal facility. In addition, the proposed General Plan policies listed below connect General Plan implementation to existing regulatory agencies and procedures.

Proposed General Plan Policies that Reduce the Impact

CSN-P-33 The City will enforce regulation of local and State laws regarding the production, use, storage, and transportation of hazardous materials and waste.

CSN-P-34 The City requires abatement of lead-based paint and asbestos prior to structural renovation or demolition, and compliance with all State, federal, Occupational Safety and Health Administration, Bay Area Air Quality Management District, Alameda County, and local rules and regulations.

Adherence to established local and state regulations, as well as the proposed General Plan policies listed above, ensure the potential impact is less than significant.

Mitigation Measures

None required.

Impact

3.3-3 New development under the proposed General Plan could release to the environment, through improper handling or storage, hazardous materials used onsite during construction activities (i.e., fuels, lubricants, solvents). *(Less than Significant)*

Any future construction activities would require the use of certain hazardous materials such as fuels, oils, lubricants, solvents, and glues. Inadvertent release of large quantities of these materials into the environment could adversely impact soil, surface waters, or groundwater quality. Larger developments could potentially include onsite storage and/or use of quantities of materials capable of significantly impacting soil and groundwater. The use of construction best management practices (BMPs) is typical of construction and redevelopment projects of this size which are required by city and county requirements as part of construction to minimize the potential negative effects to groundwater and soils. City ordinances and stormwater and control measures as a part of the Alameda Countywide Clean Water Program (ACCWP) NPDES stormwater permit and a Storm Water Pollution Prevention Plan (SWPPP) prepared as a part of General Construction Permit would minimize impacts. The BMPs included in a SWPPP often include the following:

- Following manufacturer's recommendations on use, storage and disposal of chemical products used in construction;
- Avoiding overtopping construction equipment fuel gas tanks;
- During routine maintenance of construction equipment, properly containing and removing grease and oils.
- Properly disposing of discarded containers of fuels and other chemicals.

Proposed General Plan Policies that Reduce the Impact

CSN-P-7 New commercial and industrial activities, as well as construction and demolition practices, shall be regulated to minimize discharge of pollutant and sediment concentrations into San Francisco Bay.

Adherence to existing established regulations, ordinances, and BMPs which have proven effective in minimizing the potential for accidental upset conditions of hazardous materials, in addition to the proposed General Plan policies above, ensure that the potential impact is less than significant.

Mitigation Measures

None required.

Impact

3.3-4 New development under the proposed General Plan could include uses that would handle hazardous materials, and could cause an adverse effect on the environment or the public including any nearby schools through accidental upset or through emissions from operations. *(Less than Significant)*

Redevelopment in the Study Area could include industrial/commercial/retail and residential uses that are likely to handle, store, and transport various hazardous materials and consequently generate hazardous wastes in a range of quantities. In general, current regulations require that all hazardous materials and wastes are stored, handled, and disposed of according to a host of safety requirements that are intended to protect human health and the environment. For general commercial/retail land uses as well as residential uses, hazardous materials are generally handled and transported in relatively small quantities and because the health effects associated with them are generally not as serious as industrial uses, significant adverse effects on the environment are less common. In addition, businesses are required to prepare and submit to the City a Hazardous Materials Business Plan which ensures that employees are adequately trained to handle the materials and provides information on how to respond to accidental upset conditions. Industrial uses are also required to prepare a Hazardous Materials Business Plan and ensure that all employees have adequate safety training.

Proposed General Plan Policies that Reduce the Impact

CSN-P-36 The City supports public awareness and participation in household waste management, control, and recycling.

CSN-P-37 Siting of businesses that use, store, process, or dispose of substantial quantities of hazardous materials shall be carefully restricted in areas subject to very strong levels of ground shaking. (Figure 6-2)

Adherence to established regulatory requirements, in combination with proposed General Plan policies listed above, would ensure the impact is less than significant.

Mitigation Measures

None required.

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3.4 Biological Resources

This section presents the environmental setting and impact analysis for biological resources in the study area, which includes the proposed General Plan Planning Area (the "Planning Area") and the Emeryville city limits.

ENVIRONMENTAL SETTING

PHYSICAL SETTING

The City of Emeryville is located in the Bay Area-Delta Bioregion (as defined by the State's Natural Communities Conservation Program). This Bioregion is comprised of a variety of natural communities, which range from Salt Marshes to Chaparral to Oak Woodlands. Within Alameda County, geographic and climatic variation result in many diverse habitat areas. The majority of Emeryville is developed with few open spaces and very little of the native habitat remains with exception of the Emeryville Crescent. The small number of city parks and open spaces are, for the most part, either landscaped with non-native ornamentals or have been neglected and overrun by exotic and introduced species.

HABITATS

Urban

The majority habitat and vegetation type within the city is urban. Decorative trees, shrubs, and grasses planted along streets and medians and landscaped into residential and commercial properties are common vegetation types throughout the urbanized landscape.

Wildlife Habitat

Urban wildlife habitat primarily consists of mammals like raccoons (*Procyon lotor*), skunks *(Mephitis mephitis)*, opossums *(Didelphus virginiana)*, mice, and rats which often scavenge for human garbage. Some common species of birds include rock dove *(Columbia livia)*, brewer's blackbird (*Euphagus cyanocephalus*), European starling *(Sturnus vulgaris)*, northern mockingbird *(Mimus polyglottos)*, house finch *(Carpodacus mexicanus)*, barn swallow *(Hirundo rustica)*, and several gull species. Many of these birds also benefit from human food waste. Bats find roosting habitats in crevices and old buildings around cities. Two common bat species are the California myotis *(Myotis californicus)* and Yuma myotis *(Myotis yumanensis)*.

Northern Coastal Salt Marsh

One small area on the east shoreline of the Emeryville Marina Park is characterized by shallow mudflats and saltgrass, cordgrass *(Spartina spp.)*, pickleweed *(Salcornia virginica)*, bunchgrass, along with exotic species and other aquatic vegetation, that provides cover, foraging, and nesting habitat for several bird species.

The southwestern portion of Emeryville, known as the Emeryville Crescent, is one of the city's most valuable biological resources. As indicated in Figure 3.4-1, this area is characterized by Northern Coastal Salt Marshes and is considered a sensitive habitat (California Department of Fish and Game [CDFG], 2008). Northern Coastal Salt Marshes occur along margins of the Bay that are sheltered from excessive wave action. They support a high amount of vegetation such as cordgrass, pickleweed, eelgrass *(Zostera marina)* and saltgrass *(Distichlis spicata)*, as well as potential habitat for a plant of special concern, the Point Reyes bird's-beak *(Cordylanthus maritimus ssp. palustris)*.

Wildlife Habitat

The Emeryville Crescent region provides food, cover, nesting and roosting habitat for a variety of wildlife species. Bird species known to occur as residents or as migrants include herons, egrets, ducks, hawks, shorebirds, swallows, song sparrows *(Melospiza melodia)*, marsh wren *(Cistothorus palustris)*, the endangered California clapper rail *(Rallus longirostris obsoletus)*, the threatened California black rail *(Laterallus jamaicensis)*, and the saltmarsh common yellowthroat *(Geothlypis trichas sinuosa)*. Mammals such as species of shrews, bats, and mice, including the threatened saltmarsh harvest mouse *(Reithrodontomys raviventris)*, plus raccoons, minks *(Mustela vison)*, river otters *(Lontra Canadensis)*, and harbor seals *(Phoca vitulina)* utilize this sensitive habitat. In the mudflats and marsh vegetation a number of invertebrates exist including nemotodes, crabs, clams, oysters, and worms that provide significant food resources for higher taxa. The freshwater flow from Temescal Creek mixing with the saltwater from the Bay creates a delicate transition zone important for the survival of anadromous fish.

Special Status Species

ESA reviewed the California Natural Diversity Database (CNDDB) (CDFG, 2005), California Native Plant Society (CNPS) Electronic Inventory (CNPS, 2005), U.S. Fish and Wildlife Service (USFWS) website species list (USFWS, 2005), and related literature to determine the known and potential presence of species of special concern within the Emeryville area. Within the U.S. Geological Survey 7.5-minute San Francisco North quadrangle, there are eight special status wildlife species and seven special status plant species that have the potential to occur within Emeryville. All of the wildlife species and several of the plant species are associated within the Northern Coastal Salt Marsh habitat. Species are described in Table 3.4-1 and Figure 3.4-1.

Figure 3.4-1

SENSITIVE BIOLOGIC RESOURCES

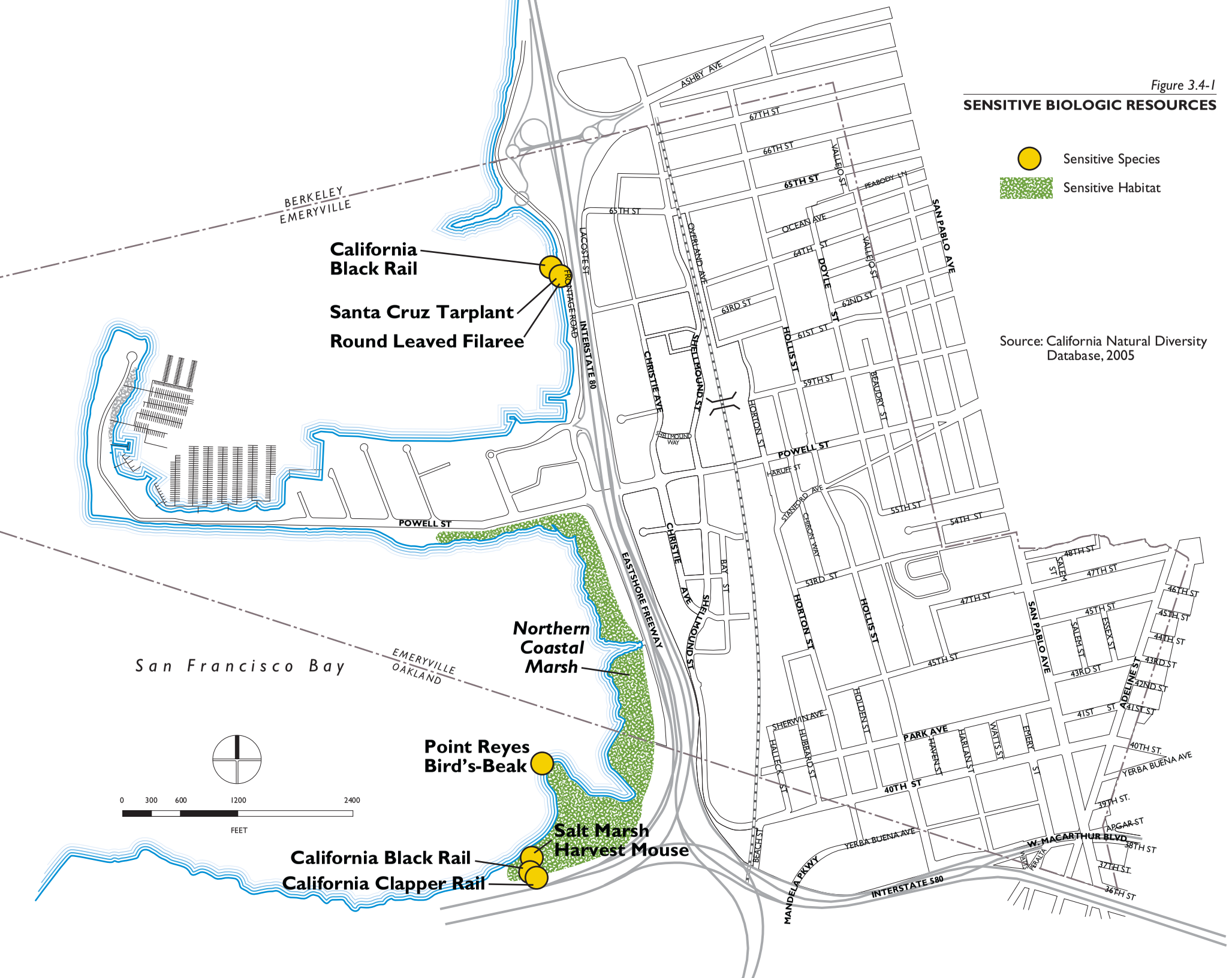

Table 3.4-1: Special Status Species Records

Species	*Listing Status USFWS/CDFG/CNPS*	*Habitat Needs*
FEDERAL OR STATE LISTED SPECIES		
Fish		
tidewater goby *Eucyclogobius newberryi*	FE/SC	Shallow waters of bays and estuaries.
Birds		
California clapper rail *Rallus longirostris obsoletus*	FE/SE	Nests and forages in emergent wetlands with pickleweed, cordgrass, and bulrush.
California black rail *Laterallus jamaicensis coturniculus*	--/ST	Nests and forages in tidal emergent wetland with pickleweed and cordgrass.
Mammals		
salt-marsh harvest mouse *Reithrodontomys raviventris*	FE/SE	Saline emergent marsh with dense pickleweed.
Plants		
Santa Cruz tarplant *Holocarpha macradenia*	FT/SE/1B.1	Coastal scrub, coastal sand dunes, openings in oak woodlands with sandy or gravelly soil.
OTHER SPECIES OF CONCERN		
Birds		
white-tailed kite *Elanus leucurus*	--/--	Nests near wet meadows and open grasslands, dense oak, willow or other large tree stands.
northern harrier *Circus cyaneus*	--/SC	Mostly nests in emergent vegetation, wet meadows or near rivers and lakes, but may nest in grasslands away from water.
Alameda song sparrow *Melospiza melodia pusillula*	--/SC	Inhabits bay area salcornia marshes, nesting in low vegetation.
Marsh common yellowthroat *Geothlypis trichas sinuosa*	--/SC	Inhabits fresh and salt water marshes, requiring thick cover down to water for foraging; nests in willows.
Plants		
alkali milk-vetch *Astragalus tener* var. *tener*	--/--/1B.2	Alkali flats and vernal pools in valley grasslands.
round-leaved filaree *California macrophylla*	--/--/1B.1	Clay soils in cismontane woodland and valley and foothill grassland.

Table 3.4-1: Special Status Species Records

Species	Listing Status USFWS/CDFG/CNPS	Habitat Needs
San Francisco spineflower *Chorizanthe cuspidate* var. *cuspidata*	--/--/1B.2	Alkali flats and vernal pools in valley grasslands.
Kellogg's horkelia *Horkelia cuneata* ssp. *sericea*	--/--/1B.1	Closed-cone coniferous forests, coastal scrub.
Point Reyes bird's-beak *Cordylanthus maritimus* ssp. *palustris*	--/--/1B.2	Upper zones of coastal salt marsh.
Saline clover *Trifolium depauperatum* var. *hydrophilum*	--/--/1B.2	Occurs in marshes and swamps, valley and foothill grasslands, and vernal pools.

Source: Department of Fish and Game, 2008.

California clapper rail

The Emeryville Crescent provides a suitable foraging and breeding habitat for the federally endangered California clapper rail. The clapper rail prefers emergent marshes containing pickleweed, cordgrass and bulrush and shallow mudflats with adjacent cover for foraging. The salt marsh habitat of the Emeryville Crescent is restricted due to heavily-urbanized surroundings, but it reaches along the shoreline from the base of the Bay Bridge to Powell Street in Emeryville. Several surveys conducted in the last 20 years have detected clapper rail in the marsh. The most recent survey by the San Francisco Bay Invasive Spartina Project (2006) detected 9 to14 individuals at seven different locations. Another recent survey by Caltrans in 2005, detected two clapper rails north of the Bay Bridge toll plaza. While both of these surveys were conducted at the western extension of the crescent located north of the bay bridge toll plaza, the wetland habitat extending eastward into Emeryville is linked continuously with this area. Similar vegetation also exists in the eastern portion of the marsh within Emeryville city limits which could be used by clapper rail.

California black rail

Suitable habitats for the state-threatened California black rail exist in the Emeryville Crescent as well as areas north of the Emeryville Marina. The black rail requires densely-vegetated marsh areas with little tidal fluctuation to construct nests. Rails forage in dense pickleweed and bulrush stands as well as mudflats. A survey in 1999 found one to two individuals in marshland north of the bay bridge toll plaza, and additional breeding populations exist in San Pablo and Suisun bays (CDFG, 2008; Spautz et al., 2005).

Salt marsh harvest mouse

East bay marshes provide habitat for the salt marsh harvest mouse, a federally-endangered species endemic to the San Francisco bay and the waters that feed into it. Extensive habitat loss and modification has been the main cause of the species' decline and listing. Saline marsh areas dominated by pickleweed are preferred by salt marsh harvest mouse for breeding and foraging, but it may venture to upland grasslands in spring or summer to forage when grass is high enough to provide cover. Several mice were found on the western edge of the crescent in 1982 and 1986 (CDFG, 2008), and one was found within the Emeryville city limit in 1982 (San Francisco Estuary Institute [SFEI], 2008). Even though these records are not current, the area of the crescent within Emeryville contains many areas of pickleweed suitable for salt marsh harvest mouse habitation.

Tidewater goby

Brackish waters in sheltered areas along the shoreline North of Powell Street are potential habitat for the federally-endangered tidewater goby. This fish species prefers shallow, fairly still water and has been historically observed in Berkeley's aquatic park less than one mile from the Emeryville city limit. Brackish water where Temescal Creek enters the Emeryville Crescent south of Powell Street could also provide habitat for the tidewater goby.

Northern harrier and white-tailed kite

Both these species have been seen near the Berkeley marina and have the potential to forage in marsh areas of the Emeryville shoreline. Both the northern harrier and white-tailed kite are birds of prey and forage for small mammals, small birds, amphibians, and reptiles in grassland or marsh habitats. Northern harrier can nest in grasses at the edge of freshwater marshes, but more suitable habitat exists north of Emeryville in upland fields.

Alameda song sparrow

The Alameda song sparrow nests exclusively in San Francisco Bay marshes, often in dense pickleweed or low shrub areas. This species of concern has been found in the southern portion of the Emeryville Crescent within the Emeryville city limits and is presumed to still be using the area for nesting and foraging habitat.

Common saltmarsh yellowthroat

This bird is another species of special concern that is heavily dependent on salt marsh habitats. The common saltmarsh yellowthroat is a distinct subspecies, separate from the common yellowthroat, and is endemic to California. This species breeds in fresh or brackish marshes but winters in salt marsh habitats, foraging for insects and seeds. A wintering pair was identified in the marsh area north of the bay bridge toll plaza, and the species is still presumed extant there (CDFG, 2008). The Emeryville Crescent could support wintering yellowthroat pairs or individuals.

Temescal Creek, similar to other small streams flowing from the Berkeley-Oakland Hills, supported viable populations of steelhead trout *(Oncorhynchus mykiss)* before the cumulative effects of urbanization led to the species' extirpation from the watershed. Currently underground culverts and the dam at Lake Temescal in the lower watershed serve as complete barriers to upstream migration (Leidy et al., 2005).

Sensitive vegetation such as the federally-threatened Santa Cruz tarplant *(Holocarpha macradenia)*, Point Reyes bird's-beak *(Cordylanthus maritimus ssp. palustris)*, and the round-leaved filaree *(Erodium macrophyllum)* had documented occurrences within the Northern Coastal Salt Marsh habitat near the Emeryville Crescent. Occurrence of Santa Cruz tarplant on San Pablo Avenue was documented in 1903, and since the area is currently completely developed, no favorable habitat for this species now exists (CDFG, 2008). Three species of special concern that had documented presence in or around Emeryville and have the potential to occur within the city if favorable conditions exist, are San Francisco spineflower *(Chorizanthe cuspidate var. cuspidata)*, alkali milk-vetch *(Astragalus tener var. tener)*, Kellog's horkelia *(Horkelia cuneata ssp. sericea)*, and saline clover *(Trifolium depauperatum var. hydrophilum)*. The only favorable habitat that remains in the city to support these species is along the shoreline in the Northern Coastal Salt Marsh. The record of alkali milk-vetch within the developed portion of Emeryville was revisited in a 2002 survey and no plants or suitable vernal pool habitat remained (CDFG, 2008). The remaining developed portion of the city is unlikely to have suitable habitat to support any other species of special concern.

Wildlife Corridors

While shoreline habitats in Emeryville support many local populations of resident species, they also provide important foraging habitat for many of the migratory bird species that travel along the Pacific Flyway. Many species of shorebirds as well as diving and dabbling ducks visit the Emeryville shoreline during fall and winter, and the San Francisco Bay is a crucial stop in the middle of their migration. Both CDFG Code and the Federal Migratory Bird Act protect any migrating bird species. The San Francisco Bay is the largest estuary on the West Coast, and the Emeryville shoreline is an important foraging habitat for migrating birds.

REGULATORY SETTING

Regulation of Activities in Wetlands

The regulations and policies of various federal agencies such as the U.S. Army Corps of Engineers (the Corps), the U.S. Environmental Protection Agency (U.S. EPA), USFWS, mandate that the filling of wetlands be avoided unless it can be demonstrated that no practicable alternatives exist. The Corps has primary federal responsibility for administering regulations and issuing permits to fill federal waters and wetlands within the project site. In this regard, the Corps acts under two statutory authorities, the Rivers and Harbors Act (Sections 9 and 10), which governs specified

activities in "navigable waters," and the Clean Water Act (Section 404), which governs specified activities in "waters of the United States," including wetlands and special aquatic sites. U.S. EPA, USFWS and several other agencies provide comment on Corps permit applications. U.S. EPA provides the primary criteria for evaluating the biological impacts of Corps permit actions in wetlands.

The State's authority in regulating activities in wetlands and waters resides primarily with the CDFG and the State Water Resources Control Board (SWRCB). The CDFG provides comment on Corps permit actions under the Fish and Wildlife Coordination Act. CDFG is also authorized under State Fish and Game Code Sections 1600–1607 to develop mitigation measures and enter into a Stream Alteration Agreement (SAA) with applicants that propose a project that would obstruct the flow or alter the bed, channel, or bank of a river or stream in which there is a fish or wildlife resource, including intermittent and ephemeral streams. The SWRCB, acting through the nine Regional Water Quality Control Boards (RWQCBs), must certify that a Corps permit action meets state water quality objectives (Section 401, Clean Water Act).

The San Francisco Bay Conservation and Development Commission (BCDC) is authorized by the McAteer Petris Act to analyze, plan and regulate San Francisco Bay and its shoreline. It implements the San Francisco Bay Plan, and regulates filling and dredging in the Bay, its sloughs and marshes, and certain creek and tributaries. BCDC jurisdiction includes the Bay and a shoreline band that extends inland 100 feet from the high tide line. BCDC permits are required for all work within either the Bay or the shoreline band.

Federal Endangered Species Act

Under the Federal Endangered Species Act (FESA), the U.S. Secretary of the Interior and the U.S. Secretary of Commerce jointly have the authority to list a species as threatened or endangered (16 USC 1533[c]). Pursuant to the requirements of FESA, an agency reviewing a proposed project within its jurisdiction must determine whether any designated or proposed federally listed threatened or endangered species, or designated or proposed critical habitat for such species may be present in the project area. The USFWS also publishes a list of candidate species for listing and "Species of Concern." Species on this list receive special attention from federal agencies during environmental review, although they are not protected otherwise under the FESA. The candidate species are taxa for which the USFWS has sufficient biological information to support a proposal to list as Endangered or Threatened.

California Endangered Species Act

Under the California Endangered Species Act (CESA), the CDFG has the responsibility for maintaining a list of threatened species and endangered species (CDFG Code 2070). The CDFG also maintains a list of "candidate species," which are species that the CDFG has formally noticed

as being under review for addition to either the list of endangered species or the list of threatened species. The CDFG also maintains lists of "Species of Special Concern" which are roughly analogous to the federal Species of Concern described above. Pursuant to the requirements of CESA, an agency reviewing a proposed project within its jurisdiction must determine whether any state-listed endangered or threatened species may be present in the project. In addition, the CDFG encourages informal consultation on any proposed project that may impact a candidate species.

CEQA Guidelines Section 15380

Although threatened and endangered species are protected by specific federal and state statutes, CEQA Guidelines Section 15380(b) provides that a species not listed on the federal or state list of protected species may be considered rare or endangered if the species can be shown to meet certain specified criteria. These criteria have been modeled after the definition in FESA and the section of the CDFG Code dealing with rare or endangered plants or animals. This section was included in the CEQA Guidelines primarily to deal with situations in which a public agency is reviewing a project that may have a significant effect on, for example, a "candidate species" that has not yet been listed by either the USFWS or CDFG. Thus, CEQA provides an agency with the ability to protect a species from a project's potential impacts until the respective government agencies have an opportunity to designate the species as protected, if warranted.

Other Statues, Codes, and Policies Affording Limited Species Protection

Birds

The Migratory Bird Treaty Act (16 U.S.C., Sec. 703, Supp. I, 1989) prohibits killing, possessing, or trading in migratory birds except in accordance with regulations prescribed by the U.S. Secretary of the Interior. This act encompasses whole birds, parts of birds, and bird nests and eggs. Birds of Prey are protected in California under the CDFG Code (Section 3503.5, 1992). Section 3503.5 states that it is "unlawful to take, possess, or destroy any birds in the order Falconiformes or Strigiformes (birds of prey) or to take, possess, or destroy the nest or eggs of any such bird except as otherwise provided by this code or any regulation adopted pursuant thereto." Disturbance that causes nest abandonment and/or loss of reproductive effort is considered a "taking" by the CDFG.

Plants

The legal framework and authority for the State's program to conserve plants are woven from various legislative sources, including CESA, the California Native Plant Protection Act (CDFG Code Section 1900–1913), the CEQA Guidelines, and the Natural Communities Conservation Planning Act.

Vascular plants listed as rare or endangered by the CNPS (Skinner and Pavlik, 1994), but which may have no designated status or protection under Federal or State endangered species legislation, are defined as follows:

List 1A: Plants Presumed Extinct

List 1B: Plants Rare, Threatened, or Endangered in California and elsewhere

List 2: Plants Rare, Threatened, or Endangered in California, but more numerous elsewhere

List 3: Plants about Which More Information is Needed – A Review List

List 4: Plants of Limited Distribution – A Watch List.

In general, plants appearing on CNPS List 1A, 1B, or 2 are considered to meet the criteria of Section 15380 of the CEQA Guidelines, which define endangered, rare and threatened species. Additionally, plants listed on CNPS List 1A, 1B or List 2 meet the definition of Section 1901, Chapter 10 (Native Plant Protection Act) and Sections 2062 and 2067 (California Endangered Species Act) of the California Department of Fish and Game Code.

Local Plans and Policies

City of Emeryville Municipal Code

The City of Emeryville adopted an Urban Forestry Ordinance (Ord. 03-015) to manage the landscaped vegetation along streets, sidewalks, and other public places. Section 7.10.04 of the ordinance affirms the maintenance (including routine and major maintenance) of street trees is the responsibility of the property owner or public agencies whose property abuts, fronts, or is adjacent to any such street trees. "Street tree" is defined as "any tree growing within the public right-of-way, including unimproved public streets and sidewalks, and any tree growing on land under the jurisdiction of the City of Emeryville." In addition, Section 7.10.05 pertains to the planting and removal of street trees. This section of the ordinance requires an encroachment permit issued by the Department of Public Works for any person to plant or to remove any street tree. Moreover, Section 7.10.06 requires the protection of street trees from impacts caused by construction work.

The Emeryville Municipal Code also includes two ordinances for the protection of tideland areas in the Eastshore State Park. Title 10, chapter 2, section 10-2.03 prohibits all public access of the Emeryville Crescent tidelands south of Powell street. Section 10-2.04 allows limited fishing, boating, and recreational access of tideland areas north of Powell Street.

Eastshore State Park General Plan

The Eastshore State Park General Plan was written in 2002 to address goals of the park, impacts future activities could have, and recreational access to different sections of the park. It calls for

preservation of sensitive bayland habitats including tidal marsh and mudflats, as well as the protection of special-status plant and animal species. The plan also restricts use of all watercraft in the Emeryville Crescent and suggests restoration and recreational improvements for upland areas along Powell Street.

IMPACT ANALYSIS

SIGNIFICANCE CRITERIA

Implementation of the proposed General Plan would have a potentially significant impact if it would result in:

- A substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the CDFG or USFWS (Revised Appendix G, *CEQA Guidelines* Section 15380);

- A substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by the CDFG or USFWS (Revised Appendix G, *CEQA Guidelines* Section 15380);

- A substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means (Revised Appendix G, *CEQA Guidelines*);

- The substantial interference of the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or the impediment of use of native wildlife nursery sites (Revised Appendix G, *CEQA Guidelines*);

- Causing a fish or wildlife population to drop below self-sustaining levels, a substantial reduction in the habitat of a fish or wildlife species, the threatened elimination of a plant or animal community, or the reduction in number or restriction of range of an endangered, rare or threatened species (*CEQA Guidelines* Section 15065);

- Fundamental conflicts with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance (Revised Appendix G, *CEQA Guidelines*); or

METHODOLOGY AND ASSUMPTIONS

The analysis of biological resources is based on review of available data sources for the General Plan area and the surrounding region including the CNDDB, the CNPS Electronic Inventory, and applicable regulations and guidelines. The proposed General Plan would facilitate development

and growth in Emeryville. This analysis considers the potential effects of future development and growth within or adjacent to areas supporting sensitive species and habitat, wetlands, or wildlife movement corridors. Development under the proposed General Plan would primarily occur on infill sites or land contiguous to existing development. Proposed development in the vicinity of Temescal Creek or other potential habitats could pose a risk of potential impacts. Potential impacts on these biological resources are addressed below, along with established regulations and proposed General Plan policies that ensure these potential impacts to less than significant levels.

Some criteria listed above will not be adversely impacted by the proposed General Plan and are not discussed further in this EIR. New development under the proposed General Plan would not interfere with any resident or migratory fish or wildlife movement, and would not conflict with the City of Emeryville's ordinances regarding tideland areas in the Eastshore State Park; or the Eastshore State Park General Plan. Therefore, there would be no related impacts.

IMPACTS AND MITIGATION MEASURES

Impact

3.4-1 New development under the proposed General Plan could result in substantial adverse effects, either directly or through habitat modifications, on special status species. *(Less than Significant)*

Sensitive species within the Eastshore State Park and the Emeryville shoreline north of Powell Street are protected from development through the State and Regional Park System. The Eastshore State Park General Plan describes management of sensitive plant and wildlife species, as well as impacts and mitigation from recreational activities. Development under the proposed Emeryville General Plan will not occur in areas inside the Eastshore State Park.

Other small patches of salt marsh and mudflat habitat suitable for sensitive species do exist along the Emeryville peninsula out to the Emeryville marina. Despite the small size of these potential habitat areas, development at or near them could have negative effects on sensitive species with marsh habitat requirements without proposed policies or adherence to existing regulatory requirements. Special status species may also be present near the interface between suitable habitat and urban development, and could occur in urban areas of Emeryville.

Habitat for sensitive plant species within urbanized areas of the city of Emeryville has been almost completely developed. Species records of sensitive plants in and around Emeryville like Santa Cruz tarplant, San Francisco spineflower, alkali milk-vetch, Kellog's horkelia, and saline clover are largely historical. Small patches of marginal habitat for these species may still occur in Emeryville.

Proposed General Plan Policies that Reduce the Impact

CSN-P-17 The City will protect special status wildlife species and the seven special status plant species (described in Table 3.4-1), and will support habitats and open spaces within Emeryville that are within the City's control.

CSN-P-18 The natural environment shall be protected from destruction during new construction and redevelopment.

CSN-P-19 The City encourages incorporation of native plants into landscape plans for new developments and City projects and parks and preservation of mature trees on new developments and City projects.

CSN-P-20 The City discourages use of non-native invasive species in any landscaped or natural areas.

CSN-P-21 Provide visual, and where practical, physical, access to the Emeryville Crescent in a manner consistent with the protection of this fragile ecological system.

Adherence to established federal, state and local regulations, in addition to above General Plan policies, ensure that potential impacts to special status species are less than significant.

Mitigation Measures

None required.

Impact

3.4-2 New development under the proposed General Plan could have adverse effects on nesting birds and nesting raptors. *(Less than Significant)*

Species of nesting birds can often be found in urban areas, using trees, shrubs, or buildings as nest sites. Nesting birds and raptors are protected by the Migratory Bird Treaty Act and CDFG Code 3503 and 3503.5. Construction under the proposed General plan could have direct and indirect adverse affects on nesting birds through tree destruction, equipment noise, or vibration.

Adherence to existing regulations and the above General Plan policies would ensure that potential impacts to nesting birds and nesting raptors would be less than significant.

Proposed General Plan Policies that Reduce the Impact

CSN-P-7 New commercial and industrial activities, as well as construction and demolition practices, shall be regulated to minimize discharge of pollutant and sediment concentrations into San Francisco Bay.

CSN-P-8 The City will continue to support regional watershed conservation through local land use planning, open space policies, and water quality conservation efforts.

CSN-P-17 The City will protect special status wildlife species and the seven special status plant species (described in Table 3.4-1), and will support habitats and open spaces within Emeryville that are within the City's control.

CSN-P-18 The natural environment shall be protected from destruction during new construction and redevelopment.

CSN-P-21 Provide visual, and where practical, physical, access to the Emeryville Crescent in a manner consistent with the protection of this fragile ecological system.

Mitigation Measures

None required.

Impact

3.4-3 New development under the proposed General Plan could result in filling of wetlands and other waters, including open water associated with San Francisco Bay. *(Less than Significant)*

Potential impacts in the form of temporary or permanent loss due to filling of wetlands or other waters could result from new development within or in the vicinity of these wetlands and other waters. General Plan policies provide appropriate programmatic mitigation measures; additional site-specific measures will be identified during CEQA review of specific development proposals made to the City. Prior to new development in areas with potential federally or State protected wetlands or waters, applicants will be required to coordinate with the Corps, CDFG, RWQCB, and/or BCDC depending on the jurisdiction potentially affected. Coordination will include evaluation of existing wetlands and waters and development of avoidance, minimization, and/or compensatory measures sufficient to procure the necessary permits from the applicable agencies.

Proposed General Plan Policies that Reduce the Impact

CSN-P-7 New commercial and industrial activities, as well as construction and demolition practices, shall be regulated to minimize discharge of pollutant and sediment concentrations into San Francisco Bay.

CSN-P-8 The City will continue to support regional watershed conservation through local land use planning, open space policies, and water quality conservation efforts.

CSN-P-17 The City will protect special status wildlife species and the seven special status plant species (described in Table 3.4-1), and will support habitats and open spaces within Emeryville that are within the City's control.

CSN-P-18 The natural environment shall be protected from destruction during new construction and redevelopment.

CSN-P-21 Provide visual, and where practical, physical, access to the Emeryville Crescent in a manner consistent with the protection of this fragile ecological system.

The combination of proposed General Plan policies and existing laws protecting wetland resources ensures that the impacts would be less than significant.

Mitigation Measures

None required.

Impact

3.4-4 New development under the proposed General Plan could result in harm to or removal of street trees. (Less than Significant)

Planted trees exist throughout Emeryville, and future development is likely to be in areas where planted trees would be impacted. Section 7.10.05 of the Urban Forestry Ordinance regulates the planting and removal of street trees and Section 7.10.06 states that it is "unlawful for any person to engage in any construction work on private or public property without first taking steps to protect all street trees from damage, including damage caused by soil compaction or contamination." (Ord. 03-015)

Proposed General Plan Policies that Reduce the Impact

UD-P-46 Streetscape landscaping shall follow Bay-Friendly Landscaping guidelines and serve the dual purpose of treating stormwater runoff and providing shade and beauty to the urban realm.

Adherence to the Urban Forestry Ordinance policy above ensures that potential impacts to street trees would be less than significant.

Mitigation Measures

None required.

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3.5 Hydrology and Flooding

This chapter provides a programmatic analysis of the impacts of the proposed Emeryville General Plan on surface and groundwater hydrology and water quality in the Planning Area, as well as the potential for new development to increase vulnerability to flooding, storm surge, sea level rise, and tsunami.

ENVIRONMENTAL SETTING

SURFACE HYDROLOGY

The City of Emeryville is located along the eastern shore of San Francisco Bay, north of the City of Oakland and south of the city of Berkeley. Emeryville lies in the Central Basin within the San Francisco Bay hydrologic region (see Figure 3.5-1). Although the topography of the city is generally flat, its elevation ranges from 15 to 20 feet above mean sea level and slopes slightly west to San Francisco Bay, which is a major receiving water body. The other surface water feature in the city is Temescal Creek, which flows west from the East Bay Hills into San Francisco Bay.

The San Francisco Bay Area experiences a climate characterized by cool, moist winters and warm, dry summers. Mean annual precipitation is approximately 19 inches and varies widely from year to year.

San Francisco Bay

The city lies in the San Francisco Bay watershed. San Francisco Bay is the most prominent surface water body (see Figure 3.5-2) that receives surface water runoff from the city and groundwater discharge from the East Bay Plain. The southern portion of the Bay shoreline in the city includes a salt marsh. Riprap has been installed along the deeper waters adjacent to the Emeryville Peninsula for erosion control (City of Emeryville, 1993).

Temescal Creek

Temescal Creek is a main drainage outfall within the city (see Figure 3.5-2). Temescal Creek is a channelized creek draining Lake Temescal, which is located about 3.5 miles east of the city. It flows through the city, passes under Interstate 80, and discharges into San Francisco Bay in an area known as the Emeryville Crescent—a salt marsh and mud flat area subject to tidal inundation (City of Emeryville, 1998). The creek is dry most of the year and runs underground through portions of the city. Its concrete lining serves as a measure to control erosion and sedimentation in the creek (City of Emeryville, 1993). Currently, the creek flows are partially regulated by the Lake Temescal Reservoir.

Stormwater Drainage

Surface runoff from the city flows through Temescal Creek or is collected in local storm drains and is discharged directly into the Bay. The city is highly urbanized and primarily covered with pavement, buildings, areas of surface-compacted soil, and other features that allow only

Figure 3.5-1

SAN FRANCISCO BAY HYDROLOGIC REGION

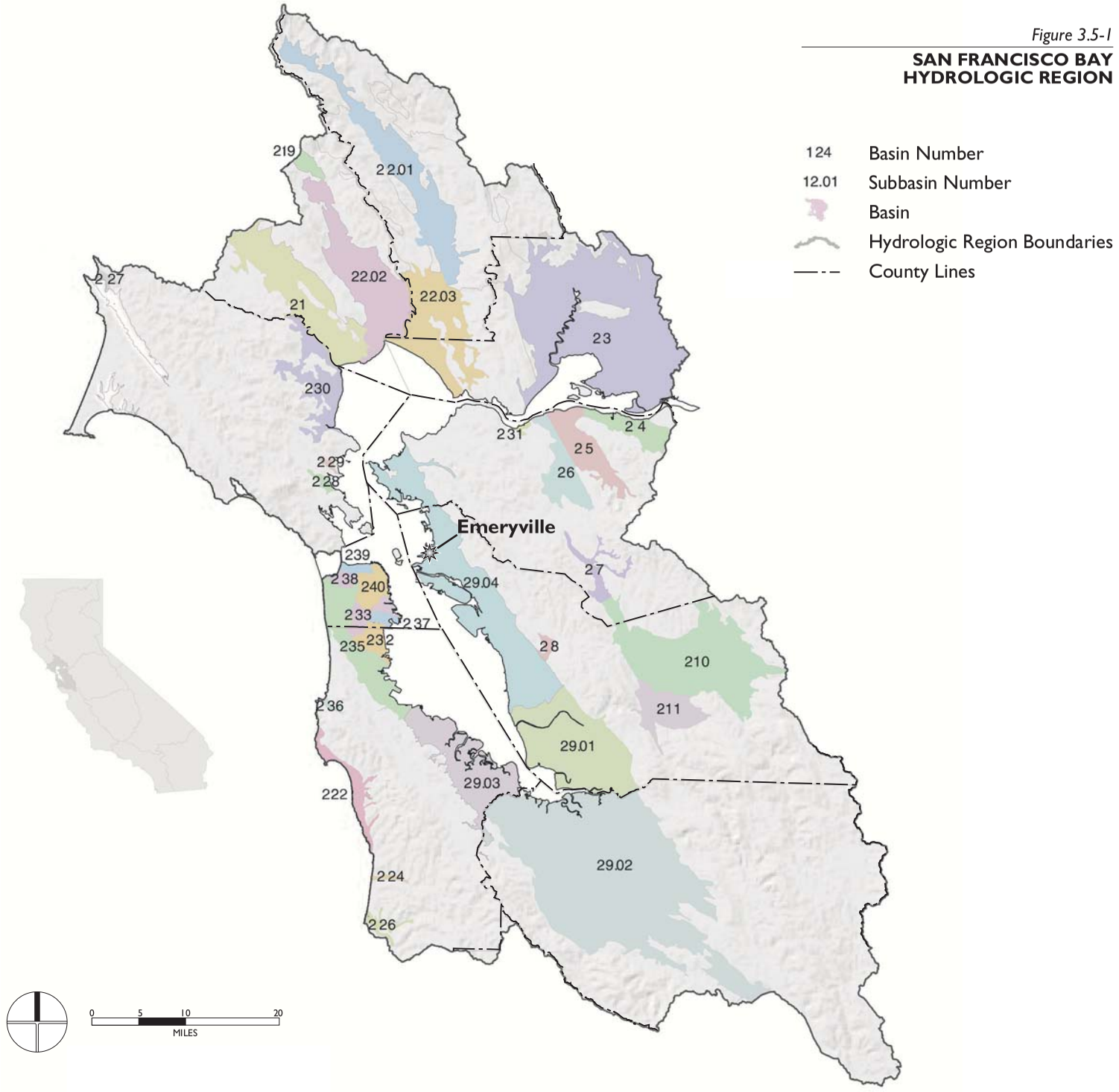
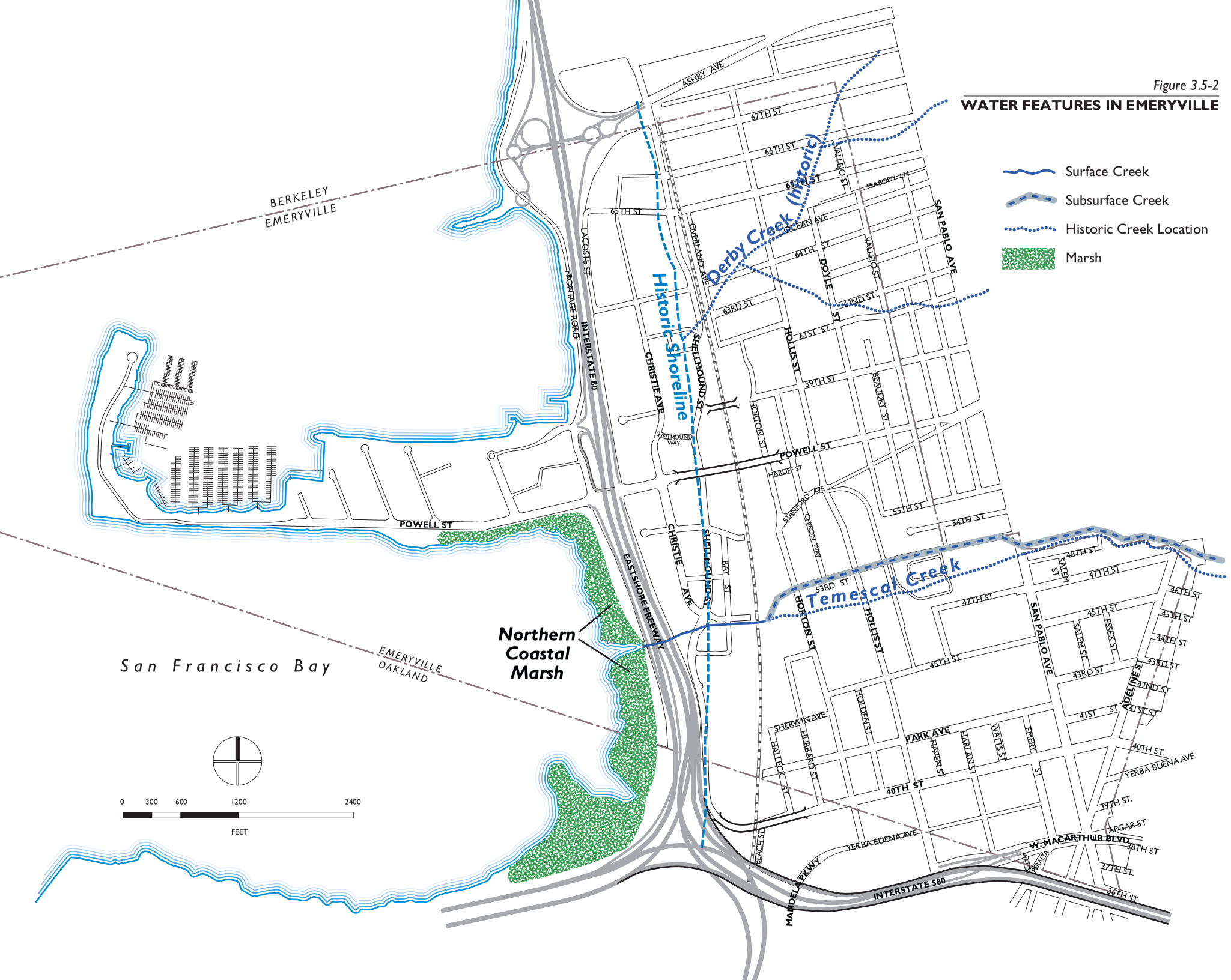


Figure 3.5-2

WATER FEATURES IN EMERYVILLE



minimal infiltration of rainfall into the soil. Although separate sanitary and storm sewer lines exist throughout the city, the lines run parallel to each other. Stormwater from the storm sewer lines can leak into the sanitary sewer lines, causing excessive infiltration into the sanitary sewer collection system. As a result, excess flows of wastewater may be released to San Francisco Bay without adequate treatment. The East Bay Municipal Utility District (EBMUD) initiated an East Bay Infiltration/Inflow (I/I) Correction Program to eliminate wet weather overflows of raw sewage to community streets, creeks, and the Bay. Emeryville has significantly reduced I/I of stormwater into its wastewater collection system over the last 20 years.

SURFACE WATER QUALITY

Pollutant sources discharging into the Bay in the project area include both point and nonpoint discharges. A point source is any discernible, confined, and discrete conveyance (e.g., a pipe discharge) of pollutants to a water body from such sources as industrial facilities or wastewater treatment plants. Nonpoint pollutant sources are sources that do not have a single, identifiable discharge point but are rather a combination of many sources. A nonpoint source can be stormwater runoff from land that contains, for example, petroleum from parking lots, pesticides from farming operations, or sediment from soil erosion.

The portion of the Bay near the city is affected by several drainage outlets that include a storm sewer outfall south of the Emeryville Peninsula, a wastewater treatment outfall in the southern portion of Emeryville Crescent in Oakland, and Temescal Creek. Groundwater also migrates into the Bay. However, due to its slow movement, any effects on the Bay and the salt marsh are minimal compared to the drainage outlets at the edge of the Bay.

In addition, the city is primarily urbanized, therefore, urban stormwater runoff is a major source of nonpoint water pollution. Pollutants such as suspended solids, heavy metals, and nutrients are often found in samples of urban stormwater runoff. The pollutants get deposited onto street surfaces and washed into receiving waters. Along the shoreline, nonpoint pollution is caused by overland stormwater flow and urban runoff from dredging activities, marine vessel waste, sediments, sand, industrial fuels, equipment and other operations, infiltration from sewer system, accidental spills of hazardous materials, and construction activities.

POLLUTANTS OF CONCERN

The near-shore sediments of the Central Basin have received significant inputs of contaminants and other pollutants (e.g., lead and copper) associated with earlier and existing urban and industrial uses in the City. Contaminants also include organic compounds, such as industrial chemicals and pesticides, some of which adhere to the Bay sediment particles and sediment that is washed off land, and add to the pollutant discharges into the Bay. Sources include spills, leaks and discharges of fossil fuels, discharges of municipal and industrial waste, and untreated runoff (City of Emeryville, 1998).

Storm drains can carry a variety of pollutants to creeks and the Bay. Some of the pollutants of concern that can harm wildlife and humans are listed below (ACCWP, 2002a).

Mercury

Much of the mercury that runs into the Bay is a remnant of the historic use of mercury in gold mining operations. Bacterial and chemical processes in the Bay cause mercury concentrations to increase or "bioaccumulate" in the bodies of animals high in the food web.[1] As a result, fish consumption advisories suggest that humans, particularly children and pregnant women, limit consumption of fish from San Francisco Bay to avoid harm to developing nervous systems.

Polychlorinated Biphenyls

Polychlorinated biphenyls (PCBs) were used in the past in a number of industrial and commercial applications, most importantly as coolants, lubricants, and insulators in electrical equipment. Although new uses are banned, PCBs continue to pose a serious risk due to their persistence in the environment. PCBs are listed by the U.S. Environmental Protection Agency as a potential carcinogen and are suspected to have negative effects on the human immune, reproductive, nervous, endocrine, and digestive systems. Similar to mercury, PCBs pose human health risks because they accumulate in fish tissue, which is then consumed by humans.

Diazinon

Diazinon is a widely used insecticide. It has been found in streams and storm drains throughout the Bay Area and California, often in concentrations toxic to aquatic life. It is also highly toxic to birds and other wildlife. Although only a very small portion of the diazinon that is applied finds its way into urban runoff, the amounts detected are sufficient to raise concerns about aquatic health.

Copper

Copper is beneficial to aquatic life at low concentrations, however, it can be extremely toxic to aquatic life at higher concentrations. This toxicity can occur at levels that are not harmful to humans. Copper gets deposited into storm drains through runoff from sources such as building materials and roads where copper is released from the brake pads of cars.

GROUNDWATER BASINS

The city is located within the East Bay Plain groundwater basin[2] (2 9.04) in Alameda County (see Figure 3.5-1). The East Bay Plain extends up to 114 square miles. The beneficial uses identified for the groundwater in the East Bay Plain are municipal and domestic water supply, industrial process and industrial service water supply, agricultural water supply, and freshwater replenishment to surface water (RWQCB, 1995). The water table (or the upper limit of the saturated groundwater zone) in the city is relatively high, occurring only several feet below the ground surface.

[1] A food web is a complex intermeshing (network) of individual food chains in an ecosystem.
[2] A groundwater basin is defined as a hydrogeologic unit containing one large aquifer or several connected and interrelated aquifers (RWQCB, 1995).

FLOOD ZONES

The Federal Emergency Management Agency (FEMA) prepared new maps of Emeryville's flood risk potential in December 2007, which are set to go into effect on August 3, 2009. As shown in Figure 3.5-3, the majority of Emeryville is designated as Zone X (i.e., areas outside the 500-year flood zone). The shoreline and marina areas are designated as Zone V and lie within the 100-year flood zone; however, these area do not contain urban uses or structures. Flooding in the city could also occur as a result of storm-induced flooding, inundations from dam failure, and tsunamis as discussed below.

Storm-Induced Flooding

The Alameda County Public Works Agency is responsible for maintaining the infrastructure, i.e., from roads and bridges to flood channels and natural creeks in Alameda County. Within the Public Works Agency, the Alameda County Flood Control and Water Conservation District works to protect the natural environment and the public from flooding. The City of Emeryville falls under the jurisdiction of Flood Control Zone 12 (Alameda County, 2005). Prior to 1963, periodic flooding and erosion occurred along Temescal Creek resulting in extensive property damage. The floodplain of the creek was then incorporated into Alameda County Flood Zone 12 and a deeper and wider concrete channel was constructed to contain the 100-year flood level (City of Emeryville, 1993). The lower portion of Temescal Creek flood control channel is subject to tidal action that ranges from three to six feet daily. Water depths in the channel vary from zero to six feet with the tides (City of Emeryville, 1998).

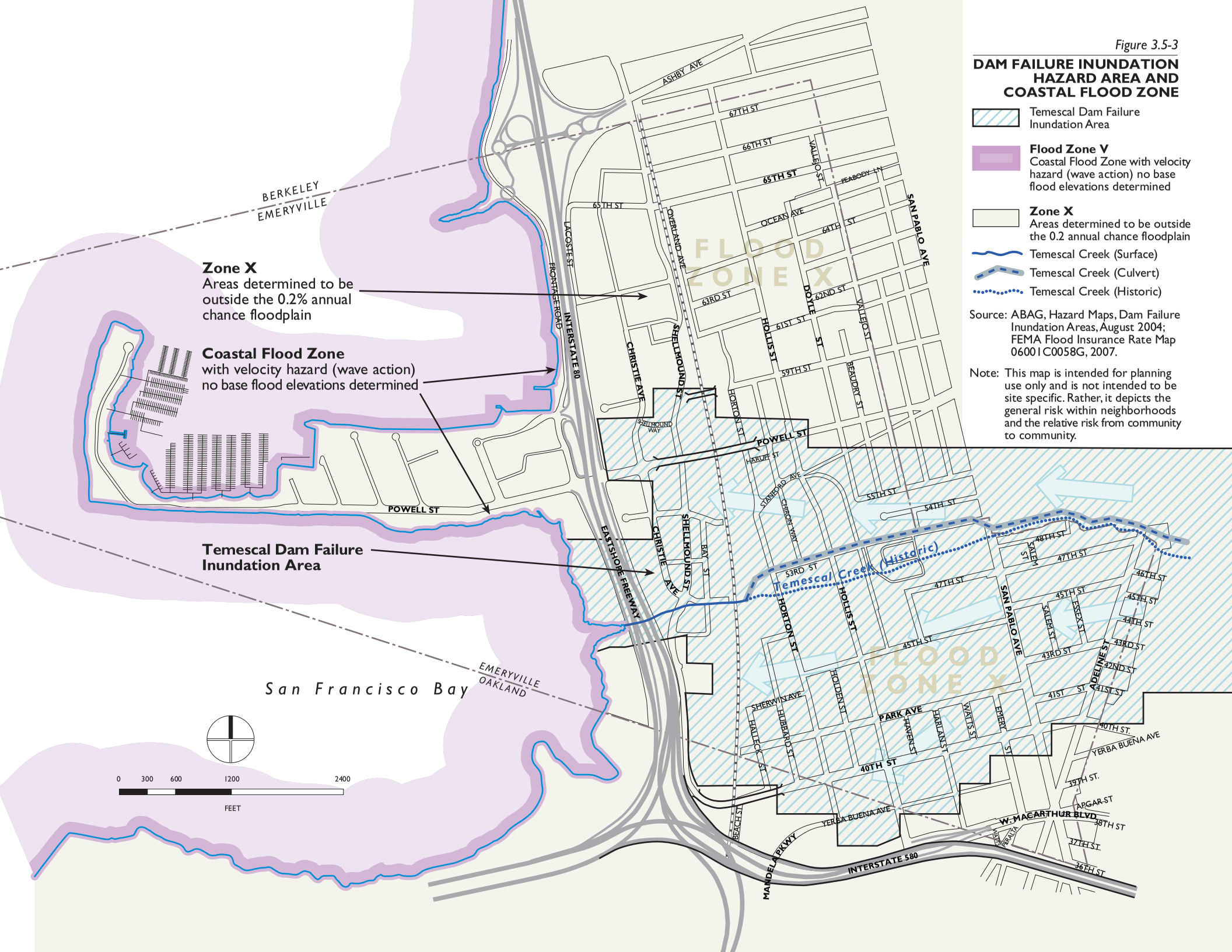


Figure 3.5-3

DAM FAILURE INUNDATION HAZARD AREA AND COASTAL FLOOD ZONE

Temescal Dam Failure Inundation Area

Flood Zone V
Coastal Flood Zone with velocity hazard (wave action) no base flood elevations determined

Zone X
Areas determined to be outside the 0.2 annual chance floodplain

Temescal Creek (Surface)

Temescal Creek (Culvert)

Temescal Creek (Historic)

Source: ABAG, Hazard Maps, Dam Failure Inundation Areas, August 2004; FEMA Flood Insurance Rate Map 06001C0058G, 2007.

Note: This map is intended for planning use only and is not intended to be site specific. Rather, it depicts the general risk within neighborhoods and the relative risk from community to community.

Inundation from Dam Failure

The closest dam near the city is the dam at Lake Temescal, which is located approximately 3.5 miles east of the city limits (Association of Bay Area Governments [ABAG], 1995). Lake Temescal Dam is managed by the East Bay Regional Parks Department and is overseen by the California Department of Water Resources, Division of Safety of Dams (DSOD). The DSOD supervises dam maintenance and inspections. Dams are required to adhere to rigorous DSOD standards, which include seismic analysis of existing dams to assure their integrity and conducting regular inspections. Failure of the dam is estimated to cause overflowing of Temescal Creek with inundation of nearly 1,000 feet of area on either side of the creek within 15 minutes. The water could reach the rest of the city, west toward the Bay, and north approximately to Powell Street within 25 minutes as shown in Figure 3.5-4. The likelihood of this flood hazard is dependent upon the occurrence of a major earthquake and the ability of the dam to withstand seismic activity (City of Emeryville, 1993).

Tsunamis

Tsunamis are caused by submarine seismic or volcanic disturbances. The California Office of Emergency Management has mapped tsunami hazard areas for coastal evacuation planning purposes along the coasts of San Mateo, San Francisco, and Marin counties, but not for areas inside San Francisco Bay. Tsunamis can inundate low-lying areas and cause erosion and sediment deposit. In addition, structures, particularly if they are poorly constructed, could be damaged by incoming and outgoing waves.

A tsunami would be weakened coming in through the Golden Gate, so although water levels would rise in the Bay, a wave situation is unlikely. The U.S. Geologic Survey estimates that a 20-foot wave at the Golden Gate Bridge (an event estimated to possibly occur once in 200 years) could potentially cause a run-up of a 10-foot wave in the Emeryville Peninsula and the shoreline area (City of Emeryville, 1993). Therefore, ground elevations less than 10 feet above mean sea level may be subjected to some level of inundation in the event of a 10-foot wave.

Sea Level Rise

The earth's atmosphere is naturally composed of a number of gases that retain heat to keep the temperature of the earth stable and hospitable for life at an average temperature of 60°F. However, recently elevated concentrations of these gases in the atmosphere have had a de-stabilizing effect on the global climate, causing the phenomenon commonly referred to as global warming. The global average surface temperature increased during the 20th century by about 1°F. In addition to causing an increase in average global surface temperature, rising levels of greenhouse gases have a destabilizing effect on a number of different micro-climates, conditions and systems. Snow cover has decreased by 10 percent in the last forty years. Average sea levels have risen between one-third and two-third of a foot over the course of the 20th century and are projected to rise by at least another one-third of a foot and up to almost three feet by the year 2100.

The San Francisco Bay Conservation and Development Commission (BCDC) released a draft staff report in April 2009, relying on United States Geological Survey mapping of sea level rise

projections in the Bay Area. BCDC uses a 16-inch sea level rise projection at mid-century and 55-inch projection at end of century. The mid-century projection shows vulnerable areas along the shoreline of the Emeryville Crescent and peninsula, but does not suggest vulnerability to structures urbanized areas, as shown in Figure 3.5-3. Note that the USGS model compares the sea level rise scenario to land-surface elevation data and does not account for shoreline protection; therefore the area south of 64th Street and west of I-80 does not account for the at-grade freeway barrier. The 2100 scenario, projecting 55-inch sea level rise would have implications for Emeryville's urban area, but lies far beyond the scope and planning horizon of the proposed General Plan.

Figure 3.5-4

AREAS VULNERABLE TO A 16-INCH SEA LEVEL RISE BY MID-CENTURY

Vulnerable Areas

Source: BCDC, 2008. Inundation data from Knowles, 2008.

Note: This map is intended for planning use and is for informational purposes only. Inundation data does not account for existing shoreline protection or wave activity.



REGULATORY SETTING

FEDERAL

Clean Water Act

Under the Clean Water Act (CWA) of 1977, the U.S. Environmental Protection Agency (EPA) seeks to restore and maintain the chemical, physical, and biological integrity in the nation's waters. The statute employs a variety of regulatory and nonregulatory tools to reduce direct pollutant discharges into waterways, finance municipal wastewater treatment facilities, and manage polluted runoff. The CWA authorizes the EPA to implement water quality regulations. The National Pollutant Discharge Elimination System (NPDES) permit program under section 402(p) of the CWA controls water pollution by regulating stormwater discharges into the waters of the U.S. California has an approved state NPDES program. The EPA has delegated authority for water permitting to the California State Water Resources Control Board (SWRCB), which has nine regional boards. The San Francisco Bay Regional Water Quality Control Board (RWQCB) regulates water quality in the City of Emeryville.

Total Maximum Daily Load

Section 303(d) of the CWA requires that each state identify water bodies or segments of water bodies that are "impaired" (i.e., not meeting one or more of the water quality standards established by the state). These waters are identified in the Section 303(d) list as waters that are polluted and need further attention to support their beneficial uses. Once the water body or segment is listed, the state is required to establish Total Maximum Daily Load or TMDL for the pollutant causing the conditions of impairment. TMDL is the maximum amount of a pollutant that a water body can receive and still meet water quality standards. Typically, TMDL is the sum of the allowable loads of a single pollutant from all contributing point and nonpoint sources. The intent of the 303(d) list is to identify water bodies that require future development of a TMDL to maintain water quality.

In accordance with Section 303(d), the RWQCB has identified impaired water bodies within its jurisdiction, and the pollutant or stressor responsible for impairing the water quality. Within the project area, the RWQCB has designated the Central Basin of the San Francisco Bay as an impaired water body. Pollutants that contribute to this impairment are chlordane, DDT, diazinon, dieldrin, various dioxins, exotic species, furan compounds, mercury, polyaromatic hydrocarbons, polychlorinated biphenyls, and selenium. The potential sources of the pollutants listed are non-point sources, atmospheric deposition, ballast water, industrial point sources and resource extraction, urban runoff, agriculture, exotic species, and natural sources (RWQCB, 2003a). The RWQCB is required to establish total maximum daily loads (TMDLs) for these pollutants in order to gradually eliminate impairment of the waters and attain water quality standards (ACCWP, 2003). Current TMDL projects include TMDLs for mercury and polychlorinated biphenyls in San Francisco Bay. Development projects would be required to be consistent with the current TMDLs and comply with specific water quality control measures under the NPDES permit requirements (see below for details) to prevent project-related contaminants from entering into Temescal Creek, which is connected to the Central Basin of the Bay.

Waste Discharge Requirements

Section 401 of the CWA requires projects to obtain a federal permit or a license for an activity that may result in a discharge of pollutants to the waters of the U.S. (including permits under section 404 of the CWA that governs discharging fill into waters of the U.S.). The purpose of the permit application is to obtain certification that the proposed activity will comply with the state water quality standards (RWQCB, 2003b).

STATE

Porter-Cologne Water Quality Control Act

The Porter-Cologne Water Quality Control Act allows the SWRCB to adopt statewide water quality control plans or basin plans. The purpose of the plans is to establish water quality objectives for specific water bodies. The RWQCB has prepared the San Francisco Bay Basin Plan that establishes water quality objectives and implementation programs to meet the stated objectives and to protect the beneficial uses of the bay waters (see regional regulatory discussion below). The act also authorizes the NPDES program under the CWA, which establishes effluent limitations and water quality requirements for discharges to waters of the state. Under the NPDES program, the San Francisco Bay RWQCB has established permit requirements for stormwater runoff for the project area (see Regional discussion below).

REGIONAL

Basin Plan

The RWQCB prepared the San Francisco Bay Water Quality Control Plan (Basin Plan) (1995) that contains descriptions of the legal, technical, and programmatic bases of water quality regulation in the region. The Basin Plan describes beneficial uses of major surface waters and their tributaries. The following beneficial uses have been listed for San Francisco Bay in the Central Basin:

- Ocean, Commercial, and Sport Fishing
- Estuarine Habitat
- Industrial Service Supply
- Fish Migration
- Navigation
- Industrial Process Supply
- Preservation of Rare and Endangered Species
- Water Contact Recreation
- Noncontact Recreation
- Shellfish Harvesting
- Fish Spawning
- Wildlife Habitat

The beneficial uses listed for Lake Temescal are cold freshwater habitat, water contact and non-contact water recreation, fish spawning, warm freshwater habitat, and wildlife habitat (RWQCB, 1995).

The RWQCB is responsible for permitting construction activities for development projects to ensure the protection of the above beneficial uses.

McAteer-Petris Act/San Francisco Bay Conservation and Development Commission

The McAteer-Petris Act is a provision under California law that preserves San Francisco Bay from indiscriminate filling. The act established BCDC as the agency charged with preparing a plan for the long-term use of the Bay and regulating development in and around the Bay while the plan was being prepared. The San Francisco Bay Plan, completed in January 1969, includes policies on 18 issues critical to the wise use of the bay ranging from ports and public access to design considerations and weather. The McAteer-Petris Act authorizes BCDC to incorporate the policies of the Bay Plan into state law (BCDC, 2000). The Bay Plan has two features: policies to guide future uses of the bay and shoreline, and maps that apply these policies to the bay and shoreline. BCDC conducts the regulatory process in accord with the Bay Plan policies and maps, which guide the protection and development of the bay and its tributary waterways, marshes, managed wetlands, salt ponds, and shoreline (BCDC, 2003).

Construction Permitting

Construction activities on one acre or more are regulated by the San Francisco Bay RWQCB and are subject to the requirements of the NPDES General Permit for Discharges of Stormwater Runoff Associated with Construction Activity (General Construction Permit). The SWRCB established the General Construction Permit for the purpose of reducing impacts to surface waters that may occur due to construction activities. Therefore, depending upon the area of the site, construction projects would be required to apply for the General Construction Permit and prepare and implement a stormwater pollution prevention plan (SWPPP). The SWPPP is prepared before project construction begins and, in certain cases, before demolition begins and includes specifications for best management practices (BMPs) that would be implemented during construction. BMPs are measures undertaken to control degradation of surface water by preventing soil erosion or the discharge of pollutants from the construction area. Examples of typical construction BMPs include scheduling or limiting activities to certain times of the year, installing sediment barriers such as silt fence and fiber rolls, maintaining equipment and vehicles used for construction, tracking controls such as stabilizing entrances to the construction site, and developing and implementing a spill prevention and cleanup plan. Non-stormwater management includes installing specific discharge controls during activities such as paving operations, vehicle and equipment washing and fueling.

Required elements of a SWPPP include:

- Site description addressing the elements and characteristics specific to the site,
- Descriptions of BMPs for erosion and sediment controls,
- BMPs for construction waste handling and disposal,

- Implementation of approved local plans,
- Proposed post-construction controls, and
- Non-stormwater management.

Additionally, the SWPPP describes measures to prevent or control runoff after construction is complete and identifies procedures for inspecting and maintaining facilities or other project elements.

Dewatering

Construction activities such as excavation and trenching in areas with shallow groundwater would require dewatering, which would be subject to the RWQCB construction dewatering permit requirements. Dewatering operations are regulated under state requirements for stormwater pollution prevention and control. Discharge of non-stormwater from a trench or excavation that contains sediments or other pollutants to sanitary sewer, storm drain systems, creek bed (even if dry), or receiving waters is prohibited. Discharge of uncontaminated groundwater from dewatering is a conditionally exempted discharge by the RWQCB. However, the removed water could potentially be contaminated with chemicals released from construction equipment or sediments from excavation. Therefore, disposal of dewatering discharge would require permits either from the RWQCB for discharge to surface creeks and groundwater or from local agencies for discharge to storm or sanitary sewers. Discharge of water resulting from dewatering operations would require an NPDES Permit, or a waiver (exemption) from the RWQCB, which would establish discharge limitations for specific chemicals (if they occur in the dewatering flows).

San Francisco Estuary Project

The San Francisco Estuary Project was established pursuant to CWA Section 320 to protect and improve the water quality and natural resources of San Francisco Bay-Delta Estuary. The San Francisco Estuary Project recommends actions in several areas such as aquatic resources, water use, pollution prevention and reduction, dredging and waterway modification, and research and monitoring. The City of Emeryville is located in the San Francisco Bay hydrologic region and drains eventually into the Bay which is a part of the Bay-Delta Estuary.

LOCAL

The Alameda County Flood Control and Water Conservation District (Flood Control Zone 12) and the City of Emeryville's Department of Public Works share the responsibility for maintaining drainage facilities in Emeryville.

Alameda Countywide Clean Water Program

The City of Emeryville has jurisdiction over and/or maintenance responsibility for its municipal separate storm drain systems and/or watercourses in Alameda County. The City is a part of the Alameda Countywide Clean Water Program (ACCWP) that consists of 17 participating agencies, which cooperatively comply with a municipal stormwater permit issued by the RWQCB. The permit contains requirements to prevent stormwater pollution and to protect and restore creek and wetland habitat. The member agencies have developed performance standards to clarify the

requirements of the stormwater pollution prevention program, adopted stormwater management ordinances, conducted extensive education and training programs, and reduced stormwater pollutants from industrial areas and construction sites (ACCWP, 2002b). In the project area, the ACCWP administers the stormwater program to meet the CWA requirements by controlling pollution in the local storm drain sewer systems.

The ACCWP prepared the Stormwater Quality Management Plan in 2001 that is effective through June 2008 (ACCWP, 2001). This plan describes the ACCWP's approach to reducing stormwater pollution. In conjunction with the stormwater discharge permit adopted by the RWQCB, the plan is designed to enable the ACCWP member agencies to meet CWA requirements. The plan provides a framework for protection and restoration of creeks and watersheds in Alameda County in part through effective and efficient implementation of appropriate control measures for pollutants. The plan addresses the following major program areas: regulatory compliance, focused watershed management, public information/participation, municipal maintenance activities, new development and construction controls, illicit discharge controls, industrial and commercial discharge controls, monitoring and special studies, control of specific pollutants of concern, and performance standards. The plan recommends tasks to implement source, site design, post-construction stormwater treatment and hydromodification controls (ACCWP, 2001).

Construction activities are subject to the NPDES permitrequirements for stormwater management and discharges. The ACCWP NPDES permit also incorporates updated state and federal requirements related to the quantity and quality of post-construction stormwater discharges from new development and redevelopment projects.

The RWQCB issued a NPDES permit (Permit No. CAS0029831) to ACCWP that includes the City of Emeryville by Order 97-030 on February 19, 1997, and modified by Order No. 99-049 on July 21, 1999. The most recent Order R2-2003-021 was adopted on February 19, 2003 for waste discharge requirements.

C.3 Permit Requirements

The NPDES permit lists provision C.3 that governs storm drain systems and regulates post-construction stormwater runoff. The provision requires new development and redevelopment projects to incorporate treatment measures and other appropriate source control and site design features to reduce the pollutant load in stormwater discharges and to manage runoff flows. "Redevelopment" is defined as a project on a previously developed site that results in the addition or replacement of impervious surface. Projects that would replace more than 50 percent of the impervious surface are required to implement treatment measures and appropriate source control and site design measures under the NPDES permit in addition to the following conditions (ACCWP, 2003):

- Implement site design/landscape characteristics as feasible, which maximize infiltration (where appropriate), provide retention or detention, slow runoff, and minimize impervious land coverage, so that post-development pollutant loads from the site have been reduced to maximum extent possible; and

- For new and redevelopment projects that discharge directly to water bodies listed as impaired (under section 303(d) of CWA), ensure that post-project runoff does not exceed pre-project levels for such pollutants through implementation of the control measures addressed in the C.3 provision, to the maximum extent practicable.

City of Emeryville Ordinances

The following ordinances under the City of Emeryville's Municipal Code would apply to projects that would affect the hydrological resources in the City:

- Title 6, Chapter 13 of the City of Emeryville's Municipal Code outlines the regulations for stormwater management and discharge. The Ordinance seeks to protect and enhance the water quality of rivers, the Bay and wetlands by:
    - Eliminating non-stormwater discharges to the municipal separate storm sewer;
    - Controlling discharge to municipal separate storm sewers from spills, dumping or disposal of materials other than stormwater; and
    - Reducing pollutants in stormwater discharge to the maximum extent practicable.
- Title 7, Chapter 2 requires permits for excavations in the public right-of-way or improvements.
- Title 7, Chapter 5 requires that excavations and fills and construction in and around water courses and public right-of-way be conducted in accordance with good engineering practices.
- Title 7, Chapter 7 requires public works construction to comply with standard specifications under this chapter.
- Title 7, Chapter 8 provides rules for sanitary sewer use, connections, fees and enforcement.
- Title 7, Chapter 8 requires all sewage and industrial waste system to comply with all the requirements of the EBMUD and the City Engineer. All industrial wastes that are not approved for deposition into sewer lines are required to be disposed off in a manner approved by the City Engineer.
- Title 7, Chapter 8 provides requirements that apply to landscaping of irrigated area (500 square feet or greater), new or rehabilitation construction, and public projects.
- Title 10, Chapter 1 provides rules and regulations for Emeryville Marina. The chapter includes regulations for disposal of refuse to protect water quality.
- Title 10, Chapter 2 codifies the City's exercise of public trust over the tidelands and provides specific restrictions on personal watercraft within the trust tidelands to protect biological resources, maintain public safety, and reduce nuisance impacts and conflicts of use of the tidelands.

IMPACT ANALYSIS

SIGNIFICANCE CRITERIA

Implementation of the proposed Emeryville General Plan would have a significant impact if it would:

- Violate any water quality standards or waste discharge requirements or degrade water quality;
- Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level;
- Substantially alter the existing drainage pattern of a site or area through the alteration of the course of a stream or river, or by other means, in a manner that would result in substantial erosion or siltation on- or off-site;
- Substantially alter the existing drainage pattern of a site or area through the alteration of the course of a stream or river or, by other means, substantially increase the rate or amount of surface runoff in a manner that would result in flooding on- or off-site;
- Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff;
- Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other authoritative flood hazard delineation map;
- Place within a 100-year flood hazard area structures that would impede or redirect flood flows;
- Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam; or
- Expose people or structures to a significant risk of loss, injury or death involving inundation by seiche, tsunami, or mudflow.

METHODOLOGY AND ASSUMPTIONS

The impact analysis considered proposed General Plan policies and goals, hydrologic conditions within Emeryville, and applicable regulations and guidelines. The proposed General Plan would facilitate development and growth in Emeryville and include improvements. Consideration is given to potential increases in new impervious surface area, erosion associated with future development-related construction activities, and other results of growth, as well as proposed General Plan policies intended to minimize the impacts of growth on water resources.

SUMMARY OF IMPACTS

Potential impacts associated with implementation of the proposed General Plan include increased rates of storm water runoff and subsequent flooding hazards, erosion, increase in nonpoint source pollutants affecting receiving water quality. These impacts would be reduced to less-than-

significant levels through regulatory compliance and with implementation of proposed policies and/or additional mitigation measures.

Cumulative Impacts

Although areas impacted by hazardous materials can be located in close proximity to each other, hazardous material impacts are typically localized or site-specific versus a cumulative geographic area. It is possible, however for combined effects of transporting and disposal of hazardous materials to be affected by cumulative development. New development under the proposed General Plan when combined with other past, present, and reasonably foreseeable development in the vicinity, would not result in cumulative hazardous materials impacts.

Future development, with implementation of the General Plan policies and established regulatory requirements, would have a less than significant hazardous materials impact to the public or the environment within the vicinity of the Study Area. Other foreseeable development within the area, although likely increasing the potential to disturb existing contamination and the handling of hazardous materials, would be required to comply with the same regulatory framework as all development projects that involve hazardous materials, as have past and present projects.. This includes federal and state regulatory requirements for transporting (Cal EPA and Caltrans) hazardous materials or cargo (including fuel and other materials used in all motor vehicles) on public roads or disposing of hazardous materials (Cal EPA, DTSC, ACEHD). In addition, all development projects in the city of Emeryville would adhere to the proposed General Plan policies. Therefore, the effect of the proposed General Plan on hazardous materials, in combination with other past, present and reasonably foreseeable projects, would be less than significant.

IMPACTS AND MITIGATION MEASURES

Impact

3.5-1 Construction activities for new development under the proposed General Plan would generate loose and erodible soils that, if not properly managed, could result in substantial erosion or siltation. Inadvertent release of fuels or other chemicals used during construction could affect water quality. (*Less than Significant*)

Emeryville has a predominantly developed landscape with office, regional retail, and high-density residential land uses, as well as mixed-use developments. Proposed changes under the General Plan include construction of residential and nonresidential development that would primarily replace existing development, as there are few undeveloped development parcels throughout the city. Construction of new development could involve activities such as excavation, soil stockpiling, and boring along with pile driving and grading. Such activities would generate loose, erodible soils that, if not properly managed, could be washed into surface water by rain or by water used during grading operations. Soil erosion could cause excess sediment loads in storm drains, affect the water quality of receiving waters and eventually San Francisco Bay. Construction would involve use of fuel and other chemicals that, if not managed properly, could get washed off into the stormwater. Although construction of specific projects would be relatively short-term,

the water quality impact could be significant. Adherence to City ordinances, specifically the stormwater ordinance (Title 6, Chapter 13), implementation of stormwater and control measures as a part of the ACCWP NPDES stormwater permit and a SWPPP prepared as a part of the General Construction Permit, would minimize the impact to less-than-significant level. For a commercial development, the City also requires preparation and submittal of a landscaping plan that includes provisions for erosion control in graded areas that would remain vacant during construction. In addition, compliance with the following General Plan policies would ensure the impact to water quality is less than significant.

Proposed General Plan Policies that Reduce the Impact

CSN-P-7 New commercial and industrial activities, as well as construction and demolition practices, shall be regulated to minimize discharge of pollutant and sediment concentrations into San Francisco Bay.

CSN-P-30 The City will continue to require soil erosion control measures during construction.

Adherence to established City regulations—Title 6, Chapter 13, which provides regulations for stormwater management and discharge—as well as the proposed General Plan policies listed above, ensure the potential impact is less than significant.

Mitigation Measures

None required.

Impact

3.5-2 New development under the proposed General Plan could require dewatering during construction activities. Discharge of the extracted water, if polluted, would cause an adverse water quality impact. (*Less than Significant*)

As discussed in the Setting section, the water table (or the upper limit of the saturated groundwater zone) in Emeryville is relatively high, occurring only several feet below the ground surface. New development proposed under the General Plan would require construction of structures with subsurface foundations or open trenches, such as building foundations or pipelines, which could intercept shallow groundwater. Common practices employed to facilitate construction include either dewatering the excavation site or shoring the sides of the excavation to reduce groundwater inflow. If dewatering methods are used, groundwater would be pumped out of the excavation to the surface and then discharged, typically to either the storm drain or sanitary sewer. Water extracted during dewatering could contain chemical contaminants (either from pre-existing sources or from equipment), or could become sediment-laden from construction activities. Depending on the construction site and the quality of the groundwater, the discharge could potentially contaminate the receiving waters and the Bay.

Dewatering operations either on a short- or long-term basis will comply with certain provisions in the NPDES permit such as the treatment of flows prior to discharge. Discharge of the groundwater from dewatering to the sanitary sewer or storm drain system shall occur pursuant to authorization and

required permits from EBMUD and/or the City of Emeryville Public Works Agency and in compliance with applicable permit conditions associated with the treatment of groundwater prior to discharge. Adherence to established regulations ensure the potential impact is less than significant.

Mitigation Measures

None required.

Impact

3.5-3 New development under the proposed General Plan could change existing drainage patterns, which could increase the volume of stormwater runoff resulting in erosion and flooding affecting the existing stormwater drainage system. *(Less than Significant)*

Approximately 2,930 housing units and 3 million square feet of non-residential space would be added, which would result in an increase of approximately 3,800 housing units and 2.5 million square feet of total non-residential space (i.e., an increase of 21 percent over 2007 levels). The new development would occur primarily on existing impervious surfaces. The stormwater runoff associated with the new development would result in generally the same quantity as well as velocity, which currently can scour creek channels causing erosion and suspension of sediment in the water and potentially cause flooding.

Emeryville is predominantly covered with impervious surfaces. Commercial districts in Emeryville are required to submit a landscape plan as part of its building permit. All improved building sites are required by the City (Title 9) to have a minimum landscaped area of 15 percent of the net site area. Further, compliance with the C.3 provision in the NPDES permit and implementation of the required stormwater control measures would ensure that the impact would be minimal. Project applicants would be required to prepare and implement of a hydrograph modification management plan (HMP). Implementation of an HMP would ensure that post-project runoff would not exceed estimated pre-project rates and/or durations. Site design and source control stormwater control measures would be required to be installed. The HMP for a development would be prepared in coordination with the HMP prepared by the ACCWP, identifying areas that are susceptible to hydrograph modification, in which projects would be required to retain, detain, or infiltrate runoff to match pre-project flows and durations. The HMP would be implemented so that the project runoff would be consistent to that under pre-development level. Further, new development would be required to adhere to the City's stormwater guidelines and select and design the stormwater solutions onsite to control the stormwater volume. Therefore, erosion, siltation or flooding impact due to increased flows from the new development would not be noticably greater than existing conditions and would be controlled through adherence to existing requirements and regulations, thus not resulting in a new exceedance of the existing storm drainage system capacity.

New development is expected to involve greater human activity, vehicle traffic, and pesticide or fertilizer use associated with lawns or parks, which could be released to drainage. This impact would be minimized by implement measures to manage activities to reduce waste such as source control measures as part of C.3 requirements. Source control measures may include prohibition of illegal dumping to storm drain inlets and waterways, designating vehicle washing areas, and

preparing and implementing a landscape plan to control any fertilizer or pesticide use and discharge into receiving waters.

Proposed General Plan Policies that Reduce the Impact

CSN-P-9 The City will continue programs to inform residents of the environmental effects of dumping household waste, such as motor oil, into storm drains that eventually discharge into San Francisco Bay.

CSN-P-10 New development is required to incorporate source control, site design, and storm water treatment to reduce pollutants in stormwater runoff.

CSN-P-11 Exterior uses of water for landscaping and other purposes shall be reduced to minimize or eliminate runoff and water waste.

CSN-P-13 The City promotes construction and incorporation of cisterns, green roofs and other rainwater harvesting methods in existing, new and rehabilitation projects.

CSN-P-15 The City will continue to support the use of recycled water in new and rehabilitation projects through the development process.

CSN-P-38 The City will continue to require development projects to implement on-site stormwater management measures through the City's development permit process.

CSN-P-39 Storm drains shall be maintained, and replaced or upgraded as needed to reduce potential flooding.

Adherence to established regulations, as well as the proposed General Plan policies listed above, ensure the potential impact is less than significant.

Mitigation Measures

None required.

Impact

3.5-4 Proposed improvements to Temescal Creek could cause a temporary water quality impact from construction, however, it would result in long term water quality improvements. (*Beneficial*)

The General Plan proposes to develop a riparian habitat for Temescal Creek by "creating a surface water feature celebrating Temescal Creek, while ensuring that the below-grade drainage that currently exists is maintained to manage stormwater flows." Portions of the creek would be daylighted into "faux" creeks, which would carry flows during winter and spring and would be dry during other times of the year. The portions of the creek that would be daylighted and the extent of the habitat that would be created are not yet determined. Riparian corridor would be

established where feasible, with removal of invasive species and additional opportunities for riparian vegetation. Following the creation of the riparian corridor, the creek would continue to flow in the below-grade pipe. Temescal Creek is largely a sub-surface drainage flowing through culverts as shown in Figure 3.5-2, therefore the construction activities associated with creation of the riparian corridor would involve excavation and clearing of paved areas in the vicinity. Short-term stormwater and potential erosion and sedimentation impacts could occur during the temporary construction phase. These short term construction-related impacts are assessed under Impacts 3.5-1 and 3.5-2. However, in the long term, the riparian corridor and vegetative stormwater treatment of the creek would provide a natural hydrology and water resource, which would be a beneficial impact.

Mitigation Measures

None required.

Impact

3.5-5 New development under the proposed General Plan could be subject to flooding. *(Less than Significant)*

As discussed in the Setting section above, Emeryville lies in Zone C, which is an area of minimal flooding therefore, the new development (i.e., housing or other structures) under the General Plan would not lie within a 100-year flood hazard area. As discussed in Impact 3.5-4 above, storm drainage facilities and stormwater control measures would minimize any adverse flooding effects. Although portions of Emeryville lie in the inundation area for Temescal dam, the dam is overseen by DSOD. The DSOD engineers and engineering geologists review and approve plans and specifications for dams for the site geology, seismic setting, site investigations, construction material evaluation, dam stability, hydrology, hydraulics, and structural review of appurtenant structures. In addition, the DSOD engineers inspect the dams on a yearly schedule to insure they are performing and being maintained in a safe manner. Due to the high maintenance and inspection standards, failure of the Temescal Dam is highly unlikely, therefore the risk from flooding to the development proposed under the General Plan is not considered high. The impact would be less than significant.

There is a low likelihood for mudflows and seiches to occur in Emeryville due to the flat topography and absence of enclosed water bodies, therefore the General Plan would not expose people or structures to a significant risk from a seiche or mudflows.

As discussed previously, the U.S. Geologic Survey estimates that a 20-foot wave at the Golden Gate Bridge (an event estimated to possibly occur once in 200 years) could potentially cause a run-up of a 10-foot wave in the Emeryville Peninsula and the shoreline area. Some of the proposed development under the General Plan would occur along the shoreline and could be subject to the risk from a tsunami, if one were to occur. The impact would be less than significant.

As discussed in Setting, the San Francisco Bay Area Conservation Commission has modeled the impact of a sea level rise of 3 feet (or approximately 1 meter) on the San Francisco Bay Area. The model has identified areas that would be under water due to sea level rise; the areas do not

include Emeryville. Therefore the development proposed under the General Plan along the shoreline in Emeryville would not be subject to the risk of flooding from sea level rise. The impact would be less than significant (Also refer to Impact 3.13-7). However, Emeryville will monitor the climate change effects and implement any measures necessary to reduce any risk of flooding from sea level rise in the future.

Adherence to the proposed General Plan policy listed above ensures the potential impact is less than significant.

Mitigation Measures

None required.

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3.6 Geology, Soils, and Seismicity

ENVIRONMENTAL SETTING

PHYSICAL SETTING

Geology

The city of Emeryville is situated within the Coast Ranges geomorphic province of California. The Coast Ranges is the largest of the state's geomorphic provinces extending approximately 400 miles from the Klamath Mountains (near northern Humboldt County) to the Santa Ynez River in Santa Barbara County. The province lies between the Pacific Ocean and the Great Valley (Sacramento and San Joaquin valleys) provinces and is characterized by a series of northwest trending mountain ridges and valleys, running generally parallel to the San Andreas Fault zone. These mountain ridges and valleys have been formed by tectonic forces that compressed ancient sedimentary deposits over the course of millions of years.

The San Francisco Bay is located in a broad depression in the Franciscan bedrock resulting from an east-west expansion between the San Andreas and the Hayward fault systems. The bedrock surface can be found at elevations of 200 to 2,000 feet below mean sea level across the Bay Area. Sedimentary deposits that overlie the Franciscan bedrock originated from millions of years of erosion, deposition, and changes in sea level. Geologists categorize these sedimentary deposits into geologic formations based on the period of deposition and material type, as described below for the San Francisco Bay region.

- The Alameda Formation is the deepest and oldest of these sedimentary deposits and consists of a mixture of clay, silt, sand, gravel, and some shells with predominantly silt and clay sediments surrounding discontinuous layers of sand and gravel. Members of this formation include Yerba Buena Mud (also named Old Bay Mud), and the San Antonio/Merrit/Posey Member, and Young Bay Mud (RWQCB, 2008).
- Younger alluvial deposits once referred to as the Alameda Formation are deposited on top of the San Antonio and consist of sandy clays, clayey sands, sands and gravels. The source material for these alluvial deposits comes from the Berkeley Hills.

Emeryville lies at the eastern edge of San Francisco Bay as part of the flatlands which are also referred to as the East Bay Plain. The East Bay Plain consists of alluvial deposits that originated from the Berkeley Hills. The western side of the city contains former tidal sloughs and marshlands that were progressively filled in dating back to the 1900s. Before it was filled and developed, the topography of the city was probably at or slightly above mean sea level (msl), and is currently between 10 to 25 feet or more above msl. The city is essentially flat with many areas located on fill; in areas not covered by fill, the city's surface soils consist predominantly of fine-grained alluvium, including silts and clays, and towards the western portion of the city the alluvium is underlain by Bay Mud, as depicted in Figure 3.6-1. Bay Mud is a natural marine deposit that consists of soft saturated clays that can contain lenses of sand and shell fragments. Development on artificial fill placed over Bay mud often presents unique

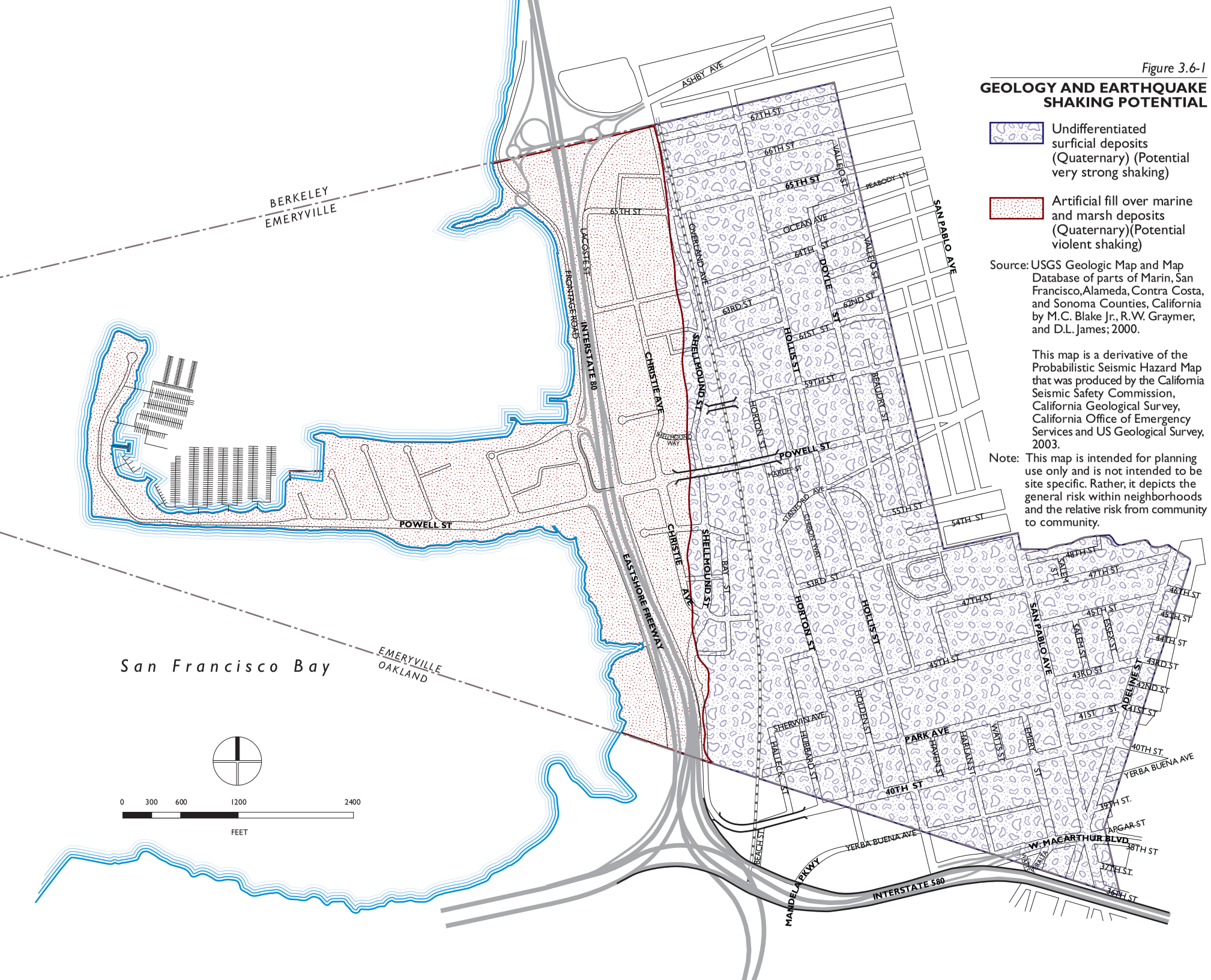

Figure 3.6-1

GEOLOGY AND EARTHQUAKE SHAKING POTENTIAL

Undifferentiated surficial deposits (Quaternary) (Potential very strong shaking)

Artificial fill over marine and marsh deposits (Quaternary)(Potential violent shaking)

Source: USGS Geologic Map and Map Database of parts of Marin, San Francisco, Alameda, Contra Costa, and Sonoma Counties, California by M.C. Blake Jr., R.W. Graymer, and D.L. James; 2000.

This map is a derivative of the Probabilistic Seismic Hazard Map that was produced by the California Seismic Safety Commission, California Geological Survey, California Office of Emergency Services and US Geological Survey, 2003.

Note: This map is intended for planning use only and is not intended to be site specific. Rather, it depicts the general risk within neighborhoods and the relative risk from community to community.

geotechnical engineering challenges because, unless the fill is properly engineered, structures can be damaged by differential settlement and subsidence. Under the bearing load of a new structure, Bay Mud tends to go through a cycle of consolidation that can lead to settlement.

Erosion is the wearing away of exposed soil and rock by processes such as mechanical or chemical weathering, mass wasting, and the action of waves, wind and underground water. Excessive soil erosion can eventually lead to damage of building foundations, roadways, and loss of topsoil. Throughout Emeryville, areas that are most susceptible to erosion are those that would be exposed during construction phase and along the shoreline where soil is subjected to wave action.

Seismic Hazards

Seismic hazards include those hazards that could reasonably be expected to occur in the area during a major earthquake on any of the active faults in the region. Some hazards can be more severe than others, depending on the location, underlying materials, and level of ground shaking. Emeryville lies within an area that contains many active and potentially active faults and is considered to be an area of high seismic activity. The U. S. Geological Survey (USGS) Working Group on California Earthquake Probabilities evaluated the probability of one or more earthquakes of Richter magnitude 6.7 or higher occurring in the San Francisco Bay Area within the next 30 years (USGS, 2008). The result of the evaluation indicated a 63-percent likelihood that such an earthquake event will occur in the Bay Area between 2007 and 2037 (USGS, 2008).

Regional Faults

Hayward-Rodgers Creek Fault

The Hayward fault trends to the northwest within the East Bay, extending from San Pablo Bay in Richmond, 60 miles south to east San José. The Hayward fault in San José converges with the Calaveras fault, a similar type fault that extends further south towards Hollister. The Hayward fault is designated by the Alquist-Priolo Earthquake Fault Zoning Act as an active fault which is defined as having displacement within the last 11,000 years. The Rodgers Creek fault located north of San Pablo Bay is considered to be an extension of the Hayward fault and the two are often combined in modeling studies.

A characteristic feature of the Hayward fault is its well-expressed and relatively consistent fault creep. Although large earthquakes on the Hayward fault have been rare since 1868, slow fault creep has continued to occur and has caused measurable offset. Fault creep on the East Bay segment of the Hayward fault is estimated at 9 millimeters per year (Peterson, 1996). However, a large earthquake could occur on the Hayward fault with an estimated moment magnitude (Mw) of about Mw 7.3. The USGS Working Group on California Earthquake Probabilities includes the Hayward-Rodgers Creek Fault Systems in the list of those faults that have the highest probability of generating earthquakes of magnitude (M) 6.7 or greater in the Bay Area (USGS, 2008).

San Andreas Fault

The San Andreas Fault Zone is a major structural feature that forms at the boundary between the North American and Pacific tectonic plates, extending from the Salton Sea in Southern California near the border with Mexico to north of Point Arena, where the fault trace extends out into the

Pacific Ocean. The main trace of the San Andreas fault runs through the Bay Area and trends northwest through the Santa Cruz Mountains along the eastern side of the San Francisco Peninsula. As the principal strike-slip boundary between the Pacific plate to the west and the North American plate to the east, the San Andreas is often a highly visible topographic feature, such as between Pacifica and San Mateo, where Crystal Springs Reservoir and San Andreas Lake clearly mark the rupture zone.

Calaveras Fault

The Calaveras fault is a major right-lateral strike-slip fault that has been active during the last 11,000 years. The Calaveras fault is located in the eastern San Francisco Bay region and generally trends along the eastern side of the East Bay Hills, west of San Ramon Valley, and extends into the western Diablo Range, and eventually joins the San Andreas Fault Zone south of Hollister. The northern extent of the fault zone is somewhat conjectural and could be linked with the Concord fault.

The Calaveras fault has been the source of numerous moderate magnitude earthquakes, and the probability of a large earthquake (greater than M6.7) is much lower than on the San Andreas or Hayward faults (USGS, 2008).

Concord-Green Valley

The Concord and Green Valley faults are part of the larger San Andreas Fault system. The Concord fault extends from the northwestern slope of Mt. Diablo north to Suisun Bay, where the Green Valley fault is generally thought to be connected to the Concord fault and continues north to Wooden Valley in Napa County. Several site-specific studies on these faults have been conducted in compliance with the Alquist-Priolo Earthquake Fault Zoning Act, and they report the most recent displacement on these faults between 2,600 and 2,700 years ago in the late Holocene.

Marsh Creek-Greenville Fault

The Marsh Creek-Greenville fault extends along the base of the Altamont Hills, which form the eastern margin of the Livermore Valley. The fault is recognized as a major structural feature and has demonstrated activity in the last 11,000 years. The Marsh Creek-Greenville fault is located approximately 23 miles northwest of Emeryville.

Ground Shaking

Ground movement during an earthquake can vary depending on the overall magnitude, distance to the fault, focus of earthquake energy, and type of geologic material. The composition of underlying soils, even those relatively distant from faults, can intensify ground shaking. For this reason, earthquake intensities are also measured in terms of their observed effects at a given location. The Modified Mercalli (MM) intensity scale (Table 9.4-1) is commonly used to measure earthquake damage due to ground shaking. The MM values for intensity range from I (earthquake not felt) to XII (damage nearly total), and intensities ranging from IV to X can cause moderate to significant structural damage. The intensities of an earthquake vary over the region of a fault and generally decrease with distance from the epicenter of the earthquake.

Historic earthquakes have caused strong ground shaking and damage in the San Francisco Bay Area, the most recent being the Loma Prieta earthquake (moment magnitude 6.9) in October 1989. The epicenter was approximately 50 miles south of Emeryville, and the earthquake caused very strong ground shaking for about 20 seconds and resulted in varying degrees of structural damage as far as 50 miles away. This event produced strong (Modified Mercalli VII) to very strong (Modified Mercalli VIII) shaking intensities in the project area (ABAG, 2008a). The 1906 San Francisco earthquake, with an estimated moment magnitude of 7.9, produced very strong (Modified Mercalli VIII) to violent (Modified Mercalli IX) shaking intensities in the City of Emeryville (ABAG, 2008a).

Emeryville does not lie in an Alquist-Priolo Earthquake Fault Zone, and no known active fault exists within the boundaries of the city. The Hayward-Rodgers Creek fault is located approximately one mile east of the eastern boundary of the city limits. Similar to the entire Bay Area, Emeryville is subject to ground shaking in the event of an earthquake on the regional faults.

The common way to describe ground motion during an earthquake is the duration of the shaking. However, a common measure of ground motion is also the peak ground acceleration; which for a given component of motion is the largest value of horizontal acceleration obtained from a seismograph.[1] Peak ground acceleration is expressed as the percentage of the equivalent acceleration of gravity (g), which is approximately 980 centimeters per second squared. For comparison purposes, the maximum peak acceleration value recorded during the Loma Prieta earthquake was in the vicinity of the epicenter, near Santa Cruz, at 0.64 g. The lowest values recorded were 0.06 g in the bedrock on Yerba Buena Island.

An earthquake on the Hayward-Rodgers Creek fault could produce more severe ground shaking than was observed during the Loma Prieta earthquake, as the epicenter of the earthquake would be in close vicinity of Emeryville. Probabilistic seismic hazard maps indicate that peak ground acceleration in the project region could reach or exceed 0.7 g (CGS, 2003).

[1] In terms of automobile acceleration, one "g" of acceleration is a rate of increase in speed equivalent to a car accelerating from a standstill to 60 mph in less than 3 seconds.

Table 3.6-1 Modified Mercalli Intensity Scale

Intensity Value	*Intensity Description*	*Average Peak Acceleration (% g[1])*
I	Not felt except by a very few persons under especially favorable circumstances.	< 0. 17
II	Felt only by a few persons at rest, especially on upper floors on buildings. Delicately suspended objects may swing.	0.17-1.4
III	Felt noticeably indoors, especially on upper floors of buildings, but many people do not recognize it as an earthquake. Standing motor cars may rock slightly, vibration similar to a passing truck. Duration estimated.	0.17-1.4
IV	During the day felt indoors by many, outdoors by few. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.	1.4–3.9
V	Felt by nearly everyone, many awakened. Some dishes and windows broken; a few instances of cracked plaster; unstable objects overturned. Disturbances of trees, poles may be noticed. Pendulum clocks may stop.	3.5 – 9.2
VI	Felt by all, many frightened and run outdoors. Some heavy furniture moved; and fallen plaster or damaged chimneys. Damage slight.	9.2 – 18
VII	Everybody runs outdoors. Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable in poorly built or badly designed structures; some chimneys broken. Noticed by persons driving motor cars.	18 – 34
VIII	Damage slight in specially designed structures; considerable in ordinary substantial buildings, with partial collapse; great in poorly built structures. Panel walls thrown out of frame structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned. Sand and mud ejected in small amounts. Changes in well water. Persons driving motor cars disturbed.	34 – 65
IX	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb; great in substantial buildings, with partial collapse. Buildings shifted off foundations. Ground cracked conspicuously. Underground pipes broken.	65 – 124
X	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations; ground badly cracked. Rails bent. Landslides considerable from riverbanks and steep slopes. Shifted sand and mud. Water splashed (slopped) over banks.	> 124
XI	Few, if any, (masonry) structures remain standing. Bridges destroyed. Broad fissures in ground. Underground pipelines completely out of service. Earth slumps and land slips in soft ground. Rails bent greatly.	> 1.24
XII	Damage total. Practically all works of construction are damaged greatly or destroyed. Waves seen on ground surface. Lines of sight and level are distorted. Objects are thrown upward into the air.	> 1.24

1. g (gravity) = 980 centimeters per second squared. 1.0 g of acceleration is a rate of increase in speed equivalent to a car traveling 328 feet from rest in 4.5 seconds.

Source: ABAG, 2008b.

Surface Fault Rupture

Seismically-induced ground rupture is defined as the physical displacement of surface deposits in response to an earthquake's seismic waves. The magnitude, sense, and nature of fault rupture can vary for different faults or even along different strands of the same fault. The city of Emeryville does not lie within an Alquist-Priolo Fault Rupture Hazard Zone, as designated through the Alquist-Priolo Earthquake Fault Zoning Act (see regulatory setting below), and no mapped active faults are known to pass through the immediate area. Therefore, the risk of ground rupture in the project area is low.

Liquefaction

Liquefaction is a transformation of soil from a solid to a liquefied state during which saturated soil temporarily loses strength resulting from the buildup of excess pore water pressure, especially during earthquake-induced cyclic loading. Soils susceptible to liquefaction include saturated loose to medium dense sands and gravels, low-plasticity silts, and some low-plasticity clay deposits. Liquefaction and associated failures could damage foundations, disrupt utility service, and can cause damage to roadways. Hazard maps available through ABAG and produced by the USGS depict liquefaction and lateral spreading hazards for the entire Bay Area in the event of a significant seismic event.[2] Within the city of Emeryville, liquefaction susceptibility ranges from moderate to very high (Knudsen et al., 2000). The California Geological Survey (CGS) has mapped the entire City of Emeryville within a Seismic Hazard Zone for liquefaction according to the requirements of the Seismic Hazards Mapping Act, discussed below (CGS, 2008).

Landslides

Slope failures, commonly referred to as landslides, include phenomena that involve the downslope displacement and movement of material, either triggered by static (i.e., gravity) or dynamic (i.e., earthquake) forces. A slope failure is a mass of rock, soil, and debris displaced downslope by sliding, flowing, or falling. Exposed rock slopes undergo rockfalls, rockslides, or rock avalanches, while soil slopes experience shallow soil slides, rapid debris flows, and deep-seated rotational slides. Landslides may occur on slopes of 15 percent or less; however, the probability is greater on steeper slopes that exhibit old landslide features such as scarps, slanted vegetation, and transverse ridges. Areas susceptible to landslides are characterized by steep slopes and downslope creep of surface materials. Debris flows consist of a loose mass of rocks and other granular material that, if saturated and present on a steep slope, can move downslope. The rate of rock and soil movement can vary from a slow creep over many years to a sudden mass movement. Landslides occur throughout the state of California, however, the density of incidents increases in zones of active faults.

Emeryville is not located in an area where earthquake-induced landslides are likely to occur because of the relatively flat topography of the city. As noted in the Seismic Hazard Zone Report for the Oakland West Quadrangle (CGS, 2002), landslides are abundant in the hillside areas of Oakland and Berkeley, although none have been mapped in the small hillside areas within the

[2] Lateral spreading is a type of ground failure associated with liquefaction and generally results from predominantly horizontal displacement of materials toward relatively unsupported free slope faces.

Oakland West Quadrangle. Therefore, the risk of landslide at the site is low and is not discussed further in this analysis.

Geologic Hazards

Considering the geologic context of the project area and nature of the project, other typical geologic hazards could include soil erosion and expansive soil. These hazards are discussed briefly below.

Expansive Soils

Expansive soils possess a "shrink-swell" behavior. Shrink-swell is the cyclic change in volume (expansion and contraction) that occurs in fine-grained clay sediments from the process of wetting and drying. Structural damage to buildings can occur over a long period of time, usually as a result of inadequate soil and foundation engineering or the placement of structures directly on expansive soils. Expansive soils are prevalent in the East Bay Plain area.

Soil Erosion

Erosion is the wearing away of soil and rock by processes such as mechanical or chemical weathering, mass wasting, the action of waves, wind and underground water. Excessive soil erosion can eventually lead to damage of building foundations and roadways.

REGULATORY FRAMEWORK

FEDERAL

Alquist-Priolo Earthquake Fault Zoning Act

The Alquist-Priolo Earthquake Fault Zoning Act (formerly the Alquist-Priolo Special Studies Zone Act), signed into law December 1972, requires the delineation of zones along active faults in California. The Alquist-Priolo Act regulates development on or near active fault traces to reduce the hazard of fault rupture and to prohibit the location of most structures for human occupancy across these traces3. Cities and counties must regulate certain development projects within the delineated zones, and regulations include withholding permits until geologic investigations demonstrate that development sites are not threatened by future surface displacement (Hart, 1997). Surface fault rupture, however, is not necessarily restricted to the area within an Alquist-Priolo Zone. Emeryville does not lie within an Alquist-Priolo Zone.

Seismic Hazards Mapping Act

The Seismic Hazards Mapping Act of 1990 addresses non-surface fault rupture earthquake hazards, including liquefaction and seismically-induced landslides. The purpose of the Act is to protect public safety from the effects of strong ground shaking, liquefaction, landslides, and other ground failure, and other hazards caused by earthquakes. The Act requires the State Geologist to delineate various seismic hazard zones and requires cities, counties, and other local permitting

[3] A "structure for human occupancy" is defined by the Alquist-Priolo Act as any structure used or intended for supporting or sheltering any use or occupancy that has an occupancy rate of more than 2,000 person-hours per year.

agencies to regulate certain development projects within these zones. Before a development permit is granted for a site within a seismic hazard zone, a geotechnical investigation of the site must be conducted and appropriate mitigation measures incorporated into the project design. The entire city of Emeryville lies within a seismic hazard zone for liquefaction (CGS, 2008).

STATE

California Building Code

The California Building Code (CBC) has been codified in the California Code of Regulations (CCR) as Title 24, Part 2. Title 24 is administered by the California Building Standards Commission, which, by law, is responsible for coordinating all building standards. Under state law, all building standards must be centralized in Title 24 or they are not enforceable. The purpose of the CBC is to establish minimum standards to safeguard the public health, safety and general welfare through structural strength, means of egress facilities, and general stability by regulating and controlling the design, construction, quality of materials, use and occupancy, location, and maintenance of all building and structures within its jurisdiction. In addition, the CBC contains necessary California amendments which are based on the American Society of Civil Engineers Minimum Design Standards 7-05, which provide requirements for general structural design and include means for determining earthquake loads as well as other loads (flood, snow, wind, etc.) for inclusion into building codes. The provisions of the CBC apply to the construction, alteration, movement, replacement, and demolition of every building or structure or any appurtenances connected or attached to such buildings or structures throughout California.

The earthquake design requirements take into account the occupancy category of the structure, site class, soil classifications, and various seismic coefficients which are used to determine a Seismic Design Category (SDC) for a project. The SDC is a classification system that combines the occupancy categories with the level of expected ground motions at the site and ranges from SDC A (very small seismic vulnerability) to SDC E/F (very high seismic vulnerability and near a major fault). Design specifications are then determined according to the SDC.

LOCAL

The City of Emeryville Municipal Code includes regulatory requirements that would apply to geology and soils for new development under the General Plan.

- Title 9 includes requirements for subdivisions and commercial developments that would occur under the General Plan.
- Chapter 3 of Title 9 requires preparation of a soils report for subdivisions, when specifically requested by the Planning Commission. In the case a soils report is required, and such report discloses an unstable condition, the City shall require appropriate steps to be taken to correct such condition, or, if such unstable condition cannot be eliminated, the subdivision, parcel map, or other division of land shall be disapproved.

New development may also require a preliminary geological study of the property and surrounding area.

IMPACT ANALYSIS

SIGNIFICANCE CRITERIA

Implementation of the proposed Emeryville General Plan could have a significant geology and soils impact if it would:

- Expose people or structures to potential substantial risk of loss, injury, or death involving
  - a) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map or Seismic Hazards Map issued by the State Geologist for the area or based on other substantial evidence of a known fault (refer to Division of Mines and Geology Special Publication 42)
  - b) Strong seismic ground shaking;
  - c) Seismic-related ground failure, including liquefaction;
  - d) Landslides
- Result in substantial soil erosion or the loss of topsoil;
- Be located on geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse;
- Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994, as it may be revised), creating substantial risks to life or property;
- Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater.

METHODOLOGY AND ASSUMPTIONS

The impact analysis takes into account the proposed General Plan policies and goals, geologic and seismic conditions within Emeryville, and applicable regulations and guidelines. The proposed General Plan would facilitate development and growth within Emeryville. Consideration is given to erosion associated with future development, related construction activities, as well as potential geologic hazards posed by liquefaction, ground shaking, and underlying geologic materials. The potential for seismic activity to affect people and structures in Emeryville and the protection from seismic hazards provided by proposed General Plan policies are assessed.

SUMMARY OF IMPACTS

Impacts related to erosion, surface fault rupture, ground shaking, liquefaction, and differential settlement are all found in this analysis to be less than significant assuming proper enforcement of existing state and local building code requirements, as well as implementation of the policies in the proposed General Plan. The new development proposed under the General Plan would be connected to the existing sewer system (Section 3.10: Public Services and Utilities states there will be no alternative disposal systems), therefore alternative wastewater disposal systems would not be required. This impact is not discussed further. The relatively flat topography of the project area

also indicates that the likelihood of potential impacts from landslides is very low and also not discussed further.

IMPACTS AND MITIGATION MEASURES

Impact

3.6-1 New development under the proposed General Plan could generate loose and erodible soils during construction activities that, if not properly managed, could result in substantial erosion. *(Less than Significant)*

Emeryville predominantly lies on flat topography and has a developed landscape with office, regional retail, and high-density residential land uses, as well as mixed-use developments. Under the General Plan, new residential and nonresidential development would replace existing development. Construction of the new development would involve activities such as site clearing, grading, and excavation. Some earthwork activities associated with construction activities would disturb subsurface soils, causing erosion. To minimize wind or water erosion on the site during construction, developments would adhere to standard engineering practices and prepare stormwater pollution prevention plan (refer to Section 9.3, Hydrology and Water Quality, for additional information) and implement measures to control any erosion that may occur on construction sites.

The common practice of implementing best management practices reduces the potential for erosion during construction. Typically, the soil erosion potential is reduced once the soil is graded and covered with concrete, structures, asphalt, slope protection, or vegetation. Long-term erosion potential shall be addressed through installation of project landscaping and storm drainage facilities, both of which would be designed to meet applicable regulations. See Section 3.5, Hydrology and Flooding, for additional information.

Proposed General Plan Policy that Reduces the Impact

CSN-P-31 The City will continue to require soil erosion control measures during construction.

Adherence to established regulations, as well as the proposed General Plan policy listed above, ensure the potential impact is less than significant.

Mitigation Measures

No mitigation measures are required.

Impact

3.6-2 New development under the proposed General Plan could be subject to fault rupture, severe ground shaking, or liquefaction capable of causing injury and/or structural damage. *(Less than Significant)*

Emeryville is not located within a Fault-Rupture Hazard Zone as designated by the Alquist-Priolo Earthquake Fault Zoning Act of 1972, and no known active faults have been mapped on or in the immediate vicinity. As the site is not located on an active or potentially active fault, potential for surface fault rupture is low.

Emeryville is located within a Seismic Hazard Zone for liquefaction as designated by the California Geological Survey (CGS), indicating a moderate to high liquefaction potential. Liquefaction could result in potentially damaging effects to the proposed structures and related improvements. Development under the proposed General Plan would be required to perform a geotechnical investigation, which will specifically address the potential for liquefaction and provide measures such as specific foundation types and pile specifications, to mitigate potential damage to the proposed residential and commercial units in accordance with CGS Special Publication 117.

Although some structural damage is typically not completely avoidable during a major earthquake, building codes and current foundation design standards have been established to protect against the adverse effects of ground failure such as liquefaction and lateral spreading. For example, deep foundations extending below any liquefiable layers can be designed to support the structures and reduce the potential effects of liquefaction. In accordance with standard City practices, complying with the Uniform Building Code (UBC) standards, and incorporating a foundation design intended to minimize effects of ground shaking and seismicity-related ground failures, the developers would be required to submit an engineering analysis along with detailed engineering drawings to the Emeryville Planning and Building Department prior to excavation, grading, or construction activities on the site. The City maintains a seismic safety and retrofit ordinance and program to upgrade structures, particularly unreinforced masonry structures that are susceptible to damage from seismic activity (Title 8, Chapter 15).

The project sponsors would be required to submit an engineering analysis report along with detailed engineering drawings and relevant grading or construction activities on the project site to address constraints and incorporate recommendations identified in the geotechnical investigations. In addition, the required submittals would ensure that the buildings are designed and constructed in conformance with the requirements of all applicable building code regulations, pursuant to standard City procedures. Because all development is required to be constructed in conformance with the CBC and UBC, the risks of injury and structural damage from a known earthquake fault, ground shaking, or seismic-related ground failure would be reduced to a less than significant level.

Proposed General Plan Policies that Reduce the Impact

CSN-P-28 The City will continue to regulate development, including remodeling or structural rehabilitation, to ensure adequate mitigation of safety hazards on sites having a history or threat of seismic dangers, erosion, subsidence, or flooding.

CSN-P-29 The City will require geotechnical investigation of all sites proposed for development in areas where geologic conditions or soil types are susceptible

to liquefaction (see "very high" and high" level areas on Figure 6-4). The City also requires submission of geotechnical investigation and demonstration that project conforms to all recommended mitigation measures prior to city approval (as required by State law).

CSN-P-31 The City will enforce regulation of potentially hazardous structures to be retrofitted and made safe and encourage property owners to abate or remove structural hazards that create unaccepted levels of risk.

Adherence to established regulations, as well as the proposed General Plan policies listed above, ensure the potential impact is less than significant.

Mitigation Measures

None required.

Impact

3.6-3 New development under the proposed General Plan could be subject to settlement due to compressive soils or settlement/uplift as a result of expansive soils. *(Less than Significant)*

Bay Mud is typically made up of soft compressible layers of saturated clays that are susceptible to consolidation and settlement. The amount and rate of consolidation can depend on the weight of any new fill or structural loads (i.e., footings), the thickness of the existing fill, the thickness of the Bay Mud deposit, the degree to which consolidation has already occurred from former and existing structures, and the presence of sand layers within the Bay Mud. Constructing new shallow foundations and/or placement of new fill at the site could begin a new or "secondary" cycle of consolidation settlement in the Bay Mud. Where primary consolidation is complete, ground surface settlement is still expected to occur under the existing loads due to secondary compression of the Bay Mud layer.

The underlying soils at the proposed project site may also have the potential for expansion. The shrink-swell capacity of expansive soils can cause damage to foundations and pipelines. Due to the fact that settlement would likely occur, the final structural design for any proposed development would be required to address the potential for expansive soils to cause structural damage, and foundation support may have to be obtained from the competent soil of the deeper geologic units. Adherence to established regulations ensure the potential impact is less than significant.

Mitigation Measures

None required.

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3.7 Noise

This section addresses noise impacts associated with the development pursuant to the Emeryville General Plan Update. It analyzes potential noise impacts caused both during the construction and operational phases of the General Plan on the ambient noise environment. It also analyzes the compatibility of the proposed noise-sensitive uses with the existing noise environment. Background information on environmental acoustics, including definitions of terms commonly used in noise analyses, is provided below.

ENVIRONMENTAL SETTING

TECHNICAL BACKGROUND

Sound

Sound is mechanical energy transmitted by pressure waves through a medium such as air. Noise is defined as unwanted sound. Sound is characterized by various parameters that include the rate of oscillation of sound waves (frequency), the speed of propagation, and the pressure level or energy content (amplitude). In particular, the sound pressure level has become the most common descriptor used to characterize the loudness of an ambient sound level. Sound pressure level is measured in decibels (dB), with zero dB corresponding roughly to the threshold of human hearing, and 120 to 140 dB corresponding to the threshold of pain.

Sound pressure fluctuations can be measured in units of hertz (Hz), which correspond to the frequency of a particular sound. Typically, sound does not consist of a single frequency, but rather a broad band of frequencies varying in levels of magnitude (sound power). When all the audible frequencies of a sound are measured, a sound spectrum is plotted consisting of a range of frequency spanning 20 to 20,000 Hz. The sound pressure level, therefore, constitutes the additive force exerted by a sound corresponding to the sound frequency/sound power level spectrum.

The typical human ear is not equally sensitive to all frequencies of the audible sound spectrum. As a consequence, when assessing potential noise impacts, sound is measured using an electronic filter that de-emphasizes the frequencies below 1,000 Hz and above 5,000 Hz in a manner corresponding to the human ear's decreased sensitivity to low and extremely high frequencies instead of the frequency mid-range. This method of frequency weighting is referred to as A-weighting and is expressed in units of A-weighted decibels (dBA).[1] Frequency A-weighting follows an international standard methodology of frequency de-emphasis and is typically applied to community noise measurements. The A-weighted scale is used to describe all noise levels discussed in this section.

[1] All noise levels reported herein reflect A-weighted decibels unless otherwise stated.

Noise Exposure and Community Noise

An individual's noise exposure is a measure of the noise experienced by the individual over a period of time. A noise level is a measure of noise at a given instant in time. However, noise levels rarely persist consistently over a long period of time. Rather, community noise varies continuously with time with respect to the contributing sound sources of the community noise environment. Community noise is primarily the product of many distant noise sources, which constitute a relatively stable background noise exposure, with the individual contributors unidentifiable. The background noise level changes throughout a typical day, but does so gradually, corresponding with the addition and subtraction of distant noise sources such as traffic and atmospheric conditions. What makes community noise constantly variable throughout a day, besides the slowly changing background noise, is the addition of short duration single event noise sources (e.g., aircraft flyovers, motor vehicles, sirens), which are readily identifiable to the individual.

These successive additions of sound to the community noise environment varies the community noise level from instant to instant requiring the measurement of noise exposure over a period of time to legitimately characterize a community noise environment and evaluate cumulative noise impacts. This time-varying characteristic of environmental noise is described using statistical noise descriptors. The most frequently used noise descriptors are summarized below:

L_{eq}: The equivalent sound level is used to describe noise over a specified period of time, typically one hour, in terms of a single numerical value. The Leq is the constant sound level, which would contain the same acoustic energy as the varying sound level, during the same time period (i.e., the average noise exposure level for the given time period).

L_{max}: The instantaneous maximum noise level measured during the measurement period of interest.

L_{min}: The instantaneous minimum noise level measured during the measurement period of interest.

L_x: The sound level that is equaled or exceeded x percent of a specified time period. The L50 represents the median sound level.

DNL: The energy average of the A-weighted sound levels occurring during a 24-hour period, and which accounts for the greater sensitivity of most people to nighttime noise by weighting noise levels at night ("penalizing" nighttime noises). Noise between 10:00 p.m. and 7:00 a.m. is weighted (penalized) by adding 10 dBA to take into account the greater annoyance of nighttime noises. This is also sometimes referred to as the Ldn.

CNEL: Similar to the DNL, the Community Noise Equivalent Level (CNEL) adds a 5-dBA "penalty" for the evening hours between 7:00 p.m. and 10:00 p.m. in addition to a 10-dBA penalty between the hours of 10:00 p.m. and 7:00 a.m.

Cumulative noise descriptors, DNL and CNEL, are directly correlated with the likelihood of public annoyance from transportation noise sources.

Individual noise events, such as train passbys, are further described using single-event and cumulative noise descriptors. For single events, the maximum measured noise level (Lmax) is often cited, as is the Sound Exposure Level (SEL). The SEL is the energy-based sum of a given-duration noise event squeezed into a reference duration of one second.

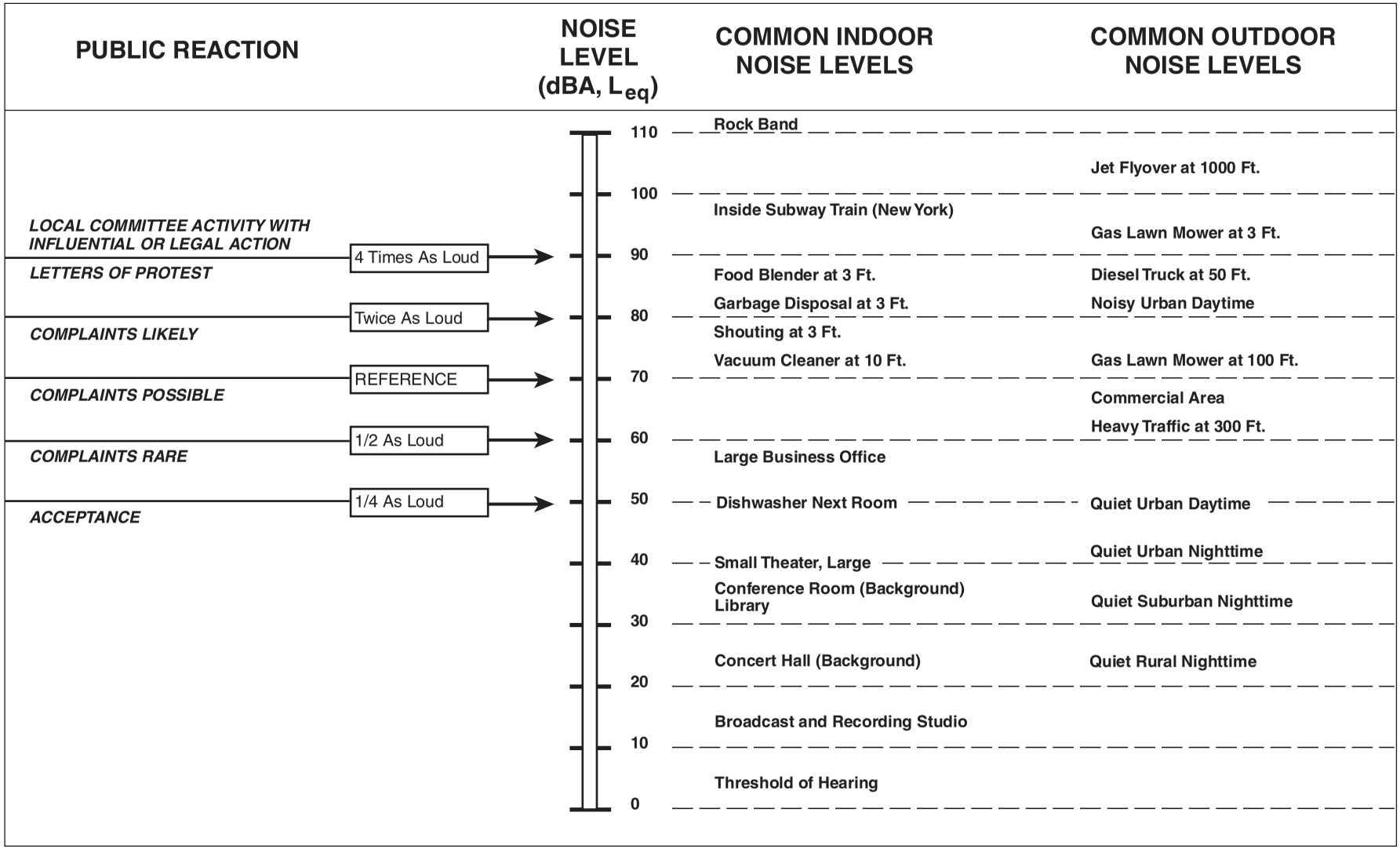
Sound Propagation and Attenuation

Sound level naturally decreases as one moves further away from the source. This basic attenuation rate is referred to as the geometric spreading loss. The basic rate of geometric spreading loss depends on whether a given noise source can be characterized as a point source or a line source. For a point source, such as an idling truck or jackhammer, the noise level decreases by about 6.0 dB for each doubling of distance away from the source.

In many cases, noise attenuation from a point source increases by 1.5 dB from 6.0 dB to 7.5 dB for each doubling of distance due to ground absorption and reflective wave canceling. These factors are collectively referred to as excess ground attenuation. The basic geometric spreading loss rate is used where the ground surface between a noise source and a receiver is reflective, such as parking lots or a smooth body of water. The excess ground attenuation rate (7.5 dB per doubling of distance) is used where the ground surface is absorptive, such as soft dirt, grass, or scattered bushes and trees.

For a line source, such as a heavily traveled roadway, the noise level decreases by a nominal value of 3.0 dB for each doubling of distance between the source and the receiver. If the ground surface between source and receiver is absorptive rather than reflective, the nominal rate increases by 1.5 dB to 4.5 dB for each doubling of distance. Atmospheric effects, such as wind and temperature gradients, can also influence noise attenuation rates from both line and point sources of noise. However, unlike ground attenuation, atmospheric effects are constantly changing and difficult to predict.

Trees and vegetation, buildings, and barriers reduce the noise level that would otherwise occur at a given receptor distance. However, for a vegetative strip to have a noticeable effect on noise levels, it must be dense and wide. For example, a stand of trees must be at least 100 feet wide and dense enough to completely obstruct a visual path to the roadway to attenuate traffic noise by 5 dB (Caltrans, 1998). A row of structures can shield more distant receivers depending upon the size and spacing of the intervening structures and site geometry. Generally, for an at-grade highway in an average residential area where the first row of houses cover at least 40 percent of the total area, the reduction provided by the first row of houses is approximately 3 dB, and 1.5 dB for each additional row (Caltrans, 1998). Similar to vegetative strips discussed above, noise barriers, which include natural topography and soundwalls, reduce noise by blocking the line of sight between the source and receiver. Generally, a noise barrier that breaks the line of sight between source and receiver will provide at least a 5-dB reduction in noise.



SOURCE: ESA, 2007

Figure 3.7-1
Effect of Noise on People

Effects of Noise

Human reaction to noise ranges from annoyance, to interference with various activities, to hearing loss and stress-related health problems. The effects of noise on people can be placed into three categories:

1. Subjective effects of annoyance, nuisance, dissatisfaction;
2. Interference with activities such as speech, sleep, learning; and
3. Physiological effects such as hearing loss or sudden startling.

These effects of noise are discussed below:

- Annoyance is the most difficult of all noise responses to describe. Annoyance is a very individual characteristic and can vary widely from person to person. What one person considers tolerable can be quite unbearable to another of equal hearing capability. (For instance, some people like the sound of trains, while others do not.)
- Speech Interference is one of the primary concerns associated with environmental noise. Normal conversational speech is in the range of 60 to 65 dB and any noise in this range or louder may interfere with speech. Depending upon the distance between the talker and the listener, background noise levels may require a raised voice in order to communicate. Transportation sources can easily interfere with conversation within a few hundred feet of the source.
- Sleep Interference is a major noise concern related to traffic-generated noise. Sleep disturbance studies have identified interior noise levels attributed to traffic noise as a key factor of sleep disturbance. However, it should be noted that sleep disturbance does not necessarily mean awakening from sleep, but can refer to altering the pattern and stages of sleep. Train noise (especially horn soundings) is a major source of complaints.
- Physiological Responses are those measurable noise effects on the human metabolism. They are ascertained as changes in pulse rate, blood pressure, etc. While such effects can be induced and observed, the extent to which these physiological responses cause harm or are a sign of harm is not known.
- Potential Hearing Loss is commonly associated with occupational exposures in heavy industry or very noisy work environments. Noise levels in neighborhoods, even near very noisy airports, are not sufficiently loud to cause hearing loss.

Environmental noise typically produces annoyance and speech interference effects. Workers in industrial plants generally experience noise affecting potential hearing loss. There is no completely satisfactory way to measure the subjective effects of noise, or the corresponding reactions of annoyance and dissatisfaction. A wide variation exists in the individual thresholds of annoyance, and different tolerances to noise tend to develop based on an individual's past experiences with noise.

Thus, an important way of predicting a human reaction to a new noise environment is the way it compares to the existing environment to which one has adapted: the so called "ambient noise" level. In general, the more a new noise exceeds the previously existing ambient noise level, the less acceptable the new noise will be judged by those hearing it. With regard to increases in A-weighted noise level, the following relationships occur:

- Except in carefully controlled laboratory experiments, a change of 1 dBA cannot be perceived;
- Outside of the laboratory, a 3-dBA change is considered a just-perceivable difference;
- A change in level of at least 5 dBA is required before any noticeable change in human response would be expected; and
- A 10-dBA change is subjectively heard as approximately a doubling in loudness, and can cause adverse response.

These relationships occur in part because of the logarithmic nature of sound and the decibel system. The human ear perceives sound in a non-linear fashion; hence the decibel scale was developed. Because the decibel scale is based on logarithms, two noise sources do not combine in a simple additive fashion. For example, if two identical noise sources produce noise levels of 50 dBA, the combined sound level would be 53 dBA, not 100 dBA.

Sensitive Receptors

People in residences, motels and hotels, schools, libraries, churches, hospitals, nursing homes, auditoriums, natural areas, parks and outdoor recreation areas are generally more sensitive to noise than are people at commercial and industrial establishments. Consequently, the noise standards for sensitive land uses are more stringent than for those at less sensitive uses. Sensitive uses are located throughout the City of Emeryville.

To protect various human activities in sensitive areas, lower noise levels are generally required. For example, a maximum outdoor noise level of 55 to 60 DNL is necessary for intelligible speech communication inside a typical home. Social surveys and case studies have shown that complaints and community annoyance in residential areas begin to occur when outdoor noise reaches 55 DNL (EPA, 1981). Sporadic complaints associated with the 55 to 60 DNL range give rise to widespread complaints and sometimes individual threats of legal action within the 60 to 70 DNL range. At 70 DNL and above, residential community reaction typically involves threats of legal action and strong appeals to local officials to stop the noise.

EXISTING NOISE SOURCES IN EMERYVILLE

Transportation sources, such as automobiles, trucks, trains, and aircraft, are the principal sources of noise in Emeryville. Along major transportation corridors, noise levels can reach 80 DNL, while along arterial streets, noise levels typically range from 65 to 70 DNL. Industrial and commercial equipment and operations and construction activities also contribute to the ambient noise environment in their vicinities.

Freeway and Internal Roadways

Freeways are a major noise source in Emeryville. Most of Emeryville is located between Interstate 80 and Interstate 580 freeways. Interstate 80 runs north-south towards the western boundary, while Interstate 580 runs approximately east-west just below the southern boundary. The section of Interstate 580 adjacent to Emeryville is elevated.

Traffic noise at a particular location depends upon the traffic volume on the roadway, the average vehicle speed, distance between the receptor and the roadway, the presence of intervening barriers between source and receiver, and the ratio of trucks (particularly heavy trucks) and buses to automobiles. A number of factors control how traffic noise levels affect nearby sensitive land uses. These include roadway elevation compared to grade; structures or terrain intervening between the roadway and the sensitive receptors; and the distance between the roadway and receptors. Freeway noise is expected to remain an issue in the future for noise sensitive uses, such as residential development.

The city also has busy internal roadways such as Powell Street, 40th Street, and San Pablo Avenue. Noise from these sources can be a significant environmental concern where buffers (e.g., buildings, landscaping, etc.) are inadequate or where there is minimal distance from the centerline to sensitive uses.

Railroad Noise

The City of Emeryville is served by the Union Pacific Railroad (UPRR) and Amtrak. These tracks traverse north-south through the center of the city. The Emeryville station is a full service Amtrak station and is a stop for local San Joaquin and Capitol trains, as well as Amtrak's interstate trains, California Zephyr and Coast Starlight.

Train noise, however intermittent, is a major source of noise due to its magnitude. Trains can generate high, relatively brief, intermittent noise events, particularly at surface crossings. Residents have observed that freight trains often park with diesel engines running for extended periods, which can also be a significant source of railroad-related noise. Train noise is an environmental concern for sensitive uses located along rail lines and in the vicinities of switching yards. Locomotive engines and the interaction of steel wheels and rails generate primary rail noise. Train air horns and crossing bell gates contribute to loud noise levels near grade crossings. The freight trains on the UPRR tracks operate as line-haul vehicles, with lower speeds in the range of 15 to 20 miles per hour. Therefore, the associated maximum noise level is also lower. Noise from freight trains on the UPRR tracks could be as high as 90 dBA at 100 feet (without horn). Sounding of train horns are limited by the Federal Railroad Administration to levels that do no exceed 113 dBA at 100 feet. Noise levels vary along the railroad tracks, showing higher noise levels in areas where surface crossings occur, generally north of Powell Street.

Airport Noise

Though the city is not located within the 65- CNEL noise contours for the San Francisco and Oakland International airports, noise from aircraft over flights is audible throughout the city and contributes to the ambient noise environment.

Industrial Noise

Industrial uses are another source of noise that can have a varying degree of impact on adjacent uses. A variety of mechanical equipment, generators, and vehicles all contribute to noise levels at industrial sites. There are also many areas in Emeryville where residential uses are in close proximity to light industrial uses. In addition, the updated General Plan may introduce more such uses.

Construction Noise

Construction can be another significant, although typically short-term, source of noise. Construction is most significant when it takes place near sensitive land uses, occurs at night, or in early morning hours. Local governments typically regulate noise associated with construction equipment and activities through enforcement of noise ordinance standards, implementation of general plan policies, and imposition of conditions of approval for building or grading permits.

The dominant construction equipment noise source is usually a diesel engine without sufficient muffling. In a few cases, however, such as impact pile driving or pavement breaking, process noise dominates. Stationary equipment operates in one location for one or more days at a time, with either a fixed-power operation (pumps, generators, compressors) or a variable noise operation (pile drivers, pavement breakers). Mobile equipment moves around the construction site with power applied in cyclic fashion (bulldozers, loaders) or to and from the site (trucks). Construction-related noise levels generally fluctuate depending on the construction phase, equipment type and duration of use, distance between the noise source and receptor, and presence or absence of barriers between the noise source and receptor. The City currently regulates construction activity through Municipal Code Chapter 13, Section 5-13.05.

Mechanical Equipment Noise

Mechanical equipment is used extensively in buildings to provide heating, cooling, air circulation and water supply. Mechanical equipment that produces noise includes motors, pumps and fans. Frequently, this equipment includes components of pure tone noise from the rotational frequency of motors. Although noise levels are generally low from these sources at nearby properties, the fact that such sources may operate continuously and may include pure tones that make them audible at a substantial distance makes them a potentially important noise source.

Portable Power Equipment

Portable power equipment includes devices such as leaf blowers, lawn mowers, portable generators, electric saws and drills, and other similar equipment. The noise source may result

from the motor, from the working surface of the tool on the work piece, from noise of blowers and fans, or a combination of these sources. Portable power equipment is ubiquitous in the modern city, and can produce very high noise levels at the location of the work.

Amplified Sound

Amplified sound includes noise from personal or home audio equipment, automotive audio equipment, loudspeakers on sound trucks or in fixed installations used for paging, and amplified sound used for music or theatrical performances. Because this sound typically includes music or speech, it is potentially more detectable and more annoying than other sounds of the same noise level.

EXISTING NOISE LEVELS IN EMERYVILLE

The primary sources of persistent noise generated within Emeryville are from major roadway arterials throughout the city (Powell Street, San Pablo Avenue, 40th Street), the 80 and 580 freeways, Union Pacific Railroad and Amtrak train activity, and aircraft overflights from the San Francisco and Oakland International Airports.

Ambient noise monitoring was conducted to assess current noise levels in Emeryville at a variety of land uses proximate to major noise sources. Short-term noise measurements were taken during the peak hour traffic periods and adjacent to the major noise sources in the City. These measured noise levels included major noise sources (traffic and/or train passbys) in addition to non-traffic noise sources (e.g., adjacent land uses, leaf blower, and aircraft flyover). Additional long-term (24-hour) noise measurements were taken near rail activity and where other major noise sources could be excluded to the extent possible. Existing noise level data and contours are presented and described in the Emeryville General Plan Opportunities and Challenges document (City of Emeryville, 2006) and shown below in Figure 3.7-2.

REGULATORY FRAMEWORK

Federal, State, and local agencies regulate different aspects of environmental noise. Federal and State agencies generally set noise standards for mobile sources such as aircraft and motor vehicles, while regulation of stationary sources is left to local agencies. Local regulation of noise involves implementation of general plan policies and noise ordinance standards. Local general plans identify general principles intended to guide and influence development plans; local noise ordinances establish standards and procedures for addressing specific noise sources and activities. Noise issues relevant to the proposed project are addressed in Title 24 of the California Code of Regulations, City of Emeryville General Plan policies and the City's Noise Ordinance standards.

State of California

State regulations include requirements for the construction of new hotels, motels, apartment houses, and dwellings other than detached single-family dwellings that are intended to limit the extent of noise transmitted into habitable spaces. These requirements are collectively known as the California Noise Insulation Standards and are found in California Code of Regulations,

Title 24 (known as the Building Standards Administrative Code), Part 2 (known as the California Building Code), Appendix Chapters 12 and 12A. For limiting noise transmitted between adjacent dwelling units, the noise insulation standards specify the extent to which walls, doors, and floor ceiling assemblies must block or absorb sound. For limiting noise from exterior sources, the noise insulation standards set forth an interior standard of DNL 45 dBA in any habitable room and, where such units are proposed in areas subject to noise levels greater than DNL 60 dBA, require an acoustical analysis demonstrating how dwelling units have been designed to meet this interior standard. If the interior noise level depends upon windows being closed, the design for the structure must also specify a ventilation or air-conditioning system to provide a habitable interior environment. Title 24 standards are enforced through the building permit application process in Emeryville, as in most jurisdictions.

Figure 3.7-2

EXISTING NOISE CONTOURS



Note: Noise contours estimated from 2005 roadway traffic volumes obtained from Fehr & Peers; 2004 freeway traffic volumes from Caltrans; and 2005 long-term monitoring of rail noise and 2005 short-term monitoring of ambient noise conducted by ESA.

Source: Enviromental Science Associates, 2005

City of Emeryville

General Plan

Emeryville is required to adopt a Noise Element as part of its General Plan. Each Noise Element is required to analyze and quantify, to the extent practicable, current and projected noise levels associated with local noise sources. These include, but are not limited to, highways and freeways, primary arterials and major local streets, rail operations, air traffic, local industrial plants, and other stationary sources that contribute to the community noise environment.

Beyond statutory requirements, local jurisdictions are free to adopt their own goals and policies in their Noise Elements. However, most jurisdictions have chosen to adopt noise/land use compatibility policies derived from state recommendations. For instance, most jurisdictions including the City of Emeryville have adopted noise/land use compatibility guidelines that are recommended by the state (see Table 3.7-1).

For residential uses, outdoor noise levels of 60 DNL or less are considered "normally acceptable"; outdoor noise levels between 60 and 70 DNL are "conditionally acceptable"; and outdoor noise levels exceeding 70 DNL are "normally unacceptable." Under state guidelines, new schools, libraries, churches, hospitals, and nursing homes that are proposed in areas subject to DNL 60 to 70 dB should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features included in the design. For many land uses, the state recommendations show overlapping DNL ranges for two or more compatibility categories. These overlapping DNL ranges indicate that local conditions (existing noise levels and community attitudes toward dominant noise sources) should be considered in evaluating land use compatibility at specific locations.

Municipal Code Noise Standards

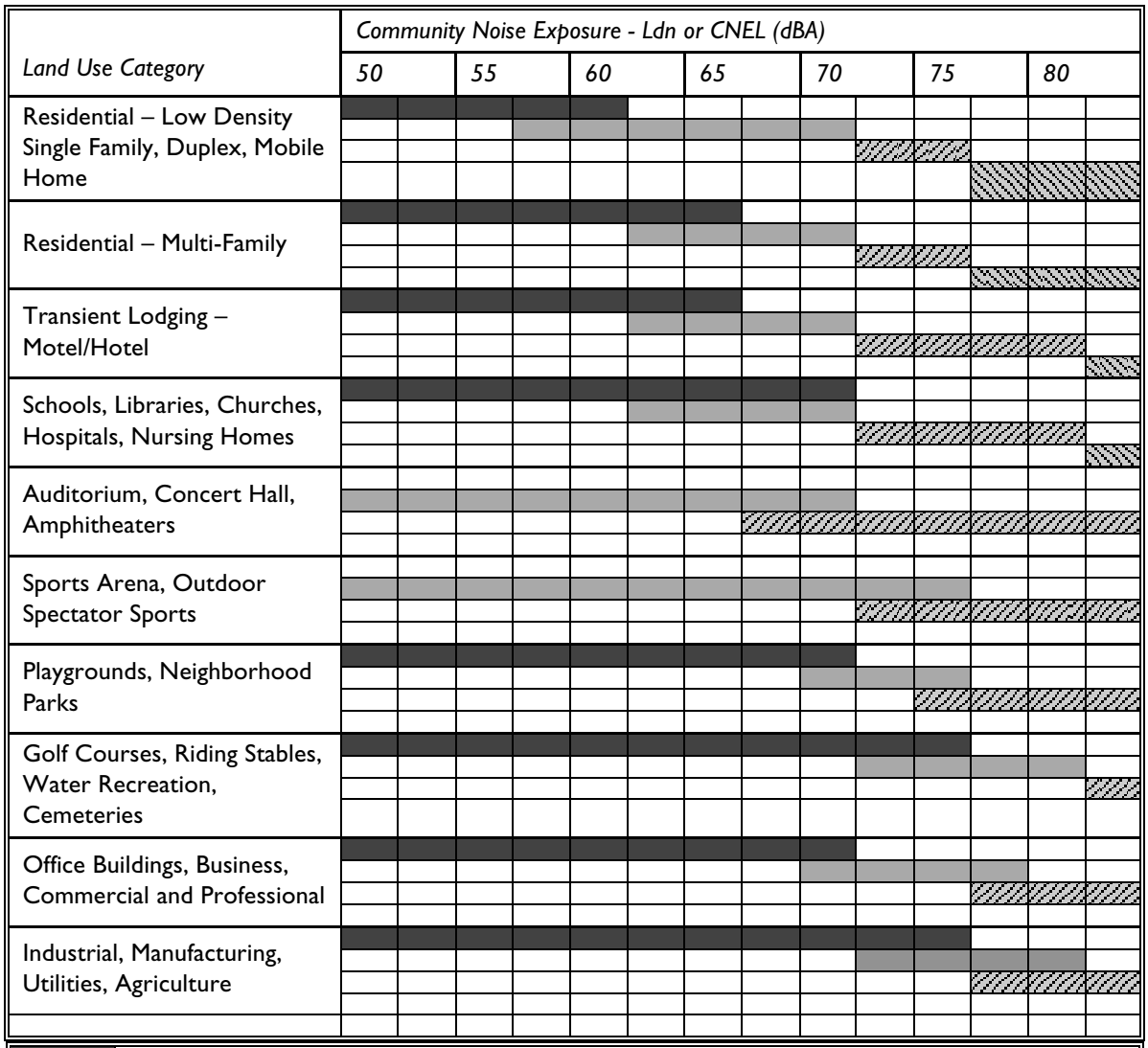
Noise may be regulated through implementation of noise element policies and through enforcement of local ordinance standards. Local noise standards generally relate to noisy activities (e.g., use of loudspeakers and construction) and stationary noise sources and facilities (e.g., air conditioning units and industrial activities). Generally, federal and state laws preempt local agencies from establishing noise standards for transportation-related noise sources, such as aircraft, ships, trains, and motor vehicles.

Chapter 13 of the City of Emeryville Municipal Code prohibits excessive and annoying noises from all sources subject to the City's police power that disturbs any reasonable person of normal sensitivity. Unless a waiver is approved by the City, general construction noise on private and public projects is limited to weekdays from 7 a.m. to 6 p.m. Pile driving and similar loud activities are limited to weekdays from 8 a.m. to 5 p.m. The Code does not provide any quantitative standards for construction or operational noise.

Any noise that would disturb or cause discomfort to any reasonable person of normal sensitivity located at the property line of the property from which such noise is emanating are restricted to the hours of 7 a.m. to 9 p.m. on weekdays and 8 a.m. to 9 p.m. on weekends. These sources and

activities include noise from the premises of any commercial, industrial or residential establishment; sustained truck idling; repair and testing of any automobile; machine or mechanical device; loading and unloading operations, band or orchestral concert, rehearsals, or practice; and electronically or acoustically amplified sound. The use of leaf blowers, generators, and other equipment with noise levels similar to those of pile drivers are limited to weekdays from 8 a.m. to 5 p.m., except that generators may be used at any time in case of power outage.

Table 3.7-1: Land Use Compatibility for Community Noise Environment



	Normally Acceptable	Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction, without any special noise insulation requirements.
	Conditionally Acceptable	New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features are included in the design. Conventional construction, but with closed windows and fresh air supply systems or air conditioning will normally suffice.
	Normally Unacceptable	New construction or development should be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirement must be made and needed noise insulation features included in the design.
	Clearly Unacceptable	New construction or development generally should not be undertaken.

Source: State of California, Governor's Office of Planning and Research, 2003. General Plan Guidelines, October 2003.

IMPACT ANALYSIS

SIGNIFICANCE CRITERIA

Implementation of the proposed General Plan would have a potentially significant impact if it would:

- Expose persons to or generate noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies;
- Expose persons to or generate excessive ground-borne vibration or ground-borne noise levels;
- Result in a substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project and in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies;
- Result in a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project and in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies;
- For a project located within an airport land use plan or, where such a plan has not been adopted, within 2 miles of a public airport or public use airport, expose people residing or working in the project area to excessive noise levels; or
- For a project within the vicinity of a private airstrip, expose people residing or working in the project area to excessive noise levels.

The following analysis discusses the first four criteria; the fifth and sixth are not discussed further since the project would not be in the vicinity of a public airport or private airstrip.

METHODOLOGY AND ASSUMPTIONS

The impact of project and cumulative traffic noise has been evaluated using guidance from Caltrans. A change in noise levels of less than 3 dBA is not discernible to the general population; an increase in average noise levels of 3 dBA is considered barely perceptible, while an increase of 5 dBA is considered readily perceptible to most people (Caltrans, 1998). Therefore, for evaluation of operational noise due to project-related traffic, an increase in noise of 5 dBA over existing noise levels would be considered substantial and indicate a significant permanent increase in ambient noise levels.

For long-term operational impacts, such as mechanical noise from stationary sources, Emeryville Noise Ordinance standards would apply to the proposed project. The significance of temporary increase in ambient noise levels is evaluated based on noise standards and hours of construction allowed in the noise ordinance. For land use compatibility impacts (noise impacts of the environment on the proposed project occupants), the land use compatibility categories published in the State of California General Plan Guidelines and adopted by the City of Emeryville would apply to the proposed project. Impacts from exposure of future occupants of the project site to ground-borne vibration from Amtrak and UPRR activity along the nearby tracks are evaluated qualitatively.

SUMMARY OF IMPACTS

Implementation of the proposed General Plan would result in increased traffic volumes, thus increasing noise levels in some areas. In addition, the proposed General Plan could locate new sensitive receptors in areas with existing noise levels that exceed the land use compatibility noise levels shown in Table 3.7-1. However, policies aimed at buffering noise levels and locating sensitive receptors away from noise sources help to reduce this impact. Increases in traffic levels can be counteracted by the implementation of alternate forms of transportation and land use design that factor in noise concerns. Locating noise-sensitive uses away from high-noise areas (e.g. major transportation routes), and buffering noise levels through design and landscaping features will help minimize future noise-related land use conflicts. Policies in the proposed General Plan establish review criteria for certain land uses to ensure that future noise levels will not exceed acceptable levels near noise-sensitive land uses.

IMPACTS AND MITIGATION MEASURES

Impact

3.7-1 New development under the proposed General Plan would potentially expose existing noise-sensitive uses to construction-related increases in ambient noise. *(Less than Significant)*

Ambient noise levels near areas of new development may temporarily increase due to construction activities. Proposed General Plan development would be required to comply with the limitations on construction activity and associated noise standards included in Chapter 13 of the City of Emeryville Municipal Code. Compliance with these provisions is mandatory; however, when restricted to within these hours, construction noise can still be a nuisance when conducted in proximity to sensitive receptors.

Construction related noise is considered a short-term noise impact associated with demolition, site preparation, grading, and other construction-related activities. Two types of short-term noise impacts could occur during these construction-related activities. First, the transport of workers and the movement of materials to and from the construction site could incrementally increase noise levels along local access roads. The second source of noise would result from the physical activities (e.g., grading, etc.) associated with any construction-related activities. Construction is performed in various distinct steps, each with its own mix of equipment, workers, and activities. Consequently, each step has its own noise characteristics. However, despite the variety in the type and size of construction equipment, similarities in the dominant noise sources and patterns of operation allow construction-related noise ranges to be categorized by work phase. Table 3.7-2 shows typical exterior noise levels at various phases of commercial construction, and Table 3.7-3 shows typical noise levels associated with various types of construction related machinery.

Table 3.7-2: Typical Construction Phase Noise Levels

Construction Phase	*Noise Level (dBA, Leq)[1]*
Ground Clearing	84
Excavation	89
Foundations	78
Erection	85
Finishing	89

1. Average noise levels 50 feet from the noisiest source and 200 feet from the rest of the equipment associated with a given construction phase. Noise levels correspond to commercial projects in a typical urban ambient noise environment.

Source: Bolt, Beranek and Newman, U.S. EPA, 1971. Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances, 1971.

Table 3.7-3: Typical Noise Levels from Construction Equipment

Construction Equipment	*Noise Level (dBA, Leq at 50 feet)*
Truck	88
Concrete Mixer (Truck)	85
Scraper	89
Jack Hammer	88
Dozer	85
Paver	89
Generator	81
Pile Driver (Impact)	101
Loader	85
Grader	85
Backhoe	80

Source: Federal Transit Administration, 2006. Transit Noise and Vibration Impact Assessment, May 2006.

Proposed General Plan Policies that Reduce the Impact

CSN-P-46 Developers shall reduce the noise impacts of new development through appropriate means (e.g., double-paned or soundproof windows, setbacks, and screening). This noise attenuation method should avoid the use of visible sound walls.

Compliance with the limitations on construction activity and associated noise standards established in Chapter 13 of the City of Emeryville Municipal Code, as well as adherence to the proposed General Plan policy above, ensure that construction noise impacts are less than significant.

Mitigation Measures

None required.

Impact

3.7-2 New development under the proposed General Plan would contribute to a noticeable increase in the ambient noise level along some major roads, which would impact nearby existing and proposed residential receptors. *(Significant and Unavoidable)*

Traffic Noise

New development proposed by the General Plan would result in population and employment increases and more automobile and truck use. This activity would contribute to raising ambient noise levels to the levels shown on the future noise contours (Figure 3.7-3), particularly around I-80. Table 3.7-4 provides a summary of expected traffic volumes, according to the traffic model prepared by Fehr and Peers for the proposed General Plan. Existing traffic volumes were estimated using the Alameda County Congestion Management Agency model for the Year 2005. Growth planned in the proposed General Plan will create about 46 percent more average daily vehicle trips and 34 percent more daily vehicle miles traveled. Most of these miles will occur on arterial roads and highways.

Table 3.7-4: Expected Traffic Volume Summary

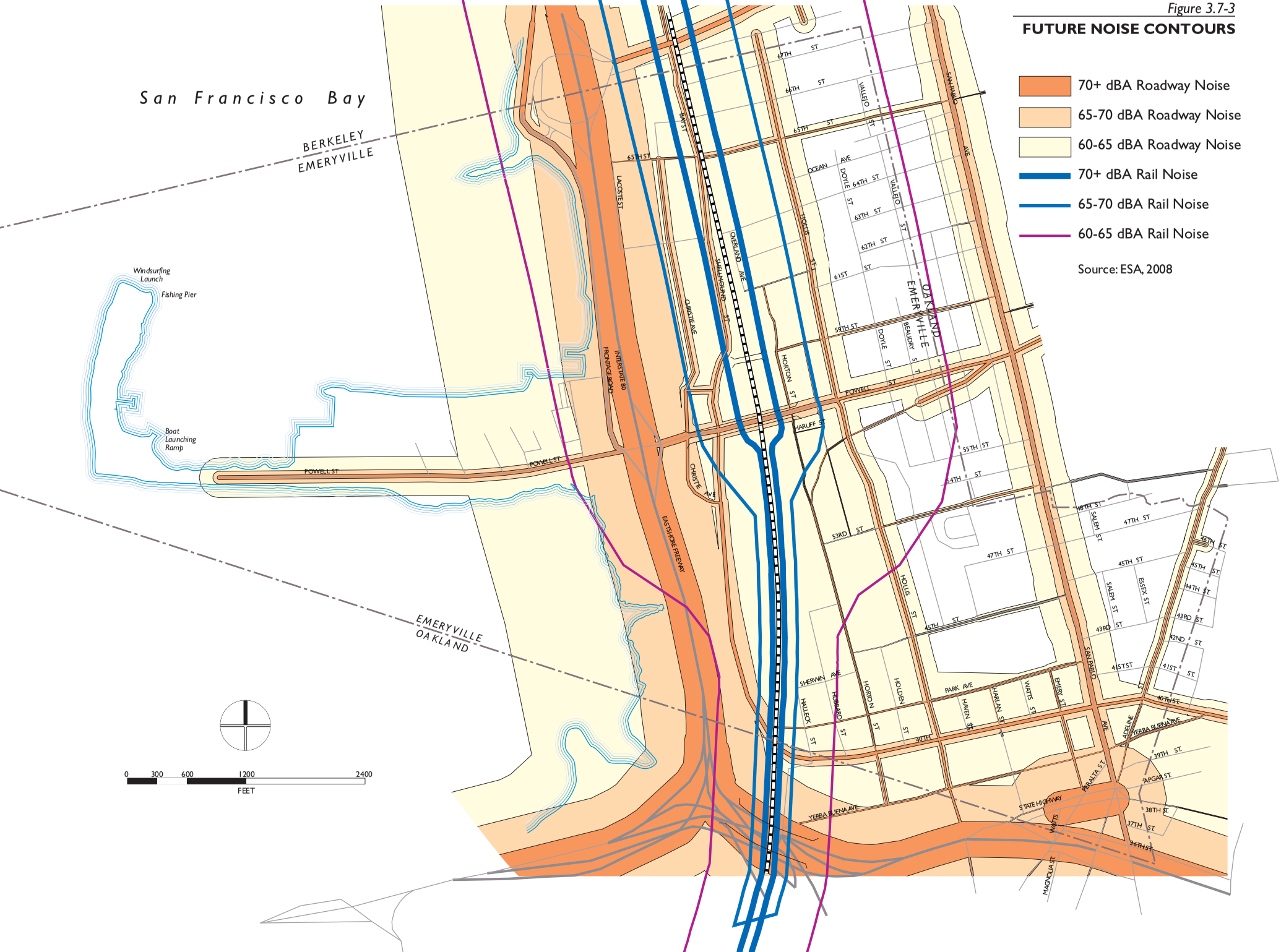
	Existing (Year 2005)	*Proposed General Plan (Year 2030)*	*Percent Increase*
Average Daily Vehicle Trips	133,000	194,000	46
Daily Vehicle Miles Traveled	859,000	1,154,000	34
Average Trip Length (miles)	6.5	6.0	(8)

Source: Fehr and Peers, 2008.

Table 3.7-5 depicts the incremental increase of proposed General Plan traffic noise (year 2030) versus existing traffic noise for specific roadway segments based on traffic information provided by Fehr and Peers. As shown in Table 3.7-5, traffic noise would increase by 5 dBA or greater on three roadway segments (Overland Ave south of 65th Street, Ohlone west of Shellmound Street, and W MacArthur Blvd east of Emery Street). However, the actual level of impact would depend on the presence and location of any existing or proposed land uses in relation to the noise source. While an increase of 5 dBA is considered significant, it is only significant if it affects sensitive land uses (residences are sensitive and could be negatively

Figure 3.7-3

FUTURE NOISE CONTOURS



affected by a 5 dBA increase; industrial uses are not sensitive and are not likely to be affected by a 5 dBA increase). Two of the roadway segments would have CNEL values below 60 dBA (a level normally acceptable with residential development) even after the increase.

Existing noise along many of the roadway segments and I-80 would be greater than 60 dBA CNEL, which is the normally acceptable noise level for residential development. The proposed General Plan could locate sensitive receptors in incompatible noise environments.

Table 3.7-5: Noise Analysis of Traffic Model Runs for Average Daily Trips and Daily Vehicle Miles Traveled

Road Segment	*From:*	*To:*	*Existing Calculated Noise Level (15 meters from roadway center)*[1]	*Year 2030 Calculated Noise Level (15 meters from roadway center)*[1]	*Incremental Increase in Noise Year 2030 Minus Existing*	*Significant? (Yes or No)*
Ashby Avenue	East of	7th Street	66.3	66.9	0.6	No
Ashby Avenue	West of	7th Street	67.6	68.1	0.5	No
7th Street	North of	Ashby Avenue	65.3	65.8	0.5	No
7th Street	South of	Ashby Avenue	64.3	65.0	0.7	No
Ashby Avenue	East of	San Pablo Avenue	66.0	66.4	0.4	No
Ashby Avenue	West of	San Pablo Avenue	66.4	67.3	0.9	No
San Pablo Avenue	North of	Ashby Avenue	66.9	67.8	0.9	No
San Pablo Avenue	South of	Ashby Avenue	66.7	67.9	1.2	No
65th Street	East of	Shellmound Street	60.9	63.5	2.6	No
65th Street	West of	Shellmound Street	58.7	59.5	0.8	No
Shellmound Street	North of	65th Street	61.7	64.3	2.6	No
Shellmound Street	South of	65th Street	62.4	64.5	2.1	No
65th Street	East of	Overland Ave	60.6	62.3	1.8	No
65th Street	West of	Overland Ave	60.9	63.5	2.6	No
Overland Ave	South of	65th Street	52.6	58.9	6.3	Yes
65th Street	East of	Hollis Street	57.9	60.7	2.8	No
65th Street	West of	Hollis Street	60.9	62.6	1.7	No
Hollis Street	North of	65Th Street	64.1	65.0	0.8	No
Hollis Street	South of	65Th Street	63.8	64.7	0.9	No
65th Street	East of	San Pablo Avenue	54.1	54.1	0.0	No

Table 3.7-5: Noise Analysis of Traffic Model Runs for Average Daily Trips and Daily Vehicle Miles Traveled

Road Segment	*From:*	*To:*	*Existing Calculated Noise Level (15 meters from roadway center)*[1]	*Year 2030 Calculated Noise Level (15 meters from roadway center)*[1]	*Incremental Increase in Noise Year 2030 Minus Existing*	*Significant? (Yes or No)*
65th Street	West of	San Pablo Avenue	57.9	59.2	1.3	No
San Pablo Avenue	North of	65th Street	66.8	67.6	0.9	No
San Pablo Avenue	South of	65th Street	66.7	67.6	0.9	No
59th Street	East of	Hollis Street	56.2	56.4	0.2	No
59th Street	West of	Hollis Street	57.1	58.9	1.8	No
Hollis Street	North of	59th Street	63.5	64.7	1.2	No
Hollis Street	South of	59th Street	63.8	65.2	1.4	No
I-80 WB Ramps	East of	Frontage Road	66.5	67.6	1.1	No
I-80 WB Ramps	West of	Frontage Road	61.7	61.8	0.1	No
Frontage Road	North of	I-80 WB Ramps	65.3	65.7	0.3	No
Frontage Road	South of	I-80 WB Ramps	67.6	68.6	1.1	No
Powell Street	East of	Frontage Road	67.6	68.7	1.1	No
Powell Street	West of	Frontage Road	65.4	65.6	0.2	No
Frontage Road	North of	Powell Street	67.1	68.3	1.2	No
Frontage Road	South of	Powell Street	59.5	59.6	0.2	No
Powell Street	East of	I-80 EB Ramps	68.1	69.3	1.3	No
Powell Street	West of	I-80 EB Ramps	67.6	68.7	1.1	No
I-80 EB Ramps	North of	Powell Street	62.2	62.7	0.5	No
I-80 EB Ramps	South of	Powell Street	65.3	65.8	0.5	No
Powell Street	East of	Christie Avenue	66.4	67.7	1.4	No
Powell Street	West of	Christie Avenue	68.3	69.6	1.3	No
Christie Avenue	North of	Powell Street	64.8	66.9	2.1	No
Christie Avenue	South of	Powell Street	64.3	65.3	1.0	No
Shellmound Way	East of	Christie Avenue	62.1	64.0	1.9	No
Shellmound Way	West of	Christie Avenue	--	59.3	--	No[2]
Christie Avenue	North of	Shellmound Way	62.6	64.7	2.0	No
Christie Avenue	South of	Shellmound Way	65.0	67.1	2.1	No
Shellmound Way	West of	Shellmound Street	62.7	64.0	1.3	No
Shellmound Street	North of	Shellmound Way	63.2	64.9	1.7	No

Table 3.7-5: Noise Analysis of Traffic Model Runs for Average Daily Trips and Daily Vehicle Miles Traveled

Road Segment	*From:*	*To:*	*Existing Calculated Noise Level (15 meters from roadway center)*[1]	*Year 2030 Calculated Noise Level (15 meters from roadway center)*[1]	*Incremental Increase in Noise Year 2030 Minus Existing*	*Significant? (Yes or No)*
Shellmound Street	South of	Shellmound Way	64.2	65.4	1.1	No
Powell Street	East of	Site B Driveway	66.4	67.5	1.1	No
Powell Street	West of	Site B Driveway	66.4	67.7	1.4	No
Site B Driveway	South of	Powell Street	--	59.1	--	No[2]
Christie Avenue	East of	Shellmound Street	60.5	61.2	0.7	No
Christie Avenue	West of	Shellmound Street	64.7	64.9	0.2	No
Shellmound Street	North of	Christie Avenue	65.5	66.3	0.7	No
Shellmound Street	South of	Christie Avenue	67.3	67.6	0.3	No
Christie Avenue	East of	Powell Plaza	64.9	65.1	0.2	No
Christie Avenue	West of	Powell Plaza	65.2	66.1	0.9	No
Powell Plaza	South of	Christie Avenue	61.7	60.9	0.0	No
Ohlone	East of	Shellmound Street	61.2	62.1	0.9	No
Ohlone	West of	Shellmound Street	54.7	61.8	7.2	Yes
Shellmound Street	North of	Ohlone	67.4	67.6	0.3	No
Shellmound Street	South of	Ohlone	67.1	67.8	0.7	No
Bay Street	East of	Shellmound Street	61.4	61.4	0.0	No
Shellmound Street	North of	Bay Street	67.1	67.8	0.7	No
Shellmound Street	South of	Bay Street	67.2	67.9	0.7	No
IKEA Exit	East of	Shellmound Street	60.5	60.5	0.0	No
Shellmound Street	North of	IKEA Exit	67.2	67.9	0.7	No
Shellmound Street	South of	IKEA Exit	67.0	67.8	0.7	No
IKEA Entrance	East of	Shellmound Street	61.8	61.8	0.0	No
Shellmound Street	North of	IKEA Entrance	67.0	67.8	0.7	No
Shellmound Street	South of	IKEA Entrance	66.6	67.4	0.8	No
Christie Avenue	East of	Bay Street	58.5	58.2	0.0	No
Christie Avenue	West of	Bay Street	60.4	60.3	0.0	No

Table 3.7-5: Noise Analysis of Traffic Model Runs for Average Daily Trips and Daily Vehicle Miles Traveled

Road Segment	*From:*	*To:*	*Existing Calculated Noise Level (15 meters from roadway center)[1]*	*Year 2030 Calculated Noise Level (15 meters from roadway center)[1]*	*Incremental Increase in Noise Year 2030 Minus Existing*	*Significant? (Yes or No)*
Bay Street	South of	Christie Avenue	58.6	58.6	0.0	No
Ohlone	East of	Bay Street	60.6	61.0	0.4	No
Ohlone	West of	Bay Street	61.4	61.7	0.4	No
Bay Street	North of	Ohlone	58.6	58.7	0.1	No
Powell Street	East of	Hollis Street	64.7	65.3	0.5	No
Powell Street	West of	Hollis Street	66.6	67.6	1.0	No
Hollis Street	North of	Powell Street	64.0	65.5	1.5	No
Hollis Street	South of	Powell Street	64.5	66.1	1.6	No
Stanford Street	East of	San Pablo Avenue	64.2	64.8	0.6	No
Stanford Street	West of	San Pablo Avenue	64.6	65.3	0.7	No
San Pablo Avenue	North of	Stanford Street	66.6	67.5	0.8	No
San Pablo Avenue	South of	Stanford Street	66.9	67.7	0.8	No
Park Avenue	East of	Hollis Street	59.4	62.2	2.8	No
Park Avenue	West of	Hollis Street	57.3	60.1	2.8	No
Hollis Street	North of	Park Avenue	62.4	64.8	2.4	No
Hollis Street	South of	Park Avenue	61.7	64.1	2.4	No
40th Street	East of	Horton Street	64.3	65.8	1.5	No
40th Street	West of	Horton Street	64.7	66.4	1.7	No
Horton Street	North of	40th Street	59.9	62.8	2.9	No
Horton Street	South of	40th Street	63.0	64.8	1.8	No
40th Street	East of	Hollis Street	65.0	66.8	1.8	No
40th Street	West of	Hollis Street	64.3	65.8	1.5	No
Hollis Street	North of	40th Street	61.8	64.2	2.4	No
Hollis Street	South of	40th Street	62.4	63.7	1.3	No
40th Street	East of	Emery Street	65.5	66.9	1.3	No
40th Street	West of	Emery Street	65.0	66.6	1.6	No
Emery Street	North of	40th Street	57.3	58.5	1.1	No
Emery Street	South of	40th Street	61.2	62.5	1.3	No
40th Street	East of	San Pablo Avenue	64.2	65.3	1.2	No

Table 3.7-5: Noise Analysis of Traffic Model Runs for Average Daily Trips and Daily Vehicle Miles Traveled

Road Segment	*From:*	*To:*	*Existing Calculated Noise Level (15 meters from roadway center)*[1]	*Year 2030 Calculated Noise Level (15 meters from roadway center)*[1]	*Incremental Increase in Noise Year 2030 Minus Existing*	*Significant? (Yes or No)*
40th Street	West of	San Pablo Avenue	65.3	66.7	1.4	No
San Pablo Avenue	North of	40th Street	67.1	68.0	0.9	No
San Pablo Avenue	South of	40th Street	67.0	68.1	1.2	No
40th Street	East of	Adeline Street	64.3	65.6	1.3	No
40th Street	West of	Adeline Street	64.5	65.6	1.1	No
Adeline Street	North of	40th Street	61.1	62.1	1.0	No
Adeline Street	South of	40th Street	59.5	61.1	1.7	No
40th Street	East of	Market Street	64.7	65.8	1.1	No
40th Street	West of	Market Street	64.7	65.9	1.2	No
Market Street	North of	40th Street	63.0	63.2	0.2	No
Market Street	South of	40th Street	62.9	64.0	1.1	No
Mandela Parkway	East of	Horton Street	60.3	61.1	0.8	No
Mandela Parkway	West of	Horton Street	62.7	64.4	1.6	No
Horton Street	North of	Mandela Parkway	63.0	64.8	1.7	No
Horton Street	South of	Mandela Parkway	59.0	59.0	0.0	No
Yerba Buena Avenue	East of	Hollis Street	58.4	58.4	0.0	No
Yerba Buena Avenue	West of	Hollis Street	60.2	61.1	1.0	No
Hollis Street	North of	Yerba Buena Avenue	61.9	63.1	1.2	No
Hollis Street	South of	Yerba Buena Avenue	61.1	62.9	1.8	No
W MacArthur Boulevard	East of	Emery Street	53.0	58.0	5.0	Yes
W MacArthur Boulevard	West of	Emery Street	58.8	60.3	1.5	No
Emery Street	North of	W MacArthur Boulevard	61.3	62.7	1.3	No
Peralta Street	South of	W MacArthur Boulevard	60.2	62.4	2.2	No
Adeline Street	East of	San Pablo Avenue	59.7	61.5	1.8	No
Adeline Street	West of	San Pablo	59.5	61.4	1.9	No

Table 3.7-5: Noise Analysis of Traffic Model Runs for Average Daily Trips and Daily Vehicle Miles Traveled

Road Segment	From:	To:	Existing Calculated Noise Level (15 meters from roadway center)[1]	Year 2030 Calculated Noise Level (15 meters from roadway center)[1]	Incremental Increase in Noise Year 2030 Minus Existing	Significant? (Yes or No)
		Avenue				
San Pablo Avenue	North of	Adeline Street	67.0	68.2	1.2	No
San Pablo Avenue	South of	Adeline Street	67.1	68.3	1.1	No
36th Street	East of	San Pablo Avenue	61.1	62.8	1.6	No
36th Street	West of	San Pablo Avenue	57.0	59.4	2.4	No
San Pablo Avenue	North of	36th Street	66.7	67.9	1.2	No
San Pablo Avenue	South of	36th Street	66.0	67.3	1.2	No
35th Street	East of	San Pablo Avenue	63.3	65.5	2.2	No
35th Street	West of	San Pablo Avenue	60.1	62.5	2.4	No
San Pablo Avenue	North of	35th Street	65.9	67.2	1.3	No
San Pablo Avenue	South of	35th Street	64.8	65.5	0.7	No

1. Noise levels were determined using FHWA Traffic Noise Prediction Model (FHWA RD-77-108). These noise levels are approximately 50 feet from the center of the specific roadway segment and are based on an assumed vehicle mix of 98 percent auto and 2 percent medium-duty truck. Vehicle speeds are assumed to be 30 miles per hour.

2. No incremental increase given for these segments since it is for a new roadway (thus, no existing traffic). However, comparison of the segment locations to the noise contours depicted in Figure 3.7-3 shows that the general noise environment would be between 60 dBA and 65 dBA CNEL and that the incremental noise increase would be less than significant.

Source: ESA, 2008; Fehr and Peers, 2008.

Stationary Equipment—Industrial and Commercial Uses

The proposed General Plan would result in a net reduction in industrial land uses (through redevelopment) and an increase in commercial land uses. The siting of these new commercial areas may increase noise levels in their proximity. This could occur due to the loading and unloading of heavy trucks used for the distribution of goods and supplies; or from equipment actually used to transport goods on site (primarily forklifts); or from heating, ventilating, and air conditioning equipment. Potential areas of land use-noise conflict could occur at the borders of these commercial areas with sensitive land uses (i.e., residential, schools, etc.).

Railroad Noise

The City of Emeryville is served by the Union Pacific Railroad and Amtrak. These tracks traverse north-south through the center of the city. The Emeryville station is a full service Amtrak station and is a stop for local San Joaquin and Capitol trains, as well as Amtrak's interstate trains, California Zephyr and Coast Starlight. Future railroad noise contours are depicted in Figure 3.7-3.

Although future rail use would not increase substantially, buildout of the proposed General Plan could locate noise-sensitive land uses in the vicinity of the railroad corridor, which could result in the exposure of sensitive receptors to noise levels that exceed City standards. The actual level of impact would depend on the presence and location of any existing or proposed land uses in relation to the noise source.

Proposed General Plan Policies that Reduce the Impact

CSN-P-44	Occupants of existing and new buildings should be protected from exposure to excessive noise, particularly adjacent to Interstate-80 and the railroad.
CSN-P-46	Developers shall reduce the noise impacts of new development through appropriate means (e.g., double-paned or soundproof windows, setbacks, and screening). This noise attenuation method should avoid the use of visible sound walls.
LU-P-26	If new residential buildings are proposed adjacent to freeways and railroad tracks impacts of these corridors, including noise, vibration, and air pollution, should be considered during site planning. Noise, vibration, and air pollution shall be mitigated to the extent possible.
T-P-5	The City encourages development that minimizes Vehicle Miles Traveled (VMT).
T-P-40	The City supports grade-separated crossings and other appropriate measures to mitigation the impacts of increased rail traffic on Emeryville, including noise, air pollution, and traffic disruption.

Significance

As stated above, the City will implement a variety of policies designed to address noise issues. In addition, the City will ensure that future CEQA documentation be prepared for individual projects (with project-specific data) that will (if technically possible) mitigate any potential noise impacts to a less than significant level. However, it should be noted, the ability to mitigate this potential impact is contingent upon a variety of factors including the severity of the noise impact, existing land use conditions and the technical feasibility of being able to implement any proposed mitigation measures. Given the uncertainty as to whether future noise impacts could be adequately mitigated for all the individual projects that will be implemented as part of the updated General Plan, this impact remains significant and unavoidable.

Mitigation Measures

No programmatic mitigation measures are feasible and site-specific measures shall be identified during CEQA review of specific development proposals made to the City.

Impact

3.7-3 New development under the proposed General Plan could result in the exposure of persons to, or generation of, excessive ground-borne vibration or ground-borne noise levels. *(Less than Significant)*

Buildout of the proposed General Plan could potentially expose more people to the impacts of excess ground-borne vibration or noise levels. Increased exposure to sources of ground-borne vibration could occur through increased residential or employment densities on lands within proximity to noise generating activities (i.e., industrial, railroad, etc.). Specifically, vibration created through construction, industrial activities, or increased railway activity could result in substantial new vibration impacts on existing or proposed sensitive land uses.

While, it is difficult to quantify and describe the nature and extent of vibration impacts at the programmatic level, subsequent CEQA analysis and documentation for individual projects will have project-specific data and will be required to mitigate any potential construction/operations-related vibration and noise impacts to a less than significant level, as feasible. The following proposed General Plan policies reinforce these requirements.

Proposed General Plan Policies that Reduce the Impact

LU-P-26 If new residential buildings are proposed adjacent to freeways and railroad tracks impacts of these corridors, including noise, vibration and air pollution, should be considered during site planning. Noise, vibration and air pollution shall be mitigated to the extent possible.

T-P-40 The City supports grade-separated crossings and other appropriate measures to mitigation the impacts of increased rail traffic on Emeryville, including noise, air pollution, and traffic disruption.

Adherence to the above proposed General Plan policies ensure ground-borne vibration and ground-borne noise impacts are less than significant.

Mitigation Measures

None required.

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3.8 Cultural Resources

This section presents the environmental setting and impact assessment for cultural and paleontological resources. Cultural resources are defined as prehistoric and historic sites, structures, and districts, or any other physical evidence associated with human activity considered important to a culture, a subculture, or a community for scientific, traditional, religious or any other reason. For analysis purposes, cultural resources may be categorized into three groups: archaeological resources, historic resources, and contemporary Native American resources.

Archaeological resources are places where human activity has measurably altered the earth or left deposits of physical remains. Archaeological resources may be either prehistoric-era (before the introduction of writing in a particular area) or historic-era (after the introduction of writing). The majority of such places in California are associated with either Native American or Euro-American occupation of the area. The most frequently encountered prehistoric archaeological sites are Native American village settlements with residential areas and sometimes cemeteries; temporary camps where food and raw materials were collected; smaller, briefly occupied sites where tools were manufactured or repaired; and special-use areas like caves, rock shelters, and sites of rock art. Historic-era archeological sites may include foundations or features such as privies, corrals, and trash dumps.

Historic resources are standing structures of historic or aesthetic significance that are generally 50 years of age or older (i.e., anything built in the year 1958 or before). In California, historic resources considered for protection tend to focus on architectural sites dating from the Spanish Period (1529–1822) through the early years of the Depression (1929–1930). Historic resources are often associated with archaeological deposits of the same age.

Contemporary Native American resources, also called ethnographic resources, can include archaeological resources, rock art, and the prominent topographical areas, features, habitats, plants, animals, and minerals that contemporary Native Americans value and consider essential for the preservation of their traditional values.

Paleontology is a branch of geology that studies the life forms of the past, especially prehistoric life forms, through the study of plant and animal fossils. Paleontological resources represent a limited, non-renewable, and impact-sensitive scientific and educational resource. As defined in this section, paleontological resources are the fossilized remains or traces of multi-cellular invertebrate and vertebrate animals and multi-cellular plants, including their imprints from a previous geologic period. Fossil remains such as bones, teeth, shells, and leaves are found in the geologic deposits (rock formations) where they were originally buried. Paleontological resources include not only the actual fossil remains, but also the collecting localities, and the geologic formations containing those localities.

Cultural resources provide us with a link to the people and the cultures of the past and enrich Emeryville's sense of community, heritage, and identity. The following provides an environmental setting for cultural resources in Emeryville, as well as the regulatory setting for the identification and protection of significant cultural resources.

ENVIRONMENTAL SETTING

Prehistory and Prehistoric Resources

The prehistoric environment of Emeryville consisted of mainly open bay waters and tidal flats, along with willow groves in proximity to Temescal Creek (SFEI 1997; Sowers 1995). Natural marshland biotic communities along the edges of bays and channels were the principal source for subsistence and other activities from the middle Holocene[1] until the contact period in the San Francisco Bay region. Remnants from the earlier Native American occupation include the numerous shellmounds or shell middens found along the Bay shorelines. Middens are generally defined as a collection of refuse at a site of human inhabitation which may include discarded shells harvested from the Bay and which provide information on the lifestyles of human settlements.

Early urbanization of the Bay Area and massive amounts of filling along the bay shores has, in many cases, destroyed or at least obscured the archaeological record. Indeed, much of the subsequent excavation work done after Nelson's (1909) investigations have been salvage operations. Many of the original surveys of archaeological sites in the Bay region were conducted between 1906 and 1908 by N.C. Nelson and yielded the initial documentation of nearly 425 "earth mounds and shell heaps" along the littoral zone of the Bay (Nelson, 1909). From these beginnings, the most notable sites in the Bay region were excavated scientifically, like the Emeryville shellmound (CA-ALA-309[2]), the Ellis Landing Site (CA-CCO-295) in Richmond, and the Fernandez Site (CA-CCO-259) in Rodeo Valley (Morrato 1984). These dense midden sites have been carbon 14 dated to be up to 2300 years old, but other evidence from around the Bay suggests that human occupation in the region is of greater antiquity, or ±5,000 B.C. (Jones, 1992). While many interpretations exist as to the function of the shellmounds, much of the evidence suggests that they served as sociopolitical landmarks on the cultural landscape and may have served as ceremonial features as well.

One of the largest shellmounds in the Bay Area was the Emeryville Shellmound (CA-ALA-309) which was estimated to have been 1,000 feet long, 300 feet wide, and 22 feet high located east of Interstate 80 in the vicinity of Temescal Creek. Three major excavations of the shellmound conducted since 1902 have indicated that the site included artifacts, immense quantities of faunal remains, grave goods, and burials, indicating that the site had been occupied for a 2,500 year period between circa (ca.) 500 B.C. to ca. A.D. 1700 (see Uhle, 1907; Nelson, 1906; Schenck,1926; Broughton, 1999). The shellmound was one of a complex of five mounds recorded along the mouth of Temescal Creek., e.g., CA-ALA-310 through ALA-313. The Emeryville Shellmound was altered in the 1870s for construction of Shellmound Park and many of the mounds were leveled in 1924 for industrial development; however, some subsurface deposits from the mounds may survive to this day. Additional subsurface deposits of the Emeryville Shellmound, including human burials, were discovered during construction for the South Bayfront Project.

[1] 10,000 years ago to present day.

[2] Site designator for the identified cultural resource, as listed on file at the Northwest Information Center, Sonoma State University.

Prehistoric Chronology

Efforts to reconstruct prehistoric times into broad cultural stages allows researchers to describe a wide number of sites with similar cultural patterns and components during a given period of time, thereby creating a regional chronology. The prehistory of the Bay Area can be divided into the Late Archaic (8,000–3,500 B.C.), the Early Period (3,500–500 B.C.), Middle Period (500 B.C.–A.D. 1,000), and Late Period (A.D. 1,000–1,700) (Milliken et al., 2007).

Late Archaic (also known as the Early Holocene) populations were generally mobile foragers, and the archaeological assemblages from this period consist of millingstones and handstones, and large wide-stemmed and leaf-shaped projectile points (Milliken et al., 2007). The earliest known occupation of the Bay Area is dated around 8,000 B.C., although it is likely that humans inhabited the area as early as 11,500 B.C. Some of the evidence for initial human occupation of the area is represented by what are commonly referred to as the Civic Center BART and Sunnyvale skeletons (Moratto, 1984). We now know that these date to just 5,000 years ago. Sea-level changes and post-Gold Rush sedimentation have obscured older materials. Recent evidence indicates that the lowest level strata of several of the oldest bay mounds are now 6 meters below sea level, while virtually all other major estuarine environments along the California coast yield significant archaeological materials older than 5,000 years (Broughton, 1999; Jones, 1992). Therefore, although the earliest known bay shore mounds date to 3,800 years ago, it is difficult to generalize about earlier periods of occupation since much of the archaeological evidence may lie below the current bay water level.

The Early Period or the so-called "Berkeley Pattern" (3,000–500 B.C.) is characterized by almost exclusive use of cobble mortars and pestles, which is often associated with a heavy reliance on acorns in the economy (Moratto, 1984). Such unusually intensive reliance on one foodstuff indicates that a shift away from the earlier reliance on a broad spectrum of dietary sources to supply demand was needed by around 1,000 B.C. The Late Pleistocene/Early Holocene profusion of food availability along lakeshores and estuaries likely led to an overexploitation of the resources that led, initially, to population increases, which may explicate the shift toward exploiting a readily available, yet lower ranked resource like acorns or seeds (Jones, 1991). Nevertheless, given the burgeoning size of Early Period settlements, it is probable that the populations were denser and more sedentary, yet continued to exploit a diverse resource base—from woodland to grassland and marshland, to bay shore resources throughout the San Francisco Bay Area (King, 1974). Many of the Berkeley traits diffused throughout the region and spread to the interior areas of central California during this time period.

The population increases and larger, more complex settlements that began in the late-Early Period typify the Middle Period (ca. 500 B.C.–A.D. 1,000) (Arnold et al., 2004). The sociopolitical landscape also appears to become more elaborate with clear differentiations in wealth. During the Late Period (ca. A.D. 1,000–1,700), however, new sites start to decline in the record and the large shellmounds were abandoned. The Late Period also showed population declines and concomitant changes in resource use—likely due to human-caused depletions in some terrestrial food sources during the Middle Period (Broughton, 1994). Broughton (1997; 1999) determined that vertebrate fauna discovered in the Emeryville shellmound showed clear changes in the Middle Period from preferred terrestrial (land-based) species to expensive (or less efficiently pursued prey per unit of

energy) marine mammals, and significant changes in body size in both terrestrial and marine animals, which suggests overexploitation.

Ethnographic Setting

The project area is within the traditional territory of the Costanoan or Ohlone people (Margolin, 1978). The Ohlone displaced an earlier people of unknown origin who had constructed the shellmounds; they were no longer in Emeryville by the time the Spanish arrived in the 1770s (Emeryville Historical Society, 1994). These people were collectively referred to by ethnographers as Costanoan, but were actually distinct sociopolitical groups that spoke at least eight languages (as different as Spanish is from French) of the same Penutian language group. The Costanoan occupied a large territory from San Francisco Bay in the north to the Big Sur and Salinas Rivers in the south. The primary sociopolitical unit was the tribelet, or village community, which was overseen by one or more chiefs. Emeryville, and a large area of the East Bay, is located within the territory of a people that spoke Chochenyo, one of several Costanoan languages.

Economically, the Ohlone engaged in hunting and gathering. Their territory encompassed both coastal and open valley environments that contained a wide variety of resources, including grass seeds, acorns, bulbs and tubers, bear, deer, elk, antelope, a variety of bird species, and rabbit and other small mammals. The Ohlone acknowledged private ownership of goods and songs, and village ownership of rights to land and/or natural resources; they appear to have aggressively protected their village territories, requiring monetary payment for access rights in the form of clamshell beads, and even shooting trespassers if caught. After European contact, Ohlone society was severely disrupted by missionization, disease, and displacement.

Recorded Archaeological Resources in Emeryville

The city of Emeryville contains 23 recorded Native American and historic-period archaeological resources. Since 1975, there have been over 30 archaeological investigations in Emeryville, primarily as a result of proposed commercial developments in the city. The most well known archaeological site is the Emeryville Shellmound discussed above. This site is recorded as site number CA-ALA-309. Four other recorded sites are directly or indirectly associated with this site and are listed as sites number CA-ALA-310, -311, -312, and -313. Like the Emeryville Shellmound, these sites were all shell midden deposits containing numerous artifacts that were mostly destroyed in the late nineteenth and early twentieth centuries with little or no scientific investigation completed at the time. Although evidence of the surface deposits left behind at these sites has largely been erased, subsurface remains likely still exist. Due to Emeryville's Bay shoreline location and the existence of important known archaeological sites, there is a high likelihood of encountering previously unrecorded Native American cultural resources anywhere in the city (Northwest Information Center [NWIC], 2005).

There are also approximately 18 recorded historic-era archaeological sites in the city of Emeryville comprised primarily of the remains of historic-era industrial buildings. These include the former Joseph T Ryerson & Son Steel Service Building and the former Breuner's Warehouse. The 18 sites are recorded as sites number P-01-001762 through P-01-010661 (NWIC, 2005).

Euroamerican History and Historic Period Resources

Spanish colonists were the first Euroamericans to settle in the Bay Area during the mid-1700s, however settlement of the Emeryville vicinity did not begin until 1820 with the establishment of the 48,000 acre Peralta land grant. This large land grant to Luis Maria Peralta encompassed the area from Emeryville northward to include what is now the northern portion of Alameda County. The area was sparsely settled and farmed from 1822 to 1846, and the mouth of Temescal Creek was used as a landing for Peralta Family's Rancho San Antonio.

The 1850s saw a huge influx of American pioneers joining in the California Gold Rush, many of whom settled in the Emeryville area, constructing numerous homes and businesses. Originally a northern suburb of Oakland, Emeryville became a city in its own right largely through the efforts of businessman Joseph S. Emery. Emery came to the Bay Area in 1850 looking for gold, but eventually started a stonework contracting business in San Francisco. In 1859, Emery purchased a 185-acre tract of land north of Oakland (the Emery Tract) and began to develop projects in the area. In 1871 Emery financed the construction of the San Pablo Avenue Horse Cart Railroad, which connected Oakland to Emeryville. He was also one of the primary builders of the California-Nevada Railroad, which began in Oakland, crossed the growing Emery Tract, and terminated in Orinda.

The small town began to develop around the Emery Tract, primarily focused along Park Avenue between San Pablo Avenue on the east and the (current) Southern Pacific Railroad tracks on the west. The town of Emeryville was officially incorporated in 1896, taking the name of its founder. Emery Station, a railroad transfer point between San Pablo Avenue Horse Cart Railway and the California-Northern Railroad was located in the heart of the Emery Tract, as was Emeryville's first post office.

Shellmound Park, an amusement park, was established in 1876 north of the mouth of Temescal Creek. It derived its name from the Emeryville Shellmound within its boundaries, and had a dance pavilion constructed on top of the shellmound. By the early part of the twentieth century, Shellmound Park had grown to encompass many diversions. Emery Station serviced Alameda County's first large industry, the Judson Manufacturing Company. Judson was established in 1882 at the foot of Park Avenue on the west side of the railroad tracks, and eventually expanded from an operation encompassing nine acres to one that was 45 acres in size by 1911. Early products were iron bars, foundry castings, agricultural implements, and tools.

Another important early industry was the Central California Cannery, constructed between 1895 and 1903 and located just north of the Judson Manufacturing Company. Neither Judson nor the cannery operations currently exist, but the fill upon which they were located is still visible along the Bay shoreline. The domed, Victorian-style Emeryville town hall was completed in 1903, and still stands today at 1333 Park Avenue.

The 1906 Earthquake and Fire damaged or destroyed many of the buildings in Emeryville, especially those constructed of unreinforced brick, which was the predominant building type at the time. As with most parts of the Bay Area immediately following the earthquake, Emeryville quickly rebuilt out of sturdier materials like concrete, steel, and reinforced brick construction.

After Shellmound Park closed in 1920 due to declining attendance, primarily from the ban of liquor sales during Prohibition, the park was demolished to make way for industrial development in 1924. At this time, the prehistoric shell midden within the park was destroyed as the materials were hauled away for disposal and fill. By the 1930s, Emeryville was largely industrialized with fill extending west from the Southern Pacific Railroad Tracks. The completion of the San Francisco-Oakland Bay Bridge in 1936 southwest of Emeryville also brought with it new highways and improved approach roadways to provide automobile access between Oakland and San Francisco. The East Shore Highway was constructed on fill along Emeryville's shoreline as an approach highway to the Bay Bridge, which was later improved and replaced by Interstate 80 in the 1950s.

While primarily industrial in nature, some residential construction did occur within Emeryville and developed two small neighborhoods between the late 1880s to the 1920s located primarily on its northern and eastern boundaries adjacent to the Oakland city limits. These neighborhoods are still relatively intact, and constitute Emeryville's 'north end' neighborhood located between Doyle and Vallejo Streets, and the 'triangle' neighborhood between San Pablo Avenue and Adeline Street. Emeryville today is no longer an industrial and manufacturing center, but contains a diverse mix of commercial, retail, light industrial, live-work, and residential uses in a relatively small geographic area.

Historic Resources in Emeryville

A comprehensive survey of historic resources in the city of Emeryville was conducted by Caltrans in 1990 in conjunction with the Interstate 880/Cypress Reconstruction Project. The Historic Architecture Survey Report prepared for this project identified historical structures in the vicinity of the proposed roadway project, including the Emeryville Historic Industrial District. The district developed primarily between 1907 and 1930 with manufacturing and warehouse facilities constructed predominantly of brick with Classical architectural details. Of the 29 buildings included in the district, 23 are considered contributory resources (Caltrans, 1990). Nineteen district contributors currently exist, while four have been demolished due to recent commercial development. The boundaries of the district are generally bound by Park Avenue to the south, 45th Street to the north, San Pablo Avenue to the east, and the railroad to the west (see Figure 3.8-1). The Emeryville Historic Industrial District is considered to be eligible for listing in the National Register of Historic Place (National Register) and was therefore automatically included in the California Register of Historic Resources (California Register) in 1990.

Two historic resources in Emeryville have been previously listed in or determined eligible for listing in the National and California Registers as individual resources. These are, 1) the former Remar Bakery (Bakery Lofts) located at 1010 46th Street, and 2) a private residence at 3604 Adeline Street. Table 3.8-1, below, provides a list of all rated historic buildings in the city of Emeryville.

Figure 3.8-1

HISTORIC RESOURCES



Source: Office of Historic Preservation and City of Emeryville

Table 3.8-1: Rated Historic Resources

	Address	*Name / Year Built*	*National / Local Rating*
A	1290 45th Street	Eagle / 1922	2D2 / T2
B	1401 45th Street	California Plywood Co. (45th St. Lofts E) / 1913	2D2 / T1
C	1420 45th Street	Artist's Co-op / 1927	2D2 / T1
D	1010 46th Street	Remar Bakery (Bakery Lofts) / 1919	1S
E	3604 Adeline Street	Private residence / 1895	2S2
F	4076 Halleck Street	Westinghouse Pacific Coast / 1930	2D2 / T3
G	4224 Holden Street	Bischoff / 1930	2D2 / T2
*	4202 Hollis Street	1925	2D2
H	4221 Hollis Street	Moreshouse Mustard / 1925	2D2 / T2
*	4224 Hollis Street	1929	2D2
I	4227 Hollis Street	PG&E South / 1930	2D2 / T3
J	4245 Hollis Street	PG&E South / 1924	2D2 / T2
K	4512 Hollis Street	Robinson / 1923	2D2 / T1
L	4525 Hollis Street	PG&E North / 1925	2D2 / T2
M	4250 Horton Street	45th Street Lofts W. / c. 1925	2D2 / T1
*	4525 Horton Street	1924	2D2
N	1175 Park Avenue	Condominiums / 1907	2D2 / T1
O	1201 Park Avenue	Silberman Office / 1913	2D2 / T1
P	1219 Park Avenue	Folkmanis / 1917	2D2 / T1
*	1250 Park Avenue	1919	2D2
Q	1255 Park Avenue	Emeryville Properties / 1925	2D2 / T1
R	1500 Park Avenue	Emeryville Warehouse Lofts / 1911, 1927	2D2 / T1
S	1545 Park Avenue	Trader Vic's/Westinghouse Pacific / 1912	2D2 / T1
T	1550 Park Avenue	Pelco Distributors / 1917	2D2 / T1
U	1500 Sherwin Street	Sherwin-Williams / 1924	2D2 / T1

1S = individual property listing in the NR
2S2 = individual property determined eligible for listing in the NR
2D2 = contributor to a district determined eligible for listing in the NR (Emeryville Historic Industrial District)
T1 = Tier 1 Architectural Significance (Park Avenue Overlay District)
T2 = Tier 2 Architectural Significance (Park Avenue Overlay District)
* = Demolished

Source: Office of Historic Preservation, 2005; and City of Emeryville, 2005.

The City's Park Avenue Overlay District, established as an amendment to Article 43 in the City's municipal code, recognizes the buildings along Park Avenue and immediate environs as the historic center of Emeryville. This Overlay District is generally bordered by Hollis Street to the east, 40th Street to the south, the Southern Pacific Railroad tracks to the west, and all properties between Park Avenue and 40th Street (see Figure 3.8-1). The Overlay District designates 43

architecturally significant buildings within the Park Avenue District as either Tier 1 (primary architectural significance) or Tier 2 (secondary architectural significance). The City's municipal code states that the Emeryville Building Official shall not issue a building permit to move, remove or demolish a Tier 1 and Tier 2 architecturally significant building or structure unless the Emeryville Planning Commission first approves such action (Emeryville, 2004). Many of the buildings in the Park Avenue Overlay District are also contributors to the National Register-eligible Emeryville Historic Industrial District. Table 3.8-1 compares the locally-rated buildings with the ones identified as contributors to the Industrial District.

City of Emeryville Preservation Ordinance

The City developed a Preservation Ordinance in 2006, to ensure that the character of Emeryville's past and setting are maintained for future generations. The Ordinance protects significant structures from moving, removal, or demolition, and ensures that replacement structures are compatible with the surrounding community. Significant structures are more than 50 years old and contain particular design features on the street-facing façade (Municipal Code, Title 9, Article 67). The Ordinance does not regulate residential structures or the Park Avenue District, which are covered by other ordinances, as described above

POTENTIAL HISTORIC RESOURCES

Some properties outside the Park Avenue District might be determined eligible for listing as official historic resources upon further review and analysis. For example, the city of Emeryville contains numerous buildings and structures that are at least 45 years old (constructed before 1964), and as such, may qualify as historic resources if other criteria apply and if they retain sufficient physical integrity to convey their historic associations (see discussion below under regulatory framework for a definition of the significance criteria). These buildings have not yet been comprehensively surveyed either individually or as a group. According to assessor's parcel data for which year built information was recorded, construction dates in the City start from approximately 1883, with a total of 496 parcels containing one or more buildings constructed prior to 1964.[3] There are 83 total buildings or structures that are the oldest buildings on record in the City and that likely survived the 1906 Earthquake and Fire (constructed between 1883 and 1905). All of these are one- to two-story single and multi-family residential structures of relatively small size (averaging about 1,500 square feet), found on smaller lots (averaging about 4,600 square feet), and with an average construction date of 1899. Upon further review and evaluation, and depending on their physical integrity, some of these older buildings might be eligible as federal and/or state historic resources, either individually or as a historic district.

[3] Emeryville Metroscan Data, 2008. Of the 4,441 total parcels recorded in Emeryville, 3,076 parcels contain year built information. The remainder of the parcels do not contain year built information because they are either recorded as marina boat slips (underwater lots), include vacant lots and parking lots, newer shopping centers on Bay and Shellmound Streets, warehouses on Powell and Christie Avenues, or are public agencies or freeway parcels that are exempt from assessor tax rolls.

PALEONTOLOGICAL RESOURCES

Paleontological resources are the fossilized remains of plants and animals, including vertebrates (animals with backbones), invertebrates (e.g., starfish, clams, ammonites, and coral marine), and fossils of microscopic plants and animals (microfossils). The age and abundance of fossils depend on the location, topographic setting, and particular geologic formation in which they are found. Fossil discoveries not only provide a historic record of past plant and animal life, but may assist geologists in dating rock formations. Often, fossil discoveries constrain the time period and the geographic range of flora or fauna.

On a regional scale, fossilized plants, animals and microorganisms are prevalent throughout the East Bay. Many of the hills in the east bay are made up of sedimentary bedrock that is known to contain a wide range of fossils, including radiolarians, mullusks, diatoms, foraminifers and non-marine vertebrates. The flat lying plains below the East Bay hills are underlain by geologically young fluvial deposits where fossils are less abundant, but have been known to contain fresh water mullusks and extinct late Pleistocene vertebrate fossils (Graymer, 2000). The City of Emeryville is on the eastern margin of the San Francisco Bay where fluvial deposits of sand and silt interfinger with bay mud deposits. Generally, the western portion of the city is constructed on artificial fills that overlie the bay mud, while the eastern portion is built over fluvial deposits of sand and silt.

REGULATORY SETTING

Federal

The National Register of Historic Places (NRHP or National Register) is the nation's master inventory of known historic resources. The National Register is administered by the National Park Service and includes listings of buildings, structures, sites, objects, and districts that possess historic, architectural, engineering, archaeological, or cultural significance at the national, state, or local level. To be eligible for the National Register, a property must first be associated with an important historic context. The National Register identifies four possible context types, of which at least one must be applicable at the national, state, or local level. These are:

A. Property is associated with events that have made a significant contribution to the broad patterns of our history.

B. Property is associated with the lives of persons significant in our past. Eligible properties based on this criterion are generally those associated with the productive life of the individual in the field in which (s)he achieved significance.

C. Property embodies the distinctive characteristics of a type, period, or method of construction or represents the work of a master, or possesses high artistic values, or represents a significant and distinguishable entity whose components lack individual distinction.

D. Property has yielded, or is likely to yield, information important to prehistory or history.

Second, for a property to qualify under the National Register's criteria for evaluation, it must also retain historic integrity of those features necessary to convey its significance. The National Register has identified seven aspects of integrity. These are: location, design, setting, materials, workmanship, feeling, and association. Under most circumstances, a property must be at least 50 years old to qualify for listing in the National Register.

A variety of federal statutes specifically address paleontological resources. They are generally applicable to a project if that project includes federally-owned or federally-managed lands or involves a federal agency license, permit, approval, or funding. Federal legislative protection for paleontological resources stems from the Antiquities Act of 1906 (PL 59-209; 16 United States Code 431 et seq.; 34 Stat. 225), which calls for protection of historic landmarks, historic and prehistoric structures, and other objects of historic or scientific interest on federal lands.

State of California

California Register of Historic Resources

The California Register of Historical Resources (California Register or CRHR) is the authoritative listing of the state's significant historic resources as well as architectural, archaeological, and cultural resources. The California Register includes properties listed in or formally determined eligible for the National Register, pursuant to Section 4851(a) of the Public Resources Code, and lists selected California Registered Historical Landmarks. The State Office of Historic Preservation also maintains the Directory of Properties in the Historic Property Data File.

The context types to be used when establishing the significance of a property for listing on the California Register are very similar to the National Register, with emphasis on local and state significance. With some minor changes, CRHR criteria 1–4 are equivalent to NRHP criteria A–D, as shown below.

1. It is associated with events that have made a significant contribution to the broad patterns of local or regional history, or the cultural heritage of California or the United States; or

2. It is associated with the lives of persons important to local, California, or national history; or

3. It embodies the distinctive characteristics of a type, period, or method of construction or represents the work of a master, or possesses high artistic values; or

4. It has yielded, or is likely to yield, information important to prehistory or history of the local area, California, or the nation.

Like the NRHP, evaluations for eligibility to the CRHR also require an establishment of physical integrity. California's list of special considerations is shorter and more lenient than the NRHP. Under most circumstances, a property must be at least 45 years old to qualify for listing in the California Register.

All properties listed in or determined eligible for the National Register are automatically included in the California Register.

California Environmental Quality Act

CEQA is the principal statute governing environmental review of projects occurring in the State. CEQA requires lead agencies to determine if a proposed project would have a significant effect on archaeological resources. CEQA is codified at Public Resources Code sec. 21000 et seq. As defined in Section 21083.2 of CEQA a "unique" archaeological resource is an archaeological artifact, object, or site, about which it can be clearly demonstrated that without merely adding to the current body of knowledge, there is a high probability that it meets any of the following criteria:

- Contains information needed to answer important scientific research questions and there is a demonstrable public interest in that information.
- Has a special and particular quality such as being the oldest of its type or the best available example of its type.
- Is directly associated with a scientifically recognized important prehistoric or historic event or person.

In addition, the CEQA Guidelines recognize that certain historical resources may also have significance. The Guidelines recognize that a historical resource includes: (1) a resource in the California Register of Historical Resources; (2) a resource included in a local register of historical resources, as defined in PRC Section 5020.1(k) or identified as significant in a historical resource survey meeting the requirements of PRC Section 5024.1(g); and (3) any object, building, structure, site, area, place, record, or manuscript which a lead agency determines to be historically significant or significant in the architectural, engineering, scientific, economic, agricultural, educational, social, political, military, or cultural annals of California by the lead agency, provided the lead agency's determination is supported by substantial evidence in light of the whole record.

If a lead agency determines that an archaeological site is a historical resource, the provisions of Section 21084.1 of CEQA and Section 15064.5 of the State CEQA Guidelines apply. If an archaeological site does not meet the criteria for a historical resource contained in the State CEQA Guidelines, then the site is to be treated in accordance with the provisions of CEQA Section 21083, which is a unique archaeological resource. The State CEQA Guidelines note that if an archaeological resource is neither a unique archaeological nor a historical resource, the effects of the project on those resources shall not be considered a significant effect on the environment (State CEQA Guidelines Section 15064.5(c)(4)).

Paleontological resources are also afforded protection by CEQA. Appendix G (Part V) of the CEQA Guidelines provides guidance relative to significant impacts on paleontological resources, stating that a project will normally result in a significant impact on the environment if it will "…disrupt or adversely affect a paleontologic resource or site or unique geologic feature, except as part of a scientific study." Section 5097.5 of the Public Resources Code specifies that any unauthorized removal of paleontological remains is a misdemeanor. Further, the California Penal Code Section 622.5 sets the penalties for the damage or removal of paleontological resources.

Case law suggests that project applicants must prepare an EIR if a historic property is slated for demolition. In the *League for Protection of Oakland Architectural and Historic Resources v. City of Oakland, Feb 10, 1997, 52 Cal App. 4th 896*, the court decided a case concerning the redevelopment of the Montgomery Ward Building, constructed in 1923, in East Oakland. Considered an example of 20th Century utilitarian architecture with Arts and Crafts and Gothic detailing, the building had been given a preliminary historic designation by Oakland Cultural Heritage Survey and was considered to be eligible for the National Register of Historic Places. The court held that because the Ward building was eligible for historic status and described as historic in the city's general plan, CEQA Section 21084.1 required the city to consider this action a significant effect, thereby requiring preparation of an EIR.

Native American Heritage Commission

Section 50907.9 of the Public Resource Code and Section 7050 of the Health and Safety Code empower the Native American Heritage Commission (NAHC) to regulate Native American concerns toward the excavation and disposition of Native American cultural resources. Among its duties, the NAHC is authorized to resolve disputes relating to the treatment and disposition of Native American human remains and items associated with burials. Upon notification of the discovery of human remains by a county coroner, the NAHC notifies the Native American group or individual most likely descended from the deceased.

Tribal Consultation Guidelines (Senate Bill 18)

Senate Bill (SB) 18, which went into effect January 1, 2005, requires local governments (city and county) to consult with Native American tribes before making certain planning decisions and to provide notice to tribes at certain key points in the planning process. The intent is to "provide California Native American tribes an opportunity to participate in local land use decisions at an early planning stage, for the purpose of protecting, or mitigating impacts to, cultural places" (Governor's Office of Planning and Research, 2005).

The purpose of involving tribes at these early planning stages is to allow consideration of cultural places in the context of broad local land use policy, before individual site-specific, project-level, land use designations are made by a local government. The consultation requirements of SB 18 apply to general plan or specific plan processes proposed on or after March 1, 2005.

According to the Tribal Consultation Guidelines: Supplement to General Plan Guidelines (2005), the following are the contact and notification responsibilities of local governments:

- Prior to the adoption or any amendment of a general plan or specific plan, a local government must notify the appropriate tribes (on the contact list maintained by the Native American Heritage Commission [NAHC]) of the opportunity to conduct consultations for the purpose of preserving, or mitigating impacts to, cultural places located on land within the local government's jurisdiction that is affected by the proposed plan adoption or amendment. Tribes have 90 days from the date on which they receive notification to request consultation, unless a shorter timeframe has been agreed to by the tribe (Government Code §65352.3).

- Prior to the adoption or substantial amendment of a general plan or specific plan, a local government must refer the proposed action to those tribes that are on the NAHC contact list and have traditional lands located within the city or county's jurisdiction. The referral must allow a 45-day comment period (Government Code §65352). Notice must be sent regardless of whether prior consultation has taken place. Such notice does not initiate a new consultation process.
- Local government must send a notice of a public hearing, at least 10 days prior to the hearing, to tribes who have filed a written request for such notice (Government Code §65092).

Upon request, the NAHC provided the City with a list of contacts of four tribal representatives who have requested information on projects like a general plan update, and who may have knowledge of Native cultural resources within the Planning Area. On March 5, 2009, the City contacted each of the four tribal representatives with information about the proposed project and a request that they contact City staff with questions or concerns. Since that time, the City has received one response from a tribal representative requesting a list and map of archeological resources in the Planning Area. A report previously obtained from the NWIC of the California Historic Resources Information System at Sonoma State University was provided to the tribal representative. However, due to the confidential nature of these resource locations, a map was not included in the NWIC report.

City of Emeryville

The existing City of Emeryville General Plan (1993) contains the following goals and policies related to cultural resources.

Objective

A. Protect Emeryville's historic and cultural resources and encourage future development to reflect that heritage.

Policies

A. The City will require archaeological evaluation of sites with likely archaeological resources and require that the development of such sites be monitored during construction; significant findings should be protected or removed.

B. The City supports increased community interest in cultural and historic resources and will take appropriate actions to preserve such resources.

C. The City strongly endorses the reuse of heritage buildings.

Article 43 of the Emeryville Municipal Code has designated that the Park Avenue Overlay District require Planning Commission approval before permitting the removal or demolition of about 30 architecturally significant buildings within the district. Similarly, the Preservation Ordinance (Article 67) protects significant structures outside the Park Avenue District from moving or demolition.

IMPACT ANALYSIS

SIGNIFICANCE CRITERIA

Implementation of the proposed General Plan would have a potentially significant impact if it would result in:

- Substantial changes to the significance of a historical resource, defined as physical demolition, destruction, relocation, or alteration of the resource or its immediate surroundings such that the significance of a historic resource would be materially impaired (CEQA Guidelines, Section 15064.5);
- Substantial changes to the significance of an archaeological resource;
- Direct or indirect destruction of a unique paleontological resource; or
- Disturbance of any human remains, including those interred outside of formal cemeteries.

Section 15064.5 of the CEQA Guidelines further defines criteria for determining the significance of impacts on archaeological and historic resources. Section 15064.5 provides that, in general, a resource not listed on state or local registers of historical resources shall be considered by an agency to be historically significant if the resource meets the criteria for listing on the California Register of Historical Resources. The section also provides standards for determining what constitutes a "substantial adverse change" that must be considered a significant impact on a historic resource. The section further states that its provisions apply to those archaeological resources that also qualify as historic resources.

METHODOLOGY AND ASSUMPTIONS

A complete records search was conducted by the NWIC at Sonoma State University, which reviewed the State of California Office of Historic Preservation records, base maps, historic maps, and literature on file for Alameda County. Because this EIR is a Program EIR on a general plan, site-specific analysis of potential impacts on cultural and historical resources is not appropriate. Instead, this analysis identifies the type and magnitude of impacts that may result from the proposed General Plan as a whole.

SUMMARY OF IMPACTS

According to the NWIC at Sonoma State University, there is a high possibility of uncovering and identifying previously unrecorded archaeological deposits in the General Plan area. According to the Museum of Paleontology Collections at University of California, unrecorded paleontological deposits may also be located in the General Plan area. Finally, both the NWIC and the City of Emeryville have identified a number of historic buildings, including many which contribute to local historic districts. New development allowable under the proposed General Plan has the potential to disrupt undiscovered archaeological or paleontological resources during project

construction, and may directly or indirectly impact sites of historic architectural importance through demolition or substantial alteration.

Specific projects implied through General Plan policy could require supplemental environmental analysis prior to implementation to comply with CEQA requirements. Existing national, state and local laws, as well as policies in the proposed General Plan suggest that future development projects consistent with the land use policies of the proposed General Plan could result in potential impacts on cultural resources that are significant and unavoidable.

IMPACTS AND MITIGATION MEASURES

Impact

3.8-1 New development under the proposed General Plan has the potential to disrupt undiscovered archaeological resources. *(Less than Significant)*

A records search revealed that five recorded Native American archaeological sites and 18 historic archaeological sites are currently located within the Emeryville General Plan area. The five prehistoric sites represent the Emeryville Shellmound and related sites, a very large and important archaeological site. Although evidence of the surface deposits left behind at these sites has largely been erased, subsurface remains likely still exist. According to the NWIC at Sonoma State University, there is a high possibility of uncovering and identifying additional archaeological deposits almost anywhere in the entire city. New development that occurs within these likely archaeological deposit sites may adversely affect these archaeological resources either during construction or once inhabited.

The City of Emeryville is expected to grow at a faster rate than surrounding areas in the next few decades. By 2030, the population is anticipated to have grown by 73 percent and housing units to have increased by 60 percent. While most of Emeryville has already been built out, the City's General Plan encourages a high rate of redevelopment. Although many of the known archaeological sites have already been destroyed or in some way affected by development, it is still a possibility that unknown archaeological deposits, either related to previously known shellmound sites or to unknown sites, may be encountered during construction of the anticipated housing and commercial developments, even in areas that are already built out.

While project-specific studies will be necessary to determine the potential for significant impacts on specific archaeological resources or locations, some overall impacts of the proposed General Plan can be identified based on the probable locations of new development in the Planning Area and known geographic features near which prehistoric resources are most likely to be located.

In general, projects in the vicinity of ridgelines, midslope terraces, alluvial flats, ecotones, and sources of water have the greatest possibility of encountering a prehistoric archaeological resource. Emeryville is located on an alluvial plain surrounding the area where Temescal Creek meets the Bay, and prehistoric habitation in that area is already well documented. The entire City of Emeryville should be considered sensitive for prehistoric archaeological resources. Thus, the potential to disrupt undiscovered archaeological resources is potentially significant.

By law, if potentially significant cultural resources are discovered during ground-disturbing activities associated with project preparation, construction, or completion, work would halt in that area until a qualified archaeologist can assess the significance of the find, and, if necessary, develop appropriate treatment measures in consultation with Alameda County and other appropriate agencies and interested parties.

All future development in the Planning Area will be in accordance with State laws pertaining to the discovery of human remains. Accordingly, if human remains of Native American origin are discovered during project construction, the City would be required to comply with State laws relating to the disposition of Native American burials, which fall within the jurisdiction of the Native American Heritage Commission (Public Resources Code, Section 5097). If any human remains are discovered or recognized in any location on the project site, there shall be no further excavation or disturbance of the site or any nearby area reasonably suspected to overlie adjacent human remains until provisions of Public Resource Code Section 5097.98 regarding the disposition of human remains are adhered to.

The City's standard condition for archeological resources ensures that previously undiscovered archeological resources are handled appropriately when encountered during construction. The standard condition is as follows: If archeological resources are encountered during construction, then Applicant shall: cease all construction activity in the vicinity; notify the Planning Director; have the significance of the items determined by a qualified archeologist or cultural consultant; and take any further appropriate measures under the California Environmental Quality Act and other applicable laws with the Planning Director's approval. If human remains are encountered, state law requires that the County Coroner be called immediately. All work must be halted in the vicinity of the discovery until the Coroner's approval to continue has been received.

Furthermore, the proposed General Plan contains a number of policies that ensure the impact on archaeological resources is less than significant.

Proposed General Plan Policies that Reduce the Impact

CSN-P-25 Archaeological sites and resources shall be protected from damage. Areas found to contain significant indigenous artifacts shall be examined by a qualified archaeologist for recommendations concerning protection and preservation.

CSN-P-27 The City encourages municipal and community awareness and support for Emeryville's historic, cultural, and archeological resources.

Overall, current federal, State, and local laws and the policies in the proposed General Plan would contribute to reducing these impacts on archaeological resources to less than significant levels.

With inclusion of these policies, the proposed General Plan impact on archaeological resources is less than significant.

Mitigation Measures

No mitigation measures are required.

Impact

3.8-2 New development under the proposed General Plan within previously developed areas of the City has the potential to impact sites of local historic importance. *(Significant and Unavoidable)*

A majority of the city's historic resources are located in the Emeryville Historic Industrial District, including 19 contributory resources. Two additional structures are listed on the NRHP. The proposed intensification of development allowable under the General Plan could result in the demolition of registered historical structures and historic structures not yet registered or deemed eligible for the NRHP, but which are sites of local historical importance. Upon further review and evaluation, and depending on their physical integrity, some older buildings may be eligible for federal, State, and/or local historic designation, either individually or as an historic district. Furthermore, new development has the potential to impact the overall character of the historical setting of the Emeryville Historic Industrial District, and other potential historic districts.

The Park Avenue Overlay District, established as an amendment to the City's municipal code, recognizes the buildings along Park Avenue and immediate environs as the historic center of Emeryville. The Overlay District designates architecturally significant buildings within the Park Avenue District as either Tier 1 (primary architectural significance) or Tier 2 (secondary architectural significance). The City's municipal code states that the Emeryville Building Official shall not issue a building permit to move, remove or demolish a Tier 1 and Tier 2 architecturally significant building or structure unless the Emeryville Planning Commission first approves such action. This Overlay District would continue to be the guiding zoning policy to ensure that new land uses allowable under the General Plan would not adversely affect historic architectural resources within this portion of Emeryville.

In addition, the following proposed General Plan policies would ensure protection of these and other sites of local historical importance and overall character by requiring new development downtown to be compatible with existing historic character.

Proposed General Plan Policies that Reduce the Impact

CSN-P-22 The City encourages developers to reuse existing historic or architecturally significant structures.

CSN-P-23 Development that proposes to demolish identified historic resources shall be reviewed on a case by case basis to determine if the benefit of preserving the resource is outweighed by benefit of the new development.

CSN-P-24 New development adjacent to historic and architecturally significant structures shall be reviewed for compatibility with the character of the structure and the surrounding neighborhood.

CSN-P-26 If demolition of a historical or architecturally significant building is necessary for safety reasons, attempt to preserve the building façade for adaptive reuse during reconstruction.

CSN-P-27 The City encourages municipal and community awareness and support for Emeryville's historic, cultural, and archeological resources.

Mitigation Measures

No additional mitigation measures (beyond General Plan policies) have been identified.

Because development under the proposed General Plan could result in the demolition of historic resources, and because the court has ruled that such impacts cannot be mitigated to a level of insignificance (52 Cal. App. 4th 896), this impact is significant and unavoidable.

Impact

3.8-3 New development under the proposed General Plan could adversely affect unidentified paleontological resources. *(Less than Significant)*

Adverse impacts to paleontological resources could occur when earthwork activities such as mass excavation cut into geological formations where fossils are buried. These impacts are in the form of physical destruction of fossil remains. Fossils are considered to be nonrenewable resources and due to the infrequency of fossil preservation, such impacts would be considered significant.

The potential to disturb paleontological resources during project construction depends on which geologic deposits would be encountered. Disturbing artificial fills during project construction will not impact paleontological resources because fossils are not preserved in such deposits. However, artificial fills usually overlie Bay Mud, which is a natural marine deposit that consists of soft saturated clays that can contain lenses of sand and shell fragments. While the Bay Mud may preserve a variety of marine invertebrate fossils (mullusks, clams, fomanifera, microorganisms, etc.), such fossils are likely to exist in other Bay Mud deposits all around the Bay Area and would not be considered significant or unique.

Where construction would disturb fluvial deposits, particularly older, deeper and more consolidated sediments, paleontological resources may be disturbed. There have been recorded fossil finds in similar deposits near Emeryville. For instance, bison and mammoth teeth have been discovered in geologic deposits beneath the Berkeley Municipal Wharf, and in Aquatic Park, north of Emeryville, adjacent to Interstate 80. These fossil finds occurred in close proximity to Emeryville and in similar geological materials that underlie parts of the city. Therefore, where construction would disturb any soil type other than Bay Mud or artificial fill, significant paleontological resources may be present. Project-specific studies will be necessary to determine the actual potential for significant impacts on paleontological resources resulting from the implementation of the proposed General Plan.

CEQA Guidelines Section 15064.5[a][3] states that adverse effects to significant scientific resources are considered a significant effect on the environment. California Public Resources Code Section 5097.5 prevents the deliberate excavation of prehistoric ruins, burial grounds, archaeological or vertebrate paleontological site, on public lands, except with the permission of

the public agency that has jurisdiction over the lands. Compliance with established regulations and the General Plan ensure that impacts on paleontological resources are less than significant.

Mitigation Measures

No mitigation measures are required.

3.9 Air Quality

This section discusses both the short-term construction and long-term operational impacts of the proposed General Plan on local and regional air quality. The setting provides an overview of the regulatory context, plans, policies, and regulations, followed by region-specific information relating to climate and topography and existing air quality conditions. The air pollutants of concern in the Bay Area are ozone, carbon monoxide, and particulate matter.

ENVIRONMENTAL SETTING

REGULATORY FRAMEWORK

The United States Environmental Protection Agency (EPA) is responsible for implementing the programs established under the federal Clean Air Act, such as establishing and reviewing the federal ambient air quality standards and judging the adequacy of State Implementation Plans (SIPs). However, the EPA has delegated the authority to implement many of the federal programs to the states while retaining an oversight role to ensure that the programs continue to be implemented. In California, the California Air Resources Board (ARB) is responsible for establishing and reviewing the state ambient air quality standards, developing and managing the California SIP, securing approval of this plan from U.S. EPA, and identifying Toxic Air Contaminants (TACs). (A notable exception exists for radioactive air contaminants as the EPA has retained its authority to enforce National Emission Standards for Hazardous Air Pollutants [NESHAP] requirements.) ARB also regulates mobile emissions sources in California, such as construction equipment, trucks, and automobiles, and oversees the activities of air quality management districts, which are organized at the county or regional level. An air quality management district is primarily responsible for regulating stationary emissions sources at facilities within its geographic areas and for preparing the air quality plans that are required under the federal Clean Air Act and California Clean Air Act. The Bay Area Air Quality Management District (BAAQMD) is the regional agency with regulatory authority over emission sources in the Bay Area, which includes all of San Francisco, San Mateo, Santa Clara, Alameda, Contra Costa, Marin, and Napa counties and the southern half of Sonoma and southwestern half of Solano counties.

ARB recently published the Air Quality and Land Use Handbook: A Community Health Perspective (California ARB, 2005). The primary goal in developing the handbook was to provide information that will help keep California's children and other vulnerable populations out of harm's way with respect to nearby sources of air pollution. The handbook highlights recent studies that have shown that public exposure to air pollution can be substantially elevated near freeways and certain other facilities. However, the health risk is greatly reduced with distance. For that reason, ARB provided some general recommendations aimed at keeping appropriate distances between sources of air pollution and sensitive land uses, such as residences.

Criteria Air Pollutants

As required by the federal Clean Air Act passed in 1970, the U.S. EPA has identified six criteria air pollutants that are pervasive in urban environments and for which state and national health-based ambient air quality standards have been established. EPA calls these pollutants criteria air pollutants because the agency has regulated them by developing specific public health- and welfare-based criteria as the basis for setting permissible levels. Ozone, carbon monoxide (CO), nitrogen dioxide (NO^2), sulfur dioxide (SO^2), particulate matter (PM), and lead are the six criteria air pollutants.

Some criteria air pollutants are considered regional in nature, some are considered local, and some have characteristics that are both regional and local. Air pollutants are also characterized as "primary" and "secondary" pollutants. Primary pollutants are those emitted directly into the atmosphere (such as carbon monoxide, sulfur dioxide, lead particulates, and hydrogen sulfide). Secondary pollutants are those formed through chemical reactions in the atmosphere; these chemical reactions usually involve primary pollutants, normal constituents of the atmosphere, and other secondary pollutants. Ozone is a secondary air pollutant produced in the atmosphere through a complex series of photochemical reactions involving reactive organic gases (ROG) compounds and nitrogen oxides (NOx). ROG and NOx are known as precursor compounds for ozone. Ozone is a regional air pollutant because its precursors are transported and diffused by wind concurrently with Ozone production.

Ozone

Short-term exposure to ozone can irritate the eyes and cause constriction of the airways. Besides causing shortness of breath, ozone can aggravate existing respiratory diseases such as asthma, bronchitis, and emphysema. Ozone is not emitted directly into the atmosphere, but is a secondary air pollutant produced in the atmosphere through a complex series of photochemical reactions involving ROGs and NOx. ROGs and NOx are known as precursor compounds for ozone. Significant ozone production generally requires ozone precursors to be present in a stable atmosphere with strong sunlight for approximately three hours. Ozone is a regional air pollutant because it is not emitted directly by sources, but is formed downwind of sources of ROGs and NOx under the influence of wind and sunlight. Ozone concentrations tend to be higher in the late spring, summer, and fall, when the long sunny days combine with regional subsidence inversions to create conditions conducive to the formation and accumulation of secondary photochemical compounds, like ozone.

Carbon Monoxide

Ambient CO concentrations normally are considered a local effect and typically correspond closely to the spatial and temporal distributions of vehicular traffic. Wind speed and atmospheric mixing also influence CO concentrations. Under inversion conditions, CO concentrations may be distributed more uniformly over an area that may extend some distance from vehicular sources. When inhaled at high concentrations, CO combines with hemoglobin in the blood and reduces the oxygen-carrying capacity of the blood. This results in reduced oxygen reaching the brain,

heart, and other body tissues. This condition is especially critical for fetuses and people with cardiovascular diseases, chronic lung disease, or anemia.

CO concentrations have declined dramatically in California due to existing controls and programs, and most areas of the state including the proposed General Plan region have no problem meeting the carbon monoxide state and federal standards. CO measurements and modeling were important in the early 1980s when CO levels were regularly exceeded throughout California. In more recent years, CO measurements and modeling have not been a priority in most California air districts due to the retirement of older polluting vehicles, fewer emissions from new vehicles, and improvements in fuels. The clear success in reducing CO levels is evident in the first paragraph of the executive summary of the California Air Resources Board *2004 Revision to the California State Implementation Plan for Carbon Monoxide Updated Maintenance Plan for Ten Federal Planning Areas* (California ARB, 2004):

- The dramatic reduction in carbon monoxide (CO) levels across California is one of the biggest success stories in air pollution control. Air Resources Board (ARB or Board) requirements for cleaner vehicles, equipment and fuels have cut peak CO levels in half since 1980, despite growth. All areas of the State designated as non-attainment for the federal 8-hour CO standard in 1991 now attain the standard, including the Los Angeles urbanized area. Even the Calexico area of Imperial County on the congested Mexican border had no violations of the federal CO standard in 2003. Only the South Coast and Calexico continue to violate the more protective State 8-hour CO standard, with declining levels beginning to approach that standard.

Nitrogen Dioxide

NO^2 is a reddish brown gas that is a by-product of combustion processes. Automobiles and industrial operations are the main sources of NO^2. NO^2 may be visible as a coloring component of a brown cloud on high pollution days, especially in conjunction with high ozone levels.

NO^2 poses an air quality concern because it acts as a respiratory irritant and is a precursor of ozone. It is a major component of the group of gaseous nitrogen compounds commonly referred to as NOx. NOx are produced by fuel combustion in motor vehicles, industrial stationary sources (such as industrial activities), ships, aircraft, and rail transit. Typically, nitrogen oxides emitted from fuel combustion are in the form of nitric oxide (NO) and NO^2. NO is often converted to NO^2 when it reacts with ozone or undergoes photochemical reactions in the atmosphere. Therefore, emissions of NO^2 from combustion sources are typically evaluated based on the amount of NOx emitted from the source.

Sulfur Dioxide

Sulfur dioxide is a combustion product of sulfur or sulfur-containing fuels such as coal and oil, which are restricted in the Bay Area. Its health effects include breathing problems and may cause permanent damage to lungs. SO^2 is an ingredient in acid rain (acid aerosols), which can damage trees, lakes and property. Acid aerosols can also reduce visibility.

Particulate Matter

PM10 and PM2.5 consist of particulate matter that is 10 microns or less in diameter and 2.5 microns or less in diameter, respectively. (A micron is one-millionth of a meter). PM10 and PM2.5 represent fractions of particulate matter that can be inhaled into the air passages and the lungs and can cause adverse health effects. Some sources of particulate matter, such as wood burning in fireplaces, demolition, and construction activities, are more local in nature, while others, such as vehicular traffic, have a more regional effect. Very small particles of certain substances (e.g., sulfates and nitrates) can cause lung damage directly, or can contain adsorbed gases (e.g., chlorides or ammonium) that may be injurious to health. Particulates also can damage materials and reduce visibility. Large dust particles (diameter greater than 10 microns) settle out rapidly and are easily filtered by human breathing passages. This large dust is of more concern as a soiling nuisance rather than a health hazard. The remaining fraction, PM10 and PM2.5, are a health concern particularly at levels above the federal and state ambient air quality standards. PM2.5 (including diesel exhaust particles) is thought to have greater effects on health, because these particles are so small and thus, are able to penetrate to the deepest parts of the lungs. Scientific studies have suggested links between fine particulate matter and numerous health problems including asthma, bronchitis, acute and chronic respiratory symptoms such as shortness of breath and painful breathing. Recent studies have shown an association between morbidity and mortality and daily concentrations of particulate matter in the air. Children are more susceptible to the health risks of PM10 and PM2.5 because their immune and respiratory systems are still developing.

Mortality studies since the 1990s have shown a statistically significant direct association between mortality (premature deaths) and daily concentrations of particulate matter in the air. Despite important gaps in scientific knowledge and continued reasons for some skepticism, a comprehensive evaluation of the research findings provides persuasive evidence that exposure to fine particulate air pollution has adverse effects on cardiopulmonary health (Dockery and Pope, 2006). The ARB has estimated that achieving the ambient air quality standards for PM10 could reduce premature mortality rates by 6,500 cases per year (California ARB, 2002).

Lead

Leaded gasoline (currently phased out), paint (houses, cars), smelters (metal refineries), manufacture of lead storage batteries have been the primary sources of lead released into the atmosphere. Lead has a range of adverse neurotoxic health effects; children are at special risk. Some lead-containing chemicals cause cancer in animals.

Toxic Air Contaminants (TACs)

Non-criteria air pollutants or TACs are airborne substances that are capable of causing short-term (acute) and/or long-term (chronic or cancer causing) adverse human health effects (i.e., injury or illness). TACs include both organic and inorganic chemical substances. As discussed in the Hazardous Materials and Safety section of this EIR, TACs may be emitted from a variety of common sources including gasoline stations, automobiles, dry cleaners, industrial operations,

and painting operations. The current California list of TACs includes approximately 200 compounds, including particulate emissions from diesel-fueled engines.

In 2001 the ARB assessed the statewide health risks from exposure to diesel exhaust and to other TACs. It is difficult to distinguish the health risks of diesel emissions from the other air toxics, since diesel exhaust contains approximately 40 different TACs. The ARB study (California ARB, 2000) detected diesel exhaust by using ambient air carbon soot measurements as a surrogate for diesel emissions. The ARB study reported that in 2000, the statewide cancer risk from exposure to diesel exhaust was approximately 540 per million (i.e., 540 cancers per million people) as compared to a total risk for exposure to all ambient air toxics of 760 per million. This estimate of risk from diesel exhaust, which accounts for approximately 70 percent of the total risk from TACs, included both urban and rural areas in the state. This calculation can be considered as an average worst-case for the state, since it assumes constant exposure to outdoor concentrations of diesel exhaust and does not account for expected lower concentrations indoors, where most people spend most of their time.

Odorous Emissions

Though offensive odors from stationary sources rarely cause any physical harm, they remain unpleasant and can lead to public distress generating citizen complaints to local governments. The occurrence and severity of odor impacts depend on the nature, frequency and intensity of the source; wind speed and direction; and the sensitivity of receptors. The BAAQMD CEQA Guidelines (BAAQMD, 1999) recommends that odor impacts be considered for any proposed new odor sources located near existing receptors, as well as any new sensitive receptors located near existing odor sources. Generally, increasing the distance between the receptor and the source will mitigate odor impacts.

Ambient Air Quality Standards

Regulation of criteria air pollutants is achieved through both national and state ambient air quality standards and emissions limits for individual sources. Regulations implementing the federal Clean Air Act and its subsequent amendments established national ambient air quality standards (national standards) for the six criteria pollutants. California has adopted more stringent state ambient air quality standards for most of the criteria air pollutants. In addition, California has established state ambient air quality standards for sulfates, hydrogen sulfide, vinyl chloride, and visibility-reducing particles. Because of the unique meteorological problems in the state, there is considerable diversity between state and federal standards currently in effect in California, as shown in Table 3.9-1. The table also summarizes the related health effects and principal sources for each pollutant.

The ambient air quality standards are intended to protect the public health and welfare, and they incorporate an adequate margin of safety. They are designed to protect those segments of the public most susceptible to respiratory distress, known as sensitive receptors, including asthmatics, the very young, the elderly, people weak from other illness or disease, or persons engaged in strenuous work or exercise. Healthy adults can tolerate occasional exposure to air pollution levels somewhat above the ambient air quality standards before adverse health effects are observed.

Table 3.9-1 Ambient Air Quality Standards and Bay Area Attainment Status

Pollutant	*Averaging Time*	*State Standard*	*Bay Area Attainment Status for California Standard*	*Federal Primary Standard*	*Bay Area Attainment Status for Federal Standard*	*Major Pollutant Sources*
Ozone	8 hours	0.07 ppm	Non-attainment	0.075 ppm	Non-attainment	Formed when ROG and NOx react in the presence of sunlight. Major sources include on-road motor vehicles, solvent evaporation, and commercial/ industrial mobile equipment.
	1 hour	0.09 ppm	Non-attainment	---	---	
Carbon Monoxide	8 hours	9.0 ppm	Attainment	9 ppm	Attainment	Internal combustion engines, primarily gasoline-powered motor vehicles
	1 Hour	20 ppm	Attainment	35 ppm	Attainment	
Nitrogen Dioxide	Annual Average	0.03 ppm	---	0.053 ppm	Attainment	Motor vehicles, petroleum refining operations, industrial sources, aircraft, ships, and railroads
	1 Hour	0.18 ppm	Attainment	---	---	
Sulfur Dioxide	Annual Average	---	---	0.03 ppm	Attainment	Fuel combustion, chemical plants, sulfur recovery plants and metal processing
	24 Hours	0.04 ppm	Attainment	0.14 ppm	Attainment	
	1 Hour	0.25 ppm	Attainment	---	---	
Particulate Matter (PM10)	Annual Arithmetic Mean	20 μg/m3	Non-attainment	---	---	Dust- and fume-producing industrial and agricultural operations, combustion, atmospheric photochemical reactions, and natural activities (e.g., wind-raised dust and ocean sprays)
	24 Hours	50 μg/m3	Non-attainment	150 μg/m3	Unclassified	
Particulate Matter (PM2.5)	Annual Arithmetic Mean	12 μg/m3	Non-attainment	15 μg/m3	Attainment	Fuel combustion in motor vehicles, equipment, and industrial sources; residential and agricultural burning; also, formed from

Table 3.9-1 Ambient Air Quality Standards and Bay Area Attainment Status

Pollutant	*Averaging Time*	*State Standard*	*Bay Area Attainment Status for California Standard*	*Federal Primary Standard*	*Bay Area Attainment Status for Federal Standard*	*Major Pollutant Sources*
	24 Hours	---	---	35 μg/m3	Non-attainment	photochemical reactions of other pollutants, including NOx, sulfur oxides, and organics
Lead	Calendar Quarter	---	---	1.5 μg/m3	Attainment	Present source: lead smelters, battery manufacturing & recycling facilities; Past source: combustion of leaded gasoline.
	30 Day Average	1.5 μg/m3	Attainment	---	---	

Note: ppm=parts per million; and μg/m3=micrograms per cubic meter

Source: Bay Area Air Quality Management District, 2008, available at http://www.baaqmd.gov/pln/air_quality/ambient_air_quality.htm, page last updated December 30, 2008; California Air Resources Board, 2001. ARB Fact Sheet: Air Pollution Sources, Effects and Control, http://www.arb.ca.gov/research/health/fs/fs2/fs2.htm, page last updated December 2005.

Attainment Status

Under amendments to the federal Clean Air Act, U.S. EPA has classified air basins or portions thereof, as either "attainment" or "non-attainment" for each criteria air pollutant, based on whether or not the national standards have been achieved. The California Clean Air Act, which is patterned after the federal Clean Air Act, also requires areas to be designated as "attainment" or "non-attainment" for the state standards. Thus, areas in California have two sets of attainment / non-attainment designations: one set with respect to the national standards and one set with respect to the state standards.

The Bay Area is currently designated "non-attainment" for state one-hour and eight-hour ozone standards, the national eight-hour ozone standard and for the state PM10 and PM2.5 standards. The Bay Area is "in attainment" or "unclassified" with respect to the other ambient air quality standards. Table 3.9-1 also shows the attainment status of the Bay Area with respect to the national and state ambient air quality standards for different criteria pollutants.

Air Quality Plans

The 1977 Clean Air Act Amendments require that regional planning and air pollution control agencies prepare a regional Air Quality Plan to outline the measures by which both stationary and mobile sources of pollutants can be controlled in order to achieve all standards specified in the Clean Air Act. The 1988 California Clean Air Act also requires development of air quality plans and strategies to meet state air quality standards in areas designated as non-attainment (with the exception of areas designated as non-attainment for the state PM standards). Maintenance plans are required for attainment areas that had previously been designated non-attainment in order to ensure continued attainment of the standards. Air quality plans developed to meet federal requirements are referred to as State Implementation Plans.

For state air quality planning purposes, the Bay Area is classified as a serious non-attainment area for ozone. The "serious" classification triggers various plan submittal requirements and transportation performance standards. One such requirement is that the Bay Area update the Clean Air Plan every three years to reflect progress in meeting the air quality standards and to incorporate new information regarding the feasibility of control measures and new emission inventory data. (See the regulatory setting in Section 3.2: Transportation for details on the BAAMQMD policies toward reducing transportation's impact on air quality.) The Bay Area's record of progress in implementing previous measures must also be reviewed. Bay Area plans are prepared with the cooperation of the Metropolitan Transportation Commission (MTC), and the Association of Bay Area Governments (ABAG). On January 4, 2006, the BAAQMD adopted the most recent revision to the Clean Air Plan—the Bay Area 2005 Ozone Strategy (BAAQMD, 2006). (As of March 2009, the 2009 Clean Air Plan was being prepared and expected to be adopted in fall of 2009.) The control strategy for the 2005 Ozone Strategy is to implement all feasible measures on an expeditious schedule in order to reduce emissions of ozone precursors and consequently reduce ozone levels in the Bay Area and reduce transport to downwind regions.

In April 2005, the ARB established a new eight-hour average ozone state standard of 0.070 ppm. The new standard took effect in May 2006. The one-hour state standard was also retained. The San Francisco Bay Area has not attained the state eight-hour standards and will be taking necessary action to address those standards as appropriate once the planning requirements have been established.

The BAAQMD is beginning the process to prepare the 2009 Bay Area Clean Air Plan. This Plan will:

- Update the Bay Area 2005 Ozone Strategy in accordance with the requirements of the California Clean Air Act to implement "all feasible measures" to reduce ozone;
- Consider the impacts of ozone control measures on particulate matter, air toxics, and greenhouse gases in a single, integrated plan;
- Review progress in improving air quality in recent years; and
- Establish emission control measures to be adopted or implemented in the 2009–2012 timeframe.

The current designation of the Bay Area's non-attainment with respect to the national eight-hour ozone standard is based on the now defunct 0.08-ppm eight-hour standard. In April 2004, the U.S. EPA designated the Bay Area as a "marginal" non-attainment area according to five classes of non-attainment areas for ozone, which range from marginal to extreme. Marginal non-attainment areas were not required to prepare attainment demonstrations for the eight-hour standard though other planning elements were required. The Bay Area was to address all requirements of the national eight-hour standard in subsequent documents. However, effective May 27, 2008, the U.S. EPA lowered the national eight-hour standard from 0.08 to 0.075 ppm. EPA is expected to issue final designations based upon the new 0.075 ppm standard by March 2010, after which planning requirements will be imposed on non-attainment areas.

Local Standards

BAAQMD Rules and Regulations

The BAAQMD is the regional agency responsible for rulemaking, permitting, and enforcement activities affecting stationary sources in the Bay Area. Specific rules and regulations adopted by the BAAQMD limit the emissions that can be generated by various uses and/or activities, and identify specific pollution reduction measures that must be implemented in association with various uses and activities. These rules regulate not only emissions of the six criteria air pollutants, but also toxic emissions and acutely hazardous non-radioactive materials emissions.

Emissions sources subject to these rules are regulated through the BAAQMD's permitting process and standards of operation. Through this permitting process, including an annual permit review, the BAAQMD monitors generation of stationary emissions and uses this information in developing its air quality plans. Any sources of stationary emissions constructed as part of the proposed General Plan would be subject to the BAAQMD *Rules and Regulations*. Both federal and

state ozone plans rely heavily upon stationary source control measures set forth in BAAQMD's *Rules and Regulations.*

New Source Review

The BAAQMD's New Source Review regulations predominantly apply to non-attainment pollutants. The purpose of the New Source Review rule is to provide for the review of new and modified sources and provide mechanisms, including the use of best available control technology for both criteria and toxic air pollutants, and emissions offsets by which authorities to construct such sources could be granted. The New Source Review regulations also include Prevention of Significant Deterioration (PSD) rules for attainment pollutants. PSD rules are designed to ensure that the emission sources will not cause or interfere with the attainment or maintenance of ambient air quality standards.

Best available control technologies are required for sources that require an authority to construct or a permit to operate if emissions from a new source or increase in emissions from a modified source would be 10 pounds or more per day of any of a number of organic compounds, nitrogen oxides, sulfur dioxide, particulate matter or carbon monoxide, or possibly lesser amounts of TAC. The BAAQMD New Source Review regulation requires the purchase of emission "offsets" (effectively precluding other emissions from occurring) for any new or modified source that produces a cumulative increase in emissions above a certain level of nitrogen oxides, precursor organic compounds.

With respect to the construction phase of the project, applicable BAAQMD regulations would relate to portable equipment (e.g., Portland concrete batch plants, and gasoline- or diesel-powered engines used for power generation, pumps, compressors, pile drivers, and cranes), architectural coatings, and paving materials. Equipment used during project construction would be subject to the requirements of BAAQMD Regulation 2 (Permits), Rule 1(General Requirements) with respect to portable equipment unless exempt under Rule 2-1-105 (Exemption, Registered Statewide Portable Equipment); BAAQMD Regulation 8 (Organic Compounds), Rule 3 (Architectural Coatings); and BAAQMD Regulation 8 (Organic Compounds), Rule 15 (Emulsified and Liquid Asphalts). With respect to the operational phase of the project, BAAQMD Regulation 2, Permits would apply to new or modified stationary sources proposed in the planning area.

PHYSICAL SETTING

Climate and Meteorology

Atmospheric conditions such as wind speed, wind direction, and air temperature gradients interact with the physical features of the landscape to determine the movement and dispersal of air pollutants. The project site is the City of Emeryville and is within the boundaries of the San Francisco Bay Area (Bay Area) Air Basin. The Bay Area Air Basin encompasses the nine-county region including all of Alameda, Contra Costa, Santa Clara, San Francisco, San Mateo, Marin and Napa counties, and the southern portions of Solano and Sonoma counties. The climate of the Bay Area is determined largely by a high-pressure system that is almost always present over the

eastern Pacific Ocean off the West Coast of North America. During winter, the Pacific high-pressure system shifts southward, allowing storms to pass through the region. During summer and fall, emissions generated within the Bay Area can combine with abundant sunshine under the restraining influences of topography and subsidence inversions to create conditions that are conducive to the formation of photochemical pollutants, such as ozone and secondary particulates, such as nitrates and sulfates.

More specifically, the project site lies within the Northern Alameda and Western Contra Costa Counties climatological subregion. This subregion stretches from Richmond to San Leandro with the San Francisco Bay as its western boundary and its eastern boundary defined by the Oakland-Berkeley Hills. In this area, marine air traveling through the Golden Gate, as well as across San Francisco and San Bruno Gap is a dominant weather factor. The Oakland-Berkeley Hills cause the westerly flow of air to split off to the north and south of Oakland, which causes diminished wind speeds. However, the air pollution potential in this subregion is relatively low for portions close to the bay, due to the largely good ventilation and less influx of pollutants from upwind sources (BAAQMD, 1999). Yet, during summer and fall, emissions generated within, and those transported to, the East Bay can combine with abundant sunshine under the restraining influences of topography and temperature inversions to create conditions that are conducive to the formation of photochemical pollutants, like ozone.

Northwest winds occur approximately 46 percent of the time. Average wind speeds vary from season to season with the strongest average winds occurring during summer and the lightest average winds during winter. Average wind speeds are 9.7 miles per hour (mph) during summer and 7.4 mph during winter. Temperature in Emeryville averages 58°F annually, ranging from an average of 40°F on winter mornings to mid-70s in the late summer afternoons. Daily and seasonal oscillations of temperature are small because of the moderating effects of the nearby ocean. In contrast to the steady temperature regime, rainfall is highly variable and confined almost exclusively to the "rainy" period from early November to mid-April. Emeryville averages 25 inches of precipitation annually, but because much of the area's rainfall is derived from the fringes of mid-latitude storms, a shift in the annual storm track of a few hundred miles can mean the difference between a very wet year and near drought conditions.

Existing Air Quality

Criteria Air Pollutants

The BAAQMD and ARB operate a regional monitoring network that measures the ambient concentrations of the six criteria air pollutants. Existing and probable future levels of air quality in Emeryville can generally be inferred from ambient air quality measurements conducted by the BAAQMD at its nearby monitoring stations. There are no monitoring stations located within Emeryville. The Alice Street station in Oakland and the San Leandro Hospital station are the nearest to the project site and can be considered to be representative of the air quality in the vicinity of the project site. Both of these stations monitor ozone, and the Alice Street Station monitors carbon monoxide as well. The Chapel Way station in Fremont and data from the Port of Oakland monitoring program measure particulate concentrations and are considered to be representative of the air quality in the vicinity of the project site. Table 3.9-2 shows a five-year

summary of monitoring data for ozone, carbon monoxide, PM10, and PM2.5 from these stations. The table also compares these measured concentrations with state and federal ambient air quality standards. Table 3.9-3 shows trends in regional exceedances of the federal and state ozone standards. Because of the number of exceedances, ozone is the pollutant of greatest concern in the Bay Area. Bay Area counties experience most ozone exceedances during the period from April through October.

The standards for NO^2, SO^2, and lead are being met in the Bay Area, and the latest pollutant trends suggest that these standards will not be exceeded in the foreseeable future (ABAG, 2001).

In contrast to some areas of the Bay Area Air Basin, air quality in Emeryville generally meets clean air standards on most days. While the meteorology is generally favorable for maintaining good air quality, this area, along with other portions of the Bay Area that make up the central urban area (i.e., Berkeley-Oakland-San Francisco), is often considered a source region for some pollutants that contribute to elevated concentration levels in downwind communities, such as the Livermore Valley. This is especially the case with mobile or transportation sources.

Motor vehicle transportation, including automobiles, trucks, transit buses, and other modes of transportation, is the major contributor to regional air pollution. Although stationary sources were once important contributors to both regional and local pollution, their role has been substantially reduced in recent years by pollution control programs, such as those of the BAAQMD. Any further progress in air quality improvement now focuses heavily on transportation sources.

Sensitive Land Uses

Some persons are considered more sensitive than others to air pollutants. The reasons for heightened sensitivity may include health problems, proximity to the emissions source, and duration of exposure to air pollutants. Land uses such as schools, hospitals, and convalescent homes are considered to be relatively sensitive to poor air quality because the very young, the old, and the infirm are more susceptible to respiratory infections and other air-quality-related health problems than the general public. Residential areas are considered sensitive to poor air quality because people are often at home for extended periods. Recreational land uses are moderately sensitive to air pollution, because vigorous exercise associated with recreation places a high demand on the human respiratory system.

Table 3.9-2: Air Quality Data Summary for the Project Area (2003-2007)

		Monitoring Data by Year[1]				
Pollutant	*Standard*[2]	*2003*	*2004*	*2005*	*2006*	*2007*
Ozone - Alice Street Station in Oakland						
Highest 1-hour Average (ppm)[3]		0.08	0.08	0.07	NA	NA
Days over State Standard	0.09	0	0	0	NA	NA
Highest 8-hour Average (ppm)		0.055	0.057	0.045	NA	NA
Days over State Standard	0.07	0	0	0	NA	NA
Days over National Standard	0.075	0	0	0	NA	NA
Ozone – San Leandro County Hospital						
Highest 1-hour Average (ppm) [3]		**0.097**	**0.104**	**0.099**	0.088	0.071
Days over State Standard	0.09	2	1	1	0	0
Highest 8-hour Average (ppm) [3]		**0.071**	0.067	0.062	0.067	0.055
Days over State Standard	0.07	1	0	0	0	0
Days over National Standard	0.075	0	0	0	0	0
Carbon Monoxide - Alice Street Station in Oakland						
Highest 1-hour Average (ppm)[3]		3.9	3.5	NA	NA	NA
Days over State Standard	20	0	0	0	NA	NA
Days over National Standard	35	0	0	0	NA	NA
Highest 8-hour Average (ppm)[3]		2.8	2.6	2.4	NA	NA
Days over State/National Standard	9	0	0	0	NA	NA
PM10 – Chapel Way Station in Fremont						
Highest 24-hour Hour Average (ug/m3)[3]		37.2	48.9	**54.1**	**56.6**	**60.6**
Estimated Days over State Standard	50	0	0	5.8	4.4	6
Estimated Days over National Standard	150	0	0	0	0	0
State Annual Average (ug/m3)[3]	20	18.2	18.6	17.8	20	19.6
PM10 e- Port of Oakland						
Highest 24-hour Average (ug/m3)[3]		49.9	48	NA	NA	NA
Number of sampled days[4]		61	61	NA	NA	NA
Sampled days over State Standard[4]	50	0	0	NA	NA	NA
Sampled days over National Standard[4]	150	0	0	NA	NA	NA

		Monitoring Data by Year[1]				
Pollutant	*Standard*[2]	*2003*	*2004*	*2005*	*2006*	*2007*
PM2.5 – Chapel Way Station in Fremont						
Highest 24-hour Hour Average (ug/m3)[3]		33.5	**39.9**	33.4	**43.9**	**51.2**
Estimated Days over National Standard	35	0	6.1	0	NA	6
State Annual Average (ug/m3)[3]	12	NA	9.4	9	NA	8.7
Particulate Matter (PM2.5) e- Port of Oakland						
Highest 24-hour Average – National (ppm)[3]	65	29.9	31	NA	NA	NA
Sampled days over National Standard[4]		0	0	NA	NA	NA

1. Values shown in bold type are in excess of applicable standard.
2. Generally, state standards are not to be exceeded and federal standards are not to be exceeded more than once per year.
3. ppm = parts per million; ug/m3 = micrograms per cubic meter.
4. PM10 and PM2.5 are not measured every day of the year. "Number of samples" refers to the number of days in a given year during which PM10 and PM2.5 were measured at the Port of Oakland monitoring stations.

Notes: Combined data from the Port and residential monitoring stations are presented. NA = Not Available.

Source: California Air Resources Board, 2008a. Summaries of Air Quality Data, 2003 - 2007; http://www.arb.ca.gov/adam; GAIA Consulting, Inc., 2006. West Oakland Particulate Air Quality Monitoring Program – Cumulative Final Report and Appendix (1997— 2005), June 2006.

Table 3.9-3: Summary of Ozone Data for the San Francisco Bay Area Air Basin (1995 – 2007)

	Number of Days Standard Exceeded[1]				Ozone Concentrations in ppm[2]	
Year	State 1 Hour	State 8 Hour	Federal 1 Hour	Federal 8 Hour	Maximum 1 Hour	Maximum 8 hour
2007	4	9	0	2	0.12	0.091
2006	18	22	1	17	0.13	0.106
2005	9	9	0	5	0.12	0.090
2004	7	13	0	7	0.11	0.085
2003	19	20	1	12	0.13	0.101
2002	16	19	2	15	0.16	0.106
2001	15	21	1	13	0.13	0.102
2000	12	17	3	9	0.15	0.115
1999	20	28	3	18	0.16	0.123
1998	29	29	8	24	0.15	0.111
1997	8	10	0	5	0.11	0.085
1996	34	37	8	25	0.14	0.113
1995	28	30	11	22	0.16	0.115

1. This table summarizes the data from all of the monitoring stations within the Bay Area.
2. ppm = parts per million.

Source: California Air Resources Board, 2008b.Air Quality Trend Summaries, http://www.arb.ca.gov/adam/cgi-bin/db2www/polltrendsb.d2w/start.

IMPACT ANALYSIS

SIGNIFICANCE CRITERIA

Implementation of the proposed General Plan would have a potentially significant impact if it would result in:

- Conflict with or obstruct implementation of the applicable air quality plan;
- Violate any air quality standard or contribute substantially to an existing or projected air quality violation;
- Result in a cumulatively considerable net increase of any nonattainment pollutant;
- Expose sensitive receptors to substantial pollutant concentrations; or
- Create objectionable odors affecting a substantial number of people.

METHODOLOGY AND ASSUMPTIONS

The methodology recommended by the BAAQMD CEQA Guidelines (BAAQMD, 1999) has been used in evaluating impacts. For the analysis of air quality impacts of local plans, the BAAQMD recommends that the analysis focus on evaluating the consistency of the plan with the regional plan affecting air quality (i.e., the 2005 Bay Area Ozone Strategy).

In forecasting future stationary and mobile source emissions and preparing the regional air quality plan, the BAAQMD uses growth projections prepared by ABAG. The resultant emissions forecasts are then used to develop strategies and control measures necessary to achieve regional ozone attainment within a designated time frame. In developing its projections, ABAG uses information from local government general plans, current zoning and other local development policies, in conjunction with economic and demographic factors. Consistent with this process, the ABAG projections for Emeryville use the development anticipated under the existing Emeryville General Plan, zoning and existing policies at the time of preparation of the projections. Because ABAG's 2003 Projections for Emeryville are lower than the population projections expected under the proposed General Plan, the Plan would exceed the assumptions used in the 2005 Bay Area Ozone Strategy to forecast emissions. Therefore the Plan would not be consistent with regional air quality planning.

For a local plan to have a less-than-significant air quality impact it should be consistent with the Clean Air Plan population and vehicle miles traveled (VMT) assumptions, which are:

1. The population growth for the jurisdiction will not exceed the values included in the current regional air quality plan, and
2. The rate of increase in VMT for the jurisdiction is equal to or lower than the rate of increase in population.

For a local plan to have a less-than-significant air quality impact it should also be consistent with Clean Air Plan Transportation Control Measures (TCM). TCM are strategies to reduce vehicle trips, use, miles traveled, idling, or traffic congestion in order to decrease emissions (e.g., transportation demand management, pedestrian amenities, bicycle facilities, etc.). Proposed General Plan policies that align with TCM are described in the impact analysis below.

For a plan-level analysis, the BAAQMD CEQA Guidelines do not require preparing pollutant estimates. The focus is entirely on whether the plan is consistent with regional air quality planning. Air quality at sensitive receptors will need to be evaluated at the project level for site-specific impacts when individual projects are proposed.

SUMMARY OF IMPACTS

Air quality impacts resulting from the implementation of the proposed General Plan fall into two categories: short-term impacts due to construction, and long-term impacts due to operation. Construction activities would affect local particulate concentrations primarily due to fugitive dust sources and increase other criteria pollutant emissions from equipment exhaust.

Over the long term, the full implementation of the proposed General Plan would result in an increase in criteria pollutant emissions primarily due to related motor vehicle trips. Stationary sources and area sources would result in lesser quantities of criteria pollutant emissions. Stationary sources and diesel-fueled mobile sources would also generate emissions of TACs including diesel particulate matter (DPM) that could pose a health risk.

Since the General Plan population projections would exceed the 2003 ABAG projections, the proposed General Plan would not be consistent with the *2005 Bay Area Ozone Strategy* and associated emissions generated by the proposed General Plan would exceed the assumptions used in the Ozone Strategy to forecast future trends in emissions that form the basis for future air quality planning. Given the consistency analysis requirement of BAAQMD, the impact of the proposed Emeryville General Plan is significant.

IMPACTS AND MITIGATION MEASURES

Impact

3.9-1 New development under the proposed General Plan would increase population in the area at a rate greater than that assumed in regional air quality planning and, therefore, conflict with the implementation of the Bay Area Ozone Strategy. *(Significant and Unavoidable)*

Air pollutant emissions are a function of human activity. If growth in population is greater than assumed in the BAAQMD Clean Air Plan emission inventory, then population-based emissions are also likely to be greater than assumed in the Clean Air Plan. Consequently attainment of the State air quality standards would be delayed, and, plans showing estimated population greater than that assumed in the ABAG Projections would be inconsistent with air quality planning and have a significant impact.

Development under the proposed General Plan would result in increases in population and employment and consequently an increase in traffic and air pollutant emissions. With respect to the BAAQMD Guidelines for determining air quality impacts, the impact analysis must determine consistency of a proposed plan or plan amendment with the population and VMT in the applicable regional air quality plan, in this case, the 2005 Bay Area Ozone Strategy. The proposed General Plan anticipates that the population in Emeryville will increase from 9,727 in 2008 to 16,600 in 2030. This represents a growth rate of 2.5 percent per year to the buildout year 2030. The *2005 Bay Area Ozone Strategy* is based on population assumptions in the 2003 ABAG Projections. Based on 2003 ABAG Projections, the population in Emeryville is projected to be 10,500 in 2030 with a rate of population growth of 1.2 percent per year between 2005 and 2030 (ABAG, 2003). Therefore, the population growth under the implementation of the proposed Emeryville General Plan would exceed the ABAG's 2003 population projections, which forms the basis of the *2005 Bay Area Ozone Strategy*. In regards to the comparative rates of VMT and population data, based on data provided by Fehr and Peers, VMT is expected to increase by 1.2 percent per year up to the buildout year 2030, which would not exceed the rate of increase in population.

Increased development in Emeryville will be consistent with and further adopted regional goals of city-centered growth and increased development in the inner Bay Area, rather than in peripheral locations[1]. Moreover, ABAG's Projections 2009 (not yet available) are expected to show a population of 16,600 in 2035, a much closer estimate to the projected population from the proposed General Plan (but less in 2030, when the proposed General Plan's projection is 16,600). However, since the General Plan population projections would exceed the 2003 ABAG projections, the proposed General Plan would not be consistent with the *2005 Bay Area Ozone Strategy* and associated emissions generated by the proposed General Plan would exceed the assumptions used in the Ozone Strategy to forecast future trends in emissions that form the basis for future air quality planning. Given the consistency analysis requirement of BAAQMD, the proposed Emeryville General Plan would not be consistent with regional air quality planning and the impact is significant.

Proposed General Plan Policies that Reduce the Impact

The following proposed General Plan policies would reduce potential air pollution emissions:

Conservation, Safety and Noise Element

CSN-P-1 Air quality will be maintained and improved by requiring project mitigation, such as Transportation Demand Management (TDM) techniques, where significant air quality impacts are identified.

CSN-P-2 The City will budget for clean fuels and vehicles in the City's long-range capital expenditure plans, to replace and improve the existing fleet of gasoline and diesel powered vehicles.

CSN-P-3 The City will coordinate air quality planning efforts with local, regional, and state agencies and support the Bay Area Air Quality Management District's efforts to monitor and control air pollutants from stationary sources.

CSN-P-4 Dust abatement actions are required for all new construction and redevelopment projects.

CSN-P-5 All large construction projects are required to reduce diesel exhaust emissions through use of alternate fuels and/or control devices.

Land Use Element

Implement policies described in the Land Use Element that would increase density and reduce VMT, which would reduce air pollutant emissions from motor vehicles. These include Policies LU-P-2 through LU-P-4, LU-P-7 and LU-P-26.

[1] See *Smart Growth Strategy Regional Livability Footprint Project: Shaping the Future of the Nine County Bay Area, October 2002 (ABAG).*

Transportation Element

Implement policies described in the Transportation Element that would promote alternative transportation and reduce VMT, which would reduce air pollutant emissions from motor vehicles. These include Policies T-P-2, T-P-3, T-P-5, T-P-7 through T-P-9, T-P-12 through T-P-19, T-P-21 through T-P-44, T-P-47, T-P-50 through T-P-52, T-P-64 through T-P-66.

Significance after Proposed General Plan Policies

Implementation of the proposed General Plan policies described above would reduce the impact, but the proposed General Plan would not be consistent with the 2005 Bay Area Ozone Strategy and this impact would therefore remain significant.

While this analysis is based on assumed development and activity that could occur pursuant to the proposed General Plan, individual projects that may be proposed in the future within the city would undergo further environmental review to determine whether they could generate site-specific air quality impacts, and any significant impacts identified would be mitigated to the greatest degree possible.

Mitigation Measures

No programmatic mitigation measures are feasible and site-specific measures shall be identified during CEQA review of specific development proposals made to the City.

Impact

3.9-.2 New development under the proposed General Plan would be inconsistent with the Transportation Control Measures (TCMs) in the 2005 Bay Area Ozone Strategy. *(Less than Significant)*

The 1988 California Clean Air Act, Section 40919(d) requires regions to implement "transportation control measures to substantially reduce the rate of increase in passenger vehicle trips and miles traveled." Consistent with this requirement, a primary goal of the Bay Area *2005 Ozone Strategy* is to reduce the number of trips and vehicle miles Bay Area residents travel in single-occupant vehicles through the implementation of 19 TCMs. Table 3.9-4 identifies those TCMs that local governments should implement through local plans to be considered in conformance with the *2005 Ozone Strategy*. However, it should be noted that even if the local plan is consistent with the TCMs, it does not equate to consistency with the *2005 Ozone Strategy* if the criteria analyzed in Impact 3.9-1 are not met. In addition, the BAAQMD recommends that local plans that do not demonstrate reasonable efforts to implement these TCMs be considered inconsistent with the regional air quality plan and therefore have a significant impact. As discussed in Table 3.9-4 below, the proposed General Plan contains policies consistent with the TCMs in the Ozone Strategy. These policies encourage mixed use development, a concept that places residential, commercial, industrial, and employment activities close to each other thereby reducing the commute distances of project area residents and residents in other parts of the City. This would reduce adverse impacts associated with motor vehicle use, such as poor air quality, and promote use of transit and other modes of travel, such as bicycling and walking. Therefore,

the proposed General Plan would be considered to be consistent with the TCMs in the *2005 Bay Area Ozone Strategy* and this impact would be less than significant.

Proposed General Plan Policies that Reduce the Impact

See Table 3.9-4, below.

Adherence to established regional plans and measures, as well as the proposed General Plan policies listed above, ensure the potential impact is less than significant.

Mitigation Measures

No mitigation is required.

Table 3.9-4: Clean Air Plan TCMs to be Implemented by Local Governments

TCM in the 2005 Ozone Strategy	*Policies in the Proposed General Plan Consistent with the TCM*	
1. Support Voluntary Employer-Based Trip Reduction Programs	Policy T-P-52.	Encourage employers to offer "parking cash out", whereby employees who choose not to drive are offered the cash value of any employee parking subsidy, to be used towards commuting to work by other means.
	Policy T-P-64.	Work with local, regional and state agencies, the Chamber of Commerce, and the Transportation Management Association, as well as employers and residents, to encourage and support programs that reduce vehicle travel such as preferential carpool parking, parking pricing, flexible work schedules, and ridesharing.
	Policy T-P-65.	Require employers in large new developments to implement comprehensive TDM programs for their employees and customers.
	Policy T-P-66.	Support and encourage the expansion of car-sharing programs in Emeryville.
2. Improve Bicycle Access and Facilities	Policy T-P-22.	Create the bicycle circulation system set forth in the Transportation chapter of the General Plan.
	Policy T-P-23.	Support the City's preferred Bay Trail route through Emeryville, including the main trail between Frontage Road in Berkeley and Mandela Parkway in Oakland, and spur trails to the Marina along Powell Street and to the Bay Bridge along both sides of Interstate 80.
	Policy T-P-24.	Designate on-street bike routes in the City's Bicycle and Pedestrian Plan as either Class II (bike lanes) or Class III (signed routes without lanes), as appropriate. These designations are not part of the General Plan and may be changed as circumstances dictate.
	Policy T-P-25.	Provide safe, secure, and convenient short- and long-term bicycle parking near destinations for all users, including commuters, residents, shoppers, students, and other bicycle travelers.
	Policy T-P-26.	Develop and implement a numbered bike route system with destination signs, consistent with the regional bike route numbering system.
	Policy T-P-27.	Promote bicycling through public education, including the publication of literature concerning bicycle safety and the travel, health and environmental benefits of bicycling.
3. Improve Arterial Traffic Management	Policy T-P-2.	Provide a circulation system that adequately provides for the transportation needs of all segments of the population, including the disadvantaged, the young, the poor, the elderly, and the disabled.
	Policy T-P-3.	Design, construct, operate, and maintain the city streets based on a "complete streets" concept that enables safe, comfortable, and attractive access and travel for pedestrians, bicyclists, motorists, and transit users of all ages and abilities, with emphasis on specific travel modes as indicated by the typologies described in this chapter.

Table 3.9-4: Clean Air Plan TCMs to be Implemented by Local Governments

TCM in the 2005 Ozone Strategy	*Policies in the Proposed General Plan Consistent with the TCM*	
	Policy T-P-7.	Encourage development that minimizes VMT per capita (i.e., resident or employee).
	Policy T-P-45.	Ensure that private developments and major public infrastructure projects provide adequate rights-of-way for all modes of transportation.
	Policy T-P-61.	Accommodate truck freight movement between the freeway system and the regional shopping destinations along 40th Street and Shellmound Street, consistent with the typologies described in this chapter.
	Policy T-P-62.	Accommodate truck freight movement to and from local businesses, consistent with the typologies described in this chapter.
4. Local Clean Air Plans, Policies and Programs	Policy CE-P-1.	Maintain and improve air quality by requiring project mitigation, such as TDM techniques, where significant air quality impacts are identified.
	Policy CE-P-3.	Budget for clean fuels and vehicles in the City's long-range capital expenditure plans, to replace and improve the existing fleet of gasoline and diesel powered vehicles.
	Policy CE-P-4.	Coordinate air quality planning efforts with local, regional, and state agencies. Support the BAAQMD's efforts to monitor and control air pollutants from stationary sources.
	Policy CE-P-5.	Encourage all large construction projects to reduce diesel exhaust emissions through use of alternate fuels and/or control devices.
5. Conduct Demonstration Projects	Policy T-P-8.	Implement the City's Traffic Impact Fee to include bicycle, pedestrian, transit, and road improvements so that development pays its fair share toward a circulation system that optimize travel by all modes.
6.Pedestrian Travel	Policy T-P-12.	Create the pedestrian circulation system set forth in the Transportation chapter of the General Plan.
	Policy T-P-13.	Provide sidewalks on both sides of all streets, and require pedestrian connections between new and existing development.
	Policy T-P-14.	Plan, upgrade, and maintain pedestrian crossings at intersections and mid-block locations by providing safe, will-marked crosswalks with audio/visual warnings, bulb-outs, and median refuges that reduce crossing widths.
	Policy T-P-15.	Provide pedestrian routes across large blocks, pursuing creative options if necessary such as purchasing private alleys, designating pathways through buildings, and acquiring public access easements.
	Policy T-P-16.	Establish Pedestrian Priority Zones in Neighborhood Centers, around schools, and in other locations, where wider

Table 3.9-4: Clean Air Plan TCMs to be Implemented by Local Governments

TCM in the 2005 Ozone Strategy	*Policies in the Proposed General Plan Consistent with the TCM*	
		sidewalks, street lighting, crosswalks, and other pedestrian amenities are emphasized. Link these zones to adjacent land uses to ensure that building frontages respect pedestrians and truck loading takes place on adjacent streets wherever possible.
	Policy T-P-17.	Encourage walking through building design and ensure that automobile parking facilities are designed to facilitate convenient pedestrian access within the parking area and between nearby buildings and adjacent sidewalks. Primary pedestrian entries to nonresidential buildings should be from the sidewalk, not from parking facilities.
	Policy T-P-18.	Require development to include safe pedestrian walkways that link to streets and adjacent bus stops.
	Policy T-P-19.	Require development to minimize the number and width of curb-cuts for vehicle traffic to reduce vehicle conflicts with pedestrians.
	Policy T-P-21.	Following completion of the new east span of the Bay Bridge, the west span should be retrofitted with a pathway to provide continuous pedestrian and bicycle access between San Francisco and the East Bay.
7. Promote Traffic Calming Measures	Policy T-P-46.	Support "traffic calming" and other neighborhood traffic management techniques to enhance the quality of life within existing neighborhoods and to discourage through traffic on bicycle boulevards and local streets.

Source: ESA, 2008.

Impact

3.9-.3 New development under the proposed General Plan would create fugitive dust and other criteria pollutant emissions generated by construction and demolition activities that would result in health and nuisance type impacts in the immediate vicinity of construction sites. *(Less than Significant)*

Construction activities would occur intermittently at different sites in the project area throughout the period of implementation of the proposed General Plan. Although the related impacts at any one location would be temporary, construction of individual projects under the proposed project could cause adverse effects on local air quality. Construction activities would generate substantial amounts of dust (including PM10 and PM2.5) primarily from "fugitive" sources (i.e., emissions released through means other than through a stack or tailpipe) and lesser amounts of other criteria air pollutants primarily from the operation of heavy equipment construction machinery (primarily diesel operated) and construction worker automobile trips (primarily gasoline operated).

Fugitive dust emissions would vary from day to day, depending on the level and type of activity, silt content of the soil, and the prevailing weather. Sources of fugitive dust during construction would include vehicle movement over paved and unpaved surfaces, demolition, excavation, earth movement, grading, and wind erosion from exposed surfaces. In the absence of mitigation, construction activities may result in significant quantities of dust, and as a result, local visibility and PM10 concentrations may be adversely affected on a temporary and intermittent basis during the construction period. In addition, the fugitive dust generated by construction would include not only PM10, but also larger particles, which would fall out of the atmosphere within several hundred feet of the site and could result in nuisance-type impacts.

Demolition of buildings constructed prior to 1980 often involves hazardous materials such as asbestos used in insulation, fire retardants, or building materials (floor tile, roofing, etc.) and/or lead-based paint. Airborne asbestos fibers and lead dust pose a serious health threat. The demolition, renovation and removal of asbestos-containing building materials would be subject to the requirements of BAAQMD Regulation 11, Rule 2.

Construction activities would also result in the emission of other criteria pollutants from equipment exhaust, construction-related vehicular activity and construction worker automobile trips. Emission levels for construction activities would vary depending on the number and type of equipment, duration of use, operation schedules, and the number of construction workers. Criteria pollutant emissions of ROG and NOx from these emission sources would incrementally add to the regional atmospheric loading of ozone precursors during project construction.

The BAAQMD's approach to analyses of construction impacts is to emphasize implementation of effective and comprehensive control measures rather than detailed quantification of emissions. The BAAQMD considers any project's construction-related impacts to be less than significant if the required dust-control measures are implemented. Without these measures, the impact would be considered significant. BAAQMD CEQA Guidelines recognize that construction equipment

emit ozone precursors, but indicate that such emissions are included in the emission inventory that is the basis for regional air quality plans. Therefore construction emissions are not expected to impede attainment or maintenance of ozone standards in the Bay Area (BAAQMD, 1999), and thus are found to be less than significant.

Proposed General Plan Policies that Reduce the Impact

The following proposed policies would reduce potential air pollution emissions from activities including construction:

Conservation, Safety and Noise Element

CSN-P-3 The City will coordinate air quality planning efforts with local, regional, and state agencies and support the Bay Area Air Quality Management District's efforts to monitor and control air pollutants from stationary sources.

CSN-P-4 Dust abatement actions are required for all new construction and redevelopment projects.

CSN-P-5 All large construction projects are required to reduce diesel exhaust emissions through use of alternate fuels and/or control devices.

Adherence to established regulations, as well as the proposed General Plan policies listed above, will ensure the potential impact is less than significant.

Mitigation Measures

No mitigation is required.

Impact

3.9-4 The proposed General Plan could expose sensitive receptors to substantial pollutant concentrations. *(Less than Significant)*

Development resulting from buildout of the proposed General Plan could place sensitive land uses near local intersections and roadways associated with air pollutant emissions that exceed State or federal ambient air quality standards. Similarly, existing sensitive land uses near local roadways that experience increased levels of traffic resulting from buildout of the proposed General Plan could be exposed to air pollutant emissions that exceed State and/or federal ambient air quality standards. In addition to these air pollutant emissions, a variety of TAC emissions could also be released from various construction and operations (i.e., industrial processes, diesel equipment and vehicles) associated with the proposed General Plan. The ARB has declared that DPM from diesel engine exhaust is a TAC. Additionally, the California Office of Environmental Health Hazard Assessment (OEHHA) has determined that chronic exposure to DPM can cause carcinogenic and non-carcinogenic health effects. Implementation of policies that ensure appropriate land use compatibility and DPM reduction would reduce this impact to less than significant.

Conservation, Safety and Noise Element

CSN-P-3 The City will coordinate air quality planning efforts with local, regional, and state agencies and support the Bay Area Air Quality Management District's efforts to monitor and control air pollutants from stationary sources.

CSN-P-5 All large construction projects are required to reduce diesel exhaust emissions through use of alternate fuels and/or control devices.

Land Use Element

LU-P-26 If new residential buildings are proposed adjacent to freeways and railroad tracks impacts of these corridors, including noise, vibration, and air pollution, should be considered during site planning. Noise, vibration, and air pollution shall be mitigated to the extent possible.

Adherence to the proposed General Plan policies listed above, ensure the potential impact is less than significant.

Mitigation Measures

No mitigation is required.

Impact

3.9-5 New development under the proposed General Plan could expose substantial numbers of people to objectionable odors. *(Less than Significant)*

Though offensive odors from stationary sources rarely cause any physical harm, they still remain unpleasant and can lead to public distress generating citizen complaints to local governments. The occurrence and severity of odor impacts depend on the nature, frequency and intensity of the source; wind speed and direction; and the sensitivity of receptors. Odor impacts should be considered for any proposed new odor sources located near existing receptors, as well as any new sensitive receptors located near existing odor sources. Generally, increasing the distance between a receptor and the source to an acceptable level will mitigate odor impacts. Table 3.9-5 shows BAAQMD-recommended buffer zones (distance between receptor and source) for known odor-emitting sources.

Development proposed under the Emeryville General Plan could place residences and other sensitive receptors in proximity to light industrial uses, which could result in odor impacts depending on the types of industries proposed.

Table 3.9-5: BAAQMD-Recommended Buffer Zone Distances for Potential Odor Sources

Type of Operation	*Buffer Zone*
Wastewater Treatment Plant	1 mile
Sanitary Landfill	1 mile
Transfer Station	1 mile
Composting Facility	1 mile
Petroleum Refinery	2 miles
Asphalt Batch Plant	1 mile
Chemical Manufacturing	1 mile
Fiberglass Manufacturing	1 mile
Painting/Coating Operations (e.g., auto body shops)	1 mile
Rendering Plant	1 mile
Coffee Roaster	1 mile

Source: BAAQMD, 1999.

Proposed General Plan Policies that Reduce the Impact

The following proposed policy in the General Plan would reduce potential air pollution impacts, including odors:

Conservation, Safety and Noise Element

CSN-P-6 Adequate buffer distances shall be provided between offensive odor sources and sensitive receptors, such as schools, hospitals, and community centers.

Adherence to established regulations, as well as the proposed General Plan policy above, will ensure that potential odor impacts are less than significant.

Mitigation Measures

No mitigation is required.

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3.10 Public Services and Utilities

This chapter presents the environmental setting and impact analysis for public services and utilities in Emeryville. The public services included in this EIR include water supply, wastewater treatment, solid waste, police and fire protection, and schools. Park facilities are addressed in section *3.11: Parks and Recreation.*

ENVIRONMENTAL SETTING

PHYSICAL SETTING

The following sections describe the existing services and facilities for schools, water supply, wastewater treatment, solid waste management, and police and fire protection within the City of Emeryville.

Schools

The city contains two public schools and three higher education institutions. Emeryville also includes one private school, the Pacific Rim International School, which serves 90 students from preschool through 6th grade.

Emery Unified School District

The city boundaries are aligned with a single public school district, Emery Unified School District (Emery USD), which runs two schools: Anna Yates Elementary School (Kindergarten– Grade 6) and Emery Secondary School (Grades 7–12). Emery USD owns an additional property at 1275 61st Street, previously called the Ralph Hawley School and prior to that, the Emery Middle School Academy. It ceased regular school operations in 2003.

Table 3.10-1: Emeryville Existing School Enrollment and Capacity (2008-2009)

	Enrollment	*Capacity*	*Remaining Capacity*	*Percent of Capacity*
Anna Yates Elementary School	422	585	163	72
Emery Secondary School	361	594	233	61
Total	783	1,179	396	66

Source: Emery USD, 2009. Anna Yates Elementary School capacity based on estimates post-current renovations and expansion.

Emery USD is a small school district and is likely to remain so during the General Plan period. As of the 2008–2009 school year, Emery USD served 783 students. Both Anna Yates Elementary and Emery Secondary are located on the Emeryville/Oakland border within the 94608 zip code area. Approximately 40% of the district's students live outside the school district boundaries. Of those, 85% reside within the 94608 zip code. Students who live outside of Emeryville must apply for an inter-district transfer each academic year. Priority is given to returning students, their siblings, and to students whose parents or guardians are employed in Emeryville.

As enrollment of Emeryville residents either increases or decreases, the percentage of students accepted through the inter-district transfer process is adjusted. This flexibility has aided the City's small public school district in maintaining stable class sizes across all grade levels.

Anna Yates Elementary School was partially renovated and expanded in 2008, increasing its capacity to serve students and programs. Although the existing school facilities throughout the district have been adequately maintained over many years of use, they have exceeded their "useful life" period and are now in need of major repair and updating or replacement. Additionally, the existing facilities present significant challenges to operating current programs in spaces designed fifty or more years ago. Finally, the existing building systems are outdated and present obstacles to owning and maintaining a safe, efficient, energy-conscious set of facilities.

Water

Water Supply

The East Bay Municipal Utility District (EBMUD) supplies water and provides wastewater treatment to areas of Alameda and Contra Costa counties. The District supplies water to approximately 1.3 million customers within a 331-square-mile service area and provides wastewater treatment to approximately 642,000 residents within an 88-square-mile area. Within the City of Emeryville, EBMUD owns, operates and maintains the water distribution system (EBMUD, 2005).

The primary source of water for the City is the protected watershed of the Mokelumne River on the western slope of Sierra Nevada mountain range. The snowmelt from the surrounding Alpine, Amador, and Calaveras counties is collected in the Comanche and Pardee Reservoirs. From there, the untreated water flows over 90 miles through the Mokelumne Aqueducts to water treatment plants or reservoirs within EBMUD's service area, and ultimately to residences and businesses in the East Bay. The secondary resource of water is run-off from local watersheds, stored in EBMUD terminal reservoirs in the East Bay. Untreated water from local and Sierra reservoirs is transported to one of EBMUD's six water treatment plants, which are capable of filtering and processing up to 375 million gallons per day (mgd). EBMUD's Easy Bay service area includes five reservoirs: Briones, Chabot, Lafayette, San Pablo, and Upper San Leandro. Based on historical average, about 90 percent of the water delivered to EBMUD's customers originates from the Mokelumne River watershed, and 10 percent originates as runoff from the protected watershed lands in the East Bay Area. EBMUD's complete distribution system includes 4,000 miles of pipes, 125 pumping plants, and 168 neighborhood reservoirs.

In years of normal conditions and rainfall, EBMUD has water rights for up to 325 million gallons daily from the Mokelumne River. In addition, the District's reservoirs receive approximately 15-25 mgd from local watershed runoff (EBMUD, 2005). The EBMUD also participates in transfer and exchange programs with other Bay Area water systems, including the City of Hayward, the San Francisco Public Utilities Commission, Dublin San Ramon Services District, and Contra Costa Water District, in order to establish cooperation between local water districts when the primary water source proves unreliable.

In order to properly manage these sources of water, EBMUD adopted a long-term Water Supply Management Program (WSMP) in 1993 that serves as a planning guide for the reliable provision of high-quality water to its service area through the year 2020. EBMUD is currently in the process of updating the WSMP to plan for resources out to 2040. The primary objectives of the WSMP 2040 are to maintain and improve the District's water supply reliability to its customers and help meet the growing need for water in the future. WSMP 2040 will also adapt the District's water planning approach to circumstances that have changed since WSMP 2020 was adopted, such as competing and changing demands for water, the availability of Freeport water (from the Freeport Regional Water Project), after 2009, and long-term climate change.

In addition, every five years EBMUD prepares an Urban Water Management Plan (UWMP), as required by the California Urban Water Management Planning Act. The UWMP is updated and revised based on evaluation of water supply and demand, water recycling projects and demand management activities. The UWMP consists of supplemental water supply, water banking, water conservation, and watershed improvement to help accommodate existing and future demand within EBMUD's ultimate service boundary. The most recent UWMP was completed in 2005 and considers water resources through 2030.

Recycled Water and Conservation

Recycled water, as defined in the California Water Code, is water which, as a result of treatment of wastewater, is suitable for direct beneficial use or controlled use that would not otherwise occur. It is therefore considered a valuable resource. The goal of using recycled water is to assist in meeting future water demand by providing recycled water for landscape, commercial, and industrial uses, and saving high-quality water to meet annual potable water needs. EBMUD's Non-potable Water Policy No. 73 (1996) mandates that all customers use recycled water for non-domestic purposes when such water is of adequate quality and quantity, available at reasonable cost, not detrimental to public health, and not injurious to plant life, fish, and wildlife. Uses for recycled water include landscape and agricultural irrigation, industrial purposes, wetlands restoration and stream flow augmentation, and toilet flushing in commercial buildings.

EBMUD recognizes the importance, advantages, and necessity of using recycled water as a supplemental water source and thus initiated the EBMUD Water Recycling Program. Utilizing recycled water for the aforementioned purposes reduces the demand for EBMUD's potable water supplies, and thus delays or eliminates the need for more potable water facilities, sustains the economy with increased water supply reliability, protects the San Francisco Bay by reducing treated wastewater discharge, and stretches the high-quality potable water supply during times of prolonged drought or disaster.

In 2005 the average daily recycled water use was 6 mgd. By 2020, EBMUD hopes to recycle a total of 14 mgd and uphold this goal through the year 2030 in order to meet the anticipated potable water needs of its service area. Current estimates indicate that recycled water projects will result in 14.5 mgd average daily recycled water use by 2030 (EBMUD, 2005). Twelve major EBMUD water recycling projects are currently planned, five of which are in progress and two of which are under construction. These are in addition to EBMUD Wastewater Treatment In-Plant Uses.

The City of Emeryville, along with parts of Alameda, Albany, Berkeley, and Oakland, falls under the East Bayshore Recycled Water Project (EBRWP). This multi-phased project, commenced in 2003 with phase one expected to be completed in 2009, will provide up to 2.5 mgd of recycled water from EBMUD's Main Wastewater Treatment Plant to customers in the aforementioned areas. The recycled water from the EBRWP will be utilized for various landscape, industrial, and commercial uses (EBMUD, 2008).

EBMUD has adopted water conservation programs to address both water supply and demand. Demand-side water conservation programs are intended to reduce overall consumption of the water supply. The Water Conservation Master Plan (1994) identifies the use of free water audits, rebates, and other incentives, regulations, education, and support activities to reduce consumption. It is estimated that these programs have saved 13 mgd since the plan adoption through to 2005. The programs were originally designed to meet a conservation goal of 33 mgd in 2020. This goal has been updated and in the 2005 UWMP, EMBUD aims to conserve 35 mgd through 2030. EBMUD's supply-side conservation measures are directed toward increasing water use efficiency before or after customer use, and include improvements within EBMUD's distribution system (i.e. leak detection, pipe replacement, and corrosion control) and water recycling programs.

Future Demand

EBMUD's service area within Alameda County currently reaches approximately 489,000 people—including the residents of Emeryville—and is projected to serve nearly an additional 100,000 people by the year 2030. The anticipated population growth of the East Bay has raised concerns about the adequate supply of water in the area.

Water consumption within the EBMUD service area has remained relatively level in recent years, despite continuing account growth. However, development projects and increased population will create extra demand for water. In anticipation, EMBUD has diligently prepared conservation and recycled water programs to ensure adequate water supply during such times of development and reduce inconvenience to those in the service boundary.

A study released in 2000, entitled *Districtwide Update of Water Demand Projections*, projected EBMUD's current water demand for 2005 as 222 mgd with a total of 391,216 accounts. The study foresaw a particularly intense period of development activities in places like Emeryville and throughout the East Bay between the years 2005 and 2010, with demand to reach 281 mgd to 451,689 accounts by the year 2030. However, the total demand figure for 2030 is expected to be reduced to 232 mgd after conservation projects and recycled water programs are exercised.

Although EBMUD's current water supply is sufficient to meet demand during normal years, it is insufficient to meet customer demand in the case of a multi-year drought, despite its aggressive conservation and water recycling efforts. EBMUD will inevitably face water supply shortages during extended periods of drought, but additional supplemental supply projects currently underway will significantly reduce the severity and frequency of customer rationing.

Wastewater

EBMUD's wastewater service district (known as Special District No. 1, or SD-1) was established in 1944. SD-1 treats domestic, commercial and industrial wastewater for the cities of Alameda, Albany, Berkeley, Emeryville, Oakland and Piedmont, and for some parts of Contra Costa County. SD-1 serves approximately 642,000 people in an 88 square-mile area. The District's collection facilities are comprised of the interceptor system and collection pumping stations. The interceptors collect wastewater from approximately 1,400 miles of sewers owned and operated by the communities in the SD-1 service area. Fifteen collection system pumping stations move the wastewater to the Wastewater Treatment Plant, located at the foot of the San Francisco Bay Bridge in Oakland.

The City of Emeryville operates a municipal sanitary sewer collection system that conveys wastewater from Emeryville and portions of the City of Oakland. Except for one pump station and a forced main at the Emeryville Marina, the City of Emeryville's collection system is generally a gravity-fed system, consisting of over 13.6 miles of pipe ranging in sizes from six to 30 inches. The collection system is divided into five drainage basins, each of which connects to the EBMUD North sanitary sewer interceptor, which is generally located along the east side of Interstate 80. The EBMUD interceptor carries sewer flows from the East Bay communities' collection systems to its Wastewater Treatment Plant (WWTP). The plant provides secondary treatment for a maximum flow of 168 mgd. Primary treatment can be provided for up to a peak flow of 320 mgd. The average annual daily flow is approximately 80 mgd, and is expected to remain constant through 2030 (EBMUD, 2005).

Solid Waste

This section describes existing solid waste management and recycling conditions for the City of Emeryville. Solid waste disposal involves non-liquid materials that include residential and commercial garbage, recyclable materials, and industrial wastes. Information for this section was gathered from the City of Emeryville, the websites of the Alameda County Waste Management Authority (ACWMA) and the City Department of Public Works, the Final Municipal Service Review report to the Alameda Local Agency Formation Commission, which was accepted November 10, 2005, the Alameda County Integrated Waste Management Plan, adopted February 26, 2003, and the California Integrated Waste Management Board (CIWMB).

County Management and Funding

The ACWMA is a joint powers authority composed of the County, the 14 cities and two sanitary districts in the county. It allows these jurisdictions to collaborate on regional waste management planning, solid waste reduction, and the promotion of recycling. The ACWMA is responsible for preparation of the County's Integrated Waste Management Plan and Hazardous Waste Management Plan. Funding for the ACWMA is provided by disposal and waste import mitigation fees.

The county's landfills are funded through tipping fees, which Waste Management, Inc. (WMI) and other haulers collect directly from customers. Because the county's landfills are privately

owned, Emeryville has not had to worry about financing the creation or maintenance of solid waste or recycling facilities.

Recycling and trash reduction programs are funded in part by fees from the Alameda County Waste and Recycling Act, which was passed as Measure D in 1990. Measure D authorized a $7.19 per ton landfill disposal fee, which adjusts based on the region's consumer price index. This fee raises around $9 million a year, half of which is returned to local jurisdictions on a per-capita basis and half spent by the Alameda County Source Reduction and Recycling Board.

Pickup and Processing

The City of Emeryville's Public Works Department arranges waste disposal and curbside recycling for the residences and businesses in the city. It contracts with WMI, charging WMI a franchise fee of 24 percent of its gross service charges. As of fiscal year 2004-05, residential solid waste collection rates in Emeryville were the second-lowest in the county: $10.42 a month for 30-35 gallons of waste. The commercial charge was $59.06 per cubic yard, which was moderate by countywide standards.

WMI provides weekly residential trash, recyclables, and greenwaste curbside pickup and also handles residential hazardous waste, on-site pickup of commercial recyclables, and food waste composting. It does not do on-site pickup of commercial greenwaste. There are two dates a year set aside for curbside pickup of bulky items and individual pickups can also be arranged. Household hazardous waste can be dropped off at an ACWMA center in Oakland. Used motor oil can be pickup at curbside, if in the proper container, or can be dropped off at a used motor oil recycling depot at the Emeryville Marina.

There are three transfer stations in Alameda County: the Davis Street Transfer Station in San Leandro, the Berkeley Transfer Station in Berkeley, and the Pleasanton Transfer Station in Pleasanton. Trash from Emeryville goes to the Davis Street station, which takes up 53 acres. It is designed for 9,600 tons of waste per day, although its permitted capacity as of 2005 was 5,600 tons per day. The station can accept Class II wastes (non-hazardous, inert and designated wastes) and is prohibited from accepting hazardous waste. The most recently available information, from 2001, shows that the station's output averaged 3,028 tons per weekday. The station also processes recyclables. According to WMI's website, the Davis Street station possesses a 500-ton-per-day organics processing line for greenwaste, wood waste, and food waste and a 300-ton-per-day sorting facility for curbside recyclables. Major upgrades to the recycling capacity of the Davis Street Transfer Station have been made since 2001, but up-to-date information on its output is not available.

Emeryville's trash is sent to several landfills, but primarily to the Altamont landfill in Livermore. Information on the landfills used by Emeryville is presented in table 3.10-2. Food waste is dumped out of the county in Gilroy or Vacaville, although the ACWMA is considering construction of a food composting facility in the county.

Table 3.10-2: Solid Waste Landfills Used by Emeryville in 2007

Landfill	*Disposal Area (acres)*	*Maximum Permitted Tons per Day (2005)*	*Total Tons Disposed by Emeryville in 2007*	*Remaining Capacity*	*Closure Year*
Altamont	472	11,500	16,425	73.7%	2029[1]
Hay Road Landfill	256	2,400	25	77.2%	2077
Keller Canyon	244	3,500	2,662	84.5%	2030
Potrero Hills (2000)	190	4,330	392	38.1%	2011
Redwood Sanitary Landfill	210	2,300	8	67.5%	2039
Vasco Road	222	2,250	624	30.9%	2015
Total		26,280	20,162		

Note: Capacity information is from 2000. Remaining 26 tons were disposed of at the Newby Island Sanitary Landfill, NORCAL Waste Systems Pacheco Pass, Zanker Material Processing Facility, and Zanker Road Class III

1. ACWMA has since estimated that the Altamont Landfill would have capacity lasting until 2050.

Source: California Integrated Waste Management Board, 2007.

As of 2001, the estimated capacity remaining was 67 million tons in the Altamont Landfill and 14 million tons in the Vasco Road Landfill, and less than 1 million tons at the Tri-Cities Landfill. This results in a countywide capacity of 81 million tons. This estimate has increased from 32 million tons in 1995 due to vertical expansion, redesign and engineering changes, and settlement of the decomposing waste material. The ACWMA estimates that the capacity at Altamont will last through the year 2050, much longer than CIWMB's original estimate of 2029, even given the exhaustion of space at Vasco Road in 2037. Countywide projections made by in their 2003 ACWMA ColWMP Countywide Element indicated in excess of 50 years of landfill capacity in Alameda County (ACWMA 2003).

Nature of Waste

In 2007, the average Emeryville resident generated 2 pounds of trash daily, which equates to 0.4 tons in a year. In comparison, in 2004, the average employee generated 4.5 pounds daily, or 0.8 tons of trash a year. Overall, 88 percent of the county's trash comes from businesses rather than residences. According to the CIWMB, in 2007 Emeryville produced 20,162 tons of solid waste for an overall disposal rate of 2.76 tons per capita.

Future growth

The amount of trash disposed in Alameda County declined nine percent from 1999 to 2003, down to 1,585,601 annual tons, despite continued growth in population and jobs. The impetus for this divergence is State Assembly Bill 939, passed in 1989, which ordered cities to reduce trash delivered to landfills by 50 percent from their 1990 levels. If this goal was not achieved by 2000, a city could face fines of $10,000 a day for failing to prepare an approved diversion plan or make a good faith effort to implement such a plan.

According to the CIWMB, Emeryville's diversion rate now meets the state mandate, rising from 48 percent in 2000 to 74 percent in 2006, as shown in table 3.10-3. Emeryville avoided a daily fine after 2000 because it was recognized with a Good Faith Effort determination by the CIWMB. As of 2004, all 15 jurisdictions in Alameda had diversion rates of over 50 percent. According to the CIWMB, Emeryville has 32 waste diversion programs, shown in Table 3.10-4.

Table 3.10-3: Emeryville Solid Waste Diversion Rates

Year	*Diversion Rate*
2000	48%
2002	54%
2004	66%
2006	74%

Source: California Integrated Waste Management Board

Table 3.10-4: Waste Diversion Programs in Emeryville

Source Reduction	Xeriscaping/ Grasscycling
	Backyard and On-Site Composting/ Mulching
	Business Waste Reduction Program
	Procurement
	School Source Reduction Programs
Recycling	Residential Curbside
	Residential Buy-Back
	Commercial On-Site Pickup
	School Recycling Programs
	Government Recycling Programs
	Special Collection Seasonal (regular)
	Other Recycling
Composting	Residential Curbside Greenwaste Collection
	Residential Self-Haul Greenwaste
	Commercial Self-Haul Greenwaste
	Food Waste Composting
	Government Composting Programs
Special Waste materials	Tires
	White Goods
	Scrap Metal
	Wood Waste
	Concrete/ Asphalt/ Rubble
	Other Special Waste
Public Education	Electronic (radio, TV, web, hotlines)
	Print (brochures, flyers, guides, news articles)
	Outreach (tech assistance, presentations, awards, fairs, field trips)
	Schools (education and curriculum)
Policy Incentives	Economic Incentives
	Ordinances
Facility Recovery	MRF
	Transfer Station
	Alternative Daily Cover

Source: California Integrated Waste Management Board

The Final Municipal Service Review (2005) report to the County Local Agency Formation Commission (LAFCO) projects that the amount of residential solid waste disposed in Alameda County will increase from 456,410 tons per year to at least 474,383 tons by 2010, and to 517,740

tons by 2020. Meanwhile, the amount of commercial solid waste in the county is projected to increase from 1,231,242 tons in 2005 to 1,338,512 tons in 2010 to 1,541,658 tons in 2020.

These projections assume that solid waste output per capita will remain steady, even though that rate has been declining due to diversion measures. The County has a future diversion goal of 75 percent by 2010 as required by the Measure D voter initiative. The median diversion rate in the county was 55 percent in 2002. The ACWMA offers financial and technical assistance to help attain this rate. This assistance is supported by the Measure D landfill fee, which is spent by the Alameda County Source Reduction and Recycling Board on programs like those listed above, public education, the purchase of recycled material products procurement, and grants to community organizations.

The county's ability to reach its 75 percent diversion goal may depend in part on the type of business development that occurs in the county. Certain industries—restaurants, medical services, retail, and construction—generate more trash than others and significant growth in those fields may compromise this goal. As of 2006, Emeryville has nearly reached the 2010 goal, with 74 percent diversion.

Public Safety and Emergency Preparedness

Fire Services

The Emeryville Fire Department (EFD) aims to educate the public, prevent fires, and respond to all emergencies in the city. Fire and emergency medical dispatch is handled through the Oakland Fire Department's communications system. All Emeryville firefighters are certified Emergency Medical Technicians.

The Fire Department employs 31 personnel in two stations: Station #1 at 2333 Powell Street on the Peninsula and Station #2 at 6303 Hollis Street, at the corner of 63rd Street. Station #2 hosts the City's Emergency Operations Center, which is a room that can serve as a disaster coordination center. The department has mutual aid agreements with the fire departments of Oakland and Berkeley. These departments automatically respond to freeway accidents in the area and can be called for help with any other incident.

There are always a minimum of seven and a maximum of nine firefighters on duty at one time. The Fire Department possesses two fire engines split between the stations, each with 55 foot ladders, and a truck with a 105 foot ladder at Station #1. All three pieces of equipment can deliver the standard 2,000 gallons of water per minute. There is also a reserve engine at Station #2, which can immediately be brought into service in case one of the front line vehicles is unavailable. The department also has mutual aid agreements with the fire departments of Oakland and Berkeley. These departments automatically respond to freeway accidents in the area and can be called for help with any other incident.

The Fire Department has an emergency management operations plan for the city. Evacuation routes from the city in the case of an emergency depend on the circumstances, although San Pablo Avenue, Hollis Street, and I-80 are major routes. The City has an informal understanding

with AC Transit that they would help evacuate people in an emergency. The department has the ability to monitor the state of emergency routes through webcams.

Standards and ISO Rating

The insurance advisory organization (ISO) rates fire departments based on features such as their communications system, water supply, and equipment. The ISO scale ranges from a best rating of one to a lowest rating of ten. The EFD has an ISO rating of three. The department does not anticipate that population growth and future development in the city would lower its ISO rating.

The department receives an average of 1,500 calls each year, which includes mutual aid responses to nearby cities. The State requires a minimum response time of eight minutes to emergency calls. The EFD averages just under five minutes time from the inception of an emergency call to their arrival on the scene. Overall, about 60 to 65 percent of the department's calls are medical, with Station #2 handling around 60 percent of all non-fire calls.

Traffic impacts on the Fire Department's response time were improved in 1991 when Station #1 was moved, though a major incident on I-80 can back traffic up onto city streets and increase response times, although this occurs infrequently.

Police Services

Law enforcement services in Emeryville are provided by the Emeryville Police Department. Emeryville has one police station, adjacent to Fire Station #1 on Powell Street on the Peninsula. The Department employs 39 sworn officers and 20 other staff positions. The result is a ratio of 4.0 sworn officers for every 1,000 residents (based on 9,727 residents in 2008). This is much higher than the countywide ratio of 2.02 officers per 1,000 residents across Alameda County. During the workday, however, the city population swells to 25,000 to 35,000, resulting in a ratio of between 1.56 and 0.9 police officers per 1,000 people. The Records and Communication Section of the Police Department is the public safety answering point for all emergency and non-emergency calls for service. In 2004, the Police Department's dispatch center processed 11,728 emergency calls.

Police Response and Standards

While the department does not have service ratios or formal response standards, it aims to respond to emergency calls in two minutes and to non-emergency calls in six minutes. The department anticipates that as the city and its population grows, its staffing levels must also grow. While additional development will impact response times, the department does not currently use set standards for providing service to a growing population.

Emergency Response

As described above, Emeryville's Fire Station #2 hosts the City's Emergency Operations Center, which is a room that can serve as a disaster coordination center. In addition, all firefighters are certified as Emergency Medical Technicians, and 9 firefighters are certified as Paramedics. This

allows Emeryville the ability to deliver emergency medical services in an average of 5 minutes or less (City of Emeryville, 2008a).

The San Francisco Bay Area is a seismically active region with numerous active faults. Although no active faults run through the city, the entire city is subject to hazardous ground shaking in a major earthquake, as described in greater detail in chapter *3.6: Geology, Soils and Seismicity*. Emeryville is approximately 3 miles from the Hayward Fault and 15 miles from the San Andreas Fault, the two most prominent and active faults in the Bay Area. Further, the entire city lies within a liquefaction hazard zone. As a result, damages and injuries resulting from a major earthquake may surpass the ability of local emergency service providers to provide needed services.

Oakland and Fremont are the Metropolitan Medical Response System (MMRS) cities in Alameda County. MMRS cities are those cities that are provided with additional federal funds for organizing, equipping, and training groups of local fire, rescue, medical, and other emergency management personnel (ABAG 2005b). There are no Hospitals located in Emeryville, though several hospitals are located in the neighboring cities of Oakland, Berkeley, and Alameda offer emergency services. They include:

- Children's Hospital Oakland, Oakland, CA, about 2 miles from Emeryville;
- Alta Bates Summit Medical Center, Oakland, CA, about 3 miles from Emeryville;
- Alta Bates Medical Center, Berkeley, CA, about 3 miles from Emeryville;
- Highland Hospital/ Alameda County Medical Center, Oakland, CA, about 5 miles from Emeryville; and
- Alameda Hospital, 2070 Clinton Ave, Alameda, CA, about 9 miles from Emeryville.

Mitigation planning is an effective method of reducing risk to life and property from natural disasters such as earthquakes or wildfires, as established and funded by the federal Disaster Mitigation Act of 2000 described below. The Multi-Jurisdictional Regional Hazard Mitigation Plan entitled "Taming Natural Disasters," was developed by the Association of Bay Area Governments (ABAG) in cooperation with other local agencies. The Plan provides a framework of eight commitment areas, organized by services supplies by local governments, where mitigation measures may be taken to reduce identified risks. The plan forms the basis for local jurisdiction-specific hazard mitigation plans, known as Annexes. Each Annex is reviewed and approved by the Federal Emergency Management Agency (FEMA). These plans are all accessible on the ABAG website (ABAG, 2008). Emeryville does not yet have a local annex, but is working on their local hazard mitigation plan currently.

REGULATORY SETTING

Regulatory Agencies

The provision of public services and safety services in the City of Emeryville is the responsibility of several local, regional, and state agencies. Emery USD is the primary provider of K-12 public schools in the City of Emeryville. The EBMUD provides water and wastewater treatment for the City. The Emeryville Fire Department provides fire and life safety services within the City of Emeryville. Police services are provided by the Emeryville Police Department. City of Emeryville's Public Works Department arranges waste disposal and curbside recycling for the residences and businesses in the city. Solid Waste is managed and regulated by CIWMB and the ACWMA.

Federal, State, and Local Regulations

Assembly Bill 797 in 1983: An Urban Water Management Plan is required by the California Urban Water Management Planning Act. Section 10610.4 of the Act specifies that "urban water suppliers shall be required to develop water management plans to actively pursue the efficient use of available supplies." The Act became part of the California Water Code with the passage of Assembly Bill 797 in 1983. Every urban water supplier providing more than 3,000 acre-feet of municipal water annually, or providing water to more than 3,000 customers, is required by the Act to prepare and adopt an UWMP. The Act has been amended by various Assembly and Senate bills which expanded the issues to be addressed in the UWMP. The State's policy, declared in the Act, is to achieve conservation and efficient use of urban water supplies to protect both the people of the State and their water resources.

Senate Bill 610, Chapter 643

SB 610 amended the State Water Code to make water availability a critical step in the CEQA process for specific types of projects. SB 610 requires the public water suppliers (PWS) to prepare and approve a "water supply assessment" that contains three parts: 1) Explicit identification of existing and anticipated water supply entitlements, water rights and water service contracts, demonstrated by contracts, CIPs and applicable permits; 2) If no water has been received by the source identified to supply the development, other competing purveyors that receive from the new source must be identified; and 3) If groundwater is a proposed supply, factors such as adjudicated rights, groundwater management practices and historical pumping must be presented to establish proper use of the resource.

The main planning tool in creating the assessment is the PWS's UWMP. If the demands expected from the development are accounted for in the UWMP, it may be used – in whole or in part – to establish supply availability under normal and drought conditions. If the project contains new demands, where the new water supply will come from must be stated. EBMUD's Board adopted the most recent UWMP on November 22, 2005, and is described in greater detail below.

EBMUD's Non-potable Water Policy No. 73 (1996)

Mandates that all customers use recycled water for non-domestic purposes when such water is of adequate quality and quantity, available at reasonable cost, not detrimental to public health, and not injurious to plant life, fish, and wildlife.

California Integrated Waste Management Act of 1989 (AB 939)

The California Integrated Waste Management Act of 1989, AB939, required each city or county plan to divert 50 percent of all solid waste by January 1, 2000 through source reduction, recycling, and composting activities; and authorized local jurisdictions to impose fees based on the types or amounts of solid waste generated to be used to pay actual costs incurred in preparing, adopting and implementing integrated waste management plans, as well as in setting and collecting the local fees. The Act also prioritized an integrated waste management hierarchy to guide the Board and local agencies, giving source reducing the highest priority, followed by recycling and composting, and environmentally safe transformation and land disposal. Source reduction is defined as the act of reducing the amount of solid waste generated by waste producers. AB 939 specifies that all other waste that is not diverted be properly and safely disposed of in a landfill or through incineration (CIWMB, 2008b).

Disaster Mitigation Act of 2000

The federal Disaster Mitigation Act of 2000[1] (DMA) establishes a national hazard mitigation program to reduce the loss of life and property, human suffering, economic disruption and disaster assistance costs resulting from natural disasters. The DMA also provides a source of pre-disaster hazard mitigation funding to assist local governments in implementing effective hazard mitigation measures to ensure the continued functionality of critical services and facilities after a natural disaster. It emphasizes the need for state, Tribal, and local entities to closely coordinate mitigation planning and implementation efforts. DMA 2000 also established a new requirement for local mitigation plans and authorized up to 7% of Hazard Mitigation Grant Program funds available to a state to be used for development of state, Tribal, and local mitigation plans.[2]

Alameda County Measure D

Approved by voters in 1990, Measure D established the Alameda County Source Reduction and Recycling Board, responsible for the creation of the Alameda County Source Reduction and Recycling Plan, Vision 2010: 75% and Beyond. This plan, adopted January in 2003, established a countywide goal of achieving a 75 percent solid waste diversion rate from landfills by the year 2010.

Emeryville Municipal Code Title 6, Chapter 4

Emeryville Municipal Code Title 6, Chapter 4, Collection of Solid Waste and Recyclables, provides additional standards for solid waste collection and recycling Citywide. This ordinance provides regulations addressing the placement of solid waste and recycling receptacles, the quantity and size of recycling receptacles, and establishes performance standards for recycling service providers.

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[1] Additional information is available in the Federal Register (44 CFR Parts 201 and 206, Hazard Mitigation Planning and Hazard Mitigation Grant Program) and at http://www.fema.gov/plan/mitplanning/index.shtm

[2] http://www.fema.gov/plan/mitplanning/dma.shtm

Plans

Water Supply Management Program 2020

Adopted by EBMUD in 1993, the Water Supply Management Program (WSMP) serves as a long-term planning guide for the reliable provision of high-quality water to its service area through the year 2020. EBMUD is currently in the process of updating the WSMP to plan for resource management through 2040. The primary objectives of the WSMP 2040 are to maintain and improve the District's water supply reliability to its customers and help meet the growing need for water in the future. WSMP 2040 will also adapt the District's water planning approach to circumstances that have changed since was adopted, such as competing and changing demands for water, the availability of Freeport water after 2009, and long-term climate change.

EBMUD's 2005 Urban Water Management Plan

Every five years EBMUD prepares an Urban Water Management Plan (UWMP), as required by the California Urban Water Management Planning Act. It provides an overview of EBMUD's water supply sources and usage, water banking, recycled water and conservation programs, and watershed improvement to help accommodate existing and future demand within EBMUD's ultimate service boundary. The UWMP is part of EBMUD's long-range planning to ensure water service reliability for EBMUD customers, especially during multiple-year drought periods. The UWMP is updated and revised based on evaluation of water supply and demand, water recycling projects and demand management activities. The most recent UWMP was completed in 2005 and considers water resources through 2030.

Alameda County Integrated Waste Management Plan

Adopted February 26, 2003, this Countywide Element establishes an approach to Alameda County's waste management challenges. It is a primary tool for designing waste reduction programs that are countywide in scope and the only means of addressing the county's landfill needs in a comprehensive way. Waste reduction and disposal facilities in Alameda County that require Solid Waste Facility Permits must conform with the policies contained in this Element.

Alameda County Source Reduction and Recycling Plan: Vision 2010: 75% and Beyond

Developed by the Alameda County Source Reduction and Recycling Board, this plan was adopted January in 2003, establishing a countywide goal of achieving a 75 percent solid waste diversion rate from landfills by the year 2010.

ABAG Multi-Jurisdictional Regional Hazard Mitigation Plan for the Bay Area

Taming Natural Disasters, the Bay Area's Multi-Jurisdictional Regional Hazard Mitigation Plan for the Bay Area, was developed by the ABAG in cooperation with other local agencies and adopted in March of 2005. The plan provides a framework of eight commitment areas, organized by services supplied by local governments, where mitigation measures may be taken to reduce identified risks. The plan forms the basis for local jurisdiction-specific hazard mitigation plans, known as Annexes. Each Annex is reviewed and approved by the FEMA (ABAG 2008).

IMPACT ANALYSIS

SIGNIFICANCE CRITERIA

A significant impact would occur with full implementation of the proposed General Plan if the following negative impacts occur to level of service standards for water supply, wastewater treatment, solid waste, police and fire protection, and schools.

- Student levels in schools exceed available school capacity;
- Water demand exceeds available supply or distribution capacity;
- Wastewater treatment would exceed requirements of the East Bay Municipal Utility District.
- New development requires or results in the construction of new water or wastewater treatment facilities or storm water drainage facilities, or expansion of such existing facilities, the construction of which could cause significant environmental effects;
- Solid waste levels exceed available disposal capacity;
- Solid waste levels are in non-compliance with federal, state, or local regulations related to solid waste (e.g., recycling requirements);
- Demand for police or fire services exceeds standards mandated by General Plan standards, such as service ratios or response times; or
- Need for emergency preparedness increases above the capacity of existing programs.

METHODOLOGY & ASSUMPTIONS

Methodology

This analysis considered current and proposed General Plan policies and goals, existing and proposed public and safety services within the city, and applicable regulations and guidelines.

Schools

This analysis determines the increase in students that would result from buildout of the General Plan and assesses potential impacts on local schools. The projected student population was calculated according to total new population under buildout according to the proposed General Plan. The school facilities calculations are based on existing conditions and projections for Alameda County and the City. The enrollment factor for each housing unit is currently 0.15. Given countywide anticipated decline in the percent of household members of school age, the enrollment factor is expected to fall to 0.12 per unit in Emeryville. This results in an anticipated 1,200 school enrollment in 2030. This new student population is compared with existing school facilities to determine the number and type of new facilities needed.

Water Demand

The water supply analysis will address effects of land use changes and future development on water resources in terms changes in demand and in the adequacy of long-term water supplies. The analysis of water demand, services, and facilities is based on data provided by the East Bay Municipal Utility District (EBMUD). In particular, the analysis will consider how growth planned for the in proposed Emeryville General Plan will impact projected water demand and resources planned for by EBMUD.

Wastewater Treatment

The analysis of wastewater treatment demand will assess the impact of the General Plan on the sanitary sewer systems and identify whether adequate sewage treatment and conveyance system exists to serve buildout. The analysis of wastewater demand, services, and facilities is based on data provided by EBMUD.

Solid Waste

This analysis determines the potential increase in solid waste generation that would result from buildout of the General Plan and assess potential impacts on local landfills and disposal services. This analysis considers existing landfill capacity, resident and employee waste generation rates, and waste diversion. The analysis of solid waste demand, services, and facilities is based on information provided by the CIWMB and the ACWMA.

Fire

This analysis identifies the demand for fire protection services, such as personnel, facilities, and equipment. Existing fire services are considered in terms of the 2030 buildout of the proposed General Plan. The analysis of fire services is also based on discussions with Emeryville Fire Department (Cutright, 2009).

Police

This analysis identifies the demand for police protection services, such as personnel, facilities, and equipment. To ensure that new development does not adversely affect the City's current ability to provide police services, the number of total police officers per 1000 residents is considered in terms of the county-wide average. The analysis of police services is also based on discussions with the Emeryville Police Department (James 2009).

Emergency Services

This section considers the combined capacities of those services that would provide services during an emergency. Capacity to provide service during a major earthquake scenario is assessed in *3.6 Geology, Soils, and Seismicity*. This analysis will includes identification of any deficiencies in hospital, fire response, police, and weak points in life-line utility services. The analysis of emergency response is based on information provided by the City of Emeryville, the proposed General Plan, and applicable regulations and guidelines.

SUMMARY OF IMPACTS

While the existing and new development will represent a significant increase in student population, this new population is expected to be accommodated in existing school facilities and in the planned Emeryville Center of Community Life. Emery USD imposes a school impact fee on development that has generated more than $5 million to be used to pay for the capital facility needs of the District. The fee is $2.97 per square foot for residential development and $0.47 for commercial development.

While the new development will add an additional estimated 2 mgd in average daily water demand, the City does not foresee any adverse impacts on water supply given that new development in the Emeryville General Plan continues to make up a very small fraction of EBMUD's service (3 percent) and is represents an increase of less than one percent of service already planned for by EBMUD. Likewise, no expansions of wastewater treatment facilities are expected given that growth is only expected to require an additional 1 percent of EBMUD's remaining wastewater treatment system capacity.

As noted above, in accordance with state mandates, cities and counties must achieve diversion rates of 50 percent through source reduction, recycling, and composting activities. The California Public Resources Code 41780A2 directs that cities and counties divert 50 percent of solid waste produced within their jurisdiction by January 1, 2000, through source reduction, recycling, and composting activities.

With 74 percent waste diversion in 2006, Emeryville is currently on track for meeting the Alameda County goal of 75 percent diversion goal by 2010 and compliant with the 50 percent diversion rate mandated by the California Integrated Waste Management Act of 1989. In addition, as the City continues to promote additional diversion, there is expected to be no adverse impact on meeting waste diversion goals as a result of implementation of the General Plan. Additional potential waste generated by the General Plan would likely be further offset by increased diversion, though even at existing rates it is expected that there is sufficient landfill capacity to meet demand.

All projects are expected to comply with Federal, State, Regional and Local regulations regarding waste management so there is not expected to be any impact related to compliance with regulations.

Police and fire services may require increases in staffing in the long-term with the population and employment growth anticipated in the proposed General Plan; facilities in addition to those already planned for are not anticipated.

The proposed General Plan is not expected to have an adverse impact on disaster and emergency preparedness. Disaster and emergency preparations are in large part handled by the Emeryville Fire Department. In addition, the city is in the process of completing a jurisdiction-specific hazard mitigation plans. As stated in the proposed General Plan, San Pablo Avenue, Hollis Street, and Interstate-80 will continue to serve as evacuation routes in case of emergency

Additional detail on potential exposure to potential seismic hazards, emergency preparations required in the event of an earthquake, and General Plan policies that eliminate or reduce impacts are addressed in *3.6 Geology, Soils, and Seismicity*. Other Emergency situations are dealt with in sections *3.3 Hazardous Materials and Toxics* and *3.5 Hydrology and Flooding*.

IMPACTS AND MITIGATION MEASURES

Impact

3.10-1 New development under the proposed Emeryville General Plan will increase the demand for school facilities. *(Less than Significant)*

Projected Enrollment

Projecting student enrollment over the life of the General Plan helps to determine the need for new school facilities over time. Emeryville's population is expected to increase by about 6,400 residents over the life of the Plan. As the population ages at the county and state level, the proportion of school-age children is expected to decline, despite an actual increase in school-aged residents as part of overall population growth. Adjusting enrollment based on this factor, results in a projection of approximately 1,200 students total by 2030, an increase of 53 percent, or 417 students, over 2008-2009 enrollment. According to a 2008 study, this is a high estimate for potential future enrollment and closer to a scenario where the District's test scores improve substantially, therefore attracting more students (Lapkoff, 2008). As shown in the Setting, the current school system has the capacity to accommodate 396 additional students, very nearly meeting the high estimate of 400 additional students. It is possible that 23 additional students could be accommodated with additional configurations or renovations.

The future of the Emery USD's facilities is tied to the development of the Emeryville Center of Community Life described in the next section. According to the 2009 Master Plan, the Center of Community Life will accommodate 800-900 students in Grades Kindergarten through 12 with the ability to expand to serve 1,200 students—enough for the projected enrollment in 2030.

It is further anticipated that the need for services for children aged 5 and under and their families will increase during this period of increased enrollment in grades Kindergarten through 12. The need to serve preschool-aged children in pre-kindergarten programs is likely to increase. Adjunct facilities may need to be utilized to serve the above population including the current Anna Yates Elementary School site once the K-6 program is relocated to the Emeryville Center of Community Life. In the case that the Center is not constructed, the City would have the option to re-open the Ralph Hawley School to accommodate additional students.

Proposed General Plan Policies and Actions that Reduce the Impact

PP-P-14 Efforts by the School District and childcare service providers to establish, maintain, and improve educational facilities and services will be supported. Encourage a range of child care facilities, including family day care homes, public and private centers, preschool programs, and before and after school programs.

PP-P-15 A strong relationship and communication between City and EUSD will be maintained.

PP-P-16 The City will continue to partner with EUSD to optimize the joint-use of school facilities for community use.

PP-P-17 The City will support the development of the ECCL.

PP-P-18 Student engagement and learning will be facilitated through expanded programs and activities.

PP-A-7 Continue to negotiate with landowners on the acquisition of land to supplement the Center for Community Life. Identify funding opportunities and implement the entire concept.

Considering the School Impact Fee and the above policies in the proposed Plan that address meeting educational needs and the fact that the student population projected for 2030 will be accommodated in existing schools and the planned Center, it is expected that growth due to the proposed general plan will have a less than significant impact on school facilities.

Mitigation Measures

None required.

Impact

3.10-2 New development under the proposed General Plan may increase the demand for water beyond available distribution capacity/available through existing EBMUD entitlements. (*Less than Significant*)

As part of the EBMUD planning district, Emeryville's water demand is considered in the EBMUD UWMP plan. This EIR considers whether changes in population projections in the proposed Emeryville General Plan would make a significant difference water demand currently planned for in the 2005 UWMP. The 2005 UWMP has projected that water demand will increase to approximately 232 mgd in 2030.

EMBUD projections for water demand are based in part on population growth projected in ABAG's Projections 2005, which forecast less growth for Emeryville than is expected under the proposed General Plan. For instance, the proposed General Plan estimates a 2030 population of 16,500, while Projections 2005 estimates a 2030 population of 11,500. Nonetheless, both forecasts only make up approximately one percent of the total projected population of 1,598,000 in the EBMUD service area in 2030. This indicates that the future population of Emeryville under the proposed General Plan is sufficiently accounted for in EBMUD's planning document.

An additional measure of the impact of the plan on water resources is to consider the amount of water demanded by the future population in comparison to total water demand for the District. EBMUD estimates that average daily potable water demand in 2006 was 215 mgd, for service of

1.35 million customers. This indicates an average of 159 gallons per customer. Assuming demand per customer remains constant, the total demand the buildout of the proposed plan would be 7.40 mgd, 3 percent of the 232 mgd total demand projected for 2030, as shown in Table 3.10-5. This represents a less than one percent difference from the result found using *Projections 2005* population projections. Further, given the implementation of planned conservation and recycled water savings, Emeryville's contribution to this total would be less.

As described above, although EBMUD's current water supply is sufficient to meet demand during normal years, it is insufficient to meet customer demand in the case of a multi-year drought, despite its aggressive conservation and water recycling efforts. EBMUD will inevitably face water supply shortages during extended periods of drought. Due to this potential shortage, EBMUD is continuing to implement conservation and recycling programs.

Table 3.10-5: Population Projections and Water Demand for 2030

	Projections 2005	*Proposed General Plan*	*Difference*
Population	11,500	16,500	5,000
Employment	22,220	30,000	7,780
Total Potential Customers	33,720	46,500	12,780
Average daily water demand in 2030 (mgd)	5.37	7.40	2.04
Percent of Total Demand in 2030	2.31%	3.19%	0.88%

Note: Total Demand in 2030 is estimated to be 232 mgd, assuming planned conservation and recycled water savings reductions have been applied.

Note: Because some people may live and work in Emeryville, the estimate for total potential customers is considered conservative.

Source: Dyett and Bhatia, 2008; UWMP, 2005; ABAG Projections, 2005; EBMUD Annual Report, 2007; EBMUD, 2005.

Given the small portion of water demand that the population of Emeryville adds to EBMUD's district and the fact that Emeryville is well served by the current EBMUD infrastructure, it is expected that water will be supplied to the project via existing and planned entitlements. In addition, several policies from the proposed Plan will further reduce the impact of increased demand on the regional water supply. Overall, considering the small increase in water demand and the following proposed measures from the General Plan, the impact is not expected to be significant.

Proposed General Plan Policies and Actions that Reduce the Impact

CSN-P-11 Exterior uses of water for landscaping and other purposes shall be reduced to minimize or eliminate runoff and water waste.

CSN-P-12 The City promotes use of recycled water on landscaping and other non-food source plantings.

CSN-P-13 The City promotes construction and incorporation of cisterns, green roofs and other rainwater harvesting methods in existing, new and rehabilitation projects.

CSN-P-14 The City will allow homeowners to divert untreated rainwater for non-potable uses, such as outdoor irrigation and toilet flushing, though use of rainwater barrels or similar methods.

CSN-P-15 The City will continue to support the use of recycled water in new and rehabilitation projects, through the development process.

CSN-P-16 The City supports public education initiatives to encourage conservation of potable water.

PP-A-12 Continue to coordinate with utilities service providers as necessary (i.e. PG&E, EBMUD).

CSN-A-3 Implement EBMUD Water efficiency requirements for new and rehabilitation projects.

Mitigation Measures

None required.

Impact

3.10-3 New development would not exceed wastewater treatment capacity of the EBMUD, and would not require construction of new wastewater treatment facilities, expansion of existing facilities or implementation of programs and policies to further reduce inflow and infiltration (I/I) of storm water into the city's wastewater collection system and private sewer laterals during wet weather events. *(Less than Significant)*

As described in the setting, EBMUD provides secondary treatment for a maximum flow of 168 mgd. Primary treatment can be provided for up to 320 mgd. Storage basins provide plant capacity for a short-term hydraulic peak of 415 mgd. The average annual flow is currently 80 mgd and is expected to remain constant through 2030 (EBMUD 2005).

This analysis assumes that wastewater generation is approximately 90 percent of total water usage, with 10 percent of total water usage being water that is consumed or used for irrigation. As described for Impact 3.10-2, the project's total anticipated water demand will be 7.4 mgd per day, indicating daily wastewater generation of 6.7 mgd per day (90 percent of 7.4 mgd). Table 3.10-6 shows wastewater generation using the same methodology for existing conditions. The increase in wastewater generation, based on total new residents and employees, would be 2.4 mgd.

Table 3.10-6: Emeryville Wastewater Generation

	Estimated Total Customers (Population and Jobs)	*Wastewater Generation (mgd)*	*Percent of average annual flow (80 mgd)*	*Percent of Secondary treatment maximum flow (168 mgd)*
Existing	30,279	4.3	5	3
Total (2030)	46,500	6.7	8	4
Difference/ New	16,321	2.4	3	1

Source: Dyett and Bhatia, 2008; EBMUD UWMP, 2005 and Annual Report, 2007.

The proposed General Plan would not exceed the remaining secondary or primary treatment capacity at the plant. The increase in wastewater flow due to the proposed General Plan would generate only one percent additional use of the secondary treatment capacity of the WWTP, resulting in a total of four percent of the maximum flow for secondary treatment, and eight percent of the total wastewater treated by EBMUD's WWTP. The wastewater would contain typical household and commercial wastes in concentrations that are routinely treated by the WWTP. As such, the proposed General Plan does not exceed wastewater treatment requirements of EBMUD.

This increase is expected to be managed by the EBMUD, indicating that the proposed project would not require the construction of new water or wastewater treatment facilities, or the expansion of existing facilities. In addition, the following proposed policies from the General Plan would further reduce the impact of increased wastewater generation. Overall, considering the small increase in capacity use and the proposed mitigation measures, the impact is not expected to be significant.

Proposed General Plan Policies that Reduce the Impact

PP-P-24 The City will continue to operate and maintain the City-owned wastewater collection conveyance system and coordinate with EBMUD on the transfer and treatment of wastewater.

Policies and actions listed for Impact 3.10-2 also apply to wastewater management, by promoting conservation and recycling.

Mitigation Measures

None Required.

Impact

3.10-4 New development under the proposed General Plan would cause an increase in waste generation, but would be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs. (*Less than Significant*).

Waste generation rates for households and businesses are maintained by the CIWMB. According to CIWMB, the typical solid waste generation rate for a resident of Emeryville is 2 pounds per resident per day. The employee waste generation rate for an employee of Emeryville is 4.5 pounds per employee per day (CIWMB 2008a).

These generation rates estimate the total amount of waste created and include all discarded materials, whether or not they are later recycled or disposed in a landfill. Therefore, the 6,873 new residents and 9,448 new employees would be expected to generate an additional 56,262 pounds per day of solid waste, or 28 tons per day. The total waste generation at buidout would be 168,200 pounds per day, or 84 tons per day. A portion of this waste would be recycled per the City's policies that encourage recycling at businesses, condominiums, and apartment buildings. This analysis assumes the same waste diversion percentage as 2007, 74 percent, as a conservative measure. This is a conservative estimate given the projects and plans to achieve zero (or near zero) waste. Applying this measure, 22 tons per day would be sent to landfills at 2030 buildout.

Given that the Altamont Landfill (the landfill most used by Emeryville) allows 11,500 tons per day, Emeryville's waste generation in 2030 will represent 0.1 percent of the daily permitted waste intake. Therefore, it is expected that the Altamount Landfill has adequate capacity to accommodate waste generated by the proposed project. Given that there are several other landfills currently used by Emeryville with remaining capacity, it is expected that waste generated by the proposed General Plan through 2030 will be accommodated under existing permitted capacity.

While the expected additional waste generation is not expected to strain existing landfill capacity, the City of Emeryville acknowledges the importance of reducing waste and has included a goal of 50 percent reduction in waste to landfill over 2004 levels by 2020. In addition, the City's CAP describes waste reduction goals. The General Plan recommends that the City adopt the goal of Zero Waste. Zero Waste (or nearly zero) is a set of policies that promote upstream changes to products and services by the manufacturers, instead of letting the consumer and government agencies try to figure out what to do with the discards of society.

Proposed General Plan Policies and Actions that Reduce the Impact

CSN-P-33 The City will enforce regulation of local and State laws regarding the production, use, storage, and transportation of hazardous materials and waste.

CSN-P-36 The City supports public awareness and participation in household waste management, control, and recycling.

ST-P-2 The City shall maintain a Climate Action Plan to achieve waste reduction goals.

ST-P-3 The City shall adopt a Zero Waste Plan and actions for the year 2030, by 2010.

ST-P-4 The City shall negotiate a new Zero Waste Franchise Agreement with a hauling company that uses waste reduction programs and the disposal rate structure to

monetarily incentivize recycling and composting which will result in zero tons of methane-producing materials going to landfill by 2030.

ST-P-7 The City shall adopt a construction and demolition waste recycling ordinance which will require that, except in unusual circumstances, all construction, demolition and renovation projects meeting a certain size or dollar value, to divert from the waste stream, 100% of all Portland cement concrete and asphalt concrete and an average of at least fifty (50) percent of all remaining debris from construction, demolition, and renovation projects.

ST-A-1 Implement Climate Action Plan in coordination with all City departments.

ST-A-2 Adopt the United Nations Environmental Accords by Resolution with a plan for implementing 14 of the 21 actions by 2012.

ST-A-3 Incorporate site-appropriate standards described by Build-It-Green GreenPoint rating system and/or Leadership in Energy and Environmental Design (LEED™), and Bay- Friendly Landscape Guidelines, Sustainable Practices for Landscape Professionals into all new construction and rehabilitation projects.

In addition, the proposed General Plan calls for the implementation of the climate action plan (CAP), once complete. Through the CAP and as part of Measure D, the City has committed to a goal of reducing waste sent to landfills by 75 percent from 1990 levels by 2010. To this end the City of Emeryville is working closely with Alameda County's StopWaste.Org, which has already taken a lead role in developing strategies to divert waste and improve recycling and composting services.

The CAP outlines a series of policies to reduce waste generation, by increasing participation in County and City compost, recycle, and reuse programs; educating residents about the benefits of sustainable landscaping; and encouraging businesses to participate in the County Green Business program. The City has already adopted an ordinance requiring that restaurants and food vendors use compostable materials for all disposable food service-ware, a clear step toward achieving the waste reduction goal.

Draft waste reduction policies in the Emeryville CAP include the following policies reduce landfilled waste in half by 2020 over 2004 levels:

Citywide policies:

- Increase participation in commercial recycling/reuse programs for paper, cardboard, metal, glass and plastics – rigid and film.
- Participate in StopWaste.Org's audit and technical assistance program
- Encourage businesses to participate in the County Green Business program
- Increase participation in residential recycling programs

- Educate residents and businesses about the benefits of Bay-Friendly Landscaping and Gardening
- Increase participation in commercial and residential food waste collection program (for composting).

Municipal policies:

- Implement a duplex copying/printing policy in municipal office buildings
- Reduce Landscape Waste in City landscapes by implementing StopWaste.Org's *Bay-Friendly Landscaping* Program. Include practices such as: Increase on-site composting and mulching of municipal plant debris, using compost as a soil amendment, mulch for weed suppression, including the use of drip irrigation systems, a diverse plant pallet to resist pests, and reducing turf and sheared hedges.
- Increase recycling and composting in municipal facilities
- Adopt policies that support reduced waste (and which support other environmental priorities) including the following:
  - Environmental purchasing policy
  - 75% Diversion Goal
  - Construction &Demolition materials recycling ordinance
  - Civic Bay-Friendly/Green Building Ordinance
  - Residential green building resolution
  - Consider mandatory residential & commercial recycling/composting ordinance

Mitigation Measures

None Required.

Impact

3.10-5 New development in the proposed General Plan requires police and fire protection services that exceed current staffing and facilities. *(Less than Significant)*

Current police and fire protection is designed to meet the needs of the existing population and employment base. Implementation of the Emeryville General Plan would generate approximately 6,800 new residents and 10,000 new jobs in the city, increasing the long-term demand for police assistance and emergency fire response.

Police

The Police Department has identified a need for additional facilities space. In 2008, the Department proposed a renovation of the existing facilities. Improvements would include an enlarged dispatch area; better east-west circulation within the building; adequate storage and

office spaces and renovation of the men's and women's locker rooms. The City Council has reviewed conceptual plans and authorized staff to move forward with the design phase. The current schedule suggests that construction would begin in 2009.

These renovations may not accommodate the future needs of the Department given population projections. There are concerns that the current station would be vulnerable and could be cut off from the rest of the city in the case of a large earthquake. The 1987 General Plan also noted that the police station had poor access to the east side of Emeryville, from which most service calls were originating. In addition, the existing station is considered too small by the Department, which would like a new facility that is 25,000-30,000 square feet in size and able to handle 10 to 15 additional personnel. A new station located on the east side of San Pablo Avenue may be suitable, although some residents of the Watergate complex are concerned about being left unprotected if the station moves from the Peninsula.

Given the current staffing at the Police Department of 39 sworn officers and 20 other staff positions, the 2030 General Plan buildout would result in a ratio of 2.3 sworn officers (based on 16,600 residents in 2030). This is closer to the countywide ratio of 2.02 officers per 1,000 residents across Alameda County. During the workday, however, the city population swells to 25,000 to 35,000, resulting in a ratio of 1.1 police officers per 1,000 people given the maximum projection. However, given that the maximum daytime population estimate for existing conditions has a ratio of 0.9 police officers per 1,000 people, this low ratio is actually an improvement over existing conditions.

The City would determine the need for additional sworn officers and staff based on response times. In addition, the Police Department has identified a need for a new facility within the next 10 to 15 years, despite the renovations of the existing facilities. Current estimates are that the Police Department requires 15,000 to 25,000 square feet of floor space to adequately meet its needs. After renovation, the existing facility will provide for only 8,000 to 11,000 square feet of usable floor space, so a new building will definitely be needed within the timeframe of the proposed General Plan. In addition to the size of the existing facility, there are concerns regarding the current location, which is on landfill. This means that all of the Police Department's resources are located on land predicted to liquefy in a major earthquake (James, 2009).

Fire

The expansion of commercial and residential building space in the city implies a higher daytime and permanent population. This higher population and greater density will create several impacts.

The City is not currently planning for new Emeryville Fire Department facilities. In December 2008, the City authorized $1 million for two adaptive response vehicles—smaller and more maneuverable vehicles that are able to handle different types of calls, although they require additional staffing. The EFD also sees a need for a backup water pressure and delivery system in the event that an earthquake disrupts the regular system.

With a larger population, call volume and complexity would likely increase. Increased call volumes could lead to simultaneous alarms and periods of either non-coverage or a requirement to employ mutual aid from Oakland or Berkeley to meet basic day-to-day coverage requirements. Emergency calls tend to be focused on the early evening hours due to commute traffic and when people are home cooking. As the population ages, there may be an increase in calls from seniors who will need emergency medical services more frequently and who would require more services per call. On the other hand, the shift from an industrial based work force to a service, mercantile, professional and technical work force results in a reduction in the numbers of traumatic injuries and industrial fires. Further, fires in high-rises or large buildings near high-rises require expanded operations in terms of investigation, search and rescue, and fire suppression. These more complex calls not only require additional resources, but also require more time on scene.

Medical calls for single individuals typically require three firefighters, while structure fires in high rise buildings often require as many as 14 firefighters on a first alarm assignment, requiring all available Emeryville firefighters as well as the activation of Emeryville's mutual aid with Oakland. An increase in high rise fires, as with similar labor-intensive kinds of calls, will require reinforced engine companies with 4-5 firefighters each, and a command staff of several chief officers to manage the incidents. As Emeryville's population grows and as call volume and complexity increases, it is expected that more routine calls for service will be handled either by increased Emeryville firefighter staffing or by neighboring jurisdictions who will charge for their services when, and if, they are available to respond into Emeryville.

As Emeryville grows, it will experience higher densities, more traffic, more congestion, which would result in greater difficulty in evacuating the city, and longer response times to emergencies and a higher potential that incidents would affect more people. At a certain point in rising traffic congestion and population density, the geographic area to which each engine company must respond may need to be reduced. This will require additional fire stations and, likely, relocating at least one of the existing fire stations to adapt to the new traffic realities. Our goal is to reach 90 percent of the emergency scenes in at least six minutes or less. Six to nine minutes is an extremely significant amount of time in terms of response to a working structure fire or a life-threatening medical emergency.

However, staffing cannot simply be increased incrementally. The Fire Department notes that hiring additional staff could require the addition of a third engine company staffed by three firefighters on a 24/7 basis. This would translate to adding three firefighters for three duty shifts, or nine firefighters total for the department. Because the adequacy of fire protection emergency service (for both medical and fire suppression) hinges on call volume, call complexity and response times, potential increases in staff would depend upon call volume, response time degradation and complexity.

Proposed General Plan Policies and Actions that Reduce the Impact

PP-P-22 Crime will be deterred through physical planning and community design.

PP-P-23 There will be adequate police and fire staff to provide timely response to all emergencies and maintain the capabilities to have minimum average response times.

PP-A-11 Conduct a feasibility study for a new location and building for Police Administration facilities.

CSN-A-9 Implement and update emergency management operations plan, including evacuation routes, cache of supplies, training of City staff, as necessary, as the city continues to develop.

CSN-A-10 Periodically update the Local Hazard Mitigation Plan (LHMP).

Given the General Plans commitment to ensuring adequate police and fire staff to provide timely response to all emergencies and maintain the capabilities to have minimum average response times, the impact of population growth, while potentially requiring investment of additional resources, is expected to be less than significant.

Mitigation Measures

None required.

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3.11 Parks, Open Space, & Recreation

This chapter presents the environmental setting and impact analysis for parks, open space, and recreation resources in Emeryville.

ENVIRONMENTAL SETTING

PHYSICAL SETTING

City Parks and Open Spaces

Due to its industrial past, Emeryville has minimal parks and open space. In recent years Emeryville has greatly improved the number, acreage, accessibility, and diversity of its park and recreation assets; however, these facilities fall short of the needs of the city's expanding population. As shown in Table 3.11-1, in 2008, Emeryville contained 15 acres of public open space in eight City-owned parks. This is a significant increase from the 7.7 acres mentioned in the 1987 General Plan. Most of the municipal parks are small open spaces, such as the .14-acre 61st Street Mini-Park, which provides a playground area for neighborhood children. A majority of city parkland is concentrated in Marina Park on the peninsula and is not easily accessible to the majority of the City's population, who live east of Highway 80.

The City has been developing the Emeryville Greenway—a series of pedestrian and bike paths intended to provide more connectivity within the city. Once completed, this north/south Greenway will link the northeastern residential neighborhoods and new residential developments throughout the city with open spaces and activity centers.

The City also has a lease agreement with Emery Unified School District to use the sports and aquatic facilities at Emery Secondary School during non-school hours. The Community Services Department offers classes, sports programs and activities in these facilities. In addition, Emeryville is a member of the Joint Powers Authority for the Tom Bates Regional Sports Complex about three miles north in Berkeley.

State and Regional Parks and Open Spaces

State and regional open spaces provide larger green spaces that connect to adjacent communities. The East Bay Regional Park District operates 98,000 acres of parkland in Alameda and Contra Costa counties. The Eastshore State Park constitutes about 2,250 acres of uplands and tidelands along the shoreline of Oakland, Emeryville, Berkeley, Albany, and Richmond, providing a prime location for bird watching and aquatic wildlife preservation. Emeryville's portion—the Emeryville Crescent—contains 30 acres of marsh shoreline and is identified as a Conservation Area. The proposed General Plan proposes extending the San Franicsco Bay Trails through the Emeryville Crescent, following environmental assessment and appropriate mitigations.

Table 3.11-1: City of Emeryville Existing Parks & Recreation Facilities

Park/Open Space	*Play Equipment*	*Sports Facilities*	*Acreage*
City Parks			
61st Street Mini-Park	X		0.14
Christie Avenue Park			0.79
Community Garden			0.29
Davenport Mini-Park			0.44
Hollis Green[1]			0.69
Marina Park			7.56
Point Emery			2.08
Shorebird Park			0.76
Stanford Avenue Park	X	X	1.74
Temescal Creek Park	X	X	0.7
Other Open Spaces & Recreation Facilities			
Anna Yates Elementary Playground	X		n/a
Eastshore State Park (Emeryville Crescent)			n/a
Emery Secondary Field		X	n/a
Emeryville Recreation Center		X	n/a
Emeryville Greenway			n/a
San Francisco Bay Trail			n/a
Total[2]			15.19

1. Owned and operated by Novartis, but open to the public.
2. Linear parks, including the Greenway and Bay Trail, and conservation areas, such as the Eastshore State Park are not included in park totals.

Source: City of Emeryville, 2008.

Supply and Distribution

Most cities have established park standards as part of their general plans—typically, these range between three and five acres per 1,000 residents for neighborhood and community parks. Existing City-operated open spaces represent a ratio of 1.56 acres per 1,000 residents (based on 15.19 acres and a 2008 population of 9,727 according to the California Department of Finance). Over 70 percent—10.8 acres—of City-owned park space is concentrated to the west of I-80 on the peninsula. All of the City's recreation facilities, however, are located on the eastern side of Emeryville: basketball courts, recreation fields, and children's play equipment are located east of Doyle Street. A new park is being constructed in the block bounded by 61st, 62nd, Hollis and Doyle streets.

Emeryville's daytime population has greatly increased since the last General Plan, with current City estimates ranging between 25,000 and 35,000. This influx of workers, shoppers, and students more than triples the city's population during an average weekday. These workers are also looking

for places to relax, eat lunch, meet friends, and take walks. Taking this population into account, and even considering open space not available to the public such as in Pixar's campus, the ratio of park users to park space becomes very low—below one acre per 1,000 people. The proposed General Plan defines a new park standard of three acres of parkland per 1,000 new residents and .25 acres of parkland per 1,000 new employees. Table 3.11-2 compares past and present park ratios in Emeryville to the ratios in nearby communities. Currently, Emeryville's park to resident ratio is low compared with Oakland, Berkeley, and South San Francisco.

Table 3.11-2: Parkland Supply of Emeryville and Nearby Cities

City	*Acres of City parkland per 1,000 residents*
Emeryville- 1984	1.54
Emeryville- 2008	1.56
Oakland- 2005[1]	2.94
Berkeley- 2005[1]	2.36
South San Francisco- 2005	2.13

1. Excluding regional parks, such as Tilden and Redwood Regional.

REGULATORY SETTING

The design, inspection and maintenance of municipal parks in the City of Emeryville are the responsibility of the City of Emeryville's Public Works Department while the programming of park activities and recreation services are the responsibility of the Community Services Department. Regional Parks are operated by the East Bay Regional Park District, including Eastshore State Park. Hollis Green is owned by Novartis, but open to the public.

IMPACT ANALYSIS

SIGNIFICANCE CRITERIA

Impacts of the proposed General Plan would be significant if buildout resulted in:

- A shortage of parks facilities for residents due to growth, by reducing the number of acres/ 1,000 residents and failure to meet a level of service standard of 3 acres/1,000 new residents;
- Increased use of existing parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated; or
- The construction or expansion of recreational facilities which might have an adverse physical effect on the environment.

METHODOLOGY & ASSUMPTIONS

This analysis considered existing and proposed General Plan policies, goals, and applicable regulations, as well as existing and proposed parks, open space, and recreation facilities within the city. Shortages or accelerated deterioration of park facilities were determined by dividing the projected resident population by the total existing and proposed acres of parkland as proposed in the General Plan. It is assumed that a lower ratio of parkland per resident would increase park deterioration. Given Emeryville's low park ratio and lack of current standards, it was determined that an increase in parkland and a standard of 3 acres/ 1,000 new residents was considered in the low range of a typical urban requirement for parkland and therefore a reasonable minimum requirement. It is also the standard in the proposed General Plan. The existing and proposed park network is shown on Figure 3.11-1.

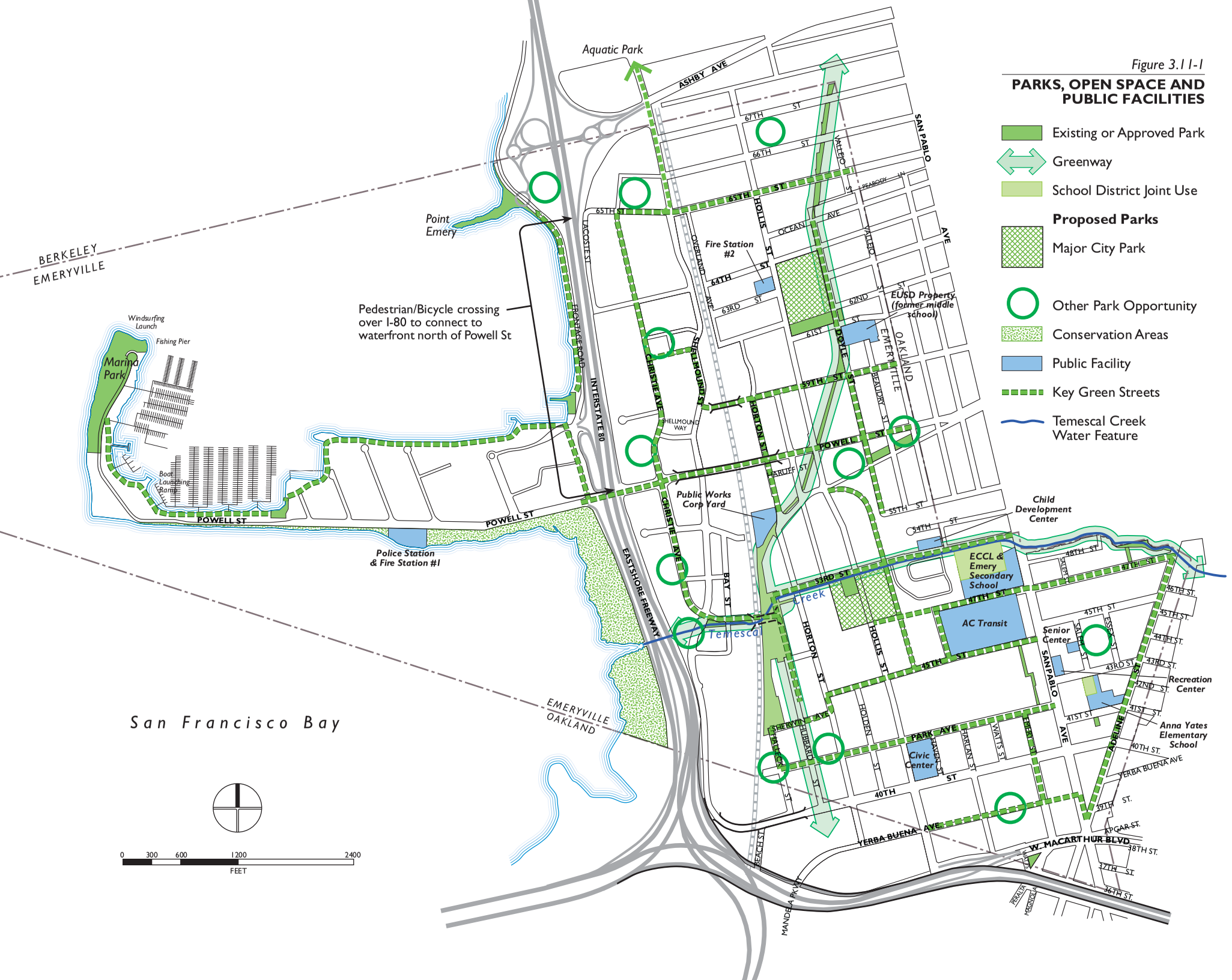
Figure 3.11-1
PARKS, OPEN SPACE AND PUBLIC FACILITIES
Existing or Approved Park
Greenway
School District Joint Use
Proposed Parks
Major City Park
Other Park Opportunity
Conservation Areas
Public Facility
Key Green Streets
Temescal Creek Water Feature
Aquatic Park
Point Emery
BERKELEY
EMERYVILLE
Pedestrian/Bicycle crossing over I-80 to connect to waterfront north of Powell St
Windsurfing Launch
Fishing Pier
Marina Park
Boat Launching Ramp
POWELL ST
Police Station & Fire Station #1
Fire Station #2
Public Works Corp Yard
EUSD Property (former middle school)
Child Development Center
ECCL & Emery Secondary School
AC Transit
Senior Center
Recreation Center
Anna Yates Elementary School
Civic Center
Temescal Creek
San Francisco Bay
EMERYVILLE
OAKLAND
INTERSTATE 80
EASTSHORE FREEWAY
ASHBY AVE
SAN PABLO AVE
HOLLIS ST
HORTON ST
CHRISTIE AVE
DOYLE
OAKLAND
EMERYVILLE
OCEAN AVE
PARK AVE
YERBA BUENA AVE
W MACARTHUR BLVD
MANDELA PKWY
0 300 600 1200 2400
FEET

SUMMARY OF IMPACTS

With full implementation of the proposed General Plan, acres of parkland, including neighborhood and community parks, per 1,000 residents increases from 1.56 to 2.5-2.8, providing higher service levels for Emeryville residents. In addition, total acres per 1,000 new residents exceeds the City's goal of 3 acres per 1,000 new residents.

The overall use of parks and the resulting deterioration will be lessened by increasing the amount of parkland per 1,000 residents. Phasing concerns are mitigated by the proposed General Plan standards that call for establishment of park acreage per 1,000 new residents and the focus on provision of public and private space in new residential developments.

The addition of open space and parks will generally have a beneficial impact on the environment since most parklands will allow improved "greening." One recreational facility, the ECCL, is proposed. A project level analysis of the impact of this facility will be required once site design is completed.

IMPACTS AND MITIGATION MEASURES

Impact

3.11-1 Future development according to the proposed General Plan will increase the ratio of parkland per 1,000 residents and meet the City's goal of 3 acres of parkland per 1,000 new residents. *(Beneficial)*

The General Plan proposes several different park types to accommodate the needs of present and future residents and to create a cohesive network of open spaces: two new large parks, several new pocket parks and small plazas, a new greenway and completion of the existing one, and a series of green streets connecting major activity centers. These proposed park and recreation facilities—which total to between 41 and 46 acres—are described in Table 3.11-3 and shown on Figure 3.11-1. The small parks, which will be developed in conjunction with development projects, are identified with circles; actual sites will be identified during the planning period.

Table 3.11-3: General Plan Park Acreage

Park	*Acreage*
Existing Parks	15.2
Planned Parks	1.3
Horton Landing Park	
Oak Walk Pocket Park	
Proposed Parks	
Neighborhood Parks	20 - 25
61st/64th/Hollis/Doyle	8
53rd/Hollis	5
Small Parks (up to 13)	7-12
Greenways	
Emeryville Greenway	1.5 miles
Temescal Creek Greenway	1 mile
Other Parks	5
Plazas and community gardens	
Total Parks[1]	41 - 46

1. Linear parks, including the Greenway and Bay Trail, and conservation areas, such as the Eastshore State Park are not included in park totals.

Source: City of Emeryville, Dyett & Bhatia, 2008.

In addition, The General Plan establishes a new standard for parkland of three acres of neighborhood parks per 1,000 new residents and .25 acres per 1,000 new employees. Using this standard, the City would need to provide 22 acres of new parkland in order to accommodate the additional 6,500 residents and 10,000 employees expected by the end of the planning period. The General Plan proposes 22 to 25 acres of new neighborhoods parks, as well as approximately five acres of other open space (including plazas and community gardens), thereby meeting the standards set here. Moreover, the City would gain more parkland per capita for all of its residents, not just new arrivals.

In total, existing, planned and proposed parks would result in 41 to 46 acres of City-owned parkland, plus the Greenways, green streets, and other trails. This total represents a ratio of 2.5 to 2.8 acres per 1,000 residents. Therefore, the plan provides an additional acre of parkland for every 1000 residents, when compared to the existing condition. This indicates that the impact of the proposed General Plan on the ratio of parkland per resident is beneficial.

Although the amount of parkland is an essential component to creating a vital network of open spaces, the quality and accessibility of these spaces are equally important elements. A city should have parks with a distribution and form that allows them to be enjoyed by workers during the day, used by children and senior citizens close to their homes, and to serve as a point of focus for residential neighborhoods. The General Plan seeks to provide a network in which there is an open space accessible within a five-minute walk of each resident's home. To achieve this goal, generalized park locations have been identified throughout the city, where a deficit has been noted within existing and proposed neighborhoods.

The following proposed General Plan policies encourage additional park development and ensure high quality park development.

Proposed General Plan Policies and Actions that Reduce the Impact

PP-P-1 Locate "other park opportunities" (whose locations are generalized on Figure 4-1) to maximize accessibility for residents, such that every resident in the City has access to a park within a five-minute walk from their residence. Parks shall be located outside the 65 dbl noise contour (Figure 6-10).

PP-P-2 Locate a series of small parks and plazas along Christie Avenue to create a continuous open space network through the district.

PP-P-3 Increase park acreage to serve the needs of the growing population and address current–deficiencies in park and open space standards. Maintain a standard of three new acres of parkland per 1,000 new residents, and 0.25 acres per 1,000 new employees.

PP-P-4 Two new large parks (five acres or larger), one each north and south of Powell Street shall be provided. The southern park may potentially be developed in conjunction with the Emeryville Center of Community Life. Active recreation uses will be a component of these parks.

PP-P-5 New smaller open spaces—including public plazas and places, community gardens, and pocket parks—will provide local focus points and diversify the built environment. These should be developed through the identification of underutilized and strategically located parcels, and the redevelopment of larger sites.

PP-P-6 Shading of parks and green streets located adjacent to buildings will be minimized.

PP-P-7 A system of greenways and Green Streets, as tree-lined open spaces will be developed as continuous recreational paths for bicyclists, joggers, and pedestrians, linking parks and activity centers.

PP-P-8 The north-south Emeryville Greenway will be expanded, enhancing its role as an open space corridor and connector across the City, and a source of inspiration and community pride.

PP-P-9 An east-west greenway located generally along the path of Temescal Creek will be created. This will include water features to celebrate the creek and improvements to the riparian corridor, where feasible, while maintaining existing drainage capabilities.

PP-P-12 Reclaim open spaces that have deteriorated, have design features that limit access and use opportunities, and/or are in need of activity and revitalization.

PP-P-13 Design, landscaping, lighting, and traffic calming measures will be employed to create safe parks and open spaces.

PP -A-1 Prepare a strategic parks master plan. Plan should identify needs, prioritize acquisition, and facilitate a significant reduction in the current deficit in parks and open space acreage. The plan shall also identify options for park financing and implementation, recognizing the challenges of providing new parks in a built-out city.

PP -A-2 Develop a park-programming plan based on assessment of user needs. Plan should maximize open space use and balance active and passive recreational needs for all segments of the community.

PP -A-4 Coordinate east-west greenway creek improvements and water features with community members and design professionals.

PP-A-9 Continue to provide ongoing and one-time cultural and recreation events for all members of the community—youth, adults, and seniors. Promote programs through City newsletter and website.

Mitigation Measures

None required.

Impact

3.11-2 Future development according to the proposed General Plan will reduce the overall deterioration of parks or other recreational facilities, although the phasing of parkland development and residential growth may have interim impacts on existing parkland. *(Less than Significant)*

The proposed General Plan proposes enough additional parkland to accommodate new residents and improve the park service for existing residents. Because there will be fewer users per acre of parklands in 2030, there will be a slower rate of deterioration of parks and recreational facilities. However, as the parks are developed over time, there may be an increase in overall park use as

parks become more accessible and desirable. In addition, the increase in daytime population will impact park use and deterioration, particularly given that with the maximum daytime population, the ratio of parks to users would be less than one acre for every 1,000 users.

However, park construction under the proposed General Plan is expected to begin early in the overall phasing, and in many cases is already underway. Construction on Horton Landing Park and Oak Walk Pocket Park has already begun, as well as a portion of Doyle Hollis Park bounded by 61st/62nd, Hollis and Doyle. The remainder of the Doyle Hollis Park, to the north, as shown in Figure 3.11-1, is proposed in the General Plan. In addition, Christie Park is being redeveloped as part of the recently approved Marketplace project. Finally, the City has already put the strategic park master plan, as called for in the General Plan, out to bid.

It is expected that the standards mentioned above, the creation of a park master plan, and the additional focus of inclusion of open space in residential developments will reduce this impact to less than significant levels.

The following proposed General Plan policies ensure sufficient park and open space will be created to accommodate new residents throughout buildout.

Proposed General Plan Policies and Actions that Reduce the Impact

PP-P-3 Increase park acreage to serve the needs of the growing population and address current deficiencies in park and open space standards. Maintain a standard of three new acres of parkland per 1,000 new residents, and 0.25 acres per 1,000 new employees.

PP-P-11 All large new residential developments shall include a combination of private and common open space.

Impact

3.11-3 The construction or expansion of recreational facilities would have an adverse physical effect on the environment. *(Less than Significant)*

The majority of new park and recreational facilities would have a beneficial effect on the environment by providing additional "greening," such as permeable surface, trees for shading and heat reduction, and other plant life. In addition, the proposed General Plan emphasizes reuse and shared use of existing facilities. As noted in the Setting, the City has a lease agreement with Emery Unified School District to use the sports and aquatic facilities at Emery Secondary School during non-school hours. This approach of sharing resources limits the need to construct new facilities. The only new facility in the General Plan is the Emeryville Center of Community Life, which will house facilities for arts, performances, meetings, community programs and services, recreation (indoor and outdoor), and administration facilities; this will also be a joint-use facility.

Initially the concept involved the Emery Secondary School site, and expanding across 47th Street to occupy the AC Transit facility. However, acquisition of the AC Transit site has not yet been successful. In 2008, two sites were under consideration: an 8.5 acre parcel owned by PG&E, near

Hollis and 45th streets, and the existing Emery Secondary site at 47th Street. Phase I of the process, which will be completed by spring of 2009, involves the creation of a Master Plan for the Emery Secondary School site. Phase II involves construction of the community recreation and educational facilities, anticipated for completion in 2013 or 2014. This process is being overseen by the City/Schools Committee. Project level environmental review will be required to assess the impact of the Center on the environment.

The construction of recreational facilities is expected to have a less than significant physical effect on the environment. The following proposed General Plan policy emphasizes the focus on reuse of existing sites to reduce the need for new construction:

Proposed General Plan Policies and Actions that Reduce the Impact

PP-P-10 Efficient use of open space will be achieved through techniques such as rooftop play courts and gardens, joint use of sports and recreation facilities at schools, co-location of parks with child care facilities, and possible use of underground parking below new plazas and parks.

PP-A-3 Explore additional joint park facilities and use agreements with surrounding communities and agencies.

PP-A-8 Work with the School District and local neighborhoods on appropriate land uses for school sites no longer needed for educational purposes.

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3.12 Visual Resources

This section presents the environmental setting and impact analysis for visual resources in the Emeryville. It evaluates how implementation of General Plan policies will affect the city's visual and aesthetic character, including the Emeryville skyline, views to the San Francisco Bay and the Berkeley-Oakland Hills, as well as street level aesthetics and character.

ENVIRONMENTAL SETTING

PHYSICAL SETTING

Located between Berkeley and Oakland, Emeryville acts as the primary gateway to the East Bay Area from San Francisco. Highly visible from major regional approaches along Interstates 80 and 580 and the Bay Bridge, the city is geographically framed by two major natural elements—the Berkeley-Oakland Hills to the east, and the San Francisco Bay to the west.

Although a compact city, Emeryville is challenged by its lack of connectivity and fragmented identity. Currently, the city contains a mix of development typologies and patterns that include both industrial and regional commercial cores, and small, low-density residential neighborhoods. Mid to high-density residential, office, and hospitality developments are interspersed mainly within the north and south Bayfront and Hollis districts. In these employment and commercial areas, large-scale developments and industrial uses have led to the creation of super-blocks—resulting in a disrupted street grid and few through streets.

Emeryville's disrupted street system reflects the substantial physical barriers that have led to distinct and somewhat isolated districts within the city. The Southern Pacific rail corridor and Interstate 80 divide the city into three major areas—the Peninsula, Bayfront, and East Emeryville. As each area has limited connectivity to the others, their isolation within the city has resulted in disjointed land uses and physical forms that often do not relate either physically or functionally between districts.

Emeryville is comprised of multiple districts, with their own distinct development typology and patterns, many of which are evolving. As in other East Bay cities, the waterfront (and the Peninsula) is physically separated from the eastern portion of the city by I-80. However, unlike cities such as Berkeley and Oakland, Emeryville does not have a historic downtown to serve as a central organizing scheme, because of its industrial past.

Key identifying features that lend Emeryville a sense of character are its location on the San Francisco Bay; wetlands and the tidal areas along the Bay; and views to San Francisco, the Golden Gate Bridge, Marin, and the Berkeley-Oakland Hills. Some visual connections are limited due to the presence of I-80, the Southern Pacific rail corridor, and disrupted street grid.

Areas and Districts

The following description provides an overview of the structure and development scale of the three main areas of the city and the districts within them. These areas include the Bayfront and freeway edge, including the central development core; central Emeryville, east of the railroad and west of Doyle Street and San Pablo Avenue; and the city's older residential neighborhoods.

Bayfront and Freeway Edge

The Bayfront area between I-80 and the railroad tracks is dominated by large-sized, regionally-oriented retail development; the northern portion of this area includes office, commercial, and residential uses, including the city's tallest structure—the Pacific Park Plaza residential building.

Central Emeryville

This area between the railroad and older residential neighborhoods to the east is a mix of industrial, office, and residential uses with an average block size of five acres and parcel size of a half acre.

Eastern Residential Neighborhoods

The eastern area of the city is defined by well established residential neighborhoods with a mix of single-family homes and medium- and high-density townhomes and apartments. While improvements to connectivity and public amenities are envisioned in the General Plan, these existing neighborhoods will remain largely unchanged.

Street Grid

A city's street grid influences how people more around their city and the accessibility of jobs, services, and other activity centers. Large super-blocks accommodate larger building footprints, but reduce pedestrian and vehicular connectivity. Likewise a disconnected street pattern (e.g. dead end streets) limit options for how to move around a city. On the other hand, a more connected grid of streets and smaller blocks can improve mobility for cars, pedestrians, and alternative transportation modes, since more options are available for travel. This type of fine-grained development pattern is also more visually interesting for pedestrians at the street level.

Because of its industrial past, Emeryville has historically had large blocks and limited connectivity. In the early 19th Century, there were no north-south streets at all except for San Pablo Avenue on the east side of town. After the Oakland Trotting Park racetrack closed around 1915, Hollis Street was constructed, connecting the north and south parts of town for the first time. Gradually, additional streets have been built, the street grid has been expanded, and blocks have gotten smaller. In addition to several new streets over the past 20 to 30 years, in 2008, the Marketplace Redevelopment project was approved which will create additional streets and an expansion of the grid in the North Bayfront area over the next 25 years. Emeryville's street system consists of several different street types: transit streets, connector streets, local streets, and bike boulevards.

Despite the addition of multiple new streets, however, the railroad corridor interrupts the city's street grid, while the I-80 freeway cuts off access to the bay and the Peninsula. These barriers force circuitous movements for all transportation modes, and make the city difficult to traverse on foot, despite Emeryville's small overall size.

Views

Views to the San Francisco Bay and the East Bay Hills visually knit the city with its context, and are an important part of how Emeryville is integrated within its surroundings. However, despite its geographically advantageous location along the San Francisco Bay, Emeryville's views to the water and San Francisco are limited by the lack of continuous streets that would extend towards the bay to provide views from inland areas, and the bulk of building along the Interstate 80 and rail corridors.

With direct views to the bay limited to the Peninsula, only taller buildings east of Interstate 80 are able to access private bay views. In the opposite direction, the Berkeley-Oakland Hills are visible along most east-west corridors in the city. However, views to the west along these streets, including 65th, 62nd, Powell, and 53rd streets, are often comprised of the freeway, massive buildings, or parking garages.

Within the city, the most prominent landmarks are the Pacific Park Plaza and I-80. Although the Pacific Park Plaza tower is visible from most points in the city and surrounding areas, the overall Emeryville skyline currently does not interrupt views from the Berkeley-Oakland Hills vantage point.





Interrupted views looking west towards the San Francisco Bay. Although views of the Bay from street-level are unlikely even without buildings, the placement of buildings at the terminus of streets interrupt views of the open sky.





Views to the San Francisco Bay





Views to the Berkeley-Oakland Hills

Skyline

Visible from I-80, the San Francisco Bay, Bay Bridge, and the Oakland and Berkeley Hills, the Emeryville skyline acts as a gateway to the East Bay as well as a primary identity for the city from afar. While Emeryville's taller buildings are visually prominent landmarks along the East Bay waterfront, their lack of continuity and centrality create a somewhat undefined quality to the urban skyline. This loose concentration of building heights and volumes has continued as new taller development has maintained a medium-height and decentralized character. This dispersed quality of the Emeryville skyline is exacerbated by poor contextual relationships between high-rises and surrounding development, and the physical barriers of I-80 and the rail corridor.



The Emeryville skyline looking west towards San Francisco.

Gateways

Gateways and entry points are key elements of city experience and identity. Clear and attractive signage, as well as significant landscape, art, or lighting elements create a sense of entry and city character. Major entries in to the city are from Interstate 80 onto Powell; the intersection of San Pablo and Adeline; and along Powell and Hollis—the only two regional and continuous streets through the length of the city. With only two through streets and a lack of significant signage along MacArthur Boulevard, San Pablo Avenue, and Adeline Street, entry points into the city act more as back doors rather than defined gateways.

However, although more subliminal in nature, changes in landscaping are a key defining characteristic for Emeryville and are distinctly notable in transition from Oakland into Emeryville's Doyle Street and Triangle residential neighborhoods as well as along San Pablo Avenue. Well-maintained landscaping, larger tree canopies, and planted medians create a richer visual standard in these areas and denote the city's attention to streetscape quality and character. In addition to recent improvements to landscape, the City approved a wayfinding and signage program in 2005, with the intention of establishing a greater city presence along major regional arterials as well as improved navigation throughout the city. This program would build Emeryville's streetscape improvements to create significant entry experiences into the city, focusing upon distinctive artwork and signage and clear wayfinding tools along the city's major corridors.

Bridges and Undercrossings

Bridges and undercrossings are also important urban design features. Bridges are highly visible and symbolic of the city's investment in connectivity. The network includes three existing

railroad overpasses at 40th, 59th (for pedestrians/bicyclists) and Powell streets, one approved pedestrian/bicycle railroad overpass at Temescal Creek, and another proposed across Powell Street just east of the freeway. Two additional grade-separated crossings are proposed north of Powell Street, one crossing the freeway and one crossing the railroad. Some of these overpasses are intended to accommodate pedestrians and bicycles only, and may include ramps for disabled and bicycle access. Appropriate lighting and signage, as well as visibility from the street and established bicycle and pedestrian routes will maintain these connections as convenient, safe, and direct links within the bicycle and pedestrian network.

Streetscapes

Streets are central to an area's identity, movement, and pedestrian experience. Regardless of method of transportation used, visitors, residents and workers must travel on streets; the way these are treated physically has an impact on the perception of the area as a whole. Street design can incorporate a wide variety of elements, ranging from benches to paving to tree grates, or even signage. Many of these detailed elements can be grouped into larger categories such as pavement and sidewalk width, landscaping, stormwater management, parking, medians and sidewalk amenities. An effective street design includes enclosure and street wall, continuity, character, relationship between pedestrians and traffic, shade and light.

Many of Emeryville's streets already contain the basic elements of good design, and improvements such as those along Park and San Pablo avenues are providing a higher standard for clear, attractive streetscapes. However, there are several challenges and opportunities for street design. Currently, walking in Emeryville can be a challenge—while there are areas within the city that are specifically designed for pedestrian movement, such as the Bay Street area, they are often surrounded by vehicle-oriented streets and development.

Distinctive streetscapes with unified tree planting and landscaping promote continuity, distinction, and identity. Currently, San Pablo Avenue acts as a key gateway and identifier for the City, with its distinct planting and streetscape design.

Public Art

Public art plays an important role in relating the story and identity of the city, and in creating the opportunity for residents and visitors to participate and share in its development. The City's Art in Public Places Program supports public art though a development impact fee and has successfully increased the amount of public art in the city. This ordinance calls for a one to 1.5 percent fee on non-residential development projects to be devoted to the acquisition or installation of publicly accessible art (or into an in lieu public art fund).

REGULATORY SETTING

The defining features of the Berkeley-Oakland hills, the San Francisco Bay, and I-80 are generally outside the control of Emeryville. These features are potentially impacted and regulated by multiple agencies and jurisdictions, including the cities of Oakland and Berkeley, the East Bay Regional Park District, Caltrans, the San Francisco Bay Conservation and Development Commission, and the County of Alameda, among others. Street level aesthetics and character are

impacted and regulated by the City of Emeryville and subject to the City's land use and zoning regulations, including area specific plans. There are no state scenic highways traversing the Planning Area.

There are several existing area plans that define development standards and policies for the individual character of neighborhoods in Emeryville. Those with impact on urban design, which impacts the visual and aesthetic character of a neighborhood, include the North Hollis Area Urban Design Program, the San Pablo Avenue Urban Design Plan, the South Bayfront Design Guidelines and the Park Avenue District Plan. These four plans must, by law, be consistent with the General Plan. These plans are described in greater detail in Section 3.1: Land Use and Housing.

IMPACT ANALYSIS

SIGNIFICANCE CRITERIA

Emeryville's proposed General Plan would have a significant adverse effect on visual resources if it resulted in:

- A substantial adverse effect on a scenic vista, which could be caused by blocking panoramic views or views of significant landscape features or landforms as seen from public viewing areas;
- Substantial damage to scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway;
- Substantial degradation to the existing visual character or quality of the study area and its surroundings; or
- Creation of a new source of substantial light or glare which would adversely affect day or nighttime views in the area.

METHODOLOGY & ASSUMPTIONS

To evaluate potential impacts on visual resources in Emeryville, this analysis considered existing views, streetscape aesthetics, and skyline, and the relative impacts on each of these resources proposed in the General Plan. The aesthetic and visual characteristics of the city are qualitatively evaluated. In addition, the proposed change in views at street-level was evaluated based on photo simulations from before and after plan implementation. These views include:

- East Bay Bridge Center: looking west across the surface parking lot and shopping center bound by Hollis Street, 40th Street, Emery Street, and MacArthur Boulevard; to become a mixed-use area, with new streets.

- Powell Street Plaza: looking south towards the shopping center, from the Powell Street and Christie Avenue intersection, to become a mixed use area.

- San Pablo Ave & 40th Street: looking north on San Pablo Avenue to a new neighborhood center.
- New greenway and creek feature along 53rd Street, near Emery Bay Village apartments.
- Sherwin Williams site: looking north from Hubbard Street and Sherwin Avenue across industrial site; to become mixed-use area.
- 61st and Hollis streets: looking north toward a new community park; a portion of the park is already under construction.

SUMMARY OF IMPACTS

Infill development and redevelopment will have a beneficial impact on the visual and aesthetic characteristics of the city as they will work to create a more unified, pedestrian-friendly, and aesthetically pleasing streetscape. Views to the Bay and Berkeley-Oakland hills will generally be improved through the expansion of the street grid. Similarly, views to Emeryville will be improved through the establishment of a more coherent skyline.

New development under the proposed General Plan is not expected to create new sources of light or glare that could adversely affect day or nighttime views in the area.

Proposed General Plan Policies and site planning criteria are expected reduce any potentially significant impacts to levels that are not significant.

Cumulative Impacts

Forecast development would change the visual character of Emeryville and improve the image of the City skyline. This would be a beneficial cumulative impact.

IMPACTS AND MITIGATION MEASURES

Impact

3.12-1 Future proposed development in Emeryville has the potential to affect scenic vistas to the San Francisco Bay and Berkeley-Oakland hills. *(Less than Significant)*

Proposed new development in the proposed General Plan is not expected to significantly affect scenic vistas or views in Emeryville. While new buildings will inevitably block some views, significant vistas of the Bay and East Bay Hills will remain unobstructed. In addition, the establishment of a small scale street grid, including new streets, will create new view opportunities. In places where the street grid is extended, visual connections will be enhanced. Generally, new views will compensate for any lost views. Although views may be obstructed in localized areas due to proposed new development, views would not be impacted on an area-wide basis.

Further, the proposed General Plan encourages the creation of a more cohesive skyline for Emeryville by focusing higher-intensity development within a central core. Building intensity and heights are greatest in this area, just to the north and south of Powell Street in the Bayfront district and the eastern edge of the Peninsula. These areas build off of the existing Emeryville skyline, providing the opportunity for a more contiguous high-rise zone in the city. Outside of this zone, building heights taper to provide a gradual transition to lower-scale development in the remainder of the city. This will create a more coherent skyline, and thereby improve views to Emeryville and views that encompass Emeryville.

Implementation of the following proposed Emeryville General Plan policies related to urban design and views would help preserve existing visual resources and would reduce potential impacts on scenic vistas or views.



This three-dimensional image illustrates the expanded street grid, views, and hypothetical buildout under the proposed General Plan land use and urban design policies.

Proposed General Plan Policies and Actions that Reduce the Impact

UD-P-4 New development will be required to extend the street grid or pedestrian connections wherever possible.

UD-P-5 The tallest buildings and highest development intensities in the city shall be located within the Powell Street/Christie Avenue core.

UD-P-6 A new neighborhood center around the intersection of Powell Street and Captain Drive will be oriented to support views of the Bay.

UD-P-8 Improved streetscape treatments, open space connections, and extension of the street grid through Powell Street Plaza.

UD-P-19 The street grid shall be extended as redevelopment on larger sites occurs.

UD-P-20 Full or partial public street closures by private development shall be prohibited. Where a street closure to vehicular traffic is necessary for public projects, as called for in this General Plan, access for pedestrians and bicycles should still be maintained.

UD-P-22 Opportunities to extend the street grid through internal connections in large parcel developments should be considered. Single-point access to new development should be avoided.

UD-P-27 Visual distinction and safety shall be prioritized in the design of bridges and undercrossings.

UD-P-28 Public views of the San Francisco Bay and the East Bay hills shall be maintained

UD-P-29 Streetscape features should not block public views.

UD-P-30 In the neighborhood centers and city parks flexibility should be provided in building massing so that sunlight is not blocked.

UD-P-32 Bulky and monolithic buildings shall be prevented through:

- Vertical articulation, such as step backs at higher floors, and less floor area as heights increase to reduce the apparent bulk of buildings.
- Horizontal articulation, such as varied setbacks, recessions/projections, change in materials, and building transparency, especially in Pedestrian Priority Zones.

UD-P-34 Tower separation shall be required to increase sky exposure for developments with multiple towers, and maintain separation standards for buildings taller than 100 feet.

UD-P-35 Where large floorplates are permitted, buildings shall be required to adhere to height, setback, and stepback standards, as required for view and sun access, but less stringent bulk standards shall be permitted.

UD-A-6 Utilize Site Plan Review:

- Identify options for pedestrian circulation
- Extend street grid wherever possible
- Require buildings within identified gateway areas to emphasize entry into the city through architectural elements.

Mitigation

None required.

Impact

3.12-2 New development and redevelopment activities may have the potential to change the visual character of Emeryville, particularly where incompatibilities with existing development in scale and/or character may exist. (*Beneficial)*

The proposed General Plan proposes a finer grain development that engages the pedestrian, especially in retail districts and neighborhood centers. This fine-grain development refers to small blocks, lots, and building footprints, allowing for more opportunities for public spaces and mid-block pedestrian routes. This smaller scale of development provides greater visual interest at the street level, and contributes to a diverse scale and character. Fine-grain development will occur in several parts of the city, including the neighborhood centers, along portions of Hollis street to the north and south, and the San Pablo Avenue districts. The Park Avenue district, as a whole, will also be primarily fine-grain to reflect and retain the historic patterns of the area. Strategic height limitations and building massing requirements will maximize sun exposure.

The proposed General Plan promotes an intimate scale of development along city streets through horizontal and vertical articulation. This includes varied building heights within neighborhoods or building clusters, recesses and projections, window articulation and treatments, and roof forms that contribute to overall texture and character. Horizontal building articulation is especially emphasized to provide richness and variety at eye level. The General Plan identifies Active Frontage Streets where the quality and character of the pedestrian realm is paramount. Along these streets there will be a high standard for building articulation, use of fenestration and entries to activate the public realm, and sidewalk/streetscape treatments.

Streetscape improvements will activate neighborhood centers, foster pedestrian comfort and emphasize neighborhood character by creating an interconnected green system with improved sidewalk treatments, seating, distinctive lighting, and public art, as well as bicycle facilities in appropriate locations. Coupled with concentrated street-front activity within neighborhood centers and retail areas, the improved street network will foster pedestrian activity and social gathering.

Two specific street types within the city will play a key role in establishing this network: Green Streets and streets in neighborhood centers. As the primary connections between major open space, activity centers, and amenities within the city, Green Streets may contain additional landscaping, such as a double row of trees, stormwater treatment measures, and adequate bike lanes. Streets within neighborhood centers are characterized by wider sidewalks, additional pedestrian amenities such as street furniture and wayfinding signs, curb bulb-outs at key intersections, and a consistent street tree theme. The four neighborhood centers are Park Avenue, North Hollis Street, Watergate Market Area and San Pablo Avenue.

The proposed General Plan Update is being completed with Design Guidelines, which (currently in draft form) outline a palette of appropriate materials, building forms, and orientation. Building form will be required to be articulated to create visual interest, prevent bulky structures, and avoid blank walls. High-quality architecture, construction practices, and urban design will help create a more attractive and distinctive city.

BEFORE



AFTER



East Bay Bridge Center Visual Simulation, before and after proposed General Plan Implementation





Powell Street and Christie Avenue Visual Simulation, before and after proposed General Plan Implementation

BEFORE **AFTER**





40th Street and San Pablo Avenue Visual Simulation, before and after proposed General Plan Implementation





Sherwin Williams Site Visual Simulation, before and after proposed General Plan Implementation

BEFORE



AFTER



Doyle Hollis Park Visual Simulation, before and after proposed General Plan Implementation





53rd Street Greenway Visual Simulation, before and after proposed General Plan Implementation

The proposed General Plan attempts to make Emeryville more navigable and visitor-friendly, by providing signage, kiosks, public art and other navigation tools. Public art within major activity nodes and regional destinations, within established neighborhoods, and along major pedestrian corridors will play a key role in articulating the city's identity.

As shown in Images 3.12-1 through 3.12-12, the overall change to the aesthetic character at the street level will be beneficial. Because impacts on existing neighborhoods would mitigated through plan policies that specify compatible character and scale, and existing neighborhoods will benefit from the improved public realm, the impact on the visual character of Emeryville is expected to be beneficial.

Proposed General Plan Policies and Actions that Reduce the Impact

UD-P-1 The City shall strive to accentuate activity and presence at the street level, particularly along pedestrian-oriented corridors and in residential areas.

UD-P-3 Parks and open space shall be accessible and available to the public through site design standards for minimum size/ dimensions, visibility, and location along public rights-of-way, particularly Key Green Streets.

UD-P-10 In the Industrial district, transitions will be designed between industrial and residential uses, creating visual continuity through building materials and design, while allowing landscaping or other buffers between uses. Increased fenestration and groundfloor entries will be required to maximize pedestrian safety and visibility.

UD-P-11 A pedestrian and bicycle-friendly mixed-use district will be developed in North Hollis, consistent with the policies and guidelines defined in the North Hollis Area Urban Design Program.

UD-P-12 In South Hollis, new development shall provide rights-of-way and greater setbacks where open space and pedestrian connections are planned. Building façades and entries should be oriented toward the Greenway, new open spaces, and the proposed Center for Community Life.

UD-P-13 The Park Avenue District Plan will continue to guide development in the Park Avenue district, honoring its unique civic, arts, and cultural amenities.

UD-P-14 A more urban character will be established for the East Bay Bridge district, by developing taller buildings, a more continuous street façade with pedestrian activity at the ground level, and increased development intensity.

UD-P-15 Infill residential development should incorporate the scale, character and identity of adjacent existing development.

UD-P-16 Streetscape improvements and greater intensity of development will be emphasized to improve the connection between the southwestern portion of the San Pablo Corridor district and the rest of Emeryville to the north.

UD-P-17 Pedestrian character and safety will be enhanced through landscaping and streetscape improvements in the Triangle and Doyle Street Districts.

UD-P-18 The San Pablo Avenue Urban Design Plan will continue to be used to improve landscaping, and streetscape design and guide development in the San Pablo Corridor district.

UD-P-21 The City shall maintain and enhance an integrated pattern of streets, pedestrian paths, and bike routes through a fine grain street grid that enables efficient movement throughout the city.

UD-P-23 The City shall establish Pedestrian Priority Zones in Regional and Neighborhood Centers, around schools, parks, and in other locations. While wider sidewalks, street lighting, bulbed crosswalks, and other pedestrian amenities should be employed throughout the city, they are prioritized in these locations.

UD-P-24 Pedestrian Priority Zones shall be linked to adjacent land uses to ensure that building frontages respect pedestrians and truck loading takes place on adjacent streets wherever possible.

UD-P-25 Commercial uses, such as retail, restaurants, hotel lobbies, and offices, shall be required at the ground level along Active Frontage Streets.

UD-P-36 Development of a finer-grain scale and texture shall be promoted citywide and required in portions of the North Hollis, Park Avenue, and San Pablo Avenue districts, and around neighborhood centers.

UD-P-37 New developments should employ changes in height, massing, and/or design character to create careful transitions in scale and density.

UD-P-38 New development should not cast significant shadow over existing development.

UD-P-39 Neighborhood structure and pedestrian scale development should be prioritized. The scale and character of existing neighborhoods should be maintained to ensure connectivity and continuity of street design within each district.

UD-P-42 Continuous and consistent street tree planting shall be provided along Green Streets and in Neighborhood Centers.

UD-P-45 Street trees shall be planted in a row along the curb, between the vehicle roadway and sidewalk, unless this is physically impossible due to constraints such as underground water or sewer lines.

UD-P-46 Streetscape landscaping shall follow Bay-Friendly Landscaping guidelines and serve the dual purpose of treating stormwater runoff and providing shade and beauty to the urban realm.

UD-P-48 City identity shall be enhanced by distinctive streetscapes through the use of street trees and unified landscape treatments.

UD-P-49 Cohesive streetscape improvements to streets in neighborhood centers and designated Green Streets are a priority.

UD-P-52 Use of the greenways shall be reinforced by fronting entrances to both commercial and residential development to the public pathway.

- Encourage open spaces and plazas adjacent to the greenways.
- Encourage other public-oriented ground level uses such as workshops, lobbies, and common areas.

UD-P-53 Generous sidewalks, and bikeways or bike lanes along greenways shall be required. Curbside parking and local vehicular access when greenways share right-of-ways with streets shall be permitted.

UD-P-54 Pedestrian-scaled street lighting, street furniture, and undergrounded utilities along greenways shall be required.

UD-P-55 Setbacks averaging 15 feet for new residential developments shall be required along greenways to create a landscaped front yard. Stairs, stoops, or other architectural encroachments, which contribute to the pedestrian life of the street, are also permitted.

UD-P-58 Parking should be screened or concealed. Pedestrian entrances to non-residential buildings should be located on the sidewalk; any entrances from parking areas should be incidental or emergency only.

UD-P-59 Parking should be located below-grade where possible.

UD-P-60 Above-grade parking structures should be wrapped with active uses, in Pedestrian Priority Zones and along Active Frontage Streets.

UD-P-61 If active uses are not feasible on the ground floor of parking garages, frontages should be architecturally attractive. This may include unique designs and materials, such as glass, articulated masonry, murals or landscaping setbacks.

UD-P-62 Motor vehicles and interior lighting should not be visible from the exterior of parking garages.

UD-P-63 Ground floor uses should be emphasized to facilitate pedestrian use, with standards for building frontage, fenestration, and entries.

UD-P-64 Buildings should be designed with ground level windows and building entries along the street.

UD-P-65 For all multifamily residential development, including high-rise, and along pedestrian-oriented streets, townhomes or other units with direct street access should be provided to promote individualization, family-friendly development, identity, and street safety.

UD-P-66 An open relationship between buildings and street edge should be maintained. Fencing and significant landscape barriers should be avoided, except to enclose individual yards.

UD-A-1 Prepare Design Guidelines for the following design elements:

- Site planning
- Building orientation and entries
- Open space
- Parking and service areas
- Building height and mass
- Building form and articulation
- Façade composition
- Building materials, detailing, and color
- Residential livability
- Streets
- Sustainability objectives
- Landscaping
- Signage
- Gateways

UD-A-2 Prepare, update, and implement neighborhood and area plans

UD-A-3 Update the Zoning Ordinance:

- Parking
- Building mass
- Signage
- Districts
- Development standards
- Streets

UD-A-4 Prepare citywide streetscape plan

UD-A-7 Invest in signage, public art, and streetscape improvements at identified city gateways.

UD-A-8 Improve the city's physical appearance through maintenance and façade renovations of older residential and industrial building stock. Support community-driven neighborhood beautification programs by emphasizing rehabilitation grants and low interest loans.

UD-A-9 Utilize the City's Public Art Fund to expand public art within the city along key pedestrian streets and at major gateways like Hollis Street, San Pablo Avenue, and Powell Street. Continue support for developer and city contributions to the Emeryville Arts in Public Places Program, with special emphasis on locating art in new parks and greenways.

UD-A-10 Develop and implement new sign regulations.

Mitigation Measures

None required.

Impact

3.12-3 Development under the proposed General Plan has the potential to adversely affect visual resources in the short-term during periods of construction by blocking or disrupting views. (*Less than Significant*)

Short-term visual impacts resulting from development includes blockage or disruption of views by construction equipment and scaffolding, removal of vegetation, temporary route changes for transportation improvements, exposed excavation, and construction staging areas. Short-term visual impacts are less than significant because they are temporary in nature. In addition, the

above mentioned policies that would reduce the impact of 3.12-2 would also ensure long-term significant adverse impacts from new development would not occur.

Mitigation Measures

None required.

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3.13 Energy and Greenhouse Gases

This section describes the current energy and electrical utilities needs of the City of Emeryville and potential impacts associated with the adoption of the proposed General Plan. Other public services, including water, wastewater, and solid waste disposal, are addressed in Section 3.10: Public Services & Utilities. This section also analyzes quantitatively how implementation of the proposed General Plan may contribute to global climate change (GCC) through greenhouse gas (GHG) emissions related to land use changes and transportation. The analysis of sea level rise impacts is provided in Section 3.5: Hydrology and Flooding.

ENVIRONMENTAL SETTING

UTILITY ENERGY

Pacific Gas and Electricity Company (PG&E) currently provides gas and electric services to Emeryville homes and businesses and is regulated by the California Public Utilities Commission (CPUC). With a few exceptions, PG&E's service area extends north to south from Eureka to Bakersfield, and east to west from the Sierra Nevada to the Pacific Ocean. The company controls 123,054 circuit miles of electric distribution lines and 18,610 circuit miles of interconnected transmission lines, as well as 40,123 miles of natural gas distribution pipelines and 6,136 miles of transportation pipelines (PG&E, 2008).

PG&E obtains its energy supplies from power plants and natural gas fields in northern California and from energy purchased outside its service area, and delivers energy through high voltage transmission lines. PG&E purchases electrical power from a variety of sources, including PG&E owned, independent, and out-of-state generators. Natural gas comes from three major sources: California, Southwestern U.S., and Canada (PG&E, 2008). To promote the safe and reliable maintenance and operation of utility facilities, the CPUC has mandated specific clearance requirements between utility facilities and surrounding objects or construction activities.

Between 2003 and 2007, demand for electricity in the City of Emeryville has gradually increased from approximately 185.5 million kilowatts in 2003 to 228.0 million kilowatts in 2007. The demand for natural gas has followed a similar trend, from 6.3 million therms in 2003 to 7.4 million therms in 2007, with a peak of 7.5 million therms in 2006 (Cheeseman, 2008). Table 3.13-1 provides a breakdown of annual energy use in Emeryville by sector. The demand for energy in the City, particularly electricity, is slowly increasing as the number of residential and commercial users rises.

Table 3.13-1: Energy Use in the City of Emeryville, 2003-2007

	2003	*2004*	*2005*	*2006*	*2007*
Electricity (kWh)					
Residential	17,994,779	18,017,277	19,042,351	19,417,643	19,838,436
Commercial/ Industrial	167,494,202	167,494,202	188,257,762	207,426,815	208,132,731
Total	185,488,981	185,511,479	207,300,113	226,844,458	227,971,167
Natural Gas (therms)					
Residential	924,365	924,491	957,541	943,759	994,173
Commercial/ Industrial	5,361,698	5,361,698	5,938,879	6,575,981	6,422,821
Total	6,286,063	6,286,189	6,896,420	7,519,740	7,416,994

Source: Cheeseman, 2008.

In its Climate Action Plan (CAP), the City of Emeryville predicts that energy demand in the residential sector will increase commensurate with the compounded annual population growth rate, while energy demand in the commercial and industrial sector will increase commensurate with job growth (City of Emeryville, 2008b).

TRANSPORTATION ENERGY

California's demand for gasoline and diesel has nearly doubled over the last twenty years. In 2007, the State consumed almost 15.7 billion gallons of gasoline and 3.1 billion gallons of diesel fuel (California Energy Commission [CEC], 2008). Energy for transportation comprised approximately 39 percent of all energy that the State consumed in 2005 (Energy Information Administration [EIA], 2005). The CEC has predicted that on-road gasoline use in California will increase steadily from 2005 levels (15.9 billion gallons) to 2010 (between 16.6 billion and 17.5 billion gallons.) This represents an increase ranging from 3.8 to 9.8 percent. CEC further estimates that that total gasoline, diesel, and jet fuel demand will increase 13.5 to 42.8 percent by 2030, to between 26.3 billion and 33.1 billion gallons per year (CEC, 2007).

In the Bay Area, as in most other places in the United States, automobiles and commercial vehicles (composed of small, medium, and large trucks) are the largest energy consumers in the transportation sector. Automobiles and commercial vehicles are generally fueled by diesel or gasoline. Other transit modes in the Bay Area include ferries, buses, light rail (San Francisco MUNI and SCVTA rail cars), BART, and commuter rail (Caltrain, Amtrak, and ACE). These transit modes consume gasoline, diesel, and electricity.

Global Climate Change

GCC is currently one of the most important and widely debated scientific, economic, and political issues in the United States. The anticipated impacts of climate change on California range from water shortages to inundation from sea level rise. GCC refers to a change in the average air

temperature that may be measured by wind patterns, storms, precipitation, and temperature. The baseline by which these changes are measured originates in historical records identifying temperature changes that have occurred in the distant past, such as during previous ice ages. Over the last 10,000 years, the rate of temperature change has typically been incremental, with warming and cooling occurring over the course of thousands of years. During this period, the earth has experienced incremental warming as glaciers retreated across the globe. However, scientists have observed an unprecedented increase in the rate of warming over the past 150 years, roughly coinciding with the global industrial revolution.

GCC is now a widely accepted phenomenon. While scientists are certain that human activities are changing the composition of the atmosphere and that increasing concentrations of GHGs (defined below) will change the planet's climate, they are less certain about how much the climate will change, at what rate it will change, or what the exact global, or even regional, effects will be. Nonetheless, the world's leading climate scientists—the IPCC[1]—have reached consensus that GCC is "very likely" caused by humans, and that hotter temperatures and rising sea levels will continue for centuries no matter how much humans control their future emissions. In particular, human influences have:

- *very likely* contributed to sea level rise and increased storm surge during the latter half of the 20th century;
- *likely* contributed to changes in wind patterns, affecting extra-tropical storm tracks and temperature patterns;
- *likely* increased temperatures of extreme hot nights, cold nights and cold days;
- *more likely than not* increased risk of heat waves, area affected by drought since the 1970s, and frequency of heavy precipitation events.[2]

The IPCC predicts that global mean temperature increase from 1990-2100 could range from 2.0 to 11.5 degrees Fahrenheit. They project a sea level rise of seven to 23 inches by the end of the century, with a greater rise possible depending on the rate of polar ice sheet melting.

According to the California Climate Action Team, accelerating GCC has the potential to cause a number of adverse impacts in California, including but not limited to: a shrinking Sierra snowpack that would threaten the state's water supply; public health threats caused by higher temperatures and more smog; damage to agriculture and forests due to reduced water storage capacity, rising temperatures, increasing salt water intrusion, flooding, and pest infestations; critical habitat

[1] The Intergovernmental Panel on Climate Change is a scientific intergovernmental body set up by the World Meteorological Organization and by the United Nations Environment Programme. Its role is to assess on a comprehensive, objective, open and transparent basis the latest scientific, technical and socio-economic literature produced worldwide relevant to the understanding of the risk of human-induced climate change, its observed and projected impacts, and options for adaptation and mitigation.

[2] Intergovernmental Panel on Climate Change, 2007a.

modification and destruction; eroding coastlines; increased wildfire risk; and increased electricity demand.[3]

While all of these impacts may be felt to some extent in the Bay Area, of particular concern are sea level rise and increased storm surge with the resulting potential for increased coastal erosion, higher storm-surge flooding, more extensive coastal inundation, changes in surface water quality and groundwater characteristics, loss of property and coastal habitats, increased flood risk and potential loss of life, loss of nonmonetary cultural resources and values, impacts on agriculture and aquaculture through decline in soil and water quality, and loss of tourism, recreation, and transportation functions. Also of concern is the potential for GCC to increase fire threat at the urban-wildland interface, and the potential for an imbalance between electricity supply and demand.

Greenhouse Gases

Gases that trap heat in the Earth's atmosphere are called greenhouse gases or GHGs. These gases play a critical role in determining the Earth's surface temperature. Part of the solar radiation that enters Earth's atmosphere from space is absorbed by the Earth's surface. The Earth reflects this radiation back toward space, but GHGs absorb some of the radiation. As a result, radiation that otherwise would have escaped back into space is retained, resulting in a warming of the atmosphere. Without natural GHGs, the Earth's surface would be about 61°F cooler.[4] This phenomenon is known as the greenhouse effect. However, many scientists believe that emissions from human activities—such as electricity generation, vehicle emissions, and even farming and forestry practices—have elevated the concentration of GHGs in the atmosphere beyond naturally-occurring concentrations, contributing to the larger process of GCC. The six primary GHGs are:

- **Carbon Dioxide (CO_2),** emitted when solid waste, fossil fuels (oil, natural gas, and coal), and wood and wood products are burned;
- **Methane (CH_4),** produced through the anaerobic decomposition of waste in landfills, animal digestion, decomposition of animal wastes, production and distribution of natural gas and petroleum, coal production, and incomplete fossil fuel combustion;
- **Nitrous oxide (N_2O),** typically generated as a result of soil cultivation practices, particularly the use of commercial and organic fertilizers, fossil fuel combustion, nitric acid production, and biomass burning;
- **Hydrofluorocarbons (HFCs),** primarily used as refrigerants;
- **Perfluorocarbons (PFCs),** originally introduced as alternatives to ozone depleting substances and typically emitted as by-products of industrial and manufacturing processes;
- **Sulfur hexafluoride (SF_6),** primarily used in electrical transmission and distribution.

[3] California Climate Action Team, 2006.

[4] Ibid.

Though there are other gases that can contribute to global warming[5], these six are identified explicitly in California legislation and litigation as being of primary concern. GHGs have varying potentials to trap heat in the atmosphere, known as global warming potential (GWP), and atmospheric lifetimes. GWP ranges from 1 (carbon dioxide) to 23,900 (sulfur hexafluoride). GHG emissions with a higher GWP have a greater global warming effect on a molecule-by-molecule basis. For example, one ton of CH_4 has the same contribution to the greenhouse effect as approximately 21 tons of CO_2.[6] GWP is alternatively described as "carbon dioxide equivalents", or CO_2e. The parameter "atmospheric lifetime" describes how long it takes to restore the system to equilibrium following an increase in the concentration of a GHG in the atmosphere. Atmospheric lifetimes of GHGs range from tens to thousands of years.

California and Bay Area GHG Emissions

GHG emissions contributing to GCC are attributable in large part to human activities associated with the industrial/manufacturing, utility, transportation, residential, and agricultural sectors.[7] The State of California alone produces about 2 percent of the entire world's GHG emissions, with major emitting sources here including fossil fuel consumption from transportation (41 percent), industry (23 percent), electricity production (20 percent), and agricultural and forestry (8 percent). Much like nations around the world, California government is looking at options and opportunities for drastically reducing GHG emissions with the hope of thereby delaying, mitigating, or preventing at least some of the anticipated impacts of GCC on California communities.

In 2008, the Bay Area Air Quality Management District (BAAQMD) completed a baseline inventory of GHG emissions for the year 2007. According to that inventory, 102 million tons of CO_2e were emitted in the Bay Area that year.[8] Table 3.13-2 shows the emissions breakdown by pollutant.

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[5] Diesel particulate matter, which is also referred to as black carbon, is a strong absorber of solar radiation; scientists have known for many years that when black carbon particles combine with dust and chemicals in air they become more efficient in absorbing solar radiation, and black carbon mixtures may be the second biggest contributor to global warming. See California Air Resources Board, Health Effects of Diesel Particulate Matter pages 4-5, available at http://www.arb.ca.gov/research/diesel/dpm_draft_3-01-06.pdf [as of October 14, 2008]. See also *Chapter 2.2: Air Quality* of this EIR for an analysis of diesel particulate matter emissions.

[6] California Climate Action Registry, General Reporting Protocol Version 2.2, 2006.

[7] California Energy Commission, 2006.

[8] Bay Area Air Quality Management District, 2006.

Table 3.13-2: 2007 Bay Area CO_2e Emissions by Pollutant

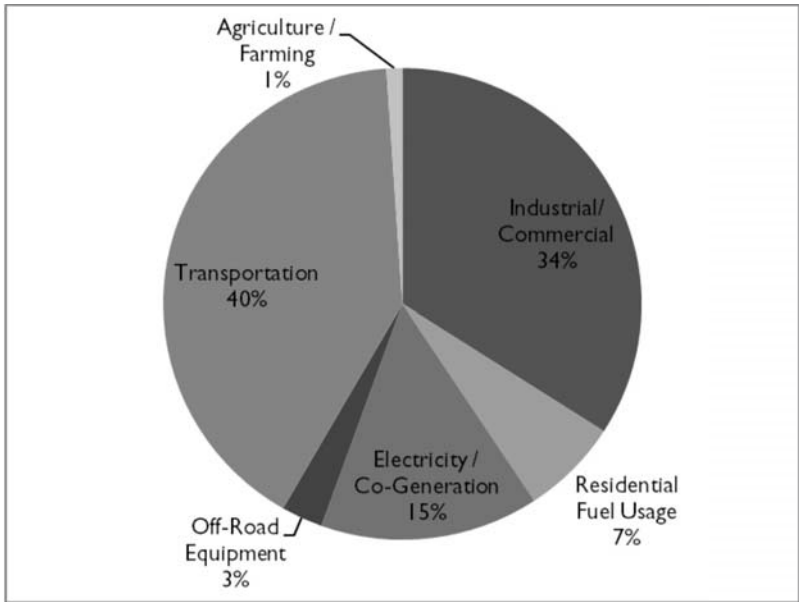
Pollutant	*Percentage*	*CO_2e (Million Tons/Year)*
Carbon Dioxide	91.4	93.7
Methane	2.4	2.5
Nitrous Oxide	2.2	2.3
HFC, PFC, SF6	3.9	4.0
Total	100	102.6

Source: Bay Area Air Quality Management District, 2008.

The Bay Area's transportation sector contributes 40 percent of the CO_2e GHG emissions, followed by industrial and commercial sources (34 percent), electricity and co-generation (15 percent), residential fuel usage (7 percent), off-road equipment (3 percent), and agriculture and farming (1 percent). Bay Area emissions by sector are illustrated in Chart 3.13-1.

Absent policy changes, Bay Area GHG emissions are expected to grow at a rate of 1.4 percent a year due to population growth and economic expansion.[9] Economic activity variations and the fraction of electric power generation in the region will cause year-to-year fluctuations in the emissions trends. Chart 3.13-2 shows the emission trends by major sources for the period of 1990 to 2029. Emeryville is one of several cities and counties in the Bay Area that has developed or is in the processing of completing a climate/GHG reduction action plan and inventory.[10]

Chart 3.13-1: Bay Area Greenhouse Gas Emissions by Sector, as a Percent of Total Emissions

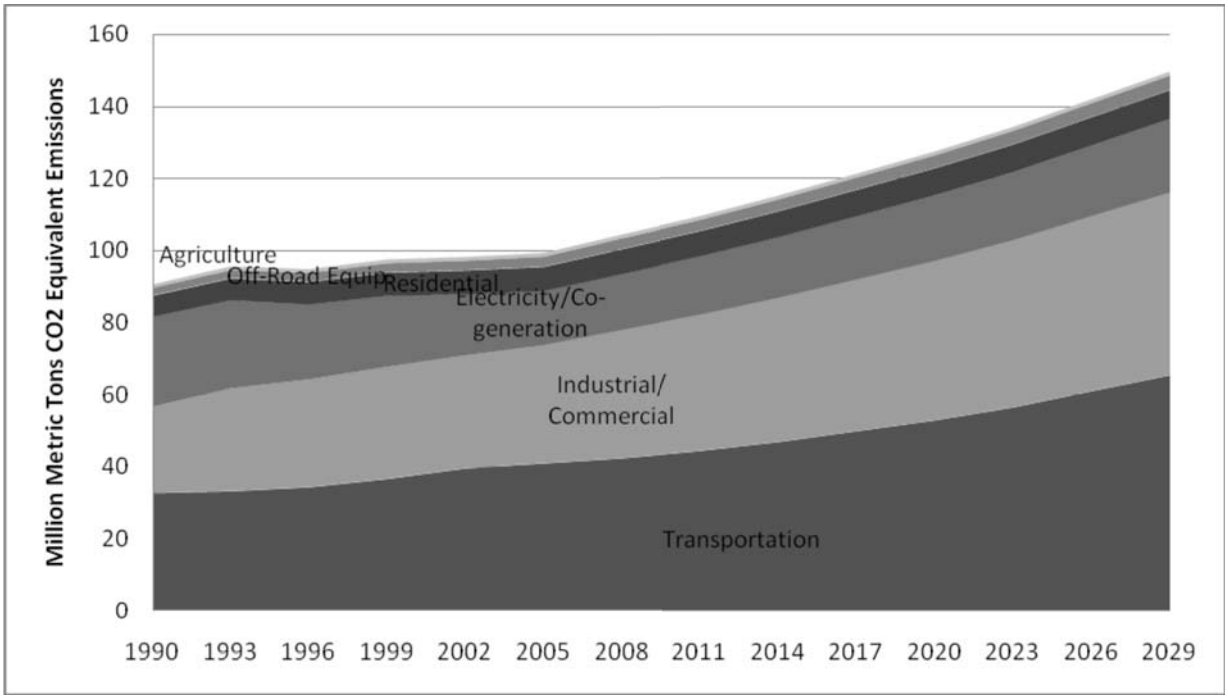


Source: Bay Area Air Quality Management District, 2008.

[9] Ibid.

[10] Office of Planning and Research, May 2008.

Chart 3.13-2: Bay Area Greenhouse Gas Emissions Trends by Sector



Source: Bay Area Air Quality Management District, 2008.

Greenhouse Gas Emissions in Emeryville

In 2006, Emeryville partnered with Alameda County and ten other cities to become members of ICLEI - Local Governments for Sustainability (ICLEI) and participate in the Alameda County Climate Protection Project. The jurisdictions committed to an "ongoing, coordinated effort to reduce the emissions that cause global warming, improve air quality, reduce waste, cut energy use and save money."[11] For its part, the City of Emeryville developed a CAP. The CAP was officially adopted by the City on November 18, 2008.

As a first step toward preparing the CAP, the City completed a baseline inventory of GHG emissions. The City of Emeryville's inventory was conducted by ICLEI in partnership with staff from the municipality. The baseline emissions inventory determined the levels of GHG emissions that Emeryville emitted in 2004. The inventory methodology systematically estimated and tracked GHG emissions from energy and waste related activities at the community-wide scale and those resulting directly from municipal operations.

As shown in Table 3.13-3, the analysis revealed that 178,832 tons of CO_2e emissions were released into the atmosphere in 2004. The inventory accounted for all energy consumed in Emeryville—even the electricity consumed in the city, but produced elsewhere (except for three percent for direct access for large commercial users). In Emeryville, the transportation sector is the largest

[11] *City of Emeryville. Climate Action Plan. November 2008: 5.*

contributor to GHG emissions, responsible for nearly half of all emissions. The transportation sector represents vehicle miles traveled (VMT) on local roads and state highways within Emeryville. The commercial/industrial sector accounts for nearly 43% of emissions, which is not surprising given the city's concentration of industrial, office, and retail uses. Residential uses and methane generated by waste account for five and three percent of total emissions, respectively.

Table 3.13-3: Emeryville 2004 Community Emissions by Sector

	Residential	*Commercial/Industrial*	*Transportation*	*Waste*	*TOTAL*
CO_2e (metric tons)	9,380	76,204	87,447	5,801	178,832
Percentage of Total CO_2e	5.2%	42.6%	48.9%	3.2%	100.0%
Energy Use (MMBtu)	160,562	1,267,105	262,451	0	1,690,118

Source: City of Emeryville, Climate Action Plan, November 2008.

For comparison, in Alameda County the transportation sector is also the largest contributor to GHG emissions, responsible for 45%. The commercial/industrial and residential sectors account for 32 and 23 percent of countywide emissions, respectively.

Existing GHG Emissions Forecasts for Emeryville

In addition, the CAP inventory includes an estimate of future emissions in 2020 based on land use changes in the proposed General Plan and VMT as estimated by the Metropolitan Transportation Commission (MTC). The CAP estimates that from 2004 to 2020, under a business-as-usual scenario, the City of Emeryville's emissions will grow by approximately 32.6% from 178,832 to 237,101 metric tons CO_2e. Table 3.13-4 shows more detailed results of that forecast.

Table 3.13-4 – Emeryville Community Emissions Forecast by Sector

	2004	*2020*	*Annual Growth Rate*	*Percent Change from 2004 to 2020*
Residential	9,380	15,587	3.444%	66.2
Commercial / Industrial	76,204	102,407	1.990%	34.4
Transportation (incl. 2005 State Hwy data)	87,447	109,467	1.509%	25.2
Waste	5,801	9,640	3.444%	66.2
Total	178,832	237,101	--	32.6

Source: City of Emeryville, Climate Action Plan, November 2008.

Recent City Actions

In addition to the CAP, Emeryville has taken several actions in recent years to address Climate Change through increasing energy efficiency, reducing air pollution, and reducing solid waste. These actions include:[12]

- Brownfield Redevelopment - Extensive programs since 1996 resulting in urban in-fill projects and reducing the need for urban sprawl. As of 2008 this redevelopment created: 2,290 new residential units for 3,500 residents of which 719 were affordable; and 3.6 million square feet of new commercial space and 800,000 square feet of new retail space creating 8,400 new jobs.

- Establishment of the EPA-award-winning Emery-Go-Round: in 2007 shuttled 1.2 million riders between the MacArthur BART station and the City and growing 8% per year.

- Requiring new City Buildings and Landscapes to be LEED™ Silver Certified and Bay-Friendly Verified.

- Reducing building permit fees for single family home solar installations.

- Installing Solar PV panels on the Civic Center roof.

- Requiring vegetated stormwater treatment in all new developments, cleaning the bay, reducing the heat island effect in the City, reducing energy use for cooling and increasing CO_2 uptake by plants.

- Increasing Street tree planting standards for new developments ensuring the long-term health of more trees in the City.

- Implementing environmental purchasing decisions such as switching to recycled content copy paper in many City buildings. This practice benefits the community by incentivizing business practices that conserve resources, reduce emissions, and reduce waste.

- Working with the Emeryville Chamber of Commerce to get 21 businesses in Emeryville to "Go Green" and become certified green businesses since 2003.

- Working with "SmartLights" of the East Bay Energy Watch program to reduce energy use in the lighting of commercial properties in the City.

- Adopting StopWaste.Org's Multi-Family Green Building Guidelines which serve to reduce GHG emissions by keeping construction and demolition debris out of landfills and increasing energy efficiency in buildings.

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[12] City of Emeryville, Climate Action Plan, November 2008.

- Converting traffic signal lights to more energy efficient LED lamps.

- Requiring new developments to rate their projects using the green building scoring systems from StopWaste.Org and the United States Green Building Council (USGBC).

- Implementing residential food scrap recycling. Since 2006, approximately 20% percent of households in the single family neighborhoods participate, thereby diverting 9 of tons of food scraps in 2006 from the landfill to a composting facility.

- Requiring landscapes in new developments and city projects to use locally produced compost and mulch partially made of feedstocks from municipal sources.

- Equipping the City Corporation Yard with motion occupancy sensors and energy efficient lighting. These steps save the City money, and reduce the emissions that cause global warming. The Senior Center also received rebate funds for the replacement of the old boiler. Other City facilities are also being considered for lighting retrofits.

- Installing Emeryville's first bike boulevard, adding more bike lanes and building the first phases of the Emeryville Greenway, an urban Rail-to-Trail project, encouraging more people to travel by bike and on foot reducing vehicle emissions.

- Educating the residents of Emeryville at each year's Earth Day event in Temescal Creek Park about environmental issues that face the City and the planet.

- Adopting the "Eco Food-ware" ordinance requiring disposable food packaging to be recyclable or compostable for all food prepared in the City and reduce plastic litter washing out to the Bay and ocean.

- Working with the East Bay Green Corridor Partnership to increase the availability of green-collar jobs and green job training.

- Starting in 2007, the City has contracted with California Youth Energy Services each summer to give local high school students energy conservation job skills and retrofit existing Emeryville homes with energy conserving devices.

- Joint Bio-Energy Institute - Partnering with UC Berkeley, the Lawrence Berkeley Laboratory and the City of Berkeley, Amyris and others creating 360 green jobs in Emeryville.

REGULATORY SETTING

Federal Regulations

Energy Policy Act of 2005

The Energy Policy Act of 2005 seeks to reduce reliance on non-renewable energy resources and provide incentives to reduce current demand on these resources. For example, under the Act,

consumers and businesses can attain federal tax credits for purchasing fuel-efficient appliances and products. Because driving fuel-efficient vehicles and installing energy-efficient appliances can provide many benefits, such as lower energy bills, increased indoor comfort, and reduced air pollution, businesses are eligible for tax credits for buying hybrid vehicles, building energy efficient buildings, and improving the energy efficiency of commercial buildings. Additionally, tax credits are given for the installation of qualified fuel cells, stationary microturbine power plants, and solar power equipment.

Global Change Research Act (1990) (15 United States Code Sections 2921 et seq.)

In 1990, Congress passed and the President signed Public Law 101-606, the Global Change Research Act. The purpose of the legislation was: "…to require the establishment of a United States Global Change Research Program aimed at understanding and responding to global change, including the cumulative effects of human activities and natural processes on the environment, to promote discussions towards international protocols in global change research, and for other purposes." To that end, the Global Change Research Information Office (GCRIO) was established in 1991 (it began formal operation in 1993) to serve as a clearinghouse of information. The Act requires a report to Congress every four years on the environmental, economic, health and safety consequences of climate change; however, the first and only one of these reports to-date, the *National Assessment on Climate Change*, was not published until 2000. In February 2004, operational responsibility for GCRIO shifted to the U.S. Climate Change Science Program.

Massachusetts v. EPA (2007) (549 U.S. 497)

In this U.S. Supreme Court case, 12 states, three cities, and 13 environmental groups filed suit that the U.S. Environmental Protection Agency (EPA) should be required to regulate carbon dioxide and other GHGs as pollutants under the federal Clean Air Act. In April 2007, the U.S. Supreme Court found that the EPA has a statutory authority to formulate standards and regulations to address GHG emissions, which it historically has not done. To-date, the EPA still has not taken any new action. It is unclear what effect the action would take, in particular on California communities as they may already be subject to more stringent regulations.

Energy Independence and Security Act of 2007 (Public Law 110-140, at 42 USC Section 7545(o) (2))

In December 2007, President Bush signed the Energy Independence and Security Act of 2007 to move the U.S. toward greater energy independence and security. This energy bill increases the supply of alternative fuel sources by setting a mandatory Renewable Fuel Standard (RFS) requiring fuel producers to use at least 36 billion gallons of biofuel in 2022. It also tightens the Corporate Average Fuel Economy (CAFE) standards that regulate the average fuel economy in the vehicles produced by each major automaker. The current CAFE standard for cars, set in 1984, requires manufacturers to achieve an average of 27.5 miles per gallon, while a new standard for light trucks and heavier SUVs was adopted in 2006 that would require new vehicles to achieve 24 mpg by 2011 (this standard was later challenged in court). This energy bill requires that these standards be increased such that, by 2020, the new cars and light trucks sold each year deliver a combined fleet average of 35 miles per gallon.

State Regulations

State of California Integrated Energy Policy

The CEC adopts and transmits to the Governor and Legislature a report of findings biannually. In 2002, the Legislature passed Senate Bill 1389. The legislation reconstituted the state's responsibility to develop an integrated energy plan for electricity, natural gas, and transportation fuels, or Energy Report. At a Special Business Meeting on November 12, 2003, the CEC adopted the 2003 Integrated Energy Policy. The 2004 Update to the Integrated Energy Policy was adopted by the Energy Commission on November 3, 2004. The 2005 Integrated Energy Policy was adopted by the Energy Commission on November 21, 2005.

The plan calls for the state to assist in the transformation of the transportation system to improve air quality, reduce congestion, and increase the efficient use of fuel supplies with the least environmental and energy costs. To further this policy, the plan identifies a number of strategies, including assistance to public agencies and fleet operators in implementing incentive programs for Zero Emission Vehicle and addressing their infrastructure needs, and encouragement of urban designs that reduce VMT and accommodate pedestrian and bicycle access.

Title 24 Building Energy Efficiency Standards

Title 24, Part 6, of the California Code of Regulations is the California Building Code, governing all aspects of building construction. Included in Part 6 of the Code are standards mandating energy efficiency measures in new construction. Since its establishment in 1977, the building efficiency standards (along with standards for energy efficiency in appliances) have contributed to a reduction in electricity and natural gas costs in California. The standards are updated every three years to allow new energy efficiency technologies to be considered. The latest update to Title 24 standards became effective on October 1, 2005. The standards regulate energy consumed in buildings for heating, cooling, ventilation, water heating, and lighting. Title 24 is implemented through the local plan check and permit process.

Executive Order S-20-04 (Gov. Schwarzenegger, July 2004)

Executive Order S-20-04, signed on July 27, 2004, requires that the State commit to aggressive action to reduce state building electricity use, and more specifically, that State agencies, departments and other entities take measures to reduce energy use by 20 percent by 2015. In addition, the Order requires that the CEC increase energy efficiency standards by 20 percent by 2015, compared to the 2003 Titles 20 and 24 standards.

California Public Utilities Commission

As a public utility, PG&E is under the jurisdiction of the CPUC. PG&E provides service in accordance within the policies and extensions rules on file with the CPUC.

Senate Bill 1078 Sher (Chapter 516, Statutes of 2002)

Established a Renewable Portfolio Standard requiring electricity providers to increase purchases of renewable energy resources by 1% per year until they have attained a portfolio of 20% renewable resources.

Senate Bill 1771 Sher (Chapter 1018, Statutes of 2000)

Requires the CEC to prepare an inventory of the state's GHG emissions, to study data on GCC, and to provide government agencies and businesses with information on the costs and methods for reducing GHG emissions. It also established the California Climate Action Registry to serve as a certifying agency for companies and local governments to quantify and register their GHG emissions for possible future trading systems.

Assembly Bill 1493 (Chapter 200, Statutes of 2002) (Calif. Health & Safety Code Sections 42823 and 43018.5)

Assembly Bill (AB) 1493 (Pavley) amended California Health & Safety Code sections 42823 and 43018.5 requiring the California Air Resources Board (CARB) to develop and adopt, by January 1, 2005, regulations that achieve maximum feasible reduction of GHGs emitted by passenger vehicles, light-duty trucks, and other vehicles used for noncommercial personal transportation in California. The regulations apply to motor vehicles manufactured in the 2009 or later model year.

In September 2004, pursuant to AB 1493, the CARB approved regulations to reduce GHG emissions from new motor vehicles. Under the regulation, one manufacturer fleet average emission standard is established for passenger cars and the lightest trucks, and a separate manufacturer fleet average emission standard is established for heavier trucks. The regulation took effect on January 1, 2006 and set near-term emission standards, phased in from 2009 through 2012, and mid-term emission standards, phased in from 2013 through 2016 (referred to as the Pavley Phase 1 rules). The CARB intends to extend the existing requirements to obtain further reductions in the 2017 to 2020 timeframe (referred to as Pavley Phase 2 rules). The CARB has included both Pavley 1 and 2 rules in its Climate Change Proposed Scoping Plan (October 2008), pursuant to the Global Warming Solutions Act of 2006 (AB 32), which outlines the State's strategy to achieve 2020 GHG emission reductions. While EPA has refused to grant a waiver that would allow California to implement these standards, and California has challenged this action in federal court, the President Obama administration has indicated it would grant the waiver.

The CARB calculates that in calendar year 2016, the Pavley Phase 1 rules will reduce California's GHG emissions by 16.4 million metric tons of carbon dioxide equivalents, and by 2020, Pavley Phase 2 would reduce emissions by 31.7 million metric tons of carbon dioxide equivalents. Further, the AB 1493 new vehicle requirements would cumulatively produce 45 percent more

GHG reductions by 2020 compared to the new federal CAFE standard in the Energy Independence and Security Act of 2007 (above).[13]

Without Pavley rules, both state and regional CO_2 emissions would increase steadily between now and 2035 as VMT increases with population growth; with Pavley rules, CO_2 emissions are projected to decrease between now and 2035. This decrease in regional 2035 CO_2 emissions compared to current levels is in large part a result of technological changes expected to reduce CO_2 emissions per VMT. The regulations would reduce climate change emissions from the light duty passenger vehicle fleet by 12.6 percent statewide and 22.9 percent in the Bay Area in the 2035 calendar year compared to 2006.

Executive Order S-3-05 (Gov. Schwarzenegger, June 2005)

Executive Order S-3-05, signed on June 1, 2005, recognizes California's vulnerability to climate change, noting that increasing temperatures could potentially reduce snow pack in the Sierra Nevada, which is a primary source of the State's water supply. Additionally, according to this Order, climate change could influence human health, coastal habitats, microclimates, and agricultural yield. The Order set the GHG reduction targets for California: by 2010, reduce GHG emissions to 2000 levels; by 2020 reduce GHG emissions to 1990 levels; by 2050 reduce GHG emissions to 80 percent below 1990 levels.

California Global Warming Solutions Act of 2006 (AB 32) (Calif. Health & Safety Code Sections 38500 et seq.)

In September 2006, Governor Arnold Schwarzenegger signed Assembly Bill (AB) 32, the California Global Warming Solutions Act (Health and Safety Code Section 38500 et. seq.). The Act requires the reduction of statewide GHG emissions to 1990 levels by the year 2020. This change, which is estimated to be a 30 percent reduction from business as usual emission levels projected for 2020, will be accomplished through an enforceable statewide cap on GHG emissions that will be phased in starting in 2012. The Act also directs the CARB to develop and implement regulations to reduce statewide GHG emissions from stationary sources and address GHG emissions from vehicles. The CARB has stated that the regulatory requirements for stationary sources will be first applied to electricity power generation and utilities, petrochemical refining, cement manufacturing, and industrial/commercial combustion. The second group of target industries will include oil and gas production/distribution, transportation, landfills and other GHG-intensive industrial processes.

Senate Bill 1368 (Chapter 598, Statutes of 2006) (Calif. Public Utilities Code Sections 8340 et seq.)

Senate Bill (SB) 1368 required the CPUC to establish a GHG emissions performance standard for "baseload" generation from investor-owned utilities by February 1, 2007. The CEC was required to establish a similar standard for local publicly-owned utilities by June 30, 2007. The legislation further required that all electricity provided to California, including imported electricity, must be generated from plants that meet or exceed the standards set by the CPUC and the CEC. In January

[13] California Air Resources Board, Comparison of Greenhouse Gas Reductions for the United States and Canada Under ARB GHG Regulations and Proposed Federal 2011-2015 Model Year Fuel Economy Standards, Addendum to February 25 Technical Assessment (2008).

2007, the CPUC adopted an interim performance standard for new long-term commitments (1,100 pounds of CO_2 per megawatt-hour), and in May 2007, the CEC approved regulations that match the CPUC standard.

Executive Order S-01-07 (Gov. Schwarzenegger, January 2007)

In January 2007, a Low-Carbon Fuel Standard was established by Executive Order S-01-07. The Order calls for a statewide goal to be established to reduce the carbon intensity of California's transportation fuels by at least 10 percent by 2020 ("2020 Target"), and that a Low Carbon Fuel Standard (LCFS) for transportation fuels be established for California. Further, it directs the CARB to determine if an LCFS can be adopted as a discrete early action measure pursuant to AB 32, and if so, consider the adoption of a LCFS on the list of early action measures required to be identified by June 30, 2007, pursuant to Health and Safety Code Section 38560.5. The LCFS applies to all refiners, blenders, producers or importers ("Providers") of transportation fuels in California, will be measured on a full fuels cycle basis, and may be met through market-based methods by which Providers exceeding the performance required by a LCFS shall receive credits that may be applied to future obligations of traded to Providers not meeting the LCFS.

In June 2007, the CARB approved the LCFS as a Discrete Early Action item under AB 32. It is expected that the regulatory process at the CARB to implement the new standard will be completed no later than December 2008.

Senate Bill 97 (Chapter 185, Statutes of 2007) (Calif. Public Resources Code Sections 21083.5 and 21097)

Senate Bill (SB) 97 directs the Office of Planning and Research (OPR) to prepare, develop, and transmit to the California Resources Agency guidelines for feasible mitigation of GHG emissions or the effects of GHG emissions, by July 1, 2009. The Resources Agency is required to certify and adopt amendments to the Guidelines implementing the CEQA Guidelines on or before January 1, 2010. These new CEQA Guidelines will provide regulatory guidance on the analysis and mitigation of GHG emissions in CEQA documents. In the interim, the OPR offered informal guidance regarding steps lead agencies should take to address climate change in their CEQA documents.[14]

Senate Bill 375 (Chapter 728, Statutes of 2008)

On September 30, 2008, Governor Schwarzenegger signed Senate Bill (SB) 375 into law. This legislation links transportation and land use planning with the CEQA process to help achieve the GHG emission reduction targets set by AB 32. Regional transportation planning agencies are required to include a sustainable community strategy (SCS) in regional transportation plans. The SCS must contain a planned growth scenario that is integrated with the transportation network and policies in such a way that it is feasible to achieve AB 32 goals on a regional level. SB 375 also identifies new CEQA exemptions and stream lining for projects that are consistent with the SCS and qualify as Transportation Priority Projects (TPP). TPPs must meet three requirements: 1) contain at least 50 percent residential use; commercial use must have floor area ratio (FAR) of not

[14] Governor's Office of Planning and Research, *CEQA and Climate Change: Addressing Climate Change through California Environmental Quality Act (CEQA) Review* Technical Advisory, June 19, 2008.

less than 0.75; 2) have a minimum net density of 20 units per acre; and 3) be located within one-half mile of a major transit stop or high quality transit corridor included in the regional transportation plan.

Regional Coordination

In the Bay Area, the Joint Policy Committee (JPC) coordinates the regional planning efforts of ABAG, the BAAQMD, the BCDC and MTC. In fall 2006, the JPC commenced a six-month program to study the issue of climate change and to recommend an initial set of actions to be pursued jointly by the four regional agencies. The study recommends that the regional agencies build their Joint Climate Protection Strategy in service of this key goal: *To be a model for California, the nation and the world.* It then organizes initial actions by six strategy elements: establish priorities, increase public awareness and motivate action, provide assistance, reduce unnecessary driving, prepare to adapt, and break old habits.[15]

As part of the proposed investments in the Transportation 2035 Plan, the region plans to invest $400 million towards a 5-year Transportation Climate Action Campaign aimed at smart traveling and smart driving in an effort to reduce GHG emissions from the transportation sector. This action campaign, to be implemented by the four regional agencies, focuses on outreach/education, Safe Routes to Schools, Safe Routes to Transit, transit priority measures (TPMs) for local bus transit, and grants/incentive programs.

City of Emeryville

Resolution: U.S. Mayors Climate Protection Agreement

In 1999, the Emeryville City Council passed a resolution authorizing the Mayor to sign the U.S. Mayors Climate Protection Agreement, thereby committing the City to taking action for climate protection. In doing so, the City joined all of the other local governments in Alameda County in becoming a signatory of ICLEI: Local Governments for Sustainability (City of Emeryville, 2008a).

Charter Member, United Nations World Environmental Accords

The City of Emeryville signed on as a charter member of the United Nations World Environmental Accords on June 5, 2005, the smallest city in the world to do so. As a member, Emeryville committed to taking one of 21 action steps each year, including setting a goal of reducing GHG emissions by 25 percent by 2030 and developing a system to track GHG emissions. Emeryville will be evaluated on its voluntary actions in 2012 by the United Nations at a follow-up conference (City of Emeryville, 2008b).

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[15] May 4, 2007 Joint Policy Committee memo regarding "Bay Area Regional Agency Climate Protection Program – Consolidated Recommendations" can be found at:

http://www.abag.ca.gov/jointpolicy/jpc_agenda_packages.htm.

Member, Alameda County Climate Protection Project

Since 2006, Emeryville has been a member of the Alameda County Climate Protection Project, coordinated by ICLEI and StopWaste.org. As a member, Emeryville is committed to ongoing, coordinated efforts to cut energy use. As part of this process, Emeryville has conducted a baseline GHG emissions inventory, set a community-wide emissions reduction target, and developed a CAP consisting of policies and measures to help Emeryville reach its target (City of Emeryville, 2008b).

Resolution: Greenhouse Gas Emissions Reduction

On May 1, 2007 the City Council of the City of Emeryville adopted a resolution establishing a GHG emissions goal to reduce city-wide and municipal emissions 25 percent below 2004 levels by 2020 (City of Emeryville, 2007).

Emeryville Climate Action Plan

The CAP GHG inventory and forecast was introduced earlier in this section. As a result of this 2004-2020 inventory and forecast, the City, through the CAP, set a goal to reduce community-wide GHG emissions by 25 percent below 2004 levels by 2020. These targets are shown in Table 3.13-5.

Table 3.13-5: Emeryville's Emissions Summary and Target Emissions Reductions

	Community-wide	*Government Operations*
Base year	2004	2004
Quantity of CO_2e emissions in base year (tons)	178,832	1,335
Target year	2020	2020
Business-as-usual projection of CO_2e emissions in 2020 (tons)	237,101	1,335
Percent CO_2e reduction targeted by target year relative to base year (%)	25	25
Quantity of CO_2e reduction targeted relative to base year (tons)	102,977	284

Source: City of Emeryville, Climate Action Plan, November 2008.

The City currently has two formal energy conservation policies. The first supports programs providing alternatives to conventional private vehicles. The second policy promotes energy conservation and the use of renewable energy resources.

The CAP also addresses energy issues through policies promoting fuel and energy efficiency and renewable energy to achieve its emission reduction goal. Measures include promotion of energy efficient appliances and practices for new construction and retrofit projects. Using renewable fuel sources to accommodate the city's power needs can substantially reduce GHG emissions, compared with production from conventional coal-fired power plants. The CAP seeks to increase the availability of renewable energy sources by offering incentives for individual homeowners to install solar photovoltaic (PV) systems and by constructing a PV system on the roof of City Hall.

The CAP outlines policies and measures in the energy efficiency, renewable energy, transportation, and solid waste management sectors that Emeryville will implement and/or is already implementing to achieve its emissions reductions target. Within these categories, measures are further divided into actions that target municipal operations and actions that affect community wide-emissions. The Plan also provides steps required for implementation. Table 3.13-6 is the Emeryville CAP Summary of Proposed Actions:

Table 3.13-6: Emeryville CAP Summary of Proposed Actions

Community-Wide	*Affected Sector*
Transit Oriented Development	New Development Projects
Green Building and Bay-Friendly Ordinance	New Development Projects
Enhanced Transportation Demand Management Conditions	New Development Projects
New Bicycle, Pedestrian and Transit Infrastructure/Incentives	All Sectors
Increased Transit Service and Ridership	All Sectors
Commercial and Residential Energy Conservation Ordinances	Existing Buildings and Homes
Reduce Waste by additional 50% by 2020	All Sectors
City Operations	
GB/BFL for new parks and buildings	
Fleet changes – fuel and vehicle types	
Reduce Waste by 50 percent by 2020 – Franchise Agreement	
Environmentally Preferable Purchasing	
Alternative Transportation Incentives/Initiatives	

Source: City of Emeryville, 2008b.

Appendix D provides a comprehensive list of the Emeryville CAP proposed measures and policies. The City anticipates completing similar inventories every five years, in 2010, 2015, and 2020.

IMPACT ANALYSIS

SIGNIFICANCE CRITERIA

The significance criteria for this analysis were developed from criteria presented in the CEQA Guidelines and based on Preliminary Draft CEQA Guideline Amendments for Greenhouse Gas Emissions, developed by OPR for public workshop and approval in January 2009, as updated and announced on April, 13 2009. A significant impact would occur with full implementation of the proposed Emeryville General Plan if it would do one or more of the following:

- Result in a substantial increase in total energy consumption in the City, compared to existing conditions;

- Result in the need for additional energy infrastructure or facilities, the construction of which could cause significant environmental effects;
- On a cumulative basis, increase per capita GHG emissions, either directly or indirectly;[16] or
- Conflict with goals, objectives, or policies of the Emeryville CAP, or other applicable energy or GHG emissions policies or standards.

METHODOLOGY & ASSUMPTIONS

The General Plan predicts that between 2005 and 2030 total net new development will result in an increase of approximately 3,800 housing units, a 70-percent increase in the existing population of 9,727 to 16,500, and 2.5 million square feet of total non-residential space, an increase of 21 percent over 2007 levels. The Plan also predicts an increase of approximately 10,000 jobs over the same time period. The proposed General Plan development potential is described in greater detail in section *3.1: Land Use and Housing*, Table 3.1-2.

Energy

The analysis of energy is based on information provided by PG&E, the CEC, Fehr & Peers, project plans, the proposed General Plan, and applicable regulations and guidelines. Future VMT presented in *Section 3.2: Traffic, Circulation, and Parking*, were used to calculate future transportation energy demand.

Greenhouse Gases

The climate change analysis is provided in response to the most recent recommendations and guidance materials from the OPR, CARB, the Attorney General, and other responsible agencies. Until official state guidance from OPR and California Resources Agency is issued, lead agencies

[16] The selection of a threshold that considers any increase in greenhouse gas emissions is based, in part, on guidance issued by the California Air Pollution Control Officers Association (CAPCOA) in the white paper entitled *CEQA and Climate Change: Evaluating and Addressing Greenhouse Gas Emissions from Projects Subject to the California Environmental Quality Act*, published in January 2008. This white paper discusses evaluating and addressing greenhouse gas emissions under CEQA in order to provide a common platform of information and tools to support local governments. While not intended to dictate the manner in which a lead agency chooses to address GHGs, this paper provides a coherent look at the tools and techniques available, and suggests possible advantages and disadvantages of each analytical approach. The CAPCOA white paper discusses three basic paths lead agencies could take when contemplating CEQA thresholds of significance for GHG emissions (CAPCOA, 2008): 1. A "no threshold" approach, wherein the lead agency determines there are sufficient reasons to not specify a universal threshold for GHG emissions, and instead requires analysis on a project-by-project basis; 2. A "zero emissions" threshold, wherein the leady agency finds that any increase in GHG emissions is potentially significant under CEQA and therefore all projects under the lead agency must quantify and mitigate GHG emissions regardless of the size of the project, or prepare EIRs to disclose the unmitigable significant impact; or 3. A "non-zero" threshold, wherein the lead agency decides that there are certain GHG emission sources that are so small they will not contribute substantially to the global GHG problem, and sets thresholds of significance, or a de minimis value for cumulative impact.

responsible for complying with CEQA are using all of the resources available to guide environmental review processes in the interim.[17]

CO_2 and CO_2e Emissions

The GHG analysis focuses CO_2, CH_4, and N_2O emissions. These are the gases that make up the overwhelming majority of GHGs. These gases are described in terms of CO_2e, in order to combine these gases and compare total emissions.

This analysis is based on the analysis completed by the City of Emeryville for its Climate CAP) Because the CAP uses projections from the proposed General Plan for population projections, this EIR uses the same growth rates assumed in the CAP for residential, commercial/ industrial, and waste emissions.

CARB indicated that it will be able to enforce AB 1493, and recently advised MTC to factor in reductions in carbon dioxide emissions that would result from the regulation in its most recent DEIR. Therefore, this EIR takes a similar approach and includes Pavley Phases 1 and 2 in the emissions analysis. This EIR uses fuel efficiency estimates for No Pavley, Pavley Phase 1, and Pavley Phase 2 as undertaken by MTC.[18] This analysis applies this fuel efficiency, projected VMT, and factors from the California Action Registry General Reporting Protocol Version 2.2, to calculate CO_2e for Emeryville's transportation sector.

SUMMARY OF IMPACTS

The effects of energy consumptions, in terms of GHG emissions, is by nature a cumulative impact. While the proposed General Plan is a component of regional contribution, for the purposes of this EIR, impacts are assessed at a cumulative level. The project adds residents and jobs that create additional energy demand and therefore contribute added GHG emissions. Although the result is a cumulatively significant impact, the contribution from the project are deemed not cumulatively consideration. By prioritizing high-density mixed-use development that results in reduced VMT per capita and has the potential to reduce per capita energy use, the plan is beneficial at a cumulative level. Energy reduction targets, energy-saving building codes, the Emeryville CAP, and an effective use of alternative modes of transportation would reduce overall energy consumption Therefore, the new population and jobs accommodated under the plan will likely have lower rates of energy use and GHG emissions than if those same residents and workers were accommodated in lower-density areas.

Total CO_2e emissions at buildout would be approximately 300,000 metric tons per year, 22 percent more than existing conditions. However, this growth in overall emissions does not reflect the fact that the proposed General Plan is designed to implement infill development that can capitalize on density benefits such as increased public transit use, increased walking and biking to work, and

[17] OPR issued a Technical Advisory entitled *CEQA and Climate Change: Addressing Climate Change through California Environmental Quality Act (CEQA) Review* (June 19, 2008). OPR's recommended approach is for each CEQA lead agency needs to develop its own approach to performing a climate change analysis for projects that generate GHG emissions.

[18] MTC, Draft Environmental Impact Report for Transportation 2035 Plan for the San Francisco Bay Area, December 2008.

reduced building energy use. The benefits of this approach are demonstrated through per capita CO_2e emissions, which at buildout of the proposed General Plan would be 18 metric tons annually, 29 percent less than existing conditions. When compared to both existing conditions and the No Project alternative, the proposed General Plan results in fewer per capita emissions, indicating that the proposed General Plan does not make a cumulatively considerable contribution to the overall cumulative impact.

Implementation of the proposed General Plan is not expected to require construction of any new energy infrastructure on the part of PG&E. Further, the proposed General Plan is found to be generally consistent with existing City policy documents, goals, and objectives related to GHG emissions and energy reduction. Likewise, as these existing documents are consistent with the wide state objectives for reduction of GHG, the proposed General Plan is also believed to be consistent with wider State policy and executive orders.

IMPACTS AND MITIGATION MEASURES

Impact

3.13-1 New development under the proposed General Plan may increase total energy consumption. *(Significant Cumulative Impact, Project Contribution Not Cumulatively Considerable)*

Electricity and Natural Gas

This analysis of electricity and natural gas consumption uses a business as usual methodology to project future demand, a similar methodology as applied by the City of Emeryville for the CAP (City of Emeryville, 2008b). This conservative method assumes that residential energy demand will increase commensurate with the compounded annual population growth rate, and energy demand in the commercial and industrial sector will increase commensurate with job growth. The analysis does not account for improvements in energy efficiency, which are difficult to quantify; therefore, these results may be considered a worst case scenario.

For this analysis, the annual growth rate was calculated based on population and job estimates for 2008 and for 2030 buildout, which reflect a 2.29 percent annual growth for population and a 1.73 percent annual growth for commercial and industrial. Note that if commercial and industrial energy use were estimated based on growth in square feet of non-residential space rather than jobs, total energy use would be lower. This is because the proposed General Plan includes a shift away from industrial land use toward office, retail and hotel, which support more jobs per square foot than industrial uses. In other words, jobs grow at a faster rate than square feet of non-residential space. These assumptions are based on a business as usual approach, where no new energy conservation measures are implemented.

Table 3.13-7: Residential and Commercial Energy Use in Emeryville, Existing and in 2030

	2007	*2030*	*Per Person / Per Job*
Electricity (kWh)			
Residential	19,838,436	32,632,361	2,040
Commercial/ Industrial	208,132,731	303,813,835	10,127
Total	227,971,167	336,448,226	
Natural Gas (therms)			
Residential	994,173	1,635,321	102
Commercial/ Industrial	6,422,821	9,375,469	313
Total	7,416,994	11,010,790	

Source: Cheeseman, 2008; Dyett & Bhatia, 2008.

As shown in Table 3.13-7, since energy is projected to grow at the same rate as population and jobs, per capita and per job energy use remains constant. However, because the total population and commercial sector is expected to grow, in the business as usual scenario total energy use would increase from 228 million kwh to 336 million kwh and from 7.5 million therms to 11 million therms, indicating a 48 percent increases for both kWh and therms. Therefore, development considered under the proposed General Plan could potentially increase demand for gas and electrical services.

However, greater energy efficiency is expected in the future. In addition to California's Energy Efficiency Standards for Residential and Nonresidential Buildings (Title 24, Part 6), which outlines improved site planning and building design as well as energy conservation measures, the proposed General Plan includes several policies which would minimize the potential for inefficient, wasteful, or unnecessary consumption of energy, as described below. Further, the CAP, which would be implemented under the proposed General Plan, outlines policies to reduce wasteful, inefficient, and unnecessary consumption of energy. The city has set an emissions reduction target of 25-percent reduction from 2004 emissions by 2020, and has developed policies in its CAP to achieve this target. This reduction in emissions inherently includes a reduction in energy use. Action areas include, but are not limited to: requiring green building for new construction; energy efficiency education targeted at residents; implementing a strict commercial energy code; energy efficiency retrofits of existing building; and transit oriented development. See Appendix D for a comprehensive list of measures.

Transportation Energy Use

Unlike the electricity and natural gas analysis above, which used a conservative business as usual method, the analysis of transportation energy use uses projected VMT resulting from the proposed General Plan as a metric for determining transportation energy demand at buildout. In this way, the projection is a closer approximation of potential energy consumption, that factors in the measurable effects of the proposed General Plan.

Adding 6,700 new residents and 10,000 new jobs between 2005 and 2030 would likely require additional energy for transportation uses within the City of Emeryville. The City of Emeryville depends on transportation energy to move people and goods along its transportation corridors. Fehr & Peers (2008) have estimated that at buildout under the proposed General Plan, VMT would increase from 859,000 (2005) to 1.15 million per year (2030), an increase of 34 percent.

Table 3.13-8: Daily Transportation Energy Use in BTUs

	Population	*Daily Vehicle Miles Traveled*	*Fuel Efficiency*	*Daily Fuel Consumption*	*Daily BTUs (Billions)*	*BTUs per Capita*	*% Change in Per Capita BTUs from Existing Condition*
Existing Conditions	9,727	859,000	17.5	49,086	6.14	630,792.05	--
Project							
No Pavley	16,600	1,154,000	18.2	63,407	7.93	477,459.29	-24
Pavley 1	16,600	1,154,000	24.6	46,911	5.86	353,242.24	-44
Pavley 1and 2	16,600	1,154,000	27.3	42,271	5.28	318,306.19	-50

Source: Fehr & Peers, 2008; Dyett & Bhatia, 2008.

As shown in Table 3.13-8, daily fuel consumption under the proposed General Plan will decline if Pavley rules are applied. It should be noted that in the case where Pavley is not applied, daily BTUs will increase by 29 percent. However, in all cases, transportation use per capita declines. Even when no Pavley rules are applied, per capita BTUs decrease by 24 percent, and when Pavley 1 and 2 are applied, per capita BTUs decrease by 49 percent.

The Emeryville CAP outlines additional policies to reduce transportation energy consumption due to the projected increases in peak hour trips. In setting an overall carbon reduction goal of 25 percent below 2004 levels by 2020, the CAP outlines the several actions that will help reduce VMT and emissions associated with VMT. These actions include: transit oriented development; education on low-carbon transportation options; bus rapid transit; expanding carshare; providing free high school bus passes; increasing BART and Amtrak ridership; increasing Emery-Go-Round ridership; parking cashout; increasing AC transit ridership; providing bicycles for daily trips; bicycling paths and facilities; promoting carpooling and vanpooling; promoting telecommuting; parking and lane incentives for hybrid vehicles; walking friendly environments; and integrating bicycles and transit. Furthermore, as shown above, state implementation of Pavley rules, phases 1 and 2 will result in less energy use per mile traveled due to increased fuel efficiency.

Proposed General Plan Policies that Reduce Overall Energy Use

To complement and reinforce the CAP, the proposed General Plan includes several goals that would result in efficient energy use, such as improving access to sunlight, promoting walkability, promoting alternative forms of transportation, and allowing dense, mixed use development. In particular, goals such as ST-G-6, which calls for a fifty-percent reduction in energy consumption

for all sectors—transportation, industrial/commercial, residential, and waste, over 2008 levels, by 2017; and ST-G-8, which calls for environmentally friendly and energy-efficient buildings throughout Emeryville in new construction, redevelopment and retrofit projects, highlight the focus of the proposed plan on improving energy efficiency.

To support these goals, Land Use policies encourage mixed-use development, live/work spaces, the creation of a walkable city, and building standards that promote energy efficiency. Urban Design and Sustainability policies promote green building and building standards that promote energy efficiency. Parks and open spaces are to be designed consistent with sustainable design principles, and the city fleet is to receive a budget for clean fuels and vehicles. The Sustainability Element in particular outlines several policies to achieve actual reductions in electricity use, such as providing incentives for retrofits to support implementation of photovoltaic and other renewable energy technologies.

The Sustainability Element also sets a 50 percent reduction target of energy consumption for transportation of 2008 levels by 2017. As a result, the proposed General Plan focuses on mixed uses and an efficient transportation system that prioritizes alternative modes. There are a number of policies in the proposed General Plan that would also help to reduce transportation energy consumption due to the projected increases in VMT. Mobility policies encourage transit-oriented development and minimization of VMT, as well as the creation of "complete streets" that encourage public transit and bicycle and pedestrian traffic.

The following policies in the proposed General Plan would directly reduce wasteful, inefficient, or unnecessary consumption of energy.

Proposed General Plan Policies that Reduce the Impact

LU-P-7 Permit live/work in all land use designations except Office/Technology, Public, Parks/Open Space, and Marina. In the Industrial district west of Hollis Street, permit only "heavy" live/work—involving, for example, manufacturing, welding, or assembly.

LU-P-18 Develop the area around the Amtrak station with transit-supportive uses, through measures such as reduced parking requirement, incorporation of public parking in developments, and transit proximity when considering height and FAR bonuses.

T-P-3 Design, construct, operate, and maintain the city streets based on a "complete streets" concept that enables safe, comfortable, and attractive access and travel for pedestrians, bicyclists, motorists, and transit users of all ages and abilities, with emphasis on specific travel modes as indicated by the typologies described in this chapter.

T-P-7 Encourage development that minimizes VMT per capita (i.e., resident or employee).

T-P-9 Promote a fine-grained street network by extending the street grid to form new connections as larger sites are redeveloped.

T-P-10 Require new development to expand the street grid and provide other new transportation facilities as shown in Figures 3-1 through 3-6.

T-P-17 Encourage walking through building design and ensure that automobile parking facilities are designed to facilitate convenient pedestrian access within the parking area and between nearby buildings and adjacent sidewalks. Primary pedestrian entries to nonresidential buildings should be from the sidewalk, not from parking facilities.

T-P-18 Require development to include safe pedestrian walkways that link to streets and adjacent bus stops.

T-P-21 Following completion of the new east span of the Bay Bridge, the west span should be retrofitted with a pathway to provide continuous pedestrian and bicycle access between San Francisco and the East Bay.

T-P-22 Create the bicycle circulation system set forth in Figure 3-4, and based on the typologies described in this chapter.

T-P-24 Designate on-street bike routes in the City's Bicycle and Pedestrian Plan as either Class II (bike lanes) or Class III (signed routes without lanes), as appropriate. These designations are not part of the General Plan and may be changed as circumstances dictate.

T-P-29 Support existing public transit to BART, Amtrak, and regional destinations, and promote transit within Emeryville for residents, workers, and visitors to move smoothly within the city without relying on the automobile.

T-P-30 Support transit service on all Transit Streets, as shown in Figures 3-1 and 3-5. This includes Powell Street to the Marina and east of Hollis Street to the Ashby BART station and downtown Berkeley, Park Avenue west of Hollis Street, and Adeline Street.

T-P-31 Develop and implement transit stop amenities such as pedestrian pathways approaching stops, benches, traveler information systems, shelters, and bike racks to facilitate transit stops as place-making destinations and further the perception of transit as an attractive alternative to driving.

T-P-32 Support transit priority on Transit Streets through features such as traffic signal priority, bus queue jump lanes at intersections, exclusive transit lanes, and other techniques as appropriate, with adjustments to technology as conditions change.

T-P-33 Support free and/or subsidized transit for both local travel within the City and travel to the regional hubs located at the Amtrak Station, the MacArthur BART station, and San Pablo Avenue at 40th Street.

T-P-34 Support high density Transit-Oriented Development with reduced parking requirements, and amenities to encourage transit use and increase pedestrian comfort around the Major Transit Hubs at the Amtrak station and the 40th Street/San Pablo Avenue intersection.

T-P-35 Require all new development (residential and non-residential) to contribute to the Emeryville Transportation Management Association to ensure that Emeryville residents are well served by transit.

T-P-36 Provide frequent, direct transit service to all points in Emeryville, especially between the east and west sides of town.

T-P-47 Provide equal priority to bicycles and public transit (and discourage through traffic by other modes) on streets in the vicinity of the Amtrak station that are designated as both Transit Streets and Bicycle Boulevards.

T-P-50 Support parking supply and pricing as a strategy to encourage use of transit, carpools, bicycles, and walking.

T-P-51 Allow flexible parking standards that reflect calculated parking demand for proposed land uses and that allow for appropriate offsets to reduce parking demand and encourage walking, bicycling, carpooling, and transit use.

T-P-52 Encourage employers to offer "parking cash out", whereby employees who choose not to drive are offered the cash value of any employee parking subsidy, to be used towards commuting to work by other means.

T-P-64 Work with local, regional and state agencies, the Chamber of Commerce, and the Transportation Management Association, as well as employers and residents, to encourage and support programs that reduce vehicle travel such as preferential carpool parking, parking pricing, flexible work schedules, and ridesharing.

T-P-66 Support and encourage the expansion of car-sharing programs in Emeryville.

UD-P-30 Enhance the pedestrian environment with multiple neighborhood access points, through-streets, and pedestrian pathways. Use site plan review as an opportunity to identify options for pedestrian circulation.

UD-P-58 Ensure that development steps back above 25 feet to allow for greater penetration of light and sky exposure along Hollis Street.

UD-P-61 Ensure that new development provides rights-of-way and greater setbacks where open space and pedestrian connections are planned. Buildings facades and entries should be oriented to these connections, along with ample fenestration and pedestrian-scaled building massing.

UD-P-66 Encourage adaptive reuse of existing industrial buildings. Explore opportunities to rehabilitate or reuse older existing industrial buildings and structures, such as the ITT Grinnell and PG&E buildings.

CE-P-3 Budget for clean fuels and vehicles in the City's long-range capital expenditure plans, to replace and improve the existing fleet of gasoline and diesel-powered vehicles.

ST-P-1 Maintain Climate Action Plan to achieve energy efficiency and conservation goals.

ST-P-6 Collaborate with residents, businesses, and other members of the community, including architects, builders and contractors, to encourage private development within the City to use green building methods and practices and to achieve standards set by LEED™ for commercial buildings and the Alameda County Residential Green Building Guidelines for residential projects.

ST-P-8 Establish incentives for energy retrofits to support implementation of photovoltaic and other renewable energy technologies that result in an energy savings of at least 20 percent when compared to consumption that would occur with traditional energy sources.

The following actions in the proposed General Plan would further reduce wasteful, inefficient, or unnecessary consumption of energy, and implement those policies listed above.

Proposed General Plan Actions that Reduce the Impact

T-A-7 Maintain and update every ten years a Pedestrian and Bicycle Plan that defines a cohesive pedestrian network of public sidewalks, paths, and street crossings that make walking convenient, safe to travel, and are universally accessible. Within the Pedestrian and Bicycle Plan provide:

- Guidelines for sidewalk functional elements (e.g., pedestrian zone, planter/furniture zone, curb zone, and building frontage zone), amenities (e.g., landscaping, benches, trash receptacles, news racks, pedestrian-scale lighting, directional/information signing, and public art), street crossings; description and schedule for public improvements; and developer responsibilities.

- Establish a Pedestrian Safety Program that provides pedestrian educational materials and a regularly updated pedestrian safety report.

- Designate and support a Citywide Pedestrian Coordinator.

T-A-8 Maintain and update every ten years a Pedestrian and Bicycle Plan that defines a cohesive bikeway network of paths, lanes, routes and boulevards that make biking convenient, safe to travel, and accessible. Within the Pedestrian and Bicycle Plan provide:

- Bikeway facilities that are appropriate to the street typology, traffic volume, traffic speed, surrounding land uses, and accounting for the constrained urban environment.
- Designate and support a Citywide Bicycle Coordinator
- Evaluate the feasibility of implementing a bicycle sharing program for Emeryville residents and workers

T-A-11 Urge public transit vehicles to carry bicycles

T-A-12 Actively work with transit providers for free and/or subsidized transit for both local travel within the City and travel to the regional hubs located at the Amtrak Station, the MacArthur BART station, and San Pablo Avenue at 40th Street.

T-A-13 Work with transit providers to expand hours of operation, reduce travel time, and increase frequencies/headways.

T-A-14 Refer to AC Transit's handbook Designing with Transit for integrating transit into the community.

T-A-15 Monitor as appropriate the transit system to assess the system's effectiveness in serving Emeryville residents and those working in Emeryville. Make changes to the transit system, as appropriate, to provide an efficient rider-friendly environment that meets the needs of all users including children, seniors, the disable, and transit-dependent persons.

T-A-16 Require all new development (residential and non-residential) to contribute to the Emeryville Transportation Management Association to ensure that Emeryville residents are well served by transit.

T-A-18 Study and implement a citywide Transportation Demand Management Program and explore funding mechanisms.

UD-A-1 Prepare Design Guidelines for the following design elements:

- Site planning
- Building orientation and entries
- Open space
- Parking and service areas

- Building height and mass
- Building form and articulation
- Façade composition
- Building materials, detailing, and color
- Residential livability
- Streets
- Sustainability objectives
- Landscaping
- Signage
- Gateways

CSN-A-1 Plant new trees and other plantings, and maintain existing healthy trees to improve air quality and reduce the urban heat island effect.

CSN-A-16 Implement Climate Action Plan in coordination with all City departments

ST-A-1 Implement Climate Action Plan in coordination with all City departments

ST-A-2 Adopt the United Nations Environmental Accords by Resolution with a plan for implementing 14 of the 21 actions by 2012.

ST-A-3 Incorporate site-appropriate standards described by Build-It-Green GreenPoint rating system and/or Leadership in Energy and Environmental Design (LEED™), and Bay- Friendly Landscape Guidelines, Sustainable Practices for Landscape Professionals into all new construction and rehabilitation projects.

ST-A-4 Implement civic green building resolution requiring City projects to follow green building and Bay-Friendly Landscaping requirements.

ST-A-5 Implement green building ordinance requiring Public-Private Partnership projects to be follow green building and Bay-Friendly Landscaping requirements. (pending)

ST-A-6 Develop and implement an environmentally preferable municipal purchasing program.

ST-A-7 Identify sites for developers to provide sites for farmers' markets

The above policies and actions would help to ensure that per capita and per job energy consumption decreases and that future energy consumption is neither wasteful nor inefficient. This analysis concludes that, given existing and proposed policies and actions, as well as statewide regulation, the cumulative effects are significant, but the project's contributions are not cumulatively considerable. The proposed General Plan adds residents and jobs that increase energy

use, but does this in an efficient way through mixed-use high-density development. The project is actually beneficial, in that the incremental impact of these future residents and workers would be greater in a lower density outlying area.

Mitigation Measures:

None required.

Impact

3.13-2 New development under the proposed General Plan may require the construction of additional energy infrastructure facilities, the construction of which could cause significant environmental effects. *(Less than Significant)*

To meet potential energy demand for build out under the proposed General Plan, PG&E could be required to upgrade its existing infrastructure and construct new electrical substations in Emeryville as necessary. The company would also upgrade local gas lines to accommodate growth and increase supply and service reliability.

PG&E does not evaluate whether specific proposed developments would require the construction of additional energy infrastructure facilities; rather, PG&E's long-term energy forecasts are conducted on a system-wide basis. PG&E states that the East Bay area is included within the Greater Bay Area Region and there are currently no regional concerns with regards to reliability deficiencies and associated transmission improvements. The electric transmission capacity in the East Bay area is adequate to serve electric demands and PG&E has not identified any necessary capacity projects for the area. While there are currently no proposals to construct additional transmission or distribution network facilities in the East Bay area, PG&E consistently monitors and evaluates the need for serving new customers and will propose projects based on need (Braddy, 2008).

One of the goals of the Sustainability Element of the proposed General Plan is that buildings in Emeryville be environmentally-friendly and energy-efficient. The Sustainability Element of the proposed General Plan contains numerous policies that promote environmentally friendly and energy efficient building design for new development, while the Urban Design Element promotes recycling and reuse of building materials and design that protects natural light thereby realizing energy efficiency benefits of passive solar design.

In addition to ST-P-6 and UD-P-66, as listed in Impact 3.13-1 the following policies in the proposed General Plan would help to reduce potential for construction of new energy use facilities.

Proposed General Plan Policies that Reduce the Impact

ST-P-7: Adopt a construction and demolition waste recycling ordinance which will require that, except in unusual circumstances, all construction, demolition and renovation projects meeting a certain size or dollar value, to divert from the waste stream, 100

percent of all portland cement concrete and asphalt concrete and an average of at least 50 percent of all remaining debris from construction, demolition, and renovation projects.

UD-P-23: Where transitions in building heights and intensities occur, ensure that new development does not cast significant shadow over existing development.

UD-P-26: Work with City departments and utilities to remove impediments to sidewalk safety and movement, undergrounding utilities/transformers or locating them on-site where possible.

In addition, actions UD-A-1 and ST-A-1 through 5, as described for Impact 3.13-1, would ensure implementation of the policies listed above. The above listed policies and actions, considered in conjunction with PG&E infrastructure improvement procedures, would reduce the potential construction impacts related to new and/or expanded energy infrastructure facilities to less than significant.

Mitigation Measures

None required.

Impact

3.13-3 Implementation of the proposed General Plan would increase total carbon dioxide equivalent emissions in the City compared to existing conditions. *(Significant Cumulative Impact, Project Contribution Not Cumulatively Considerable))*

Concurrent implementation of the proposed General Plan and forecast development of residential and employment land uses in the region could result in increased GHG emissions, thereby contributing to GCC. It is reasonable to generalize that GCC is a significant cumulative impact, as the scientific community has acknowledged its detrimental effects on ecosystems and human communities, and it is caused by the cumulative GHG emissions from human activities across the globe and over many decades. Furthermore, as GCC is accelerated by GHG, any additional GHG emissions beyond what exists today in the atmosphere can generally be considered to contribute somewhat to this significant cumulative impact. However, for the purposes of this EIR, this analysis needs to make a determination about whether the proposed Project makes a cumulatively considerable contribution to the overall cumulative impact.

For this analysis, transportation emissions were calculated based on daily VMT, including implementation of Pavley rules, as described in the methodology and assumptions. As shown in Table 3.13-9, the proposed General Plan would result in a 12 percent decrease in annual transportation emissions when Pavley 1 and 2 are considered.

Table 3.13-9: Transportation Energy and Greenhouse Gas Emissions Comparison

	Daily Vehicle Miles Traveled	*Fuel Efficiency (mpg)*	*Annual Vehicle Miles Traveled*	*Annual Fuel Consumption*	*Total Annual CO_2e Emissions (metric tons)*	*% Increase in CO_2e from Existing Conditions*
Existing Conditions	859,000	17.5	301,956,855	17,254,677	152,525	n/a
Proposed Project						
No Pavley	1,154,000	18.2	405,665,659	22,288,772	197,283	29.3
Pavley 1	1,154,000	24.6	405,655,659	16,490,067	147,704	-3.2
Pavley 1 and 2	1,154,000	27.3	405,655,659	14,859,182	133,760	-12.3

Source: Dyett & Bhatia, 2008; Emeryville Carbon Action Plan, November 2008; CCAR GRP v.2.2; Fehr & Peers, 2008.

Total GHG emissions for Emeryville in 2030 are estimated using transportation emissions when applying Pavley 1 and 2, as described in Table 3.13-9, and annual compounded growth rates for population and jobs from 2005 to 2030 to calculate the increase in residential, commercial/ industrial, and waste emissions. This methodology is consistent with the approach used in the CAP and CAP estimates are used as the GHG existing conditions baseline. As shown in Table 3.13-10, total CO_2e emissions would be approximately 288,000 metric tons per year, 18 percent more than existing conditions. Total emissions in the No Project alternative are 269,000 metric tons of CO_2e per year, seven percent less than under the proposed General Plan. However, per capita CO_2e emissions at buildout of the proposed General Plan would be around 17 metric tons annually, 38 percent less than existing conditions and 18 percent less than the No Project Alternative per capita emissions of 21 metric tons per capita. The lower per capita rate under the proposed General Plan indicates that a greater portion of regional population growth is accommodated with minimal increase in GHG emissions.

Table 3.13-10: Community Emissions Projections by Sector for 2030 (metric Tons of CO_2e)

Sector	*2004 Community Emissions*[1]	*2030 General Plan Community Emissions*	*2030 No Project*	*Percent Change from 2004 to 2030*	*% Change from No Project to Project*
Residential	9,380	19,403	13,772	106.9	40.9
Commercial / Industrial	76,204	123,051	110,496	61.5	11.4
Transportation[2]	152,525	133,760	136,078	-12.3	-1.7
Waste	5,801	12,000	8,517	106.9	40.9
Total	243,910	288,214	268,862	18.2	7.2
Population	8,650	16,600	12,700	91.9	30.7
Per Capita CO_2e emissions	28.2	17.4	21.2	-38.4	-18.0

1. 2004 emissions for residential, commercial/ industrial, and waste are based on the Emeryville CAP.
2. Assuming VMT as modeled by F&P; Assuming Pavley one and two are implemented.

Source: Dyett & Bhatia, 2008; Emeryville Carbon Action Plan, October 2008; CCAR GRP v.2.2.

Even considering no implementation of Pavley rules, emissions per capita would be lower in the proposed General Plan in 2030 than in existing conditions (a 25 percent reduction rather than 38 percent reduction as is seen when Pavley 1 and 2 are implemented). However, total emissions would continue to increase, and in 2030 there would be 44,304 CO_2e per year more than in the existing condition.

Improvements in efficiency resulting from City policy, State measures and the proposed General Plan would decrease total emissions by 2030, suggesting that this analysis represents a conservative and worst-case scenario projection of GHG emissions. Moreover, the mixed-use high density nature of the project, adds residents and workers in a way that is more efficient and necessitates fewer GHG emissions than would be required in an outlying area. The City's 2007 Resolution to reduce GHG emissions 25 percent below 2004 levels by 2020, together with the policies and measures outlined in the CAP to achieve this reduction, would result in a further reduction in per capita GHG emissions. In addition, several goals and policies in the Emeryville General Plan would help decrease total emissions by 2030.

Proposed General Plan Policies that Reduce the Impact

This General Plan calls for the implementation of the CAP, rather than duplicate its policies. The CAP was adopted by City Council in November 2008. In addition, the proposed General Plan addresses GCC and methods for reducing emissions throughout the plan, and summarizes these policies in Chapter 7: Sustainability. This chapter also includes CAP policies and urban accord energy action items. Throughout the proposed Plan, each element contributes to the overall goal of sustainability in Emeryville, including the reduction of GHG emissions. The Land Use Element describes a vision for a mixed use city, with greater residential and employment densities and enhanced neighborhood centers and services, leading to a more livable compact and efficient city. The Transportation Element focuses on orienting higher-density housing and intensive non-residential uses near transit to reduce VMT. Making alternative transportation more pleasant, convenient, and accessible, can reduce vehicle trips and therefore GHG emissions. The Parks, Open Space, Public Facilities, and Services Element describes an increase in the amount and accessibility of parks and open spaces, proposing spaces for passive and active recreation, while improving air quality and managing stormwater runoff. The Urban Design Element outlines a form for walkable streets, appropriate building massing, and attractive landscaped streetscapes that invite pedestrians, allow for solar access, and create a connected street grid. Enhancing the walkability of the street network, by adding additional streets and paths, amenable to pedestrians and bicyclists, can potentially reduce the number of vehicle trips and VMT. The Conservation, Safety, and Noise Element describes strategies to maintain environmental quality within an urban environment, through stormwater management, creek restoration, water recycling and conservation, and preservation of biological and plant resources.

Policies T-P-9, 17, 22, 30-36, 47, and ST-P-1, 6, and 8, as listed under impact 3.13-1 and UD-P-23 and ST-P-7 as listed under impact 3.13-2, are directly related to GHG emissions because they help to reduce energy use, and thus are also applicable to reducing the impact of increased GHG emissions. The following proposed policies also contribute to reducing the GHG impact of the proposed General Plan.

T-P-5	The City encourages development that minimizes Vehicle Miles Traveled (VMT).
T-P-6	To the extent allowed by law, the City's Traffic Impact Fee shall include bicycle, pedestrian, transit, and road improvements so that development pays its fair share toward a circulation system that optimizes travel by all modes.
T-P-14	Safe pedestrian walkways that link to streets and adjacent bus stops will be required of new development.
T-P-26	Existing public transit to BART, Amtrak, and regional destinations will be supported, and transit within Emeryville for residents, workers, and visitors will be promoted.
T-P-28	The City will develop and implement transit stop amenities such as pedestrian pathways approaching stops, benches, traveler information systems, shelters, and bike racks to facilitate transit stops as place-making destinations and further the perception of transit as an alternative to driving.
T-P-37	The City supports a new BART line in the East Bay that includes service to Emeryville along the existing regional rail corridor with a stop at Powell Street.
T-P-44	The City will establish equal priority to bicycles and public transit (and discourage through-traffic by other modes) on streets in the vicinity of the Amtrak station that are designated as both Transit Streets and Bicycle Boulevards.
T-P-48	Flexible parking standards are encouraged that reflect calculated parking demand for proposed land uses and that allow for appropriate offsets to reduce parking demand and encourage walking, bicycling, carpooling, and transit use.
T-P-49	Employers are encouraged to offer "parking cash out", whereby employees who choose not to drive are offered the cash value of any employee parking subsidy, to be used towards commuting to work by other means.
T-P-53	The land area devoted to parking shall be reduced by supporting innovative technologies such as parking lifts and automated parking.
T-P-60	The City will work with local, regional and state agencies, the Chamber of Commerce, and the Transportation Management Association, as well as employers and residents, to encourage and support programs that reduce vehicle miles traveled, such as preferential carpool parking, parking pricing, flexible work schedules, and ridesharing.
T-P-62	The City supports and encourages the expansion of car-sharing programs in Emeryville.

PP -P-7	A system of greenways and Green Streets, as tree-lined open spaces, and as continuous recreational paths for bicyclists, joggers, and pedestrians, linking parks and activity centers.
PP -P-8	The north-south Emeryville Greenway will be expanded, enhancing its role as an open space corridor and connector across the City, and a source of inspiration and community pride.
PP -P-10	Efficient use of open space will be achieved through techniques such as rooftop play courts and gardens, joint use of sports and recreation facilities at schools, collocation of parks with child care facilities, and possible use of underground parking below new plazas and parks.
UD-P-2	Parks and open space is required with new development.
UD-P-3	Parks and open space shall be accessible and available to the public through site design standards for minimum size/ dimensions, visibility, and location along public rights-of-way, particularly Key Green Streets.
UD-P-21	The City shall maintain and enhance an integrated pattern of streets, pedestrian paths, and bike routes through a fine-grain street grid that enables efficient movement throughout the city.
UD-P-57	Large surface parking lots shall be replaced with structured parking and incorporated into high density mixed-use developments. New or expanded large surface parking lots are not allowed.
CSN-P-1	Air quality will be maintained and improved by requiring project mitigation, such as Transportation Demand Management (TDM) techniques, where significant air quality impacts are identified.
CSN-P-2	The City will budget for clean fuels and vehicles in the City's long-range capital expenditure plans, to replace and improve the existing fleet of gasoline and diesel powered vehicles.
CSN-P-5	All large construction projects are required to reduce diesel exhaust emissions through use of alternate fuels and/or control devices.
ST-P-2	The City shall maintain a Climate Action Plan to achieve waste reduction goals.
ST-P-4	The City shall negotiate a new Zero Waste Franchise Agreement with a hauling company that uses waste reduction programs and the disposal rate structure to monetarily incentivize recycling and composting which will result in zero tons of methane-producing materials going to landfill by 2030.

ST-P-9 The City shall support companies working in the sustainability sector (such as materials recycling or green building) to locate in Emeryville.

ST-P-12 The City shall support community outreach and education to improve organic and local food systems in the city.

ST-P-13 The City shall incorporate local and organic food as part of the proposed municipal purchasing program.

Further, all actions described in Impact 3.13-1 would implement the policies listed above and ensure a reduction in energy use and GHG emissions. Therefore, because emissions at buildout of the proposed Plan are lower per capita than those under existing conditions, and because there are numerous policies and actions in the proposed General Plan designed to support and implement emissions reduction targets in the CAP and existing City resolutions, the direct impact of the proposed General Plan on GHG emissions is considered less than significant.

Mitigation Measures

None required.

Impact

3.13-4 New development under the proposed General Plan may conflict with applicable energy efficiency and GHG reduction policies or standards, such as the Emeryville Climate Action Plan. *(Less than Significant)*

Emeryville is subject to several energy efficiency and GHG reduction plans, policies and standards. These include the United Nations World Environmental Accords, the Emeryville CAP, Title 24, and AB 32. Each of these is described in terms of the proposed General Plan below.

The United Nations World Environmental Accords lists several key action steps, including those of setting a goal of reducing green house gas emissions by 25 percent by 2030 and developing a system to track GHG emissions. Through the completion of the CAP, Emeryville has achieved the first two of the key action steps. Further, the emissions reduction goal Emeryville set is more stringent than that requested by the Environmental Accords, since Emeryville has set a target year of 2020 rather than 2030 for its 25 percent reduction. By supporting the CAP, and integrating additional Environmental Accords goals into the Plan, the proposed General Plan does not conflict with the Environmental Accords.

In May 2007, the City Council of the City of Emeryville adopted a resolution establishing a GHG emissions goal to reduce city-wide and municipal emissions 25 percent below 2004 levels by 2020 (City of Emeryville, 2007). Subsequently, the Emeryville CAP was completed in 2008. As described in the Regulatory Setting, the CAP set a goal to reduce community-wide GHG emissions by 25 percent below 2004 levels by 2020. The proposed General Plan incorporates the CAP through

reference, through directive to implement, and through proposing policies that support the CAP. Therefore, the proposed General Plan does not conflict with the CAP.

Title 24 includes standards mandating energy efficiency measures, which regulate energy consumed in buildings for heating, cooling, ventilation, water heating, and lighting. Title 24 is implemented through the local plan check and permit process. The proposed General Plan includes incorporation of green building standards, and all several building standards, which are expected to be more stringent than Title 24 standards. Several policies in the proposed General Plan would enable the City of Emeryville to meet, if not exceed, Title 24 Building Energy Efficiency Standards. Consequently, new development would not conflict with applicable energy policies and impacts would be less than significant.

AB 32 requires the reduction of statewide GHG emissions to 1990 levels by the year 2020. This change, which is estimated to be a 25 to 35 percent reduction from current emission levels, will be accomplished through an enforceable statewide cap on GHG emissions that will be phased in starting in 2012. Emeryville's 25 percent reduction goal is consistent with the statewide measure.

Further, given the findings for Impacts 3.13-1 and 3.13-3, the proposed General Plan is expected to have a less than significant impact on energy consumption and GHG. This indicates that there is no conflict with pertinent plans and policies that would regulate a significant increase in emissions or energy use.

Policies ST-P-1, 6, and 8, as listed under impact 3.13-1, are directly related to energy use reduction and GHG emissions reduction. In addition, action items ST-A-1-5 and UD-A-1, as listed under impact 3.13-1, will implement the CAP, the Environmental Accords, a green building ordinance, and Design Guidelines which will include sustainability objectives. The policies listed for Impacts 3.13-1 and 3.13-2 further the reduce energy use and GHG emissions, and thus further contribute to achieving the goals set forth in the plans and policies listed above.

Mitigation Measures

None required.

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4 Analysis of Alternatives

The California Environmental Quality Act (CEQA) mandates consideration and analysis of alternatives to the proposed General Plan. According to CEQA Guidelines, the range of alternatives "shall include those that could feasibly accomplish most of the basic purposes of the project and could avoid or substantially lessen one or more of the significant impacts" (Section 15126(d)(2)). The alternatives may result in new impacts that do not result from the proposed General Plan.

Case law suggests that the discussion of alternatives need not be exhaustive and that alternatives be subject to a construction of reasonableness. The impacts of the alternatives may be discussed "in less detail than the significant effects of the project proposed" (CEQA Guidelines §15126.6(d)). Also, the Guidelines permit analysis of alternatives at a less detailed level for general plans and other program Environmental Impact Reports (EIR), compared to project EIRs. The Guidelines do not specify what would be an adequate level of detail. Quantified information on the alternatives is presented where available; however, in some cases only partial quantification can be provided because of data or analytical limitations.

4.1 BACKGROUND ON DEVELOPMENT OF ALTERNATIVES

A lengthy planning process took place to develop the proposed General Plan. This process emphasized community needs and values, as developed from an extensive outreach process that included a citywide survey, and workshops that gathered comments from Emeryville residents, business owners, other stakeholders, and City officials. The City Council and Planning Commission offered feedback during study sessions and a 16-member Steering Committee directed the process at each phase. After an initial report on existing conditions, opportunities, and constraints in Emeryville, an Alternative Concepts Report was prepared, based upon the existing conditions report and public input.

The Alternative Concepts Report identified scenarios for a range of options for how to guide development and intensification, while achieving the city's goals for creating a sustainable, connected and livable city. Alternatives for key components—land use, urban form, parks and open space, buildings heights/intensity, and circulation—were presented independently, offering community members and stakeholders an opportunity to select elements from each topic area and weave them into a viable and synergistic alternative whole. Alternatives that combined these components were prepared to understand resulting development, and their implications assessed.

4.2 ALTERNATIVES ANALYZED IN THIS EIR

Three alternatives to the proposed General Plan are described and evaluated in this chapter. These draw upon concepts illustrated in the Alternatives Concepts Report, but are somewhat modified to provide an understanding of how impacts of the proposed General Plan can be reduced:

- Alternative 1: Mixed-Use City;
- Alternative 2: Neighborhood Centers; and
- No Project.

Table 4.2-1 summarizes key characteristics of the resulting residential population and jobs at buildout (2030) under the proposed General Plan and each of the three alternatives.

Table 4.2-1: Comparison of Buildout of the Proposed General Plan and Alternatives[1]

	Existing (2008)	*Proposed General Plan*	*Alternative 1: Mixed-Use City*	*Alternative 2: Neighborhood Centers*	*No Project*
Housing Units	5,988	9,800	8,900	11,700	7,500
Households[2]	5,570	9,300	8,500	11,100	7,100
Population[3]	9,727	16,600	15,200	19,900	12,700
Employed Residents	5,800	11,600	10,600	13,900	8,900
Jobs[4]	20,552	30,000	33,000	28,000	29,000
Jobs/Employed Residents Ratio	3.5	2.6	3.1	2.0	3.3

1. Projections rounded to the nearest hundred or thousand (jobs).
2. Households calculated as 95% of housing units (assumes 5% vacancy rate).
3. Population calculated at 1.79 persons per household.
4. 2008 jobs calculated from annual growth rate assumed by ABAG for 2005-2010: 1.5%

Source: Dyett & Bhatia, 2008.

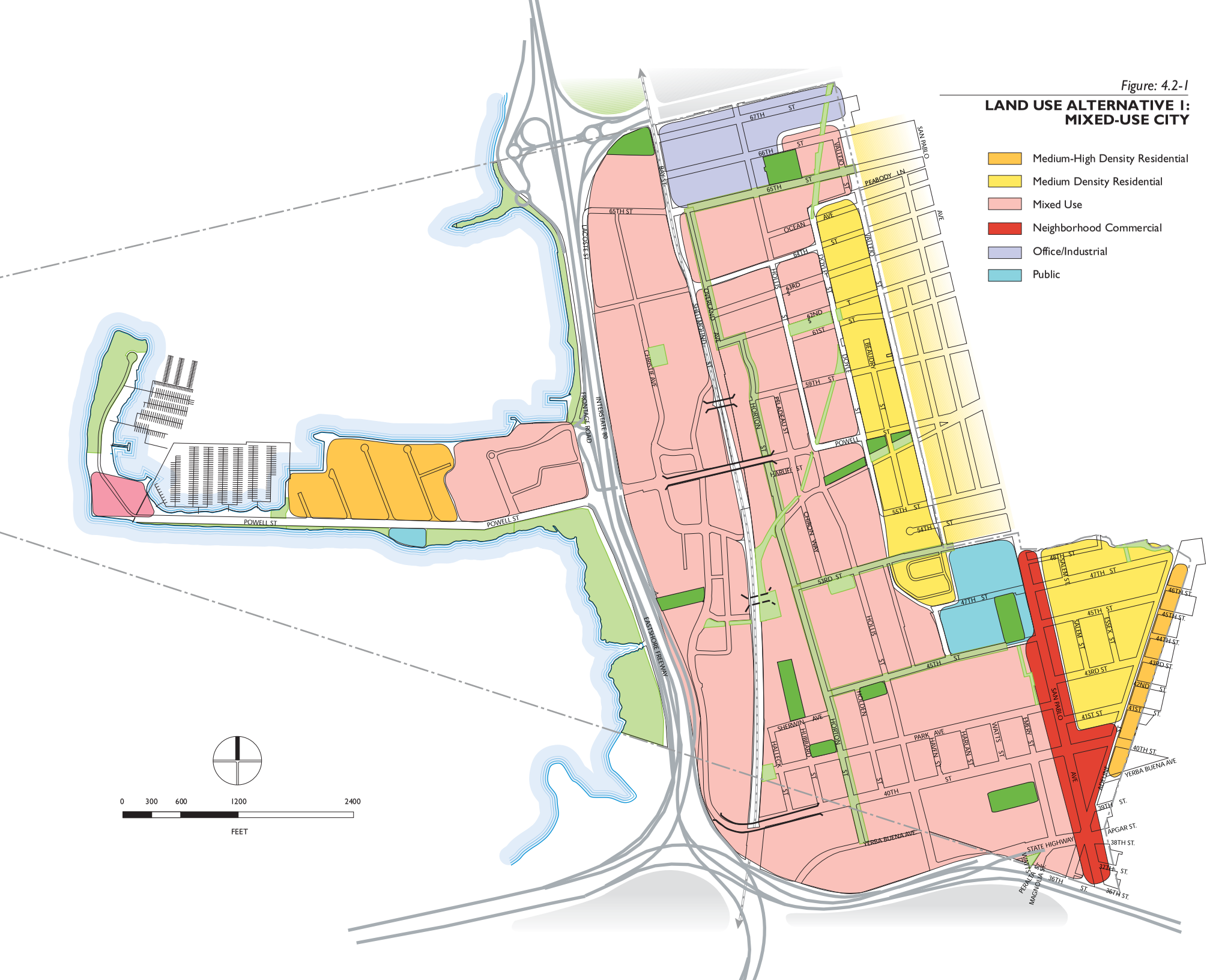
ALTERNATIVE 1: MIXED-USE CITY

The Mixed-Use City Alternative permits a range of residential and non-residential uses (office, retail and other commercial) throughout much of the city. The land use diagram for this alternative is illustrated in Figure 4.2-1. Ground floor retail would be regulated to help develop some centers of activity, even though much of the city would be mixed-use. Powell Street is emphasized as a walkable corridor between the railroad tracks and the freeway, allowing a pedestrian district to extend south to Bay Street, and the Powell Street Plaza area. Existing residential neighborhoods, including the Watergate, Triangle, and Doyle Street neighborhoods would remain largely unchanged.

This alternative assumes mid-rise building heights (up to 90 feet) in the zone bounded by 64th, Hollis, and 45th streets, and Interstate-80, as well as the eastern end of the peninsula; and low- to mid- rise heights (up to 55 feet) in all other areas. Floor-area ratio (FAR) in the mixed-use districts is assumed to average 1.2 to 1.4. As a result, this alternative would add 2,900 residential units, 5,000 residents, and 3.9 million square feet of non-residential space. At buildout, this alternative would result in somewhat fewer housing units and residents, but more jobs, compared with the proposed General Plan.

Figure: 4.2-1

LAND USE ALTERNATIVE 1: MIXED-USE CITY



ALTERNATIVE 2: NEIGHBORHOOD CENTERS

The Neighborhood Center Alternative creates new residential neighborhoods as well as neighborhood-serving activity nodes, comprised of residential, retail, and public uses. Four nodes are identified in the North Hollis, Park Avenue, Christie Avenue, and San Pablo Avenue districts. Much of the city would be within a quarter mile walking radius of these centers. The land use diagram is shown in Figure 4.2-2. A mixed-use neighborhood with high-density residential is defined in the North Hollis area, with medium-high density townhouses proposed just to the east, in order to transition to the Doyle Street low-density residential district. A high-density neighborhood is also proposed on the Sherman Williams site.

This scenario assumes high-rise mixed-use along the freeway edge (up to 250 feet) with FARs assumed to average about 3.5. Mid-rise development (up to 90 feet) around the East Bay Bridge Center and along the rail corridor is envisioned at lower intensities, with FARs of approximately 2.0. As a result of these assumptions, this alternative would add 5,700 new housing units, 9,700 residents, and 2.2 million square feet of non-residential space. Compared with the proposed General Plan, this alternative would result in more housing units and residents, but fewer jobs at buildout.

NO PROJECT

The No Project alternative assumes continuation of land use development under the 1993 General Plan and the current Zoning Ordinance (which implements the General Plan). The No Project alternative is illustrated in Figure 4.2-3. This alternative would add 1,500 housing units, 2,500 residents, and 2.8 million square feet of non-residential space. Compared with the proposed General Plan, the No Project alternative would result in fewer housings units and residents and slightly fewer jobs, at buildout.

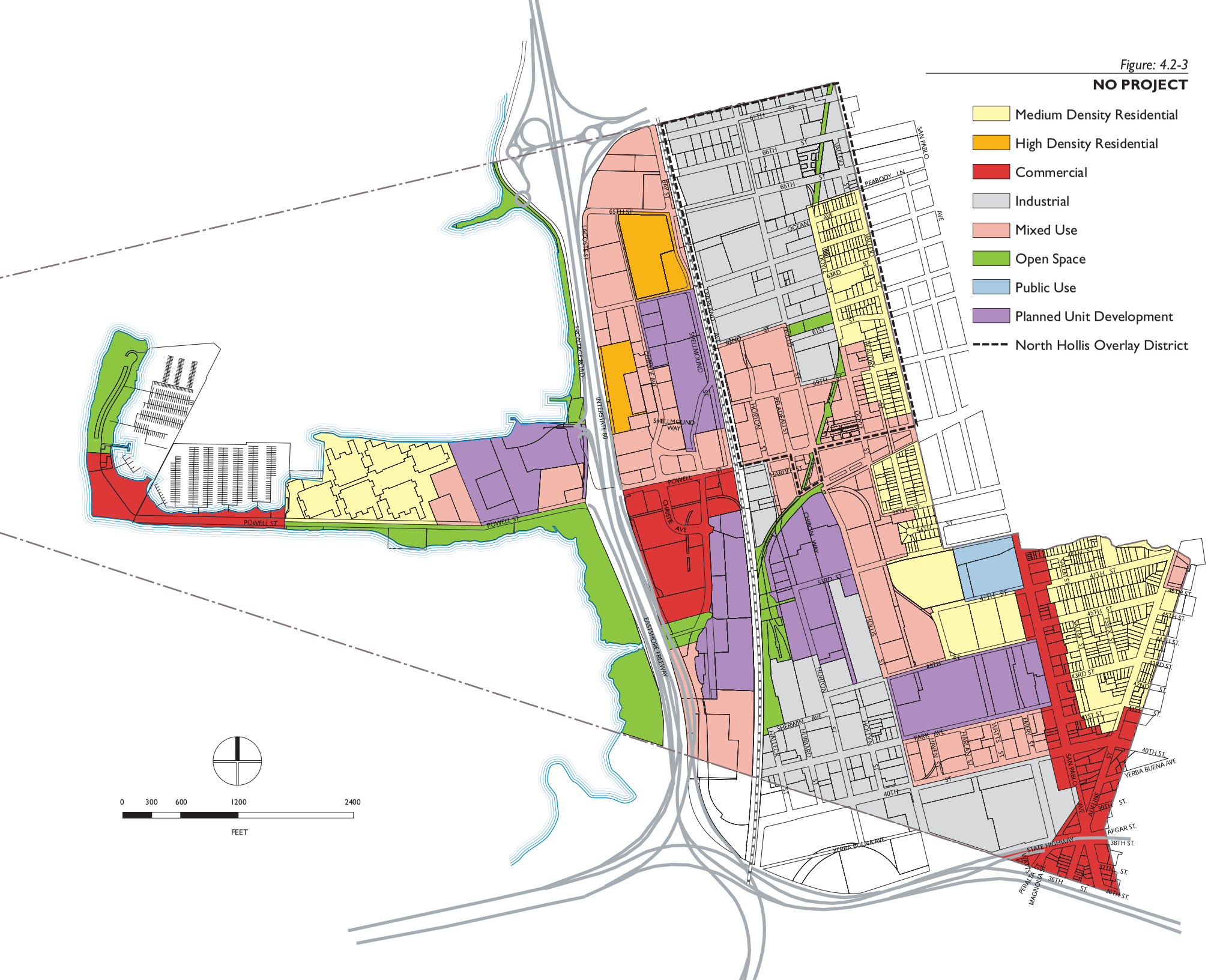
Figure: 4.2-2

LAND USE ALTERNATIVE 2: NEIGHBORHOOD CENTERS



Figure: 4.2-3

NO PROJECT



4.3 COMPARATIVE IMPACT ANALYSIS

LAND USE AND HOUSING

Table 4.3-1 shows land use by acreage at full buildout in each alternative. The alternatives differ in the amount of land dedicated to residential and non-residential uses, as well as the density and intensity of development.

The comparison of alternatives with respect to land use is summarized below. None of the alternatives would divide an established community or displace substantial numbers of existing housing or people. Because all development is infill in Emeryville, all developments will result in the same amount of land devoted to urban uses. None are expected to create any significant land use incompatibilities. Because there are no agricultural lands in Emeryville, no agricultural land would be converted.

- *Alternative 1: Mixed-Use City.* Alternative 1 devotes more land to employment uses such as office and retail space than the proposed General Plan. This comes at a comparative loss of residential developments, with this approach providing nearly 1,000 fewer units than in the proposed General Plan. Alternative 1 would result in a jobs/employed residents ratio of 3.1.
- *Alternative 2: Neighborhood Centers.* Alternative 2 has the largest increase in housing and population, accommodating 13 percent more housing than the proposed General Plan. This comes at a comparative loss of employment, with 2,000 fewer jobs than in the proposed General Plan. This alternative would result in the most balanced jobs/employed residents ratio of 2.0.

- *No Project.* The No Project alternative would result in fewer housing units, fewer jobs, and the smallest population of all proposed alternatives. The No Project alternative would also result in the least dense development. However, jobs and housing would both increase, indicating that any jobs or homes lost to redevelopment could relocate within Emeryville. Further, the No Project alternative would not make as many changes in terms of increasing connectivity. Finally, the No Project alternative would result in the highest job/employed residents ratio, 3.3, as compared with the proposed General Plan and other alternatives.

Table 4.3-1: 2030 Buildout of Alternatives

Land Use	*Proposed General Plan*	*Alternative 1*	*Alternative 2*	*No Project*
Residential (Units)	9,800	8,900	11,700	7,505
Retail (SF)	3,083,000	3,345,000	2,833,000	3,149,000
Hotel (SF)	775,000	913,000	597,000	615,000
Office (SF)	7,255,000	8,052,000	6,812,000	6,806,000
Industrial (SF)	3,353,000	3,511,000	3,805,955	4,095,000
Parks (acres)	49	30	41	23

Source: Dyett & Bhatia, 2008.

TRAFFIC, CIRCULATION, AND PARKING

Impacts of these alternatives on all modes of transportation are discussed below. Vehicle miles traveled (VMT) per trip for each alternative is also presented. Vehicle traffic forecasts at the intersection turning movement level were not developed for the No Project alternative, Alternative 1, or Alternative 2. Rather vehicle impacts of the alternatives were derived by comparing the relative difference in citywide trip generation characteristics to the traffic forecasts developed for the proposed General Plan.

The vehicle trip rates are based on the average rates published by the Institute of Transportation Engineers in *Trip Generation* (7th Ed., 2003). The rates were reduced for alternative mode use based on U.S. Census Journey to Work Data. Internalization of vehicle trips was estimated using the 4Ds method, a methodology for estimating travel demand impacts from land-use and urban design changes. The methodology uses a set of elasticity factors that relate a neighborhood's built environment characteristics and regional accessibility to the amount of vehicular travel generated in the neighborhood. These factors are used to compute the percentage change in vehicle trips resulting from different land-use plans and urban designs. The VMT per trip is based on the Daily Alameda County Congestion Management Agency's model for the Year 2030 adjusted for the internalization estimate (vehicle trips that stay within Emeryville) from the 4Ds analysis. For a complete description of the method used to estimate trips, see Section 3.2.

Trip Generation

Internalization estimates refer to the percent of trips that have origins and destinations in Emeryville; they are presented for each alternative in Table 4.3-2. A higher internalization rate suggests that there are more work, living, and recreational opportunities in Emeryville, thus, minimizing the need for travel to/from other areas of the Bay Area and reducing average VMT per trip. The internalization estimate improves under each alternative, and is highest for the proposed Plan and Alternative 2. Existing conditions, which represent the lowest internalization estimate with 30 percent, is shown for comparison purposes.

Table 4.3-2 Internalization Results

Scenario	*Internalization Estimate*
Existing	30%
Proposed General Plan	37%
Alternative 1	36%
Alternative 2	37%
No Project	33%

Source: Fehr & Peers, 2009.

Trip generation by mode and time period for each alternative is presented in Table 4.3-3. The results are similar for the proposed project and the alternatives because the same set of policies are assumed in each scenario. Plan policies support all modes of travel through the implementation of "complete streets" wherein pedestrians, bicyclists, motorists, and public transit users of all ages and abilities are able to safely and comfortably move around the city. Existing conditions are shown for comparison purposes. All of the alternatives report a lower proportion of automobile use on weekday trips, but slightly higher for weekday PM and Saturday afternoon trips.

Table 4.3-3 Allocation of Citywide Trip Generation, by Mode

		Alternative				
Mode	*Time Period*	*Existing*	*Proposed General Plan*	*Alternative 1*	*Alternative 2*	*No Project*
Automobile	Weekday	81%	79%	79%	79%	79%
	Weekday PM	79%	81%	80%	81%	80%
	Saturday Aft.	78%	81%	80%	80%	80%
Transit	Weekday	12%	13%	13%	14%	13%
	Weekday PM	14%	12%	12%	13%	12%
	Saturday Aft.	14%	11%	12%	13%	12%
Walk/Bike (excl. walking or biking to/from transit)	Weekday	7%	8%	8%	8%	8%
	Weekday PM	8%	7%	7%	7%	7%
	Saturday Aft.	8%	9%	7%	7%	7%

Source: Fehr & Peers, 2009.

Vehicle Miles Traveled

VMT per weekday trip for each alternative is presented in Table 4.3-4. VMT per trip captures some of the unique characteristics of Emeryville, including the mix of land uses provided and the ratio of jobs to employed residents—both of which can reduce the number and length of vehicle trips. Lower VMT per trip suggests that people need to travel shorter distances to reach destinations. These results show that the VMT per trip is expected to be lowest (and approximately the same) for the proposed General Plan, Alternative 1, and Alternative 2. The No Project alternative is somewhat higher, at 6.3 VMT per trip and the Existing and No Growth even higher at 6.5. All of these alternatives are substantially lower than the 8.6 average VMT per trip projected for Bay Area as a whole in 2030.

Table 4.3-4 Vehicle Miles Traveled per Trip

Location Scenario	*Year*	*VMT per Trip*
Emeryville Existing	2005	6.5
Emeryville with Proposed General Plan	2030	6.0
Emeryville with No Project (1987 General Plan)	2030	6.3
Emeryville with Alternative 1 – Mixed-Use City	2030	6.0
Emeryville with Alternative 2 – Neighborhood Centers	2030	6.0
Bay Area Existing	2005	8.4
Bay Area Projected	2030	8.6

Sources: Alameda County Congestion Management Agency Model, 2005; Metropolitan Transportation Commission for the San Francisco Bay Area, 2006; Fehr & Peers, 2009.

- *Alternative 1.* Alternative 1 has an internalization rate of 36 percent, just slightly below the proposed General Plan. Alternative 1 has similar results in terms of trip generation by mode and average VMT per trip, compared to the proposed Plan. However, buildout of Alternative 1 would generate about 25 percent more trips than the proposed General Plan and would likely result in four (4) additional significant impacts at study intersections because operations would deteriorate from acceptable Level of Service (LOS) D or better (per 1987 General Plan) under existing conditions to an unacceptable LOS E or F under future conditions with the Alternative 1:
  - Ashby Avenue/7th Street (PM)
  - Stanford Avenue/San Pablo Avenue (PM)
  - Hollis Street/Park Street (PM)
  - 40th Street/Hollis Street (PM)

  Alternative 1 would not result in additional impacts on freeway segments or roadway segments evaluated as part of the Metropolitan Transportation System network. In addition, there would be no additional impacts to transit, pedestrian, and bicycle modes as compared to the proposed General Plan. The same mitigation measures identified to reduce the impacts of the proposed General Plan are recommended to reduce the impacts of Alternative 1.

- *Alternative 2.* Alternative 2 has an internalization rate of 37 percent, which is equal to the rate for the proposed General Plan. Alternative 2 has similar results in terms of trip generation by mode and average VMT per trip, compared to the proposed Plan. Buildout of Alternative 2 would result in the same impacts of the proposed General Plan because Alternative 2 would generate only slightly fewer trips than the proposed General Plan. The same mitigation measures identified to reduce the impacts of the proposed General Plan are recommended to reduce the impacts of Alternative 2.
- *No Project.* The No Project alternative has the lowest internalization rate (33 percent) compared with the other alternatives and the projects. The No Project alternative has similar

results in terms of trip generation by mode, compared to the proposed Plan; but, it has a lower (better) average VMT per trip, with 6.0 miles per trip. Overall, buildout of the No Project alternative would result in the same impacts of the proposed General Plan because the No Project alternative would generate only ten percent less trips than the proposed General Plan. The same mitigation measures identified to reduce the impacts of the proposed General Plan would be recommended to reduce the impacts of the No Project alternative.

HAZARDOUS MATERIALS AND TOXICS

Each of the alternatives include increased residential use, as well as increased retail, commercial and other non-residential land use compared to existing conditions, as does the proposed General Plan. The difference between the alternatives with respect to hazardous materials lies largely in the relative amounts of residential and non-residential land uses proposed. Increased non-residential uses would likely result in increased hazardous materials use, handling or storage, or the generation of hazardous waste associated with industrial and commercial uses. Increases in residential use would increase overall use of household hazardous materials.

- *Alternatives 1 and 2.* Both Alternatives 1 and 2 would result in the same less-than-significant impacts resulting from increased land uses that might handle, store and dispose of hazardous materials. Whereas non-residential land uses have the potential to handle, store and dispose of greater quantities of hazardous materials, residential uses of hazardous materials are not as regulated and controlled. Nonetheless, the potential impacts would, as a whole, be similar with both Alternative 1 and Alternative 2 and the proposed General Plan, although the distribution of residential and non-residential uses varies among each scenario. Further, both alternatives would involve construction activities for new development and redevelopment. With adherence to the existing regulatory framework that controls hazardous materials, as well as proposed General Plan policies that align with existing regulations, the potential hazardous materials impacts of Alternative 1 and Alternative 2 would be the same as the proposed Project.
- *No Project.* The No Project alternative would not result in any impacts to hazardous materials beyond those identified in the EIR for the 1993 General Plan. That EIR cited former industrial use sites that would require extensive cleanup, and new industries that may employ materials which, if mishandled, could also become hazardous. However, with application of the appropriate mitigation measures, and City cooperation with State and County regulations enforcement, those potential impacts would be less than significant. Therefore, the impact would be the same as for the proposed Project.

BIOLOGICAL RESOURCES

Each of the alternatives proposes increased development in areas of the city, as does the proposed General Plan. The city is mostly urbanized with little natural area that could be lost or degraded of habitat for biological resources.

- *Alternatives 1 and 2.* Both Alternatives 1 and 2 would result in the same less-than-significant impacts associated with biological resources and wetlands impacts. The differences in the type, location, or mix of land uses that would occur with either of the alternatives would not vary the potential effects to biological resources. In particular, increases in development or

population that would result with either of the scenarios would not significantly affect habituated urban wildlife or sensitive resources, such as Eastshore State Park in particular, any differently than would occur with the proposed General Plan. As a result, Alternatives 1 and 2 would not create any new or substantially different impacts than identified in the proposed General Plan analysis. With adherence to the existing regulatory framework that applies to biological resources and wetlands, as well as proposed General Plan policies that align with existing regulations, the potential biological impacts of Alternative 1 and Alternative 2 would be the same as with the proposed General Plan.

- *No Project.* The No Project alternative result in the implementation of policies and development outlined in the 1993 General Plan. That plan contained proposals to restrict human access to the Emeryville Crescent area, a regionally important salt marsh, to protect the habitat, promote educational use and restrict any bay fill projects. Impacts analyzed in the EIR for the 1993 General Plan are addressed and minimized in this current analysis of the General Plan update. Therefore, no additional significant impacts would be created by a No Project alternative.

HYDROLOGY AND FLOODING

Each of the alternatives includes the construction of new residential, retail, commercial and other non-residential structures. The development would primarily occur in areas that have been previously developed as there are relatively few open areas remaining in the planning area.

- *Alternatives 1 and 2.* Both Alternatives 1 and 2 would result in the same less-than-significant impacts to water quality and flooding as identified for the proposed General Plan. Additional development would occur under each of the alternatives and on sites that are currently developed. Additionally, each of the alternatives would include proposed improvements to Temescal Creek to result in less-than-significant short-term impacts during construction and beneficial water quality effects long term. When compared to the proposed General Plan, water quality impacts related to hydrology and flooding would be addressed by the same regulatory framework which requires new development to adhere to drainage control measures, as well as proposed General Plan policies that further reduce impacts to less than significant.
- *No Project.* The No Project alternative would not result in hydrology resource impacts beyond those identified in the EIR for the 1993 General Plan, which identified stormwater runoff, particularly from industrial uses, as a major source of contaminants to water resources. Further, that document stated that overall impacts resulting from the transition from industrial uses to residential and commercial uses would be beneficial. The development that would occur under the No Project alternative would be required to adhere to all local and state requirements related to stormwater controls and permitting. In summary, the No Project alternative would result in the same less-than-significant and beneficial impacts as identified for the proposed Project.

GEOLOGY, SOILS, AND SEISMICITY

Each alternative would consist of increased development throughout the planning area, which would affect the same geological, soils and seismic risks and conditions as development that would occur with the proposed General Plan.

- *Alternatives 1 and 2.* Both alternatives 1 and 2 would result in new development throughout the city. The City of Emeryville is located in a region where there are a lot of seismic hazards including liquefaction, groundshaking, and settlement. Increased development, under either alternative, would result in new construction attracting a larger population. Throughout the planning area there are geologic and seismic hazards present that could potentially affect any proposed developed if not constructed appropriately. Impacts related to geology, soils, and seismicity would be similar with no additional impacts beyond those identified for the proposed General Plan. All development would be required to adhere to the California Building Code, Uniform Building Code, and implement recommendations identified in mandatory site specific geotechnical investigations. Adherence to these codes and industry standards would reduce the potential impacts of development throughout the city to less than significant, as identified for the proposed General Plan.
- *No Project.* The No Project alternative would not result in significant impacts related to Geology, Soils and Seismicity. Additional buildout would occur as projected in the 1993 General Plan, however it would be less than what is planned for in the proposed project. The EIR for that document identified the potential hazards of liquefaction, subsistence, landslides, and settlement which were not anticipated to have a high potential for occurrence. Application of mitigation measures would result in less than significant impacts of exposure of people or property to geologic hazards. In summary, no additional impacts beyond any identified in the EIR for the 1993 General Plan would occur with the proposed Project and would be similar to those for alternatives 1 and 2.

NOISE

The comparison of roadway noise impacts under the alternatives is based on traffic modeling projections since vehicular traffic on area streets and highways are the primary generators of noise in Emeryville. Noise levels will be highest at intersections with high traffic volumes, and alternatives with lower levels of development or development located further from highly travelled roadways would provide the least exposure to high noise levels.

In addition, the City of Emeryville is served by the Union Pacific Railroad (UPRR) and Amtrak, which are also major sources of noise. These tracks traverse north-south through the center of the city. Train noise, however intermittent, is a major source of noise due to its magnitude. Buildout of the proposed General Plan or one of the alternatives could locate noise-sensitive land uses in the vicinity of the railroad corridor, which could result in the exposure of sensitive receptors to noise levels that exceed City standards. The actual level of impact would depend on the presence and location of any existing or proposed land uses in relation to the noise source.

- *Alternative 1.* Alternative 1 would have projected daily vehicle trips 7.5 percent greater than buildout of the proposed General Plan. Although citywide noise levels associated with traffic

for this alternative are likely to be slightly greater when compared to the proposed Project, the difference in noise exposure would not be noticeable compared to the proposed General Plan and would also be significant and unavoidable. (By comparison, a 100-percent increase (doubling) of traffic on a roadway will generally increase noise by 3 A-weighted decibels (dBA), which would be noticeable.)

The noise impact from train operations would be potentially reduced under Alternative 1 since there are fewer housing units projected in this alternative in proximity to the railroad tracks. However, similar to the proposed General Plan, the actual level of impact would depend on the presence and location of any existing or proposed land uses in relation to the noise source.

- *Alternative 2.* Alternative 2 would have projected daily vehicle trips 1.6 percent less than buildout of the proposed General Plan. Although citywide noise levels associated with traffic for this alternative are likely to be slightly less when compared to the proposed Project, the difference in noise exposure would not be noticeable compared to the proposed General Plan and would also be significant and unavoidable. (By comparison, a 100-percent decrease (halving) of traffic on a roadway will usually decrease noise by 3 dBA, which would be noticeable.)

  The noise impact from train operations would be potentially greater under Alternative 2 compared to the proposed General Plan or Alternative 1, since Alternative 2 proposes a greater amount of residential land uses, some of which will be in close proximity to the railroad tracks. However, similar to the proposed General Plan, the actual level of impact would depend on the presence and location of any existing or proposed land uses in relation to the noise source.

- *No Project.* The No Project alternative would not have as much development as the other alternatives, and would decrease projected daily vehicle trips by 3.4 percent compared to the proposed General Plan. Thus, although citywide noise levels associated with traffic for this alternative are likely to be slightly less when compared to the proposed Project, the difference in noise exposure would not be noticeable compared to the proposed General Plan and would also be significant and unavoidable.

  The noise impact from train operations would be potentially reduced under the No Project alternative compared to the proposed General Plan since the No Project alternative proposes fewer residential uses along the railroad tracks. However, similar to the proposed General Plan, the actual level of impact would depend on the presence and location of any existing or proposed land uses in relation to the noise source.

CULTURAL RESOURCES

The City of Emeryville contains a number of historic resources, including historic buildings that are contributory to local historic districts, such as the Park Avenue Historic District. There are also five recorded Native American archaeological sites and 18 historic archaeological sites are currently located within the Emeryville General Plan area. Finally, fossil discoveries have occurred in close proximity to Emeryville and in similar geological materials that underlie parts of the city. Each of the alternatives proposed new development throughout the city, creating the

potential to affect cultural resources. Each alternative and the proposed General Plan will impact the same sites, so the potential impacts are the same in all scenarios, and are significant and unavoidable.

- *Alternatives 1 and 2.* When compared to the proposed Project, impacts to cultural resources would likely be similar under both Alternatives 1 and 2. New infill development, within previously developed areas of the city, may impact sites of local historic importance. In addition, new development could disturb previously unrecorded archaeological or paleontological resources. Existing Federal, State, and local laws which protect cultural resources would also apply to new development under Alternatives 1 and 2, as would proposed General Plan policies for the evaluation and protection of cultural resources, especially during ground-disturbing activities. Both Alternatives 1 and 2 would result in similar potential impacts to cultural resources, which are significant and unavoidable.
- *No Project.* Additional buildout would occur as projected in the 1993 General Plan—at less intensity, but in the same areas as the proposed Project. The No Project alternative would therefore also result significant impacts related to cultural resources.

AIR QUALITY

Air pollutant emissions are a function of human activity and are directly related to population and consequently to VMT by the population. Development under all alternatives would result in increases in population and employment and consequently increases in traffic and air pollutant emissions. This comparison is shown in Table 4.3-5.

In Emeryville, air quality impact analysis must determine consistency of a proposed plan with the population and VMT in the applicable regional air quality plan, in this case, the *2005 Bay Area Ozone Strategy*. In forecasting future stationary and mobile source emissions and preparing the regional air quality plan, the Bay Area Air Quality Management District (BAAQMD) uses growth projections prepared by the Association of Bay Area Governments (ABAG). Based on 2003 ABAG Projections, the population in Emeryville is projected to be 10,500 in 2030 with a rate of population growth of 1.2 percent per year between 2005 and 2030 (ABAG, 2003). The population projection at buildout for each alternative and the proposed General Plan exceed the ABAG projection. Therefore, given the consistency analysis requirement of BAAQMD, none of the alternatives would be consistent with regional air quality planning and the resulting impact is significant and unavoidable for each alternative.

Table 4.3-5: Comparative Transportation Impacts on Air Quality

	Existing	*Proposed General Plan*	*No Project*	*Alternative 1*	*Alternative 2*
Population	9,727	16,600	12,700	15,200	19,900
Average Vehicle Trip Length	6.5	6.0	6.3	6.0	6.0
Total Daily VMT	859,000	1,154,000	1,174,000	1,257,000	1,136,000

Note: Average Daily Vehicle Trips based on weekday daily trip generation estimates for the entire City of Emeryville.

Source: Fehr & Peers, 2009.

- *Alternative 1.* Alternative 1 has a projected VMT 8.9 percent greater than buildout of the proposed General Plan. Alternative 1 anticipates that the population in Emeryville will increase from 9,727 in 2008 to 15,200 in 2030. This represents a growth rate of 2.1 percent per year to the buildout year 2030. Based on 2003 ABAG Projections, the population in Emeryville is projected to be 10,500 in 2030 with a rate of population growth of 1.2 percent per year between 2005 and 2030 (ABAG, 2003). Therefore, the population growth under Alternative 1 would exceed the ABAG's 2003 population projections and would result in a significant impact, as would also occur with the proposed General Plan.

  VMT is expected to increase by 1.5 percent per year under Alternative 1, which would not exceed the rate of increase in population. Proposed General Plan policies would also apply to this alternative and further reduce impacts, but the impact would remain significant and unavoidable because of projected growth exceeding the ABAG's 2003 population projections.

- *Alternative 2* has a projected VMT 1.6 percent less than the proposed General Plan. Alternative 2 anticipates that the population in Emeryville will increase from 9,727 in 2008 to 19,900 in 2030. This represents a growth rate of 3.3 percent per year to the buildout year 2030. Based on 2003 ABAG Projections, the population in Emeryville is projected to be 10,500 in 2030 with a rate of population growth of 1.2 percent per year between 2005 and 2030 (ABAG, 2003). Therefore, the population growth under Alternative 2 would exceed the ABAG's 2003 population projections and would result in a significant impact, as would also occur with the proposed General Plan.

  VMT is expected to increase by 1.1 percent per year under Alternative 2, which would not exceed the rate of increase in population. Proposed General Plan policies would also apply to this alternative and further reduce impacts, but the impact would remain significant and unavoidable because of projected growth exceeding the ABAG's 2003 population projections.

- *No Project.* The No Project alternative would generate 12,700 residents, 29,000 jobs, and 187,500 vehicle trips at buildout. However, since the trip length is greater than the proposed General Plan, the projected VMT is 1.7 percent greater than buildout of the proposed General Plan. The No Project alternative anticipates that the population in Emeryville will increase from 9,727 in 2008 to 12,700 in 2030. This represents a growth rate of 1.2 percent per year to the buildout year 2030. Based on 2003 ABAG Projections, the population in Emeryville is projected to be 10,500 in 2030 with a rate of population growth of 1.2 percent per year between 2005 and 2030 (ABAG, 2003). Although the population growth rate would meet the ABAG projections, the total population under the No Project alternative would exceed the ABAG's 2003 population projections and would result in a significant impact, as would also occur with the proposed General Plan.

  VMT is expected to increase by 1.3 percent per year under the No Project alternative, which would exceed the rate of increase in population. Proposed General Plan policies would also apply to this alternative and further reduce impacts, but the impact would remain significant and unavoidable.

PUBLIC SERVICES AND UTILITIES

The comparison of impacts on public facilities is based on the degree of increased demand on public school, water supply, wastewater treatment, solid waste, and public safety and emergency preparedness facilities and services. The proposed General Plan and all three alternatives propose some increased demand on these public services and utilities. With little new demand for public services and facilities, the No Project alternative is the environmentally superior alternative in this issue area. However, impacts on all public services and utilities was found to be less than significant for the proposed General Plan given that regional planning has been completed for water, wastewater, and solid waste, as well as the small contribution Emeryville makes towards the capacity of these services. Since both Alternatives 1 and 2 include a combined increase in population and jobs when compared to the proposed General Plan, these alternatives would have potentially more impact on public services and utilities in Emeryville.

Schools

The comparison of impacts on school facilities is based on the degree of increased student enrollment and demand for new school facilities. This analysis considered the same enrollment factor of 0.13 students per unit for all alternatives, as was used to evaluate the proposed General Plan. Table 4.3-6 shows the projected student enrollment for each alternative. The Emeryville Center of Community Living is a separate project that is not dependent on the proposed General Plan and is therefore included in all alternatives. The proposed General Plan, No Project alternative, and Alternative 1 would all result in a student population at or below the school capacity in Emeryville in 2030.

- *Alternative 1.* Under this alternative there will be approximately 200 more students in 2030, well within the capacity of existing schools or the Center.
- *Alternative 2.* This alternative results in the largest increase in housing and population, and therefore the largest increase in student enrollment. The increase in enrollment would be approximately 600 more students than in the existing condition, exceeding the capacity of existing schools or the Center. In this case, one of the schools would have to stay open or re-open to accommodate the increase in student population.
- *No Project*. Under this alternative there will be approximately 100 more students in 2030, well within the capacity of existing schools or the Center.

Table 4.3-6 New Demand for Public Schools for Alternatives

Land Use Alternative	*Total 2030 Enrollment*[1]	*Students Above Existing Capacity*
Proposed General Plan	1,200	0
Alternative 1	1,000	-200
Alternative 2	1,400	200
No Project	900	-300

1. Student enrollment is rounded to the nearest 100.

Source: Dyett & Bhatia, 2008.

Water Supply

As part of the East Bay Municipal Utility District (EBMUD) planning district, Emeryville's water demand is considered in the EBMUD Urban Water Management Plan (UWMP). This EIR considers whether changes in population projections in the proposed General Plan or alternatives would make a significant difference on water demand currently planned for in the 2005 UWMP. The 2005 UWMP has projected that water demand will increase to approximately 232 million gallons per day (mgd) in 2030.

Table 4.3-7 projects and compares water demand under each alternative. None of the alternatives make up more than 3.3 percent of EBMUD's expected total demand for 2030. The greatest difference when compared to Projections 2005, used by EBMUD in its 2005 UWMP, is for Alternative 1, which still only varies by one percent from EBMUD's estimates. This indicates that the future population of Emeryville under the proposed General Plan is sufficiently accounted for in EBMUD's planning document, and EBMUD is expected to be able to serve this growth. However, the No Project alternative requires significantly less water due to the low population and employment growth in that alternative.

Table 4.3-7: Water Demand Comparison of Alternatives

	Proposed General Plan	*No Project*	*Alternative 1*	*Alternative 2*	*Projections 2005 (EBMUD Planning)*
Population	16,600	12,700	15,200	19,900	11,500
Employment	30,000	29,000	33,000	28,000	22,220
Total Potential Customers	46,600	12,780	48,200	47,900	33,720
Average daily water demand in 2030 (mgd)	7.40	2.03	7.66	7.62	5.37
Percent of Total Demand in 2030	3.19%	0.88%	3.30%	3.28%	2.31%

Note: Total Demand in 2030 is estimated to be 232 mgd, assuming planned conservation and recycled water savings reductions have been applied.[1]

Note: Average daily water use is estimated to be 159 gallons per person.

Note: Because some people may live and work in Emeryville, the estimate for total potential customers is considered conservative.

Source: Dyett & Bhatia, 2008; EBMUD UWMP, 2005; ABAG Projections, 2005; EBMUD Annual Report, 2007.

- *Alternative 1.* Alternative 1 results in the highest average daily water demand, though very similar to Alternative 2. Water demand is approximately one percent greater than anticipated using numbers from Projections 2005, as done by EBMUD in their 2005 UWMP. EBMUD capacity is still expected to be sufficient under this alternative.
- *Alternative 2.* Alternative 2 results in the second highest average daily water demand. Water demand is approximately one percent greater than anticipated using numbers from

[1] UWMP 2005: Chapter 4. Water Demand (4-6).

Projections 2005, as done by EBMUD in their 2005 UWMP. EBMUD capacity is still expected to be sufficient under this alternative.

- *No Project.* The No Project alternative results in the lowest average daily water demand. EBMUD capacity is still expected to be sufficient under this alternative.

Wastewater Treatment

EBMUD provides secondary treatment for a maximum flow of 168 mgd. Primary treatment can be provided for up to 320 mgd. Storage basins provide plant capacity for a short-term hydraulic peak of 415 mgd. The average annual flow is currently 80 mgd and is expected to remain constant through 2030.[2]

This analysis assumes that wastewater generation is approximately 90 percent of total water usage, with 10 percent of total water usage being water that is consumed or used for irrigation. Estimated wastewater generation is described in Table 4.3-8. None of the alternatives would exceed the remaining secondary or primary treatment capacity at the plant. Wastewater flow would use only a small percent of the capacity of the wastewater treatment plant under any of the alternatives. However, for all alternatives, it is expected that because they do not exceed wastewater treatment EBMUD requirements, the increases could be managed by EBMUD, indicating that none of the alternatives would have a significant impact on wastewater treatment facilities, or require the expansion of existing facilities.

Table 4.3-8: Wastewater Generation Comparison of Alternatives

	Proposed General Plan	*No Project*	*Alternative 1*	*Alternative 2*
Estimated Total Customers (Population and Jobs)	46,600	12,780	48,200	47,900
Wastewater Generation (mgd)	6.67	1.83	6.9	6.85
% of average annual flow (80 mgd)	8%	2%	9%	9%
% of Secondary treatment maximum flow (168 mgd)	4%	1%	4%	4%

Source: Dyett & Bhatia, 2008; EBMUD UWMP, 2005; and EBMUD Annual Report, 2007.

- *Alternative 1 and 2.* Alternative 1 and 2 result in the highest average daily wastewater demand. EBMUD capacity is still expected to be sufficient under these alternatives.
- *No Project.* The No Project alternative results in the lowest average daily wastewater generation.

Solid Waste

Waste generation rates for households and businesses are maintained by the California Integrated Waste Management Board (CIWMB). According to CIWMB, the typical solid waste generation

[2] UWMP 2005: Chapter 5: Wastewater and Recycled Water. p 5.4; http://www.ebmud.com/wastewater/treatment/default.htm

rate for a resident of Emeryville is two pounds per resident per day. The employee waste generation rate for an employee of Emeryville is 4.5 pounds per employee per day.[3] As shown in Table 4.3-9, for all alternatives, Emeryville solid waste generation is far below one percent of the capacity at Altamont Landfill. Due to the low population and employment growth, the No Project alternative results in the smallest amount of waste generation.

Table 4.3-9: Solid Waste Generation Comparison of Alternatives

	Proposed General Plan	*No Project*	*Alternative 1*	*Alternative 2*
Population Generation (tons per day)	17	13	15	20
Employee Generation (tons per day)	68	65	74	63
Total Tons	84	78	89	83
Daily tons sent to landfill[1]	22	20	23	22
Percent of permitted waste at Altamont Landfill[2]	0.19%	0.18%	0.20%	0.19%

1. Assuming 74 % waste diversion
2. Altamont landfill allows 11,500 tons per day

Source: California Integrated Waste Management Board, 2008; Dyett & Bhatia, 2008.

- *Alternative 1.* Alternative 1 results in the most waste generation of all alternatives, but still is well under one percent of Altamont Landfill's daily allowance.
- *Alternative 2.* Alternative 2 results in the same amount of waste generation as the proposed General Plan, both of which remain well under one percent of Altamont Landfill's daily allowance.
- *No Project*. The No Project alternative results in the lowest amount of waste generation.

Public Safety and Emergency Preparedness

Current police and fire protection is designed to meet the needs of the existing population and employment base. Implementation of the proposed General Plan or any of the alternatives would result in an increase in residents and employees, thereby increasing the long-term demand for police assistance and emergency fire response. Service expansion would be determined based on response times for the Police Department and call volume, complexity, and response times for the Fire Department. Please see Section *3.10: Public Services and Utilities* for more detail. Public safety and emergency preparedness services are expected to expand in order to serve new residents under all alternatives. Because the No Project results in the smallest increases in population and employment, it would result in the smallest impact on police and fire services capacity.

[3] http://www.ciwmb.ca.gov/Profiles/Juris/JurProfile1.asp?RG=C&JURID=146&JUR=Emeryville. Household estimates are based on 2007 data and employee estimates are based on 2004 data.

- *Alternative 1.* With slightly less new development projected for housing units but more than jobs, Alternative 1 would potentially place more demand on police, fire, and emergency services and facilities than the proposed General Plan. Expansion of existing capacity would be made based on identified needs, as described above.
- *Alternative 2.* With slightly more new development projected for housing units but less for jobs, Alternative 2 would potentially place more demand on police, fire, and emergency services and facilities than the proposed General Plan. Expansion of existing capacity would be made based on identified needs, as described above.
- *No Project.* The No Project alternative would result in the smallest population increase, causing the least impact on fire and police resources. However, expansion of existing capacity would be made based on identified needs, as described above.

PARKS AND RECREATION

The proposed General Plan increases the current park acreage from 15 to between 41 and 46 acres. The City's parkland supply would increase under each alternative, though potentially not as much as the proposed General Plan. The smallest increase would occur under the No Project alternative. The proposed General Plan includes the largest increase in acres of parkland as well as the largest number of acres per 1,000 new residents.

- *Alternative 1.* This alternative includes only 14.8 acres of new parkland, resulting in 2.7 acres of parkland for every 1,000 new residents. This is less than the proposed General Plan and Alternative 2. This would result in accelerated wear on the limited park resources and would not meet community desire for increased parkland. Further, this alternative would fall short of the proposed General Plan's goal of three acres of parkland for 1,000 new residents.
- *Alternative 2.* This alternative creates more balanced development and an overall citywide ratio of jobs/employed residents, and the neighborhood focus includes the creation of more parkland than the No Project alternative or Alternative 1. This alternative will see more substantial increases in the ratio of parkland acres per new 1,000 residents; though less than the proposed General Plan. Further, the this alternative would fall short of the proposed General Plan's goal of three acres of parkland for 1,000 new residents.
- *No Project.* The No Project alternative only anticipates an increase of 7.8 acres of parkland. While this alternative also has the smallest increase in population, it still results in the lowest ratio of parkland to 1,000 new residents. This would result in accelerated wear on the limited park resources and would not meet community desire for increased parkland. Further, the No Project alternative would fall short of the proposed General Plan's goal of three acres of parkland for 1,000 new residents.

Table 4.3-10 illustrates existing and proposed parkland for each alternative comparing increase or decrease of total acres per 1,000 new residents to the levels under the proposed General Plan.

Table 4.3-10: Parkland Comparison of Alternatives

	Proposed General Plan	*Alternative 1*	*Alternative 2*	*No Project*
Parks (acres)	41 - 46	30	41	23
Change from Existing Condition (acres)	30.8	14.8	25.8	7.8
Net New Population	7,000	5,500	10,000	3,000
Acres per 1,000 New Residents	4.4	2.7	2.6	2.6

Source: Dyett & Bhatia, 2008.

VISUAL RESOURCES

Differences in impacts on visual resources relate primarily to extent and type of development under each of the alternatives and to the streetscape character. The No Project provides the least improvement of streetscape or protection of existing visual resources. The proposed General Plan and Alternatives 1 and 2 would provide similar environmental benefits.

- *Alternative 1.* With slightly less new development projected for housing units but more development of office, retail and hotel, this alternative would still include improved streetscape character. Protection of existing neighborhoods would be the same as with the proposed General Plan, as would short-term impacts since the level of development is similar.
- *Alternative 2.* With slightly more new development projected for housing units but less for jobs, this alternative would still include improved streetscape character. Protection of existing neighborhoods would be the same as with the proposed General Plan, as would short-term impacts since the level of development is similar.
- *No Project.* This alternative would not have as much development as the other alternatives, so it would have less short-term impacts on visual resources. However, it would not afford any long-term protection of views or improved streetscape character.

ENERGY

Energy use forecasts are based upon anticipated population and job growth, and the resultant increase in VMT. Typically, larger quantities of energy are consumed by larger populations and greater numbers of jobs than by smaller populations with fewer jobs. Likewise, energy expended on transportation is dependent upon VMT within the city and the efficiency of the transportation network. Transportation, residential, and commercial energy uses were calculated using the same methodology described in Section *3.13: Energy*. Compounded annual growth rates for population and jobs were used to determine worst case scenario rates of growth for energy consumption. Transportation energy use was based on forecast VMT. Energy use varies by alternative, with the No Project alternative resulting in the smallest increase in commercial and residential energy use. Alternative 2 will result in more energy use than the No Project, but less than the proposed General Plan. Alternative 1, with the most focus on job growth, will result in the most commercial and residential energy use. Residential and commercial energy use, described in carbon dioxide equivalent CO^2e, is shown in Table 4.3-11. Similarly, transportation energy use, shown in Table 4.3-12, will be the highest in Alternative 1 and lowest in Alternative 2.

Table 4.3-11: Comparative Residential and Commercial/Industrial Annual Energy Use

	Existing (2007)	*Proposed General Plan*	*No Project*	*Alternative 1*	*Alternative 2*
Electricity (kWh)					
Residential	19,838,436	32,632,361	25,901,937	31,000,743	40,586,499
Commercial/Industrial	208,132,731	303,813,835	293,686,707	334,195,218	283,559,579
Total	227,971,167	336,448,226	319,590,673	365,197,991	324,148,108
% Change from Existing		48%	40%	60%	42%
Natural Gas (therms)					
Residential	994,173	1,635,321	1,298,036	1,553,555	2,033,931
Commercial/Industrial	6,422,821	9,375,469	9,062,953	10,313,015	8,750,437
Total	7,416,994	11,010,790	10,360,989	11,866,570	10,784,368
% Change from Existing		48%	40%	60%	45%

Source: Dyett & Bhatia, 2008.

Table 4.3-12: Comparative Transportation Energy Use in BTUs by Alternative

	Population	*Daily Vehicle Miles Traveled*	*Fuel Efficiency*	*Daily Fuel Consumption*	*Daily BTUs (Billions)*	*BTUs per Capita*	*% Change in Per Capita BTUs from Existing Condition*
Existing	9,727	859,000	17.5	49,086	6.14	630,792	n/a
Proposed General Plan	16,600	1,154,000	27.3	42,271	5.28	318,306	-50
No Project	12,700	1,174,000	27.3	43,004	5.38	423,264	-33
Alt 1: Mixed Use City	15,200	1,257,000	27.3	46,044	5.76	378,651	-40
Alt 2: Neighborhood Centers	19,900	1,136,000	27.3	41,612	5.20	261,380	-59

Note: All estimates assume implementation of Pavley one and two.

Source: Fehr & Peers, 2008; Dyett & Bhatia, 2008.

Greenhouse gas (GHG) emissions are based upon anticipated population, employment, waste generation, and VMT. Emissions for residential, commercial/ industrial and waste are derived based on the Emeryville's Climate Action Plan (CAP) emissions inventory and calculated annual growth rates for population and jobs, consistent with the methodology used in the CAP. Using the protocol developed by the California Climate Action Registry, projections of annual VMT were used to estimate total GHG emissions at buildout for the transportation sector. In addition, as described in greater detail in Section 3.13: Energy and Greenhouse Gases, the analysis includes implementation of Pavley phases 1 and 2 in the emissions analysis. The No Project alternative would result in the lowest total emissions, but the highest per capita emissions, and Alternative 1 would result in the highest emissions, and second highest per capita emissions. Alternative 2 would result in the lowest per capita emissions. GHG emissions are shown in Table 4.3-13.

While emissions from Emeryville would contribute to the cumulative impact of global climate change, as discussed in Section 3.13, City emissions would not have a cumulatively considerable impact under any of the alternatives.

Table 4.3-13: Community Emissions Projections by Alternative for 2030 (metric Tons of CO_2e)

	2004 Existing Conditions	*2030 Emissions*	*Percent Change from 2004 to 2030*	*Per Capita Emissions*
No Project	243,910	268,862	10.23	21
Proposed General Plan	243,910	288,214	18.16	17
Alternative 1: Mixed Use City	243,910	298,111	22.22	20
Alternative 2: Neighborhood Centers	243,910	273,284	12.04	14

Note: Estimates assuming VMT as modeled by F&P and the implementation of Pavley one and two are implemented.

Source: Dyett & Bhatia, 2008; Emeryville Climate Action Plan, November 2008; CCAR GRP v.2.2.

- *Alternative 1.* Alternative 1 would result in 900 fewer housing units and 1,400 fewer residents than the proposed General Plan, but 3,000 more jobs. Due to the focus on employment rather than housing, VMT within the city would increase to 1.257 million under Alternative 1, nine percent higher than the 1.154 million VMT under the proposed General Plan, and the highest VMT of any alternative. Therefore, the demand for transportation energy would be greater than what it would be under the proposed General Plan. Similarly, Alternative 1 results in the largest increase in electricity use and natural gas use of any alternative, including the proposed general plan, when compared to existing conditions. Alternative 1 would also result in the highest GHG emissions of any alternative, in large part due to the high VMT and resultant transportation emissions. Further, because commercial and industrial emissions were already the second largest contributor to GHG emissions, the relatively higher annual growth rate in this category results in another significant contribution to GHG emissions. While the energy-saving and GHG reduction policies implemented under the proposed General Plan would apply to Alternative 1, reducing energy demand and GHG emissions further, Alternative 1 has the least environmental benefit in regard to energy use and GHG emissions.

- *Alternative 2.* Alternative 2 would result in 1,900 more housing units and 3,300 more new residents than the proposed General Plan, but 2,000 less jobs. The estimate of 1.136 million VMT under Alternative 2 is the lowest of any alternative, including the proposed General Plan. Therefore, the demand for transportation energy is the least of any alternative. Further, due to the larger population in Alternative 2, the per capita use of transportation energy is 18 percent less than in the proposed General Plan. Electricity and natural gas use would be higher than under the No Project, but slightly less than under the General Plan, and considerably less than Alternative 1. Alternative 2 would also result in the lowest per capita GHG emissions of any alternative, due to the focus on housing, resulting in a greater jobs-to-housing ratio and the lowest overall VMT. Finally, the energy-saving and GHG reduction policies implemented under the proposed General Plan would apply to Alternative 2, reducing energy demand and GHG emissions further.
- *No Project.* The No Project alternative would result in 2,300 fewer housing units, 3,900 fewer residents, and 1,000 fewer jobs than the proposed General Plan. However, the VMT in the No Project scenario is higher than in the proposed General Plan and Alternative 2, at approximately 1.174 million. Therefore, the No Project alternative would result in the second highest overall demand for transportation energy, behind Alternative 1. The lower growth in jobs and population would result in the lowest electricity and natural gas use of any alternative. Finally, the No Project would result in the lowest GHG emissions, though when considering the smaller population, the per capita GHG emissions are actually the highest of all alternatives. The No Project alternative is the only alternative that would not include the energy-saving and GHG reduction policies implemented under the proposed General Plan. However, the Emeryville CAP includes many of these measures and would result in lower energy use and GHG emissions than shown in this analysis.

4.4 CONSIDERATION AND DISCUSSION OF THE ENVIRONMENTALLY SUPERIOR ALTERNATIVE

CEQA Guidelines (Section 15126.6(e)(2)) require the identification of an environmentally superior alternative among the alternatives analyzed. Although the environmental superiority can vary depending on the topic, or even depending on analysis criteria for the same topic, overall the proposed General Plan represents the environmentally superior alternative. Because CEQA requires identification of an environmentally superior alternative, the No Project Alternative, because of the lower amount of growth and the resulting lessening of adverse impacts, would be environmentally superior. However, CEQA Guidelines mandate that if the No Project alternative is identified as the environmentally superior alternative, then another environmentally superior alternative must be identified, among the other alternatives and the Project.

The proposed General Plan represents the environmentally superior alternative because it minimizes impacts while achieving the goals and guiding principles developed by the General Plan Steering Committee. In particular, the proposed Project focuses development at key nodes and around transit hubs, and improves the balance of job and residential growth, lessening the strain on public facilities. Alternative 2: Neighborhood Centers shows results similar to the proposed General Plan, even reducing impacts to traffic, air quality, and energy usage. But, it has greater impacts on public facilities and services due to a larger residential population. Table

4.4-1 summarizes the relative impacts for each alternative, for all of the topics discussed in this chapter.

Since all new development in the city will result from infill development—the redevelopment of existing sites—each alternative expects development on the same set of sites. Therefore, impacts are no different for many issue areas, including biological resources, hydrology, and geology. Likewise, there is no difference in displacement impacts due to land use changes. For the topics where significant impacts have been identified—traffic, noise, and air quality—differences between the alternatives and the proposed General Plan are negligible in a program EIR. For each of these topics, the result is still a significant and unavoidable impact.

Table 4.4-1: Comparison of Impacts

Topic	*Proposed General Plan*	*Alternative 1*	*Alternative 2*	*No Project*
Land Use and Housing	-	-	-	-
Traffic, Circulation, and Parking	2	4	2	1
Hazardous Materials and Toxics	-	-	-	-
Biological Resources	-	-	-	-
Hydrology and Flooding	-	-	-	-
Geology, Soils, and Seismicity	-	-	-	-
Noise	2	4	2	1
Cultural Resources	4	4	4	4
Air Quality	2	4	1	3
Public Services and Utilities				
Schools	1	1	4	1
Water Supply	2	4	3	1
Wastewater Treatment	2	4	4	1
Solid Waste	2	4	2	1
Public Safety and Emergency Preparedness	2	4	4	1
Parks and Recreation	1	3	2	4
Aesthetics	1	1	1	4
Energy	3	4	1	2
Total	**24**	**41**	**30**	**24**

1 - 4 = Relative Impact (1= Lowest, 4 = Highest)

\- = No Difference and Less than Significant

= Significant Project Impact

5 CEQA Required Conclusions

This section summarizes significant unavoidable, irreversible, growth-inducing, and cumulative impacts, as required by California Environmental Quality Act (CEQA) Guidelines.

5.1 GROWTH-INDUCING IMPACTS

The EIR must examine the potential growth-inducing impacts of the proposed General Plan. More specifically, CEQA Guidelines require that the EIR "discuss the ways in which the proposed project could foster economic or population growth, or the construction of additional housing, either directly or indirectly" (CEQA Guidelines §15126.2(d)). This analysis must also consider the removal of obstacles to population growth, such as improvements in the regional transportation system.

Growth-inducing impacts such as those associated with job increases that might affect housing and retail demand in other jurisdictions over an extended time period are difficult to assess with precision, since future economic and population trends may be influenced by unforeseeable events, such as natural disasters and business development cycles. Moreover, long-term changes in economic and population growth are often regional in scope; they are not influenced solely by changes or policies related to City or development project. Business trends are influenced by economic conditions throughout the state and country as well as around the world.

Another consideration is that the creation of growth-inducing potential does not automatically lead to growth. Growth occurs through capital investment in new economic opportunities by the private or public sector. These investment patterns reflect, in turn, the desires of investors to mobilize and allocate their resources to development in particular localities and regions. These and other pressures serve to fashion policy. These factors, combined with the regulatory authority of local governments, serve to mediate the growth-inducing potential or pressure created by a proposed plan. Despite these limitations on the analysis, it is still possible to qualitatively assess the general potential growth-inducing impacts of the proposed General Plan.

PROJECTED GROWTH

Population

According to the California Department of Finance (DOF), the 2008 population of the City of Emeryville was 9,727, comprising less than one percent of the Alameda County's total population of 1,543,000 (DOF, 2008). Under the proposed General Plan, Emeryville will accommodate a population of approximately 16,600 people at buildout, an increase of about 71 percent over the 2008 population. This represents an average annual growth rate of 2.46 percent. The population forecast by the proposed General plan is 16 percent greater than the Association of Bay Area Government's (ABAG) projected population of 14,300 in 2030 (ABAG 2007).

The increase in population attributable to the proposed General Plan would represent less than two percent of the total projected new population of Alameda County by 2030. Thus the growth is only a small fraction of anticipated regional growth.

Housing

The General Plan would allow for a maximum buildout of 9,800 households, compared to 7,940 households projected for the year 2030 by ABAG (ABAG 2007). This difference represents a 23 percent increase over ABAG projections and a 64 percent increase over existing housing units.

Employment

Employment in Emeryville under the proposed General Plan would increase by 46 percent from 20,552 in 2008 to 30,000 in 2030. The 2030 estimate under the proposed General Plan is 12 percent more than the 26,690 jobs projected by ABAG. Under the proposed General Plan, jobs in Emeryville will make up three percent of both new and total jobs in Alameda County in 2030. Roughly 500 industrial jobs may be displaced by proposed development, although the proposed General Plan is projected to provide a net increase of approximately 9,400 jobs through increases in office, technology, retail and hotel land uses.

Overall, the proposed General Plan would accommodate more population and job growth than projected by ABAG. However, given that Emeryville's borders are defined by surrounding cities of Berkeley and Oakland, as well as the San Francisco Bay, the city's growth will be through densification and intensification rather than by expanding outward. This focus of growth within the urban core with sufficient transportation and public service infrastructure is in line with the smart growth goals of ABAG, as it will lessen pressure for growth on the urban fringe.

In addition, ABAG is in the process of adapting new projections – "Projections 2009" – which are much closer to the General Plan projections.

INCREASE IN REGIONAL HOUSING DEMAND

As the employment base in Emeryville continues to increase, more people may be drawn to Emeryville and surrounding areas. As a result, housing demand may increase in both Emeryville and other adjacent areas that are within commuting distance. At the same time, the concept of transit oriented development means the jobs in this area would be accessible from many cities. Further, the proposed Plan will result in development of approximately 3,800 new housing units by the year 2030, which will help meet some of the increased housing need. Emeryville is in the process of updating its Housing Element, concurrent with the drafting of the proposed General Plan. The current version was adopted in 2001 and certified by the California Department of Housing and Community Development and includes programs to address regional housing needs of the near term. The current update will extend, modify, or add to these programs as needed to continue to respond to each city's "fair share" of regional housing needs, as required by law.

JOBS/HOUSING BALANCE

A city's jobs/employment ratio (jobs to employed residents) would be 1:1 if the number of jobs in the city equaled the number of employed residents. In theory, such a balance would eliminate the need for commuting. More realistically, a balance means that in-commuting and out-commuting are matched, leading to efficient use of the transportation system, particularly during peak hours. The current jobs/housing ratio in Emeryville is 3.7:1, which means that there are 3.7 jobs for every employed resident in the City. This is the highest ratio of jobs to employed residents of any city in the Bay Area with the exception of Colma, which has a population of 1,500. Emeryville's jobs/employed residents' ratio has remained constant over the past decade, balancing the spike in jobs between 1995 and 2000 with the residential spike between 2000 and 2005.

While the General Plan anticipates employment dominance to continue, Emeryville's jobs/employed residents' ratio is expected to be in greater balance by 2030. With nearly 10,000 jobs expected to be added over the life of the Plan, the City can expect a jobs/employed residents ratio of approximately 2.6:1. Although this still represents a much higher ratio compared with nearby cities, it does reflect a substantial improvement toward a more balanced city. As a consequence, the General Plan is not expected to have an adverse impact on jobs/housing balance that would contribute, directly or indirectly, to regional, subregional or citywide growth inducing impacts. Table 5-1 displays existing and projected jobs per employed residents' ratios.

Table 5-1: Jobs per Employed Residents Ratios for the City of Emeryville

	Existing	*Buildout*
Jobs	20,552	30,000
Employed Residents	5,565	11,600
Ratio	3.7	2.6

Source: ABAG Projections, 2007; Dyett & Bhatia, 2008.

Emeryville has always been an industrial center with more jobs than housing. As the job focus shifts to more office, technology, and retail, and housing increases, the city will achieve a more balanced ratio of jobs to employed residents. Development of housing and employment uses under the proposed General Plan may induce population growth in surrounding areas. Intensification of Emeryville with high-density residential uses and mixed-use development containing residential uses would increase the number of housing units within Emeryville. Higher densities are considered appropriate for this area, as it would provide a greater number of residents with convenient access to employment, shopping, and regional transit facilities such as AC Transit, BART, and Amtrak. It is expected that housing growth in Emeryville and a focus on transit-oriented development would relieve some of the pressure for housing elsewhere in the region and allow preservation of lower density neighborhoods in surrounding areas. If, however, cities in the subregion are unable to meet the overall housing demand while job growth continues, development in Emeryville could be said to contribute to the regional trend and exacerbate the regional demand for additional housing.

Physical changes needed to accommodate regional growth may have physical impacts on the environment. Potential effects of these physical changes are evaluated under their respective chapters, such as *3.2: Traffic, Circulation and Parking*, *3.7: Noise*, *3.9: Air Quality*, *3.10: Public Services*, and *3.13: Energy*.

5.2 CUMULATIVE IMPACTS

CEQA requires that the EIR examine cumulative impacts. As discussed in CEQA Guidelines § 15130(a)(1), a cumulative impact "consists of an impact which is created as a result of the combination of the project evaluated in the EIR together with other projects causing related impacts." The analysis of cumulative impacts need not provide the level of detail required of the analysis of impacts from the project itself, but shall "reflect the severity of the impacts and their likelihood of occurrence" (CEQA Guidelines §15130(b)).

In order to assess cumulative impacts, the EIR must analyze either a list of past, present, and probable future projects or a summary of projections contained in an adopted general plan or related planning document. It is important to note that the proposed General Plan is essentially a set of projects, representing the cumulative development scenario for the reasonably foreseeable future in the City of Emeryville Planning Area. This future scenario incorporates the likely effects of surrounding regional growth. By their nature, the air quality, transportation, and greenhouse gas (GHG) emissions analyses presented in Chapter 3 represent a cumulative analysis of the Planning Area as a whole, through 2030. As a result of adding the proposed General Plan to the regional land use and transportation baseline, the travel demand, level of service operations, and associated air quality and GHG emissions produced by the proposed project is the cumulative condition for CEQA purposes. While some cumulative impacts on transportation and air quality are found to be significant, the cumulative effects on GHG emissions are found to be cumulatively significant, but the project's contribution not considerable.

Other cumulative impacts are identified below and within the relevant sections of Chapter 3.

LAND USE AND HOUSING

Concurrent implementation of the proposed General Plan and forecast development of residential and employment land uses in the region would result in increased pressure on water supply resources, which are currently expected to require rationing during a multi-year drought cycle.

Forecast population and employment growth would result in increased pressure on fire and police services. In addition, increased congestion due to population and employment growth will slightly increase fire and police service response times. This effect is not considered significant.

HAZARDOUS MATERIALS, TOXICS, AND SAFETY

Although areas impacted by hazardous materials can be located in close proximity to each other, hazardous material impacts are typically localized or site-specific versus a cumulative geographic area. It is possible, however for combined effects of transporting and disposal of hazardous mate-

rials to be affected by cumulative development. New development under the proposed General Plan when combined with other past, present, and reasonably foreseeable development in the vicinity, would not result in cumulative hazardous materials impacts.

Future development, with implementation of the General Plan policies and established regulatory requirements, would have a less than significant hazardous materials impact to the public or the environment within the vicinity of the Planning Area. Other foreseeable development within the area, although likely increasing the potential to disturb existing contamination and the handling of hazardous materials, would be required to comply with the same regulatory framework as all development projects that involve hazardous materials, as have past and present projects. This includes federal and state regulatory requirements for transporting (Cal EPA and Caltrans) hazardous materials or cargo (including fuel and other materials used in all motor vehicles) on public roads or disposing of hazardous materials (Cal EPA, DTSC, ACEHD). In addition, all development projects in the city of Emeryville would adhere to the proposed General Plan policies. Therefore, the effect of the proposed General Plan on hazardous materials, in combination with other past, present and reasonably foreseeable projects, would be less than significant.

VISUAL RESOURCES

Forecast development would change the visual character of Emeryville and improve the image of the City skyline. This would be a beneficial cumulative impact.

5.3 SIGNIFICANT UNAVOIDABLE ENVIRONMENTAL IMPACTS

According to CEQA Guidelines 15126(b), an EIR must discuss any significant environmental impacts that cannot be avoided under full implementation of the proposed program. Also, this EIR must discuss why the program is being proposed, not withstanding such impacts. The proposed policies of the General Plan described in Chapter 3 of this EIR, would avoid or eliminate most potentially significant impacts. However, several impacts classified as significant unavoidable have been identified.

TRAFFIC

Significant impacts would occur at nine (9) study intersections and freeway segments because operations would deteriorate from acceptable LOS D or better (per 1987 General Plan) under existing conditions to an LOS E or F under future conditions with the General Plan. Poor intersection operations will generate substantial vehicle queues that increase travel time along the San Pablo Avenue corridor and through the Powell Street / Christie Avenue loop system including Christie Avenue, Shellmound Street, and Powell Street.

Buildout of the land uses envisioned in the Emeryville General Plan would result in additional automobile traffic on the freeway system in the vicinity of Emeryville. The freeway system is expected to operate at unacceptable levels for much of the morning and evening peak periods whether or not the General Plan is implemented.

NOISE

New development proposed by the General Plan would result in population and employment increases and more automobile and truck use, such that traffic noise would increase by 5 dBA or greater on three roadway segments under the proposed General Plan. While an increase of 5 dBA is considered significant, it is only significant if it affects sensitive land uses (residences are sensitive and could be negatively affected by a 5 dBA increase; industrial uses are not sensitive and are not likely to be affected by a 5 dBA increase). Two of the roadway segments would have CNEL values below 60 dBA (a level normally acceptable with residential development) even after the increase. Given the uncertainty as to whether future noise impacts could be adequately mitigated for all the individual projects that will be implemented as part of the updated General Plan, this impact remains significant and unavoidable.

AIR QUALITY

The 2005 Bay Area Ozone Strategy is based on population assumptions in the 2003 ABAG Projections. Since the General Plan population projections would exceed the 2003 ABAG projections, the proposed General Plan would not be consistent with the 2005 Bay Area Ozone Strategy and associated emissions generated by the proposed General Plan would exceed the assumptions used in the Ozone Strategy to forecast future trends in emissions that form the basis for future air quality planning. Implementation of General Plan policies would reduce the impact, but given the consistency analysis requirement of BAAQMD, the impact of the proposed Emeryville General Plan is significant.

CULTURAL RESOURCES

The City of Emeryville contains many historic sites as well as sites of local historical importance that may be eligible for designation. A majority of the city's historic resources are located in an Emeryville Historic Industrial District, identified by a 1990 Caltrans survey along Park Avenue, including 19 contributory resources. Because development under the proposed General Plan could result in the demolition of historic resources and sites of local historical importance, and because the court has ruled that such impacts cannot be mitigated to a level of insignificance (52 Cal. App. 4th 896), the potential for new development to impact these sites is significant and unavoidable.

5.4 SIGNIFICANT IRREVERSIBLE ENVIRONMENTAL CHANGES

The EIR must also examine irreversible changes to the environment. More specifically, CEQA Guidelines require the EIR to consider whether "uses of nonrenewable resources during the initial and continued phases of the project may be irreversible since a large commitment of such resources makes removal or nonuse thereafter unlikely" (CEQA Guidelines §15126.2(c)). "Nonrenewable resource" refers to the physical features of the natural environment, such as land, waterways, etc.

AIR QUALITY

Increases in vehicle trips and traffic resulting from implementation of the proposed General Plan would potentially contribute to long-term degradation of air quality and atmospheric conditions in the Bay Area, other parts of California, and the Western United States. However, technological improvements in automobiles, as well as commercial and industrial machinery, may lower the rate of air quality degradation in the coming decades.

ENERGY SOURCES

New development under the proposed General Plan would result in the commitment of existing and planned sources of energy, which would be necessary for the construction and daily use of new buildings and for transportation. Both residential and non-residential development use electricity, natural gas, and petroleum products for power, lighting, heating, and other indoor and outdoor services, while cars use both oil and gas. Use of these types of energy for new development would result in the overall increased use of non-renewable energy resources. This represents an irreversible environmental change. However, energy-reduction efforts may lower the rate of increase.

CONSTRUCTION-RELATED IMPACTS

Irreversible environmental changes could also occur during the course of constructing development projects made possible by the proposed General Plan. New construction would result in the consumption of building materials, natural gas, electricity, water, and petroleum products. Construction equipment running on fossil fuels would be needed for excavation and the shipping of building materials. Due to the non-renewable or slowly renewable nature of these resources, this represents an irretrievable commitment of resources.

5.5 EFFECTS FOUND NOT TO BE SIGNIFICANT

CEQA requires that an EIR provide a brief statement indicating why various possible significant impacts were determined to be not significant. Chapter 3 of this EIR discusses all potential impacts, regardless of their magnitude. A similar level of analysis is provided for impacts found to be less than significant as impacts found to be significant. Significance of an impact is assessed in relation to the significance criteria provided in each section in Chapter 3. A summary of all impacts is provided in the Executive Summary of this EIR.

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CHAPTER 3

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7 Report Authors

THE CITY OF EMERYVILLE

City of Emeryville
1333 Park Avenue
Emeryville, CA 94608

Charles S. Bryant, Director of Planning and Building
Deborah Diamond, Project Manager

CONSULTING TEAM

Dyett & Bhatia, Urban and Regional Planners

755 Sansome Street, Suite 400
San Francisco, CA 94111

Rajeev Bhatia, Principal
Jean Eisberg, Associate
Hannah Lindelof, Planner
Mark Chambers, Graphics Manager
Rose Abbors, Senior GIS Specialist

Environmental Science Associates

225 Bush Street, Suite 1700
San Francisco, CA 94104-4207

Crescentia Brown, Community Development Group Manager
Reema Mahamood, Managing Associate

Hazardous Materials, Toxics, and Safety
Eric Schniewind, Technical Associate

Biological Resources
Bryan Olney, Associate

Hydrology and Flooding
Geology, Soils, and Seismicity
Asavari Devadiga, Managing Associate

Noise
Air Quality
Mathew Morales, Senior Associate

Cultural Resources
Brad Brewster, Senior Managing Associate
Heidi Koenig, RPA, Senior Associate

Energy
Claire Early, Associate

Fehr & Peers
100 Pringle Avenue, Suite 600
Walnut Creek, California 94596

Traffic, Circulation, and Parking
Robert Rees, Principal
Danny Yost, Jr., Transportation Engineer/Planner

Urban Advantage
15 Shattuck Sq., Suite 208
Berkeley, CA 94704

Visual Simulations
Steve Price, President

Appendix A: Notice of Preparation

STATE OF CALIFORNIA

Governor's Office of Planning and Research

State Clearinghouse and Planning Unit

Arnold
Schwarzenegger
Governor

Sean Walsh
Director

Rec'd 2/3/06

Notice of Preparation

February 1, 2006

To: Reviewing Agencies

Re: City of Emeryville General Plan and Zoning Ordinance Update
SCH# 2006022008

Attached for your review and comment is the Notice of Preparation (NOP) for the City of Emeryville General Plan and Zoning Ordinance Update draft Environmental Impact Report (EIR).

Responsible agencies must transmit their comments on the scope and content of the NOP, focusing on specific information related to their own statutory responsibility, within 30 days of receipt of the NOP from the Lead Agency. This is a courtesy notice provided by the State Clearinghouse with a reminder for you to comment in a timely manner. We encourage other agencies to also respond to this notice and express their concerns early in the environmental review process.

Please direct your comments to:

Deborah Diamond
City of Emeryville
1333 Park Avenue
Emeryville, CA 94608

with a copy to the State Clearinghouse in the Office of Planning and Research. Please refer to the SCH number noted above in all correspondence concerning this project.

If you have any questions about the environmental document review process, please call the State Clearinghouse at (916) 445-0613.

Sincerely,

Terry Roberts for Gonzalez

Scott Morgan
Project Analyst, State Clearinghouse

Attachments
cc: Lead Agency

1400 TENTH STREET P.O. BOX 3044 SACRAMENTO, CALIFORNIA 95812-3044
TEL (916) 445-0613 FAX (916) 323-3018 www.opr.ca.gov

Document Details Report
State Clearinghouse Data Base

SCH# 2006022008
Project Title City of Emeryville General Plan and Zoning Ordinance Update
Lead Agency Emeryville, City of

Type NOP Notice of Preparation

Description The City of Emeryville has initiated a comprehensive update of its General Plan, which is an opportunity for community members to explore long-term goals and development for the City. The Plan identifies current and future needs in areas such as land use, housing, transportation, public services, environmental quality, and economic viability.

Lead Agency Contact

Name Deborah Diamond
Agency City of Emeryville
Phone 510.596.4303 **Fax**
email
Address 1333 Park Avenue
City Emeryville **State** CA **Zip** 94608

Project Location

County Alameda
City Emeryville
Region
Cross Streets
Parcel No.
Township **Range** **Section** **Base**

Proximity to:

Highways I-80, I-580
Airports
Railways
Waterways
Schools
Land Use

Project Issues Aesthetic/Visual; Landuse; Traffic/Circulation; Archaeologic-Historic; Recreation/Parks; Toxic/Hazardous; Air Quality; Biological Resources; Water Supply; Water Quality; Geologic/Seismic; Noise; Solid Waste

Reviewing Agencies Resources Agency; Office of Historic Preservation; Department of Parks and Recreation; San Francisco Bay Conservation and Development Commission; Department of Water Resources; Native American Heritage Commission; Office of Emergency Services; Department of Health Services; Department of Fish and Game, Region 3; California Highway Patrol; Department of Housing and Community Development; Caltrans, District 4; State Water Resources Control Board, Division of Water Quality; Department of Toxic Substances Control; Regional Water Quality Control Board, Region 2

Date Received 02/01/2006 **Start of Review** 02/01/2006 **End of Review** 03/02/2006

...r Distribution List

County: [illegible]

SCH# [illegible]

...esources Agency

- [ ] **Resources Agency**
  Nadell Gayou
- [ ] **Dept. of Boating & Waterways**
  David Johnson
- [ ] **California Coastal Commission**
  Elizabeth A. Fuchs
- [ ] **Colorado River Board**
  Gerald R. Zimmerman
- [ ] **Dept. of Conservation**
  Roseanne Taylor
- [ ] **California Energy Commission**
  Roger Johnson
- [ ] **Dept. of Forestry & Fire Protection**
  Allen Robertson
- [ ] **Office of Historic Preservation**
  Wayne Donaldson
- [ ] **Dept of Parks & Recreation**
  Environmental Stewardship Section
- [ ] **Reclamation Board**
  DeeDee Jones
- [ ] **S.F. Bay Conservation & Dev't. Comm.**
  Steve McAdam
- [ ] **Dept. of Water Resources**
  Resources Agency
  Nadell Gayou
- [ ] _____
  Conservancy

...sh and Game

- [ ] **Depart. of Fish & Game**
  Scott Flint
  Environmental Services Division
- [ ] **Fish & Game Region 1**
  Donald Koch
- [ ] **Fish & Game Region 2**
  Banky Curtis
- [x] **Fish & Game Region 3**
  Robert Floerke
- [ ] **Fish & Game Region 4**
  Mike Mulligan
- [ ] **Fish & Game Region 5**
  Don Chadwick
  Habitat Conservation Program
- [ ] **Fish & Game Region 6**
  Gabrina Gatchel
  Habitat Conservation Program
- [ ] **Fish & Game Region 6 I/M**
  Tammy Allen
  Inyo/Mono, Habitat Conservation Program
- [ ] **Dept. of Fish & Game M**
  George Isaac
  Marine Region

Other Departments

- [ ] **Food & Agriculture**
  Steve Shaffer
  Dept. of Food and Agriculture
- [ ] **Depart. of General Services**
  Public School Construction
- [ ] **Dept. of General Services**
  Robert Sleppy
  Environmental Services Section
- [x] **Dept. of Health Services**
  Veronica Rameriz
  Dept. of Health/Drinking Water

Independent Commissions,Boards

- [ ] **Delta Protection Commission**
  Debby Eddy
- [x] **Office of Emergency Services**
  Dennis Castrillo
- [ ] **Governor's Office of Planning & Research**
  State Clearinghouse
- [x] **Native American Heritage Comm.**
  Debbie Treadway
- [ ] **Public Utilities Commission**
  Ken Lewis
- [ ] **State Lands Commission**
  Jean Sarino
- [ ] **Tahoe Regional Planning Agency (TRPA)**
  Cherry Jacques

Business, Trans & Housing

- [ ] **Caltrans - Division of Aeronautics**
  Sandy Hesnard
- [ ] **Caltrans - Planning**
  Terri Pencovic
- [x] **California Highway Patrol**
  John Olejnik
  Office of Special Projects
- [x] **Housing & Community Development**
  Lisa Nichols
  Housing Policy Division

Dept. of Transportation

- [ ] **Caltrans, District 1**
  Rex Jackman
- [ ] **Caltrans, District 2**
  Marcelino Gonzalez
- [ ] **Caltrans, District 3**
  Katherine Eastham
- [x] **Caltrans, District 4**
  Tim Sable
- [ ] **Caltrans, District 5**
  David Murray
- [ ] **Caltrans, District 6**
  Marc Birnbaum
- [ ] **Caltrans, District 7**
  Cheryl J. Powell
- [ ] **Caltrans, District 8**
  Dan Kopulsky
- [ ] **Caltrans, District 9**
  Gayle Rosander
- [ ] **Caltrans, District 10**
  Tom Dumas
- [ ] **Caltrans, District 11**
  Mario Orso
- [ ] **Caltrans, District 12**
  Bob Joseph

Cal EPA

Air Resources Board

- [ ] Airport Projects
  Jim Lerner
  - [ ] Transportation Projects
    Kurt Karperos
  - [ ] Industrial Projects
    Mike Tollstrup
- [ ] **California Integrated Waste Management Board**
  Sue O'Leary
- [ ] **State Water Resources Control Board**
  Jim Hockenberry
  Division of Financial Assistance
- [x] **State Water Resources Control Board**
  Student Intern, 401 Water Quality Certification Unit
  Division of Water Quality
- [ ] **State Water Resouces Control Board**
  Steven Herrera
  Division of Water Rights
- [x] **Dept. of Toxic Substances Control**
  CEQA Tracking Center
- [ ] **Department of Pesticide Regulation**

Regional Water Quality Control Board (RWQCB)

- [ ] **RWQCB 1**
  Cathleen Hudson
  North Coast Region (1)
- [x] **RWQCB 2**
  Environmental Document Coordinator
  San Francisco Bay Region (2)
- [ ] **RWQCB 3**
  Central Coast Region (3)
- [ ] **RWQCB 4**
  Jonathan Bishop
  Los Angeles Region (4)
- [ ] **RWQCB 5S**
  Central Valley Region (5)
  - [ ] **RWQCB 5F**
    Central Valley Region (5)
    Fresno Branch Office
  - [ ] **RWQCB 5R**
    Central Valley Region (5)
    Redding Branch Office
- [ ] **RWQCB 6**
  Lahontan Region (6)
  - [ ] **RWQCB 6V**
    Lahontan Region (6)
    Victorville Branch Office
- [ ] **RWQCB 7**
  Colorado River Basin Region (7)
- [ ] **RWQCB 8**
  Santa Ana Region (8)
- [ ] **RWQCB 9**
  San Diego Region (9)

- [ ] **Other** _____

Last Updated on 08/10/05

NOTICE OF PREPARATION

DRAFT ENVIRONMENTAL IMPACT REPORT (EIR)

Date: January 11, 2006

To: Responsible Agencies, and Interested Parties and Organizations

Subject: Notice of Preparation (NOP) of Draft Environmental Impact Report (EIR) for the City of Emeryville General Plan and Zoning Ordinance Update

Location: City of Emeryville, California

The City of Emeryville is preparing a General Plan Update, as well as a comprehensive update of its Zoning Ordinance (hereafter collectively referred to as General Plan Update), and has determined that an Environmental Impact Report (EIR) will be necessary pursuant to the California Environmental Quality Act (CEQA). The City requests your input on how the General Plan Update may affect the environment. More specifically, input is being solicited regarding the scope and content of environmental analysis that is relevant to your respective agency's statutory/regulatory responsibilities in order to ascertain potential impacts of the proposed project.

Although specific proposals for and revisions to the Emeryville General Plan Update have not yet been determined, we are soliciting your concerns now. This will allow your input to be taken into consideration during formulation of new goals, policies, and programs for the General Plan Update, as well as issues to be addressed in the EIR. A description of the proposed action, location map, and preliminary identification of the potential environmental effects are contained in the attached materials.

If your agency is a responsible agency as defined by Section 15381 of the State CEQA Guidelines, your agency will need to use the environmental documents prepared by the City of Emeryville when considering your permit or other approval for the action.

Due to the time limits mandated by State law, your comments should be submitted by the earliest possible date, but not later than 30 days after your receipt of this notice per CEQA Guidelines Section 15082(b). Please send your written response, with the name of your agency contact person, to: Deborah Diamond, Emeryville General Plan Update, 1333 Park Avenue, Emeryville, CA

94608. Responses can also be provided by email to ddiamond@ci.emeryville.ca.us or faxed to Deborah Diamond at (510) 596-4389.

A Scoping Session for the EIR will be conducted at the regular monthly meeting of the General Plan Update Steering Committee on January 24, 2006 at 6:30 pm in the Emeryville City Council Chambers at 1333 Park Avenue, Emeryville, California. If you have questions regarding this NOP or the Scoping Meeting, you can call Ms. Diamond at (510) 596-4303.

Deborah Diamond — 1-11-06

Deborah Diamond, AICP,
Project Manager of the Emeryville General Plan Update
City of Emeryville

Date

PROJECT TITLE

City of Emeryville General Plan Update

LEAD AGENCY

City of Emeryville
Planning Division
1333 Park Avenue
Emeryville, CA 94608

CONTACT PERSON

Deborah Diamond, Project Manager for General Plan Update

City of Emeryville
(510) 596-4303

PROJECT LOCATION AND BOUNDARIES

Location

Emeryville is located on the east shore of San Francisco Bay in Alameda County, bordered by the City of Berkeley to its north and the City of Oakland to the east and south. Interstate 80 passes through Emeryville, running north from the Bay Bridge, while Interstate 580 passes just to its south. The city's regional location is provided in Figure 1 below.

The city is compact, occupying only 1.2 square miles in land area. Emeryville is largely flat and is distinguished by a

peninsula created in the 1960s that extends a little over a mile into the Bay.

Planning Boundaries

The planning boundaries for the new General Plan coincide with the city limits, show in Figure 2 on the following page.

DESCRIPTION OF PROJECT

The City of Emeryville has initiated a comprehensive update of its General Plan, which is an opportunity for community members to explore long-term goals and development for the City. The State of California requires every city and county to have a comprehensive General Plan that serves as a constitution for long-term physical development. The Plan identifies current and future needs in areas such as land use, housing, transportation, public services, environmental quality, and economic viability.

Emeryville's current General Plan was adopted in 1987 and updated in 1993. The current General Plan has outlived its usefulness, and the City has initiated an update to manage its ongoing transformation from a 20th century industrial center to a vibrant 21st century community with a diverse mix of uses.

The new General Plan, when adopted by the City Council, will govern subsequent City actions relating to Emeryville's physical development. The process of drafting a new General Plan provides residents with an opportunity to step back, assess opportunities and challenges, establish a vision for the city's future, and outline a systematic process by which to achieve it.

The Draft General Plan resulting from the Update process will contain goals and policies addressing the following topics (which may be combined or may be stand-alone elements):

- Land Use
- Urban Design
- Transportation
- Noise
- Conservation
- Safety
- Open Space
- Urban Design
- Sustainability

Figure 1: Emeryville's Location in the San Francisco Bay Region

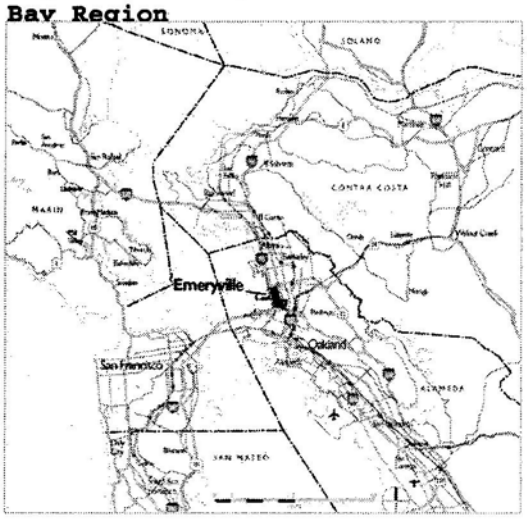
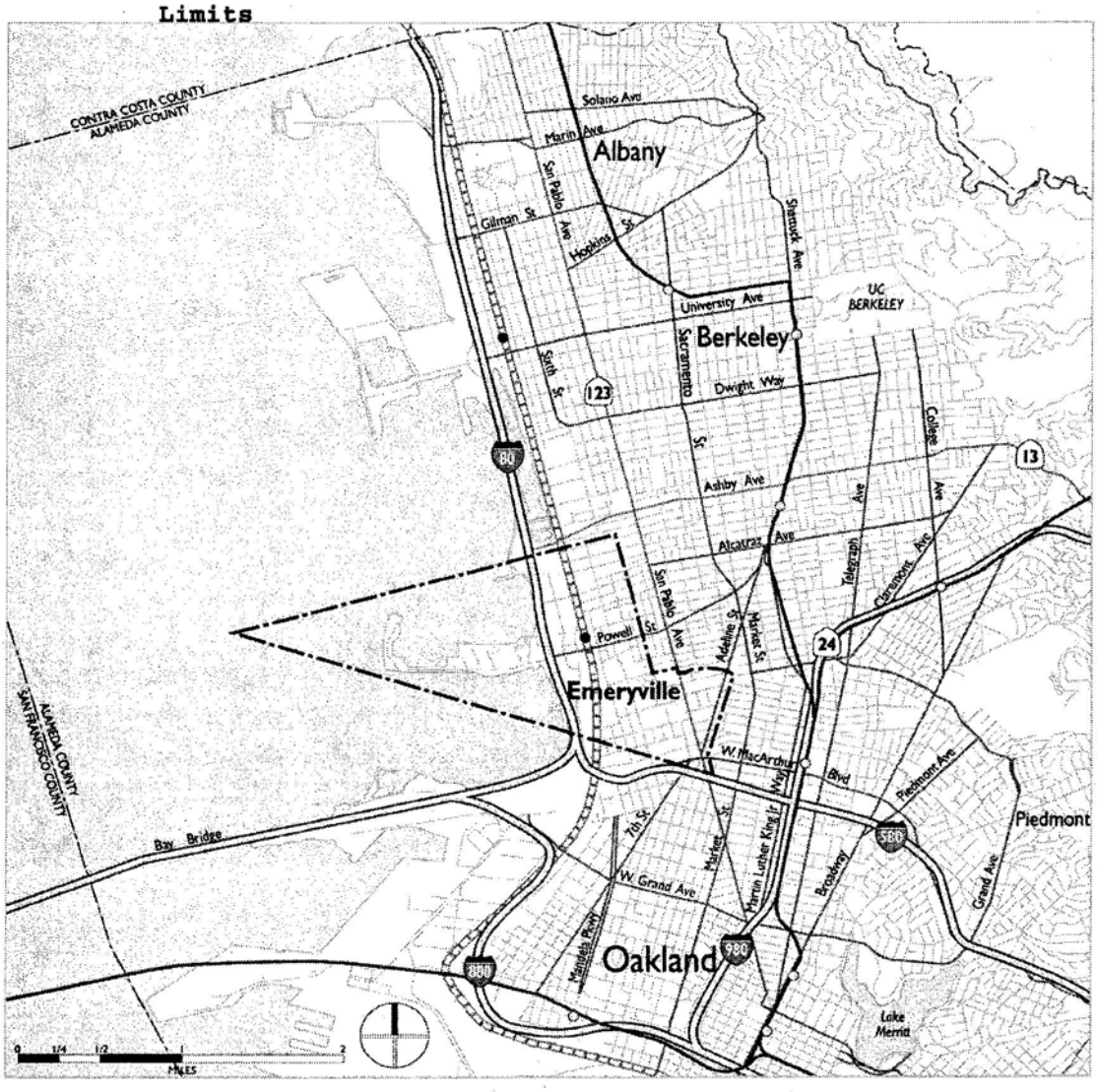


Figure 2: Emeryville City Limits



The City's Housing Element document was adopted in 2001. The Housing Element may be updated for consistency with the other updated elements, but a comprehensive update of the Housing Element is not proposed at this time.

The City's Zoning Ordinance contains development and other regulations applicable to sites within Emeryville. The Zoning Ordinance will be revised to be consistent the updated General Plan, including direction on new land use districts, development intensities, urban design policies, incentives, and other provisions contained in the General Plan.

BACKGROUND STUDIES AND PUBLIC PARTICIPATION

A critical component of the General Plan preparation process is soliciting and synthesizing public input on community concerns and possibilities. Participants in the early General Plan preparation process identified issues, opportunities, and challenges relevant to the General Plan in a variety of forums, including workshops, meetings, and a mail-in survey. The results of these efforts, held in the spring and summer of 2005, are summarized in reports available from the City's Planning Division at www.ci.emeryville.ca.us/planning/general_plan.html.

In January 2006, the City published an *Opportunities, and Challenges Report*, which provides extensive information on existing physical, environmental, and socioeconomic conditions in the City. Topics include community issues, land use, urban design, transportation, demographics, economic health, cultural resources, community facilities and services, open space and recreation, environmental issues including geologic safety and noise, and sustainable development. Each chapter concludes with a discussion of the preliminary planning issues that need to be considered during preparation of the General Plan. The full report can be acquired from the City Planning Division, and is also available for download at www.ci.emeryville.ca.us/planning/general_plan.html.

Following decision-maker review of the *Opportunities and Challenges Report*, Sketch Plan alternatives—consisting of alternative development concepts—will be prepared. The Sketch Plans will incorporate concepts of smart growth and livability, address the challenge of adapting these concepts to Emeryville, and also identify changes to the city's circulation system, such as new streets and connections or changes to street directions and intersections. A Preferred Plan will be synthesized from the public and decision-maker dialogue on the Sketch Plans and the Draft General Plan will then be prepared. The Draft Zoning

Ordinance will be prepared in parallel with the General Plan to ensure consistency.

The Draft General Plan, Draft Zoning Ordinance, and the Draft EIR are likely to be released for public review in early 2007.

OTHER PUBLIC AGENCIES WHOSE APPROVAL IS REQUIRED

No other public agency is required to adopt the Emeryville General Plan Update, and the City will consult with any other agencies as may be required under State law prior to adoption.

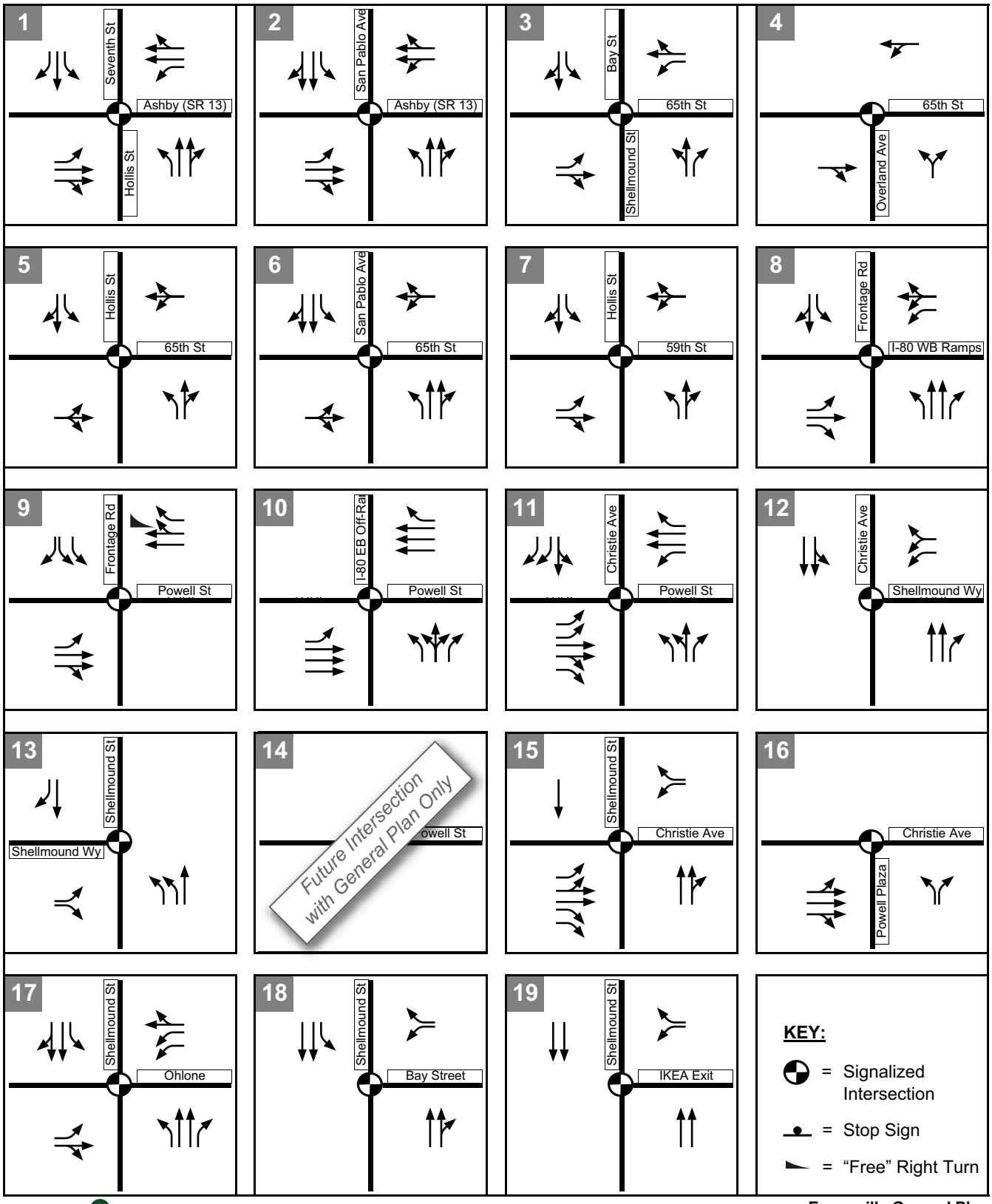
POTENTIAL ENVIRONMENTAL IMPACTS TO BE CONSIDERED

Following is a list of preliminary topics for the EIR. This list may be modified as the General Plan strategies and policies are outlined, and as further environmental information is collected:

- Land Use
- Visual Resources
- Transportation
- Cultural Resources
- Parks and Recreation
- Hazardous Materials
- Air Quality
- Biological Resources
- Water Resources
- Hydrology and Water Quality
- Geology and Seismicity
- Noise
- Wastewater and Solid Waste

In addition to the potential environmental effects listed above, the EIR will evaluate potential cumulative effects of the proposed Emeryville General Plan Update as well as alternatives to the proposed General Plan. The No Project Alternative will evaluate the impacts resulting from continued implementation of existing plans, policies, and regulations that govern the City. As appropriate, other alternatives that would avoid or lessen environmental effects related to the proposed Emeryville General Plan Update will be discussed. Where appropriate, the Draft EIR will also recommend measures to mitigate environmental impacts.

Appendix B: Intersection Turning Movements



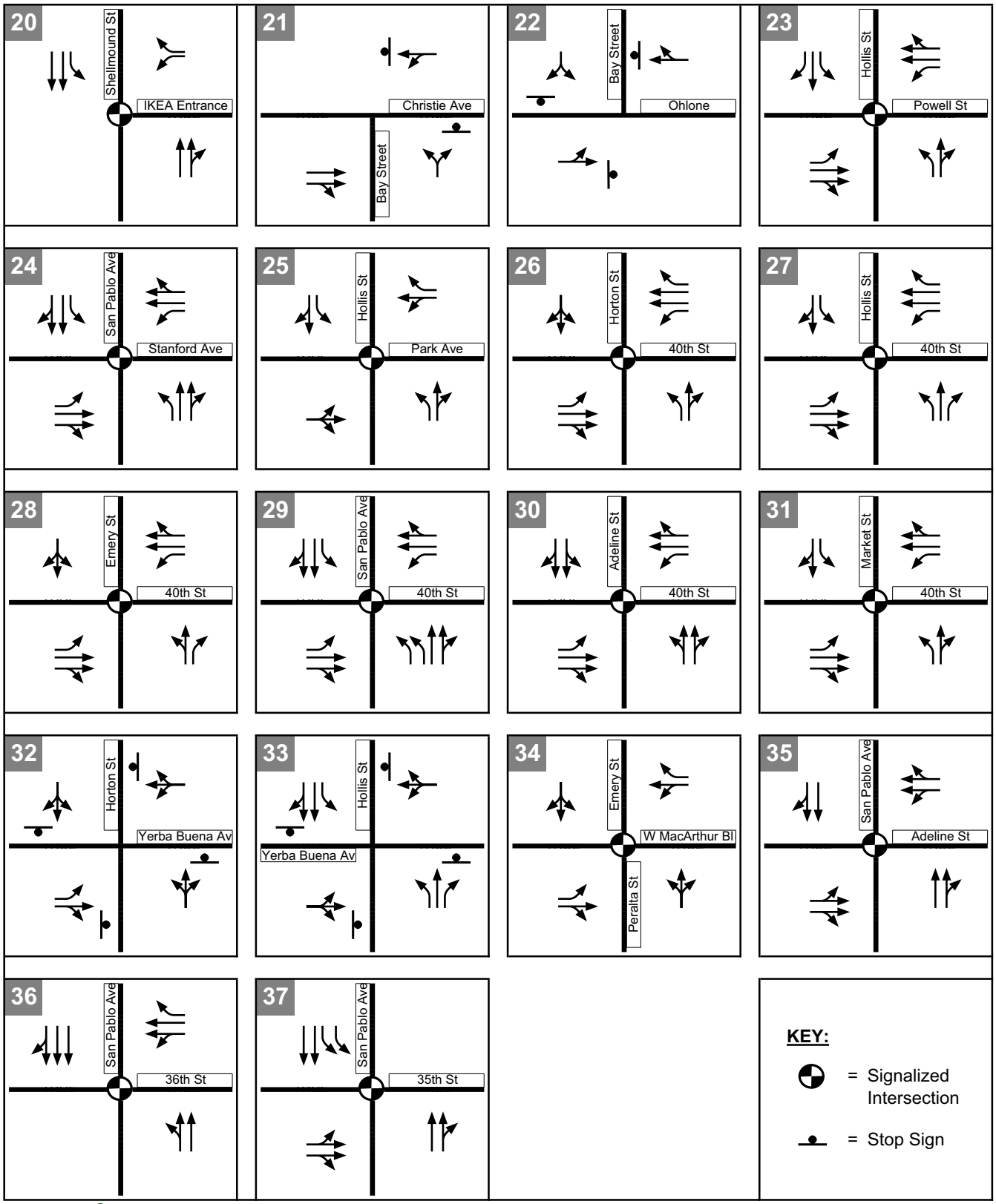
Emeryville General Plan

FEHR & PEERS
TRANSPORTATION CONSULTANTS

January 2009
WC05-2173_X-1a

EXISTING CONDITIONS
LANE CONFIGURATIONS AND TRAFFIC CONTROL

Figure B-1a



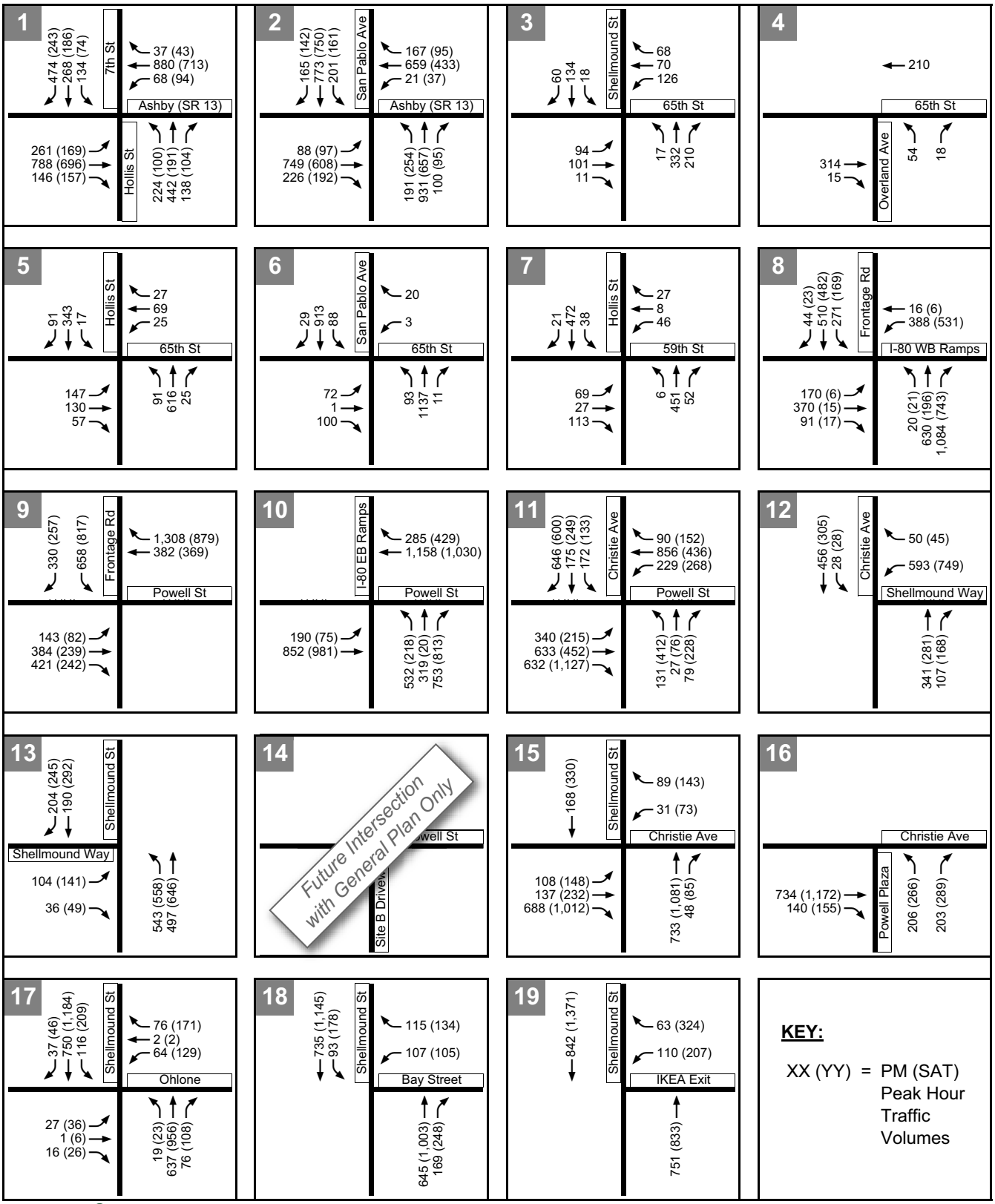
Emeryville General Plan

FEHR & PEERS
TRANSPORTATION CONSULTANTS

January 2009
WC05-2173_X-1b

EXISTING CONDITIONS
LANE CONFIGURATIONS AND TRAFFIC CONTROL

Figure B-1b



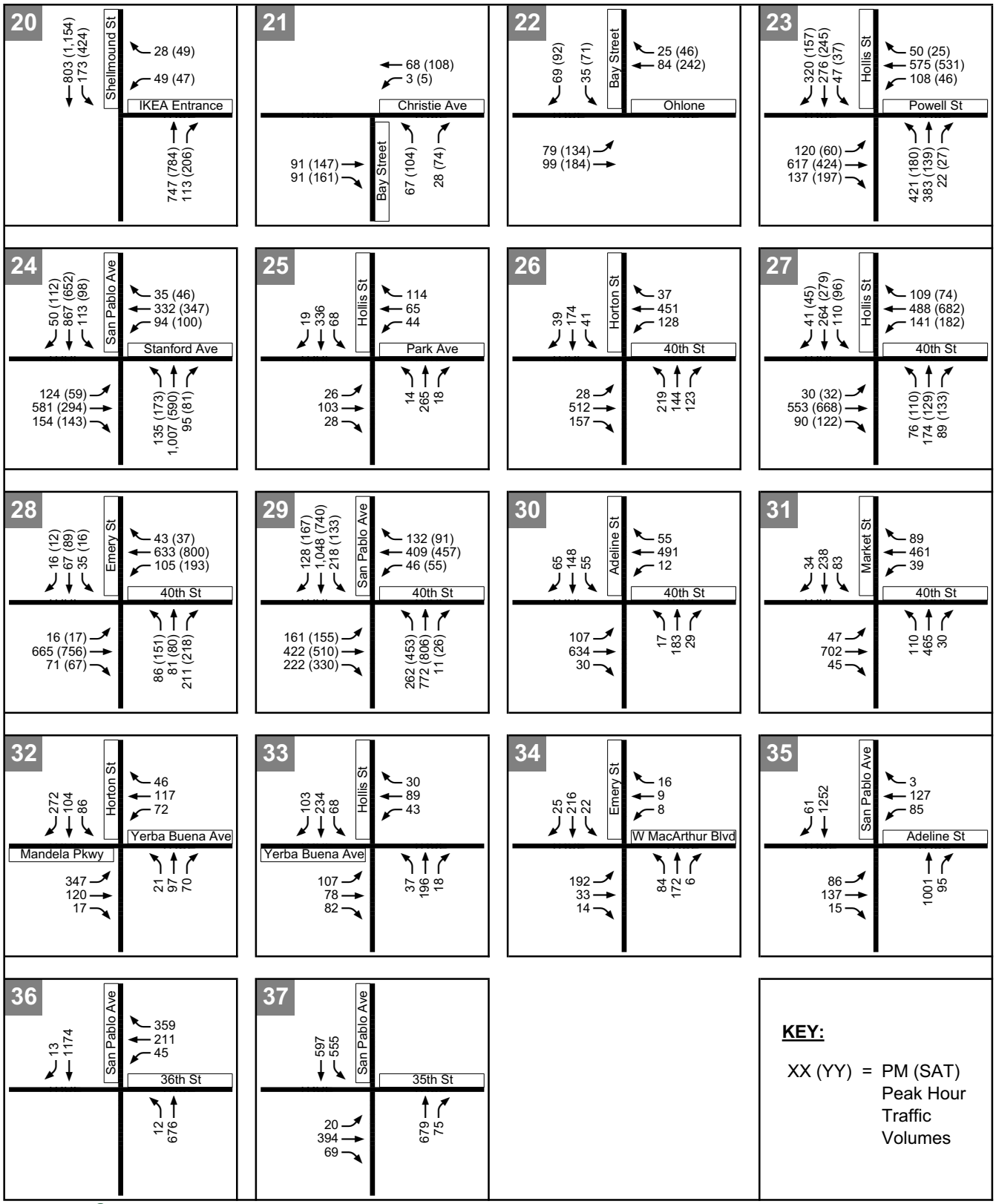
Emeryville General Plan

FEHR & PEERS
TRANSPORTATION CONSULTANTS

EXISTING CONDITIONS INTERSECTION VOLUMES

January 2009
WC05-2173_X-2a

Figure B-2a



Emeryville General Plan

FEHR & PEERS
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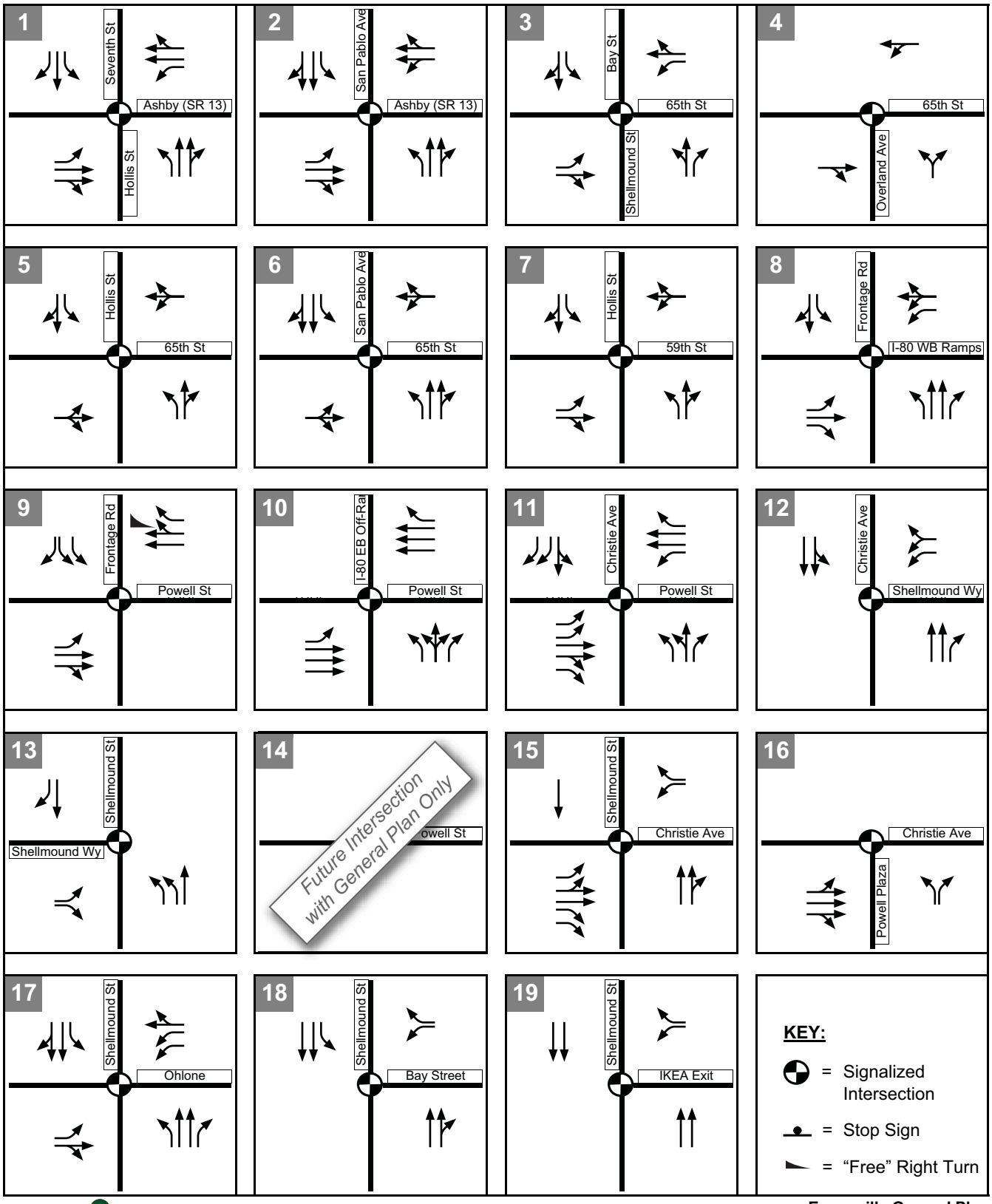
EXISTING CONDITIONS INTERSECTION VOLUMES

January 2009
WC05-2173_X-2b

Figure B-2b



Emeryville General Plan

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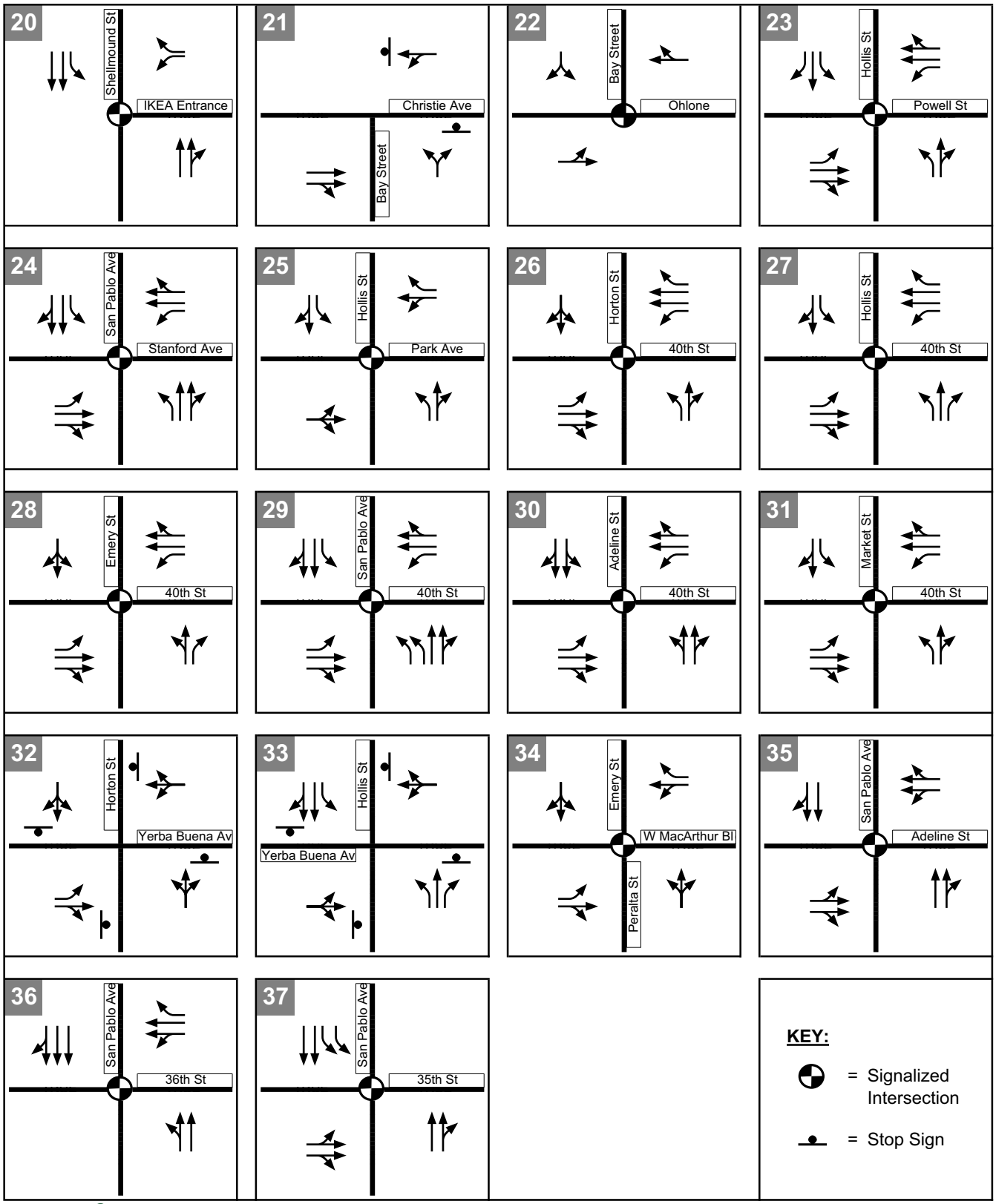
YEAR 2030 NO GROWTH ALTERNATIVE LANE CONFIGURATIONS AND TRAFFIC CONTROL

January 2009
WC05-2173_X-3a

Figure B-3a



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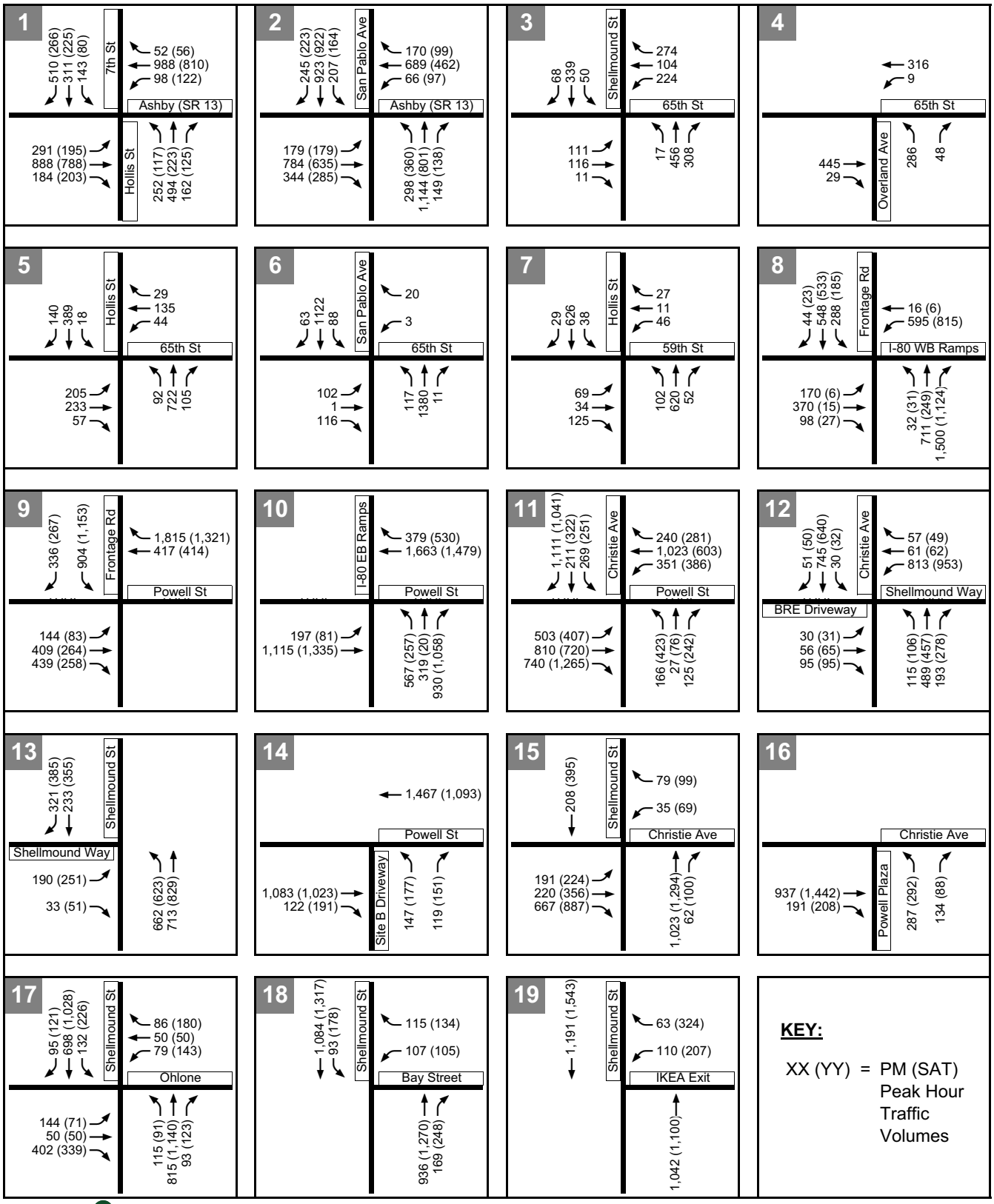
YEAR 2030 NO GROWTH ALTERNATIVE LANE CONFIGURATIONS AND TRAFFIC CONTROL

January 2009
WC05-2173_X-3b

Figure B-3b



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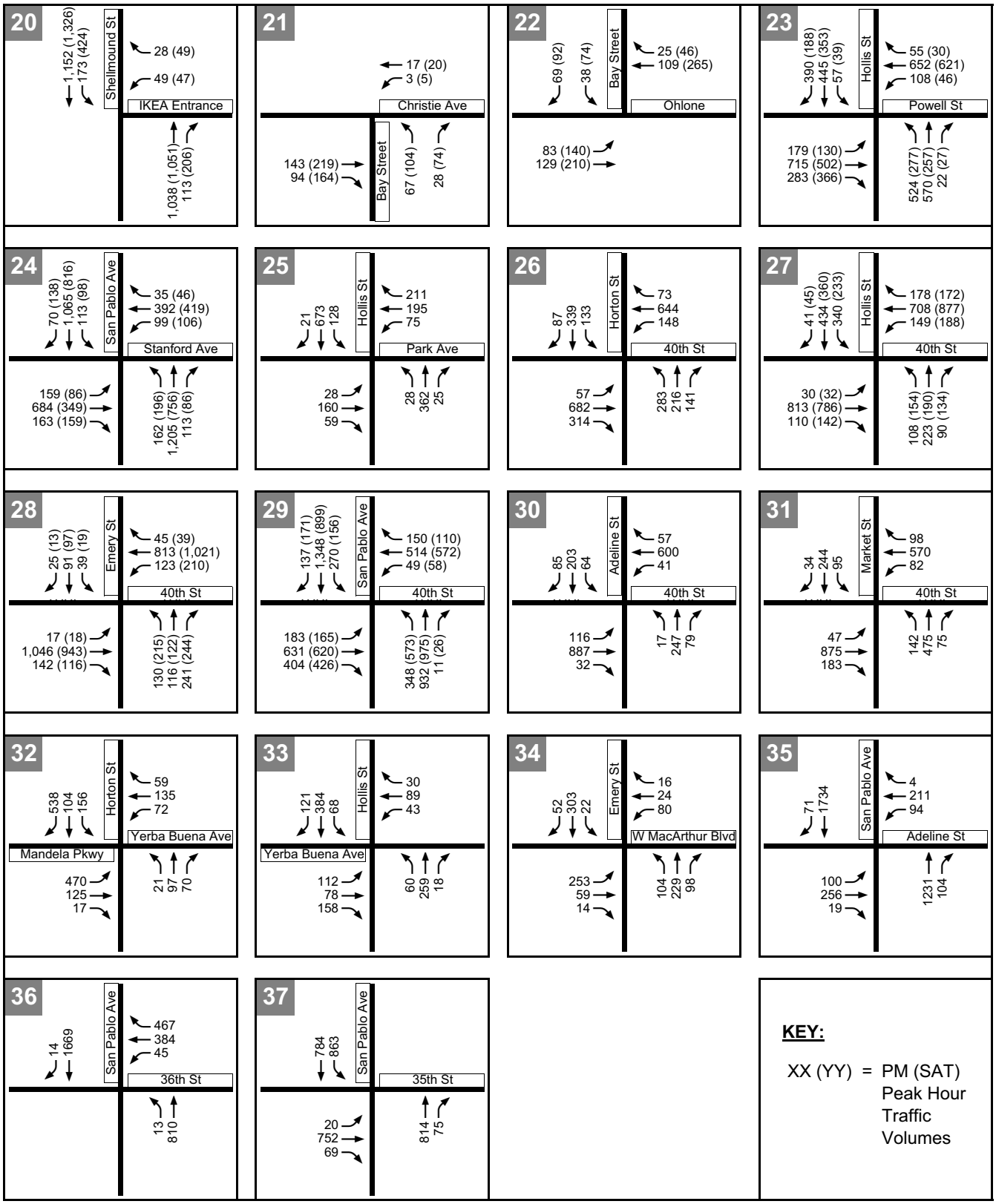
January 2009
WC05-2173_X-4a

Emeryville General Plan

YEAR 2030 DRAFT GENERAL PLAN
PEAK HOUR INTERSECTION VOLUMES FORECAST

Figure B-4a



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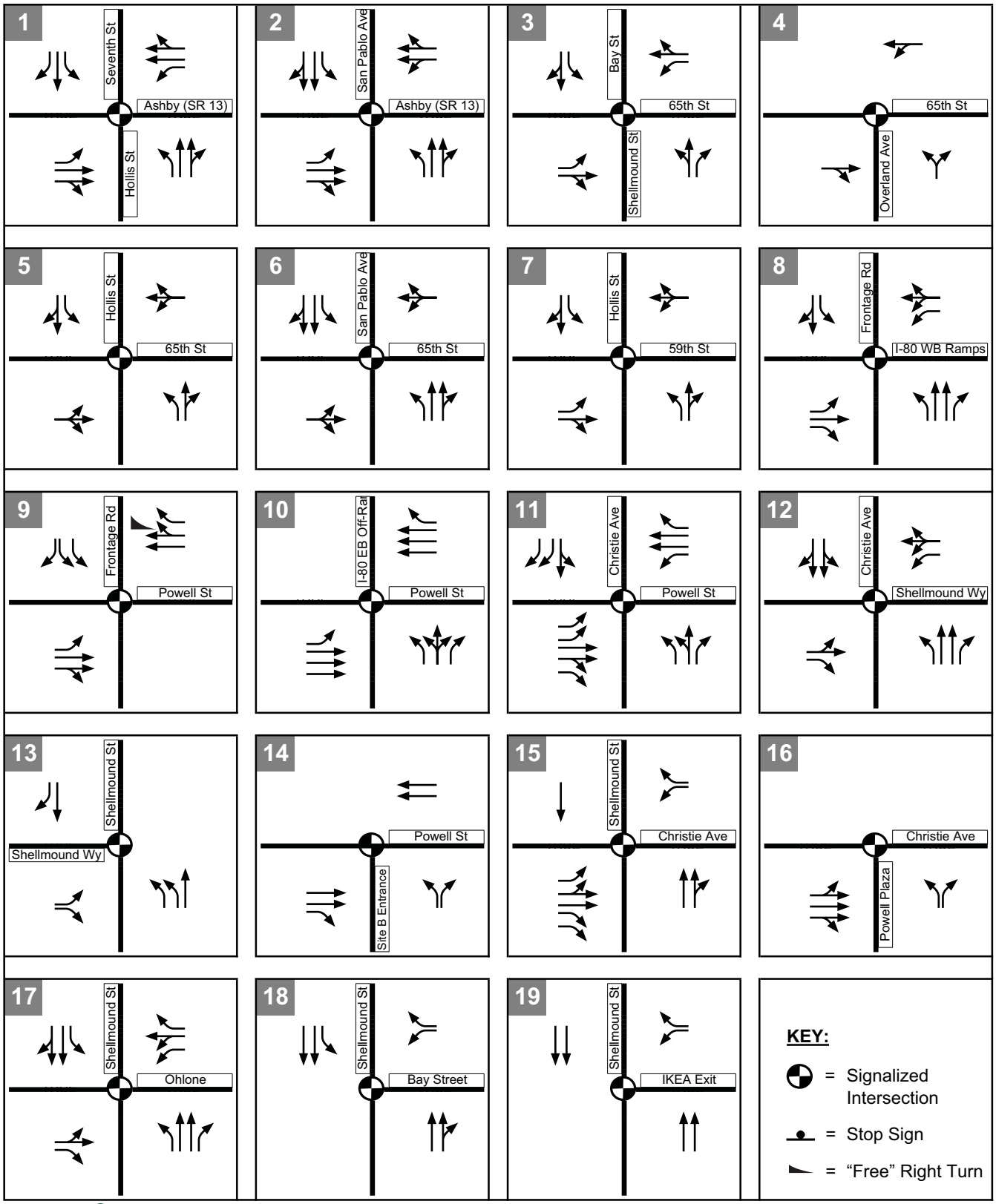
January 2009
WC05-2173_X-4b

Emeryville General Plan

YEAR 2030 DRAFT GENERAL PLAN
PEAK HOUR INTERSECTION VOLUMES FORECAST

Figure B-4b



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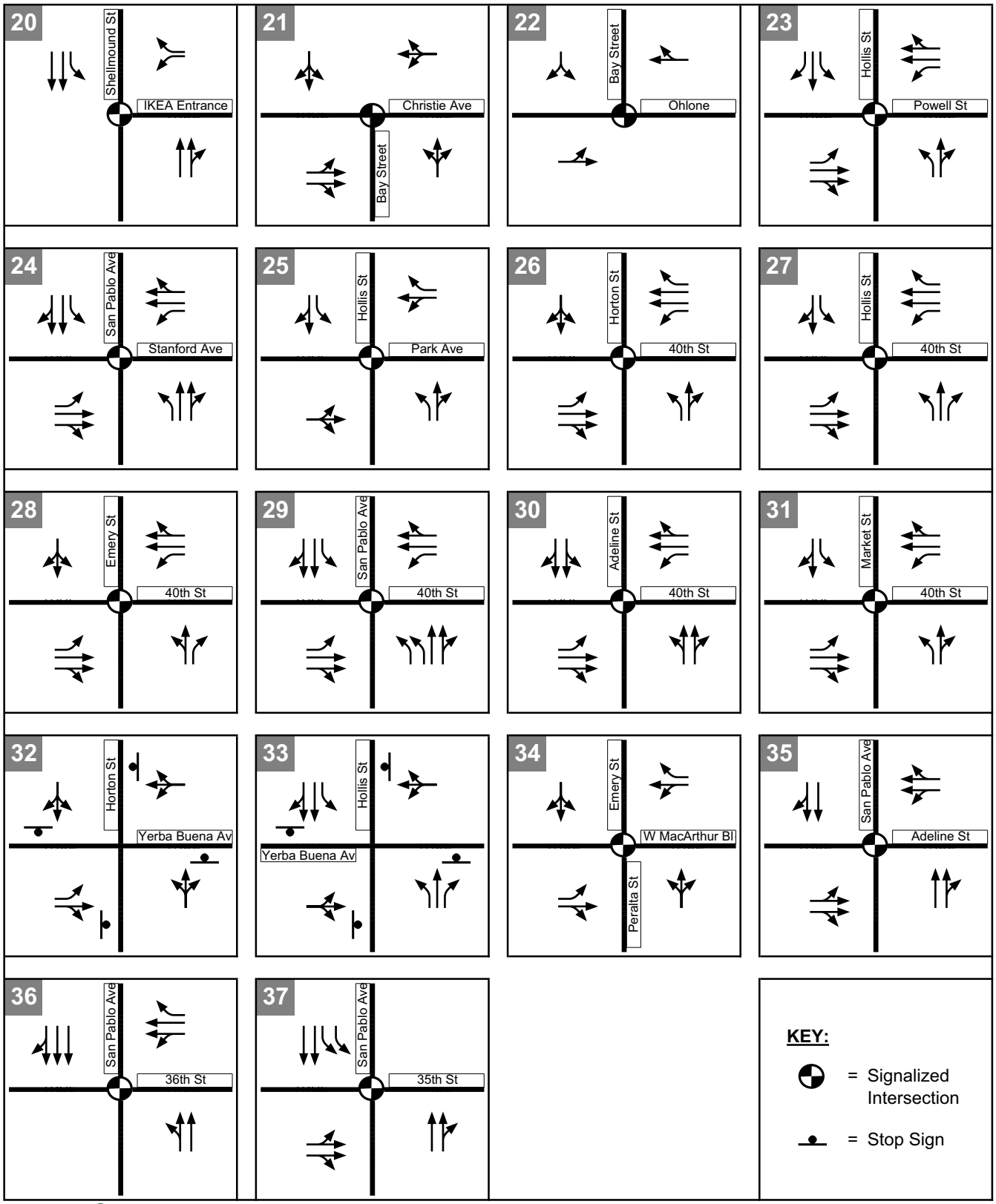
YEAR 2030 DRAFT GENERAL PLAN
LANE CONFIGURATIONS AND TRAFFIC CONTROL

January 2009
WC05-2173_X-5a

Figure B-5a



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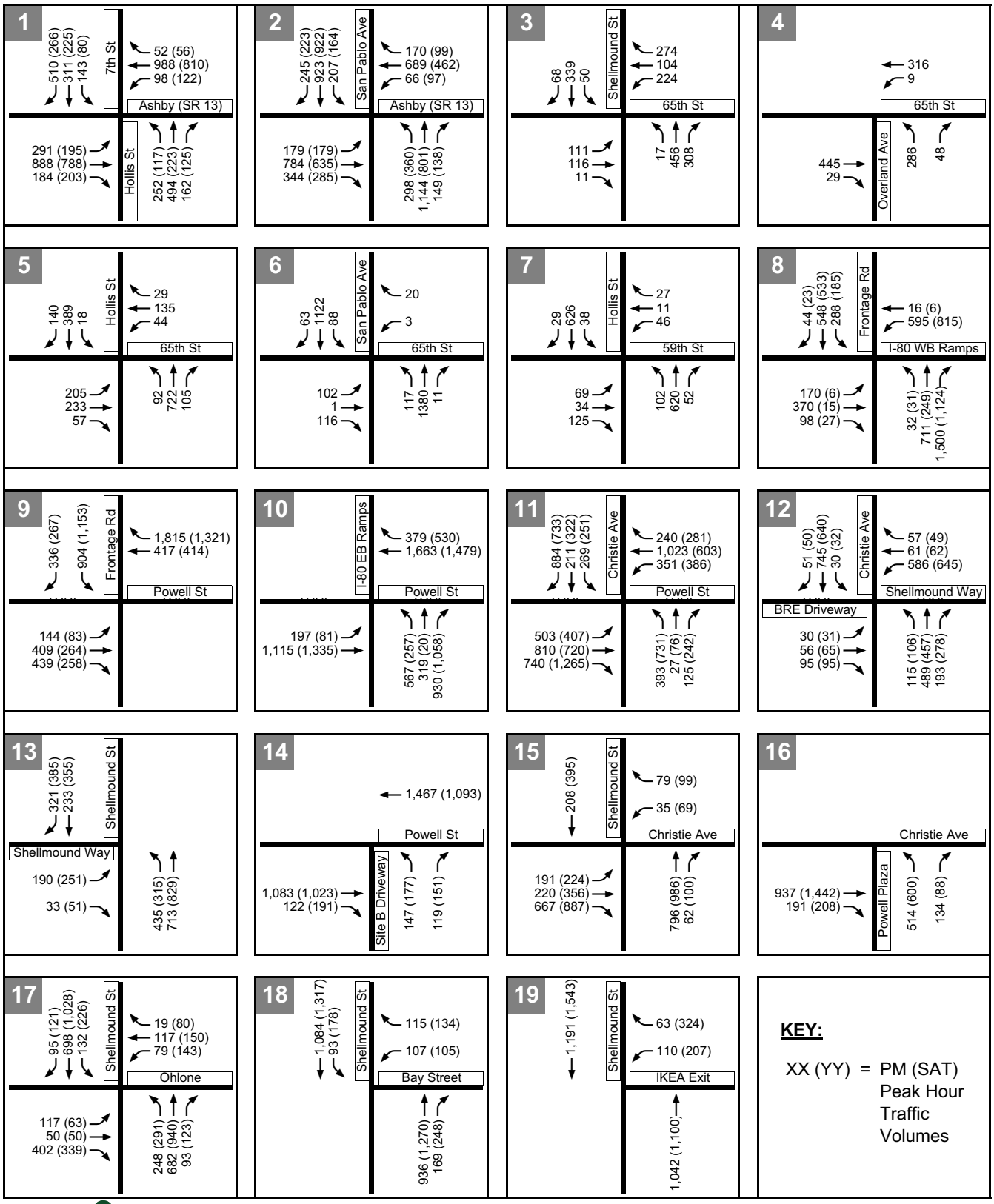
January 2009
WC05-2173_X-5b

YEAR 2030 DRAFT GENERAL PLAN
LANE CONFIGURATIONS AND TRAFFIC CONTROL

Figure B-5b



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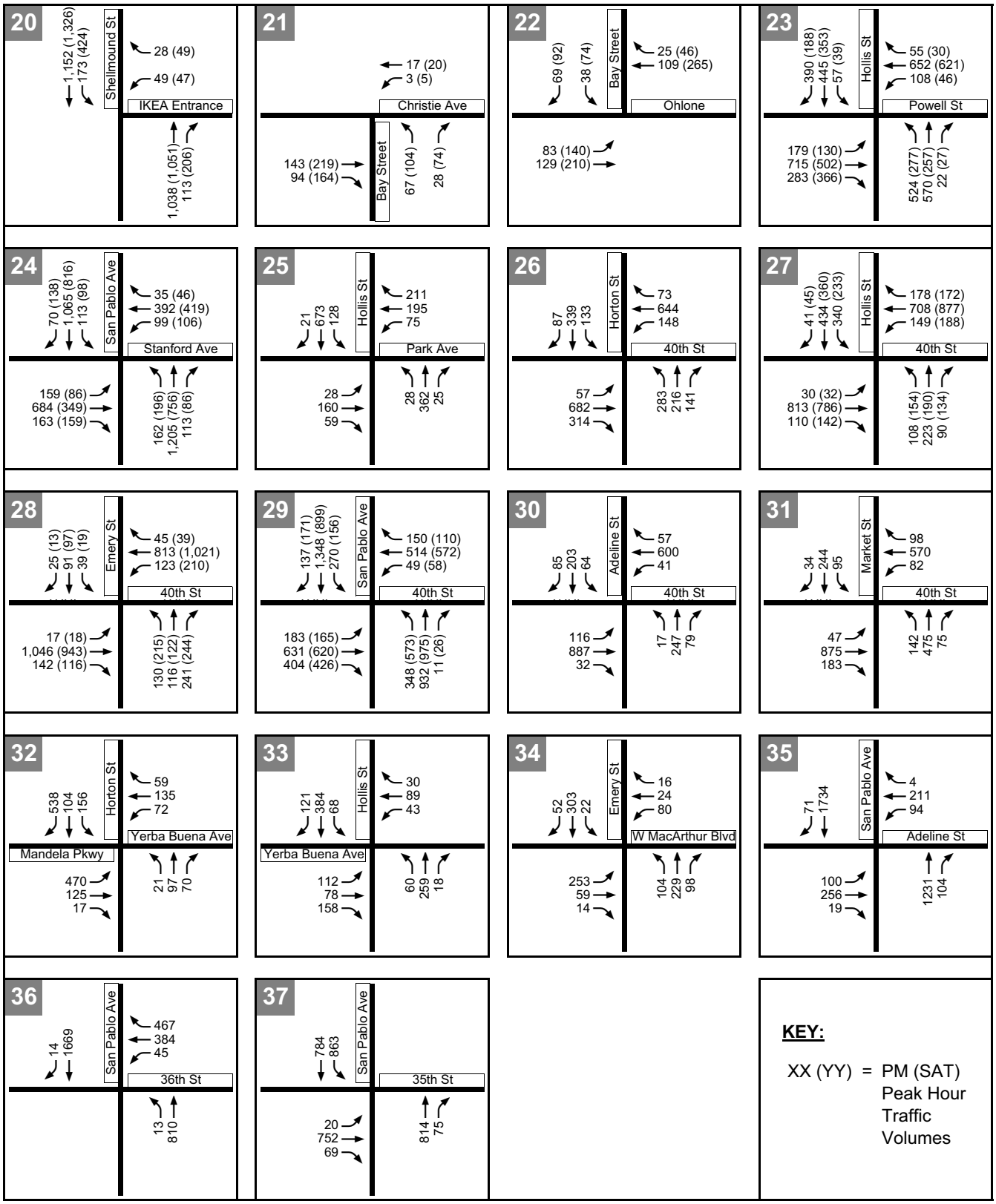
January 2009
WC05-2173_X-6a

Emeryville General Plan

YEAR 2030 DRAFT GENERAL PLAN
PEAK HOUR INTERSECTION VOLUMES FORECAST

Figure B-6a



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January 2009
WC05-2173_X-6b

Emeryville General Plan

YEAR 2030 DRAFT GENERAL PLAN
PEAK HOUR INTERSECTION VOLUMES FORECAST

Figure B-6b

Appendix C: Regional Water Quality Control Board Geotracker Database

SITE NAME	*CLEANUP STATUS*	*ADDRESS*
45TH STREET ARTIST'S COOPERATIVE INC	COMPLETED - CASE CLOSED	4250 HORTON
AA JOHNSON & SON INC	COMPLETED - CASE CLOSED	1164 66TH
ABCO WATERPROOFING	COMPLETED - CASE CLOSED	3135 FILBERT
ALLIED PACKING & SUPPLY	COMPLETED - CASE CLOSED	5303 ADELINE
ASPHALT PRODUCT OIL CORP	COMPLETED - CASE CLOSED	1001 ASHBY AVE
BALAAM BROS PROPERTY	COMPLETED - CASE CLOSED	1350 POWELL
BAY EXPORT SERVICES	COMPLETED - CASE CLOSED	717 POTTER ST
BECKER PROPERTY	COMPLETED - CASE CLOSED	1300 POWELL
BERKELEY FARMS	COMPLETED - CASE CLOSED	4550 SAN PABLO
BERKELEY INDUSTRIAL COMPLEX	COMPLETED - CASE CLOSED	729 HEINZ ST
BUTTNER PROPERTIES	COMPLETED - CASE CLOSED	4055 HUBBARD
CAHON ASSOCIATES INC	COMPLETED - CASE CLOSED	3501 SAN PABLO
CALIFORNIA ELECTRIC COMPANY	COMPLETED - CASE CLOSED	3015 ADELINE
CAN TRANSPORT INC	COMPLETED - CASE CLOSED	196 BURMA
CHEVRON	COMPLETED - CASE CLOSED	2995 SAN PABLO AVE
CHEVRON	COMPLETED - CASE CLOSED	3250 SACRAMENTO ST
CHIEF'S AUTO PARTS	COMPLETED - CASE CLOSED	5714 SAN PABLO
CHIRON	COMPLETED - CASE CLOSED	4525 HOLLIS STREET
CITY OF EMERYVILLE	COMPLETED - CASE CLOSED	1056 48TH
CITY OF OAKLAND	COMPLETED - CASE CLOSED	3455 ETTIE
CITY OF OAKLAND / CITY OF EMERYVILLE	COMPLETED - CASE CLOSED	4800 SAN PABLO
CITY OF OAKLAND FIRE STATION #5	COMPLETED - CASE CLOSED	934 34TH
CITY WOOD	COMPLETED - CASE CLOSED	3423 HARLAN
CLEARPRINT PAPER CO INC	COMPLETED - CASE CLOSED	1482 67TH
CLEMENTINA LTD	COMPLETED - CASE CLOSED	5521 DOYLE
CONSTRUCTION SERVICES	COMPLETED - CASE CLOSED	1300 POWELL
COPPER & BRASS SALES	COMPLETED - CASE CLOSED	1295 67TH
COULTER STEEL & FORGE COMPANY	COMPLETED - CASE CLOSED	1494 67TH
DAYS INN HOTEL	COMPLETED - CASE CLOSED	1603 POWELL
DIESEL FUEL TANK AREA FORMER	COMPLETED - CASE CLOSED	722 FOLGER AVE
DOUGCO METAL FINISHING	COMPLETED - CASE CLOSED	1073 34TH
DURKEE WAREHAM	COMPLETED - CASE CLOSED	700 HEINZ ST
EAST BAYBRIDGE CENTER	COMPLETED - CASE CLOSED	UNKNOWN YERBA BUENA AVE & HOLLIS ST

SITE NAME	*CLEANUP STATUS*	*ADDRESS*
EMERYLOFTS DEVELOPMENT CO	COMPLETED - CASE CLOSED	1500 PARK
EMERYVILLE REDEVELOPMENT	COMPLETED - CASE CLOSED	4300 SAN PABLO
EXXON	COMPLETED - CASE CLOSED	5829 ADELINE
FABCO AUTOMOTIVE CORP	COMPLETED - CASE CLOSED	1249 67TH
FOLGER MURPHY PROPERTY	COMPLETED - CASE CLOSED	1020 MURRAY ST
FORMER INDUSTRIAL HARD CHROME	COMPLETED - CASE CLOSED	5701 HOLLIS
GEO M MARTIN COMPANY	COMPLETED - CASE CLOSED	1308 67TH
GEROW PROPERTIES	COMPLETED - CASE CLOSED	1255 PARK
GRING PEST CONTROL	COMPLETED - CASE CLOSED	741 FOLGER AVE
GROVE VALVE & REGULATOR COMPANY (TOXIC)	COMPLETED - CASE CLOSED	6529 HOLLIS
GUITON BUS LINES	COMPLETED - CASE CLOSED	3421 HOLLIS
HENRY SHIREK ESTATE	COMPLETED - CASE CLOSED	3425 ETTIE
HFH LTD	COMPLETED - CASE CLOSED	1351 OCEAN
HOLETT MACHINE WORKS	COMPLETED - CASE CLOSED	746 FOLGER AVENUE
HOLLIS STREET PROJECT	COMPLETED - CASE CLOSED	6050 HOLLIS
J H FITZMAURICE INC	COMPLETED - CASE CLOSED	2857 HANNAH
JT TRUCKING	COMPLETED - CASE CLOSED	2818 CYPRESS
JWP MECHANICAL	COMPLETED - CASE CLOSED	999 ANTHONY ST
KING KNIGHT COMPANY	COMPLETED - CASE CLOSED	6202 CHRISTIE
KITE MAKERS	COMPLETED - CASE CLOSED	5813 FREMONT
KRENZ LIMITED	COMPLETED - CASE CLOSED	750 POTTER ST
LIQUID SUGARS INC	COMPLETED - CASE CLOSED	1275 66TH
LOOMIS ARMORED INC	COMPLETED - CASE CLOSED	936 BROCKHURST
MACBETH HARDWARE COMPANY	COMPLETED - CASE CLOSED	930 ASHBY AVE
MAGNOLIA STREET LLC PROPERTY	COMPLETED - CASE CLOSED	1200 32ND
MALCOM X SCHOOL	COMPLETED - CASE CLOSED	1734 PRINCE ST
MARTIN LUTHER KING JR SCHOOL	COMPLETED - CASE CLOSED	5714 MARTIN LUTHER KING JR
MATSON TERMINALS	COMPLETED - CASE CLOSED	3050 7TH
MEADOWS PROPERTY	COMPLETED - CASE CLOSED	1440 ASHBY AVE
MISSION TAYLOR PROPERTIES	COMPLETED - CASE CLOSED	1410 64TH
MOORE PROPERTY	COMPLETED - CASE CLOSED	3155 SACRAMENTO ST
NEIGHBORHOOD LAUNDROMAT	COMPLETED - CASE CLOSED	3838 WEST
OAKLAND ARMY BASE - OAKLAND ARMY BASE AST - 4	COMPLETED - CASE CLOSED	BURMA ROAD, BUILDING 14 (POV LOADING DOC

SITE NAME	*CLEANUP STATUS*	*ADDRESS*
OAKLAND ARMY BASE - OAKLAND ARMY BASE AST - 5	COMPLETED - CASE CLOSED	WAKE AVENUE, BALDWIN YARD
OAKLAND DIESEL FACILITY	COMPLETED - CASE CLOSED	1301 65TH
OLIVER RUBBER COMPANY	COMPLETED - CASE CLOSED	1200 65TH
OWENS MORTGAGE INVESTMENT	COMPLETED - CASE CLOSED	3623 ADELINE
PARTCH PROPERTY	COMPLETED - CASE CLOSED	2856 HELEN
PCC	COMPLETED - CASE CLOSED	6400 SAN PABLO AVE
PELCO DISTRIBUTORS	COMPLETED - CASE CLOSED	1550 PARK
PIE FREIGHT TERMINAL SITE	COMPLETED - CASE CLOSED	5500 EASTSHORE
PLYWOOD LUMBER & SALES	COMPLETED - CASE CLOSED	4050 HORTON
PRAXAIR / ALTAIR BAYOX	COMPLETED - CASE CLOSED	1171 OCEAN
ROMAK IRON WORKS	COMPLETED - CASE CLOSED	3250 HOLLIS
RYERSON STEEL & ALUMINUM	COMPLETED - CASE CLOSED	1465 65TH
SAN PABLO LLC	COMPLETED - CASE CLOSED	4550 SAN PABLO
SCOTT PROPERTY	COMPLETED - CASE CLOSED	1043 MACARTHUR
SHELL	COMPLETED - CASE CLOSED	4250 HORTON ST
SHELL BRANDED SERVICE STATION	COMPLETED - CASE CLOSED	1200 ASHBY AVENUE
SIEGAL & STRAIN ARCHITECT	COMPLETED - CASE CLOSED	1295 59TH
SOUTHERN PACIFIC TRANSPORTATION COMPANY	COMPLETED - CASE CLOSED	1450 SHERWIN
SOUTHERN PACIFIC TRANSPORTATION COMPANY	COMPLETED - CASE CLOSED	4226 HALLECK
STANDARD BRANDS PAINTS	COMPLETED - CASE CLOSED	4343 SAN PABLO
SUPERGEN	COMPLETED - CASE CLOSED	6450 HOLLIS
TEXACO	COMPLETED - CASE CLOSED	840 ASHBY AVE
UNKNOWN	COMPLETED - CASE CLOSED	UNKNOWN 64TH & 65TH ST
VACANT LOT	COMPLETED - CASE CLOSED	4800 SAN PABLO
VACANT LOT	COMPLETED - CASE CLOSED	1258 64TH
WEATHERFORD MOTORS BMW	COMPLETED - CASE CLOSED	5903 CHRISTIE
WEIBEL VINEYARDS	COMPLETED - CASE CLOSED	1250 STANFORD AVE
WESTERN BRAKE	COMPLETED - CASE CLOSED	1461 PARK
WILLIAM BYRON RUMFORD SR PLAZA	COMPLETED - CASE CLOSED	3000 SACRAMENTO ST
WOODFIN SUITE HOTEL	COMPLETED - CASE CLOSED	5800 SHELLMOUND
1465 65TH ST (RYERSON-TULL)	OPEN	1465 65TH STREET
AC TRANSIT	OPEN	1177 47TH ST
BAY CENTER PROJECT	OPEN	1665 65TH ST

SITE NAME	*CLEANUP STATUS*	*ADDRESS*
BOYSEN PAINT	OPEN	1001 42ND ST
CHAPMAN PROPERTY	OPEN	1400 53RD ST
CHEVRON #20-6265	OPEN	1520 POWELL
DUTRO COMPANY	OPEN	1333 62ND ST
ELECTRO COATING INC	OPEN	1401/1421 PARK AVENUE
EMERYVILLE INDUSTRIAL COURT	OPEN	5885 HOLLIS
FABCO	OPEN	1249 67TH ST
GOOD GUYS STORE	OPEN	5800 CHRISTIE
GROVE VALVE & REGULATOR COMPANY (TOXIC)	OPEN	6521 HOLLIS
HFH LIMITED	OPEN	6400 HOLLIS ST
JUDSON STEEL	OPEN	UNKNOWN SHELLMOUND ST
LIQUID SUGARS INC (TOXICS)	OPEN	1269 66TH
NIELSEN PROPERTY	OPEN	5800 SHELLMOUND ST
OLIVER RUBBER COMPANY	OPEN	1200 65TH
PARINA ENTERPRISES	OPEN	5433 SAN PABLO AVE
PARK AVENUE PROPERTY	OPEN	1199 PARK AVE
RD MINER COMPANY	OPEN	750 37TH ST
SCHWABACKER FREY	OPEN	5733 PELADEAU
SHERWIN-WILLIAMS CO	OPEN	1450 SHERWIN AVE
SYBASE PROPERTIES	OPEN	1410/1450 64TH STREET AND 1465 65TH STREET
UNKNOWN	OPEN	4543 HORTON ST
VACANT BUILDING	OPEN	1372 OCEAN
WESTINGHOUSE ELECTRIC - PARCEL 4	OPEN	4899 PELADEAU
ALASKA GASOLINE	OPEN - REMEDIATION	6211 SAN PABLO
ARCO #04931	OPEN - REMEDIATION	731 MACARTHUR
BP #11126	OPEN - REMEDIATION	1700 POWELL
DEL MONTE PLANT 35 (AKA 4204 HOLLIS ST)	OPEN - REMEDIATION	1250 PARK
MIKE ROBERTS COLOR PRODUCTION	OPEN - REMEDIATION	6707 BAY
MOBIL #99-105 / CARS RENT A CAR	OPEN - REMEDIATION	6301 SAN PABLO
PETERSON MANUFACTURING COMPANY INC	OPEN - REMEDIATION	1600 63RD
RUSH PROPERTY GROUP 32ND ST / PRECISION LOFTS	OPEN - REMEDIATION	1549 32ND

SITE NAME	*CLEANUP STATUS*	*ADDRESS*
SHELLMOND PROPERTIES	OPEN - REMEDIATION	4300 EASTSHORE HWY
SNK ANDANTE PROJECT	OPEN - REMEDIATION	3992 SAN PABLO
THRIFTY OIL #49	OPEN - REMEDIATION	3400 SAN PABLO
WAREHAM PROPERTY DEVELOPMENT	OPEN - REMEDIATION	2855 MANDELA
BERKELEY INDUSTRIAL COMPLEX	OPEN - REOPEN CASE	729 HEINZ AVE
1171 OCEAN AVENUE LLC PROPERTY	OPEN - SITE ASSESSMENT	1171 OCEAN
AJ TRUCKING	OPEN - SITE ASSESSMENT	5600 SHELLMOUND
AMBASSADOR LAUNDRY	OPEN - SITE ASSESSMENT	3623 ADELINE
ARCO	OPEN - SITE ASSESSMENT	4401 MARKET
ASPHALT PRODUCTS OIL CORP	OPEN - SITE ASSESSMENT	1001 ASHBY AVE
ATLAS HEATING & AIR CONDITIONING COMPANY	OPEN - SITE ASSESSMENT	1451 32ND
BARBARY COAST STEEL	OPEN - SITE ASSESSMENT	4300 EASTSHORE
BASHLAND INC	OPEN - SITE ASSESSMENT	4015 HOLLIS
BAY AREA WAREHOUSE	OPEN - SITE ASSESSMENT	4001 HOLLIS
BERKELEY BUSINESS CENTER	OPEN - SITE ASSESSMENT	2900 42 SAN PABLO AVE
BOLINS SERVICE GARAGE	OPEN - SITE ASSESSMENT	6335 SAN PABLO
BP #11127	OPEN - SITE ASSESSMENT	5425 MARTIN LUTHER KING JR
BRECKENRIDGE AUTO SHOP	OPEN - SITE ASSESSMENT	6045 SAN PABLO
CALIFORNIA LINEN RENTAL	OPEN - SITE ASSESSMENT	989 41ST
CALIFORNIA SYRUP & EXTRACT	OPEN - SITE ASSESSMENT	1355 55TH
CALTRANS	OPEN - SITE ASSESSMENT	3465 ETTIE
CALTRANS EAST BAY PAINT YARD	OPEN - SITE ASSESSMENT	0 BURMA
CELIS SERVICE STATION	OPEN - SITE ASSESSMENT	4000 SAN PABLO
CHEVRON #9-1583	OPEN - SITE ASSESSMENT	5509 MARTIN LUTHER KING JR
CHIRON CORPORATION	OPEN - SITE ASSESSMENT	4560 HORTON STREET
CITY OF EMERYVILLE	OPEN - SITE ASSESSMENT	1333 PARK
CITY OF EMERYVILLE	OPEN - SITE ASSESSMENT	3310 POWELL
CITY OF EMERYVILLE FIRE STATION	OPEN - SITE ASSESSMENT	4331 SAN PABLO
CITY OF EMERYVILLE FIRE STATION #2	OPEN - SITE ASSESSMENT	6303 HOLLIS
CITY OF PARIS CLEANERS	OPEN - SITE ASSESSMENT	3516 ADELINE
CM SERVICE STATION	OPEN - SITE ASSESSMENT	1441 ASHBY AVE
DEL MONTE PLANT #35	OPEN - SITE ASSESSMENT	4202 HOLLIS ST
DIESEL FUEL TANK AREA FORMER	OPEN - SITE ASSESSMENT	722 FOLGER AVE

SITE NAME	*CLEANUP STATUS*	*ADDRESS*
DUNN QUALITY PAINTS	OPEN - SITE ASSESSMENT	1007 41ST ST
DUNNE QUALITY PAINTS	OPEN - SITE ASSESSMENT	1007 41ST
DUTRO COMPANY	OPEN - SITE ASSESSMENT	1333 62ND
ELECTRO-COATINGS INC	OPEN - SITE ASSESSMENT	1401-21 PARK
EMERY BAY MARKETPLACE	OPEN - SITE ASSESSMENT	UNKNOWN 64TH & CHRISTIE
EMERY BAY PLAZA	OPEN - SITE ASSESSMENT	1650 65TH
EMERYVILLE APARTMENT COMPLEX DEVELOPMENT	OPEN - SITE ASSESSMENT	UNKNOWN FRONTAGE RD
FG GASOLINE	OPEN - SITE ASSESSMENT	3314 SAN PABLO
FOLGER AVENUE PROPERTY	OPEN - SITE ASSESSMENT	722 FOLGER AVE
FORDHAM PROPERTY	OPEN - SITE ASSESSMENT	5515 DOYLE
FORMER GAS STATION	OPEN - SITE ASSESSMENT	6623 SAN PABLO
FP LATHROP PROPERTY	OPEN - SITE ASSESSMENT	5813 SHELLMOUND ST
GARZA & ASSOCIATES	OPEN - SITE ASSESSMENT	1240 POWELL
GATEWAY LIQUORS	OPEN - SITE ASSESSMENT	5944 SAN PABLO
GENERAL TRANSPORTATION	OPEN - SITE ASSESSMENT	3211 WOOD
GOLDSMITH LATHROP	OPEN - SITE ASSESSMENT	5813-5815 SHELLMOUND
J&H AUTO REPAIR AND GAS STATION	OPEN - SITE ASSESSMENT	3701 MARTIN LUTHER KING JR
LATHROP SPIEKER PROPERTY	OPEN - SITE ASSESSMENT	5801 5895 CHRISTIE AVE
LERER BROTHERS TRANSMISSION	OPEN - SITE ASSESSMENT	6340 CHRISTIE
LITTLE PROPERTY	OPEN - SITE ASSESSMENT	1201 32ND
MARKET PLACE MARTIN COMPANY	OPEN - SITE ASSESSMENT	UNKNOWN CHRISTIE AVE
MARRIOT PARCEL 2	OPEN - SITE ASSESSMENT	4300 EASTSHORE HWY
MAZ GLASS	OPEN - SITE ASSESSMENT	3800 SAN PABLO
MCGRATH STEEL COMPANY	OPEN - SITE ASSESSMENT	6655 HOLLIS
MICHEL AND PELTON	OPEN - SITE ASSESSMENT	5743 LANDREGAN ST
MYERS CONTAINER CORP	OPEN - SITE ASSESSMENT	6549 SAN PABLO AVE
OAK WALK REDEVELOPMENT SITE	OPEN - SITE ASSESSMENT	4090 SAN PABLO
OAKLAND NATIONAL ENGRAVERS	OPEN - SITE ASSESSMENT	1001 42ND
OAKLAND NATIONAL ENGRAVES	OPEN - SITE ASSESSMENT	UNKNOWN 41ST AVE & ADELINE ST
OAKLAND NATIONAL ENGRAVING	OPEN - SITE ASSESSMENT	1001 42ND ST
PACIFIC GALVANIZING	OPEN - SITE ASSESSMENT	715 46TH

SITE NAME	*CLEANUP STATUS*	*ADDRESS*
PEPSI-COLA COMPANY	OPEN - SITE ASSESSMENT	1150 PARK
PERCY ADAMS JR SENIOR APARTMENTS	OPEN - SITE ASSESSMENT	1094 ALCATRAZ
PFIZER PIGMENTS	OPEN - SITE ASSESSMENT	4650 SHELLMOUND
PG&E	OPEN - SITE ASSESSMENT	4525 HOLLIS
PIE FREIGHT TERMINAL	OPEN - SITE ASSESSMENT	5500 EASTSHORE HWY
R&H AUTO REPAIR	OPEN - SITE ASSESSMENT	5315 SAN PABLO
RED TOP ELECTRIC INC	OPEN - SITE ASSESSMENT	4377 ADELINE
REDEVELOPMENT AGENCY	OPEN - SITE ASSESSMENT	1056 46TH ST
REDEVELOPMENT AGENCY	OPEN - SITE ASSESSMENT	1265 1269 OCEAN AVE
RIFKIN INVESTMENT COMPANY	OPEN - SITE ASSESSMENT	4525-4549 HORTON
RIX INDUSTRIES	OPEN - SITE ASSESSMENT	6460 HOLLIS
ROBINSON PROPERTY / MOHAWK OIL CO	OPEN - SITE ASSESSMENT	5630 SAN PABLO
SAN FRANCISCO FRENCH BREAD	OPEN - SITE ASSESSMENT	3924 MARKET
SAN FRANCISCO FRENCH BREAD COMPANY	OPEN - SITE ASSESSMENT	4070 SAN PABLO
SCHWABACHER / FREY	OPEN - SITE ASSESSMENT	5733 PELADEAU
SHELL #13-5266	OPEN - SITE ASSESSMENT	1800 POWELL
SHELL #13-9619	OPEN - SITE ASSESSMENT	3420 SAN PABLO
SOUTHLAND CORP	OPEN - SITE ASSESSMENT	901 ASHBY AVE
SOUTHLAND CORP	OPEN - SITE ASSESSMENT	901 ASHBY AVE
SPIEKER PROPERTIES	OPEN - SITE ASSESSMENT	2000 POWELL
ST FRANCIS PIE COMPANY	OPEN - SITE ASSESSMENT	1125 67TH
TASCO	OPEN - SITE ASSESSMENT	3430 WOOD ST
THOMAS SHORT COMPANY	OPEN - SITE ASSESSMENT	3430 WOOD
THOROUGHBRED BUILDING	OPEN - SITE ASSESSMENT	1397 55TH
TOSCO 76 #3737 / CHEVRON	OPEN - SITE ASSESSMENT	1400 POWELL
TRANSOL LANCOSTE SITE	OPEN - SITE ASSESSMENT	1600 64TH ST
TULLOCH CONSTRUCTION INC	OPEN - SITE ASSESSMENT	3428 ETTIE
UNKNOWN	OPEN - SITE ASSESSMENT	3707 BAY ST
US POSTAL SERVICE	OPEN - SITE ASSESSMENT	6121 HOLLIS ST
USPS	OPEN - SITE ASSESSMENT	6121 HOLLIS
VACANT FACILITY	OPEN - SITE ASSESSMENT	6603 BAY
VACANT LOT	OPEN - SITE ASSESSMENT	5531 VALLEJO
WEATHERFORD BMW	OPEN - SITE ASSESSMENT	735 ASHBY AVE
WESTINGHOUSE ELECTRIC - PARCEL 1	OPEN - SITE ASSESSMENT	5815-5899 PELADEAU

SITE NAME	*CLEANUP STATUS*	*ADDRESS*
ZIMMERMAN PROPERTY	OPEN - SITE ASSESSMENT	3442 ADELINE
1266 66TH ST	OPEN - VERIFICATION MONITORING	1266 66TH ST
4343 SAN PABLO AVENUE	OPEN - VERIFICATION MONITORING	4343 SAN PABLO AVENUE
AC TRANSIT	OPEN - VERIFICATION MONITORING	1177 47TH
BERKELEY FARMS TRUCK REPAIR SOUTHERN SITE	OPEN - VERIFICATION MONITORING	4501 SAN PABLO
BERKELEY FARMS TRUCK SHOP YARD	OPEN - VERIFICATION MONITORING	4575 SAN PABLO
CHROMEX	OPEN - VERIFICATION MONITORING	1400 PARK
CHROMEX (TOXIC)	OPEN - VERIFICATION MONITORING	1400 PARK
EMERYVILLE CRESCENT PROPERTY	OPEN - VERIFICATION MONITORING	POWELL ST & I-80
HYDRAULIC ELECTRO SERVICE	OPEN - VERIFICATION MONITORING	5812 HOLLIS
RANSOME COMPANY	OPEN - VERIFICATION MONITORING	4030 HOLLIS
SUPER 7	OPEN - VERIFICATION MONITORING	901 ASHBY AVE
SUTTA & COMPANY	OPEN - VERIFICATION MONITORING	3401 WOOD
VACANT FACILITY	OPEN - VERIFICATION MONITORING	6601 BAY

Appendix D: Climate Action Plan Emission Reduction Measures

Table D-1: Proposed Community-wide Emissions Reduction Measures

Measure ID#	*Measure*	*CO2e (metric tons)*	*% towards goal*
C58	Transit Oriented Development	17,640	18.00
C16	Require Green Building for New Construction	10,511	10.73
C29	Energy Efficiency Education Targeted at Residents	7,514	7.67
C32	Water Conservation Ordinance	5,341	5.45
C30	Promote Green Building Through Loans & Incentives	5,256	5.36
C44	Education on Low-carbon Transportation Options	3,985	4.07
C23	Require Energy Efficiency Retrofit at Time of Sale	3,757	3.83
C17	Strict Commercial Energy Code	3,504	3.58
C22	Energy Efficiency Retrofits of Existing Facilities	3,504	3.58
C47	Bus Rapid Transit	3,466	3.54
C28	Energy Efficiency Education Targeted at Business	3,325	3.39
C38	Reflective Roofing	2,346	2.39
C52	Expand Carshare	2,317	2.36
C18	Strict Residential Energy Code	2,254	2.30
C19	Offer Loans for Residential Energy Efficiency Improvements	2,254	2.30
C10	High Efficiency Water Heaters	2,185	2.23
C21	Energy Efficient Affordable Housing	1,503	1.53
C36	Low-Maintenance Landscaping	1,480	1.51
C57	Provide Free High School Bus Passes	1,002	1.07%
C36	Lighting Occupancy Sensors	958	0.98
C20	Low-income Home Weatherization	881	0.90
C27	Efficient Lighting Retrofits - T12 lamps to T-8 lamps	821	0.84
C11	Increase Chiller Efficiency	817	0.83
C31	Green Business Programs	665	0.68
C39	Install Solar Photovoltaic (PV) Energy	656	0.67
C51	Increase BART & AMTRAK Ridership	639	0.65
C5	Energy Efficient Refrigerators	556	0.57
C46	Increase Emery-Go-Round Ridership	556	0.57
C48	Parking Cashout	450	0.46
C40	Install Solar Hot Water through incentives	390	0.40
C34	Water Saving Shower Heads	377	0.39
C1	Energy Efficient Computers	365	0.37
C2	Energy Efficient Computer Monitors	340	0.35

Measure ID#	*Measure*	*CO2e (metric tons)*	*% towards goal*
C13	HVAC Fan Upgrades	331	0.34
C14	HVAC Maintenance Tune-ups	317	0.32
C50	Increase AC Transit Ridership	278	0.28
C56	Provide Bicycles for Daily Trips	262	0.27
C8	Energy-Efficient Dish Washers	252	0.26
C45	Bicycling Paths and Facilities	243	0.25
C12	Increase Boiler Efficiency	222	0.23
C6	Energy Efficient Vending Machines	199	0.20
C37	Green Roofs	196	0.20
C53	Promote Carpooling and Vanpooling	187	0.19
C15	Switch Electric Heat to Natural Gas	185	0.19
C9	Efficient Clothes Washers	172	0.18
C54	Promote Telecommuting	172	0.18
C60	Parking and Lane Incentives for Hybrid Vehicles	164	0.17
C59	Use Hybrid Vehicles - (all sectors)	164	0.17
C4	Energy Efficient Copiers	150	0.15
C63	Increase Urban Forest	126	0.13
C49	Walking Friendly Environments	122	0.12
C42	Electric Vehicle Charging Stations on Parking Structures	119	0.12
C61	Use Smaller Fleet Vehicles	92	0.09
C43	Integrate Bicycles and Transit	81	0.08
C3	Energy Efficient Printers	74	0.08
C25	Energy Efficient Exit Signs	54	0.06
C62	Plant Trees to Shade Buildings	41	0.04
C33	Water Saving Faucets	38	0.04
C24	Compact Fluorescent Light Bulb (CFL) Distribution	35	0.04
C35	High Efficiency Toilets	25	0.03
C7	Energy Efficient Water Coolers	24	0.02
C41	Use Wind Energy	20	0.02
	Sub Total from CAPPA Software	95,961	97.99
	Recycling and Composting Actions (from WARM model)	16,766	
	TOTAL TONS REDUCED	112,727	

Source: CAPPA software from ICLEI and WARM model from EPA.

Table D-2: Proposed Government Emissions Reduction Measures

Measure ID #	*Measure*	*CO2e (metric tons)*	*% of goal*
G21	Use Solar Photovoltaic (PV) Energy	65.61	23.12
G12	Require Green Building for New Construction	26.28	9.26
G13	Energy Efficiency Retrofits of Existing Facilities	21.90	7.72
G28	Increase BART & AMTRAK Transit Ridership by employees	16.80	5.92
G32	Hybrid Vehicles - City Fleet	16.45	5.80
G22	Use Solar Heat for Public Swimming Pool	15.74	5.55
G36	Establish/Expand Recycling Programs	13.15	4.63
G17	Lighting Occupancy Sensors	11.49	4.05
G35	Fuel Efficient Vehicles for Parking Enforcement	10.55	3.72
G18	Low-Maintenance Landscaping	9.87	3.48
G27	Increase Emery-Go-Round Ridership by employees	7.31	2.58
G25	Police on Bicycles	7.08	2.50
G16	LED Traffic Signals	4.73	1.67
G20	Reflective Roofing	4.69	1.65
G26	Parking Cashout	4.50	1.58
G8	Increase Chiller Efficiency	4.09	1.44
G38	Plant Trees to Shade Buildings	4.07	1.44
G19	Green Roofs	3.92	1.38
G33	Use Smaller Fleet Vehicles	3.69	1.30
G7	High Efficiency Water Heaters	3.64	1.28
G29	Carsharing program for fleet vehicles	3.45	1.22
G11	HVAC Maintenance Tune-ups	3.17	1.12
G4	Energy Efficient Copiers	3.00	1.06
G37	Reuse or Recycling of Construction Materials	2.98	1.05
G23	Install Solar Hot Water	1.92	0.68
G1	Energy Efficient Computers	1.83	0.64
G2	Energy Efficient Computer Monitors	1.70	0.60
G10	HVAC Fan Upgrades	1.65	0.58
G3	Energy Efficient Printers	1.48	0.52
G9	Increase Boiler Efficiency	1.11	0.39
G14	Energy Efficient Exit Signs	1.09	0.38
G15	LED Street Lights	1.05	0.37
G5	Energy Efficient Refrigerators	0.93	0.33
G30	Promote Telecommuting	0.86	0.30

Measure ID #	*Measure*	*CO2e (metric tons)*	*% of goal*
G34	Retire Old or Underused Fleet Vehicles	0.75	0.26
G24	Bicycling Paths and Facilities	0.46	0.16
G31	Provide Bicycles for Daily Trips	0.45	0.16
G6	Energy Efficient Water Coolers	0.41	0.14
	TOTAL TONS REDUCED	285	

Source: CAPPA software from ICLEI.

Table D-3: Proposed Community Solid Waste Measures

Reduce Waste in half by 2020 over 2004 levels with :
Increase participation in commercial recycling/reuse programs for paper, cardboard, and plastic film
Participate in StopWaste.Org's audit and technical assistance program
Encourage businesses to participate in the County Green Business program
Increase participation in residential recycling programs
Educate residents and businesses about the benefits of Bay-Friendly Landscaping and Gardening
Increase participation in commercial and residential food waste collection program (for composting).
Consider incentives for waste reduction such as new rate structures for refuse and discards collection that credit diversion and allow for reduced rate composting/recycling services for businesses and residents.

Table D-4: Proposed Government Solid Waste Management Measures

Implement a duplex copying/printing policy in municipal office buildings
Reduce Landscape Waste in City landscapes by implementing StopWaste.Org's *Bay-Friendly Landscaping* Program. Include practices such as: • Increase on-site composting and mulching of municipal plant debris, using compost as a soil amendment, mulch for weed suppression, including the use of drip irrigation systems, a diverse plant pallet to resist pests, and reducing turf and sheared hedges.
Increase recycling and composting in municipal facilities
Adopt policies that support reduced waste (and which support other environmental priorities) including the following: • Environmental purchasing policy • 75% Diversion Goal • Construction &Demolition materials recycling ordinance • Civic Bay-Friendly/Green Building Ordinance • Residential green building resolution • Consider mandatory residential & commercial recycling/composting ordinance
Revise franchise language as franchises are renegotiated to include language that maximizes diversion (see StopWaste.Org for best practices)

DYETT & BHATIA
Urban and Regional Planners

755 Sansome Street, Suite 400
San Francisco, California 94111
415 956 4300 415 956 7315



EMERYVILLE GENERAL PLAN

Final Environmental Impact Report

CITY OF EMERYVILLE | August 2009

EMERYVILLE GENERAL PLAN

Final Environmental Impact Report

CITY OF EMERYVILLE | August 2009

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Appendix A: Revisions to the Draft General Plan A-1

1 Introduction

This Program Final Environmental Impact Report (EIR) has been prepared by the City of Emeryville (City) in accordance with the California Environmental Quality Act (CEQA). The City is the lead agency responsible for ensuring that the proposed Emeryville General Plan (General Plan) complies with CEQA.

PURPOSE

The Final EIR includes the Draft EIR and this document, which includes Comments on and Responses to Comments on the Draft EIR, and minor corrections and clarifications to the Draft EIR. It is intended to disclose to City decision makers, responsible agencies, organizations, and the general public, the potential impacts of implementing the proposed General Plan. This program level analysis addresses potential impacts of activities associated with implementation of the General Plan, which are described in Chapter 2: Project Description, of the Draft EIR.

The primary purpose of the Final EIR is to revise and refine the environmental analysis in the Draft EIR, published May 15, 2009, in response to comments received during the 45-day public review period. The review period for the Draft EIR (State Clearinghouse No. 2006022008) was from May 15, 2009 to June 30, 2009. This Response Addendum, combined with the Draft EIR, constitutes the Final EIR on the project. This Final EIR amends and incorporates by reference the Draft EIR, which is available as a separately bound document from the City of Emeryville Planning Department, 1333 Park Avenue, in Emeryville.

The Draft EIR contains some impacts that are significant and unavoidable despite extensive mitigating policies, including impacts to air quality, traffic, cultural resources and noise. Other potentially significant impacts can be avoided or reduced to levels that are not significant through implementation of the policies identified in the Draft EIR.

ORGANIZATION

This document contains the following components:

- Chapter 2 lists all of the agencies and individuals that submitted either written or oral comments on the Draft EIR; reproduces all comments and provides a unique number for each EIR comment in the page margin.
- Chapter 3 provides responses to comments, numbered, and in order according to the comments in Chapter 2.
- Chapter 4 lists revisions to the Draft EIR by chapter and page, in the same order as the revisions would appear in the Draft EIR. Actual revised pages of the Draft EIR appear at the end of the section, also in the same order that they would appear in the Draft EIR.
- Appendix A lists revisions to the Draft General Plan.

PROCESS

Upon publication of the Final EIR, the Planning Commission and City Council will hold public hearings to certify the EIR and to consider adoption of the proposed General Plan. The Commission and Council will determine the adequacy of the Final EIR, and, if determined adequate, will make findings and certify the document as compliant with CEQA.

Copies of the Final EIR have been provided to agencies and other parties that commented on the Draft EIR or have requested the Final EIR. The Final EIR is also available at the City of Emeryville, Planning Department, 1333 Park Avenue, in Emeryville and the City's website at: http://ca-emeryville.civicplus.com/index.aspx?nid=385.

2 Comments on the Draft EIR

This chapter contains copies of the comment letters and oral comments received on the Draft EIR of the proposed General Plan. A total of 12 comments were received during the 45-day comment period. Additionally, oral comments were received at a Planning Commission public hearing on the Draft EIR. Each comment letter is numbered, and each individual comment is assigned a number in the page margin. Responses to each comment are provided in Chapter 3 of this document. Please note that only comments on the Draft EIR are addressed in this Final EIR. Where appropriate, the information and/or revisions suggested in these comment letters have been incorporated into the Final EIR. These revisions are included in Chapter 4 of this document.

Where comments are on the merits of the proposed General Plan rather than on the Draft EIR, this is noted in the response. Some of these comments are addressed as revisions to the proposed General Plan, as summarized in Appendix A.

Comments Received on the proposed Emeryville General Plan

Comment #	*Date*	*Agency/Organization*	*Commenter*
Agencies (Federal, State Regional, Local) (A)			
A1	June 29, 2009	East Bay Municipal Utility District	William R. Kirkpatrick
A2	June 30, 2009	San Francisco Bay Conservation and Development Commission	Sara Polgar
A3	June 30, 2009	Department of Transportation	Lisa Carboni
Organizations/Individuals (B)			
B1	June 2, 2009		Brian Donahue
B2	June 4, 2009		Brian Donahue
B3	June 5, 2009		Brian Donahue
B4	June 6, 2009		Brian Donahue
B5	June 6, 2009		Brian Donahue
B6	June 6, 2009		Brian Donahue
B7	June 7, 2009		Brian Donahue
B8	June 22, 2009	Nady Systems	Frederic Schrag
B9	June 30, 2009	Level 3 Communications	Ryan Mcmanis
Oral Testimony (C)			
C1	June 25, 2009	Planning Commission Hearing on Draft EIR	Oral Comments

COMMENTS A1

EAST BAY
MUNICIPAL UTILITY DISTRICT

June 29, 2009

Deborah Diamond, Project Manager
General Plan and Zoning Update
City of Emeryville
1333 Park Avenue
Emeryville, CA 94608

Re: Draft Environment Impact Report – City of Emeryville General Plan, Emeryville

Dear Ms. Diamond:

East Bay Municipal Utility District (EBMUD) appreciates the opportunity to comment on the Draft Environmental Impact Report (EIR) for the City of Emeryville (City) General Plan. EBMUD has the following comments.

GENERAL

A1-1 The General Plan contains outdated information about the size of EBMUD's water and wastewater service area, number of customers, demand, and facility statistics and needs to be revised. Updated information and statistics can be found in the enclosed pamphlets *All About EBMUD* and *EBMUD's Annual Report 2008*. References within the Draft EIR and corresponding tables utilizing the updated information also need to be revised.

A1-2 Page 3.10-20, under Impact Statement 3.10-2, the first paragraph states "*This EIR considers whether changes in population projects in the proposed Emeryville General Plan would make a significant difference water demand currently planned for in the 2005 UWMP.*" The City should note that EBMUD uses land-use method to project its water demands because population based methods do not capture water demand from non-residential use.

WATER SERVICE

A1-3 The Draft EIR does not reference specific development projects. Any development project associated with the General Plan will be subject to the following general requirements:

Main extensions that may be required to serve any specific development projects that will provide adequate domestic water supply, fire flows, and system redundancy will be at the project sponsor's expense. Pipeline and fire hydrant relocations and replacements due to modifications of existing streets, and off-site pipeline improvements, also at the project sponsor's expense, may be required depending on EBMUD metering requirements and fire flow requirements set by the local fire department. All project sponsors should contact

EBMUD's New Business Office and request a water service estimate to determine costs and conditions of providing water service to the development. Engineering and installation of new and relocated pipeline and services requires substantial lead-time, which should be provided for in the project sponsor's development schedule.

Please note that depending on the size and/or square footage, the lead agency for future individual projects within the City's General Plan should contact EBMUD to request a Water Supply Assessment (WSA) that meets the threshold of a WSA pursuant to Section 15155 of the California Environmental Quality Act Guidelines, and Section 10910-10915 of the California Water Code. EBMUD requires project sponsors to provide future water demand data and estimates for individual project sites for analysis of the WSA. Please be aware that the WSA can take up to 90 days to complete from the day on which the request is received.

The Draft EIR indicates the presence of hazardous materials throughout the City that are of potential concern. The project sponsor should be aware that EBMUD will not inspect, install or maintain pipeline in contaminated soil or groundwater (if groundwater is present at any time during the year at the depth piping is to be installed) that must be handled as a hazardous waste or that may pose a health and safety risk to construction or maintenance personnel wearing Level D personal protective equipment. Nor will EBMUD install piping in areas where groundwater contaminant concentrations exceed specified limits for discharge to sanitary sewer systems or sewage treatment plants. Applicants for EBMUD services requiring excavation in contaminated areas must submit copies of existing information regarding soil and groundwater quality within or adjacent to the project boundary. In addition, the applicant must provide a legally sufficient, complete and specific written remedial plan establishing the methodology, planning and design of all necessary systems for the removal, treatment, and disposal of all identified contaminated soil and/or groundwater.

EBMUD will not design the installation of pipelines until such time as soil and groundwater quality data and remediation plans are received and reviewed and will not install pipelines until remediation has been carried out and documentation of the effectiveness of the remediation has been received and reviewed. If no soil or groundwater quality data exists or the information supplied by the applicant is insufficient EBMUD may require the applicant to perform sampling and analysis to characterize the soil being excavated and groundwater that may be encountered during excavation or perform such sampling and analysis itself at the applicant's expense.

WASTEWATER PLANNING

A1-4

The Draft EIR should include additional language under section 3.10, Public Services and Utilities, about the Federal Clean Water Act and the City's National Pollutant Discharge Elimination System (NPDES) permit and associated Cease and Desist Order. The General Plan and Draft EIR should be consistent with the requirements of the City's NPDES Permit and Cease and Desist Order and include a statement to that end.

A1-5

The Draft EIR should modify the discussion of Impact 3.10-3 to include wet weather flows. The Draft EIR presents projections for future dry weather flows and makes that case that the projected increases represent a small percentage of available treatment capacity at EBMUD's Main Wastewater Treatment Plant (MWWTP). EBMUD requests the following revision to the impact statement on page 3.10-22:

Impact 3.10-3 New development would not exceed wastewater treatment capacity of the EBMUD, and would not require construction of new wastewater treatment facilities~~, expansion of existing facilities or implementation of programs and policies to further reduce inflow and infiltration (I/I) of storm water into the city's wastewater collection system and private sewer laterals during wet weather events~~. (Less than Significant)

The impact statement, as written in the Draft EIR, contradicts recent regulatory changes requiring cessation of discharges from EBMUD's Wet Weather Facilities and reduction in inflow and infiltration (I/I) throughout the East Bay wastewater collection system. EBMUD's MWWTP and interceptor system are anticipated to have adequate dry weather capacity to treat the proposed wastewater flows from this project, provided that the wastewater meets the requirements of the current EBMUD Wastewater Control Ordinance. However, wet weather flows are a concern. EBMUD has historically operated three Wet Weather Facilities to provide treatment for high wet weather flows that exceed the treatment capacity of the MWWTP. On January 14, 2009, due to the Environmental Protection Agency's (EPA) and State Water Resources Control Board's re-interpretation of applicable law, the Regional Water Quality Control Board issued an order prohibiting further discharges from EBMUD's Wet Weather Facilities.

Currently, there is insufficient information to forecast how these changes will impact allowable wet weather flows in the individual collection system subbasins contributing to the EBMUD wastewater system, including the subbasins that encompass the general plan project area. As ordered by EPA, EBMUD is conducting extensive flow monitoring and hydraulic modeling to determine the level of flow reductions that will be needed in order to comply with the new zero-discharge requirement at the Wet Weather Facilities. It is reasonable to assume that a new regional wet weather flow allocation process may occur in the East Bay, but the schedule for implementation of any new flow allocations has not yet been determined.

A1-6

In the mean time, it would be prudent for the City to incorporate the following requirements for any new development into the proposed project: (1) replace or rehabilitate any existing sanitary sewer collection systems to reduce inflow and infiltration (I/I) to the maximum extent feasible, and (2) ensure any new wastewater collection systems are constructed to prevent I/I to the maximum extent feasible. Such provisions should be incorporated into the project and described in the Draft EIR under the discussion of Impact 3.10-3. Estimates of peak wet weather flows that are expected to result from the project and compare those projected flows to current peak wet weather flows should be included. The discussion to acknowledge the possible future need for additional I/I reduction in order to meet regulatory requirements should be revised accordingly.

WATER RECYCLING

A1-7 Page 3.10-3, under Recycled Water and Conservation, fourth sentence of the first paragraph, EBMUD's Non-Potable Water Policy number should be changed to 8.01.

Page 3.10-3, under Recycled Water and Conservation, the last sentence of the first paragraph should be revised to read "*Uses for recycled water include non-residential landscape irrigation, commercial and industrial process purposes, and toilet and urinal flushing in commercial buildings.*"

Page 3.10-3, under Recycled Water and Conservation, the first and second sentences in the third paragraph should be revised to read *"In 2008, the average daily recycled water use was 5.5 mgd. By 2020, EBMUD plans to recycle a total of 14 mgd in order to meet the anticipated potable water needs of its service area."*

Page 3.10-4, under Recycled Water and Conservation, the second sentence of the first paragraph should be revised to read *"This multi-phased project, commenced in 2003 with Phase 1A recently completed, will provide up to 2.2 mgd of recycled water from EBMUD's Main Wastewater Treatment Plant to customers in the aforementioned areas."*

WATER CONSERVATION

A1-8 Individual projects within the City's General Plan Update may present opportunity to incorporate water conservation measures. EBMUD would request that the City include in its conditions of approval a requirement that the project sponsor comply with Article 9-4.54 of the Municipal Code of the City of Emeryville: Landscape Design and Development Requirements. Project sponsors should be aware that Section 31 of EBMUD's Water Service Regulations requires that water service shall not be furnished for new or expanded service unless all the applicable water-efficiency measures described in the regulation are installed at the project sponsor's expense.

If you have any questions concerning this response, please contact David J. Rehnstrom, Senior Civil Engineer, Water Service Planning at (510) 287-1365.

Sincerely,

William R. Kirkpatrick
Manager of Water Distribution Planning

WRK:AMW:sb
sb09_129.doc

Enclosures

COMMENTS A2

Making San Francisco Bay Better

June 30, 2009

Deborah Diamond
Project Manager, General Plan and Zoning Update
Planning Division
1333 Park Ave.
Emeryville, CA 94608

Subject: City of Emeryville General Plan Update. BCDC Inquiry File No. AL.EY.6501.1.

Dear Ms. Diamond:

Thank you for the opportunity to comment on the draft environmental impact report (draft EIR) for the Emeryville General Plan update, State Clearinghouse Number 2006022008 received in our office on May 14, 2009. The Commission has not reviewed this draft EIR, so the staff comments in this letter are based on the *San Francisco Bay Plan* (Bay Plan) and the McAteer-Petris Act.

A2-1

Jurisdiction. In *Chapter 3: Settings, Impacts and Mitigation Measures*, in the Land Use and Housing, Biological Resources, and Hydrology and Flooding sections, the draft EIR describes BCDC's jurisdiction and authority. There are a few inconsistencies and minor errors in these descriptions that should be resolved. For example, on page 3.4-8, the description of the 100-foot shoreline band should say that it extends inland from mean high tide line, as opposed to "the high tide line" as currently stated here. The following paragraphs provide information about BCDC's jurisdiction and authority to discuss in the Regulatory Setting sections of the report.

The Commission has "Bay" jurisdiction over all areas of the Bay subject to tidal action which is defined by the shoreline. The shoreline is located at the mean high tide line, except in marsh areas, where the shoreline is located at five feet above mean sea level. The Commission's "Bay" jurisdiction extends to certain waterways identified in the McAteer-Petris Act consisting of all areas of the waterways that are subject to tidal action including submerged lands, tidelands, and marshlands up to five feet above mean sea level. Additionally, the Commission has "shoreline band" jurisdiction over an area 100 feet wide inland and parallel to the shoreline.

The Commission controls filling and dredging within its "Bay" jurisdiction through the permit system established by the McAteer-Petris Act. The Commission also administers permits for development within its 100-foot "shoreline band" jurisdiction. However, the Commission's authority along the shoreline is more limited; it may deny a permit application for a proposed project only if the project fails to provide maximum feasible public access to the Bay and shoreline consistent with the project, or is inconsistent with a priority use designation.

In accordance with provisions of the McAteer-Petris Act, the Commission has designated certain areas within the 100-foot "shoreline band" for specific priority uses for ports, water-related industry, water-oriented recreation, airports and wildlife refuges. The Commission is authorized to grant or deny permits for development within these priority use

areas based on appropriate Bay Plan development policies pertaining to the priority use. Along the Emeryville shoreline, the Bay Plan designates the southern and western shores of the peninsula as Waterfront Park, Beach priority use area, and the crescent as a Wildlife Refuge priority use area.

Sea Level Rise and Safety of Fills. We strongly support inclusion of measures in the General Plan update to "monitor climate change effects and implement any measures necessary to reduce any risk of flooding from sea level rise in the future" as stated on page 3.5-23. Additionally, although a 2100 scenario of sea level rise is beyond the planning horizon for the General Plan update, it would still be valuable to assess potential impacts to new construction (under the built-out Proposed General Plan) of a 55-inch sea level rise. We suggest this in part because the cost of flood protection for this new development could become extremely expensive with a higher sea level in the second half of the century, and creating this future hazard and cost may not be consistent with Proposed General Plan Key Principle #8 (page E-3).

A2-2

The draft EIR considers impacts of future sea level rise in the Hydrology and Flooding section (3.5). The descriptions of future sea level rise scenarios in the Environmental Setting and Impact Analysis sections are inconsistent with each other, and some of the information is outdated. In describing BCDC's assessment of sea level rise impacts to the Bay and its shoreline, the draft EIR should consistently reference the draft BCDC staff report, *Living with a Rising Bay: Vulnerability and Adaptation in San Francisco Bay and on the Shoreline,* released in April 2009. This BCDC report assessed sea level rise projections of 16-inches and 55-inches at mid-century and end of century, respectively. Furthermore, in addition to noting on page 3.5-6 that the BCDC maps of vulnerable areas do not account for existing shoreline protection, it should also be noted in this text that the maps do not indicate increases to storm-related flood areas (such as the 100-year flood zone).

A2-3

The draft EIR accurately references the sea level rise projections from BCDC's April 2009 report in the map in Figure 3.5-4 and the paragraph beginning on page 3.5-9 and continuing on the next page. However, the final sentence of the paragraph preceding this (on page 3.5-8) states, "Average sea levels …are projected to rise by at least another one-third of a foot and up to almost three feet by the year 2100." This statement should have a reference to allow readers to understand the source of this projection information, particularly since this sea level rise projection differs from the BCDC assessment described in the next paragraph.

A2-4

The analysis of the significance of Impact 3.5-5 on page 3.5-22 is based on an older analysis of sea level rise in San Francisco Bay. This impact analysis should be done based on the sea level rise scenarios (i.e. 16-inches and 55-inches) from the recent (April 2009) BCDC assessement report.

A2-5

In the description of the Regulatory Setting in the Hydrology and Flooding section (3.5), the draft EIR should reference existing Bay Plan safety of fills findings and policies that anticipate the need for planning associated with sea level rise. The Safety of Fills findings recognize that "Bay water levels are likely to increase in the future because of a relative rise in sea level… Relative rise in sea level is the sum of: (1) a rise in global sea level and (2) land elevation change (lifting and subsidence) around the Bay." Policy 5 states, in part, "…structures on fill or near the shoreline should be above the highest estimated tide level for the expected life of the project water level during the expected life of the project or be sufficiently protected by levees…" Additionally, Policy 6 states, "local governments and special districts with responsibilities for flood protection should assure that their requirements and criteria reflect

A2-6

future relative sea level rise and should assure that new structures and uses attracting people are not approved in flood prone areas or in areas that will become flood prone in the future, and that structures and uses that are approvable will be built at stable elevations to assure long-term protection from flood hazards." It may also be appropriate to recognize in the Regulatory Setting description that shoreline development within BCDC's jurisdiction may be subject to future permit controls related to sea level rise impacts.

A2-7

The assessment of significance in Impact 3.5-5 in the Hydrology and Flooding section is, overall, difficult for the reader to follow. The draft EIR states on pages 3.5-9 and 3.5-22 and 3.5-23 that the scenarios of sea level rise do "not suggest vulnerability" to structures or urbanized areas. However, Figure 3.5-4 entitled Areas Vulnerable to a 16-inch Sea Level Rise by Mid-Century, shows that existing structures and public access on the Emeryville peninsula are potentially subject to regular inundation under this scenario. The draft EIR does not explicitly show where new development could occur along the shoreline under the Proposed General Plan build out, so it is not possible for the reader to conclude that the Impact 3.5-5 would be less than significant (as stated on page 3.5-23). Additionally, the justification of the significance determination for Impact 3.5-5 on page 3.5-23 references Impact 3.13-7 which we were unable to find.

A2-8

Lastly, although the draft EIR assesses potential impacts to structures along the shoreline due to future projected sea level rise, it does not consider impacts to recreation and biological resources. Figure 3.5-4 suggests that under the mid-century sea level rise scenario portions of Point Emery and Shorebird Park, the Emeryville Marina, and the mudflats and wetlands in the Emeryville Crescent will be inundated. Specifically addressing these future impacts in policies may be beyond the scope and timeframe of the Proposed General Plan update. However, it would be valuable to consider the potential losses of these very important recreational resources and habitats in planning for future development in Emeryville.

A2-9

Bay Trail Alignment. Development of the proposed spur alignment for the Bay Trail (Figure 3.2-5) that runs along the Emeryville Crescent to Interstate 80 may pose regulatory challenges. There are many wildlife demands on the portion of the Crescent where the trail would be located. The upland areas are designated in the Bay Plan as a wildlife refuge priority land use area (Bay Plan Map 4) and are improved with required habitat mitigation for environmental impacts of the Interstate 80 HOV improvement project. These mitigations are required in BCDC and US Army Corps of Engineers permits. Therefore, these areas cannot be displaced by a trail, unless the City provides equal or better mitigation elsewhere and convinces the regulatory agencies that the mitigation meets or exceeds current benefits. Moreover, the trail would likely be require to provide mitigation for its impacts. If a trail were built along the Crescent, it would probably have to displace the freeway. This freeway is such a vital link in the Bay Area transportation network, carrying high volumes of traffic daily; it is unlikely that such a modification would be possible now or in near future. It may be valuable to identify these and other challenges in the draft EIR discussion of impacts due to build out of the Proposed General Plan.

Thank you for your consideration of our comments. If you have any questions regarding this letter please contact me by phone at 415 352-3654 or email sarap@bcdc.ca.gov.

Sincerely,

SARA POLGAR
Coastal Planner

STATE OF CALIFORNIA

GOVERNOR'S OFFICE *of* PLANNING AND RESEARCH

STATE CLEARINGHOUSE AND PLANNING UNIT

ARNOLD SCHWARZENEGGER
GOVERNOR

CYNTHIA BRYANT
DIRECTOR

COMMENTS A3

June 30, 2009

Deborah Diamond
City of Emeryville
1333 Park Avenue
Emeryville, CA 94608

Subject: City of Emeryville General Plan Update
SCH#: 2006022008

Dear Deborah Diamond:

The enclosed comment (s) on your Draft EIR was (were) received by the State Clearinghouse after the end of the state review period, which closed on June 29, 2009. We are forwarding these comments to you because they provide information or raise issues that should be addressed in your final environmental document.

The California Environmental Quality Act does not require Lead Agencies to respond to late comments. However, we encourage you to incorporate these additional comments into your final environmental document and to consider them prior to taking final action on the proposed project.

Please contact the State Clearinghouse at (916) 445-0613 if you have any questions concerning the environmental review process. If you have a question regarding the above-named project, please refer to the ten-digit State Clearinghouse number (2006022008) when contacting this office.

Sincerely,

Terry Roberts

Terry Roberts
Senior Planner, State Clearinghouse

Enclosures
cc: Resources Agency

STATE OF CALIFORNIA—BUSINESS, TRANSPORTATION AND HOUSING AGENCY ARNOLD SCHWARZENEGGER, Governor

DEPARTMENT OF TRANSPORTATION
111 GRAND AVENUE
P. O. BOX 23660
OAKLAND, CA 94623-0660
PHONE (510) 622-5491
FAX (510) 286-5559
TTY 711

Flex your power!
Be energy efficient!

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JUN 30 2009
STATE CLEARING HOUSE

June 30, 2009

ALAGEN221
SCH#2006022008

Ms. Deborah Diamond
City of Emeryville
1333 Park Avenue
Emeryville, CA 94608

Dear Ms. Diamond:

Emeryville General Plan Update – Draft Environmental Impact Report

Thank you for including the California Department of Transportation (Department) in the environmental review process for the Emeryville General Plan Update. The following comments are based on the Draft Environmental Impact Report. As lead agency, the City of Emeryville is responsible for all project mitigation, including any needed improvements to State highways. The project's fair share contribution, financing, scheduling, and implementation responsibilities as well as lead agency monitoring should be fully discussed for all proposed mitigation measures and the project's traffic mitigation fees should be specifically identified in the environmental document. Any required roadway improvements should be completed prior to issuance of project occupancy permits. An encroachment permit is required when the project involves work in the State's right of way (ROW). The Department will not issue an encroachment permit until our concerns are adequately addressed. Therefore, we strongly recommend that the lead agency ensure resolution of the Department's California Environmental Quality Act (CEQA) concerns prior to submittal of the encroachment permit application; see the end of this letter for more information regarding the encroachment permit process.

A3-1

Community Planning

The Department encourages you to locate any needed housing, jobs and neighborhood services near major mass transit nodes, and connected to these nodes with streets configured to facilitate walking and biking, as a means of promoting mass transit use and reducing regional vehicle miles traveled and traffic impacts on the state highways.

A3-2

Please consider developing and applying pedestrian, bicycling and transit performance or quality of service measures and modeling pedestrian, bicycle and transit trips that your project will generate so that impacts and mitigation measures can be quantified. In addition to urban design treatments, these measures could include Travel Demand Management (TDM) policies (for example, lower parking ratios, car-sharing programs, transit subsidies, etc.) to encourage usage of nearby public transit lines.

In addition, please analyze secondary impacts on pedestrians and bicyclists that may result from any traffic impact mitigation measures. Please describe any pedestrian and bicycle mitigation measures and safety countermeasures that would therefore be needed as a means of maintaining and improving access to transit facilities and reducing traffic impacts on state highways.

Encroachment Permit

Any work or traffic control within the State ROW requires an encroachment permit that is issued by the Department. Traffic-related mitigation measures will be incorporated into the construction plans during the encroachment permit process. See the following website link for more information: http://www.dot.ca.gov/hq/traffops/developserv/permits/

A3-3

To apply for an encroachment permit, submit a completed encroachment permit application, environmental documentation, and five (5) sets of plans which clearly indicate State ROW to the address at the top of this letterhead, marked ATTN: Michael Condie, Mail Stop #5E.

Should you have any questions regarding this letter, please call Yatman Kwan of my staff at (510) 622-1670.

Sincerely,

Lisa Carboni

LISA CARBONI
District Branch Chief
Local Development - Intergovernmental Review

c: State Clearinghouse

COMMENTS B1

From: Brian Donahue [sophbeau@yahoo.com]
Sent: Tuesday, June 02, 2009 5:05 PM
To: Charles Bryant; Deborah Diamond
Cc: Patrick D O'Keeffe
Subject: Public Comment: DEIR to the General Plan

This e-mail is to serve as a written response to the Draft EIR for the new General Plan (the Plan). Please include a response in the EIR.

Response To The DEIR For The General Plan

The 'photo simulations' on pages 3.12-13 through 3.12-15 are not based on any findings of fact from the Plan. In fact, they have been manipulated by a 'cherry-picking' from the Plan to provide a rosier picture of Emeryville after implementation of the Plan. This would be 'playing politics'.

The pictures clearly show an increase in the pedestrian and bicycle activity from the 'Before' to the 'After' shots. This increase in activity is consistent with the findings of the Plan. The problem is the photos show *no increase in the automobile traffic,* demonstrably not supported by findings of the Plan.

B1-1 Any reading of the Plan clearly indicates an increase in the auto traffic, so why has this not been shown in the photos alongside the increase in the bike/ped traffic which IS shown? This is a mistake and if the final EIR doesn't correct this, it is directly provable that there is politics being played with the authors of the EIR and consequently, the credibility of the EIR will be in question.

A telephone conversation with Charlie Bryant, head of the Emeryville Planning Dept, on June 2, 2009 validated my charge of politics being played. Mr Bryant indicated that under no circumstances would the photo simulations in question be altered for inclusion into the EIR. This is counter to the function of the DEIR. Members of the public are allowed to point out mistakes in the document and if the writers of the DEIR agree, presumably the mistakes will be corrected for the EIR. According to Mr Bryant, this eventuality is not possible for purposes of this EIR. So I have to ask: Why should members of the public even respond to the DEIR if the outcome is pre-determined?

B1-2

In addition to the purposeful manipulations I have illustrated above there is the problem of the photo depictions of the street trees. The 'After' pictures show a plethora of large, beautiful, mature street trees. The problem is there are no provisions in the Plan to protect the existing street trees and our Urban Forestry Ordinance (UFO) historically has been too weak to provide protection so the depiction of such large trees would be wishful thinking at best. The UFO makes it very easy and cheap for developers to cut down our trees and this is exactly what happens to the vast majority of our street trees; they aren't able to grow to the scale depicted in the simulations. A more accurate depiction would show 'lollipop' trees continuing on into the future (barring a strengthening of the UFO). The DIER should make no assumptions about a future strengthening of our UFO.

An (D)EIR should be prepared with a basis in demonstrable finding of fact. The photo

simulations in this document have been presented in a most shoddy and unprofessional manner. These are not fact based, rather they serve to smooth the way for the Plan becoming law by obfuscating the negative aspects of the Plan. The public part of this has been subverted.

Brian Donahue

Emeryville Resident

From: Brian Donahue [sophbeau@yahoo.com]
Sent: Thursday, June 04, 2009 4:02 PM
To: Charles Bryant; Deborah Diamond
Cc: Patrick D O'Keeffe
Subject: Horton St Bike Blvd: General Plan DEIR

COMMENTS B2

Please include this e-mail in the FEIR and respond

Response to the DEIR for the proposed Emeryville General Plan

The Draft Environmental Impact Report (DEIR) for the proposed General Plan (the Plan) fails to sufficiently identify an important existing transportation element. This is the Horton/Overland Bicycle Boulevard.

B2-1

A bicycle boulevard is designed as a route that places the number one priority on bikes but allows vehicular traffic as a subordinate mode. It has been recognized that bicycle boulevards become failures when vehicular traffic exceeds a certain prescribed number of "trips" thus rendering the bikes subordinate to the cars, demonstrably not a bicycle boulevard. Further it has been recognized that an excess of vehicular speed will also render a bike boulevard as a failure. The actual numerical facts I allude to here are recognized by other Bay Area municipalities such as Palo Alto and Berkeley. These cities have installed traffic calming measures to prevent failures such as I described.

To transform the Horton Street Bicycle Boulevard also into a Transit Boulevard by definition degrades this existing route from its 'bikes as number one priority' into something less as far as bicycles are concerned. Further, it is universally recognized that buses and bikes are a bad combination and to be avoided in close proximity owing to the large size of buses and their reduced capacity to visualize bicyclists as compared to automobiles. So this change represents a reduction in the existing environment for bicycle transportation and the DEIR has not adequately addressed it.

It is a further insult that the Plan is calling for massively increasing automobile traffic on Holden Street with the addition of the Transit Center and the Sherwin Williams Project. The Plan and the DEIR have made no actual provisions to protect the Bike Boulevard from increases in vehicular volume and speed. A provision might take the form of a 'diverter' to allow bikes and buses but not cars. Also a critically placed 'choker' or two could provide protection for bikes.

Both the Plan and DEIR gush with praise for bicycle travel in town but they fail to advocate for the measures that would be needed if the town is to grow as they call for. We have seen what happens when the hard decisions are not made and much flowery talk is offered: it is all sound and fury, signifying nothing. I had hoped for a more bicycle friendly document.

Brian Donahue
Resident

From: Brian Donahue [sophbeau@yahoo.com]
Sent: Friday, June 05, 2009 7:07 PM
To: Charles Bryant
Cc: Deborah Diamond; Patrick D O'Keeffe
Subject: Addendum to the Horton St DEIR Response

COMMENTS B3

Please include this addendum to my previous e-mail regarding the Horton Street Bike Blvd into the responses to the DEIR for the General Plan.

Addendum to Response to DEIR for the General Plan

The DEIR categorically states "The proposed General Plan would not physically divide any established communities..". This is untrue.

B3-1 As I explained in the previous e-mail, the existing Horton/Overland Bicycle Boulevard would be harmed by the addition of traffic from the Sherwin Williams Project and the Transit Center without the express provision for traffic calming to reduce vehicle speed and volume to universally agreed upon maximums. More importantly though are the negative effects from the inclusion of the street as a Transit Boulevard and the fact that the defining characteristic of a bike boulevard would necessarily be diminished, vis a vis bicycles with this action.

B3-2 These two problems, brought on by the enactment of the Plan would, by definition, reduce the connectivity for bicycle transportation for those wishing to travel in a North/South direction in Emeryville and would as a result, divide an existing community at least by degree. Consequently, impact # 3.1-1 must be identified as a "significant" impact in the absence of any identified mitigation. Please remove the "beneficial" finding for this impact for inclusion into the EIR.

Brian Donahue
Resident

From: Brian Donahue [sophbeau@yahoo.com]
Sent: Saturday, June 06, 2009 1:50 PM
To: Charles Bryant; Deborah Diamond
Cc: Patrick D O'Keeffe
Subject: DEIR to General Plan: the Transit Center

COMMENTS B4

Please include this e-mail response to the DEIR in the FEIR and respond in kind.

Response to the DEIR for the General Plan

B4-1

I have noted the collective will of the General Plan Committee to craft an over ridding concept to answer ideas about building density and building heights permissible in Emeryville. This has been expressed as a vision of a "core" of tall buildings in the center with heights and densities lowering as one moves laterally. Specifically, the area between the freeway and the railroad tracks has been identified as the place to receive this high density. The rationale being this would allow for the most growth while being the least impactful to the existing neighborhoods and residents.

Looking at the Maximum Floor Area Ratios (FAR) (figure 2.3-2), one notes a glaring exception has been made to the reasoned maxim without benefit of a cogent rationality. This is the piece of land adjoining the rail road tracks immediately to the north of the Amtrack Station, a parcel owned by Wareham Development Corporation.

There has been much talk by City Hall that this should be a "Transit Center". Without delving into the obvious and venal politics of this exception, the DEIR has not examined the effects, not the least of which would be the dividing of an existing community, this exemption would cause. In addition, by making claim to community/environmental benefits from a "Transit Center", the General Plan has not qualified what a transit center is. This makes an thoughtful analysis of costs/benefits impossible. In this context, I take it as a given that a profit seeking developer would use the term "transit center" to describe a proposed development if he felt it would make more likely a favorable outcome with the decision makers. Since there are no metrics being offered, any development is/could be a "transit center".

To increase the permissible FAR up to 5.5/8.0 on this parcel of land, counter to the stated goals of the Plan, from the surrounding permissible FARs means the building scale would be inconsistent and would be further exacerbated by the fact there is no accompanying meaningful reduction in auto use. This will be a significant negative impact to an existing neighborhood/community.

The people need more transparency regarding public land use policy than is being offered up here. The General Plan is not providing it and the DEIR should make note of this since it involves environmental impact.

Special note to any readers of this letter from the general public: Note the probable use of Orwellian government-speak this letter will bring in response. There is common sense and then there is the real agenda of the well connected taking what they want.

Brian Donahue
Resident

From: Brian Donahue [sophbeau@yahoo.com]
Sent: Saturday, June 06, 2009 2:54 PM
To: Charles Bryant; Deborah Diamond
Cc: Patrick D O'Keeffe
Subject: Response to the DEIR: "Family Friendly Housing"

COMMENTS B5

please include this e-mail into the responses to the DEIR

Response to the DEIR for the General Plan

B5-1 The proposed General Plan makes reference in the Guiding Principles, to the need to create "family friendly housing" in the Diverse, Balanced and Inclusive Community section (#7). Neither the Plan nor the DEIR explains what this would be.

As a parent, I can say family friendly encompasses more than number of bedrooms in a residence. There are many more qualities that need to be in effect to rightfully call a residence "family friendly" and yet this is pretty much what makes up the criterion as far as these documents are concerned.

It is not good enough to proclaim a proposed development as "family friendly" as a way to move a proposal forward through the permit process. This must be qualified, otherwise Emeryville will not get real family friendly housing and unethical developers will be permitted to game the system to their advantage at the resident's expense.

For sake of accuracy and efficacy, the term 'family friendly housing' should not be used by the Plan or the DEIR unless and until it can be measured.

Brian Donahue
Resident

COMMENTS B6

From: sophbeau@yahoo.com
Sent: Saturday, June 06, 2009 10:17 PM
To: Charles Bryant; Deborah Diamond
Cc: Patrick D O'Keeffe
Subject: Response to DEIR: LOS vs QOS

The function of a general plan is to guide a city in developing consistent with the will of the people. Any plan should be written in a way that is understandable by the general population and not an arcane, jargon filled document for city planning officials. This being true, the call from the Emeryville General Plan to abandon the old way to measure traffic movement and adapt a new way without the benefit of an easily observable line of continuity is unnecessarily vague and will unfairly serve to allow more traffic on the streets in a clandestine fashion.

B6-1

For years, residents have been able to use the old traffic model, Level Of Service (LOS) to definitively see how traffic has increased and how ease of access has eroded as a result of development decisions by City Hall. LOS uses an A through F model everyone knows from school. They can easily track how votes for certain City Council members ultimately translates into intersections dropping from B to D for instance. In this way, the electorate is informed well. The DEIR accepts the General Plan dropping of LOS in favor a new model Quality Of Service (QOS) with no analysis. This is a mistake since the loss of information continuity will result in a degradation of critical information residents need to keep in check future negative environmental impacts.

While the information QOS tracks may be of value, residents lose a measurement that will effectively 'reset the clock' on traffic increase. After 15 years of massive development in Emeryville, this is a grave mistake. More then ever, we need to accurately keep track of how our government is serving or not serving us. This resetting can be used to sneak in much more development then would have been politically possible if the LOS were to still be in effect. As a town with a well earned reputation for being very pro-development, this eventuality is likely.

Lastly, the DEIR gives no reason as to why LOS couldn't continue uninterrupted alongside QOS. There needs to be a rationale for the wholesale trashing of this valuable accounting mechanism.

Brian Donahue
Resident

From: Brian Donahue [sophbeau@yahoo.com]
Sent: Sunday, June 07, 2009 2:29 PM
To: Charles Bryant; Deborah Diamond
Cc: Ken James; Patrick D O'Keeffe
Subject: General Plan DEIR: Police Services

COMMENTS B7

Please include the previous e-mail I sent regarding LOS vs QOS into the record for the General Plan FEIR. In addition also include this e-mail.

Response to the DEIR for the General Plan

B7-1 I have concerns that a potential environmental impact involving Police services has not been identified by the DEIR. Impact #3.10-5 makes reference to Police Department citizen response time and station adequacy to meet the needs of the population increase the General Plan calls for but mistakenly assumes a state of constant Police morale.

It is common knowledge that the hard to qualify notion of morale is critical to an effective Police force but what is not hard to qualify is how low pay will lower morale universally. It should be noted that the pay for rank and file EPD sworn officers has been dropped from an historic Oakland Police Dept parity to a much lower rate. It was assumed that since Emeryville is virtually surrounded by Oakland and shares a urban culture with attendant criminality, the pay rate should be the same. The pay erosion condition has deteriorated so far that EPD pay has now dropped to below the median for the ten East Bay urban core cities used to justify EPD pay. This is a recent thing and the DEIR is moving forward from this position as the "normal" state from which to measure impacts. I maintain Police morale slips with the knowledge that they are not keeping pace with their colleague's pay rate in neighboring cities, and as morale slips so will Police services to the community. One remedy of course could be a requirement to raise pay rates for EPD personnel and call for a mechanism to keep the higher rate in pace with neighboring cities so as to not fall into a more impactful environment for the community.

The DEIR needs to assume lowering Police pay will negatively impact the community and have this be quantified in the FEIR.

Brian Donahue
Resident

COMMENTS B8

-----Original Message-----
From: Frederic Schrag [mailto:schrag@nady.com]
Sent: Monday, June 22, 2009 3:36 PM
To: Deborah Diamond
Subject: General Plan

Hi Deborah,

The Planning Commission is holding a hearing this coming Thursday, June 25, 2009, to accept comments on the Draft Environmental Impact Report (DEIR) prepared for the Draft Emeryville General Plan.

The DEIR includes the Draft Emeryville General Plan's land use recommendations to the Planning Commission. Before the June 25 hearing, will city staff add a note to the proposed General Plan's land use recommendation to the Planning Commission for its consideration of the DEIR indicating that the General Plan and Zoning Update Steering Committee members are not in agreement as to whether the Northwest corner of the city should be rezoned to non-residential/mixed use or whether it should be rezoned to allow for residential/mixed use development with a concommitant height limit of 75/100 feet? (See your and my June 5, 2009 emails copied herein.)

B8-1

Shouldn't the DEIR and the EIR prepared for the proposed General Plan analyze the discussed alternative zoning that would allow residential/mixed use development with a concommitant height limit of 75/100 feet?

Do I need to raise that issue at the June 25 hearing, or will city staff's note to the proposed General Plan's land use recommendation to the Planning Commission suffice to preserve the issue for adequacy of the EIR in the event that the city adopts the alternative zoning and height limitation in the new General Plan?

Please advise.

Frederic D. Schrag
General Counsel
Nady Systems, Inc.
6701 Shellmound Street
Emeryville, CA 94608
Tel: 510.652.2411 ext. 263
Fax: 510.652.5075
schrag@nady.com

-----Original Message-----
From: Deborah Diamond [mailto:ddiamond@ci.emeryville.ca.us]
Sent: Friday, June 05, 2009 4:13 PM
To: schrag@nady.com
Subject: RE: General Plan

Hi Frederic,

Confirmed. Staff has been instructed to do so by the Steering Committee.
This will be included in the staff reports for the Planning Commission and City Council. No additional action is need.

Deborah

-----Original Message-----
From: Frederic Schrag [mailto:schrag@nady.com]
Sent: Fri 6/5/2009 2:49 PM
To: Deborah Diamond
Subject: General Plan

Hi Deborah,

At the April 15, 2009 General Plan and Zoning Update Steering Committee meeting, the committee instructed staff to add a note to the proposed General Plan's land use recommendation to the Planning Commission and City Council that the committee members are not in agreement as to whether the Northwest corner of the city should be rezoned to non-residential/mixed use or whether it should be rezoned to allow for residential/mixed use development with a concommitant height limit of 75/100 feet.

Are all the "necessaries" in place for staff to add that note to the Planning Commission and City Council without further committee action, or do I need to attend the upcoming June 9, 2009 GPZUSC meeting to press for some further committee action to accomplish that?

Please advise.

Frederic D. Schrag
General Counsel
Nady Systems, Inc.
6701 Shellmound Street
Emeryville, CA 94608
Tel: 510.652.2411 ext. 263
Fax: 510.652.5075
schrag@nady.com

COMMENTS B9

From: McManis, Ryan [mailto:Ryan.Mcmanis@Level3.com]
Sent: Tuesday, June 30, 2009 1:15 PM
To: Deborah Diamond; Charles Bryant
Cc: Greg Harper; Reed, Jason; Novak, Bob
Subject: Comment to Draft EIR - Level 3 Communications

Dear Ms. Diamond,

I am Corporate Counsel for Level 3 Communications, owner and occupier of 5000 Hollis Street.

B9-1

Level 3 wishes to note that the land use designation of its property, per the proposed general plan, changed from a combination of "Park/Open Space" and “Public” at the time the draft EIR was published for circulation, to "Office/Technology" at the time the plan was finalized by the General Plan Steering Committee. Level 3 does not presume that these changes necessarily or significantly affect the Environmental Impact Report, it merely notes that the impacts, if any, of these changes might be considered by the Study's authors.

Please don’t hesitate to contact me if you have questions or need additional information.

Yours,

Ryan McManis

Ryan McManis
Corporate Counsel
Level 3 Communications
1025 Eldorado Boulevard
Broomfield, Colorado 80021
Phone: (720) 888-1318
Facsimile: (720) 888-5619

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COMMENTS C1

SUMMARY OF PLANNING COMMISSION COMMENTS ON THE EMERYVILLE GENERAL PLAN DRAFT EIR

Planning Commission Public Hearing

June 25, 2009

Jim Martin

C1-1 1. Why are there no mitigation measures in the Draft EIR? The EIR should be revised to clarify what mitigation measures were added as a result of environmental review.

C1-2 2. The Final EIR should include a listing of all revisions to the Public Review Draft General Plan, published in January 2009.

C1-3 3. Page 3.1-19 and 3.1-20 describe 70 housing units being lost to redevelopment. Where are these units? Does this include affordable housing? How is this not a significant impact?

C1-4 4. Fehr & Peers and Nelson/Nygaard prepared a set of feasible improvements to intersections which were not referenced in the Draft EIR. Those studies should be referenced through new policies to continue studying these recommendations.

C1-5 5. Policy T-P-3 regarding Quality of Service is too long, wordy, and detailed.

C1-6 6. There are inconsistencies between the discussion of tsunamis and sea level rise on pages 5.5-8 through 3.5-9 and Figure 3.5-4 on page 3.5-10. The EIR should acknowledge flooding risks and require the City to cooperate with local and state agencies to reduce flooding impacts.

C1-7 7. Only one policy measure is listed on page 3.7-17 to mitigate Impact 3.7-1. The General Plan should expand on existing noise policies in the General Plan and include additional noise mitigation policies to reduce ambient noise and construction-generated noise, and to enable noise attenuation measures for rooftop and other mechanical equipment to mitigate impacts in Section 3.7: Noise of the General Plan.

C1-8 8. Impact 3.8-2 is concluded to be a significant and unavoidable impact. The City's existing ordinances regarding preservation and demolition should be reevaluated if we start to lose Tier 1 and 2 resources.

C1-9 9. Policies on pages. 3.11-8 through 3.11-9 of the Draft EIR should be renumbered and reordered to start with the broadest ideas and logically build on one another.

C1-10 10. Impact 3.11-3 should be edited to read: The construction or expansion of recreation facilities ~~would~~could have an adverse physical effect on the community.

C1-11 11. The proposed FAR of 0.75/1.25 in the Eastern Residential Neighborhoods seems too high compared with the FARs of existing structure. This could have the potential to disrupt neighborhood character. This does not suggest a "beneficial" impact as concluded in Impact 3.12-2 of the Draft EIR.

C1-12 12. Add a note to Figure 2.3-2: Maximum Floor Area Ratios that FAR values include parking area.

Patricia Jeffery

C1-13 13. Impact 3.1-3 should include a table that identifies how the General Plan is consistent with the existing local and regional plans and Zoning Ordinance described in this section.

C1-14 14. More discussion is need in Chapter 4: Alternatives to evaluate the three alternatives and support the conclusion of an environmentally superior alternative.

John Scheuerman

C1-15 15. Grade separation of local traffic (vehicles, bicycles, and pedestrians) from the railroad tracks at 65th Street has benefits for both circulation and noise: this linkage needs to be articulated in the relevant sections of the Draft EIR. Closing some of the at-grade crossings can reduce train noise impacts, while improving the Emery Go-Round route by allowing for a loop circulation.

C1-16 16. Why do the existing and projected railroad contours appear the same if rail traffic is expected to increase over time?

Gail Donaldson

C1-17 17. Agree with the comment regarding the FAR values for the Eastern Residential Neighborhoods.

3 Response to Comments on the Draft EIR

This chapter includes responses to each comment, and in the same order, as presented in Chapter 2. The responses are marked with the same number-letter combination as the comment to which they respond, as shown in the margin of the comment letters.

AGENCIES

A1: East Bay Municipal Utility District (EBMUD)

A1-1: A revision has been provided on page 3.10-2 of the Draft EIR to address this comment and update general information about EBMUD. See Chapter 4 of this Final EIR for revision (page 4-6). The same comment pertaining to the General Plan is noted.

A1-2: Impact 3.10-2 on page 3.10-20 of the Draft EIR and the discussions that follow project water demand based on total potential customers—both residents and workers—thereby encompassing future residential and non-residential development. These findings are shown in Table 3.10-5. The discussion recognizes that EBMUD projections are based only "in part" on population. The City acknowledges that EBMUD uses a land use method to project its water demand in order to capture demand from residential and non-residential use.

A1-3: The General Plan Draft EIR is a program-level EIR and does not include specific development projects. Individual projects will be subject to their own environmental assessment, including any necessary analysis of water supply and fire flows, and site remediation.

The City uses standard conditions of approval that are applied to projects as warranted. The City's Subdivision Ordinance requires projects to construct infrastructure improvements, including water hookups, as a condition of subdivision, parcel map, or other division of land approval. An action item in the proposed General Plan calls for the City's Public Works Department to "continue to coordinate with utilities service providers as necessary (i.e. PG&E, EBMUD)."

In terms of the commenter's concern about the presence of hazardous materials contamination, the City appreciates and concurs with EBMUD's concern for public health and safety. Emeryville is an urban area that is affected by hazardous materials and contaminants, but has shown leadership in efforts to clean up sites, allowing new uses and ensuring the healthy and safety of residents, workers, and visitors. As described on page 3.3-6 of the Draft EIR, in Alameda County, remediation of contaminated sites is generally performed under the oversight of the California Department of Toxic Substances, San Francisco Bay Regional Water Quality Control Board, Alameda County Department of Environmental Health and/or the City. At sites where contamination is suspected or known to occur, the project sponsor is required to perform a site investigation and draw up a remediation plan, if necessary. For typical development projects, site remediation is completed either before or during the construction phase of the project.

The City provides parcel-based information on contamination status; assistance with State regulatory agencies regarding investigation and preparation of clean-up documents; and grants and no/low interest loans for investigations and clean-up. As described in Chapter 7: Sustainability of the proposed General Plan, the City has cleaned up 240 acres of land with substantial soil and groundwater contamination. This was aided through the City's selection, by the Environmental Protection Agency, for a pilot program of brownfields cleanup and a $5.8 million grant for this purpose. Emeryville also received Sweden's Bangemann Challenge Award (now known as the Stockholm Challenge Award) in recognition of its international leadership in brownfields remediation. Lastly, policy CSN-P-32 has been amended to ensure that "prior to reuse, development sites and utility corridors servicing development will be remediated, according to relevant State and federal regulations."

A1-4: The Federal Clean Water Act and the National Pollutant Discharge Elimination System are described on page 3.5-11 of the Hydrology and Flooding section of the Draft EIR. Further, wastewater services are described on page 3.10-5 of Section 3.10: Public Services and Utilities of the Draft EIR. The discussion in both sections has been revised to include the Cease and Desist Order described by the commenter; see Chapter 4 for revision. Also, the "Summary of Impacts" discussion on page 3.10-8 of Section 3.10: Public Services and Utilities of the Draft EIR has also been revised; see Chapter 4 for revision. Moreover, two new policies have been added to page 4-16 of Chapter 4: Parks, Open Space, Public Facilities, and Services of the General Plan, consistent with the requirements of the NPDES system and the Order, as shown in Appendix A (page A-6).

- New Policy: The City will continue to cooperate with EBMUD, the Regional Water Quality Control Board, and other relevant agencies to adopt and implement programs and policies to further reduce inflow and infiltration (I&I) of storm water in the City's wastewater collection system and private sewer laterals during wet weather events.

- New Policy: The City will continue to require development projects to replace or upgrade as needed, sanitary sewer systems serving the development site to reduce inflow and infiltration (I&I) of stormwater in the City's wastewater collection system and private sewer laterals during wet weather events.

A1-5: Comments noted. Impact 3.10-3 on page 3.10-22 of the Draft EIR has been revised to address this comment and to be consistent with recent regulatory changes. See Chapter 4 for revision (page 4-8).

A1-6: The City appreciates EBMUD's guidance on how to address project-level wastewater management. As EBMUD is aware, Emeryville has significantly reduced I/I of storm water into its wastewater collection system over the last 20 years. As described in the response to comment A1-4, above, the City has added policies into the General Plan to implement programs to reduce inflow and infiltration.

A1-7: Revisions have been provided on page 3.10-3 and 3.10-4 of the Draft EIR to address this comment and clarify and update EBMUD's policy and projections for non-potable water use and treatment facilities. See Chapter 4 for revisions (page 4-6).

A1-8: The City appreciates EBMUD's interest in maximizing water conservation. The General Plan Draft EIR is a program-level EIR and does not evaluate specific development projects. Individual projects will be subject to City development regulations, such as Article 9-4.54 cited in EBMUD's comment, and which include water service standards and efficiency measures. The General Plan does not change developers' responsibilities to meet all applicable City regulations and requirements. Regarding EBMUD requirements, General Plan action CSN-A-3, cited on Draft EIR page 3.10-22, explicitly states that the City will "implement EBMUD water efficiency requirements for new and rehabilitation projects" without having to list all the EBMUD requirements individually therein.

A2: San Francisco Bay Conservation and Development Commission (BCDC)

A2-1: BDCD's jurisdiction and authority have been revised on pages 3.1-5, 3.4-8, and 3.5-13 of the Draft EIR to address this comment. Section 3.1: Land Use and Housing, of the Draft EIR includes a discussion of BCDC in terms of the consistency of the Bay Plan with the proposed General Plan and its permitting authority for developments. Section 3.4: Biological Resources includes BCDC due to its regulation along the shoreline, which has the potential to contain biological resources. Lastly, the Section 3.4: Hydrology and Flooding addresses BCDC's policies protection of the Bay and related waterways and its implications for flood hazards. See Chapter 4 for revisions.

A2-2: The City appreciates BCDC's interest in protecting and preparing for potential hazards due to sea level rise. The Draft EIR provides a map showing areas of the city that may be vulnerable to a 16-inch sea level rise scenario (Figure 3.5-4), which BCDC has projected at mid-century (i.e. around 2050). In addition, the discussion on page 3.5-9 acknowledges BCDC's further projection of a possible 55-inch sea level rise in 2100. The Draft EIR evaluates potential impacts of activities associated with implementation of the proposed General Plan, which as described in Chapter 2: Project Description of the Draft EIR, has a planning horizon of 2030. It is unknown how severe sea level rise and its effects will be to Emeryville, the region, and the world, and it is beyond the scope of this analysis and the capacity of the City on its own to plan for that scenario. The City wants to be responsible and proactive in addressing this potential hazard. Therefore, in response to this comment, the City has added a policy to the proposed General Plan (see Appendix A, page A-8) and subsequently to page 3.5-23 of the Draft EIR to cooperate with regulatory agencies (such as BCDC) regarding flood hazards due to a variety of impacts, including sea level rise. In this way, the City can address sea level rise and other potential flooding hazards by working together to address this regional and global threat.

A2-3: In response to this comment, the discussion regarding sea level rise on page 3.5-9 of the Draft EIR has been updated. See Chapter 4 for revision (page 4-3).

A2-4: In response to this comment, the discussion regarding sea level rise on page 3.5-8 has been updated. See Chapter 4 for revision (page 4-3).

A2-5: In response to this comment, the impact analysis for Impact 3.5-5 on page 3.5-22 has been updated. See Chapter 4 for revision (page 4-5).

A2-6: In response to this comment, the Regulatory Setting regarding BCDC safety of fills finding and policies associated with planning for sea level rise (page 3.5-13) has been updated. See Chapter 4 for revision (page 4-5).

A2-7: In response to this comment, Impact 3.5-5 has been reorganized to better describe the potential flood hazards and the General Plan policies that reduce the impact to a less than significant level. Additionally, the "Areas of Change" map has been added to Chapter 2: Project Description (page 2-14) of the Draft EIR to illustrate where new development may be expected under the proposed General Plan. This map shows where new development is likely to occur in the proposed General Plan; these areas are not located in a flood hazard area or area subject to sea level rise hazard at mid-century. See Chapter 4 for revision.

A2-8: The City appreciates BCDC's interest in protecting existing parks and open spaces from potential flood hazards. Much of the City's existing open space is located west of I-80 and therefore near or in areas with a potential for flooding due to wave action or sea level rise. The City shares this concern about its existing natural and recreation resources. Through General Plan policies the City has made a commitment to protect these amenities, including "… to encourage protection of essential habitat for special status species and support habitat protection and enhancement within Emeryville that are within the City's control." In addition, a new policy referenced in the response to comment A2-2, addresses the threat due to sea level rise, along with other potential hazards, by working with regional agencies. The threat to these wetland and park areas will continue to be evaluated as information and projections become available.

A2-9: The City appreciates BCDC's interest in protecting the Emeryville Crescent as a wildlife refuge. The City shares an interest in the protection of this valuable resource and has designated this portion of land as Conservation Area on Figure 3.11-1 which appears on page 3.11-5 of the Draft EIR. As described in the proposed General Plan, the Bay Trail route along the Emeryville Crescent was removed from local and regional plans several years ago due to concerns about its potential impacts on the fragile ecosystem of the adjacent mudflats. Since that time, a similar trail has been built along the Albany Mudflats about four miles to the north. Since the Emeryville Crescent trail would provide a critical shoreline link between East Bay cities and the Bay Bridge, the General Plan proposes that it be constructed following design studies to ensure that any impacts on the adjacent wildlife habitat are adequately mitigated. Plan policies have been revised and added, in response to this comment, to ensure that BCDC and other habitat protection measures are met:

- CSN-P-21 (revised): Provide visual, and where practical, physical, access to the Emeryville Crescent in a manner consistent with the protection of this fragile

ecological system. Improvements to the Bay Trail in the Emeryville Crescent must be consistent with habitat protection.

- New Policy: Where new trails or other improvements are proposed in the vicinity of the baylands and essential habitat for special-status species, require adequate avoidance and mitigation necessary to protect sensitive resources.

A3: Department of Transportation (Caltrans)

A3-1: Comment noted. Traffic mitigation fees are assessed at the project-level in the City of Emeryville, on the basis of the number of units and size of the development for residential and non-residential projects, respectively, pursuant to the City's Traffic Facilities Impact Program adopted September 6, 1990.

A3-2: The guiding principles of the General Plan as described in Chapter 2: Project Description of the Draft EIR prioritizes a balance of residential and employment uses that capitalize on transit nodes and enhanced pedestrian and bicycle networks. As a result, vehicle miles traveled per trip are expected to decrease under buildout of the General Plan as shown on page 3.2-28 of the Draft EIR. The General Plan includes a Quality of Service standard to measure transportation performance for all transportation modes, not just automobiles:

- T-P-3: A "Quality of Service" standard that seeks to optimize travel by all transportation modes shall be developed and used to measure transportation performance. The City does not recognize "Level of Service" (LOS) as a valid measure of overall transportation operations, and sets no maximum or minimum acceptable LOS levels, with the exception of streets that are part of the regional Congestion Management Agency network. (These streets may change, but as of 2008 include San Pablo Avenue, Frontage Road, and Powell and Adeline streets.) LOS shall not be used to measure transportation performance in environmental review documents or for any other purpose unless it is mandated by another agency over which the City has no jurisdiction (such as Caltrans, Berkeley, Oakland, and the Congestion Management Agency), and then it shall only be used for the purposes mandated by that agency.

No mitigation measures have been identified in the Draft EIR. Rather policy measures have been integrated into the General Plan, thereby creating a self-mitigating plan. As can be seen in the analysis on page 3.2-39 of the Draft EIR, automobile capacity expansions are considered infeasible for improving mobility in the project area, so all measures to increase mobility target increasing bicycle, pedestrian, and transit options, convenience, and safety. Therefore, there is no need for secondary analysis of impacts of traffic mitigation measures on bicyclist and pedestrians.

A3-3: Comment noted regarding the process for applying for encroachment permits.

ORGANIZATIONS/INDIVIDUALS

B1: Brian Donahue

B1-1: Comment noted. The visual simulations are not projections or analyses of the traffic levels expected in the future under the implementation of the General Plan. The visual simulations are intended to illustrate streetscape conditions in specific parts of the community based on the land use and urban design policies and development densities and intensities that can be expected from implementing the General Plan. As such, the simulations are included in Section 3.12: Visual Resources of the Draft EIR, not in Section 3.2: Transportation. These simulations, furthermore, are not the primary basis of the visual resources evaluation. The evaluation for this resource area is qualitative, and therefore the anticipated level of impact is based primarily on the effects of proposed General Plan policies. For urban design and streetscape, there are a multitude of such policies: Impact 3.12-2 lists 45 discrete urban design policies that the EIR preparers believe will help to achieve the streetscape depicted in the simulations, most notably UD-A-1 which commits the City to preparing Design Guidelines for various urban design elements, and UD-A-4 which requires the city to prepare a citywide streetscape plan.

B1-2: In the telephone conversation noted, Mr. Bryant indicated that the City's contract with the firm that prepared the photo simulations had been completed, and that no further revisions to the simulations were being contemplated. In a follow-up voicemail message to Mr. Donahue, Mr. Bryant clarified his previous comments, noting that all comments on the Draft EIR would be responded to in the Final EIR, and that any revisions to the Draft EIR necessary to make it accurate and legally adequate would be made in the Final EIR.

B2: Brian Donahue

B2-1: Comments noted. However, these comments represent comments on the Plan and do not concern the substance of the Draft EIR. The commenter is encouraged to review the transportation typologies described in Chapter 3: Transportation of the General Plan, which articulates safety measures and potential conflicts between modes:

- Major Transit Hub – These are transfer points where high volume transit lines intersect. These are located in the Amtrak station with access from both sides of the rail line, and at 40th Street and San Pablo Avenue.

- Bicycle Boulevard – These are through-routes for bicycles providing continuous access and connections to the local and regional bicycle route network. Through-motor vehicle traffic is discouraged. High volumes of motor vehicle traffic are also discouraged, but may be allowed in localized areas where necessary to accommodate adjacent land uses. *Local automobile, truck, and transit traffic are accommodated in the roadway, but if there are conflicts, bicycles have priority. Traffic calming techniques to slow and discourage through-automobile and truck traffic may be appropriate. Pedestrians are accommodated with ample sidewalks on both sides of the road.* (Emphasis added.)

- Transit Street - These are primary routes for AC Transit, Emery Go-Round, and other public transit providers. Signal preemption for transit vehicles, bus stops, and, where appropriate, bus lanes, are provided. Other travel modes, including automobiles, bicycles, and trucks, are accommodated in the roadway, but if there are conflicts, transit has priority. These streets accommodate moderate to high volumes of through-traffic within and beyond the city. Pedestrians are accommodated with ample sidewalks on both sides of the street, and amenities around bus stops (e.g. shelters, benches, lighting, etc).

Safety and potential conflict between bicycles and transit are addressed through the following General Plan policies:

- T-P-47: The City supports "traffic calming" and other neighborhood traffic management techniques to enhance the quality of life within existing neighborhoods and to discourage through-traffic on bicycle boulevards and local streets.

- T-P-48: The City will establish equal priority to bicycles and public transit (and discourage through-traffic by other modes) on streets in the vicinity of the Amtrak station that are designated as both Transit Streets and Bicycle Boulevards.

B3: Brian Donahue

B3-1: See response to comment B2-1, above.

B3-2: Comments noted. However, the City respectfully disagrees. The proposed General Plan is a comprehensive, program-level document that represents a careful balancing of the needs and desires of the whole community for sustainable future development. Improved connectivity is one of the paramount goals and policy strategies of the proposed General Plan. As described in the findings for Impact 3.1-1 on page 3.1-18 of the Draft EIR, land use and transportation policies identify opportunities to provide new streets, sidewalks, and circulation access for all modes of travel. Furthermore, the proposed General Plan may change the nature or character of specific streets, but a change in character or nature of a street's use does not constitute a significant adverse effect under CEQA. Rather, the environmental analysis, in this case of the physical division of established communities, is designed to look at the overall program of actions and make a determination as to whether the program as a whole is causing a significant adverse effect. The analysis in the Draft EIR concludes that the General Plan policies and land use program, taken as a whole, actually provide more linkages within Emeryville and between Emeryville and surrounding communities (Draft EIR p. 3.1-18).

B4: Brian Donahue

B4-1: Comments noted. However, these comments represent comments on the Plan and do not concern the substance of the Draft EIR. For information, Chapter 5: Urban Design of the General Plan (page 5-6) describes the high-intensity nature of the

Powell/Christie core and transit center as a focal point for transit-oriented high-density mixed-use development:

- The Powell Street/Christie Avenue core is at the center of much of the proposed growth under the General Plan and will experience considerable transformation over the next 20 years. A variety of activities, ranging from retail and entertainment, to office and residential uses will ensure the district maintains a lively, yet community-centered character. Heights will also increase substantially to fill in the Emeryville skyline—thus creating a more consistent pattern to the district's urban form and allowing views of the Bay and the hills. The transit center at the Amtrak Station and the Marketplace development are key projects to fulfill this transit-oriented mixed-use concept.

In addition, the definition of major transit hubs is provided in the response to comment B2-1, where two hubs are identified. Finally, several policies, including the following, illustrate the character of this area:

- LU-P-2: The Powell/Christie/Shellmound/I-80 interchange area will be developed into a compact but high-intensity regional transit hub. This hub will include a retail core, with stores, restaurants, and hotels; a financial and commercial center, creating a daytime work population; and a residential neighborhood, providing vitality during non-work hours.

- T-P-36: The City supports Transit-Oriented Development with reduced parking requirements, and amenities to encourage transit use and increase pedestrian comfort around the Major Transit Hubs at the Amtrak station and the 40th Street/San Pablo Avenue intersection.

B5: Brian Donahue

B5-1: Comments noted. However, these comments represent comments on the Plan and do not concern the substance of the Draft EIR. The Draft EIR does not attempt to measure or evaluate the "family-friendliness" of the proposed General Plan, nor is it required to do so under CEQA.

B6: Brian Donahue

B6-1: Comments noted. The critique of switching from LOS to QOS represents a comment on the Plan and does not concern the substance of the Draft EIR. The commenter is encouraged to review page 3-7 of the General Plan, which describes the basis for transitioning to a Quality Service metric and away from a Level of Service standard. An excerpt of this section is provided here:

- In 2002 the Florida Department of Transportation published the 2002 Quality/Level of Service Handbook. The document's methodologies incorporated extensive research into the road user's perspective of their travel experience. As a result of this research, the analytical techniques used to analyze pedestrian, bicycle, and transit modes are as rigorously developed and tested as those for automobiles. Emeryville intends to use this current state of the practice research and other valid

transportation engineering methodologies for assessing and optimizing the quality of service for all travel modes.

- Because automobile travel has been the dominant form of transportation, "Level of Service" (LOS) has traditionally been measured for vehicle drivers, with minimal regard to bicycle, pedestrian, and transit users. This bias unintentionally but inherently ignores overall mobility and conditions for non-auto road users and perpetuates a system that focuses on expanding vehicle capacity, which can reduce the quality of service for pedestrians and bicyclists.

Regarding the Draft EIR, as there are no current data about QOS, an LOS analysis is provided for information. Page 3.2-3 through 3.2-34 report results of the comparison of LOS for existing conditions, a no growth 2030 future scenario, and the proposed General Plan 2030 scenario. Furthermore, Impact 3.2-1 acknowledges that in the future the LOS on various roadway segments will be E or F. While many roadways will have failing LOS even under the No Growth scenario, some will be even less functional (for automobiles) under the proposed General Plan. This significant and unavoidable impact, which the Draft EIR acknowledges and fully discloses, is in part why the General Plan policies focus on improvements to bicycle, pedestrian, and transit mobility, and why the Plan proposes a switch to a service standard that better reflects the functionality of these other modes.

B7: Brian Donahue

B7-1: Comments noted. However, these comments represent comments on the pay rate of Emeryville Police Department and do not concern the substance of the Draft EIR, which evaluates environmental impacts and physical changes.

B8: Frederic Schrag

B8-1: Alternative 2: Neighborhood Centers as described on page 4-4 of the Draft EIR evaluates a scenario which assumes "high-rise mixed-use [development] along the freeway edge (up to 250 feet) with FARs assumed to average about 3.5." Moreover, this alternative shows a classification of High Intensity Mixed Use (which allows residential development) in the northwest corner of the city. Therefore, this alternative adequately accounts for the impacts of a residential/mixed-use development with just a 75/100 foot height limit.

B9: Ryan McManis

B9-1: Comments noted. During the public review period, the southern proposed large park location was adjusted and some land use designations altered on either side of Hollis between 53rd Streets and Park Avenue. These changes to the General Plan are documented in Appendix A. The impact of these changes were not substantial to the development buildout of the General Plan and therefore do not affect the impact analysis or conclusions.

ORAL TESTIMONY

C-1: Planning Commission Hearing on Draft EIR

C1-1: During the preparation of the Draft EIR, additional policy measures were proposed for inclusion in the General Plan based on analysis of resulting impacts. These measures could have been added to the Draft EIR in the form of mitigation measures, but in an effort to create a self-mitigating document with a clear implementation program, all policy measures have been consolidated into the Plan itself. These policies are denoted with a letter "A" (e.g. LU-P-8A) and may be found on the following pages of the Draft EIR: 3.1-23, 3.2-40, 3.2-42, and 3.2-43. Moreover, in response to comments on the Draft EIR and due to recommendations from the General Plan and Zoning Update Steering Committee and City staff, additional policy measures have been proposed for inclusion in the General Plan, and subsequently—in many cases—in the EIR. All new General Plan policies are noted in Appendix A.

C1-2: Appendix A documents all substantive changes between the Public Review Draft General Plan (January 2009) and Hearing Draft General Plan (August 2009).

C1-3: The "loss of existing due to redevelopment" value represents an accounting measure that estimates the proportion of existing development that may be redeveloped on each site in an area of change and does not represent a policy statement to replace housing units. The General Plan and Draft EIR (pages 3.1-17 through 3.1-20) have been edited in response to this comment to clarify the meaning of these values. Upon reevaluation, it has been determined that the estimate of 70 housing units was an error, and that , in fact, no housing units are anticipated to be lost through redevelopment. See Chapter 4 for Draft EIR revisions.

C1-4: In response to this comment, a policy has been added to Chapter 3: Transportation of the General Plan to continue to study and evaluate appropriate traffic and transportation improvements.

C1-5: Comments noted. However, this comment represents a comment on the Plan and does not concern the substance of the Draft EIR.

C1-6: See response to comment A2-2, which describes BCDC's modeling of two sea level rise scenarios, their applicability to the proposed General Plan, and a new policy that has been added to the Draft EIR, as a result of this comment. See Chapter 4 (page 4-5) for revision to pages 3.5-22 and 3.5-23.

C1-7: In response to this comment, policies have been added to the General Plan that will serve as additional mitigations to Impact 3.7-1. These policies have also been added to the discussion on page 3.7-17 of the Draft EIR. See Chapter 4 for Draft EIR revisions (page 4-5).

C1-8: Comments noted. As described on page 3.8-18, the City's Zoning Ordinance prohibits the movement, removing or demolition of a Tier 1 or Tier 2 architecturally significant building or structure in the Park Avenue District unless the Planning Commission first

approves such action. Article 64 of the Emeryville Municipal Code outlines the findings and conditions of approval required for removal or demolition of a significant structure in the Park Avenue District. Similarly, Article 67 requires City Council approval to demolish an "architecturally significant" building outside of the Park Avenue District. These measures are deemed sufficient for the protection of historic resources within the city, and vests the Planning Commission and City Council with absolute discretion to approve or deny demolition of historic structures.

The significant and unavoidable conclusion to Impact 3.8-2 is a result of a 1997 court decision that the demolition of any historic building is a significant and unavoidable impact and therefore may not be authorized without the preparation of an EIR (League for Protection of Oakland's Architectural and Historic Resources v. Oakland (1997) 52 Cal.App.4th 896). This EIR for the General Plan recognizes that new development may result in demolition of properties determined to be "historic" and therefore recognizes this is a significant and unavoidable impact.

C1-9: Comment noted. However, this is a comment on the Plan and does not concern the substance of the Draft EIR.

C1-10: In response to this comment, page 3.11-10 of the Draft EIR has been edited. See Chapter 4 for Draft EIR revisions (page 4-9).

C1-11: In response to this comment and related discussions at the City staff and General Plan Steering Committee levels, FAR values in the Eastern Residential Neighborhoods have been adjusted to 0.75 (base) and 1.0 (base with bonus). The intent of the FAR values in this area is to preserve the neighborhood character while including allowance for off-street parking in the FAR value. This is exemplified through General Plan goals and policies:

- LU-G-5: Preservation of residential neighborhoods—Residential use, structures, low-rise scale, and character of the Triangle, Doyle Street, and Watergate neighborhoods preserved, and the scale of other areas of stability maintained.

- LU-P-13: Building heights will step down to the east and west from the Powell/Christie core; buildings taller than 55 feet are not permitted east of Hollis Street. The height and scale of existing development (30 feet maximum) in the Doyle Street and Triangle neighborhoods will be maintained.

- UD-P-15: Infill residential development should incorporate the scale, character and identity of adjacent existing development.

The Draft EIR has been revised to reflect the new FAR values. See Chapter 4 for Draft EIR revisions.

Staff has been directed by the Planning Commission to review recent development proposals in these neighborhoods to evaluate FAR values with and without parking. As a result of this review, revised FAR values may be presented to the Planning

Commission and City Council for consideration prior to adoption of the new General Plan.

C1-12: In response to this comment, Figure 2.3-2 on page 2-11 has been updated to include a note about the inclusion of parking in the FAR value. See Chapter 4 for Draft EIR revisions (page 4-1).

C1-13: Such a table has been added to the Draft EIR; see Chapter 4 (page 4-2) for Draft EIR revisions (to page 3.1-21).

C1-14: In response to this comment, the Chapter 4: Alternatives analysis has been updated to reflect total overall development (page 4-7 of the Draft EIR) for each alternative and to expand the discussion of the environmentally superior alternative (page 4-25 and 4-26 of the Draft EIR). See Chapter 4 (page 4-9) for Draft EIR revisions.

C1-15: In response to this comment, page 3.7-26 was updated to consider the dual benefit of grade-separated railroad crossings to both improve circulation and reduce noise impacts. See Chapter 4 for Draft EIR revisions (page 4-6).

C1-16: In response to this comment, the projected noise contours, shown in Figure 3.7-3, were revised to reflect increases in freight rail traffic, particularly during night hours when noise is most disturbing to residents. See Chapter 4 for Draft EIR revisions (page 4-6).

C1-17: See response to comment C1-11.

4 Revisions to the Draft EIR

This chapter includes the revisions to the Draft EIR. These revisions have been made in response to comments or based on review by the EIR preparers. The revisions appear here in the order they appear in the Draft EIR. Text additions are noted in underline and text deletions appear in ~~strikeout~~.

The City has refined the proposed General Plan based upon agency and public comments. The changes to the Plan as described in Appendix A do not alter the conclusions presented in the Draft EIR regarding significant environmental impacts or mitigation measures and therefore do not trigger recirculation. Revisions to the Draft EIR are described in Table 4-1 and organized by chapter, page and table or figure, where applicable. Certain revised pages (including revised figures) have been appended to the end of this chapter, for clarity purposes; these pages are referenced in the table.

Table 4-1: Revisions to the Draft EIR

Chapter/ Section	*Page*	*Table/ Figure*	*Correction*
2	8	Fig. 2-3-1	Land Use Diagram figure updated as described in Appendix A.
2	11	Fig. 2-3-2	FAR figure updated as described in Appendix A.
2	12	Fig. 2-3-3	Residential Density figure updated as described in Appendix A.
2	13	Fig. 2-3-4	Building Heights figure updated as described in Appendix A.
2	14	New Fig 2.4-1	Insert new figure: Areas and Change and Stability after page 2-14. Update text as follows: In order to estimate potential buildout, the Plan makes several assumptions. A set of opportunity sites have been identified for redevelopment, as shown in Figure 2.4-1: Areas of Change and Stability. These include vacant and underutilized sites, as well as sites with proposed or approved projects.
3.1	15		~~BCDC regulates new development within the first 100 feet inland from the San Francisco Bay shoreline in order to ensure as much public access to the Bay as possible.~~ The Commission has "Bay" jurisdiction over all areas of the Bay subject to tidal action which is defined by the shoreline. The shoreline is located at the mean high tide line, except in marsh areas, where the shoreline is located at five feet above mean sea level. This jurisdiction includes substantial changes to land use, building construction or remodeling, and subdivision of property, as well as Bay fill and structures over the Bay. BCDC authored The San Francisco Bay Plan in 1969 to protect and preserve the bay through regional efforts and defines its jurisdiction and major strategies. Key initiatives that pertain to Emeryville include: developing maritime ports, water-related industries, and waterfront parks and recreation facilities; maintaining wildlife refuges in baylands; and encouraging private shoreline development. For the purposes of the updated General Plan, the BCDC's power of re-

Table 4-1: Revisions to the Draft EIR

Chapter/ Section	*Page*	*Table/ Figure*	*Correction*
			view would mainly affect any changes to land uses or structures on the Peninsula and any redevelopment of I-80's Ashby Avenue interchange. (Note: By statute Watergate and Trader Vic's are regulated only to mean high tide, not 100 feet, and the entire marina is included in BCDC jurisdiction, even beyond 100 feet inland from the mean high tide line.) The Commission controls filling and dredging within its "Bay" jurisdiction through the permit system established by the McAteer-Petris Act. The Commission also administers permits for development within its 100-foot "shoreline band" jurisdiction. However, the Commission's authority along the shoreline is more limited; it may deny a permit application for a proposed project only if the project fails to provide maximum feasible public access to the Bay and shoreline consistent with the project, or is inconsistent with a priority use designation.
3.1	17	Tab. 3.1-2	See updated table and page at the end of this chapter.
3.1	19-20		Impact 3.1-2: Changes in land uses under the proposed General Plan may result in the displacement of ~~a minimal number of~~ houses, businesses, and/or people. (Less than Significant) Generally, existing residential uses were classified in the General Plan as areas of stability, meaning that they would not undergo significant land use changes under the proposed General Plan. However, the proposed General Plan does estimate that ~~approximately 70 existing housing units~~some residential and non-residential development could be lost due to redevelopment~~, in the North Hollis district and southern portion of the San Pablo Avenue corridor~~. The "loss of existing due to redevelopment" value represents an accounting measure that estimates the proportion of existing development that may be redeveloped on each site in an area of change. It does not refer to actual units and does not represent a policy statement to replace housing units. Rather, over time, sites may redevelop as opportunities and need for rehabilitation or replacement arises.
3.1	21		See updated table and page at the end of this chapter.
3.4	8		~~BCDC jurisdiction includes the Bay and a shoreline band that extends inland 100 feet from the high tide line. BCDC permits are required for all work within either the high Bay or the shoreline band.~~ The Commission has "Bay" jurisdiction over all areas of the Bay subject to tidal action which is defined by the shoreline. The shoreline is located at the mean high tide line, except in marsh areas, where the shoreline is located at five feet above mean sea level. The Commission's "Bay" jurisdiction extends to certain waterways identified in the McAteer-Petris Act consisting of all areas of the waterways that are subject to tidal action including submerged lands, tidelands, and marshlands up to five feet above mean sea level. Additionally, the Commission has "shoreline band" jurisdiction over an area 100 feet wide inland and

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			parallel to the shoreline.
3.5	8		~~Average sea levels have risen between one-third and two-third of a foot over the course of the 20th century and are projected to rise by at least another one-third of a foot and up to almost three feet by the year 2100.~~
3.5	9		Note that the USGS model compares the sea level rise scenario to land-surface elevation data and does not account for shoreline protection; therefore the area south of 64th Street and west of I-80 does not account for the at-grade freeway barrier. Moreover, these projections do not account for potential changes to storm-related flood areas (such as the 100-year flood zone).
3.5	11		Following first paragraph: The United States of America, on behalf of the EPA, and the State of California, on behalf of the California State Water Resources Control Board and California Regional Water Quality Control Board, San Francisco Bay Region, filed a complaint against the East Bay Municipal Utility District (EBMUD) alleging that EBMUD has discharged pollutants to San Francisco Bay in violation of the federal Clean Water Act, California Water Code and the terms of its NPDES Permits. (see United States Environmental Protection Agency, California State Water Resources Control Board, California Regional Water Quality Control Board, San Francisco Bay Region v. East Bay Municipal Utility District: United States District Court, Northern District of California, Case No. CV 09-0186 CW). On July 22, 2009, a Stipulated Order ("Order") negotiated by EBMUD with the United States and State of California was entered in the U.S. District Court as a partial judgment. EBMUD receives wastewater from Emeryville and six other Satellite agencies via EBMUD's interceptor system. The interceptor system transports wastewater to EBMUD's year round main wastewater treatment plant near the eastern anchorage of the Bay Bridge. During wet weather, inflow and infiltration (I/I) of storm water into the wastewater collection system and private sewer laterals during severe wet weather events – via misconnections, cracks and other imperfections in system pipes, joints and manholes – can lead to a 10-fold increase in the volume of wastewater that reaches EBMUD's interceptor system. Accordingly, the main wastewater treatment plant can be overwhelmed resulting in illicit discharges to the Bay. The Order requires EBMUD to undertake additional data gathering and studies over the next few years regarding wet weather flows to their system and measures to reduce such flows. These studies will likely result in an agreement between Emeryville and the six other Satellite agencies and the United States and the State of California to implement programs and improvements to further eliminate inflow and infiltrate into the wastewater system. While Emeryville has significantly reduced I/I of storm water

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			into its wastewater collection system over the last 20 years, it shares drainage basins with Oakland which has not achieved the same results as Emeryville. As provided in Section 7 of the Order, the United States, State of California, and EBMUD have determined that (i) eliminating discharge from—rather than further treatment at—the wet weather facilities is in the optimal way to further reduce East Bay sanitary sewer systems' wet weather-related water quality impacts to San Francisco Bay; and (ii) the means of pursuing this objective is to reduce wet-weather flows in the collection systems and in private sewer laterals, which will reduce impacts to San Francisco Bay by reducing the frequency and volume of EBMUD's wet weather discharges. . Construction of new wastewater treatment systems or expansion of existing facilities is not identified as the preferred means to address this issue primarily due to the significant costs of constructing such facilities. Accordingly, the Order provides that EBMUD shall adopt a Regional Private Sewer Lateral Ordinance ("Regional Ordinance") setting standards for the performance of lateral sewer pipes that extend from privately-owned property/structures to the Satellites' wastewater collection systems. These standards are to provide for the testing of private sewer laterals; repair or replacement of defective laterals; and elimination of improper inflow connections (e.g. removal of downspout connections to a sewer line). The Regional Ordinance will also require the owner of a private sewer lateral to obtain a "Compliance Certificate" from EBMUD (or from the Satellite agency if the Satellite agency has adopted an ordinance imposing standards no less Stringent than the Regional Ordinance) prior to (a) transferring title to such property or structure, (b) obtaining any permit or other approval needed for the construction or significant modification of any structure, and (c) obtaining approval from EBMUD for an increase or decrease in size of the owner's water service. Finally, EBMUD is required to develop and fund a Private Lateral Incentive Work Program that will include, among other measures, financial incentives to accelerate the testing of private laterals, repair or replacement of defective sewer laterals, and elimination of improper inflow connections. On July 14, 2009, the City of Emeryville received a notice from the California Regional Water Quality Control Board (RWQCB), San Francisco Bay Region, of a Tentative Order for the City of Emeryville, Sanitary Sewer Collection System, NPDES Permit No. CA0038792 and Amendment of Cease & Desist Order. Consistent with the aforementioned Stipulated Order negotiated and agreed to by EBMUD, the State of California and the United States, the Tentative Order and Amendment of Cease & Desist Order issued by the RWQCB provides that the City of Emeryville "shall not cause or contribute discharges from EBMUD's Wet Weather Facilities that occur during wet weather or that are associate with wet weather." A hearing before the RWQCB regarding the Tentative Order

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			and Amendment of Cease & Desist Order issued to the City of Emeryville is scheduled for November 18, 2009. It is anticipated that a Final Order and Amendment of Cease & Desist Order will be issued by the RWQCB shortly after the November 18, 2009, hearing. Thereafter, subject to the right of the City of Emeryville and the six other Satellite agencies to appeal the decision of the RWQCB, the City will operate its sanitary sewer collection system in a manner consistent with the Final Order and Amendment of Cease & Desist Order.
3.5	13		Insert as second paragraph under "McAteer-Petris Act/San Francisco Bay Conservation and Development Commission" The Safety of Fills findings in BCDC's Bay Plan recognize that "Bay water levels are likely to increase in the future because of a relative rise in sea level… Relative rise in sea level is the sum of: (1) a rise in global sea level and (2) land elevation change (lifting and subsidence) around the Bay." Policy 4 states, in part, "...structures on fill or near the shoreline should have adequate flood protection including consideration of future relative sea level rise..." and as a general rule, these structures "should be above wave runup level or sufficiently set back from the edge of the shore so that the structure is not subject to dynamic wave energy." Additionally, Policy 6 states, "local governments and special districts with responsibilities for flood protection should assure that their requirements and criteria reflect future relative sea level rise and should assure that new structures and uses attracting people are not approved in flood prone areas or in areas that will become flood prone in the future, and that structures and uses that are approvable will be built at stable elevations to assure long-term protection from flood hazards." Moreover, shoreline development within BCDC's jurisdiction may be subject to future permit controls related to sea level rise impacts.
3.5	22-23		See updated pages at the end of this chapter.
3.7	17		The following new policies are being added to the General Plan, and Draft EIR to help reduce the impact: • Noise impacts should be controlled at the noise source where feasible, as opposed to at receptor end. This includes measures to buffer, dampen or actively cancel noise sources. • The City shall require noise buffering, dampening, or active cancellation, on roof-top or other outdoor mechanical equipment located near residences, parks, and other noise sensitive land uses. • The City shall limit the potential noise impacts of construction activities on surrounding land uses through Noise Ordinance regulations that address allowed days and hours of construction, types of work, construction equipment, notification of neighbors, and sound attenuation devices.

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3.7	19	Fig. 3.7-3	Future Noise Contours figure updated as described in Appendix A.
3.7	26		Following second paragraph: In addition, proposed grade-separated crossings over the railroad have the dual benefit of both improving circulation for vehicles, pedestrians, transit, and bicycles, as well as reducing noise impacts from trains.
3.10	2		The District supplies water to approximately 1.3 million customers within a ~~331~~325-square-mile service area and provides wastewater treatment to approximately 642,000 residents within an ~~88~~83-square-mile area.
3.10	3		EBMUD's Non-potable Water Policy No. ~~73~~8.01 (1996) mandates that all customers use recycled water for non-domestic purposes when such water is of adequate quality and quantity, available at reasonable cost, not detrimental to public health, and not injurious to plant life, fish, and wildlife.
3.10	3		Uses for recycled water include non-residential landscape ~~and agricultural~~ irrigation, commercial and industrial process purposes, ~~wetlands restoration and stream flow augmentation,~~ and toilet flushing and urinal flushing in commercial buildings.
3.10	3		In ~~2005~~ 2008, the average daily recycled water use was ~~6~~5.5 mgd. By 2020, EBMUD ~~hopes~~plans to recycle a total of 14 mgd ~~and uphold this goal through the year 2030~~ in order to meet the anticipated potable water needs of its service area.
3.10	4		This multi-phased project, commenced in 2003 with ~~phase one expected to be~~ Phase 1A recently completed ~~in 2009~~, will provide up to ~~2.5~~2.2 mgd of recycled water from EBMUD's Main Wastewater Treatment Plant to customers in the aforementioned areas.
3.10	5		Following second paragraph: The United States of America, on behalf of the EPA, and the State of California, on behalf of the California State Water Resources Control Board and California Regional Water Quality Control Board, San Francisco Bay Region, filed a complaint against the East Bay Municipal Utility District (EBMUD) alleging that EBMUD has discharged pollutants to San Francisco Bay in violation of the federal Clean Water Act, California Water Code and the terms of its NPDES Permits. (see United States Environmental Protection Agency, California State Water Resources Control Board, California Regional Water Quality Control Board, San Francisco Bay Region v. East Bay Municipal Utility District: United States District Court, Northern District of California, Case No. CV 09-0186 CW). On July 22, 2009, a Stipulated Order ("Order") negotiated by EBMUD with the United States and State of California was entered in the U.S. District Court as a partial judgment. EBMUD receives wastewater from Emeryville and six other Satellite agen-

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			cies via EBMUD's interceptor system. The interceptor system transports wastewater to EBMUD's year round main wastewater treatment plant near the eastern anchorage of the Bay Bridge. During wet weather, inflow and infiltration (I/I) of storm water into the wastewater collection system and private sewer laterals during severe wet weather events – via mis-connections, cracks and other imperfections in system pipes, joints and manholes – can lead to a 10-fold increase in the volume of wastewater that reaches EBMUD's interceptor system. Accordingly, the main waste-water treatment plant can be overwhelmed resulting in illicit discharges to the Bay. The Order requires EBMUD to undertake additional data gathering and studies over the next few years regarding wet weather flows to their sys-tem and measures to reduce such flows. These studies will likely result in an agreement between Emeryville and the six other Satellite agencies and the United States and the State of California to implement programs and improvements to further eliminate inflow and infiltrate into the wastewa-ter system. While Emeryville has significantly reduced I/I of storm water into its wastewater collection system over the last 20 years, it shares drainage basins with Oakland which has not achieved the same results as Emeryville. As provided in Section 7 of the Order, the United States, State of Califor-nia, and EBMUD have determined that (i) eliminating discharge from—rather than further treatment at—the wet weather facilities is in the opti-mal way to further reduce East Bay sanitary sewer systems' wet weather-related water quality impacts to San Francisco Bay; and (ii) the means of pursuing this objective is to reduce wet-weather flows in the collection systems and in private sewer laterals, which will reduce impacts to San Francisco Bay by reducing the frequency and volume of EBMUD's wet weather discharges. . Construction of new wastewater treatment systems or expansion of existing facilities is not identified as the preferred means to address this issue primarily due to the significant costs of constructing such facilities. Accordingly, the Order provides that EBMUD shall adopt a Regional Private Sewer Lateral Ordinance ("Regional Ordinance") setting standards for the performance of lateral sewer pipes that extend from privately-owned property/structures to the Satellites' wastewater collec-tion systems. These standards are to provide for the testing of private sewer laterals; repair or replacement of defective laterals; and elimination of improper inflow connections (e.g. removal of downspout connections to a sewer line). The Regional Ordinance will also require the owner of a private sewer lateral to obtain a "Compliance Certificate" from EBMUD (or from the Satellite agency if the Satellite agency has adopted an ordi-nance imposing standards no less Stringent than the Regional Ordinance) prior to (a) transferring title to such property or structure, (b) obtaining any permit or other approval needed for the construction or significant

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			modification of any structure, and (c) obtaining approval from EBMUD for an increase or decrease in size of the owner's water service. Finally, EBMUD is required to develop and fund a Private Lateral Incentive Work Program that will include, among other measures, financial incentives to accelerate the testing of private laterals, repair or replacement of defective sewer laterals, and elimination of improper inflow connections. On July 14, 2009, the City of Emeryville received a notice from the California Regional Water Quality Control Board (RWQCB), San Francisco Bay Region, of a Tentative Order for the City of Emeryville, Sanitary Sewer Collection System, NPDES Permit No. CA0038792 and Amendment of Cease & Desist Order. Consistent with the aforementioned Stipulated Order negotiated and agreed to by EBMUD, the State of California and the United States, the Tentative Order and Amendment of Cease & Desist Order issued by the RWQCB provides that the City of Emeryville "shall not cause or contribute discharges from EBMUD's Wet Weather Facilities that occur during wet weather or that are associate with wet weather." A hearing before the RWQCB regarding the Tentative Order and Amendment of Cease & Desist Order issued to the City of Emeryville is scheduled for November 18, 2009. It is anticipated that a Final Order and Amendment of Cease & Desist Order will be issued by the RWQCB shortly after the November 18, 2009, hearing. Thereafter, subject to the right of the City of Emeryville and the six other Satellite agencies to appeal the decision of the RWQCB, the City will operate its sanitary sewer collection system in a manner consistent with the Final Order and Amendment of Cease & Desist Order.
3.10	18		Add to end of second paragraph: Further, the City will continue to cooperate with EBMUD to adopt and implement a Regional Private Sewer Lateral Ordinance and a Private Lateral Incentive Work Program, and continue to require development to replace or upgrade, as needed, sanitary sewer systems servicing the development. These measures are designed to reduce inflow and infiltration (I&I) of stormwater into the City's wastewater collection system and private sewer laterals thereby mitigating any impact to wet weather facilities during wet weather events.
3.10	22		Impact 3.10-3: New development would not exceed wastewater treatment capacity of the EBMUD, and would not require construction of new wastewater treatment facilities. ~~Expansion of existing facilities of implementation of programs and policies to further reduce inflow and infiltration (I/) of storm water into the city's wastewater collection system and private seer laterals during wet weather events.~~ (Less than Significant)
3.10	23		The following new policies are being added to the General Plan and the Draft EIR to help reduce the impact: • The City will continue to cooperate with EBMUD, the Regional Water

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			Quality Control Board, and other relevant agencies to adopt and implement programs and policies to further reduce inflow and infiltration (I&I) of storm water in the City's wastewater collection system and private sewer laterals during wet weather events. • The City will continue to require development projects to replace or upgrade as needed, sanitary sewer systems serving the development site to reduce inflow and infiltration (I&I) of stormwater in the City's wastewater collection system and private sewer laterals during wet weather events.
3.11	10		Impact 3.11-3: The construction or expansion of recreation facilities ~~would~~could have an adverse physical effect on the community.
4	7	4.3-1	See updated table and page at the end of this chapter.
4	25-26	4.4-1	See updated table and page at the end of this chapter.

Figure: 2.3-1

GENERAL PLANLAND USE DIAGRAM

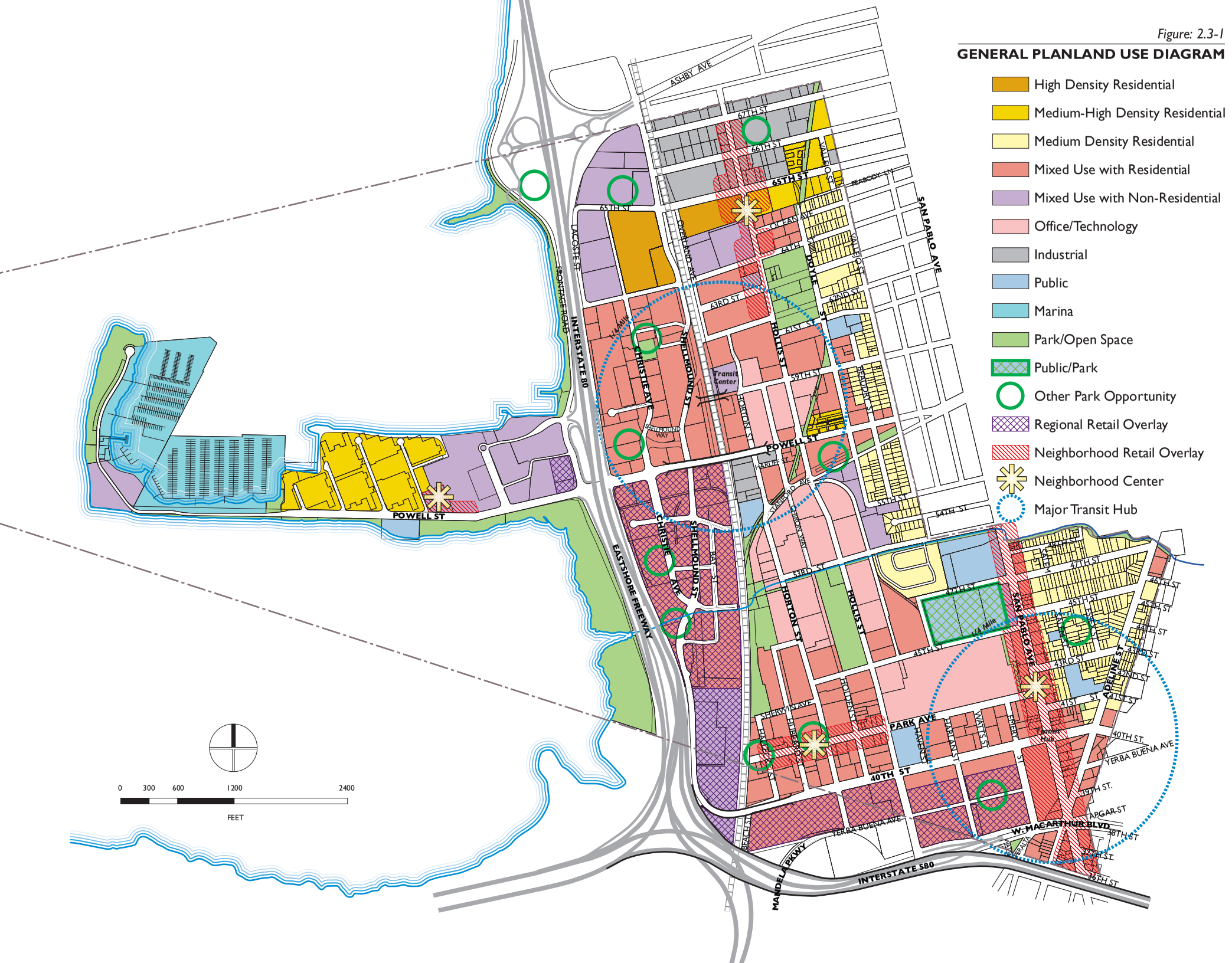


Figure: 2.3-2

FLOOR AREA RATIO

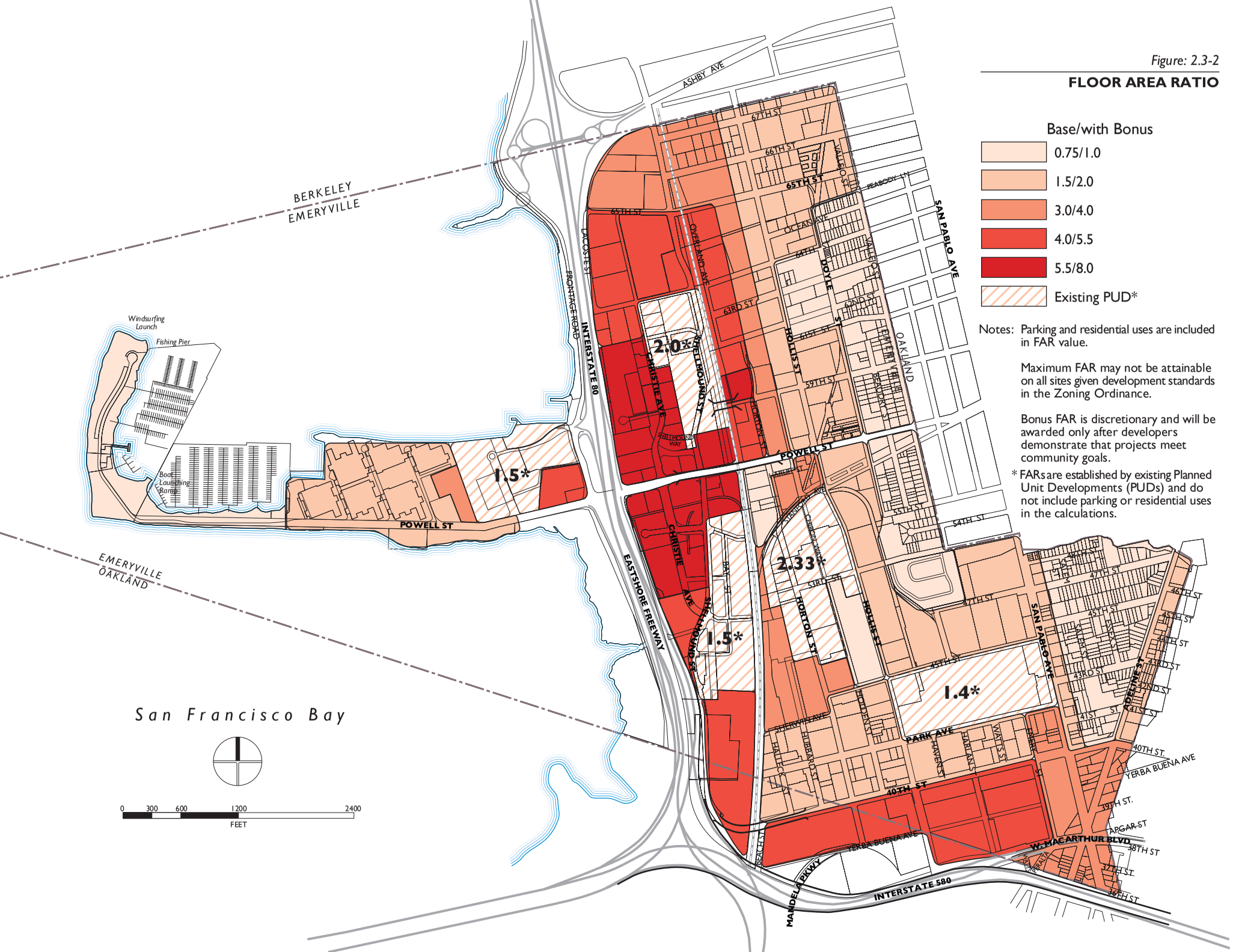
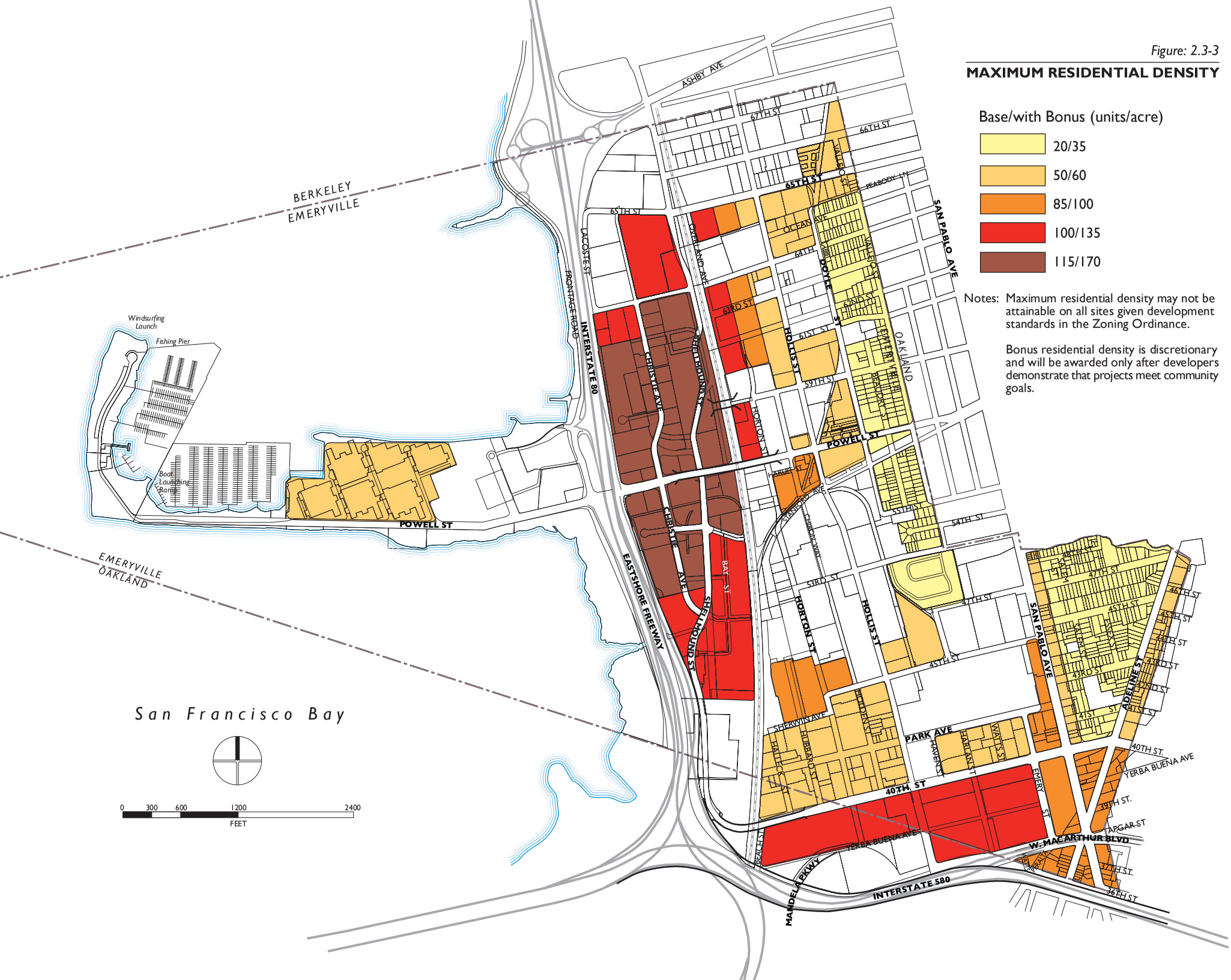


Figure: 2.3-3

MAXIMUM RESIDENTIAL DENSITY



Notes: Maximum residential density may not be attainable on all sites given development standards in the Zoning Ordinance.

Bonus residential density is discretionary and will be awarded only after developers demonstrate that projects meet community goals.

Figure: 2.3-4

MAXIMUM BUILDING HEIGHTS

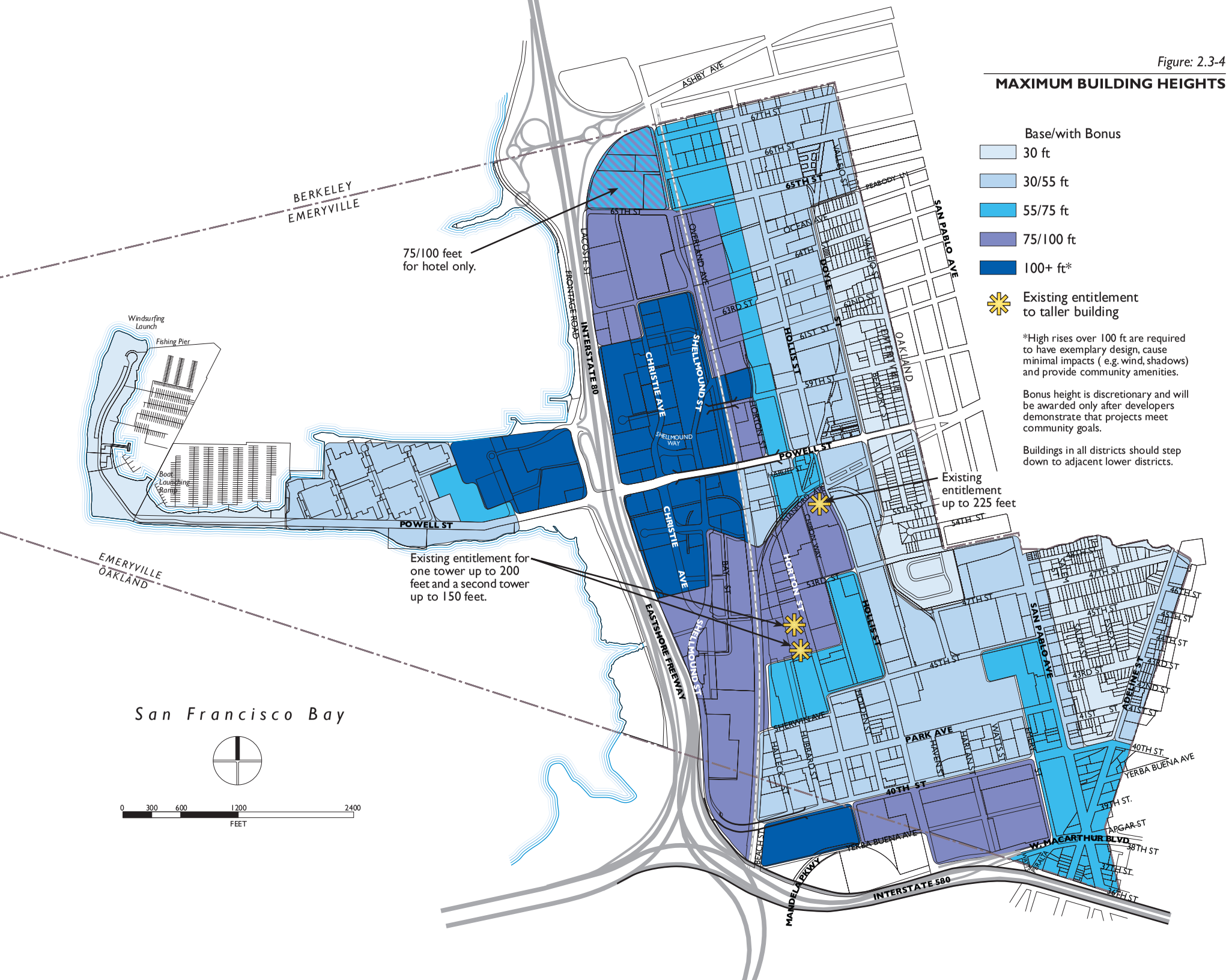


Figure: 2.4-1

AREAS OF CHANGE



Table 3.1-2: General Plan Development at 2030, by Land Use

	Residential (units)	*Retail (SF)*	*Hotel (SF)*	*Office (SF)*	*Industrial (SF)*
A. Approved Development	907	34,461		1,313,000	
B. Gross New Development	2,930	1,075,400	324,600	1,569,700	76,200
C. Loss of Existing Due to Redevelopment	~~-70~~ 0	~~-468,598~~ 469,000	~~-14,375~~ 14,000	~~-509,740~~ -510,000	~~-855,377~~ 855,000
D. Net New Development (A+B+C)	~~3,767~~ 3,837	~~641,263~~ 640,861	~~310,225~~ 310,600	~~2,372,960~~ 2,372,700	~~-779,177~~ 778,800
E. Existing Development	5,988	2,441,660	464,500	4,852,118	4,132,675
F. City at 2030 (D+E)	9,800	3,083,000	775,000	7,225,000	~~3,353,000~~ 3,354,000
Percent Change from Existing to 2030 Build-Out	63%	26%	67%	49%	-19%

Note: Office includes R&D development. Residential buildout rounded to nearest hundred; non-residential to nearest thousand

Source: Dyett & Bhatia, 2008. (Approved Development as of November 2007; Existing Development as of 2005.)

The Land Use Diagram, as shown in the Chapter 2: Project Description, Figure 2.3-1, designates the proposed location, distribution, and extent of activities that may take place throughout the city. Land use classifications—shown as color/graphic patterns on the diagram—allow for a range of activities within each classification.

SUMMARY OF IMPACTS

The proposed General Plan does not physically divide any established community. Rather, by providing better connectivity both locally and regionally, the plan provides more linkages within Emeryville and between surrounding communities.

Existing neighborhoods are designated as areas of stability and the plan does not anticipate major changes in intensity and character to these areas. While construction of proposed improvements could temporarily disrupt neighborhoods and businesses, completed improvements are expected to contribute to a vital living and working environment.

Redevelopment caused by new permitted land uses or different densities may remove a very small amount of housing in the city, as a result of redevelopment activities over time. ~~in the North Hollis district and southern portion of the San Pablo Avenue corridor, but~~ The overall proposed plan will significantly increase the number of housing units in Emeryville such that any displaced residents will be able to find accommodation in the same area. To the extent that any development activity of the Redevelopment Agency results in the removal of housing, State redevelopment law requires replacement of like type of housing within the city.

Inserted on page 3.1-21, following "Proposed General Plan Actions that Reduce the Impact."

Plan	*Consistent?*	*Discussion/Modification*
City of Emeryville		
Emeryville Zoning Ordinance	No, but pending	Zoning Ordinance must be updated to be consistent with proposed General Plan land use districts, floor area ratios, height limits, and residential densities. Proposed General Plan policies and actions call for the update of the Zoning Ordinance accordingly (already underway).
North Hollis Area Urban Design Program	Yes	The General Plan contains a policy to develop North Hollis consistently with the program's guidelines, which include: infill residential uses; a balance of transportation modes; sufficient public parking; and pedestrian improvements. Proposed General Plan policies regarding land use, transportation, and urban design, are consistent.
San Pablo Avenue Urban Design Plan	Yes	Much of the plan has already been implemented. The General Plan shares the priorities from this design plan. Moreover, the General Plan contains a policy to continue to use the design plan to guide landscaping, streetscape design and development along the corridor. Proposed General Plan policies regarding urban design are consistent.
South Bayfront Design Guidelines	Yes	Much of the South Bayfront has already been developed using these guidelines. The proposed General Plan shares its priorities in terms of streets and blocks that enable pedestrian activity; building materials and detailing; public spaces that create visual interest; and improved pedestrian and bicycle connections.
Park Avenue District Plan	Yes	The proposed General Plan supports the Park Avenue District Plan through land use, urban design, and historic resources policies. The plans are consistent in terms of FAR values, an expanded street grid (i.e. the extension of Hubbard Street), the extended Greenway, and guidelines for the development of the Sherwin Williams site. As described by a proposed General Plan policy, the Park Avenue District Plan will continue to guide development in the area.
1976 Emeryville Redevelopment Plan and 1987 Shellmound Park Redevelopment Plan	Yes	The redevelopment plans provide that all development within a redevelopment project area is required to be consistent with the City's General Plan as amended over time.
Surrounding Jurisdictions		
Berkeley Waterfront Plan	Yes	This plan covers the area of Berkeley from the railroad to the Bay shoreline. Most importantly for Emeryville, it calls for the cities of Berkeley, Albany and Emeryville to establish a joint sub-regional growth management system to minimize traffic congestion in the plan area by phasing development. This strategy is suggested due to concern that capacity along I-80 is limited and excessive development in these three cities could decline levels of service on the highway. The plan was adopted in 1986, so its assumptions have changed substantially since that time. Still, the proposed General Plan includes a policy to work with the City of Berkeley on improvements to the Ashby Avenue/I-80 interchange as a way to relieve congestion. In that way, the plans are consistent.
West Berkeley Area Plan	Yes	This plan's jurisdiction covers the area north of the Emeryville city limits between the railroad and San Pablo Avenue. Adopted in 1993, the Plan and the West Berkeley district are currently undergoing evaluation for zoning changes and possible Plan amendments. In its current form, the plan seeks to maintain a mix of land uses, buildings, and people in the area to prevent it from becoming

		excessively redeveloped or gentrified. The City of Berkeley is working with stakeholder groups to identify opportunities and challenges. This coordination will need to be maintained by both cities to ensure consistency.
Oakland General Plan Land Use and Transportation Elements	Yes	The strategic map of Oakland's General Plan designates the area to the southwest of Emeryville, as well as portions of San Pablo Avenue around Emeryville, as some of the city's key areas for growth and change. The triangular area between I-580 and Peralta Street is considered a "Housing and Business Mix Area," where both uses are allowed and neither dominates. Recommended policies of interest to Emeryville include: improving the appearance of San Pablo Avenue; targeting the Golden Gate neighborhood (east of Emeryville) for blight abatement, façade and streetscape improvements, and business attraction activities; and designating the MacArthur BART station—the one nearest to Emeryville—as a transit-oriented district. All of these policies are consistent with, and in many cases supported by, land use and urban design policies in the proposed General Plan.
Redevelopment Plan for West Oakland	Yes	This plan for the Oakland Redevelopment Agency designates the area between the Emeryville city limits, Peralta Street, and I-580 for regional commercial land uses, and the area east of Peralta Street as far north as 40th Street as mixed-typology housing. Development activities that are pertinent to Emeryville include: creating a pedestrian-friendly environment along San Pablo Avenue and Adeline Street; developing mixed-use, commercial, and high-density residential developments on San Pablo Avenue between 27th and 32nd streets; and requiring on-site public art. In the Hoover/West MacArthur area (to the southeast of Emeryville), the plan impose a five year moratorium starting in 2003 on the use of redevelopment funds for the construction of new affordable rental housing, due to the existing over-concentration of low-income housing in the area. All of these policies are consistent with, and in many cases supported by, land use and urban design policies in the proposed General Plan.
Redevelopment Plan for Broadway/MacArthur/San Pablo	Yes	This plan for the Oakland Redevelopment Agency covers two areas, one of which is immediately adjacent to the City of Emeryville: the Golden Gate neighborhood, stretching from the Emeryville city limits to San Pablo Avenue between 53rd and 67th streets. The area's A five-year implementation plan for the San Pablo subarea lays out actions for streetscape and other capital improvements; and support for business development and retention in the area. In the second portion of the Redevelopment Area, near the MacArthur BART Station, a mixed-use transit village has been approved. These policies are consistent with and in many cases supported by economic development, urban design, and transportation policies defined in the proposed General Plan.
Regional		
San Francisco Bay Conservation and Development Commission (BCDC)	Yes	General Plan policies call for the coordination with regulatory agencies, including BCDC, regarding hazard mitigation and development approvals. For the purposes of the updated General Plan, would become involved for proposed changes to land uses or structures on the Peninsula, the I-80/Ashby Avenue interchange, and the Emeryville Crescent, as described in BCDC's jurisdiction outlined in the Bay Plan.
Association of Bay Area Governments (ABAG)	No, but pending	Emeryville's buildout expectations in the proposed General Plan exceed ABAG's 2007 Projections. However, the City has been in communication with ABAG during preparation of the Plan and ABAG is expected to revise its 2009 Projections to be consistent with Emeryville's anticipated growth.

Eastshore State Park General Plan	Yes.	This plan covers the state park that runs from Oakland to Richmond, which includes the waterfront in Emeryville both north and south of the Peninsula. For the sections of the State Park within Emeryville, the plan designates the shoreline south of the Peninsula as a preservation area, and the rest of the park within Emeryville as a conservation area; there are no recreational sections of the park within Emeryville. Public access to preservation areas is restricted, while conservation areas permit passive recreation. Consequently, the plan calls for: restricting access to the shoreline south of the Peninsula, perhaps with a fence (though not on the south side of Powell Street); creating a non-paved trail along the eastern section of the Peninsula in a way that connects with the existing paved section of the Bay Trail; installing a vista point and a bird blind on the Peninsula; and providing parking for up to 20 vehicles. In particular, the proposed Emeryville General Plan calls for improvements to the Bay Trail and other improvements in a manner consistent with habitat protection and providing mitigations, as necessary. An action item in the proposed General Plan calls for coordination with the East Bay Regional Parks District.

Figure: 3.2-2

STREET SYSTEM

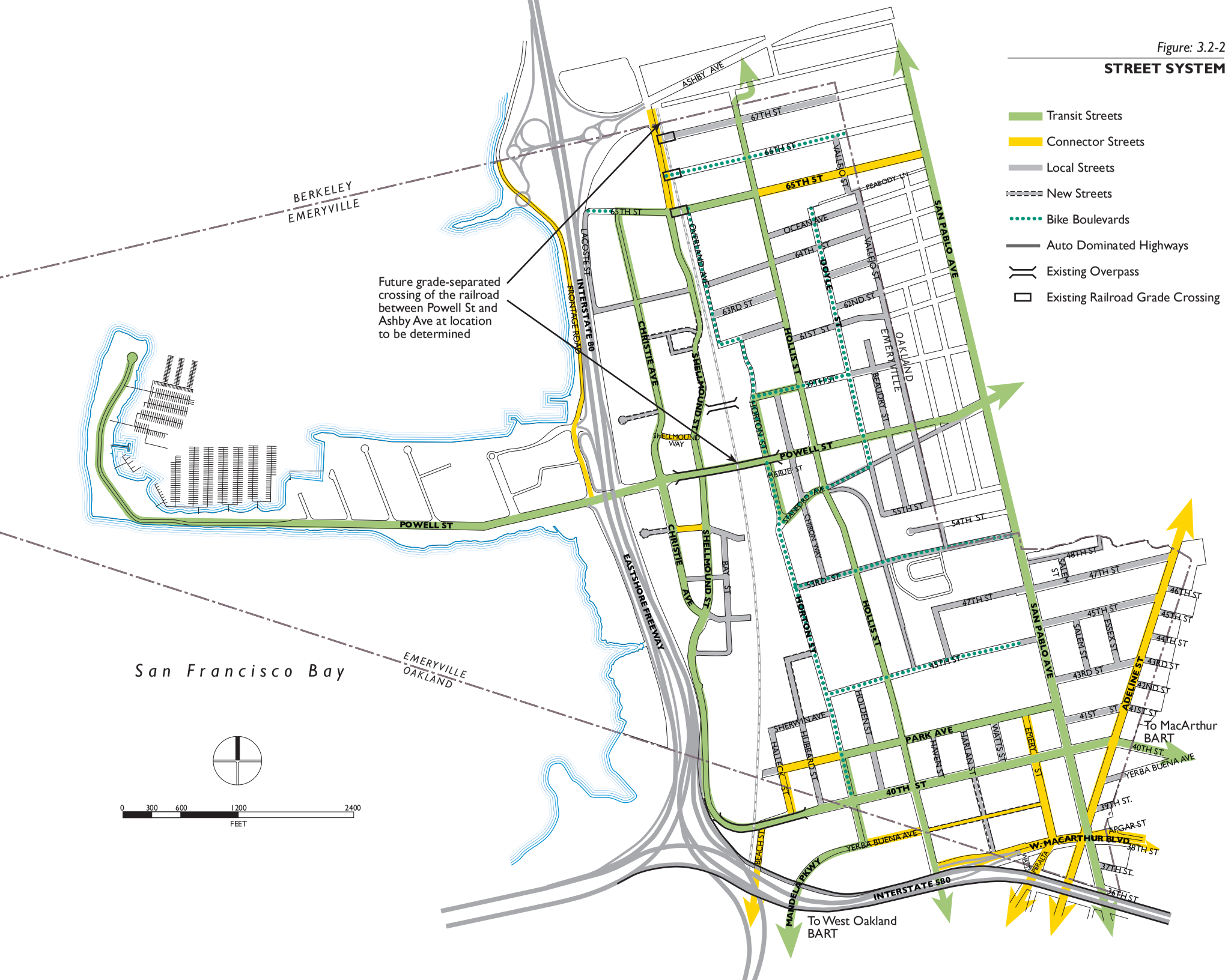
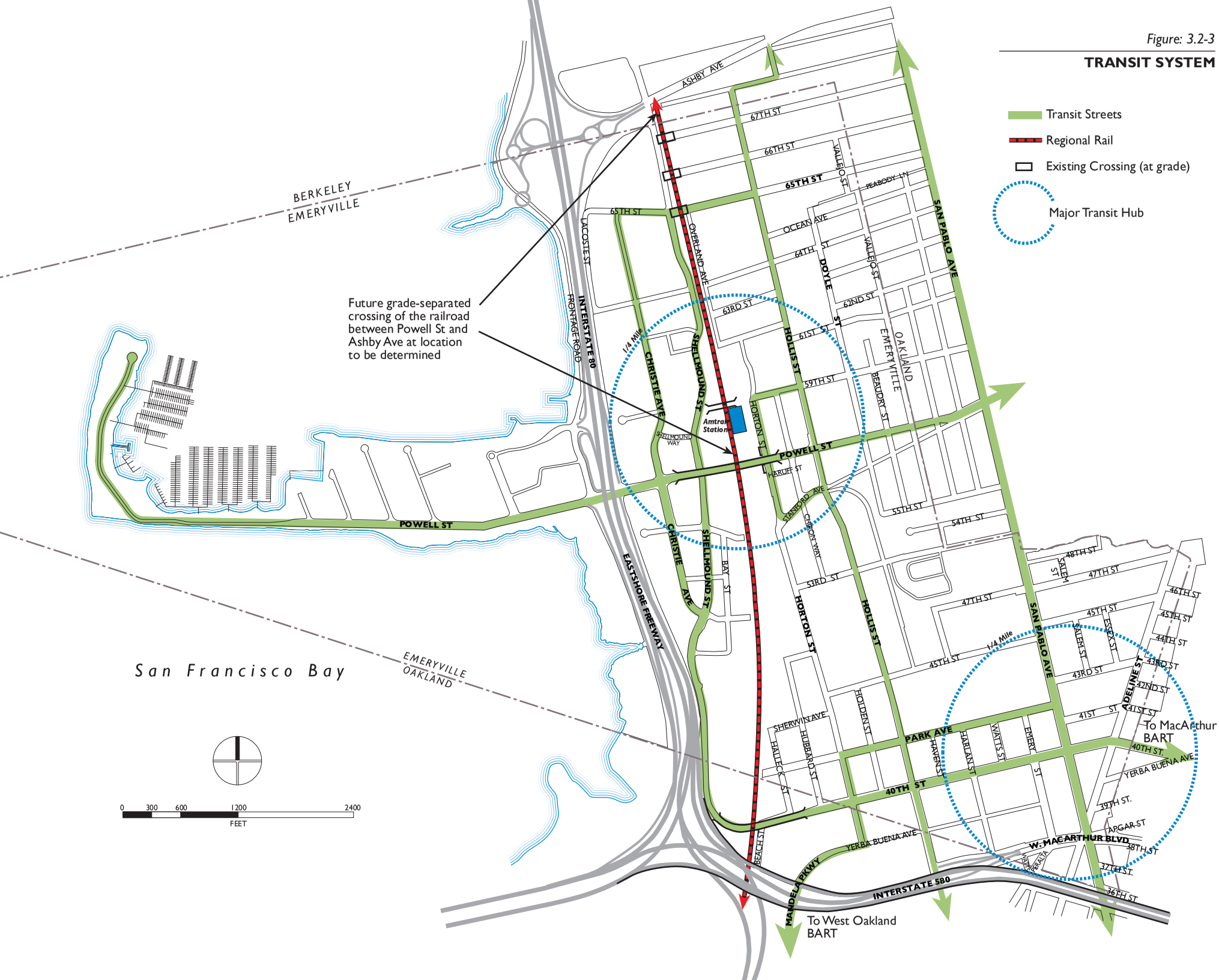
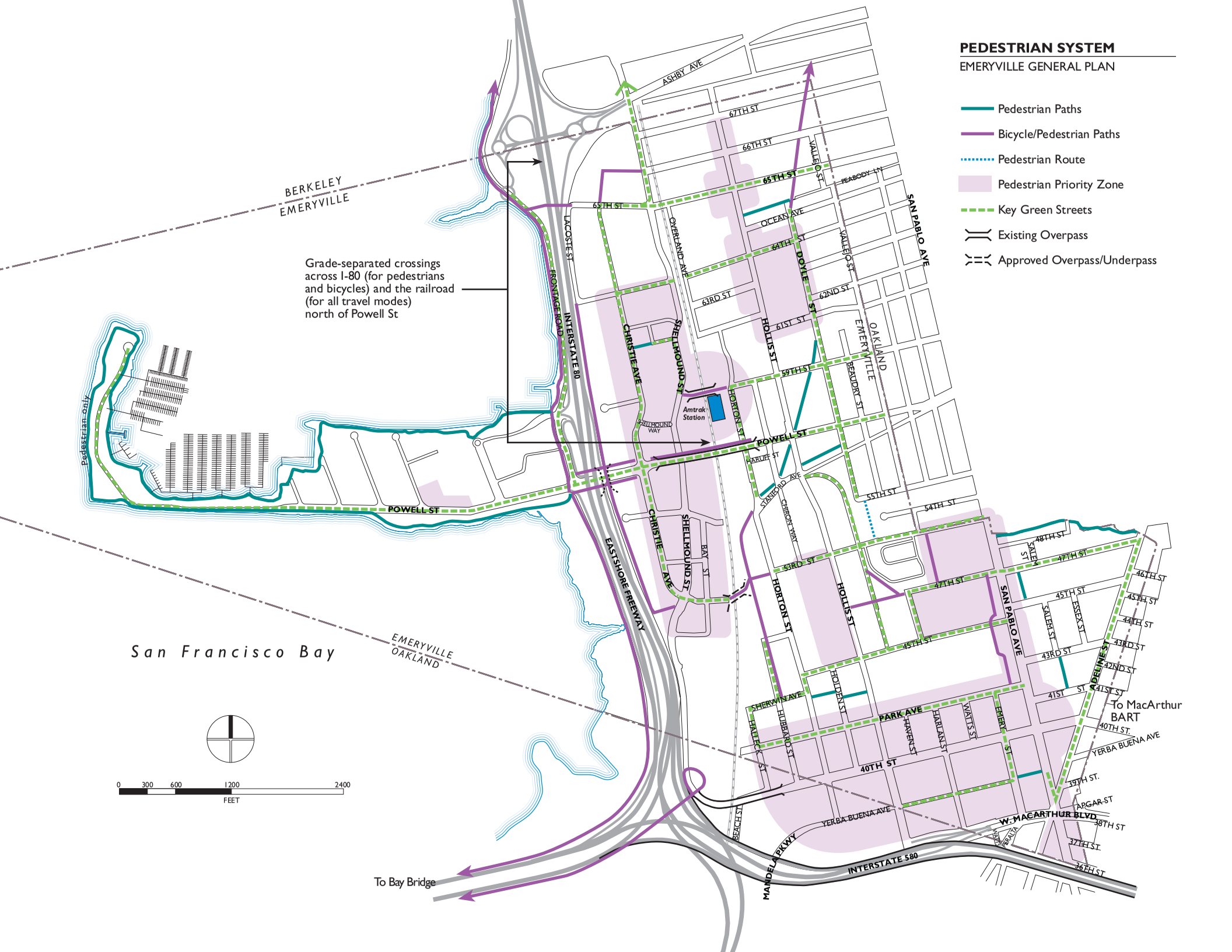


Figure: 3.2-3

TRANSIT SYSTEM




PEDESTRIAN SYSTEM
EMERYVILLE GENERAL PLAN
Pedestrian Paths
Bicycle/Pedestrian Paths
Pedestrian Route
Pedestrian Priority Zone
Key Green Streets
Existing Overpass
Approved Overpass/Underpass
Grade-separated crossings across I-80 (for pedestrians and bicycles) and the railroad (for all travel modes) north of Powell St
BERKELEY
EMERYVILLE
OAKLAND
EMERYVILLE
San Francisco Bay
Pedestrian only
To Bay Bridge
To MacArthur BART
Amtrak Station
ASHBY AVE
67TH ST
66TH ST
65TH ST
OCEAN AVE
64TH ST
63RD ST
62ND ST
61ST ST
59TH ST
55TH ST
54TH ST
53RD ST
47TH ST
45TH ST
43RD ST
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46TH ST
45TH ST
44TH ST
43RD ST
42ND ST
41ST ST
PEABODY LN
VALLEJO ST
SAN PABLO AVE
DOYLE ST
HOLLIS ST
BEAUDRY ST
OVERLAND AVE
LACOSTE ST
FRONTAGE ROAD
INTERSTATE 80
CHRISTIE AVE
SHELLMOUND ST
SHELLMOUND WAY
HORTON ST
HARUFF ST
STANFORD AVE
CHIRON WAY
BAY ST
EASTSHORE FREEWAY
SALEM ST
ESSEX ST
ADELINE ST
HOLDEN ST
SHERWIN AVE
HALLECK ST
HUBBARD ST
PARK AVE
HAVEN ST
HARLAN ST
WATTS ST
EMERY ST
YERBA BUENA AVE
APGAR ST
W. MACARTHUR BLVD
BEACH ST
MANDELA PKWY
INTERSTATE 580
0 300 600 1200 2400
FEET

Figure: 3.2-5

BAY TRAIL

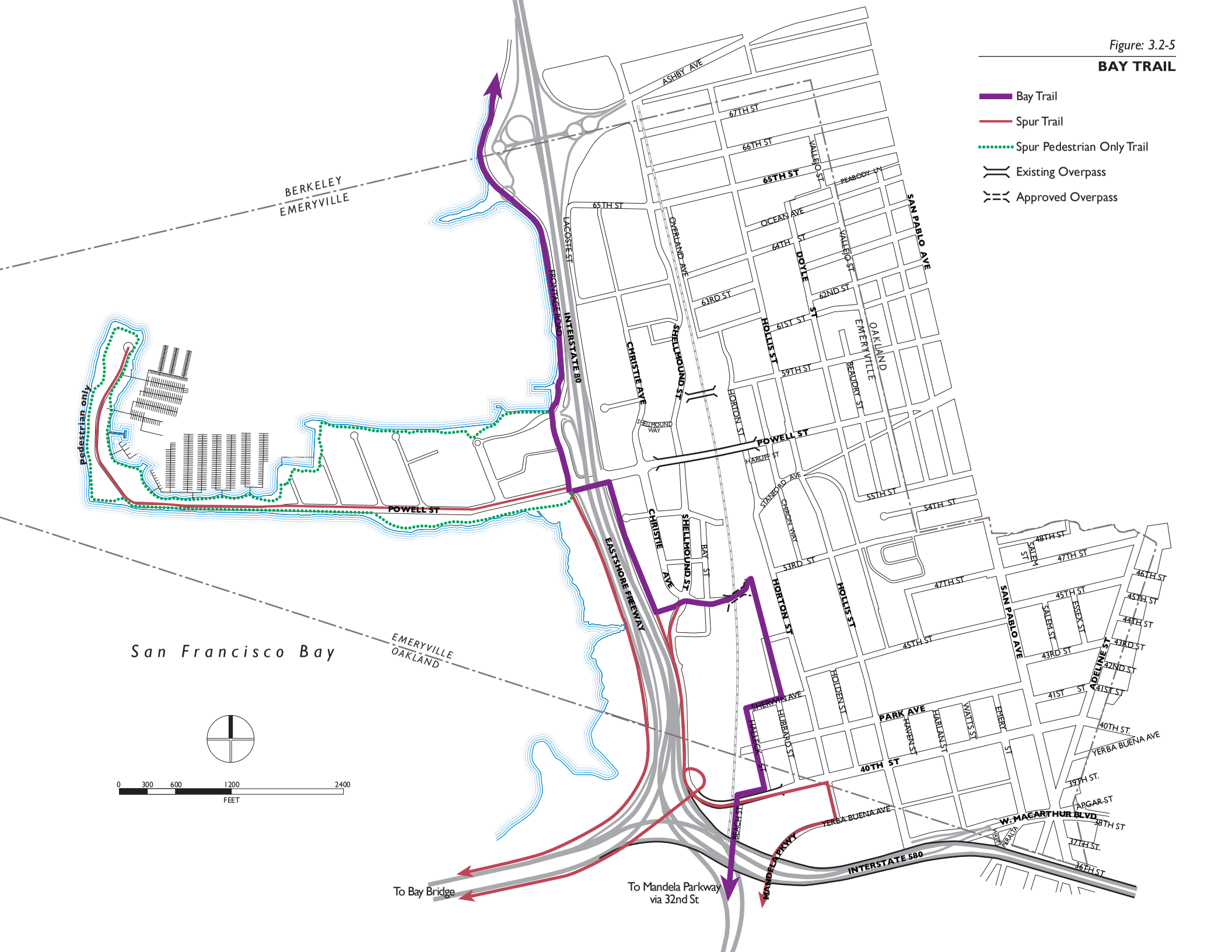
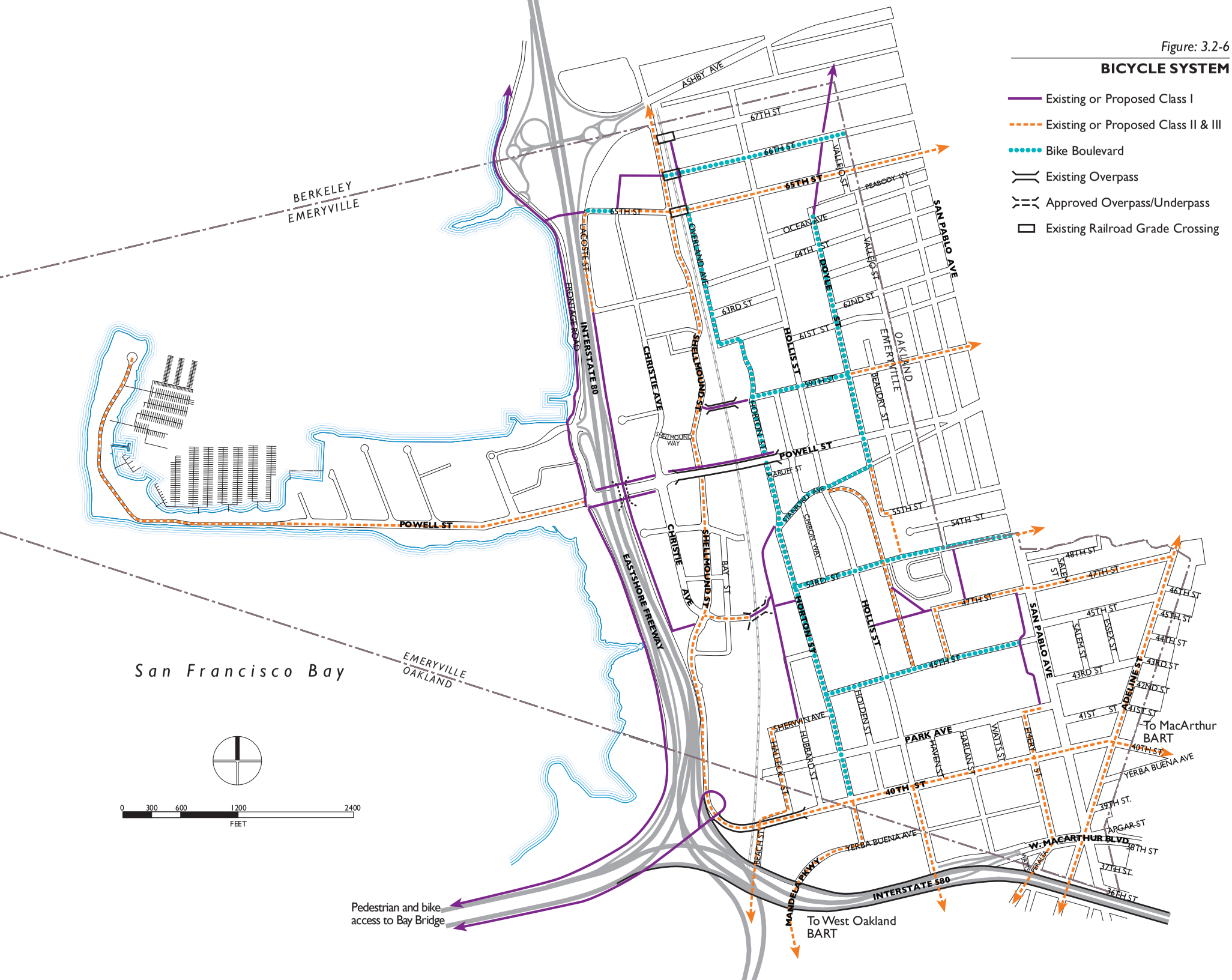


Figure: 3.2-6

BICYCLE SYSTEM



established where feasible, with removal of invasive species and additional opportunities for riparian vegetation. Following the creation of the riparian corridor, the creek would continue to flow in the below-grade pipe. Temescal Creek is largely a sub-surface drainage flowing through culverts as shown in Figure 3.5-2, therefore the construction activities associated with creation of the riparian corridor would involve excavation and clearing of paved areas in the vicinity. Short-term stormwater and potential erosion and sedimentation impacts could occur during the temporary construction phase. These short term construction-related impacts are assessed under Impacts 3.5-1 and 3.5-2. However, in the long term, the riparian corridor and vegetative stormwater treatment of the creek would provide a natural hydrology and water resource, which would be a beneficial impact.

Mitigation Measures

None required.

Impact

3.5-5 New development under the proposed General Plan could be subject to flooding. *(Less than Significant)*

New development identified in the General Plan is not subject to a significant level of flooding. As discussed in the Setting section above, the majority of Emeryville lies in Zone ~~C~~X, which signifies areas of minimal flood~~ing~~ hazard. ~~therefore, the new development (i.e., housing or other structures) under the General Plan would not lie within a 100-year flood hazard area.~~ The shoreline and marina areas are designated as Zone V and lie within the 100-year flood zone; however, these areas do not contain urban uses or structures, nor are such uses identified in the proposed General Plan.

However, in addition to FEMA designated flood zones, the city faces several environmental threats that could contribute to flooding, including dam inundation, mudflows and seiches, tsunamis, and sea level rise which must also be considered. These potential impacts are discussed below.

~~As discussed in Impact 3.5-4 above, storm drainage facilities and stormwater control measures would minimize any adverse flooding effects.~~ Although portions of Emeryville lie in the inundation area for Temescal dam, the dam is ~~overseen by DSOD~~considered to be safe and inundation due to a dam failure unlikely. The DSOD engineers and engineering geologists review and approve plans and specifications for dams for the site geology, seismic setting, site investigations, construction material evaluation, dam stability, hydrology, hydraulics, and structural review of appurtenant structures. In addition, the DSOD engineers inspect the dams on a yearly schedule to insure they are performing and being maintained in a safe manner. Due to the high maintenance and inspection standards, failure of the Temescal Dam is highly unlikely, therefore the risk from flooding to the development proposed under the General Plan is not considered high. ~~The impact would be less than significant.~~

There is a low likelihood for mudflows and seiches to occur in Emeryville due to the flat topography and absence of enclosed water bodies, therefore the General Plan would not expose people or structures to a significant risk from a seiche or mudflows.

As discussed previously, the U.S. Geologic Survey estimates that a 20-foot wave at the Golden Gate Bridge (an event estimated to possibly occur once in 200 years) could potentially cause a run-up of a 10-foot wave in the Emeryville Peninsula and the shoreline area. Some of the proposed development under the General Plan would occur along the shoreline and could be subject to the risk from a tsunami, if one were to occur. The State Office of Emergency Service is currently in the process of updating tsunami hazard maps for Alameda County. The existing USGS estimates do not suggest a threat to the built environment in Emeryville, but Plan policies described below ensure that this potential hazard will continue to be evaluated as information becomes available and conditions change (e.g. the hazard is rendered more severe due to sea level rise). ~~The impact would be less than significant.~~

Sea level rise is a global repercussion of climate change; thus the direct influence of Emeryville's GHG emissions on Bay Area sea level rise is impossible to determine with any certainty. Nonetheless, sea level rise is likely to have widespread effects on coastal structures, infrastructure, beaches, wetlands, agricultural lands, and water supply. As discussed in Setting, ~~the San Francisco Bay Area Conservation Commission~~BCDC has modeled the impact of a ~~sea level rise of 3 feet (or approximately 1 meter) on the San Francisco Bay Area~~16-inch sea level rise projection at mid-century and 55-inch projection at end of century. ~~The model has identified areas that would be under water due to sea level rise; the areas do not include Emeryville. Therefore the development proposed under the General Plan along the shoreline in Emeryville would not be subject to the risk of flooding from sea level rise.~~ The mid-century projection shows vulnerable areas along the shoreline of the Emeryville Crescent and peninsula, but does not suggest vulnerability to structures or urbanized areas. (The BCDC/USGS model compares the sea level rise scenario to land-surface elevation data and does not account for shoreline protection; therefore the area south of 64th Street and west of I-80 does not account for the at-grade freeway barrier.) The 2100 scenario, projecting 55-inch sea level rise could have implications for Emeryville's urban area, but lies beyond the scope and planning horizon of the proposed General Plan. However, General Plan policies, along with the City's Climate Action Plan, commit the City of Emeryville ~~will~~to monitor the climate change effects and implement any measures necessary to reduce any risk of flooding from sea level rise in the future. ~~The impact would be less than significant (Also refer to Impact 3.13-7).~~

Because many of the risks from these hazards are unknown (tsunamis) and subject to change over time (sea level rise), the City has committed through General Plan policies and other City initiatives and regulations to reduce the impacts of these threats. As discussed in Impact 3.5-4 above, storm drainage facilities and stormwater control measures would minimize any adverse flooding effects.

~~Adherence to the proposed General Plan policy listed above ensures the potential impact is less than significant.~~

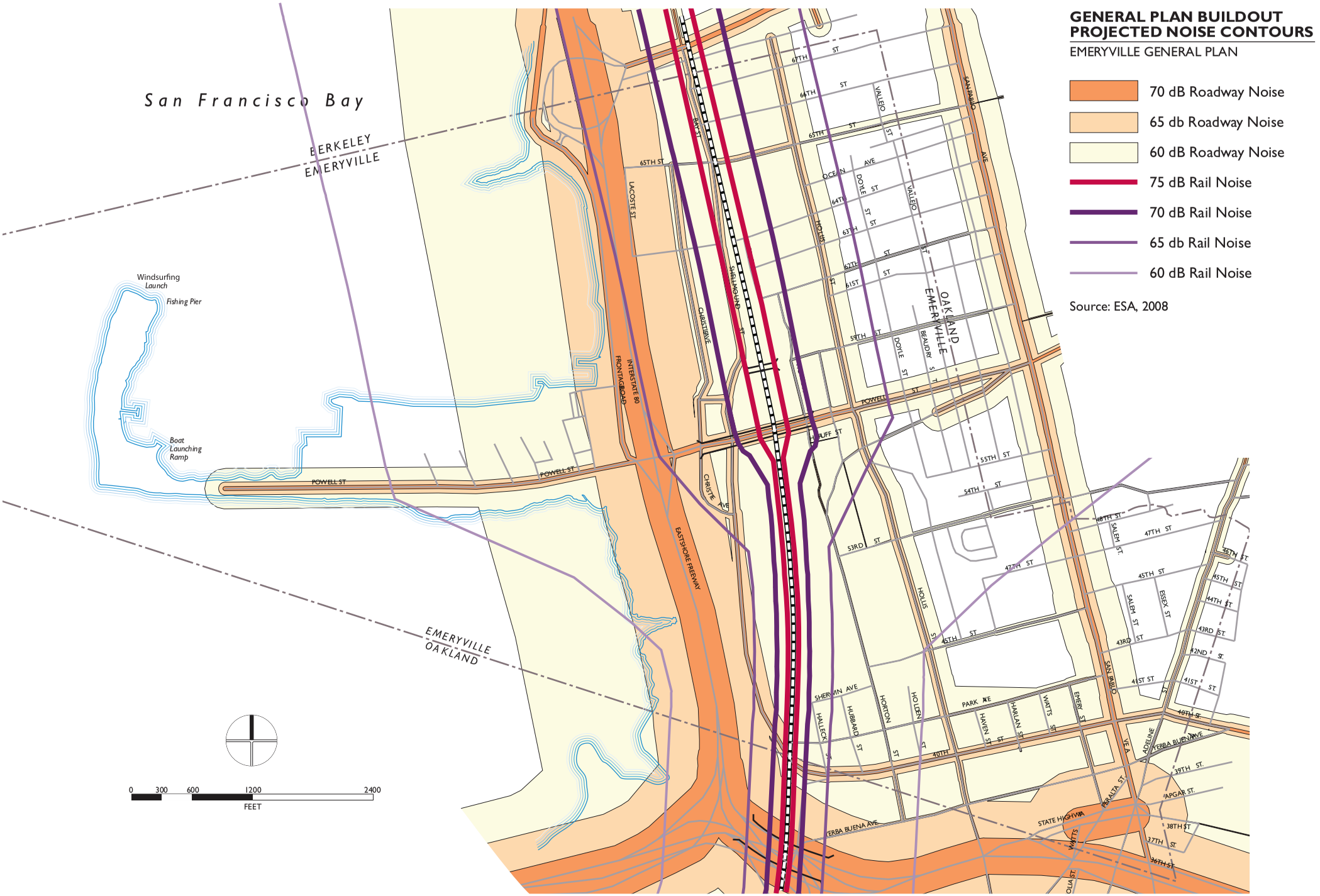
Proposed General Plan Policies that Reduce the Impact

New Policy:	The City will cooperate with State and federal agencies to address flooding risks due to dam inundation, tsunamis, sea level rise, or major flood events.
CSN-P-13	The City promotes construction and incorporation of cisterns, green roofs and other rainwater harvesting methods in existing, new and rehabilitation projects.
CSN-P-38	The City will continue to require development projects to implement on-site stormwater management measures through the City's development permit process.
CSN-P-39	Storm drains shall be maintained, and replaced or upgraded as needed to reduce potential flooding.
CSN-A-8	Cooperate with appropriate government agencies and public and private organizations to address seismic hazards and flooding risks due to dam inundation, tsunamis, sea level rise, or major flood events.
CSN-A-9	Implement and update emergency management operations plan, including evacuation routes, cache of supplies, training of City staff, as necessary, as the city continues to develop.

Adherence to established regulations, the Climate Action Plan and the proposed General Plan policies listed above, ensure the potential impact is less than significant.

Mitigation Measures

None required.


GENERAL PLAN BUILDOUT
PROJECTED NOISE CONTOURS
EMERYVILLE GENERAL PLAN
70 dB Roadway Noise
65 db Roadway Noise
60 dB Roadway Noise
75 dB Rail Noise
70 dB Rail Noise
65 db Rail Noise
60 dB Rail Noise
Source: ESA, 2008
San Francisco Bay
BERKELEY
EMERYVILLE
EMERYVILLE
OAKLAND
OAKLAND
EMERYVILLE
Windsurfing Launch
Fishing Pier
Boat Launching Ramp
POWELL ST
INTERSTATE 80
FRONTAGE ROAD
EASTSHORE FREEWAY
LACOSTE ST
CHRISTIE AVE
SHELLMOUND ST
BAY ST
HOLLIS ST
VALLEJO ST
SAN PABLO AVE
OCEAN AVE
DOYLE ST
BEAUDRY ST
HUFF ST
SHERWIN AVE
HALLECK ST
HUBBARD ST
HORTON ST
HOLDEN ST
PARK AVE
HAVEN ST
HARLAN ST
WATTS ST
EMERY ST
SALEM ST
ESSEX ST
ADELINE ST
YERBA BUENA AVE
PERALTA ST
STATE HIGHWAY
APGAR ST
0 300 600 1200 2400
FEET

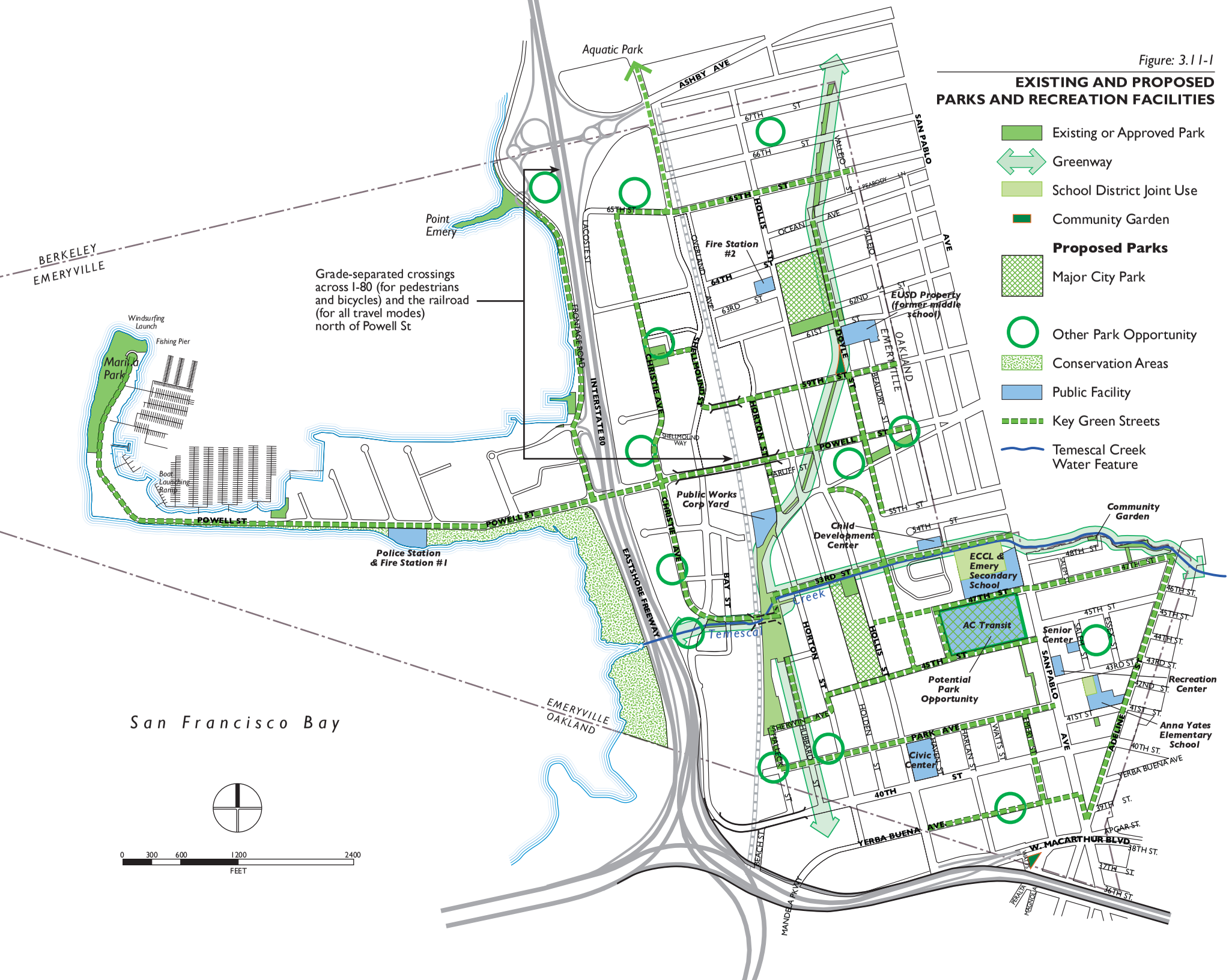


Figure: 3.11-1
EXISTING AND PROPOSED PARKS AND RECREATION FACILITIES
Existing or Approved Park
Greenway
School District Joint Use
Community Garden
Proposed Parks
Major City Park
Other Park Opportunity
Conservation Areas
Public Facility
Key Green Streets
Temescal Creek Water Feature
Aquatic Park
Point Emery
BERKELEY
EMERYVILLE
Grade-separated crossings across I-80 (for pedestrians and bicycles) and the railroad (for all travel modes) north of Powell St
Windsurfing Launch
Fishing Pier
Marina Park
Boat Launching Ramp
POWELL ST
Police Station & Fire Station #1
INTERSTATE 80
EASTSHORE FREEWAY
FRONTAGE ROAD
LACOSTE ST
CHRISTIE AVE
SHELLMOUND ST
SHELLMOUND WAY
HORTON ST
HOLLIS ST
OVERLAND AVE
OCEAN AVE
VALLEJO ST
PEABODY LN
SAN PABLO AVE
DOYLE ST
BEAUDRY ST
HARUFF ST
BAY ST
HOLDEN ST
HUBBARD ST
HALLECK ST
SHERWIN AVE
PARK AVE
HARLAN ST
WATTS ST
EMERY ST
ADELINE ST
ESSEX ST
SALEM ST
YERBA BUENA AVE
W. MACARTHUR BLVD
APGAR ST
MANDELA PKWY
BEACH ST
PERALTA
MAGNOLIA
ASHBY AVE
67TH ST
66TH ST
65TH ST
64TH ST
63RD ST
62ND ST
61ST ST
59TH ST
55TH ST
54TH ST
53RD ST
48TH ST
47TH ST
46TH ST
45TH ST
44TH ST
43RD ST
42ND ST
41ST ST
40TH ST
39TH ST
38TH ST
37TH ST
36TH ST
Fire Station #2
EUSD Property (former middle school)
Public Works Corp Yard
Child Development Center
Community Garden
ECCL & Emery Secondary School
AC Transit
Potential Park Opportunity
Senior Center
Recreation Center
Anna Yates Elementary School
Civic Center
Temescal Creek
San Francisco Bay
0 300 600 1200 2400
FEET

4.1 COMPARATIVE IMPACT ANALYSIS

LAND USE AND HOUSING

Table 4.3-1 shows land use by acreage at full buildout in each alternative. The alternatives differ in the amount of land dedicated to residential and non-residential uses, as well as the density and intensity of development.

The comparison of alternatives with respect to land use is summarized below. None of the alternatives would divide an established community or displace substantial numbers of existing housing or people. Because all development is infill in Emeryville, all developments will result in the same amount of land devoted to urban uses. None are expected to create any significant land use incompatibilities. Because there are no agricultural lands in Emeryville, no agricultural land would be converted.

- *Alternative 1: Mixed-Use City.* Alternative 1 devotes more land to employment uses such as office and retail space than the proposed General Plan. This comes at a comparative loss of residential developments, with this approach providing nearly 1,000 fewer units than in the proposed General Plan. Alternative 1 would result in a jobs/employed residents ratio of 3.1.
- *Alternative 2: Neighborhood Centers.* Alternative 2 has the largest increase in housing and population, accommodating 13 percent more housing than the proposed General Plan and resulting in the most development overall compared with the other alternatives. This comes at a comparative loss of employment, with 2,000 fewer jobs than in the proposed General Plan. This alternative would result in the most balanced jobs/employed residents ratio of 2.0.

- *No Project.* The No Project alternative would result in fewer housing units, fewer jobs, and the smallest population of all proposed alternatives. The No Project alternative would also result in the least dense development. However, jobs and housing would both increase, indicating that any jobs or homes lost to redevelopment could relocate within Emeryville. Further, the No Project alternative would not make as many changes in terms of increasing connectivity. Finally, the No Project alternative would result in the highest job/employed residents ratio, 3.3, as compared with the proposed General Plan and other alternatives.

Table 4.3-1: 2030 Buildout of Alternatives

Land Use	*Proposed General Plan*	*Alternative 1*	*Alternative 2*	*No Project*
Residential (Units)	9,800	8,900	11,700	7,505
Retail (SF)	3,083,000	3,345,000	2,833,000	3,149,000
Hotel (SF)	775,000	913,000	597,000	615,000
Office (SF)	7,255,000	8,052,000	6,812,000	6,806,000
Industrial (SF)	3,353,000	3,511,000	3,805,955	4,095,000
Parks (acres)	49	30	41	23
Total (SF)[1]	26,716,000	26,946,000	28,672,955	24,046,250

1. Total square footage excludes parks, but includes residential units (assumes 1,250 sf/unit)

Source: Dyett & Bhatia, 2008.

- *Alternative 2.* Alternative 2 would result in 1,900 more housing units and 3,300 more new residents than the proposed General Plan, but 2,000 less jobs. The estimate of 1.136 million VMT under Alternative 2 is the lowest of any alternative, including the proposed General Plan. Therefore, the demand for transportation energy is the least of any alternative. Further, due to the larger population in Alternative 2, the per capita use of transportation energy is 18 percent less than in the proposed General Plan. Electricity and natural gas use would be higher than under the No Project, but slightly less than under the General Plan, and considerably less than Alternative 1. Alternative 2 would also result in the lowest per capita GHG emissions of any alternative, due to the focus on housing, resulting in a greater jobs-to-housing ratio and the lowest overall VMT. Finally, the energy-saving and GHG reduction policies implemented under the proposed General Plan would apply to Alternative 2, reducing energy demand and GHG emissions further.
- *No Project.* The No Project alternative would result in 2,300 fewer housing units, 3,900 fewer residents, and 1,000 fewer jobs than the proposed General Plan. However, the VMT in the No Project scenario is higher than in the proposed General Plan and Alternative 2, at approximately 1.174 million. Therefore, the No Project alternative would result in the second highest overall demand for transportation energy, behind Alternative 1. The lower growth in jobs and population would result in the lowest electricity and natural gas use of any alternative. Finally, the No Project would result in the lowest GHG emissions, though when considering the smaller population, the per capita GHG emissions are actually the highest of all alternatives. The No Project alternative is the only alternative that would not include the energy-saving and GHG reduction policies implemented under the proposed General Plan. However, the Emeryville CAP includes many of these measures and would result in lower energy use and GHG emissions than shown in this analysis.

4.4 CONSIDERATION AND DISCUSSION OF THE ENVIRONMENTALLY SUPERIOR ALTERNATIVE

CEQA Guidelines (Section 15126.6(e)(2)) require the identification of an environmentally superior alternative among the alternatives analyzed. Although the environmental superiority can vary depending on the topic, or even depending on analysis criteria for the same topic, overall the proposed General Plan represents the environmentally superior alternative.

~~Because CEQA requires identification of an environmentally superior alternative,~~ The No Project Alternative, because of the lower amount of growth and the resulting lessening of adverse impacts, would be environmentally superior. The No Project scenario would result in lower population and job growth—and consequently reduced impacts—in several topic areas, such as noise, public services and utilities, and traffic. However, CEQA Guidelines mandate that if the No Project alternative is identified as the environmentally superior alternative, then another environmentally superior alternative must be identified, among the other alternatives and the Project. Even so, the No Project Alternative has several tradeoffs that make it less appealing compared with the other alternatives, namely enabling the highest jobs/employed residents ratio (3.3), thereby continuing the city's imbalance between jobs and housing; and the lowest provision of parks and aesthetic improvements.

The proposed General Plan represents the environmentally superior alternative because it minimizes impacts while achieving the goals and guiding principles developed by the General Plan Steering Committee. In particular, the proposed Project focuses development at key nodes and around transit hubs, and improves the balance of job and residential growth, lessening the strain on public facilities. Notably, it provides the most amount of parkland compared with the rest of the alternatives. Alternative 2: Neighborhood Centers shows results similar to the proposed General Plan, even reducing impacts to traffic, air quality, and energy usage. But, it has greater impacts on public facilities and services due to a larger residential population. Table 4.4-1 summarizes the relative impacts for each alternative, for all of the topics discussed in this chapter. Quantitatively, the proposed General Plan appears on par with the No Project Alternative, as shown in the "Total" column; however, qualitatively, the proposed General Plan satisfies the Plan's overarching goals. Alternative 1 and 2 both score higher (worse) in terms of their relative impacts.

Since all new development in the city will result from infill development—the redevelopment of existing sites—each alternative expects development on the same set of sites. Therefore, impacts are no different for many issue areas, including biological resources, hydrology, and geology. Likewise, there is no difference in displacement impacts due to land use changes. For the topics where significant impacts have been identified—traffic, noise, and air quality—differences between the alternatives and the proposed General Plan are negligible in a program EIR. For each of these topics, the result is still a significant and unavoidable impact.

Table 4.4-1: Comparison of Impacts				
Topic	*Proposed General Plan*	*Alternative 1*	*Alternative 2*	*No Project*
Land Use and Housing	-	-	-	-
Traffic, Circulation, and Parking	2	4	2	1
Hazardous Materials and Toxics	-	-	-	-
Biological Resources	-	-	-	-
Hydrology and Flooding	-	-	-	-
Geology, Soils, and Seismicity	-	-	-	-
Noise	2	4	2	1
Cultural Resources	4	4	4	4
Air Quality	2	4	1	3
Public Services and Utilities				
Schools	1	1	4	1
Water Supply	2	4	3	1
Wastewater Treatment	2	4	4	1
Solid Waste	2	4	2	1
Public Safety and Emergency Preparedness	2	4	4	1
Parks and Recreation	1	3	2	4
Aesthetics	1	1	1	4
Energy	3	4	1	2
Total	**24**	**41**	**30**	**24**

1 - 4 = Relative Impact (1= Lowest, 4 = Highest)

\- = No Difference and Less than Significant

= Significant Project Impact

Appendix A: Revisions to the Draft General Plan

This Final EIR document responded to comments on the Draft EIR and, subsequently, identified relevant changes to the Plan and Draft EIR. In addition to these changes, the General Plan and Zoning Update Steering Committee and/or City staff made some additional minor changes following several meetings:

- Public Open House (February 7, 2009)
- Joint City Council/Planning Commission Study Session (February 21, 2009)
- Steering Committee Meetings (April and June 2009)

The table below describes changes made to the proposed Emeryville General Plan. Many of these changes were also discussed in Chapter 3: Response to Comments on the Draft EIR and documented in Chapter 4: Revisions to the Draft EIR. It is organized by chapter/element and only reflects substantive changes. (Typos, formatting, clarifications, and updated cross-references are not recognized in the table.) Statements in **bold**, are followed by actual General Plan text and/or edits. Page, table, figure, goal, and policy numbers refer to the numbers in the January 2009 Public Review (PR) Draft. August 2009 Hearing Draft (HD) are shown in italics and parentheses, where different.

Revisions to the Draft General Plan

Chapter- PR Page (HR Page)	*Table/ Figure*	*Correction*
Introduction		
1-3		**Deleted specific park reference from Guiding Principle #3:** ~~Two large new parks are proposed in the General Plan, as described in Chapter 4: Parks, Open Space, and Public Facilities, and Figure 4-1.~~
1-11		**Corrected redevelopment project area expiration dates:** However, the 1976 Project Area will expire in ~~2016~~2019, and the Shellmound Project Area will expire in ~~2027~~2028, both during the General Plan period.
1-12		**Expanded discussion of fiscal sustainability and balanced amidst changing economic conditions:** This multi-faceted land use approach will allow the city to be flexible and resilient as market conditions change. An analysis of projected General Fund revenues illustrates the benefit of this mix of uses.
1-16	Fig. 1-2	Updated figure to include Emery Bay Village in Eastern Residential Neighborhoods.
1-17	Fig. 1-3	Updated figure to expand boundaries of San Pablo Urban Design Guidelines.
1-18		**Corrected redevelopment project area expiration dates:** The older of the two, the 503-acre 1976 Project Area, will be operational until ~~2016~~2019, the 270-acre Shellmound Project Area until ~~2027~~2028.

Chapter- PR Page (HR Page)	*Table/ Figure*	*Correction*
1-19	Fig. 1-4	Updated figure to include redevelopment area boundaries in the Bay.
Land Use		
2-8	Tab. 2-2	**Expanded explanation of "Loss of Existing Due to Redevelopment:"** This value reflects existing underutilized properties that ~~will~~may be replaced by new uses. This is an accounting measure that estimates the proportion of existing development that may be redeveloped on each site in an area of change. Table updated to reflect rounded numbers and modification of residential units lost to zero.
2-9	Chart 2-5	Updated chart to include the 2030 projection for jobs/employed residents ratio.
2-11	Fig. 2-2	Updated Land Use Diagram figure to: • Extend Mixed Use with Residential designation along Doyle Street (north of 64th Street and south of 61st Street). • Change northwest corner of Powell Street and Frontage Road to Mixed Use with Non-Residential. • Add community gardens and Stanford, Oak Walk, and Christie parks. • Amend southern park to bound 53rd, Holden, Hollis, and 45th streets. Amend opposite parcel east of Hollis Street to Office/Technology, and the northeast and southwest corners of Holden and 45th streets asMixed Use with Residential. • Add AC Transit site at 47th Street and San Pablo Avenue as a potential park opportunity.
2-12		**Clarified what is permitted in the Industrial classification:** A range of industrial and high technology uses, including light manufacturing, repair, testing, printing, service commercial, and biotechnology uses. Live/work is appropriate east of Hollis Street. "Heavy" live/work uses (e.g. work involving manufacturing, welding, and assembly) will only be allowed, west of Hollis Street. ~~West of Hollis Street, north of 65th Street, general manufacturing uses are permitted. East of Hollis Street, new general manufacturing uses are not permitted, but~~ General manufacturing uses are permitted west of Hollis Street, north of 65th Street. East of Hollis Street, new light industrial uses are permitted, but new general manufacturing uses are not. Existing general manufacturing uses can continue as conforming uses with performance standards for noise, air quality, and truck traffic, to safeguard adjacent residential uses. Unrelated retail and commercial uses that could be more appropriately located elsewhere in the city are not permitted, except for offices, subject to appropriate standards, and in Neighborhood Retail Overlay areas (i.e., North Hollis).
2-13		Updated explanation of base and bonus FAR. See new section under the heading "Density/Intensity."

Chapter- PR Page (HR Page)	*Table/ Figure*	*Correction*
2-14	Fig. 2-3	Updated FAR figure to: • Streamline base/bonus FARs into five categories (except for already established Planned Unit Developments) • Reduce FAR in Eastern Residential Neighborhoods' FAR to 0.75/1.0, base and base with bonus. • Increase FAR between San Pablo Avenue and Adeline Street, south of 40th Street to 3.0/4.0, base and base with bonus. • Increase FAR between Peabody Lane, and Vallejo, Doyle, and 65th streets, to 1.5/2.0, base and base with bonus.
2-16	Fig. 2-4	Updated Building Heights figure to: • Streamline base/bonus building heights into five categories (except for already established Planned Unit Developments) • Increase height between San Pablo Avenue and Adeline Street, south of 40th Street to 55/75 feet, base and base with bonus. • Increase height between Peabody Lane, and Vallejo, Doyle, and 65th streets, to 55/75 feet, base and base with bonus.
2-17	Fig. 2-5	Updated to show revised southern park site (bounded by 53rd, Holden, Hollis, and 45th streets).
2-18	Fig. 2-6	Updated Residential Densities figure to: • Streamline base/bonus residential densities into five categories. • Increase density between San Pablo Avenue and Adeline Street, south of 40th Street to 50/60 units/acre, base and base with bonus. • Increase density between Peabody Lane, and Vallejo, Doyle, and 65th streets, to 85/100 units/acre, base and base with bonus. • Remove parks and non-residential sites; add new residential opportunities that result from changes to the Land Use Diagram. • Increase lowest residential density category to 20/35 units/acre, base and base with bonus, to reflect existing regulations.
2-19		**Revised bonus program criteria:** • Public Parking. <u>All or a portion of</u> publicly accessible parking <u>will be excluded from FAR calculations and may be counted towards height and density bonuses</u>. . . . • ~~Exceptional Design.~~ **Added statement to remove exceptional design as bonus criteria, but maintain for findings:** <u>Bonuses are discretionary and contingent on excellence in design.</u>
2-20		**Amended goals:** LU-G-13 Local employment opportunities—encourage establishment of businesses that will employ <u>and serve</u> Emeryville residents.

Chapter- PR Page (HR Page)	*Table/ Figure*	*Correction*
2-21		**Inserted new policy:** • Zoning performance measures will ensure health and safety compatibility for industrial uses bordering residential uses.
2-22		**Amended policy:** LU-P-18 (*LU-P-19*): The area around the Amtrak station shall be developed with <u>pedestrian and bicycle amenities, and</u> transit-supportive uses, through measures such as reduced parking requirement, incorporation of public parking in developments, and accounting for transit proximity when considering height and FAR bonuses.
Transportation		
3-6, 3-9, 3-12, 3-16	Fig. 3-1, 3-2, 3-4, 3-6	Updated figures to: • Create a bike/pedestrian path extending Christie Avenue, north of 65th Street, and connecting to 67th Street. • Add a bike/pedestrian path just west of San Pablo Avenue, between 45th and 47th streets. • Add a pedestrian priority zone to the AC Transit site at 47th Street and San Pablo Avenue and the revised southern park location.
3-15		Move entire Street System section (Section 3.6) after Section 3.2: Circulation. Add a new map and discussion to this section, designating regional retail routes.
3-17		Added truck routes figure to Section 8: Goods Movement.
3-20 (*22*) through 3-23 (*26*)		**Inserted new policies:** • *T-P-7:* The City shall continue to study and evaluate appropriate traffic and transportation improvements. • *T-P-9:* The City will work with Caltrans and the City of Berkeley to develop improvements to the Ashby Interchange. • *T-P-30:* The City will undertake a study to enhance transit mobility, including feasibility of transit-only lanes (dedicated, peak-hours only/shared with automobiles at other times, or converted from parking lanes to transit-only during peak hours), especially along congested transit streets, to provide walking access from most of the city, and connect major destinations within Emeryville and to BART. • *T-P-35:* The City will support the expansion of the Emery Go-Round to accommodate workers, residents, visitors. **Amended policy:** T-P-57 (*T-P-61*): Truck freight movement will be accommodated to and from local businesses, consistent with the typologies described in this chapter. <u>Through truck traffic is discouraged.</u>
Parks, Open Space, Public Facilities, and Services		
4-6, 4-8, 4-9		Emery Unified and Emeryville Center of Community Life discussion updated per comments from School Board and City/Schools Committee, respectively.

Chapter- PR Page (HR Page)	*Table/ Figure*	*Correction*
4-2		**Emphasize that open spaces will accommodate active and passive uses:** The General Plan proposes several different park types to accommodate the needs of present and future residents, workers, and visitors and to create a cohesive network of open spaces. The proposed strategic master plan will outline recommended programming for both active recreation and passive park use. A general framework is described here:
4-7	Fig. 4-1	Updated figure to: • Add community gardens and Christie Park • Shift "Key Green Street" on the Peninsula from the pedestrian path to Powell Street. • Amend southern park to bound 53rd, Holden, Hollis, and 45th streets. • Add AC Transit site at 47th Street and San Pablo Avenue as a potential park opportunity.
4-12		**Add discussion of Community Emergency Response Training:** The Community Emergency Response Team (CERT) Program educates people about disaster preparedness for hazards that may impact their area and trains them in basic disaster response skills, such as fire safety, light search and rescue, team organization, and disaster medical operations. Using the training learned in the classroom and during exercises, CERT members can assist others in their neighborhood or workplace following an event when professional responders are not immediately available to help. CERT members also are encouraged to support emergency response agencies by taking a more active role in emergency preparedness projects in their community.

Chapter- PR Page (HR Page)	*Table/ Figure*	*Correction*
4-15		Reordered policies P-1 through p-13. **Amended policies:** PP-P-4 (*P-P-2*): Two new large parks (five acres or larger), one each north and south of Powell Street, shall be provided. Active recreation uses will be a component of these parks. The northern park site is bounded by 61st, 64th, Hollis, and Doyle streets. There are two potential southern park sites: • One potential southern park site is shown on the PG&E site on Hollis Street, between 45th and 53rd streets. On this site, consideration shall be given as to how to incorporate the existing buildings, which are rated Tier 1 and Tier 2 in the Park Avenue District Plan, into future park uses. • The second potential southern park site is located at the AC Transit bus yard between 45th and 47th streets, adjacent to the proposed Center of Community Life. Should this site become available, the city shall explore the possibility of a public park—along or with other public uses. If a large park at this site is feasible and is considered desirable, all or part of the PG&E site may no longer be needed for a public park. PP-P-6 (*PP-P-9*): Shading of parks and green streets ~~located adjacent to~~by buildings will be minimized. PP-P-12 (*PP-P-13*): Open spaces that have deteriorated, have design features that limit access and use opportunities, and/or are in need of activity ~~and revitilization~~shall be revitalized.
4-16		**Inserted new policies:** *PP-P-24*: The City will support community involvement in disaster preparation and response through the Fire Department's Community Emergency Response Training program. *PP-P-27*: The City will continue to cooperate with EBMUD, the Regional Water Quality Control Board, and other relevant agencies to adopt and implement programs and policies to further reduce inflow and infiltration (I&I) of storm water in the City's wastewater collection system and private sewer laterals during wet weather events. *PP-P-28*: The City will continue to require development projects to replace or upgrade as needed, sanitary sewer systems serving the development site to reduce inflow and infiltration (I&I) of stormwater in the City's wastewater collection system and private sewer laterals during wet weather events.
Urban Design		
5-4	Fig. 5-1	Updated figure to: • Reflect land use and park location changes • Add a gateway at 53th and San Pablo Avenue
5-6		Expand discussion of North Bayfront and Powell/Christie core as a mixed-use transit-oriented district.
5-6 through 5-9		Amended 3D graphics to include street labels, north arrows, and correct district boundaries.

5-12, 5-14	Fig. 5-4	Updated active frontage street discussion to encompass all streets. Removed accompanying map which only specified certain streets.
5-19 (*18*)		Updated tower spacing discussion: ~~Because full-block development at lower floors will be permitted in many places in Emeryville, large floor plates are permitted for building bases.~~ To ensure generous light and views, upper floors will be stepped back, and towers will be slender and spaced apart. ~~However, in several sections of the city bulkier buildings at upper levels are allowed to accommodate employment-oriented uses.~~
5-26 (*25*) through 5-31 (*30*)		Inserted photo simulations of six intersections/areas of the city, illustrating how urban design concepts could be carried out, to improve the public realm and overall quality of life.
5-35		Updated gateway discussion to add the entry point at San Pablo Avenue and 53rd Street as a gateway and encourage additional signage at other entry points to the city, such as Hollis and 67th streets.
5-38		**Inserted new policy:** *UD-P-19:* Infill development shall provide activation at the lot frontage and minimize visible off-street parking.
5-40 (*39*)		**Amended policies:** UD-P-25 (*UD-P-26)*: Commercial uses, such as retail, restaurants, hotel lobbies, and offices, shall be required at the ground level ~~along Active Frontage Streets~~ <u>in neighborhood centers and regional retail overlay districts.</u> UD-P-26 (*UD-P-27)*: ~~Development shall be brought to the street edge, on Active Frontage Streets, locating parking in the rear.~~ <u>All ground-level street frontages should be activated. Driveways, loading zones, and curb cuts shall be provided but minimized.</u>
5-41 (*40*)		**Amended policy:** UD-P-45 *(UD-P-46)*: <u>Street trees shall be provided on City streets where feasible.</u> Street trees shall be planted in a row along the curb, between the vehicle roadway and sidewalk, unless this is physically impossible due to constraints such as underground water or sewer lines.
5-43 (*42*)		**Amended policy:** UD-P-60 *(UD-P-61)*: Above-grade parking structures should be wrapped with active uses in Pedestrian Priority Zones ~~and along Active Frontage Streets.~~
Conservation, Safety, and Noise		
6-4		**Described graywater systems:** <u>Graywater — water that comes from sinks, showers, and washing machines — may be reused on-site to flush toilets and irrigate non-edible landscape plants.</u>
6-5		**Updated special species discussion:** <u>Additional species that have the potential to occur in the city include: Coopers Hawk, Sharp-shinned Hawk, and the Peregrine Falcon.</u>
6-18 through 6-20	Fig. 6-7	Updated flood zone discussion and dam inundation map to reflect the recently released Federal Emergency Management Agency's flood zones maps. Updated sea level rise discussion and added new figure showing 16-inch potential sea level rise scenario.

6-26 (*25*)	Fig. 6-10	Updated figure to reflect changes in assumptions about future railroad use.
6-27		**Amended goal:** CSN-G-5: Preservation and protection of natural resources—Preservation and enhancement of natural habitat, and protection of biological resources, particularly around the Emeryville Crescent. **Inserted new goal:** *CSN-G-5*: Ambient noise reduction—Strive to minimize increases in ambient noise levels.
6-28		**Inserted new policy:** *CSN-P-15*: The City shall consider revising plumbing and building code requirements, as necessary, to allow for graywater and rainwater harvesting systems.
6-29		**Amended policies:** CSN-P-17 (*CSN-P-18)*: The City will ~~protect~~encourage protection of essential habitat for special status ~~wildlife~~species ~~and the seven special status plant species~~ and ~~will~~support habitat protection and enhancement ~~and open spaces~~within Emeryville that are within the City's control. CSN-P-18 (*CSN-P-19)*: The natural environment, including mature trees and landscaping, shall be protected from destruction during new construction and redevelopment. Adequate replacement shall be provided where protection is impossible. CSN-P-21 (*CSN-P-22)*: Provide visual, and where practical, physical, access to the Emeryville Crescent in a manner consistent with the protection of this fragile ecological system. Improvements to the Bay Trail in the Emeryville Crescent must be consistent with habitat protection.
6-29		**Inserted new policies:** • *CSN-P-23:* Where new trails or other improvements are proposed in the vicinity of the baylands and essential habitat for special-status species, require adequate avoidance and mitigation necessary to protect sensitive resources. • *CSN-P-24:* The City shall explore opportunities for habitat restoration and enhancement, particularly in larger parks and open space areas. • *CSN-P-31:* In order to reduce light pollution and use less energy, lighting (including on streets, recreational facilities, and in parking areas) should be designed to prevent artificial lighting from illuminating natural resources or adjacent residential neighborhoods.

6-30		**Amended policy:** CSN-P-32: Prior to reuse, ~~former commercial and industrial~~development sites and utility corridors servicing development will be ~~cleaned up~~remediated, according to relevant State and federal regulations. **Inserted new policies:** • *CSN-P-44:* The City will cooperate with State and federal agencies to address flooding risks due to dam inundation, tsunamis, sea level rise, or major flood events. • *CSN-P-49:* Noise impacts should be controlled at the noise source where feasible, as opposed to at receptor end. This includes measures to buffer, dampen or actively cancel noise sources. • *CSN-P-54:* The City will work with the California Public Utilities Commission, other pertinent agencies and stakeholders to determine the feasibility of developing a railroad quiet zone in Emeryville. • *CSN-P-55:* The City shall require noise buffering, dampening, or active cancellation, on roof-top or other outdoor mechanical equipment located near residences, parks, and other noise sensitive land uses. • *CSN-P-56:* The City shall limit the potential noise impacts of construction activities on surrounding land uses through Noise Ordinance regulations that address allowed days and hours of construction, types of work, construction equipment, notification of neighbors, and sound attenuation devices.
Sustainability		
7-22 (*24*)		Update green building and construction discussion and accompanying text box to reflect Bay-Friendly Landscaping policies.
7-30 (*33*)		ST-G-8: Environmentally-friendly and energy-efficient buildings and landscaping—Green building and Bay-Friendly Landscaping practices throughout Emeryville in new construction, redevelopment and retrofit projects.
Implementation		
8-3		Inserted the City Manager's responsibilities
8-9		Inserted the General Plan annual report to the State, as an action item.
8-16	Tab. 8-3	**Amended action item:** PP-A-12 (*PP-A-13):* Work with other public agencies, including PG&E, AC Transit, Amtrak, the Post Office and the School District and local neighborhoods on appropriate land uses for ~~school~~sites no longer needed ~~for educational purposes~~by the respective public agency. **Inserted new action items:** *PP-A-12:* Continue to operate the Community Emergency Response Team (CERT) Program. *PP-A-14:* Continue to require development projects to replace or upgrade sanitary sewer systems.

8-19	Tab. 8-5	**Amended action item:** CSN-A-8: Cooperate with appropriate government agencies and public and private organizations to address seismic hazards and flooding risks due to dam inundation, tsunamis, sea level rise, or major flood events.
8-20	Tab. 8-5	**Inserted new action item:** *CSN-A-19:* Coordinate with the Public Utilities Commission and other public agencies to develop railroad quiet zones

DYETT & BHATIA
Urban and Regional Planners

755 Sansome Street, Suite 400
San Francisco, California 94111
415 956 4300 415 956 7315



EMERYVILLE GENERAL PLAN

CITY OF EMERYVILLE | Adopted: October 13, 2009

Amended: January 19, 2010
September 21, 2010
May 15, 2012
April 2, 2013

EMERYVILLE GENERAL PLAN

General Plan and Zoning Update Steering Committee:

Elizabeth C. Altieri

Ken Bukowski

Jason Crouch*

Gail Donaldson

Miguel Dwin

Forrest Gee*

Paul Germain*

Spencer Green*

Carol Handelman

Arthur Hoff

Patricia Jeffery

Richard L. Kassis

Vanessa Kuemmerle

Joe Lutz*

Lamonte Mack*

Ron Mooney

A.Robin Orden

Kris Owens

Eric Pascual*

John Scheuerman

Ed Treuting*

Ashley Walls

Deszeray Williams

Deborah Diamond, Secretary

**Former Steering Committee Members*

CITY OF EMERYVILLE

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CITY OF EMERYVILLE

City Council

Richard L. Kassis, *Mayor*

Ken Bukowski, *Vice Mayor*

Ruth Atkin

Nora Davis

John Fricke

Planning Commission

Arthur Hoff, *Chair*

Frank Flores, *Vice Chair*

Lawrence C. "Buzz" Cardoza

Gail Donaldson

Patricia Jeffery

James A. Martin

John Scheuerman

Project Staff

Patrick D. O'Keeffe, *City Manager*

Charles S. Bryant, *Director of Planning and Building*

Deborah Diamond, *Project Manager*

Support Staff

Michael G. Biddle, *City Attorney*

Helen Bean, *Director of Economic Development and Housing*

Melinda Chinn, *Director of Community Services*

Maurice Kaufman, *Director of Public Works*

Peter Schultze-Allen, *Environmental Analyst*

Edmund Suen, *Director of Finance*

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1 INTRODUCTION & OVERVIEW

Emeryville, one of the smallest cities in California, covers an area of 1.2 square miles. It is located between Berkeley to the north, Oakland to the south, and the San Francisco Bay to the west. At the eastern end of the San Francisco Bay Bridge, Emeryville is the gateway to the East Bay.



Emeryville was incorporated in 1896 as a city of industry and business at transportation cross-roads. After several decades of decline as major industries closed and relocated, Emeryville has remade itself into a dynamic mixed-use community, home to global leaders in film-making, biotechnology, software, and other high-tech industries; an incubator for entrepreneurs and innovation; a retail and entertainment destination, with flourishing arts, food, and culture; and a growing residential community.

This General Plan is designed to guide growth and development. The Plan focuses on enhancing livability and quality of life for the city's expanding population; fostering responsible sustainable development; increasing connectivity; and enhancing the public realm. The General Plan articulates a vision for the City focusing on broad objectives such as "quality of life" and "community character." It also sets forth actions to be undertaken by the City to achieve those goals. It is clear that such broad objectives can only be attained if they are translated into actions that are tangible and that can be implemented. At the same time, it is also recognized that this General Plan is indeed general in nature, allowing for flexibility and evolution. It can thus be anticipated that changing times, challenges, opportunities, market conditions, and fiscal realities may necessitate amendments to this General Plan. Nonetheless, amendments should be undertaken thoughtfully and without losing sight of the overall vision expressed in this document.

1.1 GUIDING PRINCIPLES

The Guiding Principles are at the heart of the General Plan. Collectively, they express a community vision for Emeryville's evolution from a center of commerce into a livable and diverse city. These Principles provide the platform for the goals, policies, and actions of the Plan. They have been crafted with input from the community, and respond to specific opportunities and challenges.

GUIDING PRINCIPLES

1. A cohesive city of distinctive districts and livable neighborhoods

Emeryville's growth is shaped—through land use, urban form, and design—to create a tapestry of distinctive districts, and neighborhoods with a full complement of uses and easy access to parks, stores, and other amenities of everyday living. Development intensities are designed to maximize accessibility to amenities, and provide transition in scale and height to lower-density neighborhoods.

2. A connected place

The General Plan fosters new connections—for automobiles, pedestrians, and bicyclists—between the western and eastern halves of the city; better connections to the Peninsula; and new and safe pedestrian and bicycle linkages to the San Francisco Bay. The Plan also seeks to provide more transportation choices. Protecting vistas of the San Francisco Bay and the East Bay Hills will visually connect the city with the surrounding region.

3. Enhanced and connected open space network and green streets

The General Plan outlines strategies for an expanded public realm, building on the strength and connectivity of the city's greenways, with a range of new parks, plazas, community commons, and recreational paths.[1] Open space is strategically located to maximize accessibility and building forms are organized to ensure that sunlight reaches streets and parks. Many more trees along streets and enhanced landscaping will provide a greener city.

4. A walkable, fine-grained city, emphasizing pedestrians

The General Plan establishes that all of Emeryville will be easily traversed on foot. A fine-grained pattern of blocks and streets is a fundamental prerequisite of a walkable and accessible city; the General Plan promotes walkability through encouragement of active uses, creation of smaller parcels/blocks and inter-connections as large sites are redeveloped, and improved sidewalks, pathways, and streetscapes. Where larger buildings may be appropriate, these shall be constructed with smaller footprints to preserve views and ensure pedestrian access. Where appropriate, in people-intensive places—such as retail, office, and residential districts—pedestrians will have priority over automobiles, and buildings shall be articulated and designed to visually engage and offer comfort to pedestrians.

5. A diversity of transportation modes and choices

The General Plan fosters and provides incentives for alternative transportation modes, including transit, car/vanpooling, bicycling, walking, and telecommuting. Residents will be able to access stores, offices, the waterfront, or regional transit networks without needing a car. Land uses capitalize on Amtrak, AC Transit, and Transbay bus lines, and proximity to BART, and are integrated with the Emery Go-Round that extends to within walking distance of most locations. Bicycle paths link housing, activity centers, and recreational amenities, and are buffered where feasible from automobiles to further safety.

1 *Greenways are linear parks with pedestrian and bicycle paths, small gathering places, and recreational facilities, either on their own right-of-way or along a street. See Chapter 4: Parks, Open Space, and Public Facilities for more detail.*







The Guiding Principles express a vision for a high-quality of life for residents, businesses, and visitors in Emeryville.





The General Plan seeks to provide a balance of regional and local amenities. Enhancing livability for the growing population is a key General Plan tenet.

6. A vibrant, urban community

Reflecting its strategic location in the heart of the Bay Area, Emeryville will continue as a vibrant community, with cultural offerings, and urban amenities. Active gathering spaces will be encouraged, and streets designed for pedestrian comfort, walking, and enjoyment. Higher intensities will support a range of amenities while furthering regional goals of promoting infill development, supporting transit, and curtailing sprawl. Emeryville will maintain its small-town ambiance through civic engagement, accessible government, and amenities and services for appropriate future residential and worker populations.

7. A diverse, balanced, and inclusive community

The General Plan embraces physical, social, and economic diversity, and strengthens the community with facilities and programs such as the Center of Community Life and a cultural center in the Park Avenue District. The Plan supports increased residential development to provide a more balanced use mix, sufficient concentration of residents/office workers, increased support for local-serving amenities, and opportunities for more workers to live in the city and enjoy shorter commutes, while recognizing that the City's employment primacy is likely to remain, given its history as an employment center. The Plan furthers a variety of housing types and emphasizes family-friendly housing, and linkages to Emeryville's school system to promote the success of its youth and to encourage new residents to actively contribute to the community.

8. A balance of regional and local amenities

Given its location, Emeryville will remain a regional destination. However, the City will balance retail uses that draw visitors from throughout the region, with stores and amenities that serve neighborhood needs, while ensuring fiscal health and a sustainable economy. The General Plan emphasizes development of pedestrian-oriented and scaled (rather than auto-oriented) districts and policies to ensure that development provides benefit for the local community, and that small, often local, businesses are viable.

9. Sustainability and innovation, with respect for the past

The Emeryville community strives to live within means that do not compromise the ability of future generations in Emeryville to enjoy a livable, healthy, and vibrant city. The Plan encourages redevelopment of contaminated land as a healthy and cost-effective way of improving the local environment, use of "green" construction techniques, and a lifestyle with low ecological impacts upon energy consumption, climate, and the natural environment. The City will interweave the future and the past, while respecting the scale, character, and use of the historical Doyle and Triangle neighborhoods and other districts.

10. An imageable and memorable city

The City will foster high-quality new construction of exceptional design while preserving and enhancing the best of existing buildings and neighborhoods. The City will foster a dramatic skyline of slender and elegant high rise buildings stepping down to low-rise buildings in the older residential neighborhoods. Enhance the experience of entering Emeryville with attractive and appropriate streetscape improvements along major regional and city arterials. Collectively, these elements serve to foster Emeryville's character as a vibrant, connected, livable community, and a rising signature city from afar and within.

1.2 PUBLIC PARTICIPATION IN PREPARING THE PLAN

The Guiding Principles and this General Plan are the product of a four-year relationship among community members and stakeholders to develop a Plan that reflects the goals and desires of the community. Public participation was structured for each phase of the planning process: issue identification, vision and goal setting, alternatives analysis, and synthesis of ideas and policies. During each phase, participants were asked for ideas and input through: public workshops and meetings; targeted outreach to youth; General Plan Steering Committee meetings; workshops with the City Council and Planning Commission; a project website; newsletters and media coverage; and a citywide survey. Interim products were disseminated through the project website and study sessions with City Council and Planning Commission.

Central to the process was the 16-member Steering Committee that shepherded the process and shaped the Plan. The Steering Committee's charge to consider input from the broader public was accomplished by a series of public workshops where residents and other stakeholders weighed in on issues and recommendations. The Planning Commission and the City Council were involved at all key stages in the process. Community members also had opportunities to comment during these public meetings. Because of the participation of hundreds of people, the General Plan comprehensively responds to the needs of the wide variety of stakeholders and the vision of urban culture articulated by the Guiding Principles.

1.3 SCOPE AND PURPOSE OF THE GENERAL PLAN

General Plan Purpose

The General Plan governs all City actions relating to Emeryville's physical development. The General Plan is mandated by and derives its authority from California Government Code Section 65300, which requires each city and county in California to adopt a General Plan, for the physical development of the county or city, and any land outside its boundaries which bears relation to its planning. The Emeryville General Plan is a document adopted by the City Council that serves several purposes:

- To outline a vision for Emeryville's long-term physical and economic development and community enhancement;
- To provide strategies and specific implementing actions that will allow this vision to be accomplished;
- To establish a basis for judging whether specific development proposals and public projects are in harmony with Plan policies and standards;
- To allow City departments, other public agencies, and private developers to design projects that will enhance the character of the community, preserve and enhance critical environmental resources, and minimize hazards; and
- To provide the basis for establishing and setting priorities for detailed plans and implementing programs, such as the Zoning Ordinance, Design Guidelines, the Capital Improvements Program, facilities plans, and redevelopment and area plans.







Community workshops for the general public (top) and targeted to youth (middle) provided opportunities for input that shaped the Plan. The General Plan and Zoning Update Steering Committee on a city tour (bottom).

State law requires that a variety of City actions be consistent with the General Plan so regular ongoing use of the Plan is essential. The Plan is both general and long-range and there will be circumstances and instances when detailed studies are necessary before Plan policies can be implemented.

General Plan Requirements

A city's general plan has been described as its constitution for development – the framework within which decisions must be made on how to grow, provide public services and facilities, and protect and enhance the environment. California's tradition of allowing local control over land use decisions means that the state's cities have considerable flexibility in preparing their general plans.

While they allow considerable flexibility, state planning laws do establish basic requirements about the issues that general plans must address. The California Government Code establishes both the content of general plans and rules for their adoption and subsequent amendment. Together, State law and judicial decisions establish three overall guidelines for general plans.

- *The General Plan Must Be Comprehensive.* This requirement has two aspects. First, the general plan must be geographically comprehensive. That is, it must apply throughout the entire incorporated area and it should include other areas that the City determines are relevant to its planning. Second, the general plan must address the full range of issues that affects the City's physical development.
- *The General Plan Must Be Internally Consistent.* This requirement means that the General Plan must fully integrate its separate parts and relate them to each other without conflict. "Horizontal" consistency applies as much to figures and diagrams as to the general plan text. It also applies to data and analysis as well as policies. All adopted portions of the general plan, whether required by State law or not, have equal legal weight. None may supersede another, so the General Plan must resolve conflicts among the provisions of each element.
- *The General Plan Must Be Long-Range.* Because anticipated development will affect the City and the people who live or work there for years to come, State law requires every general plan to take a long-term perspective. The time horizon for this general plan is approximately 20 years.

1.4 REGIONAL LOCATION AND PLANNING BOUNDARIES

Emeryville is located on the east shore of the San Francisco Bay in Alameda County, bordered by the City of Berkeley to its north and the City of Oakland to the east and south. Interstate 80/580 passes through Emeryville towards Sacramento, running north from the Bay Bridge, while Interstate 580 towards Hayward passes just to its south. Figure 1-1 illustrates the city's regional location.

The city is compact, occupying only 1.2 square miles. Emeryville is largely flat and is distinguished by a peninsula created in the 1960s that extends just over a mile into the Bay.

The planning boundaries for the new General Plan coincide with the city limits, with the exception of a small area to the south of the city that is under a Joint Planning Authority between Oakland and Emeryville. The Eastshore State Park is regulated by the State. Coordination with the surrounding communities will also be required in several areas that affect Emeryville, such as greenway connections to Mandela Parkway, bicycle routes, and Ashby Avenue interchange improvements. Also, the Tom Bates Regional Sports Complex in northwest Berkeley is administered through a Joint Powers Agreement of several cities, including Emeryville.

1.5 EMERYVILLE EVOLUTION

Early Settlement

Before the colonization of the area by Spain in 1776, the Emeryville area was the site of extensive Native American settlements. Mudflats rich with clams and rocky areas with oysters, plus fishing, hunting, and acorns from the local oak trees, provided a rich and easily exploited food source for the residents. They would dispose of their clam and oyster shells in a single place, over time creating a huge mound—the Emeryville Shellmound.

After settlement by Europeans, Emeryville became a city in its own right, largely through the efforts of businessman Joseph S. Emery. Emery came to California in 1850 looking for gold, but eventually started a stonework contracting business in San Francisco. In 1859, Emery purchased a 185-acre tract of land north of Oakland and began to develop projects in the area. A community began to develop around the Emery Tract, and the town of Emeryville was officially incorporated in 1896, taking the name of its founder. The Emeryville town hall was completed in 1903, and still stands as the center for local government today. (For an expanded understanding of Emeryville's history and historical and cultural resources, see Chapter 6.)



The historic Park Avenue District.

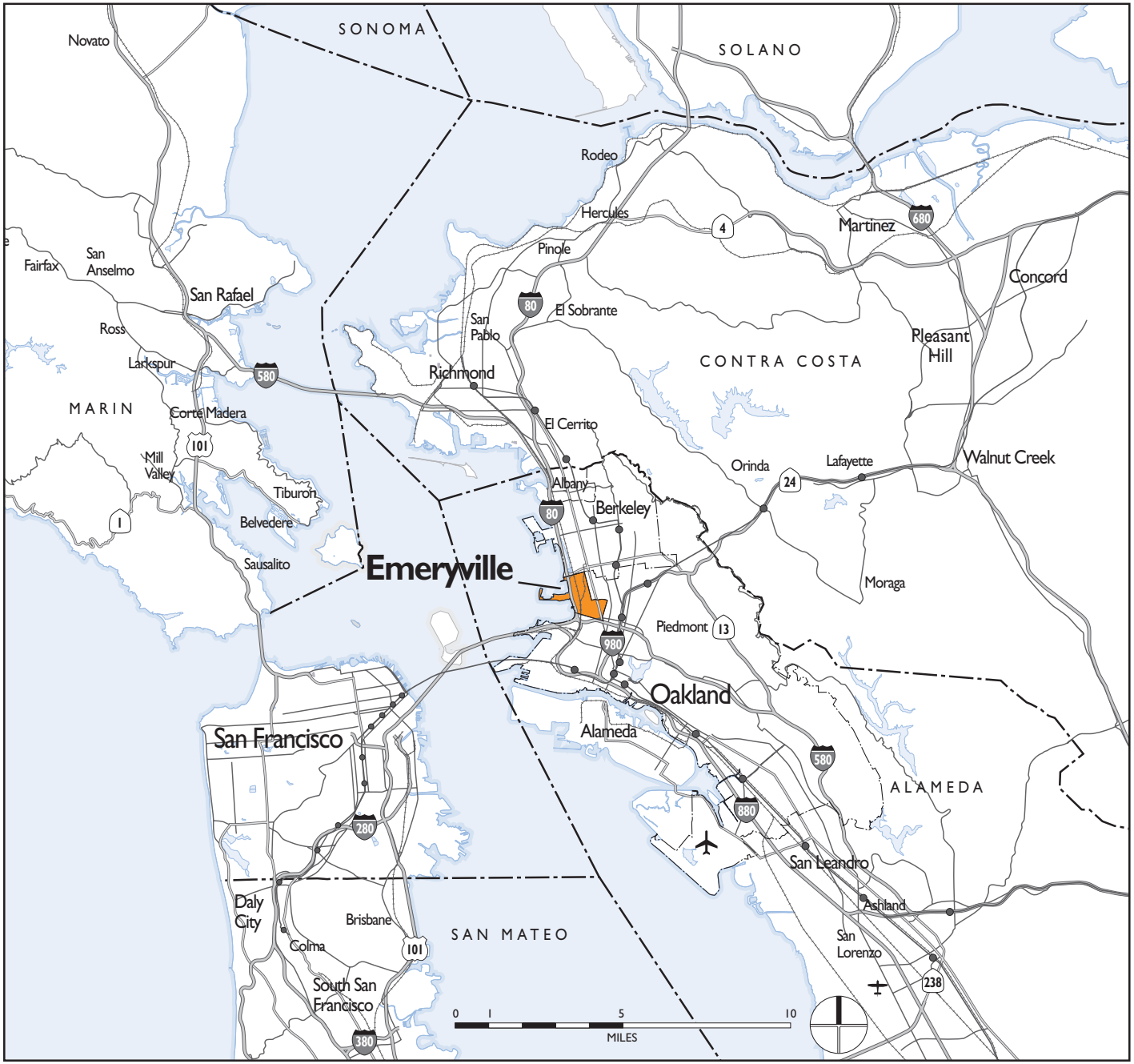


Developing on fill between the Eastshore Highway and the railroad, circa 1944.

© City of Emeryville

FIGURE 1-1

Regional Context



Industrialization

In 1871 Emery financed the construction of the San Pablo Avenue Horse Cart Railroad, which connected Oakland to Emeryville. He was also one of the primary builders of the California-Nevada Railroad, which began in Oakland, crossed the burgeoning Emery Tract, and terminated in Orinda. Emeryville soon became a city of big industrial enterprises and rail terminals. The 1870s also saw the construction of a large horse racing track on the north side of Park Avenue, which operated until 1915, and the amusement center of Shellmound Park, which stood until 1924. Successive years saw further consolidation of industry, including the paint factory of Sherwin-Williams and Shell Development, the research arm of Shell Oil Company. Residential areas remained confined to small portions at the city's eastern edge, bordering Oakland. As the city built out, bay fill was considered viable for creating new land. The Emeryville Peninsula was created in the 1960s by filling shallow water areas with demolition debris.[2]

1970s to Today: A Growing Community

In the 1970s Emeryville's landscape began to change once again as some of the city's older industries had already begun to move to the suburbs or close up shop altogether. The city's first major residential development—the 1,249-unit Watergate Apartments—was completed in 1974. In the mid 1970s Emeryville created parks and a 500-berth marina by filling in 7.8 additional acres of the San Francisco Bay to create a small boat harbor. Multi-story office buildings rose between the Eastshore Freeway and San Francisco Bay. In 1980, the 112-unit Emery Bay Village residential development was added.

With vacant warehouse and industrial space becoming available, Emeryville began to see the development of a community of artists who converted several of the buildings into live/work space. In 1984, a 583-unit housing development—the high-rise Pacific Park Plaza—was completed. Between them, Watergate, Emery Bay Village, and Pacific Park Plaza doubled the city's population to nearly 5,000 residents.

Almost all of the area to the west of the railroad tracks was developed between 1975 and 2005. Retail and office uses in large-scale redevelopment projects, such as Bay Street, IKEA, the Marketplace, and Powell Street Plaza, occupy much of this area. Development to the east of the railroad is more diverse in use, scale, and age. Here, industrial, office, and residential uses are geographically closer to one another. Two large corporate campuses—Novartis and Pixar—occupy much of the area between Park Avenue and Powell Street, along with a Pacific Gas & Electric facility. City Hall and the City's Civic Center are situated nearby, in the historic Park Avenue District, while Emery Secondary School is located East of Hollis. "Big box" retail, including the East Bay Bridge Center, fills the southern end of the city.



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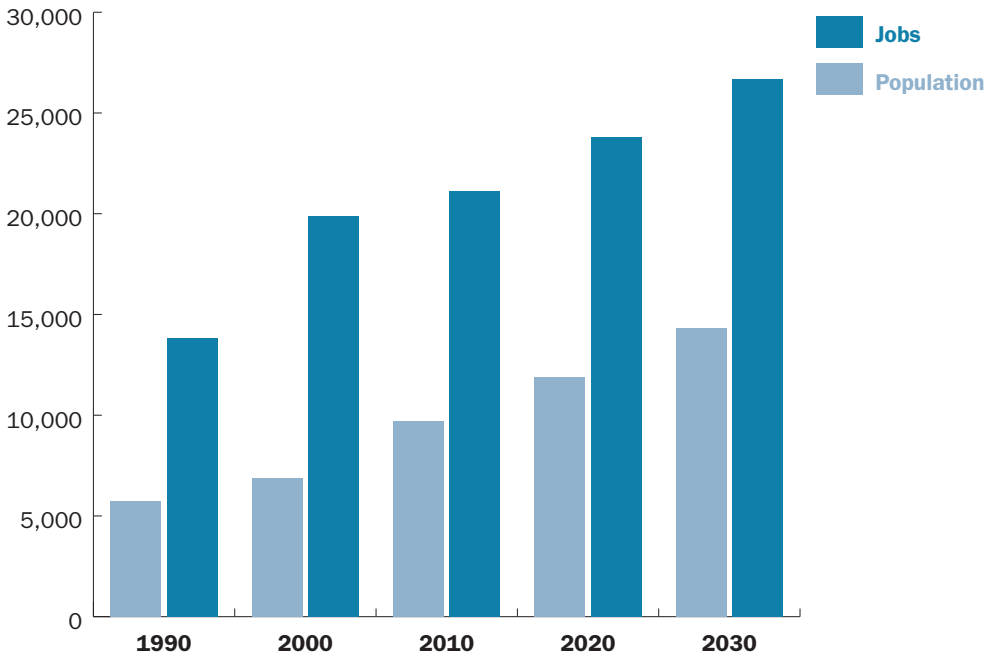
© City of Emeryville

The Key System streetcar lines contributed to the urban form we see today.

2 *Background history adapted from Images of America: Emeryville. Emeryville Historical Society. San Francisco, CA: 2005.*

CHART 1-1: Historical and Projected Population and Job Trends



Source: US Census and ABAG Projections 2007.

Population and Job Trends

As large tracts of industrial land—originally built at low intensities and supporting many fewer workers per acre of land than contemporary businesses—have continued to be redeveloped, Emeryville's transformation over the past two decades has been dramatic, with substantial increases in employment and population. In one year alone (Jan. 1, 2007 to Jan. 1, 2008), the City's population grew by 6.5 percent—the second highest growth rate in the Bay Area. Chart 1-1 illustrates population and growth since 1990, and projected to 2030, according to the Association of Bay Area Governments. These projections represent a tremendous 150 percent increase in population over the 40-year period. Although employment levels in the City are higher overall, the growth rate is projected to be relatively lower: a still-impressive 93 percent between 1990 and 2030.

1.6 GENERAL PLAN BUILDOUT AND FISCAL SUSTAINABILITY

General Plan Buildout

Full development under the General Plan is referred to as "buildout." The Plan is not intended to specify or anticipate when buildout will actually occur nor does the designation of a site for a certain use necessarily mean that the site will be redeveloped with that use during the planning period. The buildout does give an indication of potential population and employment trends and allows the City to plan for growth accordingly. Table 1-1 describes population, housing unit and job projections according to analyses undertaken for this General Plan. These results project higher levels of population and employment growth compared with the regional government's projections for 2030, described above. In this case, population is projected to grow by 71 percent over the General Plan period to 16,600 residents; housing units are projected to grow to over 9,600 units—a 64 percent increase; and employment growth expected at 46 percent to approximately 30,000 jobs. Refer to Chapter 2: Land Use for a more detailed analysis of the General Plan buildout.

Fiscal Sustainability

Maintaining the fiscal health of the City is essential to ensuring that amenities envisioned in the General Plan can be implemented and sustained. As virtually all of Emeryville falls within a Redevelopment Area, the City is able to raise revenue through tax increment financing and fund major capital improvement projects. However, the 1976 Project Area will expire in 2019, and the Shellmound Project Area will expire in 2028, both during the General Plan period. In addition to redevelopment funds, the mixed-use land use pattern proposed in the Land Use Element creates a

TABLE 1-1: General Plan Development Buildout Potential

	Existing (2008)	Buildout (2030)	Percent Change
Population	9,727	16,600	71%
Housing Units	5,988	9,800	64%
Jobs[1]	20,552	30,000	46%

[1] *Existing 2008 jobs calculated from annual growth rate assumed by ABAG for 2005-2010: 1.5%*

Source: Department of Finance 2008, ABAG Projections 2007, City of Emeryville, Dyett and Bhatia 2008.

The General Plan seeks to maintain the City's fiscal health as Emeryville continues to grow.

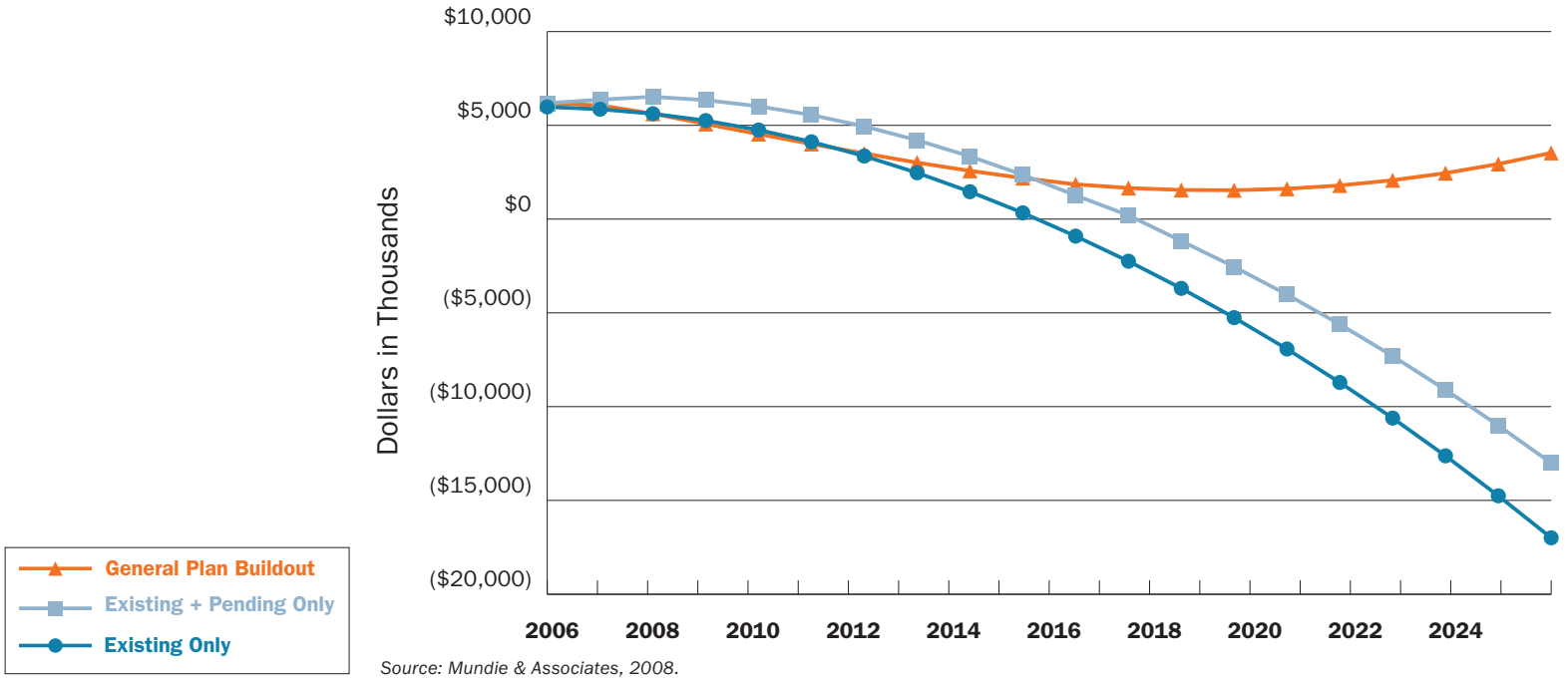


diverse revenue stream (from sales, transient-occupancy, and other taxes) that will allow for the City to fund community amenities, sustainability initiatives, and other new programming. This multi-faceted land use approach will allow the city to be flexible and resiliant as market conditions change. An analysis of projected General Fund revenues illustrates the benefit of this mix of uses.

Chart 1-2 compares the balance in the General Fund Reserves under the General Plan buildout scenario to "existing" development and "existing and pending" (which includes projects that have been approved or are under construction). The "existing" and "existing and pending" projections show a negative balance in the General Fund beginning in 2015 and 2017, respectively. On the other hand, the General Plan buildout scenario projects a continuous positive balance through the life of the Plan. This scenario represents a much better outcome for the fiscal health of the City.

While changing broader economic circumstances may result in changes to the absolute dollars shown in Chart 1-2, the relationship between these three scenarios is the most important aspect. This General Plan represents the best option regardless of economic conditions.

CHART 1-2: Balance in General Fund Reserves at Buildout



Source: Mundie & Associates, 2008.

1.7 PLAN ORGANIZATION

General Plan Structure

State law mandates that general plans include seven elements: Land Use, Circulation, Open Space, Conservation, Noise, Safety and Housing. Elements for other topics of local concern may also be included. This General Plan includes two optional elements: Urban Design and Sustainability. Table 1-2 illustrates how the nine elements are arranged.

Following Chapter 7, an Implementation Program describes the implementing actions and responsible City departments that will carry out the policies in order to achieve General Plan goals. This structure is described further in the section below.

Organization of the Elements and Policy Structure

Each chapter of this General Plan includes brief background information to establish the context for the goals and policies in the chapter. This background material is not a comprehensive statement of existing conditions nor does it contain any adopted information. (Readers interested in a comprehensive understanding of issues related to a particular topic should refer to *Emeryville General Plan Update: Opportunities and Challenges Report*; *January 2006*.) This background information is followed by goals and policies. Actions are housed in the Implementation Program.

- **Goals** are the City's statements of broad direction, philosophy, or standards to be achieved.
- **Policies** are specific statements that guide decision making. They may refer to existing programs or development standards or call for establishment of new ones.
- **Actions** are implementation measures to carry out general plan policies. Each policy has at least one implementing action. Actions and the relevant City department or agency that will be implementing the actions, are described in a matrix within the Implementation Program.

Together, the goals and policies articulate a vision for Emeryville that the General Plan seeks to achieve. They also provide protection for the city's resources by establishing planning requirements, programs, standards, and criteria for project review.

Explanatory material accompanies some policies. This explanatory material provides background information or is intended to guide Plan implementation. The use of "should" or "would" indicates that a statement is advisory, not binding; details will need

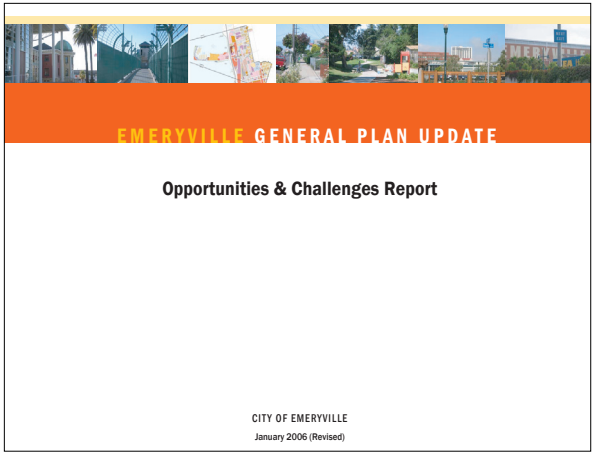
TABLE 1-2: Correspondence Between Required General Plan Elements and the Emeryville General Plan

Element	Where included in the General Plan
Land Use	Chapter 2: Land Use
Circulation	Chapter 3: Transportation
Conservation	Chapter 6: Conservation, Safety and Noise
Open Space	Chapter 6: Conservation, Safety and Noise; and Chapter 4: Parks, Open Space, and Public Facilities
Safety	Chapter 6: Conservation, Safety and Noise
Noise	Chapter 6: Conservation, Safety and Noise
Urban Design (optional)	Chapter 5: Urban Design
Sustainability (optional)	Chapter 7: Sustainability and Chapters 2-6
Housing	Separate Document

to be resolved in Plan implementation. Where the same topic is addressed in more than one chapter, sections and policies are cross-referred.

Numbering System

Goals, policies, and actions in the General Plan are organized using a two-part numbering system. The first part refers to the element and the second represents the order in which the goal, policy, or action appear, with a letter designation to distinguish goals (G), policies (P), and actions (A). For example, the first goal in the Land Use Element is numbered LU-G-1 and the first policy is LU-P-1. Thus, each goal and policy in the Plan has a discrete number for easy reference.





Interim reports based on technical analysis and community outreach efforts helped to form the General Plan.

1.8 RELATED STUDIES

As part of the General Plan preparation, several technical studies were conducted to document environmental conditions, and analyze prospects for economic development, community character and growth, and development alternatives. In addition, summaries of community outreach activities were prepared to document findings from community workshops, stakeholder interviews and a community survey. Studies and reports prepared include:

- Report on Stakeholder Interviews; June 2005.
- Report on Community Workshop #1; June 2005.
- General Plan Update Survey Report; November 2005.
- Emeryville General Plan Update: Opportunities and Challenges Report; October 2005 (updated January 2006)
- Report on Youth Workshop; May 2006.
- Alternative Plans Workbook; October 2006;
- Report on Community Workshop #2; February 2007.
- Fiscal and Financial Impacts of Future Development Scenarios; March 2007
- Draft Plan Framework; March 2008.
- Draft Environmental Impact Report; 2009
- Final Environmental Impact Report; 2009

While these background studies and environmental documents have guided Plan preparation, they do not represent adopted City policy.

1.9 THE PLANNING PROCESS

The City's planning process includes monitoring and updating the General Plan and preparing of area plans for various parts of the city. An Annual General Plan Report will provide an overview of the status of the General Plan and its implementation programs.

Amendments to the General Plan

As the City's constitution for development, the General Plan is the heart of the planning process. It is intended to be a living document and, as such, will be subject to site-specific and comprehensive amendments over time. Amendments also may be needed from time to time to conform to State or federal law passed since adoption, and to eliminate or modify policies that may become obsolete or unrealistic due to changed conditions (such as completion of a task or project, development on a site, or adoption of an ordinance or area plan).

State law limits how frequently a city can amend its general plan. Generally, no jurisdiction can amend any mandatory element of its general plan more than four times in one year, although each amendment may include more than one change to the general plan. This restriction, however, does not apply to amendments to:

- Update optional elements (such as the Urban Design and Sustainability elements);
- Allow development of affordable housing;
- Comply with a court decision; or
- Comply with an applicable airport land use plan.

Area, Neighborhood, and Redevelopment Plans

Emeryville maintains plans for some areas within the City to tailor appropriate development standards and policies to the individual character of neighborhoods. Figure 1-2 shows the general location of the city's districts. Figures 1-3 and 1-4 show the planning areas for existing area and neighborhood plans, and redevelopment plans, respectively. Although these plans do not necessarily address all of the topics required by State law for general or specific plans, they must be consistent with the General Plan.

Area and Neighborhood Plans

North Hollis Area Urban Design Program

The North Hollis Area Urban Design Program was implemented through the North Hollis Overlay Zone. The plan covers the northeast corner of the city. This plan calls for infill residential uses that complement the existing neighborhood and stimulate use of the Greenway; the discouragement of through-traffic; a balance of automobile access with other transportation modes; sufficient public parking; and private development that enhances the character and pedestrian improvements of the area.

San Pablo Avenue Urban Design Plan

The San Pablo Avenue Urban Design Plan outlines a phased strategy for the development of San Pablo Avenue into an active, attractive, neighborhood retail center. The document targets land uses for three phases of catalyst projects, establishes goals for public circulation and streetscape improvements, and design guidelines for new development along and near the avenue. Much of the plan, which was written around 1990, has already been implemented.





Area plans will continue to guide development in their respective areas, such as North Hollis and the Park Avenue District.

FIGURE 1-2
City Districts

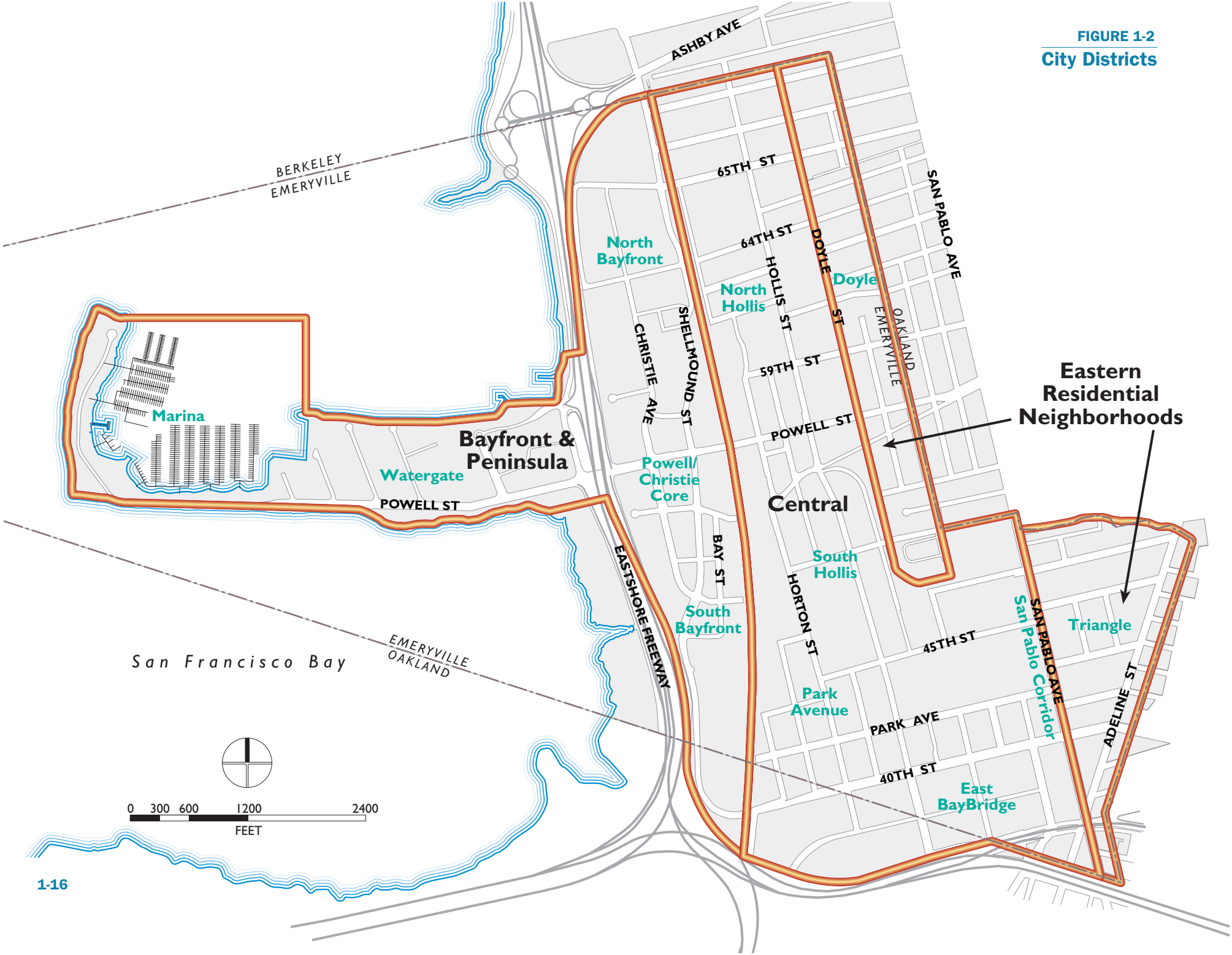
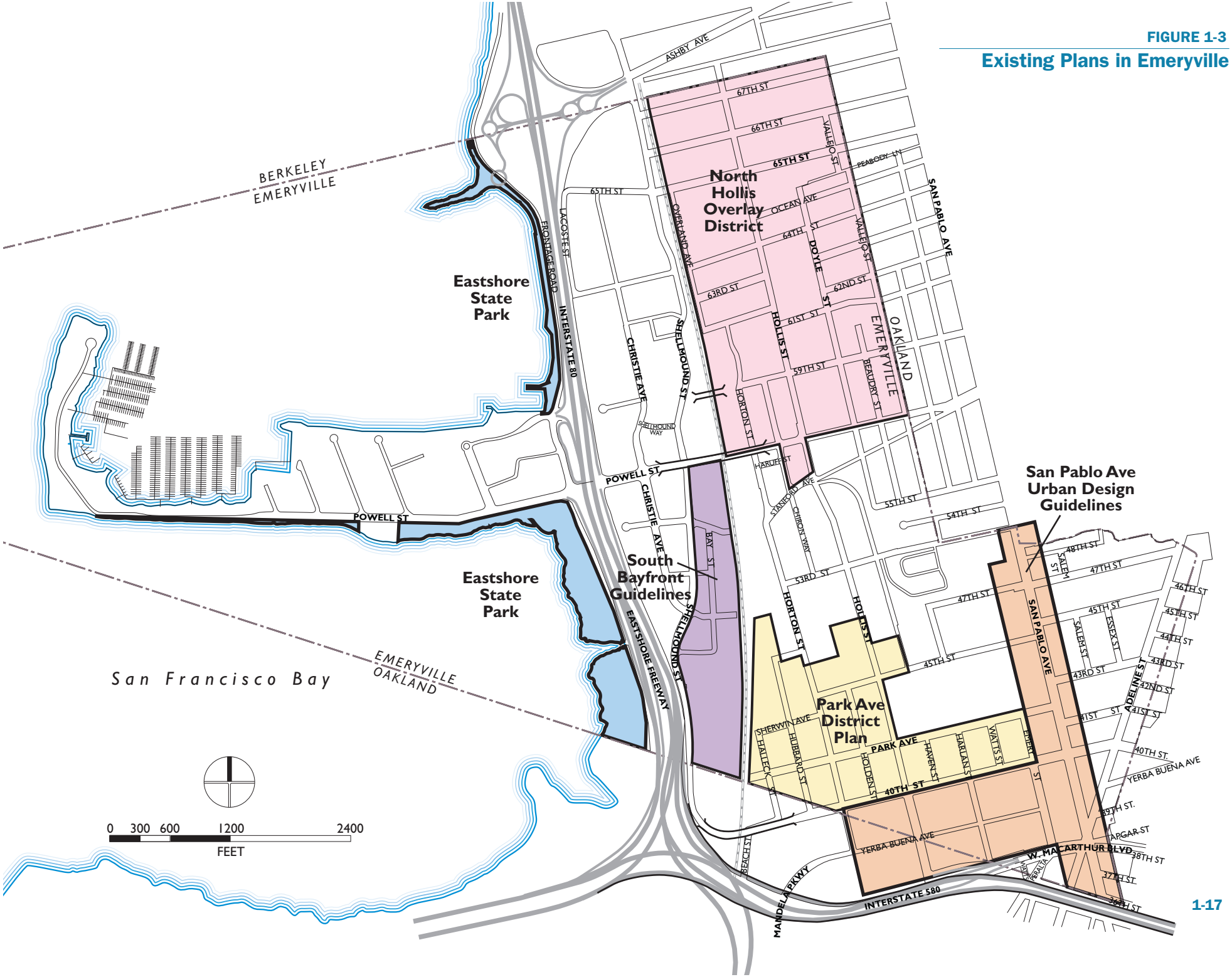


FIGURE 1-3

Existing Plans in Emeryville







Redevelopment funding has played a key role in Emeryville's retail and business development.

South Bayfront Design Guidelines

The South Bayfront Design Guidelines cover the South Bayfront district and the area south of Powell Street between the railroad and I-80. The plan lays out eight high-level site design principles for the development of the district and presents three development concepts which follow these guidelines. Each concept includes a set of possible land uses, building configurations, and circulation patterns. Much of the South Bayfront has already been developed according to these guidelines, which were established in 1997.

Park Avenue District Plan

The Park Avenue District Plan establishes incentives and development guidelines toward the creation of a vibrant, mixed-use neighborhood. It seeks to preserve the area's small parcels and historic buildings and encourage private development of live/work housing, small-scale businesses, pedestrian and bicycle accessibility, and 24-hour community uses. These uses will be supplemented with public investments, which may include an arts center, public parking facilities, community open space, and improved sidewalks.

Redevelopment Plans

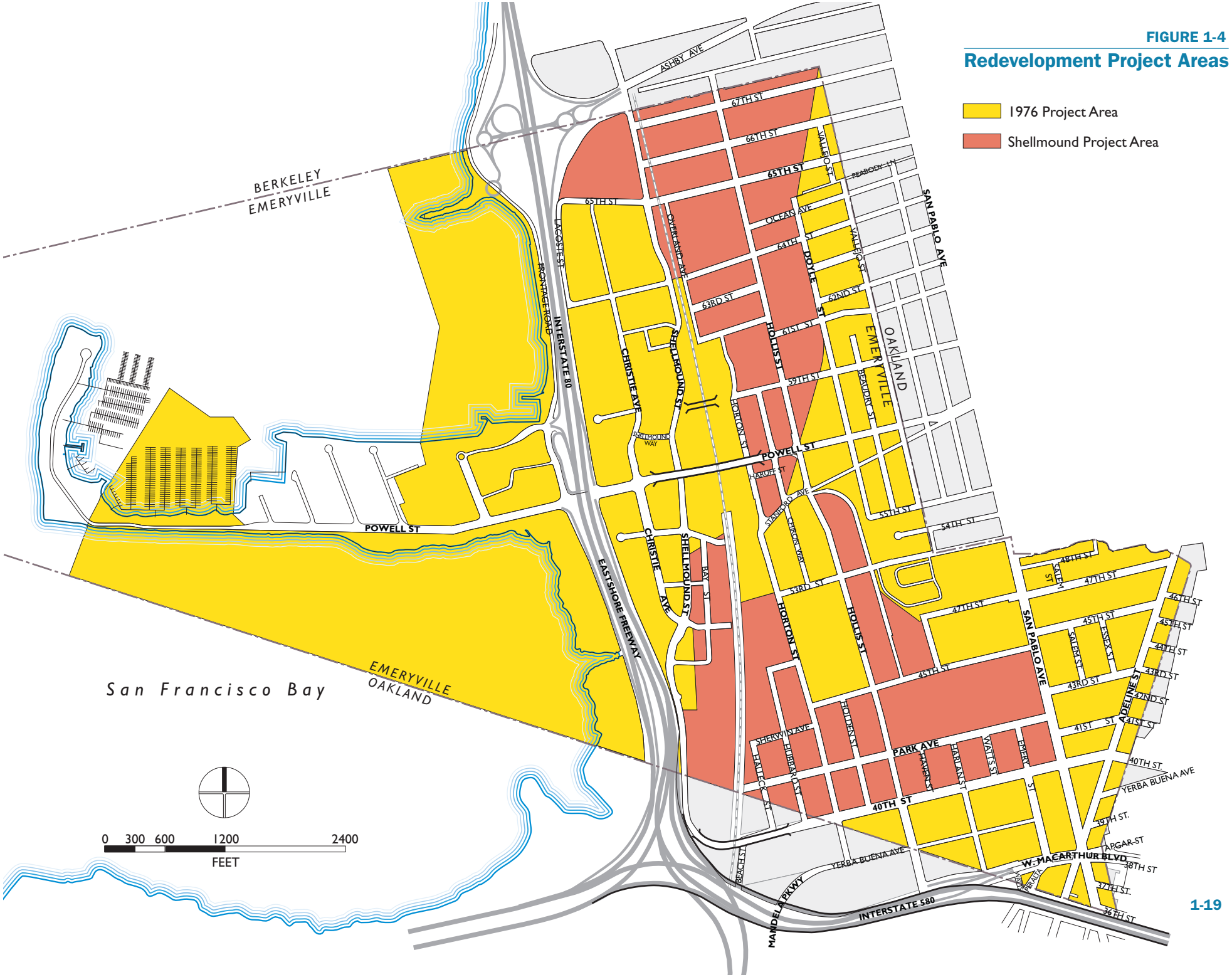
The objectives of the Redevelopment Agency are to eliminate blight, provide for economic revitalization, preserve and improve existing residential areas, establish a more beneficial mix of land uses, and restore the public infrastructure. California redevelopment law provides tax increment financing as a source of revenue to redevelopment agencies to fund redevelopment activities. Over the past 30 years, the City's Redevelopment Agency has been responsible in large part for the City's tremendous growth in the retail and office sectors, and revenue generation that has allowed for citywide capital improvements. The City contains two redevelopment project areas, covering nearly the entire city, as shown in Figure 1-4. The older of the two, the 503-acre 1976 Project Area, will be operational until 2019, the 270-acre Shellmound Project Area until 2028. These projects areas will play an integral part in the implementing the General Plan land use policies and developing the capital improvement projects—such as streetscapes, green streets, and community public facilities—described in this Plan.

Annual General Plan Report

The California Government Code requires that an annual report be submitted to the City Council on the status of the General Plan and progress in its implementation. This report also is to be submitted to the Governor's Office of Planning and Research and the Department of Housing and Community Development. It must include an analysis of the progress in meeting the City's share of regional housing needs and local efforts to remove governmental constraints to maintenance, improvement, and development of affordable housing. In addition, mitigation monitoring and reporting requirements prescribed by the California Environmental Quality Act (CEQA) should be addressed in the Annual Report because they are closely tied to Plan implementation. Finally, the Annual Report should include a summary of all General Plan amendments adopted during the preceding year and upcoming projects and General Plan issues to be addressed in the coming year.

FIGURE 1-4

Redevelopment Project Areas



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2 LAND USE

How land is used underlies the experience of living, working, or visiting any urban area, making Land Use a pivotal element of any General Plan. This chapter of the General Plan provides the basis for land use decision-making; establishes the land use classification system, intensity and height standards; and outlines citywide and area-specific land use policies. An assessment of the City's revenue generation, by land use type, is also included to better understand the influence that land use has on the City's fiscal health. For more specific policies on the design of buildings and public spaces, please see Chapter 5: Urban Design.







Office (top), retail (middle) and industrial (bottom) uses account for half of the city's developable land area, while also

While Emeryville has roots as an industrial and employment center, the Plan promotes the city's evolution into a dynamic and livable mixed-use community. The Plan outlines greater integration of uses in different parts of the city and balance between employment and residential uses, with more areas designated for mixed-use development rather than single use. The Plan enhances livability and quality of life for the increasing residential population with strategically located new parks and open spaces, neighborhood and mixed-use centers, and a variety of amenities to support urban lifestyles in a walkable environment.

Because Emeryville is a built out city, new development will result from reuse of existing underutilized sites. This development pattern will result in more efficient use of land in the Bay Area's inner core, supporting more regionally sustainable land use patterns. At 25,000 jobs per square mile, Emeryville will have a relatively high employment density, but not as high as downtown San Francisco (472,000 jobs per square mile), Oakland (118,000) or Berkeley (43,000). Building intensities will be modulated to support urban design and livability goals highlighted in Chapter 5.

Achieving Emeryville's future land use vision requires continuing redevelopment with an array of uses; enhancing livability through development of neighborhood centers and parks spaced for walking access; promoting greater balance between residential and employment while furthering Emeryville's role as a premier regional commercial center; increasing local amenities; expanding arts and culture facilities; improving connections; creating more "people places", and ensuring variation in use and mix, development intensity, and height to create a tapestry of distinctive places and experiences.

2.1 CONSTANCY AND CHANGE

Emeryville's land use transformation over the past 20 years has been extensive. Formerly dominated by manufacturing and distribution, the city is now marked by ever increasing development of office, regional retail, and high-density residential land uses, as well as mixed-use developments. Almost entirely built out, with little to no vacant land, Emeryville's growth has been through redeveloping its existing land uses and rehabilitating older buildings.

Current Land Use Pattern

Around half of the developable land in the City—that is, excluding roads, highways, and other rights-of-way—is in Commercial (36%) or Industrial (14%) use, and just under a quarter (21%) is used for housing. (However, it should be noted that much of this commercial land area is devoted to surface parking lots.) The remainder of the city is in Public use (7%), Parks and Open Space (7%), or a mix of uses (7%). Only around 20 acres, or four percent of the land, is vacant. Specific acreages for each land use are shown in Table 2-1 and summarized in Chart 2-1.[1]

Almost all of the Bayfront and freeway edge area west of the railroad tracks has been redeveloped in the past 30 years. Much of this space is devoted to retail and office uses in large-scale developments, such as Bay Street, IKEA, the Marketplace, and Powell Street Plaza, which serve a regional clientele. Almost no industrial uses remain in this area. Residential developments in this area—Watergate Condominiums, Pacific Park Plaza, Bay Street, and Archstone/Bridge-

1 *The city's total land area is 1.2 square miles, or about 768 acres. About 20% of this, or 152.9 acres, is roads, highways, and other rights-of-way, leaving about 615.1 acres of developable land.*







The number of residential developments (far left) has increased in recent years, inspiring a greater need for public facilities and parks (middle and right).

water (formerly EmeryBay Club & Apartments)—are few in number, but large in size and high in density. In total, they comprise about 2,750 housing units—half of the housing in the city.

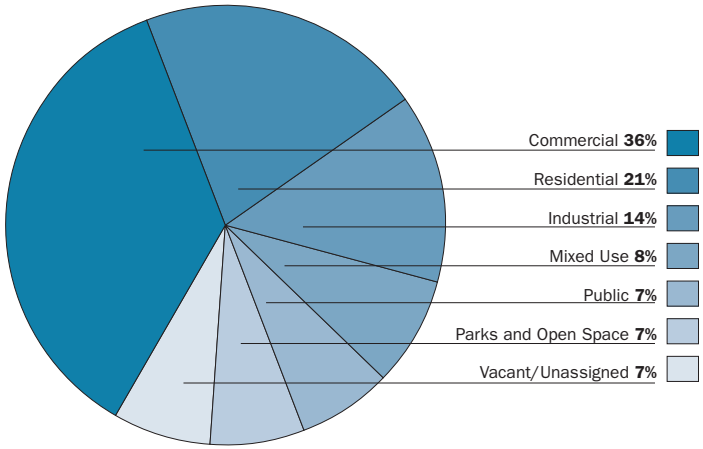
Development to the east of the railroad is more diverse in use, scale, and age. In the Central Emeryville area between the railroad tracks, Doyle Street (north of 53rd Street), and San Pablo Avenue (south of 53rd Street), industrial, office, and residential uses are geographically close to one another. Block, parcel and building sizes generally diminish toward the east, where pre-war structures are supplemented with new residential and commercial construction. The area north of Powell Street contains a wide variety of uses, including offices, old homes and new residential complexes, and industry. Corporate campuses and "big box" retail occupy much of the area south of Powell Street. Emeryville's public schools and much of its locally-oriented retail businesses lie along or near San Pablo Avenue, a major boulevard and state route which connects Emeryville with Oakland, Berkeley, and other East Bay cities. In the eastern residential neighborhoods, east of Doyle Street and San Pablo Avenue, the Triangle and Doyle Street neighborhoods are composed of lower density homes.

TABLE 2-1: Existing Land Use Distribution (2005)

	Acres
Commercial	222.0
Residential	126.2
Industrial	87.5
Mixed Use	48.0
Public	45.7
Parks and Open Space	44.7
Vacant/Unassigned	40.8
Total	**615.1**

Source: Metroscan, City of Emeryville, 2005.

CHART 2-1: Existing Land Use Distribution (2005)



Areas of Stability and Change

To develop a strategy for land use planning, the city has been divided into areas of stability, areas of potential change, and master planned areas. These are illustrated in Figure 2-1.

Areas of stability are those parts of the city that are not anticipated to change significantly in character, land use or development intensity over the next 20 years. These include the older residential neighborhoods on the east side of town as well as the Watergate residential neighborhood on the peninsula, the Watergate office complex, Pacific Park Plaza, and more recent developments such as residential projects in the North Hollis and North Bayfront areas, the Emery Station complex and the Woodfin and Marriott hotels.

Master planned areas are areas that are likely to change over the next 20 years, but that have already been approved by the City Council either through the entitlement of Planned Unit Developments (PUD), or the adoption of an area plan that includes a vision for the future character of the area. These master planned areas include the Novartis, Pixar, the Marketplace and Bay Street PUDs, and the Park Avenue District Plan area.

Several other areas of Emeryville, because of the current land use and intensity of development, have a heightened potential for redevelopment over the next 20 years. These are areas of potential change. These include the small amount of vacant land (less than 20 acres), formerly industrial sites such as Sherwin Williams, as well as low-intensity shopping centers where there are opportunities for intensification, such as Powell Street Plaza and the East Bay Bridge Center. The community and the General Plan Update Steering Committee spent considerable time deliberating land use, intensity, and building height choices for these sites. These choices are reflected in the maps in this chapter. These maps are complemented by specific policies for each change area included at the end of the chapter.

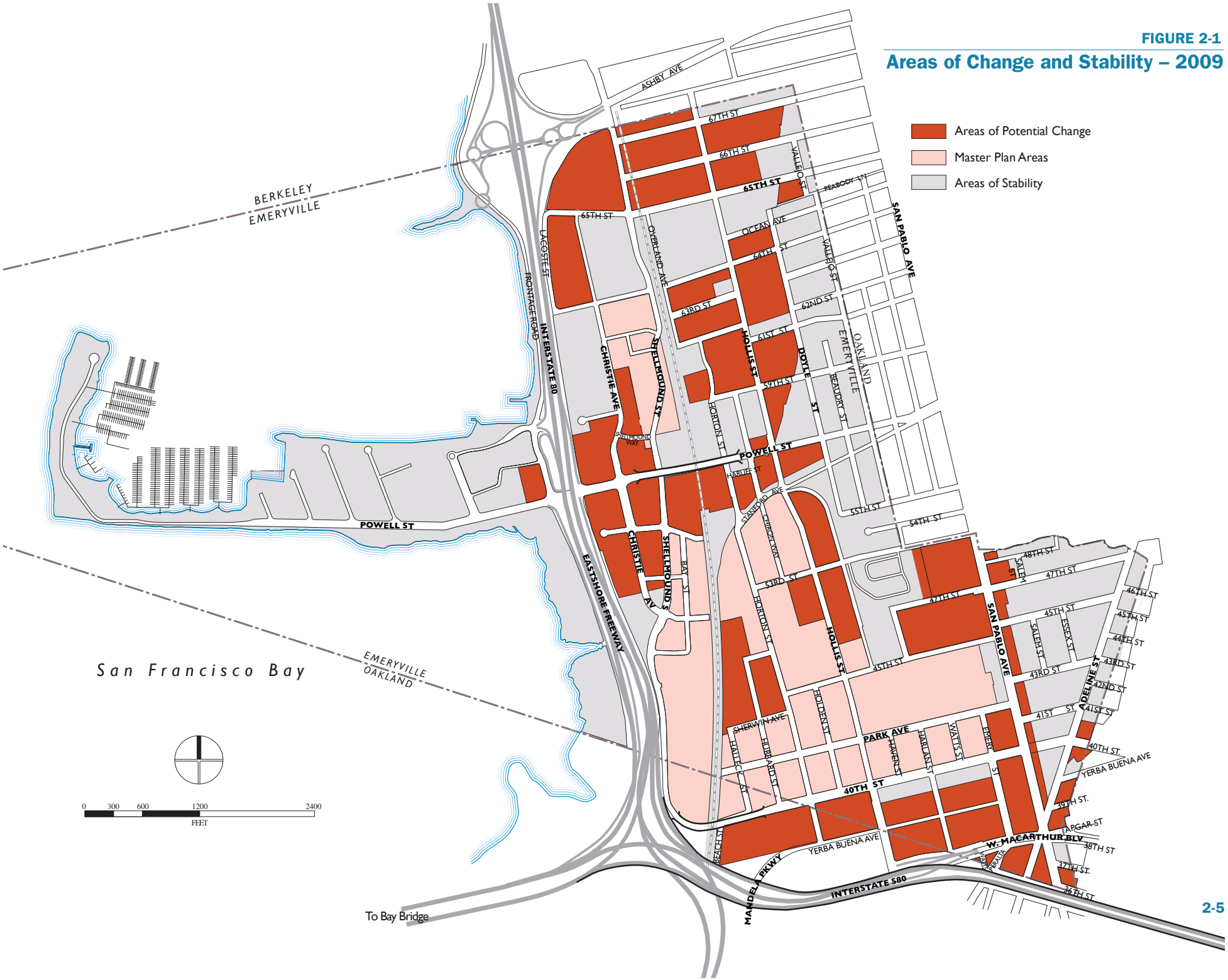




Several areas of the city have opportunities for reuse and redevelopment over the life of the General Plan, including Powell Street Plaza, the East Bay Bridge Center (bottom),

FIGURE 2-1

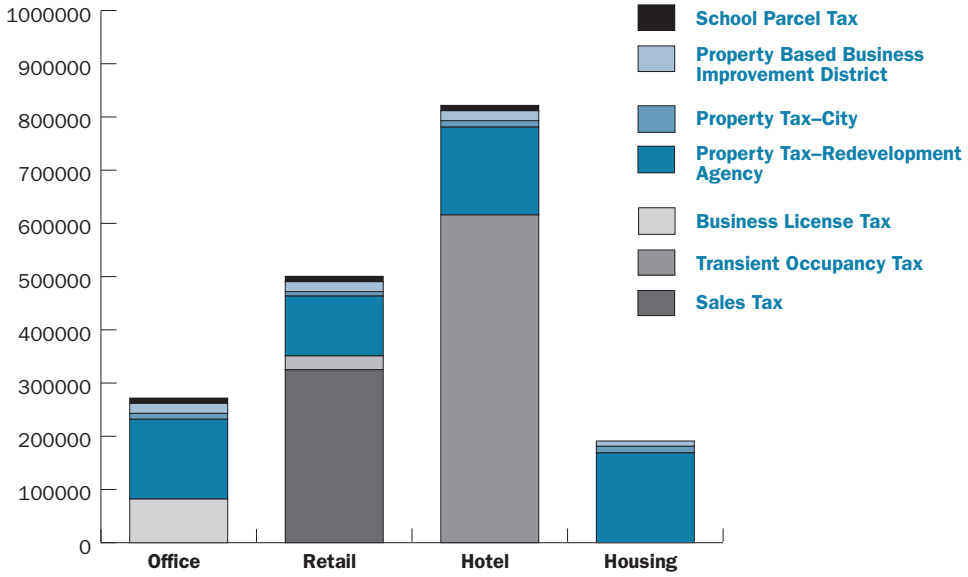
Areas of Change and Stability – 2009



2.2 ECONOMIC DEVELOPMENT

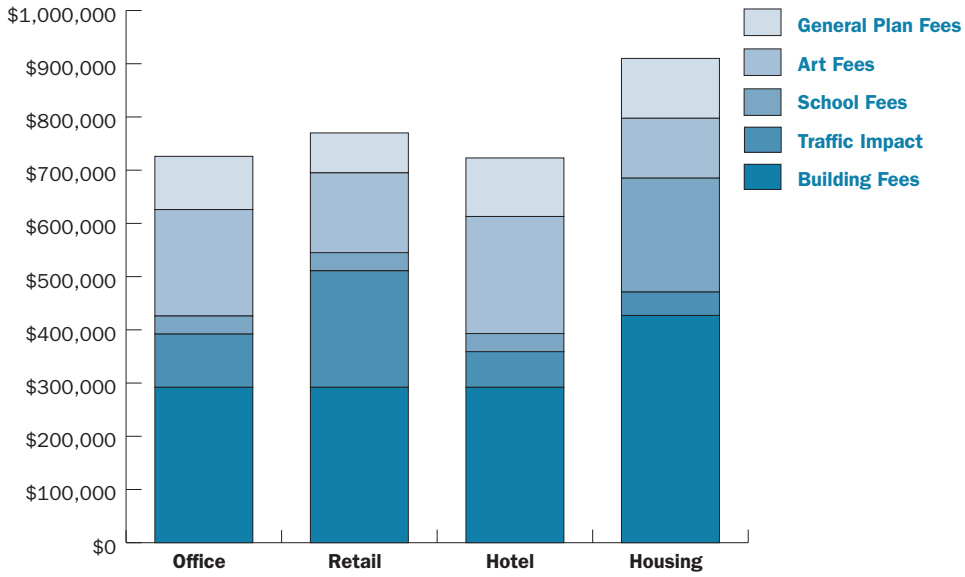
Different land uses have different impacts on the City's revenue generation and cost allocations. Emeryville finances its operations—both ongoing costs of delivering public services and investments in new capital facilities—by collecting revenue from residents and businesses. Charts 2-2 and 2-3 summarize the City's estimates of ongoing and one-time revenues associated with the different types of land uses in the city on a per hundred-thousand square-foot basis. While housing contributes the greatest amount of one-time revenues in total (housing contributes more than non-residential uses in the form of school impact fees, which go to the Emery Unified School District), hotel and retail uses make the greatest impact in terms of annual revenues. One-time fee revenues are used for capital improvements and facilities that are needed to respond to the impacts of new development (residents and businesses) and provide quality of life improvements. These include street modifications, traffic signals, new parks, and public art. On the other hand, annual revenues contribute to the City's General Fund.

CHART 2-2: Annual Revenues from Different Uses (Per 100,000 square feet of building space)



Source: Mundie & Associates, 2008.

CHART 2-3: One-time Revenues from Different Uses (Per 100,000 square feet of building space)



General Fund

The City's General Fund is its primary collection bucket for ongoing and recurring revenues that are not earmarked by law for specific purposes and its primary source of funds to cover ongoing and recurring costs of operations and maintenance. For the 2006-2007 City Budget, the greatest General Fund allocation was for Police and Fire services. Labor costs (wages and benefits) tend to account for the largest share of expenditures. The purpose of General Fund spending is to improve quality of life in the city. This mission is captured in the City's budget philosophy: to provide "innovative and responsive services to the community to create and sustain a vibrant, livable city."

Redevelopment

To maximize its ability to make the capital improvements that it requires to improve the physical condition of the city, Emeryville has a Redevelopment Agency with two redevelopment project areas (see Figure 1-5). The Redevelopment Agency gains its revenue from increases in property taxes within these areas. Within the redevelopment project areas, the Redevelopment Agency has the power to make capital improvements in the "public realm;" that is, within public rights-of-way and to create some other types of incentives to attract private development.

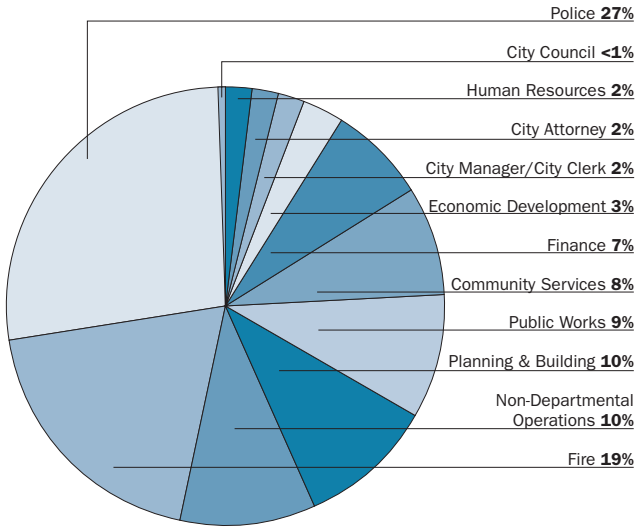
Balance

While any new development within the redevelopment areas that enhances property values will lead to greater revenues that can be spent on public improvements, development also creates a need for services that must be provided by the General Fund. In particular, residential development has the highest need for services on a per square foot basis. Thus, Emeryville needs to ensure a balance of uses that provide revenue for continued enhancement of the community, while ensuring high quality of services to the community. In order to do so, the City will need to continue pursuing development that generates ongoing revenues, in particular hotel and retail uses. This balance is reflected in the development potential outlined in the next section.



Hotels contribute the largest revenues annually due to the transit occupancy tax (TOT). Retail, office, and residential uses also gen-

CHART 2-4: ACTUAL GENERAL FUND EXPENDITURES (2006-2007)



2.3 DEVELOPMENT POTENTIAL

Applying development policies consistent with this General Plan—using assumed average intensities for the different land use classifications to vacant land and sites with redevelopment/intensification opportunities—results in the following development potential, as described in Table 2-2. The time at which this development potential is achieved is not specified in or anticipated by the Plan; however, the transportation and other public infrastructure improvements assume that this development will occur by 2030. Designation of a site for a certain use does not necessarily mean that the site will be built or redeveloped with the designated use.

Table 2-2 shows:

A. Approved Development. This includes the various projects that have been approved or are under construction as of November 2007. This development includes 907 housing units and 1.3 million square feet of non-residential space.

B. Gross New Development. This value results from application of average assumed intensities to change areas. Approximately 2,930 housing units and 3.0 million square feet of non-residential space will be added.

C. Loss of Existing Due to Redevelopment. This value reflects existing underutilized properties that may be replaced by new uses. This is an accounting measure that estimates the proportion of existing development that may be redeveloped on each site in an area of change.

D. Net New Development. This reflects the total of the three above categories, and represents the expected development during the life of the General Plan.

E. Existing Development. This reflects existing development, as of November 2007.

F. City at 2030. Totaling net new development and existing development results in the General Plan development potential at 2030. This will result in an increase of approximately 3,800 housing units, a 70 percent increase in the existing population of 9,727 to 16,500, and 2.5 million square feet of total non-residential space, an increase of 21% over 2007 levels.





The General Plan projects the greatest potential for new development in residential (top) and office (bottom) uses. Retail development is also expected to increase somewhat, while industrial uses are expected to decline.

TABLE 2-2: General Plan Development Potential at 2030, by Land Use

	Residential (units)	Retail (SF)	Hotel (SF)	Office[1] (SF)	Industrial (SF)
A. Approved Development	907	34,461		1,313,000	
B. Gross New Development	2,930	1,075,400	324,600	1,569,700	76,200
C. Loss of Existing Due to	0	-469,000	-14,000	-510,000	-855,000
D. Net New Development (A+B+C)	3,837	640,861	310,600	2,372,700	-778,800
E. Existing Development	5,988	2,441,660	464,500	4,852,118	4,132,675
F. City at 2030 (D+E)[2]	9,800	3,083,000	775,000	7,225,000	3,354,000

[1] *Office includes R&D development.*

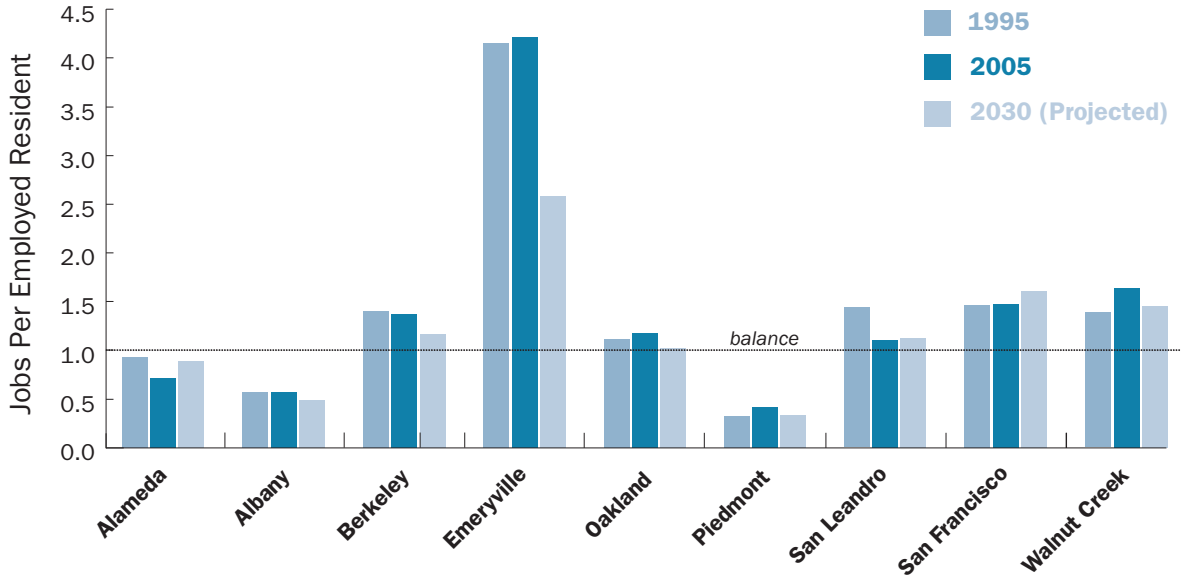
Source: City of Emeryville, Dyett & Bhatia, 2008.

Jobs: Housing Balance

The ratio of jobs to employed residents shows whether a jurisdiction has a deficit or surplus of jobs relative to population. Evaluation of data from the U.S. Census and Association of Bay Area Governments (ABAG), as illustrated in Chart 2-5, shows that Emeryville had 4.2 jobs for every employed resident in 2005; this is the highest ratio of jobs to employed residents of any city in the Bay Area with the exception of Colma, which has a population of 1,500. Emeryville's jobs/employed residents' ratio has remained constant over the past decade, balancing the spike in jobs between 1995 and 2000 with the residential spike between 2000 and 2005.

While the General Plan anticipates employment dominance to continue, Emeryville's jobs/employed residents' ratio is expected to be in greater balance by 2030. With nearly 10,000 jobs expected to be added over the life of the Plan, the City can expect a jobs/employed residents ratio of approximately 2.6. Although this still represents a much higher ratio compared with nearby cities, it does reflect a substantial improvement toward a more balanced city.

CHART 2-5: JOBS: EMPLOYED RESIDENTS' RATIO, COMPARISON OF SELECTED BAY AREA CITIES



Source: Association of Bay Area Governments, 2007 and Dyett & Bhatia (Emeryville 2030 Projected).

2.4 LAND USE FRAMEWORK

The land use framework is comprised of three components that work together to define activities and capacities:

- **Land Use Diagram and Classifications.** These specify land uses and mixes that are allowed in the different areas of the city. Building intensities are regulated independently of land use; however, residential uses are subject to both density standards as specified in the classifications, as well as intensity standards.
- **Building Density/Intensity.** For non-residential uses, this is expressed as Floor Area Ratio (FAR), and regulates the overall maximum building area that can be built on any site. (For explanation of how FAR is calculated, see Density/Intensity on page 2-13). For residential uses density is expressed as dwelling units per acre.
- **Building Height.** This controls maximum building height for development on any site.

These components are regulated through separate maps, allowing control of land use and urban form to reflect the unique need of each site and character of the city. Balancing building heights, FARs, and land uses will help to preserve public views, allow natural light, minimize impacts of wind and shadows, and create vibrant streetscapes and identifiable skylines.

The interrelationship of land use, building density/intensity, and building heights, shape the fundamental framework of the



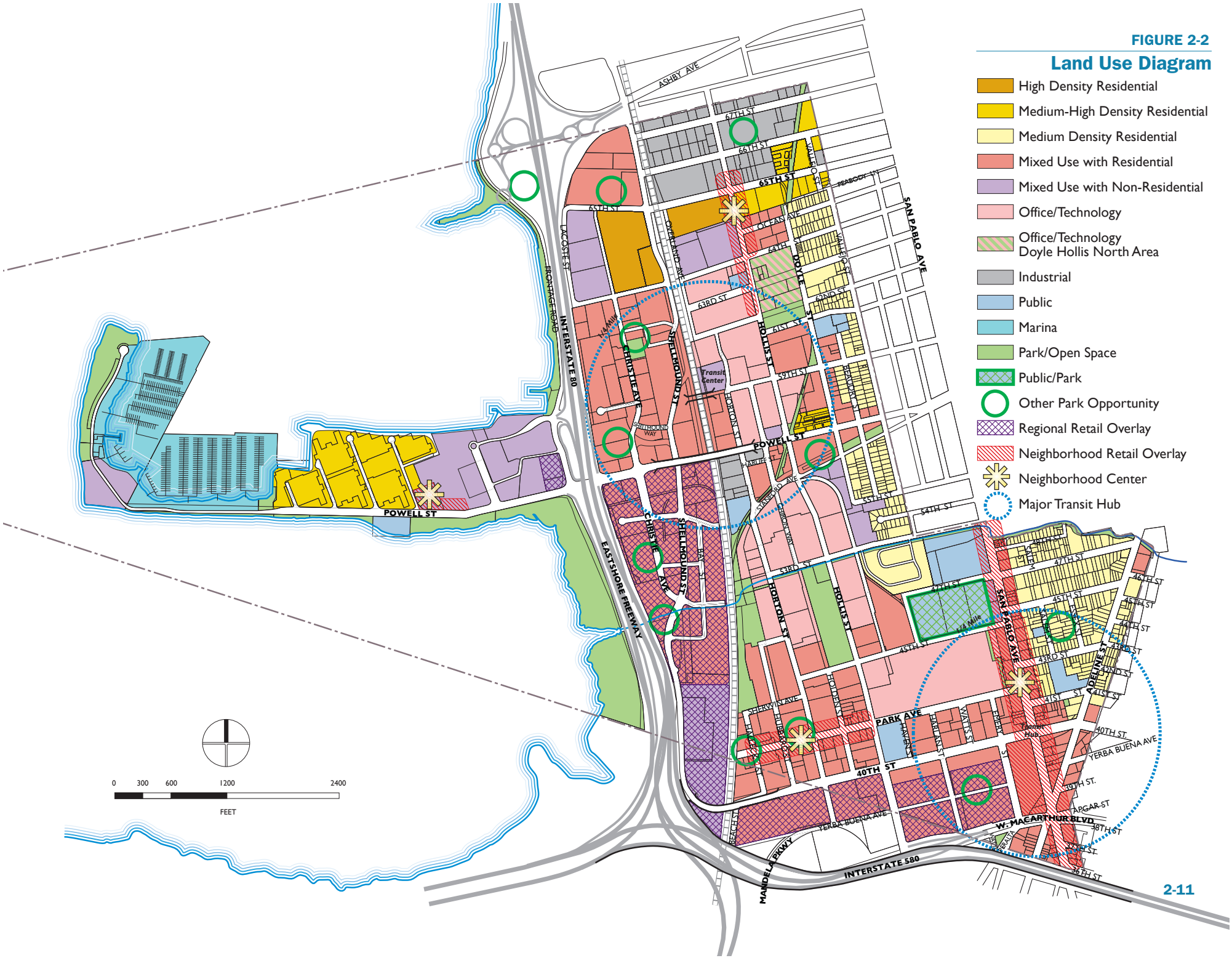
Land Use Diagram

The Land Use Diagram (Figure 2-2) designates the proposed location, distribution, and extent of activities that may take place throughout the city. Land use classifications—shown as color/graphic patterns on the diagram—allow for a range of activities within each classification. The large blue circles represent 1/4-mile radii from major transit hubs (i.e. places that can be reached within a ten minute walk).

The diagram is a graphic representation of policies contained in the General Plan; it is to be used and interpreted in conjunction with the text and other figures contained in the General Plan.

FIGURE 2-2

Land Use Diagram



Land Use Classification

Land use classifications are presented below. The Zoning Ordinance provides greater detail on specific uses permitted within each classification. In addition to the direction related to the uses provided here, public uses—including government offices, police and fire stations, and public schools—are permitted in all land use classifications, except Park/Open Space. Live/work uses are permitted in all land use designations except Office/Technology, Public, Parks/Open Space, and Marina.

High Density Residential

Mid- or high-rise residential development, generally at sites with FARs greater than 2.5. Small-scale businesses, offices, retail, services, and other commercial uses are permitted on the ground floor.

The city is expected to become increasingly mixed-use—vertically and horizontally—over the life of the General Plan.



Medium High Density Residential

Residential development generally at maximum FARs ranging from 0.8 to 1.9. Incidental retail uses that serve the neighborhood are also permitted.

Medium Density Residential

Residential development at FARs less than 0.8. Single family detached and attached housing. Multifamily housing types may be a conditional use, as specified in the Zoning Ordinance. Incidental retail uses that serve the neighborhood are also permitted.

Mixed Use with Residential

One or more of a variety of residential and nonresidential uses, including but not limited to offices, retail and hotels. On larger sites, a mix of residential and non-residential uses is required; on smaller sites, a single use may be permitted.

Mixed Use with Non-Residential

One or more of a variety of nonresidential uses, including but not limited to offices, retail and hotels. On larger sites, more than one use is required; on smaller sites, a single use may be permitted.

Office/Technology

Administrative, financial, business, professional, medical and public offices, research and development, biotechnology, and media production facilities. Warehousing and distribution facilities and retail are permitted as ancillary uses only, subject to limitations established in the Zoning Ordinance.

Industrial

A range of industrial and high technology uses, including light manufacturing, repair, testing, printing, service commercial, and biotechnology uses. Three industrial areas are designated in the Land Use Diagram: (1) west of Hollis Street and north of 65th Street ("west of Hollis"), (2) east of

Hollis Street and north of 65th Street ("east of Hollis"), and (3) along Horton Street between Powell Street and Stanford Avenue ("Horton Street"). "Light" live/work is appropriate in the east of Hollis and Horton Street industrial areas. "Heavy" live/work uses (e.g. work involving manufacturing, welding, and assembly) will only be allowed in the west of Hollis area. General manufacturing uses are only permitted in the west of Hollis area. In the east of Hollis area and the Horton Street area, new light industrial uses are permitted, but new general manufacturing uses are not. Existing general manufacturing uses can continue as conforming uses, and may be expanded with a conditional use permit subject to performance standards for noise, air quality, and truck traffic, to safeguard adjacent residential uses. Unrelated retail and commercial uses that could be more appropriately located elsewhere in the city are not permitted, except for offices, subject to appropriate standards, and in Neighborhood Retail Overlay areas (i.e., North Hollis).

Public

A variety of public and quasi-public uses, including government offices; fire and police facilities; schools; community services; transit stations and ancillary facilities.

Parks/Open Space

Parks, recreation facilities, and greenways for the general community, and open space for habitat conservation (e.g. Emeryville Crescent State Marine Reserve).

Marina

Marinas, limited retail, and recreation facilities and restaurants with a waterfront orientation.

Regional Retail Overlay

This overlay is intended to reflect sites that are appropriate for retail uses that serve as a regional draw. Stores can be small in size (such as at Bay Street) or large (such as IKEA). For sites with this overlay, 100 percent of the building area can be retail, while the uses in the underlying classification are also permitted.

Neighborhood Retail Overlay

This designation is intended for four neighborhood centers. It is intended for stores, offices, services, and restaurants/cafés that serve the local community, as well as "flex space" that can be adapted for retail/restaurant use in the future, but may be used for other uses in the interim. A majority of the ground floor use, and a substantial portion of the frontage along any public street, shall be devoted to these uses. Establishments shall generally be smaller sized, lending themselves to the pedestrian-oriented nature of the centers; however larger establishments (such as supermarkets), that serve the local community and are designed appropriately with a pedestrian orientation are also permitted. Retail and eating and drinking establishments can comprise up to 100 percent of the building area.

Density/Intensity

The General Plan establishes intensity standards for various parts of Emeryville. Intensity is measured as floor area ratio (FAR), obtained by dividing the gross floor area of a building by the lot area. (See text box and illustration for a detailed definition of FAR.) In general, all floor area above grade is included, including residential uses, but excluding parking. The implementing zoning regulations define in detail how gross floor area is measured.

Figure 2-3 shows maximum FAR permitted in each area. Where FAR boundaries cut across parcel lines, total FAR should be based on the average of FARs from each portion. FAR maximums may be distributed in any manner across these parcels, but height limits must be adhered to.

FLOOR AREA RATIO (FAR)

FAR expresses the ratio of building square footage to land square footage. For example, an FAR of 2.0 means that for every square foot of land, a developer may build two square feet of building. However, this example does not necessitate a two-story building that covers the entire lot. This FAR illustration describes different ways that a building can be constructed while meeting the FAR requirement. Within each set of examples, the building square footages and FAR values are equal, but the building massing and lot coverage changes. (Note that this illustration does not account for additional setback and lot coverage requirements, described in the Zoning Ordinance.)

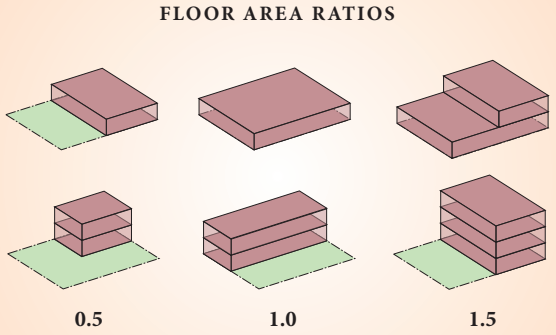
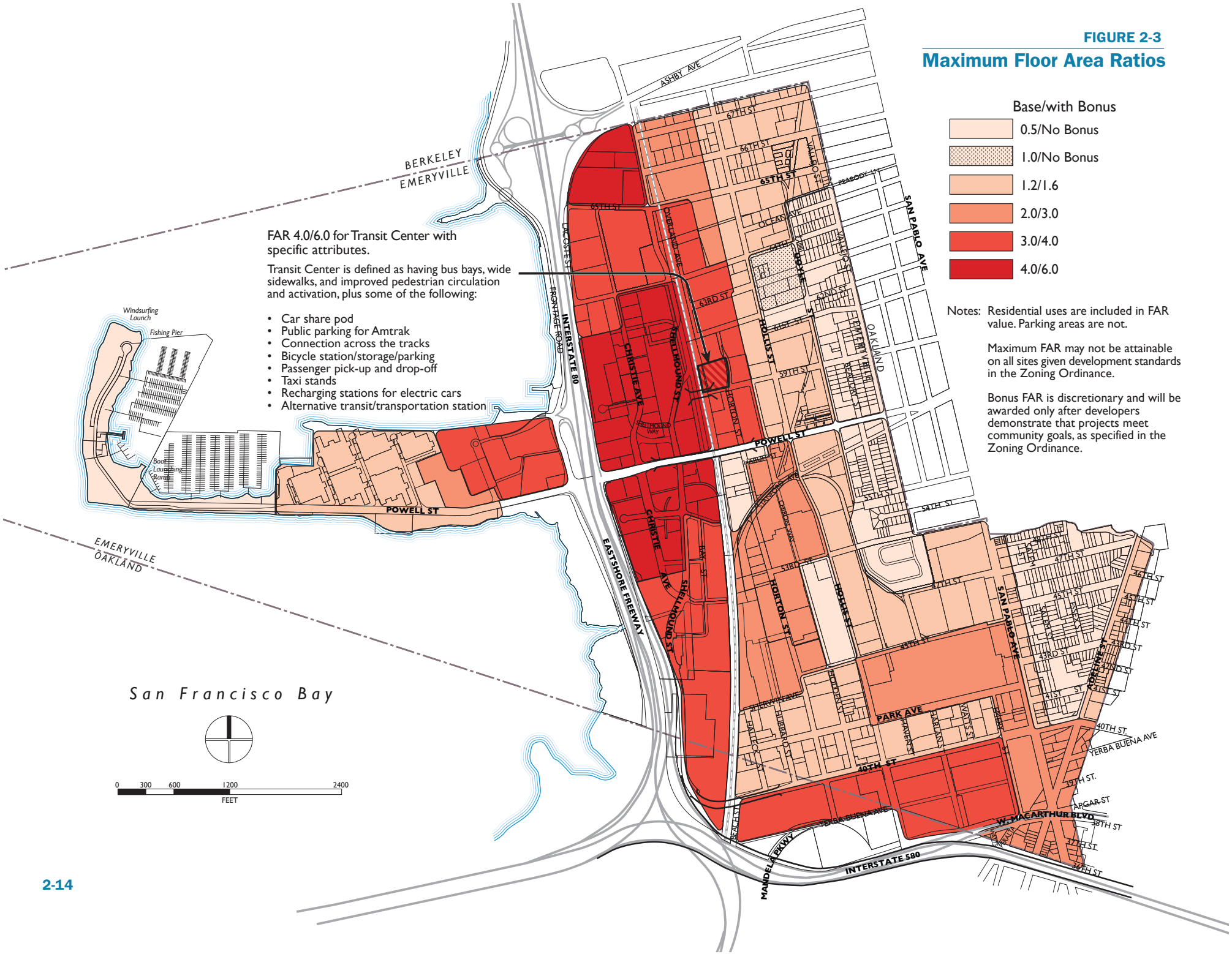


FIGURE 2-3

Maximum Floor Area Ratios



The first number describes the maximum base FAR. Proposed base development intensities in the General Plan range from 0.5 to 4.0, modulated to provide diversity, as well as high intensities in selected locations. Intensities are low in the eastern residential neighborhoods and the western end of the peninsula, gradually increasing to the highest values at the Powell Street/Christie Avenue core area.

The second number represents the maximum bonus FAR that may be awarded after developers demonstrate that projects provide certain community amenities. Bonuses are discretionary and contingent on excellence in design.

Maximum bonus FARs range from 1.6 to 6.0. (There is no bonus in the 0.5 or 1.0 FAR categories.) Maximum FARs shown on the map may not be attainable on all sites as superseding development regulations and/or site conditions may reduce development potential. The bonus program is described on page 2-19 and detailed in the Zoning Ordinance.

Building Heights

Figure 2-4 shows maximum permitted building heights—base and with bonus. Bonus height is discretionary, and will be awarded together with the bonus FAR only after developers demonstrate that projects meet specific community goals. (The bonus height provisions will be specified in the Zoning Ordinance.)

Maximum base building heights range from 30 feet to 100+ feet. Buildings heights gradually step up from the lowest in the east—reflecting the scale of the older residential neighborhoods—and the western edge of the Peninsula, to create a high-rise core in the Powell Street/Christie Avenue area. The Triangle and Doyle Street neighborhoods have a maximum height of 30 feet. These step up to 30 feet/55 feet (base/maximum) in the North Hollis and Park Avenue areas and the Watergate residential complex; these moderate heights will allow light to filter in into the streets in the North Hollis area, maintain the character and scale of the historic Park Avenue area while allowing modest increases, and maintain the scale of the Watergate residential complex, which is an area of stability.

The next step up in height (55 feet/70 feet) provides transition between the low-rise areas and the 70 feet/100 feet height limit that applies to much of Sherwin Williams, East Bay Bridge, as well majority of the sites west of the railroad. The tallest heights (100+ feet) apply to the core which extends on both sides of Powell Street, extending to Pacific Park Plaza in the north (the tallest building in the city with a height of 320 feet), as well a small portion land at the southern edge of the City at the edge of I-580 (which is elevated in the area) that is in joint Oakland/Emeryville planning jurisdiction. Several buildings have previously been approved at heights greater than these height districts would allow; these buildings are "grandfathered", and are indicated by yellow asterisks on Figure 2-4.

The three-dimensional images in Figure 2-5 illustrate how hypothetical buildings might look and feel in the cityscape under the FAR limits of Figure 2-3 and the height limits of Figure 2-4. These drawings are shown for illustrative purposes only.

Residential Density

Figure 2-6 shows maximum permitted residential density in units per acre. As described in the FAR and heights sections, the first number refers to the base maximum density value, while the second number represents the maximum value permitted with discretionary bonus allowance. Residential densities range from 20 units per acre (base) in the eastern neighborhood to 115 units per acre (base) in the Powell/Christie core. Assuming a 1.79 persons per household ratio citywide population density







Building heights will be tallest around the Powell/Christie core. Heights step down as you move away from the core, creating visual transitions between the city's districts.

FIGURE 2-4

Maximum Building Heights

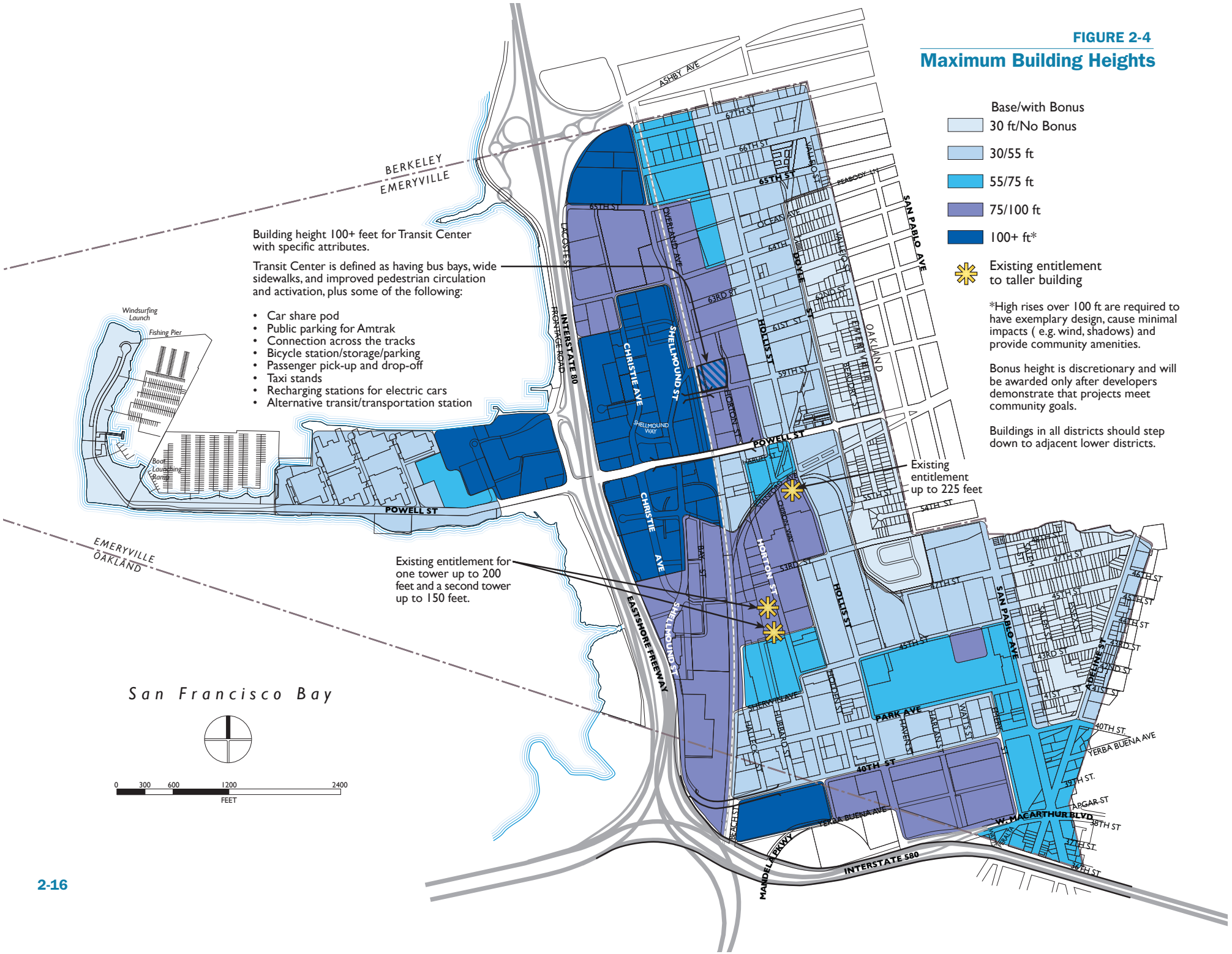
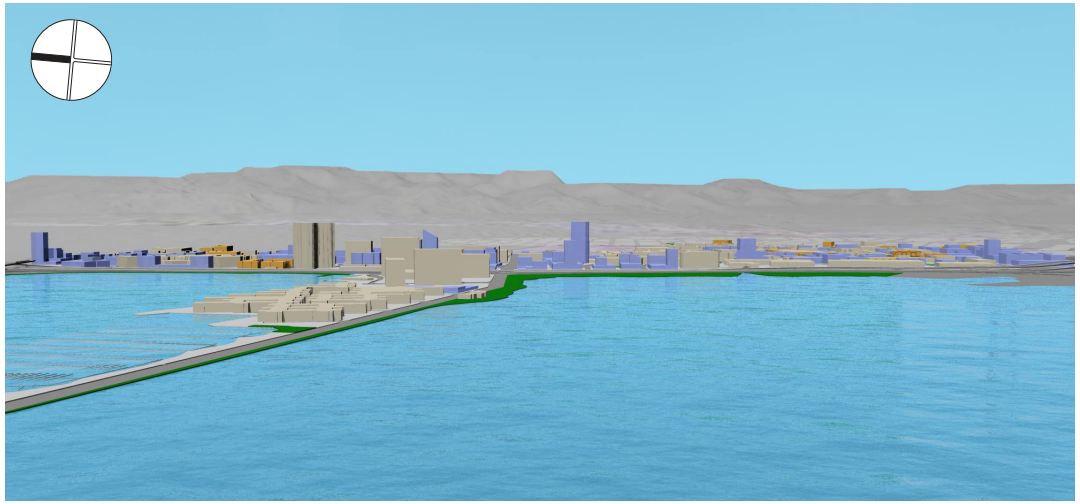


FIGURE 2-5

Building Height Perspectives, Hypothetical



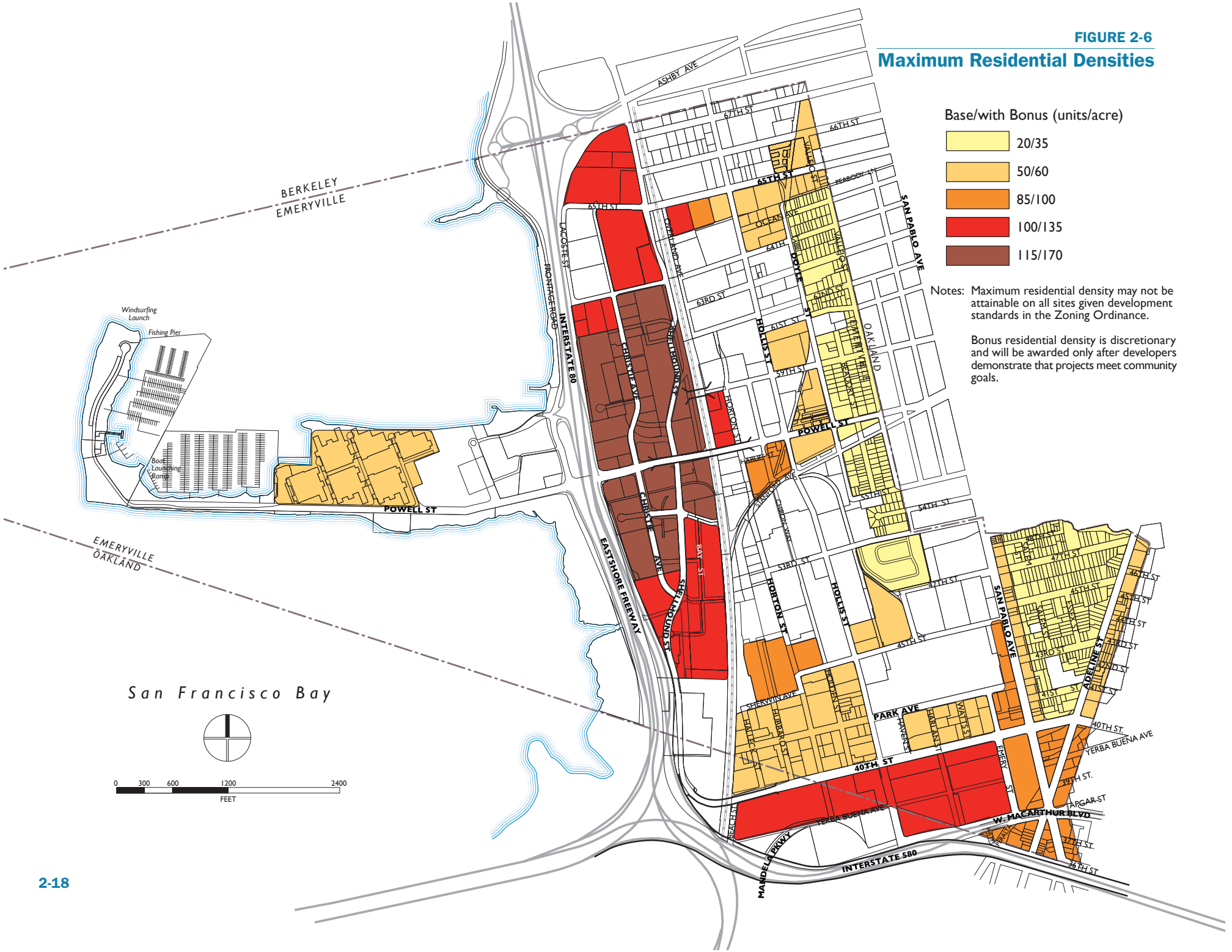




Existing buildings
Approved or recently constructed projects
Hypothetical future projects

FIGURE 2-6

Maximum Residential Densities



is projected to range from 36 persons per acre in the eastern residential neighborhood to 206 persons per acre in portions of the Powell/Christie core. Higher residential densities may be achieved through the bonus program.

These residential densities are derived from the FARs shown in Figure 2-4, but are only mapped on those areas where the underlying land use classification of Figure 2-2 would allow residential uses. Areas that are blank in Figure 2-6 would not allow residential uses. It should be noted that policies and additional standards in the Zoning Ordinance that require mixed uses may not allow maximum residential density to be attained in the mixed-use areas.

Intensity, Height, and Density Bonus

Bonus for Community Amenities

Intensity, height, and density bonuses are permitted after developers provide certain community amenities, such as family-friendly housing, green architecture, and public open space. Bonuses are discretionary and contingent on excellence in design. (In the Medium Density Residential areas, additional FAR and greater residential density would be allowed through a conditional use permit. These are not part of the bonus system.)

The City will consider a variety of mechanisms to encourage good design; however, design will not be an eligible bonus category. The Zoning Ordinance establishes criteria on how the bonus is awarded, but the basic framework is summarized below. Note that under State density bonus law, bonuses are allowed for affordable housing. This bonus is separate from the intensity, height, and density bonuses described here.

Height and Density/Intensity Bonuses

Density/intensity bonuses are specified in the Zoning Ordinance, and are based on a point system; a development may need to provide more than one bonus feature or amenity to achieve the maximum bonus. All bonuses (with the exception of State-mandated bonuses for affordable housing) are discretionary. Available bonuses may include, but are not limited to:

- **Public Open Space.** Public parks and/or plazas beyond required park-dedication standards.
- **Family Friendly Development.** Large proportion of three bedroom or larger housing units, amenities for children such as play structures.
- **Sustainable Design.** Eco-roofs, low-impact and energy-efficient design, on-site renewable energy, LEED™ certification or equivalent at various levels.
- **Transportation Demand Management and shared parking.**
- **Public Right-of-Way Improvements.** Improvements to a public right-of-way (such as improvements to a streetscape) beyond normal improvements required along property frontage.
- **Public Parking.** All or a portion of publicly accessible parking will be excluded from FAR calculations and may be counted towards height and density bonuses.
- **Neighborhood Centers.** Retail, restaurants/cafes, art, and public uses in designated Neighborhood Centers.
- **Recycled Water (dual plumbing).**
- **Small Businesses.** Spaces for small business opportunities or mechanisms to attract and retain small businesses.



Discretionary bonuses may be awarded to developers who provide community amenities, such as public open spaces (top) and streetscape improvements (bottom), over and above existing requirements.

CITYWIDE LAND USE GOALS AND POLICIES

GOALS

LAND USE

LU-G-1 **An overall balance of uses**—Employment, residential, cultural, destination and local retail—as well as a full range of amenities and services necessary to support a vibrant community.

LU-G-2 **A mixed use city**—Mixed-use development in various parts of the city, with the range of permitted and required uses varying to meet the needs of specific districts and neighborhoods.

LU-G-3 **Community activity centers**—Centers that combine residential, retail, office, and public uses to create areas of identity and activity for residents and visitors.

LU-G-4 **A mix of housing types**—A diversity of housing types to accommodate a variety of household sizes and incomes.

LU-G-5 **Preservation of residential neighborhoods**—Residential use, structures, low-rise scale, and character of the Triangle, Doyle Street, and Watergate neighborhoods preserved, and the scale of other areas of stability maintained.

LU-G-6 **Vibrant new mixed-use centers**—Intensification of existing underutilized commercial centers with surface parking (such as Powell Street Plaza and East Bay Bridge Center) as vibrant, multi-story, walkable mixed-use destinations with structured parking and open space.

HEIGHT AND INTENSITY

LU-G-7 **A varied skyline**—with the highest intensities/heights grouped in the Powell Street/Christie Avenue area, with heights stepping down from this urban core.

LU-G-8 **Uninterrupted sunlight in key areas**—during designated periods on all major parks. Adequate sunlight on sidewalks and streets, especially in Neighborhood Centers and other key public gathering areas.

LU-G-9 **Appropriately scaled buildings**—heights and massing that do not appear monolithic.

LU-G-10 **Maximum sky exposure**—for streets and public spaces, and minimal view disruptions.

ECONOMIC DEVELOPMENT

LU-G-11 **A wide range of economic activity**—An economy that capitalizes on Emeryville's central location, strengthens the City's tax base, and ensures that Emeryville has adequate fiscal resources to fund high quality public services for its residents and businesses.

LU-G-12 **Successful businesses**—retain and foster the growth of Emeryville businesses.

LU-G-13 **Local employment opportunities**—encourage establishment of businesses that will employ and serve Emeryville residents.

POLICIES

Implementing actions supporting each policy are described in Chapter 8: Implementation Program.

LAND USE

LU-P-1 Land uses will be consistent with the Land Use Classifications in section 2.4 and the Land Use Diagram, Figure 2-2.

LU-P-2 The Powell/Christie/Shellmound/I-80 core area will be developed into a compact but high-intensity regional transit hub. This hub will include a retail core, with stores, restaurants, and hotels; a financial and commercial center, creating a daytime work population; and a residential neighborhood, providing vitality during non-work hours.

LU-P-3 The northern (north of Powell) and southern halves of the Powell/Christie core area shall be integrated and connected, and the district shall be walkable, with small blocks, pedestrian-oriented streets, and connections to surroundings.

LU-P-4 Park Avenue (west of Hollis Street), Hollis Street (between 61st and midblock between 65th and 66th streets), Powell Street/Captain Drive, and San Pablo Avenue (between 36th and 47th streets) will be developed as walkable, mixed-use neighborhood centers, with an array of amenities and services—including stores, restaurants and cafes, galleries, and office uses—to serve neighborhood needs, with community-serving uses and active building frontages that engage pedestrians at the ground level.

LU-P-5 Retail uses will be concentrated in areas with Neighborhood or Regional Retail overlays, near neighborhood centers, and in the Emeryville Marketplace.

LU-P-6 The current deficiency of park and open space will be addressed by making parkland acquisition a high priority by the City, and working with private land owners to secure these areas through development incentives, land swaps, and other mechanisms.

LU-P-7 Existing uses on sites designated for large community parks along Hollis Street shall remain as conforming uses, until such time as these sites are acquired by or dedicated to the City.

LU-P-8 Live/work uses will be permitted in all land use designations except Public, Parks/Open Space, and Marina. In the Industrial district west of Hollis Street, only "heavy" live/work—involving, for example, manufacturing, welding, or assembly—will be permitted.

LU-P-9 Zoning performance measures will ensure health and safety compatibility for industrial uses bordering residential uses.

HEIGHT AND INTENSITY

LU-P-10 Maximum building height will be defined by the Maximum Building Heights diagram, Figure 2-4.

LU-P-11 Maximum floor area ratios (FARs) and residential densities for sub-areas of the city, will be defined by Figure 2-3 and 2-6, respectively.

LU-P-12 Bulk standards will be defined in the Zoning Ordinance, with particular emphasis on zones where taller buildings are permitted.

LU-P-13 Building heights will step down to the east and west from the Powell/Christie core; buildings taller than 55 feet are not permitted east of Hollis Street. The height and scale of existing development (30 feet maximum) in the Doyle Street and Triangle neighborhoods will be maintained.

LU-P-14 Heights greater than 100 feet are only permitted for buildings that meet specific criteria, such as minimal impacts on public views, sky exposure, wind, and shadows, adequate separation from other tall buildings, and exemplary design, and/or provide public amenities, through a discretionary review and approval process.

LU-P-15 Buildings in all districts shall be required to step down to meet permitted heights in adjacent lower-rise districts.

LU-P-16 A point-based system will be established for intensity, height and density bonus, as well as review and approval process.

POLICIES FOR SPECIFIC AREAS

LU-P-17 The area around the Amtrak station shall be developed with pedestrian and bicycle amenities, and transit-supportive uses, through measures such as reduced parking requirement, incorporation of public parking in developments, and accounting for transit proximity when considering height and FAR bonuses.

LU-P-18 The reuse of the Sherwin Williams site shall include a mix of residential and nonresidential uses with ample open space, centered on an extension of the Emeryville Greenway connecting Horton Landing Park and the Park Avenue District.

LU-P-19 The relocation of the AC Transit facility will be pursued. Alternative community uses if/when the facility relocates will be studied.

LU-P-20 Along San Pablo Avenue neighborhood-oriented retail establishments—that may serve a regional clientele as well—with housing above will be promoted. Development adjacent to residential uses in the Triangle neighborhood shall be in keeping with the scale and character of the residential uses.

LU-P-21 The East Bay Bridge, Powell Street Plaza, and Marketplace shopping centers shall be intensified by consolidating parking into structures and converting surface parking lots into residential and mixed-use development—including retail, hotels, and offices; expanding the city street grid through the sites; and developing new parks and public open space. Future redevelopment of these shopping centers should include at least as much retail space as existed when this General Plan was adopted.

LU-P-22 In the short term, landscaping and façades in the East Bay Bridge Shopping Center should be upgraded.

LU-P-23 The Powell Street Plaza site shall be encouraged to redevelop as a high-intensity, high-rise, mixed-use development that complements the Powell Street entrance to the city from the freeway.

LU-P-24 The Marketplace and adjacent parcels shall be encouraged to redevelop with a mix of uses, and iconic mid to high-rise development.

LU-P-25 If new residential buildings are proposed adjacent to freeways and railroad tracks impacts of these corridors, including noise, vibration, and air pollution, should be considered during site planning. Noise, vibration, and air pollution shall be mitigated to the extent possible.

ECONOMIC DEVELOPMENT

LU-P-26 A mix of retail that draws local customers as well as patrons from the greater Bay Area shall be encouraged.

LU-P-27 A diversity of commercial uses to insulate the City's fiscal base from downturns in particular markets shall be maintained.

LU-P-28 The City will pursue retail uses that will serve the need of Emeryville residents, and encourage these uses to locate in the Neighborhood Centers.

LU-P-29 The City will encourage the development and retention of small business, start-up firms, partnership incentives, and buildings that accommodate these businesses.

LU-P-30 The City will encourage development of dynamic, leading edge industries, based in high technology, medical/bio engineering, bio technology, and media that provide good quality jobs with the potential for career advancement.

LU-P-31 The City will encourage development of existing Emeryville businesses with the objective of retaining and expanding employment opportunities and strengthening the tax base. Provide assistance

to existing businesses that may be displaced by new development to relocate in Emeryville.

LU-P-32 The City will work with existing Emeryville businesses, Chamber of Commerce, and others to address the City's economic needs and stimulate growth.

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3 TRANSPORTATION

The General Plan recognizes that an efficient multi-modal transportation plan, coupled with wise land use planning, is essential to improving quality of life, supporting economic vitality, and reducing greenhouse gas emissions. The Transportation Element seeks to create a well-connected transportation network that accommodates cars, public transit, walking, and biking.

3.1 BACKGROUND

Emeryville is traversed by a number of key regional transportation routes, notably the I-80 and I-580 freeways, San Pablo Avenue corridor, AC Transit bus lines, Amtrak and freight rail lines and the San Francisco Bay Trail. The San Francisco Bay Area Rapid Transit (BART) system has several stations a short distance from Emeryville, including the West Oakland Station, with frequent service to San Francisco and the MacArthur Station, a hub for the East Bay, easily accessed by free bus service provided by the Emery Go-Round shuttle. Oakland International Airport is located 10 miles to the southeast, and San Francisco International Airport is 15 miles to the southwest. However, the infrastructure that allows for such flexibility also creates some constraints, as freeway and rail lines produce congestion and internal barriers to east-west circulation.





Removing barriers to pedestrian and bicycle connectivity will help to create a street and transportation network that is accessible for all modes and for all users.

Recent Trends

A confluence of demographic, economic, and environmental trends are converging toward the necessity of creating a multi-modal transportation network in Emeryville. An aging population, increasing fuel costs, and concerns about climate change, highlight the benefits and necessity of alternative modes of transportation. Moreover, during the General Plan update process, community members expressed a desire for Emeryville to be more pedestrian and bicycle friendly.

The surge in commercial development in the past 10 years is testament to Emeryville's central location in the Bay Area and proximity to regional transportation facilities. The city has seen increased ridership regionally on the Amtrak Capitol Corridor—serving over 160,000 passengers in July 2008, a 30 percent increase in ridership over the previous year—and locally on the Emery Go-Round which has served over one million passengers annually. However, like many places, the City has accommodated motor vehicles at the expense of pedestrian and bicycle movement. While transit use among residents of Emeryville increased during the 1990s, Emeryville's circulation network is still not conducive to pedestrian and bicycle travel. In response, the General Plan creates a more balanced approach to circulation and transportation mode choice.

Commute Patterns

Emeryville residents tend to commute less by driving alone and more by telecommuting, walking, biking, carpooling, riding transit, or bicycling compared with the Bay Area as a whole. However, the city's population swells during the day by the substantial number of non-residents who work in Emeryville and tend to come by car. In 2000, there were about 1,000 residents who both lived and worked in Emeryville, about 3,000 residents who commuted to jobs outside the city ("Out-commuters"), and about 17,000 workers who lived elsewhere and commuted to jobs in Emeryville ("In-commuters").

As shown in Table 3-1, about 60 percent of workers commuting out of Emeryville drove alone, while 77 percent of commuters employed in Emeryville drove alone to work. Only 37 percent of those who both lived and worked in Emeryville drove alone. The Bay Area average is 68 percent, so Emeryville's residents tend to drive to work less than the regional average, while those who commute to Emeryville from elsewhere drive somewhat more than the regional average.

The rate of walking and biking to work was substantially higher for those who both live and work in Emeryville than the Bay Area average (31% in Emeryville, versus 4% in the Bay Area). This is influenced by Emeryville's small size and flat terrain, which make walking and bicycling relatively easy for those who live close to their workplace. In addition, the city has a high rate of workers who work at home or telecommute: 25 percent in Emeryville, compared with just four percent in the region as a whole. The rate of transit use for out-commuters (40%) is double that of in-commuters (20%). This is influenced by the substantial proportion of residents that are employed in San Francisco, Berkeley or Oakland (the top destinations), which can be easily accessed by public transportation from Emeryville.

The journey to work is only one aspect of travel patterns. People also travel for shopping, school, personal business, recreation, and other reasons. Shopping trips are especially important in Emeryville because of the large number of retail stores. However, similar detailed data is not available for these other trip purposes. While they do not constitute the whole picture, journey to work patterns are important to understand because they make up the bulk of the traffic during the busiest time of day, the "p.m. peak hour" (rush hour), which largely determines the types of transportation improvements that are typically proposed.

TABLE 3-1: Journey to Work by Mode of Travel

	Emeryville Residents		In-Commuters	Bay Area Average
COMMUTE MODE	WORK IN EMERYVILLE	OUT-COMMUTERS		
Work at Home	25%	n/a	n/a	4%
Drive Alone	37%	60%	77%	68%
Transit/Carpool/Other	6%	40%	20%	24%
Walk	28%	0.1%	2%	3%
Bicycle	4%	0.7%	1%	1%

Source: 2000 U.S. Census provides "Journey to Work"





The General Plan seeks to enhance the city's multi-modal transportation system.

3.2 CIRCULATION SYSTEM

Typology

To ensure a balanced, multi-modal transportation network, the General Plan organizes streets and other transportation facilities according to "typologies" which consider the context and prioritize travel modes for each street. This ensures that the standards consider a facility's relation to surrounding land uses, appropriate travel speeds, and the need to accommodate multiple travel modes.

The following typology definitions apply to the streets and other facilities that make up the city's circulation plan, as shown in Figures 3-1 through 3-6:

- **Transit Street** – These are primary routes for AC Transit, Emery Go-Round, and other public transit providers. Signal preemption for transit vehicles, bus stops, and, where appropriate, bus lanes, are provided. Other travel modes, including automobiles, bicycles, and trucks, are accommodated in the roadway, but if there are conflicts, transit has priority. These streets accommodate moderate to high volumes of through-traffic within and beyond the city. Pedestrians are accommodated with ample sidewalks on both sides of the street, and amenities around bus stops (e.g. shelters, benches, lighting, etc).
- **Bicycle Boulevard** – These are through-routes for bicycles providing continuous access and connections to the local and regional bicycle route network. Through-motor vehicle traffic is discouraged. High volumes of motor vehicle traffic are also discouraged, but may be allowed in localized areas where necessary to accommodate adjacent land uses. Local automobile, truck, and transit traffic are accommodated in the roadway, but if there are conflicts, bicycles have priority. Traffic calming techniques to slow and discourage through-automobile and truck traffic may be appropriate. Pedestrians are accommodated with ample sidewalks on both sides of the road.
- **Connector Street** – Automobiles, bicycles, and trucks are accommodated equally in the roadway. Transit use, if any, is incidental. These streets accommodate moderate to high volumes of through-traffic within and beyond the city. Pedestrians are accommodated with ample sidewalks on both sides of the street.
- **Local Street** – Automobiles, bicycles, and trucks are accommodated equally in the roadway. Transit use, if any, is incidental. These streets accommodate low volumes of local traffic and primarily provide access to property. Through-traffic is discouraged. Traffic calming techniques to slow and discourage through-automobile and truck traffic may be appropriate. Pedestrians are accommodated with ample sidewalks on both sides of the street.
- **Auto Dominant Highway** – These are freeways and approach roads (e.g. Ashby Avenue and West MacArthur Boulevard underpass) that serve high volumes of high speed regional motor vehicle traffic including automobiles and trucks. Transbay and express transit buses are also accommodated. Bicycles and pedestrians are prohibited.
- **Intercity Rail** – This is the mainline Union Pacific/Amtrak railroad line serving long distance and local freight and passenger traffic. The Capitol Corridor line is the third busiest route in the U.S. Other passenger routes include cross country trains (California Zephyr and Coast Starlight), San Joaquin, and future "East Bay Express". If a new Transbay tube is built, it should connect to this





Emeryville contains a range of street types, from auto-dominated highways and connector and transit streets (top) to local streets (bottom) which are more amenable for pedestrians and bicyclists.

line to provide direct rail access between San Francisco and Sacramento with a stop in Emeryville. If any new inner-city BART lines are proposed, one should follow this alignment with a station at Powell Street and entrances from Bay Street, Marketplace, Novartis, and the Emery Station complex.

- **Major Transit Hub** – These are transfer points where high volume transit lines intersect. These are located in the Amtrak station with access from both sides of the rail line, and at 40th Street and San Pablo Avenue.
- **Bicycle Path** – Class I Bicycle path as defined by Caltrans standards accommodates both bicycles and pedestrians. Motor vehicle traffic is prohibited.
- **Bike Route** – Class II (bike lanes) or Class III (signed route) bike facilities as defined by Caltrans standards, are overlaid on transit, connector, and local streets. While bicycle use is always accommodated on these streets, it is encouraged along designated bike routes, which provide continuous access and connections to the local and regional bicycle route network.
- **Pedestrian Path** – These are exclusive walkways for pedestrians. Bicycles and motor vehicles are prohibited.
- **Pedestrian Priority Zones** – These are zones on which high volumes of pedestrian traffic are encouraged along the sidewalk. This includes zones around neighborhood centers, regional retail areas, and around school and other public facilities. Sidewalks should be wide with ample pedestrian amenities. Building frontages should provide high level of pedestrian interest. Pedestrian crossings should have a high priority at intersections. In some locations, well-protected mid-block crosswalks may be appropriate.

TRANSPORTATION FACILITIES MATRIX

Facility	Transit	Bicycles	Pedestrians	Autos
Transit Street[1]	■	□	□	□
Bicycle Boulevard	□	■	□	□
Bicycle Path (class I)	X	■	■	X
Pedestrian Path	X	X	■	X
Connector Street[1]	○	□	□	□
Local Street[1]	○	□	□	□
Auto Dominant Road	□	X	X	■

[1] Bike routes (class II and III) can be overlaid on these street types.

■ = Dominant

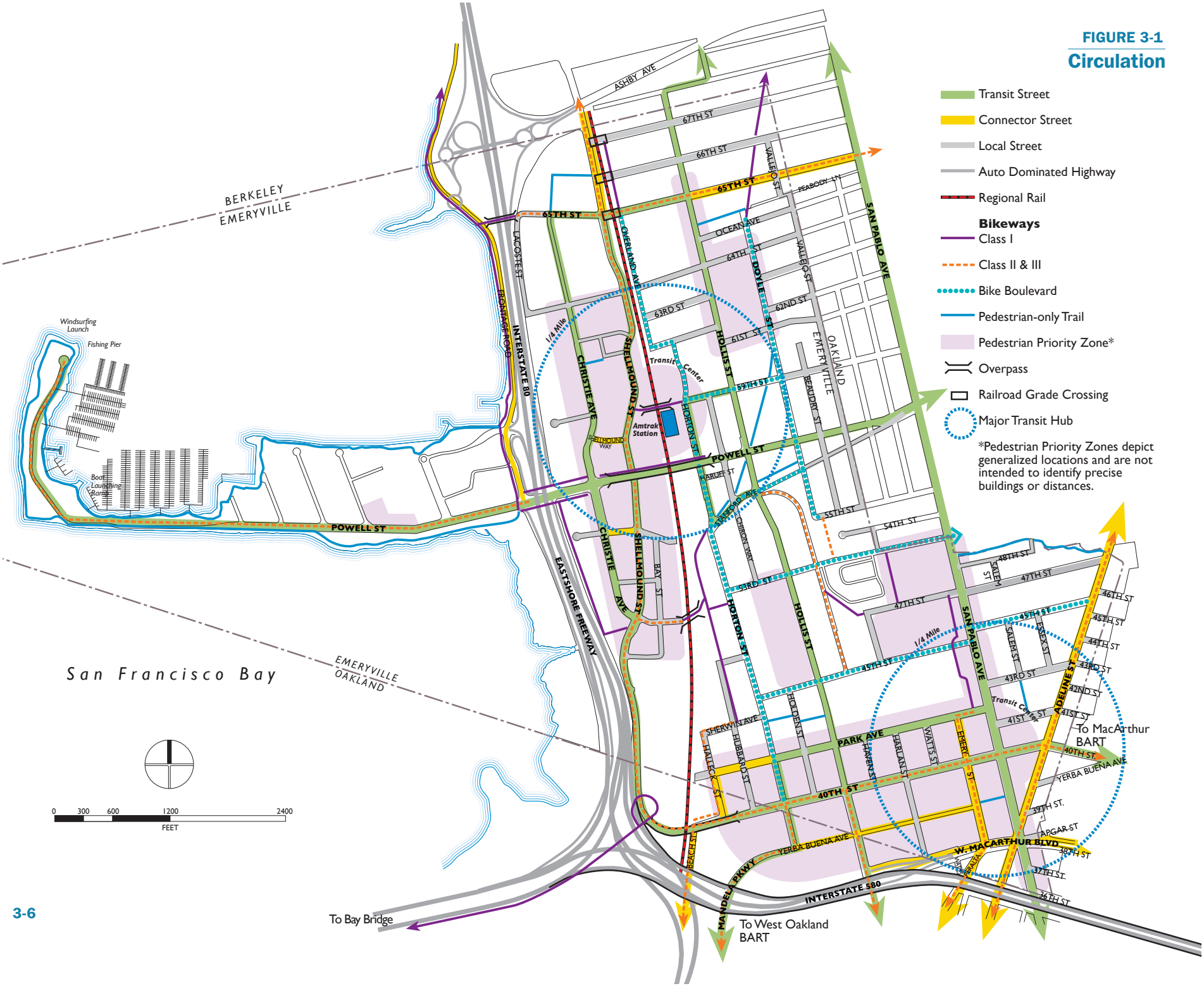
□ = Accommodated

○ = Incidental

X = Prohibited

FIGURE 3-1

Circulation



Multi-Modal Emphasis

The Transportation Element is intended to ensure the accommodation of multiple travel modes on the circulation system and to ensure mobility for all community members. This will require a rethinking of past policies that emphasized automobile circulation and prioritized motor vehicle improvements.

Because automobile travel has been the dominant form of transportation, "Level of Service" (LOS) has traditionally been measured for vehicle drivers, with minimal regard to bicycle, pedestrian, and transit users. This bias unintentionally but inherently ignores overall mobility and conditions for non-auto road users and perpetuates a system that focuses on expanding vehicle capacity, which can reduce the quality of service for pedestrians and bicyclists.

Measurement Standards

This General Plan departs from conventional thinking by doing away with the traditional Level of Service methodology and replacing it with an alternative "Quality of Service" (QOS) standard that optimizes travel by all modes of transportation, not just vehicle travel. This will permit greater development flexibility to take advantage of land use density and diversity which have been shown to increase transit ridership, biking, and walking, while decreasing the need for automobile travel. This can reduce air pollution, energy consumption, and greenhouse gas emissions, while improving the overall travel experience for Emeryville's citizens.

In 2002 the Florida Department of Transportation published the 2002 Quality/Level of Service Handbook. The document's methodologies incorporated extensive research into the road user's perspective of their travel experience. As a result of this research, the analytical techniques used to analyze pedestrian, bicycle, and transit modes are as rigorously developed and tested as those for automobiles. Emeryville intends to use this current state of the practice research and other valid transportation engineering methodologies for assessing and optimizing the quality of service for all travel modes.



Many transit trips begin or end as walking or biking trips. Therefore pedestrian and bicycle amenities such as ample sidewalks, bike parking and shelter, should be provided at these interfaces.

LEVEL OF SERVICE (LOS)

Historically roadway and intersection operations were described from the vehicle driver perspective using the term "Level of Service" (LOS). Level of Service represents a qualitative description of the traffic operations experienced by the driver at the intersection. It ranges from LOS "A", with no congestion and little delay, to LOS "F", with excessive congestion and delays. LOS uses quantifiable traffic measures such as average speed and intersection delay to determine driver satisfaction. LOS ratings are derived from the peak 15 minutes during the commute hours of the day.

COMPLETE STREETS

To further the goal of optimizing travel by all modes, this General Plan incorporates the concept of "Complete Streets." Complete Streets are designed and operated to enable safe, attractive and comfortable access and travel for all users. Pedestrians, bicyclists, motorists and public transit users of all ages and abilities are able to safely and comfortably move along and across a complete street. Complete Streets also create a sense of place and improve social interaction, while generally improving the values of adjacent property. The Governor signed into law the California Complete Streets Act of 2008 (AB 1358) in September 2008, requiring that General Plans develop a plan for a multi-modal transportation system. This Transportation Element outlines the City's policy for Complete Streets.

3.3 STREET SYSTEM

Framework

The backbone of Emeryville's circulation plan is the street system. It provides the basic transportation infrastructure of the city, including routes for public transit, bicyclists, pedestrians, and motor vehicles, as well as access to public and private property. The streets are also the major component of the "public realm," creating a sense of place where social interaction occurs. A balanced approach to accommodating multi-modal transportation on the street network is essential, especially in light of the city's strong retail sector, employment base, and growing residential neighborhoods.



An expanded street grid will create new connections for vehicular and non-vehicular travel.

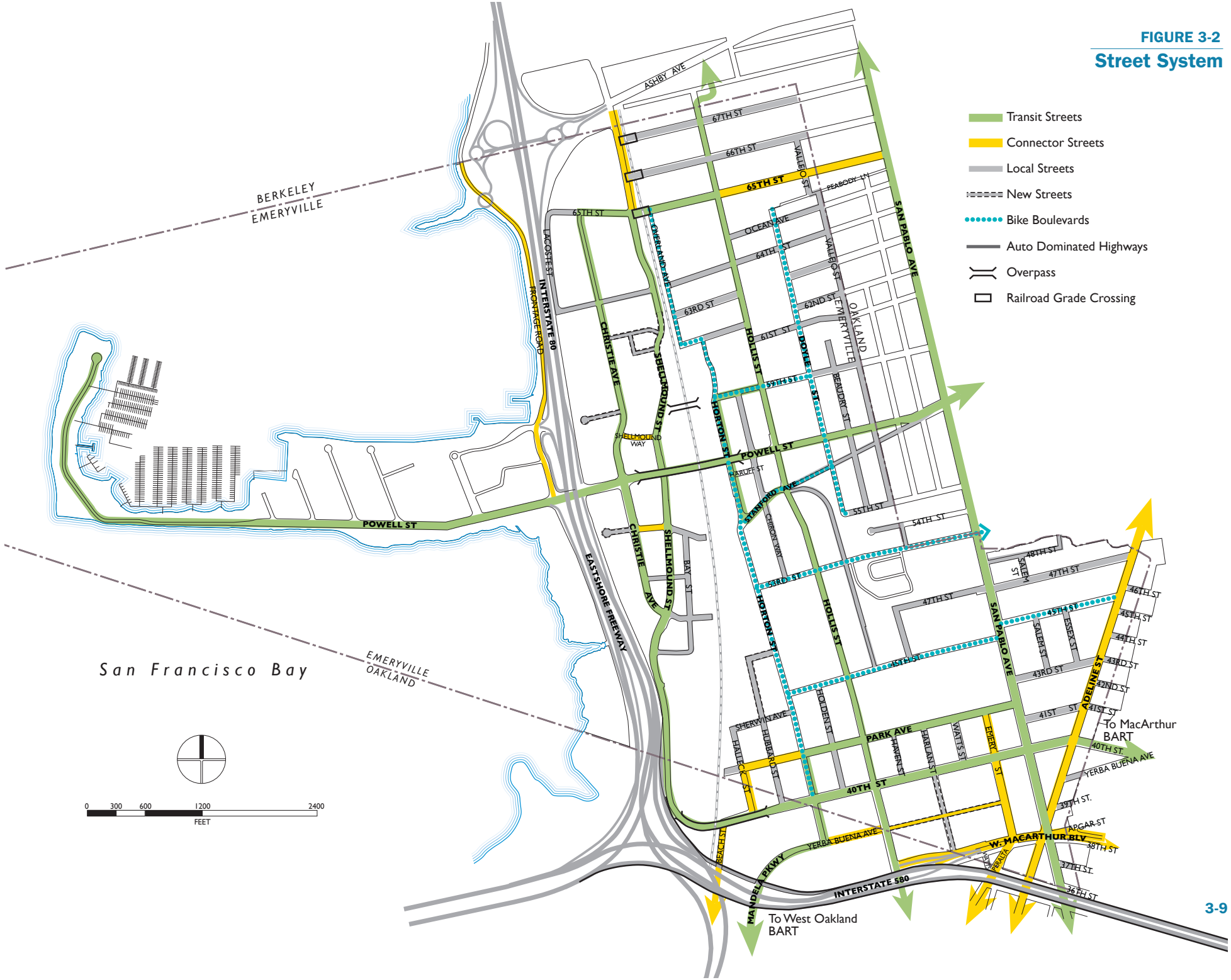


Recent transportation planning efforts have emphasized the need to maintain and enhance motor vehicle access to these regional retail destinations. At the same time, it is important to enhance travel by other modes, including public transit, bicycling, and walking, both along these regional corridors and throughout the city. The street system is set forth in Figure 3-2 and consists of the following:

- Transit streets, which carry large volumes of through-traffic, and on which public transit vehicles have priority.
- Connector streets, which carry large volumes of through-traffic, and on which all travel modes have equal priority, and where transit use, if any, is incidental.
- Bicycle Boulevards, where bicycles have priority, and on which through-traffic by other modes is discouraged.
- Local streets, which carry low volumes of local traffic, provide access to property, on which all travel modes have equal priority, and where transit use, if any, is incidental.
- Auto-dominated highways, which carry very large volumes of high speed regional traffic and on which bicycles and pedestrians are prohibited. These include the freeways and major approach roads.
- An expanded street grid throughout the city, including the North and South Bayfront areas, Sherwin Williams site, and East Bay Bridge Shopping Center.
- Regional retail access routes, which identify primary routes to regional retail stores, for all transportation modes, including automobiles.

FIGURE 3-2

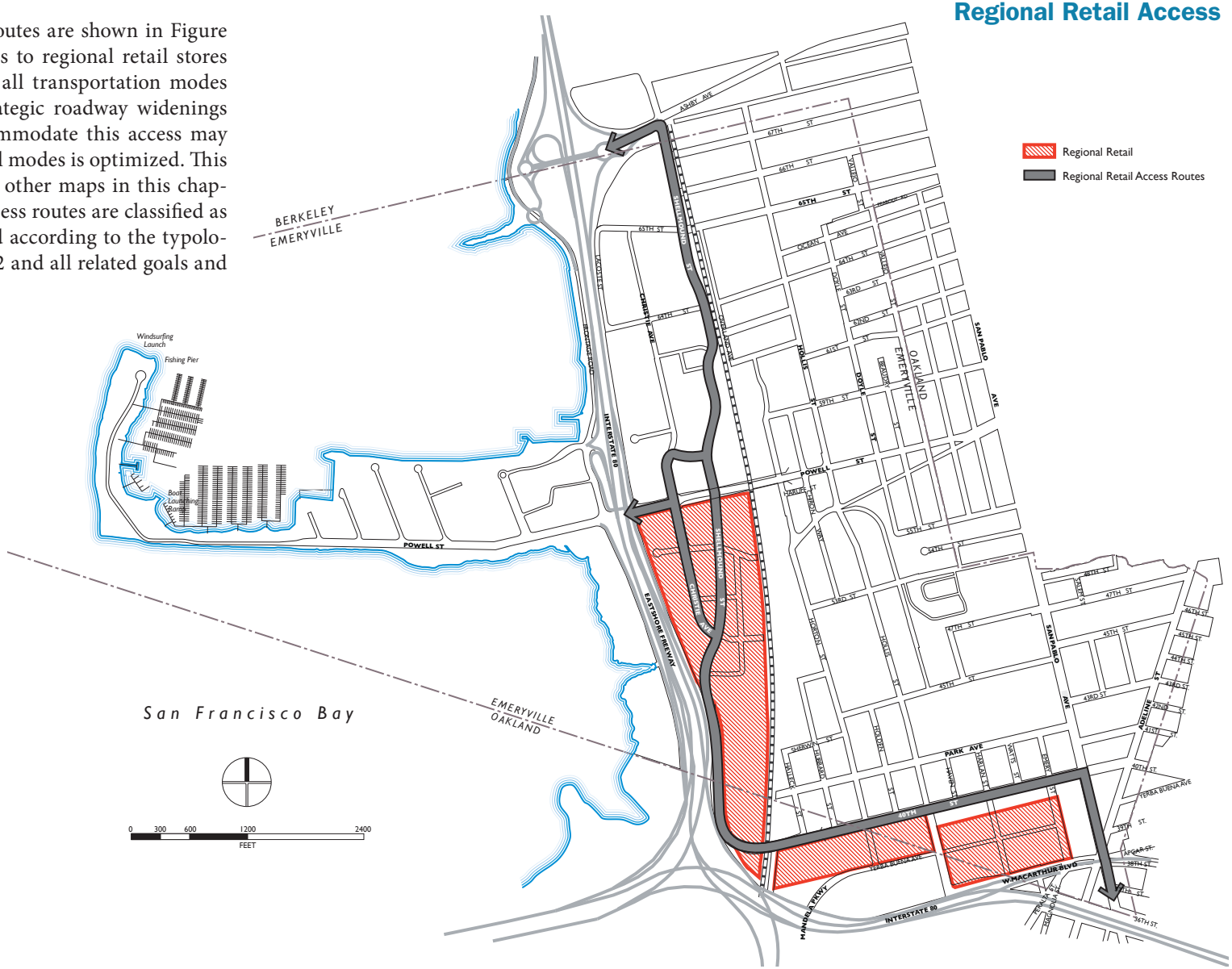
Street System



Regional Retail Access

The regional retail access routes are shown in Figure 3-3. On these streets, access to regional retail stores will be accommodated for all transportation modes including automobiles. Strategic roadway widenings and other changes to accommodate this access may be considered, if travel by all modes is optimized. This map is supplemental to the other maps in this chapter. These regional retail access routes are classified as indicated on Figure 3-2 and according to the typologies discussed in Section 3.2 and all related goals and policies.

FIGURE 3-3
Regional Retail Access



3.4 WALKING

Walking is part of every trip, whether it is from the parking lot to a building or from home to a bus stop, work, or store. The walking environment is an important element of the public realm and a fundamental component of land use planning, design standards, and guidelines.

Emeryville's pedestrian network consists of sidewalks and street crossings with some off-road paths and trails. There are still a few locations in Emeryville with no sidewalks, where pedestrians must share the street with motor vehicles and bicyclists. In the industrial and commercial areas, large blocks, railroad and freeway corridors act as barriers to pedestrian travel. These barriers to pedestrian movement limit the viability of walking as a form of transportation.

Recognizing the importance of walking trips to promote health, provide transportation choice, and reduce vehicle congestion, a pedestrian circulation system has been developed and is set forth in Figure 3-4. It consists of the following:

- Off-road pedestrian paths and routes, either exclusively for pedestrians or shared with bicyclists.
- Pedestrian priority zones along city streets.
- "Key Pedestrian Streets" connecting parks and open spaces, as identified in the Open Space Element.
- New and existing overpasses and underpasses across the railroad and freeway.
- The Bay Trail: a regional pedestrian and bicycle route that will eventually encircle San Francisco Bay and cross it at various places. The City of Emeryville's preferred Bay Trail alignment is set forth in Figure 3-5.

A Bicycle and Pedestrian Plan was prepared in 1998 and has been updated to reflect changes since that time. It contains a greater level of detail about pedestrian and bicycle facilities, and their implementation, than is appropriate in the General Plan. The Bicycle and Pedestrian Plan will need to be updated to be consistent with this General Plan.

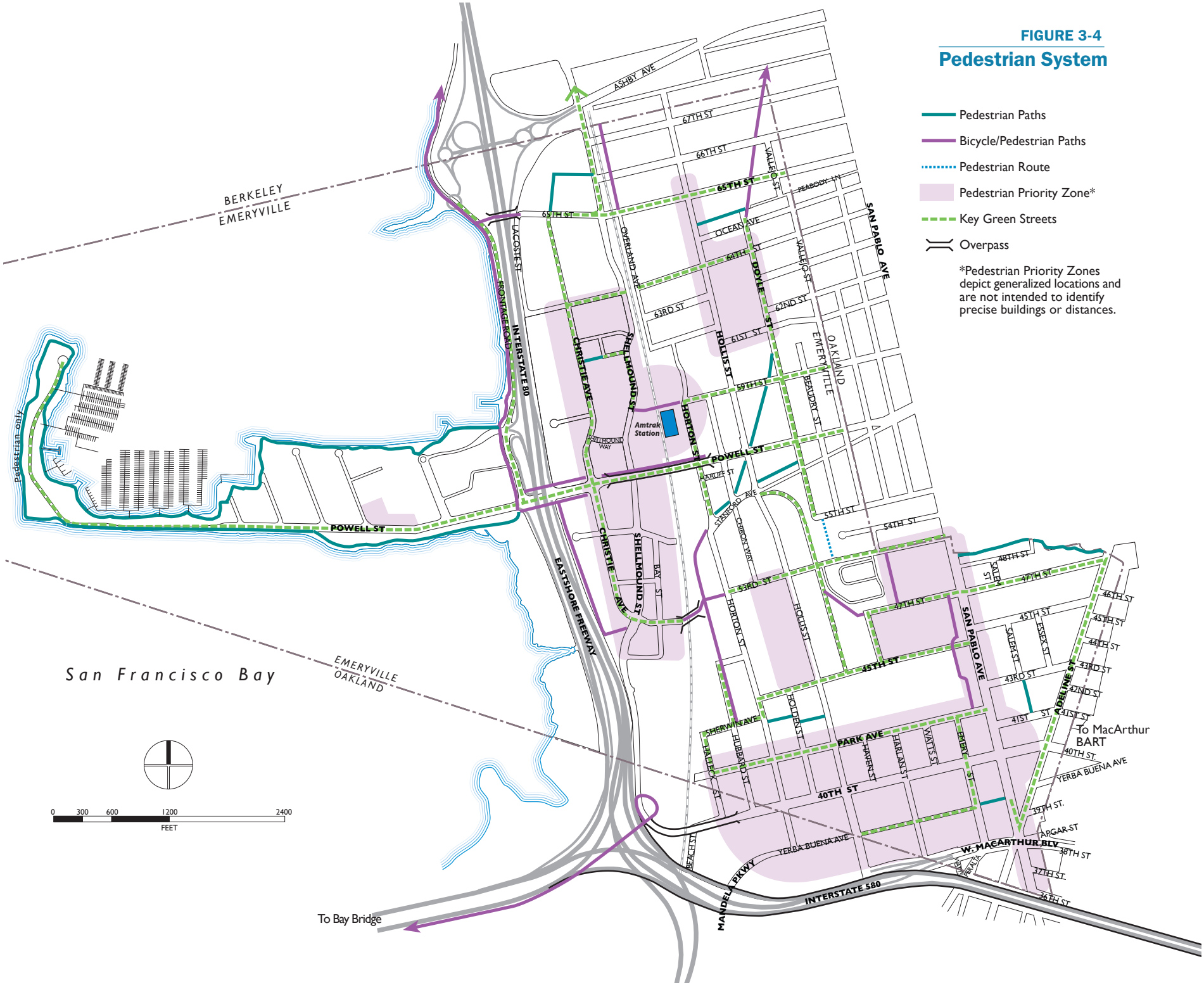




Walking can feel unsafe along narrow sidewalks when surrounded by wide streets, surface lots, and parking entrances (left). Creating a network of streets with pedestrian-oriented features (right) can improve the connectivity of the pedestrian realm and encourage walking trips.

FIGURE 3-4

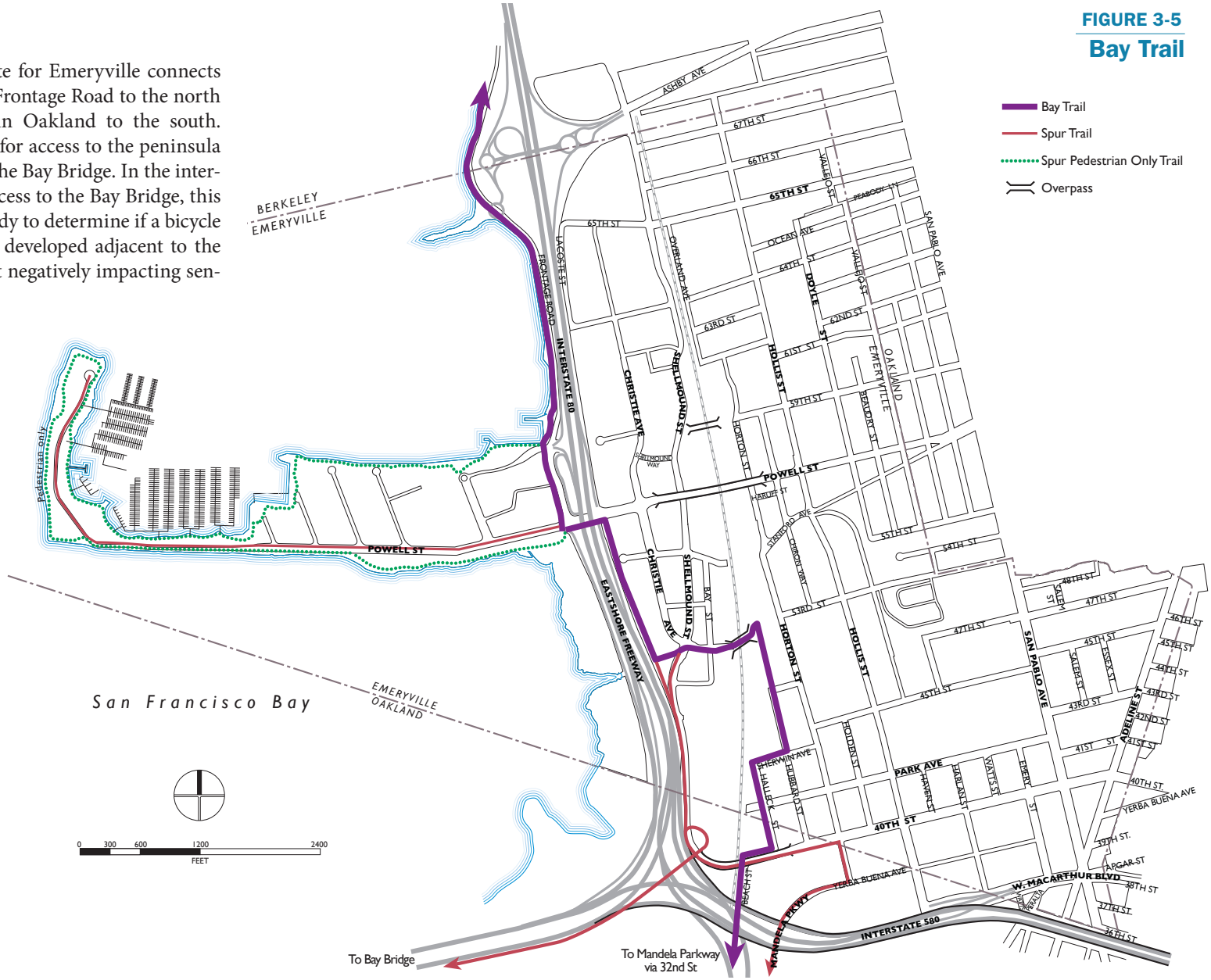
Pedestrian System



Regional Bay Trail

The preferred Bay Trail route for Emeryville connects with Berkeley's route along Frontage Road to the north and to Mandela Parkway in Oakland to the south. There are several spur trails for access to the peninsula and to cross I-580 to access the Bay Bridge. In the interest of providing shoreline access to the Bay Bridge, this Plan calls for a feasibility study to determine if a bicycle and pedestrian path can be developed adjacent to the Emeryville Crescent without negatively impacting sensitive habitat.

FIGURE 3-5
Bay Trail



3.5 BICYCLING

Emeryville's size and flat topography make it an ideal city for bicycling. Bicycles are a convenient means of transportation for short trips within the city. However, Emeryville has several barriers to safe and convenient bicycling. While most streets have low traffic volumes during most times of the day, 40th Street, Shellmound Street, San Pablo Avenue and portions of Christie Avenue and Powell Street have a large number of vehicle trips. These corridors serve regional retail destinations which are auto-oriented, and also serve vehicle traffic traveling through Emeryville.

Construction of a comprehensive citywide bicycle network and support facilities, such as bicycle parking at employment, retail, and other destinations, could greatly increase the mode share of bicycling as a form of transportation. The bicycle circulation system is set forth in Figure 3-6 and consists of the following:

- Off-road bicycle paths (Class I) which are shared with pedestrians.
- On-road bicycle routes, including bike lanes (Class II) and signed bike routes without lanes (Class III). (The General Plan does not distinguish between Class II and Class III. This level of detail is included in the City's Bicycle and Pedestrian Plan.)
- Bicycle Boulevards, a street classification on which bicycles have priority, and which may or may not have bike lanes, depending on the circumstances.
- New and existing grade-separated crossings of the railroad and freeway.
- The Bay Trail.





Constructing a citywide bike network, that includes support facilities such as bike parking, can encourage biking as an alternative transportation mode and a fun safe recreation activity.

3.6 PUBLIC TRANSIT

A coordinated set of policies regarding the City's public transit network seek to reduce greenhouse gas emissions (by attracting trips that would otherwise be taken by private automobile), and improve the viability of linking walking and bicycle trips with transit.

Local Transit System

Given Emeryville's central location in the East Bay, several public transit options serve the city, including the free Emery Go-Round shuttle to the MacArthur BART station, the 72 Rapid Bus on San Pablo Avenue, several other AC Transit bus routes, and numerous commuter trains at the Amtrak station. Moreover, with increases in ridership in recent years, particularly on BART and the Amtrak Capitol Corridor line, there is opportunity for improvements in service. For example, AC Transit transbay bus service to San Francisco is not designed to serve Emeryville, although several buses pass through the city. In addition, Amtrak operates frequent buses between Emeryville and San Francisco, but non-train passengers are not allowed to ride those buses. Although the Emery Go-Round does an excellent job of carrying commuters between Emeryville businesses and BART, it is not designed to meet the needs of Emeryville's residents or to provide service to other destinations. Transit service between the east and west sides of town is particularly lacking. In the long term, barriers to bus transit will be similar to those for automobiles. While roadway improvements will have some benefit to bus transit within Emeryville, additional measures may be necessary to maintain and improve reliability.

The transit system illustrated in Figure 3-7 designates most of Emeryville's major streets as "Transit Streets." Along these streets, techniques such as signal preemp-

FIGURE 3-6

Bicycle System

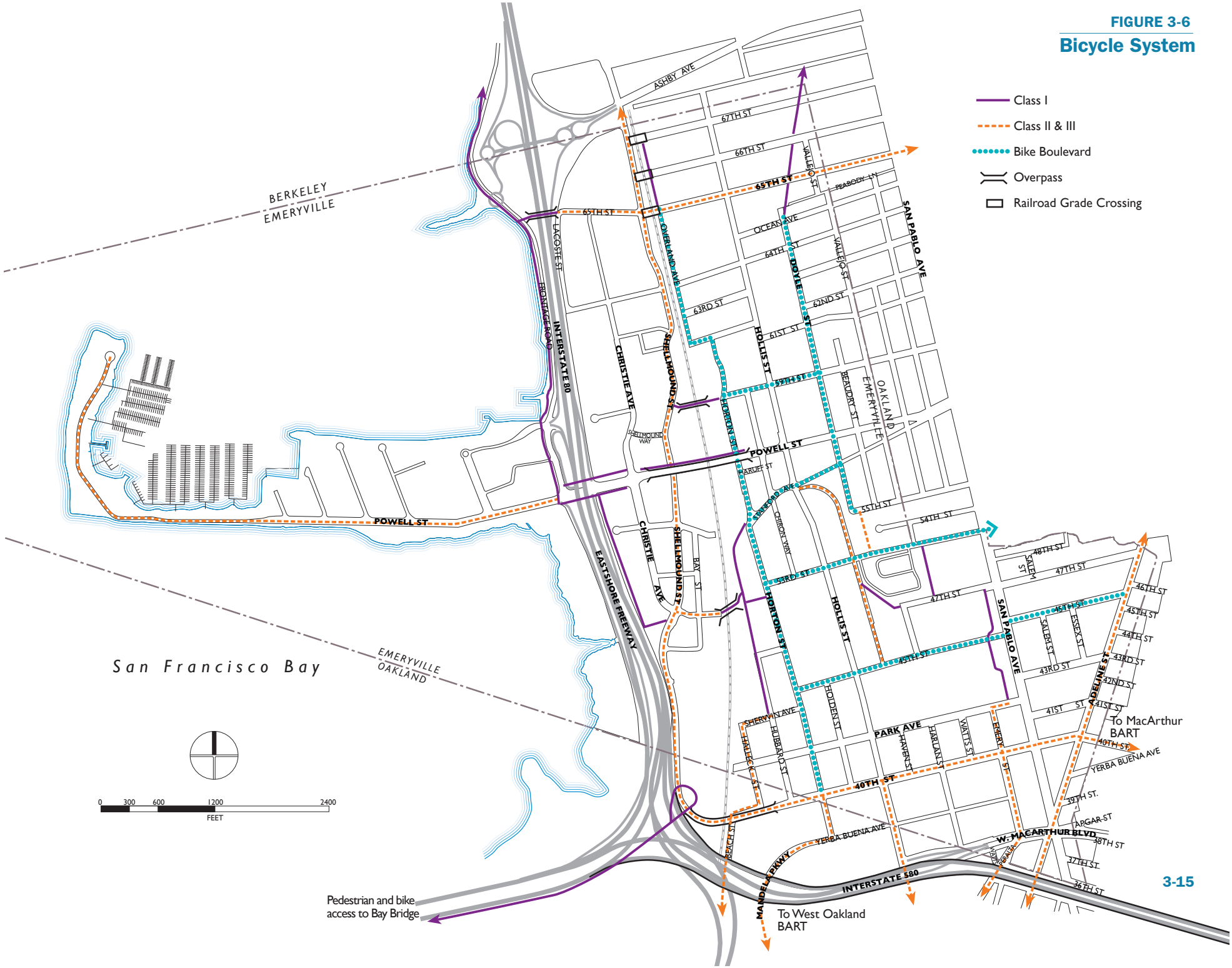
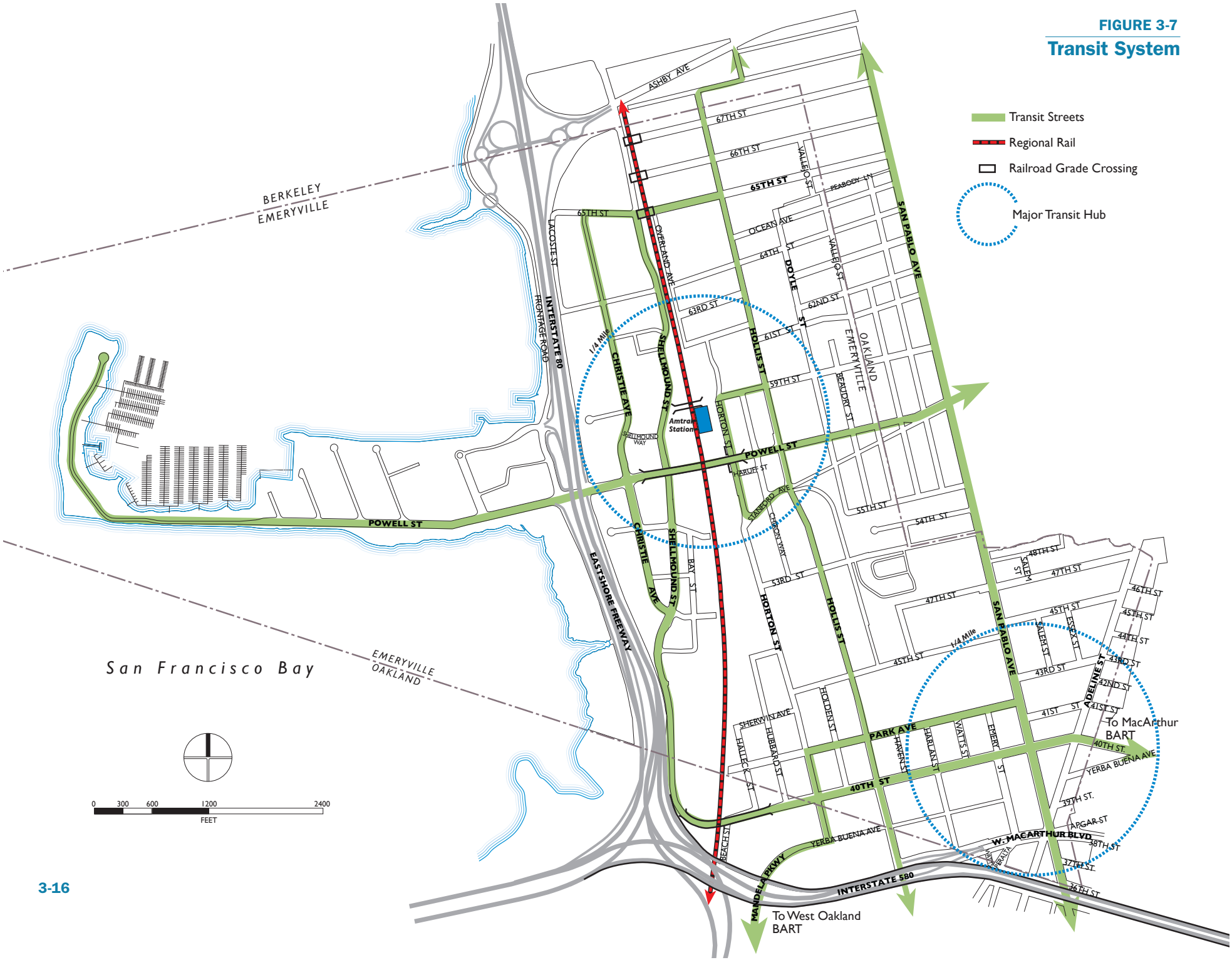


FIGURE 3-7

Transit System



tion, exclusive bus lanes, and "queue jump lanes" (lanes at intersections that allow buses to bypass traffic) will be used to give transit priority. Equally important, these streets will provide attractive, safe, and comfortable bus stops accessed by ample sidewalks with pedestrian amenities to encourage transit use. "Major Transit Hubs" are identified at the Amtrak station and the San Pablo Avenue/40th Street intersection. These are locations where a number of major transit routes intersect, and where high density "transit-oriented development" and enhanced amenities to promote transit ridership are appropriate. Other measures such as parking pricing (see Section 3-7) could increase the financial attractiveness of transit. Expanded service and increased frequency would also make transit more attractive.

Regional Rail

Figure 3-7 also identifies the regional rail line that runs north and south through the center of Emeryville. This historic rail corridor has served Emeryville for well over 100 years, and is the route for regional and transcontinental passenger and freight traffic. In September 2007, the Metropolitan Transportation Commission (MTC) adopted the 50-year Regional Rail Plan. Among other things, it proposes a new transbay tube between San Francisco and Oakland that would include both BART and conventional passenger rail tracks. This would allow the creation of new BART lines in the East Bay, as well as the direct connection of Caltrain, the Capital Corridor, and other commuter trains between San Francisco and the East Bay (although there are technical issues to be worked out with the type of rail equipment used in the tube). It would also allow future high-speed rail trains from Los Angeles to San Francisco to continue on to the East Bay.

While it is probably outside the time frame of this General Plan, a new transbay tube would provide an opportunity to develop a BART station in Emeryville at Powell Street, serving Bay Street, the Marketplace, Novartis, Emery Station, and surrounding hotels, shops, offices, and residents. It would also provide the opportunity for a direct commuter rail link between Sacramento and San Francisco via Emeryville.

In the more immediate future, the Regional Rail Plan identifies a need to expand the Union Pacific mainline to four tracks between Oakland and Martinez (through Emeryville), two serving passenger rail and two serving the increased freight traffic anticipated from the Port of Oakland. In conjunction with this, the Plan proposes "East Bay Express" train service between Pinole and Hayward. While this will allow for increased passenger rail service to Emeryville, the additional trains, especially freight, will bring noise, air pollution, and traffic disruption that will need to be mitigated. Fortunately, no additional rail right-of-way will be required.

Streetcars and Personal Rapid Transit

Streetcars and "Personal Rapid Transit" (PRT) have also been identified as a potential longer term enhancement to public transit service in Emeryville. Streetcars would operate both on city streets and on exclusive rights-of-way, similar to the systems recently developed in Portland, Oregon and many other cities, and would have stops at convenient locations throughout the city. PRT would consist of small vehicles operating above the streets with bypass tracks at each station, and would provide frequent and rapid point-to-point service between any two pairs of stations on demand. Such a system, built by the U.S. Department of Transportation, has been operating successfully since 1975 at the University of West Virginia in Morgantown. Another is under construction at London's Heathrow Airport.





Within the city, Emeryville is served by several public transit modes and agencies, including Amtrak regional rail (top) and the local Emery Go-Round (bottom).

3.7 PARKING

Emeryville currently has an abundance of free parking for residents, visitors, and workers, making driving an attractive alternative to taking public transit, walking or bicycling. In the past, zoning requirements have prescribed parking requirements by land use type, but have not allowed for appropriate off-sets to account for shared parking, transit availability, or to promote bicycling and walking.

Parking costs (including land, construction and maintenance) are substantial in Emeryville and may limit the type of redevelopment that can occur. Flexible parking standards combined with parking pricing of public spaces, works to ensure that appropriate parking supplies are provided and that revenue is generated to offset some of the parking costs. Appropriate materials, screening of parking in pedestrian priority zones, and other design considerations are discussed in Chapter 5: Urban Design. Policies in this section focus on providing sufficient parking for businesses and residents, while protecting adjacent neighborhoods and the environment, and using parking management as a means of encouraging the use of alternative modes of transportation to the automobile.



Currently, surface parking dominates many of the retail areas, supplying ample free parking, but creating consequences for pedestrian connectivity.



The harbor will continue to serve as a functioning marina.

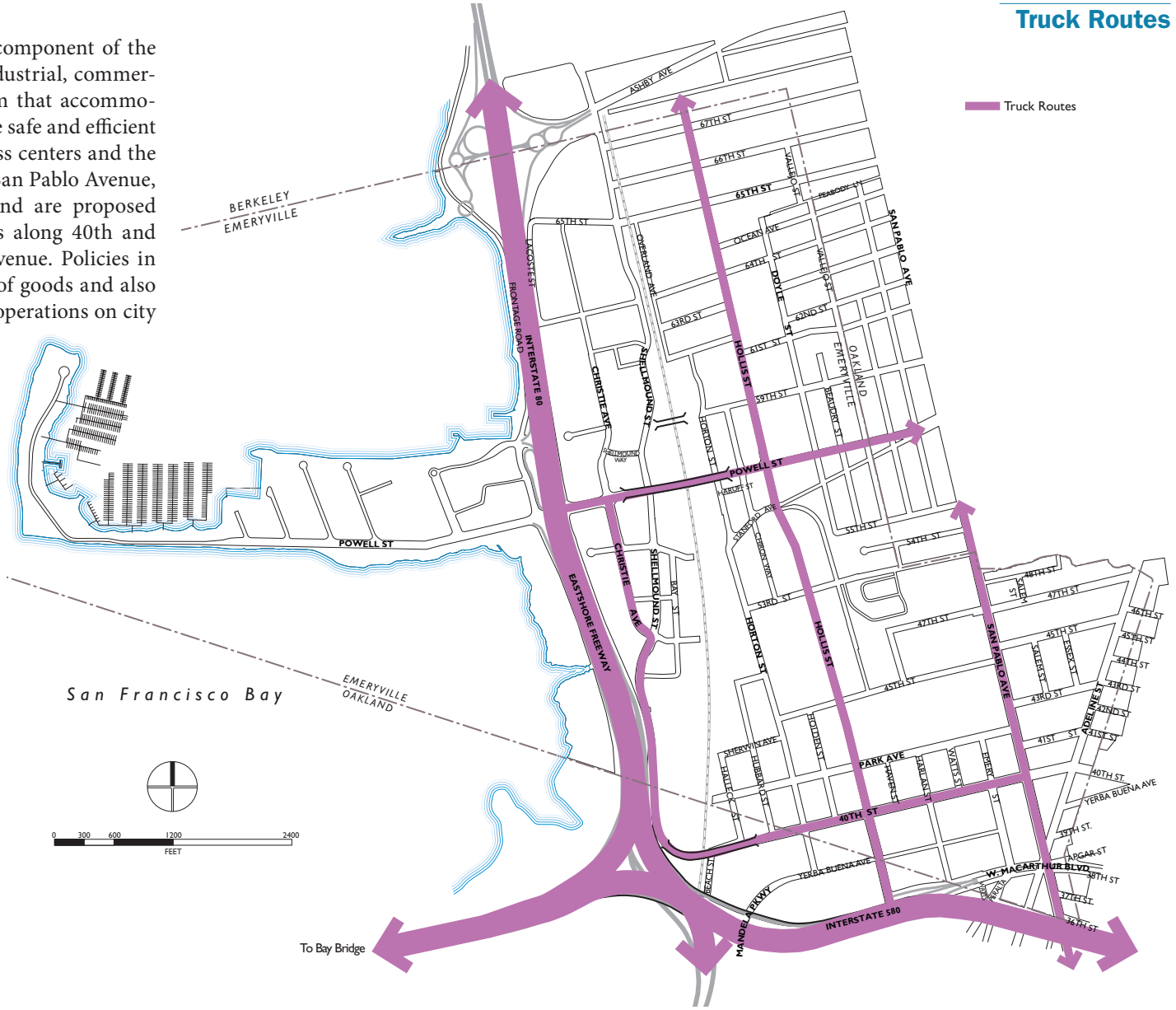
3.8 MARINA

The City of Emeryville's Marina area contains approximately 840 boat slips at the Emery Cove Yacht Harbor and Emeryville Public Marina. In addition, the Marina contains a fishing pier, boat launch, and restaurants, as well as the adjacent Watergate residential complex. There is no public ferry service from the Marina. No major changes are planned for the Marina area.

3.9 GOODS MOVEMENT

Goods movement is an important component of the city's circulation system, serving industrial, commercial, and retail uses. A street system that accommodates trucks is essential to ensure the safe and efficient movement of goods between business centers and the freeways. Trucks routes exist along San Pablo Avenue, Hollis Street, and Powell Street, and are proposed to serve regional retail destinations along 40th and Shellmound Streets and Christie Avenue. Policies in this section support the movement of goods and also seek to reduce the impacts of truck operations on city streets and adjacent land uses.

FIGURE 3-8
Truck Routes



3.10 TRANSPORTATION DEMAND MANAGEMENT

Transportation Demand Management (TDM) refers to a comprehensive strategy to reduce driving by promoting alternatives such as public transit, carpooling, bicycling, walking, and telecommuting. Many of the features that are incorporated into this Transportation Element are part of the City's TDM strategy, including:

- A street typology system that gives priority to alternate modes of travel, including the concept of complete streets.
- Pedestrian and bicycle facilities, including Safe Routes to Schools and safe routes to transit.
- Expanded and enhanced public transit service, including exclusive bus lanes, "fare free zones," and free transit passes.
- Traffic calming measures.
- Parking pricing, "unbundled" parking, parking "cash out," and reduced parking requirements for new development.

These measures are included in the plan for the city's physical transportation infrastructure and implementing actions such as zoning requirements and public transit operations. Additional TDM measures that could be undertaken by the City, private organizations, and employers, include:

- Carpooling and vanpooling: ride-matching services offered by larger employers or by organizations such as the Chamber of Commerce or the Transportation Management Association (TMA). It can be augmented by the provision of preferential parking at employment destinations.
- Car sharing and bicycle sharing programs: membership in a private organization such as Zipcar or City CarShare, where cars are available to members on demand at conveniently located "pods" for a nominal fee. The TMA operates several Zipcar pods in Emeryville. Bicycle sharing is a similar concept involving bicycles.
- Telecommuting, flexible work schedules, and alternative work schedules: Telecommuting involves working from home rather than commuting to an office. This can be facilitated by amenities in residential complexes such as business centers with copiers, fax machines, and Internet service. Sometimes employers provide such facilities to their employees who telecommute. Flexible work schedules and alternative work schedules provide alternatives to the standard "9 to 5" workday. These non-traditional schedules can reduce the number of work trips made during peak commute hours, thereby reducing overall traffic.
- Child care services are often a determining factor in employees' commute schedules. Conveniently located child care with variable schedules, either offered by employers or nearby institutions, can provide commuters with more flexibility in their daily routines. (See Section 4.3: Public Services and Facilities for additional child care policies.)

GOALS AND POLICIES

GOALS

OVERALL CIRCULATION SYSTEM

T-G-1 **A comprehensive transportation system—** A transportation system that is efficient, safe, removes barriers (e.g. accessibility near freeways and rail lines), and optimizes travel by all modes.

T-G-2 **Universally accessible—**A transportation system that meets the needs of all segments of the population, including youth, seniors, persons with disabilities, and low-income households.

T-G-3 **Multi-modal—**A transportation system that eliminates the necessity of owning and/or driving personal vehicles because of the availability of convenient and accessible alternative modes of transportation.

WALKING

T-G-4 **A walkable city—**A universally accessible, safe, pleasant, convenient, and integrated pedestrian system that provides links within the city and to surrounding communities, and reduces vehicular conflicts.

BICYCLING

T-G-5 **A safe, comprehensive, and integrated bicycle system—**A system and support facilities throughout the city that encourage accessible bicycling for all community members.

PUBLIC TRANSIT

T-G-6 **A safe, efficient, comprehensive, and integrated transit system—**A public transit system that allows for a reduction in automobile dependence for residents, employees, and visitors.

STREET SYSTEM

T-G-7 **A multi-functional street system—** A system that will ensure the safe and efficient movement of people, goods, and services and support a high quality of life and economic vitality.

PARKING

T-G-8 **A balanced parking supply system—** Parking supply that balances economic development, livable neighborhoods, environmental and energy sustainability, and public safety, while reducing dependence on the automobile.

GOODS MOVEMENT

T-G-9 **Safe and efficient movement of goods—** Goods movement that supports commerce and industry while maintaining a high quality of life.

MARINA

T-G-10 **An accessible functional harbor—**A harbor and marinas that are accessible to the rest of Emeryville and accommodate the needs of users.

TRANSPORTATION DEMAND MANAGEMENT

T-G-11 **Transportation demand management strategies—**TDM strategies that decrease single-occupant automobile demand and reduce vehicle miles traveled.

POLICIES

Implementing actions supporting each policy are described in Chapter 8: Implementation Program.

OVERALL CIRCULATION SYSTEM

T-P-1 The City's circulation plan shall be as set forth in Figures 3-1 through 3-8 and based on the typologies described in this chapter.

T-P-2 The design, construction, operation, and maintenance of city streets shall be based on a "complete streets" concept that enables safe, comfortable, and attractive access and travel for pedestrians, bicyclists, motorists, and transit users of all ages and abilities.

T-P-3 A "Quality of Service" standard that seeks to optimize travel by all transportation modes shall be developed and used to measure transportation performance. The City does not recognize "Level of Service" (LOS) as a valid measure of overall transportation operations, and sets no maximum or minimum acceptable LOS levels, with the exception of streets that are part of the regional Congestion Management Agency network. (These streets may change, but as of 2008 include San Pablo Avenue, Frontage Road, and Powell and Adeline streets). LOS shall not be used to measure transportation performance in environmental review documents or for any other purpose unless it is mandated by another agency over which the City has no jurisdiction (such as Caltrans, Berkeley, Oakland, and the Congestion Management Agency), and then it shall only be used for the purposes mandated by that agency.

T-P-4 Transportation planning shall be coordinated with emergency service providers to ensure continued emergency service operation and service levels.

T-P-5 The City encourages development that minimizes Vehicle Miles Traveled (VMT).

T-P-6 To the extent allowed by law, the City's Traffic Impact Fee shall include bicycle, pedestrian, transit, and road improvements so that development pays its fair share toward a circulation system that optimizes travel by all modes.

T-P-7 The City shall continue to study and evaluate appropriate traffic and transportation improvements.

T-P-8 Connections across the railroad and freeway shall be provided as noted in Figures 3-1 through 3-6. In addition the City will study, in collaboration with stakeholders and interested agencies and parties, additional pedestrian and bicycle connections across the freeway between the peninsula on the west and high density areas on the east.

T-P-9 The City will work with Caltrans and the City of Berkeley to develop improvements to the Ashby Interchange.

WALKING

T-P-10 The pedestrian circulation system shall be as set forth in Figure 3-4 and based on the typologies described in this chapter.

T-P-11 Sidewalks shall be provided on both sides of all streets; pedestrian connections between new and existing development is required.

T-P-12 The City will plan, upgrade, and maintain pedestrian crossings at intersections and mid-block locations by providing safe, well-marked crosswalks with audio/visual warnings, bulb-outs, and median refuges that reduce crossing widths.

T-P-13 Pedestrian routes will be provided across large blocks, pursuing creative options if necessary such as purchasing private alleys, designating pathways through buildings, and acquiring public access easements.

T-P-14 Establish Pedestrian Priority Zones in Neighborhood Centers, around schools, and in other locations as indicated in Figure 3-4, where wider sidewalks, street lighting, crosswalks, and other pedestrian amenities are emphasized. Link these zones to adjacent land uses to ensure that building frontages respect pedestrians and truck loading takes place on adjacent streets wherever possible.

T-P-15 Walking will be encouraged through building design and ensure that automobile parking facilities are designed to facilitate convenient pedestrian access within the parking area and between nearby buildings and adjacent sidewalks. Primary pedestrian entries to nonresidential buildings should be from the sidewalk, not from parking facilities.

T-P-16 Safe pedestrian walkways that link to streets and adjacent bus stops will be required of new development.

T-P-17 The City will require new development to minimize the number and width of curb-cuts for vehicle traffic to reduce vehicle conflicts with pedestrians.

T-P-18 The City will study, in collaboration with stakeholders and interested agencies and parties, the feasibility of a pedestrian/bicycle trail along the west side of I-80, east of the Emeryville Crescent, to provide access from the Bay Trail to the eastern span of the Bay Bridge.

T-P-19 Following completion of the new east span of the Bay Bridge, the west span should be retrofitted with a pathway to provide continuous pedestrian and bicycle access between San Francisco and the East Bay.

T-P-20 Safe and direct pedestrian access to Aquatic Park and the peninsula will be provided and maintained.

BICYCLING

T-P-21 The City will develop the bicycle circulation system set forth in Figure 3-6 and based on the typologies described in this chapter.

T-P-22 The City's preferred Bay Trail route through Emeryville is set forth in Figure 3-5, including the main trail between Frontage Road in Berkeley and Mandela Parkway in Oakland, and spur trails to the Marina along Powell Street and to the Bay Bridge along the east side of Interstate 80.

T-P-23 On-street bike routes in the City's Bicycle and Pedestrian Plan shall be designated as either Class II (bike lanes) or Class III (signed routes without lanes), as appropriate. These designations are not part of the General Plan and may be changed as circumstances dictate.

T-P-24 Safe, secure, and convenient short- and long-term bicycle parking shall be provided near destinations for all users, including commuters, residents, shoppers, students, and other bicycle travelers. Retail businesses in regional retail areas are encouraged to provide valet bicycle parking.

T-P-25 A numbered bike route system with destination signs, consistent with the regional bike route numbering system shall be developed and implemented with clear signage to bicycle boulevards.

T-P-26 Bicycling will be promoted through public education, including the publication of literature concerning bicycle safety and the travel, health and environmental benefits of bicycling.

PUBLIC TRANSIT

T-P-27 The public transit system will be as set forth in Figure 3-7 and based on the typologies described in this chapter.

T-P-28 Existing public transit to BART, Amtrak, and regional destinations will be supported, and transit within Emeryville for residents, workers, and visitors will be promoted.

T-P-29 The City supports transit service on all Transit Streets, as shown in Figure 3-7. This includes Powell Street to the Marina and east of Hollis Street to the Ashby BART station and downtown Berkeley; Park Avenue west of Hollis Street; and Adeline Street.

T-P-30 The City will undertake a study to enhance transit mobility, including feasibility of transit-only lanes (dedicated, peak-hours only/shared with automobiles at other times, or converted from parking lanes to transit-only during peak hours), especially along congested tran-

sit streets, to provide walking access from most of the city, and connect major destinations within Emeryville and to BART.

T-P-31 The City will develop and implement transit stop amenities such as pedestrian pathways approaching stops, benches, traveler information systems, shelters, and bike racks to facilitate transit stops as place-making destinations and further the perception of transit as an attractive alternative to driving.

T-P-32 Transit stops will be sited at safe, efficient, and convenient locations, and located appropriately within the right of way.

T-P-33 The City supports transit priority on Transit Streets through features such as traffic signal priority, bus queue jump lanes at intersections, exclusive transit lanes, and other techniques as appropriate, with adjustments to technology as conditions change.

T-P-34 The City will continue to support free and/or subsidized transit for both local travel within the City and travel to the regional hubs located at the Amtrak Station, the MacArthur BART station, and San Pablo Avenue at 40th Street.

T-P-35 The City will support the expansion of the Emery Go-Round to accommodate workers, residents, and visitors.

T-P-36 The City supports Transit-Oriented Development with reduced parking requirements, and amenities to encourage transit use and increase pedestrian comfort around the Major Transit Hubs at the Amtrak station and the 40th Street/San Pablo Avenue intersection.

T-P-37 The City will advocate for frequent, direct transit service to all points in Emeryville, especially between the east and west sides of town.

T-P-38 The City encourages Amtrak to allow local travel on Amtrak buses that provide service from Downtown San Francisco to the Emeryville Station.

T-P-39 The City will advocate for AC Transit to provide frequent, direct, two-way service between downtown San Francisco and various points within Emeryville.

T-P-40 The City will investigate and implement, if appropriate, fixed guideway transit systems, such as streetcars or personal rapid transit (PRT).

T-P-41 The City supports a new BART line in the East Bay that includes service to Emeryville along the existing regional rail corridor with a stop at Powell Street.

T-P-42 The City will advocate (in the short term) for BART to rename the MacArthur BART station to "North Oakland/Emeryville" to more accurately reflect the station's market area and to help promote awareness of transit service to Emeryville.

T-P-43 The City supports an additional transbay tube that provides for direct commuter rail service between Sacramento and San Francisco via Emeryville.

T-P-44 The City supports grade-separated crossings and other appropriate measures to mitigate the impacts of increased rail traffic on Emeryville, including noise, air pollution, and traffic disruption.

STREET SYSTEM

T-P-45 The street system will be created as set forth in Figure 3-2, and based on the typologies described in this chapter.

T-P-46 Private developments and major public infrastructure projects will provide adequate rights-of-way for all modes of transportation.

T-P-47 The City supports "traffic calming" and other neighborhood traffic management techniques to enhance the quality of life within existing neighborhoods and to discourage through-traffic on bicycle boulevards and local streets.

T-P-48 The City will establish equal priority to bicycles and public transit (and discourage through-traffic by other modes) on streets in the vicinity of the Amtrak sta-

tion that are designated as both Transit Streets and Bicycle Boulevards.

PARKING

T-P-49 Quality of life and business viability will be promoted by maintaining an adequate supply of parking to serve growing needs, while avoiding excessive supplies that discourage transit ridership and disrupt the urban fabric.

T-P-50 Public garages will be provided strategically, in locations convenient and proximate to eventual destinations.

T-P-51 The City supports parking supply and pricing as a strategy to encourage use of transit, carpools, bicycles, and walking.

T-P-52 Flexible parking standards are encouraged that reflect calculated parking demand for proposed land uses and that allow for appropriate offsets to reduce parking demand and encourage walking, bicycling, carpooling, and transit use.

T-P-53 Employers are encouraged to offer "parking cash out", whereby employees who choose not to drive are offered the cash value of any employee parking subsidy, to be used towards commuting to work by other means.

T-P-54 The City supports public parking strategies, such as variable pricing for on-street and off-street public parking and public use of private garages, to maintain a parking space utilization goal of 85 percent.

T-P-55 The City supports the use of parking revenues within "parking benefit districts" to consolidate public parking, enhance non-motorized connections between parking and land uses, and improve security and the physical environment of the districts.

T-P-56 The City supports shared parking between multiple uses to the extent possible, and will encourage private property owners to share their underutilized off-street parking resources with the general public.

T-P-57 The land area devoted to parking shall be reduced by supporting innovative technologies such as parking lifts and automated parking.

T-P-58 The City supports the expansion of the Residential Permit Parking (RPP) program to ensure adequate parking availability in residential areas, recognizing the need for adequate parking to support neighborhood businesses.

T-P-59 Development will be required to "unbundle" parking spaces from lease payments and condominium purchases, so that property lessees and buyers can choose whether to pay for parking spaces.

GOODS MOVEMENT

T-P-60 Truck freight movement will be accommodated between the freeway system and Emeryville's regional shopping destinations along 40th Street and Shellmound Street, consistent with the typologies described in this chapter.

T-P-61 Truck freight movement will be accommodated to and from local businesses, consistent with the typologies described in this chapter. Through truck traffic is discouraged.

T-P-62 Provide adequate off-street loading areas in large commercial, industrial, and residential developments that do not conflict with pedestrian, bicycle, transit, or automobile movements.

MARINA

T-P-63 The City supports marina and harbor operations and connections to these uses.

TRANSPORTATION DEMAND MANAGEMENT

T-P-64 The City will work with local, regional and state agencies, the Chamber of Commerce, and the Transportation Management Association, as well as employers and residents, to encourage and support programs that reduce vehicle miles traveled, such as preferential carpool parking, parking pricing, flexible work schedules, and ridesharing.

T-P-65 Employers in large new developments will be required to implement comprehensive TDM programs for their employees and customers.

T-P-66 The City supports and encourages the expansion of car-sharing programs in Emeryville.

T-P-67 The City supports and encourages conveniently located child care services with flexible hours.



4 PARKS, OPEN SPACE, PUBLIC FACILITIES, AND SERVICES

Parks, open space, public facilities, and services are a vital part of a livable, sustainable Emeryville. While they are essential in any city, they become even more important in areas of high population density and development intensity. Where homes may not include yard space and landscaping is scarce, green spaces provide opportunities for relaxation, informal sports, passive and active recreation, social and cultural events and a break from the stresses of everyday life.







The General Plan proposes several new open spaces, complementing existing parks, and providing new open space opportunities for existing and future residents.

They also serve as important gathering places in a community. Due to its industrial past, Emeryville has minimal parks and open space. Public facilities and services provide for community needs and amenities for education, social services, and public safety. As the residential and employment populations increase, it is essential to seize every opportunity to create additional parks and open space, and to provide public facilities and services that meet the needs of the community.

As a small incorporated city, Emeryville is able to provide high ratios of public services for its residents with a local orientation, personal attention, and quick responses. However, its small population and constrained geography limits its ability to locate and financially support the broad range of amenities found in larger cities. This chapter reviews the public facilities supplied in the City of Emeryville, including schools, libraries, safety services and other civic facilities, as well as major utility infrastructure systems.

The General Plan addresses two main issues concerning open space provisions: a shortage of park and recreation space, and a lack of accessibility—since most of the existing parkland is concentrated along the shoreline on the western portion of the city.

4.1 PARK AND OPEN SPACE SYSTEM

Framework

The General Plan proposes several different park types to accommodate the needs of present and future residents, workers, and visitors and to create a cohesive network of open spaces. The proposed strategic master plan will outline recommended programming for both active recreation and passive park use. A general framework is described here:

- **Large parks.** Two large parks north and south of Powell Street, are proposed to provide playing fields and other active uses, such as children's play structures and recreation activities.
- **Small open spaces.** Public pocket parks, plazas, tot lots, community gardens and other small open spaces throughout the city will improve residents' access to open space nearer their homes.
- **Greenways.** Two greenways will traverse the city, one north-south and the other east-west. To the extent possible these will be off-street linear parks with pedestrian and bicycle paths, small gathering places, and recreational facilities. Where necessary, the greenways may be along streets. The north-south greenway will follow old railroad spurs, and will connect Berkeley in the north to the Park Avenue District, Bay Trail, and West Oakland in the south. The east-west greenway will generally follow the alignment of Temescal Creek (currently in an underground pipe) and will include water features, daylighted portions above the culverted creek, and other amenities to celebrate the creek. This greenway will connect North Oakland in the east to the Bay Trail and San Francisco Bay in the west.

- **Green Streets.** To improve connectivity between neighborhoods, parks, employment and other activity centers, and to increase the provision of open spaces, a network of "green streets" is established. Green streets are distinguished by elements such as additional trees and plantings, wide sidewalks, pedestrian pathways and public art. This network builds on the greenways to improve connectivity along key streets.

The extent, capacity, and quality of public facilities that serve a community also affect the quality of life enjoyed by those who live, work, and own property there. The proposed Emeryville Center of Community Life will serve as the focal point for community gathering and social services. In addition to new school facilities, the Center may include gymnasiums, a theater, a library, a dance/fitness studio, playing fields, playgrounds, open space, aquatic facilities, and other community facilities.

Together, a cohesive network of open spaces and public amenities will help to create a more vibrant and livable Emeryville.

Existing Park and Recreation System

City Parks and Open Spaces

Emeryville has greatly improved the number, acreage, accessibility, and diversity of its park and recreation assets in recent years; however, these facilities fall short of the needs of the city's expanding population. As shown in Table 4-1, in 2008, Emeryville contained 15 acres of public open space in eight City-owned parks. Most of the municipal parks are small open spaces, such as the .14-acre 61st Street Mini-Park, which provides a playground area for neighborhood children. A majority of city parkland is concentrated in Marina Park on the peninsula and is not easily accessible to the majority of the city's population, who live east of Highway 80.

The City has been developing the Emeryville Greenway—a series of pedestrian and bike paths intended to provide more connectivity within the city. Once completed, this north/south Greenway will link the northeastern residential neighborhoods and new residential developments throughout the city with open spaces and activity centers. It will be complemented by the new east-west Temescal Creek greenway envisioned by this General Plan.

The City also has a lease agreement with Emery Unified School District to use the sports and aquatic facilities at Emery Secondary School during non-school hours. The Community Services Department offers classes, sports programs and activities in these facili-





Christie Park is small, but provides much needed green space in an area of increasing intensity and usage. It is slated to be enlarged and redesigned as part of the Marketplace Redevelopment Project.



TABLE 4-1: CITY OF EMERYVILLE EXISTING PARKS & RECREATION FACILITIES

Park/Open Space	Play Equipment	Sports Facilities	Acreage
CITY PARKS			
61st Street Mini-Park	X		0.14
Christie Avenue Park			0.79
Community Garden			0.29
Davenport Mini-Park			0.44
Hollis Green[1]			0.69
Marina Park			7.56
Point Emery			2.08
Shorebird Park			0.76
Stanford Avenue Park	X	X	1.74
Temescal Creek Park	X	X	0.70
OTHER OPEN SPACES & RECREATION FACILITIES			
Anna Yates Elementary Playground	X		n/a
Eastshore State Park (Emeryville Crescent)			n/a
Emery Secondary Field		X	n/a
Emeryville Recreation Center		X	n/a
Emeryville Greenway		X	n/a
San Francisco Bay Trail			n/a
Total[2]			**15.19**

[1] Owned and operated by Novartis, but open to the public.
[2] Linear parks, including the Greenway and Bay Trail, and conservation areas, such as the Eastshore State Park are not included in park totals.

Source: City of Emeryville, 2008.

ties. In addition, Emeryville is a member of the Joint Powers Authority for the Tom Bates Regional Sports Complex about three miles north in Berkeley.

State and Regional Parks and Open Spaces

State and regional open spaces provide larger green spaces that connect to adjacent communities. The Eastshore State Park constitutes about 2,250 acres of uplands and tidelands along the shoreline of Oakland, Emeryville, Berkeley, Albany, and Richmond, providing a prime location for bird watching and aquatic wildlife preservation. Emeryville's portion—the Emeryville Crescent—contains 30 acres of marsh shoreline and is identified as Conservation Area. The San Francisco Bay Trail runs through the Emeryville Crescent; this regional trail system will encircle the entire Bay once completed. The Trail runs along or near the Emeryville coastline, with a dedicated off-street pathway on and north of the peninsula, but a disconnected segment in its southern half.

Supply and Distribution

Existing City-operated open spaces represent a ratio of 1.56 acres per 1,000 residents (based on 15.19 acres and a 2008 population of 9,727 according to the California Department of Finance). The majority of the City's developed parkland is concentrated to the west of the railroad tracks, with 10.8 acres on the peninsula, making up over 70 percent of City-owned park space. All of the City's recreation facilities, however, are located on the eastern side of Emeryville: basketball courts, recreation fields, and children's play equipment are located east of Doyle Street. A new park is being constructed in the block bound by 61st, 62nd, Hollis and Doyle streets.

Improvements

Open Space System

The General Plan proposes several different park types to accommodate the needs of present and future residents and to create a cohesive network of open spaces: two new large parks, several new pocket parks and small plazas, two greenways, and a series of green streets connecting major activity centers. These proposed park and recreation facilities—which total to between 41 and 46 acres—are described in Table 4-2 and shown on Figure 4-1. The small parks are identified with circles; actual sites will be identified during the planning period.

TABLE 4-2: GENERAL PLAN PARK ACREAGE

Park Type	Acreage
EXISTING PARKS	**15.2**
PLANNED PARKS	**1.3**
Horton Landing Park	
Oak Walk Pocket Park	
PROPOSED PARKS	
Neighborhood Parks	20 to 25
61st/64th/Hollis/Doyle	*8*
53rd/Hollis	*5*
Small Parks (up to 13)	*7 to 12*
GREENWAYS	
Emeryville Greenway	1.5 miles
Temescal Creek Greenway	1 mile
OTHER PARKS	**5**
Plazas and community gardens	
Total Parks[1]	**41 to 46**

[1] Linear parks, including the Greenway and Bay Trail, and conservation areas, such as the Eastshore State Park are not included in park totals.

Source: City of Emeryville, Dyett & Bhatia 2008.







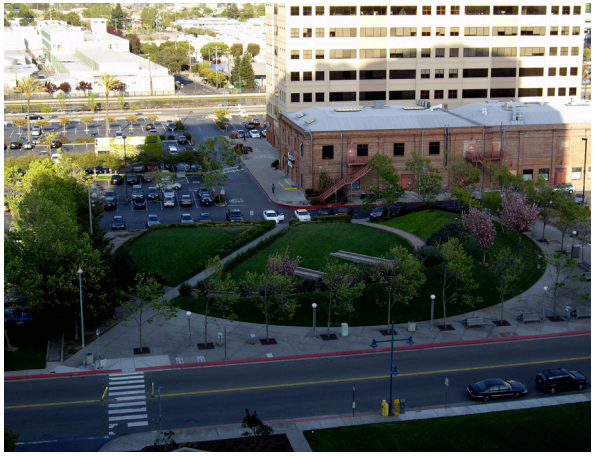




New open spaces will include areas for active recreation as well as facilities for passive activities and contemplation.

SUMMARY OF OPEN SPACE STANDARDS

- Develop 3 acres of parkland per 1,000 new residents
- Develop .25 acres of parkland per 1,000 new employees
- Locate at least one park within a five-minute walk of all residences



Park siting is essential to avoid shading by tall buildings (above).

Standards

The General Plan establishes a new standard for parkland of three acres of neighborhood parks per 1,000 new residents and .25 acres per 1,000 new employees. Using this standard, the City would need to provide 22 acres of new parkland in order to accommodate the additional 6,500 residents and 10,000 employees expected by the end of the planning period. The General Plan proposes 22 to 25 acres of new neighborhoods parks, as well as approximately five acres of other open space (including plazas and community gardens), thereby meeting the standards set here. Moreover, the City would gain more parkland per capita for all if its residents, not just new arrivals. In total, existing, planned and proposed parks would result in 41 to 46 acres of City-owned parkland, plus the Greenways, green streets, and other trails. This total represents a ratio of 2.5 to 2.8 acres per 1,000 residents.

Although the amount of parkland is an essential component to creating a vital network of open spaces, the quality and accessibility of these spaces are equally important elements. A city should have parks with a distribution and form that allows them to be enjoyed by workers during the day, used by children and senior citizens close to their homes, and to serve as a point of focus for residential neighborhoods. The General Plan seeks to provide a network in which there is an open space accessible within a five-minute walk of each resident's home. To achieve this goal, generalized park locations have been identified throughout the city, where a deficit has been noted within existing and proposed neighborhoods.

4.2 SCHOOLS AND EDUCATION

This section describes educational facilities in the City of Emeryville, including schools, libraries, and other civic facilities. Emeryville houses two public schools serving Grades Kindergarten through 12, the Pacific Rim International School serving 90 students from Pre-School through Grade 6, and three other institutions of higher education and learning. Additionally, this section highlights the Emeryville Center of Community Life as a major public facility investment for the near future.

Emery Unified School District

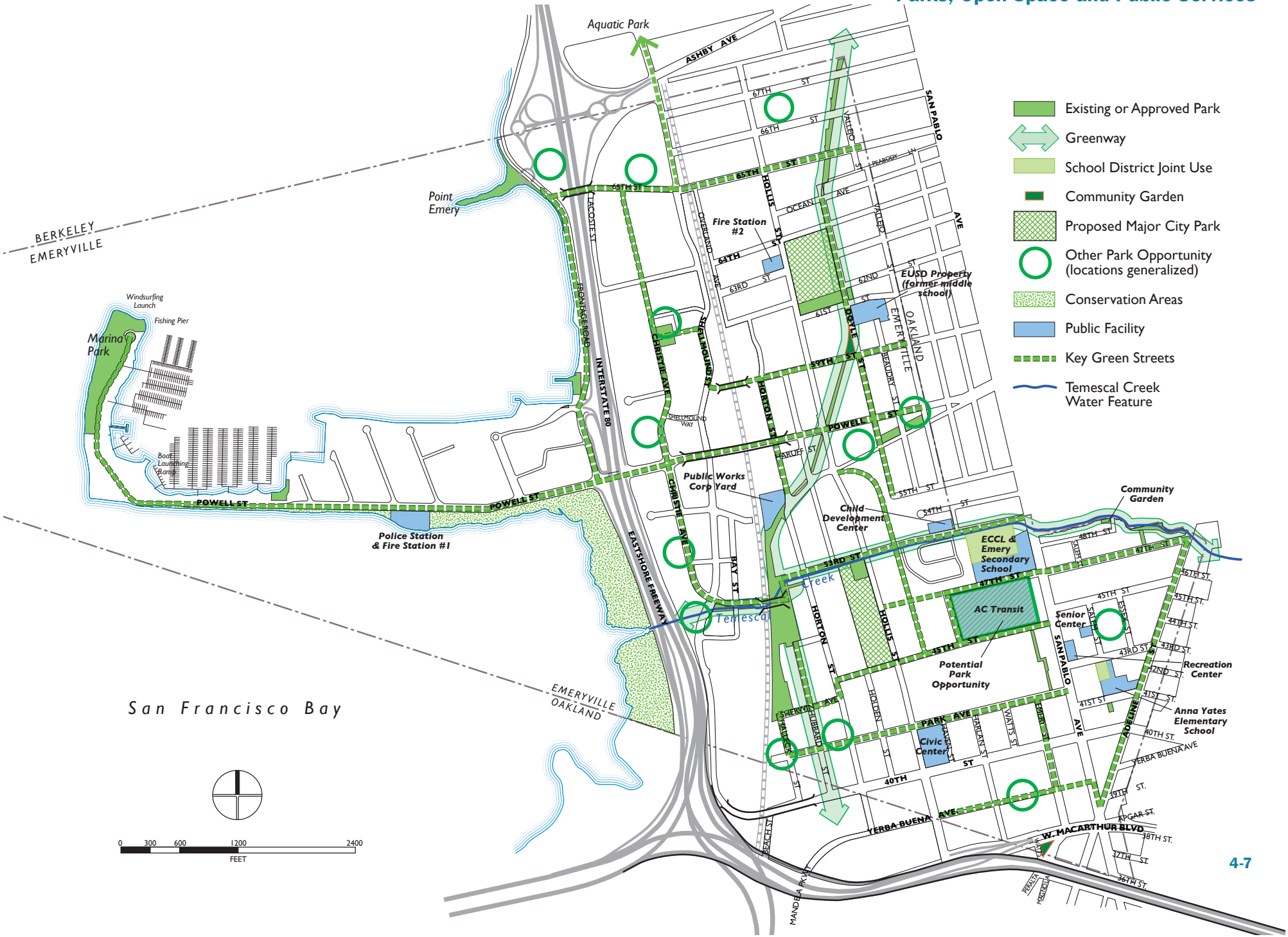
Current Enrollment & Capacity

The city boundaries are aligned with a single public school district, Emery Unified, which runs two schools: Anna Yates Elementary School (Kindergarten–Grade 6) and Emery Secondary School (Grades 7–12). Emery Unified owns an additional property at 1275 61st Street, previously called the Ralph Hawley School and prior to that, the Emery Middle School Academy. It ceased regular school operations in 2003.

Emery Unified is a small school district and is likely to remain so during the General Plan period. As of the 2007–2008 school year, Emery Unified served 822 students. Both Anna Yates Elementary and Emery Secondary are located on the Emeryville/Oakland border within the 94608 zip code area. Approximately 40 percent of the district's students live outside the school district boundaries. Of those, 85 percent reside within the 94608 zip code. Students who live outside of Emeryville must apply for an inter-district transfer each academic year. Priority is given to returning students, their siblings, and to students whose parents or guardians are employed in Emeryville.

FIGURE 4-1

Parks, Open Space and Public Services







The Emery public schools are Annie Yates Elementary (top) and Emery Secondary (bottom). These schools will be consolidated and integrated into the Emeryville Center of Community Life.

As enrollment of Emeryville residents either increases or decreases, the percentage of students accepted through the inter-district transfer process is adjusted. This flexibility has aided the City's small public school district in maintaining stable class sizes across all grade levels.

Funding

The Emery Unified School District experienced a major fiscal turn-around between 2000 and 2008, helped by several public measures. In 2001 the California Legislature passed AB96, a state takeover with a $1.3 million emergency loan to Emery Unified. In 2002, the City signed a $1.5 million, 40 year agreement with the school district to lease Emery Secondary School's sports facilities during non-school hours. In 2003, Emeryville voters approved a parcel tax to help its schools thrive. On July 1, 2004, full control was restored to the district. Emeryville voters agreed to an expanded parcel tax in 2007 with those funds allocated to strengthen the academic curriculum and/or programs in the following essential areas: school libraries, wellness initiatives, counseling, tutoring and mentoring, technology supports, English language development, professional development and teacher recruitment/retention. Additionally, the district is supported by resources from federal, state, and private foundation sources. In particular, the Emery Education Fund, a local non-profit organization supported by the Emeryville Chamber of Commerce and others, raises private donations for a variety of school programs, teacher mini-grants, and student scholarships.

Projected Enrollment

Projecting student enrollment over the life of the General Plan helps to determine the need for new school facilities over time. Emeryville's population is expected to increase by nearly 7,000 residents over the life of the Plan. As the population ages at the county and state level, the proportion of school-age children is expected to decline despite an actual increase in school-aged residents. Adjusting enrollment based on this factor results in a projection of approximately 1,200 students by 2030—an increase of nearly 400 students. According to a 2008 study, this is a high estimate for potential future enrollment.[1]

The retention of students and their families who can no longer afford to live in the city remains a concern. Emery Unified recognizes the need for an increase in affordable family friendly (3+ bedroom) housing.

Planned Improvements

The future of the Emery Unified School District's facilities is tied to the development of the Emeryville Center of Community Life described in the next section. According to the Center's 2009 Master Plan, the Center of Community Life will accommodate 800-900 students in Grades Kindergarten through 12 with the ability to expand to serve 1,200 students—enough capacity to accommodate the projected enrollment in 2030.

It is further anticipated that the need for services for children aged 0-5 and their families will increase during this period of increased enrollment in grades Kindergarten through 12. The need to serve preschool-aged children in pre-kindergarten programs is likely to increase. Adjunct facilities may need to be utilized to serve the above population including the current Anna Yates Elementary School site once the K-6 program is relocated to the Emeryville Center of Community Life.

1 *Emery Unified School District Demographic Trends and Forecasts" Presentation by Shelley Lapkoff, Ph.D., Lapkoff & Gobalet Demographic Research, Inc., June 4, 2008.*

Anna Yates Elementary School was partially renovated and expanded in 2008, increasing its capacity to serve students and programs. Although the existing school facilities throughout the district have been adequately maintained over many years of use, they have exceeded their "useful life" period and are now in need of major repair and updating or replacement. Additionally, the existing facilities present significant challenges to operating current programs in spaces designed fifty or more years ago. And finally, the existing building systems are outdated and present obstacles to owning and maintaining a safe, efficient, energy-conscious set of facilities.

Higher Education

Emeryville lies within a region that is rich with higher learning opportunities. With the University of California-Berkeley, located just a few miles away, Emeryville has access to the academic and cultural resources of one of the top college campuses in the country. In addition, the Peralta Community College District, with campuses in Berkeley and Oakland, as well as California State University-East Bay, in Hayward, provide high-quality opportunities for post-secondary degrees and lifelong learning.

Moreover, there are several institutions within Emeryville that provided specialized higher education opportunities. Ex'pression College for Digital Arts, an accredited school founded in 1999, offers bachelor degrees in animation, gaming, motion graphic design and sound arts. The campus is located in northwest Emeryville, on Shellmound Street, between 65th and 66th streets. In 2007, Ex'pression expanded its classroom facilities, resulting in about 78,000 square feet of space. In the 2007-08 academic year, Ex'pression had 1,300 actively enrolled students.

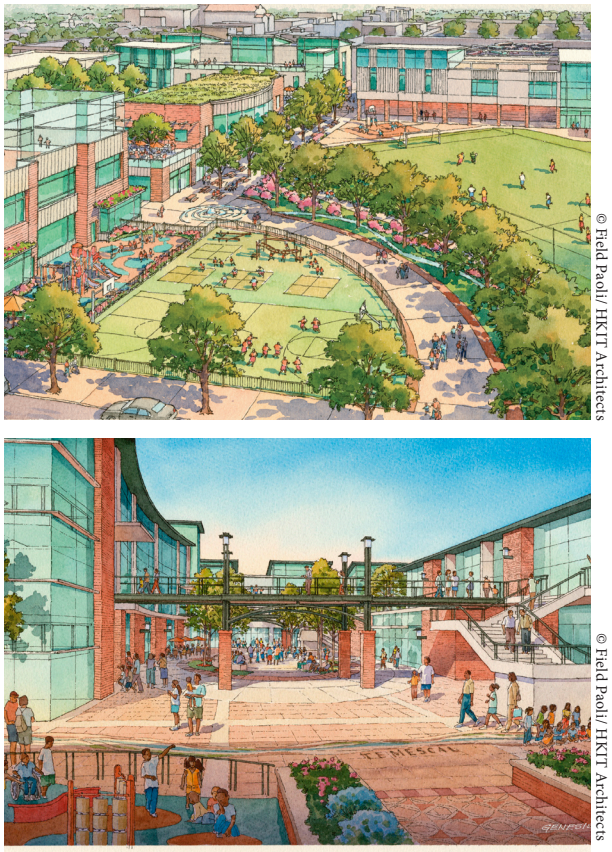
Western Career College (formerly Silicon Valley College) is an accredited private school that offers certificate and associate degree programs in the medical, pharmacy, criminal justice and graphic design fields. It has nine campuses in the Bay Area, including one in the Public Market office tower on Shellmound Street. As of 2008, about 200 students are enrolled at the Emeryville campus.

The National Holistic Institute is a massage therapy school that trains students in massage technique, theory, and career development, preparing students for the national certification exam. The campus is located at 59th and Hollis streets.

Emeryville Center of Community Life

The concept of a Center of Community Life is a once in a lifetime opportunity to combine City and School programs in a state-of-the art facility to be shared by the City of Emeryville and Emery Unified School District. It is central to the City's focus on building and supporting a healthy and vibrant community in Emeryville. Although the School District and the City are separate government entities, the City of Emeryville and Emery Unified have had a close working relationship in recent years. The Center will consolidate grades pre-Kindergarten through 12, and house joint-use facilities for arts, performances, classes, meetings, community programs and services, recreation (indoor and outdoor), and administration.

The goals for the Center include: improving quality of life within Emeryville's dense urban setting; providing a social and community resource; turning the city's public schools into the center of the community through physical and social integration; and providing a place for the mixing of all the lifestyles, ages, and races that make up the Emeryville commu-



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Concepts for the proposed Emeryville Center of Community Life.



The City's public services are essential to maintaining a high quality of life for residents. Municipal services are consolidated in City Hall.



The Emeryville Child Development Center provides market rate and subsidized child care services.

nity. Through several years of public meetings, the Emeryville community has also identified key themes to incorporate into the Center: connections to the community; access to facilities and programs; active engagement of the community in these programs, and the expression of an identity for Emeryville.

Initially the concept involved the Emery Secondary School site, and expanding across 47th Street to occupy the AC Transit facility. Due to acquisition and clean up costs, and the potential to build "up" rather than "out," it was determined to build the Center at the current Emery Secondary School site. Usable parts of the current School/District complex will be retained, but the vast majority of buildings will be demolished and replaced by higher structures built around a central courtyard, with flexibility to expand further in the future if enrollment increases.

Phase I of the process, which will be completed by the spring of 2009, involves the creation of a Master Plan for the Emery Secondary School site. While there will be separation of grades for security and safety purposes, there will also be many common areas for sure by all students, as well as the entire Emeryville community. Community services and recreation programs provided by or through the City will also make use of flexible space to maximize community-wide uses, participation, and involvement. Phase II involves construction of these community recreation and educational facilities, anticipated for completion in 2013 or 2014. This process is being overseen by the City/Schools Committee. The Center will come to fruition during the life of this General Plan.

Libraries

There are no public libraries in Emeryville. The Oakland Public Library's Golden Gate Branch, located just outside the city limits on San Pablo Avenue near Stanford Avenue, serves as the main circulation library for Emeryville residents. The Emeryville Secondary School and Anna Yates Elementary School each include a library for use by students. The Emeryville Center of Community Life may include a library, although it would likely focus on serving public school students and would not replace the Golden Gate Branch as the City's main library facility.

Other Community Facilities

Civic Center

Located in the block bounded by Park Avenue and Hollis, Haven, and 40th streets, the Civic Center consists of the historic Town Hall building and an addition completed in 2001. The 1.4-acre Civic Center area is used for City business as well as public meetings. A former industrial building behind Old Town Hall has been purchased by the Redevelopment Agency to be developed as an arts and cultural center. As of 2008, a feasibility study has been completed and a strategic plan is being prepared to determine facility requirements for potential user groups. Design work is expected to be prepared in 2009, construction to begin in 2010 and the completed center to open in 2011.

Emeryville Senior Center

The Senior Center serves older adults from its location in the Triangle neighborhood. It provides services, including meals and financial counseling, and activities for seniors. The American Legion also maintain offices in the Center. Like the rest of the Bay Area and the county as a whole, Emeryville's population is aging. Between 1990 and 2005, the median age in the

city grew slightly from 34.3 to 35.2 years. The population cohort that increased the most over this period was the group between 45 and 60 years old. The City's Commission on Aging has developed a strategic plan for senior facilities and services to accommodate the needs of this growing demographic.

Recreation Center

The City's Recreation Division of the Community Services Department offers classes and programs for children and adults. Located on San Pablo Avenue at 43rd Street, it is near the recreation facilities at Emery Secondary School and the open space at Temescal Creek Park. This location is temporary and once the ECCL is complete operations will be relocated to that site.

Child Development Center

Quality early child care and education can have a positive effect on children's learning and on parents' ability to work and earn income. In addition to family day care homes and public and private centers, the Emeryville Child Development Center (ECDC), located at 1220 53rd Street, offers specific programs for infants, toddlers and preschoolers from age four months to five years. ECDC also provides family support programs through parenting workshops, support groups, and partnerships with multiple service providers.

4.3 PUBLIC SERVICES AND FACILITIES

Public Safety

Police Services

Profile

Emeryville has one police station, adjacent to Fire Station #1 on Powell Street on the Peninsula. The Department employs 39 sworn officers and 20 other staff positions. The result is a ratio of 4.0 sworn officers for every 1,000 residents (based on 9,727 residents in 2008). This is much higher than the countywide ratio of 2.02 officers per 1,000 residents across Alameda County. During the workday, however, the city population swells to 25,000 to 35,000, resulting in a ratio of less than one police officer per 1,000 people. The Records and Communication Section of the Police Department is the public safety answering point for all emergency and non-emergency calls for service. In 2004, the Police Department's dispatch center processed 11,728 emergency calls.

Standards

While the department does not have service ratios or formal response standards, it aims to respond to emergency calls in two minutes and to non-emergency calls in six minutes. The department anticipates that as the city and its population grows, its staffing levels must also grow. While additional development will impact response times, the department does not use set standards for providing service to a growing population.

Planned Improvements

The Police Department has identified a need for additional facilities space. In 2008, the Department proposed a renovation of the existing facilities. Improvements would include an enlarged dispatch area; better east-west circulation within the building; adequate stor-

age and office spaces and renovation of the men's and women's locker rooms. The City Council has reviewed conceptual plans and authorized staff to move forward with the design phase. The current schedule suggests that construction would begin in 2009.

These renovations may not accommodate the future needs of the Department given population projections. There are concerns that the current station would be vulnerable and could be cut off from the rest of the city in the case of a large earthquake. The 1987 General Plan also noted that the police station had poor access to the east side of Emeryville, from which most service calls were originating. In addition, the existing station is considered too small by the Department, which would like a new facility that is 25,000-30,000 square feet in size and able to handle 10 to 15 additional personnel. A new station located on the east side of San Pablo Avenue may be suitable, although some residents of the Watergate complex are concerned about being left unprotected if the station moves from the Peninsula.



The Fire Department responds to emergency calls but also maintains the City's emergency management plan.

Fire Services

Profile

The Emeryville Fire Department (EFD) aims to educate the public, prevent fires, and respond to all emergencies in the city. Fire and emergency medical dispatch is handled through the Oakland Fire Department's communications system. All Emeryville firefighters are certified Emergency Medical Technicians.

The Fire Department employs 31 personnel in two stations: Station #1 at 2333 Powell Street on the Peninsula and Station #2 at 6303 Hollis Street, at the corner of 63rd Street. Station #2 hosts the City's Emergency Operations Center, which is a room that can serve as a disaster coordination center. The department has mutual aid agreements with the fire departments of Oakland and Berkeley. These departments automatically respond to freeway accidents in the area and can be called for help with any other incident.

The Fire Department has an emergency management operations plan for the city. Evacuation routes from the city in the case of an emergency depend on the circumstances, although San Pablo Avenue, Hollis Street, and I-80 are major routes. The City has an informal understanding with AC Transit that they would help evacuate people in an emergency. The department has the ability to monitor the state of emergency routes through webcams.

The Community Emergency Response Team (CERT) Program educates people about disaster preparedness for hazards that may impact their area and trains them in basic disaster response skills, such as fire safety, light search and rescue, team organization, and disaster medical operations. Using the training learned in the classroom and during exercises, CERT members can assist others in their neighborhood or workplace following an event when professional responders are not immediately available to help. CERT members also are encouraged to support emergency response agencies by taking a more active role in emergency preparedness projects in their community.

Standards

The department receives an average of 1,500 calls each year, which includes mutual aid responses to nearby cities. The State requires a minimum response time of eight minutes to emergency calls. The EFD averages just under five minutes time from the inception of an emergency call to their arrival on the scene. Overall, about 60 to 65 percent of the department's calls are medical, with Station #2 handling around 60 percent of all non-fire calls.

Planned Improvements

The EFD is not currently planning for new facilities. Expansion of the city is going to be vertical rather than horizontal. Infill development will require more equipment and staffing rather than an additional location. The department has discussed whether to expand its equipment to include an adaptive response vehicle, which would be smaller and more maneuverable and able to handle different types of calls, although it would require additional staffing. The EFD also sees a need for a backup water pressure and delivery system in the event that an earthquake disrupts the regular system.

The expansion of commercial and residential building space in the city implies a higher daytime and permanent population. This higher population and greater density will create several impacts: more emergency calls, the potential of incidents that affect more people, greater difficulty in evacuating the city, and longer response times to emergencies due to increased traffic congestion.

Utilities and Infrastructure Systems

Providing adequate public infrastructure and utilities is an essential part of a city's physical growth and development. This section provides background on the city's gas and electricity provision and wastewater treatment. Note that other public facilities and services are discussed elsewhere in the General Plan. Chapter 6: Conservation, Safety, and Noise, includes a discussion and policies on water systems—potable, recycled and stormwater management. Chapter 7: Sustainability includes a discussion and policies on energy and waste management.

Gas and Electricity

The Pacific Gas and Electricity Company (PG&E) serves Emeryville with electricity and natural gas. PG&E purchases both natural gas and electrical power from a variety of sources, including utility companies in other Western states and Mexico. PG&E charges connection and user fees for all new development in addition to sliding rates for service based on use.

PG&E delivered 10,605 thousand Megawatt-hours of electricity to customers in Alameda County in 2000. Approximately 60 percent of this energy was sold to commercial and industrial accounts. Electrical power is provided to the City of Emeryville from various distribution feeders located throughout the city; natural gas is provided to the city from several gas lines stretching from Milpitas to San Francisco. Natural gas is delivered from basins in Canada and/or Texas by transmission mains and deposited at PG&E's Milpitas Gas Terminal. PG&E has indicated that gas and electric demand for its entire service area will grow steadily through 2010, and it does not expected to substantially change the electric transmission system in Emeryville.

Wastewater

The City of Emeryville operates a municipal sanitary sewer collection system that conveys wastewater from Emeryville and portions of the City of Oakland. The collection system is divided into five drainage basins, each of which connects to the East Bay Municipal Utility District's (EBMUD) sanitary sewer interceptor, which is generally located along the east side of Interstate 80. The EBMUD interceptor carries sewer flows from the East Bay communities' collection systems to its wastewater treatment facility (SD-1) located at the foot of the San Francisco Bay Bridge in Oakland. Except for one pump station and a forced main at the Emeryville Marina, the City of Emeryville's collection system is generally a gravity-fed system, consisting of over 13.6 miles of pipe ranging in sizes from six to 30 inches.

GOALS AND POLICIES

GOALS

PARK AND OPEN SPACE SYSTEM

PP-G-1 **A comprehensive open space system—** A system that provides a diverse range of active and passive recreation and open space opportunities for residents, workers, and visitors.

PP-G-2 **New public spaces—**A public realm and new public parks and plazas that serve as focal points of the community.

PP-G-3 **Integration of parks and open space—** Parks that are coordinated with surrounding developments to form unified urban compositions and that are integrated into the redevelopment of underutilized areas.

PP-G-4 **Sunlit parks—**Public parks, plazas, and other open spaces that enjoy maximum sunlight access.

PP-G-5 **Sustainable design—**Park designs that are consistent with sustainable design principles and practices, and efficient use of open space.

PP-G-6 **Locally accessible parks—**At least one park located within a five-minute walk of all residences.

PP-G-7 **An accessible waterfront—**Connections from the waterfront to the rest of Emeryville east of the freeway.

SCHOOLS AND EDUCATION

PP-G-8 **A safe, nurturing and enriching environment—**An environment in which children and youth can flourish and become contributing members of society. The foundation of this vision is a strong and active partnership among the City, School District, and all segments of the community, so that powerful learning from the earliest years is a citywide experience and responsibility.

PP-G-9 **Accessible childcare—**An adequate and diverse supply of childcare facilities that are affordable and accessible for families, and provide safe, educational, and high-quality services for children.

PP-G-10 **Vibrancy and diversity—**Expanded arts, cultural and recreation programs that celebrate a vibrant diverse community.

PUBLIC SERVICES AND FACILITIES

PP-G-11 **Public safety—**Police and fire services that are responsive to the citizens' needs to ensure a safe and secure environment for people and property in the community.

PP-G-12 **Adequate public facilities—**Utilities and infrastructure systems that provide safe, reliable, and adequate services.

POLICIES

Implementing actions supporting each policy are described in Chapter 8: Implementation Program.

PARK AND OPEN SPACE SYSTEM

PP-P-1 Increase park acreage to serve the needs of the growing population and address current deficiencies in park and open space standards. Maintain a standard of three new acres of parkland per 1,000 new residents, and 0.25 acres per 1,000 new employees.

PP-P-2 Two new large parks (five acres or larger), one each north and south of Powell Street, shall be provided. Active recreation uses will be a component of these parks. The northern park site is bounded by 61st, 64th, Hollis, and Doyle streets. There are two potential southern park sites:

- One potential southern park site is shown on the PG&E site on Hollis Street, between 45th and 53rd Streets. On this site, consideration shall be given as to how to incorporate the existing buildings, which are rated Tier 1 and Tier 2 in the Park Avenue District Plan, into future park uses.

- The second potential southern park site is located at the AC Transit bus yard between 45th and 47th streets,

adjacent to the proposed Center of Community Life. Should this site become available, the City shall explore the possibility of a public park—along with other public uses. If a large park at this site is feasible and is considered desirable, all or part of the PG&E site may no longer be needed for a public park.

PP-P-3 New smaller open spaces—including public plazas and places, community gardens, and pocket parks—will provide local focus points and diversify the built environment. These should be developed through the identification of underutilized and strategically located parcels, and the redevelopment of larger sites.

PP-P-4 Locate "other park opportunities" (whose locations are generalized on Figure 4-1) to maximize accessibility for residents, such that every resident in the City has access to a park within a five-minute walk from their residence. Parks shall be located outside the 65 dbl noise contour (Figure 6-10).

PP-P-5 A system of greenways and Green Streets, as tree-lined open spaces will be developed as continuous recreational paths for bicyclists, joggers, and pedestrians, linking parks and activity centers.

PP-P-6 The north-south Emeryville Greenway will be expanded, enhancing its role as an open space corridor and connector across the City, and a source of inspiration and community pride. The City will support the expansion of a park at the Sherwin Williams site, in coordination with the development of Horton Landing Park and the Greenway.

PP-P-7 An east-west greenway located generally along the path of Temescal Creek will be created. This will include water features to celebrate the creek and improvements to the riparian corridor, where feasible, while maintaining existing drainage capabilities.

PP-P-8 Locate a series of small parks and plazas along Christie Avenue to create a continuous open space network throughout the district.

PP-P-9 Shading of parks and green streets by buildings will be minimized.

PP-P-10 Efficient use of open space will be achieved through techniques such as rooftop play courts and gardens, joint use of sports and recreation facilities at schools, co-location of parks with child care facilities, and possible use of underground parking below new plazas and parks.

PP-P-11 All large new residential developments shall include a combination of private and common open space.

PP-P-12 Design, landscaping, lighting, and traffic calming measures will be employed to create safe parks and open spaces.

PP-P-13 Open spaces that have deteriorated, have design features that limit access and use opportunities, and/or are in need of activity shall be revitalized.

SCHOOLS AND EDUCATION

PP-P-14 Efforts by Emery Unified School District and childcare service providers to establish, maintain, and improve educational facilities and services will be supported. Encourage a range of child care facilities, including family day care homes, public and private centers, preschool programs, and before and after school programs.

PP-P-15 A strong relationship and communication between City and Emery Unified School District will be maintained.

PP-P-16 The City will continue to partner with Emery Unified School District to optimize the joint-use of school facilities for community use.

PP-P-17 The City will support the development of the Emeryville Center of Community Life.

PP-P-18 Student engagement and learning will be facilitated through expanded programs and activities.

COMMUNITY

PP-P-19 A diversity of lifestyles, ages, and income-levels will be accommodated through zoning and community facilities and programming.

PP-P-20 The growing senior citizen community will be supported by providing appropriate cultural, recreational and assistance programs and services.

PP-P-21 A community cultural arts center will be developed.

PUBLIC SERVICES AND FACILITIES

PP-P-22 Crime will be deterred through physical planning and community design.

PP-P-23 There will be adequate police and fire staff to provide timely response to all emergencies and maintain the capability to have minimum average response times.

PP-P-24 The City will support community involvement in disaster preparation and response through the Fire Department's Community Emergency Response Training program.

PP-P-25 The City will continue to coordinate with Pacific Gas & Electric to ensure gas and electricity access to new development sand high quality service to all customers.

PP-P-26 The City will continue to operate and maintain the City-owned wastewater collection conveyance system and coordinate with EBMUD on the transfer and treatment of wastewater.

PP-P-27 The City will continue to cooperate with EBMUD, the Regional Water Quality Control Board, and other relevant agencies to adopt and implement programs and policies to further reduce inflow and infiltration (I&I) of storm water in the City's wastewater collection system and private sewer laterals during wet weather events.

PP-P-28 The City will continue to require development projects to replace or upgrade as needed, sanitary sewer systems serving the development site to reduce inflow and infiltration (I&I) of stormwater in the City's wastewater collection system and private sewer laterals during wet weather events.



5 URBAN DESIGN

The Urban Design Element focuses on enhancing the public realm and everyday livability, crafting a tapestry of distinctive yet synergistic and connected districts, and strengthening Emeryville's identity and sense of place.

Emeryville has transformed itself from an industrial town into a dynamic mixed-use urban center. A small city with flat topography, and relatively high development intensities, Emeryville has the potential to be an energetic, engaging, and walkable urban setting. However, connectivity in the City is challenging because of the presence of major transportation corridors. Additionally, because of its industrial past, the city has very large blocks, creating a sometimes fragmented, disconnected environment.

The Urban Design Element seeks to enhance livability by emphasizing the public realm—streets and public spaces; promote fine-grained development, and improve connectivity between districts; foster vital and active street life; maximize sunlight penetration into streets and open space; and build upon Emeryville's features and assets to promote richness and diversity. It also seeks to ensure that development is designed with a pedestrian orientation, and provides the framework for more detailed Design Guidelines. Photo simulations, beginning on Page 5-25, illustrate the type of development that is possible under the urban design framework outlined in this Element. The simulations represent five places that are poised for redevelopment or enhancement: East Bay Bridge Center, Sherwin Williams site, Powell Street and Christie Avenue intersection, Greenway along 53rd Street, and Doyle Hollis Park.

This chapter provides policies at a citywide scale, as well as key goals defining the areas that make up the city and the distinct districts within them. Policies in this element should be read together with existing district level plans including the Park Avenue District Plan, North Hollis Area Urban Design Program, and San Pablo Avenue Urban Design Plan, as well as master plans for large Planned Unit Developments including Pixar, Novartis (Chiron), Bay Street, and Marketplace.

5.1 CITY STRUCTURE

Framework

Located between Berkeley and Oakland, Emeryville acts as the primary gateway to the East Bay Area from San Francisco. Highly visible from major regional approaches along Interstates 80 and 580 and the Bay Bridge, the city is geographically framed by two major natural elements—the Berkeley-Oakland Hills to the east, and the San Francisco Bay to the west.

Emeryville is comprised of multiple districts, with their own development typologies and patterns, many of which are evolving. As in other East Bay cities, the waterfront (including the Peninsula) is physically separated from the eastern portion of the city by I-80. However, unlike cities such as Berkeley and Oakland, Emeryville does not have a historic downtown to serve as a central organizing element.

The basic components of Emeryville's existing city structure—its districts and diverse development scales—are built upon to establish an intensified, central city core; expanded street grid and pedestrian connections; new parks and open space; and strong, identifiable neighborhood centers that define an overall organization and character for each district. The arrangement of these components within the overall city structure is shown in Figure 5-1, City Structure. Key design and policy features include:

- **Centrally-located neighborhood centers** with public space and ground floor retail in the North Hollis, Park Avenue, Watergate, and San Pablo Avenue districts create more vibrant and balanced districts, with local shopping and a pedestrian scale.

- **A dynamic urban core** around the intersection of Powell Street and Christie Avenue, with the tallest building heights, a mix of residential and commercial uses, and active street frontages.
- **Other key activity nodes** are defined in places with intensive retail or public uses, including the Marketplace, Powell Street Plaza and Bay Street, as well as the proposed Center of Community Life.
- **Regional retail districts** with mixed commercial and residential uses along 40th and Shellmound Streets, reinforcing regional nodes and encouraging greater activity in these areas.
- **Existing residential neighborhoods**—the Triangle, Doyle Street, and Watergate neighborhoods—are preserved as lower-scale residential districts, enhancing these neighborhoods and their distinct identities.
- **Two large new parks**, centrally located to expand resident and employee access to open space while greening the environment and improving recreational opportunities.
- **Better connections**—A proposed grade separated railroad crossing and a proposed new bridge over I-80 and a greenway network, improving walkability and connectivity, particularly east-west connections to major activity centers, while enhancing the public realm with trees and landscaping.
- **Transit-oriented development** around the city's transit hubs: the Amtrak Station and the intersection of 40th Street and San Pablo Avenue, which is a major hub for AC Transit.
- **Gateways** at the main entrances to the city to celebrate the unique identity of Emeryville.
- **Expanded street grid**—Existing larger block sizes will be reduced wherever possible through extension of streets to create a more accessible pedestrian realm. Developments with large floor space will be accommodated through taller buildings, as well as mid-rise buildings.
- **Appropriate transitions**—While development intensities will be greater, emphasis upon building design and articulation, particularly at the street level, will play a key role in activating and enhancing pedestrian movement. The building heights and intensities from the core will transition to smaller-scale development in adjacent districts such as the Park Avenue District and residential neighborhoods.

By building on the city's existing assets and planning new development within the General Plan's structural framework, Emeryville will evolve into a more livable community, creating a strong sense of place and improving quality of life for its residents and visitors.







The City's character emerges from its many distinct districts and development scales. The General Plan envisions a mixed-use walkable city, creating a high quality of life for residents, workers, and visitors.

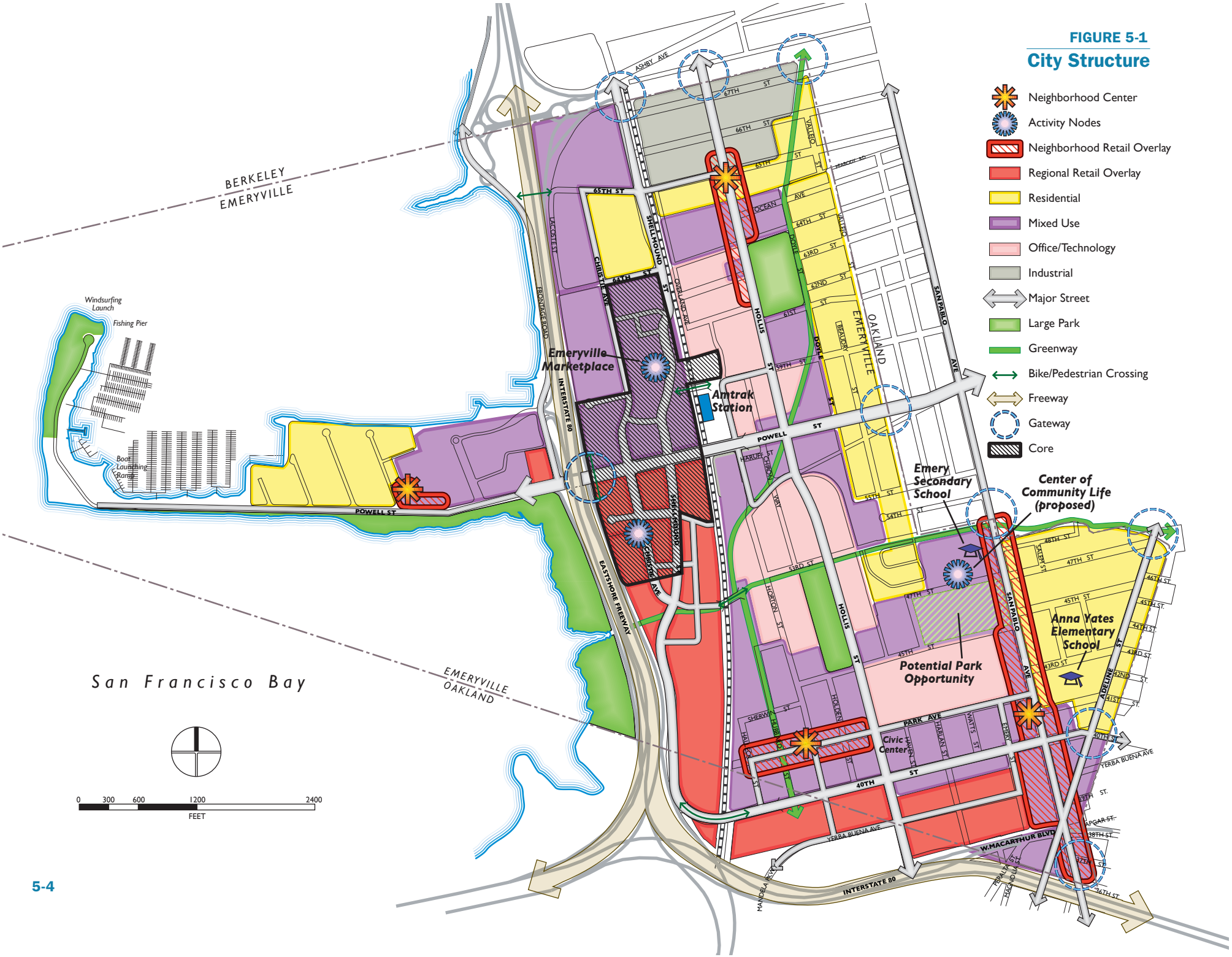


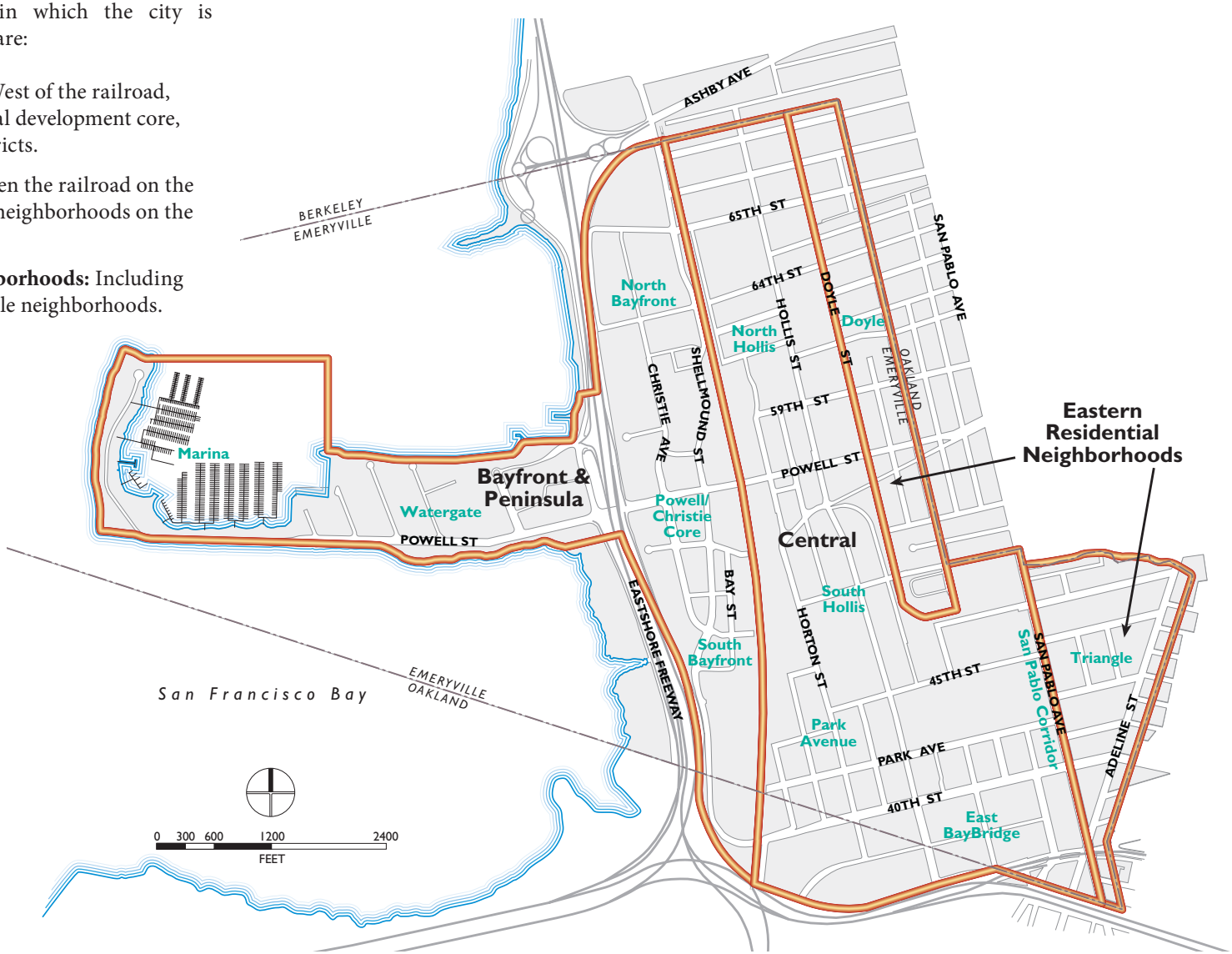
FIGURE 5-1
City Structure
Neighborhood Center
Activity Nodes
Neighborhood Retail Overlay
Regional Retail Overlay
Residential
Mixed Use
Office/Technology
Industrial
Major Street
Large Park
Greenway
Bike/Pedestrian Crossing
Freeway
Gateway
Core
BERKELEY
EMERYVILLE
EMERYVILLE
OAKLAND
San Francisco Bay
Windsurfing Launch
Fishing Pier
Boat Launching Ramp
Emeryville Marketplace
Amtrak Station
Emery Secondary School
Center of Community Life (proposed)
Potential Park Opportunity
Anna Yates Elementary School
Civic Center
POWELL ST
INTERSTATE 80
EASTSHORE FREEWAY
SAN PABLO AVE
HOLLIS ST
PARK AVE
40TH ST
65TH ST
YERBA BUENA AVE
W.MACARTHUR BLVD
0 300 600 1200 2400
FEET

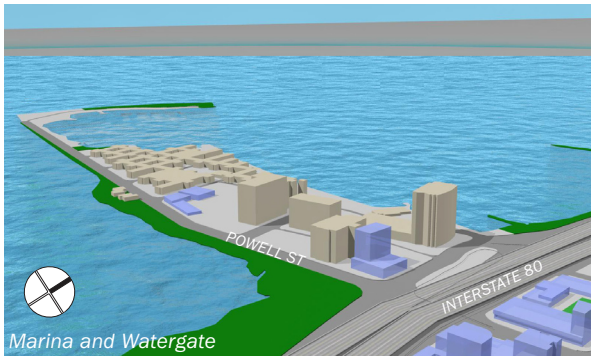
5.2 AREAS AND DISTRICTS

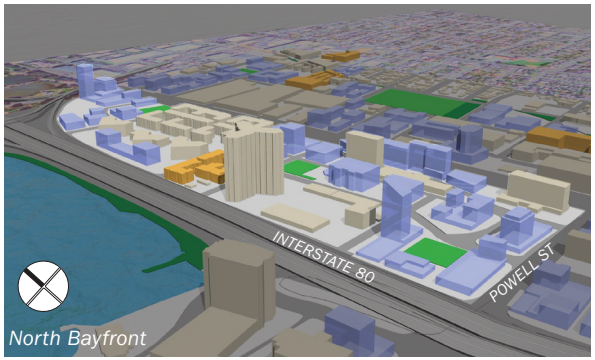
The city can be understood in relation to three large areas—north-south swaths—in which the city is divided (see Figure 5-2). They are:

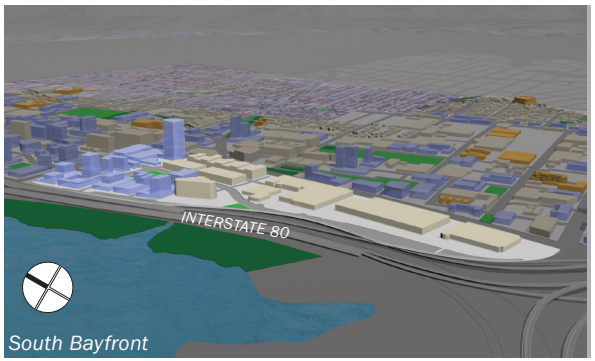
1. **Bayfront and Peninsula:** West of the railroad, this area includes the central development core, Marina and Watergate districts.
2. **Central Emeryville:** Between the railroad on the west and the lower density neighborhoods on the eastern edge.
3. **Eastern Residential Neighborhoods:** Including the Doyle Street and Triangle neighborhoods.

FIGURE 5-2
Areas and Districts









- *Existing buildings*
- *Approved or recently constructed projects*
- *Hypothetical future projects*
- *Existing or proposed park/open space*

District Character

Bayfront and Peninsula

The Bayfront area between I-80 and the railroad is dominated by large-scale, regionally-oriented retail development; the northern portion of this area includes office, commercial, and residential uses, including the city's tallest structure—the Pacific Park Plaza residential building.

Marina and Watergate

Some of the most visible districts in Emeryville, the Marina and Watergate districts are distinguished by the presence of a large residential community as well as some of the tallest buildings in the city. This district is characterized by larger block sizes and expansive development. High-rise office and hotel development on the east end of the Peninsula, adjacent to the freeway, supports a higher-intensity core at Powell Street and Christie Avenue. To the west, the existing residential development of the Watergate condominiums is characterized by lower building heights and intensities.

Planning focuses on improving access to one of Emeryville's key assets—the beautiful San Francisco Bay—and completing this district with needed convenience shopping and amenities. Additionally, changes to the district will focus on enhancement of streetscape, pathways and trails, and most importantly, pedestrian and bicycle access from the rest of the city.

North Bayfront

Located between Emeryville's waterfront, I-80, and the rail corridor, the North Bayfront district is one of the fastest changing districts within Emeryville—especially at the northern end, where several new high-density residential developments have been located over the past few years.

Powell/Christie Core

The Powell Street/Christie Avenue core is at the center of much of the proposed growth under the General Plan and will experience considerable transformation over the next 20 years. A variety of activities, ranging from retail and entertainment, to office and residential uses will ensure the district maintains a lively, yet community-centered character. Heights will also increase substantially to fill in the Emeryville skyline—thus creating a more consistent pattern to the district's urban form and allowing views of the Bay and the hills. The transit center at the Amtrak Station and the Marketplace development are key projects to fulfill this transit-oriented mixed-use concept.

South Bayfront

Located just to the south of Powell Street, the South Bayfront district is currently one of the busiest locations within Emeryville. Anchored by several major regional retail centers, including the Powell Street Plaza, Bay Street Mall, and IKEA, the district receives a high volume of visitor traffic on a daily basis. However, as the district is narrowly confined by I-80 and the rail corridor, internal circulation is limited to Shellmound Street.

Central Emeryville

This area between the railroad and older residential neighborhoods to the east is a mix of industrial, office, and residential uses with an average block size of five acres and parcel size of a half acre.

Industrial

In the northern-most portion—the Industrial district—the General Plan maintains lower scale development, with building heights and intensities that accommodate some intensification of use, but that act as more of a transition zone between industrial uses to

the north in Berkeley, and the finer scale of the Doyle Street neighborhood just to the east.

The General Plan maintains the functionality of this district and allows for a slight increase in intensity of use. However, heights and mix of uses will remain relatively the same—with emphasis on preserving the opportunity for further industrial and employment-oriented development. Industrial building façades will also need to be sensitive to the adjacent pedestrian-oriented environment.

North Hollis

The North Hollis district is one of the most eclectic districts within the City of Emeryville. This district extends north of Powell Street to the northern city boundary. The district is characterized by a mix of new residential and office buildings, and older industrial buildings. The district is also home to several mixed-use and live/work developments, as well as the Emeryville Amtrak Station, located just north of Powell Street.

The General Plan provides a central focus with a community park and new Neighborhood Center. The focus of the design of the public realm will be upon knitting new and existing development into a cohesive, urban, walkable district, with localized activity near the new park and along the northern portion of Hollis Street. Development closer to Powell Street will have more of a focus on employment uses, along with a greater height and intensity—building off of the key transit node at the Amtrak Station.

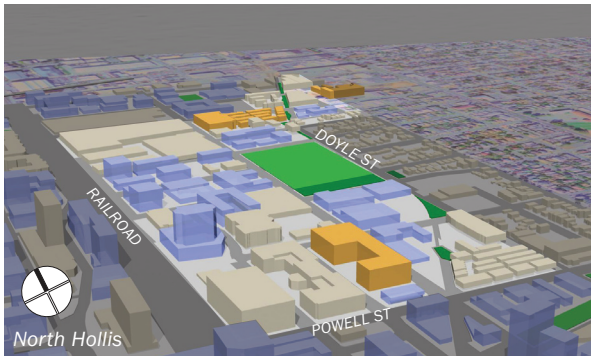
South Hollis

The South Hollis district has established itself as a key employment center within the city, with minimal residential uses. Several large-scale office and research and development uses (including Novartis and Pixar) have located in the district. These larger properties will coexist with moderate and smaller scale development. This area also includes the Emery Bay Village residential neighborhood and some older industrial and commercial development. Additionally, large-scaled public uses are also located in this district—including Emery Secondary School and the AC Transit yard.

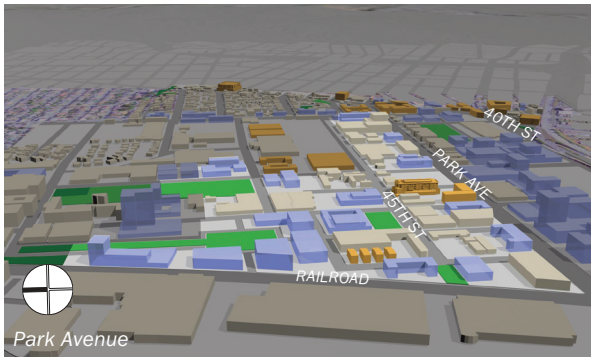
The General Plan maintains the general employment character of the district, and creates a central focus with the location of a new community park and proposed Center of Community Life. Connectivity within the district is also greatly emphasized, with improvements to the pedestrian and open space networks, including water features along Temescal Creek and the Greenway. Most development will maintain the low to mid-rise scale of existing development except for along the rail corridor, where existing and planned office uses includes mid- to high-rise buildings and greater intensities. Surrounding this node, development scale and heights step down to the adjoining Park Avenue, San Pablo Avenue, and Triangle districts.

Park Avenue

In the Park Avenue district, the majority of the district will remain at a smaller scale—true to its existing historic fabric of older industrial and architectural character—with an expanded street grid to extend the smaller block sizes at the Sherwin Williams site along the rail corridor. The General Plan vision for this district includes an extension of the Greenway along Hubbard Street, terminating in a new park, which would also form a focus of new development at the Sherwin Williams site. Smaller pocket parks and a public plaza are located along Park Avenue to create a central focus within this district. A ground floor retail overlay within this district also increases the activity in and around the public plaza, thus providing a foundation for a new neighborhood center and main street. This Plan builds on the Park Avenue Dis-







Existing buildings
Approved or recently constructed projects
Hypothetical future projects
Existing or proposed park/open space

trict Plan, adopted in 2006, that provides guidance for design of buildings and public improvements.

East Bay Bridge

The East Bay Bridge center is comprised of multiple regional, large-scale discount and specialty stores, as well as high-density residential development. Although the residential development in the district rises to five stories, the remainder of commercial development has a lower one-story retail profile. Aside from the housing, the entire district is served by extensive surface parking, which is divided by location and use. Thus, circulation through the site and between uses is difficult for both pedestrians and vehicles.

The General Plan structures the district with a gridded street network that lays the foundation for future infill development through reuse of surface parking lots with structured parking in selected locations, or a more comprehensive redevelopment of the site with new multi level retail uses or as part of vertically mixed-use buildings. Additionally, development will also be able to capitalize on transit access—both to the San Pablo Avenue transit center just to the east, as well as the MacArthur BART Station just ¾ of a mile away.

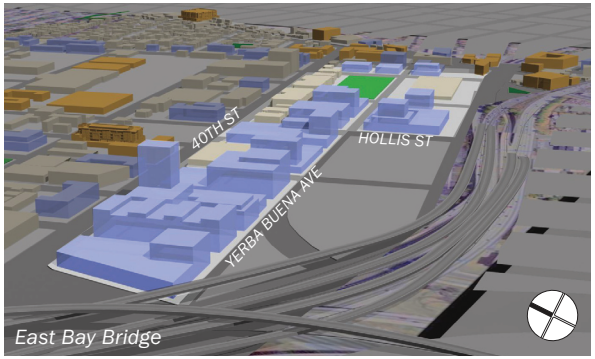
Eastern Residential Neighborhoods

The eastern area of the city is defined by well established residential neighborhoods with a mix of single-family homes and medium- and high-density townhomes and apartments. While improvements to connectivity and public amenities are envisioned in the General Plan, these existing neighborhoods will remain largely unchanged.

Triangle

Occupying the eastern-most edge of the city, the Triangle district has a strong residential core, with existing densities that range from single family homes all the way up to 60-unit/acre multi-family development. Although diverse in housing types and densities, the overall scale of development in the Triangle neighborhood has remained low, with most development rising only two stories or less. Development intensities and heights increase however, at the southern edge of the Triangle, close to Yerba Buena Avenue and the confluence of MacArthur Boulevard, Adeline Street and San Pablo Avenue.

Separated from the rest of the city by San Pablo Avenue, the Triangle district will be enhanced by greater pedestrian connectivity and streetscape improvements, and potentially a new park. While San Pablo Avenue already has improved pedestrian crosswalks, connections across Adeline Street will also be improved.





Existing buildings
Approved or recently constructed projects
Hypothetical future projects
Existing or proposed park/open space

Doyle Street

The Doyle Street district is a well-established residential neighborhood, with a mix of single family, duplexes, and slightly higher-density townhomes. Some of the oldest fabric of the city remains within this neighborhood, with smaller parcel and block sizes, lower heights, and greater vegetation. Like the North Hollis district, access to amenities is limited—very few neighborhood retail opportunities are accessible either in Emeryville or along San Pablo Avenue in Oakland to the east.

The General Plan focuses on protecting the existing scale and character of this neighborhood with lower residential densities and intensities, thus limiting the size and scale of potential new development. However, much of the district will remain unchanged over the Plan horizon.

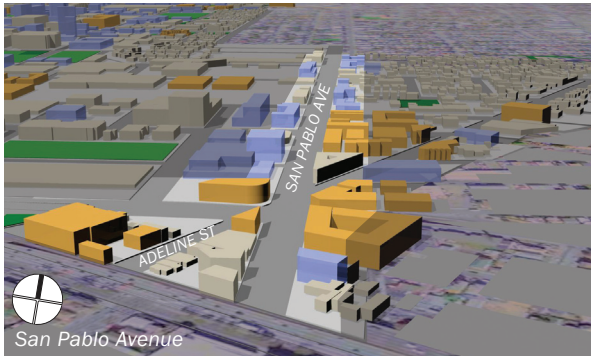
Doyle Street also plays an important role in the district as it establishes the dividing line between the greater intensities and mix of uses in the North Hollis district and the Doyle Street neighborhood. Emphasis will be upon establishing a strong streetscape theme that reinforces the residential character of the district.

San Pablo Avenue

As one of the most visible district within Emeryville, the San Pablo Avenue District acts as a key gateway and connector within the city. The mixed commercial and residential uses have also served to provide both activity and much-needed neighborhood-oriented retail for surrounding neighborhoods. The existing scale of development along San Pablo Avenue is relatively low—consisting of one and two-story buildings, most of which are at the street edge. However, new development along this stretch of San Pablo has served to enliven the street edge and enhance the district's identity.

Future development under the General Plan will maintain this lower scale within the district, with emphasis on preserving the existing low-scale fabric of adjacent districts. San Pablo Avenue is envisioned as a walkable, mixed-use corridor, supporting a neighborhood center around the intersection of Park Avenue, transit center at 40th Street, and the proposed Emeryville Center of Community Life at the Secondary School site.





- *Existing buildings*
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- *Existing or proposed park/open space*

Area and Neighborhood Plans

Chapter 1: Introduction describes existing area plans that define development standards and policies for the individual character of neighborhoods. The urban design features of these plans are summarized in this section. The General Plan upholds and builds on the existing plans to guide urban design in the respective districts.





Area and neighborhood plans have guided urban design in several areas of the city, including South Bayfront (top) and Park Avenue (bottom).

North Hollis Area Urban Design Program

The North Hollis Area Urban Design Program, prepared in 2002, focuses on the creation of the corridor as a pedestrian and bicycle-friendly mixed-use district. Streetscape design seeks to facilitate multiple modes of travel and de-emphasizes vehicular traffic. Consistent street elements, through lighting and street tree design are also prioritized. The Program supplies design guidelines for the portion of the greenway in the North Hollis area, describing typical street sections, including setbacks, parking, landscaping, and building interface. In addition, the Program proposes streamlining, or under-grounding of overhead utility lines as a feasible and necessary improvement to the pedestrian environment.

San Pablo Avenue Urban Design Plan

The San Pablo Avenue Urban Design Plan outlines land uses for three phases of "catalyst" projects, establishes goals for public circulation and streetscape improvements, and design guidelines for new development along and near the avenue. The Plan describes standards for new landscaping, paving and lighting, to improve the appearance and experience of traveling and shopping along the corridor. The Plan's design guidelines include: use of materials and architecture consistent with existing brick buildings; entrances aligned with the street grid and close to the sidewalk; "T" intersections terminating in major entries and public spaces; and surface parking in the rear of buildings.

South Bayfront Design Guidelines

The South Bayfront Design Guidelines establish a framework for future development in the areas south of Powell Street between the railroad and I-80. This includes:

- Streets and blocks that create a sense of a downtown neighborhood with pedestrian activity;
- Materials and detailing on buildings and public spaces that create visual interest; and
- Pedestrian and bicycle connections across the railroad tracks.

Many of these guidelines have been implemented since their inception in 1997.

Park Avenue District Plan

The Park Avenue District Plan establishes incentives and development guidelines toward the creation of a vibrant, mixed-use district. District-wide urban design policies seek to preserve architecturally significant buildings, maintain the existing small-lot pattern, and promote walkable and attractive places. More specifically the plan calls for sidewalks punctuated with landscaping and street furniture and unencroached by utilities; signage describing locations of historic structures, routes, and the Greenway; and visually distinct crosswalk treatment to give character to the district and ensure pedestrian safety. Along Park Avenue in particular, the Plan specifies wider sidewalks, corner bulbouts at key intersections, and bicycle racks on every block; it also encourages shared parking and allocated spaces for public parking.

5.3 STREET GRID, CONNECTIONS, AND VIEWS

Street Grid

A city's street grid influences how people move around their city and the accessibility of jobs, services, and other activity centers. Large super-blocks accommodate larger building footprints, but reduce pedestrian and vehicular connectivity. Likewise a disconnected street pattern (e.g. dead end streets) limits options for circulation. On the other hand, a more connected grid of streets and smaller blocks can improve mobility for cars, pedestrians, and alternative transportation modes, since more options are available for travel. This type of fine-grained development pattern is also more visually interesting and secure for pedestrians at the street level.

Evolution

Emeryville has historically had large blocks and limited connectivity. In the early 19th Century, there were no north-south streets at all except for San Pablo Avenue on the east side of town. After the Oakland Trotting Park racetrack closed around 1915, Hollis Street was constructed, connecting the north and south parts of town for the first time. Gradually, additional streets have been built, the street grid has been expanded, and blocks have gotten smaller. In the 1980s, Christie Avenue and Shellmound Street were built in the North Bayfront area. In the 1990s, the East Bay Bridge shopping center was built on the site of an old railroad yard and new streets were added in the south part of town. At the same time, 40th Street was built, Shellmound Street was extended, and a new bridge was constructed across the railroad tracks connecting the Bayfront area with southern Emeryville for the first time. Since 2000, Horton Street and Overland Avenue were extended from 40th Street to 65th Street, creating a north-south alternative to Hollis Street. The Bay Street mixed-use project resulted in additional streets and further expansion of the street grid in the South Bayfront area. In 2008, the Marketplace Redevelopment project was approved which will create additional streets and an expansion of the grid in the North Bayfront area over the next 25 years.

Improvements

Although circulation improvements have been completed, the railroad corridor and the I-80 freeway continue to present challenges for east-west travel. These barriers force circuitous movements for all transportation modes, and make the city difficult to traverse on foot, despite Emeryville's small overall size. With increases in population and employment projected, the General Plan identifies opportunities for enhancement and expansion of the city's street grid by establishing a number of new streets throughout the city. The resulting grid will extend the pedestrian and bicycle networks across a large contiguous area. Areas identified for an expanded street grid include:

- **The North Bayfront District.** A new street through the large block north of 65th Street will connect Christie Avenue with 66th Street. New street segments in the Marketplace Redevelopment project and adjacent areas will serve to break up these long blocks and encourage circulation within, creating extensions of 59th, 62nd, and 63rd Streets in the area. Shellmound Street will be relocated to the west, and Shellmound Way will be relocated to the north, creating smaller, more walkable, blocks.
- **The South Bayfront District.** A southwest extension of Christie Avenue will connect with Shellmound Street, near Temescal Creek, , and new cross streets will be added, making the South Bayfront district more accessible, connected, and walkable.





Historically, Emeryville has had large blocks and limited connectivity, disconnected by large industrial sites, the railroad, and freeway. The General Plan seeks to improve connections for all travel modes by expanding the street grid with new mid-block connections and through-streets.



Activity centers such as neighborhood centers and transit areas have been designated as Pedestrian Priority Zones. These zones represent areas with higher volumes of pedestrian activity, where additional amenities (e.g. streetscape improvements, lighting, traffic calming) are required.



All streets should have active frontages. On streets within commercial areas, such as the Public Market, Bay Street, and San Pablo Avenue, streets should be activated through window and building articulation, parking in the rear, and designs that create safe interesting spaces for pedestrians.

- **The Park Avenue District.** Designed in tandem with the proposed Greenway and development of the Sherwin Williams site, extension of Hubbard Street, and an additional east-west street segment will extend the Park Avenue District's grid north of Sherwin Avenue.
- **East Bay Bridge.** Extensions of Yerba Buena Avenue and Harlan Street will break up the East Bay Bridge Center's large blocks as part of the redevelopment of these surface parking lots into higher density mixed-use districts with structured parking.

As discussed in Chapter 3, Transportation, Emeryville's street system consists of several different street types: transit streets, connector streets, local streets, and bike boulevards. The new proposed streets fall into all of these categories, as illustrated in Figure 3-6 (Chapter 3: Transportation), and will include accommodation and amenities for vehicular, pedestrian, and bicycle access, according to the typologies defined in the Transportation element.

While the Plan proposes several new streets and extensions to the street grid, additional internal street connections should be encouraged for individual development projects—not only to enhance citywide circulation, but also to provide and encourage walkable and accessible internal circulation.

Connections

The General Plan fosters new pedestrian and bicycle connections between the western and eastern parts of the city; better connections to the Peninsula; and new and safe pedestrian and bicycle linkages to the waterfront and across Powell Street. These connections capitalize on new streets and planned streetscape improvements, and include non-vehicular routes and bridges, as shown in Figure 5-3. Mid-block connections and pedestrian and bike paths provide additional travel routes for pedestrians and cyclists. For a complete description of the General Plan circulation system, including pedestrian, bicycle, transit, and vehicular circulation, see Chapter 3: Transportation (Section 3.2: Circulation System). Green streets are discussed in Chapter 4: Parks, Open Space, Public Facilities, and Services. Other transportation elements that relate to urban design—Pedestrian Priority Zones, and policies for active street frontages, bridges and crossings—are described in this section.

Pedestrian Priority Zones

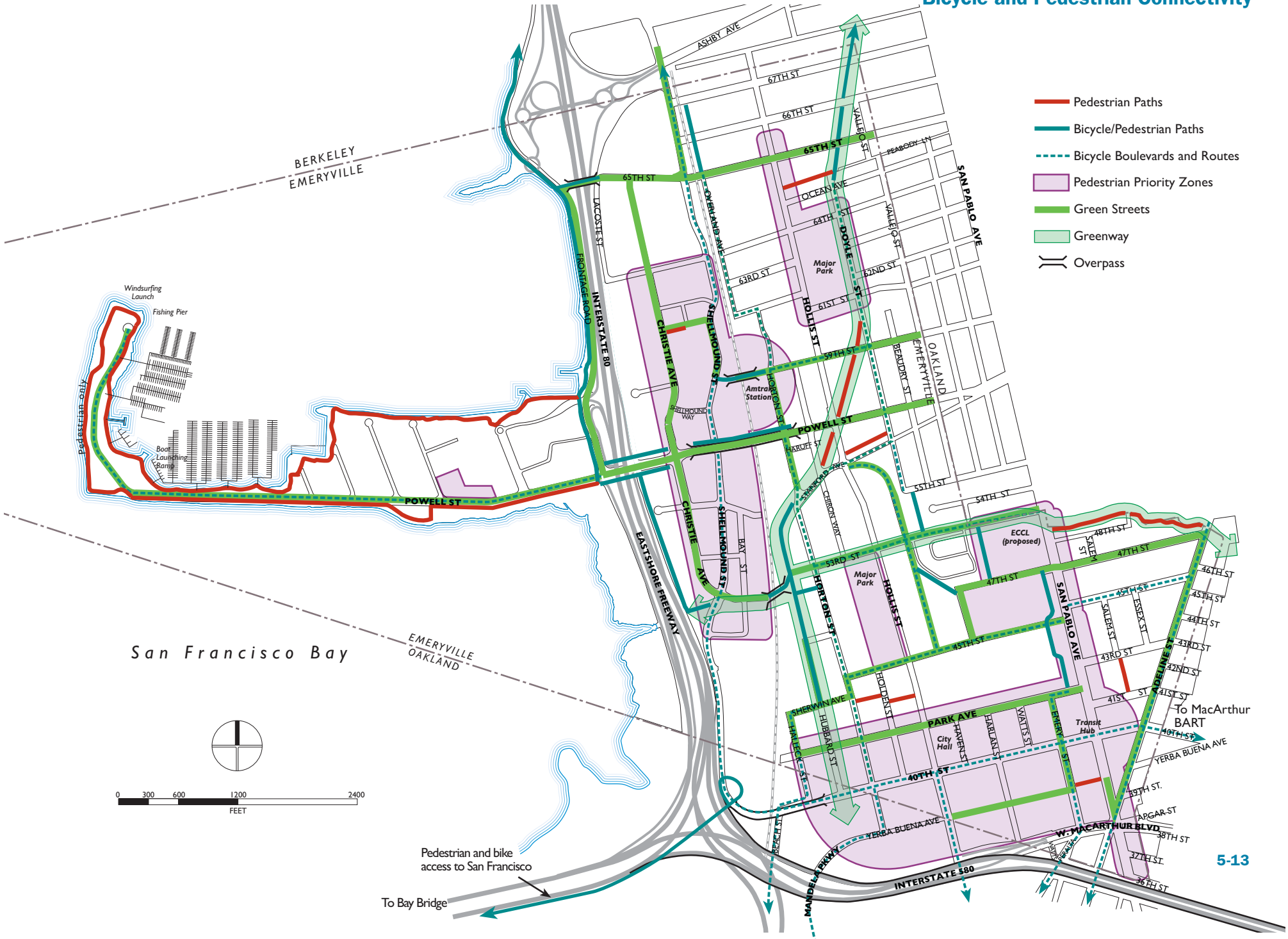
Although the entire city should be amenable and safe for pedestrians, the Pedestrian Priority Zones highlight areas where pedestrian safety and movement is the top priority. These areas include busy activity centers, such as transit stations, neighborhood centers, schools, and City Hall, as shown in Figure 5-3. In these locations, specific measures, such as streetscape improvements and traffic calming, would be required.

Active Street Frontages

General Plan policies seek to activate street frontages, creating vibrant pedestrian-friendly streetscapes. Active frontage could include retail shops, offices, restaurants, flex spaces or residential units with front stoops so the building façade is not a blank wall or otherwise unwelcoming to passerbys. In the Powell/Christie core area, several regional retail centers, including the Powell Street Plaza, Bay Street, and IKEA, receive a high volume of visitor traffic seeking to park and then walk in the district. It is essential to provide convenient circulation, pedestrian safety measures, and an interesting and inviting streetscape. Surface or structured parking facilities should be located in the rear or should have active uses on the ground floor. (For parking design policies, see Section 5.5.)

FIGURE 5-3

Bicycle and Pedestrian Connectivity









Bridges and undercrossings (top, middle) eliminate conflict points such as at-grade crossings (bottom) but must be made safe for pedestrians through good design, lighting and other safety measures.







Views: East Bay Hills from Marina (top), Powell Street (middle), and waterfront views from Bay Street (bottom).

Bridges and Crossings

Bridges and undercrossings are also important urban design features. Bridges are highly visible and symbolic of the city's investment in connectivity. Undercrossings need to be carefully designed to be inviting and safe. The network includes three existing railroad overpasses (at 40th, 59th and Powell Streets); one approved pedestrian/bicycle railroad overpass (at Temescal Creek); one proposed across Powell Street just east of the freeway; and another proposed across the freeway at 65th Street. Some of these overpasses are intended to accommodate pedestrians and bicycles only, and include either ramps or elevators for disabled and bicycle access. Appropriate lighting and signage, as well as visibility from the street and established bicycle and pedestrian routes will maintain these connections as convenient, safe, and direct links within the bicycle and pedestrian network.

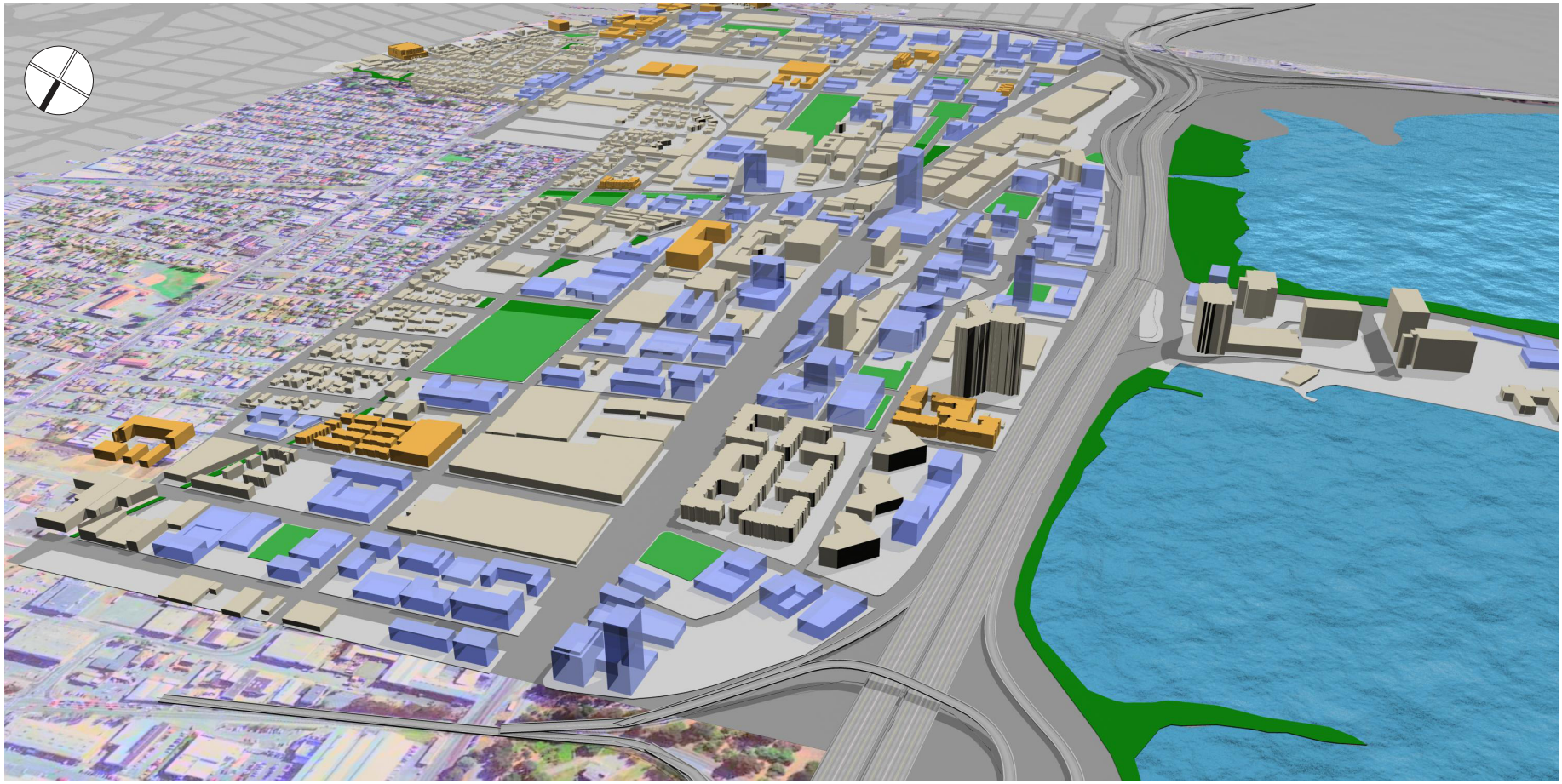
Views

Lastly, overall connectivity is enhanced by views of the San Francisco Bay and the East Bay Hills. These views visually knit the city with its context, and are an important part of how Emeryville is integrated within its surroundings. Additionally, distant views and a sense of expansiveness are important to balance the high development intensities planned for the city, even if the bay cannot be seen by a pedestrian at the ground level.

While new development will inevitably block some views, significant vistas of the Bay and East Bay Hills will remain unobstructed. These views and the overall composition of urban form are shown in Figure 5-4.

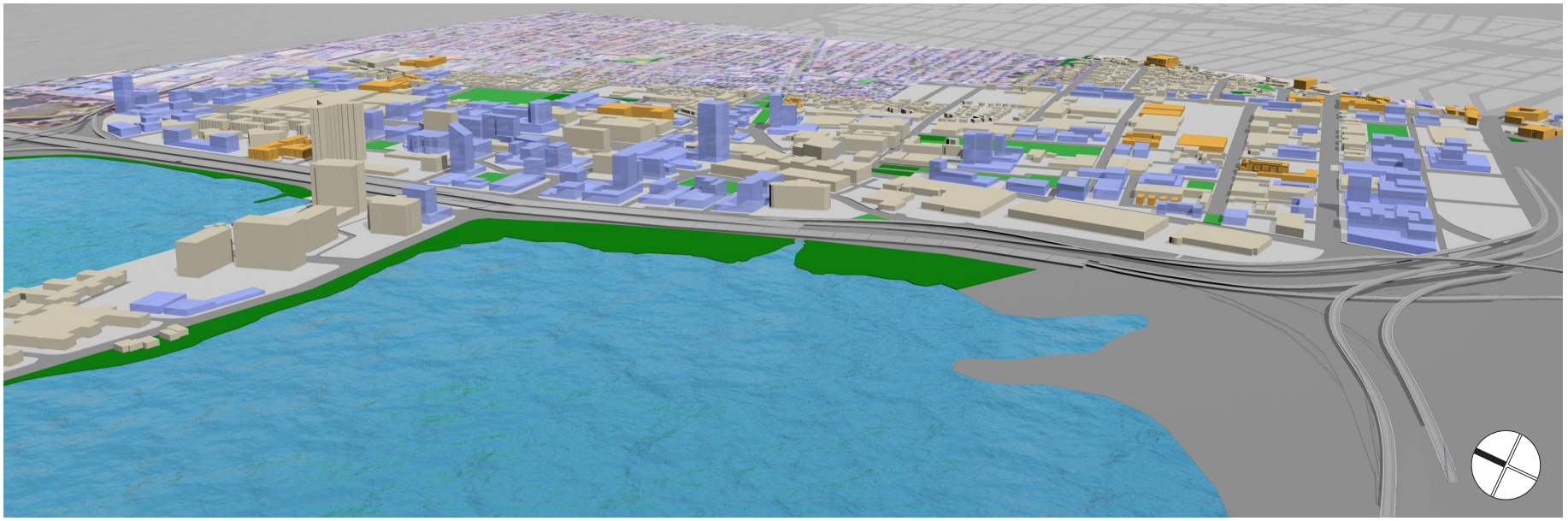
FIGURE 5-4

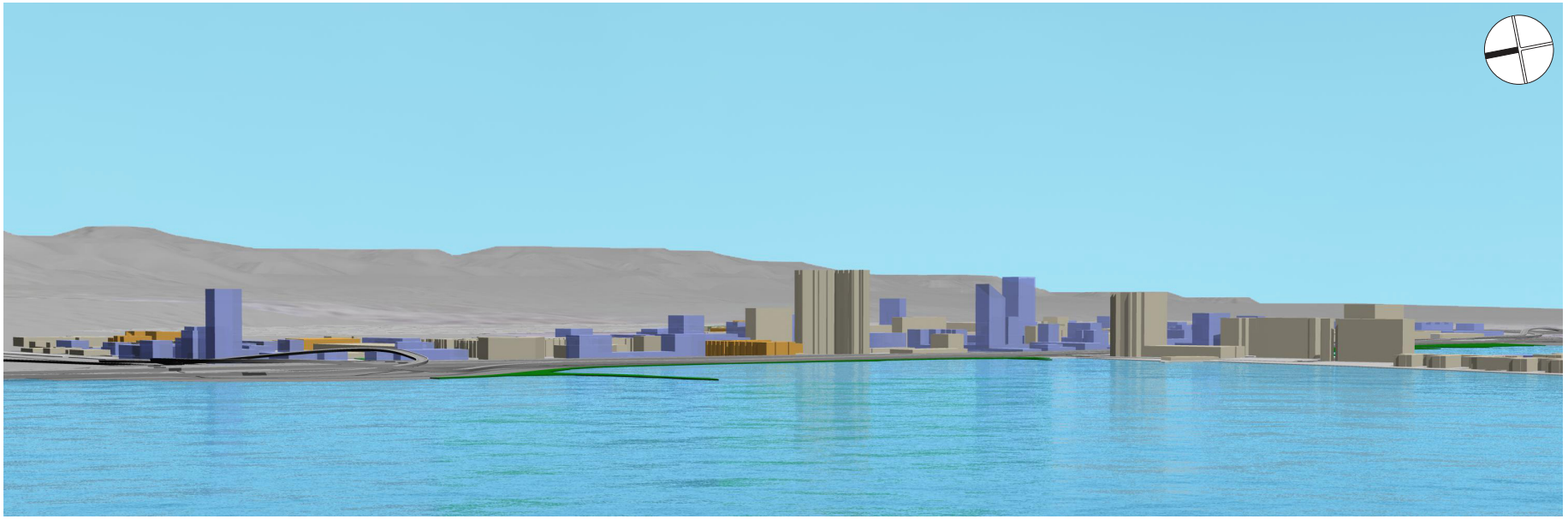
Urban Form Perspectives



These three-dimensional images illustrate the expanded street grid, views, and hypothetical buildout under General Plan land use and urban design policies.

- *Existing buildings*
- *Approved or recently constructed projects*
- *Hypothetical future projects*
- *Existing or proposed park/open space*





5.4 SKYLINE AND BUILDING BULK

Skyline

Visible from I-80, the San Francisco Bay, Bay Bridge, and the Oakland and Berkeley Hills, the Emeryville skyline acts as a gateway to the East Bay as well as a primary identity for the city from afar. While Emeryville's taller buildings are visually prominent landmarks along the East Bay waterfront, their lack of continuity and centrality create a somewhat undefined quality to the urban skyline. This loose concentration of building heights and volumes has continued as new taller development has maintained a medium-height and decentralized character. This dispersed quality of the Emeryville skyline is exacerbated by poor contextual relationships between high-rises and surrounding development and the physical barriers of I-80 and the rail corridor.

The General Plan encourages the creation of a more cohesive skyline for Emeryville by focusing higher-intensity development within a central core. Building intensity and heights are greatest in this area, just to the north and south of Powell Street in the Bayfront district and at the eastern edge of the Peninsula. These



View of Emeryville (foreground) and San Francisco (background) from the Berkeley Hills.







Taller slender buildings can allow opportunities for public spaces, mid-block connections, and more sunlight (top, San Francisco). Buildings with larger footprints may prevent them (middle). Buildings should step back on upper floors to create public or private open spaces and allow light onto the sidewalk (bottom).

areas build off of the existing Emeryville skyline, providing the opportunity for a more contiguous high-rise zone in the city. Outside of this zone, building heights taper to provide a gradual transition to lower-scale development in the remainder of the city.

Building Bulk

Building bulk and the grain of development will vary across the city—ranging from large, full-block projects to finer-grain development with many different buildings on a single block—reflecting the location, intensity, and land use mixes accommodated.

Bulk and Massing Controls

Bulk controls address massing of specific projects to minimize the visual dominance of buildings, and maximize sky exposure from streets. Detailed guidelines and standards for bulk and massing control are established in the Urban Design Guidelines and Zoning Ordinance. They address the relationship between building width and depth by specifying the maximum floorplates at various heights, correlated with floor area ratios (FARs), street width, and site area. Additionally, the General Plan follows the principle of "stepping down" to lower-scale development in the city, as well as stepping back at upper floors from the street edge in order to transition between various heights and densities.

Floor Area Ratios

Building bulk and massing are also controlled by floor area ratios (FAR). Figure 2-3 shows maximum FARs permitted in each area. The FAR values depicted in the map include all aboveground built space, both residential and nonresidential. Underground storage space is excluded from the FAR allowance (defined more precisely in the Zoning Ordinance). In this way, developers will be encouraged to maximize habitable space aboveground, resulting in buildings that are visually less bulky and more pedestrian-friendly.

Tower Spacing

To ensure generous light and views, upper floors will be stepped back, and towers will be slender and spaced apart.

Fine-Grain Development

Fine-grain development that engages the pedestrian—especially in retail districts and neighborhood centers—is essential in a high-intensity urban setting. Fine-grain development refers to small blocks, lots, and building footprints, allowing for pedestrian comfort, more opportunities for public spaces, and mid-block pedestrian routes. This smaller scale of development provides greater visual interest at the street level, and contributes to a diverse scale and character. Fine-grain development will occur in several parts of the city, including the neighborhood centers, along portions of Hollis street to the north and south, and the San Pablo Avenue districts. The Park Avenue district, as a whole, will also be primarily fine-grain to reflect and retain the historic patterns of the area.

5.5 STREETSCAPES AND BUILDING-TO-STREET INTERFACE

Streetscapes

Multi-Functionality

Streets are central to an area's identity, movement, and pedestrian experience. Regardless of the method of transportation used, visitors, residents and workers must travel on streets. The way these are treated physically has an impact on the perception of the area as a whole. Street design can incorporate a wide variety of elements, ranging from benches to paving to tree grates, or even signage. Many of these detailed elements can be grouped into larger categories such as pavement and sidewalk width, landscaping, stormwater management, parking, medians and sidewalk amenities. An effective street design includes enclosure and street wall, continuity, character, relationship between pedestrians and traffic, shade and light.

Many of Emeryville's streets already contain the basic elements of good design, and improvements such as those along Park Avenue, and San Pablo Avenue are providing a higher standard for clear, attractive streetscapes. As new development occurs throughout the city, there are several challenges and opportunities for street design:

- **Design for pedestrians.** Currently, walking in Emeryville can be a challenge—while there are areas within the city that are specifically designed for pedestrian movement, such as the Bay Street area, they are often surrounded by vehicle-oriented streets and development. Emeryville is envisioned to greatly increase its population and non-residential development in the next 20 years, with an increase in the number of visitors and employees in the city on a daily basis. The regional retail districts and the neighborhood centers will need wider sidewalks, well-defined crosswalks, and street design and traffic signalization that gives priority to pedestrians.
- **Unified planting palette to knit districts together.** Distinctive streetscapes with unified tree planting and landscaping promote continuity, distinction, and identity. This is especially critical for major streets that traverse the city. Currently, San Pablo Avenue acts as a key gateway and identifier for the City, with its distinct planting and streetscape design. Other key streets in the city would benefit from this—in particular, Hollis Street and 40th/Shellmound Streets; as well as those streets identified as Green Streets. In addition, landscaping will help to fulfill stormwater management goals. Implementing Bay-Friendly Landscaping practices, including planting native and drought-tolerant plants can help to manage stormwater runoff in wet months, while conserving water in dry months.
- **Multi-functionality.** With the increase in population and related traffic, many streets will need to be designed to do more than just handle traffic flow. They must provide for increased on-street parking in the residential areas and neighborhood centers, ensure smooth transit flow, allow safe and convenient pedestrian routes and small public plazas, and accommodate bicycle facilities on selected streets (see Chapter 3: Transportation). Moreover, streets should be accessible to all users, including children, seniors, persons with disabilities, workers and residents.

As streetscape improvements are implemented, Emeryville's street network will become a realm for public activity with improved sidewalk treatments, seating, distinctive lighting, and public art, as well



Streets should be designed for multiple uses and types of users, by providing pedestrian facilities, such as unobstructed sidewalks, street lamps and benches; bicycle lanes and facilities; and vehicular parking.

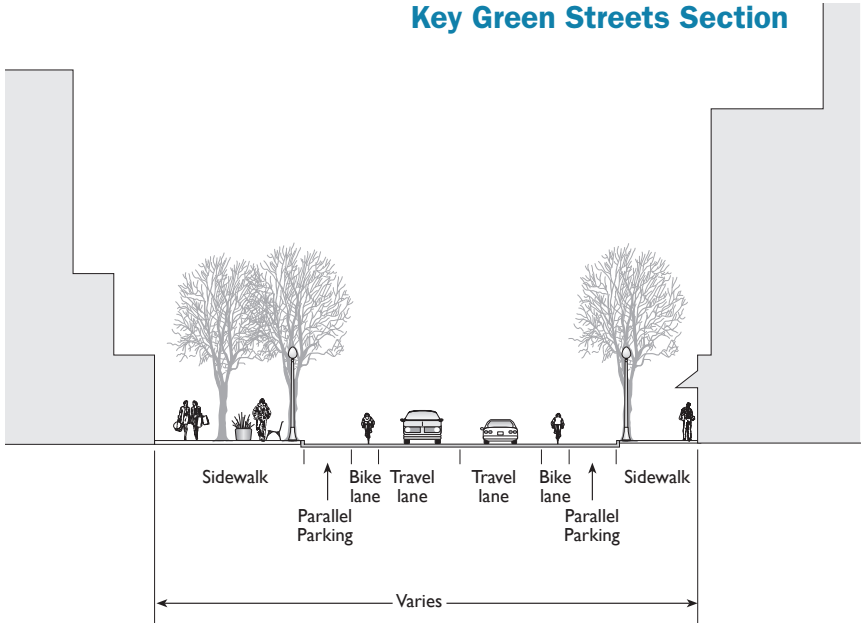
as bicycle facilities in appropriate locations. Coupled with concentrated street-front activity within neighborhood centers and retail areas, the improved street network will foster pedestrian activity and social gathering.

Green Streets and Neighborhood Center Streets

Two specific street types within the city will play a key role in establishing this network: Green Streets (described in Chapter 4) and streets in neighborhood centers. Conceptual sections of these Green Streets and neighborhood center streets are presented in figures 5-5 and 5-6, respectively. As the primary connections between major open space, activity centers, and amenities within the city, Green Streets may contain additional landscaping, such as a double row of trees (where space allows), stormwater treatment measures, and adequate bike lanes. Streets within neighborhood centers are characterized by wider sidewalks, additional pedestrian amenities such as street furniture and wayfinding signs, curb bulb-outs at key intersections, and a consistent street tree theme.

FIGURE 5-5

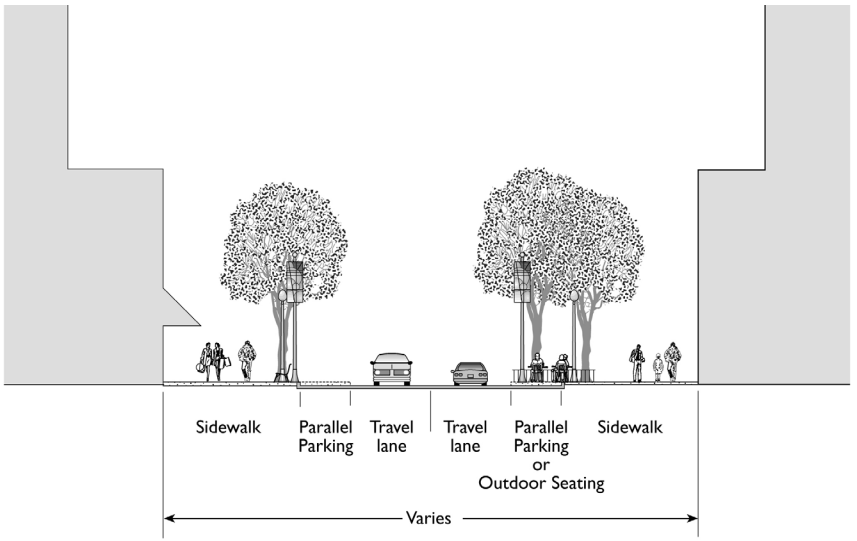
Key Green Streets Section



- Widened sidewalk with enhanced landscaping
- Two parallel parking lanes, if possible, otherwise one parking lane
- Bicycle facilities, where shown on Figure 3-6: Bicycle System
- Stormwater treatment and Bay-friendly landscaping measures

FIGURE 5-6

Neighborhood Centers Section



- Two travel lanes
- Two parallel parking lanes
- Possible outdoor seating
- Widened sidewalks

Greenways

As described in Chapter 4: Parks, Open Spaces, Public Facilities and Services, there are two greenways envisioned: one is under development, the other is proposed. These create linear open spaces, with amenities such as pedestrian and bicycle paths, small gathering places, and recreational facilities. New development constructed along the greenways should incorporate public open spaces and orient entrances onto the greenway. As shown in Figure 5-1, the north-south greenway follows old railroad spurs, connecting Berkeley in the north to the Park Avenue District, Bay Trail, and West Oakland in the south. The east-west greenway will follow the Temescal Creek alignment along 53rd Street, allowing opportunities to celebrate the creek by pumping some water to the surface while maintaining the culverted flood central system. The proposed Emeryville Center of Community Life is expected to be sited at Emery Secondary School, intersecting the greenway on 53rd Street.

Utilities Placement

Utility boxes and utility wires are an essential part of the city's infrastructure, but overhead wires also create potential hazards and obstruct views. Utility lines and poles can be dangerous during earthquakes and utility boxes and other infrastructure can disrupt movement on sidewalks. The city is already pursuing a policy to underground utilities, thereby eliminating potential hazards and creating more open views and attractive streetscapes. All new and existing on-site electrical and communication lines, including overhead utility wires, must be placed underground when new development is being constructed. Figure 5-7 shows the progress toward undergrounding utilities, as of 2008. The city's major corridors, including San Pablo Avenue, 40th Street, Park Street, Christie Avenue, Shellmound Street, and Doyle Street have ongoing or completed undergrounding projects.

Overall Streetscape Framework

In addition to these specific streetscape typologies, the General Plan outlines the overall vision and framework for Emeryville's streetscape design. Currently, specific design of individual streets occurs through implementation documents like the city's Urban Design Guidelines, as well as detailed plans for specific areas like the Park Avenue District Plan and North Hollis Area Urban Design Program. Development of a citywide streetscape plan would consolidate overarching goals, treatments based on street typologies (see Chapter 3: Transportation, Section 3.2), and design features appropriate for Emeryville. Specific improvements that might be considered include:

- Using a consistent species of trees and planting to define corridors;
- Managing stormwater and improving ecology;
- Widening sidewalks and reducing street pavement area;
- Introducing public art sequences and signage;
- Using resource-efficient materials and lighting;
- Creating a psychological distance between pedestrians and traffic with trees, planters, lights, and sidewalk furniture;
- Adding seating and other pedestrian-oriented furnishings;
- Improving intersections with corner bulb-outs;
- Establishing a consistent street signage or public signage aesthetic;
- Providing places with shade; and
- Placing utilities underground.

Photo simulations at the end of this section illustrate many of these concepts.



Greenways will extend along existing streets, such as Doyle Street as well as the former railroad right-of-way, creating off-street pathways for pedestrians and bicycles and passive spaces for relaxation.

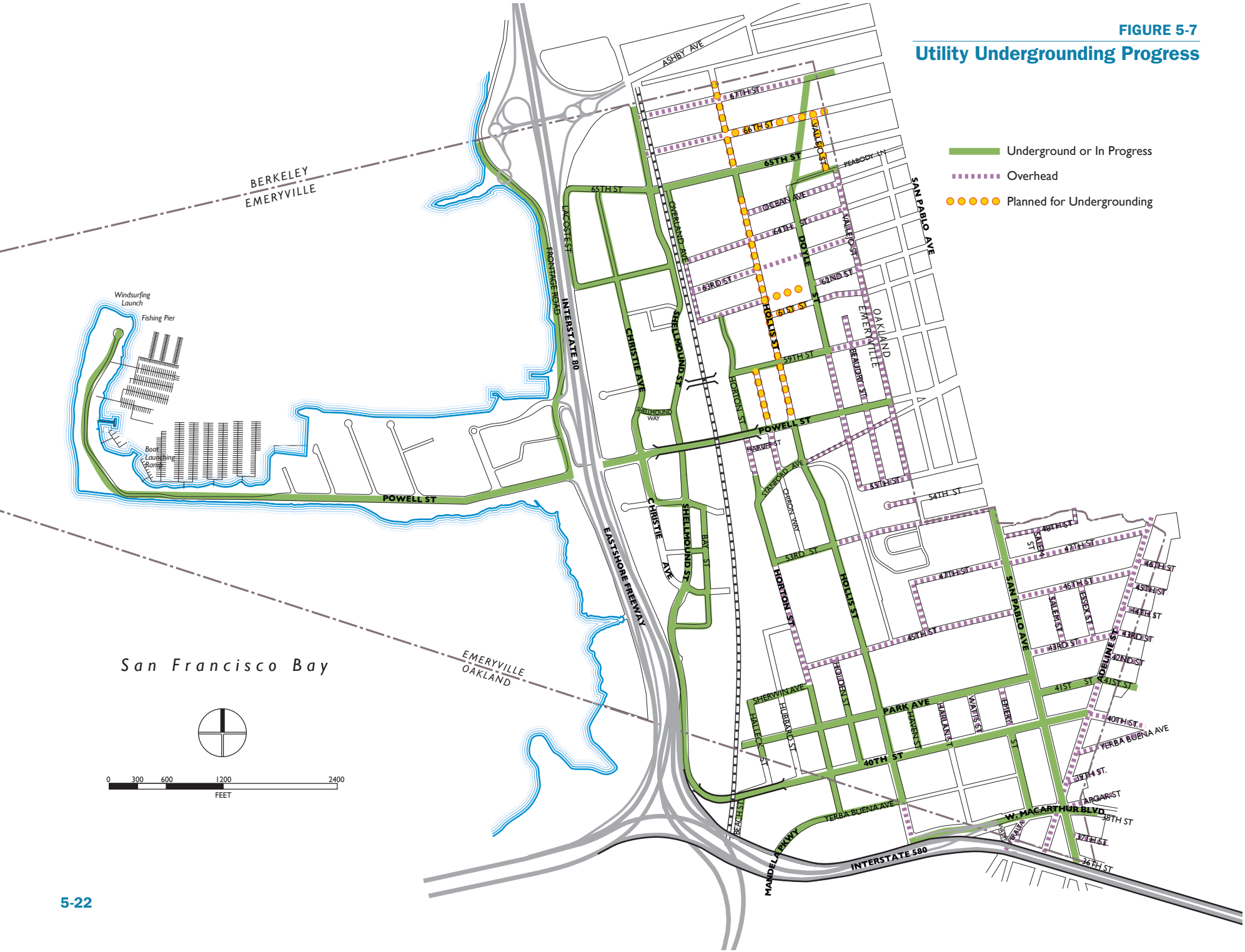




Replacing overhead wires that disrupt views and cause potential hazards (top) with underground facilities allows for safer and more attractive streetscapes (bottom).

FIGURE 5-7

Utility Undergrounding Progress



Streetscapes in Eastern Residential Neighborhoods

Streets in the existing Eastern Residential Neighborhoods have their own character and needs. Front stoops and porches, parking located in the rear, and small front yards all help to create a neighborhood where parents can watch children play and neighbors can interact. In the Triangle neighborhood, enhanced landscaping along the district's internal street network, as well as traffic calming measures, will further enhance the residential and pedestrian character of the neighborhood. In the Doyle Street district, sidewalk and landscape improvements—especially in reinforcing the existing tree canopy—will provide a transition in physical scale, as well as visual mitigation of development scale to the west. Along San Pablo Avenue, a continuous street façade will be established along the length of the district to encourage walkability and reinforce the prevailing character of small shops and services that already exist in the district.

Parking

Parking is a key issue in streetscape and building design. While this section focuses on parking as it relates to urban design, Chapter 3: Transportation (Section 3.7) describes parking policies related to demand and supply. The design and location of parking directly affects the quality and character of the street and pedestrian environment. Commercial development in the Bayfront, Peninsula, and East Bay Bridge districts is characterized by large surface parking lots—ranging from two to seven acres. These lots create a vast expanse of parking, punctuated with intermittent, isolated, and vehicle-oriented developments. A pedestrian-friendly environment is absent both from the street and internal parking lot circulation.

The General Plan presents policies to improve the design quality and pedestrian experience of parking, through use of materials and active ground-floor frontages. In addition, redevelopment of surface parking lots into mixed-use development with integrated structured parking (below- or above-grade), is part of the infill development strategy of the General Plan. For above-grade structures, the interaction of the parking structure with the street is a key element of design. To maintain a consistent and active urban environment, commercial or residential uses should wrap the parking. The City's Design Guidelines detail appropriate guidelines for parking design.

Building-to-Street Interface

In addition to streetscape design, street life and comfort are crucial for a successful public realm. This cultivation of the public realm can be accomplished not only through streetscape improvements, but also through the interplay between the built environment and the street. Methods to foster greater street friendliness include provision of an intimate and interactive building scale through horizontal and vertical articulation; height stepbacks to diminish overshadowing of the public realm; greater number of entrances and building transparency; and habitable and active space at the ground level.

Building Articulation

The General Plan promotes an intimate scale of development along city streets through horizontal and vertical articulation. This includes varied building heights within districts or building clusters, recesses and projections, window articulation and treatments, and roof forms that contribute to overall texture and character. Horizontal building articulation is especially emphasized to provide richness and variety at eye level, particularly for large floorplate structures







Buildings with articulation, that are stepped on the upper floors, and that have interesting design features create a more pleasant and engaging experience for pedestrians. Open parking structures (top) are unattractive and should be avoided.

FIGURE 5-8

Pedestrian Priority Zone in Neighborhood Center Street Section

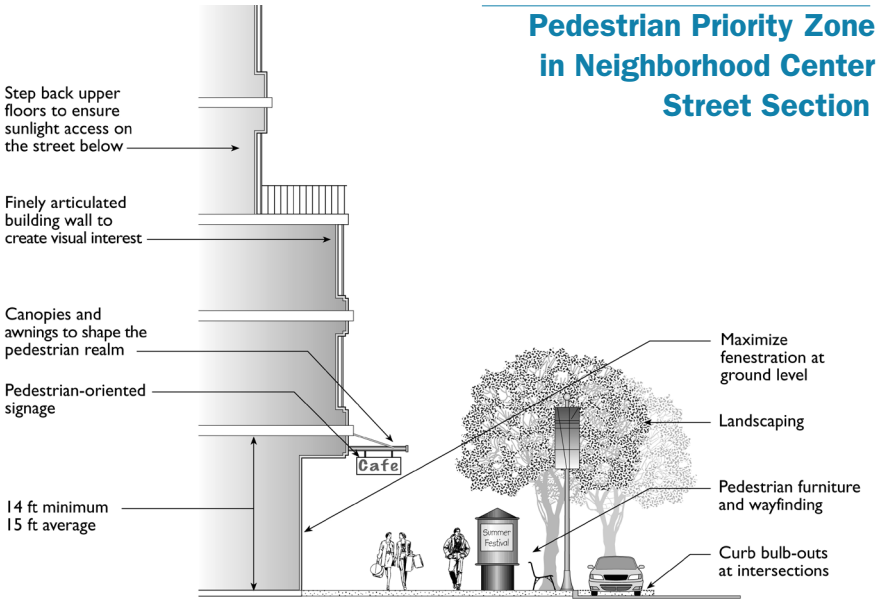
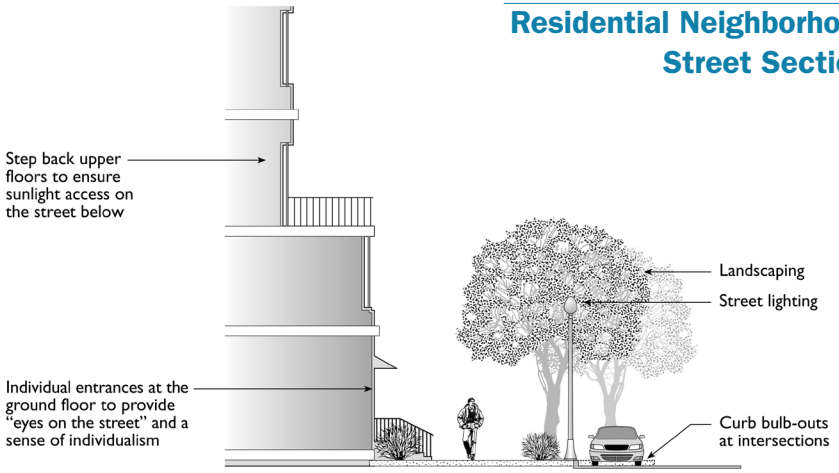


FIGURE 5-9

Residential Neighborhood Street Section



that are characteristic of the light industrial, research and development, and mixed-use commercial development throughout Emeryville. In addition, height stepbacks are also employed along streets because taller buildings at the street edge may overpower and cast shadow onto the public realm.

Building Design Elements at the Sidewalk

Often marked by canopies and awnings that can also serve to break up a building's mass, street-level entrances and windows dramatically contribute to pedestrian scale, visibility, and security. Windows and entries provide both physical and visual relief, as pedestrians are allowed to interact with interior building activities. An engaging, transparent building can help to physically and psychologically pull the pedestrian in from the street edge. Security and visibility are also enhanced along the street as buildings and their interior activities are directed toward the street edge.

All streets should have active frontages, but particularly streets in neighborhood centers and higher-intensity areas, where the quality and character of the pedestrian realm is paramount. General Plan policies reflect a high standard for building articulation, use of fenestration and entries to activate the public realm, and sidewalk/streetscape treatments (see Figure 5-8). Additionally, as the city becomes more intense, conscious strategies to provide living units at the ground level will provide "eyes on the street" for enhanced security, as well as greater visual interest for pedestrians. Ground floor residential requires careful horizontal and vertical layering to mitigate the public to private transition. Units at the lower level with individual entrances will provide a sense of individualism and identity for otherwise large residential developments, and will expand housing options and types particularly in higher-intensity areas throughout the city (see Figure 5-9).



Existing



Street Improvements and Plaza



With City Park and Parking Garage



East Bay Bridge Center



East Bay Bridge Neighborhood



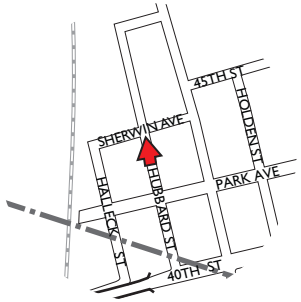
Existing



Park and Pedestrian Improvements



Evolving Neighborhood



Sherwin Williams Site



Sherwin Williams Neighborhood



Existing



Trees and Pedestrian Improvements



Pedestrian-Friendly Development



Powell Street and Christie Avenue Intersection



Mixed-Use Core Area



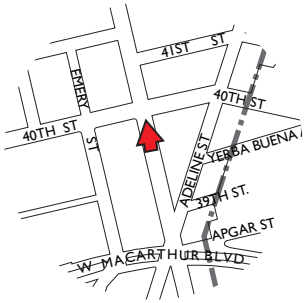
Existing



Evolving Neighborhood Center



Evolving Neighborhood Center



San Pablo Avenue and 40th Street Intersection



Neighborhood Center



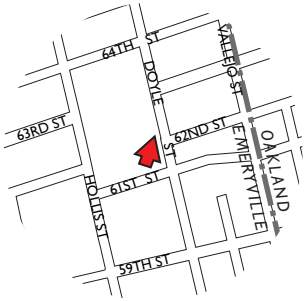
Existing



Utility Wires Undergrounded



Park Completed



Doyle Hollis Park



Park and Transit Improvements



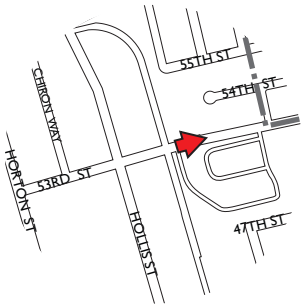
Existing



Utility Wires Undergrounded



Evolving Temescal Creek Greenway



53rd Street Greenway



Temescal Creek Greenway

5.6 NEIGHBORHOOD CENTERS

The General Plan establishes concentrations of activity to serve as a focus for retail, community services, and other amenities. These neighborhood centers and the pedestrian streets and open spaces that connect them are identified in Figure 5-10. They are also designated in the General Plan Land Use map by a Neighborhood Retail Overlay district. Neighborhood centers should have an identifiable palette of streetscape amenities and an active street frontage.

Streetscape improvements will be essential to activate these centers, and to foster pedestrian comfort and emphasize neighborhood character. The system of neighborhood centers will be linked by landscaped Green Streets and Greenways. Neighborhood centers will be active at the street level, lined with buildings that engage the pedestrian, with surface parking located in the rear of the building, as shown in Figure 5-11. They are practical destinations for errand running, nodes for local public functions, and gathering areas. Strategic height limitations and building massing requirements will maximize sun exposure.

The General Plan identifies four neighborhood centers within the city as shown in Figure 5-10:

1. **Park Avenue:** in the western half of the Park Avenue District. The scale and character of this neighborhood center will be complementary to the surrounding historic Park Avenue structures. A plaza and park will also emphasize the civic role of the area, capitalizing on the presence of City Hall on Park Avenue at Hollis Street.
2. **North Hollis Street:** connecting the northern industrial area with the North Hollis and Doyle Street districts. This center will play a key role in unifying several distinct districts, becoming a gathering place with multiple uses and attractions for both employees and residents. The center also includes access to a new park located off of Hollis Street, further enhancing social gathering opportunities. Specific design guidelines for this center will incorporate those identified in the North Hollis Area Urban Design Program, adopted in April 2002.
3. **Watergate Market Area at Powell Street and Captain Drive:** improving this center to create a central focus point along the Emeryville Peninsula. The center acts as a waterfront retail/restaurant node, serving workers, residents, and visitors, and will provide an important amenity and activity center for the Watergate residential neighborhood and adjoining employment district.
4. **San Pablo Avenue:** creating an important connection between the Triangle district and the rest of the city. The center will stretch along the landscaped boulevard, incorporating neighborhood-oriented retail uses that will reinforce this area as a key destination for the varied inhabitants of surrounding land uses—including high school students, employees, residents, visitors, and transit riders. Moreover, the Emeryville Center for Community Life, proposed on the existing Emery Secondary School campus, will provide a synergy of civic uses. The neighborhood center will have a key node at Park Avenue, creating a linear and visual connection to the historic heart of the city. Design will be guided by the San Pablo Avenue Urban Design Plan.



Neighborhood Centers are being developed in four areas of the city, including North Hollis (top) and Park Avenue (bottom).

FIGURE 5-10

Neighborhood Centers

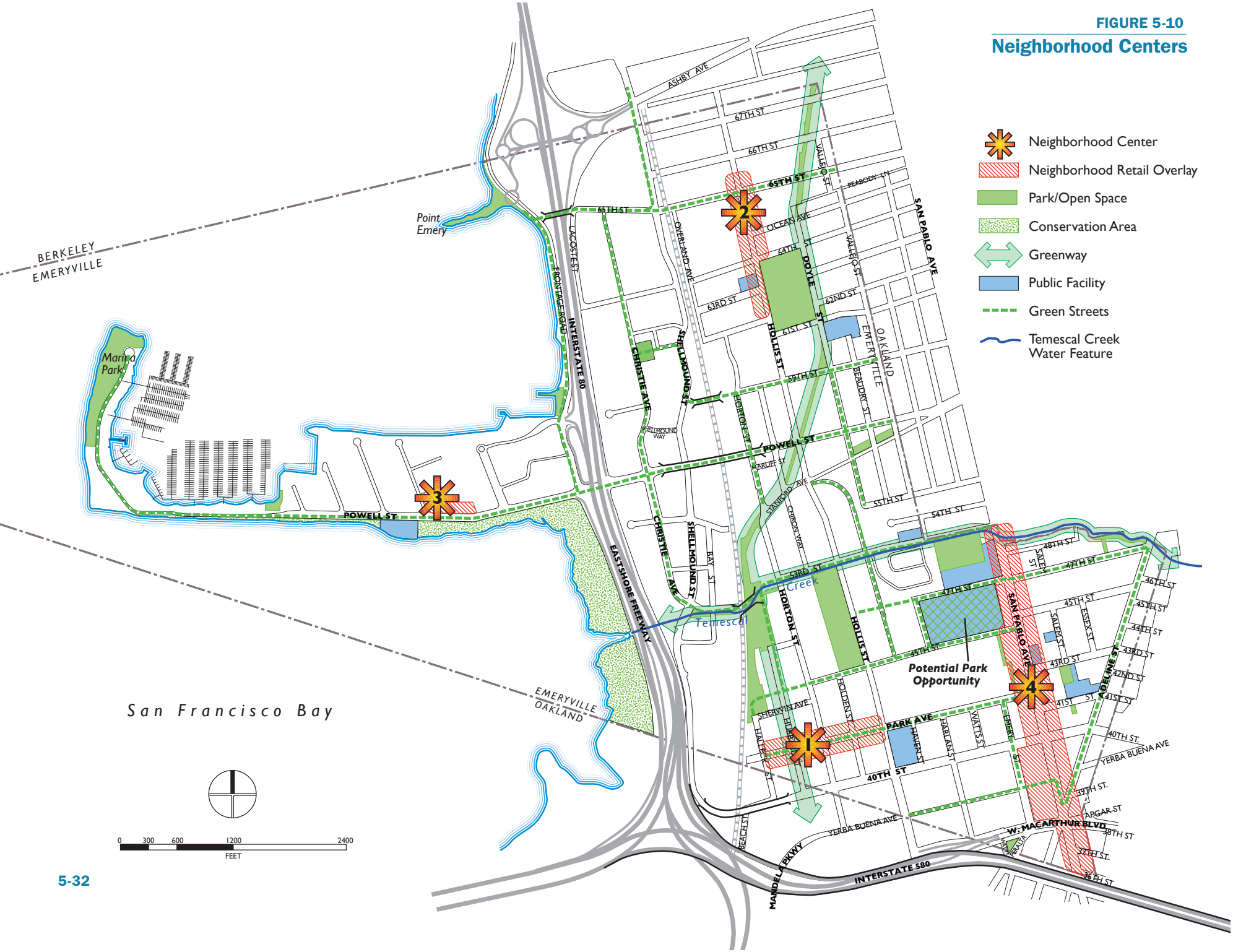
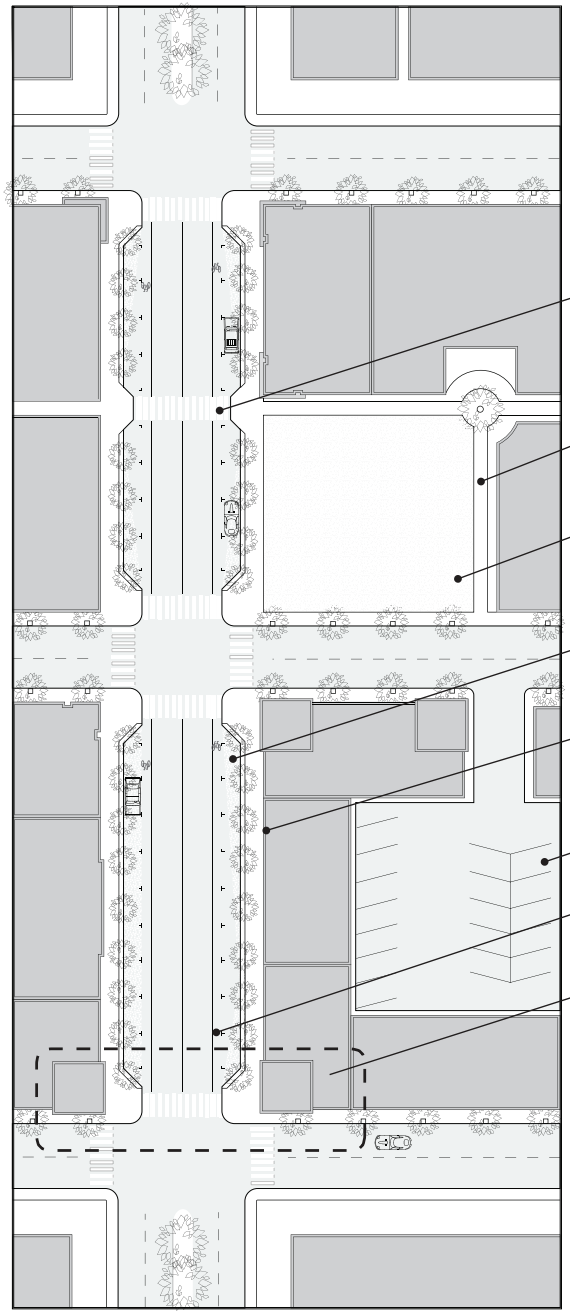


FIGURE 5-11

Neighborhood Centers Concept in Plan





Public art in Emeryville has been integrated into public infrastructure and signage.





5.7 IDENTITY AND GATEWAYS

Public Art

Public art plays an important role in relating the story and identity of the city, and in creating the opportunity for residents and visitors to participate and share in its development. The City's Art in Public Places Program supports public art though a development impact fee and has successfully increased the amount of public art in the city. This ordinance calls for a one to 1.5 percent fee on non-residential development projects to be devoted to the acquisition or installation of publicly accessible art (or into an in lieu public art fund). The General Plan supports the growth of historical, cultural and geographic awareness in the city by emphasizing public art in all areas of the city. In particular, public art within major activity nodes and regional destinations, within established neighborhoods, and along major pedestrian corridors will play a key role in articulating the city's identity. Additional support from the City may include competitions, exhibit space, and public facilities for cultural events and art shows.

Gateways

A critical part of establishing the identity of Emeryville as a whole involves "gateways." These are specially-designed landmark elements to be located at key entrances to the city as shown in Figure 5-1. It is essential that gateway features be unique in design, visible to both motorists and pedestrians, and emblematic of the city they introduce.

At Powell and I-80, the gateway features should announce one's arrival into the city from the freeway, and should speak to the regional destinations within the North and South Bayfront districts. The design of the gateway feature should factor into the scale of nearby buildings, traffic circulation patterns, and the character of the western part of the city. Along the San Pablo Avenue corridor, the gateway features should distinguish Emeryville from neighboring Oakland and Berkeley. Additionally, signage and other features may be appropriate at other gateways to the city.

Signage

Wayfinding signage is envisioned as a a way helping to make Emeryville more navigable and visitor-friendly, by providing signage, kiosks, public art and other navigation tools. Signage is to be provided to address the presence of all major destinations within the city, including key pedestrian and bicycle paths, crossings and overpasses; the Greenway and Key Green Streets; neighborhood centers and activity nodes; the Bay Trail; and major city parks. Signage efforts may also be incorporated into neighborhood streetscape and gateway elements, to become part of an integrated plan for creating and articulating identity. The City Council has already approved a citywide wayfinding program (though it has not yet been implemented) and the General Plan encourages its continuation.

Architecture and Building Materials

The quality of building materials and finishes play a large role in people's judgment of neighborhood quality. The General Plan seeks to provide consistent guidelines and coherence with existing and historic structures, while allowing for variety and freedom of design. To that end, the City's Design Guidelines outline a palette of appropriate materials, building forms, and orientation. Building form should be articulated to create visual interest, prevent bulky structures, and avoid blank walls. High-quality materials and construction are an essential part of creating efficient, attractive, and lasting architecture. Stone, tile, metal, brick, glass, and similar durable and upgradable materials should be used to further the city's architectural identity. As described in Chapter 7: Sustainability, energy-efficient and recycled materials should be used, whenever possible, through renovation and new construction projects. Together, high-quality architecture, construction practices, and urban design can create a more attractive and distinctive city.





Reuse of existing or historic materials as well as the use of new high-quality materials can create a cohesive identity for the city.

GOALS

CITY STRUCTURE

UD-G-1 **An identifiable city structure—** A city structure comprised of a vibrant, intense, and pedestrian-oriented core, and distinctive neighborhood centers and districts augmented with parks and connected by greenways and green streets.

UD-G-2 **A diversity of building types and scales—** Variation to reinforce the identity of individual districts and foster a variety of options for living and working, with continuity in development scale and character and careful transitions between densities and design typologies.

UD-G-3 **A walkable and pedestrian-scaled environment—**A network of streets and connections that expands circulation opportunities for pedestrians and bicyclists.

UD-G-4 **New parks—**Strategically located new parks and outdoor open spaces to enhance Emeryville's livability and pedestrian orientation.

UD-G-5 **Neighborhood Preservation—**Preservation of the existing small-scale residential quality of older neighborhoods.

UD-G-6 **Unique districts throughout the city.**

STREET GRID, CONNECTIONS, AND VIEWS

UD-G-7 **Expanded street grid—**A pedestrian and bicycle path system with extensions that improve connectivity throughout the city.

UD-G-8 **A safe, attractive, and connected pedestrian environment—**Throughout the city, but particularly in areas with high volumes of pedestrian activity.

UD-G-9 **An appealing and functional system of bridges and crossings—**Crossings at major barriers (e.g. freeways and rail lines). Protected public views of the San Francisco Bay and the East Bay Hills.

SKYLINE AND BUILDING BULK

UD-G-10 **A skyline with the tallest buildings concentrated in the central core—**The tallest buildings at the Powell Street/Christie Avenue area, with a gradual transition to lower building heights to the mid- to lower-scale development to the east and west.

UD-G-11 **Sky Exposure—**Building form and massing that furthers sky exposure for adjacent sidewalks and public spaces, especially in gathering places such as the core and neighborhood centers.

UD-G-12 **Uninterrupted sunlight—**During designated periods on all major parks.

STREETSCAPES AND BUILDING-TO-STREET INTERFACE

UD-G-13 **Streets that support multiple functions—**Streets designed for all types of users, including pedestrians, bicyclists, public transit, and automobiles.

UD-G-14 **Streets as an extension of Emeryville's open space network—**Opportunities to linger, stroll, and gather.

UD-G-15 **Development along streets that offers a rich visual experience—**Development that is engaging to pedestrians, is unobstructed by parking facilities, and contributes to street life, vitality, and safety.

NEIGHBORHOOD CENTERS

UD-G-16 **Focal nodes throughout the city—**Neighborhood Centers that act as centers for local services and amenities, and build upon the character and identity of surrounding districts.

UD-G-17 **A walkable and connected city—**Neighborhood centers and other amenities in proximity to employees and residents throughout the city.

IDENTITY AND GATEWAYS

UD-G-18 **A city identity—**An identity that distinguishes Emeryville for the community and its visitors.

UD-G-19 **High-quality—**Design and construction that respects existing architecture, but creates new signature places.

POLICIES

Implementing actions supporiting each policy are described in Chapter 8: Implementation Program.

CITY STRUCTURE

Citywide

UD-P-1 The City shall strive to accentuate activity and presence at the street level, particularly along pedestrian-oriented corridors and in residential areas.

UD-P-2 Parks and open space is required with new development, consistent with Figure 4-1 in the Parks, Open Space, Public Facilities and Services chapter.

UD-P-3 Parks and open space shall be accessible and available to the public through site design standards for minimum size/dimensions, visibility, and location along public rights-of-way, particularly Green Streets (Figure 5-3).

UD-P-4 New development will be required to extend the street grid or pedestrian connections wherever possible.

AREAS AND DISTRICTS

Bayfront and Peninsula

UD-P-5 The tallest buildings and highest development intensities in the city shall be located within the Powell Street/Christie Avenue core, with the exception of the northwest and southwest corners of the city.

UD-P-6 A new neighborhood center around the intersection of Powell Street and Captain Drive will be oriented to support views of the Bay

UD-P-7 A high-intensity mixed-use core will be located near Powell Street and Christie Avenue, and built to the street edge to maintain a vibrant pedestrian-oriented district.

UD-P-8 Improve streetscape treatments, open space connections, and extension of the street grid through Powell Street Plaza.

Central Emeryville

UD-P-9 The overall scale and uses of the industrial district shall be preserved.

UD-P-10 In the Industrial district, transitions will be designed between industrial and residential uses, creating visual continuity through building materials and design, while allowing landscaping or other buffers between uses. Increased fenestration and ground-floor entries will be required to maximize pedestrian safety and visibility.

UD-P-11 A pedestrian and bicycle-friendly mixed-use district will be developed in North Hollis, consistent with the policies and guidelines defined in the North Hollis Area Urban Design Program.







Regardless of land use or development type, new development must interface with the public realm of streets and open space to create a safe, connected, and vibrant Emeryville.



Emeryville's pattern of large blocks and wide streets will be improved through an expanded street grid and additional connections.



Mid-block connections can accommodate a range of users, including drivers, pedestrians, and bicyclists.

UD-P-12 In South Hollis, new development shall provide rights-of-way and greater setbacks where open space and pedestrian connections are planned. Building façades and entries should be oriented toward the Greenway, new open spaces, and the proposed Center of Community Life.

UD-P-13 The Park Avenue District Plan will continue to guide development in the Park Avenue district, honoring its unique civic, arts, and cultural amenities.

UD-P-14 A more urban character will be established for the East Bay Bridge district, by developing taller buildings, a more continuous street façade with pedestrian activity at the ground level, and increased development intensity.

Eastern Residential Neighborhoods

UD-P-15 Infill residential development should incorporate the scale, character and identity of adjacent existing development. To avoid a continuous row of garages along the street, the lot frontage should provide a minimum of 70% active non-parking related uses, provided that a driveway of maximum ten-foot width shall be permitted.

UD-P-16 Streetscape improvements and greater intensity of development will be emphasized to improve the connection between the southwestern portion of the San Pablo Corridor district and the rest of Emeryville to the north.

UD-P-17 Pedestrian character and safety will be enhanced through landscaping and streetscape improvements in the Triangle and Doyle Street Districts.

UD-P-18 The San Pablo Avenue Urban Design Plan will continue to be used to improve landscaping, and streetscape design and guide development in the San Pablo Corridor district.

UD-P-19 Infill development shall provide activation at the lot frontage and minimize visible off-street parking.

STREET GRID, CONNECTIONS, AND VIEWS

UD-P-20 The street grid shall be extended as redevelopment on larger sites occurs.

UD-P-21 Full or partial public street closures by private development shall be prohibited. Where a street closure to vehicular traffic is necessary for public projects, as called for in this General Plan, access for pedestrians and bicycles should still be maintained.

UD-P-22 The City shall maintain and enhance an integrated pattern of streets, pedestrian paths, and bike routes through a fine-grain street grid that enables efficient movement throughout the city.

UD-P-23 Opportunities to extend the street grid through internal connections in large-parcel developments should be considered. Single-point access to new development should be avoided.

UD-P-24 The City shall establish Pedestrian Priority Zones in Regional and neighborhood centers, around schools, parks, and in other locations as indicated in Figure 5-3. While wider sidewalks, street lighting, bulbed crosswalks, and other pedestrian amenities should be employed throughout the city, they are prioritized in these locations.

UD-P-25 Pedestrian Priority Zones shall be linked to adjacent land uses to ensure that building frontages respect pedestrians and truck loading takes place on adjacent streets wherever possible.

UD-P-26 Commercial uses, such as retail, restaurants, hotel lobbies, offices, and flex space shall be required at the ground level in neighborhood centers and regional retail overlay districts.

UD-P-27 All ground-level street frontages should be activated. Driveways, loading zones, and curb cuts shall be provided but minimized.

UD-P-28 Visual distinction and safety shall be prioritized in the design of bridges and undercrossings.

UD-P-29 Public views of the San Francisco Bay and the East Bay hills shall be maintained.

UD-P-30 Streetscape features should not block public views.

SKYLINE AND BUILDING BULK

UD-P-31 In the neighborhood centers and city parks flexibility should be provided in building massing so that sunlight is not blocked.

UD-P-32 Buildings with light-colored finishes shall be encouraged, especially on upper floors and along narrow corridors such as Hollis Street. Standards for building reflectivity shall be maintained to maximize day-light on sidewalks and streets without causing glare.

UD-P-33 Bulky and monolithic buildings shall be prevented through:

- Vertical articulation, such as step backs at higher floors, and less floor area as heights increase to reduce the apparent bulk of buildings.
- Horizontal articulation, such as varied setbacks, recessions/projections, change in materials, and building transparency, especially in Pedestrian Priority Zones.

UD-P-34 Volumetric building development standards shall be maintained to:

- Establish bulk standards based on a variety of considerations, including building height, intensity, and location; and
- Allow bulkier buildings in employment-emphasis areas while striving for less bulk in residential and mixed-use areas.

UD-P-35 Tower separation shall be required to increase sky exposure for developments with multiple towers, and maintain separation standards for buildings taller than 100 feet.

UD-P-36 Where large floorplates are permitted, buildings shall be required to adhere to height, setback, and stepback standards, as required for view and sun access, but less stringent bulk standards shall be permitted.

UD-P-37 Development of a finer-grain scale and texture shall be promoted citywide and required in portions of the North Hollis, Park Avenue, and San Pablo Avenue districts, and around neighborhood centers.

UD-P-38 New developments should employ changes in height, massing, and/or design character to create careful transitions in scale and density.

UD-P-39 New development should not cast significant shadow over existing development.





Building articulation and appropriate massing ensure sun access and creates visual interest.

STREETSCAPES AND BUILDING-TO-STREET INTERFACE

UD-P-40 Neighborhood structure and pedestrian scale development should be prioritized. The scale and character of existing neighborhoods should be maintained to ensure connectivity and continuity of street design within each district.

UD-P-41 Minimize pavement widths (curb to curb) to the minimum necessary to ensure traffic flow and safety, to discourage speeding through neighborhood centers and residential areas, and to prioritize pedestrian and bicycle movement.

UD-P-42 Sidewalks shall be safe, comfortable, and accessible for pedestrians.

UD-P-43 Continuous and consistent street tree planting shall be provided along Green Streets and in Neighborhood Centers.

UD-P-44 Curb cuts shall be minimized to emphasize continuous, unbroken curb lengths.

UD-P-45 Long blocks shall be minimized to allow for ease of pedestrian connectivity.

UD-P-46 Street trees shall be provided on City streets where feasible. Street trees shall be planted in a row along the curb, between the vehicle roadway and sidewalk, unless this is physically impossible due to constraints such as underground water or sewer lines.

UD-P-47 Streetscape landscaping shall follow Bay-Friendly Landscaping guidelines and serve the dual purpose of treating stormwater runoff and providing shade and beauty to the urban realm.

UD-P-48 A design framework for streetscapes shall be established by district and/or citywide.

UD-P-49 City identity shall be enhanced by distinctive streetscapes through the use of street trees and unified landscape treatments

UD-P-50 Cohesive streetscape improvements to streets in neighborhood centers, and designated Green Streets are a priority.

UD-P-51 Impediments to sidewalk safety and movement shall be removed, and utilities and transformers undergrounded where possible. Large new developments shall be required to underground any adjacent existing overhead utility lines.

UD-P-52 Funding and programs to underground utilities and overhead wires shall be continued.

UD-P-53 Use of the greenways shall be reinforced by fronting entrances to both commercial and residential development to the public pathway.

- Encourage open spaces and plazas adjacent to the greenways.

- Encourage other public-oriented ground level uses such as workshops, lobbies, and common areas.

UD-P-54 Generous sidewalks, and bikeways or bike lanes along greenways shall be required. Curbside parking and local vehicular access when greenways share right-of-ways with streets shall be permitted.

UD-P-55 Pedestrian-scaled street lighting, street furniture, and undergrounded utilities along greenways shall be required.

UD-P-56 Setbacks averaging 15 feet for new residential developments shall be required along greenways to create a landscaped front yard. Stairs, stoops, or other architectural encroachments, which contribute to the pedestrian life of the street, are also permitted.

UD-P-57 The Emeryville Center of Community Life building program shall be oriented along 53rd Street to complement and provide access to the greenway and Temescal Creek.

Parking

UD-P-58 Large surface parking lots shall be replaced with structured parking and incorporated into high density mixed-use developments. New or expanded large surface parking lots are not allowed.

UD-P-59 Parking should be screened or concealed. Pedestrian entrances to non-residential buildings should be located on the sidewalk; any entrances from parking areas should be incidental or emergency only.

UD-P-60 Parking should be located below-grade where possible.

UD-P-61 Above-grade parking structures should be wrapped with active uses in Pedestrian Priority Zones (see Figure 5-3).

UD-P-62 If active uses are not feasible on the ground floor of parking garages, frontages should be architecturally attractive. This may include unique designs and materials, such as glass, articulated masonry, murals or landscaping setbacks.

UD-P-63 Motor vehicles and interior lighting should not be visible from the exterior of parking garages.

Building to Street Interface

UD-P-64 Ground floor uses should be emphasized to facilitate pedestrian use, with standards for building frontage, fenestration, and entries.

UD-P-65 Buildings should be designed with ground level windows and building entries along the street.

UD-P-66 For all multifamily residential development, including high-rise, and along pedestrian-oriented streets, townhomes or other units with direct street access should be provided to promote individualization, family-friendly development, identity, and street safety.

UD-P-67 An open relationship between buildings and street edge should be maintained. Fencing and significant landscape barriers should be avoided, except to enclose individual yards.

NEIGHBORHOOD CENTERS

UD-P-68 The City shall foster development of neighborhood centers as identified in Figure 5-10 and described in Section 5.6.

UD-P-69 The pedestrian environment shall be enhanced with multiple neighborhood access points, through-streets, and pedestrian pathways.

UD-P-70 Street-level uses should reinforce neighborhood center streets and allow a vertical mix of a diverse range of land uses including offices, hotels and residential uses compatible with neighborhood center functions.

UD-P-71 Developments adjacent to neighborhood centers, parks or plazas should create an integrated and memorable relationship of architecture and open space. Orient primary building facades and entries to these spaces and maximize visual interest.

UD-P-72 Public space and plazas for gathering and expanded ground-floor retail activities are encouraged. These elements enhance the pedestrian realm and provide opportunities for social interaction.

IDENTITY AND GATEWAYS

UD-P-73 The City will create visual gateways through streetscape design, signage, and building massing to establish identity at key entry points to the city.

UD-P-74 The City will continue to invest in a citywide public art program that contributes to an awareness of the city's history and culture.

UD-P-75 The City will institute sign regulations that create an identity without dominating city and district appearance.

San Pablo Avenue features a Neighborhood Center around the Park Avenue intersection.





6 CONSERVATION, SAFETY, AND NOISE

This chapter establishes goals and policies for the conservation of natural and cultural resources, and for the protection of the community from hazards and excessive noise. While there are many benefits to the compact, mixed use nature of the city, it presents challenges in addressing safety and noise concerns that are not as apparent in cities where potentially harmful activities and residents are separated.

Preserving environmental resources—by maintaining water and air quality, and protecting plant and wildlife habitat—is critical given Emeryville's urban setting and limited open space. Preserving the City's many cultural and historic resources can help further the City's identity. Encouraging developers to renovate existing structures preserves the City's heritage, while reducing environmental impacts of demolition and new construction.

Health and safety issues stem from Emeryville's location within an earthquake-prone region, noise and pollution from highway and rail systems, and hazardous materials from historic industrial activities. Reducing risks associated with these potential hazards—by ensuring emergency preparedness, enforcing building codes, and continuing the City's brownfield remediation program—will create a safer, more livable community. (Note that police, fire, and emergency services are described in Chapter 4: Parks, Open Space and Public Services.)

Noise has an important effect on human habitation, health, and safety. Transportation systems, such as Interstate 80 and the railroad provide great accessibility from Emeryville to other points in and outside the Bay Area, but they also create noise and pollution. This chapter identifies implementing policies, such as appropriate building siting and materials, to lower the risk to human health.

6.1 CONSERVATION

Air Quality

See also Chapter 7: Sustainability for policies related to greenhouse gas emissions and climate change.

While air quality is largely a regional issue, the land use, circulation, and growth decisions made by local communities, such as Emeryville, affect regional air quality. Air quality in Emeryville is generally good due to clean air blowing off the ocean and San Francisco Bay. However, areas of Emeryville along major thoroughfares, such as Interstate 80 and San Pablo Avenue, experience relatively higher pollutant concentrations due to heavy traffic volumes. A 2004 inventory of greenhouse gas emissions showed that the transportation sector in Emeryville was the greatest contributor, with 49% of the total, while the commercial/industrial sector was responsible for 43%. The residential sector and waste sectors represented the smallest share of greenhouse gas emissions, with 5% and 3% of the total, respectively.[1] (See Section 7.3 of Chapter 7: Sustainability for a more detailed description of greenhouse gas emissions.)

Bay Area Air Basin

Emeryville is located in the central portion of the Bay Area Air Basin, which includes most of the nine-county Bay Area. Air basin quality is monitored by the Bay Area Air Quality Management District (BAAQMD), which operates a regional network of air pollution monitoring stations to determine if the national and State standards for criteria air pollutants and emission limits of toxic air contaminants are being achieved. The Bay Area is considered in attainment status for

1 *City of Emeryville Greenhouse Gas Emissions Analysis, July 2008.*

all national standards, except for ozone. It is in nonattainment status for State standards for ozone and particulate matter. As of 2008, BAAQMD was beginning to prepare the 2009 Bay Area Clean Air Plan in accordance with the requirements of the California Clean Air Act. The Plan will address the impacts of ozone control measures on particulate matter, air toxics, and greenhouse gases in order to implement feasible measure to reduce ozone. The Clean Air Plan will also establish emission control measures.

Toxic Air Contaminants

Toxic air contaminants are airborne substances capable of adversely affecting human health effects. They are emitted from a variety of common sources, including gasoline stations, automobiles, dry cleaners, industrial operations, and truck, train, and automobile traffic. Future development under the General Plan could result in sensitive receptors (e.g., residents, open space users) being located near these sources. Working with the Bay Area Air Quality Management District, the City can help to manage air pollutants. Moreover, the City can reduce exposure to sensitive receptors through regulations in the Zoning Ordinance.

Water Supply and Quality

The East Bay Municipal Utility District (EBMUD) supplies water and wastewater treatment services to the City. The primary source of fresh water comes from the Sierra Nevada mountain range, via the Mokelumne Aqueduct. Although EBMUD adopted a long-term program to reliably provide water through 2020, various events—such as earthquakes, drought, contamination, fires, and levee failure—may disturb the availability and reliability of water from the Mokelumne River and watershed runoff. In response to such potential hazards, EBMUD prepared an Urban Water Management Plan (UWMP) which consists of supplemental water supply, banking, conservation, and watershed improvement to help accommodate existing and future demand within EBMUD's ultimate service boundary. EBMUD also participates in transfer and exchange programs with other Bay Area water districts to establish cooperation agreements for times when primary water sources prove unreliable.

EBMUD also supplies recycled water, which, as a result of treatment of wastewater, is suitable for direct beneficial use or controlled use that would not otherwise occur. Emeryville has a Recycled Water Ordinance, requiring residential developments that require subdivisions and buildings with over 100,000 square feet of non-residential development to install a parallel water supply system for elements such as parks, greenbelts, landscaped streets or medians, and any other use that does not require potable water. The goal of using recycled water is to save high-quality water to meet annual potable water needs. Recycled water reduces the demand for EBMUD's potable water supplies, and thus delays or eliminates the need for more potable water facilities, sustains the economy with increased water supply reliability, protects the San Francisco Bay by reducing treated wastewater discharge, and stretches the high-quality potable water supply during times of prolonged drought or disaster.

Water Conservation

Similar benefits to quality and supply of water can also be achieved through conservation efforts. EBMUD has adopted water conservation programs to address both water supply and demand. Demand-side water conservation programs are intended to reduce overall consumption of the water supply through free water audits, rebates and other incentives, regulations, education, and supporting activities to reduce consumption. EBMUD's supply-side conservation measures are directed toward increasing water use efficiency





Pollution from industrial, transportation and other sources can be mitigated to reduce harmful impacts at the local level.





In wet weather, stormwater flows off of impermeable surfaces (buildings, parking lots, streets) and into Temescal Creek and the Bay, picking up particulate and debris along the way.

before or after customer use. These strategies include improvements within EBMUD's distribution system (i.e. leak detection, pipe replacement, and corrosion control) and water recycling programs.

The City can build on these conservation efforts through the development and permitting process. Cisterns can be integrated into building design or rainwater barrels installed post-occupancy in order to capture rainwater and use it for non-potable water needs (e.g. toilet flushing and irrigation). Graywater — water that comes from sinks, showers, and washing machines — may be reused on-site to flush toilets and irrigate non-edible landscape plants. These efforts decrease potable water consumption, while also reducing stormwater runoff. Green roofs can be installed on rooftops, creating many advantages over traditional roofs, such as taking on stormwater, providing a public amenity, and reducing energy consumption and costs.

Surface Water Quality and Pollution

The City of Emeryville lies in the Central Basin within the San Francisco Bay hydrologic region. Although topography is generally flat, the city's elevation ranges from 0 to 60 feet above mean sea level and slopes slightly to the west toward the Bay—the major receiving water body. The other surface water feature in the city is Temescal Creek, which flows west from the East Bay Hills into San Francisco Bay. Historically, Derby Creek also flowed through the city but has been incorporated into the storm drain system. The portion of the Bay near the city is affected by several drainage outlets that include a storm sewer outfall south of the Emeryville Peninsula, a wastewater treatment outfall in the southern portion of Emeryville Crescent in Oakland, and Temescal Creek.

Urban stormwater runoff is a major source of nonpoint water pollution. As a largely urbanized city, Emeryville has a high proportion of impermeable surfaces. Pollutants such as suspended solids, heavy metals, and nutrients are often found in samples of urban stormwater runoff. The pollutants are deposited onto street surfaces and washed into receiving waters. Along the shoreline, nonpoint pollution is caused by overland stormwater flow and urban runoff from dredging activities, marine vessel waste, sediments, sand, industrial fuels, equipment and other operations, infiltration from sewer system, accidental spills of hazardous materials, and construction activities. A further discussion of flooding and drainage, including Emeryville's participation in the National Pollutant Discharge Elimination System permit process, is described in Section 6.4 of this chapter.

Future Demand

EBMUD's service area within Alameda County currently reaches approximately 489,000 customers—including the residents of Emeryville—and is projected to serve nearly an additional 100,000 people by the year 2030. Water consumption within the EBMUD service area has remained relatively level in recent years, despite continuing account growth.

A 2000 study, *Districtwide Update of Water Demand Projections*, projected EBMUD's current water demand for 2005 as 222 millions of gallons per day (mgd) with a total of 391,216 accounts. The study then foresaw development activities in places like Emeryville and throughout the East Bay, pushing demand to reach 281 mgd to 451,689 accounts by the year 2030. However, the total demand figure for 2030 is expected to be reduced to 232 mgd after conservation projects and recycled water programs are implemented.

Although EBMUD's current water supply is sufficient to meet demand during normal years, it is insufficient to meet customer demand in the case of a multi-year

drought, despite its aggressive conservation and water recycling efforts. EBMUD will inevitably face water supply shortages during extended periods of drought, but additional supplemental supply projects currently underway will significantly reduce the severity and frequency of customer rationing.

Habitat

The majority of Emeryville is developed with few open spaces and very little of the native habitat remains.

Sensitive Habitat Areas

The southwestern portion of Emeryville, along the shoreline west of Interstate 80, is known as the Emeryville Crescent and is one of the city's most valuable biological resources. This area is considered a sensitive habitat. Northern Coastal Salt Marshes occur along the shoreline of the Bay that is sheltered from excessive wave action. They support a high amount of vegetation such as cordgrass, pickleweed, eelgrass and saltgrass. The Emeryville Crescent region provides food, cover, nesting and roosting habitat for a variety of wildlife species.

Special Status Species

Searches of the California Natural Diversity Database (CNDDB), California Native Plant Society Electronic Inventory, U.S. Fish and Wildlife Service website species list, and California Department of Fish and Game were used to determine the known and potential presence of species of special concern within the Emeryville area. According to the CNDDB there are five special status wildlife species and seven special status plant species that have the *potential* to occur within Emeryville. These species, along with their scientific names, habitat needs and observed locations are described in Table 6-1. Additional species that have the potential to occur in the city include: Coopers Hawk, Sharp-shinned Hawk, and the Peregrine Falcon.

TABLE 6-1: Federal or State Listed Species and Other Species of Concern

Common Name	Scientific Name	Habitat Needs	Location Notes
California clapper rail	*Rallus longirostris obsoletus*	Nests and forages in emergent wetlands with pickleweed, cordgrass, and bulrush	Observed in Emeryville Crescent Marsh near Bay Bridge toll plaza in several recent surveys
California black rail	*Laterallus jamaicensis coturniculus*	Nests and forages in tidal emergent wetland with pickleweed and cordgrass	Recently observed in the Emeryville Crescent marsh
salt marsh harvest mouse	*Reithrodontomys raviventris*	Saline emergent marsh with dense pickleweed	Observed in Emeryville Crescent Marsh near Bay Bridge toll plaza in several recent surveys
tidewater goby	*Eucylogobius newberryi*	Shallow waters of bays and estuaries	Record in Berkeley's Aquatic Park; potential habitat in Emeryville Crescent
Santa Cruz tarplant	*Holocarpha macradenia*	Coastal scrub, coastal sand dunes, openings in oak woodlands with sandy or gravelly soil	Historical records in Emeryville area; likely extirpated
white tailed kite	*Elanus leucurus*	Nests near wet meadows and open grasslands, dense oak, willow or other large tree stands.	Recent record in Berkeley meadow (on Berkeley marina peninsula)
northern harrier	*Circus cyaneus*	Mostly nests in emergent vegetation, wet meadows or near rivers and lakes, but may nest in grasslands away from water	Recent record in Berkeley meadow (on Berkeley marina peninsula)
alkali milk vetch	*Astragalus tener var. tener*	Alkali flats and vernal pools in valley grasslands	Historical record in Oakland near Emeryville; habitat likely gone
round leaved filaree	*California macrophylla*	Clay soils in cismontane woodland and valley and foothill grassland	Historical records in Oakland
San Francisco spineflower	*Chorizanthe cuspidata*	Alkali flats and vernal pools in valley grasslands	Historical record West of Lake Merritt in Oakland
Kellogg's horkelia	*Horkelia cuneata ssp. sericea*	Closed-cone coniferous forests, coastal scrub	Historical records in East Bay
Point Reyes birds beak	*Cordylanthus maritimus ssp. palustris*	Upper zones of coastal salt marsh	Historical record on Emeryville/Berkeley shoreline

Source: California Department of Fish and Game, 2008; California Native Plant Society, 2005; United States Fish and Wildlife Service, 2005, Environmental Sciences Associates, 2008.







The city's historic resources include the Remar Bakery building (top), now residential units; PG&E North (center); and Old Town Hall (bottom).

Almost all the plant species' records are historical, meaning found around the turn of the century before the heaviest urbanization in the area. All of the species with historical records are likely gone and most of their habitat is marginalized or eliminated. However, there could still be some small habitat patches in Emeryville.

Cultural Resources

Emeryville's cultural resources provide a link to the people and the cultures of the past and enrich sense of community, heritage, and identity. Cultural resources include both prehistoric and historic-period archaeological resources, as well as historic and architectural resources.

Archeological Resources

The Ohlone Indians and their ancestors were the first inhabitants of the San Francisco Bay. Ohlone settlements tended to be situated where freshwater creeks entered the Bay along its original shoreline edges. Remnants from the pre-Ohline occupation include the numerous shellmounds or shell middens found along the Bay shorelines. One of the largest shellmounds in the Bay Area was the Emeryville Shellmound which was estimated to have been 1,000 feet long, 300 feet wide, and 22 feet high located east of Interstate 80 in the vicinity of Temescal Creek.[2] Three major excavations of the shellmound conducted since 1902 have indicated that the resource included artifacts, immense quantities of animal remains, grave goods, and burials, indicating that the site had been occupied for a 2,500 year period between circa 500 B.C. to circa AD 1700.[3] In addition to the Emeryville Shellmound discussed above, four other recorded sites are directly or indirectly associated with this site. There are also 18 recorded historic-era archaeological sites in the city, comprised primarily of the remains of historic-era industrial buildings. This includes the former Bruener's Warehouse.[4]

Historic Resources

Emeryville has a concentration of recorded and potential historic resources in the Park Avenue District, as shown in Figure 6-1 and Table 6-2.

Recorded Historic Resources

The Caltrans Environmental Impact Report for the Cypress Freeway project identified the Emeryville Historic Industrial District developed primarily between 1907 and 1930 with manufacturing and warehouse facilities. The district was constructed predominantly of brick with Classical architectural details. Of the 29 buildings included in the district, 23 are considered contributory resources. Nineteen district contributors still exist. The Emeryville Historic Industrial District is considered to be eligible for listing in the National Register of Historic Places (National Register) and was therefore automatically included in the California Register of Historic Resources (California Register) in 1990. Two historic resources in Emeryville have gone through the process to be listed in or determined eligible for listing in the National and California Registers as individual resources. These are: the former Remar Bakery (Bakery Lofts) located at 1010 46th Street ("D" on Figure 6-1), and a private residence at 3604 Adeline Street ("E" on Figure 6-1).

2 *Site designator for the identified cultural resource, as listed on file at the Northwest Information Center, Sonoma State University.*

3 *Background history adapted from* Images of America: Emeryville. *Emeryville Historical Society. San Francisco, CA: 2005.*

4 *Northwest Information Center (NWIC), Letter re: Record Search Results for the Proposed Emeryville General Plan and EIR. File No. 05-140. August 16, 2005.*

Recognizing the buildings along Park Avenue and immediate environs as the historic center of Emeryville, the City adopted an area plan for the Park Ave district in August 2006. The City's Park Avenue Overlay District designates 43 buildings as architecturally significant. (See Cultural and Architectural Resources below.) Many, but not all of the buildings designated in the Park Avenue Overlay District are also contributors to the National Register-eligible Emeryville Historic Industrial District. The Historic District also identifies contributors in the Park Avenue District that are not designated by the Park Avenue District Overlay.

Potential Historic Resources

The City also recognizes that there are several areas and structures with local historical and/or architectural merit which characterize the City's heritage. While most of these buildings have not been officially designated as federal, state, or local historic resources, many of these and other properties would likely be determined eligible for listing as official historic resources upon further review and analysis. For example, Emeryville contains numerous buildings and structures that are more than 45 years old (constructed before 1960). Upon further review and evaluation, and depending on their physical integrity, many of these older buildings may be eligible a federal, state, and/or local historic resources, either individually or as a historic district.[5]

Cultural and Architectural Resources

Park Avenue Overlay District

The Park Avenue District Plan establishes incentives and development guidelines for the preservation of a unique historic district and creation of a vibrant mixed-use neighborhood. The Plan encourages cultural arts, streetscape and pedestrian improvements, open spaces, and a variety of transportation options around Emeryville's civic center. Within the Plan, the Park Avenue Overlay District designates 43 architecturally significant buildings within the Park Avenue District as either Tier 1 (primary architectural significance) or Tier 2 (secondary architectural significance). The City's municipal code states that the Emeryville Building Official shall not issue a building permit to move, remove or demolish a Tier 1 or Tier 2 architecturally significant building or structure unless the Emeryville Planning Commission first approves such action.[6]

Emeryville Preservation Ordinance

The City developed a Preservation Ordinance in 2006, to ensure that the character of Emeryville's historic past and setting are maintained for future generations. The Ordinance seeks to protect significant structures from moving, removal, or demolition, and ensures that replacement structures are compatible with the surrounding community. Significant structures are more than 50 years old and contain particular design features on the street-facing façade.[7] The Ordinance does not regulate residential structures or the Park Avenue District, which are covered by other ordinances.





The Park Avenue District then and now.

5 *California Office of Historic Preservation,* Directory of Properties in the Historic District Property Data File for Alameda County. *August, 2005 and City of Emeryville.*

6 *City of Emeryville Municipal Code, Title 9, Planning and Zoning, Article 43 (Preservation of Architecturally Significant Buildings in the Park Avenue District). November, 2004.*

7 *City of Emeryville Municipal Code, Title 9, Planning and Zoning, Article 67 (Demolition of Significant Structures). October, 2006.*



The Park Avenue District contains many of the city's historic buildings.

TABLE 6-2: Rated Historic Resources

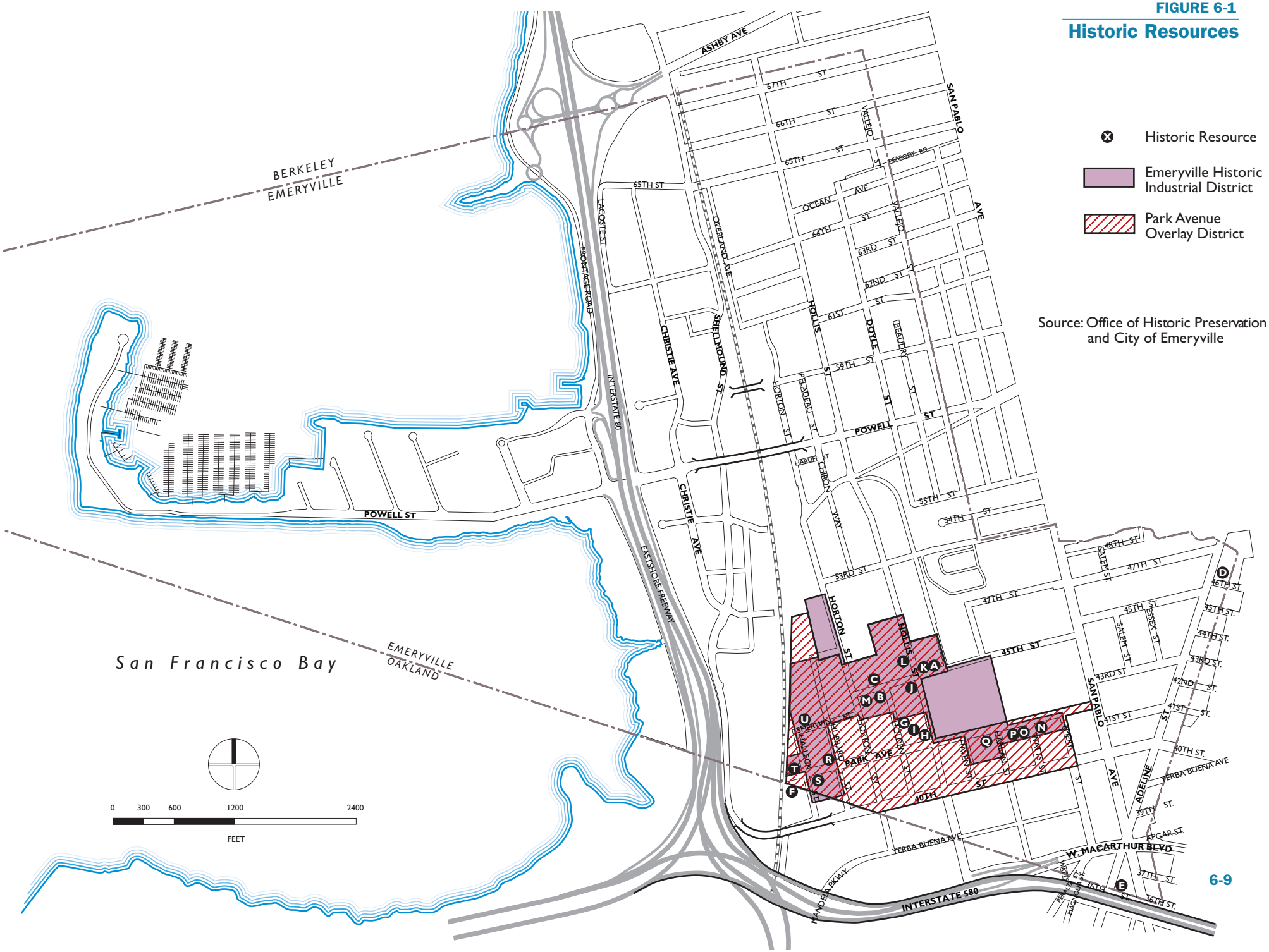
Key to Map	Address	Name/Year Built	National/Local Rating
A	1290 45th Street	Eagle / 1922	2D2 / T2
B	1401 45th Street	California Plywood Co. (45th St. Lofts E) / 1913	2D2 / T1
C	1420 45th Street	Artist's Co-op / 1927	2D2 / T1
D	1010 46th Street	Remar Bakery (Bakery Lofts) / 1919	1S
E	3604 Adeline Street	Private residence / 1895	2S2
F	4076 Halleck Street	Westinghouse Pacific Coast / 1930	2D2 / T3
G	4224 Holden Street	Bischoff / 1930	2D2 / T2
*	4202 Hollis Street	1925	2D2
H	4221 Hollis Street	Moreshouse Mustard / 1925	2D2 / T2
*	4224 Hollis Street	1929	2D2
I	4227 Hollis Street	PG&E South / 1930	2D2 / T3
J	4245 Hollis Street	PG&E South / 1924	2D2 / T2
K	4512 Hollis Street	Robinson / 1923	2D2 / T1
L	4525 Hollis Street	PG&E North / 1925	2D2 / T2
M	4250 Horton Street	45th Street Lofts W. / c. 1925	2D2 / T1
*	4525 Horton Street	1924	2D2
N	1175 Park Avenue	Condominiums / 1907	2D2 / T1
O	1201 Park Avenue	Silberman Office / 1913	2D2 / T1
P	1219 Park Avenue	Folkmanis / 1917	2D2 / T1
*	1250 Park Avenue	1919	2D2
Q	1255 Park Avenue	Emeryville Properties / 1925	2D2 / T1
R	1500 Park Avenue	Emeryville Warehouse Lofts / 1911, 1927	2D2 / T1
S	1545 Park Avenue	Trader Vic's/Westinghouse Pacific / 1912	2D2 / T1
T	1550 Park Avenue	Pelco Distributors / 1917	2D2 / T1
U	1500 Sherwin Street	Sherwin-Williams / 1924	2D2 / T1

Sources: California State Office of Historic Preservation, 2005 and City of Emeryville, 2005.

Notes:
1. 1S = individual property listing in the National Register
2. 2S2 = individual property determined eligible for listing in the National Register
3. 2D2 = contributor to a district determined eligible for listing in the National Register (Emeryville Historic Industrial District)
4. T1 = Tier 1 Architectural Significance (Park Avenue Overlay District)
5. T2 = Tier 2 Architectural Significance (Park Avenue Overlay District)
6. * = Demolished

FIGURE 6-1

Historic Resources



6.2 SAFETY

This section and its accompanying implementing policies and actions, describe potential hazards and the measures that can be taken to mitigate these risks and ensure the safety of Emeryville's population and property from seismic, flooding and chemical hazards. Chapter 4: Parks and Public Facilities describes the emergency response standards and policies of the Emeryville Fire and Emergency Services Department, which leads the city's emergency management.

Geologic, Soils, and Seismic Hazards

Geology and Soils

The City of Emeryville lies at the eastern edge of the San Francisco Bay in part of the flatlands which are also referred to as the East Bay Plain. The East Bay Plain consists of alluvial deposits that originated from the Berkeley Hills. The western side of the city contains former tidal sloughs and marshlands that were progressively filled in dating back to the 1900s. The city is essentially flat with many areas on the margin of the Bay located on artificial fill. Where not covered by fill, the city's surface soils consist predominantly of fine-grained alluvium, including silts and clays, as depicted in Figure 6-2. Toward the western portion of the city the alluvium is underlain by bay mud—a natural marine deposit that consists of soft saturated clays that can contain lenses of sand and shell fragments. Development on artificial fill placed over bay mud often presents unique geotechnical engineering challenges because, unless the fill is properly engineered, structures can be damaged by differential settlement and subsidence. Under the bearing load of a new structure, Bay Mud tends to go through a cycle of consolidation that can lead to settlement.



Artificial fill atop bay mud, along the shoreline of Emeryville may be susceptible to violent earthquake shaking.

Excessive soil erosion can eventually lead to damage of building foundations, roadways, and loss of topsoil. Throughout Emeryville, areas that are most susceptible to erosion are those that would be exposed during construction phase and along the shoreline where soil is subjected to wave action. Typically, the soil erosion potential is reduced once the soil is graded and covered with concrete, structures, asphalt, slope protection, or vegetation.

Seismicity

The San Francisco Bay Area is a seismically active region with numerous active faults. Although no active faults run through Emeryville, the city is approximately three miles from the Hayward Fault and 15 miles from the San Andreas Fault, the two most prominent and active faults in the Bay Area, as shown in Figure 6-3. Therefore, the entire city is subject to hazardous ground shaking in a major earthquake, as shown in Figure 6-2. Deep alluvium and bay mud deposits can intensify groundshaking through wave amplification and longer durations of shaking. U.S. Geological Survey and other scientists claim that there is a 62% probability of a magnitude 6.7 or greater earthquake, striking the San Francisco Bay region before 2032.[8] Recognizing this threat, earthquake safety and preparedness are essential components of the General Plan.

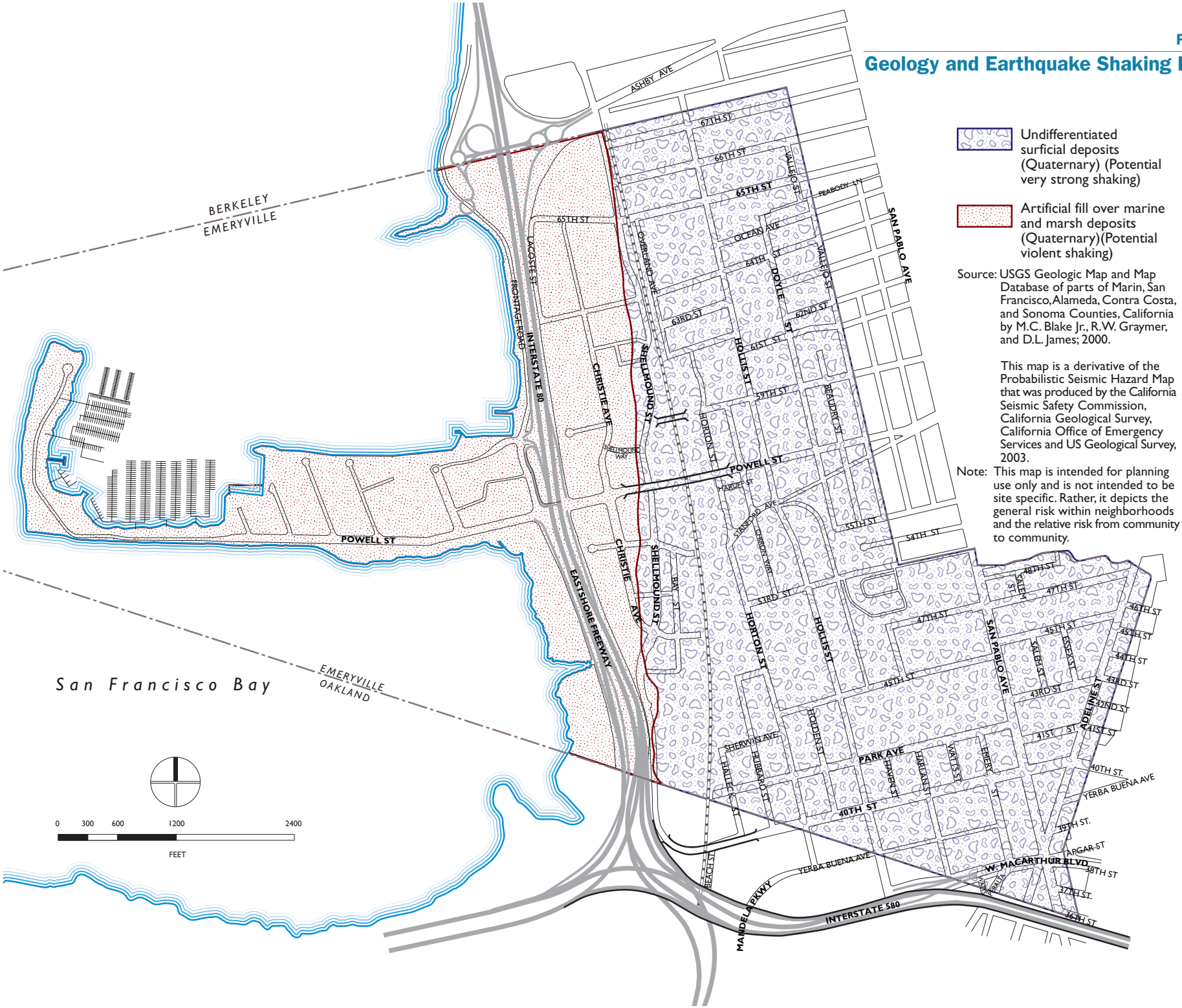
Seismic Risks to Development

Earthquake damage to structures can be caused by ground rupture, liquefaction, groundshaking, and possibly inundation from tsunami. The level of damage in the city resulting from an earthquake will depend upon the magnitude of the event, the epicenter distance from the city, the response of geologic materials, and the strength and construction quality of structures.

8 *United States Geological Survey. "Earthquake Probabilities in the San Francisco Bay Region: 2002-2031" 2003: ES1.*

FIGURE 6-2

Geology and Earthquake Shaking Potential



Undifferentiated surficial deposits (Quaternary) (Potential very strong shaking)

Artificial fill over marine and marsh deposits (Quaternary)(Potential violent shaking)

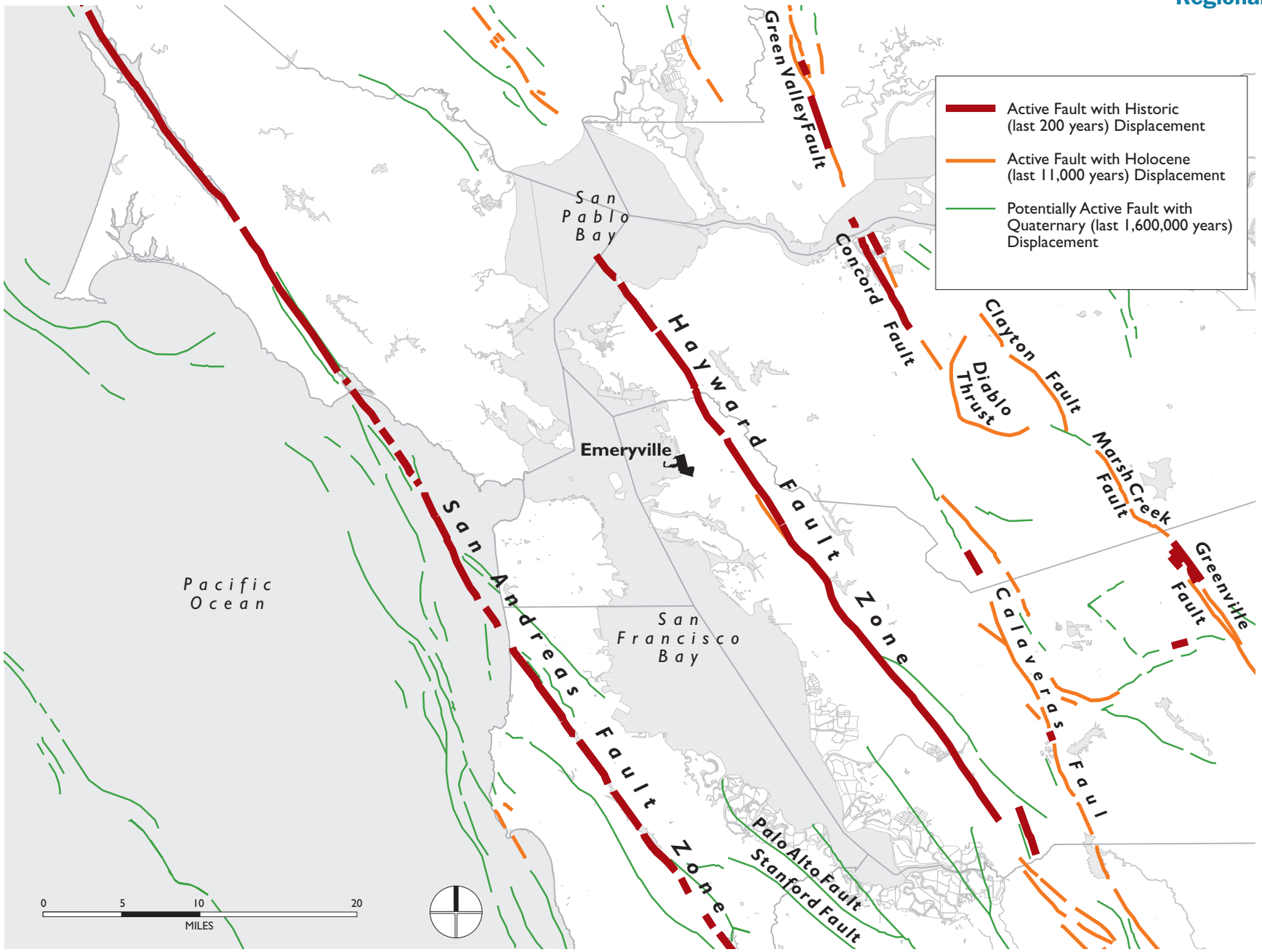
Source: USGS Geologic Map and Map Database of parts of Marin, San Francisco, Alameda, Contra Costa, and Sonoma Counties, California by M.C. Blake Jr., R.W. Graymer, and D.L. James; 2000.

This map is a derivative of the Probabilistic Seismic Hazard Map that was produced by the California Seismic Safety Commission, California Geological Survey, California Office of Emergency Services and US Geological Survey, 2003.

Note: This map is intended for planning use only and is not intended to be site specific. Rather, it depicts the general risk within neighborhoods and the relative risk from community to community.

FIGURE 6-3

Regional Faults



During an earthquake, shaking of granular loose soil saturated with water can lead to liquefaction. The entire city of Emeryville lies within a liquefaction hazard zone, as shown in Figure 6-4, which presents constraints on development. The Peninsula has a very high susceptibility to liquefaction, while the areas around the rail line and east have a moderate to low risk of liquefaction. Development in a liquefaction hazard zone requires adherence to the guidelines for evaluating and mitigating seismic hazards as required by Public Resources Code Section 2695(a). Before a development permit can be granted for a site within a Seismic Hazard Zone, (i.e. anywhere in Emeryville), a geotechnical investigation of the site must be conducted and appropriate mitigation measures incorporated into the project design. Mitigation of liquefaction hazards can include edge containment structures (e.g. berms, dikes, retaining walls, etc.), driving piles, removal or treatment of liquefiable soils, or modification of site geometry.

The City's Building Division implements and enforces the Emeryville Municipal Code and the California Building Code regulations relative to seismic risk to development. A City Ordinance specifies the need and establishes guidelines for the seismic upgrade of unreinforced masonry buildings. An increase in occupancy or intensification of use triggers the requirement for a seismic upgrade. Over the past ten years 75 percent of the City's unreinforced masonry buildings have been upgraded for seismic safety. The City also provides a program for voluntary upgrades of single family homes.

In 2009, the City is expected to compete a Local Hazards Mitigation Plan to mitigate natural hazards and enhance resistance.

LIQUEFACTION

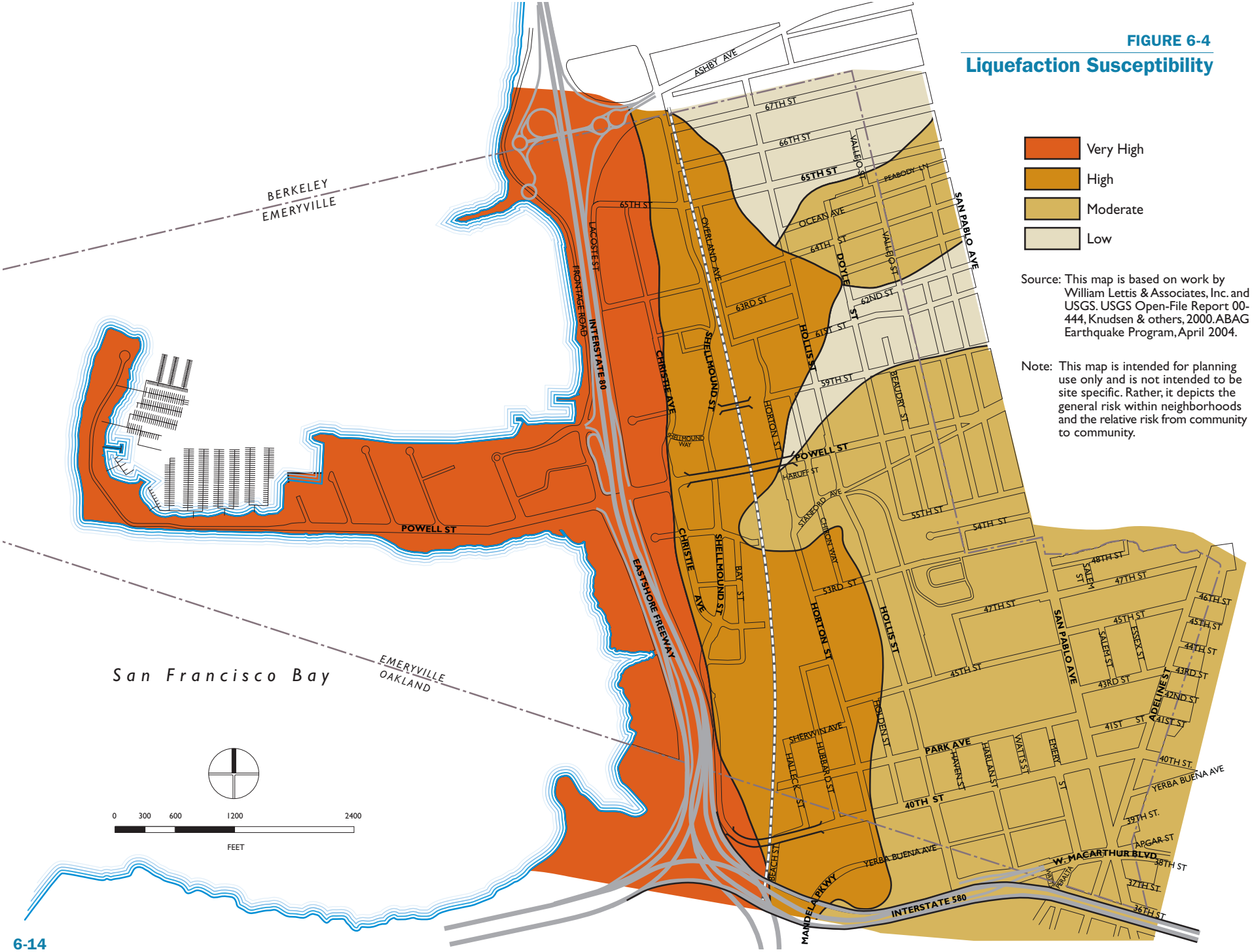
Liquefaction is a transformation of soil from a solid to a liquefied state, resulting from the buildup of excess pore water pressure, especially during earthquake-induced cyclic loading. Soil susceptible to liquefaction includes loose to medium dense sand and gravel, low-plasticity silt, and some low-plasticity clay deposits. Liquefaction and associated failures could damage foundations, disrupt utility service, and cause damage to roadways.

Development must be properly engineered to ensure safety in the event of a major earthquake.



FIGURE 6-4

Liquefaction Susceptibility



Source: This map is based on work by William Lettis & Associates, Inc. and USGS. USGS Open-File Report 00-444, Knudsen & others, 2000. ABAG Earthquake Program, April 2004.

Note: This map is intended for planning use only and is not intended to be site specific. Rather, it depicts the general risk within neighborhoods and the relative risk from community to community.

Hazardous Materials

The City of Emeryville includes a mix of uses and many areas with a high concentration of historical industrial and manufacturing activities. Most of these areas have been largely converted or will be converted to other uses, such as office, commercial retail, and residential. Hazardous material use, storage, transport, and hazardous waste generation within the city can pose hazards to the environment and public health through improper handling or storage.

As a result of the historical industrial use, substantial groundwater and soil contamination is present in many locations throughout the city. The presence of contamination can potentially restrict future development of property and require specialized construction practices. Sites should be remediated to the level prescribed by the lead reviewing agency.

Remediation

Emeryville has been a leader in the financing and remediation of brownfields. In 1995, the US EPA initiated a program to help states, communities, and others to redevelop abandoned contaminated land. The program provides grants that support revitalization efforts by funding environmental assessment, cleanup, and job training activities. The City of Emeryville has benefited from the program, which has helped revitalize an area that industry abandoned during the 1970s. As of 2008, more than 40 sites totaling 240 acres had been targeted for cleanup and have been or are identified for redevelopment.

Flooding and Drainage

Surface Hydrology

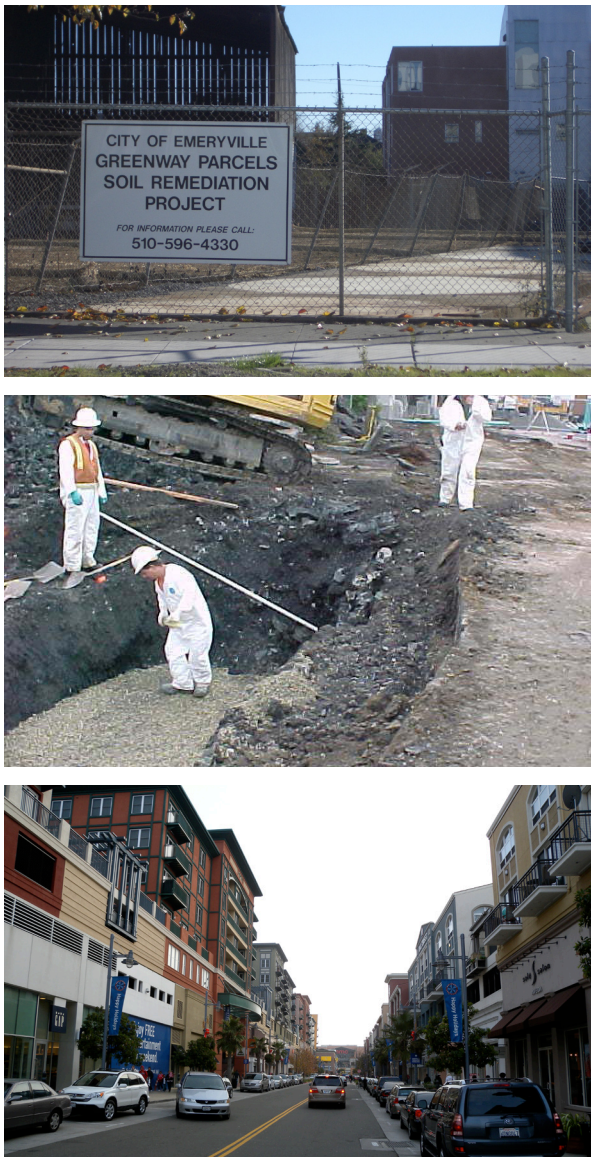
Emeryville lies in the Central Basin within the San Francisco Bay hydrologic region. Although the topography of the city is generally flat, its elevation ranges from 0 to 60 feet above mean sea level and slopes down slightly to San Francisco Bay, which is a major receiving water body. The other surface water feature in the city is Temescal Creek, which flows west from the East Bay Hills into San Francisco Bay.

San Francisco Bay

The city lies in the San Francisco Bay watershed. San Francisco Bay is the most prominent surface water body (see Figure 6-5) that receives surface water runoff from the city and groundwater discharge from the East Bay Plain. The southern portion of the Bay shoreline in the city includes a salt marsh. Rocks have been installed along the deeper waters adjacent to the Emeryville Peninsula for erosion control.

Temescal Creek

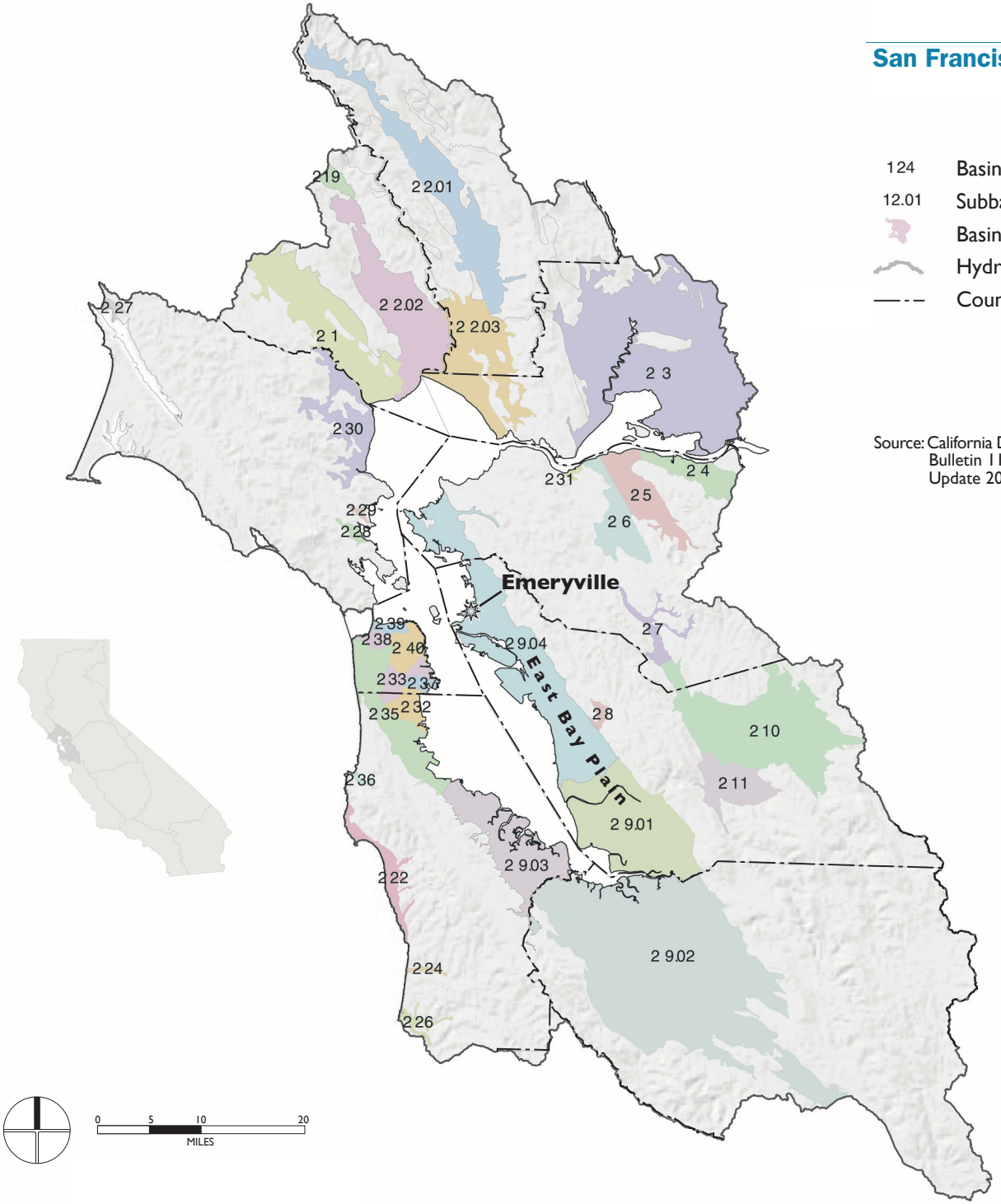
Temescal Creek, a main drainage outfall within the city (see Figure 6-6), is a channelized creek draining Lake Temescal. It flows through the city, passes under Interstate 80, and discharges into San Francisco Bay in the Emeryville Crescent. The creek is dry most of the year and runs underground through portions of the city. Currently, the creek flows are partially regulated by the Lake Temescal Reservoir. The General Plan proposes to celebrate the Creek by establishing a greenway along its course, which will include surface water features. For flood control purposes the main channel will remain primarily underground.



The City has been a leader in brownfields remediation. Emery Station (middle) and Bay Street (bottom) were constructed on remediated brownfield sites.

FIGURE 6-5

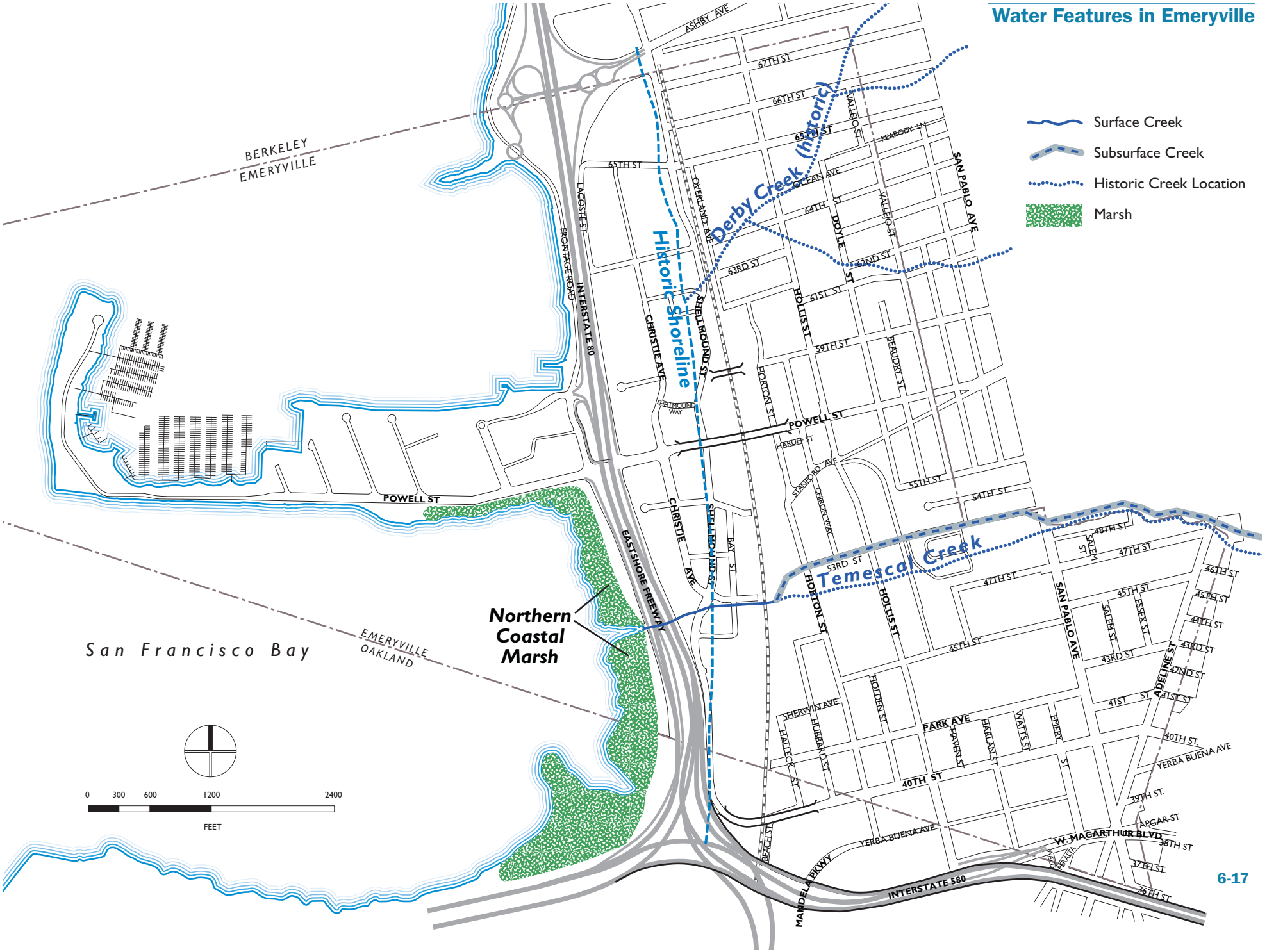
San Francisco Bay Hydrologic Region



Source: California Department of Water Resources, Bulletin 118, California Groundwater Update 2003.

FIGURE 6-6

Water Features in Emeryville



Groundwater Basins

The city is located within the East Bay Plain groundwater basin 4 in Alameda County (see Figure 6-5). The East Bay Plain extends up to 114 square miles. The water table (or the upper limit of the saturated groundwater zone) in the city is relatively high, occurring only several feet below the ground surface.

Stormwater Drainage

Surface runoff from the city flows through Temescal Creek or is collected in local storm drains and is discharged directly into the Bay. The city is highly urbanized and primarily covered with pavement, buildings, areas of surface-compacted soil, and other features that allow only minimal infiltration of rainfall into the soil. The existing sanitary sewer system in the area is generally old and in poor condition. Although separate sanitary and storm sewer lines exist throughout the city, the lines run parallel to each other. Stormwater from the storm sewer lines can leak into the sanitary sewer lines, causing excessive infiltration into the sanitary sewer collection system. As a result, excess flows of wastewater are released to San Francisco Bay without adequate treatment. The East Bay Municipal Utility District (EBMUD) initiated an East Bay Infiltration/Inflow Correction Program to eliminate wet weather overflows of raw sewage to community streets, creeks, and the Bay. Emeryville's leadership in stormwater management through the permit process and its stormwater guidelines are detailed in Section 7.2 of Chapter 7: Sustainability.

Flood Zones

The Federal Emergency Management Agency (FEMA) prepared new maps of Emeryville's flood risk potential in December 2007, which went into effect on August 3, 2009. As shown in Figure 6-7, the majority of Emeryville is designated as Zone X (i.e., areas outside the 500-year flood zone). The shoreline and marina areas are designated as Zone V and lie within the 100-year flood zone; however, these area do not contain urban uses or structures. Flooding in the city could also occur as a result of storm-induced flooding, inundations from dam failure, and tsunamis as discussed below.

Global Climate Change and Sea Level Rise

While climate change is a global concern, the local effects, in terms of flooding and sea level rise, could be severe in Emeryville. The San Francisco Bay Conservation and Development Commission (BCDC) projects a 16-inch sea level rise scenario at mid-century. This could, in turn, erode bay shores, marshes and wetlands, and increase the salinity of rivers. In addition, if average temperatures increase, this could shorten the snowfall season in the Sierra Nevada Mountains, increasing the amount of rain and the rate of snow melt, thereby threatening even coastal cities, such as Emeryville, with increased flooding.

The BCDC prediction suggests that there are vulnerable areas along the shoreline of the Emeryville Crescent and peninsula, as shown in Figure 6-8; however, there are no structures or urban areas within this zone. Moreover, the BCDC model compares a sea level rise scenario to land-surface elevation data and does not account for shoreline protection; therefore the area south of 64th Street and west of I-80 does not account for the at-grade freeway barrier. BCDC's 2100 scenario, projecting 55-inch sea level rise (not shown) would have implications for Emeryville's urban area, but lies far beyond the scope and planning horizon of the proposed General Plan. Sea level risk threats and mitigations are also discussed in Emeryville's Climate Action Plan and in Section 7.2 of Chapter 7: Sustainability.

Inundation from Dam Failure

The closest dam near the city is the dam at Lake Temescal, which is located approximately 3.5 miles east of the city limits. Lake Temescal Dam is managed by the East Bay Regional Parks Department and is overseen by the California Department of Water Resources, Division of Safety of Dams (DSOD). The DSOD supervises dam maintenance and inspections. Dams are required to adhere to rigorous DSOD standards, which include seismic analysis of existing dams to assure their integrity and conducting regular inspections. As of 2008, the dam was last inspected in September 2007, revealing no concerns for stability—particularly in light of fill from Highway 24 buttressing the dam and its wide cross section.[9] The likelihood of flood hazard is dependent upon the occurrence of a major earthquake and the ability of the dam to withstand seismic activity. If the dam were to fail, it is estimated to cause overflowing of Temescal Creek with inundation of nearly 1,000 feet of land area on either side of the creek within 15 minutes. The water could reach the rest of the city, west toward the Bay, and north approximately to Powell Street within 25 minutes as shown in Figure 6-7.

Tsunamis

Tsunamis are caused by submarine seismic or volcanic disturbances. The U.S. Geologic Survey estimates that a 20-foot wave at the Golden Gate Bridge (an event estimated to possibly occur once in 200 years) could potentially cause a run-up of a 10-foot wave in the Emeryville Peninsula and the shoreline area.

9 *Department of Water Resources. Division of Dam Safety, Correspondence with Regional Engineer, August 2008.*

Fire Hazards

The City of Emeryville does not have the terrain and vegetation conditions for large or devastating wildfires. However, urban fires are a constant threat. The worst case urban fire could be associated with an earthquake. A discussion of and policies concerning the Fire Department and related prevention and firefighting services may be found in Chapter 4: Parks, Open Space, and Public Facilities.

In the event of an emergency, the Fire Department is reliant on sufficient water flows to fight fires. The Department specifies minimum water pressure (e.g. 1,500 gallons per minute for a small building; 2,000 g.p.m. for a larger building). Actual peakload varies with districtwide demand.

Evacuation Routes and Safety Standards

Evacuation routes are designated along San Pablo Avenue, Hollis Street, and Interstate-80, although the actual routes will depend on the circumstances of the emergency. The City has an informal agreement with AC Transit to assist in evacuation in case of an emergency.

In addition, the City specifies minimum roadway widths of 20 feet (exclusive of parking lanes), in order to ensure access for emergency vehicles and other equipment.



Although Emeryville is not susceptible to wildfires like the Oakland hills (background), urban fires present a constant threat. The Fire Department maintains safety standards for road and building construction to ensure the safety of the community.

FIGURE 6-7

Coastal Flood Zone and Dam Failure Inundation Hazard Area

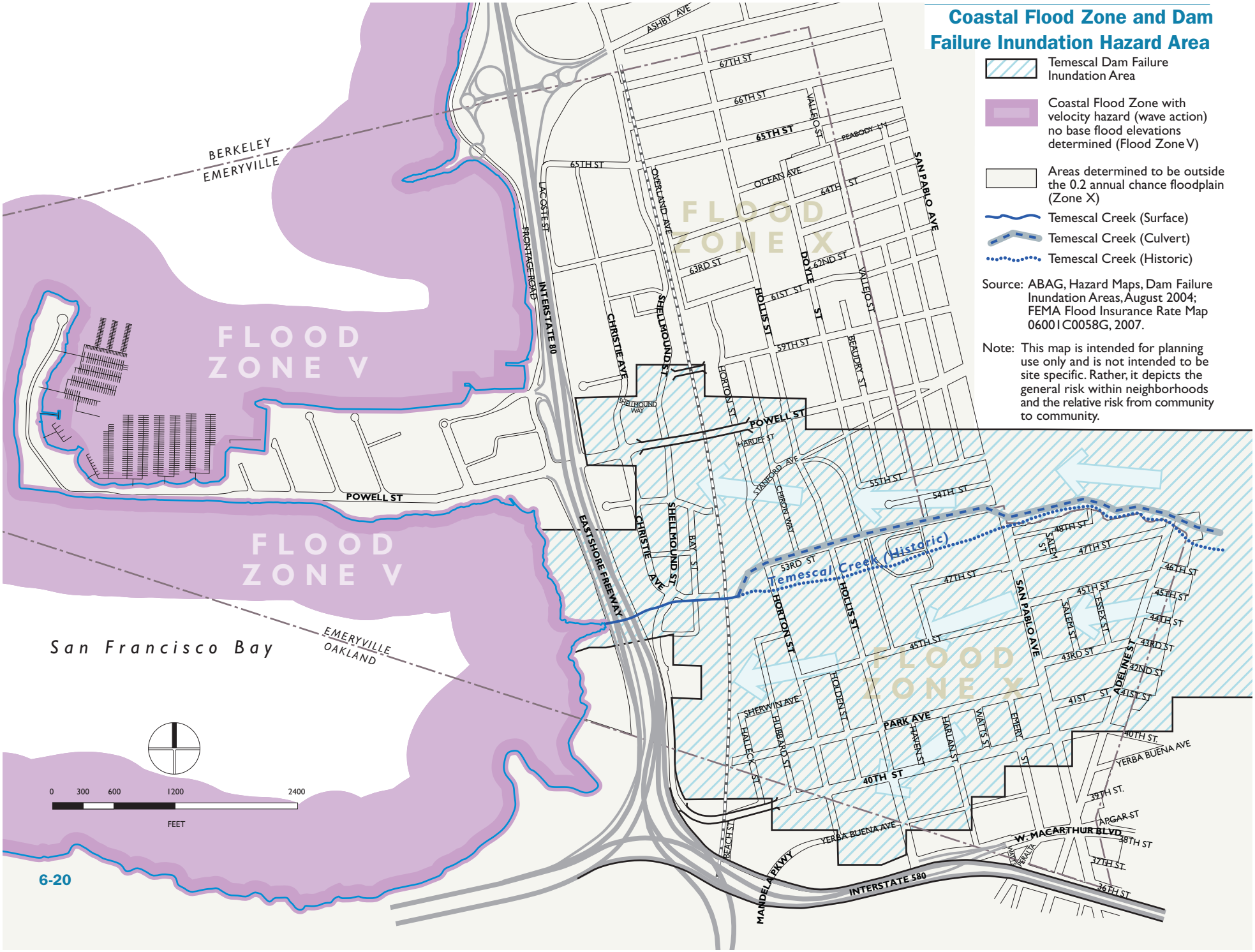
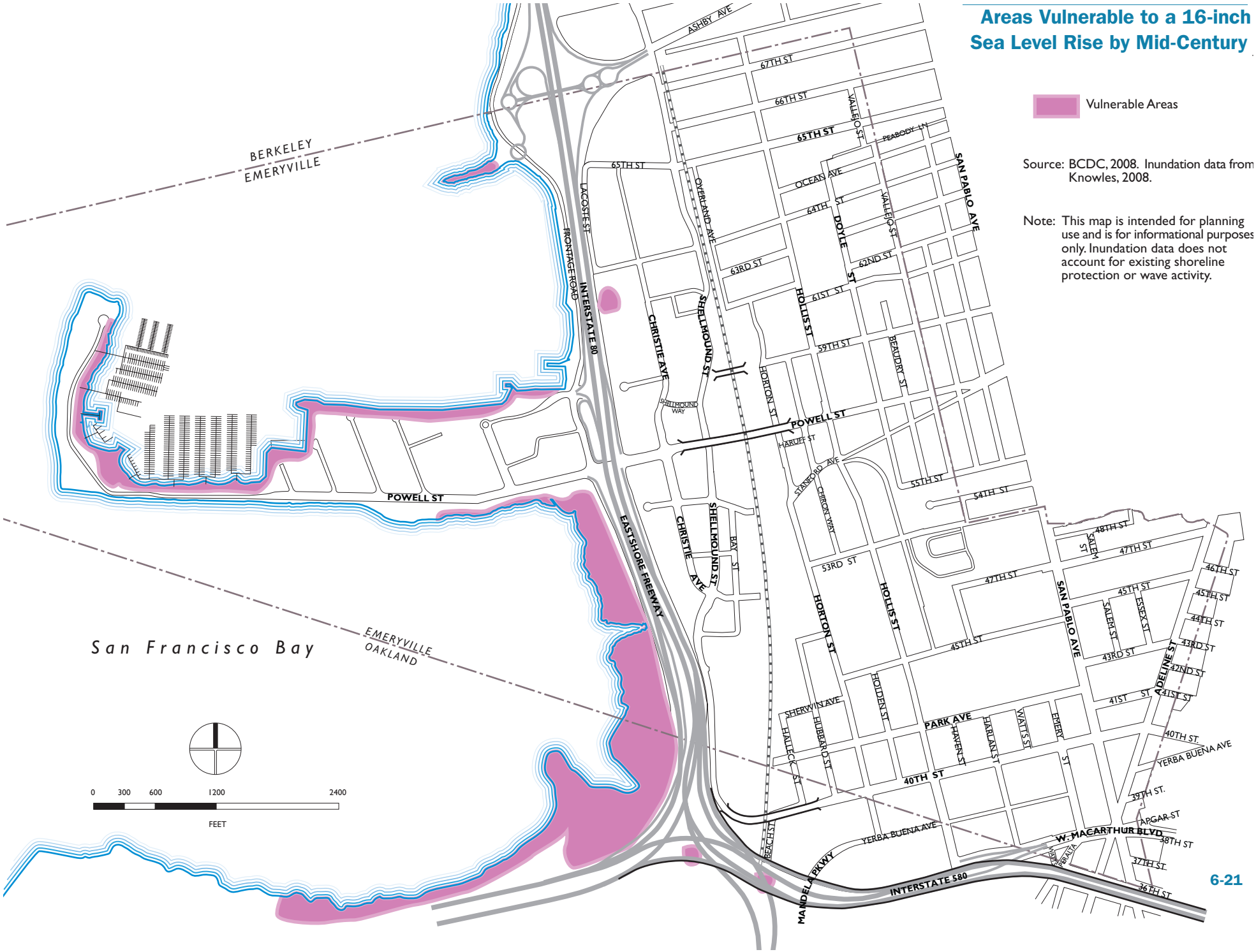


FIGURE 6-8

Areas Vulnerable to a 16-inch Sea Level Rise by Mid-Century



Source: BCDC, 2008. Inundation data from Knowles, 2008.

Note: This map is intended for planning use and is for informational purposes only. Inundation data does not account for existing shoreline protection or wave activity.

6.3 NOISE

Noise can be defined as a sound or series of sounds that are intrusive, irritating, objectionable and/or disruptive to daily life. Background noise is primarily the product of many distant noise sources, which constitute a relatively stable noise background exposure, with individual contributors unidentifiable. Noise levels are also affected by short duration single event noise sources (e.g., aircraft flyovers, motor vehicles, sirens), which are readily identifiable to the individual. The known effects of noise on humans include hearing loss, communication interference, sleep interference, physiological responses, and annoyance.

People in residences, motels and hotels, schools, libraries, churches, hospitals, nursing homes, auditoriums, natural areas, parks and outdoor recreation areas are generally more sensitive to noise than are people at commercial and industrial establishments. Consequently, noise standards for sensitive land uses are more stringent than for those at less sensitive uses. To protect various human activities in sensitive areas, lower noise levels are generally required.

Noise Measurement

When noise levels are reported, they are expressed as a measurement over time in order to account for variations in noise exposure. Levels also account for varying degrees of sensitivity to noise during daytime and nighttime hours. The Community Noise Equivalent Level (CNEL) and Day-Night Noise Level (Ldn) both reflect noise exposure over an average day with weighting to reflect this sensitivity.





Elevated highways and passing trains create prominent levels of noise in Emeryville.

Existing Noise Sources and Levels

Existing Noise Levels

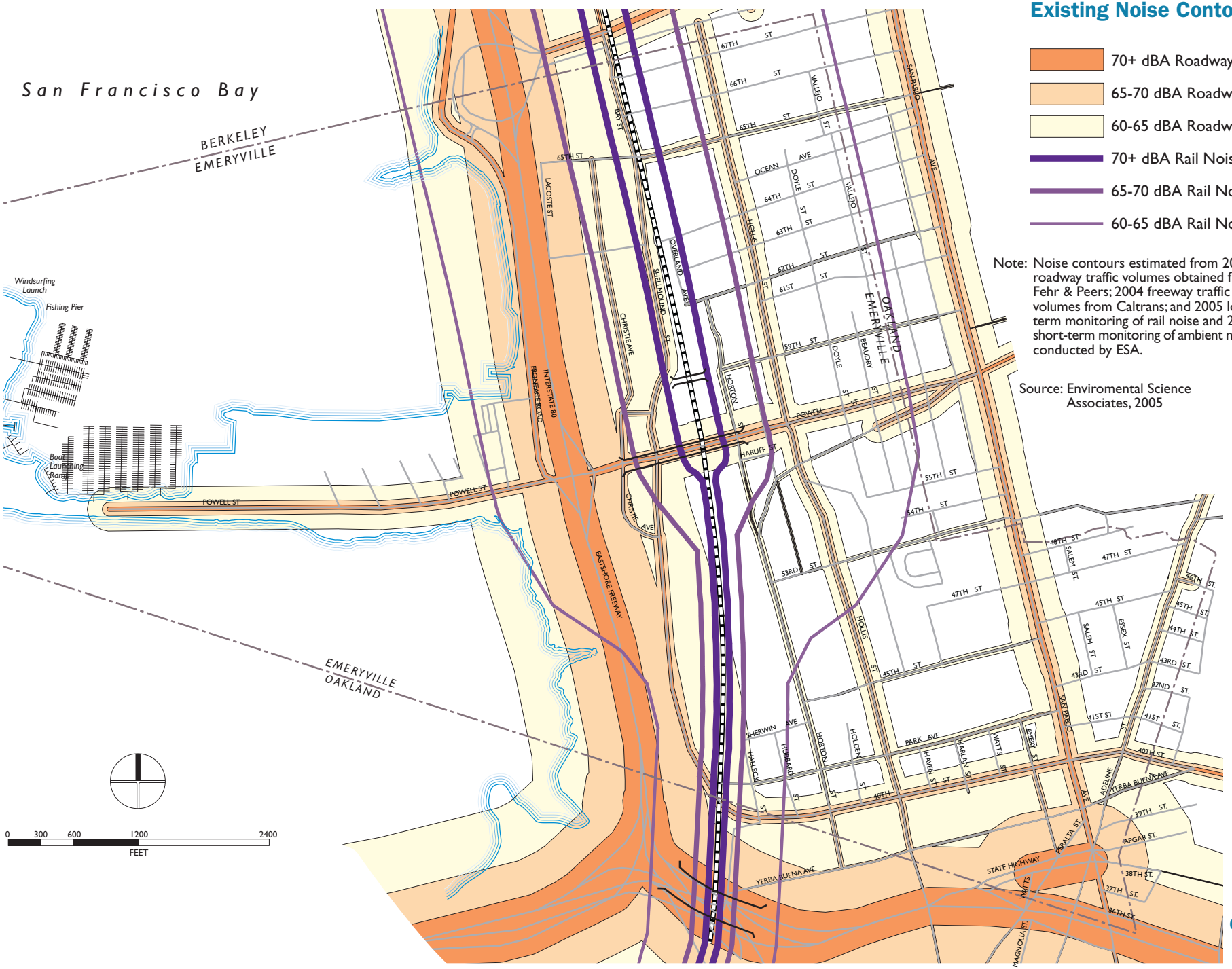
The primary major sources of persistent noise generated by transportation within Emeryville are from major roadway arterials throughout the city (Powell Street, San Pablo Avenue, 40th Street), highways 80 and 580, Union Pacific Railroad and Amtrak train activity, and aircraft overflights from the San Francisco and Oakland International airports.

Ambient noise monitoring was conducted to assess current noise levels in Emeryville at a variety of land uses proximate to major noise sources. Short-term noise measurements were taken during the peak hour traffic periods and adjacent to the major noise sources in the city. These measured noise levels included major noise sources (traffic and/or train passbys) in addition to non-traffic noise sources. Additional long-term (24-hour) noise measurements were taken near rail activity and where other major noise sources could be excluded to the extent possible.

Figure 6-9 reflects the existing noise level contours for 60, 65, and 70 dBA primarily generated by existing local roadway traffic levels (based on noise monitoring and levels calculated along roadway segments that extend from 47 traffic study intersections throughout the city, as presented in Chapter 3: Transportation) as well as freeway traffic levels.

FIGURE 6-9

Existing Noise Contours



Note: Noise contours estimated from 2005 roadway traffic volumes obtained from Fehr & Peers; 2004 freeway traffic volumes from Caltrans; and 2005 long-term monitoring of rail noise and 2005 short-term monitoring of ambient noise conducted by ESA.

Source: Enviromental Science Associates, 2005





Construction activity (top) is restricted to certain hours of the day, but still causes short-term temporary noise impacts. Mechanical equipment that is not appropriately shielded or integrated into building design may lead to unnecessary noise exposure (bottom).

Existing Noise Sources

Freeway and Internal Roadways

Freeways are a major noise source in Emeryville. Most of Emeryville is located between the I-80 and I-580 freeways. I-80 runs north-south towards the western boundary, while I-580 runs approximately east-west just below the southern boundary. The section of I-580 adjacent to Emeryville is elevated. Freeway noise is expected to remain an issue in the future for noise sensitive uses, such as residential development. The city also has busy internal roadways such as Powell Street, 40th Street, and San Pablo Avenue. Noise from these sources can be a significant environmental concern where buffers (e.g., buildings, landscaping, etc.) are inadequate or where there is minimal distance from the roadways to sensitive uses.

Railroad Noise

Train noise, however intermittent, is a major source of noise due to its magnitude. Residents have observed that freight trains often park with diesel engines running for extended periods, which can also be a significant source of railroad-related noise. Locomotive engines and the interaction of steel wheels and rails generate primary rail noise. Train air horns and crossing bell gates contribute to loud noise levels near grade crossings. The freight trains operate with lower speeds in the range of 15 to 20 miles per hour; therefore, the associated maximum noise level is also low. As depicted in Figure 6-9, noise levels vary along the railroad tracks, showing higher noise levels in areas where surface crossings occur, generally north of Powell Street.

Airport Noise

Though the city is not located within the 65-CNEL noise contours for the San Francisco and Oakland International airports, noise from aircraft over flights is audible throughout the city and contributes to the ambient noise environment.

Industrial Noise

Industrial uses are another source of noise that can have a varying degree of impact on adjacent uses. A variety of mechanical equipment, generators, and vehicles all contribute to noise levels at industrial sites. There are also many areas in Emeryville where residential uses are in close proximity to light industrial uses, which are expected to continue according to the General Plan land use diagram.

Construction Noise

Construction can be another significant, although typically short-term, source of noise. Construction is most significant when it takes place near sensitive land uses, occurs at night, or in early morning hours. The dominant construction equipment noise source is usually a diesel engine without sufficient muffling. In a few cases, however, such as impact pile driving or pavement breaking, process noise dominates. The City currently regulates construction activity through Municipal Code Chapter 13, Section 5-13.05.

Other Equipment Noise

Several other portable or small-scale pieces of equipment may also produce noise effects. Mechanical equipment, such as pumps and fans may produce low noise levels, but continuously and for substantial distances. Portable power equipment, such as leaf blowers and drills, is ubiquitous in the modern city, and can produce very high noise levels at the location of the work. Other amplified sounds, from automotive audio equipment or loudspeakers also create noise exposure.

FIGURE 6-10

Projected Noise Contours

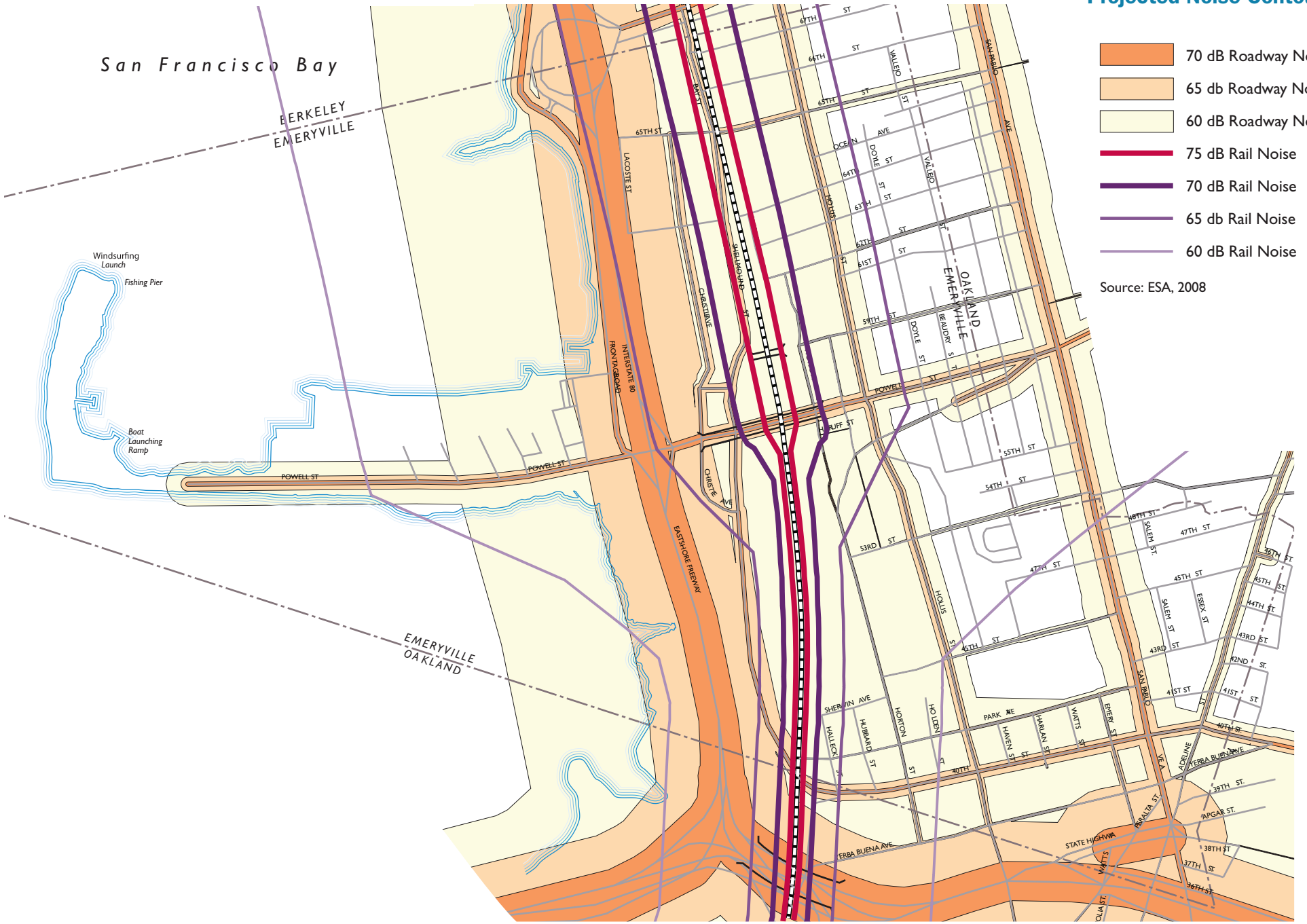
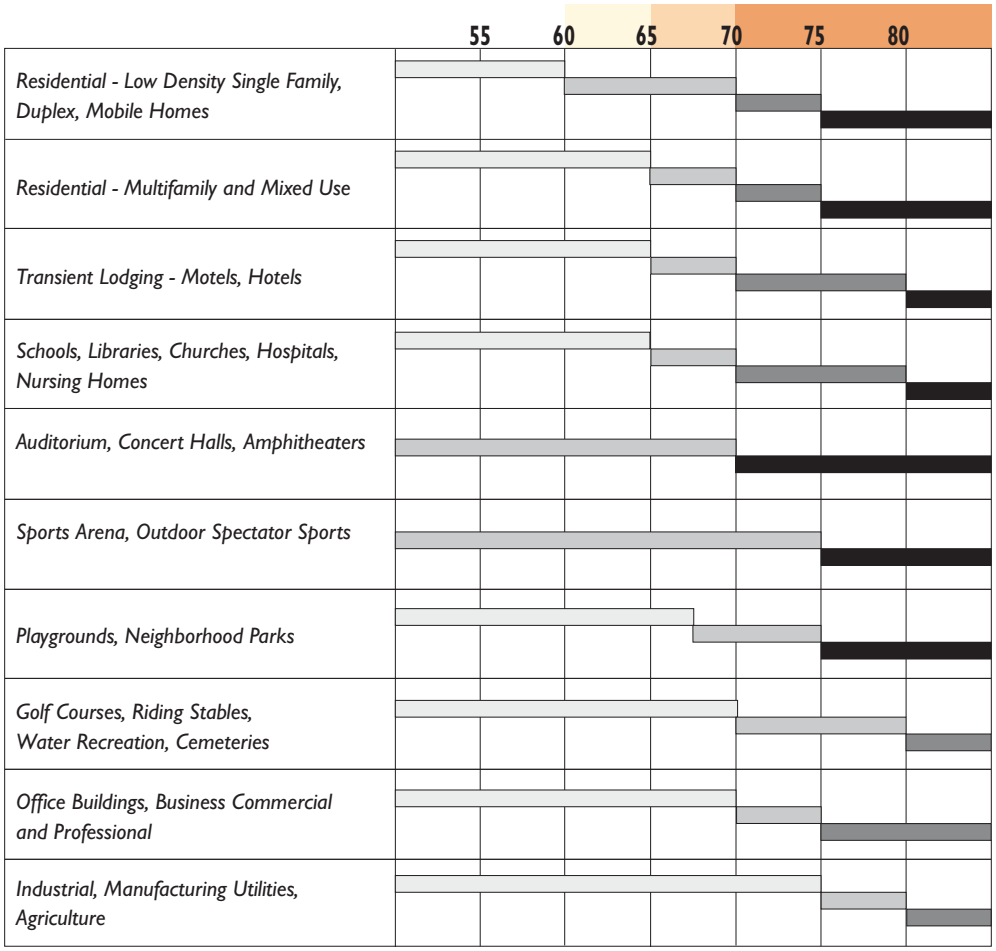


FIGURE 6-11

Community Noise Exposure (Ldn or CNEL, db)



NORMALLY ACCEPTABLE
Specified land use is satisfactory, based upon the assumption that any building involved is of normal conventional construction, without any special noise insulation requirements.

CONDITIONALLY ACCEPTABLE
New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features included in the design. Conventional construction, but with closed windows and fresh air supply systems or air conditioning will normally suffice.

NORMALLY UNACCEPTABLE
New construction or development should generally be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirements must be made and needed noise insulation features included in the design.

CLEARLY UNACCEPTABLE
New construction or development should generally not be undertaken.

Source: *California Governor's Office of Planning and Research, 1990; Environmental Science Associates, 2008.*

Projected Noise Sources and Levels

Future development within the City's Planning Area along with pass-through traffic will result in increased noise levels. The primary noise sources in Emeryville will continue to be Interstate 80, the railroad, and traffic along other major thoroughfares. Future noise contours are illustrated in Figure 6-10. Compared with existing conditions, noise levels emanating from the freeway represent the greatest increase in potential noise impacts. (Noise levels from the railroad are not expected to increase substantially.) The 70 and 65 dbl contours (the more severe impacts) are only projected to increase slightly over the planning period, while the 60 dbl contour is projected to extend east to Hollis Street.

The noise exposure matrix defined in Figure 6-11 explains the compatibility of land uses, given their respective levels of community noise exposure. This matrix can be used to review land use decisions within a given contour.

Increases in traffic levels may be counteracted by the implementation of alternate forms of transportation and land use design that reduce vehicle miles traveled in the region. In addition, the Plan calls for locating noise-sensitive uses (e.g. residences, schools, other public facilities) away from high-noise areas, such as the freeway and railroad. Where such uses are already planned such as in the North Bayfront, South Bayfront and North Hollis districts, noise studies and additional mitigations are required under the General Plan. These measures including siting residences appropriately near noise sources (see LU-P-25) and requiring design features to reduce impacts, such as double-paned windows or soundproofing.

GOALS AND POLICIES

GOALS

CSN-G-1 **Public health—**A high level of public health and safety.

CONSERVATION

CSN-G-2 **Improved air quality—**Local ambient air quality levels that help meet regional attainment status and contain low levels of air pollutants.

CSN-G-3 **Water quality and conservation—**High-quality groundwater and surface water resources. Improved water conservation, increased use of recycled water, and reduced per capita water consumption.

CSN-G-4 **Reduced per capita water consumption—**By 2030, per capita water consumption will be reduced by 30 percent over 2008 levels.

CSN-G-5 **Preservation and protection of natural resources—**Preservation and enhancement of natural habitat, and protection of biological resources, particularly around the Emeryville Crescent.

CSN-G-6 **Respect for the past—**A community that respects and preserves the cultural resources of its past and integrates that history into future development.

CSN-G-7 **Protection of cultural resources—**Protection of historic, cultural, and archeological resources for the educational, aesthetic, environmental, and economic contribution that they make to Emeryville's identity and quality of life.

SAFETY

CSN-G-8 **Protection from natural and manmade hazards—**Protection of life, natural environment, and property from natural and manmade hazards due to seismic activity, hazardous material exposure or flood damage.

NOISE

CSN-G-9 **Protection from noise—**Protection of life, natural environment, and property from manmade hazards due to excessive noise exposure.

CSN-G-10 **Ambient noise reduction—**Strive to minimize increases in ambient noise levels.

POLICIES

Implementing actions supporting each policy are described in Chapter 8: Implementation Program.

CONSERVATION

Air Quality

(Note that policies within the Land Use, Transportation, and Sustainability chapters also reduce air pollutants, by encouraging walkability and alternative transportation measures, green buildings, and other energy efficiency improvements.)

CSN-P-1 Air quality will be maintained and improved by requiring project mitigation, such as Transportation Demand Management (TDM) techniques, where significant air quality impacts are identified.

CSN-P-2 The City will budget for clean fuels and vehicles in the City's long-range capital expenditure plans, to replace and improve the existing fleet of gasoline and diesel powered vehicles.

CSN-P-3 The City will coordinate air quality planning efforts with local, regional, and state agencies and support the Bay Area Air Quality Management District's efforts to monitor and control air pollutants from stationary sources.

CSN-P-4 Dust abatement actions are required for all new construction and redevelopment projects.

CSN-P-5 All large construction projects are required to reduce diesel exhaust emissions through use of alternate fuels and/or control devices.

CSN-P-6 Adequate buffer distances shall be provided between offensive odor sources and sensitive receptors, such as schools, hospitals, and community centers.

Water Quality and Conservation

CSN-P-7 New commercial and industrial activities, as well as construction and demolition practices, shall be regulated to minimize discharge of pollutant and sediment concentrations into San Francisco Bay.

CSN-P-8 The City will continue to support regional watershed conservation through local land use planning, open space policies, and water quality conservation efforts.

CSN-P-9 The City will continue programs to inform residents of the environmental effects of dumping household waste, such as motor oil, into storm drains that eventually discharge into San Francisco Bay.

CSN-P-10 New development is required to incorporate source control, site design, and storm water treatment to reduce pollutants in stormwater runoff.

CSN-P-11 Exterior uses of water for landscaping and other purposes shall be reduced to minimize or eliminate runoff and water waste.

CSN-P-12 The City promotes use of recycled water on landscaping and other non-food source plantings.

CSN-P-13 The City promotes construction and incorporation of cisterns, green roofs and other rainwater harvesting methods in existing, new and rehabilitation projects.

CSN-P-14 The City will allow homeowners to divert untreated rainwater for non-potable uses, such as outdoor irrigation and toilet flushing, through use of rainwater barrels or similar methods.

CSN-P-15 The City shall consider revising plumbing and building code requirements, as necessary, to allow for graywater and rainwater harvesting systems.

CSN-P-16 The City will continue to support the use of recycled water in new and rehabilitation projects, through the development process.

CSN-P-17 The City supports public education initiatives to encourage conservation of potable water.

Habitat

CSN-P-18 The City will encourage protection of essential habitat for special status species and support habitat protection and enhancement within Emeryville that are within the City's control.

CSN-P-19 The natural environment, including mature trees and landscaping, shall be protected from destruction during new construction and redevelopment. Adequate replacement shall be provided where protection is impossible.

CSN-P-20 The City encourages incorporation of native plants into landscape plans for new developments and City projects and parks and preservation of mature trees on new developments and City projects.

CSN-P-21 The City discourages use of non-native invasive species in any landscaped or natural areas.

CSN-P-22 Provide visual access to the Emeryville Crescent in a manner consistent with the protection of this fragile ecological system.

CSN-P-23 Where new trails or other improvements are proposed in the vicinity of the baylands and essential habitat for special-status species, require adequate avoidance and mitigation necessary to protect sensitive resources.

CSN-P-24 The City shall explore opportunities for habitat restoration and enhancement, particularly in larger parks and open space areas.

CSN-P-25 Appropriate avoidance measures will be implemented to minimize the loss of special status species nesting birds during new construction. This can be accomplished through timing of vegetation removal and building demolition during the non-nesting season or through preconstruction surveys where a potential for nesting remains on proposed development sites.

Cultural Resources

CSN-P-26 The City encourages developers to reuse existing historic or architecturally significant structures.

CSN-P-27 Development that proposes to demolish identified historic resources shall be reviewed on a case by case basis to determine if the benefit of preserving the resource is outweighed by benefit of the new development.

CSN-P-28 The City shall continue to implement ordinances pertaining to architecturally significant structures, and as necessary refine and update these to ensure adequate recognition and incentives for reuse.

CSN-P-29 New development adjacent to historic and architecturally significant structures shall be reviewed for compatibility with the character of the structure and the surrounding neighborhood.

CSN-P-30 Archaeological sites and resources shall be protected from damage. Areas found to contain significant indigenous artifacts shall be examined by a qualified archaeologist for recommendations concerning protection and preservation.

CSN-P-31 If demolition of a historical or architecturally significant building is necessary for safety reasons, attempt to preserve the building façade for adaptive reuse during reconstruction.

CSN-P-32 The City encourages municipal and community awareness and support for Emeryville's historic, cultural, and archeological resources.

CSN-P-33 In order to reduce light pollution and use less energy, lighting (including on streets, recreational facilities, and in parking areas) should be designed to prevent artificial lighting from illumi-

nating natural resources or adjacent residential neighborhoods.

SAFETY

The Fire Department manages an emergency operations plan for the city and a set of evacuation routes in the event of an emergency. Policies are described in Chapter 4: Parks, Open Space, and Public Facilities.

Geologic, Soils, and Seismic Hazards

CSN-P-34 The City will continue to regulate development, including remodeling or structural rehabilitation, to ensure adequate mitigation of safety hazards on sites having a history or threat of seismic dangers, erosion, subsidence, or flooding.

CSN-P-35 The City will require geotechnical investigation of all sites proposed for development in areas where geologic conditions or soil types are susceptible to liquefaction (see "very high" and high" level areas on Figure 6-4). The City also requires submission of geotechnical investigation and demonstration that project conforms to all recommended mitigation measures prior to city approval (as required by State law).

CSN-P-36 The City will continue to require soil erosion control measures during construction.

CSN-P-37 The City will enforce regulation of potentially hazardous structures to be retrofitted and made safe and encourage property owners to abate or remove structural hazards that create unaccepted levels of risk.

Hazardous Materials

CSN-P-38 Prior to reuse, development sites will be remediated, according to relevant State and federal regulations.

CSN-P-39 The City will enforce regulation of local and State laws regarding the production, use, storage, and transportation of hazardous materials and waste.

CSN-P-40 The City requires abatement of lead-based paint and asbestos prior to structural renovation or demolition, and compliance with all State, Federal, Occupational Safety and Health Administration, Bay Area Air Quality Management District, Alameda County, and local rules and regulations.

CSN-P-41 Development on sites with known contamination of soil and groundwater shall be regulated to ensure that construction workers, future occupants, and the environment as a whole, are adequately protected from hazards associated with contamination.

CSN-P-42 The City supports public awareness and participation in household waste management, control, and recycling.

CSN-P-43 Siting of businesses that use, store, process, or dispose of substantial quantities of hazardous materials shall be carefully restricted in areas subject to very strong levels of ground shaking (Figure 6-2)

Flooding and Drainage

CSN-P-44 The City will continue to require development projects to implement on-site stormwater management measures through the City's development permit process.

CSN-P-45 Storm drains shall be maintained, and replaced or upgraded as needed to reduce potential flooding.

CSN-P-46 The City will cooperate with State and federal agencies to address flooding risks due to dam inundation, tsunamis, sea level rise, or major flood events.

Fire Hazards

CSN-P-47 The City will continue to specify minimum water pressure flows to ensure adequate flow in the event of a fire.

Evacuation Routes and Safety Standards

CSN-P-48 San Pablo Avenue, Hollis Street, and Interstate-80 will continue to serve as evacuation routes in case of emergency.

CSN-P-49 The City will continue to require minimum roadway widths to ensure access for emergency vehicles.

NOISE

Chapter 2: Land Use also contains policies regarding how to avoid noise impacts through and use program and siting.

CSN-P-50 The community noise compatibility standards (Figure 6-11) shall be used as review criteria for new land uses.

CSN-P-51 Noise impacts should be controlled at the noise source where feasible, as opposed to at receptor end. This includes measures to buffer, dampen or actively cancel noise sources.

CSN-P-52 Occupants of existing and new buildings should be protected from exposure to excessive noise, particularly adjacent to Interstate-80 and the railroad.

CSN-P-53 A noise study and mitigation measures shall be required for all projects that have noise exposure levels greater than "normally acceptable" levels.

CSN-P-54 Developers shall reduce the noise impacts on new development through appropriate means (e.g. double-paned or soundproof windows, setbacks, berming, and screening). This noise attenuation method should avoid the use of visible sound walls.

CSN-P-55 Site design, building design, hours of operation, and other techniques, for new developments deemed to be noise generators shall be used to control noise sources.

CSN-P-56 The City will work with the California Public Utilities Commission, other pertinent agencies and stakeholders to determine the feasibility of developing a railroad quiet zone in Emeryville.

CSN-P-57 The City shall require noise buffering, dampening, or active cancellation, on roof-top or other outdoor mechanical equipment located near residences, parks, and other noise sensitive land uses.

CSN-P-58 The City shall limit the potential noise impacts of construction activities on surrounding land uses through Noise Ordinance regulations that address allowed days and hours of construction, types of work, construction equipment, notification of neighbors, and sound attenuation devices.

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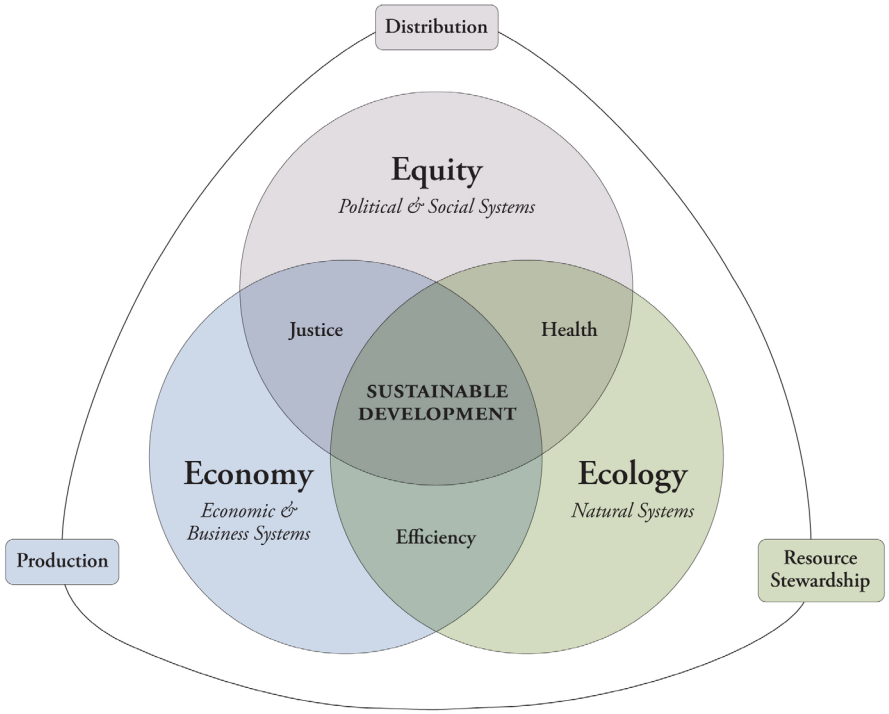
7 SUSTAINABILITY

The purpose of sustainability in Emeryville—and its incorporation throughout the General Plan—is to take responsibility for the urban development and population growth projected during the planning period and their potential impact on the environment. By implementing sustainable design measures and policies, Emeryville can reduce its contribution to global climate change, minimize its reliance on foreign oil and other fossil-fuel sources, and decrease consumption of natural resources.

The very same policies that dictate more sustainable development also enhance quality-of-life and public health: increased energy efficiency, waste diversion and reduction, mixed land uses, convenient access to parks and open spaces, alternative transportation networks, local and organic food sources, stormwater management, and many more initiatives central to this Plan.

The "3 E's" of sustainability—ecology, economy, and equity—provide a framework in which to discuss general plan development policies. The graphic below describes the interrelationship between these systems. Ecology refers to the natural systems, such as species, habitats, and water, inciting a need for stewardship of these resources. The economic component underlies the production of goods and services, integrating sustainability into the management of economic and business systems. Finally, equity refers to the distribution of costs and benefits, reflecting a fundamental human rights issue as well as a holistic perspective that sustainability can only be achieved when all segments of the community are included. Emeryville can improve ecological conditions in a way that enhances the City's already robust economy and provides equal opportunities, in terms of access to housing, transportation, jobs, education and recreation for all residents.



Since the concept of sustainability is an integral part of the Emeryville General Plan, sustainability policies are described within each of the elements. This standalone chapter consolidates these policies, existing City programs, and new goals and policies identified during the development of the General Plan. In this way, the Sustainability Element creates a convenient one-stop resource for Emeryville's sustainability programs. The chapter is organized as follows:

- Section 7.1 provides a summary of the City's leadership and accomplishments toward sustainability and what plans and programs already exist. Existing programs and policies establish a basis on which to implement goals and policies.
- Section 7.2 is a review of sustainability concepts that are included in other chapters of this plan. Sustainability encompasses many dimensions of city building and policies and principles have been woven throughout this document.
- Section 7.3 is a more detailed examination of seven topical areas including energy, waste, land use and urban design, parks and open space, transportation, environmental health and water. This section substantiates the need for additional General Plan goals and policies in certain topic areas and the direction for further work.
- Goals and policies conclude the chapter.

7.1 LEADERSHIP AND EXISTING PROGRAMS

Given its small size and built out nature, Emeryville is in many ways already practicing sustainable development, as it has to make effective use of its limited resources. The City has shown great leadership in the areas of brownfield remediation, stormwater management and local transit through the Emery Go-Round shuttle. It has joined ten other cities in Alameda County to partner with the County and Local Governments for Sustainability (ICLEI) on developing its own Climate Action Plan. Finally, Emeryville has joined cities around the world in a pledge to pursue sustainable development, signing on to the Urban Environmental Accords on United Nations World Environment Day in 2005. The City can build on these existing policies and programs to develop more effective and locally relevant sustainability programs.

Leadership

Brownfields Remediation

Through the Emeryville's brownfields programs, made possible in large part through a grant from the US Environmental Protection Agency, the City has cleaned up 240 acres of land with substantial soil and groundwater contamination. These clean-up efforts have brought new life and uses out of former industrial land, adding retail, office and housing development to create new neighborhoods and regional destinations. The City produced risk management measures that were designed to protect public health, deep groundwater resources, and the ecological resources of the San Francisco Bay. At the same time, these measures provided regulatory relief and more cost certainty for property owners, developers, and responsible parties. The collaboration among community members, regulatory agencies and technical professionals and success of the program is a model for other post-industrial cities.

Stormwater Management

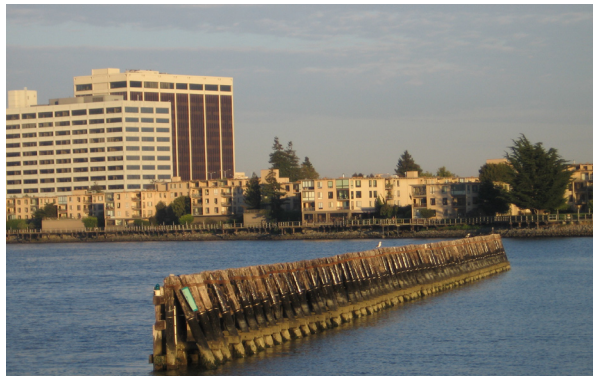
Rain washes pollutants from impervious surfaces, such as roads, rooftops and parking lots, into natural bodies of water. Emeryville has taken responsibility for its bayside location, working to reduce impervious surfaces and clean stormwater runoff before entering into the San Francisco Bay. The City is a participant in the National Pollutant Discharge Elimination System Permit, which is issued and enforced by the San Francisco Regional Water Quality Control Board. This permit system requires new development applicants to incorporate post-construction stormwater treatment systems and best management practices on the site. The City additionally requires that these treatment measures use vegetation to treat pollutants in stormwater runoff (e.g. through rain gardens, bioretention areas and living roof systems).

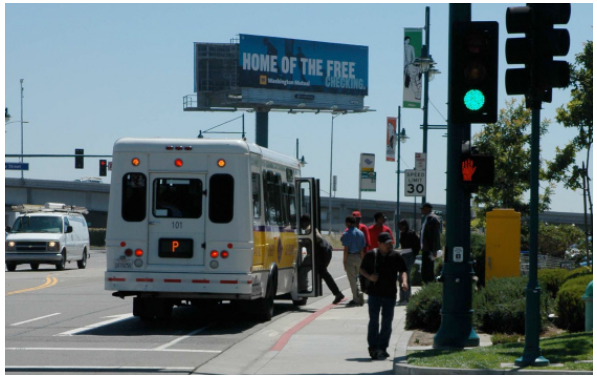
Emeryville developed Stormwater Guidelines for Green, Dense Redevelopment in 2005, with support from the Environmental Protection Agency (EPA). These guidelines outline strategies for meeting stormwater treatment thresholds using site design, parking strategies, and treatment measures to allow water to flow through vegetation. Design measures could include bioretention basins, biofiltration swales, cisterns integrated into the architecture, and/or green roofs. This set of guidelines won an award from the American Planning Association and has been promoted by EPA as a model strategy for other infill communities.

Emery Go-Round

Emeryville has been a leader in providing convenient and accessible local transit. The Emery Go-Round is a free bus shuttle service connecting key job and activity centers in the City with BART and AC Transit



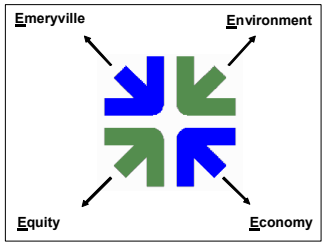




The City has shown impressive leadership through several key programs: brownfields remediation, stormwater management, and the Emery Go-Round shuttle service.



City of Emeryville
Climate Action Plan
November 2008





The City's Climate Action Plan will serve as the implementation tool to reduce greenhouse gas emissions. The Urban Environmental Accords provide an adopted framework for local policy initiatives.

transportation hubs that carries over one million passengers each year, on seven shuttle routes. The shuttle is a private transportation service, funded by all commercial property owners in the citywide transportation business improvement district and operated by the non-profit Emeryville Transportation Management Association. Since BART does not have a station in Emeryville, the shuttle provides essential connectivity to points within and outside Emeryville, while also helping to alleviate congestion. An expansion of the current system—to cover residential areas—was under consideration in June 2008.

Climate Action Plan (CAP)

Regional efforts establish a more localized approach for sustainability that addresses the unique environmental opportunities and constraints in Emeryville and the Bay Area. In 2006, Emeryville partnered with Alameda County and ten other cities to become members of ICLEI - Local Governments for Sustainability (ICLEI) and participate in the Alameda County Climate Protection Project (ACCPP). The jurisdictions committed to an "ongoing, coordinated effort to reduce the emissions that cause global warming, improve air quality, reduce waste, cut energy use and save money."[1]

ICLEI and the Alameda County Waste Management Authority & Recycling Board (StopWaste.org) helped Emeryville to develop a baseline greenhouse gas emissions inventory, a community-wide emissions reduction target, and a climate action plan that identifies policies that will enable the City to meet its target. The CAP is being drafted, led by the City's Climate Change Task Force. The Plan focuses on three key areas: transportation/land use, waste, and energy, which are described in Section 7.3. This General Plan calls for the implementation of the CAP, rather than duplicate its policies. The CAP was adopted by City Council in November 2008.

Urban Environmental Accords

Global efforts by local leaders provide a useful framework for developing a coherent sustainability program. As part of the United Nations World Environment Day, held in San Francisco in 2005, Emeryville joined other cities around the world as a signatory on the Urban Environmental Accords. These Accords represent a collaborative commitment "to build an ecologically sustainable, economically dynamic, and socially equitable future of our urban citizens." Although this General Plan's Guiding Principles, described in Chapter 1, serve as overarching goals to this Plan, the 21 action items described in the Accords dovetail beneath them, stimulating the City's policies around sustainability described in this Element and through the Plan. Section 7.3 documents the action items of the Accords within each of its seven topic area and describes the City's implementation progress so far.

The intention of the Accords was to have each city pick three action items to adopt each year and implement locally appropriate programs to achieve the Accords. Seven years later, at World Environment Day 2012, cities will again come together and determine their collective progress.

1 *City of Emeryville. Draft Climate Action Plan. October 2008: 5.*

7.2 LINKAGES TO OTHER ELEMENTS

Sustainability issues and policies are integral to each element of the General Plan. This section identifies the interrelatedness of sustainability concepts located in the other elements.

Guiding Principles

The Guiding Principles, stated in Chapter 1: Introduction, describe the overarching principles that guide General Plan goals and policies, including the City's strategy for sustainability. One Guiding Principle, in particular, supports sustainability and innovation, with respect for the past—through redevelopment of brownfields, using green construction techniques, and encouraging low ecological impact. The remaining principles support sustainability by aspiring for vibrant communities with an array of amenities and transportation choices that encourage walking and biking and provide accessibility to essential services.

Land Use Element

The Land Use Element, Chapter 2, describes a vision for a mixed use city, with greater residential and employment densities and enhanced neighborhood centers and services, leading to a more livable compact and efficient city. Orienting higher-density housing and more intensive non-residential uses near transit can reduce vehicle miles traveled.

TABLE 7-1: CROSS-REFERENCED GOALS AND POLICIES FROM THE LAND USE ELEMENT

LAND USE GOALS	
LU-G-1	**An overall balance of uses—**Employment, residential, cultural, destination and local retail—as well as a full range of amenities and services are necessary to support a vibrant community.
LU-G-3	**Community activity centers—**Centers that combine residential, retail, office, and public uses to create areas of identity and activity for residents and visitors.
LU-G-4	**A mix of housing types—**A diversity of housing types to accommodate a variety of household sizes and incomes.
LU-G-6	**Vibrant new mixed-use centers—**Intensification of existing underutilized commercial centers with surface parking (such as Powell Street Plaza and East Bay Bridge Center) as vibrant, multi-story, walkable mixed-use destinations with structured parking and open space.
LU-G-11	**A wide range of economic activity—**An economy that capitalizes on Emeryville's central location, strengthens the City's tax base, and ensures that Emeryville has adequate fiscal resources to fund high quality public services for its residents and businesses.
LAND USE POLICIES	
LU-P-2	The Powell/Christie/Shellmound/I-80 core area will be developed into a compact but high-intensity regional transit hub. This hub will include a retail core, with stores, restaurants, and hotels; a financial and commercial center, creating a daytime work population; and a residential neighborhood, providing vitality during non-work hours.
LU-P-3	The northern (north of Powell) and southern halves of the Powell/Christie core area shall be integrated and connected, and the district shall be walkable, with small blocks, pedestrian-oriented streets, and connections to surroundings.
LU-P-4	Park Avenue (west of Hollis Street), Hollis Street (between 61st and midblock between 65th and 66th streets), Powell Street/Captain Drive, and San Pablo Avenue (between 36th and 47th streets) will be developed as walkable, mixed-use neighborhood centers, with an array of amenities and services—including stores, restaurants and cafes, galleries, and office uses—to serve neighborhood needs, with community-serving uses and active building frontages that engage pedestrians at the ground level.
LU-P-6	The current deficiency of park and open space will be addressed by making parkland acquisition a high priority by the City, and working with private land owners to secure these areas through development incentives, land swaps, and other mechanisms.
LU-P-17	The area around the Amtrak station shall be developed with pedestrian and bicycle amenities, and transit-supportive uses, through measures such as reduced parking requirement, incorporation of public parking in developments, and accounting for transit proximity when considering height and FAR bonuses.

Continues on next page





New residential development will support retail and neighborhood centers in key parts of the city and around transit centers. Encouraging a mix of land uses reduces vehicle trips and promotes circulation by alternative modes.

LU-P-21 The East Bay Bridge, Powell Street Plaza, and Marketplace shopping centers shall be intensified by consolidating parking into structures and converting surface parking lots into residential and mixed-use development—including retail, hotels, and offices; expanding the city street grid through the sites; and developing new parks and public open space. Future redevelopment of these shopping centers should include at least as much retail space as existed when this General Plan was adopted.

LU-P-27 A diversity of commercial uses to insulate the City's fiscal base from downturns in particular markets shall be maintained.

LU-P-28 The City will pursue retail uses that will serve the need of Emeryville residents, and encourage these uses to locate in the Neighborhood Centers.

LU-P-29 The City will encourage the development and retention of small business, start-up firms, partnership incentives, and buildings that accommodate these businesses.

LU-P-31 The City will encourage development of existing Emeryville businesses with the objective of retaining and expanding employment opportunities and strengthening the tax base. Provide assistance to existing businesses that may be displaced by new development to relocate in Emeryville.

LU-P-32 The City will work with existing Emeryville businesses, Chamber of Commerce, and others to address the City's economic needs and stimulate growth.

Transportation Element

The Transportation Element, Chapter 3, pursues a strategy to expand the street grid and enhance alternative transportation options, allowing for more connectivity and walkability between jobs, shopping and other activity centers. Making alternative transportation more pleasant, convenient, and accessible, can reduce vehicle trips and therefore greenhouse gas emissions.

TABLE 7-2: CROSS-REFERENCED GOALS AND POLICIES FROM THE TRANSPORTATION ELEMENT

TRANSPORTATION GOALS	
T-G-1	**A comprehensive transportation system—**A transportation system that is efficient, safe, removes barriers, (e.g. accessibility near freeways and rail lines), and optimizes travel by all modes.
T-G-2	**Universally accessible—**A transportation system that meets the needs of all segments of the population, including youth, seniors, persons with disabilities, and low-income households.
T-G-3	**Multi-modal—**A transportation system that eliminates the necessity of owning and/or driving personal vehicles because of the availability of convenient and accessible alternative modes of transportation.
T-G-4	**A walkable city—**A universally accessible, safe, pleasant, convenient, and integrated pedestrian system that provides links within the city and to surrounding communities, and reduces vehicular conflicts.
T-G-5	**A safe, comprehensive, and integrated bicycle system—**A system and support facilities throughout the city that encourage accessible bicycling for all community members.
T-G-6	**A safe, efficient, comprehensive, and integrated transit system—**A public transit system that allows for a reduction in automobile dependence for residents, employees, and visitors.
T-G-7	**A multi-functional street system—**A system that will ensure the safe and efficient movement of people, goods, and services and support a high quality of life and economic vitality.
T-G-8	**A balanced parking supply system—**Parking supply that balances economic development, livable neighborhoods, environmental and energy sustainability, and public safety, while reducing dependence on the automobile.
T-G-9	**Safe and efficient movement of goods—**Goods movement that supports commerce and industry while maintaining a high quality of life.
T-G-11	**Transportation demand management strategies—**TDM strategies that decrease single-occupant automobile demand and reduce vehicle miles traveled.
TRANSPORTATION POLICIES	
T-P-2	The design, construction, operation, and maintenance of city streets shall be based on a "complete streets" concept that enables safe, comfortable, and attractive access and travel for pedestrians, bicyclists, motorists, and transit users of all ages and abilities.
T-P-5	The City encourages development that minimizes Vehicle Miles Traveled (VMT).
T-P-6	To the extent allowed by law, the City's Traffic Impact Fee shall include bicycle, pedestrian, transit, and road improvements so that development pays its fair share toward a circulation system that optimizes travel by all modes.
T-P-11	Sidewalks shall be provided on both sides of all streets; pedestrian connections between new and existing development is required.

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The Transportation Element seeks to reduce barriers to pedestrian and bicycle connectivity in order to create safe and attractive places for walking and biking.

T-P-12 The city will plan, upgrade, and maintain pedestrian crossings at intersections and mid-block locations by providing safe, well-marked crosswalks with audio/visual warnings, bulb-outs, and median refuges that reduce crossing widths.

T-P-15 Walking will be encouraged through building design and ensure that automobile parking facilities are designed to facilitate convenient pedestrian access within the parking area and between nearby buildings and adjacent sidewalks. Primary pedestrian entries to nonresidential buildings should be from the sidewalk, not from parking facilities.

T-P-16 Safe pedestrian walkways that link to streets and adjacent bus stops will be required of new development.

T-P-19 Following completion of the new east span of the Bay Bridge, the west span should be retrofitted with a pathway to provide continuous pedestrian and bicycle access between San Francisco and the East Bay.

T-P-20 Safe and direct pedestrian access to Aquatic Park and the peninsula will be provided and maintained.

T-P-23 On-street bike routes in the City's Bicycle and Pedestrian Plan shall be designated as either Class II (bike lanes) or Class III (signed routes without lanes), as appropriate. These designations are not part of the General Plan and may be changed as circumstances dictate.

T-P-24 Safe, secure, and convenient short- and long-term bicycle parking shall be provided near destinations for all users, including commuters, residents, shoppers, students, and other bicycle travelers. Retail businesses in regional retail areas are encouraged to provide valet bicycle parking.

T-P-26 Bicycling will be promoted through public education, including the publication of literature concerning bicycle safety and the travel, health and environmental benefits of bicycling.

T-P-28 Existing public transit to BART, Amtrak, and regional destinations will be supported, and transit within Emeryville for residents, workers, and visitors will be promoted.

T-P-31 The City will develop and implement transit stop amenities such as pedestrian pathways approaching stops, benches, traveler information systems, shelters, and bike racks to facilitate transit stops as place-making destinations and further the perception of transit as an alternative to driving.

T-P-32 Transit stops will be sited at safe, efficient, and convenient locations, and located appropriately within the right of way.

T-P-33 The City supports transit priority on Transit Streets through features such as traffic signal priority, bus queue jump lanes at intersections, exclusive transit lanes, and other techniques as appropriate, with adjustments to technology as conditions change.

T-P-34 The City will continue to support free and/or subsidized transit for both local travel within the City and travel to the regional hubs located at the Amtrak Station, the MacArthur BART station, and San Pablo Avenue at 40th Street.

T-P-35 The City will support the expansion of the Emery Go-Round to accommodate workers, residents, and visitors.

T-P-36 The City supports Transit-Oriented Development with reduced parking requirements, and amenities to encourage transit use and increase pedestrian comfort around the Major Transit Hubs at the Amtrak station and the 40th Street/San Pablo Avenue intersection.

T-P-37 The City will advocate for frequent, direct transit service to all points in Emeryville, especially between the east and west sides of town.

T-P-38 The City encourages Amtrak to allow local travel on Amtrak buses that provide service from Downtown San Francisco to the Emeryville Station.

T-P-39 The City will advocate for AC Transit to provide frequent, direct, two-way service between downtown San Francisco and various points within Emeryville.

T-P-40 The City will investigate and implement, if appropriate, fixed guideway transit systems, such as streetcars or personal rapid transit (PRT).

T-P-41 The City supports a new BART line in the East Bay that includes service to Emeryville along the existing regional rail corridor with a stop at Powell Street.

T-P-44 The City supports grade-separated crossings and other appropriate measures to mitigate the impacts of increased rail traffic on Emeryville, including noise, air pollution, and traffic disruption.

T-P-47 The City supports "traffic calming" and other neighborhood traffic management techniques to enhance the quality of life within existing neighborhoods and to discourage through-traffic on bicycle boulevards and local streets.

T-P-48 The City will establish equal priority to bicycles and public transit (and discourage through-traffic by other modes) on streets in the vicinity of the Amtrak station that are designated as both Transit Streets and Bicycle Boulevards.

T-P-49 Quality of life and business viability will be promoted by maintaining an adequate supply of parking to serve growing needs, while avoiding excessive supplies that discourage transit ridership and disrupt the urban fabric.

T-P-51 The City supports parking supply and pricing as a strategy to encourage the use of transit, carpools, bicycles, and walking.

T-P-52 Flexible parking standards are encouraged that reflect calculated parking demand for proposed land uses and that allow for appropriate offsets to reduce parking demand and encourage walking, bicycling, carpooling, and transit use.

T-P-53 Employers are encouraged to offer "parking cash out", whereby employees who choose not to drive are offered the cash value of any employee parking subsidy, to be used towards commuting to work by other means.

T-P-57 The land area devoted to parking shall be reduced by supporting innovative technologies such as parking lifts and automated parking.

T-P-64 The City will work with local, regional and state agencies, the Chamber of Commerce, and the Transportation Management Association, as well as employers and residents, to encourage and support programs that reduce vehicle miles traveled, such as preferential carpool parking, parking pricing, flexible work schedules, and ridesharing.

T-P-66 The City supports and encourages the expansion of car-sharing programs in Emeryville.

T-P-67 The City supports and encourages conveniently located child care services with flexible hours.





Improving connections to transit, reliability, and frequency will encourage increased ridership and reduce vehicle miles traveled and, in turn, greenhouse gas emissions.

Parks, Open Space, Public Facilities, and Services Element

The Parks, Open Space, Public Facilities, and Services Element, Chapter 4, describes an increase in the amount and accessibility of parks and open spaces, proposing spaces for passive and active recreation, while improving air quality and managing stormwater runoff.





Parks and open spaces provide spaces for recreation and relaxation, while also cleaning the air and absorbing stormwater runoff.

TABLE 7-3: CROSS-REFERENCED GOALS AND POLICIES FROM THE PARKS, OPEN SPACE, PUBLIC FACILITIES, AND SERVICES ELEMENT

PARKS, OPEN SPACE, PUBLIC FACILITIES, AND SERVICES GOALS	
PP-G-1	**A comprehensive open space system—**A system that provides a diverse range of active and passive recreation and open space opportunities for residents, workers, and visitors.
PP-G-3	**Integration of parks and open space—**Parks that are coordinated with surrounding developments to form unified urban compositions and that are integrated into the redevelopment of underutilized areas.
PP-G-5	**Sustainable design—**Park designs that are consistent with sustainable design principles and practices, and efficient use of open space.
PP-G-6	**Locally accessible parks—**At least one park located within a five-minute walk of all residences.
PP-G-8	**A safe, nurturing and enriching environment—**An environment in which children and youth can flourish and become contributing members of society. The foundation of this vision is a strong and active partnership among the City, School District, and all segments of the community, so that powerful learning from the earliest years is a citywide experience and responsibility.
PP-G-9	**Accessible childcare—**An adequate and diverse supply of childcare facilities that are affordable and accessible for families, and provide safe, educational, and high-quality services for children.

PARKS, OPEN SPACE, PUBLIC FACILITIES, AND SERVICES POLICIES

PP-P-1 Increase park acreage to serve the needs of the growing population and address current-deficiencies in park and open space standards. Maintain a standard of three new acres of parkland per 1,000 new residents, and 0.25 acres per 1,000 new employees.

PP-P-2 Two new large parks (five acres or larger), one each north and south of Powell Street, shall be provided. Active recreation uses will be a component of these parks. The northern park site is bounded by 61st, 64th, Hollis, and Doyle streets. There are two potential southern park sites:

- One potential southern park site is shown on the PG&E site on Hollis Street, between 45th and 53rd streets. On this site, consideration shall be given as to how to incorporate the existing buildings, which are rated Tier 1 and Tier 2 in the Park Avenue District Plan, into future park uses.
- The second potential southern park site is located at the AC Transit bus yard between 45th and 47th streets, adjacent to the proposed Center of Community Life. Should this site become available, the City shall explore the possibility of a public park—along with other public uses. If a large park at this site is feasible and is considered desirable, all or part of the PG&E site may no longer be needed for a public park.

PP-P-3 New smaller open spaces—including public plazas and places, community gardens, and pocket parks—will provide local focus points and diversify the built environment. These should be developed through the identification of underutilized and strategically located parcels, and the redevelopment of larger sites.

PP-P-5 A system of greenways and Green Streets, as tree-lined open spaces, and as continuous recreational paths for bicyclists, joggers, and pedestrians, linking parks and activity centers.

PP-P-6 The north-south Emeryville Greenway will be expanded, enhancing its role as an open space corridor and connector across the City, and a source of inspiration and community pride. The City will support the expansion of a park at the Sherwin Williams site, in coordination with the development of Horton Landing Park and the Greenway.

PP-P-7 An east-west greenway located generally along the path of Temescal Creek will be created. This will include water features to celebrate the creek and improvements to the riparian corridor, where feasible, while maintaining existing drainage capabilities.

PP-P-10 Efficient use of open space will be achieved through techniques such as rooftop play courts and gardens, joint use of sports and recreation facilities at schools, co-location of parks with child care facilities, and possible use of underground parking below new plazas and parks.

PP-P-12 Design, landscaping, lighting, and traffic calming measures will be employed to create safe parks and open spaces.

PP-P-13 Open spaces that have deteriorated, have design features that limit access and use opportunities, and/or are in need of activity shall be revitalized.

PP-P-16 The City will continue to partner with Emery Unified School District to optimize the joint-use of school facilities for community use.

PP-P-19 A diversity of lifestyles, ages, and income-levels will be accommodated through zoning and community facilities and programming.

PP-P-20 The growing senior citizen community will be supported by providing appropriate cultural, recreational and assistance programs and services.





Several new open spaces are planned and proposed in the General Plan, including a new large park in North Hollis (top) and the extension of the Greenway (bottom).

Urban Design Element

The Urban Design Element, Chapter 5, outlines a form for walkable streets, appropriate building massing, and attractive landscaped streetscapes that invites pedestrians, allows for solar access, and creates a connected street grid. Enhancing the walkability of the street network, by adding additional streets and paths, amenable to pedestrians and bicyclists can potentially reduce the number of vehicle trips and vehicle miles traveled.





The General Plan envisions an intensive core centered in Powell Street/Christie Avenue areas (top), and neighborhood centers distributed throughout the city to provide residents easy access to everyday amenities (bottom).

TABLE 7-4: CROSS-REFERENCED GOALS AND POLICIES FROM THE URBAN DESIGN ELEMENT

URBAN DESIGN GOALS

UD-G-1 **An identifiable city structure**—A city structure comprised of a vibrant, intense, and pedestrian-oriented core, and distinctive neighborhood centers and districts augmented with parks and connected by greenways and green streets.

UD-G-2 **A diversity of building types and scales**—Variation to reinforce the identity of individual districts and foster a variety of options for living and working, with continuity in development scale and character and careful transitions between densities and design typologies.

UD-G-3 **A walkable and pedestrian-scaled environment**—A network of streets and connections that expands circulation opportunities for pedestrians and bicyclists.

UD-G-4 **New parks**—Strategically located new parks and outdoor open spaces to enhance Emeryville's livability and pedestrian orientation.

UD-G-7 **Expanded street grid**—A pedestrian and bicycle system with extensions that improve connectivity throughout the city.

UD-G-8 **A safe, attractive, and connected pedestrian environment**—Throughout the city, but particularly in areas with high volumes of pedestrian activity.

UD-G-11 **Sky Exposure**—Building form and massing that furthers sky exposure for adjacent sidewalks and public spaces, especially in gathering places such as the core and neighborhood centers.

UD-G-13 **Streets that support multiple functions**—Streets designed for all types of users, including pedestrians, bicyclists, public transit, and automobiles.

UD-G-15 **Development along streets offers a rich visual experience**—Development that is engaging to pedestrians, is unobstructed by parking facilities, and contributes to street life, vitality, and safety.

UD-G-17 **A walkable and connected city**—Neighborhood centers and other amenities in proximity to employees and residents throughout the city.

URBAN DESIGN POLICIES

UD-P-1 The city shall strive to accentuate activity and presence at the street level, particularly along pedestrian-oriented corridors and in residential areas.

UD-P-2 Parks and open space is required with new development, consistent with Figure 4-1 in the Parks, Open Space, Public Facilities and Services chapter.

UD-P-3 Parks and open space shall be accessible and available to the public through site design standards for minimum size/dimensions, visibility, and location along public rights-of-way, particularly Green Streets (Figure 5-3).

UD-P-4 New development will be required to extend the street grid or pedestrian connections wherever possible.

UD-P-20 The street grid shall be extended as redevelopment on larger sites occurs.

UD-P-22 The City shall maintain and enhance an integrated pattern of streets, pedestrian paths, and bike routes through a fine-grain street grid that enables efficient movement throughout the city.

UD-P-24 The City shall establish Pedestrian Priority Zones in regional and neighborhood centers, around schools, parks, and in other locations as indicated in Figure 5-3. While wider sidewalks, street lighting, bulbed crosswalks, and other pedestrian amenities should be employed throughout the city, they are prioritized in these locations.

UD-P-40 Neighborhood structure and pedestrian scale development should be prioritized. The scale and character of existing neighborhoods should be maintained to ensure connectivity and continuity of street design within each district.

UD-P-47 Streetscape landscaping shall follow Bay-Friendly Landscaping guidelines and serve the dual purpose of treating stormwater runoff and providing shade and beauty to the urban realm.

UD-P-53 Use of the greenways shall be reinforced by fronting entrances to both commercial and residential development to the public pathway.

- Encourage open spaces and plazas adjacent to the greenways.
- Encourage other public-oriented ground level uses such as workshops, lobbies, and common areas.

UD-P-58 Large surface parking lots shall be replaced with structured parking and incorporated into high density mixed-use developments. New or expanded large surface parking lots are not allowed.

UD-P-69 The pedestrian environment shall be enhanced with multiple neighborhood access points, through-streets, and pedestrian pathways.

UD-P-70 Street-level uses should reinforce neighborhood center streets and allow a vertical mix of a diverse range of land uses including offices, hotels and residential uses compatible with neighborhood center functions.

UD-P-72 Public space and plazas for gathering and expanded ground-floor retail activities are encouraged. These elements enhance the pedestrian realm and provide opportunities for social interaction.





The Urban Design Element describes provides for integrating open space into new development (top) and encouraging drought-tolerant plantings (bottom).







Conservation goals and policies address protection of air, water, biological and cultural resources.

Conservation, Safety, and Noise Element

The Conservation, Safety, and Noise Element, Chapter 6, describes strategies to maintain environmental quality within an urban environment, through stormwater management, creek restoration, water recycling and conservation, and preservation of biological and plant resources.

TABLE 7-5: CROSS-REFERENCED GOALS AND POLICIES FROM THE CONSERVATION, SAFETY, AND NOISE ELEMENT

CONSERVATION, SAFETY, AND NOISE GOALS	
CSN-G-1	**Public health—**A high level of public health and safety.
CSN-G-2	**Improved air quality—**Local ambient air quality levels that help meet regional attainment status and contain low levels of air pollutants.
CSN-G-3	**Water quality and conservation—**High-quality groundwater and surface water resources. Improved water conservation, increased use of recycled water, and reduced per capita water consumption.
CSN-G-4	**Reduced per capita water consumption—**By 2030, per capita water consumption will be reduced by 30 percent over 2008 levels.
CSN-G-5	**Preservation and protection of natural resources—**Preservation and enhancement of natural habitat, and protection of biological resources, particularly around the Emeryville Crescent.
CSN-G-8	**Protection from natural and manmade hazards—**Protection of life, natural environment, and property from natural and manmade hazards due to seismic activity, hazardous material exposure or flood damage.
CSN-G-9	**Protection from noise—**Protection of life, natural environment, and property from manmade hazards due to excessive noise exposure.

CONSERVATION, SAFETY, AND NOISE POLICIES

CSN-P-1 Air quality will be maintained and improved by requiring project mitigation, such as Transportation Demand Management (TDM) techniques, where significant air quality impacts are identified.

CSN-P-2 The City will budget for clean fuels and vehicles in the City's long-range capital expenditure plans, to replace and improve the existing fleet of gasoline and diesel powered vehicles.

CSN-P-3 The City will coordinate air quality planning efforts with local, regional, and state agencies and support the Bay Area Air Quality Management District's efforts to monitor and control air pollutants from stationary sources.

CSN-P-4 Dust abatement actions are required for all new construction and redevelopment projects.

CSN-P-5 All large construction projects are required to reduce diesel exhaust emissions through use of alternate fuels and/or control devices.

CSN-P-6 Adequate buffer distances shall be provided between offensive odor sources and sensitive receptors, such as schools, hospitals, and community centers.

CSN-P-7 New commercial and industrial activities, as well as construction and demolition practices, shall be regulated to minimize discharge of pollutant and sediment concentrations into San Francisco Bay.

CSN-P-8 The City will continue to support regional watershed conservation through local land use planning, open space policies, and water quality conservation efforts.

CSN-P-9 The City will continue programs to inform residents of the environmental effects of dumping household waste, such as motor oil, into storm drains that eventually discharge into San Francisco Bay.

CSN-P-10 New development is required to incorporate source control, site design, and storm water treatment to reduce pollutants in stormwater runoff.

CSN-P-11 Exterior uses of water for landscaping and other purposes to minimize or eliminate runoff and water waste.

CSN-P-12 The City promotes use of recycled water on landscaping and other non-food source plantings.

CSN-P-13 The City promotes construction and incorporation of cisterns, green roofs and other rainfall harvesting methods in existing, new and rehabilitation projects.

CSN-P-14 The City will allow homeowners to divert untreated rainwater for non-potable uses, such as outdoor irrigation and toilet flushing, through use of rainwater barrels or similar methods.

CSN-P-15 The City shall consider revising plumbing and building code requirements, as necessary, to allow for graywater and rainwater harvesting systems.

CSN-P-16 The City will continue to support the use of recycled water in new and rehabilitation projects, through the development process.

CSN-P-17 The City supports public education initiatives to encourage conservation of potable water.

CSN-P-18 The City will encourage protection of essential habitat for special status species and support habitat protection and enhancement within Emeryville that are within the City's control.

Continues on next page





Safety measures include prevention and reduction of seismic, flooding, hazardous materials, and fire risk.





Noise sources, particularly from trains and cars on the freeway, are addressed in the Noise Element to reduce their impacts on nearby residents and other building occupants.

CSN-P-19 The natural environment, including mature trees and landscaping, shall be protected from destruction during new construction and redevelopment. Adequate replacement shall be provided where protection is impossible.

CSN-P-20 The City encourages incorporation of native plants into landscape plans for new developments and City projects and parks and preservation of mature trees on new developments and City projects.

CSN-P-21 The City discourages use of non-native invasive species in any landscaped or natural areas.

CSN-P-22 Provide visual access to the Emeryville Crescent in a manner consistent with the protection of this fragile ecological system.

CSN-P-23 Where new trails or other improvements are proposed in the vicinity of the baylands and essential habitat for special-status species, require adequate avoidance and mitigation necessary to protect sensitive resources.

CSN-P-24 The City shall explore opportunities for habitat restoration and enhancement, particularly in larger parks and open space areas.

CSN-P-25 Appropriate avoidance measures will be implemented to minimize the loss of special status species nesting birds during new construction. This can be accomplished through timing of vegetation removal and building demolition during the non-nesting season or through preconstruction surveys where a potential for nesting remains on proposed development sites.

CSN-P-26 The City encourages developers to reuse existing historic or architecturally significant structures.

CSN-P-33 In order to reduce light pollution and use less energy, lighting (including on streets, recreational facilities, and in parking areas) should be designed to prevent artificial lighting from illuminating natural resources or adjacent residential neighborhoods.

CSN-P-34 The City will continue to regulate development, including remodeling or structural rehabilitation, to ensure adequate mitigation of safety hazards on sites having a history or threat of seismic dangers, erosion, subsidence, or flooding.

CSN-P-35 The City will require geotechnical investigation of all sites proposed for development in areas where geologic conditions or soil types are susceptible to liquefaction. Require submission of geotechnical investigation and demonstration that project conforms to all recommended mitigation measures prior to city approval (as required by State law).

CSN-P-36 The City will continue to require soil erosion control measures during construction.

CSN-P-37 The City will enforce regulation of potentially hazardous structures to be retrofitted and made safe and encourage property owners to abate or remove structural hazards that create unaccepted levels of risk.

CSN-P-38 Prior to reuse, former commercial and industrial sites will be cleaned up, according to relevant State and federal regulations.

CSN-P-39 The City will enforce regulation of local and State laws regarding the production, use, storage, and transportation of hazardous materials and waste.

CSN-P-40 The City requires abatement of lead-based paint and asbestos prior to structural renovation or demolition, and compliance with all State, Federal, Occupational Safety and Health Administration, Bay Area Air Quality Management District, Alameda County, and local rules and regulations.

CSN-P-41 Development on sites with known contamination of soil and groundwater shall be regulated to ensure that construction workers, future occupants, and the environment as a whole, are adequately protected from hazards associated with contamination.

CSN-P-42 The City supports public awareness and participation in household waste management, control, and recycling.

CSN-P-43 Siting of businesses that use, store, process, or dispose of substantial quantities of hazardous materials shall be carefully restricted in areas subject to very strong levels of ground shaking

CSN-P-44 The City will continue to require development projects to implement on-site stormwater management measures through the City's development permit process.

CSN-P-45 Storm drains shall be maintained and replaced or upgraded as needed to reduce potential flooding.

CSN-P-52 Occupants of existing and new buildings should be protected from exposure to excessive noise, particularly adjacent to Interstate-80 and the railroad.

CSN-P-54 Developers shall reduce the noise impacts on new development through appropriate means (e.g. double-paned or soundproof windows, setbacks, berming, and screening). This noise attenuation method should avoid the use of visible sound walls.

7.3 KEY SUSTAINABILITY TOPICS

The following sustainability topics are grouped according to the Urban Accords' subject areas: Energy, Waste Reduction, Land Use and Urban Design, Urban Nature, Transportation, Environmental Health, and Water. Within each topic area, relevant strategies or standards from the City's Climate Action Plan, Urban Accords, and any other adopted policies are described in text boxes.

Topic 1: Energy

Greenhouse gases are released during energy production and consumption, such as electricity used to power homes and offices, and fuel used to power cars and trucks. Reducing the carbon content of the fuel source (e.g. solar or wind power versus fossil fuels) or reducing energy consumption (e.g. using energy efficient appliances or designing buildings for solar access) may limit negative impacts on global climate change.

Existing Policies and Programs

Climate Action Plan

As a first step toward preparing the CAP, the City completed a baseline inventory of greenhouse gas emissions. The analysis revealed that, in 2004, 178,832 tons of carbon dioxide equivalent (CO_2e) were released into the atmosphere. The inventory includes all energy consumed in Emeryville—even the energy and emissions associated with electricity consumed in the city, but produced elsewhere. As a result of this inventory, the City has set a goal to reduce community-wide greenhouse gas emissions by 25 percent below 2004 levels by 2020. The City currently has two formal energy conservation policies. The first supports programs providing alternatives to conventional private vehicles. The second policy promotes energy conservation and the use of renewable energy resources. The CAP was officially adopted by the City on December 2, 2008.

CLIMATE CHANGE

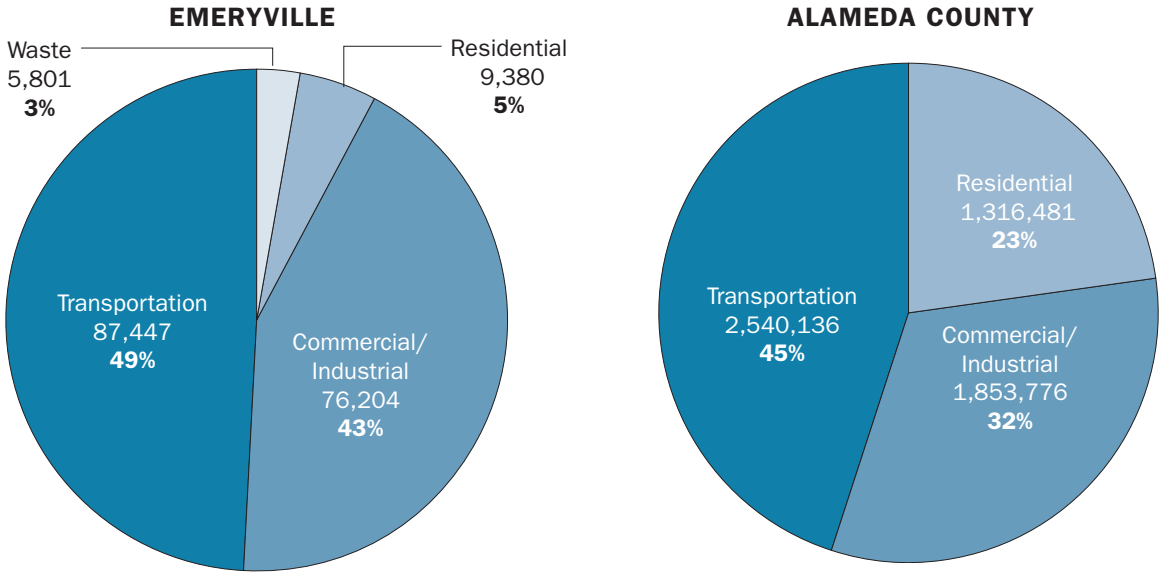
The Earth's atmosphere is naturally composed of gases that act like the glass panes of a greenhouse, retaining heat to keep the temperature of the Earth stable and hospitable for life at an average temperature of 60°F. These gases include carbon dioxide (CO_2), methane (CH_4), nitrous oxide (NO_2), ozone (O_3) and halocarbons. Recently, elevated concentrations of these gases in the atmosphere have had a destabilizing effect on the global climate, fueling the phenomenon commonly referred to as global climate change. The Intergovernmental Panel on Climate Change (IPCC), a scientific intergovernmental body set up by the World Meteorological Organization (WMO) and by the United Nations Environment Programme (UNEP), predicts that global mean temperature increase from 1990-2100 could range from 2.0 to 11.5 degrees Fahrenheit. It projects a sea level rise of seven to 23 inches by the end of the century, with a greater rise possible depending on the rate of polar ice sheet melting.

Accelerating climate change has the potential to cause a number of adverse impacts in California, including: a shrinking Sierra snowpack; public health threats caused by higher temperatures and more smog; rising temperatures, eroding coastlines; sea level rise; increased wildfire risk; and increased electricity demands. Reducing greenhouse gas emissions—such as those that result from

Chart 7-1 shows the breakdown of emissions for Emeryville and Alameda County. In Emeryville, the transportation sector is the largest contributor to greenhouse gas emissions, responsible for nearly half of all emissions. The transportation sector represents vehicle miles traveled on local roads and state highways within Emeryville. The commercial/industrial sector accounts for nearly 43% of emissions, which is not surprising given the city's concentration of industrial, office, and retail uses. Residential uses and methane generated by waste account for five and three percent of total emissions, respectively. In comparison, the transportation sector in Alameda County is also the largest contributor, responsible for 45% of greenhouse gas emissions. The commercial/industrial and residential sectors account for 32 and 23 percent of total emissions, respectively.

The CAP addresses energy issues through policies promoting fuel and energy efficiency and renewable energy to achieve its emission reduction goal. Measures include promotion of energy efficient appliances and practices for new construction and retrofit projects. Using renewable fuel sources to accommodate the city's power needs can substantially reduce greenhouse gas emissions, compared with production from conventional coal-fired power plants. The CAP seeks to increase the availability of renewable energy sources by offering incentives for individual homeowners to install solar photovoltaic (PV) systems and by constructing a PV system on the roof of City Hall.

CHART 7-1: 2004 GREENHOUSE GAS EMISSIONS, BY SECTOR (METRIC TONS CO_2)



Source: City of Emeryville Greenhouse Gas Emissions Analysis, July 2008 (Emeryville) and City of Emeryville Baseline Greenhouse Gas Emissions Inventory Report, December 2006 (Alameda County).

EMERYVILLE CLIMATE ACTION PLAN ENERGY EFFICIENCY POLICIES

CITYWIDE POLICIES

- Use Energy Star equipment: computers, monitors, printers, copiers, refrigerators, vending machines, water coolers, dishwashers, clothes washers; high efficiency water heaters; and energy efficient chillers and boilers.
- HVAC fan upgrade and maintenance tune-ups
- Switch electric heat to natural gas
- Adopt a High Performance Local Energy Code (such as green building ordinance) for new construction and renovation of facilities
- Adopt strict commercial and residential energy code requirements
- Distribute loans to citizens to make energy efficiency improvements
- Implement energy efficient weatherization of low-income housing and new public/affordable housing projects
- Perform energy efficiency retrofits of existing facilities
- Require energy upgrades of facilities at time of sale
- Distribute free CFL bulbs and/or fixtures to community members
- Install LED exit signs
- Install lighting occupancy sensors
- Retrofit T-12 lamps to T-8 lamps
- Promote energy conservation through campaigns targeted at businesses and residents
- Promote green building practices through a local green building assistance program or incentives
- Promote participation in a local green business program
- Adopt water conservation ordinance
- Install low-flow faucets, low-flow shower heads, and high efficiency toilets
- Use low maintenance landscaping
- Install green and/or reflective roofing
- Install solar photovoltaic panels, solar heating panels, and wind turbines (including via incentives)

MUNICIPAL POLICIES

- Use Energy Star equipment: computers, monitors, printers, copiers, refrigerators, water coolers; high efficiency water heaters; and energy efficient chillers and boilers.
- HVAC fan upgrade and maintenance tune-ups
- Adopt a High Performance Local Energy Code (such as green building ordinance) for new construction and renovation of facilities
- Perform energy efficiency retrofits of existing facilities
- Install LED lighting: exit signs, street lights, and traffic signals
- Install lighting occupancy sensors
- Use low maintenance landscaping
- Install green and/or reflective roofing
- Install solar photovoltaic panels, solar water heating at swimming pool, and solar water heaters

Source: City of Emeryville, Climate Action Plan, December 2008.

URBAN ACCORD ENERGY ACTION ITEMS

- **Action 1:** Adopt and implement a policy to increase the use of renewable energy to meet ten percent of the city's peak electric load within seven years.
- **Action 2:** Adopt and implement a policy to reduce the city's peak electric load by ten percent within seven years through energy efficiency, shifting the timing of energy demands, and conservation measures.
- **Action 3:** Adopt a citywide greenhouse gas reduction plan that reduces the jurisdiction's emissions by twenty-five percent by 2030, and which includes a system for accounting and auditing greenhouse gas emissions.

Source: Urban Environmental Accords. United Nations Environment Programme World Environment Day, 2005.

Topic 2: Waste

Diverting waste from landfills by promoting reduction, reuse, recycling, and composting of materials can also have a substantial impact on reducing greenhouse gas emissions. Recycling and waste prevention programs reduce energy and transportation needed to manufacture and ship resource-intensive products and packaging. Composting food and yard waste, instead of sending them to landfills, reduces the amount of methane produced in landfills.

Existing Policies and Programs

Climate Action Plan

Through the CAP, the City has committed to a goal of reducing waste sent to landfills by 75 percent from 1990 levels by 2010. The City of Emeryville is working closely with Alameda County's StopWaste.org, which has already taken a lead role in developing strategies to divert waste and improve recycling and composting services. The CAP outlines a series of policies to reduce waste generation by increasing participation in County and City compost, recycle, and reuse programs; educating residents about the benefits of sustainable landscaping; and encouraging businesses to participate in the County Green Business program. The City has already adopted an ordinance requiring that restaurants and food vendors use compostable materials for all disposable food service-ware, a clear step toward achieving the waste reduction goal.

New Policies and Programs

Building on existing programs and success, the City can join the growing community of jurisdictions that have adopted the goal of Zero Waste. Zero Waste (or nearly zero) is a set of policies that promote upstream changes to products and services by the manufacturers, instead of letting the consumer and government agencies try to figure out what to do with the discards of society. Extended Producer Responsibility, Take-Back programs and Cradle to Cradle Design are some of the concepts that the City could promote and incentivize in its business community as well as at the State and Federal level. The franchise agreement that the City oversees with its hauling company can also be a powerful tool by setting material disposal rates that incentivize waste reduction, recycling and composting.

EMERYVILLE CLIMATE ACTION PLAN WASTE REDUCTION POLICIES

CITYWIDE POLICIES

Reduce Landfilled Waste in half by 2020 over 2004 levels by:

- Increasing participation in commercial recycling/ reuse programs for paper, cardboard, metal, glass and plastics – rigid and film
- Participating in StopWaste.org's audit and technical assistance program
- Encouraging businesses to participate in the County Green Business program
- Increasing participation in residential recycling programs
- Educating residents and businesses about the benefits of Bay-Friendly Landscaping and Gardening
- Increasing participation in commercial and residential food waste collection program (for composting)

MUNICIPAL POLICIES

Reduce Landfilled Waste in half by 2020 over 2004 levels by:

- Implementing a duplex copying/printing policy in municipal office buildings
- Reducing Landscape Waste in City landscapes by implementing StopWaste.org's Bay-Friendly Landscaping Program. Include practices such as: Increase on-site composting and mulching of municipal plant debris, using compost as a soil amendment, mulch for weed suppression, including the use of drip irrigation systems, a diverse plant pallet to resist pests, and reducing turf and sheared hedges.
- Increasing recycling and composting in municipal facilities

Adopting policies that support reduced waste (and which support other environmental priorities) including the following:

- Environmental purchasing policy
- 75% Diversion Goal
- Construction & Demolition materials recycling ordinance
- Civic Bay-Friendly/Green Building Ordinance
- Residential green building resolution
- Consider mandatory residential & commercial recycling/composting ordinance

Source: City of Emeryville, Climate Action Plan, December 2008.

URBAN ACCORDS WASTE REDUCTION ACTION ITEMS

- **Action 4:** Establish a policy to achieve zero waste going to landfills and incinerators by 2040.
- **Action 5:** Adopt a citywide program that reduces the use of a disposable, toxic, or non-renewable product category by at least fifty percent in seven years.
- **Action 6:** Implement "user-friendly" recycling and composting programs, with the goal of reducing by twenty percent per capita solid waste disposal to landfill and incineration in seven years.

Source: Urban Environmental Accords. United Nations Environment Programme World Environment Day, 2005.

Topic 3: Land Use/Urban Design

Land use and urban design patterns can have a substantial impact on greenhouse gas emissions. The Land Use and Urban Design elements outline a mixed-use land use structure, such that residents, workers, and visitors can easily link multiple trips to residential neighborhoods, workplaces, shopping and public services. Architecture and construction practices are also essential determinants of sustainability in the short- and long-term. For example, recycling waste during the demolition process and implementing energy efficient design principles and appliances, have immediate and long-term benefits to the environment—and potentially to reducing costs. For a discussion of the land use pattern and urban design framework, see Chapter 2 and Chapter 5, respectively. Green building and construction practices are described in the section below.

Existing Policies and Programs

Climate Action Plan

Land use policies, combined with transportation policies, can have a key impact on reducing greenhouse gas emissions. The CAP encourages efficient land use development through focused growth and transit oriented development. The CAP builds on many initiatives that the City is already undertaking, including building on infill and brownfield sties. These measures are consistent with the goals and policies in the Land Use Elements.

LEED™ for Neighborhood Development

Emeryville is also participating in the Leadership in Energy and Environmental Design (LEED™) for Neighborhood Development pilot program, an initiative that seeks to reduce the impacts of urban sprawl, by creating more livable communities, through smart growth and transit-oriented strategies. As a participant, Emeryville obtained LEED™ Platinum certification for the Marketplace Redevelopment Project in 2008. This project will add 674 multi-family housing units and 300,000 square feet of office and retail development.

Green Building and Construction

The City has already taken the initiative to support green building, landscaping, and construction. In May 2008, the City Council adopted a resolution requiring new building or renovation projects with construction costs of at least $3,000,000 or new or renovated landscaping greater than 2,500 square feet or $50,000 in construction costs, to meet green building and landscaping standards. These standards are identified by LEED™ and Bay-Friendly Landscaping, respectively (see text boxes).

New Policies and Programs

Since the City's 2004 emissions inventory revealed that the residential, commercial and industrial sectors together account for nearly half of the City's emissions, improved efficiency in buildings can go a long way toward meeting greenhouse gas reduction goals. Buildings and landscapes that are constructed, maintained and ultimately deconstructed according to sustainable principles need fewer imports and produce fewer exports. Green buildings and landscapes also use local sources for imports and feed their exports back into the local economy for recycling.

Investment in energy-efficient buildings and proper demolition and construction practices can result in a reduction in energy consumption and greenhouse gas emissions. They can also improve indoor air quality and reduce long-term maintenance costs as less energy is required to operate more efficient buildings. With the amount of new construction and rehabilitation projected by the General Plan, this is a great opportunity for the City to initiate policies for green building and construction.

GREEN BUILDING AND CONSTRUCTION

"Green building" refers to creating an energy-efficient building through design and choice of low-impact materials. "Green construction" encompasses the demolition and construction processes, such as the energy used in machines and vehicles, the waste generated at construction sites, runoff, and water and air quality impacts associated with the construction phase of the project.

BAY-FRIENDLY LANDSCAPING: GREEN BUILDING GOALS AND POLICIES

"Bay-Friendly Landscaping" is a whole systems approach to the design, construction and maintenance of the landscape in order to support the integrity of the San Francisco Bay Watershed. "Bay-Friendly Landscapes" reduce greenhouse gases waste, and pollution, conserve water and other natural resources and create healthier communities. Key components of Bay-Friendly landscaping include the following:

- Reducing waste and using materials that contain recycled content;
- Use of native and water conserving plants;
- Nurturing healthy soils with mulch and compost while reducing fertilizer use;
- Conserving water, energy and topsoil;
- Using Integrated Pest Management to minimize chemical use and prevent pollution;
- Reducing stormwater runoff; and
- Creating wildlife habitat.

GOAL

- To encourage, promote, practice and where feasible require Bay-Friendly landscaping practices as defined in the Bay-Friendly Landscape Guidelines, Sustainable Practices for Landscape Professionals within the City of Emeryville.

POLICIES

- All newly designed public and private projects containing landscapes excluding those not subject to landscape review shall use the Bay-Friendly Landscape Guidelines, Sustainable Practices for the Landscape Professional as a reference guide.
- All landscapes maintained by City staff shall be maintained using Bay-Friendly practices to the greatest extent practicable.
- All public landscapes privately maintained shall incorporate Bay-Friendly landscaping practices to the greatest extent possible. Existing contractors shall be asked for voluntary compliance.
- City shall work with Alameda County Waste Management Authority staff to ensure that existing and new landscaping staff obtain adequate training in Bay-Friendly practices/principles.

Source: Alameda County Waste Management Authority.

EMERYVILLE CLIMATE ACTION PLAN LAND USE POLICIES

CITYWIDE POLICIES

- Support transit oriented development
- Establish a Walk-Friendly City - Improve / Expand Pedestrian Infrastructure (e.g., slow traffic, improve sidewalks and safety, ped-only areas)

Source: City of Emeryville, Climate Action Plan, December 2008.

LEED™ NEW CONSTRUCTION POINT CATEGORIES

CATEGORIES	CRITERIA TO EARN POINTS
Sustainable Sites	› Density › Brownfield Remediation › Alternative Transportation Access › Open Space Protection, › Stormwater Management › Heat Island Effect Reduction
Water Efficiency	› Water Efficient Landscaping › Innovative Wastewater Techniques › Water Use Reduction
Energy & Atmosphere	› Optimized Energy Performance › Green Power › Refrigerant Management
Materials & Resources	› Storage & Collection of Recyclables › Building and/or Materials Reuse › Construction Waste Management › Recycled Content › Regional Materials › Certified Wood or Rapidly Renewable Materials
Indoor Environmental Quality	› Performance Measures › Construction Management Plan › Increased Ventilation › Low-Emitting Materials › Controllability of Systems (lighting, thermal comfort) › Thermal Comfort (design, verification) › Daylight & Views
Innovation & Design Process	› Innovative Design › Involvement of LEED™ Accredited Professional

Source: LEED™ for New Construction v2.2, Registered Project Checklist.

URBAN ACCORDS URBAN DESIGN ACTION ITEMS

- **Action 7:** Adopt a policy that mandates a green building rating system standard that applies to all new municipal buildings.
- **Action 8:** Adopt urban planning principles and practices that advance higher density, mixed use, walkable, bikeable and disabled-accessible neighborhoods which coordinate land use and transportation with open space systems for recreation and ecological restoration.
- **Action 9:** Adopt a policy or implement a program that creates environmentally beneficial jobs and "green collar" job training.

Source: Urban Environmental Accords. United Nations Environment Programme World Environment Day, 2005.

Topic 4: Parks, Open Space, and Urban Nature

Parks and open spaces are a vital part of Emeryville's sustainability strategy, adding to the livability of the city and the health of air, water and the city's inhabitants. As a small city, Emeryville contains few parks. As the city continues to grow, in terms of residents, workers, and visitors, Chapter 4: Parks, Open, Space, and Public Facilities Element outlines a strategy to add more parks (small and large), greenways, plazas, and other public open spaces. In addition, the Conservation, Safety, and Noise Element includes policies that seek to preserve existing habitat and special species to ensure that they continue to thrive within the city.

Bay-Friendly Landscaping Standards help to ensure that parks are designed and built using environmentally sound practices.

Existing Policies and Programs

As of 2008, the City enjoys 15 acres of parks, as well as joint-use recreation facilities and the Emeryville Greenway, which is currently undergoing expansion. In addition, the East Bay Regional Parks District manages the Emeryville Crescent, a marsh area that contains plant and wildlife habitat. The City continues to work with regional agencies to protect these species.

URBAN ACCORDS PARKS, OPEN SPACE, AND URBAN NATURE ACTIONS ITEMS

- **Action 10:** Ensure that there is an accessible public park or recreational open space within half-a-kilometer of every city resident by 2015.
- **Action 11:** Conduct an inventory of existing canopy coverage in the city and then establish a goal based on ecological and community considerations to plant or maintain canopy coverage in not less than 50 per cent of all available sidewalk planting sites.
- **Action 12:** Pass legislation that protects critical habitat corridors and other key habitat characteristics (e.g. water features, food-bearing plants, shelter for wildlife, use of native species, etc.) from unsustainable development.

Source: Urban Environmental Accords. United Nations Environment Programme World Environment Day, 2005.

Topic 5: Transportation

An effective transportation network, that accommodates cars, public transit, walking and biking, is an essential component to achieving Emeryville's mobility and sustainability goals. With half of the City's greenhouse gas emissions coming from transportation sources, transportation provides a significant challenge and opportunity to meet the City's sustainability goals. Since automobiles contribute to greenhouse gas emissions, air pollution, and traffic congestion, the Plan seeks to reduce the necessity of driving, by improving alternative transportation modes, and to reduce emissions by reducing the carbon content of fuels and the fuel efficiency of vehicles. Reliable and affordable public transit, along with enhanced pedestrian and bicycle routes and facilities, can reduce these negative impacts, while having the added benefit of improving public health. Chapter 3, the Transportation Element, provides a full description of goals and policies.

Existing Policies and Programs

Climate Action Plan

The CAP outlines four major strategies for reducing emissions from transportation on a citywide basis and within the municipal government: increasing the fuel efficiency of vehicles, promoting the use of alternative fuels (with lower carbon content), implementing trip reduction strategies and transportation demand management practices, and investing in alternative modes of transportation, such as walking, biking, and public transit.

Alternative Transportation

As described in Section 7.1, the City has a legacy of providing free and convenient local transportation service successfully, with the Emery-Go-Round shuttle—which the Transportation Element seeks to build on and expand.

EMERYVILLE CLIMATE ACTION PLAN TRANSPORTATION POLICIES

CITYWIDE POLICIES

- Construct electric vehicle recharging facilities in new large parking facilities
- Allow bikes on trains/buses
- Educate citizens on options for utilizing local low-carbon transportation
- Expand bicycling infrastructure (e.g., lanes, storage facilities)
- Expand EGR bus service in range and / or frequency
- Implement bus rapid transit or shuttle programs
- Implement parking cash-out program
- Increase AC Transit, BART and AMTRAK ridership
- Initiate a car sharing program
- Increase ride-sharing (e.g., carpools)
- Increase telecommuting
- Institute a "safe routes to school" program
- Provide bicycles for daily trips
- Provide high school students with free bus passes
- Procure of hybrid vehicles
- Incentive hybrid vehicles with parking or lane priority
- Procure smaller fleet vehicles
- Install low-flow faucets, low-flow shower heads, and high efficiency toilets
- Use low maintenance landscaping
- Install green and/or reflective roofing
- Install solar photovoltaic panels, solar heating panels, and wind turbines (including via incentives)

MUNICIPAL POLICIES

- Expand bicycling infrastructure (e.g., lanes, storage facilities)
- Implement a police on bicycles program
- Implement parking cash-out program
- Increase EGR & AC Transit, BART & AMTRAK ridership
- Initiate a car sharing program
- Promote telecommuting
- Provide bicycles for daily trips
- Procure Hybrid vehicles
- Procure of smaller fleet vehicles
- Retire old and under-used vehicles
- Utilize fuel-efficient vehicles (e.g., scooters) for parking enforcement

Source: City of Emeryville, Climate Action Plan, December 2008.

URBAN ACCORDS TRANSPORTATION ACTIONS ITEMS

- **Action 13:** Develop and implement a policy which expands affordable public transportation coverage to within half-a-kilometer of all city residents in ten years.
- **Action 14:** Pass a law or implement a program that eliminates leaded gasoline (where it is still used); phases down sulfur levels in diesel and gasoline fuels, concurrent with using advanced emission controls on all buses, taxis, and public fleets to reduce particulate matter and smog-forming emissions from those fleets by 50 per cent in seven years.
- **Action 15:** Implement a policy to reduce the percentage of commuter trips by single occupancy vehicles by ten per cent in seven years.

Source: Urban Environmental Accords. United Nations Environment Programme World Environment Day, 2005.

URBAN ACCORDS ENVIRONMENTAL HEALTH ACTION ITEMS

- **Action 16:** Every year, identify one product, chemical, or compound that is used within the city that represents the greatest risk to human health and adopt a law and provide incentives to reduce or eliminate its use by the municipal government.
- **Action 17:** Promote the public health and environmental benefits of supporting locally grown organic foods. Ensure that twenty per cent of all city facilities (including schools) serve locally grown and organic food within seven years.
- **Action 18:** Establish an Air Quality Index (AQI) to measure the level of air pollution and set the goal of reducing by 10 per cent in seven years the number of days categorized in the AQI range as "unhealthy" or "hazardous."

Source: Urban Environmental Accords. United Nations Environment Programme World Environment Day, 2005.

Topic 6: Environmental Health

Providing a healthy and safe city for all residents, workers, and visitors is critical to the livability of a city and the quality of the natural environment. As a post-industrial city, Emeryville has been a leader in cleaning up contaminants on industrial properties and seeks to continue this legacy of environmental responsibility. In many ways, the City has already accomplished many of the most arduous and costly endeavors to improve environmental health. This section describes smaller-scale programs and policies for prioritizing safe and low-impact supplies as part of municipal purchasing practices, as well as healthy food systems.

Existing Policies and Programs

Brownfields Remediation

As described in Section 7.1, the City has shown great leadership in financing, cleaning up, and redeveloping brownfield sites successfully.

New Policies and Programs

Purchasing

The goods and services purchased by a municipality impact costs, energy consumption, and ultimately greenhouse gas emissions. Sustainability goals may be met through prioritizing Environmentally Preferable purchasing of products, such as post-consumer recycled content office products; Green Seal® certified products and EnergyStar® rated equipment; and standards for city contractors, such as local businesses or companies that are certified green businesses. The City should initiate a purchasing program that addresses the effects of goods and services on pollution, waste, energy consumption, recycled material content, natural resources and public health, and provides a guide for appropriate vendors. The purchasing program should describe a process and identify suppliers for products and services that include recycled content, are durable and long-lasting, conserve energy and water, reduce greenhouse gas emissions, use unbleached or chlorine free manufacturing processes, are lead-free and mercury-free, and use wood from sustainably harvested forests. These products should meet US EPA minimum recycled content standard guidelines and US EPA energy star certification, when practical. The City can also encourage the use of recycled materials and low-impact purchasing among residents and businesses.

Food

As an urban city, Emeryville imports most of its food from farms and purveyors in other parts of the Bay Area and around the world. Agriculture practices often rely on synthetic fertilizers and pesticides, artificial hormones, large amounts of water, long-distance trucking, and factory-style practices for raising livestock and crops. These impacts may be damaging to public health, increase emissions, and use up precious natural resources. Purchasing locally grown and organic foods cuts down on many of these negative impacts.

The City can prioritize sustainable food purchases as a municipality, as well as encourage residents and business to do the same: through providing space for community gardens, fruit-bearing trees, and farmers' markets, and incentivizing relationships with community supported agriculture groups which deliver local fresh produce. With several headquarters for food businesses within its boundaries, food is already a vital part of the City's economy and economic development strategy. City policies can ensure access to local and organic foods, affordability, and cultural relevance for all its residents. In this way, food purchasing exemplifies the 3 E's of sustainability, promoting good ecological practices, supporting a vibrant economy, and ensuring equal access.

Topic 7: Water

From the Bay to the taps, water is an essential resource that City policy can help to protect. Through the management of stormwater, potable and recycled water, Bay-Friendly Landscaping, and conservation initiatives, the City, in collaboration with its water provider, can ensure high-quality water and sufficient supply for years to come. Emeryville's policies for ensuring water quality and supply are detailed in Section 6.1 of Chapter 6: Conservation, Safety, and Noise. The City's leadership in stormwater management and policies for conservation, reclaimed water use, and flood and drainage management, are detailed in Section 6.2 of Chapter 6.

Existing Policies and Programs

Stormwater Management

As described in Section 7.1, the City has shown leadership in stormwater management by providing guidelines for developers and requiring on-site treatment as part of the building permit process.

URBAN ACCORDS WATER QUALITY AND CONSERVATION ACTION ITEMS

- **Action 19:** Develop policies to increase adequate access to safe drinking water, aiming at access for all by 2015. For cities with potable water consumption greater than 100 liters per capita per day, adopt and implement policies to reduce consumption by 10 per cent by 2015.
- **Action 20:** Protect the ecological integrity of the city's primary drinking water sources (i.e., aquifers, rivers, lakes, wetlands and associated ecosystems).
- **Action 21:** Adopt municipal wastewater management guidelines and reduce the volume of untreated wastewater discharges by ten per cent in seven years through the expanded use of recycled water and the implementation of a sustainable urban watershed planning process that includes participants of all affected communities and is based on sound economic, social, and environmental principles.

Source: Urban Environmental Accords. United Nations Environment Programme World Environment Day, 2005.

GOALS AND POLICIES

GOALS

OVERALL SUSTAINABILITY

ST-G-1 **A balance among the three E's of sustainability—**A healthy environment; equity in access to and distribution of goods, services and resources; and a vibrant economy for local businesses and the municipality.

ST-G-2 **Continuous environmental improvement—**Sustainable development through implementation of existing policies and programs.

ST-G-3 **Salient and current—**A municipality and citizenry informed of evolving technology and new approaches to sustainability.

ST-G-4 **Collaboration in sustainability initiatives—**Coordination and collaboration with efforts outside the City to improve local conditions.

ST-G-5 **An advocate for sustainability—**The City will serve as an advocate for sustainability for the municipality and the community.

ENERGY

ST-G-6 **Energy conservation—**Fifty percent reduction in energy consumption for all sectors—transportation, industrial/commercial, residential, and waste, over 2008 levels, by 2017.

The Climate Action Plan describes additional energy goals. This document should be referenced for details.

WASTE

ST-G-7 **Waste reduction—**Fifty percent reduction in waste to landfill, over 2004 levels, by 2020.

The Climate Action Plan describes waste reduction goals. This document should be referenced for details.

LAND USE AND URBAN DESIGN

The Climate Action Plan and Land Use Element of the General Plan sufficiently describe land use goals. The Urban Design Element of the General Plan describes urban design goals. These documents should be referenced for details.

GREEN BUILDING

ST-G-8 **Environmentally-friendly and energy-efficient buildings and landscaping—**Green building and Bay-Friendly Landscaping practices throughout Emeryville in new construction, redevelopment and retrofit projects.

TRANSPORTATION

The Climate Action Plan and Transportation Element of the General Plan describe transportation goals. These documents should be referenced for details.

ENVIRONMENTAL HEALTH

ST-G-9 **Purchasing and consumption to improve public health—**Increased purchasing of Environmentally Preferable products such as those that are biodegradable, recycled-content, reused less-toxic and other low-carbon materials in municipal and community purchasing.

ST-G-10 **Access to healthy foods—**A food system where all residents have financial and physical access to culturally appropriate, affordable, nutritious foods that were grown and transported in an environmentally preferable system.

WATER

The Conservation, Safety, and Noise Element of the General Plan describes water quality, supply, and conservation goals. This chapter should be referenced for details.

POLICIES

Implementing actions supporting each policy are described in Chapter 8: Implementation Program.

ENERGY

ST-P-1 The City shall maintain Climate Action Plan to achieve energy efficiency and conservation goals.

WASTE

ST-P-2 The City shall maintain a Climate Action Plan to achieve waste reduction goals.

ST-P-3 The City shall adopt a Zero Waste Plan and actions for the year 2030, by 2010.

ST-P-4 The City shall negotiate a new Zero Waste Franchise Agreement with a hauling company that uses waste reduction programs and the disposal rate structure to monetarily incentivize recycling and composting which will result in zero tons of methane-producing materials going to landfill by 2030.

LAND USE AND URBAN DESIGN

The Climate Action Plan and Land Use Element of the General Plan describe policies to achieve land use goals. The Urban Design Element of the General Plan describes policies to achieve urban design goals. These documents should be referenced for details.

Green Building

ST-P-5 The City shall encourage, promote, practice, and where feasible, require Bay-Friendly landscaping practices as defined in the Bay-Friendly Landscape Guidelines, Sustainable Practices for Landscape Professionals.

ST-P-6 The City shall collaborate with residents, businesses, and other members of the community, including architects, builders and contractors, to encourage private development within the City to use green building methods and practices and to achieve standards set by LEED™ for commercial buildings and the Alameda County Residential Green Building Guidelines for residential projects.

ST-P-7 The City shall adopt a construction and demolition waste recycling ordinance which will require that, except in unusual circumstances, all construction, demolition and renovation projects meeting a certain size or dollar value, to divert from the waste stream, 100% of all portland cement concrete and asphalt concrete and an average of at least fifty (50) percent of all remaining debris from construction, demolition, and renovation projects.

ST-P-8 The City shall establish incentives for energy retrofits to support implementation of photovoltaic and other renewable energy technologies that result in an energy savings of at least 20 percent when compared to consumption that would occur with traditional energy sources.

ST-P-9 The City shall support companies working in the sustainability sector (such as materials recycling or green building) to locate in Emeryville.

TRANSPORTATION

The Climate Action Plan and Transportation Element of the General Plan describe policies to achieve transportation goals. These documents should be referenced for details.

ENVIRONMENTAL HEALTH

ST-P-10 The City shall develop and implement an Environmentally Preferable Product Purchasing program for municipal purchases that targets products and services, which minimize environmental impacts, toxics, pollution, and hazards to worker and community safety to the greatest extent possible.

ST-P-11 The City shall support education initiatives that encourage private companies and residences to purchase Environmentally Preferable products and services

ST-P-12 The City shall support community outreach and education to improve organic and local food systems in the city.

ST-P-13 The City shall incorporate local and organic food as part of the proposed municipal purchasing program.

WATER

The Conservation, Safety, and Noise Element of the General Plan describes policies to achieve water quality, supply, and conservation goals. This chapter should be referenced for details.







8 IMPLEMENTATION PROGRAM

The General Plan provides specific policy guidance for implementation of plan concepts in each of the Plan elements and establishes a basis for action. The policies in each element of the Plan provide details that will guide program development. This chapter describes, in general terms, the responsibilities for implementation.

8.1 OVERVIEW

The implementation plan outlines specific implementation actions that will be initiated after adoption. The major implementation process for the land use proposals will be administration of the Zoning Ordinance through the Zoning Map. The Zoning Ordinance and Zoning Map will need to be amended to be consistent with the General Plan's policies, and work on these efforts is already underway. In addition, Design Guidelines, adopted concurrently with the General Plan, guide physical planning and building design, as well as landscape treatment in private projects and streetscape design.

With nearly the entire City encompassed within one of two redevelopment project areas, the Redevelopment Agency will play a key role in the financing of capital improvements and implementing the land use program, consistent with redevelopment project area plans and State law. In addition, the City's five-year Capital Improvement Program will continue to be the primary means of scheduling and estimating costs of infrastructure improvements.

In many areas, General Plan implementation will depend on actions of other public agencies and of the private sector that will fund a large portion of the development expected to occur. The General Plan will serve a coordinating function for private-sector decisions. It provides a basis for action on individual development applications, which must be found to be consistent with the General Plan if they are to be approved. The General Plan and the Zoning Ordinance also include criteria for granting Floor Area Ratio and height bonuses, which must be satisfied for the bonuses to be availed.

8.2 RESPONSIBILITIES

Implementing the General Plan will involve the City Council, the Planning Commission, other City boards and commissions, and City departments. The City also will need to consult with Alameda County departments, adjacent cities, and other public agencies about implementation proposals that affect their respective areas of jurisdiction. The principal responsibilities that City officials and staff have for Plan implementation are briefly summarized below; details on their powers and duties are documented in the Emeryville Municipal Code.

City of Emeryville

City Council (CC)

The City Council is responsible for the overall management of municipal affairs; it acts as the legislative body and is responsible for adoption of the General Plan and any amendments to it. The City Council also appoints the Planning Commission and other boards and commissions established under the Municipal Code.

The City Council's role in implementing the General Plan will be to set implementation priorities and approve Zoning Map and the Updated Zoning Ordinance, consistent with the General Plan, and a Capital Improvement Program and budget to carry out the Plan. The City Council also acts as the Redevelopment Agency and, in this capacity, will help finance public facilities and improvements needed to implement the Plan. The Council also approves certain development projects consistent with the General Plan.

City Manager (CM)

The City Council appoints the City Manager who is their key staff advisor and has overall responsibility for the day-to-day implementation of the Plan and preparation of the recommended budget for City Council approval. The City Manager also serves as the Executive Director of the Emeryville Redevelopment Agency.

Planning Commission (PC)

The Planning Commission is responsible for preparing and recommending adoption or amendment of the General Plan, zoning and subdivision ordinances and other regulations, resource conservation plans, and programs and legislation needed to implement the General Plan. The Planning Commission may also prepare and recommend adoption of specific plans, neighborhood plans or special plans, as needed for Plan implementation. The Planning Commission also approves most major development projects requiring use permits and design review.

Planning and Building Department (PB)

The Planning and Building Department has primary responsibility for administering the laws, regulations and requirements that pertain to the physical development of the City. Tasks include administering planning and building permit procedures, providing public information, performing building and code enforcement inspections, maintaining complete public records on planning and building projects and issuing necessary permits, certificates, approvals and enforcement citations.

Specific duties related to General Plan implementation include preparing zoning and subdivision ordinance amendments, design guidelines, reviewing development applications, conducting investigations and making reports and recommendations on planning and land use, zoning, subdivisions, design review, development plans and environmental controls. The Planning and Building Department will have a lead role in implementing the policies of the Land Use and Parks, Open Space, and Public Facilities elements. Finally, the Department will have the primary responsibility for preparing the annual report on the General Plan. (These reporting requirements are described in Chapter 1 of the General Plan.) The Planning and Building Department also approves minor development projects.

City Attorney (CAO)

The City Attorney is retained by the City Council and Redevelopment Agency to act as the legal advisor and administrator of the legal affairs of the City and Agency.

The City Attorney renders legal advice to the Council, Redevelopment Agency, City Manager, Department Heads, and all City officials on matters of law pertaining to official activities. The City Attorney represents the City and Agency in litigation and reviews all legal documents, including ordinances, resolutions, leases, contracts, and deeds, and approves each as to form. The City Attorney's Office also negotiates development agreements with private parties on behalf of the City Council and Redevelopment Agency.

Finance Department (F)

The Finance Department is responsible for managing all financial aspects of City and Redevelopment Agency operations. The Department handles all accounting; oversees the annual audit; tracks and accounts for all revenues received by the City and Redevelopment Agency; bills regularly for Business License accounts; and processes purchasing, accounts payable, and payroll. The Department is responsible for preparation and management of the Annual

Budget and Annual Financial Report. The Department also complies with a host of State and Federal requirements involving filing of reports and information regarding City/Agency finances. The Department manages all of the City/Agency cash, handles investments under the investment policy adopted by the City, and handles bond financing and assessment district financial management.

Economic Development and Housing Department (EDH)

The Economic Development and Housing Department coordinates programs and projects of the Emeryville Redevelopment Agency. These responsibilities include redevelopment-financed projects, brownfields remediation programs, business development, and infrastructure improvements improvements. Housing programs include assistance to local businesses and a full service housing rehabilitation program to maintain and improve the housing stock available to low to moderate income residents. This department also has substantial implementation responsibilities for the Housing Element of the General Plan, in addition to the Land Use Element.

Public Works Department (PW)

The Public Works Department consists of four divisions: Administration, Engineering, Environmental, and Maintenance. The Department is responsible for designing, inspecting, and managing City's Capital Improvement Projects, including City's parks, sidewalk and street reconstructions/constructions, street lights, traffic signals, storm drains and sanitary sewer. The Department will take the lead in the implementation of many of the General Plan's sustainability initiatives. It will also have specific implementation responsibilities for portions of the Land Use, Circulation, and Conservation and Natural Environment elements, as well as redesign of streets in accordance with the Design Guidelines.

Community Services Department (CS)

The Community Services Department is responsible for managing the City's parks and recreation programs as well as senior services and child care. The Community Services Department will have responsibility over the programming of parks and open spaces, and coordinate with the Emery Unified School District and School Board to develop and oversee delivery of service in the Emeryville Center of Community Life.

Police and Fire Departments (PD, FD)

Within the City, responsibility for public safety is assigned to the Police and Fire departments. The Police Department is responsible for preventing crime and maintaining law and order. The Emeryville Fire Department aims to educate the public, prevent fires, and respond to all emergencies in the city. These departments are responsible for implementing public safety policies described in the Conservation and Natural Environment and Parks, Open Space, and Public Facilities elements.

Emery Unified School District (EUSD)

The Emery Unified School District, led by the School Board, manages the public schools in the city. Together, the District and the City are pursuing the development of the Center of Community Life, which will consolidate the public schools in addition to a range of community services and facilities.

Emeryville Transit Management Association (ETMA)

The Emeryville Transit Management Association operates the Emery Go-Round free shuttle service. The Emery Go-Round provides service within Emeryville and between the MacArthur BART Station and the

city. The shuttle system is funded through property taxes on local businesses. The Transit Management Association will continue to be responsible for operating the Emery-Go-Round as its mission expands to serve residents in addition to employees, as called for in the General Plan. The TMA also coordinates the car share program and other transportation services.

Other Boards and Committees

The City has established a number of other boards and committees, some of which will be involved in Plan implementation in their respective areas of expertise. These may include the AC Transit/Emeryville Liaison Committee, Bicycle/Pedestrian Advisory Committee, City/Schools Committee, Housing Committee, Marina Committee, Public Safety Committee, Public Works Committee, and Emeryville Education and Youth Services Advisory Committee. The General Plan does not envision any substantive change in the responsibilities assigned to these boards and commissions. They will be administering new or amended regulations adopted pursuant to Plan policies, and their actions will need to be consistent with the General Plan.

Regional, State, Federal, and Private

Association of Bay Area Governments (ABAG)

The Association of Bay Area Governments is the regional council of governments that includes Emeryville and others in the nine-county Bay Area. ABAG does not have authority over land use in Emeryville, but it does provide overarching land use goals for the region. In particular, ABAG supports growth in the inner urban ring of the Bay Area—which includes Emeryville—as opposed to building in the remaining greenfield portions of the region. To that end, ABAG, along with three other regional agencies, has started the FOCUS initiative, prioritizing funds for "Priority Development Areas" (PDA) that have high level of transit accessibility and potential for redevelopment. The City of Emeryville has submitted to ABAG an application for designation of all of Emeryville, with the exception of the lower density neighborhoods and the area west of Interstate 80, as a PDA.

Metropolitan Transportation Commission (MTC)

The Metropolitan Transportation Commission serves as both the regional transportation planning agency (a State designation) and as the region's metropolitan planning organization (a federal designation). MTC is responsible for the Regional Transportation Plan, a comprehensive plan covering transit, roads, airports, ports, rail, bicycle and pedestrian facilities. It also administers funds to local jurisdictions and transit agencies based on this Plan. MTC has several grant programs including:

- Transportation for Livable Communities (TLC): supports projects that enhance community vitality and promote walking, bicycling and transit use.
- Housing Incentive Program (HIP): assists housing construction near transit hubs.
- Low Income Flexible Transportation (LIFT): funds services that assist low-income residents travel to and from work, school and other essential destinations.

East Bay Regional Parks (EBRPD)

Serving Alameda and Contra Costa counties, the East Bay Regional Park District manages 98,000 acres of parkland in the East Bay. It operates the Eastshore State Park along Emeryville's waterfront and the funds from the District's Measure CC, approved by voters in 2004, which created a 15-year special excise tax to improve public access, wildfire protection, pub-

lic safety and environmental maintenance of District parks and trails.

Alameda County (ACo)

Alameda County encompasses 14 cities, including Emeryville, and unincorporated land. Its Board of Supervisors has jurisdiction only in the unincorporated portions of the County. However, Alameda County has pursued several initiatives, particularly around sustainability measures (e.g. Bay-Friendly Landscaping, StopWaste.Org, that have been integrated into City policy. Alameda County is also the umbrella for the Alameda County Congestion Management Agency (CMA), which was created in 1991 by a joint-powers agreement between Alameda County and all its cities. The CMA's goals, duties and composition make it easier for local governments to tackle the increasingly complex problem of traffic congestion. The CMA helps local governments meet the requirements of federal, state and local transportation laws by providing technical assistance. The CMA also coordinates with county and regional transportation organizations. Over the past six years, the CMA has built a framework to plan and obtain funding for Alameda County transportation services and projects.

AC Transit (AC)

The Alameda-Contra Costa Transit District (AC Transit) is the transit authority for Alameda and Contra Costa counties. AC Transit provides bus service to Emeryville along nine routes, in addition to school routes. An AC Transit bus yard is located on 45th Street at San Palo Avenue.

Union Pacific Railroad (UP)

Union Pacific owns the right-of-way along the north-south railroad tracks, operating freight trains on as line-haul vehicles. Although UP is not a public agency, the City must coordinate with UP about crossings and noise mitigations that the City pursues as part of the General Plan. With the anticipated expansion of the Port of Oakland, freight rail traffic through Emeryville is anticipated to increase dramatically.

Amtrak (AMTK)

Amtrak provides national passenger rail service and serves Emeryville with a station located on Horton Street. Four Amtrak routes serve this station, including the Capitol Corridor and San Joaquin commuter service routes. In 2008, these four routes had 44 trains per day serving Emeryville.

Bay Conservation and Development Commission (BCDC)

The Bay Conservation and Development Commission regulates new development within the first 100 feet of the San Francisco Bay shoreline. Its purpose is to protect the Bay and ensure public access to the Bay. The agency has authority over land use, construction, and subdivisions of property. In Emeryville, BCDC's power of review mainly affects any changes to land uses or structures along the Peninsula and at the Interstate-80 Ashby Avenue interchange. By agreement, Watergate and Trader Vic's are regulated only to mean high tide, not 100 feet. On the other hand, the entire marina is included in BCDC's jurisdiction, even beyond 100 feet inland.

California Department of Transportation (DOT)

The Department of Transportation, or "Caltrans", is the State agency that owns and operates freeways and state routes that provide access to and through the city, including Interstates 80, 580, and 880, and State Route 123 (San Pablo Avenue). Particularly along San Pablo Avenue and interchanges, where changes have been identified in the General Plan, coordination between the City and the Caltrans is critical.

California Environmental Protection Agency (CEPA)

The California Environmental Protection Agency is charged with developing, implementing and enforcing the state's environmental protection laws that ensure clean air, clean water, clean soil, safe pesticides and waste recycling and reduction. It includes several sub agencies that have jurisdiction over environmental elements in Emeryville, including:

- Department of Toxic Substance Control (DTSC)
- Regional Water Quality Control Board (RWQCB)
- The Air Resources Board (ARB)

East Bay Municipal Utility District (EBMUD)

The East Bay Municipal Utility District is a publicly owned utility that supplies water and provides wastewater treatment for parts of Alameda and Contra Costa counties on the eastern side of San Francisco Bay in northern California.

8.3 THE PLAN AND THE REGULATORY SYSTEM

The City will use a variety of regulatory mechanisms and administrative procedures to implement the General Plan. Under California law, Emeryville is required to have the Zoning Ordinance be consistent with the General Plan. In fact, the consistency requirement is the keystone of Plan implementation. Without a consistency requirement, there is no assurance that Plan policies will be implemented and that environmental resources earmarked for protection in the Plan will be preserved. Nevertheless, minor and routine maintenance and repair of existing buildings or alteration of addition to existing buildings that do not add significant floor areas nor facilitate a chance in use are not intended to trigger an evaluation of weather such activity is consistent with the General Plan. Other regulatory mechanisms, including subdivision approvals, building and housing codes, capital improvement programs, and environmental review procedures also will be used to implement Plan policies. All project approvals must be found to be consistent with the General Plan.

Zoning Regulations

The City's Zoning Ordinance translates plan policies into specific use regulations, development standards and performance criteria that govern development on individual properties. The General Plan establishes the policy framework, while the Zoning Ordinance prescribes standards, rules and procedures for development. The Zoning Map provides more detail than the General Plan Diagram.

Regulations for zoning districts will be established as part of the comprehensive zoning update being undertaken concurrently with the General Plan update. The

use regulations and development standards for existing zoning districts will need to be amended to conform to Plan policies. The City will bring both the Zoning Ordinance and the Zoning Map into conformance with the General Plan. When the General Plan is amended in the future, the Zoning Ordinance and Zoning Map also may need to be amended to maintain consistency between the Plan and zoning.

Subdivision Regulations

No subdivision of land may be approved under California law and the City's Subdivision Regulations unless its design and proposed improvements are found to be consistent with the General Plan. Update of the City's Subdivision Regulations (contained in Title 9 of the Municipal Code) to conform to the updated General Plan policies is underway.

Building and Housing Codes

No building permit may be issued under California law (*Gov. Code Section 65567*) unless the proposed development is consistent with the City's open space plan and conforms to General Plan policies.

8.4 CAPITAL IMPROVEMENTS PROGRAMMING

The Five-Year Capital Improvements Program (CIP) is the infrastructure funding plan for the city. It includes a list of public works projects that the City intends to design and construct in coming years. As a capital plan, the CIP represents one-time expenditures, as opposed to ongoing funding for operations expenses. The current CIP covers fiscal years 2006-2007 through 2011-2012. Redevelopment funds comprise 69 percent of total CIP funding with $147 million. Private and State/Federal sources each contribute an additional $18 million. Future funds are expected to make up the remaining funding needs with $26 million.

The General Plan has identified a range of capital outlays that will be implemented and funded through the CIP:

- Parks (specifically two new large parks);
- Street and intersection improvements;
- Bike boulevards and bikeways;
- Bridges and underpasses;
- Pedestrian Priority Zone improvements;
- Streetscape design; and
- Facility plan updates (e.g. water, wastewater, stormwater).

City Council reviews and adjusts the CIP every two years to reflect changes in priority, funding availability and need, and the general economy. With input from other departments the Finance Department and City Manager prepare and update the CIP. The Public Works Department has the lead role in carrying out the capital improvements.

8.5 IMPLEMENTATION ACTIONS FOR PLAN POLICIES

The tables on the following pages summarize implementation actions that the City will undertake to carry out the policies proposed in each element of the General Plan. (Note that the Housing Element contains its own implementation program.) Each action item implements one or more policies (the policy number is given in the table below, the actual policy is listed in the individual elements). The code listed first in the "Responsibility" column, represents the lead agency or department. In the final columns, an implementation schedule specifies the short- or long-term nature of implementation actions: ongoing, 0-5 years, 6-10 years, or 11-20 years.

Annual Report

As discussed in Chapter 1: Introduction, the City is required to prepare an annual report on progress in implementation of the General Plan. The action items that follow provide a template to monitor this progress. The annual report will be prepared by the Planning Department and submitted to the City Council, and to the Govenor's Office of Planning and Research.

IMPLEMENTATION RESPONSIBILITY CODES

Code	Department/Agency
CITY OF EMERYVILLE	
CC	City Council
CM	City Manager
PC	Planning Commission
PB	Planning and Building Department
EDH	Economic Development and Housing Department
PW	Public Works Department
CS	Community Services Department
ETMA	Emeryville Transit Management Association
F	Finance Department
CAO	City Attorney's Office
FD	Fire Department
EUSD	Emery Unified School District
ETMA	Emeryville Transit Management Association
REGIONAL, STATE, FEDERAL, AND PRIVATE	
ABAG	Association of Bay Area Governments
MTC	Metropolitan Transportation Commission
EBRPD	East Bay Regional Parks
ACo	Alameda County
AC	AC Transit
UP	Union Pacific Railroad
AMTK	Amtrak
BCDC	Bay Conservation and Development Commission
DOT	California Department of Transportation (Caltrans)
EMBUD	East Bay Municipal Utility District
CEPA	California Environmental Protection Agency

TABLE 8-1: Implementation Actions for Land Use

				IMPLEMENTATION SCHEDULE			
Action Number	**Implementation Actions**	**Policy Numbers**	**Responsibility**	**Ongoing**	**0-5 Yrs**	**6-10 Yrs**	**11-20 Yrs**
LU-A-1	Update the Zoning Ordinance: › Base zoning districts › Overlay and special districts › FAR bonus criteria › Use regulations and classifications › Supplemental standards › Subdivisions › Administrative Procedures	LU-P-1, LU-P-2, LU-P-4, LU-P-5, LU-P-6, LU-P-7, LU-P-8, LU-P-9, LU-P-10, LU-P-11, LU-P-12, LU-P-13, LU-P-14, LU-P-15, LU-P-16, LU-P-17, LU-P-18, LU-P-19, LU-P-21, LU-P-23, LU-P-24	PB, PW, CAO		X		
LU-A-2	Project review and approval process.	LU-P-2, LU-P-3, LU-P-4, LU-P-5, LU-P-6, LU-P-17, LU-P-18, LU-P-21, LU-P-23, LU-P-24, LU-P-25	PC, CC	X			
LU-A-3	Prepare, update, and implement specific or area plans.	LU-P-17, LU-P-18, LU-P-21, LU-P-23, LU-P-24	PB, CAO	X			
LU-A-4	Prepare and update Design Guidelines.	LU-P-3, LU-P-12, LU-P-13, LU-P-14, LU-P-15, LU-P-20	PB		X		
LU-A-5	Update the Capital Improvements Program.	LU-P-3, LU-P-6, LU-P-19, LU-P-22	F, PW, EDH	X			
LU-A-6	Utilize economic development tools and resources to attract businesses and address the needs of existing businesses and customers.	LU-P-26, LU-P-27, LU-P-28, LU-P-29, LU-P-30, LU-P-31, LU-P-32	EDH	X			
LU-A-7	Identify sites and available space suitable for new business growth and expansion.	LU-P-28, LU-P-29	EDH, PB	X			
LU-A-8	Coordinate and establish partnerships with other public agencies, education institutions, and non-government organizations to attract and support a diverse range of businesses.	LU-P-27, LU-P-29, LU-P-30	EDH	X			

TABLE 8-2: Implementation Actions for Transportation

Action Number	Implementation Actions	Policy Numbers	Responsibility	IMPLEMENTATION SCHEDULE			
				Ongoing	0-5 Yrs	6-10 Yrs	11-20 Yrs
T-A-1	Prepare Quality of Service (QOS) standards for all transportation modes using current state-of-the-practice research in transportation engineering. The techniques shall focus on the actual trip itself, which transportation professionals can directly affect, and not the overall quality of the trip experience. The QOS standards shall also be measurable and based on the physical characteristics of the street and the modal demands.	T-P-2, T-P-3, T-P-5	PB, PW		X		
T-A-2	Coordinate with emergency service providers to ensure continued emergency vehicle access, operations and response levels.	T-P-4	PW, FD, DOT	X			
T-A-3	Maintain the City's Traffic Impact Fee to insure that development (to the extent allowed by law) pays its fair share toward a circulation system that optimizes travel by all modes.	T-P-1, T-P-2, T-P-6, T-P-7, T-P-8, T-P-10, T-P-11, T-P-13, T-P-14, T-P-16, T-P-17, T-P-21, T-P-24, T-P-25, T-P-27, T-P-31, T-P-45, T-P-46, T-P-49	PW, CAO, F	X			
T-A-4	Actively participate in the Alameda County Congestion Management Agency (ACCMA) regional transportation planning efforts to coordinate transportation priorities with neighboring jurisdictions.	T-P-9, T-P-19, T-P-20, T-P-22, T-P-29, T-P-64	PW, PB	X			
T-A-5	Actively work with the California Department of Transportation to promote pedestrian and bicycle accessibility at the Powell Street and Ashby Avenue freeway interchanges and along San Pablo Avenue.	T-P-8, T-P-9, T-P-20, T-P-44, T-P-63	PW, PB, DOT, EDH		X		
T-A-6	Work with regional and state agencies, as well as the railroad, to provide an additional grade-separated road crossing in Emeryville to serve as an alternative to one or more of the existing at-grade railroad crossings and quiet zones.	T-P-7, T-P-8, T-P-44	PW, EDH				X
T-A-7	Consider the transportation needs of seniors and disabled persons. Refer to *Senior and Disabled Transportation Needs Assessment*, October, 2006	T-P-2, T-P-31, T-P-32, T-P-35, T-P-47	CS, PW, ACo	X			

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				IMPLEMENTATION SCHEDULE			
Action Number	**Implementation Actions**	**Policy Numbers**	**Responsibility**	**Ongoing**	**0-5 Yrs**	**6-10 Yrs**	**11-20 Yrs**
T-A-8	Maintain and update every ten years a Pedestrian and Bicycle Plan that defines a cohesive pedestrian network of public sidewalks, paths, and street crossings that make walking convenient, safe to travel, and are universally accessible. Within the Pedestrian and Bicycle Plan provide: › Guidelines for sidewalk functional elements (e.g., pedestrian zone, planter/furniture zone, curb zone, and building frontage zone), amenities (e.g., landscaping, benches, trash receptacles, news racks, pedestrian-scale lighting, directional/information signing, and public art), street crossings; description and schedule for public improvements; and developer responsibilities. › Establish a Pedestrian Safety Program that provides pedestrian educational materials and a regularly updated pedestrian safety report. › Designate and support a Citywide Pedestrian Coordinator.	T-P-2, T-P-10, T-P-11, T-P-12, T-P-13, T-P-14, T-P-15, T-P-16, T-P-17, T-P-18, T-P-19, T-P-20, T-P-31	EDH, PB		**X**	**X**	
T-A-9	Maintain and update every ten years a Pedestrian and Bicycle Plan that defines a cohesive bikeway network of paths, lanes, routes and boulevards that make biking convenient, safe to travel, and accessible. Within the Pedestrian and Bicycle Plan provide: › Bikeway facilities that are appropriate to the street typology, traffic volume, traffic speed, surrounding land uses, and accounting for the constrained urban environment. › Designate and support a Citywide Bicycle Coordinator › Evaluate the feasibility of implementing a bicycle sharing program for Emeryville residents and workers	T-P-2, T-P-18, T-P-19, T-P-21, T-P-22, T-P-23, T-P-24, T-P-25, T-P-26, T-P-48	PB, PW, EDH, PD		**X**	**X**	

				IMPLEMENTATION SCHEDULE			
Action Number	**Implementation Actions**	**Policy Numbers**	**Responsibility**	**Ongoing**	**0-5 Yrs**	**6-10 Yrs**	**11-20 Yrs**
T-A-10	Participate with the Emery Unified School District to identify measures to enhance pedestrian circulation to and from the local public school sites, parks, the Center of Community Life, and other local community service locations. Participate in and support recommendations of the Safe Routes to Schools program.	T-P-11, T-P-13, T-P-14, T-P-15, T-P-16	PB, PW, ETMA, EUSD, CS, PD		**X**		
T-A-11	Install and maintain detection loops at signalized intersections that are sensitive to bicycles, including those with aluminum frames.	T-P-2, T-P-25	PW		**X**		
T-A-12	Urge public transit vehicles to carry bicycles	T-P-2	PW, ETMA, AC		**X**		
T-A-13	Actively work with transit providers for free and/or subsidized transit for both local travel within the city and travel to the regional hubs located at the Amtrak Station, the MacArthur BART station, and San Pablo Avenue at 40th Street.	T-P-34, T-P-35, T-P-36	PW, ETMA		**X**		
T-A-14	Work with transit providers to expand hours of operation, reduce travel time, and increase frequencies/headways.	T-P-28, T-P-29, T-P-30, T-P-33, T-P-35, T-P-37, T-P-38, T-P-39, T-P-41, T-P-43	PW, AC, AMTK, BART, ETMA	**X**			
T-A-15	Refer to AC Transit's handbook *Designing with Transit* for integrating transit into the community.	T-P-2, T-P-16, T-P-31, T-P-32, T-P-33, T-P-36, T-P-39, T-P-42	PB	**X**			
T-A-16	Monitor as appropriate the transit system to assess the system's effectiveness in serving Emeryville residents and those working in Emeryville. Make changes to the transit system, as appropriate, to provide an efficient rider-friendly environment that meets the needs of all users including children, seniors, the disable, and transit-dependent persons.	T-P-2, T-P-16, T-P-28, T-P-29, T-P-30, T-P-31, T-P-32, T-P-33, T-P-34, T-P-35, T-P-37, T-P-38, T-P-39, T-P-40, T-P-41, T-P-42, T-P-43, T-P-44, T-P-47	PB, PW, ETMA, CS, CAO, AC	**X**			

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				IMPLEMENTATION SCHEDULE			
Action Number	**Implementation Actions**	**Policy Numbers**	**Responsibility**	**Ongoing**	**0-5 Yrs**	**6-10 Yrs**	**11-20 Yrs**
T-A-17	Require all new development (residential and non-residential) to contribute to the Emeryville Transportation Management Association to ensure that Emeryville residents are well served by transit.	T-P-34, T-P-35 T-P-46	PB, ETMA	X			
T-A-18	Monitor, as appropriate, public parking supply and utilization to identify deficiencies and optimize efficiency to 85 percent. Adjust pricing and supply as appropriate and apply other parking management strategies such as Residential Permit Parking (RPP) to ensure adequate parking availability in residential areas, recognizing the need for adequate parking to support neighborhood businesses.	T-P-49, T-P-50, T-P-51, T-P-52, T-P-53, T-P-54, T-P-55, T-P-56, T-P-57, T-P-58, T-P-59	PW, PB	X			
T-A-19	Study and implement a citywide Transportation Demand Management Program and explore funding mechanisms.	T-P-53, T-P-64, T-P-65, T-P-66, T-P-67	PB, PW, ETMA, CAO, F		X		
T-A-20	Coordinate with stakeholders and interested agencies and parties to explore the feasibility of a bicycle and pedestrian trail adjacent to the Emeryville Crescent.	T-P-18, T-P-20, T-P-22	PB, CAO, PW, EBRPD, State Parks		X		
T-A-21	Maintain designated truck routes to dictate appropriate routes for truck traffic.	T-P-60, T-P-61, T-P-62	PW	X			

TABLE 8-3: Implementation Actions for Parks, Open Space, Public Facilities and Services

				IMPLEMENTATION SCHEDULE			
Action Number	**Implementation Actions**	**Policy Numbers**	**Responsibility**	**Ongoing**	**0-5 Yrs**	**6-10 Yrs**	**11-20 Yrs**
PP-A-1	Prepare a strategic parks master plan. Plan should identify needs, prioritize acquisition, and facilitate a significant reduction in the current deficit in parks and open space acreage. The plan shall also identify options for park financing and implementation, recognizing the challenges of providing new parks in a built-out city.	PP-P-1, PP-P-2, PP-P-3, PP-P-4, PP-P-5, PP-P-6, PP-P-7, PP-P-8, PP-P-10, PP-P-12, PP-P-13	CS, PB, PW, F		X		
PP-A-2	Develop a park-programming plan based on assessment of user needs. Plan should maximize open space use and balance active and passive recreational needs for all segments of the community.	PP-P-1, PP-P-2, PP-P-3, PP-P-4, PP-P-8, PP-P-10	CS		X		
PP-A-3	Explore additional joint park facilities and use agreements with surrounding communities and agencies.	PP-P-4, PP-P-10, PP-P-14, PP-P-15, PP-P-16, PP-P-17	CS, EUSD	X			
PP-A-4	Coordinate east-west greenway creek improvements and water features with community members and design professionals.	PP-P-7	PB, PW, CS, EUSD, EDH, CAO			X	
PP-A-5	Update and implement Five-Year Capital Improvement Program.	PP-P-1, PP-P-2, PP-P-3, PP-P-4, PP-P-5, PP-P-6, PP-P-7, PP-P-8, PP-P-13, PP-P-17, PP-P-21	F (updates), PW (implements), EDH		X		
PP-A-6	Update zoning and subdivision regulations and the zoning map.	PP-P-9, PP-P-10, PP-P-11, PP-P-14, PP-P-22	CAO			X	
PP-A-7	Continue to negotiate with landowners on the acquisition of land to supplement the Center of Community Life. Identify funding opportunities and implement the entire concept.	PP-P-2, PP-P-15, PP-P-16, PP-P-17	CS, EUSD, F	X			
PP-A-8	Work with other public agencies, including PG&E, AC Transit, Amtrak, the Post Office and the School District and local neighborhoods on appropriate land uses for sites no longer needed by the respective public agency.	PP-P-2, PP-P-3, PP-P-4, PP-P-15, PP-P-16, PP-P-17	PB, CS, EUSD	X			

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				IMPLEMENTATION SCHEDULE			
Action Number	**Implementation Actions**	**Policy Numbers**	**Responsibility**	**Ongoing**	**0-5 Yrs**	**6-10 Yrs**	**11-20 Yrs**
PP-A-9	Continue to provide ongoing and one-time cultural and recreation events for all members of the community—youth, adults, and seniors. Promote programs through City newsletter and website.	PP-P-18, PP-P-19, PP-P-20	CS	X			
PP-A-10	Prepare a strategic plan and design documents for an Arts and Cultural Center.	PP-P-21	EDH		X		
PP-A-11	Conduct a feasibility study for a new location and building for Police Administration facilities.	PP-P-22, PP-P-23	PD, PW				X
PP-A-12	Continue to operate the Community Emergency Response Team (CERT) Program.	PP-P-24	FD	X			
PP-A-13	Continue to coordinate with utilities service providers as necessary (i.e. PG&E, EBMUD)	PP-P-25, PP-P-26, PP-P-27	PW	X			
PP-A-14	Continue to require development projects to replace or upgrade sanitary sewer systems.	PP-P-27, PP-P-28	PW, PB	X			

TABLE 8-4: Implementation Actions for Urban Design

				IMPLEMENTATION SCHEDULE			
Action Number	**Implementation Actions**	**Policy Numbers**	**Responsibility**	**Ongoing**	**0-5 Yrs**	**6-10 Yrs**	**11-20 Yrs**
UD-A-1	Prepare Design Guidelines for the following design elements: › Site planning › Building orientation and entries › Open space › Parking and service areas › Building height and mass › Building form and articulation › Façade composition › Building materials, detailing, and color › Residential livability › Streets › Sustainability objectives › Landscaping › Signage › Gateways	UD-P-1, UD-P-3, UD-P-10, UD-P-15, UD-P-19, UD-P-20, UD-P-21, UD-P-22, UD-P-23, UD-P-24, UD-P-25, UD-P-26, UD-P-27, UD-P-28, UD-P-29, UD-P-30, UD-P-31, UD-P-32, UD-P-33, UD-P-34, UD-P-35, UD-P-36 UD-P-38, UD-P-39, UD-P-40, UD-P-43, UD-P-45, UD-P-46, UD-P-47, UD-P-51, UD-P-53, UD-P-54, UD-P-55, UD-P-59, UD-P-60, UD-P-61, UD-P-62, UD-P-63, UD-P-64, UD-P-65, UD-P-66, UD-P-67, UD-P-68, UD-P-70, UD-P-71, UD-P-72	PW		X		
UD-A-2	Prepare, update, and implement neighborhood and area plans.	UD-P-5, UD-P-6, UD-P-7, UD-P-8, UD-P-9, UD-P-10, UD-P-11, UD-P-12, UD-P-13, UD-P-14, UD-P-15, UD-P-16, UD-P-17, UD-P-18, UD-P-37, UD-P-48, UD-P-68	PB, PW, EDH	X			
UD-A-3	Update the Zoning Ordinance: › Parking › Building mass › Signage › Districts › Development standards › Streets	UD-P-5, UD-P-9, UD-P-10, UD-P-15, UD-P-19, UD-P-26, UD-P-31, UD-P-34, UD-P-35, UD-P-36, UD-P-38, UD-P-54, UD-P-55, UD-P-56, UD-P-58, UD-P-59	PB, CAO	X			
UD-A-4	Prepare citywide streetscape plan.	UD-P-1, UD-P-8, UD-P-16, UD-P-17, UD-P-18, UD-P-41, UD-P-42, UD-P-43, UD-P-44, UD-P-45, UD-P-46, UD-P-47, UD-P-48, UD-P-49, UD-P-50, UD-P-51, UD-P-69	PB, PW, EDH			X	

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				IMPLEMENTATION SCHEDULE			
Action Number	**Implementation Actions**	**Policy Numbers**	**Responsibility**	**Ongoing**	**0-5 Yrs**	**6-10 Yrs**	**11-20 Yrs**
UD-A-5	Update Capital Improvements Program.	UD-P-2, UD-P-20, UD-P-48, UD-P-52	F, PW, EDH	X			
UD-A-6	Utilize Site Plan Review › Identify options for pedestrian circulation › Extend street grid wherever possible › Require buildings within identified gateway areas to emphasize entry into the city through architectural elements.	UD-P-4, UD-P-5, UD-P-7, UD-P-8, UD-P-11, UD-P-12, UD-P-13, UD-P-14, UD-P-20, UD-P-37, UD-P-57, UD-P-58, UD-P-69	PB	X			
UD-A-7	Invest in signage, public art, and streetscape improvements at identified city gateways.	UD-P-1, UD-P-73, UD-P-74, UD-P-75	EDH, PW	X			
UD-A-8	Improve the city's physical appearance through maintenance and façade renovations of older residential and industrial building stock. Support community-driven neighborhood beautification programs by emphasizing rehabilitation grants and low-interest loans.	UD-P-9, UD-P-10, UD-P-13, UD-P-15, UD-P-19	EDH, PB, PW	X			
UD-A-9	Utilize the City's Public Art Fund to expand public art within the city along key pedestrian streets and at major gateways like Hollis Street, San Pablo Avenue, and Powell Street. Continue support for developer and city contributions to the Emeryville Arts in Public Places Program, with special emphasis on locating art in new parks and greenways.	UD-P-73, UD-P-74	EDH	X			
UD-A-10	Develop and implement new sign regulations.	UD-P-73, UD-P-75	CAO	X			

TABLE 8-5: Implementation Actions for Conservation, Safety, and Noise

				IMPLEMENTATION SCHEDULE			
Action Number	**Implementation Actions**	**Policy Numbers**	**Responsibility**	**Ongoing**	**0-5 Yrs**	**6-10 Yrs**	**11-20 Yrs**
CSN-A-1	Plant new trees and other plantings, and maintain existing healthy trees to improve air quality and reduce the urban heat island effect.	CSN-P-19, CSN-P-20	PW	X			
CSN-A-2	Continue working with the San Francisco Regional Water Quality Control Board in the implementation of the National Pollutant Discharge Elimination System permit process for the protection of surface and groundwater quality.	CSN-P-7, CSN-P-8, CSN-P-10, CSN-P-44	PW	X			
CSN-A-3	Implement EBMUD Water efficiency requirements for new and rehabilitation projects.	CSN-P-12, CSN-P-13, CSN-P-14, CSN-P-15, CSN-P-16, CSN-P-17	PW		X		
CSN-A-4	Disseminate information about the potentially harmful effects of toxic chemical substances and safe alternative measures, for home and garden use.	CSN-P-9	ACo, PW	X			
CSN-A-5	Support the East Bay Regional Parks District in the maintenance and protection of the biological resources in the Emeryville Crescent portion of the Eastshore State Park, while studying the feasibility of a bicycle and pedestrian trail adjacent to the Emeryville Crescent.	CSN-P-18, CSN-P-19, CSN-P-22, CSN-P-23, CSN-P-24, CSN-P-25	PW, EBRPD, State Parks	X			
CSN-A-6	Identify historic and cultural resources within Emeryville and continue to refine and implement ordinances pertaining to architecturally significant structures, to ensure adequate recognition and incentives for reuse.	CSN-P-26, CSN-P-28, CSN-P-32	PB		X		
CSN-A-7	Offer funding through the Redevelopment Agency for façade preservation projects.	CSN-P-26, CSN-P-31	EDH	X			
CSN-A-8	Cooperate with appropriate government agencies and public and private organizations to address seismic hazards and flooding risks due to dam inundation, tsunamis, sea level rise, or major flood events.	CSN-P-34, CSN-P-35, CSN-P-44, CSN-P-46	PB	X			
CSN-A-9	Implement and update emergency management operations plan, including evacuation routes, cache of supplies, training of City staff, as necessary, as the city continues to develop.	CSN-P-48, CSN-P-49	FD	X			

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				IMPLEMENTATION SCHEDULE			
Action Number	**Implementation Actions**	**Policy Numbers**	**Responsibility**	**Ongoing**	**0-5 Yrs**	**6-10 Yrs**	**11-20 Yrs**
CSN-A-10	Periodically update the Local Hazard Mitigation Plan (LHMP).	CSN-P-34, CSN-P-37, CSN-P-38, CSN-P-39, CSN-P-40, CSN-P-41, CSN-P-43, CSN-P-48, CSN-P-49	FD, PD, PW, PB	X			
CSN-A-11	Continue to work with the Alameda County Waste Management Authority & Recycling Board (StopWaste.Org) regarding disposal of hazardous materials.	CSN-P-9, CSN-P-38, CSN-P-39, CSN-P-40, CSN-P-41, CSN-P-42, CSN-P-43	PW, ACo, FD	X			
CSN-A-12	Continue working with the Alameda County Flood Control and Water Conservation District.	CSN-P-44, CSN-P-45, CSN-P-46	PW, ACo	X			
CSN-A-13	Utilize Site Plan Review process to ensure public health and safety, and the protection of natural and cultural resources.	CSN-P-1, CSN-P-19, CSN-P-25, CSN-P-27, CSN-P-29, CSN-P-30, CSN-P-33, CSN-P-34, CSN-P-35, CSN-P-41, CSN-P-43, CSN-P-48, CSN-P-50, CSN-P-58, CSN-P-59	PB	X			
CSN-A-14	Update Zoning Ordinance.	CSN-P-4, CSN-P-5, CSN-P-6, CSN-P-11, CSN-P-12, CSN-P-13, CSN-P-14, CSN-P-15, CSN-P-16, CSN-P-33, CSN-P-34, CSN-P-35, CSN-P-36, CSN-P-39, CSN-P-50, CSN-P-57, CSN-P-58	PB, CAO	X			
CSN-A-15	Update Capital Improvements Program.	CSN-P-2, CSN-P-20, CSN-P-22, CSN-P-23, CSN-P-24, CSN-P-45	F, PW, EDH	X			
CSN-A-16	Implement Climate Action Plan in coordination with all City departments.	CSN-P-2, CSN-P-3, CSN-P-11, CSN-P-12, CSN-P-13, CSN-P-14, CSN-P-15, CSN-P-16, CSN-P-20, CSN-P-21	PW		X		
CSN-A-17	Establish conditions of approval for mechanical equipment with potential noise impacts.	CSN-P-51, CSN-P-53, CSN-P-55, CSN-P-57, CSN-P-58	PB	X			
CSN-A-18	As part of development review, ensure that all development located within future noise exposure (as shown on Figure 6-10) levels greater than “Normally Acceptable” must complete a noise study and implement appropriate mitigation measures to bring interior noise levels to “Acceptable” levels.	CSN-P-52, CSN-P-53, CSN-P-54	PB	X			
CSN-A-19	Coordinate with the Public Utilities Commission and other public agencies to develop railroad quiet zones.	CSN-P-56	PB	X			

TABLE 8-6: Implementation Actions for Sustainability

				IMPLEMENTATION SCHEDULE			
Action Number	**Implementation Actions**	**Policy Numbers**	**Responsibility**	**Ongoing**	**0-5 Yrs**	**6-10 Yrs**	**11-20 Yrs**
ST-A-1	Implement Climate Action Plan in coordination with all City departments.	ST-P-1, ST-P-2, ST-P-3, ST-P-4, ST-P-9	PW		**X**		
ST-A-2	Adopt the United Nations Environmental Accords by Resolution with a plan for implementing 14 of the 21 actions by 2012.	ST-P-1, ST-P-2	PW		**X**		
ST-A-3	Incorporate site-appropriate standards described by Build-It-Green GreenPoint rating system and/or Leadership in Energy and Environmental Design (LEED™), and Bay-Friendly Landscape Scorecard into all new construction and rehabilitation projects.	ST-P-5, ST-P-6, ST-P-7, ST-P-8	PW		**X**		
ST-A-4	Implement civic green building resolution requiring City projects to follow green building and Bay-Friendly Landscaping requirements.	ST-P-5, ST-P-6, ST-P-7, ST-P-8	PW	**X**			
ST-A-5	Implement green building ordinance requiring Public-Private Partnership projects to be follow green building and Bay-Friendly Landscaping requirements. (pending)	ST-P-5, ST-P-6, ST-P-7, ST-P-8	PW	**X**			
ST-A-6	Develop and implement an environmentally preferable municipal purchasing program.	ST-P-10, ST-P-11, ST-P-13	PB, EDH	**X**			
ST-A-7	Identify sites for developers to provide sites for farmers' markets.	ST-P-12	PB, EDH	**X**			

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Amendment 1:

January 19, 2010

Resolution No. 10-12 and

Resolution No. 10-13

Resolutions of the City Council of the City of Emeryville Approving a General Plan Amendment to Modify the Maximum Floor Area Ratios Map to Increase the Floor Area Ratio to 2.0/3.0 on the Pixar Animation Studios Property Bounded by Park Avenue, Hollis Street, 45th Street, and Properties Fronting on San Pablo Avenue (APNs: 49-1539-1, 2, 4-2, and 5; 49-1027-37; 49-1041-59); and to Increase the Floor Area Ratio to 3.0/4.0 on the Wareham Development Property Between Hollis Street and the Railroad from Powell Street to 64th Street. (APNs: 49-1487-5-3; 49-1488-1; 49-1489-13-3, 14, and 17)

Amendment 2:

September 21, 2010

Resolution No. 10-52

Resolution of the City Council of the City of Emeryville Amending the General Plan to Redesignate the "Doyle Hollis North Area", Bounded by 62nd, Hollis, 64th, and Doyle Streets, from Park/Open Space to Office/ Technology-Doyle Hollis North Area on the Land Use Diagram, and from an Far of 0.5/No Bonus to an FAR of 1.0/No Bonus on the Maximum Floor Area Ratios (FAR) Map.

Amendment 3:

May 15, 2012

Resolution No. 12-77

Resolution of the City Council of the City of Emeryville Adopting a General Plan Amendment Adding Text to Policy T-P-8 in the Transportation Element and Modifying the Circulation Diagram, Street System Diagram, Pedestrian System Diagram, and Bicycle System Diagram.

Amendment 4:

April 2, 2013

Resolution No. 13-58

Resolution of the City Council of the City of Emeryville Approving a General Plan Amendment to Delete the Pedestrian Path Connecting 45th Street and 47th Street Along the Eastern Property Line of Escuela Bilingüe Internacional from the General Plan and the Pedestrian and Bicycle Plan.

EMERYVILLE GENERAL PLAN

Prepared by:

DYETT & BHATIA
Urban and Regional Planners

With assistance from:

Environmental Science Associates

Fehr & Peers

Keyser Marston Associates

MIG, Inc.

Mundie & Associates

Urban Advantage

DYETT & BHATIA
Urban and Regional Planners

755 Sansome Street, Suite 400
San Francisco, California 94111
415 956 4300 415 956 7315

EMERYVILLE GENERAL PLAN UPDATE



EMERYVILLE HOUSING ELEMENT
2009-2014

CITY OF EMERYVILLE | JUNE 2010

CREDITS

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Virginia McNeill*

CITY OF EMERYVILLE STAFF
Patrick D. O'Keeffe, City Manager
Charles S. Bryant, Director of Planning and Building
Helen Bean, Director of Economic Development and Housing
Michael G. Biddle, City Attorney
Deborah Diamond, Housing Element Co-Project Manager and General Plan Update Manager
Amy Hiestand, Housing Element Co-Project Manager and Housing Coordinator
Miroo Desai, Senior Planner
Diana Keena, Associate Planner
Courtney Barratt, Building Plan Checker
Abby Bilkiss, Deputy City Attorney
Rasha Aweiss, Planning Intern
Sara Billing, Planning Intern
Lena Mik, Planning Intern*
Robert McCracken, Planning Intern*
Amanda Leahy, Planning Intern*
Zaheen Chowdhury, Housing Intern*
Noelle Cole, Housing Intern*
Lawrence Morris, Housing Intern*
Laura Cacho, Housing Intern*

* Former member or staff person

CITY OF EMERYVILLE FIVE YEAR HOUSING ELEMENT – 2009-2014

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EXECUTIVE SUMMARY

This Emeryville Housing Element establishes the City's housing goals, policies and programs for the period of 2009 to 2014. Its primary purpose is to guide decisions and identify programs that will facilitate housing availability during the five year period.

Included in this document is information on existing conditions and characteristics that provides the basis for its goals and policies. These goals and policies will be achieved through a Housing Action Plan specifically designed to fit the local needs and opportunities. Key findings and goals of the 2009-2014 Emeryville Housing Element are summarized as follows:

Housing Needs Assessment

Population and Households

- **Emeryville's population is growing at a rapid rate:** Since the 2000 Census, Emeryville's population has grown 41%, from 6,822 to 9,727 persons.
- **Non-family households represent the bulk of this growth:** Non-family households were the fastest growing household type between 1990 and 2000, and comprise 70% of all households in Emeryville. In 2000, 51% of Emeryville's population lived in non-family households, up from 44% in 1990.
- **One- and two- person households comprise the majority of all households:** One-person households grew at a faster rate than all households combined, and increased their share of total households to 55%, followed by two person households at 30%.
- **Emeryville is increasingly attractive to those 21-24 years old, and those older than 45 years old:** 21-24 year olds represented 33% of total population growth between 1990 and 2000, but those 45-64 accounted for 48%.
- **Emeryville's racial and ethnic composition is very diverse**: In 2000, of the non-Hispanic population (91% of the total population), 42% was white, 19% was black or African-American, 1% was American Indian or Alaskan Native, and 26% was Asian, Native Hawaiian, or Pacific Islander. Nine percent of the population was Hispanic. The greatest population growth from 1990 to 2000 was in the Non-Hispanic Asian, Native Hawaiian, or Pacific Islander group.
- **Special Needs Populations**: Large families and single parent families may face housing affordability issues, particularly female-headed households. Seven percent of Emeryville's families with a female head of household and no spouse present were below the poverty level in 2000. Other special needs groups identified in the Housing Element that may have affordable housing issues include Emeryville's seniors and disabled people. Those at risk of homelessness or who are homeless also are

identified as special needs because they are likely to have greater difficulty obtaining affordable housing with appropriate supportive services.

- **Local Opportunity Groups:** The Housing Element identifies certain groups that are important to the Emeryville community including families with children, artists, city employees, and employees of the Emery Unified School District.

Housing Characteristics

- **Emeryville's housing stock expanded even faster than the population between 2000 and 2008:** Since 2000, the city has added 1,997 housing units, a 47% increase.
- **Housing in Emeryville increasingly consists of large-scale projects with few rooms per unit:** 71% of all housing in Emeryville in 2008 was in structures with over 50 units, and the average unit has about 3 rooms, compared with 5 in Alameda County.

Income Characteristics

- **Emeryville is attracting households with higher incomes faster than those with lower incomes:** Only households earning $50,000 and more grew at a faster rate than total household growth; they accounted for 49% of all households in 2006.
- **There are income differences amongst renter and owner households:** More than half of Emeryville's renter households in 2000 (55%) were extremely low, very low, or low income. 30% of owner households were in these income levels.
- **Housing costs remain high for many Emeryville renters:** 45% of renting households pay greater than 30% of their income to rent; the majority of these households were extremely low, very low, or low income.

Economic Characteristics

- **Industry trends in Emeryville indicate growth in high and low income jobs, and a decline in middle income jobs:** The fastest growing industries in Emeryville are finance, retail, and food service and accommodation, while manufacturing, wholesaling, and administrative support are in decline.

Resources and Constraints to Housing Development and Affordability

Land Use and Zoning

- **Emeryville's land use policies and zoning regulations encourage residential and mixed use development**: Multi-family developments of five or more units represent 78 percent of the total housing stock. The zoning ordinance allows residential development and/or live work in six of the nine zoning districts.
- **Constraints imposed by the zoning regulations are related to development standards:** Parking requirements are particularly difficult to achieve in infill development, frequently resulting in a scaled-back project.

Sites and Facilities

- **For a small city, Emeryville has been aggressively developing housing in recent years and has opportunity sites for additional housing:** Building permits for approximately 1,281 dwelling units are anticipated by 2014. The city's most significant constraint is its small size.

Housing Costs

- **Housing development costs continue to increase as a result of increasing costs of land, materials, labor, site preparation and insurance:** A sampling of recent developments in Emeryville show construction costs range from $360,000 to $450,000 per unit.
- **Recent market rate for-sale housing prices in Emeryville significantly exceed the prices considered affordable by redevelopment law and the gap between affordable rents and market rents is largest for very low and low income households.**

Housing Resources

- **There are a variety of Federal, State and City programs to support housing supply and affordability:** Emeryville programs include the Affordable Housing Set Aside ordinance, the Redevelopment Agency's Low and Moderate Income Housing Fund, the Ten-Year Housing Compliance Plan, and several developer and homebuyer subsidy programs.
- **There are several non-governmental resources:** housing developers, lenders, and non-profit housing advocacy organizations**.**

Achievement of 2002 Housing Element

The City annually reports on implementation of the adopted housing element. Key outcomes on the four goals of the 2002 housing element, during the period of January 1, 2002 to December 31, 2008 are summarized below:

- **Goal I. Preserve existing housing stock:** The City offers a wide range of grant and loan programs through the Housing Rehabilitation Program with the goal of preserving the City's older, existing housing stock. Between 2002 and 2008, the City assisted with improvements to 103 dwelling units.
- **Goal II. Promote a variety of housing types and affordability levels:** The City has a strong record of expanding its housing supply and will continue to support development of a wide range of housing types and affordability levels in the coming years. Between January 1, 1999 and June 30, 2006, the previous Regional Housing Need Allocation period, over 1,800 units were added to the City's housing stock.
- **Goal III. Promote housing for special needs groups:** The Courtyards apartment project includes 3 units for developmentally disabled households. In 2006, the City approved AgeSong Assisted Living project, which will feature 121 assisted living units, 28 independent living units, a dining room, and a publicly accessible café. In 2008, the Redevelopment Agency approved a new project to renovate a four-plex building as an affordable supportive housing project for five developmentally disabled adults.
- **Goal IV. Promote equal opportunity in housing:** Anti-discrimination clauses are standard in the City and Agency's agreements with housing developers, and failure to comply with fair housing laws is a violation of the City and Agency's agreements. The City contracts with Housing Rights, Inc. to provide fair housing counseling services to both tenants and landlords, including counseling, tenant/landlord mediation, attorney and small claims court referral, and housing discrimination investigation.

Housing Goals and Implementation

There are seven housing goals for this 2009 to 2014 housing element:

- **Goal I. Preserve existing housing stock.**
- **Goal II. Promote a range of affordability levels.**
- **Goal III. Promote development of affordable housing for persons with special needs.**
- **Goal IV. Ensure that the City has a variety of housing types to meet the diverse needs of its residents as well as attract new residents.**
- **Goal V. Maintain and expand activities designed to prevent those currently housed from becoming homeless and to assist those who are homeless.**
- **Goal VI. Promote equal opportunity in housing.**
- **Goal VII. Promote environmental responsibility and long-term sustainability of City's housing development through remediation of brownfields and promotion of "green" housing development.**

Each goal is supported with objectives, policies, and implementation programs. The Housing Action Plan specifies the measurable outcomes, funding sources, responsible agents for implementation, and action steps.

CHAPTER 1. INTRODUCTION

The city of Emeryville is located in the San Francisco Bay Area region at the gateway to the East Bay. Emeryville is one of the smallest cities in the Bay Area, covering an area of just 1.2 square mile. It is located between the city of Berkeley to the north, Oakland to the south, and the San Francisco Bay to the west. Emeryville is located at the eastern end of the San Francisco Bay Bridge, a major crossing between the East Bay and San Francisco. Emeryville was incorporated in 1896 as a city of industry and business at transportation cross roads. Today Emeryville is a bustling mixed use city that includes a and vibrant arts community, high-tech industries such as software, animation, and biotechnology, retail and entertainment destinations, and a wide range of residential housing, from older single family neighborhoods, to converted live/work lofts, and higher-density rental and ownership housing. This Housing Element is intended to guide decisions that will facilitate the development, rehabilitation and availability of housing in the city of Emeryville over the five-year period from July 1, 2009 to June 30, 2014. Included in this Housing Element is an action program to implement its goals and policies.

Legal Context

The housing element is one of seven State-mandated elements of the Emeryville General Plan. Emeryville's Housing Element was last revised in 2000, adopted in 2001, and certified by the State Housing and Community Development Department (HCD) in 2002. By State law, housing elements are required to be updated every five years. Due to extensions in the State schedule, this five-year planning document applies for the period of July 1, 2009 to June 30, 2014, and replaces the 2002 Housing Element. It fulfills the State requirement for planning to meet the housing needs of all economic segments of the community. It also meets the mandate for consistency with the other elements of Emeryville's General Plan. [1]

State requirements for housing elements are more detailed and specific than for other general plan elements. This housing element meets the requirements of housing law specified in California Government Code Article 10.6, Sections 65580-65589.5. The law emphasizes the availability of housing as a statewide priority and requires participation from regional and local governments as well as the private sector. State law says that the housing element "shall consist of an identification and analysis of existing and projected housing needs and a statement of goals, policies, quantified objectives and scheduled programs for the preservation, improvement, and development of housing".

Regional Housing Need Allocation

This housing element addresses the requirements of Section 65584 of Article 10.6 of the Government Code, namely, the identification of sites suitable for residential development to accommodate Emeryville's housing need allocation assigned through the Regional Housing Need

[1] Concurrently with this Housing Element, the other six mandatory elements of Emeryville's General Plan, plus two optional elements, are being updated, as are the City's zoning regulations. A new comprehensive general plan and regulations, and a set of design guidelines, were completed in early 2009 and are anticipated to be adopted in mid-2009. This Housing Element and the progress of the other elements will be regularly evaluated and adjusted for consistency up until adoption.

Allocation (RHNA) process. On March 20, 2008, the Association of Bay Area Governments (ABAG), the Council of Local Government for the nine-County Bay Area region, approved the final housing need allocation for the RHNA for each jurisdiction in the Bay Area for the 2007 through 2014 period. Emeryville's allocation for this period is 1,137 units, broken down by income category as shown below. Chapter 3 of this housing element provides an analysis of potential sites for additional housing that will accommodate the 1,137 housing units assigned through the RHNA process.

Very low income units:	186	(16.4% of total)
Low income units:	174	(15.3% of total)
Moderate income units:	219	(19.3% of total)
Above-moderate income units:	558	(49.0% of total)
TOTAL:	**1,137 units**	

Contents

Emeryville's Housing Element identifies development sites adequate to accommodate a variety of housing types for all income levels, analyzes resources as well as constraints to housing development and affordability, and outlines policies to promote housing opportunities for all persons. Following this introductory chapter, the Housing Element's components are arranged as follows:

Chapter 2:	An assessment of local housing needs, including demographic information.
Chapter 3:	An analysis of government and non-government resources and constraints to housing development and affordability.
Chapter 4:	A progress report outlining the City's achievement with respect to goals, policies, and programs found in the 2001 Housing Element for the reporting period of January 1, 2002 through December 31, 2008.
Chapter 5:	The new goals, objectives, policies and programs that will be implemented during the Housing Element period.
Chapter 6:	A housing action plan for implementing the new goals, objectives, policies and programs identified in Chapter 5.
Appendices:	Technical data and background information supporting the Housing Element.

Review Process and Public Participation

The City of Emeryville began working on the Housing Element Update in summer 2007, with the intention of completing a first draft by summer 2008 that could be submitted to the State of California Department of Housing and Community Development (HCD) for its initial review and comment. Over a period of eight months, from August 2007 through April 2008, the Emeryville Housing Committee worked with city staff to create a draft document for further public review. A citywide public workshop on the first draft of the Housing Element was held on March 15, 2008 and attended by over twenty people not including staff. The draft was presented by staff and followed by a discussion and comment period. The draft was presented to the Planning Commission on April 24, 2008 as part of a public hearing and to the City Council on May 20, 2008 for comments and acceptance prior to forwarding to State HCD. All Housing Committee, Planning Commission and City

Council meetings during this period were fully noticed and open to the public. Over 400 individuals on a Housing Element interest list were notified of the March 15, 2008 workshop as well as the Planning Commission meeting.

To encourage full public participation, an article was published in the February 2008 edition of the *Emeryville Connection,* a Chamber of Commerce newsletter that is sent to all Emeryville addresses. The article announced the housing element update and community workshop and invited community members to get involved. The article listed upcoming opportunities for public participation including the March workshop and the public meetings. An informational flyer was broadly distributed and posted in store windows, at local restaurants, and in other visible locations. Information was also posted on the City's website. The first draft of the Housing Element was made available on the City's website, at City offices, and at the local library.

In August 2008, State HCD provided written comments on the City's first draft Housing Element. These comments were addressed and incorporated into the current version of the Housing Element. In fall 2008 and early 2009, City staff began its update to the draft Housing Element, based on the written comments from HCD. A second community workshop was held on March 28, 2009 to discuss and comment on the revised Housing Element. A number of public outreach efforts were made to encourage attendance at the workshop. Announcements were made via Emeryville's public access television station, E-TV, which reaches all households in Emeryville, with information regarding the Housing Element Workshop. An article announcing the Housing Element Update was included in the March 2009 Emeryville Chamber of Commerce newsletter which reaches all households and businesses in Emeryville. Flyers announcing the Workshop were posted around town at coffee shops, retail stores, and restaurants, at Emeryville City Hall, and at outlying departments that serve a broad range of the population, including the Emeryville Child Development Center, the Emeryville Senior Center, and the Emeryville Recreation Department which runs the after-school programs for the Emery Unified School District serving many of the families in Emeryville. Flyers were also provided to the Public Information Exchange Officer at the Emery Unified School District. To encourage participation in the Housing Element review process by lower and moderate income persons, the flyers were sent with a cover letter directly to the Home Owner Association contacts and Property Management Offices for housing developments in Emeryville that contain Below Market Rate rental apartments or ownership units. The contacts were requested to post the flyer in public notice locations within their buildings to encourage participation. The flyer was also sent electronically to several residents in the community who maintain list-servs for their neighborhoods. Postcard announcements were sent to over 350 individuals on the City's Housing Element update interest list, as well as City Committees, the Emeryville Planning Commission, the Emeryville City Council, housing developers, and housing advocacy organizations with an interest in housing issues in Emeryville. Along with these public outreach efforts, Emeryville's mayor announced the Housing Element update and March 28th workshop at the March 17th City Council meeting which is televised to Emeryville residents on the local cable access station. The proposed Housing Element was made available in its entirety online, with a request feature to sign up for the Housing Element interest list.

The revised Housing Element was presented to the Housing Committee at its April 1, 2009 meeting, to the Planning Commission on April 23, 2009 as part of a public hearing and to the City Council on June 16, 2009 for comments and acceptance prior to forwarding to State HCD. All Housing Committee, Planning Commission and City Council meetings during this period were fully noticed and open to the public. Copies of related public information materials may be found in Appendix H.

CHAPTER 2. HOUSING NEEDS ASSESSMENT

Population Characteristics

Population, Households, and Families

Emeryville's Housing Element was last updated in 2001. Since the 2001 update Emeryville has experienced rapid population and housing growth. Between 1990 and 2000 the city's population grew by almost 20% from 5,740 to 6,882 persons. From the 2000 Census through January 1, 2008, the estimated population increase has been 2,845 persons, a 41% gain to the estimated population of 9,727 persons as of January 1, 2008, the date for which the most current population estimate is available from the State Department of Finance. This growth rate exceeded that of Alameda County, whose population increased by 4.6% between 2000 and 2006. Projections by the California Department of Finance predict 9,300 residents in Emeryville by 2010. Table 2-1 provides data on the total Emeryville population between 2000 and 2008, as well as the breakdown of households by family type between 2000 and 2006. Overall, Emeryville's total population increased 41% from 2000 to 2008, with the addition of 2,845 persons so far this decade. Non-family households have been and remain the largest share of all households (70%), and grew at a slightly faster rate than family households between 2000 and 2006. Non-family households are defined as those in which the householder lives alone or with non-relatives only. In terms of household size trends since 1990, household size and family size have remained relatively steady since 1990, at 1.7 and 2.8 persons in 2000, respectively. Alameda County's average family size of 2.9 in 2000 was similar to that of Emeryville's. Non-family households, which account for a majority of Emeryville's households, had 1.3 persons on average in 2000. Emeryville's non-family households have markedly fewer persons than those in Alameda County where the average non-family household had 2.7 persons in 2000.

Table 2-1: Population and Households

	2000		2008		% change 2000 - 2008
Population	6,882		9,727		41%
In Households	6,815		9,660		42%
In Group Quarters	67		67		0%
	2000	% of Total Population	2006	% of Total Population	% change 2000 - 2006
Total Households	3,968	100%	5,056	100%	27%
Family Households	1,186	30%	1,484	29%	25%
Non-family Households	2,782	70%	3,572	71%	28%
Persons per Household	1990	2000	2007		
Average Household Size	1.8	1.7	1.8		
Average Family Size	2.9	2.8	not available		
Average Non-family Size	1.2	1.3	not available		

Sources: US Census, 1990, 2000 SF3; California Dept. of Finance 2008; Claritas Demographic Snapshot Report, 2007

Table 2-2 provides data on changes in household composition in Emeryville between 1990 and 2000. Household growth in Emeryville was robust between 1990 and 2000, with the city adding 764 total households, for an increase of 24%. The rate of growth for non-family households was greater than family households by a wide margin, increasing the share of non-family households from 65% to 70% citywide. In absolute terms, the city added 698 non-family households, a household type which represents 91% of all households added in that period.

For family households, married couples with children under 18 years increased at twice the rate of total household growth, and continued to make up the largest single share of family households (68%). There was a marked increase in the number of male family householders with children under 18 years, though in absolute numbers it was small (9 in 1990 to 87 in 2000). Female family householders decreased over the same period, falling by approximately 20% from 282 to 226. Female family householders with children fell even more precipitously, declining from 208 to 131 (37% decrease).

Table 2-2: Household Types

	1990	% of Total Households	2000	% of Total Households	% Change 1990 - 2000
Total Households	**3,204**	**100%**	**3,968**	**100%**	**24%**
Family households:	1,120	35%	1,186	30%	6%
Married-couple family:	746	23%	805	20%	8%
With own children under 18 years	187	6%	282	7%	51%
No own children under 18 years	559	17%	523	13%	-6%
Male householder, no wife present:	92	3%	155	4%	68%
With own children under 18 years	9	0%	87	2%	867%
No own children under 18 years	83	3%	68	2%	-18%
Female householder, no husband present:	282	9%	226	6%	-20%
With own children under 18 years	208	6%	131	3%	-37%
No own children under 18 years	74	2%	95	2%	28%
Non-family households	2,084	65%	2,782	70%	33%

Sources: US Census, 1990, 2000 SF3

As shown in Table 2-3, which tracks household composition trends between 1990 and 2000, in addition to the number of family households declining in relation to non-family households, the share of Emeryville's population that lives in family households grew only slightly (1%) but shrank proportionally. In contrast, the non-family population increased at a rate of 41%, over twice the rate of the city's growth as a whole. In 2000, 51% of the city's population lived in non-family households, up from 44% in 1990.

The composition of family households in Emeryville was relatively unchanged between 1990 and 2000, although the number of grandchildren in Emeryville families decreased dramatically, from 86 to 15. The total number of children in Emeryville family households declined slightly as well. "Other relatives" living in family households marked the biggest percentage increase from 1990 to 2000. In sum, families in Emeryville in 2000 had slightly fewer children and grandchildren but had more of other relatives than in 1990. For non-family households, there were two remarkable shifts. First, the share of total females heading non-family households grew at a much faster rate than the total population, so that by 2000 there was roughly an equal number of female and male non-family householders. Most of these females in 2000 lived alone (83%), comparable to 1990 (82%). In contrast, the proportion of male heads of household living alone declined from 1990 to 2000 (79% and 75%, respectively). Second, non-relatives living in non-family households also increased dramatically (79%) from 423 to 756.

Table 2-3: Household Composition

	1990		2000		% Change 1990 - 2000
Total Population:	**5,740**	**100%**	**6,882**	**100%**	**20%**
In Households	5,740	100%	6,815	99%	19%
In family households:	3,233	56%	3,277	48%	1%
Householder	1,120	20%	1,186	17%	6%
Spouse	767	13%	806	12%	5%
Child	916	16%	902	13%	-2%
Grandchild	86	1%	15	0%	-83%
Other relatives	255	4%	290	4%	14%
Non-relatives	89	2%	78	1%	-12%
In non-family households:	2,507	44%	3,538	51%	41%
Male householder:	1,135	20%	1,400	20%	23%
Living alone	897	16%	1,045	15%	16%
Not living alone	238	4%	355	5%	49%
Female householder:	949	17%	1,382	20%	46%
Living alone	786	14%	1,157	17%	47%
Not living alone	163	3%	225	3%	38%
Non-relatives	423	7%	756	11%	79%
In group quarters:	-	0%	67	1%	n/a
Institutionalized persons	-	0%	-	0%	
Other persons in group quarters	-	0%	67	1%	

Sources: US Census, 1990, 2000 SF3

Table 2-4 shows the number of persons per occupied housing unit. Between 1990 and 2000 the number of units with one occupant increased 31%, a faster rate than all other categories, increasing the share from 53% to 55%. In 2000, there were 2,205 occupied units in Emeryville with one person living in them. Units with three and four persons declined proportionally while units with 5 or more persons maintained a 3% share.

Table 2-4: Persons Per Occupied Housing Unit 1990 - 2000

	1990	% of Total Housing Units	2000	% of Total Housing Units	% Change 1990-2000
Total Occupied Housing Units	3,204	100%	3,975	100%	24%
1 Person	1,683	53%	2,205	55%	31%
2 Persons	977	30%	1175	30%	20%
3 Persons	280	9%	309	8%	10%
4 Persons	172	5%	172	4%	0%
5 or more Persons	92	3%	114	3%	24%

Source: US Census, 1990, 2000 SF3

In summary, between 1990 and 2000 the total share of Emeryville's population that lived in family households declined from 56% to 48%. Married couples and male heads of households with children increased at a rate faster than general household growth while female headed households, especially those with children, declined. In 2000, 48% of the city's population lived in family households (down from 56% in 1990). One third of the population lived alone, and 11% were unrelated individuals living in non-family households (up from 7% in 1990). Female householders living alone were one of the fastest growing groups, and in 2000 they represented 17% of the city's population.

Age Characteristics

Emeryville's age profile (Table 2-5) marked an increase in the overall age of the population between 1990 and 2000. The population of people 18 years and younger declined, while population of 35 years and older grew. The population of people over 65 remained more or less the same even though its largest growth occurred among those 75 and older. These trends are reflected in an overall increase in the median age in Emeryville by two years from 1990 to 2000, from 34.4 years to 36.4 years.

Table 2-5: Median Age (years)

	1990	2000
Emeryville	34.4	36.4
Alameda County	32.7	34.7

Source: US Census, 1990, 2000 SF3

As shown in Table 2-6, between 1990 and 2000, the total share of the population under 18 fell from 14% to 11%, reflecting an 8% decline. Growth in the 18-65 age bracket was greater than growth for the population as a whole, having its most dramatic increase among 21- 24-years old (91% increase). 21-24 years old registered the largest proportional increase in population share from 7% to 11% (366 out of 1,142), to which one third of the population growth in the city from 1990 to 2000 can be attributed. In contrast, there was no growth in the 25-34 age bracket which comprised the largest bracket at 22%, (down from 27%). Combined, the 21-24 and 25-34 age brackets make up 33% of the city's total population. Those in the age brackets between 35 and 64 years increased their share of the city's population from 38% to 43%; this group made up 66% of the total population increase between 1990 and 2000. The majority of this population is clustered in the 35-44 age bracket, representing 19% of the city's population (unchanged from 1990). Those 45-64, while evenly distributed, made up 48% of the city's population growth. In sum, the city's 35-64 age bracket lost population, while people in older brackets added population. The population of people over 65 increased by 12%; this increase helped maintained its number at 9% of the total population. On average, there was a larger group of people over 65 in 2000 than there was in 1990, with a net loss in the 65- to 74- year bracket and dramatic growth among 75-84 and 85 and older.

Table 2-6: Age Distribution

	1990		2000		% Growth 1990-2000
Total Population	**5,740**	**100%**	**6,882**	**100%**	**20%**
Age 0 - 4	252	4%	236	3%	-6%
Age 5 - 9	160	3%	168	2%	5%
Age 10 - 14	247	4%	172	2%	-30%
Age 15 - 17	132	2%	154	2%	17%
Under 18	**791**	**14%**	**730**	**11%**	**-8%**
Age 18 - 20	261	5%	269	4%	3%
Age 21 - 24	402	7%	768	11%	91%
Age 25 - 34	1,522	27%	1,529	22%	0%
Age 35 - 44	1,105	19%	1,318	19%	19%
Age 45 - 49	302	5%	485	7%	61%
Age 50 - 54	279	5%	497	7%	78%
Age 55 - 59	234	4%	344	5%	47%
Age 60 - 64	306	5%	341	5%	11%
18 to 64	**4,411**	**77%**	**5,551**	**81%**	**26%**
Age 65 - 74	383	7%	293	4%	-23%
Age 75 - 84	117	2%	219	3%	87%
Age 85 and over	38	1%	89	1%	134%
65 and over	**538**	**9%**	**601**	**9%**	**12%**

Sources: US Census, 1990, 2000 SF3

A comparison of growth rates in each age bracket illustrates Emeryville's population shifting towards people of older age. Compared with the citywide population growth rate of 20%, the under-18 age brackets grew slowly, or declined (ages 10-14), and thus, declined in its share of the population. On the other end of the scale, strong growth among those 45-59 helped push the city's age profile up. Notably, the 21-24 age bracket grew dramatically. However, the 25-34 age bracket remained unchanged from 1990 levels. While those age 84 and over grew at the fastest rate (134%), their absolute numbers represent just 1% of the total population.

The proportional decline of those under 18 years old prompts several interpretations. One is that the need for housing that can accommodate families is in decline; another is that new housing construction that occurred during the 1990-2000 period was not designed to be family-oriented (i.e. projects were built with predominantly smaller units with fewer bedrooms). It appears that Emeryville has been very attractive to those who are typically younger than most new parents (i.e. those 21-24, recently out of college) and those who are older than the typical childbearing years (i.e. those 45-59 and older than 65).

Comparing Emeryville's population to that of Alameda County will help highlight Emeryville's unique context: The proportion of Emeryville's population that was under 18 years old in 2000 was 11%; in Alameda County it was 24%. Concurrently, those 18-65 years old in Emeryville made up 81% of the population; in Alameda County it was 65%.

The upshot is that a third of the population, those in the 21-24 and 25-34 brackets, is more likely to need housing units that are smaller than single-family detached homes. Studios and one-bedroom units are likely to be the most attractive housing type for those 21-24, while one and maybe two-bedroom units may be more attractive to young couples in the 25-34 year old bracket. The high rate of growth of individuals living alone (32% of the population in 2000) also reflects a trend in the residential units types being developed in that a greater percentage of new units are one-bedrooms than larger sized units. This is discussed further below in the section on Housing Unit Characteristics.

The 45-59 age group is more likely to already have children, but the absolute decline in children between 1990 and 2000 suggests that those who moved to Emeryville either did not have children or had children who are grown or moved to college etc. Current or future "empty nesters" appear to have been attracted to Emeryville. One and two bedroom unit lofts are likely to be popular housing products for this group.

Finally, although proportionally small, the growth in population over 65 is worthy of discussion. Combined, this group represented 9% of the city's population in 2000, and was skewed toward those 75 and older. Indeed, the number of people in the age 85 and over age group grew from 38 people in 1990 to 89 people in 2000, a 134% increase. Managed care and independent living units may be needed to accommodate this population.

Education Characteristics

In 2000 Emeryville's educational attainment profile was that of a fairly highly educated population. As shown in Table 2-7, over half of the population held at least a bachelor's degree (54%), compared with about one-third in Alameda County (34%). Because incomes typically rise with educational attainment, a greater share of Emeryville's population has more financial resources to devote to housing than Alameda County as a whole.

Table 2-7: Educational Attainment for Residents 25 Years and Over

	Emeryville	% of Total Population	Alameda County	% of Total Population
Total Population 25 years and over	5,115	100%	953,716	100%
Less than 9th Grade	135	3%	76,513	8%
Some High School, no diploma	394	8%	91,768	10%
High School Graduate	583	11%	181,668	19%
Some College, no degree	1025	20%	206,013	22%
Associate Degree	240	5%	64,800	7%
Bachelor's Degree	1439	28%	202,586	21%
Master's Degree	871	17%	85,704	9%
Professional School Degree	190	4%	24,450	3%
Doctorate degree	238	5%	20,214	2%

Source: US Census 2000, SF3

As shown in Table 2-8, a sizable minority of Emeryville's population, 16%, was enrolled in undergraduate or graduate school in 2000. This was respectively greater than the Alameda County and Statewide figures of 9% and 8%. Emeryville's proximity to the University of California, Berkeley and other institutions in Emeryville and Oakland likely explains this figure.

Table 2-8: School Enrollment

	2000	% of Total Population
Total Population 3 years and over	6,702	100%
Enrolled in nursery school, preschool:	50	1%
Enrolled in kindergarten:	29	0%
Enrolled in grade 1 to grade 4:	131	2%
Enrolled in grade 5 to grade 8:	130	2%
Enrolled in grade 9 to grade 12:	235	4%
Subtotal K-12	**525**	**8%**
Enrolled in college, undergraduate years:	746	11%
Enrolled in graduate or professional school:	367	5%
Subtotal college (incl. graduate/prof)	**1,113**	**16%**
Alameda County Enrollment in undergraduate or graduate school		**9%**
State of California Enrollment in undergraduate or graduate school		**8%**

Source: US Census 2000, SF3

Racial and Ethnic Characteristics

Table 2-9 compares race and ethnicity changes from 1990 to 2000 in Emeryville. Between 1990 and 2000, all racial and ethnic groups in Emeryville increased in number, though not all at the same rate as the total population increased. The result was a modest evening out of racial and ethnic distribution in the form of a proportional decrease of Whites and Blacks, corresponding with the growth of Asians and those identifying as "Other".

In general, Emeryville's population remained predominantly Non-Hispanic in 2000 (91%). Non-Hispanic Whites still remain the largest racial group even though it fell proportionally from 49% to 42% of the total population. Non-Hispanic Asians, Native Americans, and Pacific Islanders became the second largest racial group, over 25%. This group essentially switched places with Non-Hispanic Black or African Americans, whose share declined from nearly a quarter to about one fifth of the total population. Those identifying as Non-Hispanic "Other" increased from 1% to 4% of the total population, representing the largest growth rate of all racial groups. The Hispanic population increased, but in 2000, it still made up about one tenth of the city's population (the same as it was in 1990). Approximately half of the Hispanic population identified as "Other race," with the next largest share identified as White (38%).

In summary, the population of Non-Hispanic Asians, Native Hawaiians, and Pacific Islanders grew most substantially at a rate of 69% and accounted for the largest share of total population added to the city from 1990 to 2000, 724 people (63%). The growth rate of Non-Hispanic Whites and Non-Hispanic Black or African American population was small, respectively 3% and 1%. The dramatic increase (33%) in Non-Hispanic "Other race" is likely attributed to changes to the reporting formats between the 1990 and 2000 Decennial Census. The Hispanic population grew at a rate somewhat faster than the total population, but overall, Hispanics in 2000 made up the same proportion of the total population as in 1990. The "Other race" group represented the most substantial increase within the Hispanic category, accounting for 78 of the 122 persons added (63%).

Table 2-9: Race and Ethnicity

	1990		2000		% change 1990 - 2000
Total Population	5,740	100%	6,882	100%	20%
Non-Hispanic	5,252	91%	6,272	91%	19%
White	2,784	49%	2,859	42%	3%
Black or African American	1,308	23%	1,322	19%	1%
American Indian and Alaska Native	33	1%	45	1%	36%
Asian, Native Hawaiian, and Pacific Islander	1,048	18%	1,772	26%	69%
Other race	79	1%	274	4%	247%
Hispanic	488	9%	610	9%	25%
White	217	4%	234	3%	8%
Black or African American	17	0%	36	1%	112%
American Indian and Alaska Native	0	0%	0	0%	0%
Asian, Native Hawaiian, and Pacific Islander	20	0%	28	0%	40%
Other race	234	4%	312	5%	33%

Source: US Census 1990, 2000 SF3

Special Needs Populations

This section describes groups in the City of Emeryville with a range of housing and supportive service needs, including groups defined in State Housing Element law as having special needs. These groups consist of agricultural workers, large families, female-headed households, the elderly, persons with disabilities, and homeless people.

Agricultural Workers

According to the 2000 Census, only 12 people, or 0.3% of Emeryville's population, work in the fields of agriculture, forestry, fishing and hunting, or mining. Emeryville's agricultural worker population is generally composed of boat workers and garden store employees. Neither of these groups requires special housing.

Emeryville's Large Families

Large families are identified as a special needs population in State Housing Element law because with a limited supply of adequately sized units to accommodate larger households, large families can face difficulty located adequately-sized affordable housing. Large households are defined by the U.S. Census Bureau as households containing five or more persons (related or unrelated). As shown previously in Table 2-4, the majority of households in Emeryville in 2000 were occupied by one or two persons, although in this year there were also 114 households with five or more persons, representing 3% of total occupied units. This was a 24% increase in the number of large family units since 1990 (22 more units). The break-down by tenure is shown in Table 2-10 below. Two percent of owner-occupied housing units were occupied by households with five or more persons (24 units), and 5% of renter-occupied housing units were occupied by households with five or more persons (90 units).

Table 2-10: Family Size by Tenure

	1-4 persons		5+ persons		Total	
	Number	Percent	Number	Percent	Number	Percent
Owner Occupied	1,440	98%	24	2%	1,464	100%
Renter Occupied	2,421	95%	90	5%	2,511	100%
Total	3,861	97%	114	3%	3,975	100%

Source: US Census 2000 SF3

Emeryville's Single Parent Families

State housing element law considers single female-headed households to have special needs. Single mothers often rely on one income to meet all household expenses, and on average, women earn less than men in similar occupations. As shown in Table 2-11, the 2000 Census identified 131 single-mother households (with their own children) in Emeryville, 3% of Emeryville's total households.

According to the 2000 Census, 7.1% of Emeryville families with a female householder and no husband present were below poverty level. These single-mother households may experience a significant housing affordability gap.

In addition to economic problems, single mother families are often vulnerable to displacement due to domestic violence. According to the Alameda Countywide Homeless and Special Needs Housing Plan, published in April 2006, assistance is only available to a small percentage of these families. In Alameda County there are over 150 shelter beds available exclusively for women escaping domestic violence. There are over 70 units of transitional or permanent housing specifically for victims of domestic abuse. The City of Emeryville annually allocates a portion of its federal CDBG allocation to the Berkeley Food and Housing Project (BFHP) in support of that organization's transitional housing project for women and children.

It is interesting to note that single-mother households in Emeryville declined between 1990 and 2000, whereas single-father households grew, as shown in Table 2-11. This may be due to changes in family law courts resulting in an increasing number of fathers receiving custody of their children. In Alameda County, single-father and single-mother households both grew from 1990 to 2000, though single-father households experienced greater growth.

Table 2-11: Single-Parent Households

	1990	% of Total Households	2000	% of Total Households	% Change 1990-2000
Alameda County					
Single-father households	7,833	2%	10,853	2%	39%
Single-mother households	34,478	7%	35,482	7%	3%
City of Emeryville					
Single-father households	9	0%	87	2%	867%
Single-mother households	208	6%	131	3%	-37%

Sources: US Census, 1990, 2000, SF3

Emeryville's Elderly People

As of the 2000 Census, 9% of Emeryville residents were 65 years of age or older and the group was skewed toward those 75 and older (see Table 2-6). Many seniors live on fixed incomes, which can translate to seniors having difficulty with housing costs if rents or ownership housing costs increase. The tenure profile of Emeryville's seniors is shown in Table 2-12. Of the total 537 units occupied by seniors ages 65 years and older, 44% were occupied by renter households (236 units) and 56% by owner households (301 units).

Table 2-12: Occupied Units by Tenure by Age

Household Age	Renters		Owners		Total	
65 to 74 years	96	40.7%	124	52.5%	220	41.0%
75 to 84 years	102	43.2%	127	53.8%	229	42.6%
85+ years	38	16.1%	50	21.2%	88	16.4%
Total	236	100.0%	301	127.5%	537	100.0%

Source: US Census 2000 SF3

This is a fairly high rate of ownership by senior households for a group that comprises just 9% of Emeryville's population. Seniors' ownership rate is higher than the City's overall ownership rate, which was 37% in 2000. As shown in Table 2-13, however, most seniors have low or very low incomes. Among elderly renter households, fully 74% have incomes that are extremely or very low income. Among elderly owner households, there is also a high percentage who are extremely or very low income (49%). Table 2-13 also shows that all lower income elderly renter households (those less than 80% of the area median income) had some form of housing problems (either experienced cost burden, paying more than 30% of their income on housing costs, overcrowding, and/or substandard kitchen or plumbing facilities). (Housing problems and overpayment issues are described later in this chapter under "Housing Affordability" section.) Among elderly owner households, a majority of extremely low income and very low income seniors experienced housing problems.

Table 2-13: Elderly Households by Income and Tenure; % with Housing Problems

Household Age	Elderly Renter Households	As % Total	% with Housing Problems	Elderly Owner Households	As % Total	% with Housing Problems	Total	As % Total
Below 30% MFI	140	51.9%	67.9%	70	16.5%	50.0%	210	30.2%
31-50% MFI	60	22.2%	100.0%	70	16.5%	78.6%	130	18.7%
51-80% MFI	10	3.7%	100.0%	60	14.1%	41.7%	70	10.1%
>80% MFI	60	22.2%	0.0%	225	52.9%	13.3%	285	41.0%
Total	270	100.0%		425	100.0%		695	100.0%

Source: CHAS Data, Housing Problems, 2000

Two apartment buildings in Emeryville are reserved for very low-income seniors including Emery Villa (which contains 50 units) and Avalon Senior Apartments (which contains 66 units). By reserving units at very low income rents for seniors, these two developments assist in alleviating the cost burden issues that many seniors face.

According to the Alameda County Social Services Department, 130 Emeryville residents are involved with the In-Home Supportive Services Program (IHSS). The percentage of those receiving support has increased by only 0.1% since 2004**.**

The Alameda County Area Agency on Aging is the local arm of the national aging network that works to advance the social and economic health of elders (60 and over) within the county. In 1994 they completed a study expressing the need for a higher level of

care and assistance for the elderly within Emeryville. Since then, a Needs Assessment Report has been completed concerning issues facing seniors. This 2005 report includes data and surveys from those residing in the North County (defined as the cities of Alameda, Albany, Berkeley, Emeryville, Oakland, and Piedmont). Twenty-eight percent of North County seniors have been residents for over 30 years, and 72% of the elderly in the North County are female.

According to data collected through a focus group survey as part of the 2005 Needs Assessment, 15% of respondents think that housing is a serious problem for seniors, many of whom in the low income range. The 2005 Needs Assessment also reveals that 64% of married North County seniors have a monthly income below $1,781, with the county wide average being 51%. Fifty-nine percent of single seniors in the North County have a monthly income of below $937 while the countywide average is 47%. Given that the estimated mean rent for a one-bedroom apartment in Emeryville exceeds $1,300 (based on a March 2007 City of Emeryville survey), there is a significant imbalance between rents and what seniors can pay. It may be surmised that some seniors are living in substandard housing, are living with relatives, or have been able to secure subsidized housing.

The second phase of the 2005 Needs Assessment was the facilitation of six focus groups, each with ten to twenty participants. Housing was a key topic of discussion. The participants identified financial abuse as a significant concern, as well as home safety. Difficulty with landlords was a recurrent theme, especially when modifications to the home were requested (such as grab bars and banister repair). Many seniors said that they were unfamiliar with what resources were available to them and were afraid of being overcharged for services. Two seniors suggested an agency be created that cater to 'senior friendly' services. The majority of seniors were unwilling to consider shared housing situations for fear that they would become the caregiver of someone who became disabled. This conclusion was unanimous across regions. Participants were reluctant to burden family members but welcomed the idea of supportive housing and more structured care. None expressed an aversion to a nursing home or institutional care, but they feared a lack of resources would not give them any choice in the type of housing they would be able to have. Lower income seniors from the North County were more averse to institutional care. The majority viewed new housing developments as less than accessible, feeling that what developers propose for low income seniors rarely resulted in truly 'low-income' housing.

The 2005 Needs Assessment also indicates that many of the elderly in Emeryville may need assistance performing daily tasks. Thirty-seven percent of seniors in the North County reported an inability to do heavy housework, 26% are unable to shop, 23% can not prepare their own meals, and 28% have no means of transportation. Of those unable to manage or who have serious difficulty with certain activities, 66% of seniors in the North County had no help managing money, 74% had no help getting to the bathroom, 65% had no help bathing, and 46% had no help preparing meals.

Forty-seven percent of North County seniors live alone. Of those that live with others, 38% of North County seniors share their home with a spouse or partner, 22% live with other family members, and 2% live with a friend or caregiver. The largest percentage (49%) of North County seniors reside in a house while 38% live in an apartment or condominium/townhouse; 4% live in senior housing, an assisted living facility, or a residential care home; and 1% are homeless.

The Emeryville Senior Center functions as a community focal point for older adults in Emeryville and the surrounding community. It provides an array of services that promote healthy aging, such as in-home care, health services, financial counseling, subsidized transportation, and social activities. In 2006, the Emeryville Senior Center served an average of 430 seniors per month and a total of 5,152 seniors during the year.

Emeryville's Disabled People and Housing Resources for People with Disabilities

Disabled households (either elderly or non-elderly) include households that have members who are disabled due to a physical handicap, a mental illness, or developmental disabilities. In general, persons with disabilities have lower incomes, especially in those cases where the disability limits the ability to hold a job. Moreover, disabled people often experience significant barriers to adequate housing due to physical or structural obstacles.

According to the 2000 U.S. Census, 1,029 (19.5%) of Emeryville residents between the ages of 21 and 64 years had some type of disability. Employment disability, where a physical, mental, or emotional condition lasting 6 months or more that makes it difficult for an individual to work, was the most prevalent disability type. Of those individuals with one disability, 57% reported having an employment disability. Other disability types included sensory disability (blindness, deafness), physical disability (difficulty walking or reaching), mental disability (difficulty learning, remembering, or concentrating), self-care disability (difficulty dressing, bathing, or getting around inside the home), and going outside the home disability (difficulty shopping or visiting a doctor's office alone).

According to the 2000 U.S. Census, 42% of the population over 65 years of age had a disability. Over 25% of those over age 65 had more than one disability. Of those with one disability, 73% were physically disabled.

The cost and availability of housing is a significant barrier. Disability incomes in Alameda County were just $870 per month in 2008. Many with disabilities depend on Supplemental Security Income (SSI) as their sole source of income, and would be considered as extremely low-income. The area median income for a one-person household in Alameda County was $60,300 in 2008. In comparison, in 2008 SSI was an equivalent of $10,440 per year to a disabled single person under 65. This is just 17% of Alameda County's median income for an individual. SSI payments alone leave recipients near the poverty level, established at $10,400 per year in 2008.

Physical Disabilities. Table 2-14 lists permanent housing located in or near Emeryville that is available to physically disabled people and people with limited mobility. The majority of the developments listed below are affordable senior housing projects that also allow physically disabled residents over the age of 18. Therefore, though there appears to be a large number of units available for the physically disabled, it should be noted that a large portion of these units are occupied by seniors who may or may not have a physical disability. Providence House in Oakland, Adeline Street Apartments in Berkeley, and Ocean Avenue Apartments in Emeryville are dedicated solely to very low income, physically disabled individuals and their families. Ocean Avenue Apartments is located in Emeryville and consists of six affordable units; this development was built in 1997.

Table 2-14: Permanent Housing For People with Physical Disabilities

Sponsor/Owner	Project Name	Number of Units
Alameda County Housing Authority	Ocean Avenue Apartments (Emeryville)	6
Providence Health System	Providence House (Oakland)	34 1-BR, 6 2-BR
Satellite Housing	Valdez Plaza (Oakland)	150
1st Congregational Church	Amistad House (Berkeley)	6
Resources for Community Development	Adeline Street Apartments (Berkeley)	19
Interstate Realty	Harriet Tubman Terrace (Berkeley)	90 (studios & 1-BR)
John Stewart Company	Redwood Gardens (Berkeley)	17
American Baptist Homes of the West	Allen Temple Arms II (Oakland)	38 1-BR, 13 studios
John Stewart Company	Baywood Apartments (Oakland)	5
Oakland Community Housing	Beth Eden (Oakland)	50 (studios & 1-BR)
Christian Church Homes of Northern California	Casa Velasco (Oakland)	8 1-BR, 12 studios
E.E. Cleveland Manor	E.E. Cleveland Manor (Oakland)	13 studios, 40 1-BR
A.F. Evans	Hotel Oakland (Oakland)	77 studios, 237 1-BR
Christian Church Homes of Northern California	J.L. Richards Terrace (Oakland)	20 studios, 60 1-BR
G & K Management	Lake Merritt Apartments (Oakland)	54 1-BR
Related Management Co.	Noble Towers (Oakland)	195 1-BR
Christian Church Homes of Northern California	Posada de Colores (Oakland)	99 1-BR, 1 2-BR
Alton Management	Rose of Sharon (Oakland)	83 studios, 56 1-BR
Christian Church Homes of Northern California	Sister Thea Bowman Manor (Oakland)	14 studios, 41 1-BR
Christian Church Homes of Northern California	Sojourner Truth Housing (Oakland)	74 studios, 13 1-BR
Christian Church Homes of Northern California	Southlake Tower (Oakland)	129 1-BR, 1 2-BR

Mental Illness. People with behavioral health problems, including mental illness and/or substance abuse, face substantial challenges obtaining and maintaining stable housing. In Alameda County, there are approximately 30,000 adults and children with serious mental illness or serious emotional disturbance living in households with incomes at or below 200 percent of the poverty level (State of California Department of Mental Health Statistics and Data Analysis, Prevalence Rates of Mental Disorders, Updated October 2004). Table 2-15 below provides data on the housing situation of adults living with mental illness who are in care managed by the Alameda County Behavioral Health Care Services (BHCS). BHCS served more than 18,000 adults in 2002. Consumers who are seriously and persistently mentally ill and have the most acute service needs are assigned by BHCS to Service Teams for care. In July 2004, there were 4,074 adults on Service Teams.

Available data from the "Alameda Countywide Homeless and Special Needs Plan" published in April 2006 (now known as the "EveryOne Home Plan") indicates that 866 adults with mental illness are homeless at any given time in Alameda County. Because of the extremely low incomes of the majority of single adults and households with someone living in them with serious mental illness, the *EveryOne Home Plan* estimates a need for housing assistance for approximately 17,818 low income adults and heads of family household with mental illness who are at-risk of homelessness.

BHCS operates a short-term partial rent subsidy program referred to as '20% Rent Subsidies'. This program provides 20% of monthly rent to help people with mental illness move from homelessness to stable housing. A total of 494 permanent supportive housing units at seven sites in Oakland and Berkeley are linked to supportive services through the Health, Housing, and Integrated Service Network (HHISN) Pathways Project in Alameda County. Teams of public and private nonprofit organizations deliver integrated services to residents. Evaluations have shown that service-enriched housing improved access to care and reduced total public costs by 15% by shifting demand towards less expensive services.

Table 2-15: Housing Situation of Adults in care of Alameda County Behavioral Health Care Services (July 2004 and 2002)

	Seriously and Persistently Mentally Ill Adults Care Managed by BHCS (July 2004)		All Adult Clients served by BHCS Mental Health Services in 2002	
Housing Situation	Number	Percentage	Number	Percentage
Independent Living	2,326	57%	3,908	22%
Independent With Support	574	14%	1,631	9%
Board & Care	302	7%	1,103	6%
Treatment Facility	213	5%	1,008	6%
Criminal Justice System	5	<1%	3,185	18%
Homeless	164	4%	1,077	6%
Temporary	41	1%	184	1%
Unknown	423	10%	5,660	31%
Other	26	<1%	268	1%
Total	**4,074**	**100%**	**18,024**	**100%**

Source: Alameda County Behavioral Health Care Services, *Companion Materials, 9 Behavioral Health in Alameda County: Expanded Version. (2006).*

Throughout Alameda County, there are six family units, 16 family beds, and 118 individual beds reserved for people with mental illness. Table 2-16 lists the permanent housing units near Emeryville which are dedicated solely to serving people with mental illness.

Table 2-16: Permanent Housing For People With Mental Illness

Sponsor/Owner	Project Name	Family Units	Family Beds	Individual Beds
Alameda County Behavioral Health Care Services	Lakehurst SRO (Oakland)	--	--	3
Alameda Point Collaborative	Multiple Sites (Alameda)	--	--	10
Bay Area Community Services	Amber House (Oakland)	--	--	6
Bay Area Community Services	Humphrey Lane (Oakland)	--	--	12
Bonita House	Channing Way (Berkeley)	--	--	4
Bonita House	Hearst Street (Berkeley)	--	--	12
Bonita House	Martin Luther King Street (Berkeley)	--	--	7
City of Berkeley Housing Department/Bonita House and Berkeley Mental Health	Shelter Plus Care (tenant-based)	2	6	37
Fred Finch Youth Center	Coolidge Court (Oakland)	--	--	19
Resources for Community Development (RCD)/Oakland Community Housing Inc. (OCHI)	MLK House (Berkeley)	--	--	8
	Total	**2**	**6**	**118**

Source: Alameda County Behavioral Health Care Services; Alameda Countywide Homeless and Special Needs Housing Plan, April 2006

Developmental Disabilities. The Courtyards Apartments in Emeryville, a project built in 2004, has 331 units. Sixty-three units in the development are reserved as Below Market Rate (BMR) units pursuant to the City's Affordable Housing Set Aside Ordinance. When the City entered into an Agreement on Affordable Units with the owner, the City negotiated the inclusion of three of the BMR units as reserved for households living with developmental disabilities. Two of these units are reserved for moderate income households; one unit is for a very low income household. The Affordability Agreement requires the owner to obtain referrals from the Regional Center of the East Bay, which is the local agency for the East Bay serving this population. In 2008, the Emeryville Redevelopment Agency issued a Request for Proposals to solicit affordable housing projects for a four-plex structure that it owns at 4001 Adeline Street. The Agency has selected Housing Consortium of the East Bay (HCEB), whose mission is to provide affordable housing opportunities for persons living with developmental disabilities, to renovate the four-plex as five units serving extremely low income developmentally disabled households with support services provided through HCEB and the Regional Center. The project is anticipated to be completed by fall 2010.

Emeryville's Persons Living with HIV/AIDS. The number of AIDS cases and case rates for the seventeen cities in Alameda County has decreased over time. Historically, the largest number of cases and the highest case rate has been in Oakland, the largest city in the county. Case rates (per 100,000 residents) in Emeryville have been higher than in Oakland in recent years (67% in Emeryville and 26% in Oakland from 2003 to 2005); as only 16 cases (versus 324 in Oakland) were actually diagnosed during this time period, this high case rate is most likely due to the small overall population of Emeryville.

According to the AIDS Epidemiology Report from Alameda County prepared by the Alameda County Public Health Department and released in August 2006, the number of cases diagnosed in a single year peaked in 1992 (621 cases) and has been declining steadily since, with 143 cases diagnosed in 2005. This decreasing trend is similar to that observed in California and the United States as a whole. As of December 31, 2005, the majority of people living with AIDS in Alameda County were male (82%) and the racial/ethnic group with the highest proportion of cases was African American (47%). Fifty-four people in Emeryville were diagnosed and living with AIDS as of 2005; 85% of these residents were male, 48% of were white, and 43% were African American.

People with HIV and AIDS often encounter significant housing problems similar to the elderly and disabled. This can be due either to limited incomes or to the structural capacity of the housing supply to accommodate their physical needs. There are few available services within Emeryville that cater to those with HIV and AIDS. However, the Baybridge Apartments project in Emeryville includes six units for very low income households living with HIV/AIDS.

The HIV/AIDS services system within Alameda County updated a housing plan in 1998. Two new programs were developed as part of the implementation of that plan: Project Independence and the AIDS Housing Information Project. The current housing and service system is supported by two federal programs: HUD's Housing Opportunities for Persons with AIDS (HOPWA) program and the Ryan White CARE Act. HOPWA funds are used for the development of emergency, transitional, and permanent housing. Since 1999, the US Health Resources and Services Administration, HRSA, has determined that Ryan White funds can no longer be used for permanent rental or ownership housing, and the use of HOPWA for services should be limited to 35% of the total grant amount in a given project.

Alameda County has implemented a partial rent subsidy program for people living with HIV/AIDS since 1996. Project Independence provides partial rent subsidies, support service coordination, and accessibility improvements to people living with HIV/AIDS who are at risk of homelessness. The project was initiated in the 1996 *Alameda County Multi-Year AIDS Housing Plan,* and its funding has since been renewed.

Table 2-17 provides a complete list of permanent housing available for people living with AIDS/HIV in Alameda County. Emeryville's Bay Bridge Apartments is reserved for six very low income households living with AIDS/HIV.

Table 2-17: Permanent Housing for People Living With HIV/AIDS in Alameda County

Sponsor/Owner	Project Name	Family Units	Family Beds	Individual Beds
Affordable Housing Associates	University Neighborhood Apartments (Berkeley)	2	6	--
Affordable Housing Associates/Building Opportunities for Self Sufficiency (BOSS)	Peter Babcock House (Berkeley)	--	--	5
Alameda Point Collaborative/Housing and Community Development (HCD)	Spirit of Hope (Alameda)	4	13	--
Alameda Point Collaborative/Resources for Community Development	Miramar Apartments (Alameda)	12	36	--
Allen Temple Housing Corporation	Allen Temple Manor (Oakland)	2	4	21
East Bay Asian Local Development Corporation	Swans Market (Oakland)	4	12	--
Resources for Community Development (RCD)	Providence House (Oakland)	--	--	40
Resources for Community Development (RCD)	Bay Bridge Apartments (Emeryville)	--	--	6
Resources for Community Development (RCD)	Concord House (Hayward)	--	--	8
Resources for Community Development (RCD)	Dwight Way (Berkeley)	--	--	2
Resources for Community Development (RCD)	Eastmont Court (Oakland)	--	--	4
Resources for Community Development (RCD)	Harrison Hotel (Oakland)	--	--	14
Resources for Community Development (RCD)	Marlon Riggs (Oakland)	--	--	12
	Total	**24**	**71**	**112**
Permanent Housing In Development				
Allied Housing, Inc.	Housing Alliance (Hayward)	**--**	**--**	2
Affordable Housing Associates	Sacramento Senior Homes (Berkeley)	--	--	4
	Total	**--**	**--**	**6**

Homeless Profile in Emeryville and Alameda County

Homelessness and housing crises have wide-ranging negative impacts. When individuals are homeless or at-risk of becoming homeless, they are unable to reach their full potential at home, at work, at school, or in the community. Homelessness is a symptom of a wide range of challenges and characteristics. The high cost of housing in Alameda County increases cases of homelessness and presents a barrier to its prevention. According to the National Low Income Housing Coalition, Alameda County is one of the ten least affordable counties in the nation. Approaches to end homelessness need to combine services with housing and emphasize the importance of permanent housing options that are affordable to households with extremely low incomes. Many homeless adults and youth are living with mental illness, substance abuse issues, HIV or AIDS-related illness, and/or other disabilities. The profile of people who are homeless is wide-ranging as well. There are single adults who are homeless (men and women), youth who are emancipated out of the foster system, families with children, and seniors.

Alameda County, of which Emeryville is a part, has made a significant investment in affordable housing and services related to homelessness, behavioral health, and HIV/AIDS. In April 2006, the "Alameda Countywide Homeless and Special Needs Plan" (now known as the "EveryOne Home Plan") was released by a collaborative of sponsoring agencies, including the Alameda County Housing and Community Development Department, Alameda County Behavioral Health Care Services, Alameda County Social Services Agency, Alameda County Public Health Department Office of AIDS Administration, the Cities of Oakland and Berkeley, and the Alameda County Homeless Continuum of Care Council. As of early 2009, nearly every jurisdiction in Alameda County as well as numerous other organizations, have endorsed the *EveryOne Home Plan*.

EveryOne Home Plan

The vision of the *EveryOne Home Plan* is to end chronic homelessness in Alameda County by 2020 through five major goals: preventing individuals from becoming homeless in the first place by focusing on providing appropriate services for those exiting foster care, hospitals, or prison; increasing housing opportunities for those who are homeless or have special needs through delivery of 15,000 new units County-wide of housing for people who are homeless or living with AIDS/HIV or mental illness; delivering flexible services to support stability and independence; measuring success and reporting outcomes so that successful programs can be identified; and developing long-term leadership, community support, and political will to implement the Plan. The *EveryOne Home Plan* is seeking to address homelessness, which crosses borders in its effects and characteristics, through a collaborative, regional, county-wide approach.

Homeless Count

The findings of the Alameda Countywide Shelter and Services Survey May 2004 Report formed the background data for the recommendations of the *EveryOne Home Plan.* The report was based on a comprehensive homeless count the Alameda County Continuum of Care Council sponsored in February 2003. The 2003 count was based on surveys conducted with clients at homeless services sites over a four-week period in February 2003. The survey involved an in-depth interview of clients and data was sub-divided amongst the cities of Oakland, Berkeley, the south and east county, and the mid- and north county. The survey revealed that there are as many as 16,000 people who are homeless during the course of a year in Alameda County, and more than 6,000 who are homeless on any given night. Children comprise 28% of the county's homeless population and families comprise 43% of the county's homeless. The urbanized areas of the north part of the County, Berkeley and Oakland, have higher percentages of adults unaccompanied by children. More suburban areas of the County have higher percentages of families with children (including single parent families). The 2004 Survey also included these findings:

- 58% of homeless adults have one or more disabilities.
- Over 30,000 people with mental illness have extremely low incomes and are at-risk of homelessness in Alameda County.
- Homeless persons are more likely to rely on emergency room care.
- 20% of homeless adults have been in an institution such as foster care or juvenile justice prior to age 18.
- In Alameda County, there are nearly 5,000 people living with AIDS/HIV who are extremely low income and at risk of becoming homeless.

In the 2003 Count, the City of Emeryville was included in data collected at the "Mid- and North-County" level, which also included the cities of Alameda, Hayward, and San Leandro as well as the mid-county unincorporated areas including Castro Valley. The survey found that a much higher number of single adults were amongst the homeless in the cities of Oakland and Berkeley, while the "Mid and North County" region and South and East County had a higher proportion of adults with children. The findings of the homeless county by sub-regional area are shown in Table 2-18.

Table 2-18: Homeless Count Estimates by Sub-Regional Area, 2003 Count

Definition (See Notes)	Oakland	As % of Total	Berkeley	As % of Total	Mid & North	As % of Total	South & East	As % of Total	Totals
HUD Homeless									
Adults	1,921	78%	773	94%	436	47%	474	54%	3,604
Children with surveyed adult	529	22%	48	6%	489	53%	411	46%	1,477
Total	2,450	100%	821	100%	925	100%	885	100%	5,081
Community Homeless									
Adults	2,475	81%	785	94%	532	50%	668	53%	4,460
Children with surveyed adult	571	19%	50	6%	532	50%	592	47%	1,745
Total	3,046	100%	835	100%	1,064	100%	1,260	100%	6,205

Notes: HUD Homelessness includes persons living on streets, abandoned buildings, or residing in shelter, transitional housing, or hotels paid by service agency, in vehicle, or place not meant for human habitation. Community homelessness extends HUD definition to include persons whose living situation is transient and those who lack place of their own, or for whom homelessness may be imminent.

Source: Alameda countywide Shelter and Services Survey County Report, May 2004. The complete report may be downloaded at the EveryOne Home website, at www.everyonehome.org.

Emeryville's inclusion in the Mid and North County totals in the 2003 survey may be problematic in that Emeryville's profile of homelessness tends to be more similar to that found in the cities of Oakland and Berkeley, in terms of greater numbers of single adults. This is based on anecdotal evidence provided by the Emeryville Police Department, as well as the data for clients using shelter services at the Berkeley Food and Housing Project.

County-wide Housing Resources for Homeless Populations

According to the *EveryOne Home Plan*, there are approximately 20,000 units of subsidized housing in Alameda County, 20% of which is owned and operated by public housing authorities, and 80% of which is owned by nonprofit and private owners. While these units are an important resource, many of them are still not affordable to people who are homeless, mentally ill, or living with HIV/AIDS. According to the Plan, housing resources for these latter populations in Alameda County include:

- 747 emergency shelter beds for single individuals and 73 emergency shelter units for families that can accommodate 485 people in families.
- 543 transitional housing beds for single individuals and 326 transitional units for families that can accommodate 1,077 people in families.

- 1,369 permanent housing beds or units for single individuals plus 650 beds for individuals in Board and Care homes and 10 beds in a residential care facility. For families, the unduplicated permanent housing inventory includes 358 permanent housing units that can accommodate 1,022 people in families.

Local Efforts

Due to the small size of its city staff, the City of Emeryville does not collect data on the number of homeless persons in the City. City staff consulted with the Emeryville Police Department about the nature and profile of homeless persons that the Police Department encounters and how it addresses providing referrals to these individuals. Because of the proximity of Emeryville to Oakland and Berkeley, the Police Department indicates that most homeless persons who officers encounter tend to be single adults. There is also a recycling center located in Oakland on Peralta Street, about five blocks south of Emeryville's border, where many individuals bring bottles and cans that they have collected. It is presumed that a fair number of the individuals that are seen on-foot travelling to this recycling center are homeless. For those homeless individuals the Police encounters, police personnel provide resources including providing information on the county-wide "2-1-1" phone hot-line that provides emergency service and housing information, and directing homeless individuals to the City of Berkeley Men's Shelter and Women's Shelter, operated by the Berkeley Food and Housing Project in Berkeley.

The emergency shelters nearest to Emeryville are those operated by the Berkeley Food and Housing Project (BFHP). BFHP provides emergency shelter, transitional housing, food, services, and outreach services. Emeryville contributes to the program's operating budget in order to cover the cost of providing shelter to those who come from Emeryville, using funds from the City's allocation of Community Development Block Grant (CDBG) funds. The City's contract with BFHP includes the goal to serve nine homeless clients per quarter who indicate Emeryville as a former place of residence.

In addition to supporting BFHP, the City of Emeryville provides CDBG funding to the Emeryville Community Action Program (ECAP), which is in charge of collecting food donations and providing hot meals to community members in need. This service continues throughout the year with additional special holiday programs. ECAP provides food bags every week on Monday through Thursday as well as Saturday. The program director indicated that each day in excess of 200 people are provided emergency food bags. While ECAP does not collect data on how many of these clients are housed versus homeless, the program director told city staff that it is likely that a fair number of the clients are homeless or extremely low income. The high demand for this program is evident of the fact that a large number of people are living with very little means and in need of emergency food assistance.

Another major support service location for the homeless is one mile south of Emeryville on the San Pablo Avenue corridor (an AC Transit bus route) -- the Society of St. Vincent de Paul of Alameda County (SVdP). SVdp's main Community Center is located at this site and provides a wide range of services, including a free dining room which serves a hot daily meal to 1,000 people in need, food bank, drop-in health clinic two to four times per month, referral services for homeless and very low income men, women and children, and job training assistance. The SVdp Community Center also serves as one of the host sites for the Alameda County Homeless

Court, a program instituted in 2004 to assist homeless individuals with non-violent, low-level misdemeanors to solve legal issues if they are actively working to seek support services to work on obtaining a "clean slate." The Homeless Court is a collaborative effort by the Superior Court of California for Alameda County, the County District Attorney's Office, the EveryOne Home Program, and the Alameda County Public Defender's Office.

Each year, the City of Emeryville provides an allocation of CDBG funds to support the *EveryOne Home Plan's* "InHOUSE Housing Management Information System" (HMIS). Beginning in 2005, this program has been implemented to track the number of homeless individuals receiving housing and service throughout Alameda County.

The *EveryOne Home Plan* sponsored an update to the 2003 Homeless Count in late January 2009. In this recent count, a similar service-site methodology was employed at 27 service sites throughout the County, conducted on one day, January 27, 2009. Over 1,200 surveys were completed, which will provide a very robust data set. The data from 2009 Homeless Count is expected to be available by late 2009. In the new Homeless Count, the data will be provided at the Berkeley and Oakland city levels, other North County (including Albany, Emeryville and Alameda), South County, and East County. Having Emeryville's data included with other North County cities, and not included with Mid-County jurisdictions, will be helpful in achieving a better profile of the sub-regional nature of homelessness in the Emeryville area.

The Action Plan of this Housing Element includes objectives and policies supporting the broad efforts of the *EveryOne Home Plan* to provide supportive housing with services for extremely low income, special needs populations as well as those who are homeless or at-risk of homelessness. The Emeryville City Council has endorsed the *EveryOne Home Plan* and is the City is represented through a staff person on the EveryOne Home Leadership Board. The Housing Element Appendices contain excerpts from the *EveryOne Home Plan* and a homelessness fact sheet. The full plan may downloaded at the EveryOne Home website at www.everyonehome.org.

Local Opportunity Groups

Based on the review of this Housing Element by the Emeryville community, Housing Advisory Committee, Planning Commission, and City Council, several local opportunity groups have been identified for which the City would like to also focus its housing efforts. The Action Plan for this Housing Element identifies specific objectives to encourage housing opportunities for these groups. The local opportunity groups are identified as families with children, artists, City employees, and employees of the Emery Unified School District (EUSD).

Emeryville's Families with Children

According to the 2000 Census, 30% of Emeryville's total 3,968 households at the time were family households and 70% were non-family households. A total of 500 family households had children living with them under 18 years of age. This data is shown earlier in this chapter at Table 2-2. As shown in Table 2-19, there were 75 Emeryville families living below the poverty level in 1999 which represented 6.3% of all families, slightly less than Alameda County's rate of 7.7%. 2006 projections show an increase to 106 families living in poverty, representing 7.1% of families citywide, with the largest increases occurring in female headed households, from 16 to 31 families. As of 2007, 8.2% of Alameda County families lived in poverty.

Table 2-19: 1999 Families Below Poverty Level

	Emeryville 1999	% of Total Families	Alameda County 1999	Emeryville 2006	% of Total Families 2006	% Change 2000 - 2006
Total Families Citywide	1,186	100%		1,484	100.0%	25%
Families Living Below Poverty Line	**75**	**6.3%**	**7.7%**	**106**	**7.1%**	**41%**
Married-couple family	35	3.0%	3.1%	43	2.9%	23%
With children under 18 years	-	0.0%	2.2%	-	0.0%	0%
Male householder	24	2.0%	0.8%	32	2.2%	33%
With children under 18 years	14	1.2%	0.5%	14	0.9%	0%
Female householder	16	1.3%	3.8%	31	2.1%	94%
With children under 18 years	5	0.4%	3.3%	9	0.6%	80%

Sources: US Census 2000, SF3; Claritas Demographic Snapshot Report, 2007

Based on Census data collected at the School District level, Table 2-20 provides a comparison of child poverty in the Emery Unified School District (EUSD) with three other Alameda County school districts, Albany, Berkeley, and Oakland, based on 2007 estimates released in December 2008. The Census estimate is based on the number of children living in the district. Out of a total of an

estimated 501 school age children (children ages 5 to 17) living in the EUSD, 74 children (14.9%) lived in families with incomes below the federally defined poverty threshold. This compares to 7.5% in Albany, 11.5% in Berkeley, and 20.3% in Oakland.

Table 2-20: Children in Albany, Berkeley, Emeryville and Oakland, 2007 Estimates

	Population	Age 5-17	Percent Children	Age 5-17 in families in poverty	Percent children in poverty
Albany	16,697	2,640	15.8%	197	7.5%
Berkeley	104,104	9,889	9.5%	1,135	11.5%
Emeryville	6,980	501	7.2%	74	14.8%
Oakland	405,237	68,084	16.8%	13,842	20.3%

Source: US Census Small Area Income and Poverty Estimates (SAIPE) Program; December 2008 Release of 2007 Estimates

The Emeryville estimate above does not take into account inter-district transfers. The EUSD has approximately 800 students, of which 446 live in Emeryville. The City has taken efforts to promote affordable housing opportunities for Emeryville families. The City's Affordable Housing Set Aside (AHSA) Ordinance (inclusionary housing ordinance) requires that a preference be applied in the lotteries for new Below Market Rate housing, which enables Emeryville families to have an opportunity to apply for and obtain affordable rental or for-sale BMR housing. In some Redevelopment Agency-assisted developments, such as the Oak Walk renovated single family homes, and Adeline Place, both of which are opening in 2009, the top preference is applied for lower and moderate income families with children in the Emery Unified School District. A secondary preference for EUSD teachers with children is also being applied at the Oak Walk project.

Based on the housing needs for families with children in Emeryville, the Action Plan of the Housing Element contains policies to encourage the development of family-oriented affordable housing development which would contain appropriate unit sizes (such as three- or more bedrooms) and inclusion of amenities such as community rooms, computer lab space, and outdoor play space for a variety of ages.

Emeryville's Artists

Emeryville is a city well endowed with artists. Various groups within the city enrich the area with their talent. According to the numbers of participants who participated in the Emeryville Arts Exhibition, there are an estimated 400 artists living in the city. The Emeryville Artist Co-Op, set up by the Emeryville Redevelopment Agency, consists of 56 live-work units that are affordable to low and moderate income persons. It provides some space for resident artists, but not nearly enough to support the already sizeable

community. The City has and continues to recognize the artists currently living here and encourages the growth of the community within Emeryville. Seventeen projects in Emeryville include live-work units. The majority of these projects were completed by 2006. The Housing Action Plan contains policies to support a variety of housing types, including live/work housing and housing designed to accommodate groups such as artists.

Emeryville's City and School District Employees

It can be seen as in the public interest for city and school district employees to live in Emeryville. Workers who live nearby can spend less time and energy commuting, and essential service employees such as Fire Department and Police Department personnel are closer in case of emergency. City employees also might have more of an interest in the community than non-residents and can get to work if the regional transportation fails. The City has 163 full-time, 8 permanent part-time, and 74 seasonal employees in its employment. As of January 2009, these include 26 sworn fire personnel, 38 sworn police officers and 16 non-sworn other police personnel. Currently, 21 City employees live in Emeryville.

To encourage city and Emeryville Unified School District (EUSD) employees to live in Emeryville, the City has special assistance available through its First Time Homebuyer Program (FTHB) for both market rate units and Below Market Rate (BMR) units for these groups. The FTHB Program offers special assistance for city employees and teachers in the EUSD in which the City will provide silent-second downpayment assistance loans of up to 20% of the purchase price, with no downpayment requirement. This is greater than the maximum loan amount offered to other applicants through the FTBB equal to one and a half times the buyer's downpayment up to 15% of purchase price. Also, the City waives its first-time homebuyer requirement and the income limits, if the applicant is a teacher in the EUSD or is a City employee, although applicants purchasing BMR units must have incomes that do not exceed the moderate income limits.

Two City employees and one EUSD teacher has taken advantage of these special financing terms to purchase homes in Emeryville. While the City has made these loans available, some City employees, particularly Fire Department and Police Department personnel, and EUSD teachers have indicated that they wanted to keep their personal and work lives separate by living in a different community, to protect both their own privacy and the privacy of the residents whom they serve.

Another mechanism for encouraging residency in Emeryville is that the AHSA Ordinance includes a preference, employed when lotteries are conducted for BMR units, in which people who work in Emeryville are given second preference after people who live in Emeryville. The combination of these preferences has enabled many individuals seeking affordable rental and for-sale housing who either live or work in Emeryville to have a better chance of obtaining the housing.

Housing Characteristics

Housing Unit Production

Since 2000, Emeryville has added a substantial number of new housing units, shown in Table 2-21. According to data maintained by the Emeryville Department of Housing and Economic Development, 1,822 housing units were permitted and completed over the course of the previous January 1, 1999 – June 30, 2006 Association of Bay Area Governments (ABAG) Regional Housing Needs Allocation (RHNA) period. This represents a 42% increase in total housing units over the period, and it exceeded the City's total goal under the RHNA by 234%. A detailed accounting of the housing projects permitted and constructed during the previous RHNA period may be found in Table 2-55. An additional 175 units were completed in 2007 and 2008, for a total of 6,271 units in the City as of the end of 2008, a 47% increase over the 2000 level.

Table 2-21: Housing Unit Production 2000-2008

Total Housing Units as of 2000 Census	4,274
Units Produced Previous RHNA Period 1999-2006	1,822
Units Produced 2007-2008	175
Total Housing Units through 2008	6,271
Percent Change 2000 - 2008	47%

Source: US Census 2000, SF3, Emeryville Department of Housing and Economic Development 2008

Housing Tenure

As shown in Table 2-22, between 2000 and 2008, the balance of housing tenure (renter- versus owner-occupied) in Emeryville shifted slightly. The citywide increase in housing units between 2000 and 2008 was 47% (1,997 units), but owner occupied units were added at a faster rate (66%). The number of rental units grew substantially, but at a lower rate of growth (41%) than overall housing production. As a result, ownership units increased as a proportion of the total housing stock, from 37% of the total housing stock in 2000 to 41% of the total housing stock in 2008. Alameda County's tenure profile is still more heavily weighted toward ownership than Emeryville's. Fifty-five percent (55%) of units in the County were owner-occupied in 2000.

The growth in ownership housing built in Emeryville during the first several years of this decade reflects, in part, Bay Area-wide market conditions that favored condominium over rental apartment development. Availability of financing for condominium development and high demand fueled much of the condominium market growth during the decade. However, the downturn of the real estate market and broader economy that the Bay Area and nation have experienced since the beginning of 2008 have significantly

changed the outlook for residential development for the next several years, particularly the development of condominium projects, which are likely to not be developed in the coming two to three years.

Table 2-22: Housing Tenure Changes 2000-2008

	2000	% of Total Units	2008*	% of Total Units	% Change
Total Occupied Housing Units	3,975	100%	5,972	100%	50%
Owner Occupied	1,464	37%	2,433	41%	66%
Renter Occupied	2,511	63%	3,539	59%	41%

*Includes 1999-2006 ABAG RHNA Period as well as completed units through 12/31/08. 2000 figure based on Census and represents occupied units. 2008 figure based on City's count of completed units 2000-2008; this explains the discrepancy in total count between Table 15 and Table 16.
Source: US Census SF3, Emeryville Department of Economic Development and Housing

Housing Production by Project Size

Emeryville's housing stock was primarily shaped by three major phases of construction. Prior to 1970, single family homes and small apartments in the eastern neighborhoods typified residential housing in the City. In the 1970s and 1980s two large residential projects (Pacific Park Plaza and Watergate) together added 1,830 units. In 2000 these two projects represented 30% of the city's total housing stock. In the 1990's construction of live-work lofts, medium-density, mixed-use, and single-use residential projects typified development. Since 2000, this pattern of adding medium- to high- density housing and mixed-use housing has continued.

Both the 1990 and 2000 Census included a rough measure of housing project size by tabulating how many units were in a structure (e.g. 1 unit, 2-4 units, etc.). As shown in Table 2-23, between 1990 and 2000 Emeryville added 713 occupied housing units, an increase of 20%. The largest increase took place in structures with 50 or more units, adding 689 units; projects with 50 or more units represented 65% of the total housing stock in 2000, up from 59% in 1990. Structures with 5-19 units also registered strong growth, adding 123 units for a 52% increase. One and 2-4 unit structures made up about a quarter of the city's housing stock in 2000, down from nearly a third in 1990.

Table 2-23: Distribution of Units per Structure 1990-2000

	1990	% of Total Units	2000	% of Total Units	% Change 1990 - 2000
Total Housing Units*	3,524	100%	4,237	100%	20%
1 Unit (attached or detached)	515	15%	542	13%	5%
2-4 Units	505	14%	484	11%	-4%
5-19 Units	238	7%	361	9%	52%
20-49 Units	203	6%	198	5%	-2%
50 or more	2,063	59%	2,752	65%	33%

*Does not include "Other" (n=116) in 1990 or "RV, Vans, Boats" (n=26) in 2000
Source: US Census 1990, 2000, SF3

An estimate of unit production since 2000 shows that the city's housing production has continued to be concentrated in larger structures of 20 or more units; all other structure sizes added few or no units. As shown in Table 2-24, the largest buildings (those with 50 or more units) still make up a substantial share of new housing production, adding 1,670 units for a 61% increase. Medium sized structures (20-49 units) also more than doubled their contribution by accounting for 272 units; this category grew at a faster rate than the largest projects. In fact, the two largest categories (20-49 units and 50 and more units) were the only two to increase their proportional share of the city's housing stock.

As the largest parcels in Emeryville are developed, projects with fewer units will probably fill in the gaps. But for the time being, Emeryville's housing production is primarily in the form of large projects that can make use of economies of scale to overcome high land and remediation costs.

Table 2-24: Estimated Distribution of Units per Structure in 2000-2008

	2000*	% of Total Units	2008**	% of Total Units	% Change 2000 – 2008
Total Housing Units	4,237	100%	6,234	100%	47%
1 Unit (attached or detached)	542	13%	542	9%	0%
2-4 Units	484	11%	487	8%	<1%
5-19 Units	361	9%	373	6%	3%
20-49 Units	198	5%	470	8%	137%
50 or more	2,752	65%	4,422	71%	61%

*Does not include "Other" (n=116) in 1990 or "RV, Vans, Boats" (n=26) in 2000.
**Figures are imputed and use vacancy rate from 2000
Sources: US Census 2000, SF3; Emeryville Department of Housing and Economic Development, 2008

Housing Unit Characteristics

As defined by the U.S. Census Bureau, "rooms" include living rooms, dining rooms, bedrooms, and dens, but not kitchens, bathrooms, or closets. Emeryville's average housing unit has fewer rooms than those in Alameda County or statewide, by a factor of almost two. Interestingly, the city's rooms per capita figure in 2000 was somewhat higher than in Alameda County or California. This means that while Emeryville's units tend to have fewer rooms, its households also tend to be proportionally smaller.

Table 2-25: Rooms per Unit Indices 1990 - 2000

	1990	2000	Alameda County	California
Median Rooms per Unit	n/a	3	4.8	4.8
Average Rooms per Unit	3.4	3.3	5	5
Rooms per Capita	2.1	2.3	2	1.7

Source: US Census 1990, 2000 SF3

Emeryville tripled the number of one-room housing units between 1990 and 2000, from 311 to 944. As a share of total occupied housing units, one-room units increased from 9% to 22%. There is no information available about the total square footage of these units, but it can be assumed that they consist of studios or lofts. Two-room units grew modestly. Interestingly, there was a net decrease in three- and five-room units. This could be attributed to the subdivision of houses into separate condo units, differences in interpretation of "room" between 1990 and 2000 census, and/or a statistical aberration due to sampling variation.

Table 2-26: Rooms Per Unit 1990 - 2000

	1990	% of Total Units	2000	% of Total Units	% Change 1990 - 2000
Total Housing Units	3,640	100%	4,274	100%	17%
1 Room	311	9%	944	22%	204%
2 Rooms	632	17%	739	17%	17%
3 Rooms	1,186	33%	877	21%	-26%
4 Rooms	749	21%	955	22%	28%
5 or more	762	21%	759	18%	0%

Source: US Census 1990, 2000, SF3

Another example of Emeryville's unique housing stock is the preponderance of studio or loft, one-bedroom, and two-bedroom units. In 2000 these unit types accounted for 93% of the city's housing stock, compared with 54% in Alameda County. Growth in no-bedroom units has been the strongest; between 1990 and 2000 the city added 560 studio or loft units, a 119% increase. One-bedroom units declined slightly, but still comprise the largest share of Emeryville's housing stock. It is notable that three-bedroom units grew at approximately the same rate as overall housing units, and in 2000 represented 6% of the city's housing stock (compared with 29% in Alameda County).

Table 2-27: Bedrooms per Unit 1990 - 2000

	1990	% of Total Units	2000	% of Total Units	% Change 1990 - 2000
Total Housing Units	3,640	100%	4,274	100%	17%
No Bedroom	471	13%	1,031	24%	119%
1 Bedroom	1,812	50%	1,758	41%	-3%
2 Bedrooms	1,080	30%	1,182	28%	9%
3 Bedrooms	219	6%	253	6%	16%
4 Bedrooms	58	2%	45	1%	-22%
5 or more	0	0%	5	0%	n/a

Source: US Census 1990, 2000 SF3

Overcrowding

Overcrowded units, as defined by the U.S. Census Bureau, have 1.10 to 1.50 persons per room; "Severely Overcrowded" units have 1.51 or more persons per room. The number of Emeryville's overcrowded units increased dramatically between 1990 and 2000, at an overall rate of 66%, and increased the proportion of overcrowded units to total occupied housing units from 7% to 9%, as noted in Table 2-28. Broken down by "overcrowded" and "severely overcrowded", the former more than doubled. Severely overcrowded units increased at a high rate (41%), and continued to represent the highest proportion of overcrowded units, 5% of the citywide occupied housing units.

It should be noted, however, that this definition may overstate whether there is, indeed, an overcrowding problem in Emeryville. For example, a large loft unit that technically consists of one room housing two people would be considered "Severely Overcrowded" (2 persons per room). A two-bedroom, two-bath unit with a living room housing a family of four would be classified as "Overcrowded" (1.33 persons per room). Furthermore, Emeryville's overcrowding rates are somewhat lower than those of Alameda County or the State of California. In 2000 Alameda County's overcrowded units accounted for 12% of all occupied units (5% overcrowded, 7% severely overcrowded), and statewide, 15% of all units were overcrowded (6% overcrowded, 9% severely overcrowded).

Table 2-28: Overcrowded Housing Units

	1990	% of Total Units	2000	% of Total Units	% Change 1990 - 2000
Total Occupied Housing Units	3,227	100%	3,975	100%	23%
Total Overcrowded Units	223	7%	370	9%	66%
Overcrowded Units	71	2%	155	4%	118%
Severely Overcrowded Units	152	5%	215	5%	41%

Source: US Census 1990, 2000, SF3

Table 2-29 shows overcrowding data by tenure. In 2000, most overcrowded units were renter-occupied (288 out of 370 total overcrowded units, or 78%), with an even split between overcrowded and severely overcrowded. Overcrowded owner-occupied units represent a very small share of the total 3,975 occupied housing units in 2000 (82 units, or 2%), but the vast majority of them are classified as severely overcrowded. To address overcrowding, the Housing Element includes policies to promote the supply of larger sized family units with three and more bedrooms, and to expand affordability by working with affordable housing developers to develop multi-family rental developments with larger sized units.

Table 2-29: Overcrowding by Tenure in 2000

	Owner Occupied	% of Total Units	Renter Occupied	% of Total Units
Total Occupied Housing Units	1464	100.0%	2511	100.0%
Overcrowded Units	9	0.2%	146	3.7%
Severely Overcrowded Units	73	1.8%	142	3.6%
Combined Overcrowded Units	82	2.1%	288	7.2%

Source: US Census 2000, SF3

Table 2-30 reports densities for a selection of projects and neighborhoods in Emeryville. Density is equal to units per gross residential acre (an acre being 43,560 square feet). Gross residential acres include public or private internal roads and open spaces in addition to the building coverage area. The projects are listed in descending order by density. The 30-story Pacific Park Plaza is the densest project in the city. Emeryville's early 20th century neighborhoods have lower densities. Those projects completed or proposed after 2000 have densities of at least 39 units to the acre. Interestingly, the second densest prospect is a midrise building

Table 2-30: Densities of Selected Projects and Residential Areas

Project	Location	Units	Acres	Units/Gross Acre	Year Built
Pacific Park Plaza	6363 Christie Ave.	583	5.86	99.5	1981
Icon at Park Apartments	1401 Park Ave.	54	0.60	90.0	2007
Bridgewater Condos	6400 Christie Ave.	424	5.90	71.9	1988
Archstone-Emeryville	6401 Shellmound	260	3.70	70.3	1993
Emeryville Warehouse Lofts	1500 Park	141	1.70	82.9	2000
Andante Condos	3998 San Pablo Ave.	125	1.83	68.3	2006
Courtyards at 65th Apartments	1465 65th St.	331	4.80	69.0	2004
Key Route Lofts	Adeline and 40th	22	0.30	73.3	2006
Bridgecourt Apartments	1325 40th St.	220	3.90	40.2	1997
Avalon Senior Apartments	3850 San Pablo Ave.	67	1.19	56.3	2000
Terraces at Emery Station	5855 Horton St.	101	2.00	50.5	2002
Glashaus Condos	65th St./Hollis St.	145	3.60	40.3	2008
Watergate Condominiums	Powell St.	1,247	25.90	48.1	1971
Oliver Lofts Condos	1200 65th St.	50	1.07	46.7	2002
Blue Star Corner	Hubbard St.	20	0.50	40.0	2007
Windsor at Bay Street Apartments	Bay St.	284	19	19.9	2006
Bay Street One Condos	Bay St.	95	2.40	39.6	2006
Liquid Sugar Condos	1284 65th St.	55	1.40	39.3	2003
Oak Walk Condos / Townhomes	41st and San Pablo	53	1.49	39.0	2009
Elevation 22 Condos	1300 Powell St.	71	1.82	39.0	2004
Triangle Court Apartments	1063 – 69 45th St.	20	0.91	22.0	1994
Emery Bay Village Condos	Temescal/Emery Bay	112	6.80	16.5	1979
Neighborhood					
Triangle (East of San Pablo)				22.3	
53rd-54th Street				22.0	
Doyle Street – south of Powell				21.9	
Doyle Street – north of Powell				20.8	

Source: City of Emeryville Planning Department 2007

Housing Conditions

In 2007 city staff surveyed the exterior conditions of houses in the city's original early 20th century neighborhoods, using a uniform rating system to classify each structure. The survey results (shown in Table 2-31) found that 75% of the units in these neighborhoods had only one or two minor problems or no problems at all (Units with an "A" or "B" rating). This was a reduction from city staff's 2001 survey, which found that 78% of the units had an "A" or "B" rating. Units with a "C" rating--two to three major problems or three to four minor problems--comprised about a quarter of the these units (compared with 19% in 2001). While it may appear that these neighborhoods have higher proportion of "C"-rated units than in 2001, it should be noted that the survey method and interpretation of structural problems were not exactly the same.

Table 2-31: Conditions Survey of Early 20th Century Neighborhoods

			Unit Condition Ratings							
Neighborhood	Structures	Units	A*		B		C		D	
Adeline South	13	23			22	96%	1	4%	0	
Triangle	281	601	81	13%	340	57%	178	30%	2	0.3%
Doyle South	72	132	34	26%	60	45%	37	28%	1	1%
Doyle North	150	305	40	13%	218	71%	40	13%	7	2%
Total and % of Total**	516	1061	155	15%	640	60%	256	24%	10	3%

*Grades: A (no problems), B (1-2 minor problems), C (2-3 major/3-4 minor), D (3-4 major), F (>5 major; dilapidated)

**Total percentages do not equal 100%, due to rounding.

Source: City of Emeryville Planning Division

The housing conditions survey rated the housing stock on nine different factors including roofs, walls, foundations, paint, and yard upkeep. Overall, the majority of problems were minor in nature. None of the four neighborhoods surveyed had a disproportionately large share of minor or major problems, with the exception of paint; about 10% of units in both Doyle Street neighborhoods had major paint problems. Eleven percent of the units in the Doyle Street South neighborhood had major landscaping problems.

The incidence of minor problems consisted mainly of paint (chipping or fading) and landscaping (unkempt lawns, broken concrete walkways, etc.). Major problems also consisted mainly of paint, with 75 units (7% of total units surveyed) in structures that have severely deteriorated paint on one or more exterior walls. Units accessed by badly sagging or deteriorated porches or stairs made up 57 or 5% of total units surveyed.

Table 2-32: Housing Problem Breakdown by Units

			Maintenance or repairs needed by building component (# and % of units needing work)																	
Neighborhood	Units	Severity	Roof		Walls		Foundation		Porch/ Stairs		Paint		Doors		Windows		Trash		Landscaping	
Adeline South	23	Minor	2	9%	1	4%	1	4%			3	13%			4	17%	4	17%	10	43%
		Major																		
Triangle	601	Minor	67	11%	124	21%	16	3%	125	21%	203	34%	29	5%	123	20%	17	3%	205	34%
		Major	18	3%	3	0%	1	0%	46	8%	29	5%			23	4%	12	2%	7	1%
Doyle South	132	Minor	31	23%	19	14%			16	12%	44	33%	8	6%	17	13%	21	16%	30	23%
		Major							4	3%	15	11%			3	2%			15	11%
Doyle North	305	Minor	41	13%	34	11%			52	17%	131	43%	14	5%	61	20%	4	1%	107	35%
		Major	7	2%					7	2%	31	10%					16	5%	1	0%
Total	1,061	Minor	141	13%	178	17%	17	2%	193	18%	381	36%	51	5%	205	19%	46	4%	352	33%
		Major	25	2%	3	0%	1	0%	57	5%	75	7%	0	0%	26	2%	28	3%	23	2%

Source: City of Emeryville Planning Division

The survey also broke down problems by structure, because many of the housing units in these neighborhoods are in multi-unit buildings. Because incidence of problems is divided by the number of structures and not units, in general the percentage of incidence is higher. Conversely, of course, repairs and maintenance performed on multi-unit buildings will reduce the number of units with problems at a higher rate.

As with units, the distribution of minor and major problems in each factor across the four neighborhoods was fairly even. Landscaping and paint top the incidence of factors, with 67% and 65% of structures having these problems, respectively. The top major factor was paint, with 16% of all structures having seriously deteriorated paint on one or more exterior wall.

Table 2-33: Housing Problem Breakdown by Structures

Neighborhood	Structures	Severity	Roof		Walls		Foundation		Porch/ Stairs		Paint		Doors		Windows		Trash		Landscaping	
Adeline South	13	Minor	2	15%	1	8%	1	8%			3	23%			1	8%	2	15%	5	38%
		Major																		
Triangle	281	Minor	36	13%	56	20%	6	2%	62	22%	89	32%	17	6%	49	17%	12	4%	95	34%
		Major	8	3%	2	1%	1	0%	10	4%	14	5%			9	3%	9	3%	4	1%
Doyle South	72	Minor	13	18%	13	18%			9	13%	25	35%	4	6%	10	14%	9	13%	20	28%
		Major	3	4%					3	4%	10	14%			2	3%			5	7%
Doyle North	150	Minor	23	15%	23	15%			30	20%	49	33%	4	3%	27	18%	2	1%	51	34%
		Major	4	3%	4	3%			3	2%	16	11%					9	6%	1	1%
Total	516	Minor	74	29%	93	36%	7	3%	101	40%	166	65%	25	10%	87	34%	25	10%	171	67%
		Major	15	6%	6	2%	1	0%	16	6%	40	16%	0	0%	11	4%	18	7%	10	4%

Source: City of Emeryville Planning Division

Emeryville's Housing Rehabilitation Program provides funding for the replacement of chain-link fences with wrought iron. .The City had a Security Bar Retrofit program which replaced fixed bars with operational bars. The program was put on hold due to issues regarding approved bars and uses. The housing condition survey found the highest concentration of units with door bars in the Doyle South neighborhood, where 25% had them installed. Window bars were evenly distributed, for an average of 7% of units in all four neighborhoods. Chain-link fences were most common in both Doyle North and South neighborhoods, with 8% and 9%, respectively.

Table 2-34: Units with Doors/Window Bars, and Chain-link fences

Neighborhood	Door bars	% of Neighborhood	Window bars	% of Neighborhood	Chain-link fences	% of Neighborhood
Adeline South	3	13%	5	22%	4	17%
Triangle	102	17%	46	8%	23	4%
Doyle South	33	25%	8	6%	11	8%
Doyle North	39	13%	22	7%	27	9%
Total and % of All Units	177	16%	81	7%	65	6%

Source: City of Emeryville Planning Division

Income Characteristics

Mean and Median Incomes

Table 2-35 shows the reported and projected Mean Household Income from 2000 to 2010 for Emeryville, its surrounding cities, and Alameda County. Household median income steadily increased in Emeryville between 2000 and 2005 and is projected to increase at the same pace through 2010.

Table 2-35: Mean Household Income for Emeryville and Surrounding Cities

	2000	2005	2010
Emeryville	$70,900	$73,200	$75,400
Oakland	$70,500	$68,800	$72,600
Berkeley	$84,300	$83,500	$88,500
Alameda County	$90,300	$88,500	$92,900

Source: ABAG 2000 and 2007 Projections

Table 2-36 compares median income by family type in Emeryville and the County as of 1999. In 1999 Emeryville's median non-family household income was almost $2,000 higher than that of Alameda County. However, the median family household in Emeryville earned almost $8,800 less than its Alameda County counterpart. Per capita income in Emeryville was higher than Alameda County, reflecting a population made up of proportionally fewer children and a smaller non-working population.

Table 2-36: Household Income Indices in 1999

	Emeryville		Alameda County
Median household income	$ 45,359	$	55,946
Median Family Income	**$ 57,063**	$	65,857
Median Non-family Income	**$ 38,664**	$	36,795
Per Capita Income	$ 33,260	$	26,680

Source: US Census 2000, SF3

Median household income projections between 1999 and 2006 are shown in Table 2-37. In 2006 the median household income in Emeryville was estimated at $48,876, an 8% increase over 1999. The median family household fared better than all households, experiencing a 19% increase. Per capita income also increased at a healthy rate of 13%. In both 1999 and 2006 the median Emeryville household had an income about 80% of that in Alameda County. Similarly, the median family income in Emeryville was about 90% of that in Alameda County. Non-family median income information was not available for 2006.

Table 2-37: Projected Comparative Income Indices 1999-2006

	Emeryville			Alameda County		
	1999	2006	% Change	1999	2005	% Change
Median household income	$ 45,359	$ 48,876	8%	$ 55,946	$ 61,014	9%
Median Family Income	$ 57,063	$ 68,080	19%	$ 65,857	$ 74,662	13%
Median Nonfamily Income	$ 38,664	n/a		$ 36,795	n/a	
Per Capita Income	$ 33,260	$ 37,472	13%	$ 26,680	$ 30,943	16%

Source: US Census 2000, SF3; ACS 2005; Claritas Demographic Snapshot Report, 2007

Household Income Characteristics

Table 2-38 shows projections of Emeryville's households by income level from 1999 to 2006. There is a trend toward growth in higher earning households. Only households earning $50,000 and more grew at a faster rate than total household growth (27%). Households earning less than $50,000 all increased in number but declined slightly as a proportion of total households. The fastest growth rate was among households earning $150,000 and more, at 57%. Households earning $50,000 or more accounted for 49% of all households, up from 45% in 1999.

Table 2-38: Household Incomes 1999

	1999		2006		% Growth in Income Bracket 1999-2006
Total Households	3,968	100%	5,056	100%	27%
Less than $15,000	622	16%	749	15%	20%
$15,000 to $24,999	502	13%	560	11%	12%
$25,000 to $34,999	433	11%	522	10%	21%
$35,000 to $49,999	628	16%	753	15%	20%
$50,000 to $74,999	746	19%	982	19%	32%
$75,000 to $99,999	443	11%	587	12%	33%
$100,000 to $149,999	391	10%	584	12%	49%
$150,000 and more	203	5%	319	6%	57%

Sources: US Census 2000, SF3; Claritas Demographic Snapshot Report, 2007

Family households demonstrate an even more dramatic shift in income levels, shown in Table 2-39. According to projections, the only family household income group earning below $75,000 per year to increase at a greater rate than the overall family household growth rate were those earning $15,000 to $24,999. This income group maintained its proportional share of 5% total family households, while the remaining groups below $75,000 declined. The largest percentage increase was among those earning $150,000 or more, at 82%. Families earning $50,000 or more in 2006 accounted for 63% of the city's total family households, up from 58% in 1999.

Table 2-39: Emeryville Family Household Income

	1999		2006		% Growth in Income Bracket 1999-2006
Total Family Households	1,186	100%	1,484	100%	25%
Income Less than $15,000	132	11%	131	9%	-1%
Income $15,000 - $24,999	60	5%	76	5%	27%
Income $25,000 - $34,999	119	10%	132	9%	11%
Income $35,000 - $49,999	201	17%	210	14%	4%
Income $50,000 - $74,999	247	21%	267	18%	8%
Income $75,000 - $99,999	162	14%	266	18%	64%
Income $100,000 - $149,999	173	15%	235	16%	36%
Income $150,000 - or more	92	8%	167	11%	82%

Sources: US Census 2000, SF3; Claritas Demographic Snapshot Report, 2007

Non-family households, which in 2000 represented 70% of Emeryville's population, exhibit a slightly more even growth by income bracket, but have also tended to skew toward the higher income levels, shown in Table 2-40. Only those earning $15,000 to $24,999 and $75,000 to $99,999 grew at markedly lower rates than the overall non-family growth rate of 28% (10% and 14%, respectively). The highest growth rates were clustered in those groups earning $50,000 and above (with one exception, those earning $75,000-$99,999), with the highest growth rate among those earning $100,000 to $149,999 (60%). Non-family households earning $50,000 or more represented 43% of non-family households in 2006, a slight increase from 40% in 1999.

Table 2-40: Emeryville Non-family Income

	1999		2006		% Growth in Income Bracket 1999-2006
Total Non-family Households	2,782	100%	3,572	100%	28%
Income Less than $15,000	490	18%	618	17%	26%
Income $15,000 - $24,999	442	16%	484	14%	10%
Income $25,000 - $34,999	314	11%	390	11%	24%
Income $35,000 - $49,999	427	15%	543	15%	27%
Income $50,000 - $74,999	499	18%	715	20%	43%
Income $75,000 - $99,999	281	10%	321	9%	14%
Income $100,000 - $149,999	218	8%	349	10%	60%
Income $150,000 - or more	111	4%	152	4%	37%

Sources: US Census 2000, SF3; Claritas Demographic Snapshot Report, 2007

In sum, family households added to Emeryville between 1999 and 2006 have tended to be wealthier. In 2006 they made up approximately half of the top earning households in the city, while representing just a minority of total households. In contrast, growth of non-family households was more evenly distributed, but also skewed toward the higher income brackets. See Figures 2-1 and 2-2.

Figure 2-1

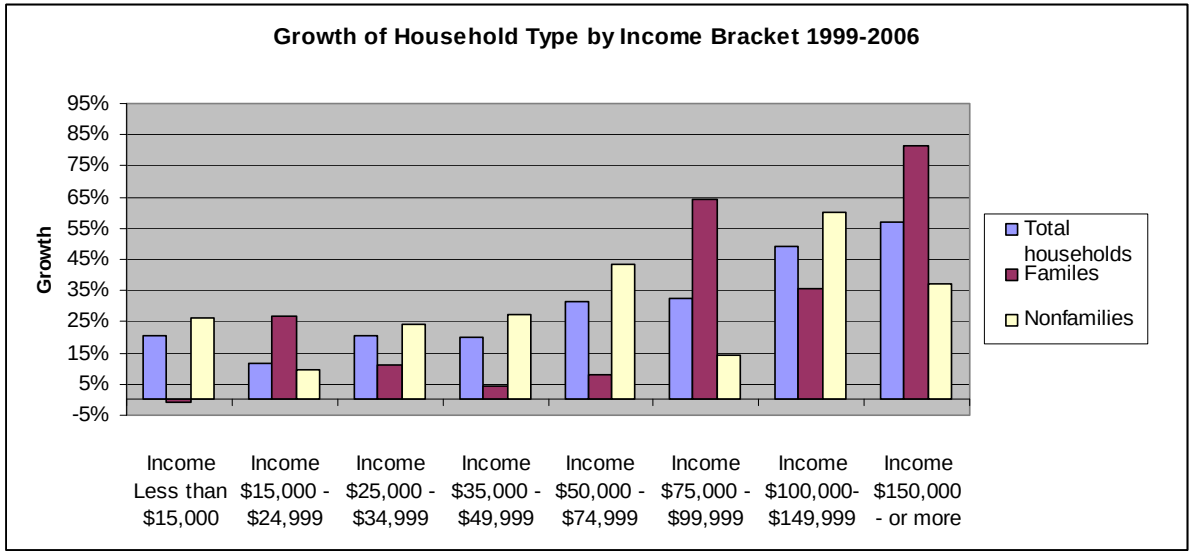
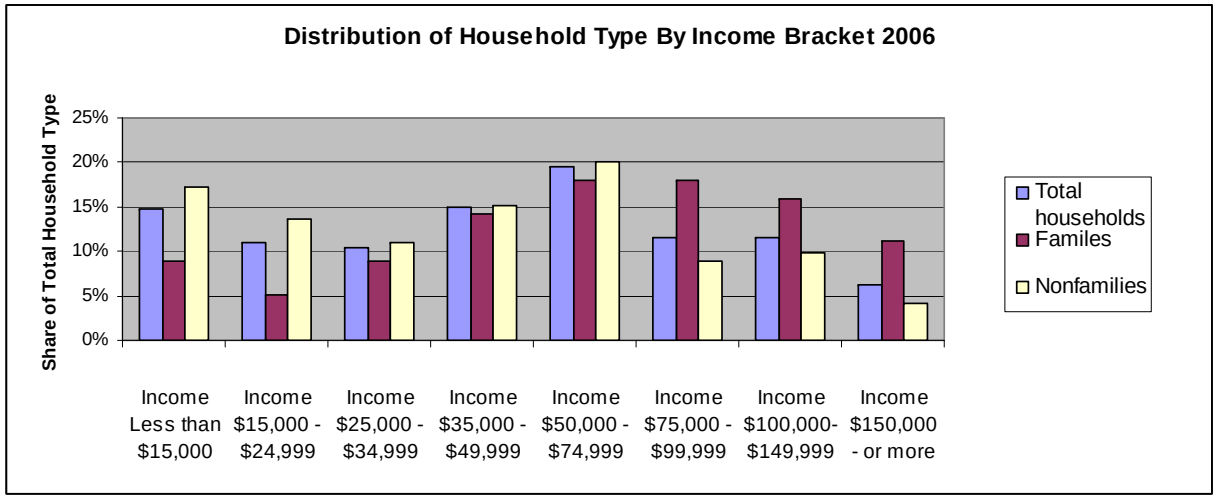


Figure 2-2



Emeryville's Public Benefits Recipients

In 1999, 13% of Emeryville residents had incomes below the federal poverty level, which at that time was $17,050 (U.S. Census, 2000). The federal poverty level was established in 1964 and has been adjusted only for inflation since that year. It does not take into account regional variations in the cost of living. Therefore, many localities use the Self-Sufficiency Standard to measure poverty as it is modified to account for geographical differences in the costs of child care, housing, transportation, and health care. The Self-Sufficiency Standard for Alameda County in 2000 was calculated to be $46,976 ($45,965 in 1999 dollars) annually for a family of two adults with a preschooler and a school-age child; this is 276% of the 2000 federal poverty guideline of $17,050. In 1999, 39% of 4-person families in Emeryville had a family income of less than $45,000 (U.S. Census, 2000), indicating that a large proportion of Emeryville families may not be meeting this Self-Sufficiency Standard.

While data is not available for 1989, approximately 4% of the city's households received Supplemental Social Security (SSI) in 1999. The number of households receiving public assistance income declined by about one-third between 1989 and 1999. This could be attributable to Federal Welfare reform in the mid-1990s, successful transition to full-time employment, or these households moving out of the city. The number of households with retirement income increased slightly, indicating that retirees did not move to Emeryville at the same rate as the working population during this period. In all, 10% of Emeryville's households in 1999 received some form of retirement income, with an average annual income of $18,000. Data is shown in Table 2-41.

Table 2-41: SSI, Public Assistance, Retirement Income

	1989	% of Total Households	1999	% of Total Households	% Change 1989 - 1999
Total Households	3,204	100%	3,968	100%	24%
Receiving Supplemental Social Security (SSI)*	n/a		153	4%	
Mean SSI Income			$ 8,175		
Receiving Public Assistance Income	165	5%	113	3%	-32%
Mean Public Assistance Income			$ 3,794		
With Retirement Income	401	13%	413	10%	3%
Mean Retirement Income			$ 18,135		

*Not collected in 1990 Census

Source: US Census 1990, 2000 SF3

According to the Alameda County Social Services Agency**,** the distribution of public benefits recipients in Emeryville was as follows for the third quarter of 2004: 123 CalWORKs recipients; 438 MEDI-CAL only recipients; 168 food stamps recipients; 33 general

assistance recipients. Based on these figures, the percentage of public benefits recipients in the City (0.6 – 0.7% of the Alameda County recipients per category) appears to be in line with the City's current share of Alameda County's population (0.5% of the Alameda County population).

CalWORKs (California Work Opportunity and Responsibility to Kids), a state-wide program operated locally by county welfare departments, is a temporary financial assistance program for low-income families with children; as an employment-based program, it requires employable adults to participate in work-related activities in order to receive aid. A report on the Alameda County CalWORKs Needs Assessment and Outcomes Study, released in December 2002, was conducted to assess the associations of barriers with welfare, work, and income and to determine critical service and treatment elements for programs that may assist Alameda County in better addressing the service needs of its welfare clients. During this study, over 400 CalWORKs cash benefit recipients were interviewed at a baseline date and then again 15 months and 27 months later.

Barriers to employment and successful welfare departure were experienced by the majority of the respondents in the CalWORKs Needs Assessment and Outcomes Study. Over 80% of those interviewed were facing one or more of these barriers, including logistic barriers (such as problems with transportation), health-related barriers (such as alcohol dependency, daily illegal drug use, partner violence), and family responsibility barriers (such as lack of child care or a new pregnancy). During the course of the CalWORKs Needs Assessment study, the prevalence of those facing a housing barrier (defined as living in temporary housing or homeless in the past year) increased by 1.2%.

Housing Affordability

Household Income Characteristics

Table 2-42 provides detail on the tenure by income level for households in Emeryville. In 2000, 45.2% of Emeryville's households were at less than 80% of the Median Family Income (MFI) for Alameda County. The MFI for Alameda County was $69,200. Renter households were more likely to be below 80% of the MFI than owner households, with approximately 55% of renter households in this category and just 30% of owner households in this category. Forty percent (40%) of renter households were either extremely low income (defined as households with less than 30 percent of area median income) or very low income (households between 31 and 50 percent of area median income), for a total of 982 households. Together, extremely and very low income owner households represented 17.6% of total owner households.

Table 2-42: Households by Income Level, 2000

	Renter Households	As % of Total Renter Hhs	Owner Households	As % of Total Owner Hhs	Total Households	As % of Total Households
Extremely Low Income <30% MFI	560	22.4%	115	7.8%	675	16.9%
Very Low Income 31-50% MFI	422	16.9%	145	9.8%	567	14.2%
Low Income 51-80% MFI	374	15.0%	184	12.4%	558	14.0%
Above Low Income >80% MFI	1,144	45.8%	1,039	70.1%	2,183	54.8%
Total Households	2,500	100.0%	1,483	100.0%	3,983	100.0%

Note: "MFI" is Median Family Income
Extremely Low Income level - $20,750; Very Low Income - $34,600; Low Income - $50,050; MFI - $69,200
Source: State of the Cities Data Systems: Comprehensive Housing Affordability Strategy (CHAS) Data

Extremely Low Income Households Needs

In 2000, there were 675 households in Emeryville who were extremely low income (nearly 17% of the total households). This corresponds to an annual income of $20,750 or less for a four-person household. Of these, the majority were renter households (560 households, representing 22.4% of total renter households) and 115 were owner households (7.8% of the total owner households). Households with extremely low incomes have a variety of housing situations and needs. Most families receiving public assistance income or disability insurance are considered extremely low income households. Depending on household size, many minimum wage occupations would be considered extremely low income with an annual income of $16,640 or less based on the State of California minimum wage of $8.00 in effect as of January 1, 2008.

Housing Element law requires analysis of the projected housing needs for extremely low income households, including an estimate of the number of projected households with extremely low incomes. Since updated Census data is not available from the 2000 Census on

the number of households in this subset of the very low income category, pursuant to State Housing Element law the City has presumed that one half of the Regional Housing Need Allocation (RHNA) for the very low income level qualifies as extremely low income households. The RHNA assigned for the very low income level for the 2006-2014 period is 186 units; as a result, half of this amount, or 93 units, is the projected extremely low income housing need. It is likely, based on the 2000 Census CHAS data, that most of these households will face cost burden unless housing is provided at an affordable housing cost. Some of the households may be special needs households and require supportive services. To address the needs of extremely low income households, the Housing Element includes in its Housing Action Plan programs and policies to support the inclusion of affordable units for this income level in Redevelopment-Agency sponsored projects where possible, to seek leveraging of Redevelopment Agency funding by other state and federal funding sources to support deeper targeting of units' affordability, the promotion of a variety of housing types, and encouraging the provision of supportive services in affordable housing developments for specific special needs populations.

Rent Burden and Housing Costs

It is important to consider housing affordability and housing problem measures for lower income households, particularly extremely low income households, to determine housing needs An important measure of housing affordability is how much of a household's income is devoted to rent. A household is considered to be overpaying for housing, and is "cost burdened" if it spends more than 30% of its gross income on housing. Severe housing cost burden occurs when a household pays more than 50% of its income on housing. The prevalence of overpayment varies by income, tenure, household type and household size.

Data from the Comprehensive Housing Affordability Strategy documents cost burden as well as other housing problems. "Housing problems" are defined as cost burden greater than 30% of income and/or overcrowding and/or without complete kitchen or plumbing facilities. As shown in Table 2-43, nearly half (49.3%) of all households in Emeryville in 2000 had housing problems, 42% were cost burdened and 20.7% were severely cost burdened. Renter households were relatively more likely to have housing overpayment problems than owner households overall.

Table 2-43: Emeryville Households with Cost Burden and other housing problems

	Renter Households	Owner Households	Total Households
Extremely Low Income <30% MFI	**560**	**115**	**675**
% Hhs with any housing problems	72.3%	60.9%	70.4%
% Hhs with Cost Burden	65.2%	60.9%	64.4%
% Hhs with Severe Cost Burden	58.0%	52.2%	57.0%
Very Low Income 31-50% MFI	**422**	**145**	**567**
% Hhs with any housing problems	91.7%	89.7%	91.2%
% Hhs with Cost Burden	87.4%	89.7%	88.0%
% Hhs with Severe Cost Burden	45.0%	55.2%	47.6%
Low Income 51-80% MFI	**374**	**184**	**558**
% Hhs with any housing problems	76.2%	73.4%	75.3%
% Hhs with Cost Burden	57.5%	67.9%	60.9%
% Hhs with Severe Cost Burden	10.7%	32.6%	17.9%
Above Low Income >80% MFI	**1,144**	**1,039**	**2,183**
% Hhs with any housing problems	21.8%	29.3%	25.3%
% Hhs with Cost Burden	15.6%	22.1%	18.7%
% Hhs with Severe Cost Burden	0.0%	5.8%	3.2%
Total Households	**2,500**	**1,483**	**3,983**
% Hhs with any housing problems	53.0%	43.1%	49.3%
% Hhs with Cost Burden	45.1%	37.4%	42.3%
Total Hhs with Cost Burden	1,128	555	1,685
% Hhs with Severe Cost Burden	22.6%	17.5%	20.7%
Total Hhs with Severe Cost Burden	565	260	824

Note: MFI is Median Family Income; Source: State of the Cities Data Systems: Comprehensive Housing Affordability Strategy (CHAS) Data, 2000

Table 2-43 demonstrates how housing problems, particularly cost burden, affect households living below 80% of the area median income. Amongst extremely low income and very low income households, the problems of overpayment are most acute, as the majority of households in these income categories experience housing problems of some kind, whether they are renter or owner

households. This data suggests the affordability gap between market rents and for-sale housing and affordable housing costs for lower income households.

Cost burden (overpayment) also fluctuates by household type and size in Emeryville, as shown in Table 2-44. Overall, cost burden is predominantly found in the "All Other Households" category. Sixty-six percent of all renter households with cost burden fell into this category, followed next by small related households (19.3% of the total.) Fifteen percent of renter households with cost burden were elderly. The statistics shift somewhat for owner households. The "other households" category had the majority of those with cost burden, followed next by elderly households, representing 26% of the total owner households with cost burden, followed by small related households (20.7%). Large families represented a small portion of total households with cost burden issues. Most housing problems related to this household type relate to overcrowding issues.

Table 2-44: Households with Cost Burden by Household Type

	Renter Households	As % of Total Renter Hhs with Cost Burden	Owner Households	As % of Total Owner Hhs with Cost Burden
Elderly 1 and 2 member households	165	14.6%	145	26.1%
Small Related (2-4)	218	19.3%	115	20.7%
Large Related (5 or more)	0	0.0%	10	1.8%
All other households	745	66.0%	285	51.4%
Total Households with Cost Burden	1,128	100.0%	555	100.0%

Table shows number of households with cost burden by particular household type. Source: State of the Cities Data Systems: Comprehensive Housing Affordability Strategy (CHAS) Data, 2000

To address the housing issues raised by overpayment and other housing problems, the Housing Action Program of this Housing Element promotes the development of affordable housing for a range of income levels in order to reduce the incidence of housing problems including cost burden, particularly for those living at the lower income levels.

Rental Market Conditions

In February 2009, city staff sampled the average market rents and units of several large rental projects. The data from this rent survey is shown in Table 2-45. Rents for a studio ranged from $1,645 to $1,850 per month; one bedroom units ranged from $1,423 to $2,235; two bedroom units had rents ranging from $1,865 to $2,860; and three bedroom units (or two bedroom with loft) ranged from $1,945 to $3,795.

Table 2-45: Rental Housing Market Rent and Unit Size

Unit Type	Project	Average Rent	Average Sq Ft	Rent/Sq Ft
Studio				
	Archstone	$1,645	575	$2.86
	Avenue 64	$1,703	549	$3.10
	Bakery Lofts	$1,850	720	$2.57
1BR/1BA				
	Archstone	$1,930	695	$2.78
	Avenue 64	$2,063	751	$2.75
	Bakery Lofts	$1,925	1,100	$1.75
	Bay Street by Windsor	$1,581	695	$2.27
	Bridgecourt	$1,423	788	$1.81
	Courtyards @ 65th	$2,235	714	$3.13
2BR/1BA				
	Archstone	$2,381	935	$2.55
2BR/2BA				
	Avenue 64	$2,763	1,095	$2.52
	Bay Street by Windsor	$2,860	1,229	$2.33
	Bridgecourt	$1,865	1,052	$1.77
	Courtyards @ 65th	$2,198	1,025	$2.14
3BR/2BA or 2BR Loft				
	Archstone	$2,660	1,208	$2.20
	Bay Street by Windsor	$3,795	1,424	$2.67
	Bridgecourt	$1,945	1,194	$1.63

Source: City of Emeryville, Economic Development and Housing Department, Survey conducted February 2009

Table 2-46 shows a sample of occupational wages and the maximum affordable monthly housing expenses corresponding to that wage.

Table 2-46: Sample of Occupational Wages

Profession	Hourly Wage	Average Annual Wage	Percent of Area Median Income (a)	Maximum Affordable Housing Expense (b)
Moderate Income Occupations (up to $90,500 for a family of 3)				
Financial Analyst	$ 41.63	$ 86,590	115%	$ 2,526
Architect	$ 40.63	$ 84,510	112%	$ 2,465
Computer Systems Analyst	$ 38.73	$ 80,558	107%	$ 2,350
Real Estate Sales Agent	$ 33.16	$ 68,973	91%	$ 2,012
Chemist	$ 31.57	$ 65,666	87%	$ 1,915
Low Income Occupations (Up to $59,600 for a family of 3)				
Drywall Installer	$ 27.32	$ 56,826	75%	$ 1,421
Property, Real Estate & Community Association Mgr	$ 26.42	$ 54,954	73%	$ 1,374
Graphic Designer	$ 25.89	$ 53,851	71%	$ 1,346
Chemical Technician	$ 19.32	$ 40,186	53%	$ 1,005
Secretary, Except Legal, Medical, and Executive	$ 18.11	$ 37,669	50%	$ 942
Very-Low Income Occupations (Up to $37,700 for a family of 3)				
Order Clerk	$ 15.91	$ 33,093	44%	$ 827
Bus Driver, School	$ 15.20	$ 31,616	42%	$ 790
Cook	$ 13.72	$ 28,538	38%	$ 713
Retail Salesperson	$ 12.88	$ 26,790	36%	$ 670
Maids and Housekeeping Cleaner	$ 10.98	$ 22,838	30%	$ 571

Source: 2007 CA EDD Occupational Employment Statistics for the Oakland Primary Metropolitan Statistical Area, 2006
Notes: (a) Assumes one wage earner per family of three, (b) Maximum monthly housing expense defined as 35% of total income for moderate income households and 30% of income for low and very-low income households

When comparing average rents and the selection of representative occupations, families of three persons with incomes between $38,750 and $59,600 per year (i.e. low income families with incomes between 51 and 80% of the area median income for 2008) have to spend more than 30% of their income on rent for a typical market rate two-bedroom unit in Emeryville. For example, a three-person family where the sole earner works as a drywall and ceiling tile installer and can devote $1,421 a month to rent, but the lowest average two bedroom unit identified by the survey is $1,865 per month. Furthermore, housing production in the city has been overwhelmingly concentrated in studio and loft units without separate bedrooms. Another perspective, however, is that rents in Emeryville are high because many more households have dual incomes and no children, thus allowing more income to be devoted to housing than otherwise.

Ownership Market Conditions

A significant amount of for-sale ownership housing was added to Emeryville's housing stock between 2000 and 2008, as was described earlier in this chapter. During this period, the cost of ownership housing also increased. Table 2-47 shows a comparison between 2007 and 2008 median sales prices for single family homes and condominiums, as well as the high and low prices in each category. The median sales price for a condominium in 2001 was $277,000. This had risen by $119,500 by 2007. The increased cost of single-family homes was considerably higher. The median price in 2001 was $242,000. The median price in 2007 was $486,000. The median sales price of single family homes decreased from 2007 to 2008 by 18% due to the downturn in the economy. The median sales price of condos increased modestly, by 7% between 2007 and 2008; however, due to the slumping economy it is anticipated that sales prices in both single family homes and condominiums will decrease from 2008 levels during 2009.

Table 2-47: Sales Prices in 2007 and 2008

		12-Month Period 2007	12-Month Period 2008	% Change 2007-2008
Condominiums				
	High	$800,000	$925,000	16%
	Median	$396,500	$425,000	7%
	Low	$205,000	$230,000	12%
Single Family Homes				
	High	$539,500	$437,500	-19%
	Median	$486,000	$399,000	-18%
	Low	$380,000	$321,000	-16%

Source: Realquest 2009; City of Emeryville Department of Economic Development and Housing

Broken down by the year the housing unit was built, average sales prices per square foot (when available and not including BMR units) from 2005 through 2008 show some interesting patterns, shown in Table 2-48. Overall, price per square foot increased between 2005 and 2006, but it has been falling steadily since then, with a 25% decrease overall between 2005 and 2008. Price per square foot

rose between 2005 and 2006 for the oldest units (those built 1900-1950) as well as the newest units (those built 2001-2008). The most dramatic decrease over the period has occurred with the newer housing, which has experienced a 28% decline between 2005 and 2008. If looking at the decline of average sales price for the housing built since 2001 between 2006 (its highest point) and 2008, the decline is more steep, with a 32% drop. The lower average sales prices for housing in Emeryville provides some relief for the affordability gap; however, with the difficult conditions for obtaining mortgage financing in the current recession, and unemployment on the rise, the lower priced housing is likely still out of reach for many households.

Table 2-48: Average Sales Cost Per Square Foot by Year Unit Built

		Year Unit Built			
Year of Sale	Overall Average $/SQFT	1900-1950	1951-1980	1981-2000	2001-2008
2005	$517	$443	$532	$540	$488
2006	$521	$481	$515	$537	$513
2007	$478	$447	$392	$485	$467
2008	$390	$433	$511	$428	$349
% Change 2005-2008	-25%	-2%	-4%	-21%	-28%

Sources: Realquest 2009; City of Emeryville Department of Economic Development and Housing

Foreclosure Crisis

In 2007, the number of foreclosures in the Bay Area, California, and nationwide rose dramatically, due to a number of factors including home values leveling off or depreciating and the wide-spread use of looser loan underwriting and riskier loans, including sub-prime mortgages. The number of Bay Area homes lost to foreclosure in the second quarter of 2007 was the highest level in two decades. Nearly half of the notices of default resulted in homes being lost to foreclosure, as compared to just 12% the year prior. Notices of Default in Alameda County, as reported by East Bay Economic Development Alliance in their East Bay Indicators 2007 report, increased 252% from the second quarter of 2005 to the same quarter of 2007. The Center for Responsible Lending estimated in its "Losing Ground: Foreclosures in the Subprime Market and Their Cost to Homeowners" report that 19% of all subprime loans originated in 2005 and 2006 would result in foreclosure.

High foreclosure rates destabilize communities and can also cause displacement of tenants who are impacted if their property owners default and foreclose. A November 18, 2007 New York Times article reported that, according to ForclosureRadar.com, 22% of foreclosed properties in California were non-owner-occupied. Rents have also escalated, in part, due to increased demand for rental units by residents displaced by foreclosures, so that it is more difficult for displaced residents to find affordable rentals.

In December of 2007, the Emeryville City Council adopted an 8-point Predatory Lending Prevention and Foreclosure Prevention Strategy to take a proactive approach to addressing the foreclosure crisis. The Strategy has been implemented throughout 2008 and will continue to be implemented in 2009 and beyond depending on the on-going nature of the foreclosure crisis. The Strategy includes a number of components, including providing resource information to Emeryville residents, sponsoring information workshops, and offering individual counseling to owners facing foreclosure. In addition, the Strategy includes keeping monthly track of foreclosure incidence in Emeryville.

Unfortunately, the incidence of foreclosures throughout the Bay Area has increased during 2008 due to the general economic recession. From December 2007 through February 2009, there have been 138 Emeryville properties in some phase of foreclosure, including homes that have received Notices of Default (NOD's) (91 properties); foreclosure auctions currently scheduled or the auctions have been postponed (12 properties); and homes that have been lost through foreclosure (35 properties). Of the total 138 properties, four homeowners who have participated in City homeowner programs are in default or are having difficulty making mortgage payments. Of these, three are occupied by homeowners who own BMR unit and one has a grant through the City's Rehabilitation Program. As part of the Strategy, the City works directly with these individuals to refer them to HUD-certified organizations who provide homeowner foreclosure counseling. Emeryville has historically had a very low foreclosure rate in its homebuyer programs. Up through Fiscal Year 2006/2007, there was just one foreclosure on the first mortgage financing out of over 440 loans issued through the City's First Time Homebuyers Program, representing a 0.23% default rate.

Below Market Rate Housing Production

The City of Emeryville's inclusionary housing ordinance (called the Affordable Housing Set Aside Ordinance) and the Redevelopment Agency's use of its Low and Moderate Income Housing Fund "housing set-aside" funds have helped facilitate the production of 362 Below Market Rate (BMR) housing units during the previous 1999-2006 Regional Housing Need Allocation (RHNA) period of January 1, 1999 through June 30, 2006. While the city produced 234% of the total 777 units set out as the total goal for the previous RHNA period, the majority of added units were market rate. The city was able to perform very strongly, however, in the Very Low, Low, and Moderate Income categories, by meeting 71%, 66%, and 76%, respectively, of the RHNA goals. The comparison of the actual production during the previous RHNA cycle compared to the RHNA goals is shown in Table 2-49. Detailed project-specific information for the RHNA period may be found in Table 2-55 at the end of this chapter.

Table 2-49: Housing Production by RHNA Period of January 1, 1999 – June 30, 2006, by Affordability Level

ABAG RHNA 1999-2006 Period	Total Number of Units	Very Low	Low	Moderate	Market Rate
Permitted Units	1,822	127	63	172	1,460
ABAG RHNA Goals	777	178	95	226	278
% of Goals Met	234%	71%	66%	76%	525%

Source: City of Emeryville, Economic Development and Housing Department, 2009

As shown in Table 2-50, during the 1999-2006 RHNA period, 61% of the BMR units (220 out of 362) produced were rental units, of which 58% (127 out of 220 units) were designated at the very low income level. This data is shown in Table 2-50. Two projects account for virtually all of the very low income rental units produced during the cycle -- Avalon Senior Apartments (with 66 very low income units) and the Windsor Apartments at Bay Street (formerly called Metropolitan Apartments at Bay Street) with 57 very low income units. A majority of the moderate income rental units (62 units) are included in the Courtyards Apartment project. These figures illustrate how the production of rental apartments in Emeryville is concentrated in large-scale projects between 200 and 350 units. There is no similar concentration of ownership BMR units. BMR ownership units are distributed amongst eleven different developments, with the largest concentrations (about 20 units each) in three projects: Emeryville Warehouse Lofts, Terraces at Emery Station, and the Andante. The majority of BMR ownership units designated during the previous cycle were designated as Moderate Income (61%), with 39% designated as Low Income. No very low income units were designated as for-sale units during the 1999-2006 RHNA period.

Table 2-50: Below Market Rate Unit Production January 1, 1999 – June 30, 2006 by Tenure

	BMR Units	Very Low Income	Low Income	Moderate Income
Total	370	124	63	183
Ownership	142	0	55	87
Rental	228	124	8	96

Source: City of Emeryville, Economic Development and Housing Department, 2009

Economic Characteristics

Employment and Unemployment

Unemployment in Emeryville and in Alameda County has been on the increase since 2006, due to the downturn and recession in the economy. The unemployment rates for both the city and county are shown in Table 2-51. As of January 2009, the State of California calculated the unemployment rate of Emeryville residents at 4.5%, and Alameda County's rate was 6.2%. Historically, Emeryville has had a lower rate of unemployment than Alameda County as a whole, which could be a result of Emeryville's more highly educated population.

Table 2-51: Unemployment Rates 2000-2008

Year	Emeryville	Alameda County
2000	2.6%	3.6%
2001	3.5%	4.8%
2002	4.9%	6.7%
2003	5.0%	6.9%
2004	4.3%	5.9%
2005	3.7%	5.1%
2006	3.2%	4.5%
2007	3.5%	4.8%
2008	4.5%	6.2%

Source: California Employment Development Department, 2009

Industry Characteristics

Table 2-52 provides data on the number of jobs by job sector in Emeryville and Alameda County. Emeryville has a larger share of jobs in the Retail, Financial and Professional Services sectors than Alameda County. The city's proportional share of Health, Educational, and Recreational Service jobs is less than half of that in Alameda County, however, while Manufacturing and Wholesale is also somewhat lower. These differences are likely explained by Emeryville's large regional shopping centers found at and around Bay Street and the East BayBridge shopping center, large companies such as Novartis (formerly Chiron biotech company) and Pixar Animation Studio, and a concentration of professional office buildings on the city's peninsula.

Table 2-52: Jobs by Industry 2005			
		Emeryville % of Total	Alameda County % of Total
Total	19,670	100%	100%
Manufacturing and Wholesale	3,960	20%	24%
Retail	3,240	17%	11%
Financial and Professional Service Job	6,530	33%	20%
Health, Educational and Recreational Service	2,760	14%	30%
Other	3,180	16%	15%

Source: ABAG Projections 2007

Another way to view Emeryville's employment breakdown is by the change in the number of establishments in each industry type. By looking at a snapshot of how the number and distribution of businesses has changed over time, it is possible to make some inferences about Emeryville's housing needs. The US Census provides business pattern information at the zip code level; Emeryville's zip code, 94608, includes the entire city and a small portion of neighboring Oakland.

Between 1998 and 2005, the growth in establishments (individual businesses, not classified by size of payroll) was highest among typically high wage industries, Finance and Insurance, Information, Real Estate and Leasing, and Professional, Scientific, and Technical Services. Retail trade establishments, a typically low-wage industry, grew at the second fastest rate over the same period. As a proportion of total establishments, Professional, Scientific, and Technical Services increased from 16% to 18%. The only other industry to represent over 10% of the zip code's establishments in 2005 was Retail trade, which increased from 10% to 14%.

Generally, the changes in industry make-up in Emeryville appear to mirror those among the population. The growth of establishments in high-skill, high-wage industries is matched by the greater rate of growth in high income and highly educated households. For example establishments in the Finance and Insurance, Information, Real Estate and Leasing, and Professional, Scientific, and Technical Services industries increased from 27% of total establishments in 1998 to 32% in 2005, as shown in Table 2-53. In contrast, establishments in industries that have typically paid middle class wages, Transportation and Warehousing, Manufacturing, and Wholesale Trade declined in number and share of total establishments. Perhaps most important for affordable housing policy is the fact that Retail Trade and Accommodation and Food Services represent 22% of all establishments in the zip code area. Workers in these industries are likely to be on the lower end of pay scales are some of the most likely to qualify for affordable housing.

Table 2-53: Growth in Business Establishments in 94608 ZIP Code 1998-2005

Industry Code Description	1998	% of Total	2005	% of Total	% Change 1998-2005
Total	1,028	100%	1,098	100%	6%
Finance & insurance	37	4%	58	5%	36%
Retail trade	104	10%	153	14%	32%
Accommodation & food services	64	6%	84	8%	24%
Information	41	4%	53	5%	23%
Real estate & rental & leasing	28	3%	36	3%	22%
Educational services	13	1%	16	1%	19%
Professional, scientific & technical services	168	16%	201	18%	16%
Construction	66	6%	69	6%	4%
Arts, entertainment & recreation	16	2%	16	1%	0%
Transportation & warehousing	20	2%	19	2%	-5%
Other services (except public administration)	79	8%	75	7%	-5%
Health care and social assistance	56	5%	49	4%	-14%
Manufacturing	123	12%	101	9%	-22%
Wholesale trade	127	12%	104	9%	-22%
Management of companies & enterprises	18	2%	14	1%	-29%
Admin, support, waste mgt, remediation services	68	7%	50	5%	-36%

Source: US Census Bureau, Business Patterns

Jobs-Housing Balance

In general, jobs/housing balance is an in indicator of how many vehicle miles workers must commute to their jobs. A highly skewed ratio often means workers must commute far from where they live. Compared to Alameda County, Emeryville has a very high number of jobs versus housing units, also known as jobs/housing balance. However, the large increase in housing units in Emeryville between 2000 and 2005 contributed to a sizable decline in that ratio, from 4.4 to 3.1. This data is shown in Table 2-54.

Table 2-54: Jobs-Housing Balance in 2000 and 2005

	Emeryville			Alameda County		
	2000	2005	% Change	2000	2005	% Change
Total Employed Residents	4,600	4,500	-2%	694,600	733,500	6%
Total Jobs	19,300	19,670	2%	750,160	730,270	-3%
Housing units	4,431	6,421	45%	531,166	562,479	6%
Jobs-Housing Balance	4.4	3.1	-30%	1.4	1.3	-5%

Source: CA EDD, ABAG Projections 2007, City of Emeryville, County of Alameda

Another perspective on Emeryville's jobs-housing balance is to look at how many Emeryville residents live and work in the city. The latest data available from the 2000 Census found that 22% of employed residents worked in Emeryville (920 of 4,214); the remaining employed residents commuted outside the city for work. Those who both lived *and* worked in Emeryville in 2000 represented about 5% of the total 18,000 people employed in the city. Emeryville's rapidly expanding housing supply provides a greater opportunity for those who work in Emeryville to move here. While current data is not available, it is not unreasonable to assume that the proportion of workers who also live in Emeryville has grown.

Table 2-55
EMERYVILLE HOUSING PRODUCTION

JANUARY 1971 - DECEMBER 1998*										
Project Name	Address	Year Built	Tenure	Total Number of Units	Very Low	Low	Mode-rate	Market Rate	Live/ Work	
Watergate Condominiums	Powell Street	1971	OWN	1247	0	0	0	1247		
Emery Bay Village	Temescal/Emery Bay	1979	OWN	112	0	0	0	112		
Hollis Street Complex	6221 Hollis	1980	RENT	40	0	0	0	40	L/W	
Pacific Park Plaza	6363 Christie	1981	OWN	583	0	0	0	583		
Emery Glen	6200 Doyle	1983	RENT	36	36	0	0	0		
Besler Building Art Center	4053 Harlan	1986	OWN	52	0	0	0	52	L/W	
Monthly Building	1301 59th	1986	RENT	16	0	0	0	16	L/W	
Hollis Street Project	5900 Hollis	1986	RENT	20	0	0	0	20	L/W	
Artist Co-Op	1420 45th	1986	OWN	53	29	4	6	14	L/W	
Bridgewater (formerly Emery Bay Club & Apts I, a rental project)	6400 Christie	1988	OWN	424	0	0	0	424		
Krausen/Doyle St. Townhomes	Doyle/64 SE	1989	RENT	5	0	0	0	5		
Krausen/Vallejo		1990	RENT	2	0	0	1	1		
Beaudry Second Unit		1990	RENT	1	0	0	0	1		
Emeryville Business Center	1250 45th Street	1990	RENT	6	0	0	3	3	L/W	
47th Street Second Unit	47th Street	1990	RENT	1	0	0	0	1		
Sailer et al units	1053 47th	1990	OWN	3	0	0	1	2		
Co-Housing	5512 Doyle	1991	OWN	12	0	0	5	7		
1423-33 Park	1423-33 Park	1991	OWN	6	0	0	3	3	L/W	
Emery Villa Senior Apartment	4320 San Pablo	1992	RENT	50	50	0	0	0		
Archstone-Emeryville (formerly Emery Bay Club & Apts. II)	6401 Shellmound Street	1993	RENT	260	52	0	0	208		
Affordable Condos (VHP)	1292/94 63rd	1993	OWN	4	0	3	1	0		
Affordable Condos (VHP)	1056 48th	1993	OWN	2	0	1	1	0		
Horton Street Lofts	4300 Horton	1993	OWN	15	0	0	7	8	L/W	
Triangle Court	1063-69 45th	1994	RENT	20	9	11	0	0		
Powell Street Lofts	1250 Powell	1994	OWN	10	0	0	5	5	L/W	
3622/24 Adeline	3622 Adeline	1994	RENT	2	0	0	1	1	L/W	
Temescal Lofts	1001 47th	1995	OWN	4	0	0	2	2	L/W	
Ocean Avenue Court	1265-69 Ocean	1996	RENT	6	6	0	0	0		
Bridgecourt Apartments	1325 40th	1997	RENT	220	24	64	0	132		
Ocean Avenue Lofts	Ocean/Doyle	1997	OWN	5	0	0	2	3	L/W	
Holden Live/Work	Holden	1997	OWN	1	0	0	0	1	L/W	
Affordable Condos (VHP)	1258 and 1268 64th Street	1998	OWN	5	0	3	2	0		
Baybridge Apartments	1034-44 36th Street	1998	RENT	6	6	0	0	0		
SUBTOTAL CONSTRUCTED 1971-1998				**3229**	**212**	**86**	**40**	**2891**		

*Total estimated number of units built prior to 1971 is 1,194 units. This includes single family units and small buildings.

Table 2-55
EMERYVILLE HOUSING PRODUCTION

JANUARY 1999 - JUNE 2006 ***(Previous Regional Housing Need Allocation Period)***

Project Name	Address	Year Completed	Tenure	Total Number of Units	Very Low	Low	Mode-rate	Market Rate	Includes Live/Work
Emeryville Warehouse Lofts	1500 Park	2000	OWN	141	0	2	24	115	L/W
Dollar Lofts	5950 Doyle	2000	OWN	20	0	0	0	20	
Avalon Senior Apts.	3850 San Pablo	2000	RENT	67	66	0	0	1	
Gateway Commons Townhouses**	48th/San Pablo	2000	OWN	6	0	1	5	0	L/W
Oliver Lofts	1200 65th	2002	OWN	50	0	5	5	40	
Bakery Lofts I & II **	1001 46th	2002	RENT	41	0	0	8	33	L/W
Terraces at EmeryStation	5855 Horton	2002	OWN	101	0	9	11	81	
Liquid Sugar Lofts	1284 65th	2003	OWN	55	0	5	6	44	
The Courtyards	1465 65th	2004	RENT	331	1	0	62	268	
Elevation 22	1300-1350 Powell	2004	OWN	71	0	7	7	57	
CityLimits**	1165 67th	2005	OWN	31	0	4	5	22	
Green City Lofts**	4050 Adeline	2006	OWN	31	0	3	3	25	
Key Route Lofts	Adeline and 40th	2006	OWN	22	0	0	0	22	L/W
Andante I and II	3998 San Pablo	2006	OWN	125	0	15	10	100	
Bay Street One Condos	Bay Street	2006	OWN	95	0	0	0	95	
Windsor Apartments at Bay Street	5684 Bay Street	2006	RENT	284	57	0	0	227	
Artisan Walk**	66th/Vallejo	2006	OWN	6	0	1	5	0	
Blue Star Corner	Hubbard Street	2007	OWN	20	0	0	0	20	
Avenue 64	64th and Christie	2007	RENT	224	0	8	15	201	
Icon at Park Apartments	1401 Park	2007	RENT	54	3	0	0	51	L/W
Vue46**	Adeline/46th	2007	OWN	47	0	3	6	38	
SUBTOTAL CONSTRUCTED OR BUILDING PERMITS PULLED IN ABAG				**1,822**	**127**	**63**	**172**	**1,460**	
ABAG GOALS FOR PERIOD				777	178	95	226	278	
% OF ABAG GOALS MET				234%	71%	66%	76%	525%	

**These developments are partially in Oakland. Units listed are in Emeryville portion only. Total unit counts for each development are as follows: Gateway Commons: 17; Bakery Lofts: 57; CityLimits: 92; Vue 46: 79; Green City Lofts: 62; Artisan Walk: 72.

Table 2-55
EMERYVILLE HOUSING PRODUCTION

JULY 2006 - JUNE 2014 ***(Current Regional Housing Need Allocation Period) (Note 1)***

Project Name	Address	Est. Compl. Year	Tenure	Total Number of Units	Very Low	Low	Moderate	Market Rate	Status (Note 3)	Affordability Mechanism (Note 4)
Icon at Doyle Apartments	Stanford at Doyle	2007	OWN	27	0	0	0	27	Completed	Not applicable; project under the AHSA Ordinance threshold.
Salem Manor	4333 Salem St	2008	OWN	3	0	0	0	3	Completed	Not applicable; project under the AHSA Ordinance threshold.
Glashaus Lofts	65th/Hollis	2008	OWN	145	5	6	18	116	Completed	AHSA Ordinance; Affordability Agmt executed and recorded; BMR-price restricted; owners enter Resale Restriction Agmt with City. Agency provided $1.76M Ownership Housing Assistance Program (OHAP) downpayment funds for low and very low income units.
Oak Walk New Construct Condos	4098 San Pablo	2009	OWN	53	0	4	0	49	Completed	AHSA Ordinance; Affordability Agmt executed and recorded; BMR-price restricted; owners enter Resale Restriction Agmt with City. Agency provided $440K in OHAP funds for low income units.
Oak Walk - 5 houses renovation	1077-1085 41st Street	2009	OWN	5	0	0	5	0	Completed	Owner Participation Agreement signed between Redevelopment Agency & developer; $1.6 million subsidy provided to provide Moderate Income BMRs.
Adeline Place	3801 San Pablo	2009	OWN	36	0	3	10	23	Completed	AHSA Ordinance; Affordability Agmt executed and recorded; BMR-price restricted; owners enter Resale Restriction Agmt with City; Agency entered Disposition and Development Agmt (DDA) with developer to provide $4.5M Agency financial assistance to provide BMR units.
AgeSong Assisted Living	4050 Horton	2009	RENT	28	0	0	0	28	Completed	Not applicable; project under the AHSA Ordinance threshold.
Magnolia Terrace	4001 Adeline Street	2011	RENT	5	5	0	0	0	Approved	Agency has entered into DDA with developer and Regulatory Agreement for 55-year term of affordability; also provided land write down and $1.38 million development subsidy; construction to begin May 2010.
San Pablo Townhouses	4520 San Pablo Avenue	2012	OWN	29	0	0	0	29	Approved	Not applicable; project under the AHSA Ordinance threshold.
Ambassador Homes	1168 36th Street	2012	RENT	69	68	0	0	1	Approved	Agency has entered into Exclusive Negotiating Rights Agreement with developer and anticipates entering into DDA with developer to provide land write-down and housing development subsidy to provide BMR units. Developer will be required to enter into a Regulatory Agreement with Agency to provide units for 55-year term of affordability.
Bakery Lofts IV	53rd/Adeline	2012	RENT	18	0	0	0	18	Approved	Not applicable; project under the AHSA Ordinance threshold.
Papermill Mixed Use	1255 Powell	2012	RENT	173	10	0	16	147	Approved	Project is subject to the AHSA Ordinance. Rental project requires 6% Very Low Income BMRs and 9% Moderate Income BMRs. City expects to enter into Affordability Agmt with developer in 2010.
39th/Adeline Apartments (Note 2)	3900 Adeline	2012	RENT	80	5	0	7	68	Approved	Project is subject to the AHSA Ordinance. Rental project requires 6% Very Low Income BMRs and 9% Moderate Income BMRs. City expects to enter into Affordability Agmt with developer in 2010.
Christie Park Towers	6150 Christie	2013	OWN	60	0	6	6	48	Approved	City has entered into Affordability Agmt with developer and appropriated $660K in OHAP funds for the 6 Low Income BMRs.
Baker Metal Live Work and Townhouses	1265 65th Street	2013	OWN	22	0	0	0	22	Approved	Not applicable; project under the AHSA Ordinance threshold.

Table 2-55
EMERYVILLE HOUSING PRODUCTION

Project Name	Address	Est. Compl. Year	Tenure	Total Number of Units	Very Low	Low	Moderate	Market Rate	Status (Note 3)	Affordability Mechanism (Note 4)
Marketplace Redevelopment Phase I-Shellmound Site (Tower & Parking Structure: 196 units plus 10 townhomes)	Shellmound Street and Christie Street	2013	OWN	206	0	20	21	165	Proposed	Project would be subject to the AHSA Ordinance requiring 20% of units set aside at moderate income (41 total units). Agency would provide downpayment assistance to enable a portion of units to be provided for low income households instead, and First Time Homebuyer Assistance for moderate income BMR units. City would enter into Affordability Agreement with developer. Overall BMR inclusionary level is 20% of the total.
Marketplace Redevelopment Phase I-64th/Christie Site	64th & Christie	2012	RENT	185	28	0	0	157	Proposed	Project is subject to the AHSA Ordinance requiring inclusion of 6% at very low income and 9% at moderate income. Agency contemplating entering into Owner Participation Agreement with developer to provide financial assistance for provision of all BMR units as very low income units for a 55-year term of affordability.
SUBTOTAL CONSTRUCTED OR BUILDING PERMITS PULLED IN ABAG GOAL PERIOD OF JULY 2006 - JUNE 2014				**1,144**	**121**	**39**	**83**	**901**		
ABAG GOALS FOR PERIOD				1,137	186	174	219	558		
% OF ABAG GOALS MET				101%	65%	22%	38%	161%		

Note 1: This table includes those projects for which building permits were pulled or received Planning Approvals July 1, 2006 through December 31, 2009, and those projects for which building permits are anticipated to be pulled during the RHNA period through June 30, 2014.

Note 2: This development is partially in Oakland; units listed in the table are those located in Emeryville portion only. The development includes 101 total units.

Note 3: Status refers to whether project has been completed, is under construction, is "Approved" by Planning Commission, or has been "Proposed" to City but has not yet received Planning Commission approvals.

CHAPTER 3. RESOURCES AND CONSTRAINTS

This chapter analyzes the availability of sites suitable for housing and describes both governmental and non-governmental resources and constraints on the housing supply and affordability. Local land use controls, availability of sites, housing market conditions, and financial resources are also discussed in this chapter. The chapter starts with an analysis of previous housing production to establish a baseline for future production. Although Emeryville is a small, built-out city, with no opportunity for outward expansion, it has been successful at capitalizing on favorable market conditions to recycle older industrial and commercial properties into sites with new housing development. As indicated in Chapter 2, the citywide increase in housing units between 2000 and 2008 was 1,997 units, a 47% increase. Sufficient sites are identified to meet the RHNA housing goals for 2014. However, it is important to understand the constraints of a built out city of only 1.2 square miles. The housing growth rate experienced over the past 10 years will not be sustainable into the future.

Housing Production 1999 to 2006

Table 3-1 below lists projects that resulted in new housing from January, 1999 through June, 2006. The table demonstrates that Emeryville has been highly successful at developing housing units at a range of affordability levels on sites that were contaminated, on non-vacant sites, and on properties that are zoned for non-residential uses or mixed-use. Table 2-55 in Chapter 2 provides additional detail on the affordability levels within each of the projects shown. Of the 21 projects, 17 (80%) were contaminated and successfully remediated for residential use. Sixteen were on sites formerly used for industry, and the remaining five were commercially used sites or vacant property.

Table 3-1. Analysis of Previous Housing Production

Housing Sites Where Building Permits Were Issued – January 1999 through June 2006

Project Name	*Project Address*	*Total Units*	*Site Acres*	*Units/Acre*	*BMR Units*	*Zoning District*	*Mixed Use or Live Work*	*Previous Use of Site*	*Toxic Remediation*	*Access to Services & Amenities*				
										Distance in Miles				
												Schools		
										Grocery Store	*Park*	*Secondary*	*Elementary*	*Transit*
Emeryville Warehouse Lofts (rehab & new construction)	1500 Park Avenue	141	1.7	82.9	26	I-L	L/W	Vacant warehouse	Yes	0.6	0.6	0.7	0.7	0.2
Dollar Lofts	5950 Doyle Street	20	0.5	40.0	0	M-U		Industrial building	Not needed	0.7	0.1	0.7	1.2	0.2
Avalon Senior Apts	3850 San Pablo Avenue	67	1.2	56.3	66	C-G	MU	Commercial buildings	Yes	0.1	0.5	0.5	0.2	0
Gateway Commons Townhouses	48th/San Pablo Avenue	6	0.3	20.0	6	C-G	L/W	Commercial buildings	Yes	0.2	0.2	0	0.4	0
Oliver Lofts	1200 65th Street	50	1.1	46.7	10	I-L		Oliver Tire & Rubber	Yes	1.0	0.3	1.0	1.4	0.2

Table 3-1. Analysis of Previous Housing Production

Housing Sites Where Building Permits Were Issued – January 1999 through June 2006

Project Name	*Project Address*	*Total Units*	*Site Acres*	*Units/Acre*	*BMR Units*	*Zoning District*	*Mixed Use or Live Work*	*Previous Use of Site*	*Toxic Remediation*	*Access to Services & Amenities*				
										Distance in Miles				
										Grocery Store	*Park*	*Schools*		*Transit*
												Secondary	*Elementary*	
Bakery Lofts I and II* (rehab & new construction)	1001 48th Street	41	1.3	31.5	8	R-M	L/W	Remar Bakery	Not needed	0.3	0.1	0.3	0.4	0.3
Terraces at EmeryStation	5855 Horton Street	101	2.0	50.5	20	M-U		Westinghouse Factory	Yes	0.3	0.3	0.8	1.2	0.1
Liquid Sugar Lofts	1284 65th Street	55	1.4	39.3	11	I-L		Food processing plant	Yes	1.0	0.3	1.0	1.4	0.2
The Courtyards	1465 65th Street	331	4.8	69.0	63	I-L	MU	Ryerson Steel Mill	Yes	0.9	0.3	1.2	1.6	0
Elevation 22	1300 Powell Street	71	1.8	39.0	14	M-U	MU	Industrial buildings	Yes	0.5	0.1	0.6	1.0	0
City Limits	1165 67th Street	31	1.1	29.0	9	I-L		Fabco Auto Parts	Not needed	1.1	0.4	1.1	1.5	0.2
Green City Lofts*	4050 Adeline Street	31	0.4	77.5	6	C-G		Vacant industrial building	Yes	0.3	0.4	0.6	0	0.1
Key Route Lofts	Adeline/40th Streets	22	0.3	73.3	0	C-G	L/W	Commercial buildings	Not needed	0.3	0.5	0.6	0.2	0.1
Andante I and II	3998 San Pablo Avenue	125	1.8	68.3	25	C-G	MU	Vacant commercial buildings & RR r-o-w	Yes	0.1	0.5	0.4	0.2	0
Bay Street One Condos	Bay Street	95	2.4	39.6	0	PUD	MU	Elementis paint factory	Yes	0.2	0.5	1.1	1.5	0
Windsor Apartments at Bay Street	Bay Street	284	19.0	19.9	57	PUD	MU	Elementis paint factory	Yes	0.2	0.5	1.1	1.6	0
Artisan Walk*	66th/Vallejo Street	6	0.3	20.0	6	I-L		Myer Drum factory	Yes	1.1	0.4	0.9	1.2	0
Blue Star Corner	Hubbard Street	20	0.5	40.0	0	I-L		Vacant lot	Yes	0.6	0.6	0.7	0.7	0.2
Avenue 64	64th/Christie Avenue	224	3.1	72.3	23	M-U		Industrial businesses	Yes	0.5	0.1	1.3	1.7	0
Icon at Park Apts	1401 Park Avenue	54	0.6	90.0	3	I-L	L/W	Eletro-coating chrome plating	Yes	0.5	0.4	0.6	0.5	0.1
Vue 46* (rehab & new construction)	46th/Adeline Avenue	47	0.6	78.3	9	R-M		Flecto stain factory	Yes	0.3	0.1	0.4	0.3	0.2
Subtotal/Average January 1999 – June 2006		1,822	46.2	39.4	362					0.5	0.3	0.7	0.9	0.1
Median				46.7										

* Emeryville units in border projects

Inventory and Analysis of Sites and Facilities

On March 20, 2008 the Association of Bay Area Governments approved the Regional Housing Needs Allocation (RHNA) for jurisdictions in the nine-county Bay Area. Emeryville's share of the regional housing need is 1,137 units in the following affordability categories:

Very low income units:	186	(16.4% of total)
Low income units:	174	(15.3% of total)
Moderate income units:	219	(19.3% of total)
Above-moderate income units:	558	(49.0% of total)
TOTAL:	**1,137**	

As required under Government Code Sections 65583 and 65583.2, this section of the element provides a parcel-specific inventory of suitable and appropriately zoned sites for the provision of housing for all affordability ranges. The inventory was developed by compiling information from the City's Major Development Projects listing (which is updated monthly) and the Redevelopment Agency's project list This inventory includes a listing of sites for which housing is anticipated to be developed within the planning period and a second list of more tentative future housing sites. This inventory shows the sites which will provide housing to meet the RHNA goal of 1,137 units.

A new Emeryville General Plan, including the Land Use Element, became effective on November 12, 2009. New zoning regulations consistent with the new General Plan are being prepared and will be adopted in 2011. Interim zoning regulations are currently in place to insure that development coming forward prior to the adoption of new zoning is consistent with the General Plan, including this Housing Element. The housing sites inventories below and the section on zoning that follows reflect the interim zoning that is currently in place. Although the projects listed in Table 3-2 below were developed under the old General Plan and under previous zoning regulations they are generally consistent with the new General Plan and interim zoning.

Sites Appropriate for Residential Development within the Planning Period

Table 3-2 below lists the sites where building permits are anticipated to be pulled during the July 2006 through June 2014 RHNA period. Projects listed in Table 3-2 mirror those listed in Table 2-55 in Chapter 2, which provides greater detail on the affordability levels of Below Market Rate units and the mechanism for achieving affordability. The Sites found in Table 3-2 are mapped in Diagram 3-1. Table 3-2 includes, for the July 2006 through June 2014 period, completed housing projects, approved housing projects, and proposed housing projects.

As shown in Table 3-2, the City provides the appropriate zoning for the development of 1,144 units during the 2006-2014 RHNA period which is within the horizon of this Housing Element. This number exceeds the RHNA goal by 7 units. The sites where this housing will occur are detailed in Table 3-2 below.

Table 3-2: Inventory and Analysis of Housing Sites – Appropriate and Available for Residential Use in the Planning Period

Sites Where Building Permits are Anticipated through June 30, 2014 – Completed and Proposed Projects

Map #	APN	Project Name & Description	Status of Approvals & Construction Schedule	Units approved or proposed	Acres	Units per acre	Below Market Rate	General Plan Land Use*	GP Density - units per acre (base/bonus) *	Current Zone *	Existing or pre-existing use	Environmental Issues Site Remediation	Access to Services & Amenities				
													Distance in Miles				
													Grocery Store	Park	Schools		Transit
															Secondary	Elementary	
1	049-1313-001-03+	Icon at Doyle Street; Stanford & Doyle	Completed	27	0.5	54.0	0	MD-Res	20/35	RM	Industrial building	None	0.8	0	0.6	1	0.1
2	049-1079-006	Salem Manor 4333 Salem St.	Completed	3	0.1	30	0	MD-Res Major Transit Hub	20/35	RM	Single dwelling	None	0.2	0.7	0.7	0.3	0.2
3	049-1404-192+	Glashaus Lofts; SE 65th St & Hollis St; MU, res, live/work, commercial	Completed	145	3.6	40.3	29	MHD-Res N-Retail Overlay	50/60	RMH North Hollis Overlay	Industrial and commercial buildings	Remediated	0.9	0.3	1.2	1.6	0
4	049-1025-021-05+	Oak Walk, MU, condos/commercial	Completed	53	1.5	35.3	4	MU-Res Major Transit Hub N-Retail Overlay	20/35 50/60	MUR	Commercial buildings	Remediated	0.2	0.4	0.4	0	0
5	049-1025-005+	Oak Walk; 41st St; housing rehab	Completed	5	0.2	25.0	5	MU-Res Major Transit Hub	20/35	MUR	Single dwellings, duplexes.	None	0.2	0.4	0.4	0	0

Table 3-2: Inventory and Analysis of Housing Sites – Appropriate and Available for Residential Use in the Planning Period

Sites Where Building Permits are Anticipated through June 30, 2014 – Completed and Proposed Projects

Map #	APN	Project Name & Description	Status of Approvals & Construction Schedule	Units approved or proposed	Acres	Units per acre	Below Market Rate	General Plan Land Use*	GP Density - units per acre (base/bonus) *	Current Zone *	Existing or pre-existing use	Environmental Issues Site Remediation	Access to Services & Amenities – Distance in Miles				
													Grocery Store	Park	Schools		Transit
															Secondary	Elementary	
6	049-0481-002	Adeline Place; 3801 Adeline St.	Completed	36	0.3	120.0	13	MU-Res Major Transit Hub N-Retail Overlay	85/100	MUR	Commercial building & parking	None	0.1	0.9	0.5	0.3	0
7	049-0617-016-02	AgeSong Assisted Living; 4050 Horton St. Senior housing	Completed	28	0.7	40	0	MU-Res	50/60	MUR Park Avenue Overlay District	Commercial building	Remediated	0.5	0.5	0.8	0.6	0
8	049-1025-026-03	Magnolia Terrace; 4001 Adeline St.	Approved	5	0.07	71.0	5	MD-Res Major Transit Hub	20/35	RM	Vacant lot	Needs small clean up	0.2	0.6	0.4	0	0
9	049-1174-031-03	San Pablo Townhomes; 4520 San Pablo Ave	Planning Permit extension approved 12-11-2008	29	0.9	32.2	0	MU-Res N-Retail Overlay	50/60	C-G R-M	Commercial buildings and surface pkg.	Remediated	0.1	0.3	0.2	0.3	0
10	049-0481-016 & 017	Ambassador Homes; 1168 36th St; affordable rental housing	Approved 12-10-2009; in DDA negotiations	69	0.79	87.3	68	MU-Res Major Transit Hub	85/100	MUR	Vacant, previous industrial building demolished	Remediation in process	0.2	0.4	0.6	0.4	0.1
11	049-1173-003	Bakery Lofts IV; SE 53rd & Adeline Sts.; MU w/ res.; partially in Oakland	1 year extension approved 12-10-2009	18	0.3	60.0	0	MU-Res	50/60	MUR	Vacant commercial building	None	0.3	0.8	0.3	0.4	0.3

Table 3-2: Inventory and Analysis of Housing Sites – Appropriate and Available for Residential Use in the Planning Period

Sites Where Building Permits are Anticipated through June 30, 2014 – Completed and Proposed Projects

Map #	APN	Project Name & Description	Status of Approvals & Construction Schedule	Units approved or proposed	Acres	Units per acre	Below Market Rate	General Plan Land Use*	GP Density - units per acre (base/bonus) *	Current Zone *	Existing or pre-existing use	Environmental Issues Site Remediation	Access to Services & Amenities – Distance in Miles: Grocery Store	Park	Schools: Secondary	Schools: Elementary	Transit
12	040-1317-001-01	Papermill Mixed Use; 1255 Powell St.; res, live/work flex	Approved 11-18-08; 1 year extension approved 12-01-2009	173	2.4	72.0	26	MU-Res Major Transit Other Park Opport.	50/60	MUR	Commercial buildings	Needs soil study	0.5	0.3	0l7	1.0	0
13	012-0953-033	39th & Adeline Project; 39th/Adeline/ Yerba Buena; MU (Note 2)	Approved 1-20-09	80	0.8	100.0	12	MU-Res Major Transit Hub	85/100	MUR	Single-story commercial bldg, surface parking	None	0.2	0.5	0.6	0.2	0
14	049-1493-003	Christie Park Towers; 6150 Christie Ave; residential/live work	Building permit issued 3-30-05; construction not commenced	60	0.6	100.0	12	MU-Res Major Transit Hub	115/170	MUR	Vacant, building foundation	None	0.3	0	1.2	1.6	0
15	049-1504-002	Baker Metal; 17 Live/Work & 5 Townhouses; 1265 65th St.	Approved 08-27-2009	22	0.3	73.3	0	MHD-Res MD-Res	50/60	RMH RM	Vacant industrial building	Needs soil study	0.4	0	.7	.9	0
16	049-1494-03-02	Marketplace Redevelopment; Shellmound Bldg. MU	PUD Approved	206	1.5	137.3	41	MU-Res Major Transit Hub	115/170	PUD	Surface parking	Remediation needed	0.4	0	1	1.5	0
17	049-1492-006-01	Marketplace Redevelopment I; 64th & Christie Av building; Res + Shopkeeper Units	PUD Approved	185	1.2	154.2	28	MU-Res	115/170	PUD	Commercial buildings & surface parking	Remediation needed	0.4	0	1	1.5	0
Total Units and Average Density				1,144	15.8	72.4	243										
Median Project Density						71											

Table 3-2: Inventory and Analysis of Housing Sites – Appropriate and Available for Residential Use in the Planning Period

Sites Where Building Permits are Anticipated through June 30, 2014 – Completed and Proposed Projects

Map #	APN	Project Name & Description	Status of Approvals & Construction Schedule	Units approved or proposed	Acres	Units per acre	Below Market Rate	General Plan Land Use*	GP Density - units per acre (base/bonus) *	Current Zone *	Existing or pre-existing use	Environmental Issues Site Remediation	Access to Services & Amenities: Distance in Miles: Grocery Store	Park	Schools: Secondary	Schools: Elementary	Transit
Note 1: Zoning information is based upon interim zoning regulations that were enacted on November 12, 2009. New permanent zoning regulations consistent with the 2009 General Plan will likely be completed in 2011.																	
Note 2: This development is partially in Oakland. Units listed are in the Emeryville portion only. The total unit count for the development is 101.																	

Housing Capacities - Table 3-2: The majority of the projects listed in Table 3-2 already have entitlements in place. Seven were recently completed and another eight projects totaling 456 units have received planning approvals. The unit capacities are based upon the actual number of completed project units, the approved number of units in projects that have received entitlements, or the proposed number of units for the site, which have been determined to be feasible in accordance with the General Plan land use and zoning. Therefore it is not instructive to provide an analysis of the impacts of development standards for each site. Current residential development standards are discussed in the section on Land Use and Zoning below. Examples of the impact of development standards on density are provided under the discussion of Government Constraints to Housing Development.

Like Table 3-1, Table 3-2 above, which correlates to the Regional Housing Need Allocation period of 2006-2014, demonstrates a successful housing production record for both completed projects as well as projects anticipated to be completed during the period. As noted in Table 2-55 in the previous Chapter 2, an additional 243 units are projected to be produced at the very low, low, and moderate income levels, representing 21% of the total 1,144 units projected.

For the projects list in Table 3-2 above the planning permits required and density capacities varied from project to project. Three examples are provided as follows:

> *Salem Manor (#2)* is a triplex in the R-M zone. This project involved demolition of an existing single family residence and construction of three units on a 6,418 square foot parcel. A conditional use permit (CUP) was required for multi-family residential development, which is defined as any residential development of 3 units or more, in the R-M district. The project also required Planning Commission approval to demolish a single family dwelling. The CEQA determination was Categorical Exemption for urban infill housing.

Adeline Place (#6) is a 36 unit mix-use project. Multi-family residential development is a conditionally permitted use in what was formerly the C-G zone so this project required a CUP. The maximum allowable height in this district is 40 feet, which can be increased to 55 feet with a Conditional Use Permit. The project height is 49 feet 4 inches with an additional two and a half foot parapet wall. The project therefore required a CUP for the proposed height. Design review was also required. As an urban infill housing project Adeline Place was deemed categorically exempt from CEQA.

The Papermill Mixed Use project (#12) will have 168 residential units, 5 live-work units, 3 flex space units, 10,222 square feet of retail space, and 299 parking spaces, and a new park. The project required design review and a conditional use permit. The project is considered a multi-family residential use with ground level commercial use. Live-work units are considered as a separate use. Flexible space can be live-work space or commercial space. All three use categories were allowed with a CUP in the former M-U district. The project required a conditional use permit for a building height of 55 feet but is in conformance with setback, parking and floor area ratio requirements. Additionally the project required a demolition permit for removing a commercial building. An Initial Study/Mitigated Negative Declaration was prepared.

All three of the examples listed above were entitled under the previous General Plan and zoning regulations.

Table 3-2 demonstrates an increasing density over the previous housing cycle with an average 72.4 units per acre and a median density of 71. This period will experience more infill development of underutilized commercial properties and surface parking areas. Four of the sites are former industrial properties. Six of the sites listed have completed soil remediation and another four sites need further clean up or study.

Infill Development: Table 3-2 also demonstrates the City's ability to produce housing in mixed use, commercial, and industrial zones, on non-vacant properties, and on sites where toxic remediation is required. Only a small percentage of the sites listed were in residentially zoned districts, in this case the R-M Medium Density Residential District. The mechanism for determining how these units have or will accommodate the very low, low and moderate income regional housing need is described in Table 2-55 in Chapter 2.

Variety of Housing Types: As the above table shows, Emeryville is able to attract a wide range of housing types, including rental and ownership housing; live/work; small-, medium-, and large-size units; and townhomes as well as higher density buildings in mixed use, urban environments. Emeryville does not have the land capacity for subdivision and construction of single-family homes. Projects on the lower end of the density scale include rehabilitation of existing single-family homes (Oak Walk #5), and replacement of single dwellings with small multi-plexes (Salem Manor #2) in the older neighborhoods. (Further discussion of housing types is included below in the Land Use and Zoning section and under Zoning Constraints in the Government Constraints section.)

Tentative Future Housing Sites

In addition to the sites inventoried in Table 3-2, there are other sites in Emeryville that are appropriate for future housing development. Because these additional sites are more tentative than those listed in Table 3-2, they are inventoried separately. Table 3-3 below evaluates six sites that have capacity to yield additional housing in the future.

Table 3-3: Inventory and Analysis of Tentative Future Housing Sites Appropriate for Residential Use

Map #	Project Name; Address	APN	Estimated Completion Year	Projected Tenure	Site Acres	GP Density	GP Land Use	Current Zone	Existing or pre-existing use	Environmental Issues	Access to Services and Amenities (Distance in Miles)
18	Golden Gate Site Redevelopment; 3706 San Pablo	**Three-parcel site under one ownership** (First Citizens Bank). Parcel 1: 049-0951-004-02 (23,560 sf); Parcel 2: 049-0951-005-01 (8,964 sf); Parcel 3: 049-0951-006-01 (5,133 sf); Total: 37,657 sf site.	2013	RENT	0.86	85/100	MU-Residential Neighborhood Retail Overlay Major Transit Hub	MUR	Commercial building; vacant	Some past automotive uses; soilt testing underway spring 2010; some remediation may be needed	Grocery Store: 0.1 ; Park: 0.7; Secondary School: 0.6; Elementary School: 0.3, Transit: 0
			Potential Units (General Plan units/acre x 80%)					***Potential Units (General Plan Units @ 80% with BONUS)***			***Affordability Assumptions:*** Affordability based on assumption that this would be a Redevelopment-Agency sponsored housing development where developer would obtain financial assistance through Agency and Agency funds would be leveraged with outside sources to achieve given affordability levels.
			Total units	*58*				*Total units*	*69*		
			Very low	*29*				*Very low*	*23*		
			Low	*28*				*Low*	*45*		
			Moderate	*0*				*Moderate*	*0*		
			Market Rate	*1*				*Market Rate*	*1*		
	Redevelopment Potential: This site is currently comprised of the vacant Golden Gate commercial buildings and surface lots overgrown with weeds; the site has become blighted with vandalism. The property went into foreclosure and is bank-owned. Site is located on major transit corridor (San Pablo Avenue) with access to retail and services. The Site is located on the San Pablo Avenue corridor with transit access north to Berkeley and south to downtown Oakland. Redevelopment of Site with mixed use residential and retail uses would be highly desirable for bringing about revitalization of the area and providing needed housing.										
19	MAZ Site Redevelopment; 3800 San Pablo	**One-parcel site under one ownership.** FCM Props San Pablo Avenue LLC. Parcel 1: 049-0952-007. Total: 38,768 sf site.	2013	RENT	0.89	85/100	MU-Residential Neighborhood Retail Overlay Major Transit Hub	MUR	Auto-related commercial	Soil Study Needed	Grocery Store: 0; Park: 0.6; Secondary School: 0.5; Elementary School: 0.5, Transit: 0
			Potential Units (General Plan units/acre x 80%)					***Potential Units (General Plan Units @ 80% with BONUS)***			***Affordability Assumptions***: Affordability based on rental inclusionary requirements of City's Affordable Housing Set Aside Ordinance -- 6% of units at Very Low and 9% at Moderate Income.
			Total units	*61*				*Total units*	*71*		
			Very low	*4*				*Very low*	*4*		
			Low	*0*				*Low*	*0*		
			Moderate	*5*				*Moderate*	*6*		
			Market Rate	*52*				*Market Rate*	*61*		
	Redevelopment Potential: The MAZ building is currently vacant. The Site is located on major transit corridor (San Pablo Avenue) with access to retail and services. The Site is located on the San Pablo Avenue corridor with transit access north to Berkeley and south to downtown Oakland. Redevelopment of this Site with mixed use residential and retail uses would be highly desirable for bringing about revitalization of the area and providing needed housing.										

20	Gateway/Equity Building Redevelopment (BRE Properties); NE corner Powell/Christie	**Three-parcel site. Each parcel has separate ownership**. Parcel 1: 049-1494-004-07 (27,000 sf); owned by Dennys Realty; Parcel 2: 049-1494-004-08 (91,475 sf) owned by BRE Properties; Parcel 3: 049-1494-004-10 (18,295 sf) owned by Delta Fair. Total: 136,770 sf site.	2013	RENT	3.14	115/170	MU-Residential Neighborhood Major Transit Hub	MUR	Office building, gas station, restaurant, surface parking	Remediation Needed	Grocery Store: 0.2; Park: 0.2; Secondary School: 1.1; Elementary School: 1.3, Transit: 0
			Potential Units (General Plan units/acre x 80%)					***Potential Units (General Plan Units @ 80% with BONUS)***			***Affordability Assumptions:*** Affordability based on assumption that developer would receive financial assistance through the Agency to achieve given affordability levels beyond the inclusionary level required by the City's Affordable Housing Set Aside Ordinance for rental projects.
			Total units	*423*				*Total units*	*626*		
			Very low	*25*				*Very low*	*38*		
			Low	*42*				*Low*	*42*		
			Moderate	*38*				*Moderate*	*56*		
			Market Rate	*318*				*Market Rate*	*490*		
	Redevelopment Potential: The Gateway/Equity Office Site is located at a major transportion access point in the City, with access to the Amtrak Station, Emery-Go-Round access to the MacArthur BART Station, the I-80/580 interchanges, and SF Bay Bridge. BRE Properties owns the major portion of the site occupied by the Gateway/Equity Office building, which is occupied by an office building with Wells Fargo Bank on its ground floor that would be included in the redevelopment of the site, and fronted with a large surface parking lot. Other portions of the site include a Dennys Restaurant surrounded by surface parking and a Chevron gas station. The Site is located close to retail services and a grocery store (Trader Joe's). The Site is zoned Mixed Use Residential in the updated General Plan, in an area allowing the City's highest densities, building heights, and floor area rations. Redevelopment of the Site would enable consolidation of these retail uses and structured parking at ground floor and residential uses above, providing a defined building edge and more pedestrian-friendly design.									
21	Black & White Mixed Use; NW corner San Pablo/40th	**Four-parcel site under two ownerships:** Three parcels owned by Oaks Corner Inc.: 049-0618-021, 049-0618-024-02, and 049-0618-033 (1 ac. combined); one parcel owned by Pavlatos &Tsakopoul: 049-0618-022 (.5 ac.); Total: 65,340 sf site.	2013	OWN	1.50	85/100	MU-Residential Neighborhood Retail Overlay Major Transit Hub	MUR	Single story commercial building	Soil Study Needed	Grocery Store: 0.1; Park: 0.6; Secondary School: 0.4; Elementary School: 0.1, Transit: 0
			Potential Units (General Plan units/acre x 80%)					***Potential Units (General Plan Units @ 80% with BONUS)***			***Affordability Assumptions:*** As ownership development, the City's Affordable Housing Set Aside Ordinance requires 20% of units to be set aside at Moderate Income Levels, as shown in total BMR unit count. Affordability based on assumption that some BMR units would be sold at Low Income levels through provision of Ownership Housing Assistance Program (OHAP) downpayment assistance program.
			Total units	*102*				*Total units*	*120*		
			Very low	*0*				*Very low*	*0*		
			Low	*10*				*Low*	*12*		
			Moderate	*10*				*Moderate*	*12*		
			Market Rate	*82*				*Market Rate*	*96*		
	Redevelopment Potential: The Black & White Site is occupied by a small grocery and liquor store within an older commercial building building and surface parking lots for the store and nearby Oaks Card Room. The building is older and not in prime condition; the liquor store has sometimes attracted less desirable activities. Redevelopment of the Site with mixed use retail and residential uses would allow creation of structured parking and elimination of the surface parking lots, create vibrant ground floor activity with the retail uses, and needed housing to activate the retail. The Site is located at the intersection of a transit corridor (San Pablo Avenue and 40th Street both have bus lines to Berkeley, downtown Oakland, and MacArthur BART station, respectively) and access to nearby retail and services. Redevelopment of this Site with mixed use residential and retail uses would be highly desirable for bringing about revitalization of the area and providing needed housing.									

22	Sherwin Williams Redevelopment; Horton Street	**One-parcel site under one ownership** (Sherwin Williams Company): Parcel 1: 049-1041-026-15.	2014	OWN	5.84	85/100	MU-Residential	MUR and Park Avenue Overlay District	Vacant	Currently under remediation	Grocery Store: 0.5; Park: 0.3; Secondary School: 0.5; Elementary School: 0.2, Transit: 0
			Potential Units (General Plan units/acre x 80%)					***Potential Units (General Plan Units @ 80% with BONUS)***			***Affordability Assumptions:*** As ownership development, the City's Affordable Housing Set Aside Ordinance requires 20% of units to be set aside at Moderate Income Levels, as shown in total BMR unit count. Affordability based on assumption that some BMR units would be sold at Low Income levels through provision of Ownership Housing Assistance Program (OHAP) downpayment assistance program.
			Total units	*397*				*Total units*	*467*		
			Very low	*0*				*Very low*	*0*		
			Low	*30*				*Low*	*30*		
			Moderate	*49*				*Moderate*	*63*		
			Market Rate	*318*				*Market Rate*	*374*		
	Redevelopment Potential: The Sherwin Williams site is occupied by a former paint factory that is now a vacant building. The site represents one of the few larger-scale properties in Emeryville and could include a large number of units based on allowed new densities for the MUR zone. The site is within one block of an identified new neighborhood center in the updated General Plan land use map and within one block of the Park Avenue District which includes a mix of residential, live/work, office and restaurant uses. Due to its past industrial use, the site has required remediation which is underway and when completed will contribute to the site's redevelopment potential.										
23	Oaks/Bank of America Site Redevelopment; NE corner San Pablo/41st	**Five-parcel site under three ownerships**. 1) 049-1026-21 (5,100 sf), owned by Kulka; 2) 049-1026-22 (3,337 sf), owned by Oaks Corner; 3) 049-1026-23 (10,000 sf), owned by Oaks Corner; 4) 049-1026-24 (10,853 sf), owned by Oaks Corner; 5) 049-1026-02 (34,999 sf), owned by Bank of America National Trust and Savings Association. Total: 64,289 sf site.	2014	OWN	1.48	20/35 50/60	MU-Residential Neighborhood Retail Overlay Major Transit Hub	MUR R-M	Single story commercial building/surface parking	Soil Study Needed	Grocery Store: 0.3; Park: 0.5; Secondary School: 0.3; Elementary School: 0.2, Transit: 0
			Potential Units (General Plan units/acre x 80%)					***Potential Units (General Plan Units @ 80% with BONUS)***			***Affordability Assumptions:*** As ownership development, the City's Affordable Housing Set Aside Ordinance requires 20% of units to be set aside at Moderate Income Levels, as shown in total BMR unit count. Affordability based on assumption that some BMR units would be sold at Low Income levels through provision of Ownership Housing Assistance Program (OHAP) downpayment assistance program.
			Total units	*46*				*Total units*	*59*		
			Very low	*0*				*Very low*	*0*		
			Low	*4*				*Low*	*6*		
			Moderate	*5*				*Moderate*	*6*		
			Market Rate	*37*				*Market Rate*	*47*		
	Redevelopment Potential: The Oaks/Bank of America Site is occupied by the Bank of America branch and surface parking lots for the bank and the nearby Oaks Card Room. Redevelopment of the Site with mixed use retail and residential uses would allow creation of structured parking and elimination of the surface parking lots, create vibrant ground floor activity with the retail uses, and needed housing to activate the retail. The Site is located along the San Pablo Avenue corridor with transit access to Berkeley and cities north, downtown Oakland, and MacArthur BART station, and access to nearby retail and services. Redevelopment of this Site with mixed use residential and retail uses would be highly desirable for bringing about revitalization of the area and providing needed housing.										

Housing Capacities - Table 3-3: The Land Use Element of the General Plan defines residential density maximums based upon dwelling units per acre. The General Plan and interim zoning also allow for bonuses to exceed the maximum density, building intensity (floor area ratio), and building height for developments that provide public benefits. (These public benefit bonuses are separate from density bonuses allowed under State law for affordable housing.) In Table 3-3, capacities are shown for both the maximum densities allowed on the site (base density) and the densities that could be achieved if a bonus is applied (bonus density).

When updating the Land Use Element, projections were made to determine the growth likely to occur under the updated densities and intensities. This was done by reducing the maximum densities by 20% to account for properties that would not develop over the life of the Element. For consistency, the unit capacities estimates for the sites in Table 3-3 are calculated at 80% of the densities allowed under the Land Use Element. The density calculation examples provided below (and those provided under Development Standards in the section on Governmental Constraints to Housing Development in this chapter) demonstrate that the cumulative impact of development controls upon a site do not normally reduce the density from what is allowed by the Land Use Element. Although the densities are achievable, they may result in small dwelling units. If larger units are desired the densities would be reduced. Also, there may be situations, such as locations adjacent to lower density development, where the density allowed by the Land Use diagram would be limited. Furthermore, future zoning regulations may result in new open space standards that could result in slightly lower density. Therefore, the capacity assumption of 80% of maximum density as shown in Table 3.3 provides a sufficient margin to demonstrate realistic capacities for the sites inventoried.

Density Calculation Examples. The following examples provide residential density estimates under what is allowed by the Land Use Element without bonus and current development standard. These examples are for illustrative purposes.

#19 MAZ Site: 75 units allowed without bonus.
This example assumes residential development with structured parking and commercial space on the ground floor.
This is a 38,764 square foot site in the MUR (mixed use with residential) in an area designated as a Neighborhood Retail Overly where ground floor commercial use is required, and within a Major Transit Hub where transit-oriented development is encouraged. The base density allowed is 85 units per acre (with out bonuses) which calculates to75 units for this site**.** The Floor Area Ratio (FAR) maximum is 2.0 (without bonus) so that floor area would be limited to 77,528 square feet. Building height is limited to 55 feet -- about 5 stories (without bonuses). There are no yard or setback requirements in the MUR zone unless abutting a residential zone which is not the case for this site. The ground floor commercial area is assumed at 15,000 square feet. To determine the residential parking requirement a mixture of unit types are assumed: 30 one-bedroom units, 45 two-bedroom units. Forty five spaces are required for the commercial use, resulting in total parking requirement of 161 spaces to be accommodated in approximately 56,000 square feet of structured parking on the first two floors, leaving three full floors for residential development. Parking is not included in calculation of FAR. The minimum dwelling size is 500 square feet.

Subtracting the 15,000 square feet of commercial space from the allowed floor area of 77,528 square feet results in 62,528 square feet for residential use. This is further reduced by 25% for corridors, mechanical and common areas resulting in approximately

46,896 square feet for dwelling space which can accommodate 75 units, with an average unit size of 625 square feet. The example shows that full allowable density may be achievable but would result in small units. The potential unit capacity (without bonuses) determined in Table 3-3 is 61 units (80% of allowed density). At this density larger units would be possible.

 # 22 Oaks/Bank of America Site: 57 units allowed without bonus
This example also assumes residential development over structured parking with commercial space on the first floor.
This is a 64,289 square foot site in both the RM (medium density) and the MUR (mixed use with residential) zones. As with the example above, the site is in a Neighborhood Retail Overlay area and within a Major Transit Hub. The densities permitted (without bonuses) are 20 units per acre for the smaller portion in the RM zone, and up to 50 units per acre for the larger portion of the site in the MUR zone. A total of 57 units are allowed. The limits on floor area (without bonuses) vary on the project site from 0.5 to 1.2, so that overall floor area would be limited to 58,292 square feet. Building height (without bonuses) is limited to 30 ft (2 to 3 stories). Setback requirements would reduce the building footprint to 56,659 square feet. The ground floor commercial space is assumed to be about 12,000 square feet. Assuming 35 one-bedroom units and 22 two-bedroom units the total parking requirement would be 120 spaces which can be accommodated in a ground level structure within the building footprint. Parking is not included in the calculation of floor area.

Subtracting the 12,000 square feet of commercial floor area from the allowed 58,292 square feet would leave 46,292 square feet for residential development on a second level. Reducing this by 25% to account for corridors, mechanical and common areas, results in 34,719 square feet for residential use. The minimum dwelling size is 500 square feet. The allowed density of 57 units on this site can be accommodated in this 34,919 square feet of floor area with an average unit size of 609 square feet. The unit capacity shown in Table 3-3 is 46 units (80% of 57) would enable larger units.

#21 Black and White Site: 127 units allowed without bonus
This example also assumes residential development over structured parking with commercial space on the first floor.
This is a 65,340 square foot site in the MUR (mixed use with residential) zone, also in a Neighborhood Retail Overlay within a Major Transit Hub. The density permitted without bonuses is 85 units per acre allowing 127 units The limits on floor area (without bonus) is 2.0 so that 130,680 square feet would be allowed. Building height (without bonus) is limited to 55 feet (about 5 stories). There are no yard or setback requirements. The minimum dwelling size is 500 square feet. The ground floor commercial area is assumed to be 13,000 square feet. Assuming 77 one-bedroom units, 50 two-bedroom units, and 42 parking spaces for commercial development, a total of 226 parking spaces are required. This would be accommodated in structured parking on two levels. Parking area is not included in the calculation of floor area. The commercial space of 13,000 square feet is subtracted from the total permitted floor area of 130,680 square feet, resulting in 117,680 square feet for residential use which can be accommodated in two floors. When further reduced by 25% for corridors, mechanical and common areas, approximately 88,209 square feet would be available for

residential space which can accommodate 127 units with an average unit size of 695 square feet. The unit capacity shown in Table 3-3, 102 units (80% of 127), would allow for larger units, as is the case with the other examples above.

Attainment of Regional Housing Need Allocation for 2006-2014

The chart below summarizes Emeryville's attainment of goals set forth for the 2006-2014 Regional Housing Need Allocation period, including completed, approved, and proposed housing projects found in Table 3-2, and tentative housing sites shown in Table 3-3. The chart breaks out the units produced within each income category (very low, low, moderate, and above moderate income), calculating the unit capacity at 80% of General Plan densities for both the maximum allowed on the site and the maximum achievable with a bonus. The chart shows that Emeryville has the housing site capacity to exceed the overall RHNA goal of 1,137 units, by 196% and 225%, respectively. Under capacities provided in the General Plan, at 80% (without the bonus), Emeryville meets between 87% and 97% of the RHNA goals in the very low, low, and moderate income categories. Inclusive of the bonus, Emeryville meets or exceeds the RHNA goals**.**

Housing Sites Analysis: Attainment of Regional Housing Need Allocation for 2006-2014

	Units @ 80% of General Plan Density					Units @ 80% of General Plan Density with BONUS				
	Total Units	Very Low	Low	Moderate	Market Rate	Total Units	Very Low	Low	Moderate	Market Rate
Total Completed, Approved, and Proposed Units (Table 3-2 Sites)	1,144	121	39	83	901	1,144	121	39	83	901
Total Tentative Units (Table 3-3 Sites)	1,087	58	114	108	807	1,412	65	135	144	1,069
TOTAL UNITS ANTICIPATED	**2,231**	**179**	**153**	**191**	**1,708**	**2,556**	**186**	**174**	**227**	**1,970**
Total RHNA Goal for Emeryville, 2006-2014	1,137	186	174	219	558	1,137	186	174	219	558
Number of Units Over (Under) RHNA Goal	**1,094**	**(7)**	**(21)**	**(28)**	**1,150**	**1,419**	**(0)**	**0**	**8**	**1,412**
Percent of RHNA Goal Met through Identified Sites	196%	96%	88%	87%	306%	225%	100%	100%	104%	353%

Tables 3-1, 3-2, and 3-3 combined substantiate Emeryville's successful track record for developing and having the site capacity to develop infill housing of a variety of types and affordability levels.

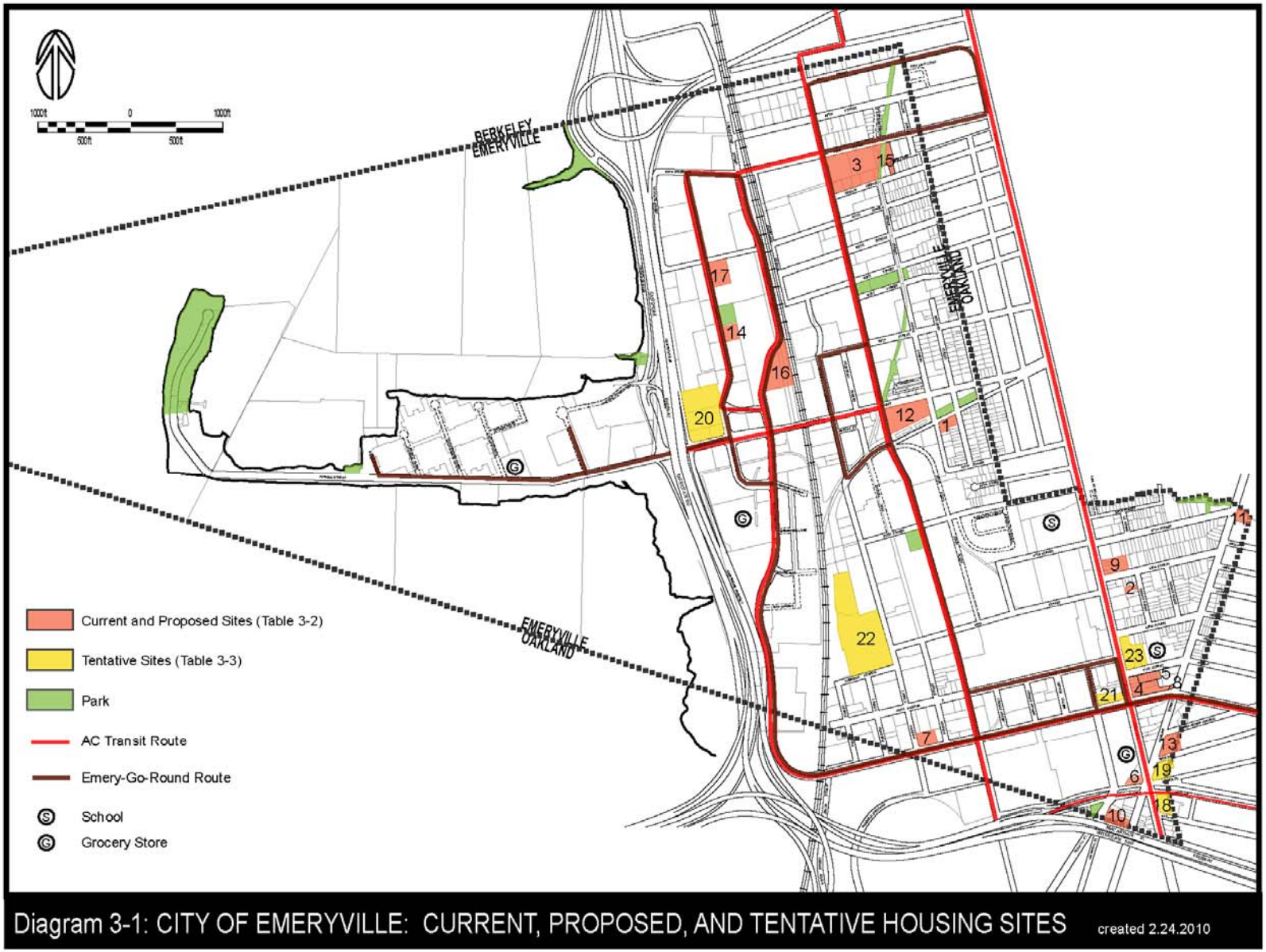


Diagram 3-1: CITY OF EMERYVILLE: CURRENT, PROPOSED, AND TENTATIVE HOUSING SITES created 2.24.2010

Facilities and Infrastructure. Public facilities and infrastructure have a direct influence on a city's ability to accommodate residential growth. This section provides information on schools, parks, grocery stores, and public transit, and summarizes other aspects of infrastructure, including water supply and wastewater treatment.

Schools. The Emery Unified School District operates two public schools in Emeryville: Anna Yates Elementary School and Emery Secondary School, which is a combined middle and high school. The total district enrollment is about 800 students. These schools are adequate to serve the population and have capacity for growth. The Emeryville community is very supportive of the School District and associated youth programs. Both the City Council and Planning Commission actively encourage the development of family housing to boost school enrollments. In 2003 city voters approved the community's first parcel tax for school funding. Again, on June 5, 2007 a remarkable 87% of the voters approved an extended and enhanced parcel tax to provide the district with $2.5 million per year for a ten year period. This will augment the schools' budget for smaller class sizes, counseling, tutoring, technical support, literacy, library facilities, arts, and music. Additionally, residential and commercial developers pay a school facilities fee based on projected future needs. As shown on Diagram 3-1 the public schools are in close proximity to housing throughout the City.

A private school, Pacific Rim School, is located on Doyle Street at Stanford Avenue. It includes grades kindergarten through eight. Other charter and private schools are located nearby. Schools providing higher education in Emeryville include Western Career College, Ex'pressions College for Digital Arts, and the National Holistic Institute.

Parks and Recreation. Today the city contains 13.74 acres of parkland. The majority of the City's developed parkland is concentrated to the west of the railroad tracks, with 8 acres on the peninsula and another 2.87 acres in the bayfront area. All of the City's recreation facilities (basketball courts, sports field, and play equipment) are located on the east side. The distribution of existing and planned parks leaves the extreme north and south portions of the city, east of the railroad, outside of a quarter-mile from a park.

There are 1.66 acres of parkland for every 1,000 residents, up from 1.54 in 1984. However, compared to neighboring cities, this ratio is low. Oakland has 2.94 acres of parkland per 1,000 residents and Berkeley's supply is 2.36 per 1,000 residents. The City is currently developing a new park in the North Hollis area which will add 1.25 acres to the supply. Plans for development of several other parks and expansion of the Emeryville Greenway are being considered, and other opportunity sites for new parks are identified in the Parks, Open Space and Public Services Element of the General Plan, including two large recreational parks, one on the north side of the City and one on the south. The City is also in the process of developing a parks and recreation strategic plan to determine needs and a funding strategy. Meanwhile, the City has been working with private developers to provide open space inside large residential and commercial projects, thereby offering a convenient, sheltered place for play and relaxation. In addition to public parks and private open space, the Emery Unified School District opens schoolyards to the public on weekends and allows public use of the sports field and swimming pool at Emery Secondary School when not being used by the school. Continued joint use of School District facilities is an important component of the City's recreation programs.

Grocery Stores. Four grocery stores are located in or on the border of Emeryville, as shown on the map in Diagram 3-4. These include the Watergate Market serving the peninsula, Trader Joe's which is centrally located at the Powell Street Plaza, a small corner grocery at 59th and Vallejo streets in Oakland, and Safeway in the south end of town. Safeway is a full supermarket serving the entire city and beyond. A new Berkeley Bowl grocery store is being constructed in southwest Berkeley less than a half mile from Emeryville's northern boundary.

Transit. Three organizations provide transit service into and out of Emeryville: the Emery Go-Round, AC Transit, and AMTRAK. The Emeryville Transportation Management Association, a consortium of employers, residential complexes and the City, funds the Emery Go-Round. The Emery Go-Round is a free shuttle connecting the city to the MacArthur BART station and Emeryville's Amtrak station. It runs within a quarter-mile of every property in the city. Buses run every ten to twelve minutes during peak commute times and every 15 to 20 minutes midday. Its two routes operate weekdays from 5:45 AM until 10:15 PM. On weekends it runs shopper shuttles from 9:25 AM to 9:50 PM on Saturday and 10:20 AM to 7:00 PM on Sundays.

AC Transit operates eleven routes in Emeryville: five local East Bay routes (26, 31, 57, 72 and 72M), one rapid bus line (72R), one "all-nighter" bus route (802) and four transbay bus lines (C, F, J and Z). Every property in Emeryville is within a quarter-mile of at least one AC Transit route. Emeryville's AMTRAK station provides national passenger rail service and is linked to San Francisco by bus service. Four AMTRAK routes serve this station, including the Capitol Corridor (between Sacramento and San Jose) and San Joaquin (between Oakland and Stockton) commuter service routes, and the long distance Coast Starlight (LA – Seattle) and California Zephyr (SF - Chicago). In 2008, Emeryville's station was the 20th busiest in the country. With 44 trains per day, over half a million passengers went through the Emeryville station during Amtrak's 2009 Fiscal Year. Diagram 3-4 shows that transit is available in close proximity to all areas of town. In addition the MacArthur BART station, located in Oakland, is approximately a half -mile from Emeryville's eastern border.

Water. East Bay Municipal Utility District (EBMUD) supplies water and provides wastewater treatment to areas of Alameda and Contra Costa counties, including Emeryville. Within the city EBMUD owns, operates and maintains the water distribution system that brings Sierra Nevada snowmelt and seasonal runoff through a distribution and treatment system to Emeryville. In 1993 EBMUD adopted its Water Supply Management Program (WSMP) that outlines projects to provide reliable sources of high-quality water through the year 2020. EBMUD is currently in the process of updating the WSMP to plan for resources out to 2040. In addition, every five years EBMUD prepares an Urban Water Management Plan (UWMP), as required by the California Urban Water Management Planning Act. The most recent UWMP was completed in 2005 and considers water resources through 2030. Water recycling and conservation programs are in place to reduce the future demand for water. Although the water supply is sufficient to meet demand during normal years, like most of California it is insufficient to meet customer demand in the case of multi-year drought despite aggressive conservation and recycling efforts. Additional supplemental supply projects are currently underway to reduce the severity and frequency of water rationing.

As an older city, Emeryville has had a water supply system in place for many years. The former industrial users demanded large quantities of water to serve their businesses so the system was built to accommodate large capacities. The system is regularly maintained and upgraded to serve densification. Currently the water supply system has capacity for growth. Where there is insufficient localized capacity to serve proposed development, upgrades or installations are required as conditions of project approval. For example, redevelopment of the Marketplace will necessitate installation of additional on site water and sewer lines to connect with the City's systems.

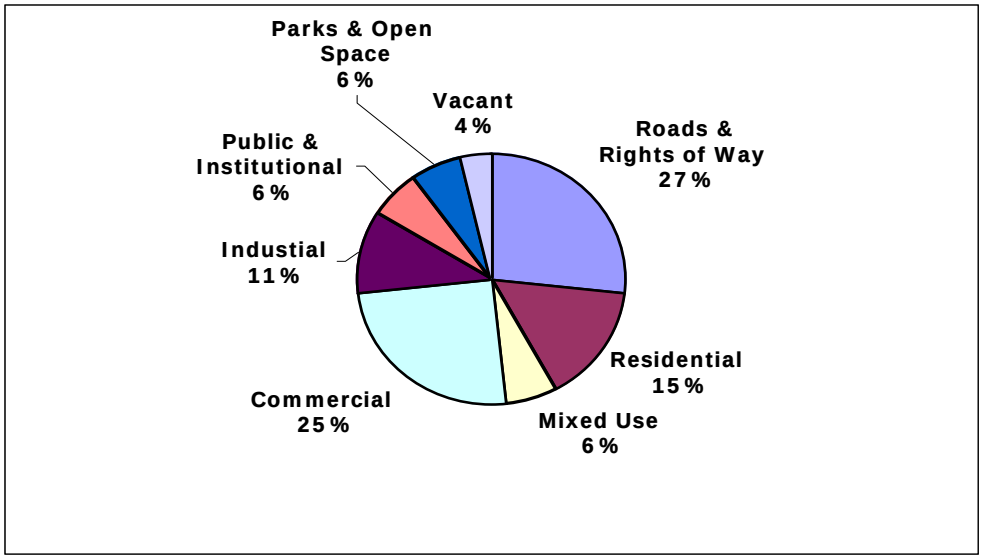
Wastewater The City of Emeryville operates a municipal sanitary sewer collection system that conveys wastewater from Emeryville and portions of the City of Oakland. Except for one pump station and a forced main at the Emeryville Marina, the City of Emeryville's collection system is generally a gravity-fed system, consisting of over 15 miles of sanitary sewer mains ranging in sizes from six to 30 inches. Additionally, the City of Emeryville's collection system carries wastewater from approximately 11 miles of sanitary sewer collection system owned and maintained by the City of Oakland. Emeryville's collection system is divided into five drainage basins, each of which connects to the East Bay Municipal Utility District's (EBMUD) North sanitary sewer interceptor, which is generally located along the east side of Interstate 80. The EBMUD interceptor carries sewer flows from the East Bay communities' collection systems to its Wastewater Treatment Plant. The plant provides secondary treatment for a maximum flow of 168 mgd. Primary treatment can be provided for up to a peak flow of 320 mgd. The average annual daily flow is approximately 80 mgd. In addition to the main wastewater treatment plant, EBMUD operates three wet weather treatment facilities. These facilities were constructed in the late 1980's to handle all the wet weather flows generated from Infiltration and Inflow (I&I) into the Satellite Agencies collection systems. The volume of wet weather flow is generally as high as 15 times the average dry weather flow. During periods of wet weather, the Wet Weather facilities are designed to provide primary treatment to the wet weather sewage flow prior to discharge into the Bay. (See additional discussion under the following section on governmental constraints.)

Land Use and Zoning

As noted previously, a new Land Use Element and interim zoning regulations were enacted in 2009. New permanent zoning regulations consistent with the General Plan are being prepared and will likely be adopted within a year of adoption of this Housing Element. The interim zoning measures insure that development projects under review prior to adoption of new zoning regulations, are consistent with all elements of the General Plan. The land use policy section below is based upon the Land Use Element and the zoning section describes the interim regulations which will be replaced once the new regulations are adopted.

Emeryville's land use history has been dominated by change. With the exception of small pockets with stable residential neighborhoods, most of the city's developed property has cycled through multiple land uses over time. By the middle of the twentieth century Emeryville was firmly established as an industrial and warehousing center with large properties flanking the railroad and Interstate 80. During the period of industrial decline in the latter part of the century, land use policies were set in place to transform the city into a vibrant mixed use city. These polices resulted in a remarkable transformation. As of 2003, housing and mixed use areas accounted for 29% of the city's developable land area – excluding roads and rights-of-way, with industrial areas reduced to only 14%. Since 2000, housing in mixed use developments has grown, accounting for two-thirds of approved residential construction. Typical mixed use projects are predominantly residential with a small amount of local-serving retail. For example, Icon at 1401 Park Avenue in Table 3-1 is a six story residential building with a small café space on the ground floor. Adeline Place (#6 in Table 3.2) has 36 residential units with only 2,400 square feet of commercial space. However, for the larger sites with a regional retail component such as Bay Street, the ratio of housing to commercial is more balanced.

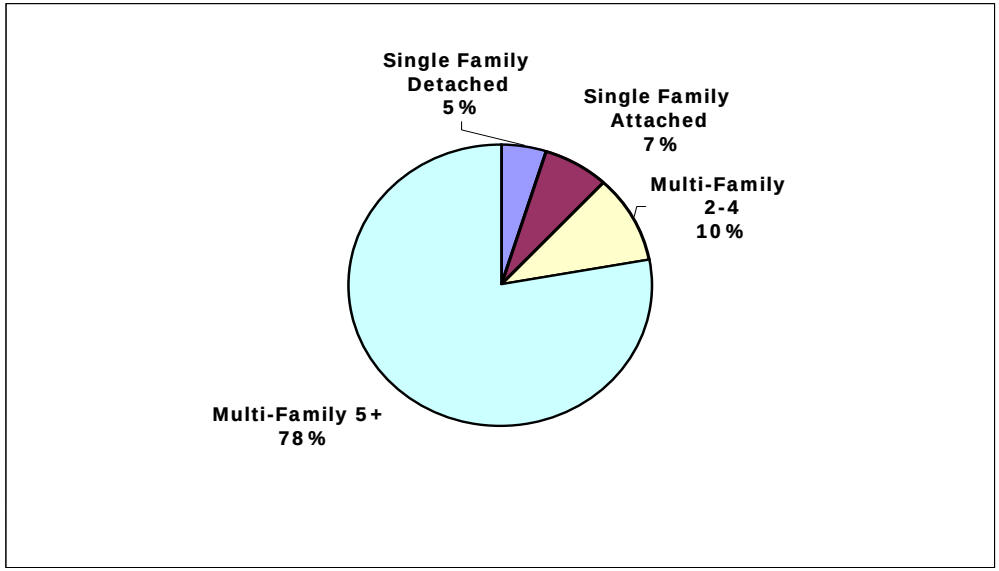
Diagram 3-2: Distribution of Land Uses



General Plan Opportunities and Challenges Report – January 2006

Given the city's small size, higher density projects have dominated the residential growth. The citywide distribution of housing by type is displayed in Diagram 3-3, showing that multi-family developments with five or more units far outnumber the lower density units. Seventy-eight percent (78%) of the City's housing units were in multi-family buildings with five or more units.

Diagram 3-3: Distribution of Housing Units by Type



General Plan Opportunities and Challenges Report –kJanuary 2006

General Plan Land Use Policy. Land uses, and standards for residential density, building intensity and building height are established by the Land Use Element and implemented by the zoning regulations. The land use goals of the 2009 General Plan call for a balance of uses within a predominantly mixed use city, preservation of older residential neighborhoods, and vibrant new mixed use centers where underutilized commercial centers now exist. The Plan can accommodate a capacity for an additional 3,800 dwelling units for a citywide total capacity of 9,800 units through 2030. This would represent a 64% increase in the housing supply. The areas where residential use is permitted constitute approximately 57% of the city, allowing for a continuation of residential expansion.

Residential Density: The Land Use Element provides for residential densities that range from 20 units per acre in the eastern neighborhood to 115 units per acre, and up to 170 units per acre with bonus, in the Powell Street/Christie Avenue core.

Building Height: Maximum building heights range from 30 feet to 100+ feet. Buildings heights gradually step up from the lowest in the east—reflecting the scale of the older residential neighborhoods—and the western edge of the Peninsula, to create a high-rise core in the Powell Street/Christie Avenue area.

Intensity: The General Plan establishes intensity standards for various parts of Emeryville. Intensity is measured as floor area ratio (FAR), obtained by dividing the gross floor area of a building by the lot area. In general, all floor area above grade is included, including residential uses, but excluding parking. The citywide distribution of FAR's are aligned with residential densities and building heights, with the most intense development targeted to the core area.

Density, intensity and building height maximums may be exceeded through bonuses for public benefit. (See General Plan diagrams in Appendix C.)

***Zoning*.** This section reviews how the City's interim zoning regulations apply to residential development. The interim zoning regulations establish zoning districts that apply to each of the land use designations established by the Land Use Diagram in the Land Use Element. In the RM (medium density residential), RMH (medium high density residential) and RH (high density residential) zones, single-family, townhouses, duplex units are allowed by right. Multi-family housing are also allowed by right except in the RM zone where a conditional use permit is required. Emeryville has no low-density residential zone because there are no neighborhoods with exclusively single family housing. In the MUR (mixed use with residential) zone multi-family housing is allowed by right, and other residential uses types are allowed with a conditional use permit. The zoning districts in which residential use is not permitted are MUN (mixed use with non-residential, OT (office technology), IND (industrial), PUB (public), MAR (marina) except for live-aboard boats, POS (parks/open space), and SM (shoreline management). Live work is permitted in the residential, commercial and industrial zones. For larger properties and/or phased development the PUD (planned unit development) zone may be used. Consistent with the Land Use Element, zones where residential use is permitted constitute approximately 57% of the city.

Table 3-4: Zones Where Residential Uses Are Permitted

Uses Permitted (P), Conditionally Permitted (C), and Prohibited (X).

Uses:	Base Zones:										
	RH High Density Residential	**RMH** Medium High Density Residential	**RM** Medium Density Residential	**MUR** Mixed Use with Residential	**MUN** Mixed Use with Non-Residential	**OT** Office/Technology	**IND** Industrial	**PUB** Public	**MAR** Marina	**POS** Park/Open Space	**S-M** Shoreline Management
RESIDENTIAL											
Family Residential											
Single-family detached	P	P	P	C	X	X	X	X	P	X	X
Two-family	P	P	P	C	X	X	X	X	X	X	X
Single-family semiattached	P	P	P	C	X	X	X	X	X	X	X
Townhouse	P	P	P	P	X	X	X	X	X	X	X
Multifamily	P	P	C	P	X	X	X	X	X	X	X
Group Residential	X	C	C	C	X	X	X	X	X	X	X
Residential Second Unit	P	P	P	C	X	X	X	X	X	X	X
Mobile Home Parks	C	C	C	X	X	X	X	X	X	X	X
LIVE/WORK											
Light	C	C	C	C	C	C	C	X	X	X	X
Heavy	X	X	X	X	X	X	C	X	X	X	X

Zoning for a Variety of Housing Types. Table 3-4 above shows the residential use types identified in the zoning regulations, the zones where they are permitted, and whether they are permitted by right or if a CUP is required. The Zoning Ordinance expressly treats factory-built homes the same as site-built homes, and allows mobile homes with a use permit in residential zones. Single room occupancy housing is considered Group Residential and allowed in RMH, RM and MUR zones with a CUP. The Zoning Ordinance was amended to list

emergency shelters and transitional housing in the definition of Group Residential as well, thereby permitting these types of housing where group housing is permitted. State law requires cities to permit these uses in their Zoning Ordinances if there is a need for these facilities. The homeless and transitional population in Emeryville is described in Chapter 2. (See additional discussion under Zoning Constraints below.) The Housing Action Plan includes Policy IV-A-4 to modify the zoning regulations to be in compliance with new State law regarding emergency shelters and transitional housing.

Residential Development Standards. Yard requirements are shown in Table 3-5 below and parking standards are shown in Table 3-6. In the MUR (mixed use with residential) the mix of uses must include residential development if the site is from one to five acres in size. Sites five acres or greater must be developed as a Planned Unit Development. As indicated previously, density, building intensity and building height prescribed by the Land Use Element. Density, intensity and height bonuses may be conditionally permitted for projects demonstrating a significant public benefit, such as public open space, family friendly housing, sustainable design, etc. Specific findings are required to approve a public benefit bonus.

Table 3-5: Residential Development Standards

	Zones					Unit Types	
	RH	**RMH**	**RM**	**MUR**	**MUR** if abutting other residential zones	Residential Second Units	Live/Work
	High Density Residential	Medium High Density Residential	Medium Density Residential	Mixed Use with Residential	Mixed Use with Residential		
Minimum Front Yard Setbacks							
If the two adjacent lots are developed:	Average of adjacent front yards	Average of adjacent front yards	Average of adjacent front yards	None.	Where street frontage abuts a lot in a residential zone, setback from street line shall be the same as required on the adjacent residential lot.	A detached dwelling unit shall be separated by a minimum of 10 feet	Set- backs are pursuant to the zone which the unit is located in.
If only one of the adjacent lots is developeda:	Same as front yard on developed lot but not less than 5 feet	Same as front yard on developed lot but not less than 5 feet	Same as front yard on developed lot but not less than 10 feet				
If neither of the adjacent lots are developed:	5 feet	5 feet	10 feet				
For all corner lots:	5 feet	5 feet	10 feet				
Other Minimum Setbacks							
Street Side:	3 feet	3 feet	3 feet	None.	Where street frontage abuts a lot in a residential zone, setback from street line shall be the same as required on the adjacent residential lot.	3 feet	Set- backs are pursuant to the zone which the unit is located in.
Interior Side:	3 feet	3 feet	3 feet		10 feet, plus an additional 2 feet for each 1 foot by which the height of the building on the nonresidential lot exceeds 30 feet.	3 feet	
Rear:	15 feet	15 feet	15 feet			10 feet	
Unit Size							
Minimum Dwelling Unit Size in Sq. Feet:	500	500	500	500	500	500	500
Maximum Dwelling Unit Size in Sq. Feet:	X	X	X	x	X	½ gross floor area of the existing dwelling unit	2000
Open Space							
Usable Open Space Per Unit in Sq. Feet:	X	X	X	x	X	X	36

Table 3-6: Residential Parking Standards

Uses	Required Parking Spaces
RESIDENTIAL	
Single-family detached Single-family semiattached	2 covered per unit
Two-family Townhouse Multifamily	1 per studio unit 1 per one-bedroom unit 1.5 per two (or more) bedroom units All sites with 5 or more dwelling units must provide 1 guest parking space for every 4 dwelling units.
Group Residential Residential Second Unit Mobile Home Parks	Specific parking requirements are not listed for these uses. Per Emeryville Zoning Ordinance 9-4.55.9 "the Planning Commission, upon recommendation of City staff, shall determine the parking requirements for said use" on a case by case basis.
LIVE/WORK	
Light Heavy	1.5 per unit or 1.5 per 1000 sq. ft., whichever is greater. 1 loading space per 50,000 sq. ft

Governmental Constraints to Housing Development

This section evaluates land use controls and other government regulations and procedures that may impact the affordability and supply of housing.

Zoning Constraints.

Conditional Use Permits and Design Review. As discussed in the previous section, the currently adopted Zoning Ordinance provides for a variety of housing types, although conditional use permits and design review approvals are required in a number of circumstances. The City finds that conditional use permits and design review are necessary to address the many complex issues associated with infill development in such a small city, such as adjacent industrial and commercial uses, site irregularities, and environmental conditions created by the City's unique land use history. As part of the update of the zoning regulations the City will be reducing the level of review for some types of projects so that more permits may be processed administratively.

The fee for a CUP is $1,055 for a residential project of less than three units. For projects with 3 to 10 units the fee is $1,583. Larger projects are charged on a cost recovery basis with a $2,000 minimum. The processing time depending upon the size and complexity of the project and environmental review, can range from two months for simple projects up to the better part of a year for complex projects requiring redesign and an EIR. The Zoning Ordinance mandates that specific findings be made upon approval of a CUP. Emeryville's findings, listed below, are based upon standard findings provided by the State Office of Planning and Research:

a) That the location, size, and design and operating characteristics of the proposed use or uses will be compatible with and will not adversely affect or be materially detrimental to: neighborhood character, with consideration given to harmony in scale, bulk, coverage, and density of nearby uses, buildings and structures; the availability of civic facilities and utilities; the capacity and physical character of surrounding streets; the physical safety of the immediate area; and the amount of light falling on adjacent buildings and open spaces;
b) That the proposed use or uses are consistent with the capability of the circulation , water supply, wastewater disposal, fire, police and school systems to operate adequately and cons-effectively;
c) That the proposed use or uses with its impacts, as described in subsection a) of this section, and at its proposed location are consistent with the General Plan;
d) That the proposed use or uses at its proposed location will provide a service or facility which will contribute to the general well-being of the surrounding neighborhood or community;
e) That the proposed use or uses complies with all applicable standards and requirements of the Zoning Ordinance; and
f) That the environmental determination has been prepared in accordance with CEQA.

Design Review. The zoning regulations establish a design review procedure for development proposals that involve construction or exterior alterations. Smaller scale proposals are reviewed administratively. Design review applications are reviewed concurrently with any applicable use permit, variance or PUD application. For Minor Design Review the fee is $1,055, except projects involving less than three units have a fee of $422. Major Design Review is charged on a cost recovery basis with a $2,000 minimum. For Minor Design Review the processing times generally range between 14 to 30 days. With larger projects processing times are comparable to those of a CUP.

*Development Standards. S*pecific development standards required by zoning regulations may impose constraints on development so that the maximum density allowed under the General Plan and zoning may not be achievable. Three hypothetical examples of residential projects are provided below to illustrate the effect of Emeryville's development standards on densities permitted under the General Plan and zoning regulations. None of the examples illustrated result in lower densities as under normal development standards. (For the purpose of simplification the illustrations below do not factor increases in densities, height and floor area that may be achieved with bonuses.)

Effect of development standards on residential density:

Example #1: RM zone with 20 units per acre:
This example is based upon a 5,000 square foot lot
Density: 20 units per acre allowing **two units**
Intensity: FAR maximum is 0.5 so that total floor area would be limited to 2,500 square feet
Height: 30 feet, two stories
Minimum dwelling size: 500 square feet
Parking: Assuming two units with two or bedrooms each, the parking requirement would be three spaces, two of which can be tandem. (Parking is not included as floor area.)
Yard requirements plus a ten foot driveway would result in a building footprint of 2,775 square feet

In this example the development standards would not limit the density. The most limiting factor is the FAR of 2,500 square feet which can generously accommodate two units. A common constraint in the RM zone is designing on-site parking on narrow lots. Three units may be achieved through a conditional use permit in the RM zone. In that case the lot would need to be large enough to accommodate on site parking without it dominating the appearance from the street.

Example #2: MUR zone with 85 units per acre:
This example assumes a 20,000 square foot site
Density: 85 units per acre allowing **39 units**
Intensity: FAR maximum is 2.0 or 40,000 square feet
Height: 55 feet (four to five stories)
Minimum dwelling size: 500 square feet
Parking: Assuming 39 two bedroom units, 74 spaces in two-level structure – not included as floor area

Yard requirements: None

This example assumes residential development with two levels of structured parking. The floor area limitation of 40,000 square feet, which would occupy two full residential floors. When this floor area is reduced by 25% for corridors, mechanical and common areas, approximately 30,000 square feet would be available for living space. This area can accommodate 39 units averaging 770 square feet each.

Example #3: MUR zone with 115 units per acre:
This example is based upon a 40,000 square foot site in the core area
Density: 115 units per acre allowing **106 units**
Intensity: FAR maximum is 4.0 so that floor area would be limited to 160,000 square feet
Height: 100+ feet (over 8 stories)
Minimum dwelling size: 500 square feet
Parking: Assuming 106 two bedroom units, 199 spaces accommodated in two levels of structured parking – not included as floor area
Yard requirement: None

This example assumes residential development over structured parking. Floor area is limited to 160,000 square feet which when reduced by 25% for corridors, mechanical and common areas, would provide approximately 120,000 square feet for residential space which would accommodate 106 units averaging 1,132 square feet in size.

The above examples indicate that the development standards in Emeryville's zoning regulations do not normally constrain residential density. If larger units are desired the achievable number of units may decrease. There may be individual circumstance such as adjacent development or site characteristics where additional standards may be triggered,

Zoning Updates for Compliance with State Law. The City is currently updating its zoning regulations to be in compliance with State laws regarding permitting of secondary units, transitional housing and emergency shelters and other group residential uses, and with density bonus allowances, as described below.

Secondary Units. The zoning regulations will be updated to reflect State law that removed obstacles to the permitting of secondary dwelling units. Interim zoning regulations now allow them by right in all residential zones. A policy is included in this Element requiring revision of the zoning regulations to ensure that the requirements for secondary units conform to State law. (See Policy II-A-3.)

Group Residential Uses. As shown in Table 3-4 above, Group Residential uses are conditionally permitted in the RM and RMH zones. However, the State Health and Safety Code requires that group homes and residential care facilities for six or fewer residents

be treated as other single-family uses. Policy IV-A-5 requires that the zoning regulations be clarified to treat group homes and residential care facilities for six or fewer residents similarly to other single-family uses.

Emergency Shelters and Transitional Housing. Although the Zoning Ordinance was provisionally amended to provide for emergency housing and transitional shelters as Group Residential uses, these uses now require a conditional use permit in Emeryville. A policy is included in this Element calling for the revision of the Zoning Ordinance to be in compliance with Senate Bill 2. The policy requires establishment of a zoning district that allows emergency shelters by right and insures that transitional and supportive housing developments are considered as a residential use of property subject only to those same restrictions that apply to other residential uses of the same type in the same zone (See Policy IV-A-4.)

Two optional areas have been identified as appropriate places to apply by-right zoning for emergency shelters and supportive and transitional housing pursuant to Senate Bill 2 (SB2). These are identified on Diagram 3-4 as *SB2 Potential Zone #1* and *SB2 Potential Zone #2*. The City's zoning ordinance will be amended to accommodate these uses, in conformance with SB2 in one of these two areas.

Both areas have capacity for new uses and could easily accommodate at least one year-round emergency shelter. Potential Zone #1 is approximately 12 acres in size. Redevelopment is feasible on over half of the properties. There are at least six properties, comprising approximately two and a half acres, which are either vacant lots used for surface parking, or occupied by older low-rise buildings, some of which are vacant. Potential Zone #2 is about 24.5 acres, with about 2 acres of property that is vacant or underutilized.

Of the two areas, Potential Zone #2 is better suited for emergency shelters, and supportive and transitional housing. As shown in Table 3-7, basic services are more accessible to Potential Zone #2. From a land use perspective, Zone #2 the better area for emergency shelters and supportive and transitional housing because there is a balanced mix of residential and commercial properties, and it is in an area of the City that is experiencing residential growth. Conversely, Zone #1 has no residential development, and is targeted for industrial use with ancillary offices and the possibility of live/work. Zoning regulations, including performance standards for industrial uses, could provide for an emergency shelter and supportive and transitional housing in Potential Zone #1. However, since residential uses are not permitted in this area (other than live/work), and SB2 mandates that transitional and supportive housing be subject to the same permitting processes as other housing in the zone, transitional an supportive housing would be accommodated in another zoning district that permits residential use. Potential Zone #2 allows residential use and can accommodate both emergency shelters and transitional and supportive housing.

Both Potential Zones will be evaluated in more detail during Fiscal Year 2010/2011 as part of the City's Zoning Ordinance update, with the objective of meeting the requirements of SB2.

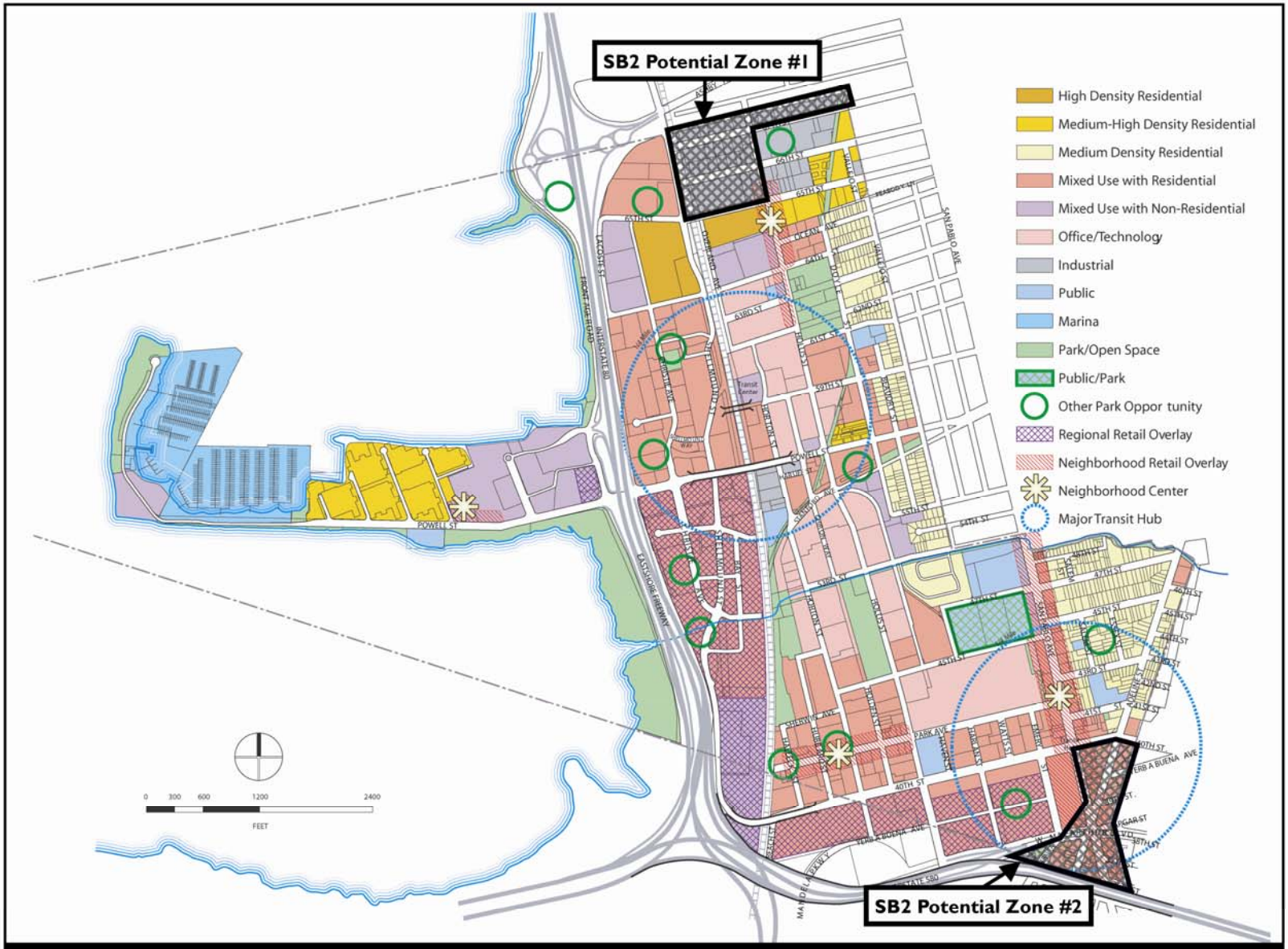


Diagram 3-4: EMERYVILLE LAND USE AND SB2 POTENTIAL ZONES

Table 3-6: Identification of Basic Services in and around potential SB2 Zones

SB2 Zone # 1*	Distance	SB2 Zone # 2**	Distance
Social Services		**Social Services**	
St. Vincent De Paul Community Services and Homeless Action Center (HAC)	2.8 mi	St. Vincent De Paul Community Services and Homeless Action Center (HAC)	1.2 mi
2272 San Pablo Avenue, Oakland, CA		2272 San Pablo Avenue, Oakland, CA	
Berkeley Multi Service Center (Berkeley Food and Housing Project)	2.7 mi	Berkeley Multi Service Center (Berkeley Food and Housing Project)	3 mi
2362 Bancroft Way, Berkeley, CA		2362 Bancroft Way, Berkeley, CA	
Medical Clinic / Hospital / Emergency Services		**Medical Clinic / Hospital / Emergency Services**	
Kaiser Permanente Oakland Medical Center	2.9 mi	Kaiser Permanente Oakland Medical Center	1.3 mi
280 W. MacArthur Boulevard, Oakland, CA		280 W. MacArthur Boulevard, Oakland, CA	
Alta Bates Summit Medical Center - Summit Campus	2.8 mi	Alta Bates Summit Medical Center - Summit Campus	1.2 mi
350 Hawthorne Avenue, Oakland, CA		350 Hawthorne Avenue, Oakland, CA	
Alta Bates Summit Medical Center - Alta Bates Campus	2.2 mi	Alta Bates Summit Medical Center - Alta Bates Campus	2.5 mi
2450 Ashby Avenue, Berkeley, CA		2450 Ashby Avenue, Berkeley, CA	
Planned Parenthood - MacArthur Health Center	2.5 mi	Planned Parenthood - MacArthur Health Center	.9 mi
482 W. MacArthur Boulevard, Oakland, CA		482 W. MacArthur Boulevard, Oakland, CA	
Berkeley Free Clinic	2.7 mi	Berkeley Free Clinic	3.0 mi
2339 Durant Avenue, Berkeley, CA		2339 Durant Avenue, Berkeley, CA	
Pharmacy		**Pharmacy**	
Walgreen's	.6 mi	CVS Pharmacy	.3 mi
2995 San Pablo Avenue, Berkeley, CA		4349 San Pablo Avenue, Emeryville, CA	
Food Pantry		**Food Pantry**	
ECAP	1.8 mi	ECAP	.1 mi
3610 San Pablo Avenue, Emeryville, CA		3610 San Pablo Avenue, Emeryville, CA	
Food Stores		**Food Stores**	
Gateway Supermarket	.7 mi	Pak n' Save	.0 mi
5908 San Pablo Avenue, Emeryville, CA		3889 San Pablo Avenue, Emeryville, CA	
Trader Joe's	.8 mi	CVS Store	.3 mi
5700 Christie Avenue, Emeryville, CA		4349 San Pablo Avenue, Emeryville, CA	

* All distances are measured from central point of Hollis Street and 65th Street in SB2 Potential Zone #1

** All distances are measured from central point of Adeline Street and 39th Street in SB2 Potential Zone #2

Table 3-6: Identification of Basic Services in and around potential SB2 Zones

SB2 Zone # 1*	Distance	SB2 Zone # 2*	Distance
Bank		**Bank**	
Wells Fargo	.7 mi	Bank of America	.2 mi
5801 Christie Avenue, Emeryville, CA		4120 San Pablo Avenue, Emeryville, CA	
Senior Center		**Senior Center**	
4321 Salem Street, Emeryville, CA	1.4 mi	4321 Salem Street, Emeryville, CA	.4 mi
City Offices		**City Offices**	
Emeryville City Hall	1.1 mi	Emeryville City Hall	.5 mi
1333 Park Avenue, Emeryville, CA		1333 Park Avenue, Emeryville, CA	
Transit Links		**Transit Links**	
MacArthur BART Station (Emery-go-Round provides direct service)	2.3 mi	MacArthur BART Station (Emery-go-Round provides direct service)	.8 mi
MacArthur Boulevard & Martin Luther King Street		MacArthur Boulevard & Martin Luther King Street	
Emeryville Amtrak Station	.5 mi	Emeryville Amtrak Station	1.3 mi
5885 Horton Street, Emeryville, CA		5885 Horton Street, Emeryville, CA	
AC Transit Bus Lines:		AC Transit Bus Lines:	
North/South: Lines 72 and 802 (San Pablo Ave.), Line 19 (Hollis St.)		North/South: Lines 72 and 802 (San Pablo Ave.), Line 19 (Hollis St.)	
East/West: Line 9 (Ashby)		East/West: Lines 57 and 14 (40th St.)	
Transbay Service: Lines Z and J (Closest stop: Hollis St. & 65th St.)		Transbay Service: Line F (40th St.)	
Emery-go-Round Free Shuttle (Citywide)		Emery-go-Round Free Shuttle (Citywide)	
Closest stop: Hollis St. & 65th St.		Closest stop: Emery St. & 40th St.	

* All distances are measured from central point of Hollis Street and 65th Street in SB2 Potential Zone #1

** All distances are measured from central point of Adeline Street and 39th Street in SB2 Potential Zone #2

Density Bonus for Affordable Housing. Emeryville's density bonus for affordable housing regulations are contained in Section 9-4.62.9 of the City's Affordable Housing Set Aside Program (Article 62 of the Zoning Ordinance). In conformance with State law Emeryville offers a 25% density bonus incentive to allow developers to increase the amount of affordable housing being built. This is offered with other incentives, such as help in finding financial assistance, and in some cases redevelopment bond funding to help developers increase the amount of affordable housing in their projects. Since projects of 30 units or more are required to provide affordable housing, they are automatically eligible for the density bonus. Policy II-A-2 requires that the density bonus section be updated to reflect changes in State law to provide for greater bonuses and for the inclusion of more affordable units.

Constraints on Persons with Disabilities. Pursuant to Federal Fair Housing Amendments Act, the Americans with Disabilities Act and the California Fair Employment and Housing Act, Emeryville's Zoning Ordinance (Section 9-4-95.1-.80) provides for reasonable accommodation by modifying the application of its zoning and subdivision regulations for persons with disabilities. In determining whether a requested modification of zoning or subdivision regulations is reasonable, the City will consider, among other relevant factors, the extent to which the requested modification might be in conflict with the legitimate purposes of its existing zoning or subdivision regulations. The purpose of these provisions is to provide a process for making requests for reasonable accommodation to zoning and subdivision decisions and procedures regulating the siting, funding, development and use of housing for people with disabilities. Pursuant to the zoning regulations, requests for accommodation are referred to the Planning and Building Director, or designee, who must issue a decision within 45 days. There are provisions for appeal of the Director's decision. A packet of materials, including an information sheet and forms for application, decision, and appeal is provided in Appendix C.

The Magnolia Terrace project provides an example of a recent request for reasonable accommodation. In 2009 Housing Consortium of the East Bay (HCEB) received entitlements to restore a relocated building into five independent units for people with developmental disabilities. The project will offer long-term, affordable, accessible apartment units for adults and households with developmental disabilities, with leasing preferences for very low-income households. The relocated building met setback requirements except that a small portion of the front entry porch roof encroached into the 10-foot front setback. The applicant made a request for accommodation for the encroachment of the front entry into the setback to minimizing slippery conditions for a person in a wheelchair. The request was approved by the Planning and Building Director,

The Emeryville Zoning Ordinance includes few specific standards for the development of housing for persons with disabilities. It establishes the dimensions of accessible parking stalls and sets the parking requirement for convalescent facilities (sanitariums, asylums, residential care facilities, convalescent and nursing homes, homes for the aged, and rest homes) at 5-1/2 spaces per every 1,000 square feet of floor area. Residential parking requirements for housing for persons with disabilities are the same as for the non-disabled. The Zoning Ordinance defines *family* as one or more persons occupying a dwelling unit and living as a single housekeeping unit, as distinguished from a group occupying a hotel, club, or fraternity or sorority house. Title 24, the State Building Standards Code cover construction-related accessibility requirements for persons with disabilities. The City has a disabilities coordinator to facilitate ADA compliance.

Inclusionary Housing Ordinance

In 1990, the City of Emeryville adopted the Affordable Housing Set Aside (AHSA) Ordinance, an inclusionary housing ordinance, which is part of the Emeryville Municipal Code (EMC). As adopted in 1990, the AHSA Ordinance required that 20% of units in projects (both rental and ownership) which have 30 or more units must be set aside at affordable housing levels to moderate income households, which are households earning between 81 and 120% of the Area Median Income (AMI).

In June 2008, the Emeryville City Council approved a revision to the AHSA Ordinance to facilitate the production of units affordable to very low income households (households earning 50% or less of the AMI) by revising the inclusionary percentage requirement for rental developments. The revision was also made in response to the new Regional Housing Need Allocation (RHNA) for the 2006-2014 goal period that places greater emphasis on very low and low income housing. The AHSA Ordinance currently requires the following inclusionary levels in developments of 30 or more units:

- 20% of units in for-sale developments must be set aside for and affordable to moderate income households (no change from original Ordinance level).
- 9% of units in rental developments must be set aside for moderate income households, and 6% of units must be set aside for very low income households.

The inclusionary level for rental developments mirrors the "Housing Production" requirement set forth in the California Community Redevelopment Law for redevelopment agencies. Over the period of an Agency's Ten-Year Housing Compliance Plan, an agency must ensure that 15% of all privately-built housing in its project area be affordable to very low income households and moderate income households at these percentages, with 9% for moderate income and 6% for very low income. The inclusionary percentage level for rental developments was revised to encourage the production of very low income housing, a level not previously provided for in the AHSA Ordinance, but was reduced from 20% to 15% of the total units in the project to help offset the net cost of providing very low income instead of moderate income units. Prior to the revision of the rental inclusionary level, the City undertook feasibility analysis of the proposed income targeting mix and concluded that there was some loss of net revenue to the developer resulting from changing the inclusionary requirement to very low income, based on an average development size of 100 units (which is less than the average residential size for projects completed between 1999-2006 at 115 units). The potential impact of the inclusionary revision on the supply and cost of rental housing is, however, off-set by the incentives and concessions stipulated in the AHSA Ordinance, as well as the availability of financial assistance through the Redevelopment Agency to facilitate compliance with the AHSA Ordinance. The City did not reduce the 30-unit threshold unit level because developers indicated that imposing an inclusionary requirement for projects with fewer than 30 units would be economically infeasible and a constraint on the production of housing.

Production of Affordable Housing under the AHSA Ordinance

Although the AHSA Ordinance was adopted in 1990, during much of the 1990s, much of the residential development built in Emeryville was the result of public-private partnerships between developers and the City through its Redevelopment Agency. The Agency provided financial assistance through its Low and Moderate Income Housing Fund for several residential projects developed by private, for-profit and non-profit residential developers, and in one case, the Alameda County Housing Authority. Some of these developments did not exceed the 30-unit threshold of the AHSA Ordinance, while others provided a percentage of affordable units greater than the inclusionary requirement by leveraging Agency assistance with other federal, state and private sources. Between 1990 and 1999, 281 very low and low income units were added to the City's housing stock, including units within these major developments:

- Emery Villa, a 50-unit apartment development for very low income seniors.
- EmeryBay Club and Apartments Phase II, a 260-unit mixed market rate/affordable multi-family housing development with 104 very low and low income units.
- Triangle Court Apartments, a 100% affordable rental development with 20 affordable units for low and very low income families.
- Ocean Avenue Court, a 6-unit affordable project for physically disabled persons developed, owned and operated by the Alameda County Housing Authority.
- Bridgecourt Apartments, a 220-unit mixed market rate/affordable multi-family housing development with 88 very low and low income units.
- Baybridge Apartments, a 6-unit development for individuals living with AIDS-related illness.

The first private, ownership development proposed in the City that was subject to the requirements of the AHSA Ordinance was Emeryville Warehouse Lofts, a 140-unit live/work, residential unit condominium development completed in 2000. The project contains 24 moderate income and 2 low income-designated BMR units. This project ushered in a period of very strong residential growth undertaken by the private sector that continued throughout much of the decade, until housing starts declined rapidly beginning in 2008. Between 2000 and 2009, 413 units for very low, low, and moderate income households were completed in Emeryville within twenty separate developments, all but one of which were in developments subject to the AHSA Ordinance. About 53% of the BMR units were completed in rental developments (220 units) and 47% of the BMR units were completed in ownership developments (193 units).

The inclusionary units provided through the AHSA Ordinance have helped the City meet a substantial portion of the Regional Housing Need Allocation (RHNA) assigned to Emeryville during the 1999 through 2006 period, as shown in Table 2-55 in Chapter 2. The AHSA Ordinance has therefore not appeared to have had a constraining impact on the production of either rental or ownership housing or hindered the City from meeting its share of the overall regional housing need.

Developer Incentives

The City offers a number of incentives and financial mechanisms to encourage development of inclusionary units and to facilitate developers in their compliance with the AHSA Ordinance.

Incentives contained in the AHSA Ordinance:

- Below Market Rate ("BMR") units set aside through the AHSA Ordinance are to be proportional to the mix of unit sizes (e.g. studios, one-bedrooms, two-bedrooms, etc.) in the development but on the whole may be slightly smaller than the average square footage for that unit type because they do not include a development's "premium" units, such as top-floor units or penthouse units. (EMC 9-4.62.3(d))
- BMR units are required to include the same interior features and finishes as the "base level" of market rate units prior to purchaser-funded upgrades. The materials should be good quality and durable but do not need to reflect the highest level of finishes that a purchaser of a market-rate unit might select. (EMC 9-4.62.3(d))
- The developer has the ability to reduce the number of inclusionary units in a project if the developer agrees to provide more deeply affordable BMR units instead of the level required by the Ordinance. For example, a developer may agree to provide very low or low income units instead of moderate income units. In such cases, developers are able to reduce the interior amenity level and the unit square footages of these units, as well as seek Redevelopment Agency assistance for traffic impact fees, building fees, or other fees/exactions required. (EMC 9-4.62.3(i)(1 through 4))
- The developer has the ability to construct the BMR units off-site at sites either contiguous or non-contiguous with a development project if it is deemed the BMR units are not feasible or appropriate at that location. (EMC 9-4.62.3(f))
- In order to avoid any undue economic burden of the AHSA Ordinance, developers may seek a density bonus of 25% through the Ordinance that is exclusive of other density bonuses allowed. (EMC 9-4.62.9)
- Developers may claim an economic hardship resulting from imposition of the AHSA Ordinance, which provides ability for a developer to reduce the project interior amenity level or square footage of the BMR units (EMC 9-4.62.10).
- Developers may seek Redevelopment Agency financial assistance for the cost of traffic impact, building, and other fees imposed on the development if there is an undue burden or cost associated with imposition of the inclusionary requirement. (EMC 9-4.62.11)
- The Ordinance contains a process for appealing the requirements of the inclusionary requirement (EMC 9-4.62.14)

If a developer proceeds with an economic hardship claim, in practical terms that manner in which it is processed is the following: The developer is required to share their financial pro forma with City staff so that the City may review it to determine if the AHSA Ordinance makes the project financially unviable. The developer is able to present this case to the Council and the Council may take action to reduce the impacts of the Ordinance by one of the measures cited above. In terms of the appeal provision, of 20 residential development projects that were completed between 2000 and 2009 that were subject to the AHSA Ordinance, only one developer appealed the Ordinance requirement before the City Council while all others complied and completed their developments. The appeal was denied by the Council because the developer failed to provide supporting evidence that the Ordinance presented an economic hardship.

The City Council has approved projects where a lesser inclusionary percentage was required in exchange for deeper affordability. In these cases, City staff worked with the developer to determine a cost-neutral point at which the provision of units at low or very low income, in lieu of moderate income units (the inclusionary requirement for all projects up through mid-2008), would not negatively impact the development costs. The Avenue64 rental project, with 224 total units, was approved with a 10% inclusionary level instead of 20% (the project was approved prior to the June 2008 AHSA Ordinance revision). The development has 23 BMR units out of the total 223 project units; 8 are set aside at Low Income and 15 are set aside at Moderate Income units. The Icon at Park project has 54 rental units. The project has 3 very low income units (6% of the total units) and the remaining units are market rate, instead of the 20% inclusionary level that would have been required under the Ordinance (the project was approved prior to the June 2008 AHSA Ordinance revision).

Other Resources and Incentives for Compliance:

In addition to the incentives and concessions outlined in the AHSA Ordinance directly, the City commits staff time and Redevelopment Agency financial resources to facilitate implementation of the AHSA Ordinance, in the following ways:

- Staff participates actively with the marketing and sales/leasing teams of the developers in crafting marketing plans for the BMR units aimed at successfully leasing up or selling the BMR units.
- The City provides developers with its mailing list of over 2,500 people who have expressed interest in Emeryville housing, to assist in marketing outreach.
- The City participates in the open houses and information workshops for prospective tenants and purchasers of BMR units within the developments.
- The City actively markets new BMR units (including serving as a distribution point for BMR unit applications) at the City Hall information area, the City's website, through City-wide mailings, and notices to the Emeryville Chamber of Commerce, and neighborhood-based groups.
- The Redevelopment Agency provides Low and Moderate Income Housing Funds to support the City's First Time Homebuyer Programs for Low and Moderate Income Households purchasing inclusionary ownership unit. The Agency has also provided housing subsidies directly to developers to support the financial viability of residential developments. In a number of completed residential projects with BMR units, developers have been provided both land write-downs and financial subsidies to assist in the development costs of the BMR units. Further explanation of the resources provided to encourage affordable housing development is provided in the Government Resources section of this chapter.

Fees and Exactions.

Planning application fees range from $500 to $2,000, plus cost recovery for staff time, consultant fees and other expenses. For larger projects this can be over $50,000. The Building Permit Fee (BPF) is one of the largest fees and is 0.8% of the total valuation (replacement cost of the project once it is completed). Another major building fee is the Plan Review Fee which is 65% of the Building Permit Fee (50% for residential less than $100,000). Other major fees include the General Plan Maintenance Fee and the Art in Public Places fee. The former is a fee of 0.5% of valuation. The Art in Public Places fee applies to commercial projects of over $300,000 value and is an artwork or in-lieu fee of 1% of valuation. This fee also applies to residential projects of 20 units or greater and is .05% of valuation of these projects. Other fees include the Energy Conservation Fee (12.5% of BPF), the Electrical Permit Fee (20% of BPF), the Plumbing Permit Fee (18% of BPF) and the Mechanical Permit Fee (17% of BPF). Fire Department Fees and Traffic Impact Fees (calculation depends on type of building) can also add up to a large amount. The Emeryville Unified School Facilities Development Fee is based on the type of project and is calculated as a fee/sq. ft. This fee is $0.42/sq. ft. for residential projects, $1.53/sq.ft for live /work projects and $2.63/sq. ft. commercial projects. Planning application fees are due at the time of filing. For cost recovery, a deposit is required up front and billings will be made as costs incur. Building permit and impact fees are collected in three phases. Plan review fees and energy fees are due at plan check submittal. At the time the permits are issued the following fees are due: building, electrical, plumbing, and mechanical permit fees, Fire Department fees, sewer connection fees, schools, public art, and the general plan maintenance fee. The traffic impact fee and any business license fee, as well as any remaining planning fee, are due with the final inspection.

School Facilities Development Fees are waived for developments that provide affordable housing set-aside units. Additionally, to relieve any undue burden on developers who are required to provide moderate-income set-aside units under the Affordable Housing Set-aside Program, the Redevelopment Agency may subsidize the cost of any traffic fees, building fees and other City fees applicable to the set-aside units.

To illustrate the cumulative effect of fees on a project three examples are provided below:

Salem Manor (#2), new triplex
Conditional use permit $1, 031
Building fees and all other fees: $13,446
Total fees per unit: $4,825
Estimated development cost/unit $469,000
Proportion of fees to development costs: 1.0%

Elevation 22, 71 for sale townhouse units
Planning fees $28,245
Building fees and all other fees: $393,435
Total fees per unit $6,024
Estimated development cost/unit $375,000

Proportion of fees to development costs: 6.2%

Courtyards, 331 for-rent apartments

Planning fees	$87,274
Building fees and all other fees:	$1,725,296
Total fees per unit:	$5,476
Estimated development costs/unit	$375,000
Proportion of fees to development costs:	1.5%

As indicated in the above examples planning and building fees are a very small percentage of the total cost of developing housing in Emeryville.

Site Improvements.

Because many sites are small and being re-used, improvements consist of upgrading water and sewer lines if needed for intensification of use, providing parking and on-site circulation, and placing utility wires underground. The City uses standard conditions of approval that are applied to projects as warranted. Public improvements may also be required to improve the safety and livability of the city. These include curb, gutter, and sidewalks, street trees, street reconstruction, traffic signals, utility lines, and park and greenway improvements.

Permit Process. As a small city, Emeryville's zoning permit process is less time-consuming than that of many East Bay cities and staff is able to provide a higher level of customer service than seen in larger cities. Administrative planning approvals including staff-level (minor) design review, sign permits and other small projects, take about three days to three weeks to process. Planning Commission approvals (use permit, design review, variance, sign permit, subdivision) take about two months for simple projects, once the application is complete. Appeals to City Council or approval of a Redevelopment Agency agreement may add up to two months. A request for a planned unit development, an amendment to the Zoning Ordinance or a General Plan Amendment will likely take longer due to required hearings by the Planning Commission and City Council. For larger projects, the developer is asked to meet with neighbors prior to seeking approval from the Planning Commission. Informal study sessions with the Planning Commission, City Council, or both are also recommended for larger projects prior to filing of an application. Study sessions are beneficial to the applicant because any concerns by the Planning Commission and City Council can be aired prior to large investment into design. Likewise, applicants receive preliminary review by staff to determine conformance with zoning and the General Plan and to identify the permits required. By the time the project appears before the Planning Commission, significant issues are resolved. Emeryville's permit procedures are straightforward. Unlike neighboring cities and larger cities, there are no design or historical review boards. CEQA analysis can prolong project review but many projects are eligible for urban infill exemption. One of the objectives of the update of the zoning regulations is to expand the types of planning permits processed through administrative (staff) review, thereby simplifying the process for the developer and relieving the Planning Commission of long meetings with full agendas.

Building permits and the related reviews (plan, energy, electrical, plumbing, mechanical, fire) are processed together. For a mid-size, uncomplicated project with complete drawings and other submittal requirements, it generally takes about six weeks to produce first comments and two to three weeks to respond to the developer's response, for a total of two to three months. Larger, more complex projects can take several additional months to receive building permits.

To reduce staff time, the City is implementing a permit tracking system, allowing computerized access to files. Ultimately, this will result in limited public access to records online and will enable applicants to submit applications through the internet.

Overall the permit process in Emeryville is efficient and, as demonstrated by the City's success at developing housing (Tables 3-1 and 3-2) does not impeded housing production.

Building Code and Enforcement.

The mission of the Emeryville Building Division is to provide information and assistance to those planning a construction project in the City of Emeryville, as well as providing timely services for projects already under construction. Project design teams are encouraged to meet with the Building Official, the plan check engineer, and Fire Department staff in the early stages of the project in order to discuss significant code issues that will impact the project. By working out potential problems early, applicants can usually proceed more efficiently through the plan review stage of a project. On January 1, 2008 a new International Building Code came into effect in California. The City of Emeryville has transitioned to this new code.

The code enforcement program focuses on enforcing ordinances and laws that require abatement to properties that are dangerous to the public or are a public nuisance. Building inspectors respond to complaints, issuing notices of violations and informing property owners about rehabilitation programs. Building owners are given a reasonable period of time to correct code violations, and the buildings are re-inspected. If violations are not corrected, the owners can be cited or nuisance abatement proceedings can be initiated.

Environmental Issues.

Environmental review, in compliance with state and federal requirements, runs concurrent with other aspects of the local development approval process. Pursuant to the California Environmental Quality Act (CEQA), if a project has no significant impacts or the impacts can all be mitigated to a less-than-significant level, then an Initial Study and Mitigated Negative Declaration is adequate. This process usually takes two to three months. If the project has potentially unavoidable significant impacts, it requires an Environmental Impact Report, which can take four to six months, and sometimes longer. Use of an exemption for urban infill housing projects is often used to expedite environmental review if there are no identified impacts. The Environmental Impact Report prepared for the update of the other elements of the General Plan is a programmed EIR that will enable development projects in the near future to tier off the evaluation provided by the EIR. This means that future projects will require less evaluation under CEQA.

As a small city, Emeryville's environmental concerns are limited to a few areas. Landslides are not of concern because the entire city is on flat terrain. The City is not in a flood hazard zone and seismicity issues are addressed by building codes. Sensitive biologic resources are confined to bayshore areas that are designated and zoned for parks and open space. As indicated in the sites analysis section above, toxic contamination from previous industrial uses has been a key environmental concern. Noise is also a localized problem associated with the location of sensitive receptors relative to commercial and light industrial uses and the existence of freeways and a major rail line.

Toxic Cleanup. Site characterization, health risk assessment and site remediation in accordance with State mandates can present major development expenses. The Redevelopment Agency has implemented a grant to characterize sites and make information available, and administers a grant and loan program for assessment and cleanup work. The program is called Capital Incentives for Emeryville's Redevelopment and Remediation (CIERRA). It provides financial, technical and regulatory assistance and expertise for property owners and developers. This program has been instrumental in expediting the cleanup many sites.

Wastewater Facilities. In 2009, the Regional Water Quality Control Board adopted Order No. R2-2009-0004 reissuing a permit to EBMUD to operate its Wastewater Treatment Facilities but prohibiting any discharge from their three wet weather sanitary sewage treatment facilities. Shortly thereafter, the US Environmental Protection Agency, and the Regional and State Water Boards filed suit against EBMUD for discharges in violation of this prohibition and entered into a Stipulated Order. A provision of this Order requires EBMUD to pass a regional ordinance to implement a Regional Private Sanitary Sewer Lateral (PSL) Replacement Program in an effort to reduce the amount of wet weather sanitary sewage flows to their treatment facilities. It is believed that 50% of the wet weather flows originate from runoff entering the sanitary sewer collection systems through private sewer laterals.

On November 18, 2009 the US Environmental Protection Agency issued the City of Emeryville an order to reduce sanitary sewer overflows from its collection system and to control Infiltration and Inflow (I&I) into the collection system so as not to cause or contribute to overflows from the EBMUD wastewater facilities. This order includes a number of requirements for the City to implement immediately in order to improve on the current program for controlling overflows and reducing I&I. One of the requirements is to develop and implement a PSL Replacement Program or to coordinate with EBMUD in the implementation of the Regional PSL Replacement Program. The timeline to complete this requirement is within 90 days of the adoption of the Regional PSL Ordinance or by October 15, 2010, whichever is later. Emeryville will coordinate with EBMUD to fulfill the requirement.

In general, the proposed Regional Ordinance will require that the PSL be brought into compliance whenever the title of any private property is transferred associated with a sale of real property, whenever a property owner applies for any permit to remodel a structure where the cost of the work is projected to exceed $100,000, or whenever a property owner applies for any permit to increase or decrease the size of the property owner's water meter. The ordinance also requires that all PSLs belonging to Homeowners Associations for multi unit condominium developments comply with the Regional Ordinance within 10 years of the adoption of the Ordinance. When the PSL is replaced, a Certificate of Compliance will be issued by EBMUD that will be valid for 20 years.

The City has analyzed the capacity of its collection system to handle the dry weather flows generated from all the land use changes at full build out of the General Plan in conjunction with the wet weather I&I flow generated in Emeryville and the subbasins in Oakland draining into Emeryville. Various sewer mains within the system have been identified as needing capacity upgrades. The upgrades are primarily necessary to handle the I&I flow entering the system within the City of Oakland. The identified upgrades are funded and projects are underway. The Parks Open Space and Public Facilities Element of the Draft General Plan contains policies and actions to sewers.

Noise. The I-80 and I-580 freeways and the Union Pacific and Amtrak rail facilities will continue to be a major source of noise in the western and southern portions of Emeryville. With a growing residential population in a mixed use environment there is an increasing awareness of noise from non-residential uses, including newer high tech uses. The Emeryville Municipal Code prohibits excessive and annoying noises from all sources and limits the hours for construction and other noisy activities. However, some noises occur on an continual or continual but intermittent basis, such as freeway and train noise, and noise emitted by mechanical equipment such as heating and cooling facilities. The Conservation, Safety, and Noise Element of the Draft General Plan contains policies and actions to address noise.

Non-Governmental Constraints to Housing Development

This section evaluates non-governmental factors that may impact the affordability and supply of housing.

Local Geography. Perhaps the most obvious of Emeryville's constraints to housing development is its small size and inability to expand beyond its 1.2 square miles of land area. Infill densification has and will continue to occur but the rate will slow as the underutilized sites are redeveloped.

Residential Development Costs. The cost of developing residential housing escalated significantly during this decade due to the increasing cost of land, building materials such as lumber and steel, labor, remediation costs, and the need for construction defects liability insurance. During this decade, Emeryville has seen its land values increase dramatically, with many sites selling in the $85 to $120 per square foot range. This is a large increase from the land values reported in the 2001 Housing Element, which ranged from $20 to $60 per square foot.

Construction costs vary from site to site and may increase or decrease depending on project size, construction type (wood frame vs. steel), the number of funding sources involved, developer capacity, and the level of amenities or services being provided in the development. Emeryville's Affordable Housing Set Aside Ordinance requires that developers of residential units subject to the Ordinance provide the same base level of amenities and quality of unit finishes in the designated "below market rate" units as in the market rate units. Similarly, the City requires that regardless of whether a residential development is 100% market rate or 100% affordable, the architectural design and quality of the units must be of a very high standard. Therefore, the construction costs associated with affordable housing are likely to be as high as that of market rate housing. A sampling of recent residential developments that have been approved in Emeryville with Redevelopment Agency financial involvement have construction costs ranging from $360,000 to $450,000 per unit. Including land and soft costs, the City has reviewed development budgets for specific Agency-involved housing projects that have been in the range of $500,000 to $600,000 per unit. These high costs can be viewed as a constraint to affordable housing development because the cost of the units far exceeds the revenue potential from the affordable units. As described under the next section on Governmental Resources, the Emeryville Redevelopment Agency has often provided housing development subsidy to provide lower and very low income units, to off-set the cost of producing the housing and to ensure the provision of affordable units at these levels.

Affordable Sales Prices and Rents. The Bay Area has historically had higher market rate housing costs than much of the rest of the nation, and market rate housing prices and rent levels have exceeded that which is considered affordable by state housing law, particularly at the very low and low income levels. Each year, the City of Emeryville publishes a chart showing the maximum sales prices and rent levels that are considered affordable for very low, low, and moderate income households, pursuant to affordability definitions found in State of California redevelopment law. According to the law, total housing costs may not exceed the amounts shown in the formulas below:

Ownership Housing - For purchasers, housing costs include principal and interest on a mortgage, property taxes and assessments, fire and casualty insurance, property maintenance and repairs, allowance for utilities and homeowner associates fees.

- For moderate income households – 35% of 110% of the area median income
- For lower income households – 30% of 70% of the area median income
- For very low income households – 30% of 50% of the area median income

Rental Housing - For renters, housing costs include rent, allowance for utilities, fees or service charges assessed by the lessor and charged to all tenants, and any taxes or fees charged by a party other than the lessor.

- For moderate income households – 30% of 110% of the area median income
- For lower income households – 30% of 60% of the area median income
- For very low income households – 30% of 50% of the area median income

Using the formulas above, Table 3-7 shows the maximum affordable sales prices and gross rents that are based on the area median income for Alameda County in Year 2009.

Table 3-7: Year 2009 Affordable Housing Sales and Rental Chart

Unit Size	Studio	1-BR	2-BR	3-BR
Moderate Income Rent	**$1,719**	**$1,965**	**$2,210**	**$2,456**
Moderate Income Sales Price	$241,201	$276,083	$310,725	$349,364
Low Income Rent	**$938**	**$1,072**	**$1,205**	**$1,340**
Low Income Sales Price	$104,244	$119,514	$134,653	$153,680
Very Low Income Rent	**$781**	**$893**	**$1,004**	**$1,116**
Very Low Income Sales Price	$57,287	$65,739	$74,379	$86,588

Market Rate Ownership Housing. Using data collected for 2007 and 2008, Table 3-8 compares sales price averages between 2007 and 2008. While the data shows a drop in the median sales price for single family homes, from a median of $486,000 in 2007 to $399,000 in 2008, the 2008 median is still well above what would be considered an affordable sales price to low or very low income households, about

$133,000 and $75,000 respectively for a two-bedroom unit. The median single family home price of $399,000 is over what a moderate income household could afford in 2008, which was about $302,000.

The average condominium unit price increased 7% between 2007 and 2008, to $425,000. This level is significantly higher than the affordable Below Market Rate (BMR) level for moderate, low or very low income households.

Table 3-8: Sales Prices in 2007 and 2008

		12-month period 2007	12-month period 2008	% Change 2007-2008
Condominiums	High	$800,000	$925,000	16%
	Median	$396,500	$425,000	7%
	Low	$205,000	$230,000	12%
Single Family Homes	High	$539,500	$437,500	-19%
	Median	$486,000	$399,000	-18%
	Low	$380,000	$321,000	-16%
Source: Realquest 2009; City of Emeryville Economic Development and Housing Department				

Market Rate Rental Housing. As shown in Table 2-45 in Chapter 2, average market rents from a February 2009 survey of existing larger apartment complexes in Emeryville show rental housing rates at high levels, despite the economic downturn. Rents for a studio ranged from $1,645 to $1,850 per month; one bedroom units ranged from $1,423 to $2,235; two bedroom units had rents ranging from $1,865 to $2,860; and three bedroom units (or two bedroom with loft) ranged from $1,945 to $3,795. The gap between what is considered an affordable rent and current market rents is very significant at the very low and low income levels. For example, the gross allowed affordable very low income rent for a two-bedroom unit is just $969 per month. For a low income two-bedroom unit, the rent is just $1,163 per month. Affordable rent levels for very low and low income households are about $800 less per month than what is available in the market. Low and very low income households have more difficulty obtaining affordable housing on the market, which is illustrated in the very high interest that the City receives from individuals looking for affordable rental opportunities in Emeryville and interest in new developments that contain a below market rate rental component. The City maintains a "Housing Interest Notification List" that it provides to developers when they are ready to begin marketing a new project with BMR units. The City's Housing Interest List has over 3,000 individuals on it who have shown interest in affordable housing opportunities. When new projects open that have low or very low income units, there is strong interest in the projects, and far more people apply for the units than there are units available. For example, over 450 applications were received for the 57 very low income designated units at the Windsor Apartments at Bay Street (formerly called Metropolitan Apartments at Bay Street), and over 80 applications were received for 8 low income units designated at the Avenue 64 rental development.

By contrast, currently the moderate income rents are not significantly different from what is available on the market at the lower end of the range; in fact, in some cases, market rents are less. With maximum allowed moderate income rents ranging from about $1,600 to $2,300 per month for studios up through three-bedrooms, on the market, as of early 2009 it was possible to obtain a studio unit for about the same amount, a one-bedroom unit for $1,423, a two-bedroom for $1,865, and a three-bedroom for $1,945.

The Non-Profit Housing Association of Northern California, an affordable housing advocacy organization, produced a resource and membership guide, "Opening New Doors," which contains analysis of Bay Area housing affordability conditions, looking at the nine Bay Area Counties as well as some metro-area data. This analysis may be found in Appendix B to this Housing Element. Included in the analysis are factors such as:

- In the third quarter of 2006, the annual income needed to purchase the median priced home in the Oakland Metro Area was $191,000 for the median price of $560,000.
- In Alameda County, a household must earn $50,000 to afford a two-bedroom unit at the Fair Market Rent (FMR) which is $1250 per month.
- In Alameda County, 142 minimum wage work-hours are required per week to afford a two-bedroom unit at the FMR.

Economic Recession and Budget Cuts: The provision of affordable housing in the market is contingent in part on governmental policies and programs that encourage the development of affordable units, as well as the availability and suitability of land for development, availability of financing from both public and private sources, and reasonable construction costs. The nationwide recession that began in late 2007, triggered by the housing foreclosure crisis and ensuing tightening of credit markets, has resulted in a significant downturn in the amount of residential housing and availability of financing for new residential development. Budget cuts at the state and federal levels have reduced the ability to leverage local public funds in affordable housing development which in practical terms reduces the number of affordable units that can be subsidized. Meeting the 579-unit goal for very low, low, and moderate income housing units specified for the 2006-2014 Regional Housing Need Allocation period (which represents 51% of the total 1,137-unit need allocation) will require significant levels of local public subsidy to underwrite the affordable units, as well as leveraging by other state and federal funding sources. As demonstrated in the Government Resources section of this chapter, the Emeryville Redevelopment Agency has a strong track record of supporting and funding very low, low, and moderate income housing through its Low and Moderate Income Housing Fund. However, the potential that redevelopment agencies will be required to shift local redevelopment funds to the State in May 2010 is certain to negatively impact the Agency's ability to fund as many affordable housing units in the coming years.

Government Resources

Emeryville Housing Policies, Programs, and Financing

The City of Emeryville and Emeryville Redevelopment Agency use a variety of mechanisms to encourage the production of affordable housing at the moderate, low, and very low income levels.

Emeryville Redevelopment Agency. The Emeryville Redevelopment Agency undertakes a variety of projects and programs for the purpose of revitalizing the community and fostering the production of affordable housing. The Agency has two Project Areas in which in focuses its activities – the 1976 Project Area and the Shellmound Project Area. Combined, these areas cover more than 95% of Emeryville's geographical area. The California Community Redevelopment Law (CRL) requires redevelopment agencies to set aside at least 20% of all tax increment revenues generated within their project areas into a separate Housing Set Aside Fund, or Low and Moderate Income Housing Fund (LMIHF). Funds in the LMIHF must be used for the purpose of increasing, improving or preserving the supply of low and moderate income units within the community. To meet these objectives, agencies may expend funds on land acquisition, building acquisition, construction of new units, on- and off-site improvements, rehabilitation of existing units, a portion of principal and interest payments on bonds, loans and subsidies to buyers or renters, and other programs that meet the stated objectives. In Emeryville, the major source of local public funding for affordable housing is the Emeryville Redevelopment Agency's LMIHF.

Agency Housing Production Requirements. The California Community Redevelopment Law (CRL) also requires that redevelopment agencies meet affordable housing production requirements, set forth in Section 33413 of the California Health and Safety Code, which covers Agency-built housing and Non-Agency-built housing. Because the Emeryville Redevelopment Agency has not directly produced affordable housing since undertaking the construction of new for-sale housing through the Vacant Housing Program in the 1990s, the Agency tracks its housing production against the requirement for Non-Agency-built housing. Specifically, the CRL requires that 9% of all housing constructed within the redevelopment project areas, regardless of Agency financing, must be designated for low or moderate income households, and 6% must be for very low income households (for 15% total). The CRL requires that redevelopment agencies prepare and update a Ten-Year Housing Compliance Plan every five years in conjunction with preparation of a "Redevelopment Implementation Plan" that describes the programs that will be undertaken by the agency to eliminate blight conditions in the redevelopment project areas. An Agency's housing production requirements must be met within the ten-year Housing Compliance Plan period. In December 2009, the Emeryville Redevelopment Agency adopted an update to the 2005-2014 Ten-Year Housing Compliance Plan in conjunction with adoption of the 2010-2014 Redevelopment Implementation Plan. The Implementation Plan and Housing Compliance Plan may be found in the Appendices to the Housing Element.

To ensure that the Housing Production Requirement is met over the ten-year Housing Compliance Plan period, the City regularly tracks affordable housing production to measure its achievement of both the redevelopment production requirement as well as attainment of the Regional Housing Need Allocation goals. The City's Affordable Housing Set Aside Ordinance, discussed previously in this Chapter, includes a requirement that 20% of ownership units be set aside for moderate income households; and within rental projects, 9% of units

must be set aside for moderate income households, and 6% for very low income units, mirroring the State redevelopment law production requirement.

Agency Financial Assistance. The Emeryville Redevelopment Agency implements its affordable housing objectives through a number of mechanisms. This includes: providing direct financial subsidy to private developers to achieve deeper affordability levels through land write-downs, low interest and/or deferred-payment loans, and/or housing grants to support the development of Below Market Rate (BMR) units; providing financial assistance through other Agency programs, such as the Emeryville Housing Rehabilitation Program, the Brownfields Loan and Grant Program which reduces remediation costs for the development; financing public right-of-way infrastructure improvements to support and facilitate the development of the housing; and providing subsidies directly to first-time homebuyers in the form of downpayment assistance loans that fill the gap between the sales price and the buyer's first mortgage.

Over the past decade, particularly during the very strong housing boom in the mid-decade, the gap between market rate housing prices and rents, and those of BMR units, was significant. To increase the financial feasibility of the BMR units, the Redevelopment Agency has provided subsidies from its LMIHF in both the form of developer subsidy as well as downpayment assistance loans. As documented in Table 8 of the 2005-2014 Ten-Year Housing Compliance Plan (see Appendix), between 2005 and 2009, the Agency extended $8.85 million in Agency housing funds to support the development of 57 new BMR units, an average of $155,000 per unit. Over the ten-year compliance plan period, the Agency anticipates making $56.7 million available through its LMIHF, projected bond sales, and leveraged State Programs for downpayment assistance to support the development of 565 BMR units. A fuller description of how the Agency has supported production of affordable housing between 2002 and 2008 through these mechanisms is found in Chapter 4 – Achievement of 2001 Housing Element Goals.

First Time Homebuyers Program. This program provides assistance through low-interest, deferred payment second mortgages to lower to moderate income home buyers purchasing a home in Emeryville. The program provides 1.5 times the buyer's amount, up to 15% of the cost of the home. The amount of the City's loans therefore varies between units. The Redevelopment Agency allocates $220,000 annually of new funds to the program, and loan repayments are put into a revolving fund to support new loans. The loans through this program are made to purchasers of BMR units created through the City's Affordable Housing Set-Aside Ordinance, and to purchasers of market-rate units. Within the First Time Homebuyers Program are sub-set programs that offer additional assistance to income-eligible teachers in the Emery Unified School District as well as City of Emeryville employees. The program offers loans up to 20% of the purchase price with no downpayment requirement. For Fire and Police Department personnel, due to the City's interest in encouraging them to live in Emeryville, above moderate income individuals may apply for the First Time Homebuyer Program loans.

Ownership Housing Assistance Program (OHAP). This program provides assistance through low-interest, deferred payment second mortgages to low and very low income households purchasing BMR units set aside through the City's Affordable Housing Set Aside Ordinance. Buyers make a 3% downpayment and obtain a first mortgage based on their household income. The Agency's loan fills the gap between the downpayment and the first mortgage loan. For low income buyers, the maximum loan amount is $110,000; for very low income buyers, the maximum loan amount is $220,000. Agency LMIHF funds have been supplemented with funds from the State CalHome and the

California Housing Finance Agency (CalHFA) Housing Enabled by Local Partnerships (HELP) Program to provide the Agency's assistance loans at these levels.

In 2004, the City applied for and was awarded a $1 million grant from the State CalHome Program to augment the Agency's LMIHF funds dedicated to OHAP being used in BMR units as well as for very low and low income buyers purchasing market rate units. In June 2008, the City applied for and was awarded an additional $900,000 in CalHome funds for these programs. The City was also awarded a $1.5 million deferred-payment, low interest-rate loan from the CalHFA HELP Program to leverage the Agency's funds in the OHAP Program. The final HELP loans were funded in October 2009; while the CalHome funds are still available as of the writing of this Housing Element.

At the end of each fiscal year, a report is compiled with detailed statistics on the First Time Homebuyer Programs for both market rate and below market rate units. During Fiscal Year 2008/2009, which ended on June 30, 2009, 28 households purchased homes in Emeryville through the Homebuyer Programs, and $2.2 million in loan funds were expended, of which $1.4 million was from the Agency LMIHF and $800,000 was from the HELP Program. The Program included these statistics:

- The average loan amount for all homebuyer loan programs combined was $83,873, a 37% increase over the prior fiscal year.
- The average household income for homebuyers assisted was $54,204.:
- 57% of the homebuyers assisted were households below median income.
- Loans made to minority households were 71% of the total loans.
- The average price of units purchased was down 10% from the prior year, to $295,732.
- The homebuyer programs continue to serve a young age group of homebuyers – 39% were in their 20s.
- Loan repayments contributed $536,516 to the Program's Revolving Loan Fund during the fiscal year. The City disbursed the balance of the previously awarded $1 million in CalHome funds and was awarded an addition $900,000 in CalHome.

City Foreclosure Prevention and Predatory Lending Prevention Strategy. Emeryville has historically had a very low foreclosure rate in its homebuyer programs. Up through Fiscal Year 2008/2009, there have been just two foreclosures on the first mortgage financing out of over 500 households assisted through the City's First Time Homebuyers Program, representing a 0.4% default rate. However, due to the increase in the incidence of foreclosures that began occurring in late 2007, in December of 2007, the City Council adopted an 8-point Predatory Lending Prevention and Foreclosure Prevention Strategy to take a proactive approach to addressing the foreclosure crisis. In implementing the strategy, the City has:

- provided information on its website and made brochures available throughout the City on predatory lending and foreclosure prevention;
- in December of 2007, began tracking properties in foreclosure in Emeryville through RealtyTrac and, as of October 2009, identified 262 properties in some phase foreclosure;

- entered into contracts with non-profit and U.S Department of Housing & Urban Development (HUD)-approved housing counseling agencies to participate in foreclosure workshops and provide free counseling to Emeryville loan program participants;
- contacted all Emeryville property owners who had received Notices of Default (NOD) to provide referral information and warn them of foreclosure scams;
- adopted in Summer 2009 a Declining Market Policy to enable short sales for certain homebuyer loans to avoid foreclosure;
- worked with sixteen Emeryville homeowner program participants who had received NOD's to assist them in avoiding foreclosure by helping them cure their defaults or take advantage of the City's Declining Market Policy, enabling the City to secure over $1 million in outstanding loan balances and retaining fourteen BMR units in the City's affordable housing stock; and
- organized foreclosure prevention workshop quarterly and coordinated with City of Oakland on two foreclosure workshops at the Oakland Housing Fair in June 2008.

The Strategy has been implemented through 2009 and will continue to be implemented by the City depending on the on-going nature of the foreclosure crisis.

Emeryville Housing Rehabilitation Program. This program offers owners low-interest or deferred payment loans for major rehabilitation and seismic retrofitting, and grants for minor home repairs, exterior painting and clean up. Loans are also made available to rental property owners through Rental Limitation Agreements assuring rental units remain affordable for fifteen years. The allocation of funding for the Emeryville Rehabilitation Program from the Low/Moderate Income Housing Fund was increased from $100,000 to $290,000 annually in 2007. The increase benefits both low and moderate-income households. The Program also uses an annual allocation of Community Development Block Grant (CDBG) funds through Emeryville's allocation of CDBG from the Alameda County Urban County. The annual allocation for this program is in the $40,000 to $45,000 range. The City also receives program income payments from loan pay-offs and monthly loan payments.

Federal and State Financing Sources

In addition to the Agency's LMIHF, there are funding sources available at the federal and state levels to assist in the development of affordable housing, although the demand for these resources often greatly outweighs the available supply. At the federal level, the U.S. Department of Housing and Urban Development (HUD) oversees many programs, including the Community Development Block Grant (CDBG), the HOME Investment Partnership Program, Section 811 for housing for disabled persons, Section 202 for senior housing, Housing Opportunities for People With Aids (HOPWA) and the McKinney Homeless Assistance Act's Supportive Housing Program and Shelter Plus Care Program. Alameda County Housing and Community Development Department (HCD) is the conduit for the CDBG, HOME and McKinney Programs on behalf of the City of Emeryville. In the past, Emeryville has been very successful in developing affordable housing by leveraging its Redevelopment Housing funds with federal funds.

A major source of affordable housing equity funding is the Low Income Housing Tax Credit. Federal tax credits are allocated through the State of California's Tax Credit Allocation Committee and State housing tax credits are allocated through the California Debt Limit Allocation Committee (CDLAC).

At the State level, there have been more funding resources available during the past decade than were available in the latter half of the 1990s. The State Housing and Community Development Department manages a number of programs using proceeds of the voter-approved housing bonds passed in November 2002 (Proposition 46, which authorized $2.1 billion in state bonds for housing investment) and most recently in November 2006 (Proposition 1C, which authorized $2.85 billion in General Obligation bonds to continue several important bond-funded housing assistance programs). With Proposition 1C, programs such as the Multifamily Housing Program (MHP), the CalHome Program, the Multifamily Supportive Housing Program, the Building Equity and Growth in Neighborhoods (BEGIN) Program, and CalHFA's Homebuyer Assistance Program, were funded. Substantial funding for infrastructure related to housing development is available through the State's Transit-Oriented Development Housing Program and Infill Incentive Grant Program, each of which provide funding for infrastructure and housing near transit stations. These programs were funded through Proposition IC.

The California Housing Finance Agency (CalHFA) administers a number of programs to further affordable housing efforts in the State, including multi-family acquisition and rehabilitation funding, single family development funding, tax exempt and mortgage revenue bonds, and assistance programs (the Housing Enabled by Local Partnerships (HELP) Program). CalHFA also provides a number of loan products for first time homebuyers with favorable interest rates and terms. The City's First Time Homebuyer Program may be used in conjunction with CalHFA's loans. Alameda County HCD administers the Mortgage Credit Certificate (MCC) Program for Alameda County, including Emeryville, which provides a tax credit to subsidize mortgage interest rates for low and moderate income first time home buyers. MCCs are allocated through CDLAC. The City of Emeryville has been successful in applying for and receiving funding awards from both State HCD's CalHome Program and CalHFA's HELP Program.

Priority Development Area Designation. On November 20, 2008, the ABAG Executive Board approved Emeryville's application for Priority Development Area (PDA) designation in conjunction with the FOCUS program to advance the region's Smart Growth Strategy/Regional Liveability Footprint. PDAs are areas that are already developed, near existing transit service, and are planned for more housing. Emeryville's PDA includes the entire city except for the existing lower density neighborhoods and the area west of Interstate 80. Local governments with PDA's will be eligible for technical assistance, planning grants, and capital funding.

Non-Governmental Resources

Developers. The City of Emeryville has worked with both private for-profit and non-profit developers to produce affordable very low, low, and moderate income housing in the city. For-profit and non-profit developers bring their expertise in the area of housing design, finance, site development, marketing, and operations to ensure that high quality housing is produced and maintained in the city. A list of housing developers and resources (non-profit developers, for-profit developers, advocacy organizations, and emergency housing resources) is included in Appendix F.

Lenders. On the private side, the Community Reinvestment Act requires banks to invest in local projects by providing favorable lending terms or programs geared toward investing in traditionally under-served communities. Some banks have established Community Lending

Divisions that have developed strong relationships with the affordable housing industry in the Bay Area. The Federal Home Loan Bank's Affordable Housing Program (AHP) provides grants and loans to subsidize affordability within rental and ownership housing developments. Non-profit lenders such as the Northern California Community Loan Fund, Local Initiatives Support Coalition (LISC), and the California Community Reinvestment Corporation have also provided funding to affordable housing development. Some affordable housing developments have received partial funding from philanthropic organizations and individuals in the community.

Advocacy Organizations. Other non-governmental resources are organizations dedicated to supporting and promoting affordable housing in the Bay Area and in California. The Non-Profit Housing Association of Northern California (NPH) is a nonprofit advocacy group that provides professional training, networking opportunities, and resources for housing policy analysts, advocates and activists. NPH was founded in 1979 with a mission of highlighting the successes of the non-profit housing section in developing affordable housing and to help guide affordable housing policy solutions. NPH's membership includes individuals, local governments, affordable housing development corporations, leading financial institutions, environmental non-profits, faith-based organizations and community development corporations. Another Bay Area organization is East Bay Housing Organizations (EBHO), which in 2009 celebrated its 25th year. EBHO is an affordable housing advocacy coalition that works with communities in Alameda and Contra Costa counties to preserve, protect and expand affordable housing opportunities through education and advocacy. EBHO's membership is made up of over 140 organizations and individuals, including non-profit housing developers, development consultants, fair housing agencies, tenant organizations, faith-based groups, housing counseling agencies, architects, homeless and tenant advocates and service providers, neighborhood organizations, municipal housing staff, financial institutions and elected officials.

Housing California (HCA) is a statewide non-profit affordable housing advocacy organization dedicated to promoting the housing needs of California by increasing the supply and variety of homes being built. Housing California runs the nation's largest annual statewide housing conference and monitors and sponsors statewide housing-related legislation. A second organization, the California Housing Consortium, was founded in 1997 as an umbrella organization for nonprofit and for-profit developers, lenders, representatives from State and local government agencies, housing professionals and specialists, investors, property managers and owners, residents and business leaders to address a broad range of housing and economic development community needs. Other organizations are also dedicated to a wide range of statewide issues that affect housing, community development, green building and redevelopment. Some of these include the California Redevelopment Association, and the League of California Cities.

CHAPTER 4. ACHIEVEMENT OF 2001 HOUSING ELEMENT GOALS

This chapter outlines the City's achievement with respect to goals, policies, and programs found in the 2001 Housing Element. The period covered in this chapter is January 1, 2002 through December 31, 2008. Each year, the City of Emeryville prepares an annual Progress Report on the Housing Element covering the prior calendar year. This report is approved by the Emeryville City Council and forwarded to the State Department of Housing and Community Development by its annual deadline of April 1st. This chapter represents a summary of the annual Progress Reports.

A. Progress in meeting Regional Housing Need Allocation

The Association of Bay Area Governments (ABAG) releases a Regional Housing Need Allocation (RHNA) for each jurisdiction in the Bay Area. The period that most closely corresponds to the period of this report is the previous RHNA cycle of January 1, 1999 to June 30, 2006. From January 1, 1999 to June 30, 2006, the City issued 1,822 building permits for housing units.

Building Permits Issued during ABAG RHNA Period by Income Level: Jan 1, 1999–June 30, 2006

	Income Level				
RHNA Period	Very Low	Low	Moderate	Market Rate	**Total Units Permitted**
Total ABAG RHNA Housing Goals	178	95	226	278	**777**
Building Permits Issued (units)	127	63	172	1460	**1,822**
Percentage of ABAG Goals Met	71%	66%	76%	525%	**234%**

The ABAG Executive Board adopted the final current cycle RHNA for Bay Area jurisdictions on March 20, 2008. The RHNA covers the period July 1, 2006 through June 30, 2014 and represents the number of housing units, by income level, for which cities and counties must plan through zoning and other regulatory and programmatic means. The table below shows progress towards the RHNA goals during the current cycle, by income level.

Progress Toward ABAG Housing Goals

	Income Level				
	Very Low	Low	Moderate	Market Rate	Total Units Permitted
Building Permits Issued: 7/1/06-12/31/06	5	6	18	95	124
Building Permits Issued: 1/1/07-12/31/07	0	4	18	123	145
Building Permits Issued: 1/1/08-12/31/08	0	0	0	127	127
Total Building Permits Issued 7/1/06-12/31/08	**5**	**10**	**36**	**345**	**396**
ABAG RHNA Housing Goals 7/1/06 – 6/30/2014	**186**	**174**	**219**	**558**	**1137**
Percentage of Housing Goals Met in 7/1/06-12/31/08 period as % of 7/1/06-6/30/14 Goal*	3%	6%	16%	62%	35%

** As of 12/31/08, 31.3% of RHNA Goal Period has elapsed.*

B. Attainment of housing goals and objectives

1. ACTIONS TAKEN

Goal I. Preserve existing housing stock.

Objective I-A. Promote preservation of existing housing through the Emeryville Housing Rehabilitation Program. Emeryville's Housing Rehabilitation Program will provide funding for 17 projects per year.

In 2002, the City took over administration of the Housing Rehabilitation Program from the Alameda County Housing and Community Development Department and created a new position, the Community Preservation Officer, to manage the program. This program

provides low interest loans and grants to low and moderate income homeowners and to rental property owners who provide a portion of units at affordable levels to low and moderate income households. The Housing Rehabilitation Program funded a total of 103 projects between 2002 and 2008, as follows: 0 in 2002, 11 in 2003, 21 in 2004, 34 in 2005, 13 in 2006, 15 in 2007, and 9 in 2008.

A table showing the types of grants and loans provided, by year, is below.

Housing Rehabilitation Projects by Grant/Loan Type: 2003-2008

	Year						
Grant/Loan	2003	2004	2005	2006	2007	2008	**Total**
Paint Grants	6	12	16	3	6	4	**47**
Security Bar Grants	1	1	2	0	0	0	**4**
Accessibility Grants	2	1	5	1	2	1	**12**
Rehab Loan	1	2	3	6	3	1	**16**
Minor Home Repair Grants	1	2	2	2	4	3	**14**
Exterior Clean-up Grants	0	3	6	1	0	0	**10**
Total	**11**	**21**	**34**	**13**	**15**	**9**	**103**

Housing Rehabilitation Projects by Grant/Loan Type: 2003-2008

	Year						
Grant/Loan	2003	2004	2005	2006	2007	2008	**Total**
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Security Bar Grants	1	1	2	0	0	0	**4**
Accessibility Grants	2	1	5	1	2	1	**12**
Rehab Loan	1	2	3	6	3	1	**16**
Minor Home Repair Grants	1	2	2	2	4	3	**14**
Exterior Clean-up Grants	0	3	6	1	0	0	**10**
Total	**11**	**21**	**34**	**13**	**15**	**9**	**103**

Program I-A-1. Increase funding for the Emeryville Housing Rehabilitation Program on a demand basis up to 50% through a combination of Redevelopment and Community Development Block Grant (CDBG) funds.

The allocation of funding for the Emeryville Rehabilitation Program from the Low/Moderate Income Housing Fund was the same from 2002 to 2006, at $100,000. In 2007, the Redevelopment Agency approved an increase in funding to the Housing Rehabilitation

Program to $290,000 annually. The increase benefits both low and moderate-income households, for whom funding is available. The Program also relies on an annual allocation of Community Development Block Grant (CDBG) funds through Emeryville's allocation of CDBG from the Alameda County Urban County. The annual allocation for this program is in the $40,000 to $45,000 range. The City does receive program income payments from loan pay-offs and monthly loan payments.

The Non-housing Redevelopment Tax Increment Fund has been used to add the following grant programs, which are available to all property owners regardless of income levels: concrete buyback, wrought iron fence, multi-family façade improvement and graffiti abatement. The graffiti program is also available for commercial properties. The multi-family façade improvement program will use housing funds if properties qualify. Though an interest has been shown in this program by two property owners, no applications have been received to date. An application was received last year (2007), but the property owner opted to withdraw from the program this year.

Program I-A-2. Make all types of rehabilitation loans and grants available to both homeowners and landlords. Make major accessibility grants available to homeowners, and make seismic retrofit loans and minor repair grants available to landlords.

Minor home repair and seismic retrofit grants are for low-income homeowners as they are funded with federal Community Development Block Grants (CDBG) funds, which may only be made available to households up to 80% of the area median income (AMI). The minor home repair grants are very small ($1,000) and are for repairs such as plumbing, electrical work, locks and broken windows. If more expensive repairs are necessary, the seismic retrofit grant program for owner-occupied units can be supplemented with the owner-occupied loan program.

All other programs (exterior paint grants, accessibility grants, and rehabilitation loans) are open to owners of low and moderate owner-occupied units and to rental property owners who own property occupied by low-to-moderate income tenants. These programs are funded with both CDBG and Redevelopment housing funds, the latter of which can be made available to households up to 120% of AMI.

Program I-A-3. Continue existing marketing and establish new marketing efforts for the Emeryville Housing Rehabilitation Program, directed to landlords and homeowners in the historic residential neighborhoods east of Hollis Street and east of San Pablo Avenue.

The City has marketed the rehabilitation program through Emeryville News (the Chamber's version is now called Emeryville Connection), which the City and Chamber of Commerce send to each resident and business in the city. Staff has marketed the

program at neighborhood meetings. Information on the Rehabilitation Program is also found on the City's website on the Economic Development and Housing Department webpage.

Objective I-B. Maintain and improve existing housing, especially the historic neighborhoods east of Hollis Street and east of San Pablo Avenue.

Policy I-B-1. Continue the Community Preservation Program to improve maintenance of residences in the historic neighborhoods. Provide rehabilitation program information and conduct code inspections on a case-by-case basis.

The City Council's Community Preservation Committee administers this program, assisted by the Community Preservation Officer and City Attorney. The program includes code inspections and cooperation with other city departments to resolve maintenance issues with property owners city-wide. In 2002, a Deputy City Attorney was hired to help with code enforcement. The Community Preservation Committee, supported by interdepartmental staff, meets monthly to track progress with all problem properties.

Program I-B-2. Continue the "Emeryville Is Proud" award program for well maintained residential and commercial properties.

Most properties are well-maintained, and thus, this program was discontinued due to changing conditions. The Program also required significant monitoring of properties to ensure they still met the award criteria, which is difficult with limited staff resources.

Objective I-C. Replace affordable housing that must be demolished as part of a City action.

Policy I-C-1. Continue to review aggregate housing demolition and construction in the City each year, and review the overall housing provision plan to confirm that there will be no net loss through demolition of very low, low and moderate income units.

There was no housing demolition by City action between 2002 and 2004. In 2005, one vacant bungalow was demolished at the corner of Adeline and 36th streets in Oakland by City action, and the Redevelopment Agency is involved in developer negotiations for a new affordable project, the 55-unit Ambassador Homes project (1168 36th Street), which is slated to include affordable units and be completed by 2010/11.

In October 2006, the City adopted an ordinance that requires City Council approval for the demolition of any residential unit. A residential demolition permit must be accompanied by entitlements for the replacement structure (i.e. use permits, design review, and any required variances), which must be approved by the City Council, and the replacement structure must provide at least as many units as are demolished.

A total of five residential units were demolished in 2007. Four houses were demolished as part of the Oak Walk project, and another house was demolished for the Salem Manor project (to be replaced by three units). At the Oak Walk project, nine Below Market Rate units will be designated and completed in 2009 – five single family homes being renovated for moderate income households, and four low income units within the new construction portion of the project. No residential units were demolished in 2008.

Goal II. Promote a variety of housing types and affordability levels.

Objective II-A. Support development of new housing for very low, low and moderate income households to meet Emeryville's fair share allocation of regional affordable housing need, as established by the Association of Bay Area Governments. Develop 104 very low income units and 73 low income units using the Redevelopment Agency's Low and Moderate Income Housing Fund and seeking funding for the remaining units

Emeryville's fair share allocation of regional affordable housing need established by ABAG was 178 very low income units, 95 low income units, and 226 moderate income units for the January 1, 1999 to the June 30, 2006 period. The production targets of the objective (104 very low income and 73 low income) were the projected number of units to be completed during the ABAG period, as listed in Table 11 of the 2001 Housing Element. As noted at the beginning of this chapter under Section A, through 12/31/08, the City issued building permits for 129 very low income units, 73 low income units, and 208 moderate income units. In terms of the goal of this objective, the City has exceeded its very low income goal by 25 units and has met its low income goal.

Policy II-A-1. Make very low and low income housing a priority for use of the Redevelopment Agency's Low and Moderate Income Housing Fund (LMIHF).

The Redevelopment Agency's Ownership Housing Assistance Program (OHAP) is a downpayment assistance program that provides low-interest, deferred payment second mortgages to low and very low income households purchasing units set aside through the City's Affordable Housing Set Aside Ordinance. In 2002, through OHAP, the Agency used $550,000 of the LMIHF to fund five low income units in Oliver Lofts and $990,000 of LMIHF to fund nine low income units in the Terraces project. In 2003, $550,000 was allocated to Liquid Sugar Town Homes for 5 low income units through OHAP. In 2005, $660,000 of OHAP funds were appropriated for 6 low income units within Christie Park Towers and $550,000 was appropriated for 5 low income units within 1401 Park Avenue Condominiums (this project was subsequently marketed as a rental project and a new Affordability Agreement was executed between the City and developer requiring three very low income rental units). During 2006, funds were appropriated from the LMIHF through OHAP for the following projects: Andante Phase II (5 low income units, $550,000), Green City Lofts ($300,000 for 3 low income

units), and Glashaus Lofts ($1.76 million for 5 very low income and 6 low income units). In 2007, $440,000 was allocated through OHAP to fund 4 low income units in the new construction portion of the Oak Walk Project. During 2008, $330,000 in OHAP funds was also allocated for 9 low and moderate income units in the Vue46 project.

Projects not funded through OHAP but which include a low or very low income affordability component include: Andante Phase I (completed in 2004), to which the Agency provided a $1 million land write-down to enable the provision of 10 units at below market rate prices affordable to low income households, Artisan Walk (1 low income unit), and the Windsor Apartments at Bay Street (formerly called the Metropolitan Apartments at Bay Street) (completed in 2006) in which 57 very low income units were financed through multi-family housing bonds leveraged by the Agency's LMIHF.

4001 Adeline Four-Plex Project: In December 2008, the Redevelopment Agency approved an Exclusive Right to Negotiate Agreement with Housing Consortium of the East Bay (HCEB) to renovate a four-plex for five studio units serving very low income households with developmental disabilities. It is contemplated that a Disposition and Development Agreement will be prepared for consideration by the Agency in 2009 to convey the four-plex property through a land write-down and additional housing subsidy to enable the project to commence construction.

Housing Compliance Plan: In October 2007, the Agency adopted a mid-cycle amendment to the Ten-Year Housing Compliance Plan covering the period 2005 through 2014. This document outlines the Agency's projected expenditures and programs for the Housing Compliance Plan period, and includes several projects to be implemented over the period that will contain low and very low income units. The Housing Compliance Plan also demonstrates, in compliance with the State Community Redevelopment Law, that the Agency will spend its Low and Moderate Income Housing Fund dollars for very low and low income households in at least the same proportion as the Regional Housing Need Allocation (RHNA) assigned for the City of Emeryville. The Agency's 2007-2014 RHNA for very low income category is 16% of the total allocation of 1,137 units – during the Agency's ten-year Housing Compliance Plan period, it is expected to spend 50% of its funding availability for this income level. The RHNA for the low income category is 15% of the total allocation; the Agency's projected ten-year expenditures for this income level are 22% of its total resources.

<u>Policy II-A-2. Include some low and very low income housing in Redevelopment Agency assisted development projects whenever feasible.</u>

Oliver Lofts and the Terraces at EmeryStation were built in 2002. Oliver Lofts includes 5 low income and 5 moderate income units. The Terraces include 9 low income and 11 moderate rate apartments.

In 2003, the Liquid Sugar Loft project was completed. This development includes 5 low income and 6 moderate income units.

The City Limits condominium project was completed in 2005 and included 4 low income units. The Agency appropriated down payment assistance in the amount of $440,000 to provide down payment assistance loans for the buyers of this project. In addition, this project included 5 units for sale to moderate income households.

Projects completed in 2006 with low or very low income units included: the Andante condominium development at 1121 40th Street (5 low income units), the Metropolitan Apartments at Bay Street (57 very low income units), the Artisan Walk condominium development at 6549 San Pablo Avenue (1 low income unit), and the Green City Lofts condominium development at 4050 Adeline Street (3 low income units).

In 2007, projects completed include Avenue 64, with 8 low income units; Vue 46 with 3 low income units; and Icon at Park Avenue with 3 low income units, located at 1401 Park Avenue.

Projects completed in 2008 with low or very low income units included: Glashaus Lofts, with 5 very low income ownership units and 2 low income ownership units. Projects considered under construction during 2008 include the Oak Walk Project, with 4 low income units; and Adeline Place, with 3 low income units.

Program II-A-3. Continue funding for the Vacant Housing Program, which provides first-time home buyer opportunities for low and moderate-income households.

The Vacant Housing Program (also known as the Infill program), which was a Redevelopment Agency-funded and developed first-time homebuyer housing program, has become obsolete as the private sector has taken the main initiative to renovate residential properties and construct infill housing. The last Vacant Housing Program units were developed in 1998.

Program II-A-4. Expand the First-Time Homebuyers Program to provide 1.5 times buyer's down payment up to 15% of purchase price for low and moderate-income households.

In January of 2001, the First Time Homebuyers Program guidelines were amended to include this program provision, and between 2002 and 2008, 148 loans were made.

In 2008, the City implemented its "Foreclosure Prevention and Predatory Lending Prevention Program", a program which is continuing to be implemented in 2009. This program was adopted by the Emeryville City Council in December 2007 in response to the growing incidence of foreclosures throughout the region in late 2007. The City's strategy includes providing information and referral information to property owners who are in default, tracking foreclosure data, convening workshops for homeowners on foreclosure prevention, providing free housing counseling to Emeryville residents who are participants in a City homebuyer or rehabilitation loan program who having difficulty making their mortgage payments or are in default on their first mortgages, updating the City's website to include relevant information and referrals to federally approved housing counseling agencies, distributing information throughout the City and at City Hall, and working with other local jurisdictions, the Emeryville Chamber of Commerce, and local mortgage lenders to do community outreach and education.

Program II-A-5. Leverage State and Federal funding programs to maximize the number of affordable units and/or the number of units available to low and very low income households, whenever possible.

The Windsor Apartments at Bay Street (originally called Metropolitan Apartments at Bay Street) were able to obtain an allocation of federal Low Income Housing Tax Credits and multi-family housing bonds to provide 57 very low income units in the 284 project.

The City applied for and received a $1 million grant from the State Housing and Community Development Department CalHome Program and a $1.5 million loan from the CalHFA HELP Program in 2005. These programs were used to provide $30,000 silent second, down payment assistance loans in combination with funding from the Agency's LMIHF ($80,000 for low income buyers, and $190,000 for very low income buyers) for combined loans of up to $110,000 for low income buyers, and $220,000 for very low income buyers. The CalHome funds were completed expended as the end of 2008. During 2007, the first HELP loans were funded: one within the Andante Phase II project, and one within Artisan Walk. There were five CalHome loans and two HELP Program loans funded in 2007. The City did not receive any new State or Federal funding in 2007.

In 2008, the City applied for and received a new $900,000 grant from the State Housing and Community Development Department CalHome Program. The CalHome and HELP programs are currently being used to provide $58,000 silent second, down payment assistance loans in combination with funding from the Agency's LMIHF ($52,000 for low income buyers and $162,000 for very low income buyers) for combined loans of up to $110,000 for low income buyers and $220,000 for very low income buyers. During 2008, eight HELP loans were funded: three in Vue 46, two in Glashaus phase II, two in the Terraces at EmeryStation, and one in Oliver Lofts. The CalHome 2008 award was not yet available in 2008. It is anticipated that the HELP loan will be completely expended by the end of 2009.

Program II-A-6. Encourage and facilitate the conversion of underutilized industrial sites to mixed-use or residential projects that

include low and very low-income units.

The City has used assessment loans, grants, and cleanup loans, along with a City consultant, to expedite hazardous material review and assist for-profit developers in developing residential projects on former industrial sites. The City has negotiated low-income units in several such conversion projects.

Projects completed in 2002 include Oliver Lofts, a former rubber plant, which contains 5 low-income ownership units, and Terraces at EmeryStation, a former Chevron above-ground tank facility, which includes 9 low-income ownership units. Liquid Sugar Lofts, on the site of a former molasses and syrup manufacturing facility, was built in 2003 and contains 5 low-income ownership units.

Built in 2004, the Courtyards, formerly Ryerson Steel, includes one very low income rental unit; Elevation 22, formerly Becker Construction Services and Industrial Gas, includes 7 low-income ownership units; and Andante Phase I, former King Midas card room and the site of a rail line, includes 10 low-income ownership units (Andante Phase II was completed in 2006 and contains 5 low-income ownership units).

City Limits, completed in 2005, was formerly Fabco, an automobile component manufacturer. This project contains 4 low-income ownership units.

Projects completed in 2006 included the Metropolitan Apartments at Bay Street, a former steel and paint pigment manufacturing site, which includes 57 very low-income rental units; Green City Lofts, a former paint manufacturing site, which includes 3 low-income ownership units; and Artisan Walk, a former drum recycling facility, which includes 1 low-income ownership unit.

In 2007, projects completed included Vue 46, a former Flecto paint factory, which includes 3 low income units; and the Avenue 64 project, a former PG&E site, which includes 8 low income units.

Projects completed in 2008 included Glashaus Lofts, a former machinery plant, with 5 very low and 2 low income units, built on a former brownfield site; and Icon at Park Avenue, with 3 very low income units. The remediation of the Icon at Park Avenue site, previously used as a plating facility, involved groundwater treatment and was capped with an impervious surface.

Set for completion in 2009 is the Oak Walk project, built on a former brownfield, which includes 4 low income units in the new

construction portion and five renovated single family homes along 41st Street.

Objective II-B. Amend the Zoning Ordinance to better facilitate the development of affordable housing, and retain existing affordable housing policies.

Policy II-B-1. Within a year after adoption of this Housing Element, change the regulations for multiple-use projects so that the Planning Commission may choose to exempt residential square footage from the floor area ratio (FAR, ratio of floor area to site area) calculations for a project, with a Conditional Use Permit. The revised regulation could include findings necessary to grant such an exemption, such as transit access or a mechanism to reduce the number of automobiles per unit.

This policy was implemented. In November of 2002, the Zoning Ordinance was amended to allow residential space exemption from the FAR in multiple use projects.

Policy II-B-2. Maintain the Affordable Housing Set-Aside Ordinance, requiring projects with 30 units or more to provide 20% of the units affordable to moderate, low or very low income households.

The Affordable Housing Set-Aside Ordinance has been maintained. It was revised in 2002 to reflect state legislation regarding increasing the term of income restrictions to 45 years for ownership units and to 55 years for rental units. In June 2008, the City Council approved a revision to the Ordinance that stipulates that rental projects of thirty or more units include six percent (6%) of the total project units as designated very low income BMR units, and nine percent (9%) of the total project units as designated moderate income BMR units. This represents a revision from the previous requirement that twenty percent (20%) of the total project units be designated at the moderate income level. Projects of thirty or more units that are approved by the Planning Commission have language included in the project Conditions of Approval requiring the applicant to comply with the Ordinance.

Policy II-B-3. Continue the affordable housing density bonus, and Group Residential and Group Care as conditionally permitted uses. Within a year after adoption of this Housing Element, list emergency shelter and transitional housing in the definition of Group Residential.

In November of 2002, the Zoning Ordinance was amended to list emergency shelter and transitional housing in the definition of Group Residential. In June of 2006, the Zoning Ordinance was amended to add Group Care as a conditionally permitted use in the I-L zone.

Objective II-C. Encourage a variety of housing types and settings, energy efficiency and water conservation.

Policy II-C-1. Encourage non-traditional group housing, live-work units and housing in multiple-use projects and mixed-use areas.

Projects Built 2002-2008

Live/Work Loft Projects

Project Name	Year Built	Total Number of Units	**Live/Work**
Oliver Lofts	2002	50	12
Key Route Lofts	2005	22	7
Icon Park Avenue	2007	54	11
Glashaus Lofts	2008	48	3

Since 2002, 33 live/work units have been constructed in Emeryville: 12 in Oliver Lofts (built in 2002), 7 in Key Route Lofts (built in 2005), 11 in Icon Park Avenue (built in 2007), and 3 in Glashaus Lofts (built in 2008).

Mixed-use projects completed between 2002 and 2008 include: Andante Phase I (102 units over retail), The Courtyards (331 units over commercial), Elevation 22 (70 units with ground floor commercial space), Bay Street Site A (95 condos and 284 rental apartments over retail), Andante Phase II (part of the Andante Phase I project which includes 125 units total over retail), Icon Park Avenue (54 units with a café on the ground floor), Vue 46 (45 dwelling units with approximately 3,000 sq. ft. of retail/commercial space at the 46th Street and Adeline Street), and Glashaus Lofts Townhouse Phase (live-work units and a café on the ground floor). Under construction in 2008 were Glashaus Lofts Podium Phase (live-work units with café on ground floor), Adeline Place (36 units over 2,400 sq. ft. of retail), and Oak Walk Mixed Use Project (residential/commercial mixed use development with 5,500 square feet of retail space).

Policy II-C-2. Encourage residential and live-work development in industrial areas where appropriate.

Between 2002 and 2008, all residential and live-work developments were built on former industrial sites, including Oliver Lofts, Terraces at EmeryStation, Liquid Sugar Town Homes, Courtyard Apartments, Elevation 22 Town Homes, City Limits Town Homes, Windsor Apartments at Bay Street (formerly called the Metropolitan), Bay Street One Condominiums, Green City Lofts, Artisan Walk, Avenue 64, Vue 46, Icon Park Avenue, and Glashaus Lofts.

Policy II-C-3. Encourage energy-efficient, water-conserving construction.

The City now requires project plans at the planning approval and building permit stage to show which of Build it Green's Greenpoint Rating Checklist items or the appropriate LEED checklist items the project follows. The City has adopted Bay-Friendly Landscaping and LEED for its own projects and landscapes. These would apply to private projects for landscaping in the public right of way, as well as projects involving the Redevelopment Agency.

Goal III. Promote housing for special needs groups.

Objective III-A. Support development of affordable housing for single-parent families in transition, people with AIDS, seniors, large families, disabled people, and artists who have very low, low and moderate incomes. Ways to support housing for special needs groups include providing funding and technical assistance for the development of housing and the establishment of cooperatives.

Program III-A-1. Support development of service-enriched transitional housing for single-parent families who have been displaced by economic problems or domestic violence.

No action has been taken.

Program III-A-2. Support the inclusion of Shelter-Plus-Care units (rent-assisted units for people with mental illness, substance abuse and/or AIDS-related illness) in some multi-unit projects. These units could be combined with other programs, and could be used to meet part of the 20% Affordable Housing Set-Aside requirement.

No action has been taken.

Program III-A-3. Support development of affordable 3- to 4-bedroom units for large families (families with five or more members) in appropriate projects.

The Courtyards, a 331 unit project with three affordable 3-bedroom units, was built in 2004. In 2006, Artisan Walk was constructed, which contained three affordable 3-bedroom units. Among projects currently under construction, the 53-unit Oak Walk Mixed Use

project includes seven 3-bedroom units. In 2008, permits were issued for a project on 1260 64th Street, comprised of two 3-bedroom units. The Ambassador Homes Project, which had been delayed to a billboard easement litigation matter, is beginning predevelopment work again since the billboard matter was settled. The developer is anticipating development of a 100% affordable, multi-family rental development with a significant portion of larger-sized units to accommodate large families. The City's Housing Committee and Planning Commission continue to support projects that contain larger units and encourage developers to include a greater percentage of larger sized units.

Projects Built 1999-2009
Housing Projects with Affordable and 3-bedroom Units

Project Name	Year Built or Anticipated Completion	Tenure	Total Number of Units	Total Number of Affordable Units	**Number of Affordable 3 bedrooms**
The Courtyards	2004	RENT	331	63	3
Artisan Walk	2006	OWN	6	6	3
Icon at Park Avenue	2007	RENT	54	3	1
Ambassador Homes	2009	OWN	55	TBD	TBD
Glasshaus Lofts Townhomes & Podium	2008	OWN	145	29	2
Oak Walk Mixed Use	2009	OWN	53	9	0
1260 64th Street	2009	OWN	2	0	0

Program III-A-4. Support development of affordable housing for disabled people in small households.

The Courtyards at 65th includes 63 units restricted through the City's Affordable Housing Set Aside Ordinance, of which 3 are reserved for developmentally disabled households. One unit was leased in 2005, and the last two were leased in 2006. In 2008, the Redevelopment Agency issued a Request for Qualifications and Proposals for an Agency-owned four-plex property at 4001 Adeline Street to solicit proposals for its redevelopment as affordable rental housing. In late 2008, the Agency entered into an exclusive Right to Negotiate Agreement with Housing Consortium of the East Bay to renovate the four-plex as five studio units serving single-person households with developmental disabilities. The ground floor units will be made fully accessible and targeted to developmentally disabled people who have physical disabilities. This project is located at a major bus hub.

Program III-A-5. Support the development of affordable housing including Shelter-Plus-Care units for people with AIDS-related illness.

No action has been taken.

Program III-A-6. Support development of affordable assisted-living and independent senior housing.

The City approved AgeSong Assisted Living project in 2006, which will include 121 assisted living units, 28 independent living units, a dining room, and publicly accessible café. None of the units are required to be classified as affordable under the provisions of the City's affordable Housing Set-Aside Ordinance.

Program III-A-7. Support development of transitional housing for veterans with physical disabilities, mental disorders and substance abuse problems.

No action has been taken.

Program III-A-8. Support development of affordable live-work space for artists.

Icon Park Avenue includes one live-work unit available for low income households; this project was completed in 2007.

Objective III-B. Support assistance for veterans, teachers and public safety employees in obtaining housing in Emeryville.

Program III-B-1. Support assistance for veterans with physical disabilities, mental disorders and substance abuse problems to live in residential treatment centers, supervised work settings, or transitional or permanent housing.

No action has been taken.

Program III-B-2. Offer additional home loan assistance to low and moderate income Emery Unified School District teachers, and moderate income Emeryville Police and Fire Department staff. Actively pursue funding to assist with this program.

The City offers favorable homebuyer loan terms for teachers in the Emery Unified School District and all city employees by waiving the down-payment requirement, offering deferred payment loans up to 20% of the purchase price, and waiving the first time homebuyers requirement. There have been a total of three loans to City of Emeryville staff, two in 2006 and one in 2007.

Goal IV. Promote equal opportunity in housing.

Objective IV-A. Prevent and redress discrimination based on race, color, ancestry, national origin, religion, familial status, sex, marital status, sexual orientation, age, disability or source of income.

Program IV-A-1. Continue to have a contract with Housing Rights or another fair housing counseling organization to provide fair housing counseling, tenant-landlord mediation, public education and legal referrals.

Through its participation as a member of the Alameda County Urban County, an entitlement jurisdiction for federal Community Development Block Grant funds, the City enters into a contract annually with Berkeley-based Housing Rights, Inc. to provide fair housing services to Emeryville residents.

Program IV-A-2. Effectively market the availability of the fair housing counseling service through a variety of means.

The counseling service is advertised on the public service television channel and in local periodicals. Information is also available in City Hall reception area and on the Economic Development and Housing Department's webpage under Community Resources.

2. EFFECTIVENESS AND OUTCOMES

Goal I. Preserve existing housing stock.

The City offers a wide range of grant and loan programs through the Housing Rehabilitation Program with the goal of preserving the City's older, existing housing stock. Between 2002 and 2008, the City assisted with improvements to 103 dwelling units.

One dwelling unit was demolished in 2005 on the Agency-owned parcel slated for development as the 55-unit Ambassador Homes project. In 2007, 5 residential units were demolished, including one house for the Salem Manor project, which will be replaced by three units, and five units were demolished for the Oak Walk project. Through an Owner Participation Agreement entered into between the Redevelopment Agency and the developer of the Oak Walk project in 2007, the developer is renovating five single family houses which will be sold as first time homebuyer housing to moderate income households. The developer was also required to relocate a four-plex building to an Agency-owned site at 4001 Adeline Street.

In October 2006, the City adopted an ordinance that requires City Council approval for the demolition of any residential unit. Under the ordinance, issuance of a residential demolition permit requires the concurrent approval of a replacement structure (i.e. use permits, design review, and any required variances). The replacement structure must provide at least as many units as are demolished.

Goal II. Promote a variety of housing types and affordability levels.

The City has a strong record of expanding its housing supply and will continue to support development of a wide range of housing types and affordability levels in the coming years. During the previous ABAG RHNA period (January 1, 1999 to June 30, 2006), 1,822 units were added to the City's housing stock, including townhouses, lofts, senior apartments, live/work units, and traditional condominiums. The individual projects are listed in Table 50 at the end of Chapter 2 of this Housing Element.
As described at the beginning of this chapter under Section A, from July 1, 2006 through December 31, 2008, 396 residential units have been produced in Emeryville. All projects of 30 or more units must comply with the City's Affordable Housing Set Aside Ordinance.

Goal III. Promote housing for special needs groups.

The Courtyards at 65th apartment project includes 3 units for developmentally disabled households. In 2006, the City approved AgeSong Assisted Living project, which will feature 121 assisted living units, 28 independent living units, a dining room, and publicly

accessible café. The City will consider any proposals that are made for special needs housing. The 2009-2014 Housing Element contains a number of new policies and programs specific to support of special needs housing.

Goal IV. Promote equal opportunity in housing.

Anti-discrimination clauses are standard in the City and Agency's agreements with housing developers, and failure to comply with fair housing laws is a violation of the City and Agency's agreements. The City, through its participation in the Urban County, contracts with Housing Rights, Inc. to provide fair housing counseling services to both tenants and landlords. Housing Rights, Inc.'s services include housing rights counseling, tenant/landlord mediation, attorney and small claims court referral, and housing discrimination investigation.

C. Progress toward mitigating governmental constraints identified in the housing element.

The Zoning Ordinance was amended in November 2002, changing the regulations for multiple-use projects to exempt residential square footage from the floor area ratio with a Conditional Use Permit and listing emergency shelter and transitional housing in the definition of Group Residential. It was further amended in June of 2006 to add Group Care as a conditionally permitted use in the I-L Zone.

CHAPTER 5. GOALS, OBJECTIVES, POLICIES AND PROGRAMS

This chapter presents the goals, objectives, policies and programs that will be implemented during the housing element period. The Housing Action Program outlined in Chapter 6 identifies the implementing department, implementation action, funding source, funding level, and measurable outcome for each of these policies and programs. These goals, objectives, policies and programs are consistent with the other elements of the General Plan.

Goal I. Preserve existing housing stock.

Objective I-A. Promote preservation of existing housing stock through the Emeryville Housing Rehabilitation Program.

Program I-A-1. Continue support of the Emeryville Housing Rehabilitation Program through Redevelopment Agency funding and allocation of a portion of Emeryville's annual federal Community Development Block Grant (CDBG) funds.

Program I-A-2. Conduct annual review of Emeryville Housing Rehabilitation Program and projected program demand for next fiscal year.

Program I-A-3. Continue existing marketing and establish new marketing efforts for the Emeryville Housing Rehabilitation Program through regular updates to the City's website, participation at community-wide events, and annual, targeted mailings to landlords and homeowners in the City's older residential neighborhoods.

Objective I-B. Maintain and improve existing older housing stock, especially the older residential housing located in the Triangle neighborhood east of San Pablo Avenue and the Doyle Street neighborhood located east of Hollis Street.

Program I-B-1. Continue administration of the Community Preservation Program and the Community Preservation Committee to encourage and improve maintenance of single and multi-family residences in the older residential neighborhoods. Provide rehabilitation program information and conduct code inspections on a case-by-case basis.

Policy I-B-2. Retain and continue implementing the Residential Preservation Ordinance, which requires Council approval for demolition of residential structures.

Objective I-C. Minimize the loss of affordable units and displacement of residents of lower and moderate income through implementation of State Community Redevelopment law provisions relating to replacement housing and relocation.

Policy I-C-1. Continue to review aggregate housing demolition and construction in the City each year through the annual Redevelopment Agency report submitted to the State Department of Housing and Community Development.

Policy I-C-2. Ensure that a replacement housing plan is implemented in connection with any loss of residential units housing lower or moderate income persons as a result of a specific Redevelopment Agency-sponsored or assisted project.

Policy I-C-3. Ensure that state relocation law is applied as required in connection with a specific Redevelopment Agency-sponsored or assisted project as required.

Goal II. Promote a range of affordability levels.

Objective II-A. Ensure that the Zoning Ordinance continues to facilitate the development of affordable housing.

Policy II-A-1. Ensure that sufficient sites are zoned in the City to allow for the development of the City's overall fair share allocation of regional affordable housing need.

Policy II-A-2. Incentivize the provision of extremely low, very low, low, and moderate income housing in conjunction with the revision to the Density Bonus Ordinance to ensure compliance with State Density Bonus law.

Policy II-A-3. Revise the City's Zoning Ordinance to ensure that the requirements for secondary units are consistent with State law.

Policy II-A-4. Continue implementation of the Affordable Housing Set-Aside Ordinance to ensure inclusion of Below Market Rate Units in residential projects of 30 or more units.

Objective II-B. Support new housing opportunities for extremely low, very low, low and moderate income households.

Policy II-B-1. Make extremely low, very low, and low income housing a priority for use of the Redevelopment Agency's Low and Moderate Income Housing Fund.

Policy II-B-2. Include extremely low, very low, and/or low income housing in Redevelopment Agency-assisted development projects whenever feasible.

Policy II-B-3. Where feasible, consider a reduction in the moderate income inclusionary percentage requirement on development projects subject to the City's Affordable Housing Set Aside Ordinance to support the inclusion of extremely low, very low, and/or low income units.

Program II-B-4. Continue funding of the City's First Time Homebuyer Program and Ownership Housing Assistance Program through Redevelopment funds to ensure that downpayment assistance can be provided to support homeownership opportunities for very low, low, and moderate income households purchasing homes in Emeryville.

Policy II-B-5. Leverage State and Federal funding programs to maximize the number of affordable units available to low and very low income households, whenever possible.

Program II-B-6. Coordinate with the Housing Authority of Alameda County to link Emeryville Section 8 Program participants in its Family Self-Sufficiency Program with homeownership opportunities in Emeryville.

Objective II-C. Sustain affordable housing availability for existing participants in the City's Below Market Rate and Market Rate First Time Homebuyers Program.

Program II-C-1. Continue implementation of the City Foreclosure Prevention and Predatory Lending Prevention Strategy so long as required during the Bay Area foreclosure crisis.

Goal III. Promote development of affordable housing for persons with special needs.

Objective III-A. Support development of affordable housing for disabled people, people living with HIV/AIDS, single-parent families, and seniors who are extremely low, very low, low or moderate income.

Policy III-A-1. Encourage the inclusion of extremely low and very low income affordable set-aside units for people living with physical and/or developmental disabilities in projects subject to the City's Affordable Housing Set Aside Ordinance. Ensure that support services are provided to tenants of these units.

Policy III-A-2. Encourage the inclusion of Shelter-Plus-Care units (rent-assisted units for dually-diagnosed people with mental illness, substance abuse and/or AIDS-related illness) in projects subject to the City's Affordable Housing Set Aside Ordinance or as set-aside within new Agency-sponsored affordable rental developments. Ensure that support services are provided to tenants of these units.

Policy III-A-3. Support the development of Residential Care Facilities for the Elderly (RCFE) and independent senior housing developments.

Policy III-A-4. Continue to support the County-wide long-range effort to prevent and end homelessness, the "EveryOne Home–Alameda Countywide Homeless and Special Needs Housing Plan", and monitor the Plan's progress through City participation in collaborative groups such as the EveryOne Home Leadership Board, the Alameda County Urban County Technical Advisory Committee, and the Alameda County HOME Consortium Technical Advisory Committee.

Goal IV. Ensure that the City has a variety of housing types to meet the diverse needs of its residents as well as attract new residents.

Objective IV-A. Ensure that the Zoning Ordinance facilitates the development of a variety of housing types.

Policy IV-A-1. Continue support of residential mixed use development through broader General Plan and update of zoning regulations.

Policy IV-A-2. Continue allowing development of live/work units as conditionally permitted in the light industrial and mixed use zones.

Policy IV-A-3. Encourage new developments to provide unit types for which there is an identifiable gap in Emeryville's housing stock.

Policy IV-A-4. Revise the Zoning Ordinance to be in compliance with Senate Bill 2, effective January 1, 2008, requiring establishment of a zoning district allowing emergency shelters without a conditional use permit or other discretionary approval and ensuring that transitional and supportive housing developments are considered as a residential use of property subject only to those same restrictions that apply to other residential uses of the same type in the same zone.

Policy IV-A-5. Revise the Zoning Ordinance to clarify that group homes and residential care facilities for six or fewer residents be subject only to those same restrictions that apply to other single family uses.

Policy IV-A-6. Revise the Zoning Ordinance to allow exemptions from design review for projects with a negligible visual impact, and to reduce the level of review to minor design review for one- and two-unit residential buildings and accessory dwelling units.

Policy IV-A-7. The City adopted an update of its General Plan including new General Plan Designations on October 13, 2009. The capacity assumptions for sites included in Table 3-3 are based on the newly established General Plan designations

and interim zoning classifications. To ensure sites in the inventory are adequate to accommodate the City's regional need, the City will amend zoning to adopt the interim densities as identified in the sites inventory.

Objective IV-B. Promote opportunities for affordable housing that serves locally identified target groups, including teachers of the Emery Unified School District, City personnel, families with children, and artists/craftspeople.

Program IV-B-1. Continue special homebuyer assistance terms through the City's First Time Homebuyer Program which provides zero-percent down, downpayment assistance loans up to 20% of the purchase price to very low income to moderate income teachers in the Emery Unified School District for both market rate and below market rate units.

Program IV-B-2. Continue special homebuyer assistance terms through the City's First Time Homebuyer Program which provides zero-percent down, downpayment assistance loans up to 20% of the purchase price to City of Emeryville employees who are any income for market rate units and very low to moderate income for below market rate units.

Policy IV-B-3. Encourage provision of set-aside below market rate units for teachers and employees of the Emery Unified School District where feasible in new residential development subject to the City's Affordable Housing Set Aside Ordinance.

Policy IV-B-4. Promote housing designs to attract families with children by encouraging developers to include larger unit sizes (two-, three-, and four-bedroom units) as well as other on-site amenities such as usable outdoor open space, play equipment for a variety of ages, community rooms, and multi-purpose rooms that can be utilized for after-school homework clubs, computer, art, or other resident activities.

Program IV-B-5. Consider development of affordable housing development specifically designed to attract families with children and collaboration between Redevelopment Agency and non-profit developer with expertise in this area of affordable housing development to implement such a development during the course of the housing element period.

Policy IV-B-6. Ensure that new residential developments that include a set-aside of below market rate live/work units conduct targeted marketing to artists and craftspeople to foster occupancy of these affordable below market rate live/work units by artists/craftspeople.

Program IV-B-7. Encourage development of affordable live-work space for artists and craftspeople.

Goal V. Maintain and expand activities designed to prevent those currently housed from becoming homeless and to assist those who are homeless.

Objective V-A: Support activities to assist Emeryville residents who are at-risk of homelessness or are homeless.

Program V-A-1. Continue providing funding through Emeryville's allocation of Community Development Block Grant funds to support the Berkeley Food and Housing Project's shelters, transitional housing, and Multi-Service Center to provide housing, meals and other support services to homeless individuals who have resided in Emeryville.

Program V-A-2. Continue providing information at City Hall and through City's website on resources available for emergency housing assistance.

Program V-A-3. Improve City departmental coordination to ensure that information on resources is made available to assist Emeryville families and households at-risk of homelessness.

Program V-A-4. Improve coordination between the City and Emery Unified School District to determine if there are families who may be at risk of homelessness to provide resource and housing referrals.

Program V-A-5. Assist in the development of affordable rental units serving extremely low income households within Redevelopment Agency-sponsored rental developments whenever feasible. Support projects that provide services to tenants of these units.

Goal VI. Promote equal opportunity in housing.

Objective VI-A. Prevent and redress discrimination based on race, color, ancestry, national origin, religion, familial status, sex, marital status, sexual orientation, age, disability or source of income.

Program VI-A-1. Through participation in the Alameda County Urban County Community Development Block Grant Entitlement jurisdiction, continue to contract with Housing Rights, Inc. or another fair housing counseling organization on an annual basis to provide fair housing counseling services, tenant-landlord mediation, public education and legal referrals for Emeryville resident tenants and landlords.

Program VI-A-2. Continue effective marketing of the fair housing counseling service provided through Housing Rights, Inc. or another fair housing counseling organization through a variety of means, including public information available at Emeryville City Hall, on the City's website, and at community-wide events.

Program VI-A-3. Require that developers include language stating that they provide equal opportunity in housing in their marketing materials for below-market-rate units provided through the City's Affordable Housing Set Aside Ordinance.

Program VI-A-4. Include appropriate equal opportunity and anti-discrimination language in all contractual agreements that the City and/or Emeryville Redevelopment Agency enter into with developers pertaining to housing, such as Agreements on Affordable Units, Resale Restriction Agreements, Disposition and Development Agreements, and Owner Participation Agreements.

Program VI-A-5. Continue Accessibility Grant Program through the Emeryville Housing Rehabilitation Program to provide grant assistance to lower income households with disabilities.

Goal VII. Promote environmental responsibility and long-term sustainability of City's housing development through remediation of brownfields and promotion of "green" and "healthy" housing development.

Objective VII-A. Encourage the remediation of former industrial sites through public-private partnerships and Redevelopment Agency assistance.

Program VII-A-1. Continue Agency grant and loan program, "Capital Incentives for Emeryville's Redevelopment and Remediation" (CIERRA) to provide financial, technical, and regulatory assistance to property owners and developers seeking to assess and remediate their housing development sites.

Program VII-A-2. Continue seeking outside funding opportunities to leverage the Agency's funding for site remediation at Agency-sponsored housing and mixed use developments, thereby increasing the financial feasibility of the projects.

Objective VII-B. Ensure that the City and Redevelopment Agency review and permitting process encourages "green" and "healthy" housing development, defined as clean indoor air and conservation of energy, water, and building materials.

Policy VII-B-1. Continue requirement that developers complete the appropriate GreenPoint Rated or LEED Checklist as part of their submittal to the Emeryville Planning and Building Department.

Policy VII-B-2. Include the appropriate GreenPoint or LEED Checklist in all Redevelopment Agency-led Request for Proposals (RFPs) for new housing developments and include the Checklist as a review criterion in the developer selection process.

Program VII-B-3. Ensure that public information materials are available at the City and through the website on green building resources and funding opportunities.

Program VII-B-4. Consider an ordinance requiring projects involving public funds to meet minimum green building thresholds.

Program VII-B-5. Consider an ordinance providing density, FAR, and height bonus for private projects that meet certain green building thresholds.

Objective VII-C. Encourage site and building design that includes social spaces, stormwater treatment, transit access, bicycle parking, and strong interface with the street.

Policy VII-C-1. Adopt open space requirements and design guidelines for multi-family housing projects.

Policy VII-C-2. Continue to require design and operation measures to protect stormwater quality, including site design, pollutant source control, and vegetative stormwater treatment.

Objective VII-D. Support property retrofits that reduce the City's carbon footprint through energy conservation, waste reduction, and transportation access measures.

Policy VII-D-1. Disseminate information on retrofit assistance programs such as youth energy services, solar energy rebates and alternative transportation facilities, such as bicycle parking and car sharing pods.

Program VII-D-2. Continue to provide assistance through the Emeryville Housing Rehabilitation Program for weatherization and energy efficiency repairs.

Policy VII-D-3. Encourage energy conservation measures and use of green building materials in residential remodel projects.

The Housing Action Plan is the implementation plan for the 2009-2014 Emeryville Housing Element. It consists of a comprehensive table that takes each of the goals, objectives, policies and programs described in Chapter 5, and for each policy and program identifies the responsible administrative department, the responsible review authority (such as the Planning Commission, City Council, or Redevelopment Agency), the funding source(s) for implementation of the policy or program, measurable outcomes, and action steps with completion dates.

Policy or Program	Responsible Department	Responsible Review Authority	Funding Source(s)	Measurable Outcomes	Action Steps/ (Completion Dates)
Goal I. Preserve existing housing stock					
Objective I-A. Promote preservation of existing housing stock through the Emeryville Housing Rehabilitation Program.					
Program I-A-1. Continue support of the Emeryville Housing Rehabilitation Program through Redevelopment Agency funding and allocation of a portion of Emeryville's annual federal Community Development Block Grant (CDBG) funds.	Economic Development & Housing (EDH)	Agency; Council	Agency Housing Set-Aside; CDBG	1 Ownership Rehab loans per FY; 1 Rental rehab loans per FY; 1 Paint grants per FY; 4 Accessibility grants per FY; 2 Clean-Up grants per FY; 1 Minor Home Repair Grants per FY; 5 Concrete buyback grants per FY; 6 Fence grants per FY.	1) Agency funding appropriation is made through budget process every 2 years in spring; next cycle is for FY10/11-FY11/12; 2) CDBG allocation to Program is done each spring for upcoming Fiscal Year through annual Community Development Block Grant (CDBG) application process through Urban County entitlement.
Program I-A-2. Conduct annual review of Emeryville's Housing Rehabilitation Program and projected program demand for next fiscal year.	EDH	Agency; Council	Agency Housing Set-Aside	Annual review of Program; determination if additional funding or resources are needed for subsequent fiscal year (July-June)	1) Conduct administrative annual review of completed and in-process projects and expenditures during first quarter of fiscal year (July-September); 2) submit funding request to Agency for program funding increase if needed as part of budget process.

Policy or Program	Responsible Department	Responsible Review Authority	Funding Source(s)	Measurable Outcomes	Action Steps/ (Completion Dates)	
Program I-A-3. Continue existing marketing and establish new marketing efforts for the Emeryville Housing Rehabilitation Program through regular updates to the city's website, participation at community-wide events, and annual, targeted mailings to landlords and homeowners in the City's older residential neighborhoods.	EDH	Administrative	Agency Housing Set-Aside	Annual program updates to information materials; participation in community events; outreach to potential participants.	1) Update website and program materials (brochures, applications, guidelines) each spring after release of new income limits; 2) Develop new marketing outreach program to reach potential participants (FY09/10); 3) Participate in community events sponsored by Community Services Department (as scheduled); 4) submit articles for city-wide activity guide (twice yearly).	
Objective I-B. Maintain and improve existing older housing stock, especially the older residential housing located in the Triangle neighborhood east of San Pablo Avenue and the Doyle Street neighborhood located east of Hollis Street.						
Program I-B-1. Continue administration of the Community Preservation Program and the Community Preservation Committee to encourage and improve maintenance of single and multi-family residences in the older residential neighborhoods. Provide rehabilitation program information and conduct code inspections on a case-by-case basis.	EDH (lead department); Police, Fire, City Attorney Office, Planning & Building; Public Works.	Planning Commission for code violations; Agency for any action taken related to providing Rehab Program funding or property acquisition.	General Fund for staffing	Reduction in number of dilapidated properties; increased level of property maintenance; resolution of code violations.	1) Hold quarterly meetings of CPC; 2) hold monthly progress meeting with City Attorney's Office and Planning; 3) monitor property condition on identified properties (on-going); 4) work with City Attorney Office to process code violations (on-going as required); 5) provide Emeryville Rehabilitation Program information to neighborhoods through targeted mailings (twice yearly).	
Policy-I-B-2. Retain and continue implementing the Residential Preservation Ordinance, which requires Council approval for demolition of residential structures.	Planning and Building	Council	Developers	No demolition without Council approval	Take applications for residential demolition to Planning Commission and Council when developers apply (on-going as required).	

Policy or Program	Responsible Department	Responsible Review Authority	Funding Source(s)	Measurable Outcomes	Action Steps/ (Completion Dates)	
Objective I-C. Minimize the loss of affordable units and displacement of residents of lower and moderate income through implementation of State Community Redevelopment law provisions relating to relocation and replacement housing.						
Policy I-C-1. Continue to review aggregate housing demolition and construction in the City each year through the annual Redevelopment Agency report submitted to the State Department of Housing and Community Development.	Building; EDH	Agency	General Fund for staffing	Timely submittal of annual report to State HCD on Agency housing activity and submittal of demolition and construction completion reports to State Dept of Finance.	1) Annually review demolition and construction permits in preparation for State HCD Report due no later than 12/31; 2) Monthly submit reports to DOF.	
Policy 1-C-2. Ensure that a replacement housing plan is implemented in connection with any loss of affordable residential units housing lower or moderate income persons as a result of a specific Redevelopment Agency-sponsored or assisted project action.	EDH; City Attorney Office	Agency	Agency Housing Set-Aside	Replacement Housing Plan adopted for any identified project; units replaced as required.	As part of review of new Agency-sponsored development, review potential impact on units occupied by lower or moderate income households. Adopt replacement housing plan as required by state redevelopment law. (As projects proposed to Agency)	
Policy 1-C-3. Ensure that state relocation law is applied as required in connection with a specific Redevelopment Agency-sponsored or assisted project as required.	EDH; City Attorney Office	Agency	Agency Housing Set-Aside	Relocation Plan adopted as required for any identified project; households relocated as required.	As part of review of new Agency-sponsored development, review potential relocation impacts and adopt relocation plan as required by state redevelopment law. (As projects proposed to Agency)	

Policy or Program	Responsible Department	Responsible Review Authority	Funding Source(s)	Measurable Outcomes	Action Steps/ (Completion Dates)	
Goal II. Promote a range of affordability levels						
Objective II-A. Ensure that the Zoning Ordinance continues to facilitate the development of affordable housing.						
Policy II-A-1. Ensure that sufficient sites are zoned in the City to allow for the development of the City's overall fair share allocation of regional affordable housing need.	Planning and Building	Planning Commission; Council	General Plan Maintenance Fund	23 acres must be zoned to allow residential assuming 50 units per acre with use permit.	Include in General Plan and Zoning Ordinance update to be completed by end of FY09/10. FY10/11.	
Policy II-A-2. Incentivize the provision of extremely low, very low, low, and moderate income housing in conjunction with the revision to the Density Bonus Ordinance to ensure compliance with State Density Bonus Law.	Planning and Building	Planning Commission; Council	General Plan Maintenance Fund	Revised Density Bonus Ordinance	Adopt Density Bonus Ordinance Revision as part of Zoning Ordinance update to be completed by end of FY09/10. FY10/11.	
Policy II-A-3. Revise the City's Zoning Ordinance to ensure that the requirements for secondary units are consistent with State law.	Planning and Building	Planning Commission; Council	General Plan Maintenance Fund	Review of secondary units requirements as part of Zoning Ordinance update.	Revise Zoning Ordinance by end of FY09/10 FY10/11 and ensure secondary units requirements are not onerous.	

Policy or Program	Responsible Department	Responsible Review Authority	Funding Source(s)	Measurable Outcomes	Action Steps/ (Completion Dates)	
Policy II-A-4. Continue implementation of the Affordable Housing Set Aside Ordinance to ensure inclusion of Below Market Rate Units in residential projects of 30 or more units.	EDH	Planning Commission; Council	General fund for staffing	Enforce the ordinance for all applicable projects.	1) Review applicability of AHSA Ordinance for each new residential project and include as required in Planning Conditions of Approval (as residential applications submitted); 2) For projects subject to Ordinance, negotiate and prepare Affordability Agreements for Council approval (after Conditions of Approval are approved, EDH begins Affordability Agreement preparations); 3) To ensure the City's Inclusionary requirements do not pose a significant constraint of the provision of housing, the City shall annually monitor the Ordinance to consider the costs and benefits and any impact of the Ordinance on the production of housing due to changing market conditions and amend the ordinance as necessary in order to provide more flexibility to developers.	
Objective II-B. Support housing opportunities for extremely low, very low, low and moderate income households.						
Policy II-B-1. Make extremely low, very low and low income housing a priority for use of the Redevelopment Agency's Low and Moderate Income Housing Fund.	EDH	Agency	Agency Housing Set-Aside	Provision of extremely low, very low or low income units in housing projects.	1) Annually review housing production against goals of 10-year Agency Housing Compliance Plan (spring of each year); 2) negotiate additional affordable units for low and very low income in inclusionary housing developments (as Affordability Agmts negotiated); 3) Identify opportunities for extremely low, very low, and low units in Agency-sponsored projects and incorporate need into Agency-issued RFPs (as RFPs issued).	

Policy or Program	Responsible Department	Responsible Review Authority	Funding Source(s)	Measurable Outcomes	Action Steps/ (Completion Dates)	
Policy II-B-2. Include extremely low, very low, and/or low income housing in Redevelopment Agency-assisted development projects whenever feasible.	EDH	Agency	Agency Housing Set-Aside	Provision of extremely low, very low and low income units in Agency-sponsored housing projects.	For Agency-sponsored or assisted housing developments, negotiate the inclusion of extremely low, very low, and low income housing where feasible. Include language in each RFP issued for affordable rental housing a goal to encourage developers to include extremely low, very low, and low income housing (as RFPs drafted).	
Policy II-B-3. Where feasible, consider a reduction in the moderate income inclusionary percentage requirement on development projects subject to the City's Affordable Housing Set Aside Ordinance to support the inclusion of extremely low, very low, and/or low income units.	EDH	Council; Agency if funding appropriation needed.	Agency Housing Set-Aside if Agency funds required to write down affordability.	Approval of Affordability Agreements for inclusionary projects with low and/or very low income units where not initially required by Ordinance.	1) Review potential for inclusion of extremely low, very low, and/or low income units in projects subject to the Ordinance that only have moderate income requirement and negotiate affordability agreement with developers for this inclusion (as Affordable Agmts being negotiated); 2) appropriate funds through the Ownership Housing Assistance Program for for-sale projects which include low income or very low income BMRs (as projects negotiated to include BMRs at these levels).	

Policy or Program	Responsible Department	Responsible Review Authority	Funding Source(s)	Measurable Outcomes	Action Steps/ (Completion Dates)	
Policy II-B-4. Continue funding of the City's First Time Homebuyer Program and Ownership Housing Assistance Program through Redevelopment funds to ensure that downpayment assistance can be provided to support homeownership opportunities for very low, low, and moderate income houshold purchasing homes in Emeryville.	EDH	Agency	Agency Housing Set-Aside	Provision of downpayment assistance loans for first-time homebuyers.	1) Appropriate funds for FTHB program through two-year budget process; 2) conduct annual review after close of program year and give annual report on FTHB activities to Agency in the first quarter of subsequent year.	
Policy II-B-5. Leverage State and Federal funding programs to maximize the number of affordable units available to low and very low income households, whenever possible.	EDH	Council	To be identified	Obtain and utilize outside funding to leverage Agency funds for affordable housing.	1) Keep apprised of outside funding opportunities and identify potential projects or programs to use funding; apply for these funding sources as appropriate (on-going); 2) utilize outside funding in projects (on-going).	
Policy II-B-6. Coordinate with the Housing Authority of Alameda County to link Emeryville Section 8 Program participants in its Family Self-Sufficiency Program with homeownership opportunities in Emeryville.	EDH	Administrative	General Fund for staffing.	Work with Housing Authority to place participants into Emeryville homeownership opportunities.	1) Establish coordination with FSS program coordinator (FY09/10); 2) identify potential projects for placement of FSS program participants (through on-going coordination).	
Objective II-C. Sustain affordable housing availability for existing participants in the City's Below Market Rate and Market Rate Homebuyers Program.						
Program II-C-1. Continue implementation of the City Foreclosure Prevention and Predatory Lending Prevention Strategy so long as required during the Bay Area foreclosure crisis.	EDH	Administrative	Agency Housing Set-Aside	Assistance to homeowner participants facing foreclosure to help them avoid foreclosure.	1) Prepare bi-monthly updates on Strategy Implementation for review by the Housing Committee (bi-monthly); 2) work with individual homeowners facing foreclosure (on-going)	

Policy or Program	Responsible Department	Responsible Review Authority	Funding Source(s)	Measurable Outcomes	Action Steps/ (Completion Dates)	
Goal III. Promote development of affordable housing for persons with special needs.						
Objective III-A. Support development of affordable housing for disabled people, people living with HIV/AIDS, single families, and seniors who are extremely low, very low, low or moderate income.						
Policy III-A-1. Support inclusion of extremely low and very low income affordable set-aside units for people living with physical and/or developmental disabilities in projects subject to the City's Affordable Housing Set Aside Ordinance. Ensure that support services are provided to tenants of these units.	EDH	Council	General Fund for staffing	Additional units in housing stock for extremely low and very low income people living with physical and/or developmental disabilities.	1) Identify projects for inclusion of accessible set-aside units for people with physical and/or developmental disabilities (as project Affordability Agmts are negotiated); 2) work with service providers for these special needs groups to identify opportunity projects and to ensure services are provided to support these tenants (after projects approved with these set-aside units); 3) promote universal design in projects containing set-aside units for people living with disabilities.	
Policy III-A-2. Support inclusion of Shelter-Plus-Care units (rent-assisted units for dually-diagnosed people with mental illness, substance abuse and/or AIDs-related illness) in projects subject to the City's Affordable Housing Set Aside Ordinance or as set-aside within Agency-sponsored rental affordable developments. Ensure that support services are provided to tenants of these units.	EDH	Council	Shelter Plus Care - federal	Additional units in housing stock serving individuals who qualify for Shelter Plus Care housing assistance.	1) Identify availability of Shelter Plus Care vouchers through coordination with countywide EveryOne Home Homeless and Special Needs Plan collaborative and opportunity developments (on-going); 2) work with developers to negotiate inclusion of set-aside of some SPC units within inclusionary projects (as project Affordability Agmts are negotiated); 3) consider inclusion of set-aside of SPC units within new Agency-sponsored affordable rental projects (as projects are developed).	

Policy or Program	Responsible Department	Responsible Review Authority	Funding Source(s)	Measurable Outcomes	Action Steps/ (Completion Dates)	
Policy III-A-3. Support development of Residential Care Facilities for the Elderly (RCFE) projects and independent senior housing developments.	Planning and Building	Planning Commission/ Council	General Fund for staffing	Additional units in housing stock that are either RCFE units or independent senior units.	1) Support projects that provide assisted living (Residential Care Facilities for the Elderly) or independent senior units; 2) establish mechanism through Zoning Ordinance to provide bonus (FAR, density, height, etc.) to developers who provide a certain percentage of the RCFE units to those with incomes at SSI levels through draft of Ordinance for review by Planning Commission and City Council by end of FY09/10 FY10/11.	
Policy III-A-4. Continue to support the County-wide long-range effort to prevent and end homelessness, the "EveryOne Home - Alameda Countywide Homeless and Special Needs housing Plan", and monitor the Plan's progress through City participation in the collorative groups such as the EveryOne Home Leadership Board, the Alameda County Urban County Technical Advisory Committee and the Alameda County HOME Consortium Technical Advisory Committee.	EDH	Council; administrative	General Fund for staffing	Participation in collaborative planning; continued financial support of agencies that serve homeless in Emeryville; creation of supportive housing units that serve extremely low income special needs groups that are identified in the EveryOne Home Plan.	1) staff-level participation on the Urban County and HOME Consortium TACs and EveryOne Home Board (on-going); 2) seek opportunities to encourage development of supportive housing within new Agency-sponsored rental developments.	

Policy or Program	Responsible Department	Responsible Review Authority	Funding Source(s)	Measurable Outcomes	Action Steps/ (Completion Dates)	
Goal IV. Ensure that the City has a variety of housing types to meet the diverse needs of its residents as well as attract new residents.						
Objective IV-A. Ensure that the Zoning Ordinance facilitates the development of a variety of housing types.						
Policy IV-A-1. Continue support of residential mixed use development through broader General Plan and update of zoning regulations.	Planning and Building	Planning Commission	General Plan Maintenance Fund	At least half of City to be zoned for mixed use with where residential use is permitted through General Plan update.	Include in Zoning Ordinance update to be completed by end of FY09/10 FY10/11.	
Policy IV-A-2. Continue allowing development of live/work units as conditionally permitted use in light industrial zones and mixed use zones.	Planning and Building	Planning Commission	General Plan Maintenance Fund	Update ordinance to define heavy live/work and allow it with use permit in IG (general industrial)	Include in Zoning Ordinance update to be completed by end of FY09/10 FY10/11.	
Policy IV-A-3. Encourage new developments to provide unit types for which there is an identifiable gap in Emeryville's housing stock.	Planning and Building	Planning Commission	General Fund for staffing	Production of a variety of housing types, particularly unit types for which there is an identifiable gap, including family-oriented projects with larger unit sizes, over Housing Element period,	Include in Zoning Ordinance update to be completed by end of FY09/10 FY10/11; Planning Commission to encourage creation of larger units as part of unit mix in proposed new residential multi-family development (on-going).	

Policy or Program	Responsible Department	Responsible Review Authority	Funding Source(s)	Measurable Outcomes	Action Steps/ (Completion Dates)	
Policy IV-A-4. Revise the Zoning Ordinance to be in compliance with Senate Bill 2, effective January 1, 2008, requiring establishment of a zoning district allowing emergency shelters without a conditional use permit or other discretionary approval and ensuring that transitional and supportive housing developments are considered as a residential use of property subject only to those restrictions that apply to other residential uses of the same type in the same zone.	Planning and Building	Planning Commission	General Fund for staffing	Zoning Ordinance updated to be in compliance with SB2.	1) Conduct an information session on requirements of SB2 with the Housing Committee and Planning Commission (fall 2009) as part of the Zoning Ordinance update in FY09/10; 2) Include in Zoning Ordinance update to be completed by end of FY09/10 FY10/11.	
Policy IV-A-5. Revise the Zoning Ordinance to clarify that group homes and residential care facilities for six or fewer residents be subject only to those same restrictions that apply to other single family uses.	Planning and Building	Planning Commission	General Fund for staffing	Zoning Ordinance revised to meet policy objective.	1) Include in Zoning Ordinance update to be completed by end of FY09/10 FY10/11.	

Policy or Program	Responsible Department	Responsible Review Authority	Funding Source(s)	Measurable Outcomes	Action Steps/ (Completion Dates)	
Policy IV-A-6. Revise the Zoning Ordinance to allow exemptions from design review for projects with a negligible visual impact, and to reduce the level of review to minor design review for one- and two-unit residential buildings and accessory dwelling units.	Planning and Building	Planning Commission	General Plan Maintenance Fund	Zoning Ordinance revised to meet policy objective.	1) Include in Zoning Ordinance update to be completed by end of FY10/11.	
Policy IV-A-7. The City adopted an update of its General Plan including new General Plan Designations on October 13, 2009. The capacity assumptions for sites included in Table 3-3 are based on the newly-established General Plan designations and interim zoning classifications. To ensure sites in the inventory are adequate to accommodate the City's regional need, the City will amend zoning to adopt the interim densities as identified in the sites inventory.	Planning and Building	Planning Commission	General Plan Maintenance Fund	Zoning Ordinance revised to meet policy objective.	1) Include in Zoning Ordinance update to be completed by end of FY10/11.	

Policy or Program	Responsible Department	Responsible Review Authority	Funding Source(s)	Measurable Outcomes	Action Steps/ (Completion Dates)	
Objective IV-B. Promote opportunities for affordable housing that serves locally identified target groups, including teachers of the Emery Unified School District, City personnel, families with children, and artists/craftspeople.						
Program IV-B-1. Continue special homebuyers assistance terms through the city's First Time Homebuyer Program which provides zero-percent down, downpayment assistance loans up to 20% of the purchase price to very low income to moderate income teachers in the Emery Unified School District for both market rate and below market rate units.	EDH	Agency	Agency Housing Set-Aside	Provision of downpayment assistance loans for this group.	1) Continue marketing efforts to this group to encourage participation in the FTHB Program through City website and flyers, and through distribution of program materials to each of the school sites and the EUSD district office (website updates on-going; distribution of materials to EUSD is annual); 2) Annually review number of participants who fall into this category and report to Agency as part of annual report on City's Homebuyer Programs (annually in first quarter of City's fiscal year).	
Program IV-B-2. Continue Special homebuyer assistance terms through the City's First Time Homebuyer Program which provides zero-percent down, downpayment assistance up to 20% of the purchase price to city of Emeryville employees who are any income for market units and very low moderate income for below market rate units.	EDH	Agency	Agency Housing Set-Aside	Provision of downpayment assistance loans for this group.	1) Continue marketing efforts to this group to encourage participation in the FTHB Program (on-going); 2) Annually review number of participants who fall into this category and report to Agency as part of annual report on City's Homebuyer Programs (annually in first quarter of City's fiscal year).	

Policy or Program	Responsible Department	Responsible Review Authority	Funding Source(s)	Measurable Outcomes	Action Steps/ (Completion Dates)	
Policy IV-B-3. Encourage provision of set-aside below market rate units for teachers and employees of the Emery Unified School District where feasible in new residential development subject to the City's Affordable Housing Set Aside Ordinance.	EDH	Council	General Fund for staffing	Provision of set-aside units for low to moderate income EUSD employees.	1) Identify appropriate projects for inclusion of set-aside units for EUSD employees and negotiate developer agreements for inclusion of these units (as projects Affordability Agmts negotiated).	
Policy IV-B-4. Promote housing designed to attract families with children by encouraging developers to include larger unit sizes (two-, three-, and four-bedroom units) as well as other on-site amenities such as usable outdoor open space, play equipment for a variety of ages, community rooms, and multi-purpose rooms that can be utilized for after-school homework clubs, computer, art, or other resident activities.	Planning and Building; EDH	Planning Commission/ City Council	General Fund for staffing	Completion of developer manual; New residential developments built that include larger units plus other on-site and nearby amenities that will attract households with children.	1) Encourage developers applying for planning permits to include not only larger units but other on-site, family-oriented amenities that will attract households with children (on-going); 2) Draft ordinance that provides a density, FAR, and/or height bonus if developer provides three-bedroom units and additional on-site family-oriented amenities (include in Zoning Code update for completion by end of FY09/10); 3) create developer manual or other distribution materials for Building Department counter with examples of well-designed family-oriented housing developments (by end of FY09/10).	

Policy or Program	Responsible Department	Responsible Review Authority	Funding Source(s)	Measurable Outcomes	Action Steps/ (Completion Dates)	
Policy IV-B-5. Consider development of affordable housing development specifically designed to attract families with children and collaboration between Redevelopment Agency and non-profit developer with expertise in this area of affordable housing development to implement such a development during the course of the housing element period.	EDH	Agency	General Fund for staffing; Agency Housing Set Aside	Agency-sponsored development(s) completed that are specifically designed to attract households with children.	1) Identify opportunity affordable housing development(s) for Agency-non-profit developer partnership that will be designed to attract households with children (during FY09/10); 2) evaluate opportunity as project proposals are submitted by private developers (as needed when proposals submitted to Agency); 3) consider inclusion of multi-family affordable housing development as part of update to Agency Housing Compliance Plan for 2010-2014 Implementation Plan period.	
Policy IV-B-6. Ensure that new residential developments that include a set-aside of below market rate live/work units conduct targeted marketing to artists and craftspeople to foster occupancy of these affordable below market rate live/work units by artists/craftspeople.	EDH	Administrative	General Fund for staffing	Occupancy of live/work units by artists or craftspeople.	1) Ensure that marketing plans submitted for city approval in projects with BMR live/work units include targeted marketing to artists/craftspeople (City will review and approve the plans as submitted; timing of submittal varies and is dependent on completion schedule of projects); 2) City assists in marketing of BMR units by including application materials at City Hall, presenting at project information workshops; including information on its website (varies in accordance with BMR marketing schedule for a particular project).	

Policy or Program	Responsible Department	Responsible Review Authority	Funding Source(s)	Measurable Outcomes	Action Steps/ (Completion Dates)	
Policy IV-B-7. Encourage development of affordable live-work space for artists and craftspeople.	Planning and Building	Planning Commission/ Council	General Fund for staffing	Development of affordable live/work space for artists and craftspeople	1) Process applications expeditiously as submitted for artist housing (as project applications submitted).	
Goal V. Maintain and expand activities designed to prevent those currently housed from becoming homeless and to assist those who are homeless.						
Objective V-A: Support activities to assist Emeryville residents who are at-risk of homelessness or are homeless.						
Program V-A-1. Continue providing funding through Emeryville's allocation of Community Development Block Grant funds to support the Berkeley Food and Housing Project's shelters, transitional housing, and Multi-Service Center to provide housing, meals and other support services to homeless individuals who have resided in Emeryville.	EDH	Council	CDBG	Support of homeless who have lived in Emeryville with needed services and shelter.	1) Undertake annual CDBG application process with County HCD and enter contract with Berkeley Food and Housing Project for fiscal year (January - June of each year); 2) review quarterly reports submitted by Agency and submit data to County HCD (quarterly)	
Program V-A-2. Continue providing information at City Hall and through City's website on resources available for emergency housing assistance.	EDH	Administrative	General Fund for staffing	Updated information available at City Hall and website.	1) Do quarterly update of public information materials and provide at City Hall and on-line.	

Policy or Program	Responsible Department	Responsible Review Authority	Funding Source(s)	Measurable Outcomes	Action Steps/ (Completion Dates)	
Program V-A-3. Improve City departmental coordination to ensure that information is made available on resources available to assist Emeryville families and households at-risk of homelessness.	EDH	Administrative	General Fund for staffing	Dissemination of information to City departments who interface with those at-risk of homelessness; dissemination of information to those individuals.	1) Convene annual meetings of City departments including Economic Development & Housing, Police, Fire, Recreation, Senior Center, and Child Development Center to discuss available resources, share information (first quarter of City's fiscal year); 2) establish lines of communication to improve dissemination of information to at-risk households (on-going)	
Program V-A-4. Improve coordination between the City and Emery Unified School District to determine if there are families who may be at risk of homelessness to provide resource and housing referrals.	EDH	Administrative	General Fund for staffing	Dissemination of information to EUSD on housing and services available; increased coordination between entities.	1) Convene annual meeting between EDH staff and EUSD to discuss housing resources, coordination needs to determine families at risk of homelessness, and dissemination of information to assist those households (first quarter of City's fiscal year); 2) Establish coordination efforts with City-Schools Committee (on-going)	

Policy or Program	Responsible Department	Responsible Review Authority	Funding Source(s)	Measurable Outcomes	Action Steps/ (Completion Dates)	
Program V-A-5. Support inclusion Assist in the development of affordable rental units serving extremely low income households as 30% of the area median income within future Redevelopment Agency-sponsored rental developments whenever feasible. Ensure that support services are provided to tenants of these units.	EDH	Agency	Housing Set-Aside; other outside funding	Provision of rental units that serve very low income households at 30% of the AMI.	1) Identify opportunities for development of units that support households at this income level and negotiate development agreements that include these affordability covenants and services requirements as needed; 2) Provide Agency financial assistance to support development at housing affordable at this income level if required for financial viability of project; 3) Require supportive services plan as submittal requirement in Agency-sponsored RFPs.	

Policy or Program	Responsible Department	Responsible Review Authority	Funding Source(s)	Measurable Outcomes	Action Steps/ (Completion Dates)	
Goal VI. Promote equal opportunity in housing.						
Objective VI-A. Prevent and redress discrimination based on race, color, ancestry, national origin, religion, familial status, sex, marital status, sexual orientation, age, disability, or source of income.						
Program VI-A-1. Through participation in the Alameda County Urban County Community Development Block Grant Entitlement jurisdiction, continue to contract with Housing Rights, Inc. or another fair housing counseling organization on an annual basis to provide fair housing counseling services, tenant-landlord mediation, public education and legal referrals for Emeryville resident tenants and landlords.	EDH	Council	CDBG	Provision of fair housing counseling services to Emeryville residents and landlords.	1) Enter into annual City-County CDBG agreement to continue participation in Urban County CDBG Program (annually in spring); 2) through staff participation on Urban County Technical Advisory Committee, review and approve quarterly reports of fair housing organization to ensure that Emeryville residents and landlords are being provided fair housing services. (on-going)	
Program VI-A-2. Continue effective marketing of the fair housing counseling service provided through Housing Rights, Inc. or another fair housing counseling organizaton through a variety of means, including public information available at Emeryville City Hall, on the City's website, and community-wide events.	EDH	Administrative	General Fund for staffing	Provision of updated fair housing information at City Hall and on web-site; information available at Emeryville community events	1) Communicate with fair housing organization to ensure that updated information is provided at City Hall (quarterly); 2) identify community-wide events as opportunities for dissemination of fair housing information (participate in annual community fair sponsored by Community Services Department)	

Policy or Program	Responsible Department	Responsible Review Authority	Funding Source(s)	Measurable Outcomes	Action Steps/ (Completion Dates)	
Program VI-A-3. Require that developers include language stating that they provide equal opportunity in housing in their marketing materials for below-market-rate units provided through the City's Affordable Housing Set Aside Ordinance.	EDH	Administrative	General Fund for staffing	Inclusion of equal opportunity language in marketing materials for BMR units.	1) Review marketing plans submitted by developers pursuant to affordability agreements and ensure that equal opportunity language is included (varies as project marketing plans are submitted)	
Program VI-A-4. Include appropriate equal opportunity and anti-discrimination language in all contractual agreements that the City and/or Emeryville Redevelopment Agency enter into with developers pertaining to housing, such as Agreements on Affordable Units, Resale Restriction Agreements, Disposition and Development Agreements, and Owner Participation Agreements.	City Attorney's Office	Council/ Agency	General Fund for staffing	Inclusion of equal opportunity and anti-discrimination language in City and Agency housing agreements.	1) Ensure inclusion of equal opportunity and anti-discrimination language in housing-related contracts and agreements with developers (varies, as Agency and City enter into agreements these clauses are reviewed by City Attorney's Office)	
Program VI-A-5. Continue Accessibility Grant Program through the Emeryville Housing Rehabilitation Program to provide grant assistance to lower income households with disabilities.	EDH	Agency	Agency Housing Set-Aside	Provision of grants to disabled households for accessibility improvements.	1) Continue marketing of Accessibility Grant Program through City Hall, website, and community events (annual update to website and program materials; participation in annual community fair); 2) expediting grant process as applications received (on-going)	

Policy or Program	Responsible Department	Responsible Review Authority	Funding Source(s)	Measurable Outcomes	Action Steps/ (Completion Dates)	
Goal VII. Promote environmental responsibility and long-term sustainability of City's housing development through remediation of brownfields and promotion of "green" and "healthy" housing development.						
Objective VII-A. Encourage the remediation of former industrial sites through public-private partnerships and Redevelopment Agency assistance.						
Program VII-A-1. Continue Agency grant and loan program, "Capital Incentives for Emeryville's Redevelopment and Remediation" (CIERRA) to provide financial, technical, and regulatory assistance to property owners and developers seeking to assess and remediate their housing development sites.	EDH	Agency	EPA/Agency funds for match	Provision of loans and grants to property owners that result in remediation of sites.	1) Continue implementation of CIERRA Program and direct program repayments back into new remediation assistance (on-going); 2) research new possible funding sources to enable continuation of program during housing element period (on-going)	
Program VII-A-2. Continue seeking outside funding opportunities to leverage the Agency's funding for site remediation at Agency-sponsored housing and mixed use developments, thereby increasing the financial feasibility of the projects.	EDH	Agency	To be determined.	Attainment of additional outside funding to support Agency's site remediation goals.	1) At staff level, continue to identify funding opportunities and seek authority to apply for these funding sources (on-going)	

Policy or Program	Responsible Department	Responsible Review Authority	Funding Source(s)	Measurable Outcomes	Action Steps/ (Completion Dates)	
Objective VII-B. Ensure that the City and Redevelopment Agency review and permitting process encourages "green" and "healthy" housing development, defined as clean, indoor air and conservation of energy, water, and building materials.						
Policy VII-B-1. Continue requirement that developers complete the appropriate GreenPoint Rated or LEED Checklist as part of their submittals to the Emeryville Planning and Building Department.	Planning and Building	Planning Commission for entitlements; Administrative for plan check.	General Fund for staffing	Developers' inclusion of checklist in planning application submittal, inspiring them to consider green design features.	1) Review applications as submitted by developers and ensure one of the checklists has been submitted (on-going); 2) ensure the conditions of approval require compliance with submitted green building measures (on-going); 3) review plans at plan check in accordance with checklist (on--going)	
Policy VII-B-2. Include the appropriate GreenPoint Rated or LEED Checklist in all Redevelopment Agency-led Request for Proposals (RFPs) for residential and/or live/work projects and include the Checklist as a review criterion in the developer selection process.	EDH	Agency	General Fund for staffing	Inclusion of GreenPoint Rated or LEED Checklist in all Agency-led RFPs for new housing; incorporation of green building measures in Agency-sponsored housing developments.	1) Include GreenPoint Rated or LEED Checklist in Agency housing RFPs for Agency approval prior to issuance (on-going as RFPs issued); 2) require developers to incorporate green building measures in Agency-sponsored housing developments (on-going as RFPs issued)	

Policy or Program	Responsible Department	Responsible Review Authority	Funding Source(s)	Measurable Outcomes	Action Steps/ (Completion Dates)	
Policy VII-B-3. Ensure that public information materials are available at the City and through the website on green building resources and funding opportunities.	Public Works	Administrative	General Fund for staffing	Provision of information materials at Planning and Building Counter.	1) Ensure that updated public information materials are available at Planning and Building Counter (quarterly); 2) Develop information for website with referrals and information on green building resources and funding opportunities (incorporate with new City website update in 2009)	
Policy VII-B-4 Consider an ordinance requiring projects involving public funds to meet minimum green building thresholds.	Public Works	Planning Commission and City Council	General Fund for staffing, project costs	Public-private projects meeting higher green building thresholds, helping to meet City's climate change goal.	1) Survey previous projects to set threshold (FY09/10); 2) Draft ordinance and present draft to Planning Commission and City Council (FY10/11)	
Policy VII-B-5 Consider an ordinance providing density, FAR, and height bonus for private projects that meet certain green building thresholds.	Public Works	Planning Commission and City Council	General Fund for staffing	Private projects meeting higher green building thresholds, helping to meet City's greenhouse gas reduction goal.	1) Survey previous projects to set threshold; 2) Recommend density and height bonus level; 3)Draft ordinance and present draft to Planning Commission and City Council. (complete action steps by end of FY09/10)	
Objective VII-C. Encourage site and building design that includes social spaces, stormwater treatment, transit access, bicycle parking, and strong interface with the street.						
Policy VII-C-1. Adopt open space requirements and design guidelines for multi-family housing projects.	Planning and Building	Planning Commission	General Plan Fund	Requirements in Zoning Ordinance, leading to more open space and better design.	Include in General Plan and Zoning Ordinance update to be completed by end of FY09/10.	

Policy or Program	Responsible Department	Responsible Review Authority	Funding Source(s)	Measurable Outcomes	Action Steps/ (Completion Dates)	
Policy VII-C-2. Continue to require design and operation measures to protect stormwater quality, including site design, pollutant source control, and vegetative stormwater treatment.	Public Works	Administrative	General Fund for staffing	Inclusion of design and operation measures to protect stormwater quality.	1) Public Works to review and approve stormwater treatment measures in connection with development projects (on-going)	

Policy or Program	Responsible Department	Responsible Review Authority	Funding Source(s)	Measurable Outcomes	Action Steps/ (Completion Dates)	
Objective VII-D. Support property retrofits that reduce the City's carbon footprint through energy conservation, waste reduction, and transportation access measures.						
Policy VII-D-1. Disseminate information on retrofit assistance programs such as youth energy services, solar energy rebates and alternative transportation facilities, such as bicycle parking and car-sharing pods.	Planning and Building / Economic Development and Housing	Administrative	General Fund for staffing	Retrofit of existing residential buildings to be more energy efficient, less wasteful and better oriented to non-auto travel.	1) Provide information on retrofit resource programs at the Planning and Building Counter and through the Community Preservation program (on-going)	
Program VII-D-2. Continue to provide assistance through the Emeryville Housing Rehabilitation Program for weatherization and energy efficiency repairs.	Economic Development and Housing	Administrative	Agency Housing Set Aside Fund	Property retrofits that would not occur without Agency funding.	1) Continue use of program for weatherization repairs and other energy-efficiency retrofits (on-going)	
Policy VII-D-3. Encourage energy conservation measures and use of green building materials in residential remodel projects.	Planning and Building	Administrative	General Fund for Staffing	Green remodel features in property improvement and maintenance projects	1) Include checklist in planning and building applications (complete by end of FY09/10)	

Quantified Objectives by Unit Type and Income Level

Projects Completed 2009 through 2014*

	New Construction	Rehabilitation	Conservation**	Total
Extremely Low Income***	28	5	0	33
Very Low Income	83	0	0	83
Low Income	33	0	0	33
Moderate Income	60	5	0	65
Above Moderate Income	755	0	0	755
Total	**959**	**10**	**0**	**969**

Extremely Low Income - households at or less 30% Area Median Income (AMI); Very Low Income - households 31-50% AMI; Low Income - households 51-80% AMI; Moderate Income - households 81-120% AMI; Above Moderate Income - households above 120% AMI.

* Projects included are a sub-set of projects listed in Table 2-55; Table 2-55 includes projects completed 2007 and 2008, which are not included here. This list does not contain Icon at Doyle (27 market rate); Salem Manor (3 market rate); Glashaus Lofts (5 very low, 6 low, 18 moderate, 116 market rate)

** No projects will have expiring Project Based Section 8 contracts during this time period.

*** Extremely low income unit assumptions: REHABILITATION: 5 rehabiliation units in Magnolia Terrace project. NEW CONSTRUCTION: 8 units within the Ambassador Apartments Project for FY09/10; 20 units as set-aside units within Agency-sponsored projects and/or inclusionary projects with negotiated set-aside at this level for four fiscal years remaining in Housing Element period of FY10/11 through FY13/14 (5 units per year)

CITY OF EMERYVILLE

SEWER SYSTEM MANAGEMENT PLAN



FEBRUARY 21, 2012

City of Emeryville
Department of Public Works
1333 Park Avenue
Emeryville, CA 94608

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INTRODUCTION

I-1. Background on the City's Sanitary Sewer System and Regional Issues Facing the Operations of the Collection System

The City of Emeryville is located between the Cities of Berkeley (to the north) and Oakland (to the south and east), with San Francisco Bay to the west. Emeryville is a small community, covering about 670 acres, with a population of about 10,000. Originally, Emeryville was an industrial community with meat packing plants, steel works, manufacturing, and a rail yard. In the 1960's, heavy industries began leaving the City, making way for the current mix of housing, commercial and retail properties, biotech research, and computer and graphic film industries.

The City of Emeryville's sanitary sewer service area is shown on Figure 1 and a schematic of Emeryville's 15 miles of sanitary sewer system is shown on Figure 2. The collection system serves the entire City. In addition, approximately 11 miles of sanitary sewer mains from 370 acres of primarily residential property in the City of Oakland and 0.25 acres of residential property in the City of Berkeley drain into Emeryville's sanitary sewer system.

The first sewers in Emeryville were constructed in the mid-1880s. They were generally small diameter pipes carrying sanitary flows to larger pipes that carried a combination of sanitary sewage and storm water to local creeks and San Francisco Bay. Over the ensuing 50 years, the system was extended and enlarged to handle increasing flow from the growing community. Many of the early sewers were installed by private developers and were not subject to uniform standards and inspection. Because the drainage system was a combined sanitary/storm water system, roof, basement, and area drains were connected to the system. Emeryville's early development was heavily industrialized, with canneries, paint production, wood processing, and steel manufacturing contributing to the wastewater load. In addition, much of the system was below the groundwater table for all or part of the year. The combination of these factors resulted in a sewer system that had inadequate capacity, was subject to frequent overflows during wet weather, and contributed heavy pollution loads to the receiving streams and ultimately the San Francisco Bay.

In the late-1930's, construction of the San Francisco Bay Bridge first brought public awareness to the odors and pollution caused by untreated sewage discharges directly to San Francisco Bay. In 1944, Special Sewer District No. 1 was formed by the East Bay Municipal Utility District (EBMUD) to construct interceptor sewers through the communities bordering San Francisco Bay (from El Cerrito to the Oakland/San Leandro border) and provide primary wastewater treatment at a centralized location near the eastern side of the Bay Bridge. These new regional facilities were brought online in 1951. Persistent overflows within the communities during wet weather prompted EBMUD to undertake a program to separate the storm sewers from the sanitary sewers. This program, begun in the 1940's, was essentially complete by 1975, three years before EBMUD upgraded its treatment plant to include a secondary facility with land-based sludge disposal.

High wet weather flows and associated overflows continued to plague the East Bay communities through the 1970's. Federal and State requirements calling for the reduction and eventual

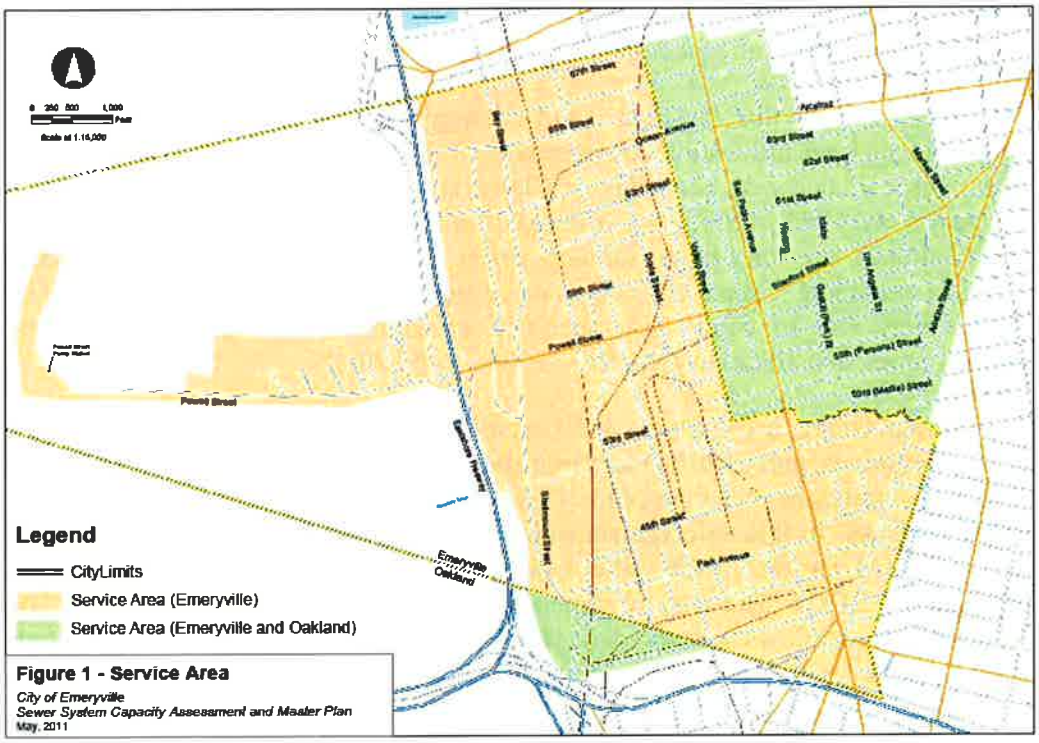


Figure 1 - Service Area
City of Emeryville
Sewer System Capacity Assessment and Master Plan
May, 2011

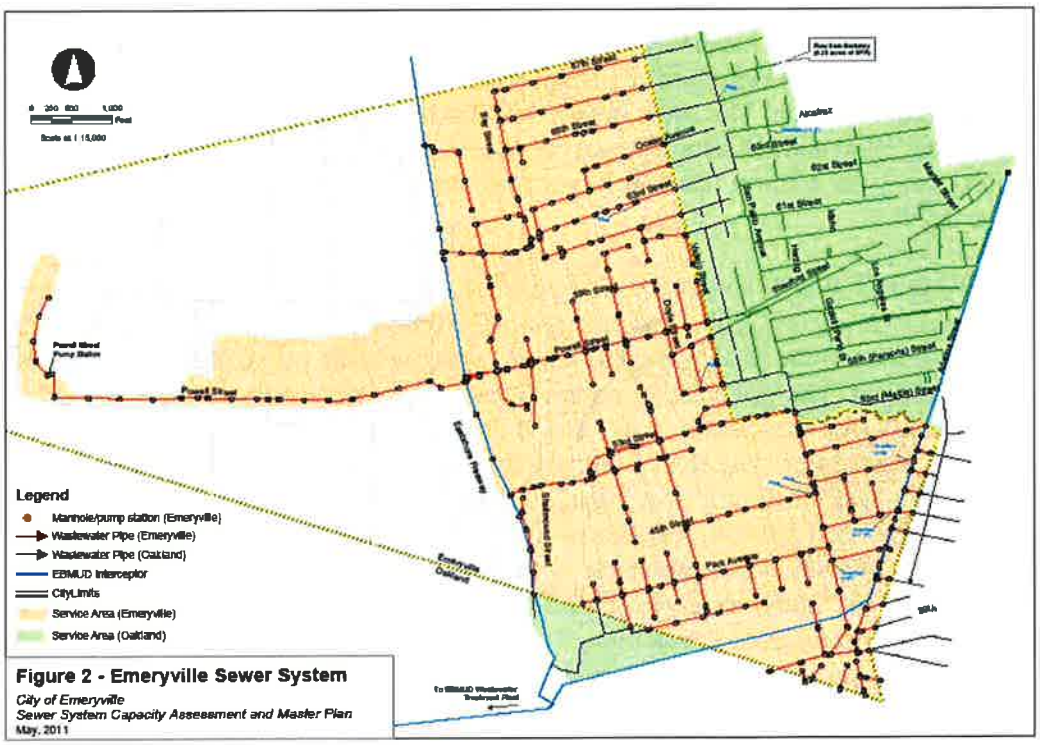


Figure 2 - Emeryville Sewer System
City of Emeryville
Sewer System Capacity Assessment and Master Plan
May, 2011

elimination of sewer overflows prompted EBMUD and its service communities to undertake a systematic, system-wide capacity and condition assessment of the local sewer systems. At the same time, EBMUD undertook an assessment of its interceptor and treatment facilities.

In 1980, the City of Emeryville, the East Bay Communities, and EBMUD, coordinated their efforts and initiated a 6-year infiltration/inflow study (I/I Study) to develop a program to address sanitary sewer overflows that were occurring on City streets and in the Bay during periods of wet weather. The completed 1985 I/I Study was used to develop the East Bay I/I Correction Program (I/ICP), which outlined the long-range sanitary sewer improvements that were necessary to correct overflows occurring within the collection system of each community and along the EBMUD Interceptor. The I/I Study also specified schedules, called Compliance Plans, to complete various sewer rehabilitation projects specified in the I/ICP.

In 1986, the Regional Board issued Cease and Desist Orders (CDOs) to the City of Emeryville, the East Bay Communities, and EBMUD to eliminate all sanitary sewer overflows and to reduce the overall I/I. The immediate objective of the CDOs was to eliminate the public health impacts caused by the overflows. In this enforcement order, the Regional Board accepted the proposed improvements outlined in the I/ICP. The Compliance Plans for each Community were incorporated into the CDOs. The City of Emeryville's Compliance Plan specified a 20-year program to correct the overflows and to reduce the overall I/I. There were eight known overflow locations within the City of Emeryville at the time the CDOs were issued.

In concurrence with the I/ICP, EBMUD underwent its own Wet Weather Program for the treatment plant. The objective of the Wet Weather Program was to equip EBMUD's treatment plant and facilities with the capacity to convey peak flows from the East Bay Communities trunk sewers by the end of the I/ICP implementing period.

Since it was cost-prohibitive to eliminate all I/I into the sanitary sewer collection system as part of the I/I Study, the East Bay Communities performed a cost analysis to determine the most cost-effective level of rehabilitation. The study concluded that the most cost-effective solution was to design the treatment plant and collection system to accommodate peak I/I flows generated during a 5-year design storm. For a storm that was larger than the 5-year design storm, overflows would be permitted to occur.

As a part of EBMUD's Wet Weather Program, each connection to EBMUD's interceptor was allotted a peak wet weather design flow as stated in the I/I Study. The total of these design flows from all the connections in the East Bay communities was the basis for sizing the capacity at the EBMUD treatment plant. The wet weather design flows include three components: a 3-hour peak base flow, a groundwater infiltration flow, and a rain dependent I/I flow. Emeryville has 5 connections to the interceptor. The total peak wet weather flow contribution from Emeryville's system to EBMUD's overall design flow was 25.59 mgd as stated in the 1985 I/I Study. This design flow was about half from Emeryville and half from Oakland. Of the total wet weather flow, only 4.36 mgd or 17% was attributable to dry weather base flow. The dry weather base flows defined in the I/I Study were developed from flow metering in the early 1980's and included a growth factor projected at that time.

In 2006, the City of Emeryville reached the end of the I/ICP implementation period specified in the Compliance Plan. To date, the City spent approximately $11,000,000 on the program and reconstructed approximately 75% of its sanitary sewer infrastructure. The City successfully performed projects as necessary to correct overflows at the previously identified locations. In addition, EBMUD spent more that $310 million on its wet weather facilities in order to accommodate the wet weather flows as defined in the Wet Weather Program. These facilities are working as intended and as were permitted by the Regulators.

The City of Emeryville initiated a Sewer System Capacity Analysis and Master Plan in 2005. This study was triggered by an update to the City's General Plan and was completed in 2010. A model of the sanitary sewer system was developed based on upgrades to the sanitary sewer system as a result of the I/ICP. The analysis was performed using the same general approach to system analysis that was used in 1986 and was calibrated with wet weather flow data collected in 2005/06. It was estimated that under design storm conditions with an allowance for an increase in flow from future land use modifications, the design wet weather flow is now 20.4 mgd (versus 25.59 mgd in 1985, or a reduction of 5.19 mgd). The flow contribution from Emeryville was determined to be 7.9 mgd, with the remaining flow of 12.5 mgd from Oakland.

In 2009, the California Regional Water Quality Control Board, San Francisco Bay Region, adopted Order No. R2-2009-0004 reissuing an NPDES permit to EBMUD to operate its Wastewater Treatment Facilities. However, the new NPDES permit prohibited any discharge from its three wet weather sanitary sewage treatment facilities. The reason for prohibiting discharge from the wet weather facilities had to do with a change by the US Environmental Protection Agency (USEPA) in the interpretation of provisions of the Clean Water Act dealing with heavy metals in the effluent of sanitary sewage treatment facilities. Given that the EBMUD wet weather facilities only provide primary treatment to the wet weather wastewater flow, the wet weather facilities do not treat the heavy metals as needed to meet the revised requirements. In order to eliminate discharge from these facilities, further reduction of wet weather flows from the East Bay Communities is needed as well as an expansion of EBMUD's storage capacity.

Shortly after EBMUD received its reissued NPDES permit in 2009, the USEPA and the Regional and State Water Boards filed suit against EBMUD for discharges in violation of this prohibition and entered into a Stipulated Order (SO). One provision of the EBMUD SO required them to pass an ordinance to implement a Regional Private Sanitary Sewer Lateral (PSL) Program http://www.ebmud.com/psl. The purpose of the PSL program was to reduce the amount of wet weather sanitary sewage flow to their treatment facilities from old leaky private sewer laterals. Another product of the EBMUD SO was the preparation of a Flow Modeling and Limits Report that could be used in the future by the USEPA as a basis for imposing flow limits on each of the East Bay collection system agencies.

In November 2009, the California Regional Water Quality Control Board issued the City of Emeryville NPDES Permit No. CA0038792 for the operation of the City's sanitary sewer system. The most notable difference in this renewed NPDES permit was a discharge prohibition stating "The Discharger shall not cause or contribute to discharges from EBMUD's Wet Weather Facilities that occur during wet weather or that are associated with wet weather."

On November 18, 2009, the USEPA issued the City of Emeryville and all the other Collection System Agencies that are part of the service area of EBMUD treatment facilities, an Administrative Order (AO) to reduce Sanitary Sewer Overflows (SSOs) from its collection system and to control I/I into the collection system so as not to cause or contribute to overflows from the EBMUD wastewater facilities. The AO included a number of requirements for the City to implement immediately in order to improve on the current program for controlling SSOs and to reduce I/I.

Then, on September 6, 2011, the United States District Court Northern District of California issued Stipulated Order for Preliminary Relief (SO). The requirements contained in this SO are similar to those in the 2009 AO, with the addition of penalties for failure to comply with the timeline and reporting requirements. The terms of the SO identify the following work to be performed by the City of Emeryville:

- Maintaining its current program for controlling SSOs and reducing I/I set forth in this SSMP (this document)
- Implementing improvements in its current programs
- Preparing an Asset Management Implementation Plan (AMIP) by July 15, 2012
- Participating in EBMUD's Regional PSL program
- Cooperating with EBMUD in the development of the Regional Flow Monitoring Data Assessment Program
- Formulating a program for inflow identification and reduction
- Providing SSO response, recordkeeping, notification, and reporting
- Implementing a Maintenance Management System by October 15, 2011
- Submitting a Sewer Pipe and Maintenance Hole Inspection plan
- Providing EPA with copies of annual SSO reports now provided to the Regional Water Board

I-2. Requirement from Regulators for Preparing Sanitary Sewer Management Plans

In a statewide effort to reduce the amount of pollution caused by poor management of sanitary sewer collection systems, the Regional and State Water Boards have developed very strict policies in recent years dealing with Sanitary Sewer Overflows (SSO). Some of the major causes of SSO's include grease blockages, root blockages, manhole structure failures, vandalism, pump station mechanical failures, power outages, excessive storm or ground water inflow/infiltration, debris blockages, sanitary sewer system material failures, lack of proper operation and maintenance, insufficient capacity and contractor-caused damages. Many SSOs are preventable with adequate and appropriate facilities, source control measures and operation and maintenance of the sanitary sewer system.

In July 2005, in order to facilitate proper funding and management of sanitary sewer systems, the Regional Water Quality Board issued "New Requirements for Preparing Sewer System Management Plans (SSMP)" to all the sewer collection agencies in the San Francisco Bay Area. These requirements provided for a three-year phased compliance schedule and included exemptions from certain requirements for communities with populations less than 10,000. To be effective, the SSMP's were required to include provisions to provide proper and efficient

management, operation, and maintenance of sanitary sewer systems, while taking into consideration risk management and cost benefit analysis. Additionally, the SSMP had to contain a spill response plan that establishes standard procedures for immediate response to an SSO in a manner designed to minimize water quality impacts and potential nuisance conditions.

On May 2, 2006, the State Water Resources Control Board issued order No. 2006-0003 Statewide General Waste Discharge Requirements for Sanitary Sewer Systems (WDR). The WDR mirrors the Regional Board's SSSP requirements, but includes some additional provisions, one of which is that the City Council must approve the SSMP at a public meeting and it must be made available to the Public in the City's office or on the internet. Also, the SSMP must be updated every five years and the City Council must reapprove the document if significant updates are made.

SECTION 1. GOALS

The goals for the City's SSMP include the following five items:

- To properly manage, operate, and maintain all parts of the wastewater collection system.
- To use a GIS-based system for daily management and operation of all parts of the wastewater collection system.
- To work closely with EBMUD on the FOG program to reduce the amount of fats, oils, and grease in the wastewater collection system in order to prevent SSOs.
- To provide adequate capacity in the collection system to convey the peak wet weather flows to minimize the frequency of SSOs.
- To reduce wet weather I/I by working with EBMUD in the implementation of the Regional PSL Program and by eliminating I/I from pipe defects identified through field work.
- To provide routine training for all personnel involved with the management, reporting, and cleanup of SSOs.

SECTION 2. ORGANIZATION

Figure 3 illustrates the City's organization chart in relationship to the SSMP requirements. The roles and responsibilities of the positions included in this chart are described below. The individuals currently holding key positions are listed in Table 1.

- City Manager - Implements policy, plans strategy, leads staff, allocates resources, delegates responsibility, authorizes outside contractors to perform services, recommends required budget to City Council, and arranges for emergency meetings of City Council if necessary.

- Public Works Director/City Engineer - Provides information updates to the City Council, prepares wastewater collection system planning documents with the help of consultants, oversees preparation of budget for SSMP, coordinates development and implementation of SSMP, oversees the Maintenance Supervisor, Sr. Civil Engineer, and Environmental Programs Administrative Analyst, and is the City's authorized representative for the SSMP.

- Engineering Consultant - Provides technical support to the Public Works Director/City Engineer on issues associated with the sanitary sewer system.

- Sr. Civil Engineer - Assists the City Engineer in the development and implementation of the Capital Improvement Program (CIP), manages the design and oversees construction of CIP projects, manages consulting Public Works Inspectors, and ensures that the new and rehabilitated assets meet the agency standards.

- Public Works Inspector (Consultant) - Inspects construction of City sanitary sewer capital improvement projects and construction of private sewer laterals.

- Environmental Programs Administrative Analyst - Prepares monthly report of SSOs in CIWQS database, submits SSO reports as stated in overflow response plan, prepares written and electronic reports as required, including the annual SSO report.

- Public Works Superintendent - Manages field operations and maintenance activities, manages annual contract for routine and emergency sewer cleaning and closed circuit television (CCTV) inspection, prepares and implements contingency plans, leads emergency response, investigates and reports SSOs, and trains field crew.

- Public Works Administrative Secretary - Directly assists the Public Works Director/City Engineer and Public Works Superintendent with day-to-day efforts of the department, receives and responds to calls from the public.

- Sewer Cleaning/CCTV Contractor - Provides field services for routine and emergency sewer cleaning and CCTV inspection, and structure inspection.

- Public Works Crew Chief - Staffs preventive maintenance activities, mobilizes and responds to notification of stoppages and SSOs, (mobilizes sewer cleaning equipment, by-pass pumping

equipment, and portable generators as needed when contract sewer cleaning firm is not able to respond), rotates on stand-by mode to respond to emergency call-outs during off hours.

- Public Works Maintenance Worker - Works under the direction of the Public Works Crew Chief responding to notification of stoppages and SSOs, rotates on stand-by mode to respond to emergency call-outs during off hours.

As outlined in the "Overflow Response and Reporting Procedure," in the event of an SSO, the Fire Department is generally the initial responder to the scene and the Fire Department Incident Commander is responsible for reporting the SSO to the Regional Water Board and other applicable agencies.

FIGURE 3
CITY OF EMERYVILLE ORGANIZATION CHART
FOR SSMP

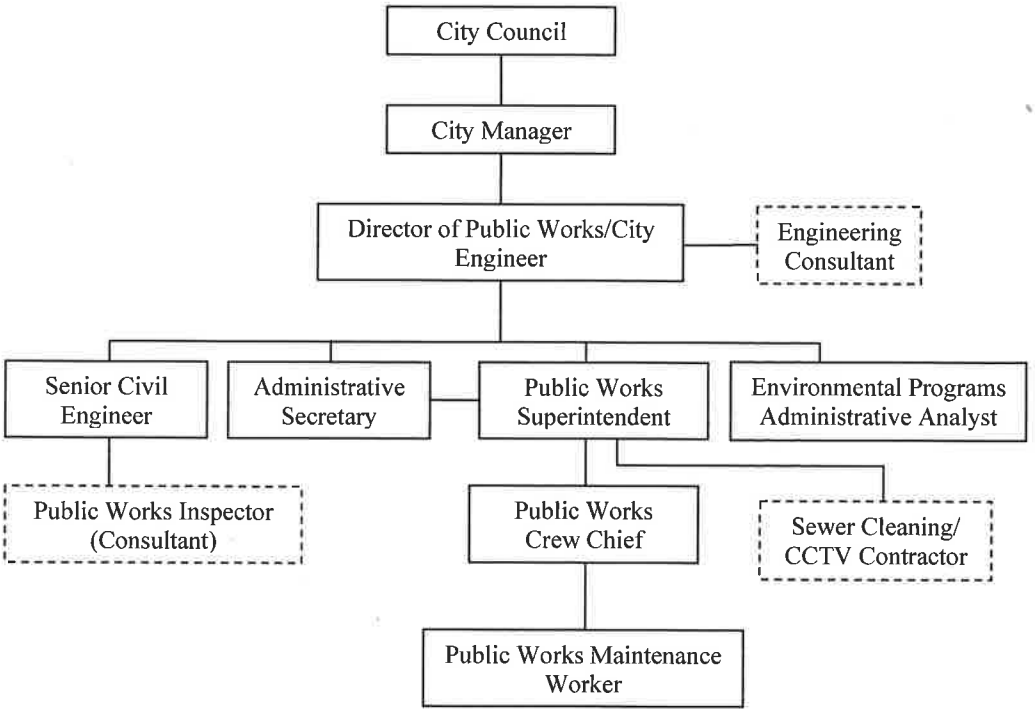


TABLE 1
CITY OF EMERYVILLE CONTACT INFORMATION

Position	Individual	Contact Phone No.	Email Address
City Manager	Patrick O'Keeffe	510-596-4370	pokeeffe@ci.emeryville.ca.us
Assistant City Manager	Delores Turner	510-5964391	dturner@ci.emeryville.ca.us
Director of Public Works, Legally Responsible Individual	Maurice Kaufman	510-596-4334	mkaufman@ci.emeryville.ca.us
Senior Civil Engineer	Michael Roberts	510-596-4333	mroberts@ci.emeryville.ca.us
Public Works Superintendent	Michael Mahoney	510-596-4341	mmahoney@ci.emeryville.ca.us
Environmental Program Administrative Analyst*	Peter Schultze-Allen	510-596-4728	pschultze-allen@ci.emeryville.ca.us
Mayor	Jennifer West	510-596-4376	jwest@ci.emeryville.ca.us
Vice Mayor	Kurt Brinkman	510-596-4376	kbrinkman@emeryville.org
City Council Member	Jac Asher	510-596-4376	jacasher@ci.emeryville.ca.us
City Council Member	Ruth Atkin	510-596-4376	ratkin@ci.emeryville.ca.us
City Council Member	Nora Davis	510-596-4376	ndavis@ci.emeryville.ca.us

* The Fire Department is responsible for the initial communication of SSOs to CIWQS; the Environmental Program Administrative Analyst is responsible for compiling the annual SSO reports.

SECTION 3. LEGAL AUTHORITY

The City's legal authority over the sanitary sewers is contained in the City of Emeryville Municipal Code, Chapter 8 of Title 7, Wastewater Collection System. This code was updated and adopted by the City Council on May 3, 2011.
http://www.codepublishing.com/ca/emeryville/?Emeryville07/Emeryville078.html

3-1. Illicit Discharges (Control I/I, FOG)

Article 4. of Chapter 8 of Title 7, "Sewer Use Regulations," addresses illicit discharges into the City's wastewater collection system. This article includes among other items, prohibited uses, requirements for food service establishments (FSEs) to control FOG discharges, the conditions for discharge of radioactive wastes into the City's collection system, and the permitting of industrial waste discharges.

3-2. Proper Design and Construction

Article 2. of Chapter 8 of Title 7, "Building Sewer Lateral," addresses the requirements for and design of privately-owned building sewer laterals or PSLs. The City has streamlined the permit process for the Public Works Encroachment and the Building Department into a single Sewer Lateral Permit that must be obtained before construction of a new building sewer lateral or the repair, replacement, or abandonment of an existing building sewer lateral. This section of the City's municipal code also adopts the EBMUD Regional PSL ordinance http://www.ebmud.com/sites/default/files/pdfs/071211%20-%20Ordinance%20No.%20355-11%20-%20WW%20Control%20Ordinance.pdf by reference (Municipal Code 7-8.211)

3-3. Installation, Testing, and Inspection

The requirements for installation, testing and inspection of Building Sewer Laterals are defined in Article 2. of Chapter 8 of Title 7. "Building Sewer Lateral," of the Municipal Code..

3-4. Enforcement of Sewer Ordinance

Enforcement of the Wastewater Collection system ordinance is described in Article 6 of Chapter 8 of Title 7.

SECTION 4. OPERATION AND MAINTENANCE PROGRAM

4-1. Resources and Budget

The Sewer Fund is an Enterprise Fund that supports operation and maintenance of the City's sanitary sewer system. The fund is supported by Sewer User Charges collected by EBMUD via water bills. The rates were last increased in January, 1995. Capital funds for sewer improvements are also generated by the Sewer Connection Fee Fund when new development occurs. Emeryville's Sewer User Charge is the lowest in the East Bay region at $8 per month per single family service or $1.25 per month for each 100 cubic feet of water use for multiple family connections. The new sewer connection fee is in the amount of $746 for a single family dwelling equivalent. At this time, there is sufficient revenue generated by the current charges and fees to operate the sanitary sewer system. There is also a sufficient fund balance of assets available to pay for up coming known capital improvements that are needed on the system.

Both the Sewer Rehabilitation Fund and the Sewer Connection Fee Fund are addressed in the City's Operating Budget and Capital Improvement Program. Table 2 outlines the City's sewer operations funds, including the actual budget for FY 2010/2011 and projected budgets for F2011/2012 and FY 2012/2013.

TABLE 2
SEWER OPERATIONS FUNDS

	FY 2010/11 Actual	FY 2011/2012 Budgeted	FY 2012/2013 Proposed Budget
Revenue Estimates			
Investment Earnings	$7,348	$15,816	$7,000
Sewer Service Charges	$812,756	$800,000	$800,000
Total Revenues	**$820,104**	**$815,816**	**$807,000**
Proposed Expenses			
Public Works/Sewer Division	$183,500	$187,134	$190,000
Professional Services	$60,000	$135,000	$130,000
FOG	$8,028	$10,669	$12,000
Maintenance Management Services	$25,000	$25,000	$25,000
Cleaning	$40,661	$136,000	$40,000
Video Inspection	$11,724	$120,000	$10,000
Emergency Repair	-	$25,000	$25,000
Smoke Testing	$11,388	$25,000	$10,000
Pump Station Maintenance	$12,820	$15,000	$15,000
Debt Service	$2,082	$25,000	$25,000
Interfund Transfer	$81,500	$81,500	$81,500
Total O & M Expenses	**$436,703**	**$785,303**	**$563,500**
Capital Improvement Program	$998,776	-	$1,000,000
Total Expenses	**$1,435,479**	**$785,303**	**$1,563,500**

Total Current Assets as reported in the Comprehensive Annual Financial Report Year Ended June 30, 2011 were $4,718,238.

4-2. Collection System Mapping

The City of Emeryville contracts with the firm of Redzone to host a comprehensive web-based maintenance management system for the sanitary sewer system called ICOMMM. The system incorporates GIS database files and mapping and is used to manage CCTV inspection and smoke testing data for the collection system. Given that there have been issues with developing accurate data on the system, the older hard copy plans are still used at times when questions arise. It is expected that a complete transition to the web-based system will be during the 2011/2012 fiscal year. The ICOMMM database includes asset information for sewers, manholes, and the one pump station operated by the City. The City also working on the developing a layer of information on private sewer laterals which should be completed in 2012.

4-3. Routine Preventive Operation and Maintenance Activities

In 2011, the City started a system-wide cleaning and CCTV inspection program of the public sanitary sewer system. The project is anticipated to be complete in early 2012. With the use of the ICOMMM system to manage the CCTV inspection data, a prioritization of preventive maintenance activities will be established.

Given that Emeryville's sanitary sewer system is so small, the system historically used for prioritizing preventative maintenance has been to clean the lines that are known to collect grease and debris. The most frequently cleaned main in Emeryville is the Powell Street main west of I-80. This main is cleaned every three months due to the large grease buildup in the line coupled with the irregular grade of the pipe. This issue is an on-going enforcement issue for the FOG program as the City deals with the various restaurants contributing to the grease problem.

There are no mains in Emeryville that have serious root control problems; however recent CCTV inspection has uncovered a limited number of pipes with root intrusion. As the system-wide CCTV inspection is completed, additional pipes with root intrusion may be identified. Odor control has not been an historical issue in the City.

The City's only pump station was reconstructed during fiscal year 2006/2007 and has weekly inspections.

4-4. Scheduled Inspections and Condition Assessment

Beginning in FY 2010/2011, the City began a system-wide smoke testing, CCTV inspection, and structure inspection program. The system used for identifying pipe condition with the CCTV work is the NASSCO PACP version 4.2-4.4 defect codes. The information is stored and accessed on the ICOMMM system.

Smoke testing for inflow sources has been completed in Basin 20, 21E, 22, and 23. The remaining smoke testing is scheduled for completion in FY 2012/2013. City-wide sewer cleaning, CCTV inspection and structure inspection are expected to be completed in FY 2011/2012. Once the entire system is inspected, smoke testing, CCTV inspection, and structure inspections will be conducted every 10 to 15 years. However, certain line segments may require more frequent CCTV inspection to monitor the rate of buildup of sediment and possible deterioration of non-acute defects.

4-5. Rehabilitation and Replacement Plan

The CCTV inspection data capture technology includes an automated rating system to identify condition-based rehabilitation and replacement needs within the sewer system. As a result of the condition inspections, capital, and operation and maintenance projects can be identified and prioritized via the ICOMMM system. Structures with "poor" or "deteriorated" ratings can also be screened via the ICOMMM system. Once the CCTV inspections are completed, a capital improvement plan, including estimated costs, budgets and schedules, will be formulated. This plan will also incorporate capacity deficiency projects identified in the Sewer System Capacity Analysis.

4-6. Training

Emeryville's training program for the public works crew includes annual training by the Public Works Superintendent on the use and operations of sanitary sewer maintenance equipment. The entire crew was recently trained through a special class on SSO response by an outside consultant and also participated in a seminar by the Alameda County Clean Water Program for hazardous waste spills, including SSOs.

As new crew members are hired, each member is required to complete the SSO response training.

4-7. Outreach to Plumbers and Building Contractors

The City's municipal code is posted in its entirety on the City's website (www.emeryville.org). The Municipal Code includes information on installation, repair and maintenance of privately-owned sewers within the city limits. Information on the PSL Program is also available on the City's website. http://www.ebmud.com/psl

4-8. Contingency Equipment and Replacement Inventories

The City maintains the following contingency equipment and replacement parts for its sanitary sewer system.

- Vactor cleaning truck
- Bypass pump with suction and discharge hose
- Trash pump with suction and discharge hose
- Water trailer
- Portable hydrant meter

- Fire hose and nozzle
- Sand bags and rope
- Plastic sheeting
- Wattles
- Hand tools (shovels, rakes, brooms)
- Plastic bags
- Cones/Barricades/Caution Tape/Signage
- Digital camera

In addition to in-house staff, the City contracts with private sewer service contractors to clean and inspect the collection system and to assist in emergency response to system blockages and SSOs.

SECTION 5. DESIGN AND PERFORMANCE STANDARDS

5-1. Standards for Installation, Rehabilitation, and Repair

The City of Emeryville uses the latest edition of the APWA Green Book for the design and construction standards for sanitary sewers.

5-2. Standards for Inspection and Testing of New and Rehabilitated Facilities

Emeryville Public Works uses the APWA Green Book standards for inspection and testing of new and rehabilitated facilities. The testing is performed by the contractors and the City Public Works Inspector ensures that the proper testing procedure is followed and that the results are adequate prior to approval. Testing methods generally include air testing, video inspection, smoke testing, and dye testing.

In addition to the City's requirements for testing new and rehabilitated sewer facilities, the EBMUD Regional PSL ordinance requires that an EBMUD inspector witness a verification test (air or water pressure test) on all rehabilitated or repaired PSLs that are subject to the Regional PSL program requirements. Upon passing a verification test, EBMUD issues the property owner a certificate of compliance that is effective for 20 years if the entire lateral has been rehabilitated and seven years if the existing lateral has been repaired.

SECTION 6. OVERFLOW EMERGENCY RESPONSE PLAN

6-1. Procedures

The City's overflow emergency response plan is a stand-alone document that was approved by the USEPA on July 15, 2010 as part of the requirements of the Administrative Order. A revised and updated plan dated October 1, 2011, is now in use by the City. This document, entitled "Overflow Response and Reporting Procedure",
http://emeryville.org/DocumentView.aspx?DID=1694
contains instructions for:

- Incident Notification
- Incident Operations
- Incident Reporting
- Staffing Resources
- Equipment List

6-2. Description of Procedure Elements

The following elements are incorporated in the City's "Overflow Response and Reporting Procedure:"

- Notification - This document outlines the procedures for internal notification of a spill including to the Public Works Superintendent and the Fire Department as well as external notification to the Regulatory Agencies.

- Response - This document outlines how the City staff and contracted support staff are to follow the "Overflow Response and Reporting Procedure" when mitigating an overflow, correcting a sewer deficiency, warning the public, and cleaning up during the spill and after it has been stopped.

- Emergency Operations - This document includes instructions on isolating the spill site with barricades and caution tape, and posting warning signs as appropriate. Traffic control may be as required depending on the size and location of the spill.

- Reporting - This document outlines the timeline and responsibility for incident reporting to local, regional, and state agencies.

- Mitigation - This document outlines the procedures for identifying the cause of the spill, the actions necessary to stop and contain the spill, the follow-up activities to prevent similar spills in the future, and necessary clean-up activities.

SECTION 7. FATS, OILS, AND GREASE (FOG) CONTROL PROGRAM

7-1. Purpose

The purpose of having a FOG control program is to eliminate or minimize the discharge of fats, oils, and grease into the sanitary sewer system, thereby reducing the formation of blockages that could result in SSOs. The City's legal authority and requirements for FOG control are included in Article 4 of Chapter 8 of Title 7 of the Municipal Code. In addition, the City participates in the EBMUD Regional FOG Control Program.

7-2. EBMUD Regional FOG Control Program

The EBMUD Regional FOG Control Program consists of permitting, inspections, and multiple-language outreach to food service establishments (FSEs) in the service area. http://emeryville.org/DocumentView.aspx?DID=1695
The program requires the installation of a grease interceptor under defined circumstances, maintenance of all grease removal devices at a facility, and maintenance record keeping. This program includes the following elements http://www.ebmud.com/fog

- Source identification
- Legal authority
- Program structure/requirements
- Grease removal device technology for FSEs
- Inspections and monitoring for FSEs
- Enforcement for FSEs
- FOG disposal
- Public Education and Outreach

SECTION 8. CAPACITY MANAGEMENT

8-1. Capacity Assessment

In June 2010, the City completed its "Sewer System Capacity Analysis and Master Plan." This plan includes a hydraulic capacity model of the City's sanitary sewer system and identifies line segments with existing and projected future capacity deficiencies under design wet weather flow conditions (5-year storm). Since the City has fixed boundaries, additional future flows in the system will stem from land use changes in Emeryville and upstream in Oakland, rather than expansion of the service area.

8-2. System Evaluation and Capacity Assurance Plan

The Sewer System Capacity Analysis and Master Plan identified 18 reaches of pipe within the City of Emeryville that have deficient capacity. Of these, fourteen were replaced by the City in 2011. The remaining deficient pipe segments within the City are four reaches of pipe at the east end of Powell Street near the Oakland City limits. These pipes carry flow primarily from the City of Oakland. The upsizing of these pipes will be addressed in the near future when the Capital Improvement Program is developed.

8-3. Capacity Improvement Projects

The City has addressed its sewer capacity deficiencies along with its sewer rehabilitation projects. At this time there are only four reaches of pipe on Powell Street with modeled deficiencies under design storm conditions. The need for a capacity improvement project for these pipes will be addressed after the condition assessment has been completed.

SECTION 9. MONITORING, MEASUREMENT, AND PROGRAM MODIFICATIONS

In general, Emeryville's sanitary sewer system performs very well since it is mostly new. The City is small geographically and communication is good between departments so various staff can work together to report overflows quickly for rapid response times. During the 2010 and 2011 calendar years there were no overflows in the City. The City reports to the State CIWQS website on a monthly basis to report SSOs should they occur.

The ICOMMM system is being used to track maintenance activities on the collection system and can also be used to measure the level of effort placed on the program. This tool can be used to determine if SSMP program modifications are necessary.

SECTION 10. SSMP AUDITS

Beginning in 2012, the City will conduct an annual audit of its SSMP and report the findings of the audit to the Regional Water Quality Control Board and the State Water Resources Control Board as part of its annual Sanitary Sewer Overflow report, which is due by March 15 each year.

The audit report will identify the results of implementing the SSMP elements, necessary improvements to the SSMP, sewer system improvements undertaken during the reporting year, and planned improvements for the coming year.

Approximately every five years or if significant system changes warrant it, the SSMP will undergo a formal review and revision, which will be taken to the City Council for approval.

SECTION 11. COMMUNICATIONS

The City maintains a website (www.emeryville.org) to inform the public about all aspects of city government. As a member of the East Bay Technical Advisory Board (TAB) and the East Bay Collections Systems Advisory Committee (EBCSAC), the City communicates and works with other East Bay collection agencies on a regular basis.

DESIRABLE



Housing should meet the needs of various ages and groups. The Bayside Park development in Emeryville offers independent and assisted living for seniors, in an attractive design and transit accessible location.

DESIRABLE



High-rises are fronted by townhomes with entrances at the street level in this San Diego development, providing more access points and increasing safety and security, since residents can look directly onto the street.

DESIRABLE



Landscaped walkways add charm to residential projects.

DESIRABLE



Balconies created through building stepbacks, and windows create textured buildings for both the residents and passersby in this Emeryville example.

RESIDENTIAL

SITE & BUILDING DESIGN

J-21 Design housing to support a range of household types, incomes, and sizes.

J-22 Landscape pedestrian walkways to provide attractive spaces, as well as privacy.

J-23 Provide visual privacy between units. Where units face each other across a narrow distance, windows should be offset.

J-24 Place the mailboxes on the path to units from the main pedestrian entrance.

J-25 Arrange parking, pedestrian circulation, and building entrances so that residents and visitors are encouraged to access residential units from a street or greenway.

J-26 Consider additional lighting, changes in plane, and other security measures to ensure safety and security. Avoid using bars or security grills on windows and doors.

J-27 For all multifamily residential development, promote identity and street safety.

- Design a portion of the ground level frontage of all multifamily residential developments (including high-rises) to be residential units or other active uses, with individual or paired entrances from the street edged with landscaping. Alternatively, articulate ground-floor residential building façades to differentiate individual residential units

Exhibit A

from each other and from the overall massing of the building, in order to express a rhythm of individual units along the street.

- Design ground floor units to include windows that face onto the street. At the same time, ensure the privacy of residents by considering the interior floor height, window height and other design factors. Maximize views of the street from the interiors of units while minimizing views into units from the street.

J-28 In projects with 30 or more units, provide a community multipurpose room with at least 500 square feet of space, internet access, kitchen facilities and a rest room, for parties, meetings, homework clubs, computer access, art, or other resident activities.

DESIRABLE



This Emeryville affordable housing project at 3706 San Pablo features an interior courtyard with designated circulation paths and play areas for different age groups.

J-29 In corridors serving six units or more, define entries and break up walls by using lighting and articulation of walls and ceiling.

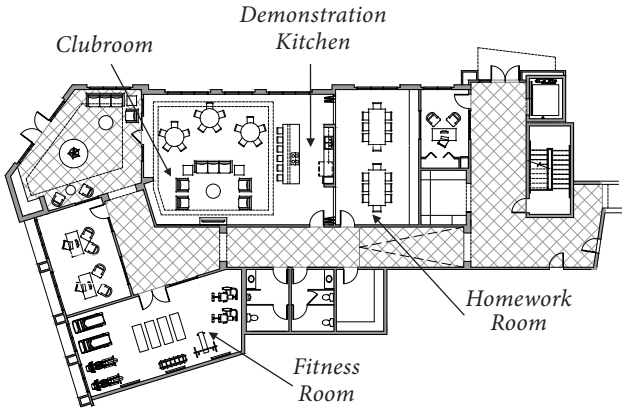
J-30 Provide efficient access from units to exterior common open space, and visual connections from interior hallways and stairs to exterior space.

UNIT DESIGN

J-31 Maximize ventilation and sunlight by providing multiple exposures and shallow unit depths as much as possible. Place living areas along exterior walls and place bath and storage areas along interior walls.

J-32 Take advantage of views and natural light, particularly for living areas, by providing large areas of glazing looking onto streets, yards, or other exterior spaces. Provide shading on south and west exposures.

DESIRABLE



The 3706 San Pablo project offers a variety of amenities to the residents, including a clubroom, a homework room, a demonstration kitchen and a fitness room.

J-33 Maintain a sense of privacy from within housing units, while allowing views onto streets and interior courtyards.

J-34 Provide visual interest and improve quality of life for inhabitants through the use of stoops, porches, recessed windows, bay windows, and balconies.

J-35 Incorporate architectural features and materials that assure high-quality, human-scale, distinctive design that is comfortable and attractive to residents. Consider vaulted ceilings; arches; corner treatments; window, ceiling, and roof proportions; and the proportional relationship between the façade and the roof, where roof height is less than or equal to floor height, above the first floor.

J-36 For units that are adjacent to common open space, provide access through transition spaces between the units and the common space.

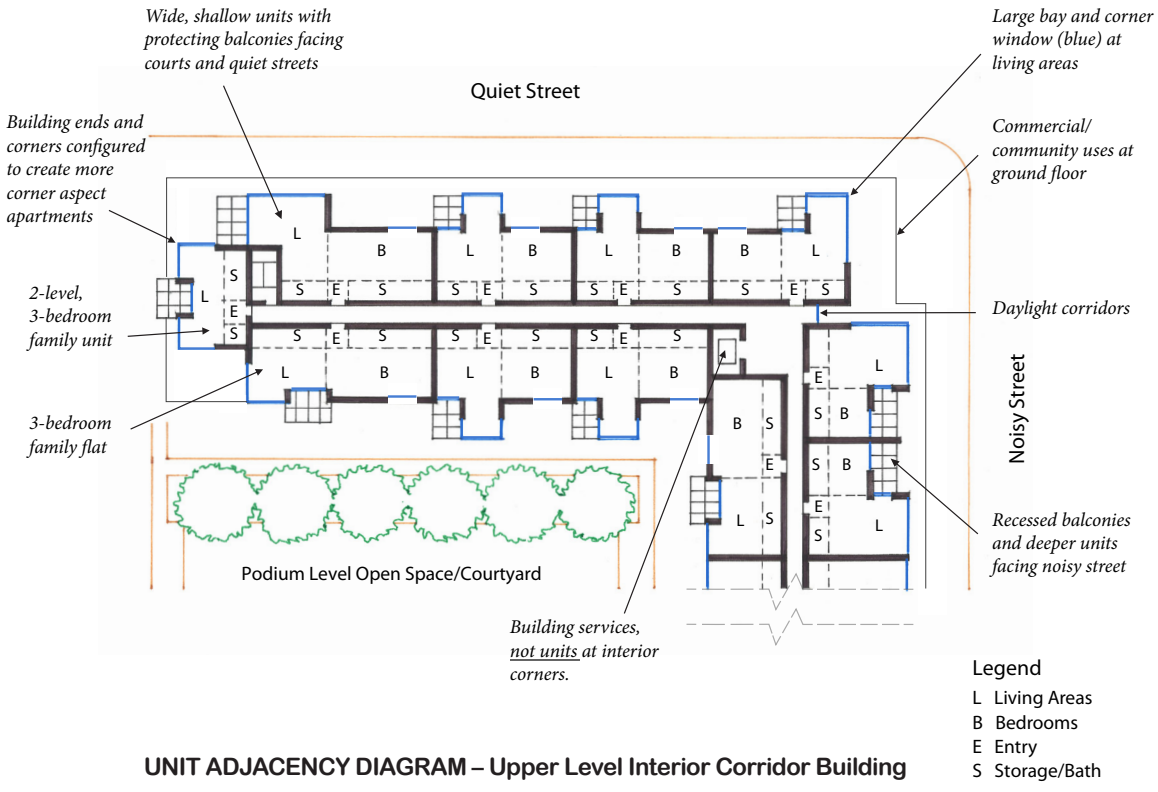
J-37 Kitchens should be well ventilated with windows providing cross ventilation or a quiet, powerful fan venting to the outside.

J-38 In units with two or more bedrooms, include an entry coat closet, a pantry, and a linen closet or cabinet.

J-39 In multi-level units, provide closed stair risers.

J-40 Show furniture in unit plans submitted for planning approvals.

DESIRABLE



UNIT ADJACENCY DIAGRAM – Upper Level Interior Corridor Building

The relation of units to each other, the type of streets and open space is important for successful family-friendly design.

FAMILY-FRIENDLY RESIDENTIAL

SITE & BUILDING DESIGN

J-41 Provide units with two, three or more bedrooms.

J-42 In high density housing, include a variety of unit types. Multi-story units can be included in a larger building with single-story units for greater diversity.

J-43 Place and configure units to relate well to quiet and noisy streets, on-site open space and each other, as shown in the Unit Adjacency Diagram.

J-44 Situate as many family-oriented units as possible adjacent to open spaces designed and landscaped to create active play areas and opportunities for gathering and quiet respite.

J-45 Provide ample exterior play areas that are safe and visible from major spaces in homes, with a variety of age-appropriate equipment.

J-46 Design visible places where pre-teens and teens will want to gather.

J-47 In larger projects (e.g. over a hundred units), consider dividing the project into sections where residents have exclusive access to their common and circulation areas.

J-48 Designate parking for family-friendly units near hallways and elevators. If parking lifts are used for family units, they should not require backing one car out to get to another car.

J-49 Provide more bicycle parking than the code requires, with space for longer family bicycles and trailers.

J-50 Provide ample in-unit or common laundry areas. Common laundry areas should have convenient access, and be located on each floor, or near common gathering space. In-unit laundry facilities are preferred in units with three or more bedrooms.

UNIT DESIGN

J-51 Front doors should not enter directly into a room, but rather should enter into a transitional space, which could be an enclosed foyer.

J-52 Provide indoor space near the entry for tricycles, strollers, outdoor toys, etc., where parked items will not obstruct circulation.

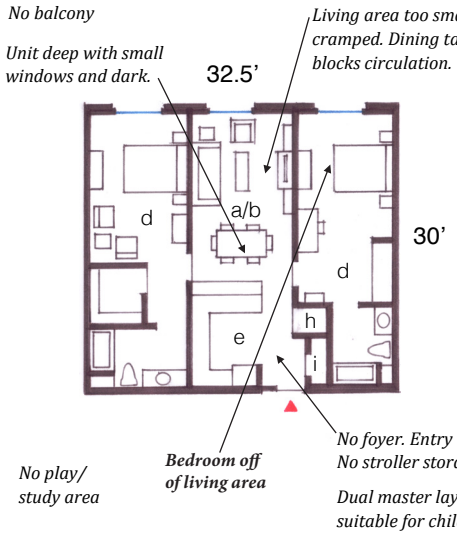
J-53 Provide only one master suite. Other bedrooms should have access to a common bathroom. In three-bedroom units provide at least two full bathrooms.

J-54 Separate sleeping areas from living areas. In two-level units, place bedrooms on a separate floor from living areas.

J-55 Provide each bedroom with access to a full bathroom without going through the living room, dining room or kitchen. Provide a bathtub in the unit. In multi-level units, provide at least a half bath on the floor with the living room, dining room and kitchen.

UNDESIRABLE

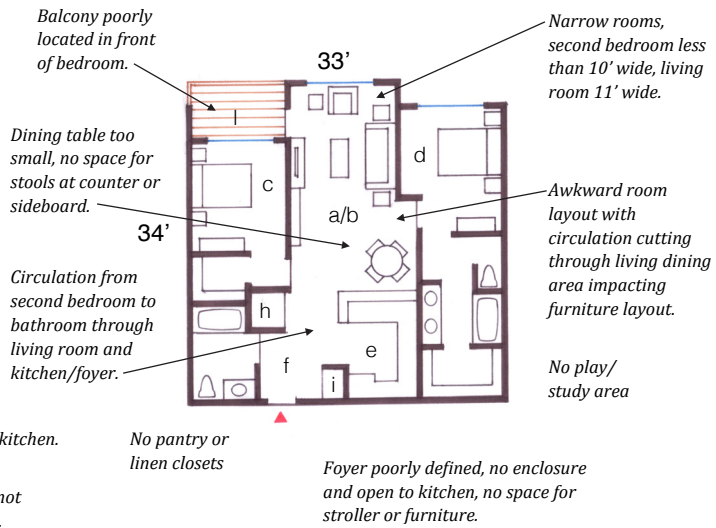
All rooms narrow, minimal space for circulation around furniture.



2 Bedroom/2 Bath Dual Master FLAT – 975 SF
(Interior access from corridor; single aspect)

UNDESIRABLE

Deep unit requires more floor area than shallow unit to fit rooms, but is cramped and has poor daylight potential.

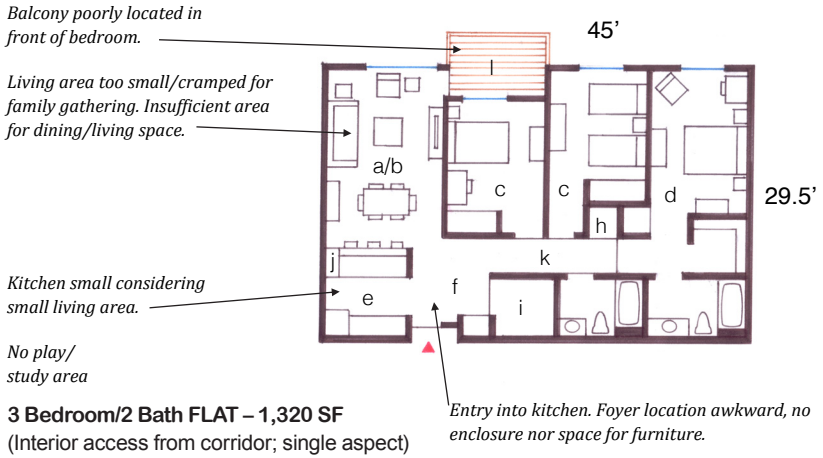


2 Bedroom/2 Bath FLAT – 1,035 SF
(Interior access from corridor; single aspect)

Room Legend

a. Living
b. Dining
c. Bedroom
d. Master Suite
e. Kitchen
f. Foyer
g. Study
h. Laundry
i. Closet/Stroller
j. Pantry/Storage
k. Wide Hallway
l. Patio/Balcony
◀ Entrance

UNDESIRABLE

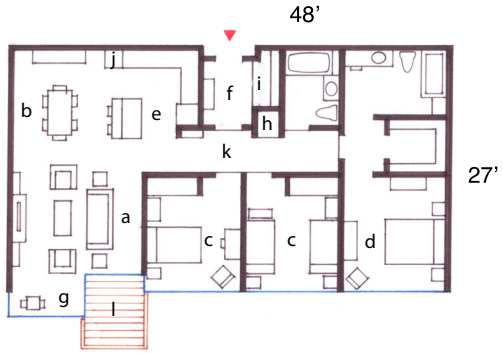


3 Bedroom/2 Bath FLAT – 1,320 SF
(Interior access from corridor; single aspect)

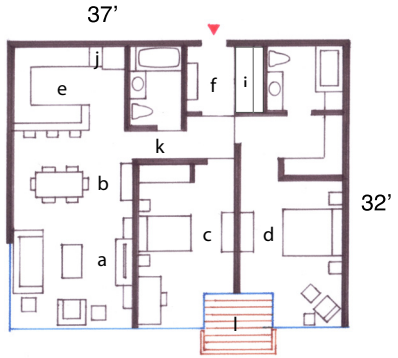
DESIRABLE



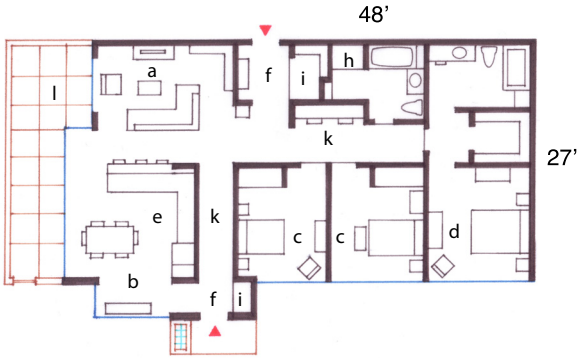
EXAMPLE A
2 Bedroom/2 Bath FLAT – 1,100 SF
(Interior access from corridor; large bay form)



EXAMPLE C
3 Bedroom/2 Bath FLAT – 1,300 SF
(Interior access from corridor; single aspect)



EXAMPLE B
2 Bedroom/2 Bath FLAT – 1,152 SF
(Interior access from corridor; deep unit; adjacent unit set back or shallow to improve daylight)



EXAMPLE D
3 Bedroom/2 Bath FLAT – 1,419 SF
(Exterior access from courtyard/mew; private patio; building corner/end location)

The examples above illustrate ways to arrange one-story family friendly two- and three-bedroom units.

J-56 The dining area should have enough room for a family-sized dining table with all household members seated around it, plus circulation. The living area should also have enough room for seating for all household members plus other furniture and circulation.

J-57 In units near play areas, provide windows that allow for supervision of children outdoors.

J-58 Hallways in units should be well lighted and wide enough for children to play in.

J-59 Provide space that can change use as children grow, such as from toddler play to homework to music making to gathering.

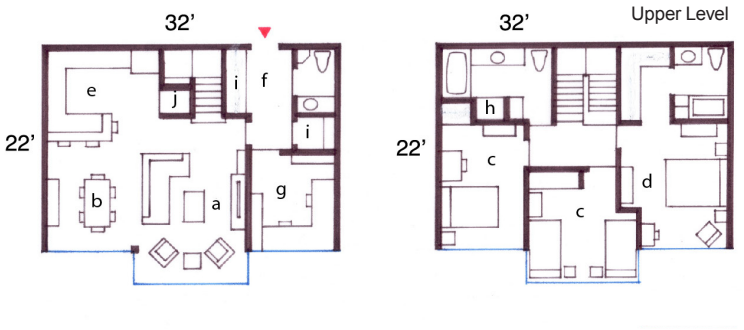
Room Legend
a. Living
b. Dining
c. Bedroom
d. Master Suite
e. Kitchen
f. Foyer
g. Study
h. Laundry
i. Closet/Stroller
j. Pantry/Storage
k. Wide Hallway
l. Patio/Balcony
◀ Entrance

J-60 For units with other units below, provide soundproofing between ceilings and floors with an Impact Insulation Classification that is above the Building Code requirement, except under kitchens and bathrooms.

J-61 Design units with infant and toddler safety in mind (e.g. stairs that easily accept toddler gates, no glass room dividers, and ability to add child safety devices or window locks to prevent toddlers from climbing out of windows).

DESIRABLE





EXAMPLE F
3 Bedroom/2.5 Bath with Study/Play Room 2-LEVEL – 1,437 SF
(Interior access from corridor; single aspect)



EXAMPLE E
2 Bedroom/2.5 Bath 2-LEVEL – 1,263 SF
(Exterior access from courtyard/mew/street)



Note: Ten percent of two-story units must meet accessibility standards at entry level.

EXAMPLE G
4 Bedroom/2.5 Bath 2-LEVEL – 1,548 SF
(Exterior access from courtyard/mew/street;
note: stacked unit above with gallery access possible)

Room Legend
- a. Living
- b. Dining
- c. Bedroom
- d. Master Suite
- e. Kitchen
- f. Foyer
- g. Study
- h. Laundry
- i. Closet/Stroller
- j. Pantry/Storage
- k. Wide Hallway
- l. Patio/Balcony
- ◀ Entrance

The examples above illustrate ways to layout two-story family friendly two-, three-, and four-bedroom units.

6701 SHELLMOUND STREET MIXED-USE ENVIRONMENTAL NOISE AND VIBRATION STUDY



Draft

Urban Planning Partners

May 13, 2014

CSDA | DESIGN GROUP

6701 Shellmound Street Mixed-Use Environmental Noise and Vibration Study

May 13, 2014

Draft

Prepared for:
Jean Eisberg, AICP
Urban Planning Partners

Prepared by:
Randy Waldeck, PE
Greg Baker
CSDA Design Group
475 Sansome Street, Suite 800
San Francisco, CA 94111

CSDA Project No. 1415.01

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Draft

1.0 Executive Summary

- Environmental noise measurements were conducted at the project site. The noise environment is dominated by trains on the Union Pacific Railroad (UPRR) line and traffic on Shellmound Street, the I-80 offramps, and I-80. Measured noise levels range from DNL[1] 68 to 86 dB which is considered "Conditionally Acceptable" to "Clearly Unacceptable" per the City's noise and land-use compatibility guidelines.

- Measurements of ground-borne vibration were conducted at the closest project setbacks to the UPRR rail line. Vibration levels were within the Federal Transit Administration (FTA) guidelines; however, we recommend that a disclosure to future residents be made notifying them of vibration from train passbys.

- In order to meet the interior noise criterion of DNL 45 dB in the residences, sound-rated windows, exterior (patio) doors, and upgraded exterior walls are necessary. The following summarizes the required STC[2] ratings:
  - Windows: STC 35 to 50
  - Exterior Doors: STC 32 to 42
  - Exterior Walls: STC 40 to 60

2.0 Project Description

The project consists of a mixed-use, seven-story building with residences, retail, and amenity spaces. A total of 211 residential units are planned. The project site is located in Emeryville, east of Interstate 80, south of the Ashby/Shellmound offramps, and west of Shellmound Street. There is an active rail line east of the site, just past Shellmound Street; the rail line consists of three active tracks and one siding and is used by both freight and passenger trains.

CSDA conducted an environmental noise and vibration study to quantify the existing environmental noise and vibration levels at the site and provide mitigation recommendations to meet the applicable project criteria. This report summarizes our findings and recommendations.

Draft

[1] Day/Night Average Sound Level (L_{dn} or DNL): A descriptor established by the U.S. Environmental Protection Agency to describe the average day-night level with a 10 dB penalty applied to noise occurring during the nighttime hours (10 pm to 7 am) to account for the increased sensitivity of people during sleeping hours. A 10 dB increase in sound level is perceived by people to be twice as loud.

[2] Sound Transmission Class (STC): A single number used to rate how well a building partition (wall, floor/ceiling assembly, door) attenuates airborne sound.

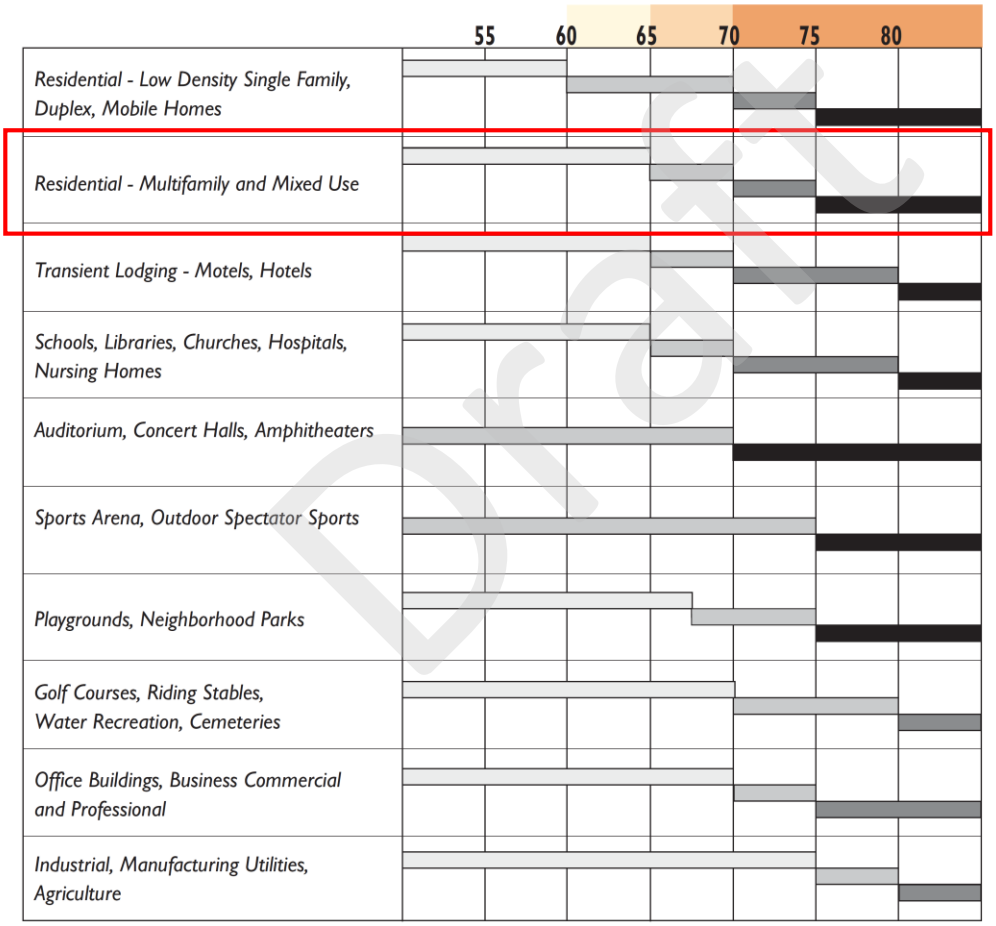
3.0 Acoustical Criteria

The project is located in Emeryville and is subject to the City's General Plan Noise Element acoustical criteria and the acoustical criteria contained in the State Building Code. In addition, the Federal Transit Administration stipulates rail vibration criteria. The following summarizes the relevant project criteria:

3.1 Emeryville General Plan

The Land Use and Conservation, Safety, and Noise Elements from the City's 2009 General Plan stipulates the following:

- Policy CSN-P-50: The community noise compatibility standards (reproduced below) shall be used as review criteria for new land uses.



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- Policy LU-P-25: If new residential buildings are proposed adjacent to freeways and railroad tracks impacts of these corridors, including noise, vibration, and air pollution, should be considered during site planning. Noise, vibration, and air pollution shall be mitigated to the extent possible.

- Policy CSN-P-52: Occupants of existing and new buildings should be protected from exposure to excessive noise, particularly adjacent to Interstate-80 and the railroad.

- Policy CSN-P-53: A noise study and mitigation measures shall be required for all projects that have noise exposure levels greater than "normally acceptable" levels.

- Policy CSN-P-54: Developers shall reduce the noise impacts of new development through appropriate means (e.g., double-paned or soundproof windows, setbacks, berming, and screening). This noise attenuation method should avoid the use of visible sound walls.

3.2 California Building Code

The 2010 California Building Code (CBC), Section 1207, stipulated an interior noise level requirement of DNL 45 dB for multi-family residences; however, the new 2013 California Building Code no longer stipulates this criterion. However, we understand Emeryville's General Plan EIR stipulates the DNL 45 dB criterion, and, regardless, we recommend that noise levels in the multi-family residences be DNL 45 dB or less.

The 2013 California Green Building Code, Section 5.507, stipulates an hourly L_{eq} limit of 50 dB in occupied, non-residential spaces (e.g., the retail spaces, leasing office) for projects with noise exposure above DNL 65 dB.

3.3 Federal Transit Administration

The Federal Transit Administration stipulates vibration criteria for rail activity.[3] Table 1 summarizes the criteria:

Table 1 – FTA Rail Vibration Criteria, RMS (VdB re 1 micro-inch/sec)

Land Use Category	Frequent Events [1]	Occasional Events [2]	Infrequent Events [3]
Residences and buildings where people normally sleep	72	75	80
Institutional Land uses with primarily daytime use	75	78	83

[1] "Frequent Events" is defined as more than 70 vibration events of the same source per day.
[2] "Occasional Events" is defined as between 30 and 70 vibration events of the same source per day.
[3] "Infrequent Events" is defined as fewer than 30 vibration events of the same kind per day.

Per the Fehr and Peers Transportation Assessment dated March 28, 2014, there are up to 63 train passbys per day. Since the guidelines above were designed for light rail rather than freight, we are applying the "Frequent Events" criteria to all train passbys since there is a mixture of freight and passenger trains. However, per the FTA, we are applying the criteria for "infrequent events" to freight locomotive vibration levels since the duration of the actual locomotive passby is short.[4]

[3] Federal Transit Administration, 2006. Transit Noise and Vibration Impact Assessment (DTA-VA-90-1003-06).
[4] Ibid. Section 8.1.3, Page 8-5.

4.0 Noise Measurement Results

In order to quantify the noise environment at the site, long-term (i.e., 48 hour) noise measurements were conducted at three locations from April 29 to May 2, 2014. Short-term (i.e., 10 to 60 minute) measurements were conducted at four locations to supplement the long-term measurements and quantify noise levels at the upper floors of the project.

The noise environment at the project site is dominated by noise from the UPRR line, especially train horns as they approach the grade crossings from the south. We measured train horn noise levels between 100 and 110 dB. Noise from traffic on Shellmound Street, the I-80 off ramps, and I-80 also contribute to the noise environment.

Figure 1 shows the noise measurement locations; Table 2 summarizes the noise measurement results.

Table 2 – Noise Measurement Results

Location	Description	Height (feet)	Measured DNL (dB)
LT-1	Shellmound Street, dominated by UPRR noise	12	86
ST-1	Shellmound Street, at project setback	25	85
ST-2	Shellmound Street, at project setback	6	82
LT-2	I-80 off ramps, north portion of site	12	71
ST-3	I-80 off ramps, north portion of site	25	68
LT-3	West end of site facing I-80	6	69
ST-4	West end of site facing I-80	25	70

In order to calculate the noise level at the outdoor-use areas and interior (courtyard) facades, we created a three-dimensional computer model. The results of our noise modeling are shown in Figures 2 through 5.

Noise levels at the facade facing Shellmound Street and the UPRR lines are considered "Clearly Unacceptable" for residential uses per the City's noise and land-use compatibility standards. However, we understand this incompatibility was addressed in the General Plan EIR. The noise level at the other building facades is considered "Conditionally Acceptable" to "Normally Unacceptable." Noise levels at the courtyards and roof deck (DNL 67 to 70 dB) are considered "Conditionally Acceptable."

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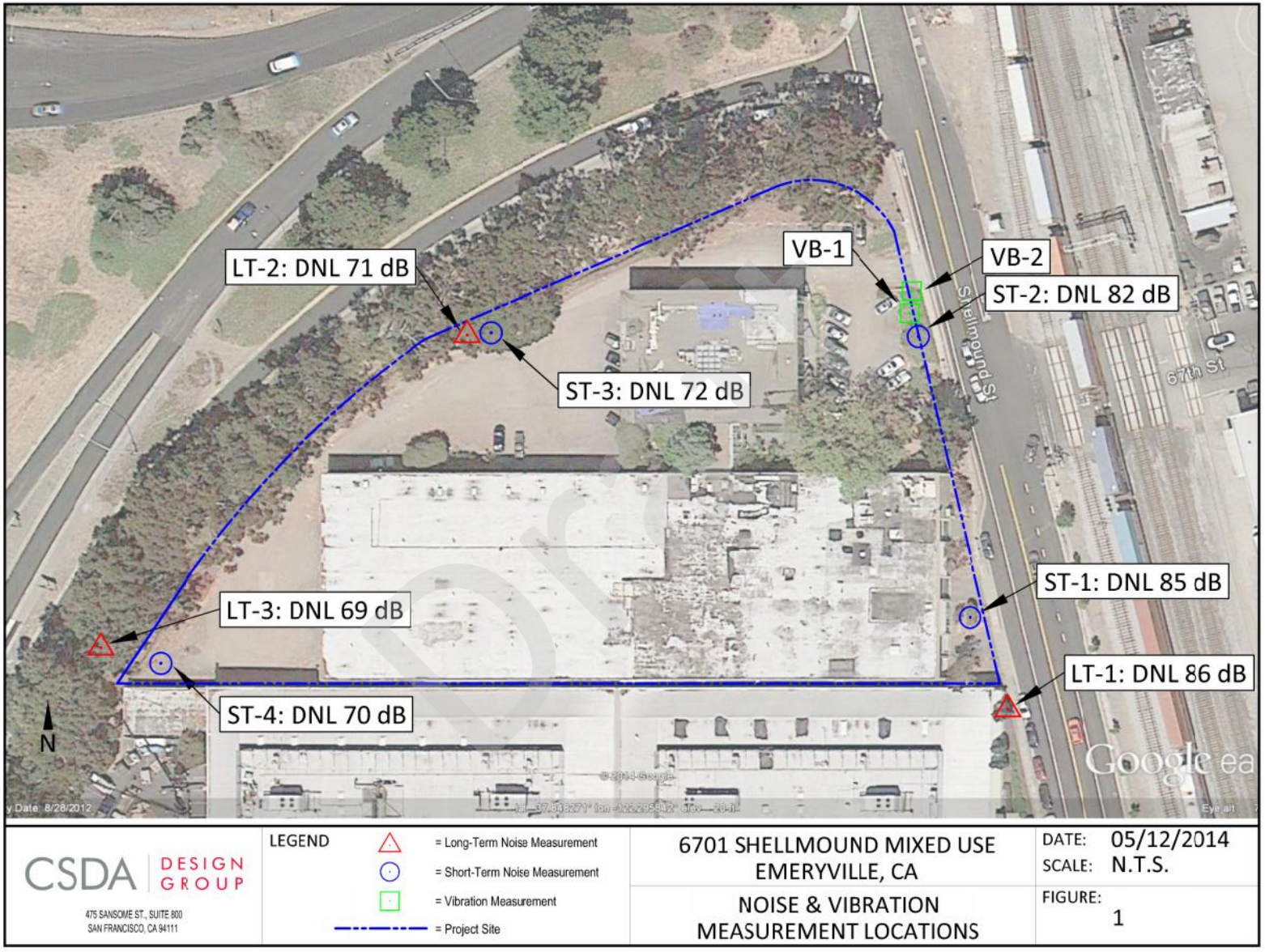

Figure 1 – Measurement Locations and Measured DNL



Figure 2 – DNL Noise Levels, Plan View



Figure 3 – DNL Noise Levels, View from Northeast

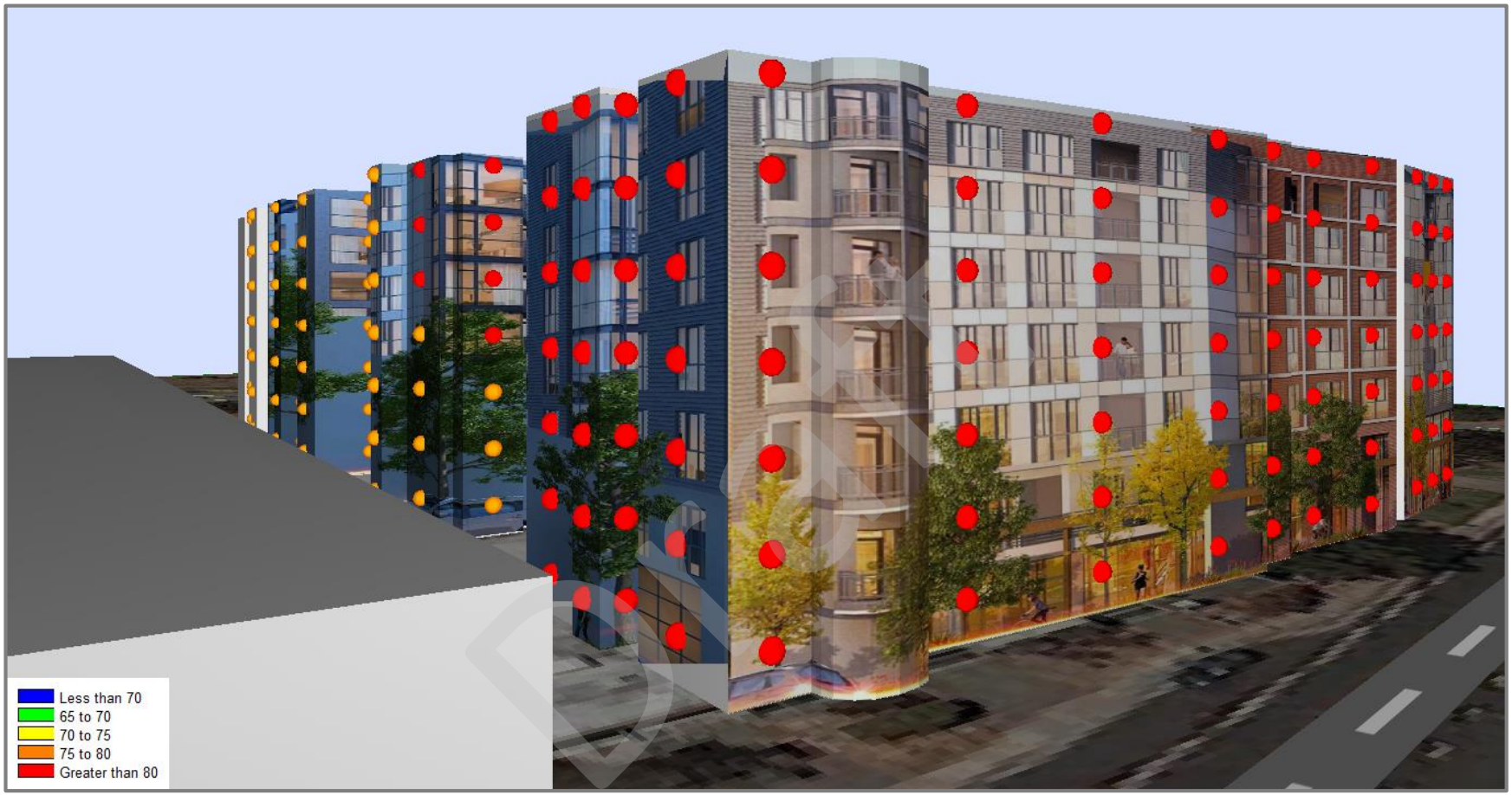

Figure 4 – DNL Noise Levels, View from Southeast

5.0 Rail Vibration

We measured ground-borne train vibration levels at two locations along the future west facade of the project building; see Figure 1 for the measurement locations. Both measurement locations were approximately 90 feet from the closest active rail line. We measured multiple freight and passenger train passbys at varying speeds on all three active tracks. Table 4 presents the results of our train vibration measurements.

Table 3 – Measured Train Vibration Levels, (VdB re 1 micro-inch/sec)

Event	Measurement Location	Measured Vibration Level	FTA Criteria
Freight Train Locomotive	VB-1	76	80 (Infrequent)
Freight Train Locomotive	VB-2	75	80 (Infrequent)
Freight Train Cars	VB-1	69	72 (Frequent)
Freight Train Cars	VB-2	68	72 (Frequent)
Passenger Trains	VB-1	63	72 (Frequent)
Passenger Trains	VB-2	63	72 (Frequent)

The measured train vibration levels meet the FTA criteria.

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6.0 Recommendations

6.1 Interior Noise Calculation

In order to meet the DNL 45 dB criterion inside of the residences and the L_{eq} 50 dB criterion in the non-residential spaces, sound-rated windows and exterior doors are required. Our calculations are based upon the March 7, 2014 Planning Study Session drawings and, where information was not shown on the drawings, we used typical window sizes. These calculations will need to be refined as the project design progresses. We incorporated future increases in traffic noise levels into our calculations; these were based upon traffic volume increases contained in the Fehr and Peers traffic study and a 2% increase in traffic volume per year on I-80.[5]

Where sound-rated windows are required to meet the interior noise requirement, fresh air ventilation should be provided. The ventilation system should meet applicable Code requirements and should not compromise the noise reduction provided by the exterior facade assembly.

The STC ratings provided are for the entire window assembly, including frame and seals. Table 4 summarizes the required STC ratings; we have organized the ratings by building zone. Figure 5 shows the zones and required ratings on the project plan.

Table 4 – Summary of Exterior Noise Levels and Preliminary Facade STC Ratings

Zone/Facade	Future Exterior Noise Level, DNL (dB)	Windows	Balcony Doors	Exterior Walls*	Interior Noise Level, DNL (dB)	Meets Criteria?
A - East	82-84	STC 50	STC 42	STC 60	45	Yes
B – Southeast/Northeast	82	STC 45	STC 42	STC 55	45	Yes
C – South	80	STC 45	STC 42	STC 50	45	Yes
D – South/North	74-79	STC 40	STC 35	STC 45	45	Yes
E – West/Courtyards	66-73	STC 35	STC 32	STC 40	45	Yes
Non-Residential Spaces	L_{eq} 82	STC 41	NA	NA	L_{eq} 50	Yes

Note: We assumed the standard exterior wall assembly meets STC 40 unless otherwise noted; this will need to be confirmed during detailed design. Exterior wall ratings above STC 40 will require additional layers of gypsum board, resilient channels, and/or double-stud construction.

6.2 Vibration

Although the train vibration levels meet the FTA criteria, we recommend a disclosure be made to residents advising them of vibration from train passbys.

[5] The 2% traffic volume growth is based upon the 2007-2012 average traffic volume growth summarized in the 2012 Traffic Volumes on the California State Highway System book published by Caltrans.

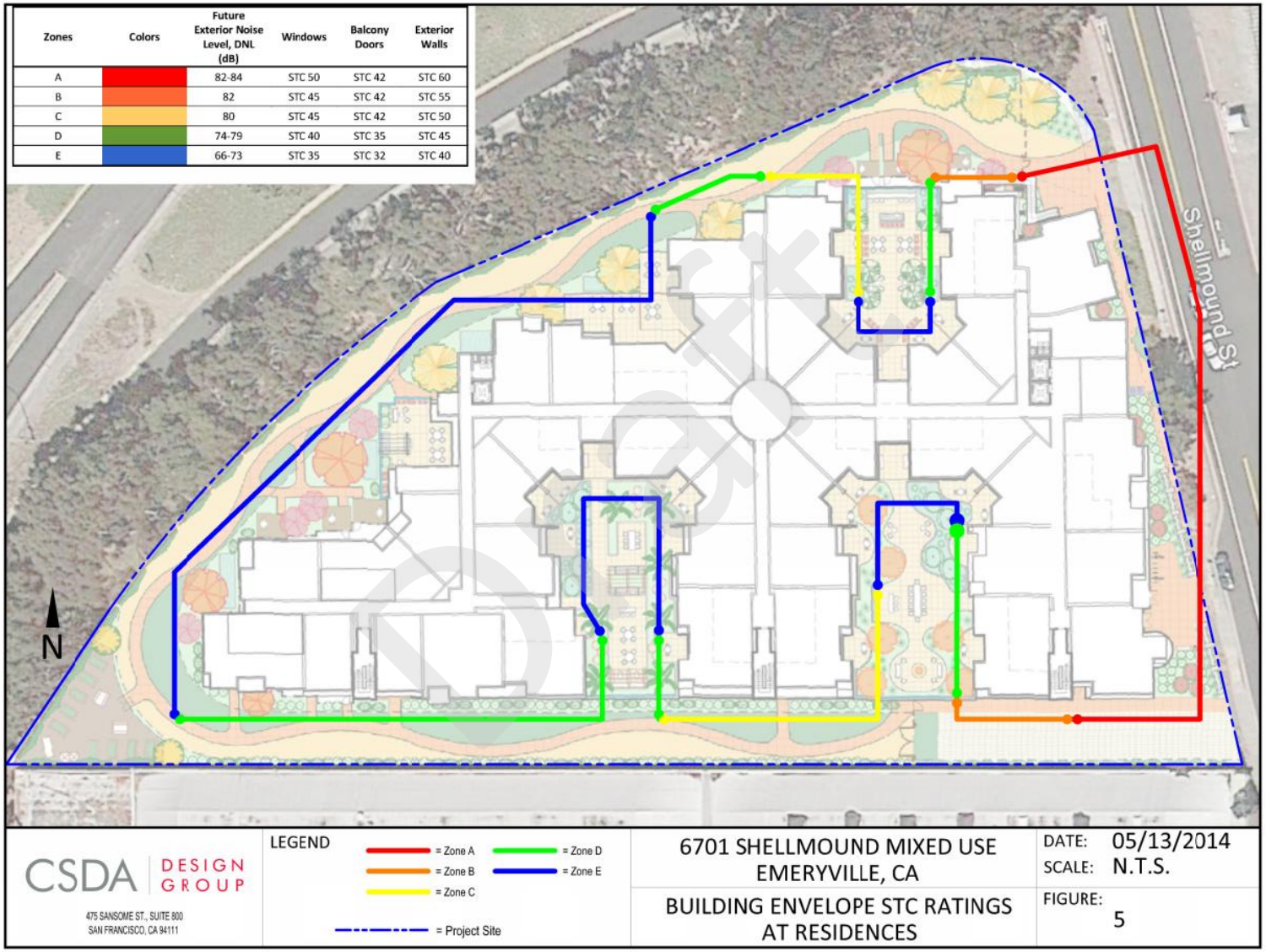


Figure 5 – Building Envelope STC Ratings at Residences



East Bay Water

A Status Report on Local Water Use & Water Supplies

EBMUD

Introduction

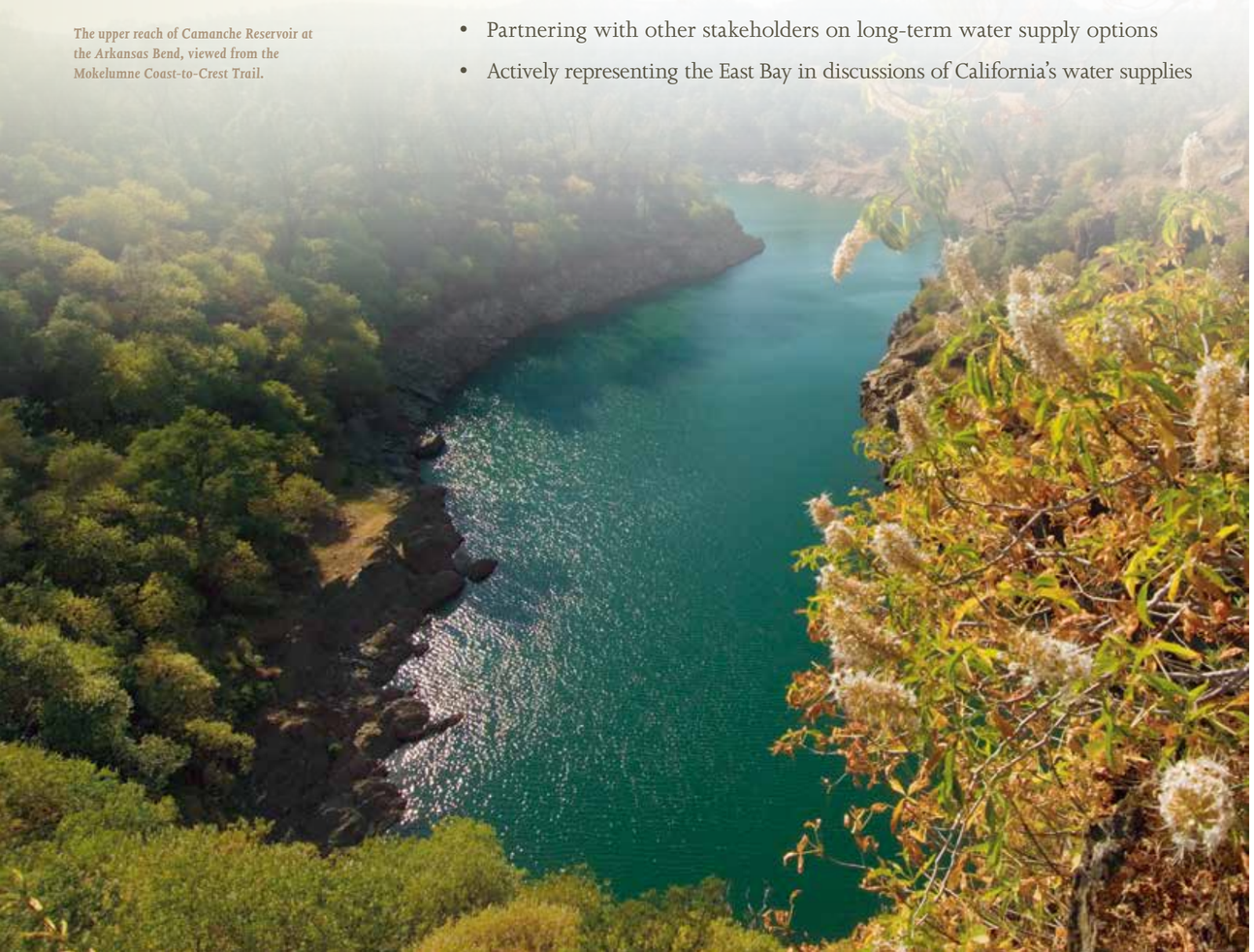
This report describes the water supplies currently used by East Bay communities and plans for ensuring reliable supplies for the future.

The East Bay Municipal Utility District provides drinking water supplies essential to the quality of life we enjoy in the East Bay. Our ability to reliably provide water depends on many partnerships. Local residents and businesses use water efficiently and help us stretch the available supplies. We coordinate infrastructure work with local communities to cost-effectively maintain the water supply and delivery system that stretches across 4,100 miles of pipes. Throughout northern California, a host of agencies work with us to find and store water supplies and protect watersheds for future generations.

As a public agency, EBMUD ensures delivery of supplies to meet today's needs and plans for tomorrow's water needs with guidance from an elected Board of Directors. Adopted Board policies give priority to:

- Improving water efficiency through conservation and recycling
- Promoting environmental sustainability
- Preserving the existing boundaries of the area that receives water service
- Requiring new customers in the service area to be water-efficient from the start
- Partnering with other stakeholders on long-term water supply options
- Actively representing the East Bay in discussions of California's water supplies

The upper reach of Camanche Reservoir at the Arkansas Bend, viewed from the Mokelumne Coast-to-Crest Trail.





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EBMUD and the Delta 16

Pardee Reservoir holds most of EBMUD's water supplies. Its depth enables EBMUD to retain cold water and release it through Pardee Dam to the lower Mokelumne River in the fall, providing cooler water to support a healthy fishery.

Current Water Supply

EBMUD's 1.3 million customers used an average of 161 million gallons per day of water in calendar year 2011 and a similar amount in 2012. To meet the daily water needs of businesses and residents in the East Bay, EBMUD relies on water stored in two large Sierra reservoirs and a network of more than 160 local reservoirs and neighborhood tanks. We reduce water demand by supporting customer efforts to use water efficiently and by providing recycled water for industrial and irrigation uses. In dry years when water supplies are short, EBMUD can activate a contract for additional water supplies from the Sacramento River and can draw some water from underground storage in a local groundwater basin. (The map on pages 14–15 shows available and future water supplies.)

EBMUD evaluates the water supply throughout each rainy season. Each April we forecast one of four scenarios for the following October: normal conditions, moderate shortage, severe shortage or critical shortage. Moderate and severe shortages, respectively, occurred in 2008 and 2009 and customers rationed their water use. In 2010, 2011 and 2012, EBMUD's supply was normal. Under normal water supply conditions, EBMUD asks that customers use water wisely.

Water for Daily Use

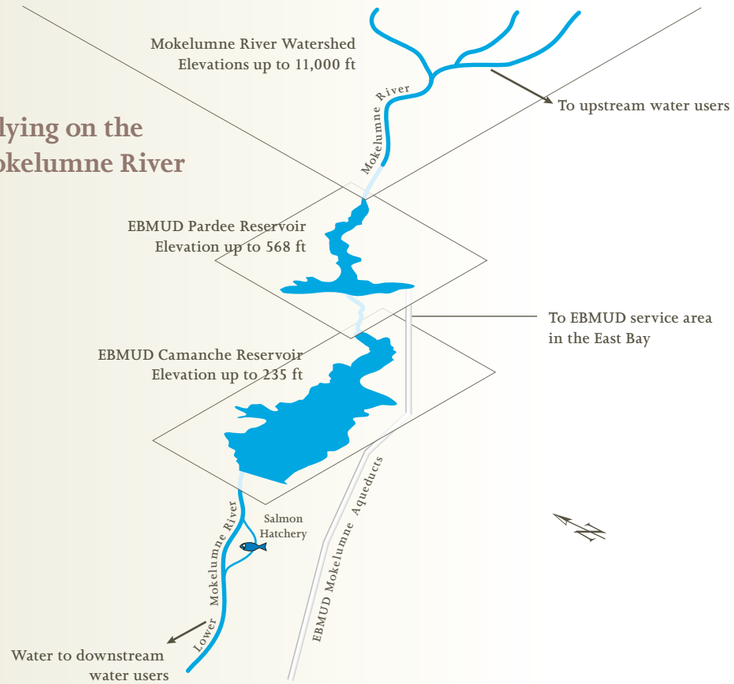
Protecting the East Bay's existing water rights is one of EBMUD's most important responsibilities. Mokelumne River water rights are vital to the East Bay's water supply, since most of our daily water supplies originate from the Sierra-fed Mokelumne. EBMUD is working on updating one of the key water rights permits that secure those supplies.

Like other California rivers, the Mokelumne supports many water supply needs while providing respite and recreation for residents along its course. EBMUD operates its two reservoirs on the river to provide a high-quality water supply for 1.3 million East Bay customers while meeting all regulatory requirements and downstream release obligations.

Yet, the amount of water the East Bay can rely on from that central Sierra source is declining. The central Sierra foothill region has more senior rights to Mokelumne River water, and as that region grows, its residents and businesses are using more water. In addition, EBMUD has a long-standing commitment to protect the river environment and maintain fishery conditions on the lower Mokelumne.

To meet the needs of lower Mokelumne fisheries, EBMUD releases up to 148 million gallons a day on average during normal condition water years. EBMUD also releases water to meet the needs of other Mokelumne water rights holders downstream of EBMUD reservoirs.

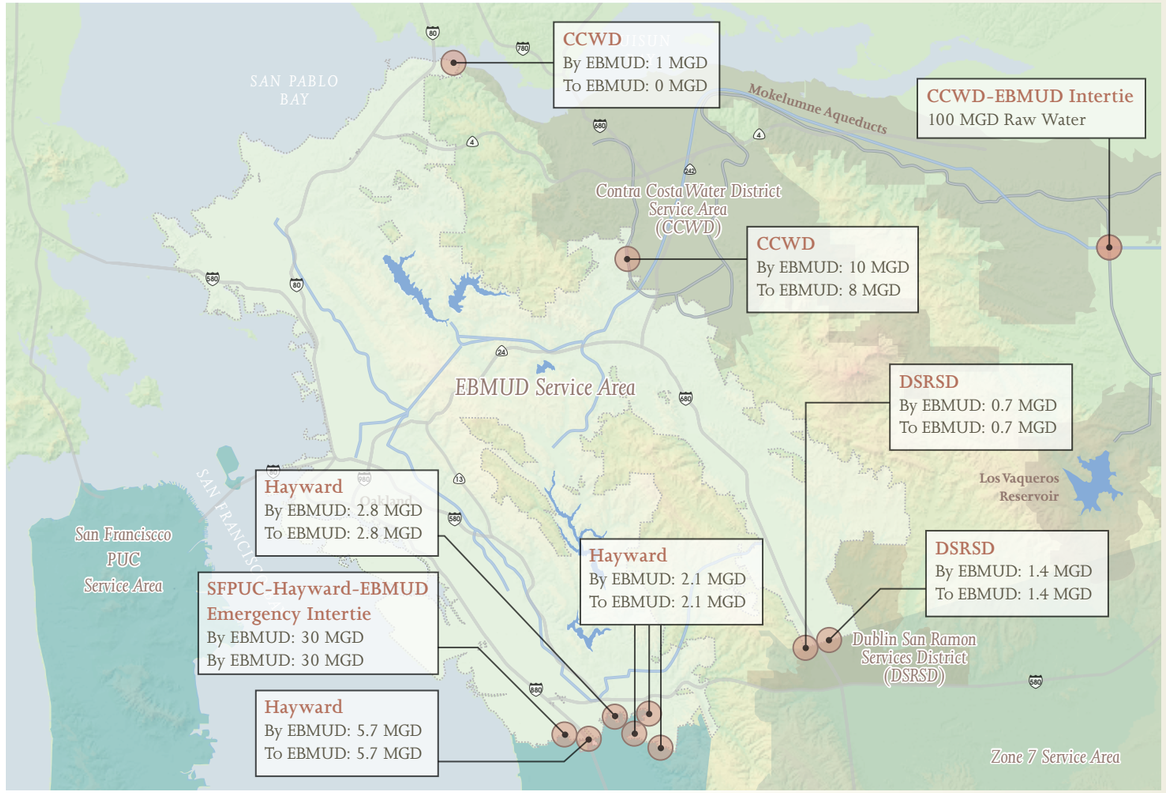
Relying on the Mokelumne River



Water for Emergencies

Emergencies can disrupt the storage and delivery of current water supplies. EBMUD is ready to receive as well as to provide mutual assistance during emergencies to restore water service as quickly as possible. Pipeline connections that intertie EBMUD to other systems in the Bay Area are in place that will allow partner agencies to share water during emergencies, as well as to make repairs on critical facilities.

EBMUD also works with customers to encourage personal preparedness. Customers should store enough tap water or bottled water to last at least three to seven days during an emergency. That is about one to two gallons per person per day.



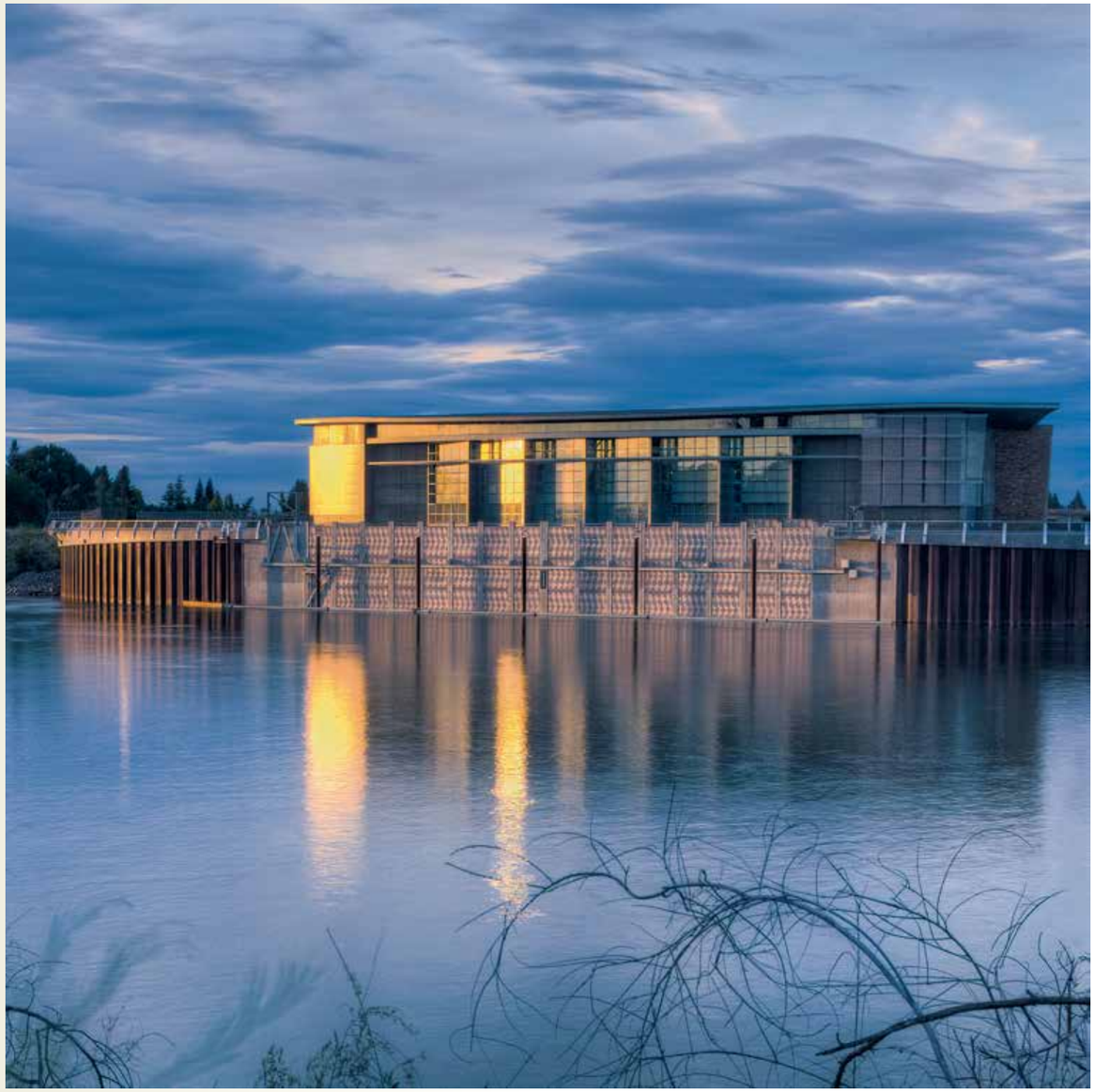
Bay Area agencies have water rights to a range of supply sources that have different short-term and long-term vulnerabilities. Interties make it easier for Bay Area agencies to respond to emergencies and keep vital water supplies flowing.

Water for Dry Years

In years with little Sierra snowfall, the amount of Mokelumne River water held in EBMUD's two Sierra reservoirs can be well below the target levels of storage (the target is set based on the next two years' expected water needs in the East Bay). When the Sierra reservoirs' storage falls below target levels, EBMUD can use a contract for water from the Sacramento River to draw up to 100 million gallons per day of additional water supplies.

EBMUD's strategy for meeting the region's need for water begins with demand management. EBMUD is currently achieving the 2020 goal for reducing water use that the State of California set for each water service provider. East Bay customers conserve supplies year-round through wise water use. During times of severe drought, EBMUD policy calls for customers to save even more—up to 15 percent of overall supplies.

When needed, EBMUD can draw water from the Sacramento River via the Freeport Regional Water Facility, completed in 2011.



Conserving Water

The typical East Bay residence uses approximately one-third less water today than in the 1970s. EBMUD supports efforts to conserve water by advising residential, commercial and industrial customers on water-efficient fixtures, appliances and equipment, and by demonstrating how outdoor landscaping can be both water-efficient and beautiful.

EBMUD's 4,100-mile water distribution system receives constant attention. On average, water pipes in the ground are more than fifty years old. Some are nearly a century old. Hard-wired and hand-held leak detectors, coupled with customer reports of leaks, help EBMUD dispatch crews to investigate potential leaks.

Recent Water Conservation Savings

Since the 2008 drought ended, customers have continued to use water wisely and EBMUD has developed a new water conservation master plan to support continued customer conservation.

WaterSmart Practices at Home Residential water use keeps getting more efficient. Outdoors, more households are controlling water use by using efficient irrigation systems and selecting plants that thrive in our summer-dry climate zone. Inside, a growing percentage of customers use water-efficient practices, appliances and fixtures, and repair leaks.

High-efficiency toilet rebates are popular with customers. Toilets installed with EBMUD rebates in 2011/2012 are saving an estimated 85,460 gallons of water or more every day. Clothes washer rebates also are popular, and in fiscal years 2011 and 2012 18,269 EBMUD residential customers participated in a joint water and energy rebate program implemented by Bay Area water utilities and PG&E. By completing one rebate application, East Bay residents who purchased qualifying clothes washers saved an estimated combined 345,280 gallons of water daily.



Berkeley students participating in California Youth Energy Services (CYES) retrofit plumbing fixtures for EBMUD customers with water and energy conserving devices. This program, run by the non-profit Rising Sun Energy Center and sponsored by EBMUD, educates teachers, students and the community about water and energy conservation and available utility services.



The David Brower Center in Berkeley has received certification from EBMUD as a WaterSmart Business. The 50,000 square foot facility uses recirculating cooling, radiant heat and rain water catchment along with high-efficiency water fixtures. A similar building with traditional plumbing would consume 3–5 times as much water.

WaterSmart Businesses

Saving water is a good business practice and improves the bottom line for East Bay businesses. The EBMUD Board of Directors recognizes businesses and institutions for outstanding water use efficiency when they work with EBMUD to assess their water use, implement water saving measures at their facilities, and make ongoing water management a priority. Businesses that participate in the WaterSmart Business Certification program receive expert assistance in evaluating water use. In some cases, they qualify for rebates on water conserving technology. Businesses implementing water-efficient best practices can publicly display their EBMUD WaterSmart certificate for up to three years. In fiscal years 2011 and 2012, EBMUD recognized 27 businesses for their WaterSmart practices. To date, WaterSmart businesses have reduced their annual water use by more than 18 million gallons since 2010—that's enough water to serve approximately 200 households for an entire year.

Shut-off nozzles save water when hand-irrigating.



Conservation in the Community

State law requires EBMUD to serve water for all development approved by land-use planning agencies within its service area. EBMUD tries to reduce the impact of new users on the water supply we all share. To be eligible for water service, new EBMUD customers must meet rigorous indoor and outdoor water efficiency standards for appliances, landscaping, plumbing fixtures and for commercial processes that use water. EBMUD encourages sustainable development and landscape design and works with local land-use planning agencies to make it happen by providing free landscape plan and code review to support water-efficient landscape choices and building designs.

To help existing residents and businesses use only the water they need, EBMUD conservation experts talk with thousands of customers at community fairs, festivals and events sponsored by neighborhoods, cities, towns, businesses and civic groups. Demonstration gardens in Alameda, Oakland and Walnut Creek help local residents better understand low water use approaches to beautifying local property. EBMUD's award-winning book, *Plants and Landscapes for Summer-Dry Climates*, is a useful resource for gardeners that describes water efficiency and sustainable design principles.

Water Conservation Program FY11 and FY12

Program Description	Activity or Accounts	Incentives ($)	Water Savings (gpd)
Residential Services			
Single-Family Surveys	215	–	14,210
Multi-Family Surveys	261	–	45,080
CYES Student Surveys	987	–	19,740
Home Water Use Do-it-Yourself Survey Kits	2,895	–	–
Residential Incentives			
High-Efficiency Clothes Washer Rebates	18,269	$913,200	345,280
High-Efficiency Toilet Rebates	3,911	$233,984	85,460
Residential Landscape Rebates	166	$66,241	18,720
Free Device Distribution	15,261	$20,108	16,790
Subtotal Residential Program Savings/Incentives	**41,965**	**$1,233,533**	**545,280**
Non-Residential Services			
Commercial Surveys	452	–	30,970
Industrial Surveys	6	–	2,900
Institutional Surveys	28	–	17,310
Non-Residential Incentives			
Commercial Clothes Washer Rebates	27	$14,650	2,700
Custom Non-Residential Rebates	10	$4,068	1,700
Commercial Dishwashing Spray Valves	13	$390	1,430
Toilet/Urinal Rebates	154	$10,000	1,700
Subtotal Non-Residential Program Savings/Incentives	**690**	**$29,108**	**58,710**
Irrigation Services/Incentives			
Irrigation Surveys	173	–	85,430
New Customers in the Water Budget Program	311	–	44,380
Annual Water Budgets Delivered to Customers	20,700	–	–
Landscape Irrigation Upgrade Rebates	41	$34,389	38,550
Irrigation Controllers (Residential and Commercial)	17	$2,050	1,950
Subtotal Irrigation Savings/Incentives	**21,242**	**$36,439**	**170,310**
Total EBMUD Program Incentives/Savings FY 11 and 12	**63,897**	**$1,299,080**	**774,300**

Finding Leaks in Underground Pipes

It's expensive to repair damage that can occur when there are leaks on large pipes that serve thousands if not hundreds of thousands of customers. Finding the leak early reduces the cost of repairs and the amount of disruption to our customers' daily life resulting from the repair work, while saving the valuable water supply. EBMUD regularly deploys acoustic pipeline leak detection equipment designed to listen for running water and to report findings via a computer uplink. EBMUD leak detection efforts have located leaks not only on EBMUD pipelines in the streets but also on homeowner pipes in neighboring yards.

The average age of the 4,100 miles of pipes in our system is more than 50 years. As our pipes age they can be more susceptible to cracking, corroding and even bursting. As infrastructure ages, it takes more work to keep it in good working condition so dependable water supplies arrive at customer taps round-the-clock, every day of the year. Maintenance and replacement work planning focuses on ensuring public, worker and environmental safety and considers the financial burden to customers and the potential disruption to daily life that results when crews are at work near homes and businesses.



The median strip near El Cerrito City Hall demonstrates low-water-use landscaping.

Conservation for Tomorrow

Over the past two decades, EBMUD-sponsored conservation programs have saved an estimated additional 26 million gallons per day of water in the service area. By 2040, EBMUD is committed to saving an additional 36 million gallons per day through residential and commercial indoor and outdoor water use surveys; technical assistance; leak detection services; incentives including distribution of water-saving showerheads, aerators and other devices; water-efficient technology research; and on-going customer education and outreach. All told, EBMUD water conservation efforts for the period 1995-2040 are projected to save nearly 23 billion gallons of water annually by the year 2040.

EBMUD's Water Conservation Master Plan was updated in 2011. It reviews water demand, water savings, and future conservation and drought response plans. Its ten-year implementation schedule is consistent with water demand reduction targets established by the Urban Water Management Planning Act, the Water Conservation Act of 2009, and the Statewide Memorandum of Understanding for Urban Water Conservation. The plan is available on EBMUD's website.

Recycling Water

Recycling Today

EBMUD currently can produce an average of nine million gallons per day of recycled water. Plans are in place to construct more pipelines and pumping plants so additional customer sites using recycled water can be built or retrofitted. EBMUD's Recycling Master Plan calls for recycling up to 20 million gallons per day by 2040, reducing the overall need for drinking water by approximately six percent.

EBMUD customers use recycled water for irrigating landscapes, including parks, greenbelts, community and school sports fields, business parks, and private and public golf courses. Recycled water also is used for industrial applications, construction dust control and flushing toilets. Recycled water has protected Bay Area investments in landscaping and parks from episodic droughts for nearly a century. EBMUD has used recycled water for more than 40 years for industrial processes and irrigation at the wastewater treatment plant located at the foot of the Bay Bridge in west Oakland.

EBMUD's East Bayshore Recycled Water Project supplies recycled water for irrigation in portions of Oakland and Emeryville. EBMUD plans to expand the recycled water distribution system in Emeryville and into Albany, Berkeley and Alameda. In 2011, customers in Oakland and Emeryville used about 80,000 gallons per day and EBMUD used another 2.3 million gallons a day at its wastewater treatment plant.

EBMUD also provides recycled water in partnership with other public agencies: the West County Wastewater District for service in Richmond, the City of San Leandro for service in Alameda and the Dublin San Ramon Services District for multiple EBMUD customer sites in the San Ramon Valley.

EBMUD delivers recycled water to parks, greenbelts, schools, common area landscapes and a golf course in the San Ramon Valley. In 2011, that use offset the need for more than 500,000 gallons per day of drinking water.

EBMUD works closely with local businesses that use large volumes of water for industrial processing to evaluate opportunities to replace drinking water with recycled water. One example is the Chevron refinery in Richmond. It has been using recycled water in its industrial cooling towers since 1996. In 2011, Chevron used an average of almost 4 million gallons per day in three cooling towers and 3.1 million gallons per day in its boilers.



EBMUD's East Bayshore Recycled Water Project provides recycled water to portions of Oakland for landscaping at places like Lake Merritt.

Recycling in the Future

EBMUD's goal is to be reusing 20 million gallons per day of recycled water by 2040. During water shortages, recycling will reduce the overall system demand by about six percent.

One area of future growth is West Contra Costa County, the northwestern part of EBMUD's service area. Hercules, Pinole, and West County Wastewater District are all potential sources of effluent that could be used for recycled water. EBMUD's long-range water supply plans identify several potential recycled water projects, including projects in West County, which could use effluent from these agencies for primarily industrial processes (see map).



In 2012, the EBMUD Board of Directors adopted a new long-term water supply plan to meet customer needs through the year 2040. The plan is a partnership-oriented approach to cope with changing demand for water locally and statewide, and relies on the latest knowledge from technical research into how climate change can affect local water supplies over the long term.

The 2040 plan has three fundamental assumptions:

1. **Water-efficient hardware and wise water use habits are ingrained and will make it harder for East Bay customers to cut back in droughts.** Each increment of future savings will be more difficult to achieve.
2. **Growth in the Central Sierra will affect EBMUD's daily supply source, the Mokelumne River.** The Central Sierra foothill communities located near EBMUD's water supplies face growth pressures. EBMUD is working with the foothill region to promote land management programs that will protect water quality as land is developed, to protect the Mokelumne and to meet the needs of the many Californians that rely on it.
3. **Global climate change will add uncertainty over time.** The long-term impacts of climate change on water supplies are complex (see below). The best strategy is a robust, flexible water supply program that can adapt to a variety of future conditions.

With guidance from previous long-term water supply plans, EBMUD promoted conservation and recycling, developed emergency pipeline connections with adjacent water service providers, improved drought supplies and launched pilot studies of groundwater and desalination. The Water Supply Management Program 2040 (WSMP 2040) is a strategy to meet future water supply needs by working with stakeholder groups and customers. WSMP 2040 will rely on the most cost-effective measures for reducing water demand to build on decades of aggressive conservation and water recycling in the East Bay. WSMP 2040 recognizes California's conservation savings goal to achieve a 20 percent statewide reduction in water use by the year 2020.

Above and beyond the aggressive water conservation goals established in WSMP 2040, EBMUD relies on an additional 15 percent reduction in water use by all customers in multi-year droughts. Reaching this target could require as much as a 19 percent reduction by single family residential customers in dry years.

EBMUD will simultaneously investigate several ways to close the anticipated gap between long-term water supplies and projected water needs. The options to be explored include groundwater banking/conjunctive use, water transfers, regional desalination and water storage. Parallel study provides the best possibility of timely success in the face of statewide water challenges, a complex regulatory environment, and the threat of climate change.

Climate Change

Despite the uncertainties with global climate models, climate change is almost sure to pose new challenges for providing safe and reliable water supplies. EBMUD has identified how changes in temperature and precipitation may affect the water system, and routinely assesses its ability to respond to those vulnerabilities.

Increasing Outdoor Water Use

A warming climate could extend the growing season, reduce natural soil moisture content and result in more heat waves.

Decreasing Water Supplies

A warming climate could decrease precipitation and the snow pack and change the timing of spring runoff.

Warmer Waters

Warmer river temperatures could hurt salmon eggs that need cool water to survive. Warmer ocean temperatures could stress migrating fish by disrupting the oceanic food chain. EBMUD supports aquatic habitats by managing its Sierra reservoirs to release cold water to the lower Mokelumne River; warming waters would make this more difficult.

Increasing Flood Risks

A rise in sea level could increase flooding risks to communities along San Francisco Bay and to Delta levees that protect EBMUD's aqueducts across the Delta.

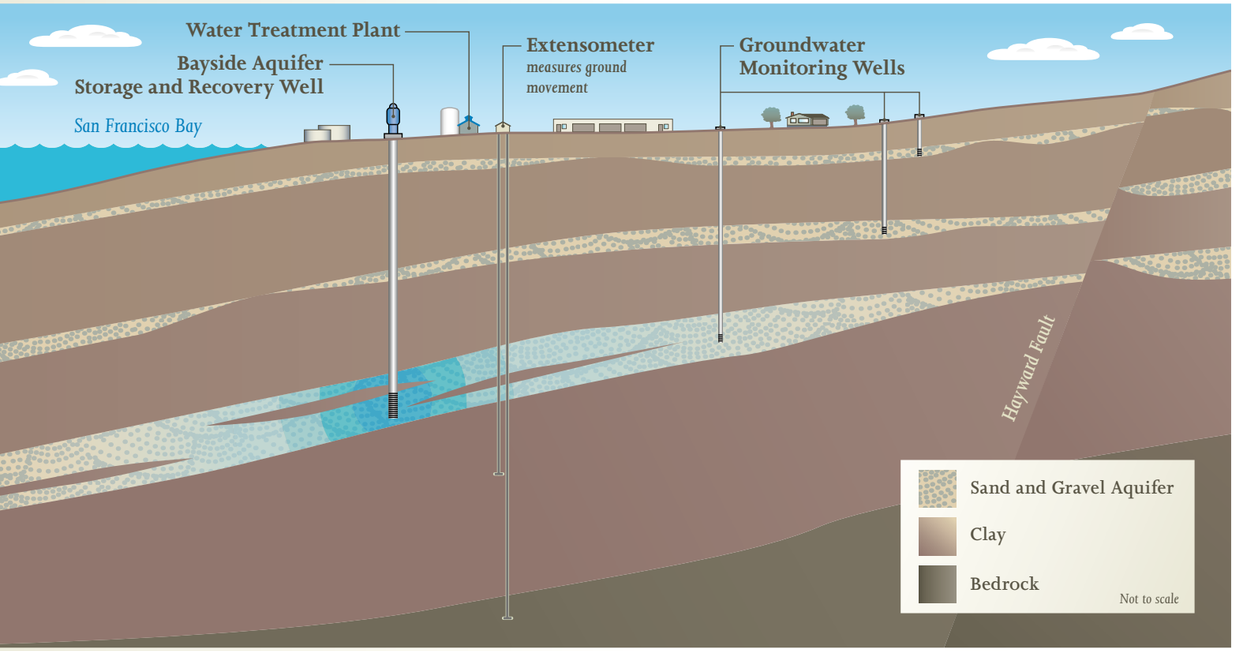
Greenhouse Gas Emissions

EBMUD monitors and mitigates its greenhouse gas emissions and produces renewable energy. In an average year, EBMUD hydropower generation exceeds the amount of power needed to treat and deliver water to our 1.3 million customers. EBMUD also generates solar power at several facilities and is a net energy generator at its wastewater treatment plant. EBMUD is an active participant in national efforts by EPA and by industry groups to assess the vulnerabilities to water supplies that could result from a changing climate.

New Water Storage in the Greater East Bay

The fragile state of the Delta is a concern for EBMUD because our aqueducts cross the Delta. One option now being explored that could help mitigate that concern is to store some EBMUD water in Contra Costa Water District's (CCWD) Los Vaqueros Reservoir, which is located to the west of the Delta. CCWD has expanded that reservoir and EBMUD could partner with CCWD for a portion of the storage that was created.

EBMUD also can store some water locally in a deep underground aquifer. (See below)



The Bayside Groundwater Facility is a state-of-the-art groundwater injection well that can move some water into a deep underground aquifer more than 500 feet below ground. During shortages, EBMUD can draw the water from storage into the treatment facility and then distribute the treated water to customers. The well can provide a supply of up to one million gallons of water per day on average.

Water Transfers and New Water Storage

The EBMUD-Sacramento County jointly-owned pumping facilities on the Sacramento River offer another way to move water to places where it is needed. Conjunctive use projects designed to replenish groundwater basins in wet years and also store some water underground for use during future dry times are being investigated in Sacramento County and San Joaquin County. EBMUD is exploring water transfer and exchange possibilities throughout Northern California that would make use of the Sacramento River pumping facilities at Freeport.

An additional option being explored is a regional project that would include conjunctive use opportunities in San Joaquin County (one or more groundwater storage projects located in the county).

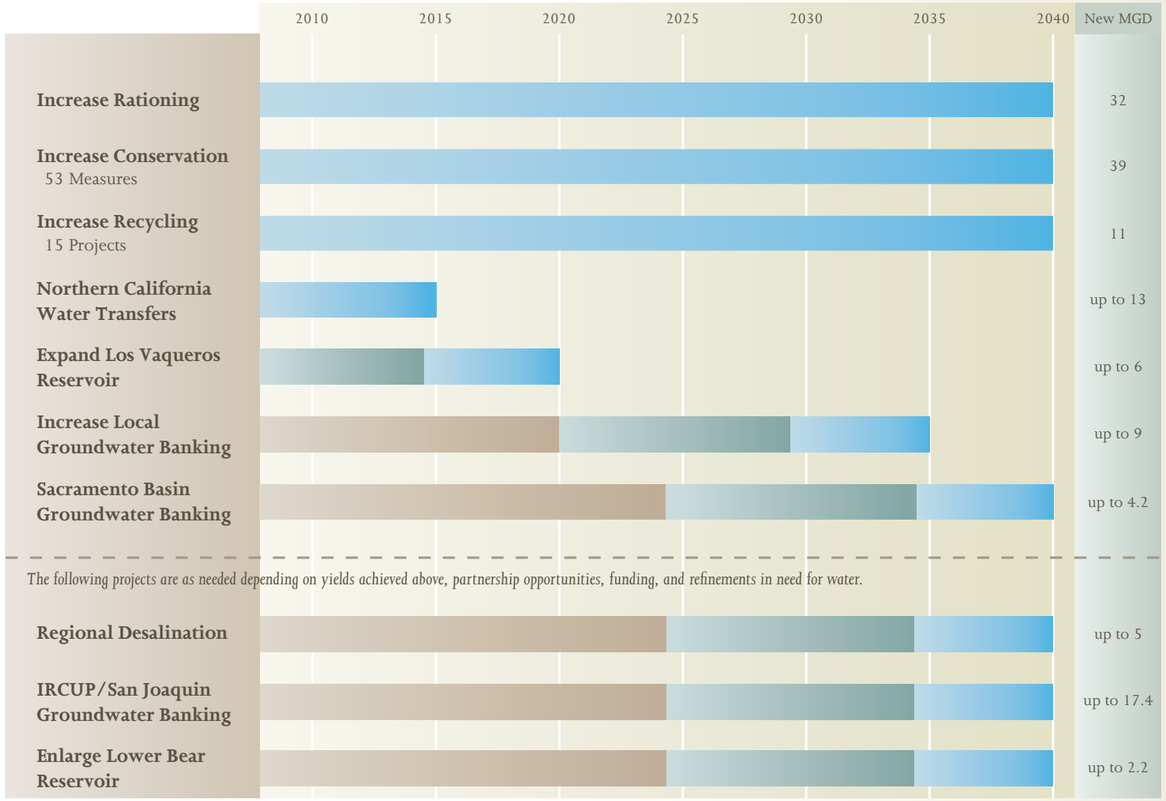
EBMUD is committed to a partnership-driven approach for any water supply and/or storage plan. Before moving to project-level planning, stakeholder support, regional benefits and a confirmed need for water will need to be in place.

Regional Desalination

Taking the salt out of brackish or salty water has been possible for many years, but prohibitively expensive. EBMUD is working with other Bay Area water agencies (Contra Costa Water District, San Francisco Public Utilities Commission, Santa Clara Valley Water District and Zone 7 Water Agency) to explore adding desalinated water to the local water supply. Today, the costs of desalination are lower, but questions remain about the environmental impacts of the process.

A pilot test showed it would be feasible to desalinate up to 20 million gallons per day of water at a location in eastern Contra Costa County. Desalination costs are still high, and environmental impacts must be analyzed and addressed. But over time, with advancements in technologies, desalination may prove to be a viable supplemental supply source for the Bay Area. Investigation into this supply option continues to assess the pros and cons of moving forward into an actual operation.

EBMUD's 30-Year Plan to Meet the East Bay's Water Needs*



**Assumes that when needed, an average of 32 million gallons per day (MGD) will be saved through rationing to stretch supplies. Project MGD by project as estimated in WSMP 2040; actual yields to EBMUD and project partners will vary.*

Exploratory Phase · Determine Project Feasibility · Implementation of Feasible Projects

WSMP 2040:

Diverse Regional Partnerships Seeking a Secure Water Future

Conservation and Recycling

Water conservation and recycling are critical elements of EBMUD water supplies for today and tomorrow. Water Supply Management Program 2040 calls for conserving 62 million gallons a day by 2040 and for recycling 20 million gallons a day by that same year. Additionally, customers will be asked to cut use up to 15 percent in dry years.

- Existing water supply
- Dry-year water transfer options
- Regional interties
- Future supply options

Supply Transfers

Potential partnership agreements with other water agencies. Water transfer agreements allow agencies to share their supplies to best meet their collective water needs.

Desalination in Partnership with Multiple Bay Area Water Agencies

Continuing study and investigation of how desalination could one day serve as a supplemental water source.

Sacramento County Groundwater

Potential partnerships with water agencies and interests in Sacramento County.

Water would be stored ("banked") in the underlying groundwater basin in wet years. The banked groundwater would be extracted during dry years and delivered to EBMUD via the Freeport intake and Mokelumne conveyance facilities.

Lower Bear Reservoir

Continued partnership with Amador Water Agency, PG&E and other foothill water interests to study the option to expand the water storage volume of Lower Bear Reservoir.

San Joaquin Groundwater

Potential partnership(s) with Upper Mokelumne River Water Authority (UMRWA) and Northeastern San Joaquin County Groundwater Banking Authority (GBA) member agencies as well as environmental interest groups.

UMRWA in partnership with the GBA has secured grant monies through the California Department of Water Resources to implement the Mokelumne Watershed Interregional Sustainability Evaluation (Moke WISE) Program. The goal of the work effort is to identify comprehensive and sustainable approaches to water resources management in the Mokelumne watershed. A wide array of water sources and strategies to balance water supplies and demands while minimizing environmental impacts will be investigated.

As the concept moves forward, partnership arrangements will become clearer, as will possible program elements such as expanded use of recycled water, groundwater storage/conjunctive use, increased water conservation, etc.

Expand Los Vaqueros

Potential partnership with Contra Costa Water District (CCWD).

In mid 2012, CCWD completed the expansion of their Los Vaqueros Reservoir, increasing the total storage from a total of 100,000 acre feet to 160,000 acre feet. CCWD has indicated that a portion of the storage capacity created could be made available to EBMUD and that CCWD's existing conveyance facilities could be used to move water to and from the reservoir. EBMUD is working with CCWD to develop plans to move the concept forward.

EBMUD and the Delta

The Sacramento-San Joaquin Delta provides habitat for more than 500 species. It provides water to roughly two-thirds of California's population, is a vital recreation resource and is critical to commercial fisheries, agriculture and an extensive network of infrastructure including EBMUD's Mokelumne Aqueducts. State legislation passed in 2009 calls for investing billions in restoring the ecosystem, protecting levees and potentially building a canal or tunnel to take water south of the Delta.

EBMUD does not deliver Delta water to the East Bay, but 60 percent of water for the Bay Area comes from the larger Delta watershed. Over the past two decades, EBMUD investments in Delta-related projects have totaled almost $100 million to protect and maintain aqueducts and levees and effectively manage the Mokelumne River fishery.

Pressures to increase freshwater inflows to the Delta may lead to new limits on upstream water diversions, including EBMUD's water diversions from the Mokelumne River (which represent about 1.5 percent of all Delta watershed diversions). Projects to improve the conveyance of water to the Delta export pumps may disrupt the migration of the steelhead and salmon that EBMUD has invested so heavily to restore. And funding that now helps maintain levees that protect EBMUD's aqueducts could be diverted to other purposes.

EBMUD has an exemplary record in water use efficiency and stewardship of natural resources. Average fall-run Mokelumne River salmon returns over the past ten years have surpassed the long-term historic average, an indicator that the stewardship program is working. Any Delta restoration plan must provide that EBMUD's resource management plan can continue to ensure the river's health.

In addition to the potential effects a new Delta plan could have on water supplies, it also could affect water costs. Some options would make the East Bay responsible for a share of the costs for new water facilities it doesn't want or need. Other options would increase EBMUD's financial obligation to protect Delta levees.

EBMUD is working to ensure the interests of its customers are protected while actively participating to help balance the many competing needs in the Delta.

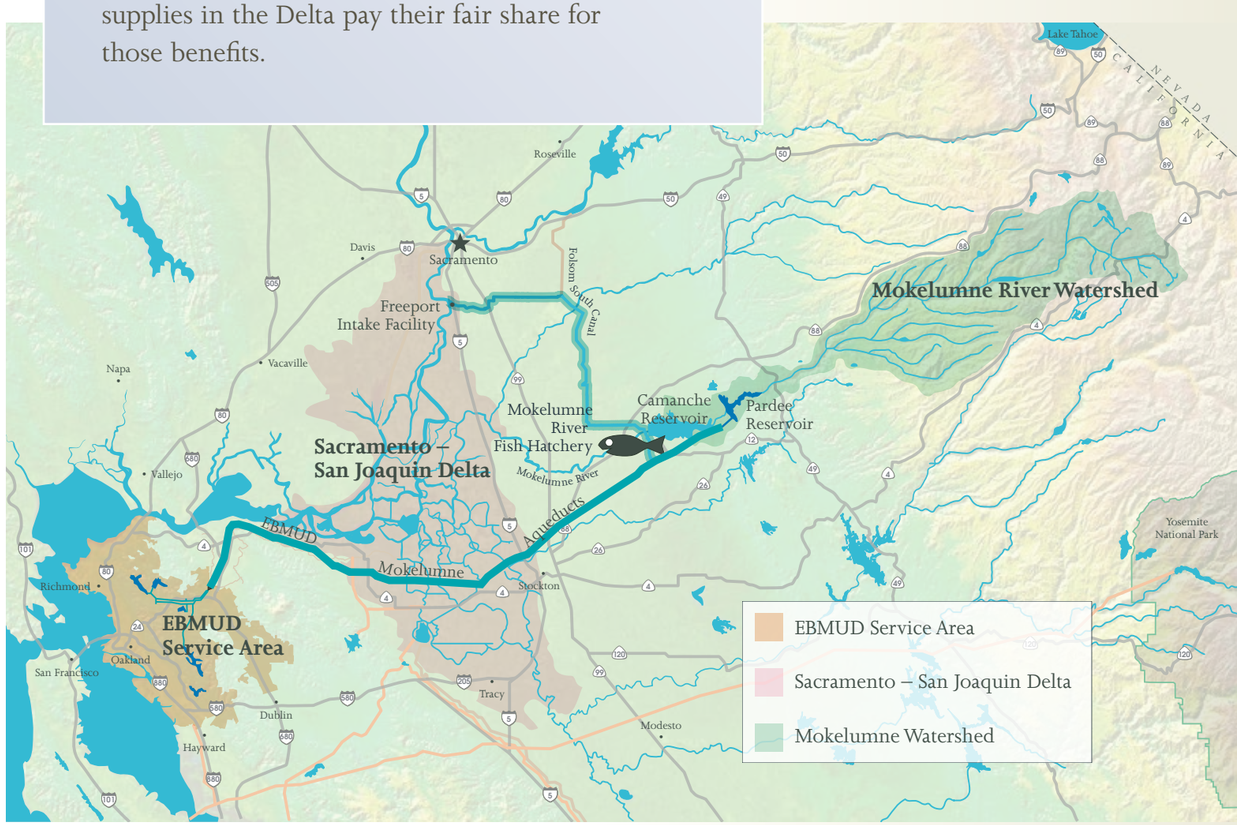
Decisions about the Delta could affect the cost of the East Bay's water and the reliability of its water supply.



EBMUD Goals for the Delta

- Ensure that any additional Delta flows needed to mitigate impacts from a new tunnel or canal are provided by the direct beneficiaries of that project
- Strengthen the levees surrounding islands that protect critical infrastructure, including EBMUD's Mokelumne Aqueducts
- Protect the Mokelumne fishery and its migratory routes through the Delta
- Minimize impacts on water supplies from the Freeport facility on the Sacramento River
- Ensure that those who benefit from new water supplies in the Delta pay their fair share for those benefits.

EBMUD has invested millions in the lower Mokelumne River salmon fishery, and Delta operations affect the migration of fish from the Mokelumne.



EBMUD provides high-quality drinking water for 1.3 million customers in Alameda and Contra Costa counties.

EBMUD's award-winning wastewater treatment plant generates renewable energy from waste and protects San Francisco Bay; it serves 650,000 customers.

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EAST BAY
MUNICIPAL UTILITY DISTRICT
375 11th Street
Oakland, CA 94607
1-866-40-EBMUD
www.ebmud.com

EAST BAYSHORE RECYCLED WATER PROJECT

PROJECT PURPOSE

EBMUD's East Bayshore Recycled Water Project currently supplies recycled water for landscape irrigation in areas of Oakland and Emeryville where recycled water pipelines have been installed. EBMUD plans to expand the distribution system into Alameda, Albany and Berkeley. In addition to irrigating landscapes, recycled water uses may include restoring wetlands, flushing toilets in dual-plumbed buildings, and industrial processes.

RECYCLED WATER BENEFITS

- Stretches our limited drinking water supply, especially in droughts
- Safeguards community and private investments in parks and landscaping
- Makes drinking water supplies more reliable, helping to sustain our economy
- Protects San Francisco Bay

PROJECT STATUS

Recycled water treatment facilities were constructed at EBMUD's wastewater treatment plant, located at the foot of the Bay Bridge. Using microfiltration and extra disinfection, EBMUD produces recycled water that meets or surpasses California Department of Public Health standards for unrestricted use. EBMUD stores the recycled water in a 1.5 million gallon storage tank on the site. A recycled water transmission pipeline along 4.4 miles of the Eastshore Freeway is largely complete, and 2 miles of transmission pipeline have been installed Oakland.

The East Bayshore Recycled Water Project began deliveries to customers in 2008. In 2012 the project delivered recycled water to offset the need for a total of more than 25 million gallons of EBMUD drinking water. EBMUD itself used another 2.6 million gallons a day at the wastewater treatment plant for various industrial processes and for landscape irrigation.

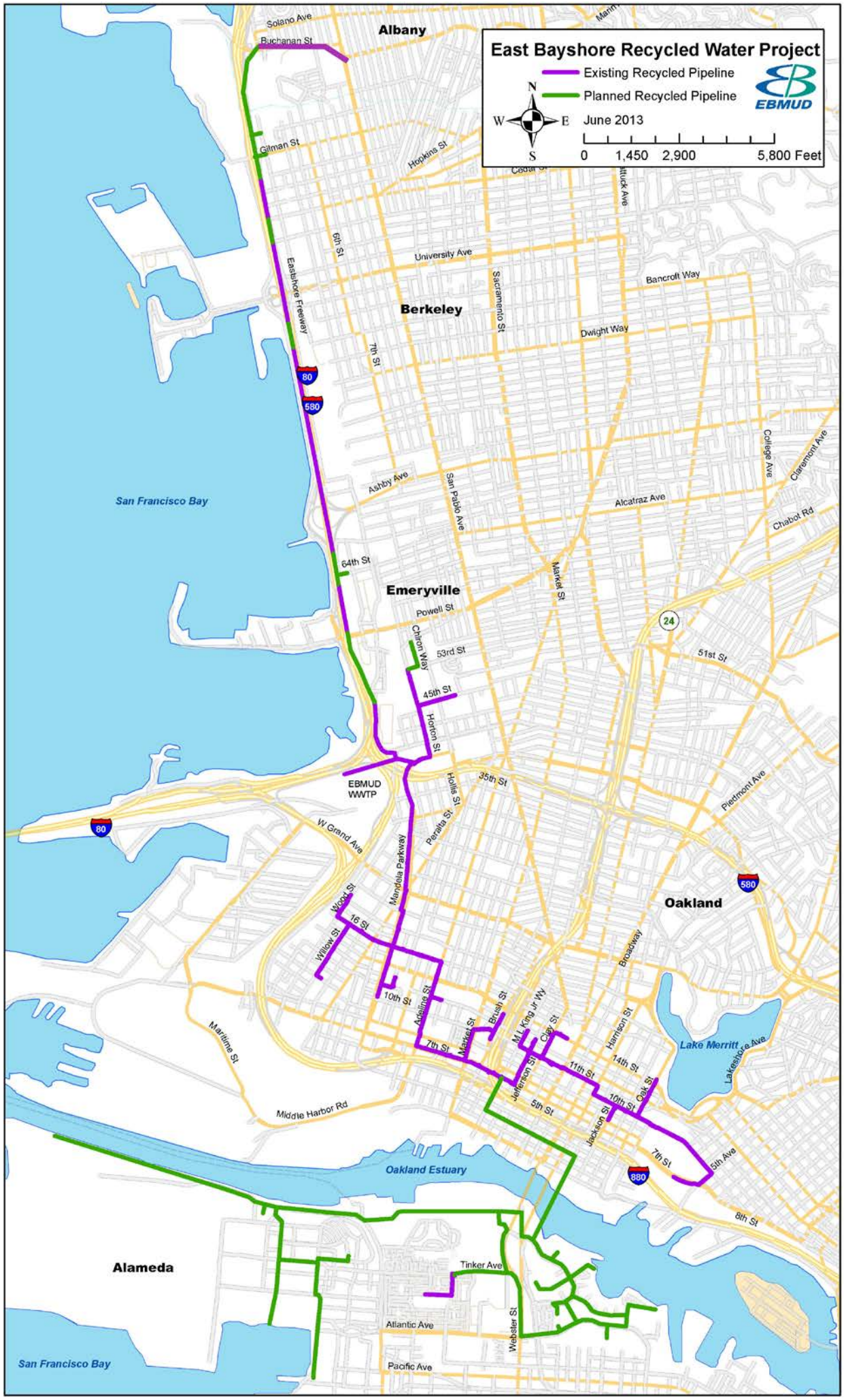
When complete, up to 24 miles of distribution pipelines will be in place and up to 2.2 million gallons per day of recycled water will be available to East Bayshore Recycled Water Project customers. (See map on page 2.)

NEXT STEPS

- Retrofit customer sites in areas of Oakland, Emeryville, Berkeley, Albany, and Alameda
- Complete construction of transmission pipeline along the Eastshore Freeway
- Design and construct pipeline to reach customer sites in northern Emeryville, Albany, Berkeley, and western Alameda, including pipeline under the Oakland Estuary

CONTACT US

Lori Steere, Community Affairs Representative at 510-287-1631 or lsteere@ebmud.com


East Bayshore Recycled Water Project
Existing Recycled Pipeline
Planned Recycled Pipeline
June 2013
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Alameda
San Francisco Bay
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Lake Merritt
EBMUD WWTP
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Buchanan St
Gilman St
Hopkins St
University Ave
Bancroft Way
Dwight Way
Eastshore Freeway
6th St
7th St
Sacramento St
Ashby Ave
San Pablo Ave
Alcatraz Ave
College Ave
Claremont Ave
Chabot Rd
64th St
Market St
Powell St
Chiron Way
53rd St
51st St
45th St
Horton St
35th St
Hollis St
Peralta St
Piedmont Ave
W Grand Ave
Mandela Parkway
Wood St
16 St
Willow St
10th St
Adeline St
Brush St
M L King Jr Wy
Clay St
Harrison St
Broadway
Lakeshore Ave
Maritime St
7th St
Market St
Jefferson St
11th St
14th St
10th St
Oak St
5th St
Jackson St
7th St
5th Ave
Middle Harbor Rd
8th St
Tinker Ave
Atlantic Ave
Webster St
Pacific Ave
80
580
24
880

UCERF3: A New Earthquake Forecast for California's Complex Fault System

With innovations, fresh data, and lessons learned from recent earthquakes, scientists have developed a new earthquake forecast model for California, a region under constant threat from potentially damaging events. The new model, referred to as the third Uniform California Earthquake Rupture Forecast, or "UCERF3" (http://www.WGCEP.org/UCERF3), provides authoritative estimates of the magnitude, location, and likelihood of earthquake fault rupture throughout the state. Overall the results confirm previous findings, but with some significant changes because of model improvements. For example, compared to the previous forecast (UCERF2), the likelihood of moderate-sized earthquakes (magnitude 6.5 to 7.5) is lower, whereas that of larger events is higher. This is because of the inclusion of multifault ruptures, where earthquakes are no longer confined to separate, individual faults, but can occasionally rupture multiple faults simultaneously. The public-safety implications of this and other model improvements depend on several factors, including site location and type of structure (for example, family dwelling compared to a long-span bridge). Building codes, earthquake insurance products, emergency plans, and other risk-mitigation efforts will be updated accordingly. This model also serves as a reminder that damaging earthquakes are inevitable for California. Fortunately, there are many simple steps residents can take to protect lives and property.

What is UCERF3?

California is sandwiched between the Pacific and North American tectonic plates, with the former migrating northwest about two inches per year compared to the latter. The plate boundary is far from smooth, reflecting more of a fragmented zone locked in a tectonic battle over which areas will give way, producing some of the steepest mountain ranges in the world. The sliding between plates is also not steady, but rather plays out in fits and starts with periods of rest interrupted by sudden slip along cracks in the Earth. These "fault ruptures" in turn cause the ground to shake, much like the ripples that radiate from a pebble tossed in a pond, and it is this shaking that causes the most damage in earthquakes.

Two kinds of scientific models are used to help safeguard against earthquake losses: an Earthquake Rupture Forecast, which tells us where and when the Earth might slip along the state's many faults, and a Ground Motion Prediction model, which estimates the subsequent shaking given one of the fault ruptures. UCERF3 is the first type of model, representing the latest earthquake-rupture forecast for California. It was developed and reviewed by dozens of leading scientific experts from the fields of seismology, geology, geodesy, paleoseismology, earthquake physics, and earthquake engineering. As such, it represents the best available science with respect to authoritative estimates of the magnitude, location, and likelihood of potentially damaging earthquakes throughout the state (further background on these models, especially with respect to ingredients, can be found in U.S. Geological Survey Fact Sheet 2008–3027, http://pubs.usgs.gov/fs/2008/3027/).

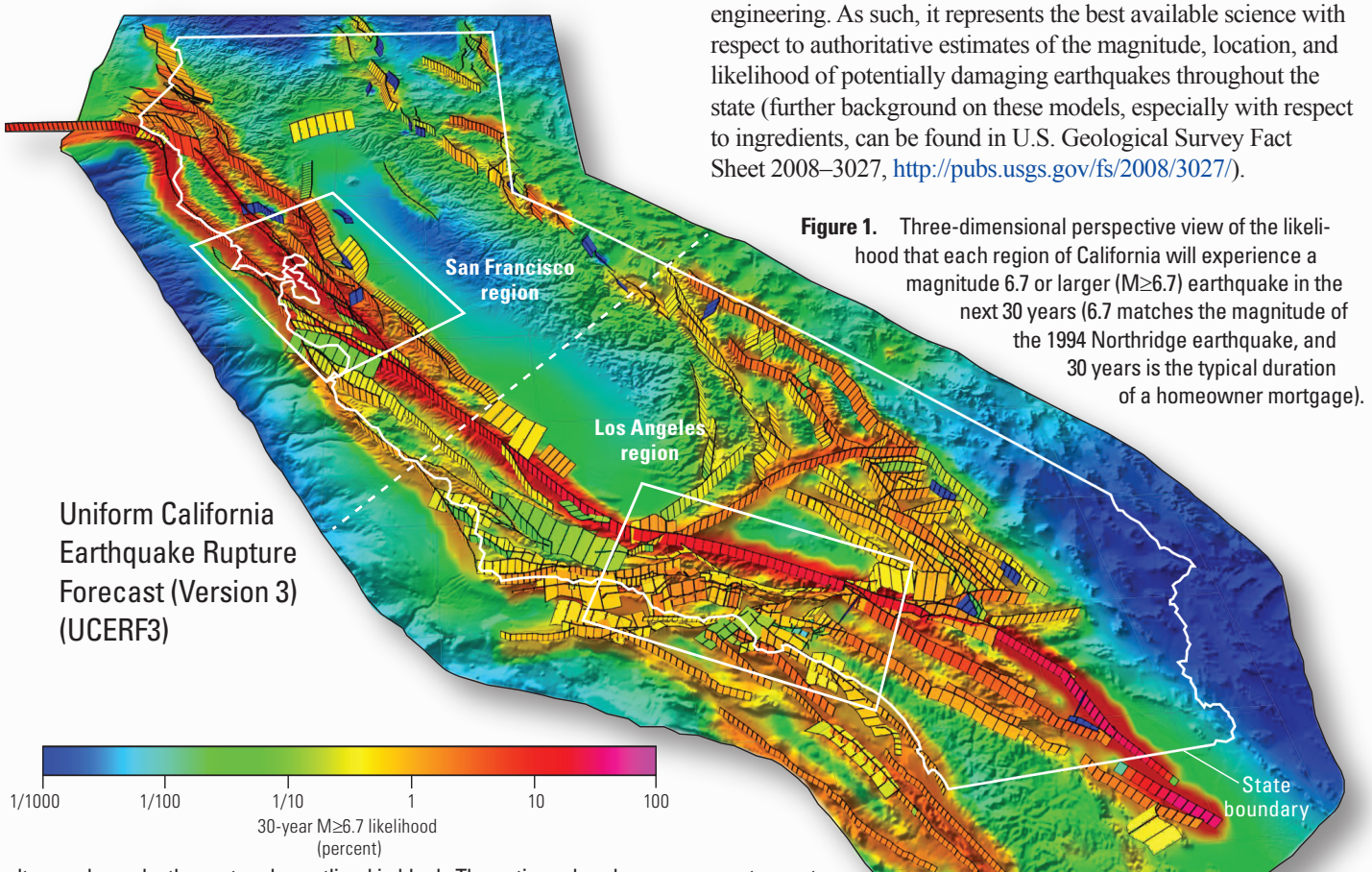

Figure 1. Three-dimensional perspective view of the likelihood that each region of California will experience a magnitude 6.7 or larger (M≥6.7) earthquake in the next 30 years (6.7 matches the magnitude of the 1994 Northridge earthquake, and 30 years is the typical duration of a homeowner mortgage). Faults are shown by the rectangles outlined in black. The entire colored area represents greater California, and the white line across the middle defines northern versus southern California. Results do not include earthquakes on the Cascadia Subduction Zone, a 750-mile offshore fault that extends about 150 miles into California from Oregon and Washington to the north.

U.S. Department of the Interior
U.S. Geological Survey

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March 2015

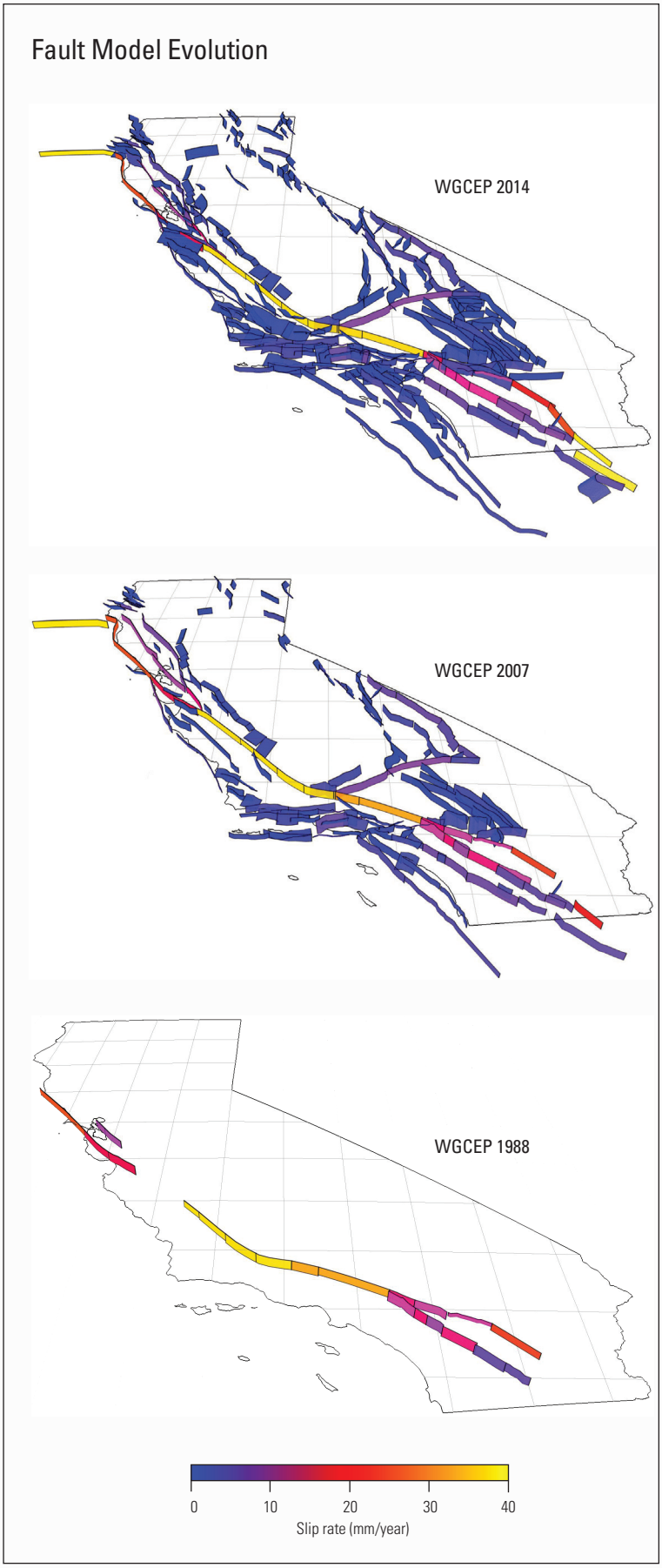

Figure 2. Changes with time of the inventory of faults used in California earthquake forecast models (WGCEP, Working Group on California Earthquake Probabilities).

Why a New Earthquake Forecast Model?

All scientific models, including earthquake rupture forecasts, are an approximation of the physical system they represent, in the same way that "the map is not the actual territory" (Korzbski, 1931). UCERF3 represents the latest model from the Working Group on California Earthquake Probabilities (WGCEP) (WGCEP, 2014), which also released forecasts in 1988, 1990, 1995, 2003, and 2007. This historical progression of models reflects increasingly accurate, detailed, and sophisticated representations of a particularly complex natural system.

A puzzling feature of previous models has been a forecasted rate of moderate-sized earthquakes (between magnitude 6.5 and 7.0) that is up to a factor of two higher than that observed historically. The first discovery of this discrepancy, by the 1995 WGCEP, was particularly disturbing in that one such event, the magnitude 6.7 1994 Northridge earthquake, had just surprised many as the costliest earthquake in U.S. history. In fact, the prospect of such events becoming more frequent contributed to an ensuing homeowner-insurance-availability crisis, as most insurance providers opted to pull out of the market altogether, rather than comply with a state law requiring they offer an earthquake option with each policy. This insurance availability crisis was ultimately solved in 1996 with the legislative creation of the California Earthquake Authority (http://www.earthquakeauthority.com), which has since become the largest earthquake insurance provider in the state. However, the discrepancy between the forecast rate and the observed rate at moderate magnitudes has remained through the most recent previous study (WGCEP, 2007), and scientists have hotly debated whether this is real or a result of some model limitation.

Recent earthquakes have fortunately provided clues. For example, the Northridge earthquake occurred on a previously unrecognized fault, which motivated scientists to search for other faults and quantify those that might be capable of producing damaging earthquakes. The effort has paid off. Whereas the 1988 WGCEP considered only 16 different faults, albeit the main ones, by the time of the WGCEP 2007 effort there were about 200. With UCERF3, there are now more than 350 fault sections in the model, thanks in part to using space-based geodesy where geologic data are limited. This historical progression is shown in the fault model evolution figure at left.

Another clue with respect to the moderate-magnitude rate discrepancy is that many recent earthquakes have plowed past previously inferred fault-rupture boundaries. That is, past models have generally assumed that earthquakes are either confined to separate faults, or that long faults like the San Andreas can be divided into different segments that only rupture separately. However, all three of the most-recent, largest earthquakes in California ruptured right past such boundaries, jumping from one fault to another as multifault ruptures. These were the 1992 magnitude 7.3 Landers, the 1999 magnitude 7.2 Hector Mine, and the 2010 magnitude 7.2 El Mayor–Cucapah earthquakes. The 2011 magnitude 9.0 Tohoku, Japan earthquake also violated previously defined fault-segment boundaries, resulting in a much larger fault-rupture area and magnitude than expected, and contributing to the deadly tsunami and Fukushima nuclear disaster.

Given these observations, the possibility of multifault ruptures clearly needed to be considered in our new model. In fact, as the inventory of California faults has grown over the years, it

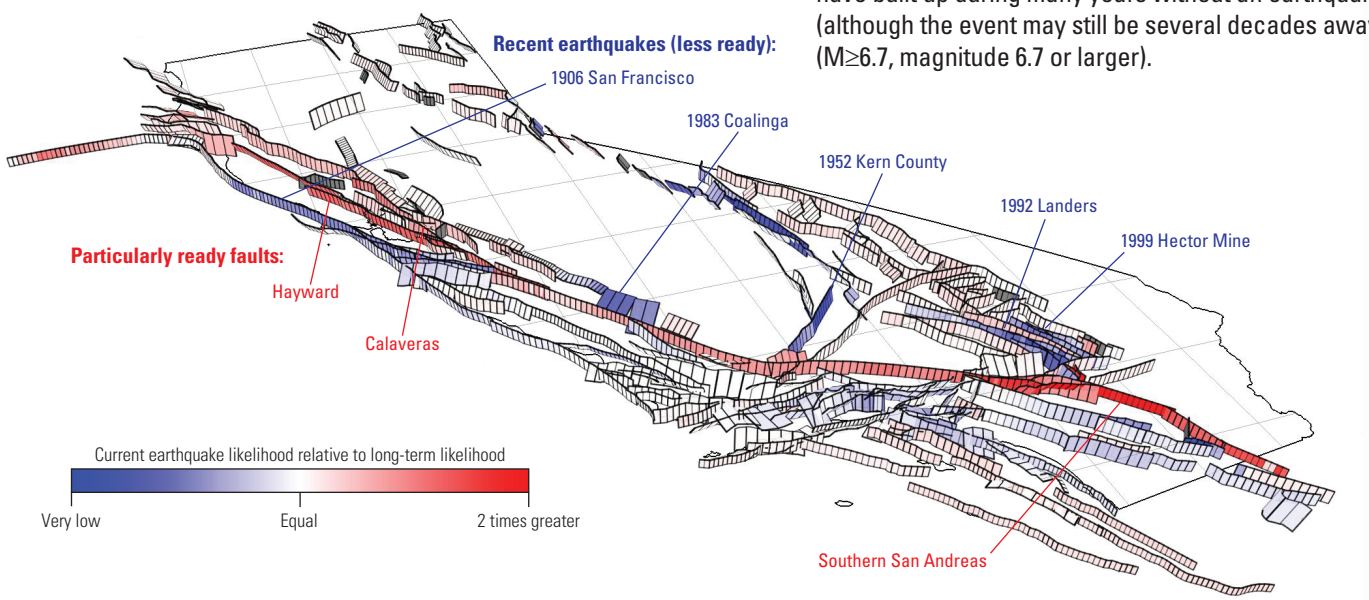

Figure 3. California earthquake likelihood in UCERF3 incorporates the concept that earthquake probabilities change with time according to elastic-rebound theory. Faults are less likely to rupture (less ready) when and where there has been a recent earthquake, and are more likely to rupture (more ready) where tectonic forces have built up during many years without an earthquake (although the event may still be several decades away) (M≥6.7, magnitude 6.7 or larger).

has become increasingly apparent that we are not dealing with a few well-separate faults, but with a vast interconnected fault system. In fact, it has become difficult to identify where some faults end and others begin, implying many more opportunities for multifault ruptures. As a consequence, UCERF3 now considers more than 250,000 different fault-based earthquakes, including multifault ruptures, whereas UCERF2 had about 10,000, and previous models had far fewer. Because we still lack a complete inventory of faults, UCERF3 (and UCERF2 before it) also includes the possibility of earthquakes on unrecognized faults elsewhere in the region.

Solving for the rate of all possible ruptures in the interconnected fault system represented a significant challenge. The UCERF3 methodological breakthrough, referred to as the "grand inversion," allowed us to not only solve for the rate of each earthquake rupture, but to also draw upon a broader range of observations in doing so. For example, the previous rate discrepancy at moderate-magnitudes was turned into part of the solution. That is, because the total plate-tectonic deformation is generally well known, any increase in the rate of larger, multifault ruptures must come with a consequent reduction in rates at lower magnitudes. The grand inversion manages the overall plate-tectonic, fault-system budget mathematically, adding whatever multifault ruptures are needed to eliminate the rate discrepancy at moderate magnitudes. So, not only does UCERF3 include the types of multifault ruptures seen in nature, but doing so has also eliminated the overprediction of moderate-sized events, implying the latter was simply a manifestation of the isolation and segmentation of faults in the previous models.

UCERF3 also includes the notion of fault "readiness," where earthquake likelihoods go down on faults that have recently ruptured, and build back up with time as tectonic stresses reaccumulate. Although this concept, known formally as Reid's elastic rebound theory (Reid, 1911), has been around for more than a century, applying it in a model that includes multifault ruptures also proved challenging. A new methodology was therefore developed, which also relaxes the requirement that the date-of-last event be known where applied. That is, we may not know when the most recent event occurred on many California faults, but we do know that it had to have been prior to 1875 (the year when reliable recordkeeping began). Being able to account for this "historic open interval" for events that precede 1875 allowed us to quantify fault readiness throughout the entire fault system (fig. 3), rather than being limited to only a subset of faults as in previous studies.

There are many uncertainties in both the data and scientific theories that go into UCERF3, and alternative values for each element can lead to a different forecast. Consequently, UCERF3 is not a single model, but rather a collection of 5,760 different viable models. The results presented in the next section represent an average of these forecasts. Calculating grand-inversion results for all the models required the use of super computers, as they would have taken more than 8 years on a single desktop computer.

What Are the Results, and How Do They Differ from Previous Estimates?

UCERF3 results for various regions and faults of interest are shown in the figures and tables here. How have expected earthquake rates changed from the previous model? Overall, the results confirm earlier findings (California is earthquake country), but with some important refinements in certain areas. Considering the entire region, the average time between magnitude 6.7 and larger earthquakes has gone from 1 every 4.8 years in UCERF2, to 1 about every 6.3 years in UCERF3, representing a 30 percent decrease in the new forecasted

Table 1. Average time between earthquakes in the various regions together with the likelihood of having one or more such earthquakes in the next 30 years (starting from 2014). Values listed in parentheses indicate the factor by which the rates and likelihoods have increased, or decreased, since the previous model (UCERF2). "Readiness" indicates the factor by which likelihoods are currently elevated, or lower, because of the length of time since the most recent large earthquakes (see text). These values include aftershocks. It is important to note that actual repeat times will exhibit a high degree of variability, and will almost never exactly equal the average listed here.

Greater California region

Magnitude (greater than or equal to)	Average repeat time (years)		30-year likelihood of one or more events		Readiness
5	0.12	(0.7)	100%	(1.0)	1.0
6	1.2	(0.9)	100%	(1.0)	1.0
6.7	6.3	(1.3)	>99%	(1.0)	1.0
7	13	(1.3)	93%	(1.0)	1.0
7.5	52	(1.0)	48%	(1.0)	1.1
8	494	(0.8)	7%	(1.5)	1.2

Southern California region

Magnitude (greater than or equal to)	Average repeat time (years)		30-year likelihood of one or more events		Readiness
5	0.24	(0.7)	100%	(1.0)	1.0
6	2.3	(0.9)	100%	(1.0)	1.0
6.7	12	(1.5)	93%	(1.0)	1.0
7	25	(1.4)	75%	(0.9)	1.1
7.5	87	(1.2)	36%	(0.9)	1.2
8	522	(0.4)	7%	(2.5)	1.3

Northern California region

Magnitude (greater than or equal to)	Average repeat time (years)		30-year likelihood of one or more events		Readiness
5	0.24	(0.7)	100%	(1.0)	1.0
6	2.4	(0.9)	100%	(1.0)	1.0
6.7	12	(1.2)	95%	(1.0)	1.0
7	25	(1.2)	76%	(1.0)	1.1
7.5	92	(0.9)	28%	(1.1)	1.0
8	645	(0.8)	5%	(1.4)	1.1

San Francisco region

Magnitude (greater than or equal to)	Average repeat time (years)		30-year likelihood of one or more events		Readiness
5	1.3	(0.7)	100%	(1.0)	1.0
6	8.9	(1.0)	98%	(1.0)	1.0
6.7	29	(1.1)	72%	(1.1)	1.1
7	48	(0.9)	51%	(1.3)	1.1
7.5	124	(0.7)	20%	(1.6)	0.9
8	825	(0.7)	4%	(1.9)	1.0

Los Angeles region

Magnitude (greater than or equal to)	Average repeat time (years)		30-year likelihood of one or more events		Readiness
5	1.4	(0.6)	100%	(1.0)	1.0
6	10	(1.1)	96%	(1.0)	1.0
6.7	40	(2.1)	60%	(0.8)	1.1
7	61	(2.0)	46%	(0.7)	1.2
7.5	109	(1.3)	31%	(0.9)	1.3
8	532	(0.4)	7%	(2.5)	1.3

rate (and note that most of these events occur in remote areas of the state). For magnitude 8 and larger, on the other hand, the rate has increased by 20 percent in UCERF3, with an expected repeat time of 494 years for UCERF3, down from 1 every 617 years in UCERF2. These changes are a direct and expected manifestation of including multifault ruptures in UCERF3. A more careful analysis of historical seismicity has also produced an increased rate for magnitude 5 and greater earthquakes, going from about 5.8 per year in UCERF2 to 8.3 per year in UCERF3. All of these trends are similar to those seen in various subregions of the state, with differences being slightly more dramatic for the Los Angeles area because that region has a large number of faults that can now host multifault ruptures.

Results are also expressed in terms of the likelihood of experiencing one or more earthquakes in the next 30 years, the duration of a typical home mortgage, and these values also take fault readiness into consideration (how long it has been since the most recent event). As in UCERF2, the likelihood for magnitude 6.7 and larger earthquakes somewhere in the entire region remains near certainty (greater than 99 percent). The likelihood is 7 percent for magnitude 8 and greater, a 50 percent increase over UCERF2, resulting from both the inclusion of multifault ruptures and the particular readiness of some large faults.

One particularly ready fault is the Southern San Andreas, which contributes to its continued status of being the most likely to host a large earthquake. Specifically, it has a 19 percent chance of having one or more events larger than magnitude 6.7 in the next 30 years near Mojave, Calif. The comparably low values for the Northern San Andreas, such as 6.4 percent near San Francisco, are partly because of the relatively recent 1906 earthquake on that fault. In fact, probabilities on two other Bay Area faults, the Hayward–Rodgers Creek and the Calaveras, currently rival or exceed those on the Northern San Andreas, in part because they are both relatively ready.

Compared to the previous model, UCERF2, the San Jacinto fault has a three-fold decrease in the likelihood of magnitude 6.7 or larger earthquakes. Much of this decrease is because of the inclusion of more multifault ruptures, as indicated by the factor of 57 increase in the likelihood of magnitude 8 and larger earthquakes. In other words, the fault has traded some moderate-sized events for rare larger ones.

The Calveras fault, on the other hand, has a three-fold increase in the likelihood of magnitude 6.7 or larger earthquakes. In UCERF2 most Calaveras events were well below magnitude 6.7, so the inclusion of multifault ruptures in UCERF3 has increased the frequency of earthquakes above magnitude 6.7.

We have only touched on a few of the more important changes between UCERF2 and UCERF3, and have highlighted only some of the influential factors. Many more are currently understood, and scientists will be further analyzing results and testing assumptions for years to come.

So what do these changes imply with respect to seismic hazard, the likelihood of ground shaking, as well as for seismic risk, the threat to the built environment with respect to fatalities and economic losses? The answer turns out to be entirely dependent on what you are concerned about. For example, increasing the likelihood of large multifault earthquakes, which consequently reduces the likelihood of moderate-sized events, may increase the risk to tall buildings or large bridges, but actually lower the risk to residential homes.

As a consequence, it is difficult to make generalizations about the hazard or risk implications of UCERF3 without first specifying both asset types and their locations. Conclusions will vary depending on whether you are designing a single family dwelling in Sacramento, retrofitting the San Francisco–Oakland Bay Bridge, considering the location of a nuclear power plant, laying pipeline across the San Andreas Fault, or considering aggregate losses over a large insurance portfolio. The practical implications will need to be considered on a case-by-case basis.

What Next?

UCERF3 can now be used to evaluate seismic hazard and risk in California. In fact, it has already been used for the 2014 update of the U.S. Geological Survey National Seismic Hazard Maps (http://earthquake.usgs.gov/hazards/), which in turn are used in building codes. The California Earthquake Authority, which is required by law to use the best available science, will use UCERF3 to evaluate insurance premiums charged to customers, as well as their own level of reinsurance. UCERF3 will be used in many other risk mitigation

Tabulated values represent the likelihood of having one or more earthquakes in the next 30 years (starting from 2014).

[At the points on the fault indicated by white circles. M≥6.7 means magnitude greater than or equal to 6.7, and likewise for the other two magnitude thresholds. %, percent. Values listed in parentheses indicate the factor by which the likelihoods have increased, or decreased, relative to the previous model (UCERF2), where "--" means the previous value was zero. "Readiness" indicates the factor by which probabilities are currently elevated, or lower, because of the length of time since the previous large earthquake]

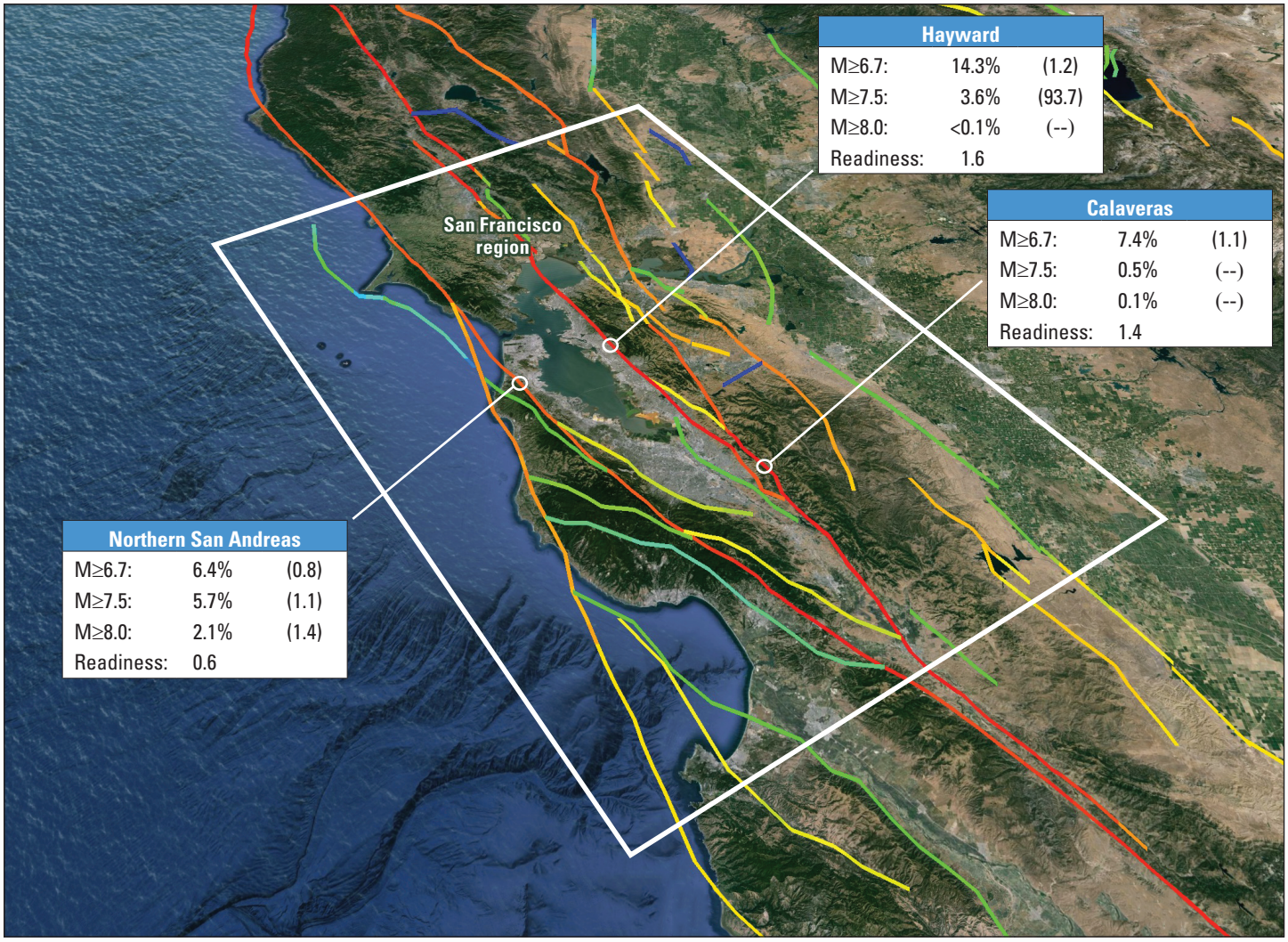

Figure 4. Likelihood of magnitude 6.7 or greater earthquakes in the next 30 years, from 2014, on the faults near San Francisco, Calif.

efforts in the years to come, including engineering design of buildings and lifelines, loss estimation for catastrophic bonds and other risk-linked securities, and emergency preparedness, all of which have the ultimate goal of increasing public safety and community resilience.

UCERF3 should also serve as a reminder that California is earthquake country, and residents should always be prepared. Simple safeguards include practicing "drop, cover, and hold on," securing items in your home and workplace that could fall during an earthquake, and storing seven-days worth of food and water. Homeowners can also consider structural retrofits, such as bolting the house to its foundation, as well as earthquake insurance options. For further guidance on how to prepare for, survive, and recover after big earthquakes, follow the Seven Steps to Earthquake Safety (http://www.earthquakecountry.org/sevensteps).

Although UCERF3 is a clear improvement over the previous model (UCERF2), it is still an approximation of the natural system. For example, it does not model the earthquake-triggering process that produces aftershocks, even though we know such events can be large and damaging. Through the National Earthquake Hazard Reduction Program (http://www.nehrp.gov), the U.S. Geological Survey and its partners will continue to conduct research aimed at improving our understanding of fault behavior and estimates of earthquake hazard in the future.

Tabulated values represent the likelihood of having one or more earthquakes in the next 30 years (starting from 2014).

[At the points on the fault indicated by white circles. M≥6.7 means magnitude greater than or equal to 6.7, and likewise for the other two magnitude thresholds. %, percent. Values listed in parentheses indicate the factor by which the likelihoods have increased, or decreased, relative to the previous model (UCERF2), where "--" means the previous value was zero. "Readiness" indicates the factor by which probabilities are currently elevated, or lower, because of the length of time since the previous large earthquake]

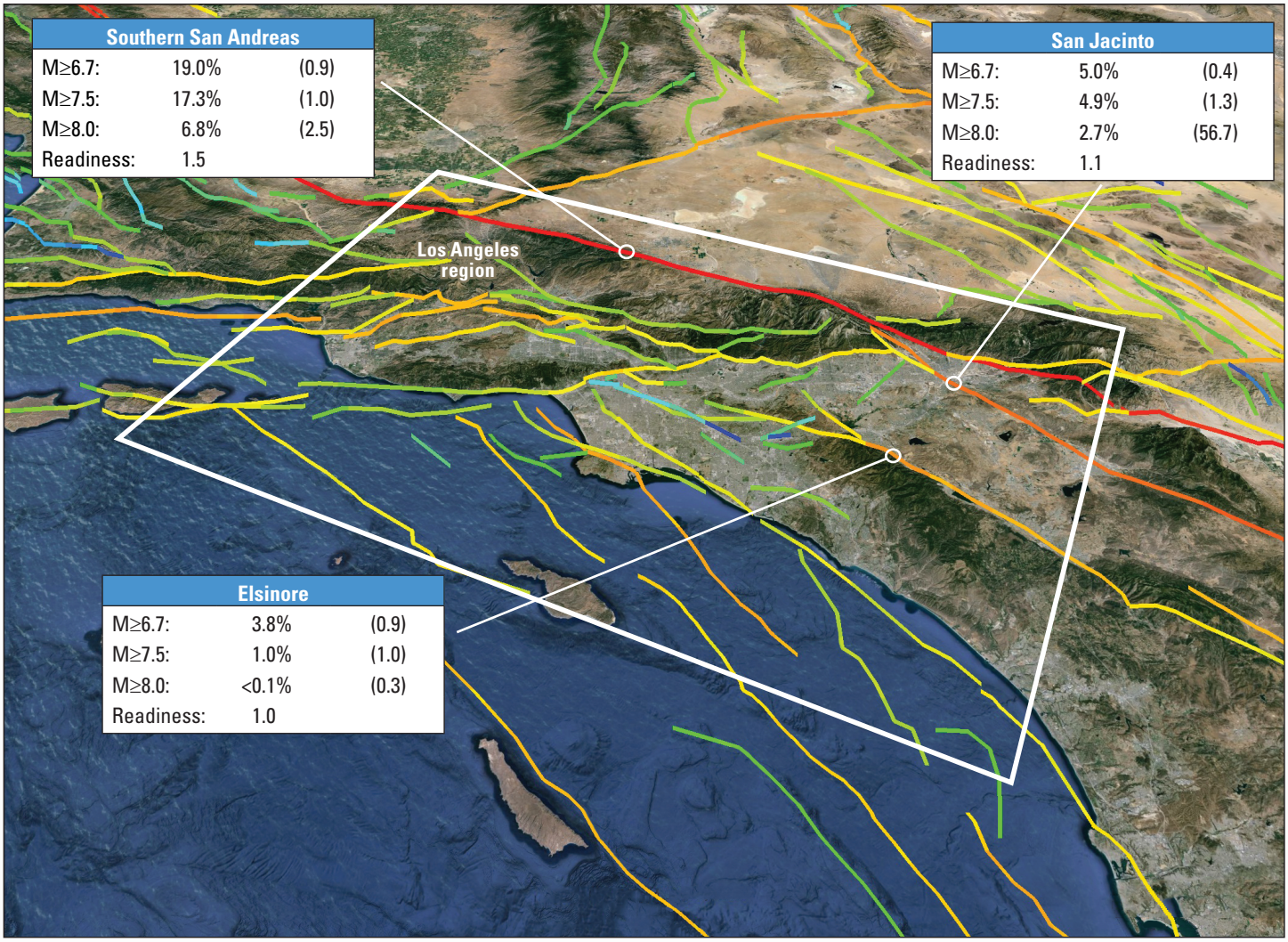

Figure 5. Likelihood of magnitude 6.7 or greater earthquakes in the next 30 years, from 2014, on the faults near Los Angeles, Calif.

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—*Authors: Edward H. Field and members of the 2014 WGCEP*

Cooperating organizations:
Southern California Earthquake Center (SCEC)
California Geological Survey (CGS)
California Earthquake Authority
U.S. Geological Survey

Additional Resources:

For general earthquake information contact:
1-888-ASK-USGS (1-888-275-8747)
http://earthquake.usgs.gov/
http://ask.usgs.gov
or
SCEC Education and Outreach: 213-740-3262

For UCERF3 information see:
http://www.WGCEP.org/UCERF3

For technical questions contact:
Edward (Ned) Field: field@usgs.gov

MEMORANDUM
GEOSPHERE CONSULTANTS, INC.
2001 Crow Canyon Road, Suite 100 Tel: (925) 314-7100
San Ramon, California 94583 Fax: (925) 855-7140

Geosphere Consultants, Inc.
AN ETS COMPANY
Geotechnical Engineering · Engineering Geology
Environmental Management · Water Resources

To:	Jeff White, AvalonBay Communities	Date:	May 17, 2013
From:	Corey T. Dare, PE, GE	Project No:	91-02935-A
Subject:	Progress Report Nady Property Development 6701 Shellmound Street Emeryville, California	Copies to:	Duane Carlson, AvalonBay Bryan Moore, AvalonBay

This memorandum presents our preliminary findings and recommendations resulting from our preliminary geotechnical study being performed for the Nady property located at 6701 Shellmound Street in Berkeley, California (Figure 1). The work was performed in accordance with our proposal dated October 9, 2012 and Addendum No. 1 dated April 16, 2013.

FIELD EXPLORATION PROGRAM

Three rotary wash borings were drilled on April 18 and 19, 2013 to depths of 60 (B-1), 40 (B-2) and 45 (B-3) feet at the approximate locations indicated on Figure 2. Boring logs are attached. Drill fluids and excess soil cuttings were stored in 55-gallon drums, and initial representative soil samples were tested for environmental contaminants. Drums awaiting removal following completion of additional landfill requested soil and liquid characterization testing and receipt of landfill acceptance for receiving spoils and drilling product (offhaul and acceptance by landfill handled by drilling subcontractor Woodward Drilling).

SUBSURFACE SOIL CONDITIONS

The general subsurface conditions encountered across the site in our test borings consisted of approximately 18' of non-engineered variable soil (primarily clayey gravel with some sand) and debris fill (placed in the late 1940s) overlying about 3 feet or less of overconsolidated, stiff Bay Mud. Some hydrocarbon or oil products were encountered within the fill zone and mixed into the drill fluid. Debris materials encountered within the fill included concrete, glass, metal, rubber and wood fragments. Native materials encountered below the Bay Mud below a depth of about 20 to 21 feet consisted of medium dense silty sand and/or stiff to very stiff lean clays to a depth of 30 feet, underlain by dense sands or stiff to very stiff lean clays to the depth explored of about 60 feet. Two of three borings encountered a dense silty sand layer between depths of about 30 feet and 37 feet (B-1) and 43 feet (B-3).

Older URS borings and Cone Penetration Tests (CPTs) encountered generally consistent soil conditions as encountered during the present field exploration. CPTs indicate a discontinuous dense sand layer may be present between 30 and 45 feet bgs, and that soils may be very dense below a depth of 60 – 70 feet at the eastern portion of the site.

GROUNDWATER CONDITIONS

Groundwater was encountered during Geosphere's current field exploration in the three borings at depths ranging between about 8 and 11 feet below ground surface (bgs). We understand that during concurrent environmental field exploration conducted at the site by Environ, the shallowest groundwater encountered in their borings was measured at 10.4 feet bgs.

Available recorded groundwater depth levels from groundwater well measurements taken by various investigators between 1989 and 1996 in relation to previous environmental studies conducted on in the vicinity of the subject property were reviewed. Measured groundwater depths taken from onsite wells installed by Subsurface Consultants between 1989 and 1993 ranged between 7.1 and 12.9 feet bgs. Two old wells (designated in the data as PES MW-5 and MW-7) at unknown locations believed to be somewhere within the nearby property to the south (1650 65th Street) showed shallowest GW levels at 5.2 and 5.4 feet bgs in measurements taken in May 1995.

GEOTECHNICAL DEVELOPMENT CONSIDERATIONS

1. Near-surface fill materials are not suitable for heavy foundation support without modification; heavy debris presence presents uncertainty in suitability and effectiveness of certain ground modification techniques of near-surface soils such as dynamic compaction, vibro-compaction, and grouting. The likely contaminated nature of the fill soils and desire to limit contaminated soil offhaul likely limits the use of non-displacement type improvement methods such as stone columns and Geopiers. However, use of displacement-type auger concrete or soil-cement columns to dissipate as well as transfer shallow foundation loads through the fill materials to stiffer underlying materials appear to be feasible options for further evaluation.

2. A significant thickness of compressible Bay Mud was not encountered below the fill layer. The mud layer encountered was up to about 3 feet thick. This site is just outside the edge of the pre-1940s bay shoreline and within the tidal zone; the thickness of overlying fill indicates the pre-development site elevation was on the order of +0 (sea level) or slightly lower.

3. Isolated liquefiable zones may be present in portions of the fill layer that are more granular in nature (difficult to assess due to the heterogeneity of the fill). No granular layers within the underlying native alluvial soils were encountered that would be considered to be significantly susceptible to liquefaction to an extent resulting in significant seismic surface settlement. A more complete evaluation can and would be made as a result of future CPTs needed to be performed for a design-level geotechnical study.

FOUNDATION FEASIBILITY EVALUATION

Shallow Foundations

1. Shallow, relatively heavily loaded footing foundations appear to be a feasible option for further study assuming footing loads can be dissipated and transferred below the fill and mud zones by use of "soil improvement" techniques below the footings. Augered displacement columns (e.g., Farrell Drill Displacement Columns) extending to stiff competent materials below the fill and Bay Mud layers have been locally used at similar projects, and are the subject of further cost evaluation. Using augered displacement columns, some spoils would be generated through excavations required for footing construction. Due to the desire to limit the volume of soil cuttings due to offhaul costs of environmentally-impacted material as well as aquifer cross contamination concerns, use of a non-displacement-type drilled pier foundation type such as Geopiers is not favored for this site.
2. Structural mat foundations are geotechnically feasible at this site, but would require some combination of reworking of the upper portion of the existing soils as engineered fill and constructing an imported engineered fill layer in order to provide a suitable subgrade for the foundation (typically three feet total thickness of engineered fill would be required). Mat foundations are typically more advantageous when a below or partially below-grade level is used for the project. Possible construction and design constraints to the use of below-grade mat foundations include the presence of a relatively shallow groundwater table and the desire to limit offhaul of existing potentially contaminated fill materials excavated to reach a below-grade subgrade level. For evaluation and preliminary design purposes, given the existing GW data discussed herein, a highest (shallow) groundwater depth could be assumed to be on the order of 5 to 6 feet below existing ground surface, pending revision if more site-specific measurements are eventually generated.

Deep Foundations

1. Precast, pre-stressed concrete displacement piles are suitable for this site from a geotechnical standpoint. Supporting capacity would be derived by frictional resistance between the sides of the pile and the surrounding soils primarily below a depth of 25 feet. Suitable capacities can be derived by using 14-inch square piles driven to a depth of at least 60 feet (calculated preliminary allowable load [FS=2] of 170 kips for a 60-foot long pile). Use of such piles will minimize the amount of construction spoils except for pile cap excavation. Noise and vibration considerations could be an issue with driven piles.
2. Drilled pier foundations are also suitable for this site from a geotechnical standpoint. Supporting capacity would also be derived by frictional resistance between the sides of the pier and the surrounding soils primarily below a depth of 25 feet. *Non-displacement* drilled piers are judged not to be feasible at this site due to the significant amount of soil spoils

generated as well as the potential for cross contamination of groundwater aquifers. Use of *displacement* type drilled piers such as APGD (Berkel) and Omega (Malcolm) would significantly decrease the amount of spoil generation as well as reduce the potential for aquifer cross contamination. Subsurface geotechnical data available and generated to date indicate that auger displacement piles (ADPs) are feasible at the site. Typical ADP diameters are 18, 24 and 30 inches. Based on preliminary engineering evaluation, use of an 18-inch diameter, 60-foot long ADP would derive on the order of 140 kips allowable load. Per foot cost of an 18" ADP ($40-60/lf installed) may be a little higher than cost of a 14" square pile. This option will also necessitate excavating for pile caps that would generate spoils. The greatest advantage of an ADP over comparable pre-stressed concrete pile is the minimization of noise and vibration concerns.

The results of our preliminary evaluation of foundation options have been previously discussed with AvalonBay personnel in conjunction with the development of preliminary comparative cost estimates for various foundation system options for the project. If you have any other questions regarding the contents of this memorandum, please contact me at (925) 314-7123, or by e-mail at cdare@geosphereinc.net.

Trammell Crow • Proposed Emeryville Residential Development

Statement of Hammett & Edison, Inc., Consulting Engineers

The firm of Hammett & Edison, Inc., Consulting Engineers, has been retained by Trammell Crow Residential to evaluate the impact on Radio Stations KFRC, 610 kHz, San Francisco, and KVTO, 1400 kHz, Berkeley, California from a new residential high-rise building proposed to be constructed near the intersection of Bay Street and Ashby Avenue in Emeryville, California.

Background

Trammell Crow Residential has proposed to construct a new high-rise residential building to be located on the southwest corner of the intersection of Ashby Avenue and Bay Street in Emeryville. The structure would be located about 150 meters south of the KFRC/KVTO tower from which both stations operate non-directionally at nominal powers of 5.0 kW and 1.0 kW, respectively. Trammell Crow has requested an analysis to determine the recommended maximum height of the building in order to minimize the impact on KFRC and KVTO. In addition, Trammell Crow has requested that the proposed construction be evaluated relative to radio frequency interference/radio frequency exposure and that mitigation measures, if required, be recommended.

Maximum Building Height

Figure 1 shows two building areas being considered for construction of the new residential structure. The northern area is the primary site under consideration, with the southern area being considered as an alternate or possibly an addition to the primary site. The effect of the proposed building was evaluated using the Numerical Electromagnetics Code (NEC), a program developed by Lawrence Livermore National Laboratory. Distances from the proposed building to the KFRC/KVTO tower were determined using aerial photographs and a building frame model was constructed in NEC. Building heights from one to twelve stories were modeled, assuming a height of 10 feet per story, and evaluated versus the 1400 kHz frequency of KVTO. KVTO is far more susceptible to interference from surrounding structures than KFRC due to the fact that the wavelength at 1400 kHz is less than half that at 610 kHz (703 feet versus 1613 feet). Therefore, and the effect of the proposed building on KVTO is the deciding factor in determining the recommended height of the residential high-rise.

Figure 2 provides a graph of the height of a building constructed covering all of Area 1 (from Figure 1), in stories, versus the maximum perturbation of the KVTO electromagnetic field signal. The percentage perturbation is given as absolute values, but in all cases represents the maximum null depth created by the introduction of the residential building, as compared to the desired circular azimuth pattern. As can be seen, the effects increase dramatically between seven and twelve stories. Several variations on this model were run with similar results. Two other models were also run assuming that

the new building would be located entirely on Area 2 and that the new building would cover all of Areas 1 and 2. The results for Area 2 are very close to those shown in Figure 2 for Area 1. When assuming a building encompassing both areas, however, the calculated perturbation of the KVTO pattern increases somewhat, with maximum value similar to what would be seen from either Area 1 or 2 from a building one more story in height.

Based upon this analysis, it is our recommendation that the proposed residential high-rise be built no higher than nine stories if the building is to be built to encompass *either* Areas 1 or 2. If the building is to be constructed on both Areas 1 and 2, however, it is recommended that the height be limited to eight stories.

Radio Frequency Exposure

The NEC model was also used to determine if electric or magnetic fields in excess of the FCC exposure limit applicable at AM frequencies were predicted to occur within the finished residential structure. The limits at the 610 kHz frequency of KFRC are 614 V/m for electric fields and 1.63 A/m for magnetic fields, with limits at the 1400 kHz frequency of KVTO of 588 V/m and 1.56 A/m. A summary of the FCC's exposure limits is shown in Figure 3. These limits apply for continuous exposures and are intended to provide a prudent margin of safety for all persons, regardless of age, gender, size, or health.

Based upon a grid model near field analysis, the maximum electric field due to the operation of both stations is calculated to be 254 V/m, occurring within four inches of several of the framing beams used in the model. The maximum cumulative magnetic field is calculated to be 1.5 A/m, again occurring within four inches of certain framing beams. It should be noted that good bonding practices, as well as the presence of other metallic materials in the vicinity of the beam, likely will serve to further reduce localized electromagnetic field levels.

Radio Frequency Interference

Throughout the proposed structure, even assuming attenuation due to the metal construction of the building, typical field levels may still range from 4 V/m, caused by the direct signal from the two stations, to 200 V/m, in extremely localized cases of re-radiation. As a result, interference to telephones, consumer electronics, and other electronic devices may occur, with residents along the north side of the building likely to experience the greatest effects. There are several techniques that can be employed to mitigate the interference. First, metal interfaces in the building frame construction, whether steel beams or rebar, should be well bonded to electrically "shorten" the individual elements. The building frame should also be grounded, though the use of ground rods, along the entire perimeter of the building, spaced at intervals not greater than 40 feet. Telephone and

power service feeds to the building should be undergrounded, with a well-bonded grounding system connected to the building ground. Building phone and power lines should be run in metal conduit, where practical, with phone lines consisting of shielded, twisted-pair wires. The shielding should be grounded only at the service end to prevent ground loops.

A further measure to reduce interference would be to screen the roof and north side of the building. Copper mesh or a similar material could be laid along the roof and the interior or exterior of the north wall and bonded to the building's steel structure. While this approach would not completely shield the structure from interference, it should provide for significant attenuation of the radio signals, and, therefore, significant reduction of interference within the building.

It is typically not possible to eliminate all cases of interference through mitigation measures during construction. Ongoing interference after the building is occupied can be dealt with on a case-by-case basis by the installation of filters or the replacement of susceptible devices.

Construction Issues

New construction in the vicinity of AM radio stations can present several problems not seen at typical construction sites that, nevertheless, are usually mitigable. In particular, cranes and concrete boom trucks can create very long re-radiating elements that present an RF shock hazard to workers on site. It is recommended that an occupational exposure guide be developed prior to the start of constructed that can be configured to address construction techniques planned for the site. Such a guide should include, but not be limited to, the following:

- Require the use non-conductive cable or hooks for cranes utilized at the site.
- Require ground straps at the working end of all concrete booms employed at the site.
- Require that protective, non-conductive gloves, such as lineman's gloves, protective glasses, and boots be utilized by workers when working with cranes, boom trucks, pile drivers, or any equipment of sufficient size to present an RF shock hazard.
- Require that all steel elements being raised by crane be grounded to the building structure prior to being contacted and placed by workers.

Conclusion

Provided that the high-rise residential structure proposed by Trammel Crow is limited to nine stories on Areas 1 or 2, or eight stories over both areas, it should not have a significant impact on the operation of Radio Stations KFRC and KVTO. Provided that bonding and grounding recommendations are followed, calculations indicate that the proposed structure will not present field

levels in excess of the FCC exposure limits applicable at AM frequencies in any accessible area. Re-radiation of the AM signals may present worker safety issues during construction and an occupation exposure guide is recommended to address potential site problems. Radio frequency interference is likely to be an issue within the proposed building, however mitigation measures during and after construction can be used to minimize this effect and solve most, if not all, cases of interference to within the structure.

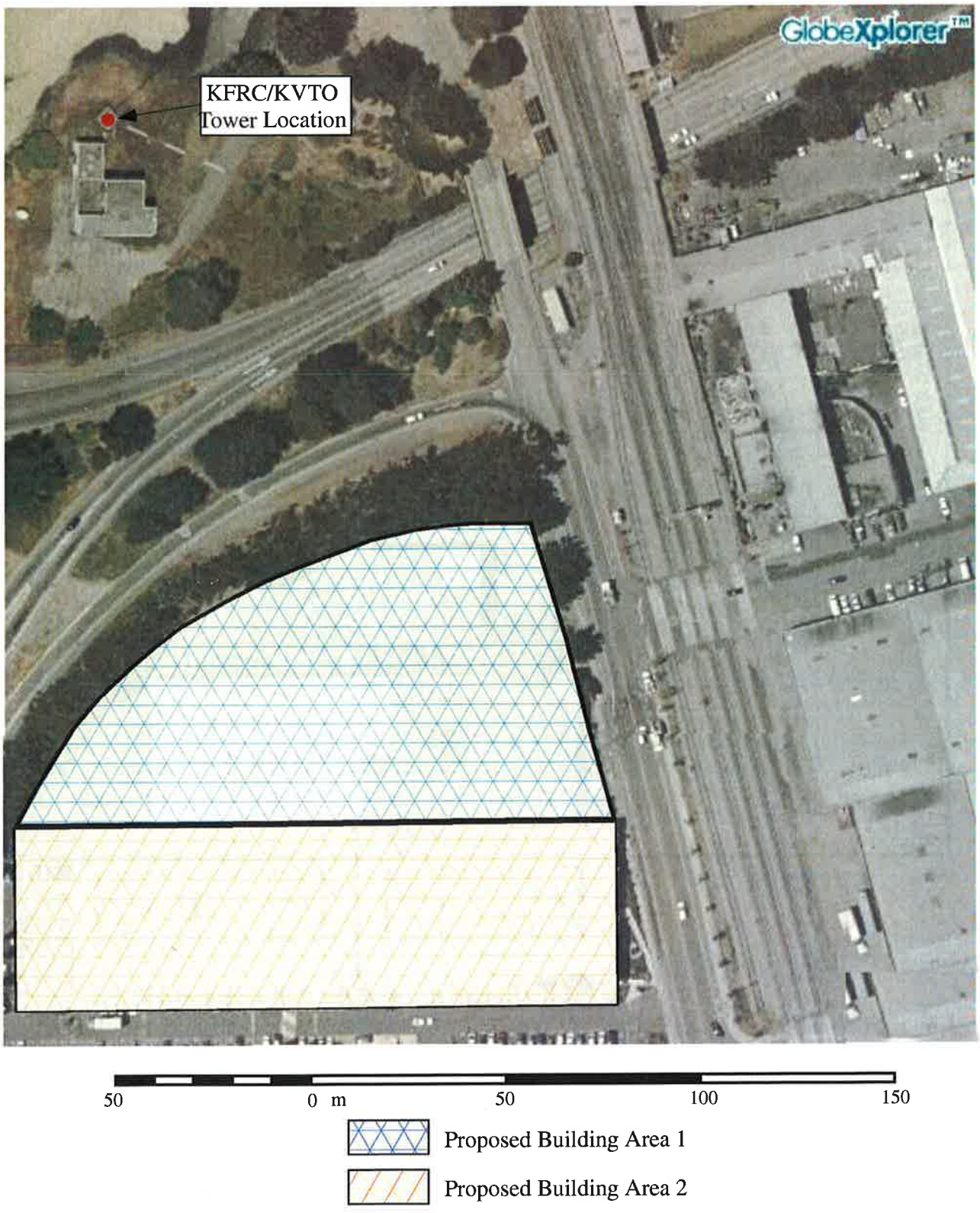


Mark D. Neumann, P.E.

August 15, 2005

Trammell Crow • Proposed Emeryville Residential Development

Building Envelopes For Proposed Structures

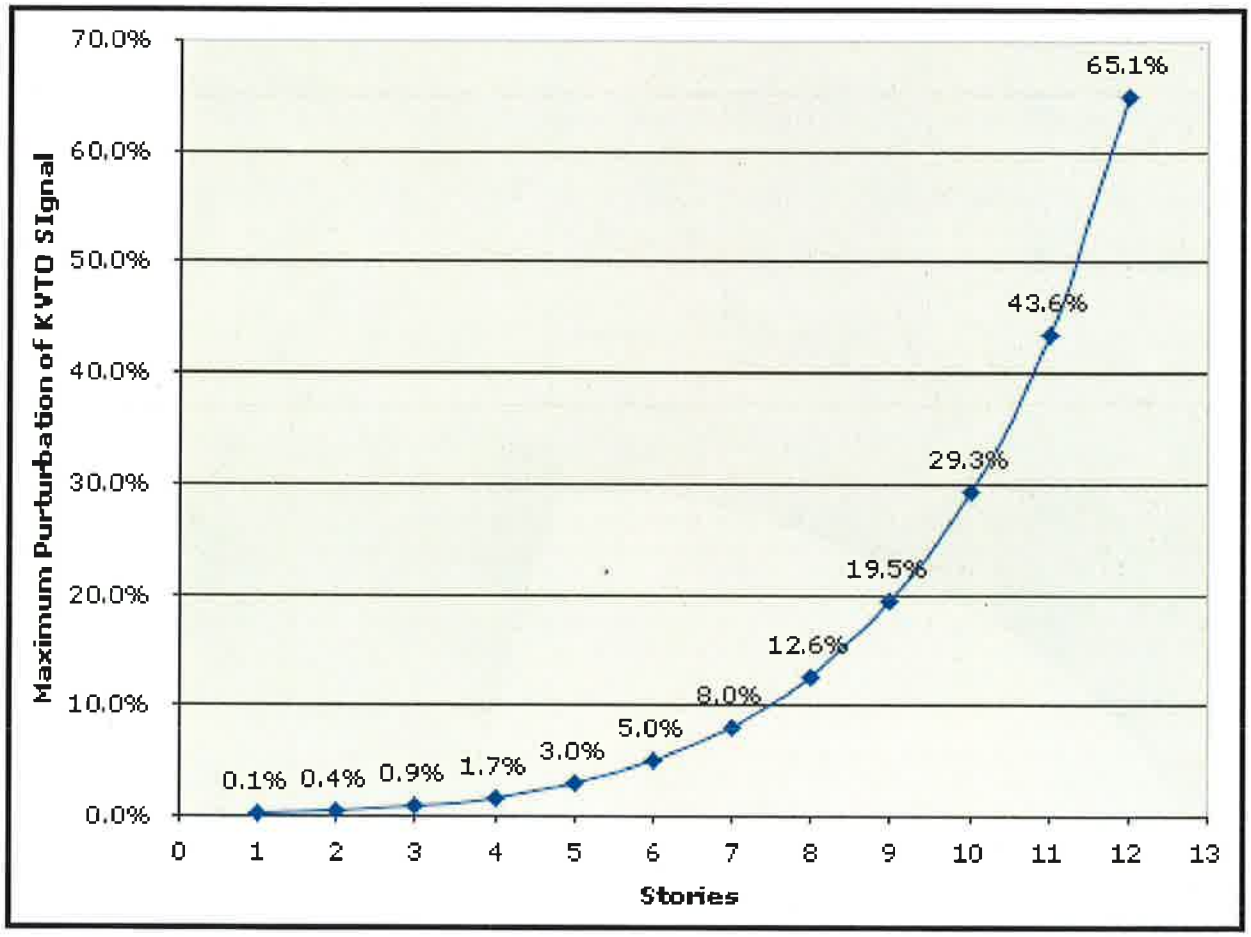


HAMMETT & EDISON, INC.
CONSULTING ENGINEERS
SAN FRANCISCO

050815
Figure 1

Trammell Crow • Proposed Emeryville Residential Development

Maximum Perturbation of Signal for
Radio Station KVTO, 1400 kHz, Berkeley, California
Versus Height of Proposed Building 1

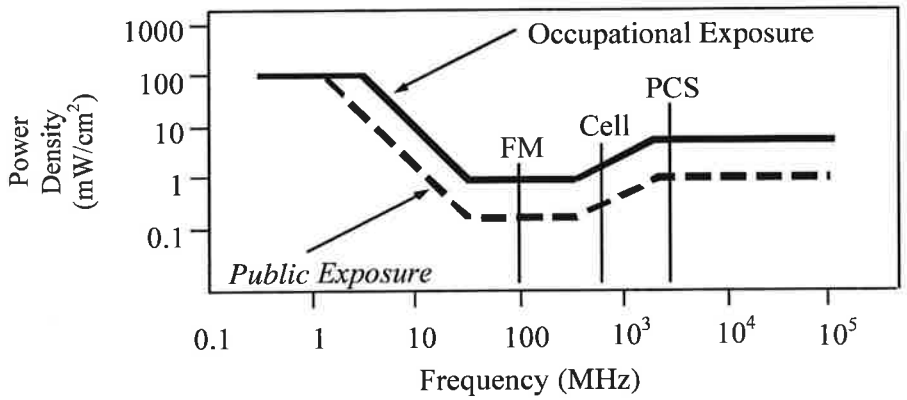


FCC Radio Frequency Protection Guide

The U.S. Congress required (1996 Telecom Act) the Federal Communications Commission ("FCC") to adopt a nationwide human exposure standard to ensure that its licensees do not, cumulatively, have a significant impact on the environment. The FCC adopted the limits from Report No. 86, "Biological Effects and Exposure Criteria for Radiofrequency Electromagnetic Fields," published in 1986 by the Congressionally chartered National Council on Radiation Protection and Measurements, which are nearly identical to the more recent Institute of Electrical and Electronics Engineers Standard C95.1-1999, "Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz." These limits apply for continuous exposures from all sources and are intended to provide a prudent margin of safety for all persons, regardless of age, gender, size, or health.

As shown in the table and chart below, separate limits apply for occupational and public exposure conditions, with the latter limits (in *italics* and/or dashed) up to five times more restrictive:

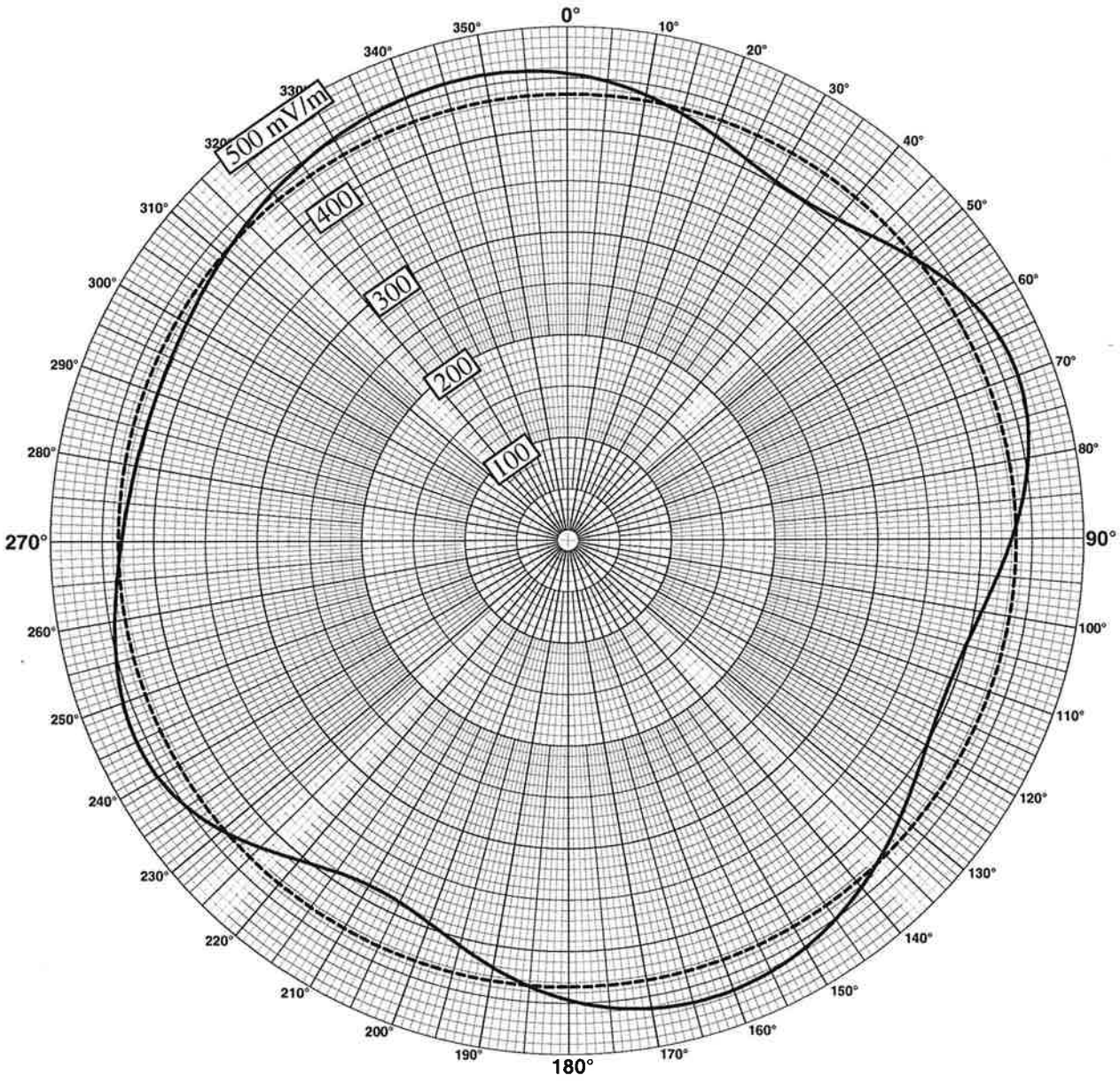
Frequency	Electromagnetic Fields (f is frequency of emission in MHz)					
Applicable Range (MHz)	Electric Field Strength (V/m)		Magnetic Field Strength (A/m)		Equivalent Far-Field Power Density (mW/cm^2)	
0.3 – 1.34	614	*614*	1.63	*1.63*	100	*100*
1.34 – 3.0	614	*823.8/f*	1.63	*2.19/f*	100	*180/f^2*
3.0 – 30	1842/ f	*823.8/f*	4.89/ f	*2.19/f*	900/ f^2	*180/f^2*
30 – 300	61.4	*27.5*	0.163	*0.0729*	1.0	*0.2*
300 – 1,500	$3.54\sqrt{f}$	*$1.59\sqrt{f}$*	$\sqrt{f}/106$	*$\sqrt{f}/238$*	f/300	*f/1500*
1,500 – 100,000	137	*61.4*	0.364	*0.163*	5.0	*1.0*



Higher levels are allowed for short periods of time, such that total exposure levels averaged over six or thirty minutes, for occupational or public settings, respectively, do not exceed the limits, and higher levels also are allowed for exposures to small areas, such that the spatially averaged levels do not exceed the limits. However, neither of these allowances is incorporated in the conservative calculation formulas in the FCC Office of Engineering and Technology Bulletin No. 65 (August 1997) for projecting field levels. Hammett & Edison has built those formulas into a proprietary program that calculates, at each location on an arbitrary rectangular grid, the total expected power density from any number of individual radio sources. The program allows for the description of buildings and uneven terrain, if required to obtain more accurate projections.

Trammell Crow Proposed Emeryville Residential Development

Perturbation of Azimuth Pattern for
Radio Station KVTO, 1400 kHz, Berkeley, California
Versus Eight Story Structure at Proposed Building Site 1
Inverse Field (mV/m@1 km)



KVTO Radiation with 8 Story Structure

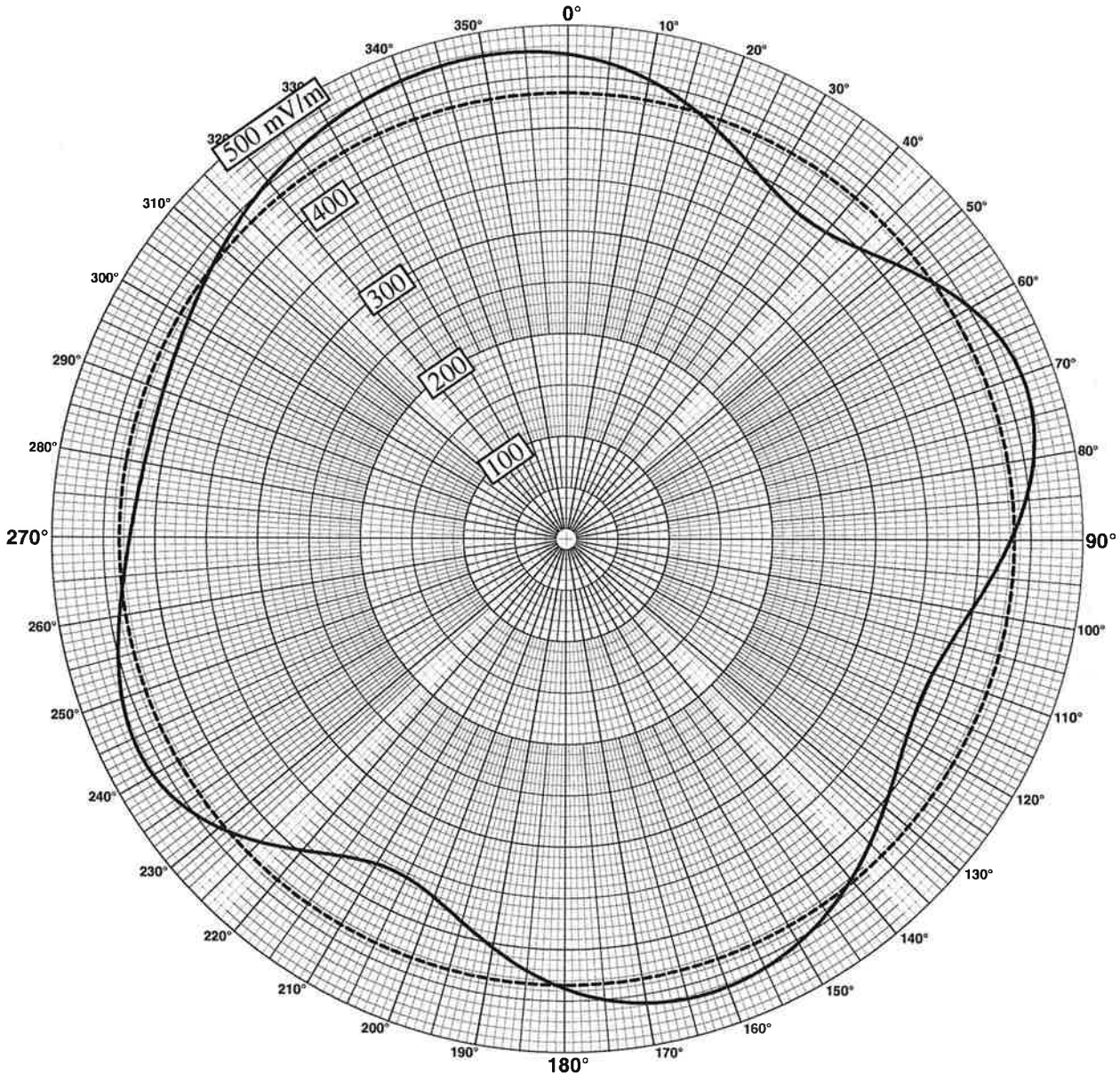
Reference Level (434.3 mV/m), KVTO Unattenuated Radiation

HAMMETT & EDISON, INC.
CONSULTING ENGINEERS
SAN FRANCISCO

September 6, 2005
Figure 1

Trammell Crow Proposed Emeryville Residential Development

Perturbation of Azimuth Pattern for Radio Station KVTO, 1400 kHz, Berkeley, California Versus Nine Story Structure at Proposed Building Site 1 Inverse Field (mV/m@1 km)

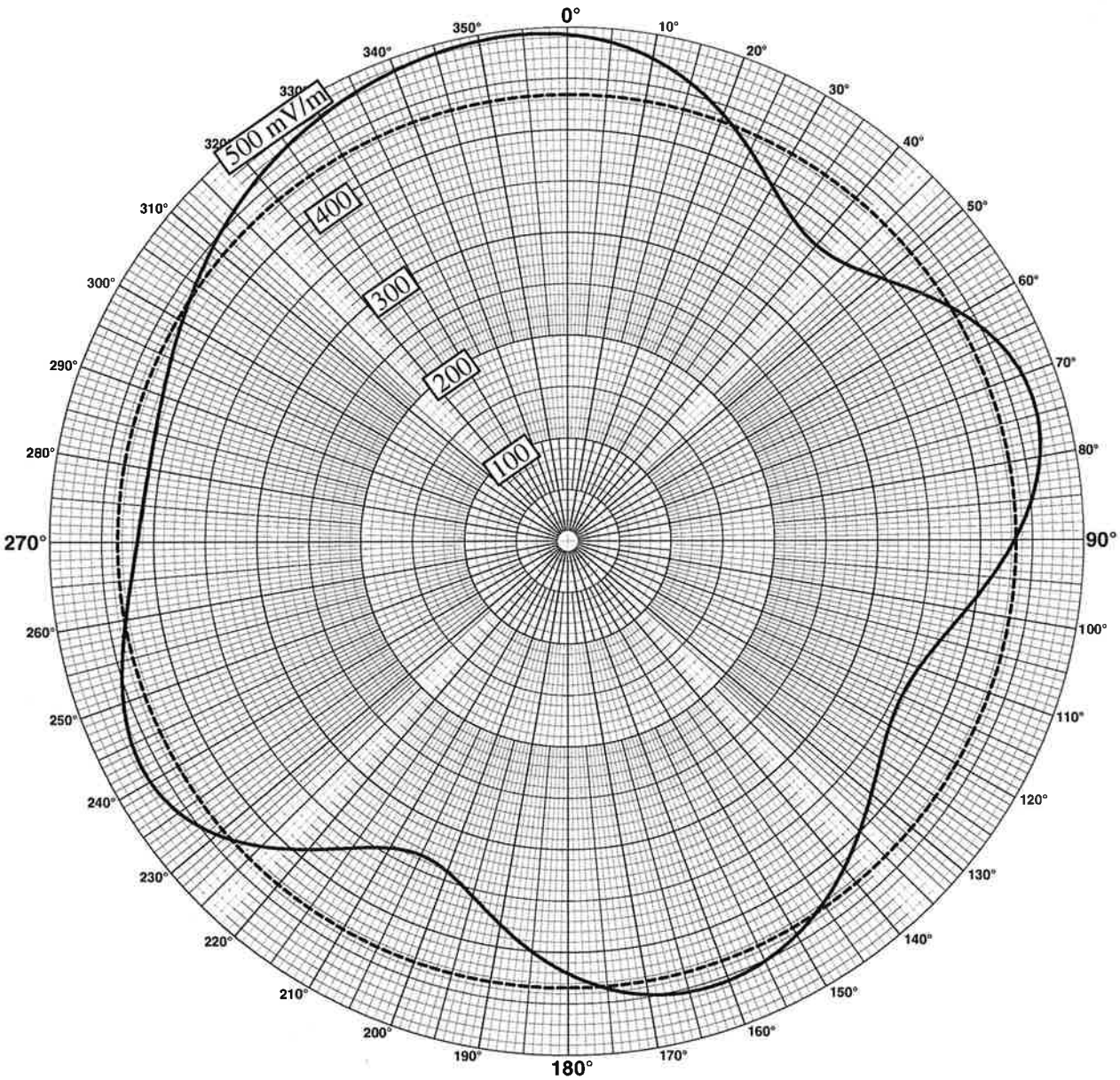


KVTO Radiation with 9 Story Structure

Reference Level (434.3 mV/m), KVTO Unattenuated Radiation

Trammell Crow Proposed Emeryville Residential Development

Perturbation of Azimuth Pattern for
Radio Station KVTO, 1400 kHz, Berkeley, California
Versus Ten Story Structure at Proposed Building Site 1
Inverse Field (mV/m@1 km)



KVTO Radiation with 10 Story Structure

Reference Level (434.3 mV/m), KVTO Unattenuated Radiation

2.2 Air Quality

This section evaluates the regional air quality impacts of implementing the proposed Plan. The analysis focuses on the following criteria pollutants: (1) ground-level ozone precursor emissions, for which the Bay Area is currently designated as a non-attainment area under the national and state standards, (2) particulate matter (PM) emissions, for which the Bay Area is currently designated as non-attainment under the national and state standards; and (3) carbon monoxide emissions, for which the Bay Area is designated as attainment under the national standard. It also evaluates criteria pollutants and Toxic Air Contaminants (TACs) from construction activity and local and regional emissions of TACs and fine particulate matter ($PM_{2.5}$).

This EIR examines these at a regional level. However, for TACs and $PM_{2.5}$ a localized analysis is provided to identify potential public health impacts from locating new sensitive receptors within Transit Priority Project (TPPs) areas. The EIR does not examine the effects on local or regional air quality from specific land use and transportation improvements in the proposed Plan.

The related issues of greenhouse gas emissions and potential climate change effects are addressed separately in *Chapter 2.5: Climate Change and Greenhouse Gases* of this EIR.

Environmental Setting

PHYSICAL SETTING

Air quality is affected by the rate, amount, and location of pollutant emissions, and the associated meteorological conditions that influence pollutant movement and dispersal. Atmospheric conditions, including wind speed, wind direction, and air temperature, in combination with local surface topography (i.e., geographic features such as mountains and valleys), determine the effect of air pollutant emissions on local and regional air quality.

Climate, Meteorology, and Topography

The Bay Area region has a Mediterranean climate characterized by wet winters and dry summers. Rainfall totals can vary widely over a short distance, with windward coastal mountain areas receiving over 40 inches of rain, while leeward areas receive about 15 inches. During rainy periods, horizontal and vertical air movement ensures rapid pollutant dispersal. Rain also washes out particulate and other pollutants.

Normally, air temperatures decrease with increasing elevations. Sometimes this normal pattern is inverted, with warmer air aloft, and cool air trapped near the earth's surface. This phenomenon occurs in all seasons. In summer, especially when wind speeds are very low, a strong inversion will trap air

emissions and high levels of ozone smog can occur. In winter, a strong inversion can trap emissions of particulate and carbon monoxide near the surface, resulting in unhealthful air quality.

The Bay Area topography is complex, consisting of coastal mountain ranges, inland valleys, and bays, which distort normal wind flow patterns. The Pacific Ocean bounds the area to the west with warmer inland valleys to the south and east. The only major break in California's Coast Range occurs at San Francisco Bay. The gap on the western side is called the Golden Gate, and on the eastern side, it is called the Carquinez Strait. These gaps allow air to pass between the Central Valley and the Pacific Ocean. The general region lies in the semi-permanent high-pressure zone of the eastern Pacific, resulting in a mild climate tempered by cool sea breezes with light average wind speeds. The usually mild climatological pattern is interrupted occasionally by periods of extremely hot weather, winter storms, and offshore winds.

Regional wind patterns vary from season to season. During the summer, winds flowing from the northwest are drawn inland through the Golden Gate and over the lower portions of the San Francisco Peninsula. Wind speeds may be strong locally in areas where air is channeled through a narrow opening, such as the Carquinez Strait, Golden Gate or the San Bruno Gap. In the winter, the region frequently experiences stormy conditions with moderate to strong winds, as well as periods of stagnation with very light winds. Winter stagnation episodes are characterized by nighttime drainage flows in coastal valleys. Drainage refers to the reversal of the usual daytime air-flow patterns; air moves from the Central Valley toward the coast.

Wind tends to move from areas of high-pressure to areas of low-pressure. In warmer months, this means that air currents move on-shore from the Pacific Ocean to inland areas. Pacific Ocean air receives emissions from numerous sources (anthropogenic and biogenic) as it comes onshore, and will then carry these pollutants to areas many miles away. Mountains and valleys often affect on-shore winds. This means that a wind pattern that started as northwesterly will often swing 90 degrees or more when it encounters topographic features.

The climatological pollution potential of an area is largely dependent on winds, atmospheric stability, solar radiation, and terrain. The combination of low wind speeds and a strong inversion produces the greatest concentration of air pollutants. On days without inversions, or on days of winds averaging over 15 miles per hour (mph), smog potential is greatly reduced. Because of wind patterns, and, to a lesser degree, the geographic location of emission sources, high ozone levels usually occur in inland valleys, such as the Livermore area. High particulate matter levels can occur in areas of intense motor vehicle use, such as freeways, ports, etc., and in most valley areas where residential wood smoke and other pollutants are trapped by inversions and stagnant air.

Existing Air Quality and Attainment Status Summary

The federal Clean Air Act requires the U.S. Environmental Protection Agency (EPA) to set National Ambient Air Quality Standards (NAAQS) (40 CFR part 5) for six pollutants considered harmful to public health and the environment. These six pollutants are ground-level ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), particulate matter (PM), and lead (Pb). EPA calls these pollutants "criteria" air pollutants because it regulates them by developing human health-based and/or environmentally-based criteria (science-based guidelines) for setting permissible levels.

Under amendments to the federal Clean Air Act, EPA has classified air basins or portions thereof, as either "attainment" or "nonattainment" for each criteria pollutant, based on whether or not the national standards have been achieved. The California Clean Air Act, patterned after the federal Clean Air Act, also designates areas as "attainment" or "nonattainment" for State standards. Thus, California has two sets of attainment/nonattainment designations: one with respect to national standards and one with respect to State standards.

Table 2.2-1 identifies the ambient air quality standards and attainment status for all criteria pollutants. The Bay Area is currently designated as a nonattainment area for State and federal ozone standards, the federal 24 hour $PM_{2.5}$ standard, and State PM_{10} standards. Based on the nonattainment status of these pollutants, this analysis is focused on ground-level ozone, particulate matter, and carbon monoxide.[1] **Table 2.2-2** presents a ten-year Bay Area air quality summary for days over the national and California standards for ozone, carbon monoxide, and particulate matter. Each of these criteria pollutants is discussed in more detail in the following pages.

[1] In April 1998, the Bay Area was re-designated to attainment for the national 8-hour carbon monoxide standard. However, the Bay Area must continue to demonstrate attainment of that standard. Because of this, the EIR evaluates the carbon monoxide impacts of the proposed Plan.

TABLE 2.2-1: BAY AREA AMBIENT AIR QUALITY STANDARDS AND ATTAINMENT STATUS AS OF 2012

Pollutant	*Averaging Time*	*California Standard[1,2]*	*Attainment Status for California Standard*	*Federal Primary Standard[1,3]*	*Attainment Status for Federal Standard*	*Major Pollutant Sources*
Ozone	8 hour	0.070 ppm	Non-Attainment	0.075 ppm	Non-Attainment	Motor vehicles, other mobile sources, combustion, industrial and commercial processes
	1 hour	0.09 ppm	Non-Attainment			
Carbon Monoxide (CO)	8 hour	9.0 ppm	Attainment	9 ppm	Attainment	Internal combustion engines, primarily gasoline-powered motor vehicles
	1 hour	20 ppm	Attainment	35 ppm	Attainment	
Nitrogen Dioxide (NO_2)	1 hour	0.18 ppm	Attainment	0.100 ppm	Unclassified	Emissions from cars, trucks, and buses
	Annual Arithmetic Mean	0.030 ppm	---	0.053 ppm	Attainment	
Sulfur Dioxide (SO_2)	24 Hour	0.04 ppm	Attainment	0.14 ppm	Attainment	Fossil fuel combustion at power plants and other industrial facilities, and burning of high sulfur containing fuels by locomotives, large ships, and non-road equipment
	1 Hour	0.25 ppm	Attainment	0.075 ppm	Attainment	
	Annual Arithmetic Mean	---	---	0.030 ppm	Attainment	
Particulate Matter (PM_{10})	24 Hour	50 µg/m^3	Non-Attainment	150 µg/m^3	Unclassified	Dust- and fume-producing industrial and agricultural operations, combustion, atmospheric photochemical reactions, and natural activities (e.g., wind-raised dust and ocean sprays)
	Annual Arithmetic Mean	20 µg/m^3	Non-Attainment	---	---	
Particulate Matter – Fine ($PM_{2.5}$)	24 Hour	---	---	35 µg/m^3	Non-Attainment	Same as above
	Annual Arithmetic Mean	12 µg/m^3	Non-Attainment	15 µg/m^3	Attainment	

TABLE 2.2-1: BAY AREA AMBIENT AIR QUALITY STANDARDS AND ATTAINMENT STATUS AS OF 2012

Pollutant	*Averaging Time*	*California Standard[1,2]*	*Attainment Status for California Standard*	*Federal Primary Standard[1,3]*	*Attainment Status for Federal Standard*	*Major Pollutant Sources*
Lead[4]	30 day Average	1.5 µg/m^3	---	---	Attainment	Fuels in on-road motor vehicles and industrial sources
	Calendar Quarter	---	---	1.5 µg/m^3	Attainment	
	Rolling 3 Month Average[5]	---	---	0.15 µg/m^3		

Notes:

1. PPM=parts per million; mg/m^3=milligrams per cubic meter; and µg/m^3=micrograms per cubic meter
2. California standards for ozone, CO (except Lake Tahoe), NO_2, SO_2, PM_{10}, $PM_{2.5}$, and visibility reducing particles are values not to be exceeded. All other are not to be equaled or exceeded.
3. National standards (other than ozone, PM, and those based on annual averages or annual arithmetic means) are not to be exceeded more than once a year. The ozone standard is attained when the fourth highest eight-hour concentration in a year, averaged over three years, is equal to or less than the standard. For PM_{10}, the 24-hour standard is attained when the expected number of days per calendar year with a 24-hour average concentration above 150 µg/m^3 is equal to or less than one. For $PM_{2.5}$, the 24-hour standard is attained when 98 percent of the daily concentrations, averaged over three years, are equal to or less than the standard.
4. The California Air Resources Board has identified lead and vinyl chloride as "toxic air contaminants" with no threshold level of exposure for adverse health effects determined. These actions allow for the implementation of control measures at levels below the ambient concentrations specified for these pollutants.
5. National lead standard, rolling 3-month average: final rule signed October 15, 2008.

Source: Bay Area Air Quality Management District, 2012; The California Air Resources Board 2011a.

TABLE 2.2-2: TEN-YEAR BAY AREA AIR QUALITY SUMMARY (2002-2011)

Days Over Standard for Ozone, Carbon Monoxide and Particulate Matter (PM)

	Ozone			*Carbon Monoxide*			*PM_{10}*		*$PM_{2.5}$*
	1-Hr	*8-Hr*		*1-Hr*	*8-Hr*		*24-Hr*		*24-Hr[2]*
Year	*Cal*	*Nat[1]*	*Cal*	*Nat*	*Cal*	*Nat/Cal*	*Nat*	*Cal*	*Nat*
2002	16	7	-	0	0	0	0	6	7
2003	19	7	-	0	0	0	0	6	0
2004	7	0	-	0	0	0	0	7	1
2005	9	1	9	0	0	0	0	6	0
2006	18	12	22	0	0	0	0	15	10
2007	4	1	9	0	0	0	0	4	14
2008	9	12	20	0	0	0	0	5	12
2009	11	8	13	0	0	0	0	1	11
2010	8	9	11	0	0	0	0	2	6
2011	-	4	10	0	0	0	0	4	8

Notes:

1. On May 17, 2008, the U.S. EPA implemented a more stringent national 8-hour ozone standard, revising it from 0.08 ppm to 0.075 ppm. Ozone exceedance days for 2008 reflect the new standard.
2. On December 17, 2006, the U.S. EPA implemented a more stringent national 24-hour $PM_{2.5}$ standard—revising it from 65 µg/m^3 to 35 µg/m^3. Starting in 2006, $PM_{2.5}$ exceedance days reflect the new standard.

Nat = National, Cal =California

Source: Bay Area Air Quality Management District, 2010.

Ozone

Ozone is a reactive pollutant, which is not emitted directly into the atmosphere, but is a secondary air pollutant produced in the atmosphere through a complex series of photochemical reactions involving reactive organic gases (ROG) and oxides of nitrogen (NO_x). ROG and NO_x are known as precursor compounds of ozone. Motor vehicle exhaust and industrial emissions, gasoline vapors, and chemical solvents are some of the major sources of ROG and NO_x that help to form ozone. Ozone is a regional air pollutant because it is formed downwind of sources of ROG and NO_x under the influence of wind and sunlight. During summertime (particularly on hot, sunny days with little or no wind), ozone levels are at their highest.

Short-term exposure to elevated concentrations of ozone is linked to such health effects as eye irritation and breathing difficulties. Repeated exposure to ozone can make people more susceptible to respiratory infections and aggravate pre-existing respiratory diseases. Long-term exposures to ozone can cause more serious respiratory illnesses. Ozone also damages trees and other natural vegetation, reduces agricultural productivity, and causes deterioration of building materials, surface coatings, rubber, plastic products and textiles.

Tables 2.2-3 and **2.2-4** show exceedances of the State one-hour ozone standard and national eight-hour ozone standard, respectively. The number of days the region experiences unhealthy ozone levels has fallen overall. This improvement is due to the California Air Resources Board (ARB) regulations affecting motor vehicle emissions and Bay Area Air Quality Management District (BAAQMD) regulations to reduce emissions from industrial and commercial sources.

TABLE 2.2-3: DAYS EXCEEDING THE CALIFORNIA 1-HOUR OZONE STANDARD (1998-2010)

Stations by Sub-Region	*1998*	*1999*	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*	*2008*	*2009*	*2010*
Northern													
Benicia	--	--	--	--	--	--	--	--	--	0	2	--	--
Napa	3	4	0	1	1	2	0	0	1	0	1	1	1
San Rafael	0	2	0	0	0	0	0	0	0	0	0	0	0
Santa Rosa	0	1	0	0	0	1	0	0	0	0	0	0	0
Vallejo	3	4	0	0	1	2	1	0	0	0	1	2	0
Central													
Hayward	4	4	1	2	0	3	0	0	2	0	1	4	--
Oakland	0	0	0	0	0	0	0	0	--	--	0	0	1
Redwood City	0	0	0	1	0	1	1	0	0	0	0	0	2
San Francisco	0	0	0	0	0	0	0	0	0	0	0	0	0
San Leandro	2	3	1	0	1	2	1	1	0	0	0	--	--
Richmond/San Pablo	0	1	0	0	0	0	1	0	0	0	0	0	1
Eastern													
Bethel Island	10	5	1	3	5	0	1	0	9	0	4	2	3
Concord	13	8	2	6	5	5	1	1	8	1	3	2	2
Fairfield	9	9	1	3	4	0	1	0	3	0	2	2	1
Livermore	21	14	7	9	10	10	5	6	13	2	5	8	3
Pittsburg	4	2	1	2	4	0	0	0	3	1	1	--	--
Southern													
Fremont	7	3	2	3	3	4	0	1	4	0	1	4	1
Los Gatos	5	4	0	2	4	7	0	3	7	0	2	3	2
Mountain View/ Sunnyvale	2	7	--	0	0	4	1	1	3	0	0	--	--
San José Central	4	3	0	2	--	4	0	1	5	0	1	0	5
San José East	5	2	1	0	0	2	0	1	--	--	--	--	--
Gilroy	10	3	--	3	6	6	0	0	4	0	1	1	0
San Martin	15	7	4	7	8	9	0	2	7	1	2	4	2

Source: Bay Area Air Quality Management District, 2010.

TABLE 2.2-4: DAYS EXCEEDING THE NATIONAL 8-HOUR OZONE STANDARD (1998-2010)

Stations by Sub-Region	*1998*	*1999*	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*	*2008*	*2009*	*2010*
Northern													
Benicia	--	--	--	--	--	--	--	--	--	0	--	--	--
Napa	1	1	0	0	0	0	0	0	0	0	2	1	2
San Rafael	0	0	0	0	0	0	0	0	0	0	0	0	0
Santa Rosa	0	0	0	0	0	0	0	0	0	0	0	0	0
Vallejo	0	1	0	0	0	0	0	0	0	0	0	0	1
Central													
Hayward	0	1	0	1	0	1	0	--	0	0	1	3	--
Oakland	0	0	0	0	0	0	0	0	--	--	0	0	0
Redwood City	0	0	0	0	0	0	0	0	0	0	0	0	1
San Francisco	0	0	0	0	0	0	0	0	0	0	0	0	0
San Leandro	0	0	0	0	0	0	0	0	0	0	--	--	--
Richmond/San Pablo	0	0	0	0	0	0	0	0	0	0	0	--	1
Eastern													
Bethel Island	5	5	1	2	3	0	0	0	1	0	4	3	4
Concord	6	6	1	1	3	1	0	0	4	0	6	2	1
Fairfield	3	4	0	0	0	0	0	0	1	0	1	2	2
Livermore	10	5	2	2	6	3	0	1	5	1	6	6	3
Pittsburg	1	1	0	1	2	0	0	0	1	0	1	--	--
Southern													
Fremont	0	1	0	0	0	1	0	0	0	0	1	0	1
Los Gatos	2	1	0	1	2	2	0	1	4	0	2	4	2
Mountain View/Sunnyvale	0	1	--	0	0	2	0	0	0	0	1	--	--
San José Central	1	0	0	0	--	0	0	0	1	0	2	0	3
San José East	0	0	0	0	0	0	0	0	--	--	--	--	--
Gilroy	4	0	--	2	2	2	0	0	2	0	1	2	5
San Martin	6	3	1	2	5	4	0	0	5	0	2	5	5

Source: Bay Area Air Quality Management District, 2010.

Carbon Monoxide

Carbon monoxide (CO) is an odorless and invisible gas. It is a non-reactive pollutant that is a product of incomplete combustion of gasoline in automobile engines. Carbon monoxide is a localized pollutant, and the highest concentrations are found near the source. Ambient carbon monoxide concentrations generally follow the spatial and temporal distributions of vehicular traffic and are influenced by wind speed and atmospheric mixing. Carbon monoxide concentrations are highest in flat areas on still winter nights, when temperature inversions trap the carbon monoxide near the ground. When inhaled at high

concentrations, carbon monoxide reduces the oxygen-carrying capacity of the blood, which, in turn, results in reduced oxygen reaching parts of the body. Most of the Bay Area's carbon monoxide comes from on-road motor vehicles, although a substantial amount also comes from burning wood in fireplaces. Over the past 10 years, the Bay Area has not experienced any exceedances of either the national or state carbon monoxide standard.

Particulate Matter

Particulate matter includes dirt, dust, soot, smoke and liquid droplets found in the air. Coarse particulate matter, or PM_{10}, refers to particles less than or equal to 10 microns in diameter (about one-seventh the diameter of a human hair). PM_{10} is primarily composed of large particles from sources such as road dust, residential wood burning, construction/demolition activities, and emissions from on- and off-road engines. Some sources of particulate matter, such as demolition and construction activities, are more local in nature, while others, such as vehicular traffic, have a more regional effect. Fine particulate matter, or $PM_{2.5}$, refers to particles less than or equal to 2.5 microns in diameter, and contains particles formed in the air from primary gaseous emissions. Examples include sulfates formed from SO_2 emissions from power plants and industrial facilities, nitrates formed from NO_x emissions from power plants, automobiles, and other combustion sources, and carbon formed from organic gas emissions from automobiles and industrial facilities.

The Bay Area experiences its highest particulate matter concentrations in the winter, especially during evening and night hours, due to the cool temperatures, low-wind speeds, low inversion layers, and high humidity. Specifically, $PM_{2.5}$ is viewed as a significant component of the region's total particulate matter problem because the $PM_{2.5}$ fraction of total particulate matter accounts for approximately 60 percent of the PM_{10} during the winter and approximately 45 percent during the rest of the year. On days when the PM standards are exceeded, $PM_{2.5}$ can account for as much as 90 percent of PM_{10}.

Coarse and fine particulate matters are small enough to get into the lungs and can cause numerous health problems, including respiratory conditions such as asthma and bronchitis, and heart and lung disease. People with heart or lung disease, the elderly, and children are at highest risk from exposure to particulate matter.

Toxic Air Contaminants

The California Health and Safety Code defines toxic air contaminants (TACs) as air pollutants that may cause or contribute to an increase in mortality or in serious illness, or that may pose a present or potential hazard to human health. TACs are less pervasive in the urban atmosphere than criteria air pollutants, but are linked to short-term (acute) or long-term (chronic and/or carcinogenic) adverse human health effects. For evaluation purposes, TACs are separated into carcinogens and non-carcinogens based on the nature of the physiological effects associated with exposure to TACs. Carcinogens are assumed to have no safe threshold below which health impacts would not occur. Cancer risk from carcinogens is expressed as excess cancer cases per one million exposed individuals, typically over a lifetime of exposure. Non-carcinogens differ in that there is a safe level in which it is generally assumed that no negative health impacts would occur. These levels are determined on a pollutant-by-pollutant basis.

There are many different types of TACs with varying degrees of toxicity. TACs may also exist as particulate matter or as vapors or gases. Sources of TACs include industrial processes, commercial operations (e.g., gasoline stations and dry cleaners), and motor vehicle exhaust—particularly diesel-

powered vehicles. Compared to other air toxics that ARB has identified and controlled, diesel particulate matter (diesel PM) emissions are estimated to be responsible for about 70 percent of the total ambient air toxics risk statewide.

The three most potent carcinogens come primarily from motor vehicles—diesel PM overall, and 1,3-butadiene and benzene as specific components of diesel PM. Cleaner motor vehicles and fuels are reducing the risks from these three priority toxic air pollutants. The remaining toxic air pollutants, such as hexavalent chromium and perchloroethylene, while not appearing to contribute as much to the overall risks, can present high risks to people living close to a source due to the highly localized concentration of TACs. ARB has control measures for motor vehicles, consumer products, and industrial source programs either already on the books, in development, or under evaluation for most TACs.

Health risks from diesel PM are highest in areas of concentrated emissions, such as near ports, rail yards, freeways, or warehouse distribution centers. According to the ARB, diesel engine emissions are responsible for the majority of California's known cancer risk from outdoor air pollutants. Those most vulnerable are children whose lungs are still developing and the elderly who may have other serious health problems. Based on numerous studies, ARB has also stated that diesel PM is a contributing factor for premature death from heart and/or lung diseases. In addition, diesel PM reduces visibility and is a strong absorber of solar radiation that contributes to global warming.[2]

According to the ARB, levels of toxic air pollutants have decreased significantly with the adoption of airborne toxic control measures, stringent vehicle standards, requirements for low emission vehicles, and cleaner fuels. Since 1980, there has been a statewide reduction of 98 percent in lead, and since 1990, there has been a statewide reduction of 85 percent in benzene 80 percent in 1,3-butadiene, 75 percent in hexavalent chromium, and 50 percent in diesel PM. The estimated cancer risk from TACs, measured statewide, has been reduced by 60 percent since 1990.[3]

To address community risk from air toxics, BAAQMD initiated the Community Air Risk Evaluation (CARE) program in 2004 to evaluate and reduce health risks associated with exposure to outdoor TACs. The program examines TAC emissions from point sources, area sources and on-road and off-road mobile sources co-located with sensitive populations to help focus mitigation strategies. In fiscal year 2012 alone, the BAAQMD allocated over $60 million to fund diesel emission reduction projects in CARE communities. Some of the projects funded included replacing or retrofitting on and off road heavy duty trucks; installation of shore side electric power at 11 berths at the Port of Oakland to reduce ship emissions; and to replace a locomotive operating at the rail yard in Richmond.

Based on annual emissions inventory of TACs prepared through the CARE program, TAC emissions from all sources in the Bay Area region were estimated to be 115 tons per day for 2005. The largest single source of daily average TAC emissions was on-road mobile sources, accounting for 38 percent. Diesel PM emissions constitute about 86 percent of cancer toxicity-weighted pollutants emitted in the region.

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[2] See ARB's fact sheet entitled "Health Effects of Diesel Exhaust Particulate Matter found at http://www.arb.ca.gov/research/diesel/dpm_draft_3-01-06.pdf.

[3] ARB, The California Almanac of Emissions and Air Quality, 2009 Edition.

The largest single sources of diesel PM in the Bay Area region include the Port of Oakland, refineries, and rail yards.

REGULATORY SETTING

Air quality is regulated at the federal, state, and regional levels. The following subsection summarizes the applicable air quality regulations and regulatory agencies.

Federal Regulations

Federal Clean Air Act

The federal Clean Air Act (CAA) of 1970, amended in 1977 and 1990 (42 USC 7506(c)), was enacted for the purposes of protecting and enhancing the nation's air resources to benefit public health. In 1971, the CAA required the EPA to set NAAQS to achieve the purposes of Section 109 of the act. The NAAQS require that certain pollutants should not exceed specified levels; areas that exceed the standard for specified pollutants are designated as "nonattainment" areas. In promulgating the NAAQs, the EPA allowed some states the option to develop stricter state standards. As such, California has adopted its own set of stricter standards under the California Clean Air Act (CCAA) of 1988 (described under State Regulations).

The federal CAA requires states to develop State Implementation Plans (SIPs) that outline how each state will control air pollution under the CAA. A SIP includes the regulations, programs and policies that a state will use to clean up polluted areas. States must hold public hearings and provide opportunities for the public and industries to be involved and comment on the development of each state plan. The Bay Area's latest SIP is the *2001 Ozone Attainment Plan*, which demonstrates how the region is addressing the national 1-hour ozone standard.

1990 Amendments to Clean Air Act

The 1990 Amendments to the CAA included a provision to address air toxics. Under Title III of the CAA, EPA establishes and enforces National Emission Standards for Hazardous Air Pollutants (NESHAPs), which are nationally uniform standards oriented towards controlling particular hazardous air pollutants (HAPs). Section 112(b) of the CAA identifies 189 "Air Toxics" (hazardous air pollutants), directs EPA to identify sources of the 189 pollutants, and establishes a 10-year time period for EPA to issue technology-based emissions standards for each source category. Title III of the CAA provides for a second phase under which EPA is to assess residual risk after the implementation of the first phase of standards and impose new standards, when appropriate, to protect public health.

Federal Transportation Conformity Requirements

Transportation conformity is required under the CAA section 176(c) to ensure that federally supported highway and transportation project activities are consistent with ("conform to") the purpose and requirements of the SIP. Conformity currently applies to areas that are designated nonattainment, and those re-designated to attainment after 1990 ("maintenance areas") for the following transportation-related criteria pollutants: ozone, $PM_{2.5}$ and PM_{10}, CO, and NO_x. Conformity, to the purpose of the SIP, means that transportation activities will not cause new air quality violations, worsen existing violations, or delay timely attainment of the relevant NAAQS. Conformity is demonstrated by showing that the total

air pollutant emissions projected for a RTP/SCS are within the emissions limits ("budgets") established by the SIP.

Conformity requires demonstration that transportation control measures (TCMs) in ozone nonattainment areas are implemented in a timely fashion. TCMs are expected to be given funding priority and to be implemented on schedule and, in the case of any delays, any obstacles to implementation have been or are being overcome. A total of 33 TCMs have been fully implemented since the 1982 Bay Area Air Quality Plan; 12 TCMs were originally listed in the 1982 Bay Area Air Quality Plan, 16 additional TCMs were adopted by MTC in February 1990 in response to a 1990 lawsuit in the federal District Court to bring the region back on the "Reasonable Further Progress" track, and five TCMs were adopted as part of the 2001 1-Hour Ozone Attainment Plan. These TCMs include strategies such as improved transit service and transit coordination, ridesharing services and new carpool lanes, signal timing, freeway incident management, and increased gas taxes and bridge tolls to encourage use of alternatives modes.

MTC must make a determination that the proposed Plan conforms to the SIP and is consistent with the applicable air quality attainment plans. The transportation conformity analysis and findings prepared by MTC for the proposed Plan are addressed in a separate process from the Plan Bay Area environmental review process, and are included as a Supplemental Report to Plan Bay Area that is available for review at www.onebayarea.org.

State Regulations

California Clean Air Act

The California Clean Air Act (CCAA) of 1988 requires nonattainment areas to achieve and maintain the state ambient air quality standards by the earliest practicable date and local air districts to develop plans for attaining the state ozone, carbon monoxide, sulfur dioxide, and nitrogen dioxide standards. The ARB sets the state ambient air quality standards.

Under the CCAA, areas not in compliance with the standard must prepare plans to reduce ozone. Non-compliance with the state ozone standard does not impact the ability to proceed with any transportation plan, program, or project. The first Bay Area Clean Air Plan (CAP) was adopted in 1991, and updates to the CAP have occurred since then, with the most recent being the *Bay Area 2010 Clean Air Plan*. The Bay Area 2010 CAP provides "all feasible measures" to reduce ozone in the Bay Area.

Senate Bill 656 (Chapter 738, Statues of 2003)

In 2003, the Legislature enacted Senate Bill (SB) 656 (Chapter 738, Statutes of 2003), codified as Health and Safety Code Section 39614, to reduce public exposure to PM_{10} and $PM_{2.5}$. SB 656 requires ARB, in consultation with local air pollution control and air quality management districts (air districts), to develop and adopt, by January 1, 2005, a list of the most readily available, feasible, and cost-effective control measures that could be employed by ARB and the air districts to reduce PM_{10} and $PM_{2.5}$ (collectively referred to as PM). The legislation establishes a process for achieving near-term reductions in PM throughout California ahead of federally required deadlines for $PM_{2.5}$, and provides new direction on PM reductions in those areas not subject to federal requirements for PM. Measures adopted as part of SB 656 will complement and support those required for federal $PM_{2.5}$ attainment plans, as well as for State ozone plans. This will ensure continuing focus on PM reduction and progress towards attaining California's more health protective standards. This list of air district control measures was adopted by the ARB on

November 18, 2004. ARB also developed a list of State PM control measures for mobile and stationary sources, including measures planned for adoption as part of ARB's Diesel Risk Reduction Plan. The lists are at the following web site: http://www.arb.ca.gov/pm/pmmeasures/pmmeasures.htm.

To comply with SB 656, BAAQMD reviewed the list of 103 potential PM control measures prepared by ARB and developed a Particulate Matter Implementation Schedule which was adopted by BAAQMD in November 2005.[4] As a result, the BAAQMD adopted or amended existing rules to reduce particulate matter from internal combustion engines, chain driven commercial broiling, and residential woodburning and expanded its public awareness program.

Toxic Air Contaminant Identification and Control Act of 1983

Under the Toxic Air Contaminant Identification and Control Act of 1983 (Assembly Bill (AB) 1807, Chapter 1047, Statues of 1983), the California Legislature created a two-step identification and risk management program to reduce the risk of health effects from air toxic substances. During the first step (identification), the ARB and the Office of Environmental Health Hazard Assessment (OEHHA) determines if a substance should be formally identified as a toxic air contaminant (TAC) in California. During the second step (risk management), the ARB reviews the emission sources of an identified TAC to determine if any regulatory action is necessary to reduce the risk. The analysis includes a review of controls already in place, the available technologies and associated costs for reducing emissions, and the associated risk. Conducting public outreach is essential during the development of a control plan and any control measure to ensure that the ARB efforts are cost-effective and appropriately balance public health protection and economic growth.

In 1993, AB 1807 was amended to include the identification and control of additional TACs. Specifically, AB 2728 required the ARB to identify the 189 federal hazardous air pollutants as TACs. For substances that have not previously been identified under AB 1807, but were subsequently identified under AB 2728, health effects values will need to be developed.

Assembly Bill 2588 Air Toxics "Hot Spots" Information and Assessment Act of 1987

In September 1987, the California Legislature established the Air Toxics "Hot Spots" Information and Assessment Act of 1987, Assembly Bill (AB) 2588 (Health and Safety Code Sections 44300-44394). It requires facilities to report their air toxics emissions, ascertain health risks, and to notify nearby residents of significant risks. The emissions inventory and risk assessment information from this program has been incorporated into this report. In September 1992, the "Hot Spots" Act was amended by Senate Bill 1731 which required facilities that pose a significant health risk to the community to reduce their risk through a risk management plan.

Diesel Risk Reduction Plan

In August 1998, the ARB identified particulate emissions from diesel-fueled engines (diesel PM) as toxic air contaminants, based on data linking diesel PM emissions to increased risks of lung cancer and respiratory disease. Following the identification process, the ARB was required by law to determine if

[4] http://www.baaqmd.gov/~/media/Files/Planning%20and%20Research/Particulate%20Matter/sb656_staff_report.ashx.

there is a need for further control, which led to creation of the Diesel Advisory Committee to assist in the development of a risk management guidance document and risk reduction plan. In September 2000, the ARB adopted the Diesel Risk Reduction Plan, which recommends control measures to reduce the risks associated with diesel PM and achieve a goal of 75 percent diesel PM reduction by 2010 and 85 percent by 2020.

Specific statewide regulations designed to further reduce diesel PM emissions from diesel-fueled engines and vehicles will be evaluated and developed. The goal of these regulations is to make diesel engines as clean as possible by establishing state-of-the-art technology requirements or emission standards to reduce diesel PM emissions.

California Health and Safety

Under the California Health and Safety Code, Division 26 (Air Resources), the ARB is authorized to adopt regulations to protect public health and the environment through the reduction of TACs and other air pollutants with adverse health effects. As such, the ARB has promulgated several mobile and stationary source airborne toxic control measures (ATCMs). For instance, effective as of July 2003, ARB approved an ATCM that limits school bus idling and idling at or near schools to only when necessary for safety or operational concerns (13 CCR Chapter 10 Section 2480). This ATCM is intended to reduce diesel PM and other TACs and air pollutants from heavy-duty motor vehicle exhaust. It applies to school buses, transit buses, school activity buses, youth buses, general public paratransit vehicles, and other commercial motor vehicles. This ATCM focuses on reducing public exposure to diesel PM and other TACs, particularly for children riding in and playing near school buses and other commercial motor vehicles, who are disproportionately exposed to pollutants from these sources. In addition, effective February 2005, the ARB approved an ATCM to limit the idling of diesel-fueled commercial motor vehicles with gross vehicular weight ratings of greater than 10,000 pounds, regardless of the state or country in which the vehicle is registered (13 CCR Chapter 10 Section 2485).

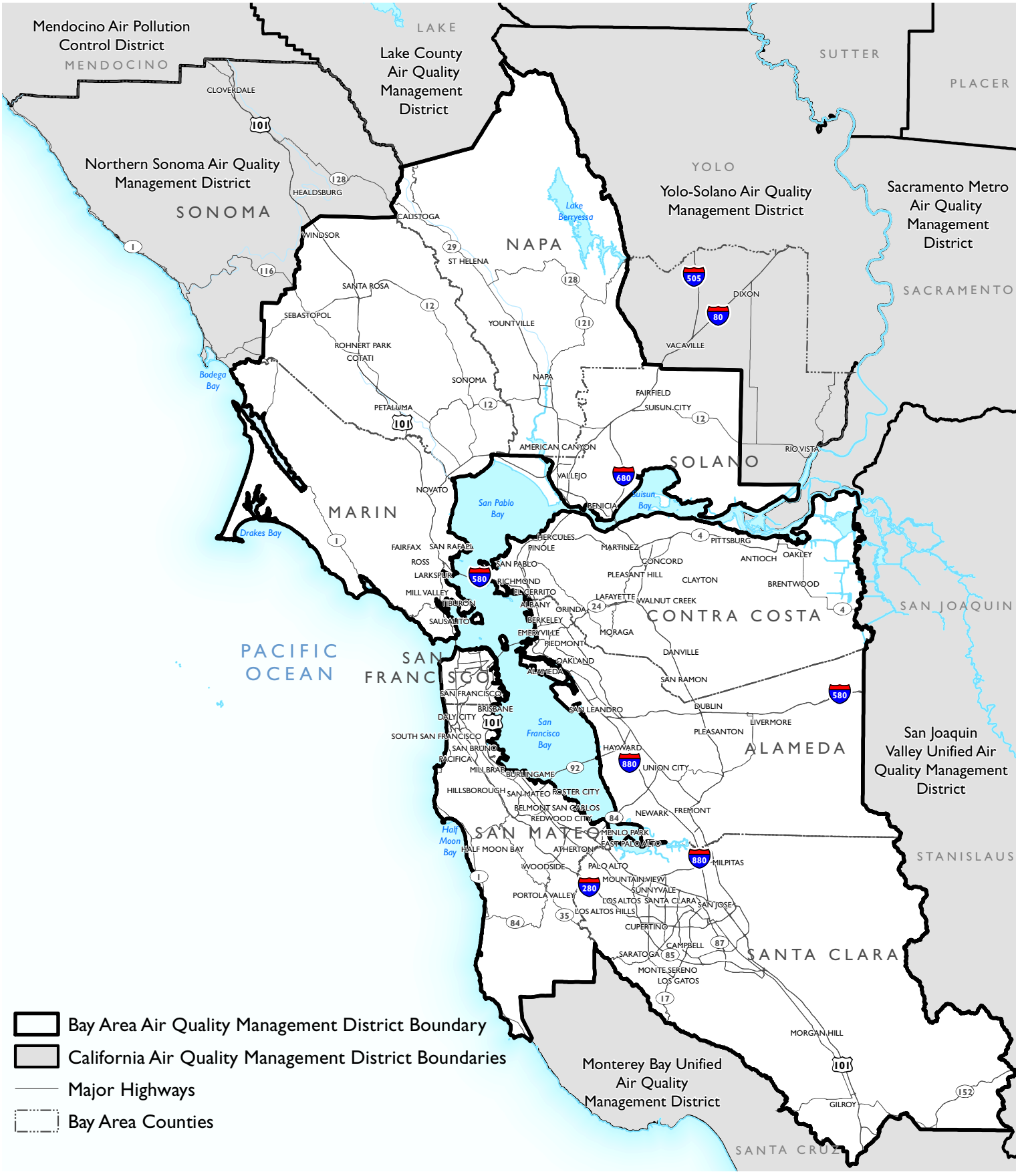
Regional Regulations

Air District Boundaries

The nine-county MTC region encompasses three air basins: the San Francisco Bay Air Basin in its entirety, portions of the North Coast Air Basin, and portions of the Sacramento Valley Air Basin. Northern Sonoma County is located within the North Coast Air Basin, and eastern Solano County is located within the Sacramento Valley Air Basin (the remaining areas not located within those air basins are located within the San Francisco Bay Air Basin). BAAQMD governs the San Francisco Bay Air District, the Northern Sonoma County Air Pollution Control District (NSCAPCD) governs the North Coast Air Basin, and the Yolo-Solano Air Pollution Control District (YSAPCD) governs the Sacramento Valley Air Basin. The geographic boundaries of these three air basins and air districts are shown in **Figure 2.2-1**. Each air pollution control district is responsible for attaining and maintaining air quality standards and undertakes a variety of activities, including: adopting and enforcing rules and regulations, issuing permits for stationary sources of air pollution, inspecting stationary sources of air pollution, responding to citizen inquiries and complaints, monitoring ambient air quality and meteorological conditions, administering incentives-based programs to reduce motor vehicle emissions, and conducting public education campaigns. In California, air pollution control districts generally follow county boundaries; in the more urban areas, county agencies were merged by State legislation into unified air quality management districts.

Figure 2.2-1

Air Basin Boundaries



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Impact Analysis

IMPACT SIGNIFICANCE CRITERIA

Implementation of the proposed Plan would have a potentially significant adverse impact if it would:

Criterion 1: Conflict with or obstruct implementation of an applicable air quality plan, including: (a) the primary goals; (b) applicable control measures; or (c) implementation of any control measures.

Criterion 2: Cause a substantial net increase in construction-related emissions.

Criterion 3: Cause a net increase of emissions of criteria pollutants from on-road mobile sources compared to existing conditions, including: (a) ROG, NO_x, CO, and $PM_{2.5}$; or (b) PM_{10}.

Criterion 4: Cause a cumulative net increase in emissions of diesel PM, 1,3-butadiene, and benzene (TACs) from on-road mobile sources compared to existing conditions.

Criterion 5: Cause a localized net increase in sensitive receptors located in Transit Priority Project (TPP) corridors where: (a) TACs or fine particulate matter ($PM_{2.5}$) concentrations result in a cancer risk greater than 100/million or a concentration of $PM_{2.5}$ greater than 0.8 $\mu g/m^3$ of $PM_{2.5}$; or (b) sensitive receptors are located within set distances (**Table 2.2-10**) to mobile or stationary sources of TAC or $PM_{2.5}$ emissions; or (c) TACs or fine particulate matter ($PM_{2.5}$) concentrations result in noncompliance with an adopted Community Risk Reduction Plan.

Criterion 6: Cause a localized larger increase or smaller decrease of TACs and or $PM_{2.5}$ emissions in disproportionally impacted communities compared to the remainder of the Bay Area communities.

METHOD OF ANALYSIS

Consistency with Air Quality Plans

The EIR includes a qualitative assessment to evaluate whether the proposed Plan's transportation investments and land development pattern will result in any inconsistencies with BAAQMD's 2010 Clean Air Plan (2010 CAP) or the 2001 State Implementation Plan (SIP) for ozone.

A more detailed analysis related to consistency with the 2001 SIP is addressed in the required federal transportation conformity analysis and findings prepared by MTC, which is being prepared separately from the environmental review process for Plan Bay Area, and will be included as a Supplemental Report to Plan Bay Area and can be found at www.onebayarea.org.

Construction-Related Emissions

Construction emissions can vary depending on the level of activity, the specific operations taking place, the equipment being operated, local soil conditions, weather conditions, and other factors. A qualitative

analysis of potential local and regional air quality impacts from construction activity associated with proposed Plan investments was conducted. The qualitative analysis is based on dispersion modeling that has been completed for representative construction projects. At the program level of analysis, it is not possible to quantify the amount of emissions expected from implementation of the transportation projects or land use development that would be consistent with the proposed Plan. However, the overall impact on local and regional air quality from any one project or all of the projects combined will be primarily dependent on the number of pieces and age of diesel powered equipment operating daily and the duration of their operation at the construction site or in the region. Should implementing agencies adopt feasible mitigation measures for each construction project resulting from the proposed Plan, impacts associated with construction activity on local and regional air quality will be less than significant. Therefore, this analysis identifies the measures, or best management practices (BMPs), that must be implemented for an individual construction project to have less than significant impacts.

Motor Vehicle Emissions

MTC's travel demand forecasting models produce forecasts of travel behavior and vehicle activity. These models have been extensively reviewed by federal and State agencies and refined in connection with their application to air quality analyses of various kinds. Key model outputs for use in air quality analyses include: total daily vehicle trips, vehicle miles of travel (VMT), and distribution of vehicle miles of travel by speed. This information was then used to determine total emissions from transportation activity in the Bay Area using motor vehicle emissions models developed and maintained by the ARB.

Table 2.2-5 provides the core 2040 travel activity data used to calculate regional motor vehicle emissions. Between 2010 and 2040, the Bay Area is projected to add about 2.1 million people (30 percent increase) and 1.1 million jobs (33 percent increase). Based on expected future growth, MTC and ABAG estimate that the total vehicles miles traveled will increase by 20 percent, which means that VMT is growing at a slower rate compared to population growth and job growth in the region. This can be attributed to the focused land use pattern and investment in transit and roadway projects in the proposed Plan.

TABLE 2.2-5: TRAVEL DATA

	2010	*2040 Plan*	*Change 2010 to 2040 Plan*	
			Numerical	*Percent*
Vehicles in Use	4,608,722	5,463,760	855,038	19%
Daily Vehicle Miles Traveled (VMT)	163,903,095	196,927,122	33,024,027	20%
Engine Starts	30,834,375	36,362,648	5,528,273	18%
Total Population	**7,091,000**	**9,196,000**	**2,105,000**	**30%**
Total Employment	**3,385,000**	**4,505,000**	**1,120,000**	**33%**

Source: Metropolitan Transportation Commission, 2012.

ARB's latest emissions inventory model that calculates emissions for motor vehicles operating on roads in California is EMFAC2011. Emission estimates of on-road vehicle emissions include consideration of the fleet mix (vehicle type, model year, and accumulated mileage); miles traveled; ambient temperatures; vehicle speeds; and vehicle emission factors, as developed from Smog Check data, Caltrans vehicle counts, and ARB testing programs. The model also incorporates the effects of recent diesel regulations including ARB's truck and bus rules; and greenhouse gas regulations including the Pavley Clean Car

Standard and the Low Carbon Fuel standard; however the newest national fuel standards for model year (MY) 2017 through 2025 light-duty motor vehicles are not included in EMFAC2011. EMFAC2011 has CO_2 controls for MYs 2009 through 2016 (Pavley Phase I) only. Because of this, and the ARB Advanced Clean Car Standards approved in 2012, it is anticipated that emissions in the future will be lower than those calculated by this current version of the EMFAC model (EMFAC2011).[5]

EMFAC2011 generates emission factors for all types of on-road vehicles under different ambient and driving conditions. ARB developed these factors based on thousands of emissions tests on both new and used vehicles recruited randomly from the California fleet. In the EMFAC2011 model, the emission rates were combined with vehicle activity data provided by regional transportation agencies (such as MTC) to calculate the regional emissions inventories.

Emission estimates for ROG, NO_X, CO and particulate matter (associated with engine exhaust and tire wear) are direct outputs from EMFAC2011. To obtain rough estimates of the amount of particulate matter generated by autos from roads (called "entrained dust"), regional VMT[6] was multiplied by the following (annual) factors: (1) 0.132 grams/mile entrained dust for $PM_{10,}$ and (2) 0.020 grams/mile entrained dust for $PM_{2.5}$.[7]

Toxic Air Contaminants (TACs)

TACs were evaluated on both a regional and local level. The regional analysis studies the impacts of the cumulative TAC emissions for the entire Bay Area; the local analysis studies the impacts of TAC emissions on corridors within TPPs and disproportionally impacted communities to provide a better understanding of localized health impacts. The methodologies for both the regional TACs and localized TACs analysis are described below.

Regional TACs

To calculate TACs from all on-road motor vehicles, MTC uses the CT-EMFAC model, a complementary model to EMFAC2011, which estimates diesel PM, benzene and 1,3-butadiene emissions in units of kilograms per day. The EMFAC2011 and CT-EMFAC emissions factors reflect travel speeds and vehicle types specific to each roadway link.

Local Pollutant Impact Analysis

The purpose of the local pollutant impact analysis is to assess potential localized health impacts to new sensitive receptors that could be located within TPP corridors based on the proposed Plan transportation investments and proposed Plan land use scenario. One of the primary objectives of SB 375 and the SCS is to locate more residential and commercial/retail development along existing transit corridors to reduce vehicle trips, vehicle miles traveled and mobile source air pollution. While this strategy can be beneficial

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[5] http://www.arb.ca.gov/msprog/consumer_info/advanced_clean_cars/consumer_acc.htm.

[6] Note that MTC upwardly adjusts the regional VMT forecasts from the MTC travel demand models to account for differences in VMT estimates produced by ARB and MTC using a protocol prescribed by ARB.

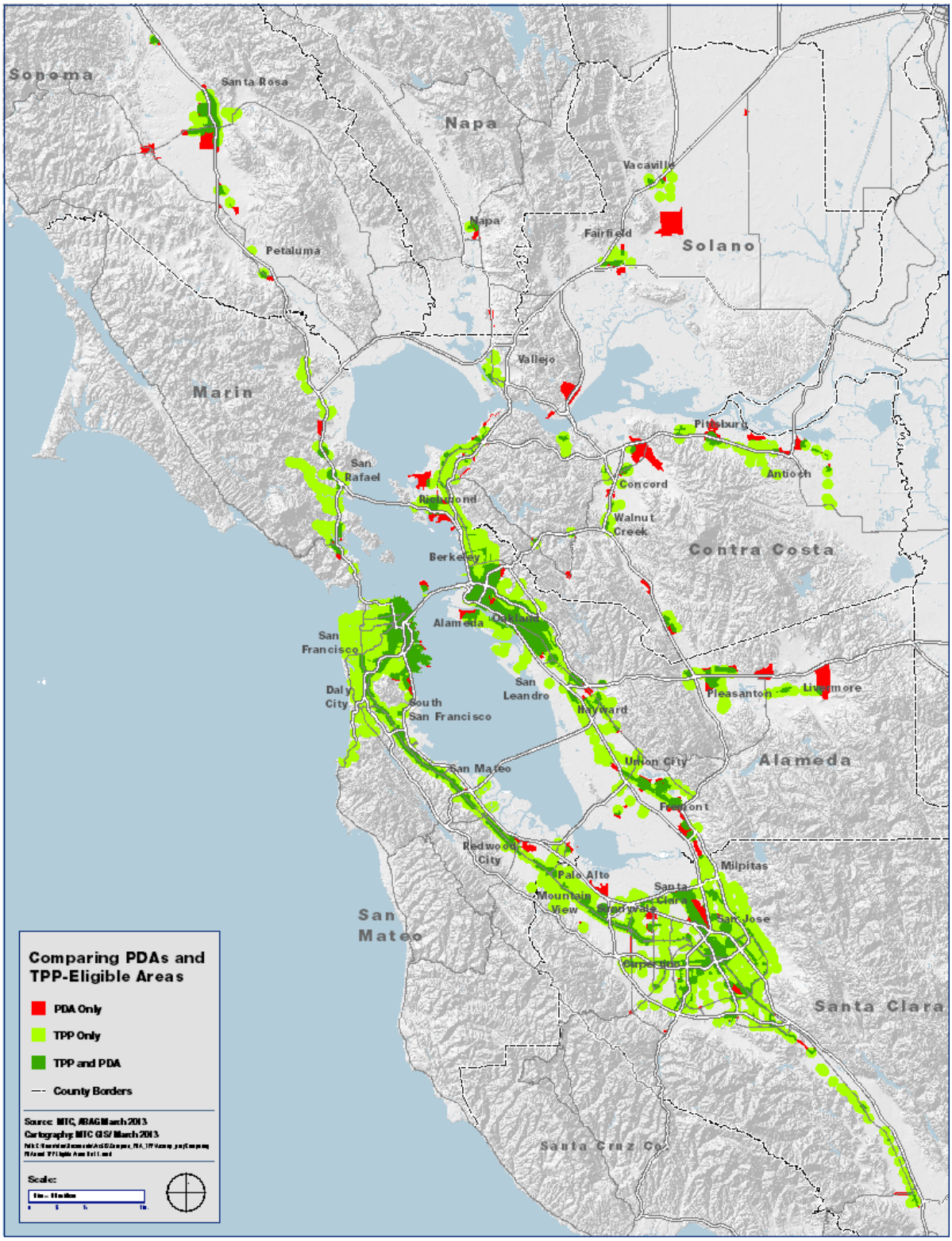
[7] California Air Resources Board, Miscellaneous Process Methodology 7.9 - Entrained Paved Road Travel, Paved Road Dust. Revised and Updated, July 2012

to air quality in general by reducing the amount of air pollution emitted into the atmosphere every day, serious adverse health impacts can result by locating sensitive receptors within close proximity to sources of TACs and $PM_{2.5}$. The urbanized areas along these transit corridors typically contain a wide range of air pollution sources including stationary and area sources (e.g., gas stations, manufacturing facilities, etc.) and mobile sources (e.g., cars, trucks, trains etc.) which generate TACs and $PM_{2.5}$ that can create localized health risks to residents and other sensitive receptors from prolonged exposure to elevated concentrations.

An analysis of TAC concentrations from stationary and mobile emission sources was conducted within TPP areas, which can include Priority Development Areas (PDAs). As shown in **Figure 2.2-2**, many PDAs (74 percent of PDA acreage) overlap with TPP areas. While PDAs were locally defined and used by MTC and ABAG to identify future growth areas in the proposed Plan, TPP areas are defined by SB 375 as areas within half a mile of a major transit stop or high quality transit corridor, amongst other criteria[8]. TPP corridors generally include existing neighborhoods served by transit, and contain a wide range of housing options along with jobs, schools, and amenities. Under SB 375, certain residential or mixed use residential projects and projects located within TPP corridors that meet defined criteria may be eligible for CEQA streamlining. The local pollutant impact analysis focuses on impacts within TPP areas, rather than in PDAs, to more closely mirror SB 375 and to more closely reflect data and modeling prepared by BAAQMD and used in the local pollutant impact analysis. Implementing agencies can utilize the analysis for certain CEQA streamlining purposes, as appropriate.

[8] More information on TPP areas can be found here: http://opr.ca.gov/docs/SB375-Intro-Charts.pdf.

Figure 2.2-2: Priority Development Areas and Transit Priority Projects Corridors



Under the proposed Plan land use scenario, it is anticipated that TPP corridors will absorb a majority of the approximately 700,000 new households and 1.1 million new jobs expected in the Bay Area by 2040. The majority of the housing growth and job growth is expected to occur around the Bay Area's core transit network (e.g., BART, Caltrain, etc.) in San Francisco, Alameda, San Mateo, and Santa Clara counties. With more limited transit access, the North Bay counties of Marin, Napa, Sonoma, and Solano are expected to take on a much smaller share of regional growth.

Using emissions data from BAAQMD, stationary and mobile emission sources were estimated through dispersion modeling for highways and rail lines. For the cities of San Francisco and San José, BAAQMD is assisting with the preparation of Community Risk Reduction Plans (CRRPs) to address TACs and $PM_{2.5}$. To identify the potential for adverse health effects to occur if sensitive receptors were located within TPPs, BAAQMD evaluated TPP corridors to identify areas that may be exposed to existing sources of TACs and $PM_{2.5}$ that would exceed impact significance Criterion 5. BAAQMD used its extensive stationary source database to estimate cancer risk and particulate matter concentrations around these stationary sources. The cancer risk and $PM_{2.5}$ concentrations for stationary sources were calculated using health effect values adopted by the Office of Environmental health Hazard Assessment (OEHHA); health protective assumptions relating to the extent of an individual's exposure (a 70-year exposure duration was used) including age sensitivity factors; and a conservative modeling procedure (using the EPA SCREEN 3 model) that established how TACs are dispersed in the atmosphere.[9] For a few of the stationary sources, BAAQMD staff had conducted a site-specific health risk assessment as part of a separate permit process. The cancer risk and $PM_{2.5}$ concentrations from these health risk assessments are also included in the database.

BAAQMD estimated cancer risk and $PM_{2.5}$ concentration data for mobile sources located in and within 1,000 feet of TPP areas. Mobile sources include freeways, roadways with over 30,000 annual average daily trips (AADT), and railroads. Mobile source TAC and $PM_{2.5}$ emissions from Bay Area highways were calculated through modeling using CALINE3, developed by the California Department of Transportation. The dispersion modeling applied EMFAC2011 emission factors from ARB and daily vehicle activity profiles by highway link provided by Caltrans and MTC. BAAQMD meteorological data were used for each County within the Bay Area. A similar analysis was conducted to estimate TAC and $PM_{2.5}$ emissions from the Bay Area's railroad network (further described below).

A geospatial analysis was conducted using GIS software to evaluate potential increased cancer risks and/or $PM_{2.5}$ concentrations due to TAC and/or $PM_{2.5}$ emissions from mobile and stationary sources in TPP areas. The geospatial analysis was executed using BAAQMD's estimated health risk data on stationary and mobile sources of TAC's and $PM_{2.5}$. The geospatial analysis identifies areas where the cumulative cancer risks and/or $PM_{2.5}$ concentrations exceed MTC's air quality significance thresholds using a spatial additive process. The spatial additive process involves three data sets: a regularized raster dataset[10] representing the spatial extent of the TPP areas, to which all pollution values associated with the

[9] Except for gas stations, where EPA's AERMOD atmospheric dispersion model was used instead.

[10] Raster data consists of a matrix of cells (or pixels) organized into rows and columns (a grid) where each cell contains a value representing information, such as temperature (or, in this case, health risk data). Source: Esri.com.

stationary and mobile sources are added; raster datasets representing the TAC and/or $PM_{2.5}$ plumes associated with each stationary sources that were decayed to a specified distance (discussed in greater detail in Appendix E); and raster datasets representing TAC emissions and/or $PM_{2.5}$ concentrations generated by mobile sources. Appendix E contains a more detailed description of the GIS model methodology.

The following subsections describe the emission sources included in the local pollutant analysis and how health risks from each source were estimated.

Highways

Highways include all freeways, highways, and state routes that run through a TPP corridor. Cancer risk and $PM_{2.5}$ concentrations were derived for highways using BAAQMD's Highway Screening Analysis Tool. The data in the tool is based on dispersion modeling conducted by BAAQMD for every highway in the Bay Area.

High Traffic Roadways

This source includes all roadways with over 30,000 vehicles per day that run through a TPP corridor. Cancer risk and $PM_{2.5}$ concentrations were estimated using BAAQMD's Roadway Screening Analysis Tool. BAAQMD developed county-specific roadway screening tables based on annual average daily vehicle trips on roadways.

Railroads

Railroad sources include all rail lines and rail stations in TPP corridors. BAAQMD prepared screening tables for Amtrak, Caltrain, SMART rail, ACE, and freight rail. The screening tables are based on dispersion modeling.

Ferry Terminals

Ferry Terminals include commuter ferry stations located in TPP corridors. BAAQMD prepared general screening data for ferry terminals by county.

Large Mobile Sources

This source includes ports, railyards, distribution centers, refineries, and chrome platters located within or in close proximity to TPP corridors. Appropriate distances from large sources identified in the impact assessment (**Table 2.2-11**) are based on BAAQMD emission data, health studies, and ARB recommendations.

Stationary Sources

Stationary sources include sources permitted by BAAQMD such as refineries, gas stations, back-up generators, auto body shops, etc. Cancer risk and $PM_{2.5}$ concentrations are estimated using BAAQMD's Stationary Source Screening Analysis Tool.

The TAC analysis also analyzed exposure to impacted communities within the entire region. Using MTC roadway modeling information, all freeway links within impacted communities were evaluated to determine if there will be a localized increase or decrease in TACs associated with the implementation of the proposed Plan. These levels were compared to a "no net increase" threshold.

Regional Pollutant Analysis of Toxic Air Contaminants and $PM_{2.5}$ in Disproportionally Impacted Communities

There are numerous locations within the Bay Area where concentrations of TACs and fine particulate matter ($PM_{2.5}$) are substantially higher than other areas. These areas tend to be along major transportation and goods movement corridors. These areas also often include communities that are more vulnerable to the effects of air pollution, due to age of residents (youth and seniors), higher rates of adverse health outcomes, or low household income. The effects of the proposed transportation projects and land use scenario are evaluated to determine if TAC and $PM_{2.5}$ emissions will increase or decrease in these disproportionally impacted communities compared to other communities. For the purpose of this analysis, disproportionally impacted communities were identified through BAAQMD's Community Air Risk Evaluation Program.

CARE Communities

BAAQMD's Community Air Risk Evaluation Program (CARE) was initiated in 2004 to identify areas with elevated concentrations of, and public exposure to, TACs. The CARE program is examining population exposure to elevated concentrations of $PM_{2.5}$ and other pollutants as additional criteria for identifying areas that are disproportionally impacted. The intent of the CARE program is to estimate the potential increased health risks associated with exposure to TACs and $PM_{2.5}$ from stationary and mobile sources, to identify the primary sources causing this disproportionate impact, and to develop risk reduction strategies to reduce public exposure and therefore public health risks.[11]

CARE communities are defined as areas that (1) are close to or within areas of high TAC and $PM_{2.5}$ emissions; (2) contain sensitive populations, defined as youth and seniors; and (3) where over 40 percent of the population has income levels below the federal poverty level. Six CARE communities have been identified to date: Concord, eastern San Francisco, western Alameda County, Redwood City/East Palo Alto, Richmond/San Pablo, and San José. In general, these communities are adjacent to major arterials, roadways, freeways and ports. The counties of Marin, Napa, Solano, and Sonoma are not evaluated in this impact discussion since they do not contain any CARE communities.

The six CARE communities overlap with most of the MTC's Communities of Concern (COC)—which are low income and minority communities defined by MTC as experiencing potential transportation accessibility disparities.[12] MTC's evaluation of the proposed Plan's transportation investments on COCs will be addressed in the Plan Bay Area Equity Analysis, prepared as a Supplemental Report and available at www.onebayarea.org. The analysis in this EIR focuses on potential impacts in CARE communities alone because these areas have been identified as those with the highest existing emissions of TACs and $PM_{2.5}$ and are currently disproportionately impacted when compared to other communities in the Bay Area.

Figure 2.2-3 below highlights the region's six CARE communities and demonstrates how the CARE communities overlap with the majority of MTC's COCs.

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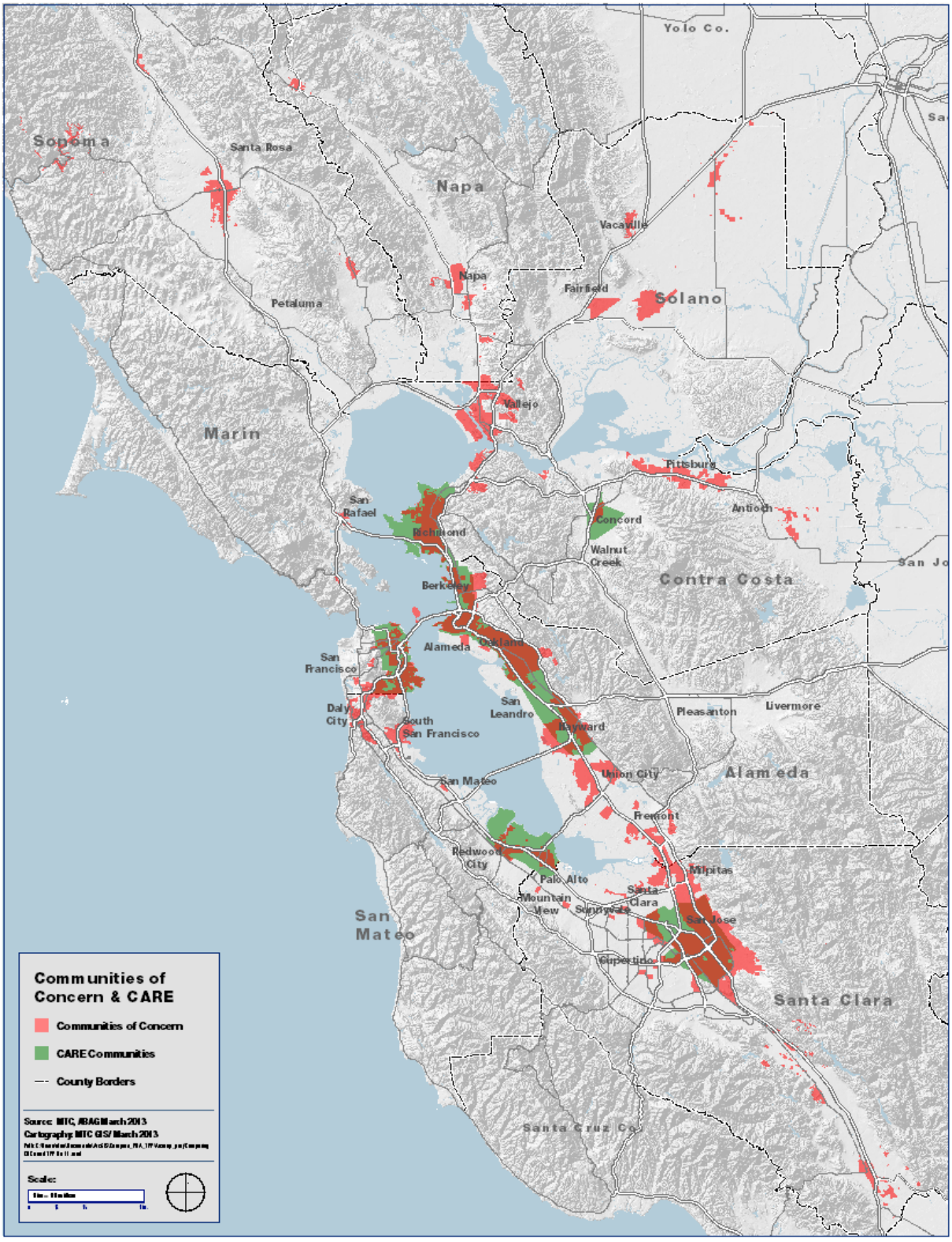
[11] http://baaqmd.gov/Divisions/Planning-and-Research/CARE-Program.aspx.

[12] More information on MTC's Communities of Concern is available here, http://www.mtc.ca.gov/planning/snapshot/

Figure 2.2-3: Communities of Concern and CARE



Motor Vehicle Emissions

Travel activity data for the roadway network in CARE communities and the Bay Area in general were derived from MTC's travel demand forecasting model. The model produced forecasts of travel behavior and vehicle activity for the proposed Plan's base year, 2010; the horizon year 2040 with Project; and the horizon year 2040 without the Project. The model provides outputs for VMT, along with daily vehicle trips and distribution of vehicle miles of travel by speed. This data is then imported into EMFAC2011, the motor vehicles emissions model developed and maintained by ARB to obtain emissions data.

In this analysis, MTC only included in its model runs roadway links that carry 10,000 or more vehicles per day with sensitive land uses (including residential, schools, and day cares) within 1,000 feet of the roadway's centerline. Roadway links without any sensitive land uses within 1000 feet of the roadway centerline were not included in the analysis. This approach was developed through MTC's Equity Analysis workgroup and is consistent with BAAQMD's methodology for evaluating TACs and $PM_{2.5}$ impacts. MTC then identified all the roadway links that run through identified CARE communities and non-CARE communities per the criteria listed above. TAC and $PM_{2.5}$ emissions were then estimated for CARE and non-CARE roadway links in each county. For example, the emission estimates for CARE communities in Contra Costa County reflect vehicle activity on the roadway links in the Concord and Richmond/San Pablo CARE communities.

SUMMARY OF IMPACTS

The combined impact of the land use and transportation changes anticipated from implementation of the proposed Plan would not conflict with or obstruct implementation of the applicable air quality plans. The overall impact of the proposed Plan due to construction of land-use and transportation projects would result in a direct but short-term impact as projects advance into construction at different times, over the horizon of the proposed Plan.

Compared to existing conditions, the impacts in 2040 with the proposed Plan show lower ROG, NOx (summertime and wintertime), CO, and $PM_{2.5}$ emissions, largely because of stringent controls for new vehicles, engines and fuels. However, due to growth in VMT and generation of road dust, emissions for PM_{10} are expected to increase under the proposed Plan compared to existing conditions.

The impacts for TACs (diesel PM, 1,3-butadiene, and benzene) show lower emissions in 2040 with the implementation of the proposed Plan, also as a result of stronger state regulations for vehicles and fuels. There would be a net increase in sensitive receptors located in TPP corridors (including PDAs located within TPPs) where TAC concentrations result in a cancer risk greater than 100/million or a $PM_{2.5}$ concentration greater than 0.8 $\mu g/m^3$; or within set distances to mobile and/or stationary sources of TAC or $PM_{2.5}$ emissions; however, in jurisdictions with an adopted CRRP, any proposed project that includes sensitive land uses and or receptors should be evaluated against the standards, thresholds and mitigation measures in those adopted plans and where a proposed project is consistent with an adopted CRRP, the impact would be less than significant.

Between CARE and non-CARE communities there are slight differences in the percent reductions in TACs and $PM_{2.5}$ expected in 2040 under the proposed Plan and 2010 existing conditions. When re-entrained road dust is included in total emissions, some CARE communities will experience an increase in emissions while non-CARE communities will experience either a smaller increase or a decrease in

these emissions. This disproportionate effect in CARE communities would result in a potentially significant impact.

IMPACTS AND MITIGATION MEASURES

Impact

2.2-1(a) Implementation of the proposed Plan could conflict with or obstruct implementation of the primary goals of an applicable air quality plan.

The region's most recent ozone plan, the Bay Area 2010 Clean Air Plan (2010 CAP), prepared by BAAQMD, was developed in response to ozone planning requirement in the California Health and Safety Code. The 2010 CAP set forth a control strategy that includes control measures to reduce emissions and atmospheric concentrations of ozone and its precursors, $PM_{2.5}$, key toxic air contaminants, as well as the "Kyoto 6" greenhouse gases (carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulpher hexafluoride).[13]

The primary goals of the 2010 CAP are to improve Bay Area air quality and protect public health. The control strategy in the 2010 CAP recognizes the need to reduce motor vehicle travel and emissions by integrating transportation, land use, and air quality planning. Cleaner fuels and improved emission controls have substantially reduced emissions from mobile sources in recent decades. However, growth in motor vehicle use (as measured in VMT on both a per capita and an absolute basis) has offset some of the benefit of the improved emission controls. This increase in VMT has been caused or facilitated by dispersed development patterns that result in people being dependent on motor vehicles for all types of trips and activities, in addition to increases that are the result of population and job growth. Therefore, the 2010 CAP recognizes the need to encourage future population and job growth in areas that are well served by transit and where mixed-use communities provide jobs, housing, and retail in close proximity.

Key themes embedded in the 2010 CAP include:

- The need to reduce motor vehicle emissions by driving cleaner, driving smarter, and driving less;
- Reducing per capita VMT and promoting policies that enable families to choose reduce their motor vehicle ownership;
- Designing communities where people can walk, bike, or use transit on a convenient basis; and
- Ensuring that focused growth in priority areas is planned and designed so as to protect people from both existing sources and new sources of emissions.

Consistent with the 2010 CAP, the proposed Plan is based on the goals of reducing emissions of greenhouse gases from the transportation sector, reducing VMT on a per capita basis, and focusing growth in areas that are well-served by transit and existing infrastructure.

[13] The 2010 Clean Air Plan prepared by BAAQMD can be found here: http://www.baaqmd.gov/Divisions/Planning-and-Research/Plans/Clean-Air-Plans.aspx

Both the land use patterns and the transportation investments defined in the proposed Plan support the primary goals of the Bay Area 2010 Clean Air Plan. The proposed Plan would therefore not conflict with or obstruct implementation of the primary goals of an applicable air quality plan and the impact is less than significant (LS). No mitigation measures are required.

Mitigation Measures

None required.

Impact

2.2-1(b) Implementation of the proposed Plan could conflict with or obstruct implementation of applicable control measures of an applicable air quality plan.

Numerous transportation projects included in the proposed Plan will help implement the applicable control measures listed in the 2010 CAP. **Table 2.2-6** provides a summary of the proposed Plan transportation investments that will help implement relevant control measures in the 2010 CAP. For purposes of evaluating consistency with the proposed Plan, the relevant 2010 CAP control measures include mobile source measures (MSMs) A-1 and A-2, the full set of 17 transportation control measures (TCMs), and local impact measure (LUM) #4.

TABLE 2.2-6: PROPOSED PLAN INVESTMENTS AND POLICIES THAT SUPPORT IMPLEMENTATION OF 2010 CAP CONTROL MEASURES

Relevant Control Measures in 2010 Clean Air Plan	*Supporting Policies and Investments in the proposed Plan **
MSM A-1: Promote Clean and Fuel-Efficient Vehicles: Promote the use of clean and fuel-efficient vehicles, and efficient driving habits and proper vehicle maintenance to reduce emissions.	The Climate Policy Initiatives in the proposed Plan (RTP ID # 230550) will include measures to promote efficient driving habits.
MSM A-2: Zero Emission Vehicles and Plug-In Hybrids: Acquire and deploy battery-electric and plug-in hybrid electric vehicles. Install and expand public charging infrastructure. Promote the use of public charging infrastructure.	As an element of the Climate Policy Initiatives (RTP ID # 230550), the proposed Plan will allocate approximately $170 million over ten years to promote electric vehicles, including consumer incentives, education, and installation of charging stations.
TCM A-1: Local and Area-Wide Bus Service Improvements: Sustain and improve bus service by funding existing service, implementing Bus Rapid Transit (BRT) in key corridors, and implementing transit priority measures to improve the speed of bus service.	The proposed Plan includes substantial funding for bus operators throughout the region, including funding to implement BRT in key corridors. Projects to fund bus service improvements include RTP ID #s 21017, 94526, 94527, 94558, 94572, 94610, 94636, 94666, 94683, 98207, 22455, 240526, 230161, 230164 and 240077.
TCM A-2: Local and Regional Rail Service Improvements: Sustain and expand rail service providing funding for rail cars and stations. Fund BART extensions, Caltrain electrification, new Transbay Terminal, Capitol Corridor, and SMART commuter rail in the North Bay.	The proposed Plan includes substantial funding for commuter rail operators throughout the region. This includes BART (RTP ID #s 21132, 94525, 240196, 21211, 240374 and 240375); Transbay Transit Center/Caltrain extension (RTP ID #s 21342 and 230290); Caltrain electrification and improvements (RTP ID #s 22481, 21627, 240019, 240031, 240048); SMART rail (RTP ID #s 22001 and 240736); Capitol Corridor (RTP ID # 22009); and ACE commuter rail (21790).
TCM B-1: Freeway and Arterial Operations Strategies: Implement freeway and arterial performance improvements, including the Freeway Performance Initiative, the Bay Area Freeway Service Patrol, and the Arterial Management Program.	The proposed Plan projects 230221, 230222, 230419, and 230597 will all help to implement TCM B-1 by improving traffic flow on freeways and key arterials.
TCM B-2: Transit Efficiency and Use Strategies: Improve transit efficiency and rider convenience through continued operation of 511 Transit, and full implementation of Clipper fare payment system and the Transit Hub Signage Program.	The proposed Plan includes funds to implement the regional Transit Performance Initiative (RTP ID # 240735), MTC's Transit Connectivity Plan (RTP ID # 230336), as well as projects in specific counties, such as Contra Costa (230196) and the San Francisco Transit Effectiveness Project (240171).
TCM B-3: Bay Area Express Lane Network: Implement the regional express lane network; provide express bus service in these corridors.	The proposed Plan includes funds to implement the regional express lane network via 25 specific projects, including 22002, 22042, 230088, 230656, and 230657.
TCM B-4: Goods Movement Improvements and	The proposed Plan projects that will help to

TABLE 2.2-6: PROPOSED PLAN INVESTMENTS AND POLICIES THAT SUPPORT IMPLEMENTATION OF 2010 CAP CONTROL MEASURES

Relevant Control Measures in 2010 Clean Air Plan	*Supporting Policies and Investments in the proposed Plan **
Emission Reductions Strategies: Reduce diesel emissions from trucks used in goods movement. Implement seven Proposition 1B Trade Corridors Improvement Fund projects identified in this measure.	implement TCM B-4 include Alameda County Goods Movement Program (RTP ID # 22082, 22760, and 240394); Martinez Rail Corridor improvements (240738); and relocation of Cordelia truck scales facility in Solano County (230322).
TCM C-1: Voluntary Employer Trip-Reduction Programs: Work with employers, transit agencies, and shuttle providers to promote ridesharing, transit, cycling and walking for work trips. Consider adopting a commute benefits ordinance to reduce out-of-pocket transit costs to employees.	The proposed Plan Climate Policy Initiatives (see RTP ID # 230550), including vanpool incentives, will support implementation of TCM C-1. The proposed Plan policy initiatives also include adoption and implementation of a regional commute benefits ordinance, a key element of TCM-1.
TCM C-2: Safe Routes to Schools and Safe Routes to Transit Programs: Implement Safe Routes to Schools (SR2S) programs and other measures to promote safe access for pedestrians and cyclists to schools and transit.	The proposed Plan includes $30 million to implement Safe Routes to Transit (RTP ID # 22245). Additional projects that will help to implement TCM C-2 include Alameda County Transportation Demand Management Program (240393), and Safe Routes to Schools programs in Napa County (22417), San Mateo County (240084), and Sonoma County (240561).
TCM C-3: Ridesharing Services and Incentives: Encourage ridesharing and promote and expand car-sharing services.	The proposed Plan includes $5 million to expand City Carshare (RTP ID #22244). The proposed Plan also earmarks $6 million for vanpool incentives as part of the Climate Policy Initiatives.
TCM C-4: Conduct Public Education and Outreach: Implement the Spare the Air program and related elements in the regional Transportation Climate Action Campaign.	The proposed Plan includes approximately $700 million to implement various Climate Policy Initiatives (RTP ID #230550), including public outreach and education.
TCM C-5: Promote "Smart Driving": Promote smart driving, compliance with posted speed limits, and related efforts to reduce greenhouse gas emissions from the transportation sector.	The proposed Plan includes approximately $700 million to implement various Climate Policy Initiatives (RTP ID #230550), including a public education campaign, a tire pressure cap rebate program, and a fuel economy meter rebate program.
TCM D-1: Bicycle Access and Facilities Improvements: Provide a comprehensive network of bicycle lanes, routes, and pathways, as well as continued and routine maintenance on existing bicycle facilities. Implement "complete streets" policies to ensure that cyclists and pedestrians are safely accommodated on all streets and roads. Maintain and expand facilities to accommodate bicycles on rail transit, buses and ferries. Consider implementing bicycle-sharing programs.	The proposed Plan will provide funding to implement bicycle projects throughout the region, including: Alameda County: 24003, 240206, 240227, Contra Costa County: 240381, 21225, 230542, 240459, 240637 Marin County: 240678 Napa County: 230527, 240612 San Francisco: 240488, 240533, 240551 San Mateo County: 230430, 240590 Santa Clara County: 240509 Solano County: 98212, 2405566, 240558

TABLE 2.2-6: PROPOSED PLAN INVESTMENTS AND POLICIES THAT SUPPORT IMPLEMENTATION OF 2010 CAP CONTROL MEASURES

Relevant Control Measures in 2010 Clean Air Plan	*Supporting Policies and Investments in the proposed Plan **
	Sonoma County: 240651
TCM D-2: Pedestrian Access and Facilities Improvements: Provide a comprehensive network of facilities, including sidewalks, pathways and provide for pedestrian access in their development plans. Implement "complete streets" policies to ensure that cyclists and pedestrians are safely accommodated on all streets and roads. Adopt land use policies that support more compact, infill development to make neighborhoods more walkable.	The proposed Plan projects to improve pedestrian facilities include the City of Berkeley Pedestrian Master Plan (240197), the Napa County Safe Routes to Schools program (22417), and projects to implement bike and ped improvements in San Mateo County (230430). (Also see pedestrian improvements in Santa Clara, Solano and Sonoma counties described for TCM D-1 above.)
TCM D-3: Local Land-Use Strategies: Update general plans and area plans to promote infill development and support land use that allows residents and employees to walk, bicycle, and use transit, instead of relying on private automobiles. Create mixed-use transit-oriented developments in proximity to transit stations and key bus routes.	Many of the policies and investments in the proposed Plan, such as the One Bay Area Grant (OBAG) program, are directed toward implementation of the land-use strategies described in TCM D-3. Examples of local projects include projects # 21624 (incentive program to support transit-oriented development) and # 240086 (Transportation for Livable Communities program) in San Mateo county.
TCM E-1: Value-Pricing Strategies: Implement value pricing policies and programs such as time-of-day pricing on trans-bay bridges and cordon pricing recommendations from San Francisco County's Mobility, Access, and Pricing Study.	The proposed Plan includes funding to implement the San Francisco congestion pricing program, including Treasure Island pricing program and cordon pricing (240728).
TCM E-2: Promote Parking Policies to Reduce Motor Vehicle Travel: Implement parking policies to reduce motor vehicle travel, such as limiting the supply of off-street parking in areas well served by transit, eliminating or reducing minimum parking requirements, unbundling the price of parking spaces from rents, and implementing performance-based pricing for curb parking in high-use areas.	Policy Action 4.2 (see Table __ above) calls for revising parking policies to support infill development. PDA earmarks funding to expand San Francisco's innovative *SFpark* program (RTP ID # 240334 and 240476).
TCM E-3: Implement Transportation Pricing Reform: Develop and implement policies to ensure that user costs to own and operate motor vehicles reflect the full environmental and social costs related to vehicle use.	The proposed Plan includes funding to implement the San Francisco congestion pricing program, including Treasure Island pricing program and cordon pricing (240728) and programs that MTC has underway, including bridge tolls and express lane network.
LUM 4: Land Use Guidance: Provide tools and resources to local agencies to help them develop policies and plans to improve air quality, reduce motor vehicle travel, and reduce population exposure to air pollutants.	PDA Policy Action # 1.6 calls for regional agencies to provide tools to help local jurisdictions develop and implement plans to focus new growth in priority development areas.

TABLE 2.2-6: PROPOSED PLAN INVESTMENTS AND POLICIES THAT SUPPORT IMPLEMENTATION OF 2010 CAP CONTROL MEASURES

Relevant Control Measures in 2010 Clean Air Plan	*Supporting Policies and Investments in the proposed Plan **

Note:

* The proposed Plan investments shown in Table 2.2-6 are intended to demonstrate how the proposed Plan will help to implement the 2010 CAP. There may be additional proposed Plan investments not shown in Table 2.2-6 that also help to implement the 2010 CAP control measures.

Both the policies and the transportation investments defined in the proposed Plan are consistent with the relevant control measures in the 2010 CAP and the impact is less than significant (LS). No mitigation measures are required.

Mitigation Measures

None required.

Impact

2.2-1(c) Implementation of the proposed Plan could conflict with or obstruct implementation of any control measures in an applicable air quality plan.

As a whole, the proposed Plan investments described in **Table 2.2-6** support the goals of the 2010 CAP and will help implement key control measures in the 2010 CAP. However, it is possible that certain proposed Plan investments could increase VMT and/or emissions of air pollutants and GHGs, including projects that increase highway capacity, such as expansion of express lanes in the region. The expanded regional ferry network was changed from a TCM to a further study measure (FSM) in the 2010 CAP due to uncertainty as to whether expanded ferry service will actually achieve a net reduction in emissions of air pollutants and GHGs. These issues should be addressed in the project-level CEQA analyses prepared for these projects.

A key theme in the 2010 CAP is the need to ensure that the region plans for focused growth in PDAs in a way that protects people from both existing sources and new sources of emissions.[14] Protecting Bay Area residents who live and/or work in areas identified for future development in the proposed Plan will require a combination of good land use planning and project design to identify and avoid potential impacts to public health, in addition to appropriate measures to mitigate any potentially significant impacts that are identified.

Issues related to potential localized air quality impacts from specific projects will be addressed in the sections below which analyze potential impacts in terms of short-term construction emissions, cumulative increase of criteria pollution from on-road mobile sources, and avoiding exposure of sensitive receptors to substantial concentrations TACs and $PM_{2.5}$.

[14] See discussion on pages 4-21 to 4-23 in Volume I of the 2010 Clean Air Plan, as well as the description of LUM 4 in Volume II of the 2010 Clean Air Plan

Based on the assessment of each measure of consistency, the combined impact of the land use and transportation changes anticipated from implementation of the proposed Plan would not conflict with or obstruct implementation of the applicable air quality plan. As discussed above, proposed Plan investments could be inconsistent with the 2010 CAP goals of reducing VMT. However, subsequent project level review of those investments should ensure any potential impacts are identified and mitigated. Therefore, the impact on the implementation of other applicable air quality plans would be less than significant (LS). No mitigation measures are required.

Mitigation Measures

None required.

Impact

2.2-2 Implementation of the proposed Plan could result in a substantial net increase in construction-related emissions.

The U.S. EPA and the ARB have adopted rules and regulations establishing criteria pollutant and hazardous emissions limits for diesel powered on-road vehicles and off-road equipment. The current EPA and ARB rules and emission standards are in the process of being implemented and are therefore reasonably foreseeable. They will continue to be phased in over the next 10 years and are expected to reduce diesel PM emissions by 90 percent or more when compared to vehicles and equipment built prior to 2004. EPA and ARB on-road and off-road regulations target the primary sources of emissions at construction sites. These include on-road heavy duty trucks, and cranes and off-road aerial lifts, backhoes, crawler tractors, excavators, forklifts, graders, loaders, mowers, rollers, scrapers, skid steer loaders, tractors, trenchers, two engine vehicles and workover rigs. In addition, ARB's cleaner fuel standards will reduce emissions from all internal combustion engines and their stationary and portable equipment regulations will reduce emissions from the smaller equipment used at construction sites, such as portable generators and tub grinders.

The most effective way to ensure that construction projects do not adversely impact local and regional air quality and therefore public health is to minimize the amount of criteria and TACs associated with each individual projects' construction activity. The EPA and ARB have adopted stringent air emission regulations for new and existing fleets of construction equipment that is common to all construction sites. However, these regulations alone cannot assure that all projects consistent with the proposed Plan will use only the lowest emission construction equipment due primarily to the fleet averaging component of the regulations compliance requirements. Therefore, construction impacts are considered potentially significant (PS). Mitigation measure 2.2(a) is described below.

Mitigation Measures

Implementing agencies and/or project sponsors shall consider implementation of mitigations measures including but not limited to those identified below.

2.2(a) Mitigation measures that shall be considered by implementing agencies and/or project sponsors where feasible based on project-and site-specific considerations include, but are not limited to best management practices (BMPs), such as the following:[15]

Construction Best Practices for Exhaust

- The applicant/general contractor for the project shall submit a list of all off-road equipment greater than 25 hp that will be operating for more than 20 hours over the entire duration of the construction activities at the site, including equipment from subcontractors, to BAAQMD for review and certification. The list shall include all of the information necessary to ensure the equipment meets the following requirement:
  - All off-road equipment shall have: 1) engines that meet or exceed either USEPA or ARB Tier 2 off-road emission standards; and 2) engines are retrofitted with an ARB Level 3 Verified Diesel Emissions Control Strategy (VDECS), if one is available for the equipment being used.[16]
- Idling time of diesel powered construction equipment and trucks shall be limited to no more than two minutes. Clear signage shall be provided for construction workers at all access points.
- All construction equipment shall be maintained and properly tuned in accordance with the manufacturers' specifications.
- Portable diesel generators shall be prohibited. Grid power electricity should be used to provide power at construction sites; or propane and natural gas generators may be used when grid power electricity is not feasible.

Construction Best Practices for Dust

- All exposed surfaces (e.g., parking areas, staging areas, soil piles, graded areas, and unpaved access roads) shall be watered two times per day. For projects over five acres of size, soil moisture should be maintained at 12 percent. Moisture content can be verified by lab samples or moisture probe.
- All haul trucks transporting soil, sand, or other loose material off-site shall be covered.
- All visible mud or dirt track-out onto adjacent public roads shall be removed using wet power vacuum street sweepers at least once per day. The use of dry power sweeping should be done in conjunction with thorough watering of the subject roads.
- All vehicle speeds on unpaved roads shall be limited to 15 mph.
- All roadway, driveway, and sidewalk paving shall be completed as soon as possible. Building pads shall be laid as soon as possible after grading.

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[15] Adapted from BAAQMD, CEQA Air Quality Guidelines (May 2011).

[16] Equipment with engines meeting Tier 4 Interim or Tier 4 Final emission standards automatically meet this requirement, therefore a VDECS would not be required.

- All construction sites shall provide a posted sign visible to the public with the telephone number and person to contact at the Lead Agency regarding dust complaints. The recommended response time for corrective action shall be within 48 hours. BAAQMD's Complaint Line (1-800 334-6367) shall also be included on posted signs to ensure compliance with applicable regulations.
- All excavation, grading, and/or demolition activities shall be suspended when average wind speeds exceed 20 mph.
- Wind breaks (e.g., trees, fences) shall be installed on the windward side(s) of actively disturbed areas of construction. Wind breaks should have at maximum 50 percent air porosity.
- Vegetative ground cover (e.g., fast-germinating native grass seed) shall be planted in disturbed areas as soon as possible and watered appropriately until vegetation is established.
- The simultaneous occurrence of excavation, grading, and ground-disturbing construction activities on the same area at any one time shall be limited. Activities shall be phased to reduce the amount of disturbed surfaces at any one time.
- All trucks and equipment, including their tires, shall be washed off prior to leaving the site.
- Site accesses to a distance of 100 feet from the paved road shall be treated with a six- to 12-inch compacted layer of wood chips, mulch, or gravel.
- Sandbags or other erosion control measures shall be installed to prevent silt runoff to public roadways from sites with a slope greater than 1 percent.

Significance after Mitigation

The measures described above are intended to keep dust from becoming airborne and to keep diesel PM emissions as low as possible through the use of readily available, lower-emitting diesel equipment, and/or equipment using alternative cleaner fuels, such as propane, natural gas, and electricity, as well as on-road trucks using diesel PM filters.

Projects taking advantage of CEQA Streamlining provisions of SB 375 (Public Resources sections 21155.1, 21155.2, and 21159.28) must apply the mitigation measures described above, as feasible, to address site-specific conditions. To the extent that an individual project adopts and implements all feasible mitigation measures described above, the impact would be less than significant with mitigation (LS-M).

MTC/ABAG cannot require local implementing agencies to adopt the above mitigation measures, and it is ultimately the responsibility of a lead agency to determine and adopt mitigation. Therefore it cannot be ensured that this mitigation measure would be implemented in all cases, and this impact remains significant and unavoidable (SU).

Impact

2.2-3(a) Implementation of the proposed Plan could cause a net increase in emissions of criteria pollutants ROG, NO_x, CO, and $PM_{2.5}$ from on-road mobile sources compared to existing conditions.

As shown in **Table 2.2-7**, the emissions for criteria pollutants ROG, NO_x (summertime and wintertime), CO, and $PM_{2.5}$ from mobile sources would decrease between 2010 and the 2040 horizon for the proposed Plan (emissions of PM_{10} would increase and are described under Impact 2.2-3b). When compared to existing conditions (2010), the proposed Plan reduces ROG emissions by 61 percent, summertime NO_x emissions by 70 percent, wintertime NO_x emissions by 71 percent, CO emissions by 70 percent, and $PM_{2.5}$ emissions by five percent. A major reason for these reductions is the increasingly stringent emission controls ARB has adopted for new vehicle engines and fuels over the past few decades. This includes the Truck and Bus Regulation which requires diesel trucks and buses to be upgraded to reduce emissions. As of January 1, 2012, heavier trucks must be retrofitted with PM filters; older trucks must be replaced starting January 1, 2015, and nearly all trucks and buses will need to have 2010 model year engines or equivalent by January 1, 2023. Other contributors include emission-control devices, the Enhanced Smog Check Program, and fleet turnover wherein older polluting cars are retired and replaced with newer and substantially less polluting cars. Additionally, the land use pattern in the proposed Plan includes concentrating future growth at higher densities around existing and proposed transit investments, which would reduce driving and motor vehicle emissions. Therefore, there is no adverse impact (NI).

TABLE 2.2-7: EMISSION ESTIMATES FOR CRITERIA POLLUTANTS USING EMFAC2011 EMISSION RATES (TONS PER DAY)

	2010	*2040 Plan*	*Change 2010 to 2040 Plan*	
			Numerical	*Percent*
ROG	93.7	36.5	-57.1	-61%
NOx (Summertime)	164.3	48.5	-115.8	-70%
NOx (Wintertime)	185.3	53.7	-131.5	-71%
CO	879.9	266.5	-613.4	-70%
$PM_{2.5}$	10.4	9.9	-0.5	-5%

Source: Metropolitan Transportation Commission, 2012.

Mitigation Measures

None required.

Impact

2.2-3(b) Implementation of the proposed Plan could cause a net increase in emissions of PM_{10} from on-road mobile sources compared to existing conditions.

As shown in **Table 2.2-8**, PM_{10} emissions from mobile sources would increase by 12 percent during the proposed Plan's timeframe compared to existing conditions. The higher levels of PM_{10} emissions in 2040 conditions are due to the fact that these emissions are strongly influenced by the 20 percent growth in VMT (which directly affects entrained roadway dust), with some contributions from tire and brake wear and exhaust. The reason particulate matter emissions from mobile sources are not expected to increase at the same rate as VMT (20 percent) is the stringent emission control ARB has adopted for new vehicle engines, particularly diesel engines, including the Truck and Bus Regulation. Note that daily VMT and daily VHD are increasing when comparing the proposed Plan to existing conditions, but to a large

degree, these increases are offset by the regulatory and fleet improvements. PM control programs implemented by local Air Districts also contribute to the emission reductions relative to VMT.

In addition to the Truck and Bus Regulation, there are already ongoing State and regional efforts to mitigate the effects of particulate matter emissions. For instance, the ARB adopted a Diesel Risk Reduction Plan (DRRP) in October 2000, and as a part of that, has since adopted a series of regulations to require cleaner diesel fuel, to restrict idling of diesel engines, and to reduce emissions from both old and new on-road and off-road diesel engines. In 2005, MTC implemented a $14 million program to retrofit 1,700 diesel bus engines operated by Bay Area transit agencies to reduce particulate matter emissions, and in 2006, MTC and BAAQMD implemented a $2 million incentive program to reduce emissions from solid waste collection vehicle fleets that operate within BAAQMD. Furthermore, BAAQMD implements a variety of incentive programs that help fleet operators offset the cost of purchasing low-emission vehicles, re-powering old polluting heavy duty engines with cleaner, lower-emission engines, and installing control devices that reduce particulate and NO_x. Nonetheless, this increase in PM_{10} emissions overall represents a potentially significant (PS) impact. Mitigation measures 2.2(b) and 2.2 (c) are described below.

TABLE 2.2-8: EMISSION ESTIMATES FOR CRITERIA POLLUTANTS USING EMFAC2011 EMISSION RATES (TONS PER DAY)

	2010	*2040 Plan*	*Change 2010 to 2040 Plan*	
			Numerical	*Percent*
PM_{10}	36.4	41.0	4.5	12%

Source: Metropolitan Transportation Commission, 2012.

Mitigation Measures

2.2(b) MTC and ABAG, in partnership with BAAQMD, and other partners who would like to participate, shall work to leverage existing air quality and transportation funds and seek additional funds to continue to implement BAAQMD and ARB programs aimed at retrofits and replacements of trucks and locomotives.

2.2(c) MTC and ABAG, in partnership with BAAQMD and the Port of Oakland, and other partners who would like to participate, shall work together to secure incentive funding that may be available through the Carl Moyer Memorial Air Quality Standards Attainment Program to reduce port-related emissions.

Mitigation Measures 2.1 (a), 2.1(b), and 2.1 (c) (included in *Chapter 2.1: Transportation*) as well as 2.2 (d) and 2.2 (e) (included below under Impacts 2.2-5(b) and 2.2-6) could help reduce the increase in PM_{10}.

Significance after Mitigation

The increase in PM_{10} represents a significant impact compared to existing conditions. The mitigation measures identified above are anticipated to reduce this potentially significant impact. However, the exact reductions are not known at this time. Therefore, the impact is determined to remain significant and unavoidable (SU).

Impact

2.2-4 Implementation of the proposed Plan could cause a cumulative net increase in emissions of diesel PM, 1,3-butadiene, and benzene (toxic air contaminants) from on-road mobile sources compared to existing conditions.

As shown in **Table 2.2-9**, there would be a 71 percent decrease in diesel PM, a 70 percent decrease in 1,3-butadiene, and a 70 percent decrease in benzene compared to existing conditions. These reductions can be attributed to California's state laws to evaluate and control TACs, namely AB 1807 that created the Toxic Air Contaminant Identification and Control Act, SB 2588 that established the Air Toxics "HOT Spots" Information and Assessment Act, and SB 656 that requires ARB and local Air Districts to identify control measures for PM. Other state regulations that reduce smog or other pollutants also reduce TACs, such as the standards for low emission vehicles, clean fuels, reformulated gasoline, diesel fuel specifications, and ARB's Heavy Duty Diesel Inspection Programs. In addition, there are a number of regional programs in place to address PM in general and TACs in particular, including the ARB, BAAQMD, and Port of Oakland's Bay Area Goods Movement Program that provides financial incentives to owners of equipment used in freight movement to upgrade to cleaner technologies, and numerous Port of Oakland Clean Air Programs such as the Maritime Air Quality Improvement Plan, Comprehensive Truck Management Plan, Truck Air Quality Project, Vision 2000 Program and Air Emissions, and West Oakland Particulate Air Quality Monitoring Program. Overall, the reduction in TAC emissions and ongoing regulations and programs would ensure there would be no adverse impact (NI).

TABLE 2.2-9: EMISSION ESTIMATES FOR TOXIC AIR CONTAMINANTS POLLUTANTS (KILOGRAMS PER DAY)

	2010	*2040 Plan*	*Change 2010 to 2040 Plan*	
			Numerical	*Percent*
Diesel PM	2,599.6	755.9	-1,843.8	-71%
1,3-Butadiene	162.4	48.2	-114.1	-70%
Benzene	731.2	219.3	-511.9	-70%

Source: Metropolitan Transportation Commission, 2012.

Mitigation Measures

None required. However, see also mitigation measures for Impact 2.2-3(b) above, which have co-benefits for addressing TAC emissions.

Local Impact

2.2-5(a) Implementation of the proposed Plan could cause a localized net increase in sensitive receptors located in Transit Priority Project (TPP) corridors where TACs or fine particulate matter ($PM_{2.5}$) concentrations result in a cancer risk greater than 100/million or a concentration of $PM_{2.5}$ greater than 0.8 µg/m³.

The local pollutant analysis quantified and mapped the anticipated increased risk and $PM_{2.5}$ concentrations within TPPs throughout the Bay Area based on existing conditions. Any areas identified as having an increased cancer risk greater than 100 in a million or $PM_{2.5}$ concentration greater than 0.8

$\mu g/m^3$ would result in a potentially significant and unavoidable impact. TAC and $PM_{2.5}$ sources that were evaluated in this analysis include freeways, high volume roadways, ports, rail yards, refineries, chrome plating facilities; dry cleaners using perchloroethylene, gas stations and numerous other Air District permitted stationary sources. The emission sources and GIS spatial analysis that makes up the local pollutant analysis is described in more detail below.

Note that, for future projects not within one of these mapped areas, the significance of impacts is considered in the analyses presented under impacts 2.2-5(b) and 2.2-5(c) below.

Stationary Source Data

Using air pollutant emissions data from 2012 stationary source permits, BAAQMD developed a stationary source screening tool that contains cancer risk and $PM_{2.5}$ concentration data for all stationary sources in the Bay Area, available on BAAQMD's website.[17] The stationary source screening tool provides estimated cancer risk and $PM_{2.5}$ concentrations for stationary sources based on conservative modeling parameters, including worst case assumptions for meteorology. The estimated cancer risk and $PM_{2.5}$ concentration are considered "worst case" potential impacts since consideration of source specific conditions, such as exhaust stack heights, exhaust flow rates, and more site specific meteorology would result in lower estimates of cancer risk and $PM_{2.5}$ concentrations.

Where data were available, cancer risk and $PM_{2.5}$ concentrations were adjusted to reflect decreasing values based on distance from a source. For example, BAAQMD developed distance multiplier tools for gas stations and diesel back-up generators (also known as emergency or standby generators). These multiplier tools, available on BAAQMD's website, provide dispersion values to estimate the reductions in cancer risk and $PM_{2.5}$ concentrations expected further away from the source of emissions.[18] For other sources besides gas station and generators, where BAAQMD could not identify dispersion values, the cancer risk and $PM_{2.5}$ concentrations for each source were assumed to be the same at the source and up to 1,000 feet from the source.

BAAQMD's stationary source data also includes the effects of the ARB's air toxics control measure (ATCM) for dry cleaners using perchloroethylene (PERC). The ATCM regulation requires that dry cleaners using PERC be phased out by January 2023. The cancer risk estimates in the stationary source screening tool are based on a 70 year exposure rate, the health risk exposure standard used by OEHHA. The cancer risks for dry cleaners used in the GIS model were adjusted to be based on a 13-year exposure, from the years 2010 to 2035, to reflect the phasing out of PERC.

Large sources, such as refineries, ports, and land use sources without available emissions data, such as truck distribution centers, are addressed below under Impact 2.2-5(b).

Mobile Source Data

For freeways, BAAQMD conducted dispersion modeling, using vehicle activity data for 2009 and vehicle fleet emissions data for 2014, to estimate cancer risk and $PM_{2.5}$ concentrations for every freeway link in

[17] http://baaqmd.gov/Divisions/Planning-and-Research/CEQA-GUIDELINES/Tools-and-Methodology.aspx

[18] http://baaqmd.gov/Divisions/Planning-and-Research/CEQA-GUIDELINES/Tools-and-Methodology.aspx.

the Bay Area. The 2009 activity data was the most recent available from Caltrans at the time of the BAAQMD modeling in 2012. The 2014 vehicle fleet emissions data reflects the best available emissions data available from ARB's EMFAC2011 model. Known as the highway screening tool, it considers average annual daily traffic (AADT) counts, fleet mix and profiles, ARB emission factors using EMFAC 2011, vehicle speeds from MTC's travel demand model, and other modeling parameters per freeway link. The screening tool captures anticipated diesel PM emission reductions from ARB's on-road heavy duty diesel vehicle regulations, specifically the On-Road Heavy Duty Diesel Vehicles Regulation targeting trucks and buses. The tool provides estimated cancer risk and $PM_{2.5}$ concentration data measured from the edge of the freeway for distances from 10 to 1,000 feet on either side of the freeway, demonstrating how health risks lessen with distance from the freeway.[19]

For roadways with over 30,000 AADT, BAAQMD conducted dispersion modeling to develop a roadway screening tool. The tool, available on BAAQMD's website, is organized as county specific tables based on: a roadways AADT count, percent of heavy duty trucks and truck profiles, distance from roadway (10 to 1000 feet), north/south or east/west direction from roadway, ARB emission factors (EMFAC 2007 was best available data at time of modeling), and county-specific meteorological data from Air District monitoring stations. The roadway tool also reflects anticipated diesel PM emission reductions from ARB's On-Road Heavy Duty Diesel Vehicles Regulation.

BAAQMD estimated cancer risk and $PM_{2.5}$ concentrations for railroads and rail stations. Rail emissions were estimated along existing passenger and freight lines as well as proposed future lines in Marin County (i.e., SMART line) and eBART along Highway 4 in Contra Costa County. Emissions along freight corridors were estimated based on fuel consumption and passenger rail emissions were estimated based on the rail activity, idling times at stations, and speeds of individual trains. Passenger and freight (including switchers) emissions that run on parallel or shared tracks were aggregated to estimate total emissions along rail corridors. Site-specific meteorological conditions for each rail link were used. Estimates of cancer risk and $PM_{2.5}$ concentrations at various distances from the edge of the rail lines were provided in the GIS layer for railroad emissions.

Local Pollutant Impact Conclusion

The GIS spatial analysis model was used to compile and process all the stationary and mobile source cancer risk and $PM_{2.5}$ concentration data described above to identify areas in and within 1,000 feet of the TPP areas where an increased cancer risk is greater than 100 in a million and/or $PM_{2.5}$ concentrations exceed 0.8 $\mu g/m^3$. **Figures 2.2-4** through **2.2-21** below display the results of the GIS spatial analysis by county. In general, the figures show that areas over the threshold tend to occur along high traffic freeways, high use rail lines, locations with numerous stationary sources, and locations where a single stationary source has very high estimated cancer risk or $PM_{2.5}$ concentration levels.

TPP areas with cancer risk and $PM_{2.5}$ concentrations estimated to be below the thresholds; and that are not within the set distances (described in Impact 2.2-5(b) below); and are compliant with an adopted Community Risk Reduction Plan (described in Impact 2.2-5(c) below) are considered to have a less than

[19] The screening tool provides modeled health risks at 6 feet and 20 feet heights. The 20 feet heights are meant for project level analysis where residents may only be located on the second floor and above. The GIS model applies the modeled health risks at 6 feet, which is the worst case scenario.

significant impact to locating new sensitive receptors within these areas of TPPs and do not present a significant public health risk from localized TAC and $PM_{2.5}$ emissions.

TPP areas with an increased cancer risk and/or $PM_{2.5}$ concentration over the thresholds do present a potential public health impact and are considered to have potentially significant impacts for locating new sensitive receptors. Any future land use proposals for these areas that include sensitive receptors should evaluate potential TAC and $PM_{2.5}$ impacts during project level environmental review.[20] It is anticipated that future project level environmental review will in most cases result in less conservative and therefore lower estimates of cancer risk and $PM_{2.5}$ concentrations from existing sources. This would be due primarily to the use of more site specific TAC and $PM_{2.5}$ emissions and meteorology data. In some cases, estimated increased cancer risks or $PM_{2.5}$ concentrations may be found to be less than the preliminary estimates provided here.

The results of the GIS spatial analysis are based on increased cancer risk and $PM_{2.5}$ data for existing stationary and mobile sources in and within 1,000 feet of TPP areas. Proposed projects that include a new source of TAC and/or $PM_{2.5}$ or are located within a source that was not included in this analysis should conduct project specific environmental review to assess their potential increased cancer risk and $PM_{2.5}$ concentrations. Any new stationary sources of emissions subject to a BAAQMD permit will be required to analyze TAC and $PM_{2.5}$ emissions which will ensure that they do not adversely impact existing or new sensitive receptors above MTC thresholds. Projects locating sensitive receptors in areas mapped above the significance thresholds would result in potentially significant (PS) impacts.

Mitigation Measures

Implement Mitigation Measure 2.2(d) under Impact 2.2-5(b) below.

Significance after Mitigation

Implementation of Mitigation Measure 2.2(d) would reduce the severity of the impacts identified for projects that would locate sensitive receptors in TPP areas where the increased cancer risk is greater than 100 in a million or $PM_{2.5}$ concentrations are greater than 0.8 $\mu g/m^3$. However, the mitigation measure may not be sufficient to reduce all impacts to less than significant in all areas above the thresholds. Additional site specific analysis would be needed when a project is proposed in these areas to determine the actual level of impact and if feasible mitigation measures exist for the project to implement to get them below the thresholds.

Projects taking advantage of CEQA Streamlining provisions of SB 375 (Public Resources Code sections 21155.1, 21155.2, and 21159.28) must apply the mitigation measures described above, as feasible, to address site-specific conditions. To the extent that an individual project adopts and implements all feasible mitigation measures described above, the impact would normally be less than significant with mitigation (LS-M). However, there may be instances in which site-specific or project-specific conditions

[20] Lead agencies for proposed projects should contact BAAQMD if they are unsure whether their project site falls in an impacted area or not.

preclude the reduction of all project impacts to less than significant levels. For purposes of a conservative analysis, therefore, this impact remains significant and unavoidable (SU).

MTC/ABAG cannot require local implementing agencies to adopt the above mitigation measures, and it is ultimately the responsibility of a lead agency to determine and adopt mitigation. Therefore it cannot be ensured that this mitigation measure would be implemented in all cases. Further, there may be instances in which site-specific or project-specific conditions preclude the reduction of all project impacts to less-than-significant levels. For purposes of a conservative analysis, therefore, this impact remains significant and unavoidable (SU).

Figure 2.2-4

San Francisco Bay Area Local Pollutant Analysis

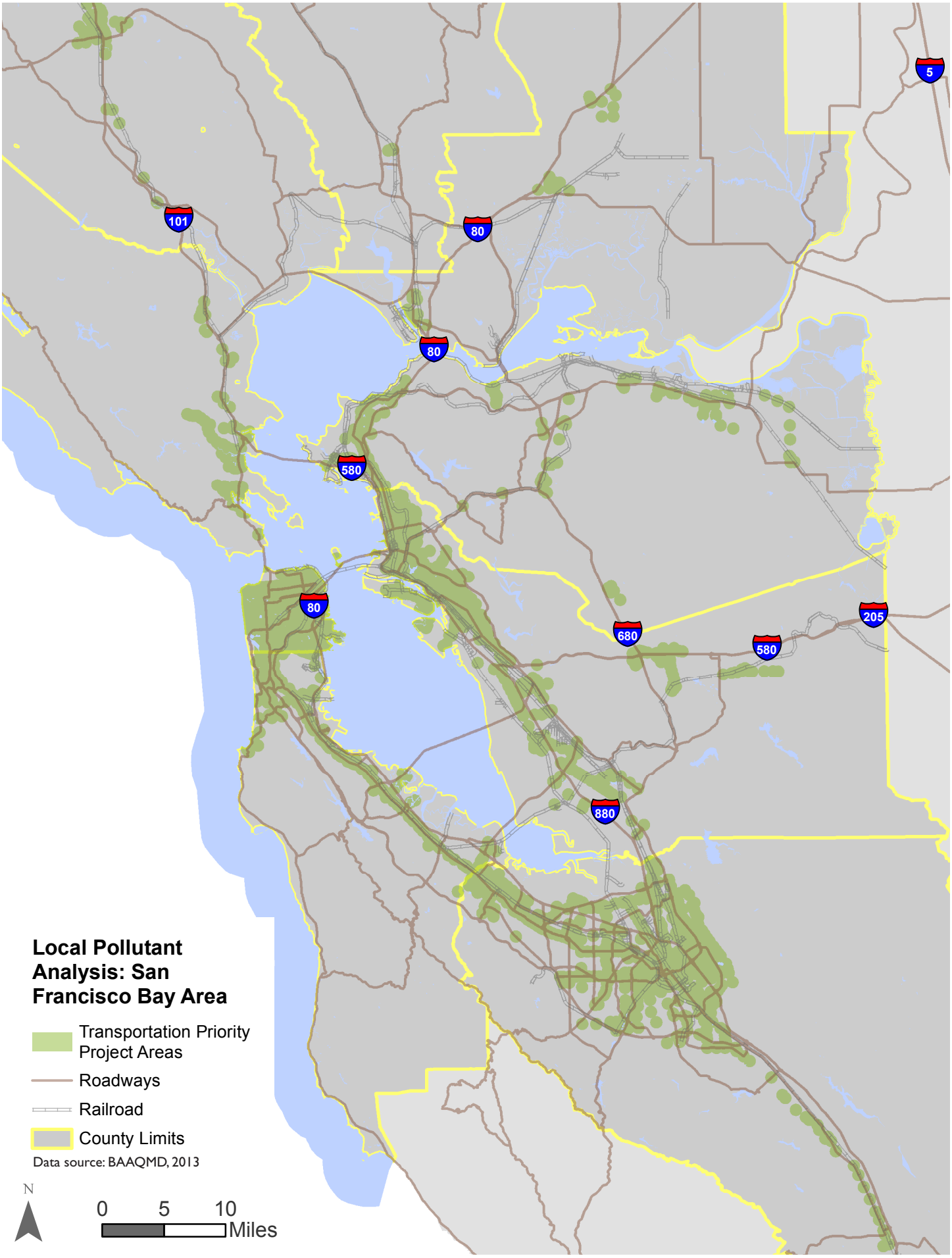

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Figure 2.2-5

Northern Alameda County Local Pollutant Analysis

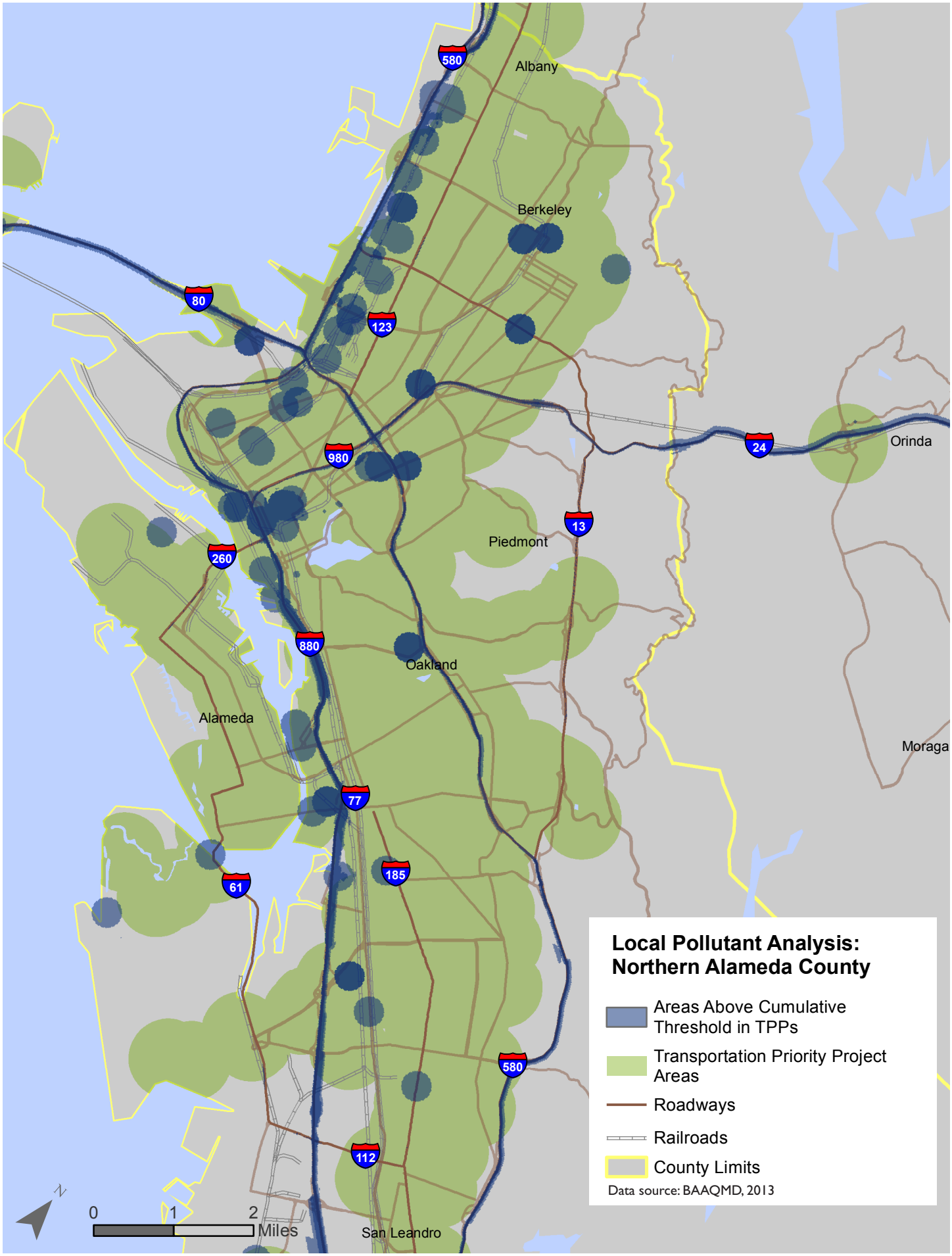

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Figure 2.2-6

Eastern Alameda County

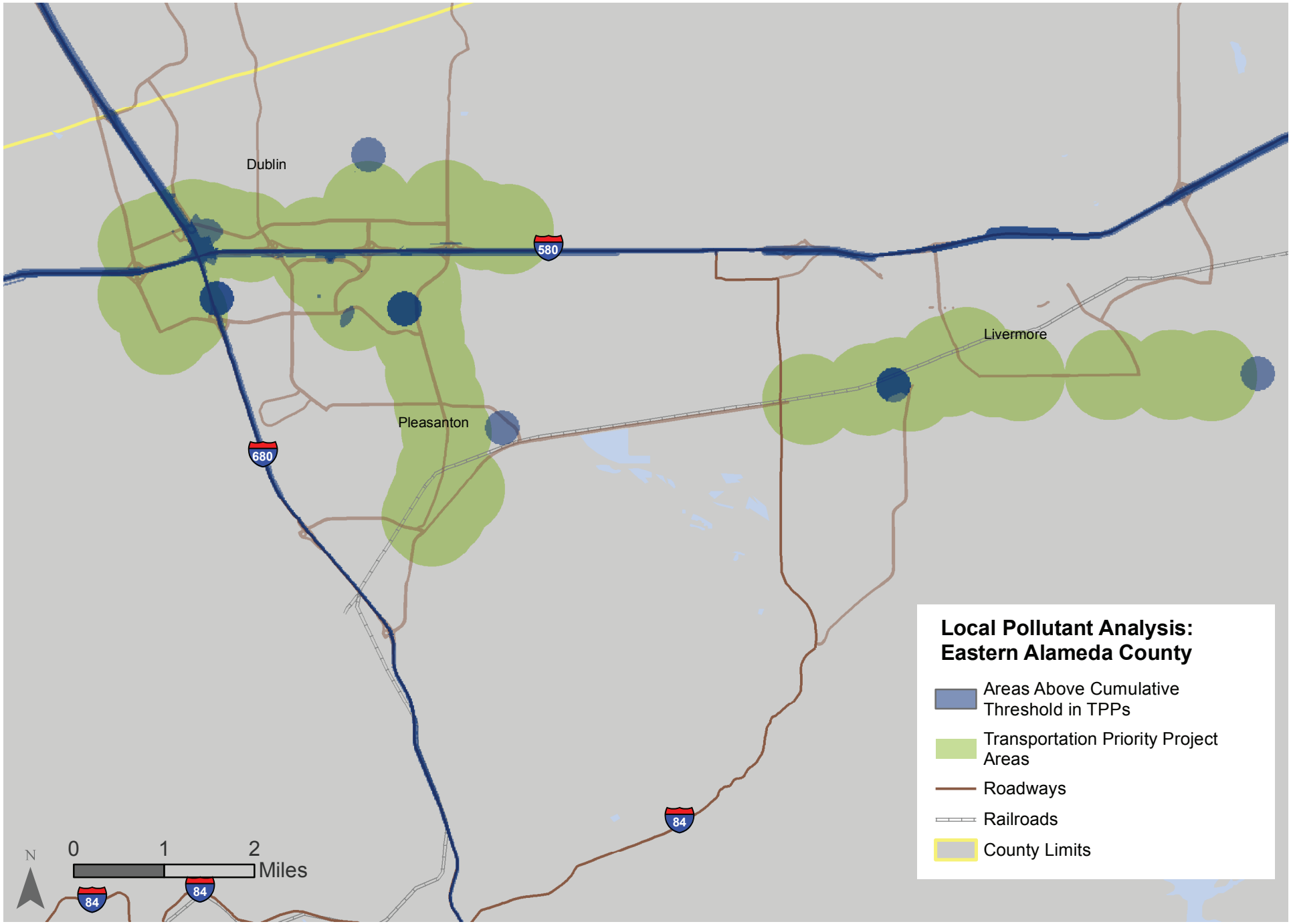

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Figure 2.2-7

Southern Alameda County Local Pollutant Analysis

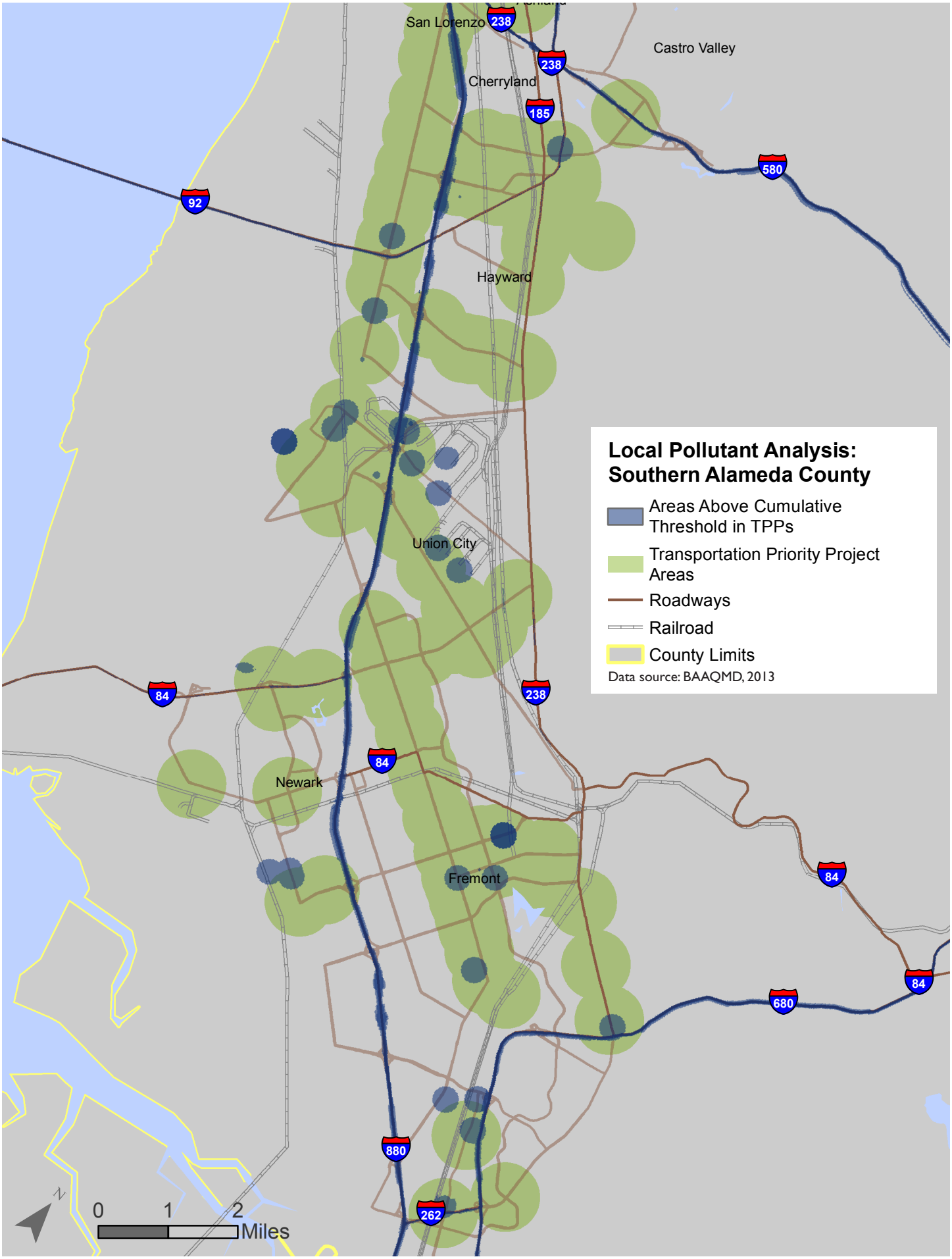

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Figure 2.2-8

Western Contra Costa County

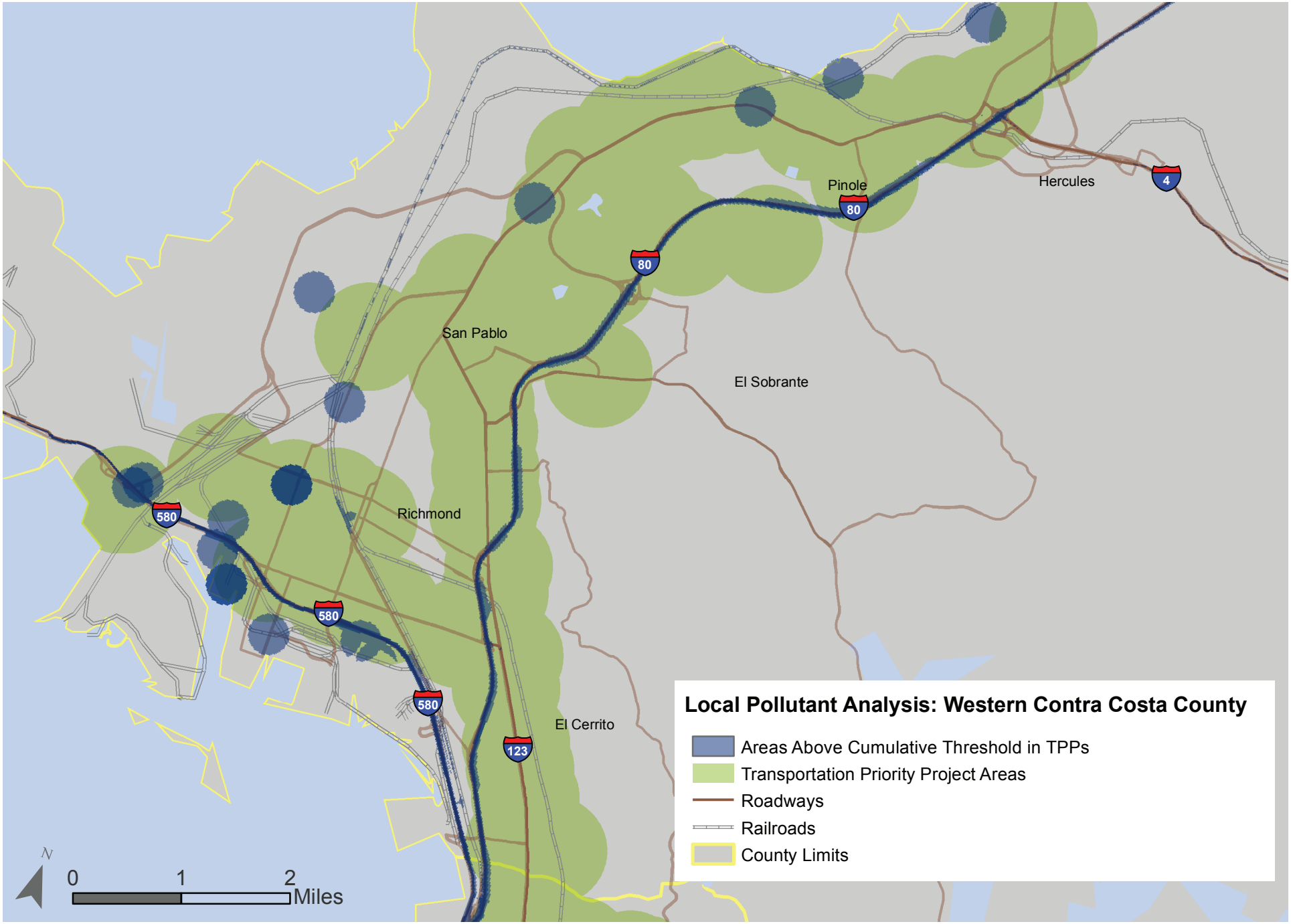

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Figure 2.2-9

Central Contra Costa County

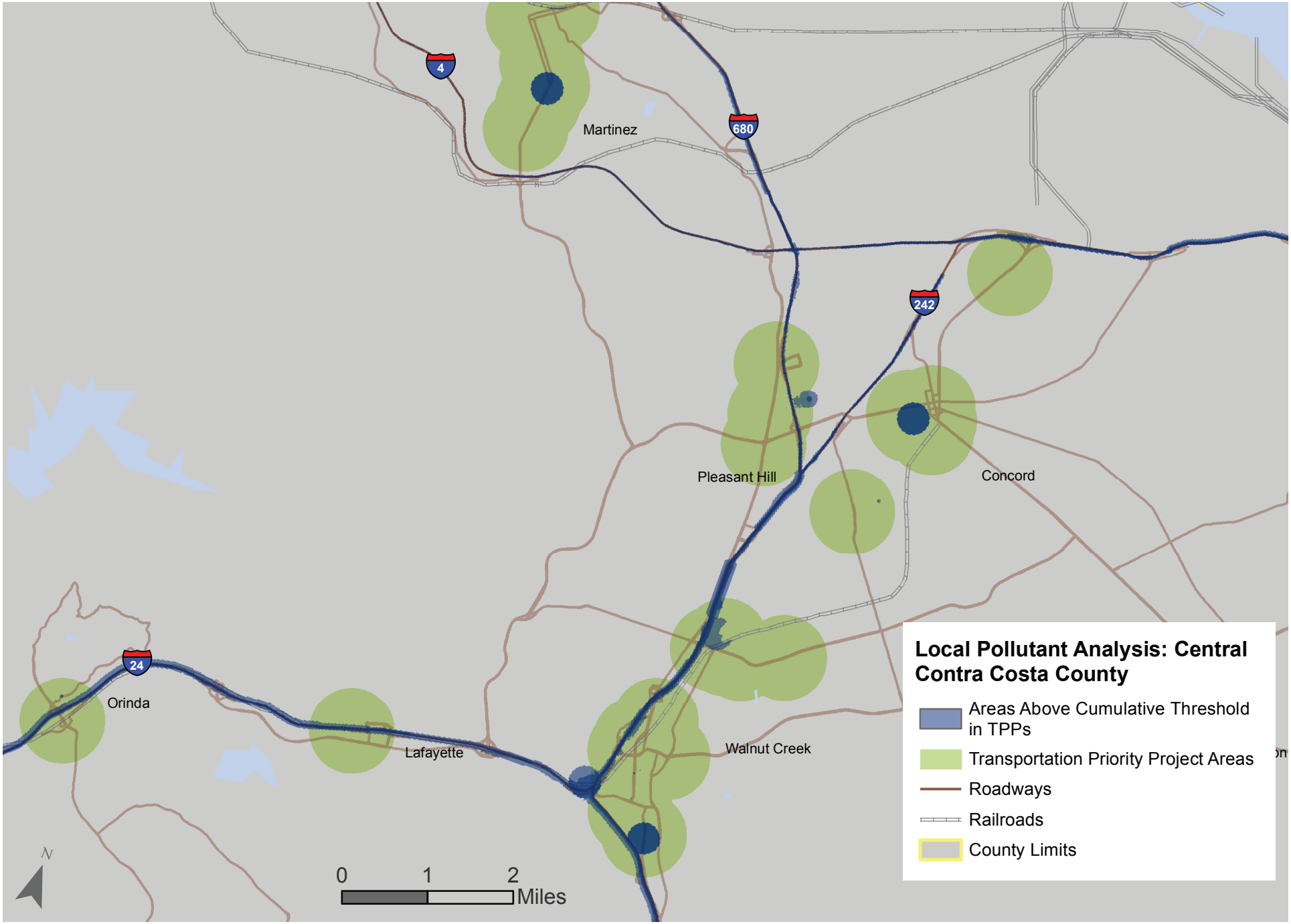

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Figure 2.2-10

Eastern Contra Costa County

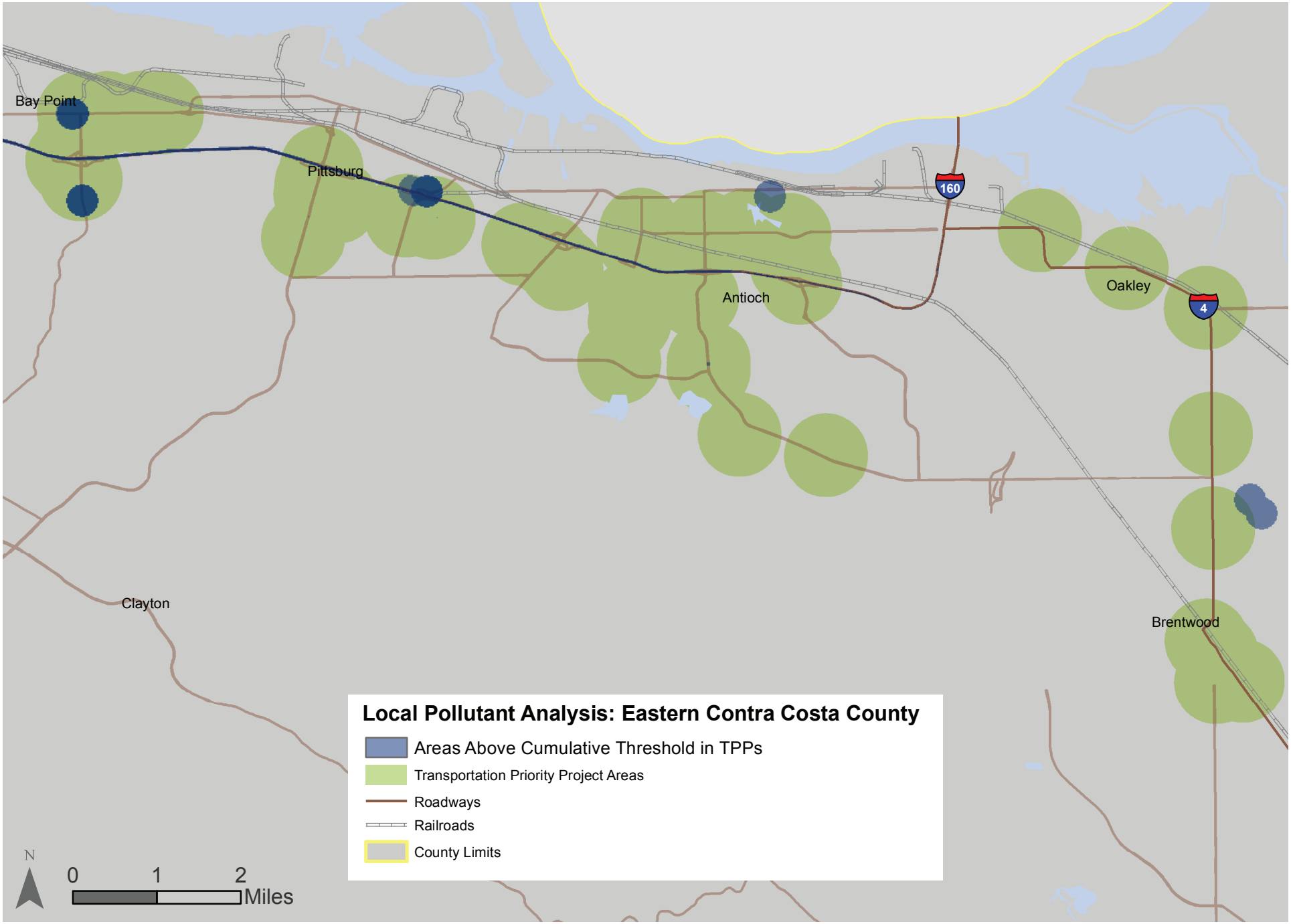

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Figure 2.2-11

Northern Marin County Local Pollutant Analysis

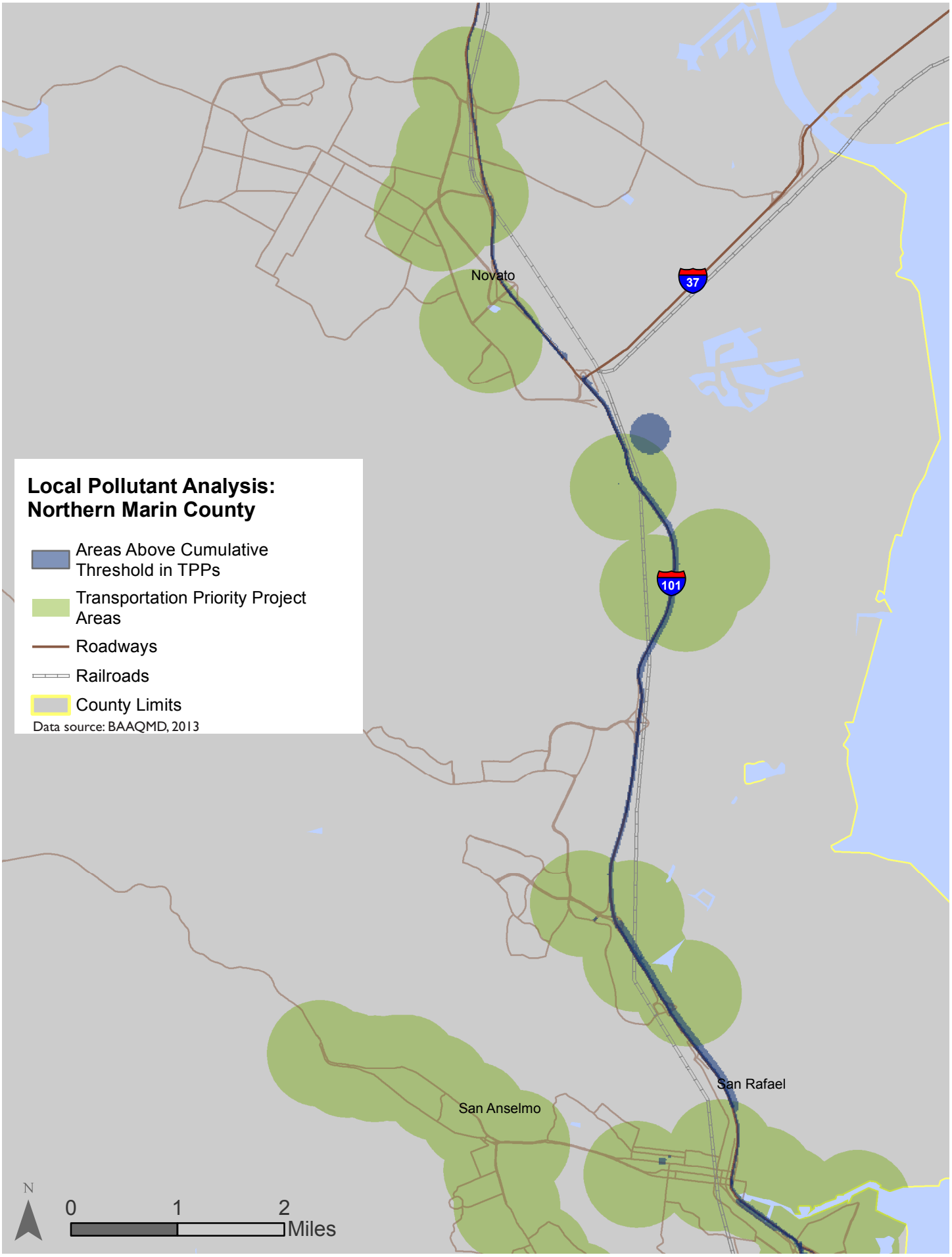

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Figure 2.2-12

Southern Marin County Local Pollutant Analysis

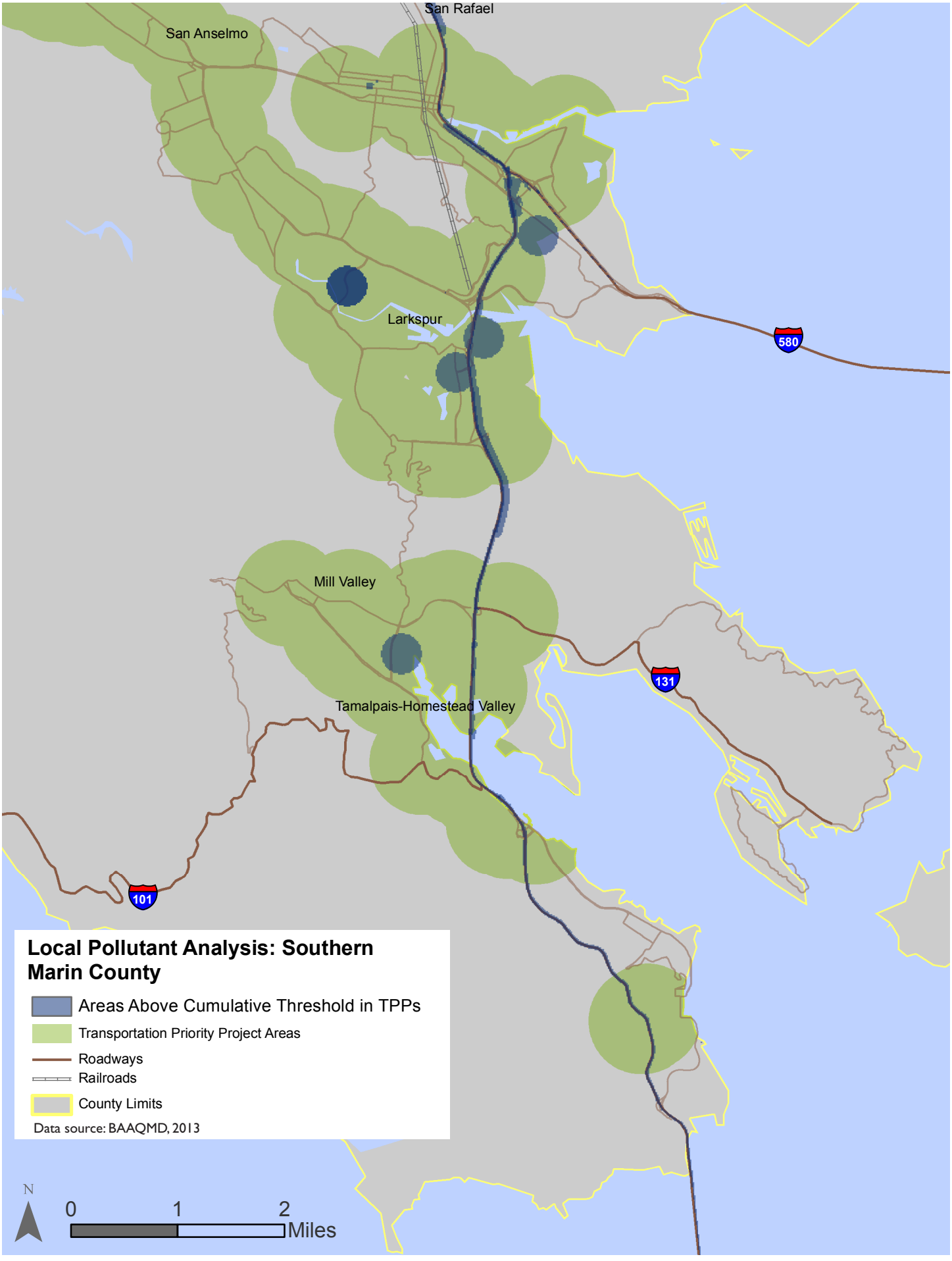

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Figure 2.2-13

Napa County Local Pollutant Analysis

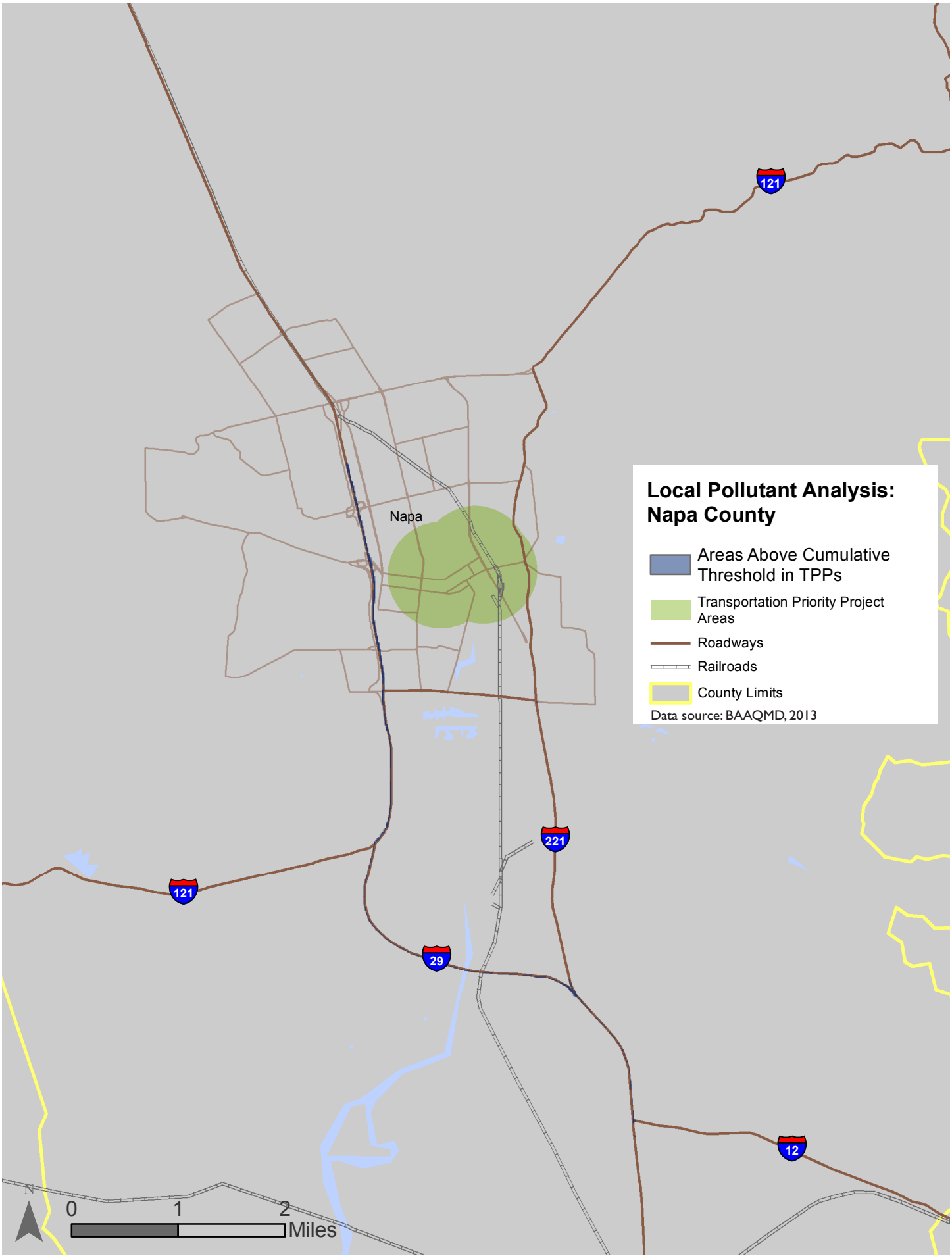

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Figure 2.2-14

Northern Santa Clara County Local Pollutant Analysis

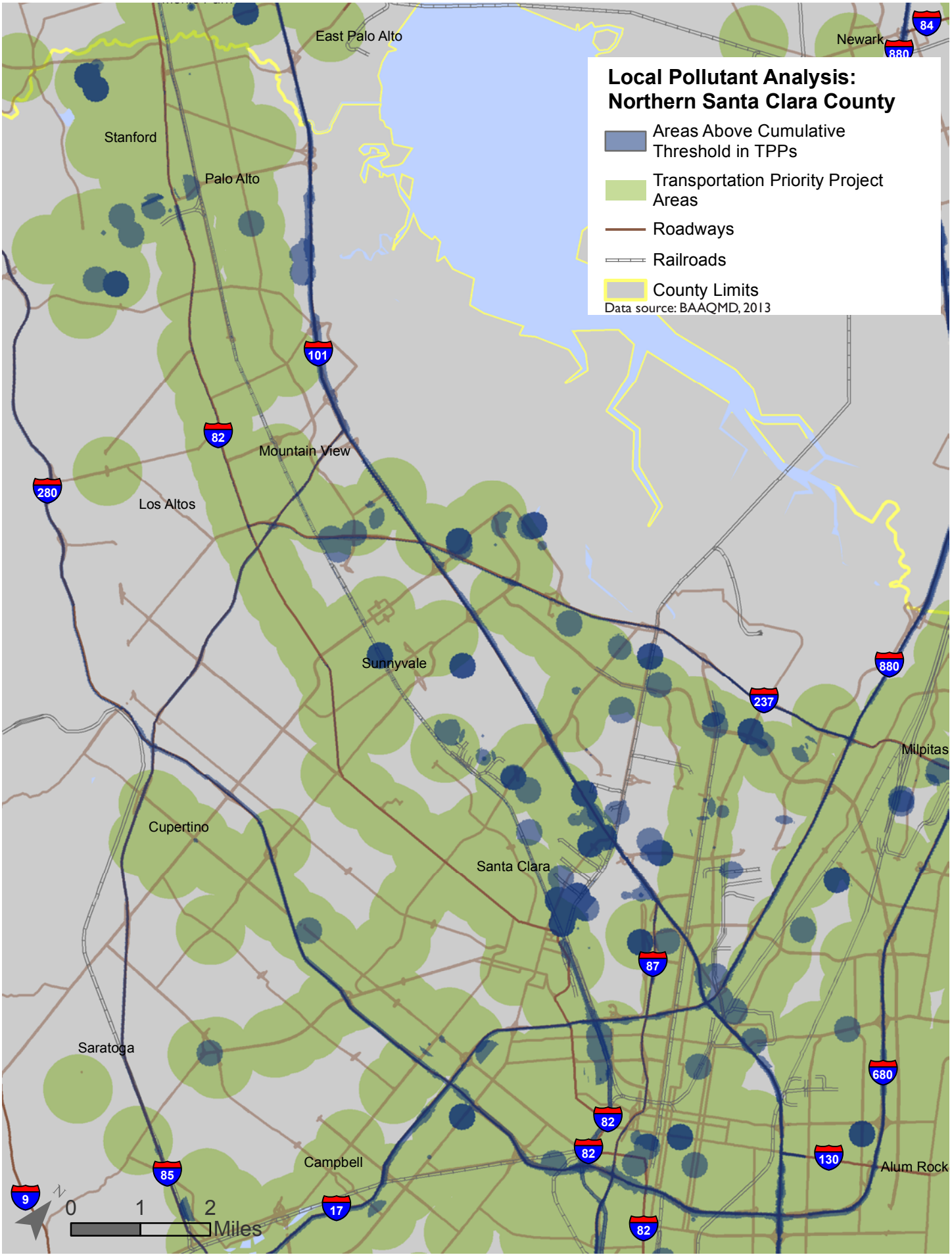

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Figure 2.2-15

Central Santa Clara County Local Pollutant Analysis

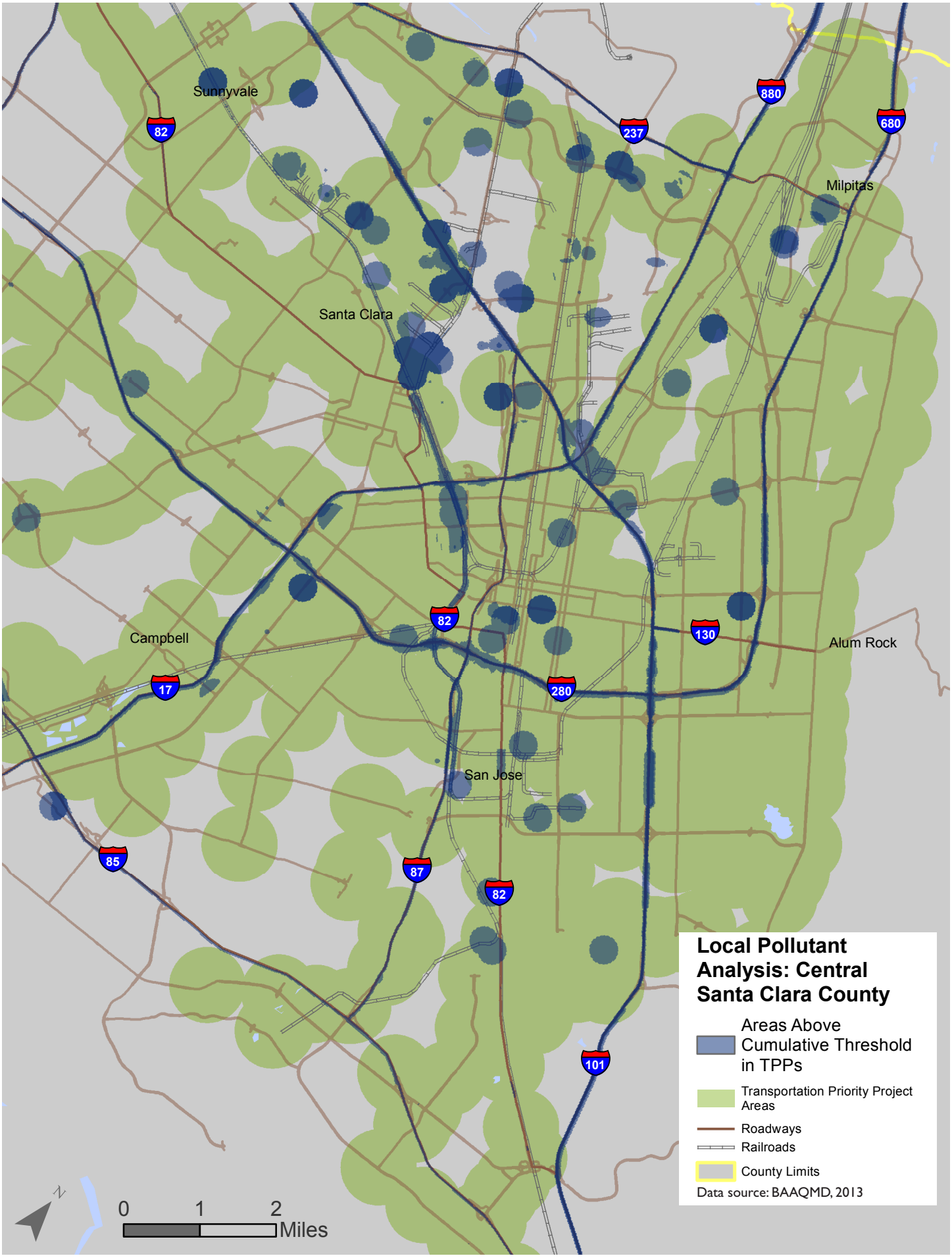

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Figure 2.2-16

Southern Santa Clara County Local Pollutant Analysis

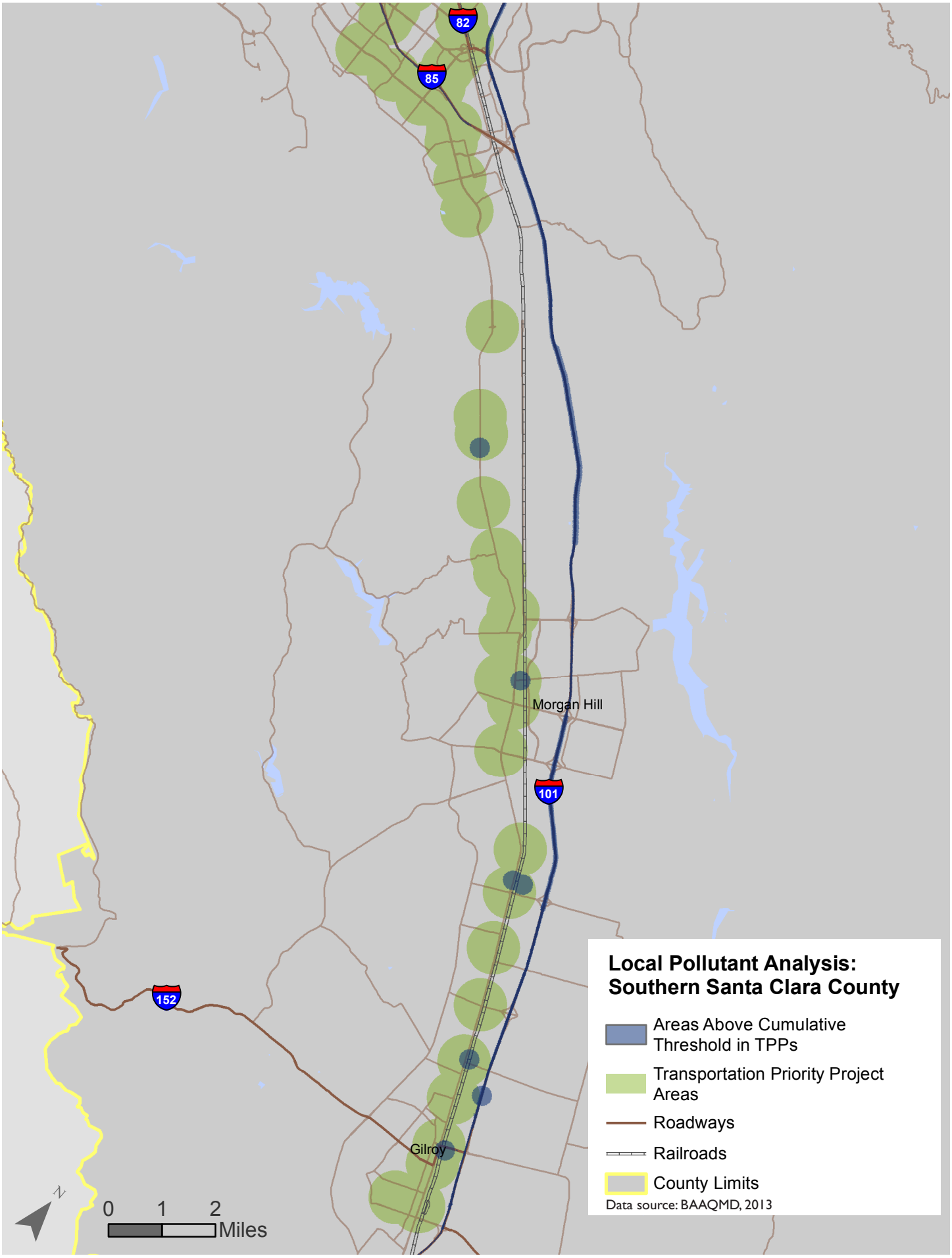

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Figure 2.2-17

San Francisco County

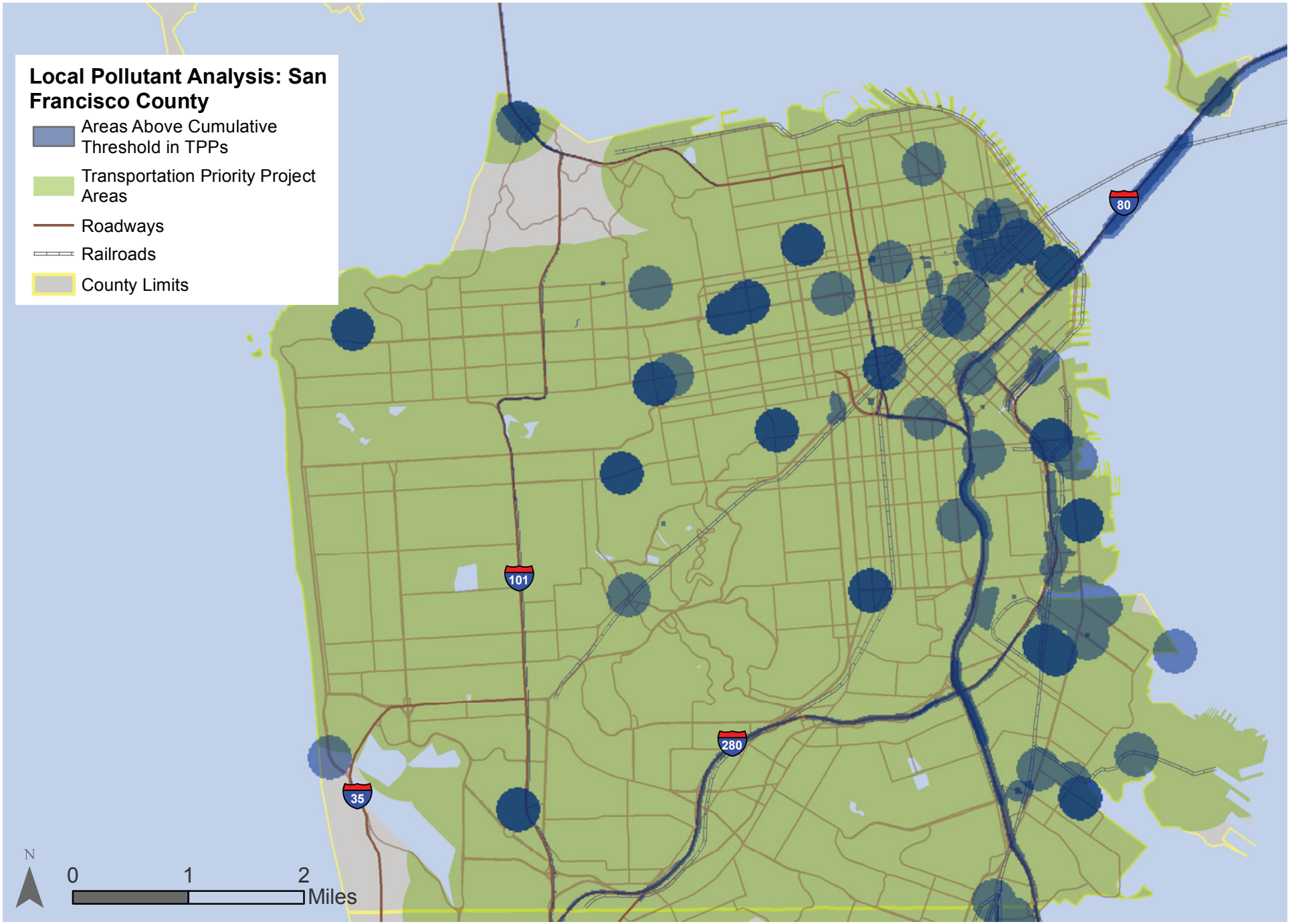

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Figure 2.2-18

Northern San Mateo County Local Pollutant Analysis

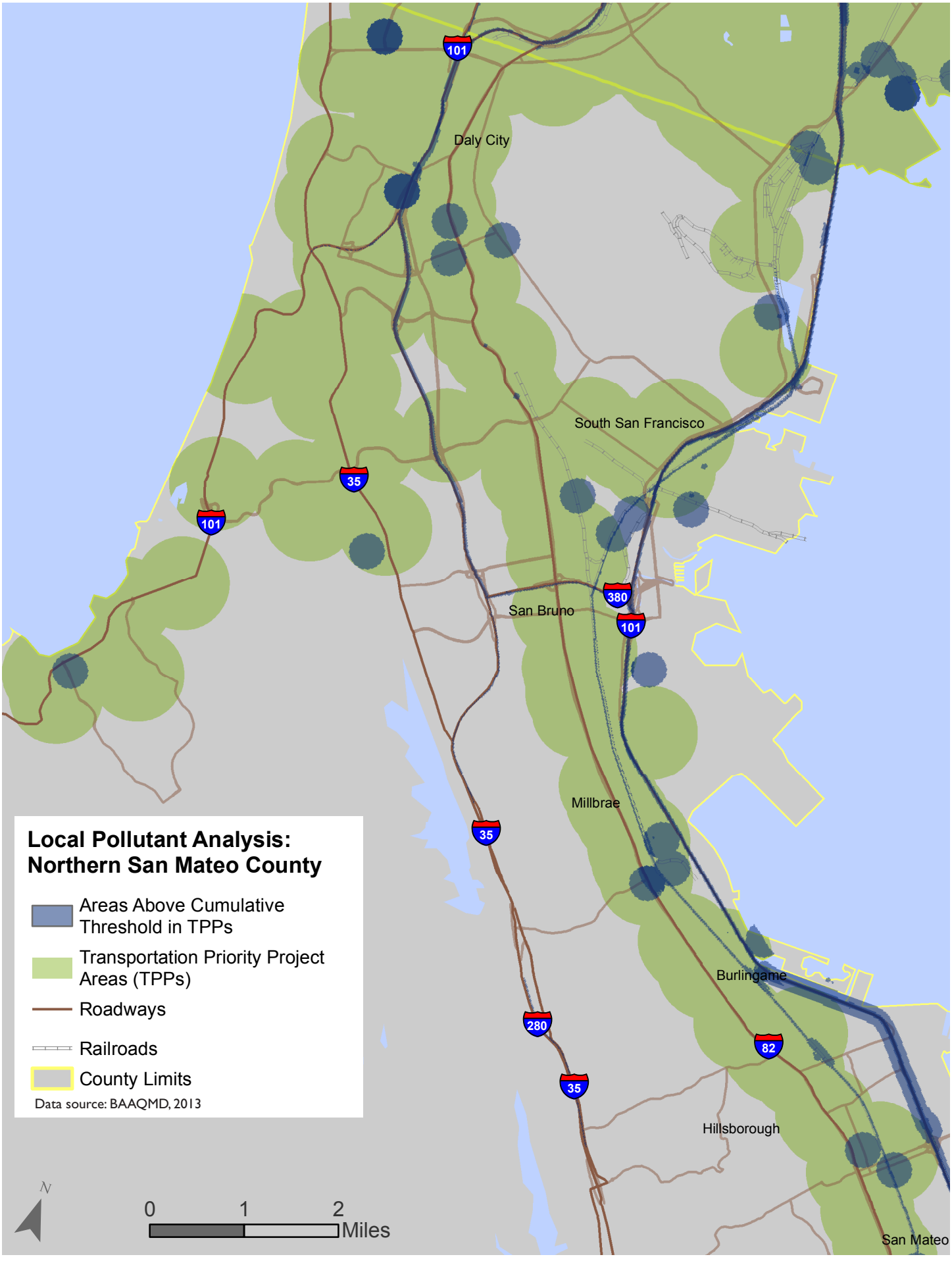

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Figure 2.2-19

Southern San Mateo County Local Pollutant Analysis

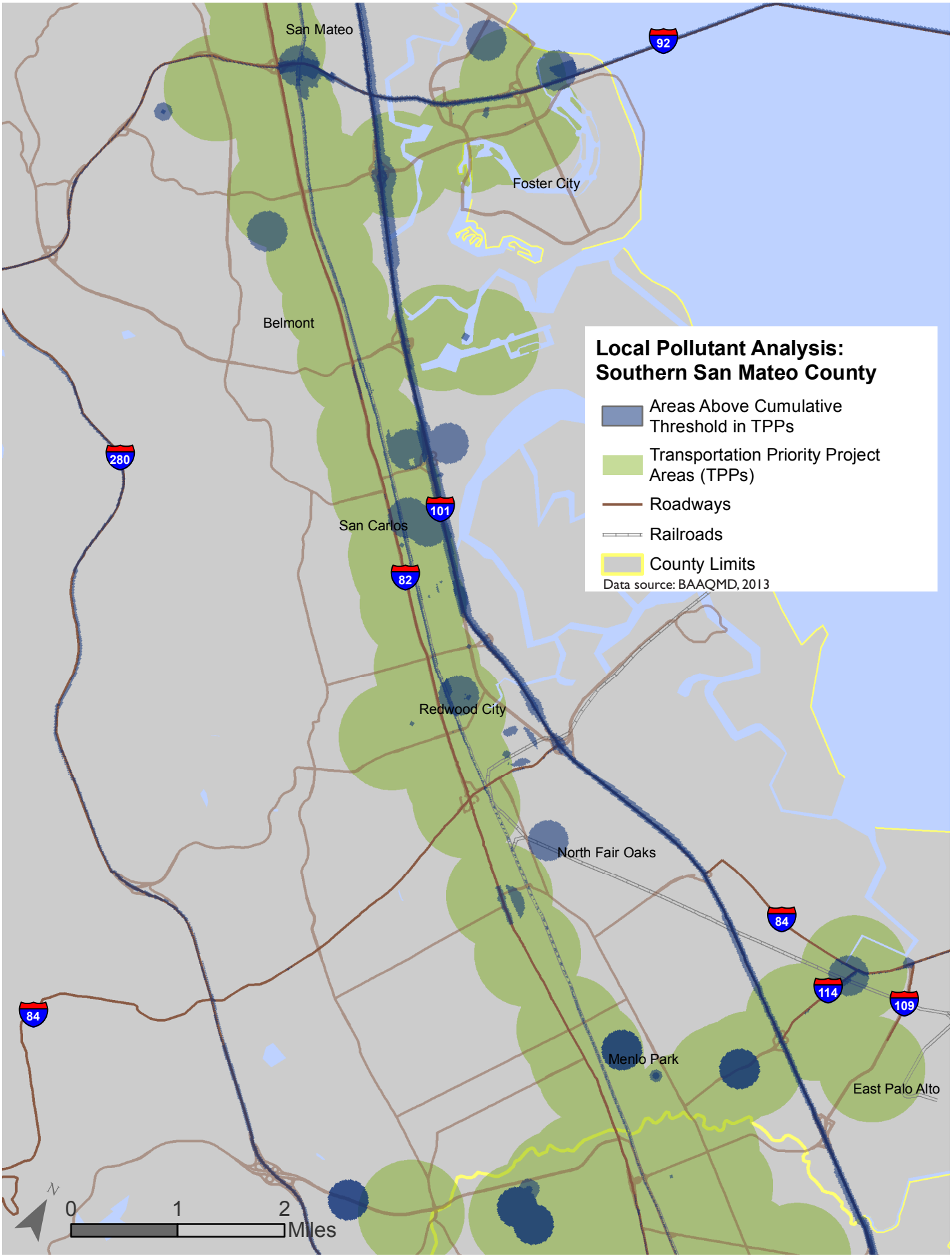

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Figure 2.2-20

Southern Solano County Local Pollutant Analysis

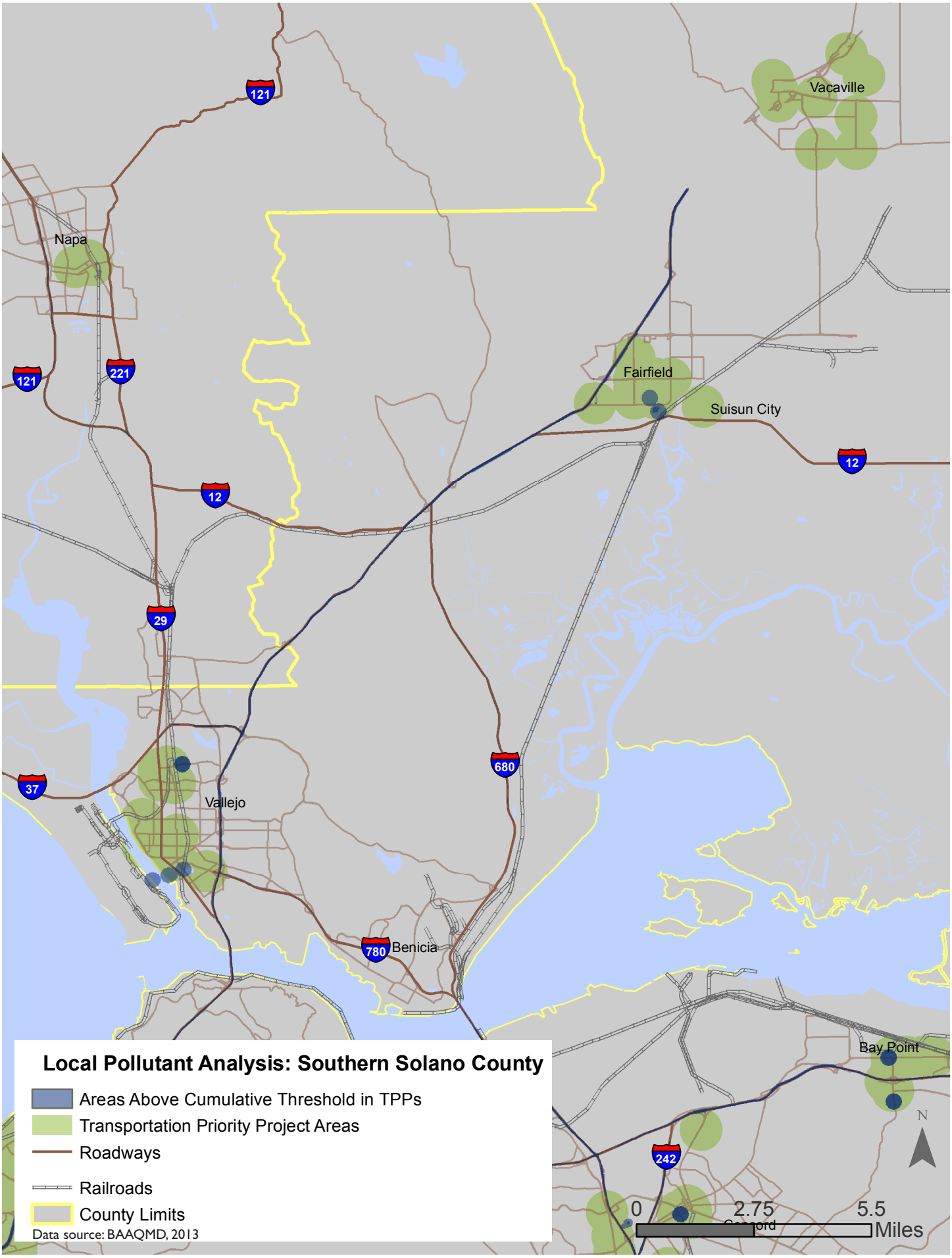

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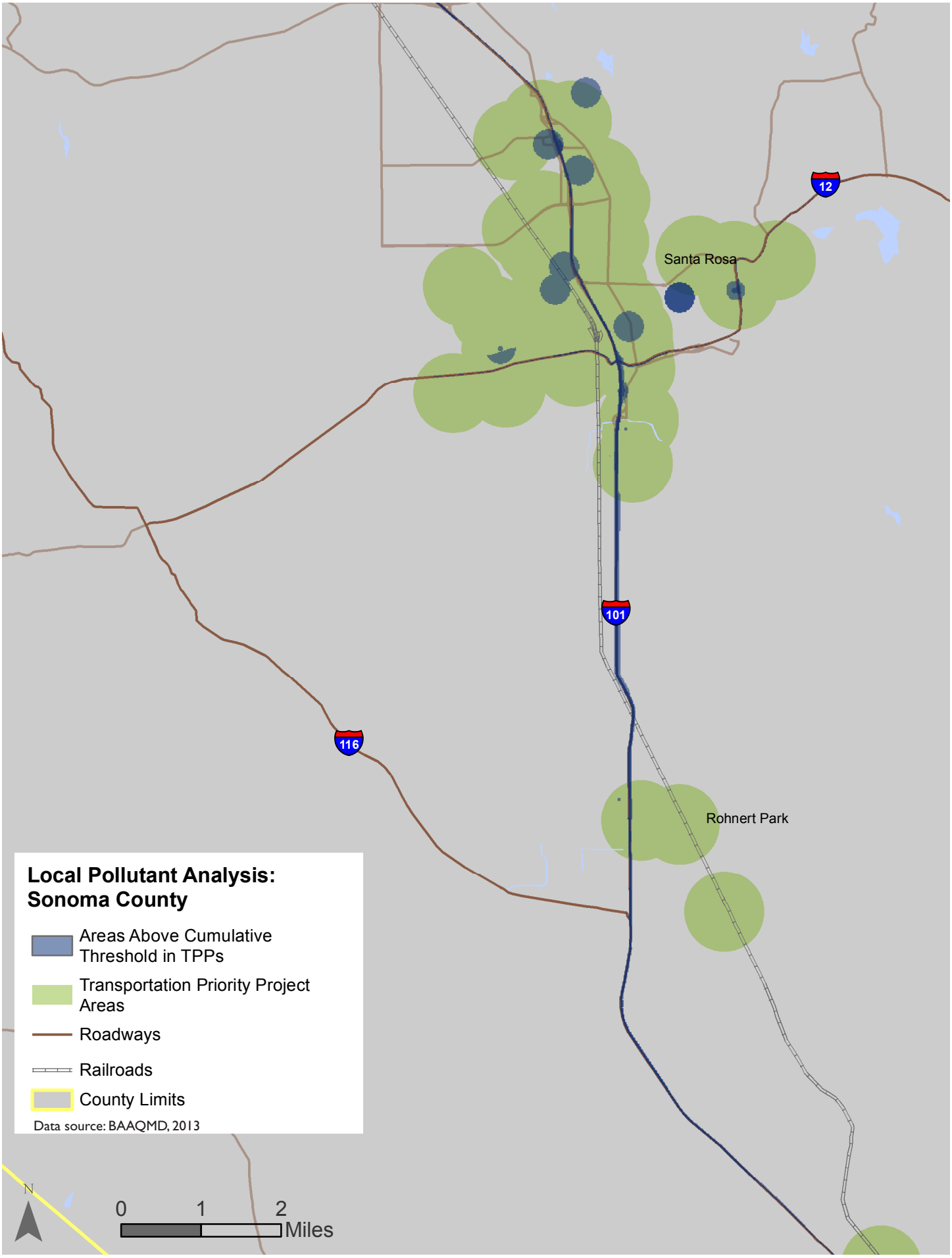
Figure 2.2-21

Sonoma County Local Pollutant Analysis



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Impact

2.2-5(b) Implementation of the proposed Plan could cause a localized net increase in sensitive receptors located in Transit Priority Project (TPP) corridors within set distances (Table 2.2-10) to mobile or stationary sources of TAC or $PM_{2.5}$ emissions.

New research on the health effects of TACs and $PM_{2.5}$ reinforces earlier findings regarding adverse health impacts on both respiratory and cardiovascular health but also a wider range of potential effects, such as diabetes, autism, cognitive functions in older adults, and oxidative damage to DNA. In addition, US EPA has not identified a level of TAC/ $PM_{2.5}$ concentration where no negative health effects are observed.[21]

In general, the closer one gets to a source of emissions, the higher the pollutant concentrations one will be exposed to. Ideally, sensitive land uses would be set back an appropriate distance such that sensitive receptors would not be exposed to TAC and $PM_{2.5}$ concentrations that could adversely affect their health. However, this is the central issue surrounding infill development, such as in TPPs and PDAs, where the objective is to locate jobs and housing in close proximity to each other to reduce automobile trips and therefore mobile source emissions. In doing so, sensitive receptors can be located too close to stationary or mobile sources and exposed to unhealthy levels of TACs and $PM_{2.5}$ concentrations.

To help identify the appropriate distances that sensitive receptors should be protected from these stationary and mobile sources, MTC utilized work prepared by ARB 2005 *Air Quality and Land Use Handbook: A Community Health Perspective* (Handbook), and BAAQMD permit data. ARB developed the Handbook to bring attention to the potential health impacts associated with locating sensitive receptors in close proximity to air pollution sources. Using available health data, air quality modeling, and monitoring studies, the Handbook provides recommendations for how far sensitive land uses should be located away from some specific sources of air pollution. The ARB recommended distances are based primarily on data showing that air pollution exposure from TACs and $PM_{2.5}$ can be reduced as much as 80 percent when sensitive land uses are set back the recommended distance. The distance recommendations were based on existing health studies and data available at that time. ARB distance recommendations were only made when the relative exposure and health risk from a source could be reasonably characterized from the available data. For each source type, the Handbook summarizes the key health and distance related findings that helped form the distance recommendation for that source.

ARB recommends using local air pollution source data, where appropriate and if available, to better determine specific health risk near local TAC and $PM_{2.5}$ sources, especially for sources not included in ARB's Handbook, or to identify more appropriate distance recommendations than they provide in the Handbook.

For sources of TACs and $PM_{2.5}$ not included in ARB's Land Use Handbook or for sources where Air District data was more site specific than ARB's data, MTC and ABAG worked with BAAQMD to develop distance recommendations for siting new sensitive land uses for use in this analysis. BAAQMD provided site specific stationary source permit data or existing studies to support the distance

[21] "Understanding Particulate Matter: Protecting Public Health in the San Francisco Bay Area," Bay Area Air Quality Management District, November 2012.

recommendations for diesel generators, refineries, sea ports, airports, railroads, rail stations, and ferry terminals.

The specific set distances recommended for avoiding locating sensitive land uses are listed below in **Table 2.2-10**. For detailed explanations of set distances recommended by ARB, see the 2005 *Air Quality and Land Use Handbook: A Community Health Perspective*. Recommended distances used for this analysis are summarized below and described in detail in Appendix E.

The ARB recommends that land use agencies "avoid siting" any sensitive land uses within the set distances identified within the Handbook. This recommendation is due to potential adverse health impacts that could affect sensitive receptors from prolonged exposure to higher concentrations of TACs and $PM_{2.5}$. Therefore, any future land use development that includes sensitive receptors within any of the set distances identified above would be considered a potentially significant (PS) impact. Mitigation Measure 2.2(d) is described below.

TABLE 2.2-10: DISTANCE RECOMMENDATION FROM SENSITIVE RECEPTORS

Source	*Distance Recommendation from Sensitive Receptors*
Freeway/Highway, Roadway	500 feet of a freeway, urban roads with 100,000 vehicles/day, or rural roads with 50,000 vehicles/day.
Distribution Center	1,000 feet of a distribution center with over 100 daily truck trips.
Gas Dispensing Facility	300 feet of a large gas dispensing facility (a facility with a throughput of 3.6 million gallons or more per year); 50 feet of a small gas dispensing facility (a facility with a throughput of less than 3.6 million gallons per year).
Dry Cleaning Operation	300 feet of dry cleaning operation using PERC; 500 feet of dry cleaning operations with two or more machines using PERC.
Chrome Plating Facility	1,000 feet of a chrome plating facility.
Railyard	1,000 feet of BNSF Richmond; BNSF Railway, Pittsburg; Union Pacific, Martinez; and Union Pacific, Milpitas. 0.5 miles of Maritime Port of Oakland/UP Railyard.
Railroad and Rail Station	200 feet of a railroad or rail station.
Ferry Terminal	500 feet of a ferry terminal.
Diesel Generator	350 feet of a diesel generator with an estimated cancer risk greater than 10 in a million.
Sea Port	0.5 miles of Maritime Port of Oakland/UP Railyard; 1,000 feet of Port of Benicia, Port of Redwood City; Port of Richmond.
Oil Refinery	0.5 miles of Chevron, Richmond; Shell, Martinez; Phillips 66, Rodeo; Tesoro, Martinez; and Valero, Benicia.
Airport	0.5 miles of all major airports, including San Francisco International, Oakland International Airport, and Norman Y. Mineta San José International Airport.

Source: The Bay Area Air Quality Management District, 2013.

Mitigation Measures

Implementing agencies and/or project sponsors shall consider implementation of mitigations measures including but not limited to those identified below.

2.2(d) Mitigation measures that shall be considered by implementing agencies and/or project sponsors where feasible based on project-and site-specific considerations include, but are not limited to best management practices (BMPs), such as the following:

- Installation of air filtration to reduce cancer risks and PM exposure for residents, and other sensitive populations, in buildings that are in close proximity to freeways, major roadways, diesel generators, distribution centers, railyards, railroads or rail stations, and ferry terminals. Air filter devices shall be rated MERV-13 or higher. As part of implementing this measure, an ongoing maintenance plan for the building's HVAC air filtration system shall be required.
- Phasing of residential developments when proposed within 500 feet of freeways such that homes nearest the freeway are built last, if feasible.
- Sites shall be designed to locate sensitive receptors as far as possible from any freeways, roadways, diesel generators, distribution centers, and railyards. Operable windows, balconies, and building air intakes shall be located as far away from these sources as feasible. If near a distribution center, residents shall not be located immediately adjacent to a loading dock or where trucks concentrate to deliver goods.
- Limiting ground floor uses in residential or mixed-use buildings that are located within the set distance of 500 feet to a non-elevated highway or roadway. Sensitive land uses, such as residential units or day cares, shall be prohibited on the ground floor.
- Planting trees and/or vegetation between sensitive receptors and pollution source, if feasible. Trees that are best suited to trapping PM shall be planted, including one or more of the following: Pine (*Pinus nigra* var. *maritima*), Cypress (*X Cupressocyparis leylandii*), Hybrid popular (*Populus deltoids X trichocarpa*), and Redwoods *(Sequoia sempervirens*).
- Within developments, sensitive receptors shall be separated as far away from truck activity areas, such as loading docks and delivery areas, as feasible. Loading dock shall be required electrification and all idling of heavy duty diesel trucks at these locations shall be prohibited.
- If within the project site, diesel generators that are not equipped to meet ARB's Tier 4 emission standards shall be replaced or retrofitted.
- If within the project site, emissions from diesel trucks shall be reduced through the following measures:
  - Installing electrical hook-ups for diesel trucks at loading docks.
  - Requiring trucks to use Transportation Refrigeration Units (TRU) that meet Tier 4 emission standards.
  - Requiring truck-intensive projects to use advanced exhaust technology (e.g. hybrid) or alternative fuels.
  - Prohibiting trucks from idling for more than two minutes as feasible.

- Establishing truck routes to avoid residential neighborhoods or other land uses serving sensitive populations. A truck route program, along with truck calming, parking and delivery restrictions, shall be implemented to direct traffic activity at non permitted sources and large construction projects.

Significance after Mitigation

The mitigation measures described above may result in cancer risk and $PM_{2.5}$ concentration reductions of 40 to 90 percent, depending on their applicability in a proposed project. See Appendix E for more information on the effectiveness of each mitigation measure.

Projects taking advantage of CEQA Streamlining provisions of SB 375 (Public Resources Code sections 21155.1, 21155.2, and 21159.28) must apply the mitigation measures described above, as feasible, to address site-specific conditions. To the extent that an individual project located within a set distance to a freeway or roadway, diesel generator, distribution center, rail line or railyard as defined above adopts and implements all feasible mitigation measures described above, the impact would be less than significant with mitigation (LS-M) (so long as the proposed project is not located in an area above the 100/million cancer risk or $PM_{2.5}$ concentration of 0.8 $\mu g/m^3$, as outlined in Impact 2.2-5(a)). However, for future development with sensitive land uses within set distances for gas stations, dry cleaners, airports, sea ports, chrome plating facilities, and oil refineries, implementation of Mitigation Measure 2.2(d) may not be sufficient to reduce the impact in all cases. Additional site specific analysis would be needed when a project is proposed in these areas to determine the actual level of impact and if feasible mitigation measures exist for the project to implement to get them below the thresholds. The impact for these projects would therefore remain significant and unavoidable (SU).

MTC/ABAG cannot require local implementing agencies to adopt the above mitigation measures, and it is ultimately the responsibility of a lead agency to determine and adopt mitigation. Therefore it cannot be ensured that this mitigation measure would be implemented in all cases. Further, there may be instances in which site-specific or project-specific conditions preclude the reduction of all project impacts to less-than-significant levels (as described above). For purposes of a conservative analysis, therefore, this impact remains significant and unavoidable (SU).

Impact

2.2-5(c) Implementation of the proposed Plan could cause a localized net increase in sensitive receptors located in Transit Priority Project (TPP) corridors where TACs or fine particulate matter ($PM_{2.5}$) concentrations result in noncompliance with an adopted Community Risk Reduction Plan.

BAAQMD launched an initiative in 2010 to assist cities and counties in reducing TACs and $PM_{2.5}$ through a plan-based, comprehensive, community-wide approach, commonly known as a community risk reduction plan (CRRP). BAAQMD prepared a guidance document, *Draft Guidelines for a Plan Approach for Reducing TACs and $PM_{2.5}$*, and partnered with the cities of San Francisco and San José to prepare CRRPs. BAAQMD provided funding, staff time, and technical resources, including emissions data and dispersion modeling, to each of the cities. At the time of this EIR's publication, BAAQMD completed the emissions inventory and dispersion modeling for San Francisco and the emissions inventory for San José. According to BAAQMD, the dispersion modeling for San José is anticipated to be completed in spring 2013.

In jurisdictions with an adopted CRRP, any proposed project that includes sensitive land uses and or receptors should be evaluated against the standards, thresholds and mitigation measures in those adopted plans. Where a proposed project is consistent with an adopted CRRP, the impact would be less than significant (LS).

Mitigation Measures

None required.

Impact

2.2-6 Implementation of the proposed Plan could result in a localized larger increase or smaller decrease of TACs and or $PM_{2.5}$ emissions in disproportionally impacted communities compared to the remainder of the Bay Area communities.

The method of analysis described above was used to determine if the investments and land use scenario would result in a larger increase or smaller decrease in TAC and $PM_{2.5}$ emissions in disproportionately impacted communities when compared to the Bay Area at large. TAC and $PM_{2.5}$ emissions were estimated along the major transportation corridors within the CARE communities for the proposed Plan's base year (2010) and the horizon year (2040).

Table 2.2-11 lists MTC's modeling results, expressed as a percentage change in TAC and $PM_{2.5}$ exhaust emissions when compared to the base year emissions for each county with a CARE community and the entire region. Overall TAC and $PM_{2.5}$ exhaust emissions from diesel and gasoline vehicles decrease significantly throughout the Bay Area between existing conditions in 2010 and the proposed Plan's horizon year 2040. Diesel PM, benzene, and 1, 3 butadiene TAC emissions from on-road vehicle exhaust are estimated to decrease between 68 and 75 percent. Region-wide $PM_{2.5}$ emissions from all on-road vehicle exhaust are expected to decrease by approximately 55 percent. These reductions are largely attributed to the implementation of ARB's On-Road Heavy-Duty Diesel Vehicle Regulations, which aims to achieve an 85 percent reduction in diesel PM by 2023.

Between CARE and non-CARE communities there are slight differences in the percent reductions expected in 2040. There are certain instances where non-CARE communities are estimated to have slightly higher $PM_{2.5}$ and TAC exhaust emission reductions than the CARE communities. The CARE community in Santa Clara County is an example where this occurs. These results may be explained by the fairly substantial increase expected in VMT within the Santa Clara CARE community when compared to the anticipated increase in VMT for the remainder of Santa Clara County. Then there are instances where a CARE community is expected to result in slightly higher reductions in TACs and $PM_{2.5}$, such as in Alameda County. While the percent difference in estimated $PM_{2.5}$ and TAC emissions isn't substantial between CARE and non-CARE communities, it does suggest that these disproportionally impacted communities may not realize the same level of $PM_{2.5}$ and TAC emission reductions expected throughout the remainder of the county.

TABLE 2.2-11: PERCENT CHANGE IN ON-ROAD MOBILE SOURCE EXHAUST EMISSIONS, YEARS 2010 - 2040

	Exhaust Only $PM_{2.5}$	*Diesel PM*	*Benzene*	*1, 3 Butadiene*	*VMT*
Alameda CARE Community	-56.11%	-69.23%	-71.16%	-71.56%	18.64%
Remainder of County	-55.13%	-67.24%	-69.27%	-69.58%	24.69%
Contra Costa CARE Community	-57.54%	-69.35%	-71.82%	-72.15%	14.56%
Remainder of County	-57.69%	-68.71%	-70.57%	-70.84%	15.92%
San Francisco CARE Community	-53.23%	-70.01%	-74.02%	-74.47%	11.57%
Remainder of County	-46.22%	-69.78%	-75.53%	-75.80%	7.89%
San Mateo CARE Community	-56.91%	-69.90%	-70.68%	-71.19%	19.00%
Remainder of County	-57.67%	-69.16%	-71.20%	-71.51%	15.53%
Santa Clara CARE Community	-50.86%	-66.16%	-67.58%	-68.08%	31.63%
Remainder of County	-54.14%	-67.23%	-69.55%	-69.92%	23.00%
Regionwide CARE Communities	-54.49%	-68.43%	-70.55%	-70.99%	21.12%
Remainder of Region	-55.64%	-67.66%	-69.97%	-70.27%	20.21%

Source: The Bay Area Air Quality Management District, 2013.

Table 2.2-12 lists MTC's modeling results, expressed as a percentage change in Total $PM_{2.5}$ emissions when compared to the 2010 base year emissions, for each county with a CARE community and the entire region. Total $PM_{2.5}$ includes exhaust from all vehicles, as well as re-entrained road dust, brake wear and tire wear, and does not include TACs from gasoline vehicles. Brake wear and tire wear emission rates are estimated in EMFAC2011. Road dust emissions are estimated from ARB's paved road dust methodology, which is based on EPA's dust emission rates estimates (EPA, AP-42 13.2.1, January 2011). When all sources of $PM_{2.5}$ are aggregated, the anticipated $PM_{2.5}$ emission reductions are much smaller than the emission changes presented in **Table 2.2-11**, which only show vehicle exhaust emissions. In fact, when Total $PM_{2.5}$ is estimated some counties even show an increase between 2010 and 2040.

This outcome may be explained by a number of factors. Emissions from gasoline and diesel on-road vehicles have been substantially reduced by stringent California and federal exhaust emission standards. ARB on-road Heavy-Duty Diesel Regulations are expected to reduce diesel PM by 85 percent by 2020. In addition, $PM_{2.5}$ from brake and tire wear from passenger vehicles is expected to represent approximately 85 to 90 percent of particulate matter from vehicles well into the future.[22] Currently, there are no regulations that have been adopted that will reduce future levels of particulate matter from tire and brake wear and re-entrained road dust emissions. Therefore, EMFAC2011 does not consider any improvements in brake and tire wear and re-entrained road dust emissions in future year's emission estimates. This means that as VMT increases, so do $PM_{2.5}$ emissions from brake and tire wear and re-entrained road dust. This is an example where increases in VMT are outstripping the technological advances of low emission vehicles.

[22] EMFAC 2011 Technical Documentation, ARB, September 19, 2011, p. 112.

Table 2.2-12 also shows that the CARE community in Santa Clara County, as well as regionwide CARE communities, will experience higher total $PM_{2.5}$ emissions between 2010 and 2040 in comparison with non-CARE portions of the County, and the region as a whole. As a result of the projected increase of $PM_{2.5}$ emissions in the CARE communities from 2010 to 2040, a potentially significant (PS) impact will occur based on the impact criteria for disproportionally impacted communities. Mitigation measures 2.2 (e) and 2.2 (f) are described below.

TABLE 2.2-12: PERCENT CHANGE IN ON-ROAD MOBILE SOURCE TOTAL PM EMISSIONS, YEARS 2010–2040 (TOTAL $PM_{2.5}$ INCLUDES VEHICLE EXHAUST, RE-ENTRAINED ROAD DUST, TIRE AND BRAKE WEAR)

Alameda CARE Community	**-1.36%**
Remainder of County	**2.49%**
Contra Costa CARE Community	**-3.64%**
Remainder of County	**-3.70%**
San Francisco CARE Community	**-3.62%**
Remainder of County	**-2.35%**
San Mateo CARE Community	**-1.53%**
Remainder of County	**-4.82%**
Santa Clara CARE Community	**10.53%**
Remainder of County	**2.89%**
Regionwide CARE Communities	**1.65%**
Remainder of Region	**-0.23%**

Source: The Bay Area Air Quality Management District, 2013.

Mitigation Measures

Mitigation measures to reduce TAC and $PM_{2.5}$ emissions from on-road trucks and locomotives that shall be implemented by MTC/ABAG and BAAQMD include, but are not limited to the following:

2.2(e) MTC/ABAG shall partner with BAAQMD to develop a program to install air filtration devices in existing residential buildings, and other buildings with sensitive receptors, located near freeways or sources of TACs and $PM_{2.5}$.

2.2(f) MTC/ABAG shall partner with BAAQMD to develop a program to provide incentives to replace older locomotives and trucks in the region to reduce TACs and $PM_{2.5}$.

In addition, Mitigation Measures 2.1 (a), 2.1(b), and 2.1 (c) (included in *Chapter 2.1: Transportation*) and 2.2 (d) (included under Impact 2.2-5(b)) could help reduce TAC and $PM_{2.5}$ emissions.

Significance after Mitigation

The proposed Plan could result in a larger increase or smaller decrease of TACs and $PM_{2.5}$ emissions in disproportionally impacted communities. These impacts vary across counties. The mitigation measures

identified above are anticipated to reduce this potentially significant impact. However, the exact reductions are not known at this time. Therefore, this impact remains significant and unavoidable (SU).

OFFICE OF ENVIRONMENTAL HEALTH HAZARD ASSESSMENT

Air Toxics Hot Spots Program

Risk Assessment Guidelines

Guidance Manual for Preparation of Health Risk Assessments

February 2015

Air, Community, and Environmental Research Branch
Office of Environmental Health Hazard Assessment
California Environmental Protection Agency

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February 2015

Air Toxics Hot Spots Program
Risk Assessment Guidelines

The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments

Office of Environmental Health Hazard Assessment
California Environmental Protection Agency
George V. Alexeeff, Ph.D., Director

Project Leads: Daryn E. Dodge, Ph.D.[a] and Gregory Harris[b]

Reviewed by:

Melanie A. Marty, Ph.D.[a]

Assistant Deputy Director, Division of Scientific Affairs

David Siegel, Ph.D.[a]

Chief, Air, Community, and Environmental Research Branch

OEHHA acknowledges the following contributors:

Abdullah Mahmud, Ph.D[b]

Anthony Servin, P.E.[b]

Steven Yee[b]

Yan-Ping Zuo[b]

James F. Collins, Ph.D., D.A.B.T.[a]

Andrew G. Salmon, M.A., D.Phil.[a]

Aijun Albert Wang, Ph.D.[a]

[a] *Air, Community, and Environmental Research Branch*
Office of Environmental Health Hazard Assessment

[b] *California Air Resources Board*

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Preface

The draft of the *Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments* (Guidance Manual) is a description of the algorithms, recommended exposure variates, cancer and noncancer health values, and the air modeling protocols needed to perform a health risk assessment (HRA) under the Air Toxics Hot Spots Information and Assessment Act of 1987(Health and Safety Code Section 44300 et seq., see Appendix B). The Children's Environmental Health Protection Act of 1999 (Health and Safety Code Section 39606, also contained in Appendix B), which requires explicit consideration of infants and children in assessing risks from air toxics, necessitated revisions of the methods for both noncancer and cancer risk assessment, and of the exposure variates. This draft version of the Guidance Manual updates the previous version (OEHHA, 2003), and reflects advances in the field of risk assessment along with explicit consideration of infants and children.

The information presented in the draft manual is compiled from three technical support documents (TSDs) released by the Office of Environmental Health Hazard Assessment (OEHHA) for the Hot Spots Program. The three TSDs (which are also revised versions, replacing the original four Hot Spots TSDs adopted between 1999 and 2003) underwent public comment and peer review and were adopted for use in the Air Toxics Hot Spots program by the Director of OEHHA. The Technical Support Document for the Derivation of Noncancer Reference Exposure Levels (June, 2008) addressed the methodology for deriving acute, chronic and eight hour Reference Exposure Levels. The Technical Support Document for Cancer Potency Factors (May 2009) addresses the methodology for deriving cancer potency factors and adjusting cancer potency to account for the increased sensitivity of early-in-life exposure to carcinogens. The Technical Support Document for Exposure Assessment and Stochastic Analysis (June 2012) presents the exposure model for the Hot Spots program and reviews the available literature on exposure and relevant fate and transport variates. All three TSDs are available on OEHHA's web site at: http://www.oehha.ca.gov/air/hot_spots/index.html. Excerpts of these three TSDs are presented in this document. There is relatively little new information in the Guidance Manual since the adoption of the TSDs.

The draft Guidance Manual was released for public review. Public comments were received and changes were made in response to some comments. Responses were developed to all public comments. Both the Guidance Manual and OEHHA's response to comments were then reviewed by the State's Scientific Review Panel on Toxic Air Contaminants (SRP), who previously reviewed the three TSDs upon which this guidance is based. Following review by the SRP, OEHHA finalized this Guidance Manual. This Guidance Manual supersedes the risk assessment methods presented in the Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments (OEHHA, 2003), which in turn replaced earlier guidance provided by the California Air Pollution Control Officer's Association (CAPCOA, 1993). This manual updates health effects values, exposure pathway variates (e.g., breathing rates), and

continues to use a tiered approach for performing HRAs based on current science and policy assessment. The Technical Support Document for Cancer Potency Factors (OEHHA, 2009) recommends a tenfold early-in-life potency factor adjustment for the third trimester and ages zero to less than two, and a threefold adjustment factor for ages two to less than sixteen. In addition, we recommend evaluating residency periods of nine, thirty and seventy years. This means that exposure variates are needed for the third trimester, ages zero to less than two, ages two to less than nine, ages two to less than 16, ages 16 to less than 30, and ages 16 to 70.

The tiered approach presented in this draft manual provides a risk assessor with flexibility and allows consideration of site-specific differences. Furthermore, risk assessors can tailor the level of effort and refinement of an HRA by using the point-estimate exposure variates or the stochastic treatment of distributions of exposure variates. The four-tiered approach to risk assessment primarily applies to residential cancer risk assessment. Compared to the OEHHA 2003 document, the exposure pathways in the Guidance Manual remain the same. The exposure and risk algorithms are similar, but they have been revised to accept new data or variables that are used in the tiered risk assessment approach.

The draft manual also contains example calculations and an outline for a modeling protocol and an HRA report. A software program, the Hot Spots Analysis and Reporting Program (HARP), has been developed by the Air Resources Board in consultation with OEHHA and Air Pollution Control/Air Quality Management District representatives. The HARP software, which is being updated with the new exposure variates and health values, is the recommended model for calculating and presenting HRA results for the Hot Spots Program. Information on obtaining the HARP software can be found on the ARB's web site at *www.arb.ca.gov* under the Hot Spots Program.

The intent of the Guidance Manual and the HARP software is to incorporate children's health concerns, update risk assessment practices, and to provide consistent risk assessment procedures. The use of consistent risk assessment methods and report presentation has many benefits, such as expediting the preparation and review of HRAs, minimizing revision and resubmission of HRAs, allowing a format for facility comparisons, and cost-effective implementation of HRAs and the Hot Spots Program. Risk assessments prepared with this Guidance Manual may be used for permitting new or modified stationary sources, or public notification, and risk reduction requirements of the Hot Spots Program. The use of uniform procedures allows comparison of risks from different facilities and enables identification of facilities that are problematic from a public health perspective. OEHHA reviews the HRAs to insure they are adequate for decision making, but does not play a role in permitting decisions that may result from the HRAs. OEHHA will provide advice to the Districts when requested on any of the risk assessment methods or health values they have used.

References

CAPCOA, 1993. CAPCOA Air Toxics Hot Spots Program Revised 1992 Risk Assessment Guidelines. California Air Pollution Control Officers Association, October 1993.

OEHHA, 2003. Air Toxics Hot Spots Risk Assessment Guidelines: The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments.

OEHHA, 2008. Air Toxics Hot Spots Risk Assessment Guidelines Technical Support Document for the Derivation of Noncancer Reference Exposure Levels. Available online at: http://www.oehha.ca.gov

OEHHA, 2009. Technical Support Document for Cancer Potency Factors: Methodologies for derivation, listing of available values, and adjustments to allow for early life stage exposures. May 2009. Available online at: http://www.oehha.ca.gov

OEHHA, 2012. Air Toxics Hot Spots Program Risk Assessment Guidelines; Technical Support Document for Exposure Assessment and Stochastic Analysis. Available online at http://www.oehha.ca.gov

1 - Introduction

1.1 Development of Guidelines

The Air Toxics Hot Spots Information and Assessment Act is designed to provide information to state and local agencies and to the general public on the extent of airborne emissions from stationary sources and the potential public health impacts of those emissions. The Hot Spots Act requires that the Office of Environmental Health Hazard Assessment (OEHHA) develop risk assessment guidelines for the Hot Spots program (Health and Safety Code (HSC) Section 44360(b)(2)) (see Appendix B for the text of the HSC). In addition, the Hot Spots Act specifically requires OEHHA to develop a "likelihood of risks" approach to health risk assessment. In response, OEHHA developed a tiered approach to risk assessment where a point estimate approach is first employed. If a more detailed analysis is needed, OEHHA has developed a stochastic, or probabilistic, approach using exposure factor distributions that can be applied in a stochastic estimate of the exposure. A detailed presentation of the tiered approach, risk assessment algorithms, selected exposure variates (e.g., breathing rate), and distributions with a literature review is presented in the *Air Toxics Hot Spots Program Risk Assessment Guidelines*; *Technical Support Document for Exposure Assessment and Stochastic Analysis* (OEHHA, 2012). A summary of this information can be found in Chapter 5 of this document.

The Technical Support Document for the Derivation of Noncancer Reference Exposure Levels (OEHHA, 2008) addresses dose response relationships for noncancer health effects and the methodology for deriving acute, chronic and 8-hour Reference Exposure Levels (RELs). Currently there are 53 acute RELs, 82 chronic RELs, and 10 eight-hour RELs. Review and revision of RELs to take into account new information and sensitive subpopulations including infants and children is an ongoing process. All draft RELs for individual chemicals revised under the current noncancer methodology will undergo public comment and peer review, as mandated by the Hot Spots Act. The Technical Support Document for Cancer Potency Factors (OEHHA, 2009) addresses the methodology for deriving cancer potency factors and adjusting cancer potency to account for the increased sensitivity to early-in-life exposure to carcinogens. This document contains inhalation cancer potency factors and oral cancer potency factors for 142 toxicants and toxicant compound classes developed by OEHHA or developed by other authoritative bodies and endorsed by OEHHA. The OEHHA website (*www.oehha.ca.gov*) should be consulted for the most current adopted chronic, acute and 8-hour RELs and cancer potency factors. In addition, for a small subset of these substances that are subject to airborne deposition and hence human oral and dermal exposure, oral chronic RELs and oral cancer potency factors have been developed by OEHHA. A summary of cancer and noncancer health effects values can be found in Appendix L and Chapters 6 and 7 of the Guidance Manual. All three Technical Support Documents have undergone public and peer review and have been approved by the state's Scientific Review Panel on Toxic Air Contaminants and adopted by OEHHA. The Guidance Manual is undergoing the same public and peer review process.

The Guidance Manual contains a description of the algorithms, recommended exposure variates, and cancer and noncancer health values, and modeling protocols needed to perform a Hot Spots risk assessment under the Hot Spots Act (see Appendix B). The information for the Guidance Manual is taken from the three TSDs. The Guidance Manual supersedes the risk assessment methods presented in the Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments (OEHHA, 2003).

The Guidance Manual is intended to address health risks from airborne contaminants released by stationary sources. Some of the methodology used is common to other regulatory risk assessment applications, particularly for California programs. However, if the reader needs to prepare a Health Risk Assessment (HRA) under another program, the HRA may need additional analyses. Therefore, appropriate California and federal agencies should be contacted. For example, if a facility must comply with HRA requirements under the Resource Conservation and Recovery Act (RCRA) or the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), the California Department of Toxic Substances Control (DTSC) must be contacted to determine if an HRA written to comply with AB 2588 will also satisfy RCRA/CERCLA requirements.

1.2 Use of the Guidance Manual

The intent in developing this Guidance Manual is to provide HRA procedures for use in the Air Toxics Hot Spots Program or for the permitting of existing, new, or modified stationary sources. The Air Resources Board (ARB) website (*www.arb.ca.gov*) provides more information on the Hot Spots Program and risk management guidelines, including recommendations for permitting existing, new, or modified stationary sources. The use of consistent risk assessment procedures and report presentation allows comparison of one facility to another, expedites the review of HRAs by reviewing agencies, and minimizes revision and resubmission of HRAs.

OEHHA recognizes that no one risk assessment procedure or set of exposure variates could perfectly address the many types of stationary facilities in diverse locations in California. Therefore a tiered risk assessment approach was developed to provide flexibility and allow consideration of site-specific differences. The tiered approach to risk assessment is discussed in detail in Chapter 8 of this Guidance.

These guidelines should be used in conjunction with the emission data collected and reported pursuant to requirements of the ARB's *Emission Inventory Criteria and Guidelines Regulations (Title 17, California Code of Regulations, Sections 93300-93300.5*), and the *Emission Inventory Criteria and Guidelines Report for the Air Toxics "Hot Spots" Program* (EICG Report), which is incorporated by reference therein (see ARB's web site: http://www.arb.ca.gov/ab2588/2588guid.htm for the most current version, which was approved on August 27, 2007). This regulation outlines requirements for the collection of emission data, based on an inventory plan, which must be approved by the Air Pollution Control or Air Quality Management District (District). The emissions reported under this program are routine or predictable and include continuous

and intermittent releases and predictable process upsets or leaks. Emissions for unpredictable releases (e.g., accidental catastrophic releases) are not reported under this program.

For landfill sites, these guidelines should be applied to the results of the landfill testing required under Health and Safety Code Section 41805.5 as well as to any emissions reported under the emission inventory requirements of the Air Toxics Hot Spots Act (e.g., from flares or other on-site equipment). Districts should be consulted to determine the specific landfill testing data to be used.

1.3 Who is Required to Conduct a Risk Assessment

The Hot Spots Act requires that each local Air Pollution Control District or Air Quality Management District (hereinafter referred to as District) determine which facilities will prepare an HRA. As defined under the Hot Spots Act, an HRA includes a comprehensive analysis of the dispersion of hazardous substances in the environment, their potential for human exposure, and a quantitative assessment of both individual and population-wide health risks associated with those levels of exposure.

Districts are to determine which facilities will prepare an HRA based on a prioritization process outlined in the law. The process by which Districts identify priority facilities for risk assessment involves consideration of potency, toxicity, quantity of emissions, and proximity to sensitive receptors such as hospitals, daycare centers, schools, work-sites, and residences. The District may also consider other factors that may contribute to an increased potential for significant risk to human receptors. As part of this process Districts categorize facilities as high, intermediate, or low priority. The District prioritization process is described in the *CAPCOA Air Toxics Hot Spots Program Facility Prioritization Guidelines, July 1990* (CAPCOA, 1990), although some Districts may have adopted their own method for prioritizing facilities for the purposes of AB2588, permitting, etc. Consult the District for updates to the Prioritization Guidelines. See the Hot Spots Program on ARB's web site at *www.arb.ca.gov* for more information on facility prioritization procedures.

Facilities designated by a District as "high priority" are required to submit an HRA to the District within 150 days of designation. Districts may grant a 30-day extension. However, a District may require any facility to prepare and submit an HRA according to the District priorities established for purposes of the Hot Spots Act.

1.4 The Hot Spots Analysis and Reporting Program (HARP) Software

The ARB and the Districts have identified a critical need for software to assist with the programmatic aspects of the Hot Spots Program. HARP is computer software used by the ARB, OEHHA, Districts, and facility operators to promote statewide consistency, efficiency, and cost-effective implementation of HRAs and the Hot Spots Program. The HARP software package includes: 1) an Emissions Inventory Database Module, 2) an Air Dispersion Modeling Module, and 3) a Risk Analysis Module. The user-friendly Windows-based package provides for:

1. Electronic implementation of the risk assessment methods presented in the OEHHA guidelines (Guidance Manual);
2. Electronic data transfer from facilities and Districts;
3. The production of reports;
4. Facility prioritization;
5. Air dispersion modeling (AERMOD) of multiple emission releases or facilities for cumulative impact evaluations;
6. A summary report of acute, 8-hour, and chronic health hazard quotients or indices, and cancer risk at the point of maximum impact (PMI), maximally exposed individual resident (MEIR), maximally exposed individual worker (MEIW) and other receptors to be evaluated as needed;
7. Mapping displays of facility property boundaries, risk isopleths, and elevation contours;
8. The ability to display combined risk contours from multiple emission sources;
9. Output of data for use in other “off-the-shelf” Geographic Information Systems (GIS) programs for additional types of analysis; and
10. Census data for determining population-related health impacts showing the number of people exposed at various cancer risk levels and cancer burden.

1.5 Risk Assessment Review Process

The Hot Spots Act risk assessments are reviewed by the local District and by OEHHA. The Districts focus their review on the emissions data and the air dispersion modeling. OEHHA provides comments on the HRA’s general concordance with the Guidelines Manual and the completeness of the reported health risks. The District, taking into account the comments of OEHHA, approves the HRA or returns it to the facility for revision and resubmission. If the HRA is not revised and resubmitted by the facility within 60 days, the District may modify the HRA and approve it as modified. Based on the approved HRA, the District determines if there is a significant health risk associated with emissions from the facility. If the District determines that facility emissions pose a significant health risk, the facility operator provides notice to all exposed individuals regarding the results of the HRA and may be required to take steps to reduce emissions by implementing a risk reduction audit and plan. Notification is to be made according to

procedures specified by the District. Each District determines its own levels of significance for cancer and noncancer health effects for notification and risk reduction. See the Hot Spots Program on ARB's web site at *www.arb.ca.gov* for more information on significance levels selected by each District.

1.6 Uncertainty in Risk Assessment

OEHHA has striven to use the best science available in developing these risk assessment guidelines. However, there is a great deal of uncertainty associated with the process of risk assessment. The uncertainty arises from lack of data in many areas necessitating the use of assumptions. The assumptions used in these guidelines are designed to err on the side of health protection in order to avoid underestimation of risk to the public. Sources of uncertainty, which may overestimate or underestimate risk, include: 1) extrapolation of toxicity data in animals to humans, 2) uncertainty in the estimation of emissions, 3) uncertainty in the air dispersion models, and 4) uncertainty in the exposure estimates. In addition to uncertainty, there is a natural range or variability in measured parameters defining the exposure scenario. Scientific studies with representative sampling and large enough sample sizes can characterize this variability. In the specific context of a Hot Spots risk assessment, the source of variability with the greatest quantitative impact is variation among the human population in such properties as height, weight, food consumption, breathing rates, and susceptibility to chemical toxicants. OEHHA captures at least some of the variability in exposure by developing data driven distributions of intake rates, where feasible, in the TSD for Exposure Assessment (OEHHA, 2012).

Interactive effects of exposure to more than one carcinogen or toxicant are addressed in the risk assessment with default assumptions of additivity. Cancer risks from all carcinogens addressed in the HRA are added. Similarly, non-cancer hazard quotients for substances impacting the same target organ/system are added to determine the hazard index (HI). Although such effects of multiple chemicals are assumed to be additive by default, several examples of synergism (interactive effects greater than additive) are known. For substances that act synergistically, the HRA could underestimate the risks. Some substances may have antagonistic effects (lessen the toxic effects produced by another substance). For substances that act antagonistically, the HRA could overestimate the risks.

Other sources of uncertainty, which may underestimate or overestimate risk, can be found in exposure estimates where little or no data are available (e.g., soil half-life and dermal penetration of some substances from a soil matrix).

The differences among species and within human populations usually cannot be easily quantified and incorporated into risk assessments. Factors including metabolism, target site sensitivity, diet, immunological responses, and genetics may influence the response to toxicants. The human population is much more diverse both genetically and culturally (e.g., lifestyle, diet) than inbred experimental animals. The intraspecies variability among humans is expected to be much greater than in laboratory animals.

In most cases, cancer potency values have been estimated only for the single most affected tumor site. This represents a source of uncertainty in the cancer risk assessment. Adjustment for tumors at multiple sites induced by some carcinogens may result in a higher potency. Some recent assessments of carcinogens include such adjustments. Other uncertainties arise 1) in the assumptions underlying the dose-response model used, and 2) in extrapolating from large experimental doses, where other toxic effects may compromise the assessment of carcinogenic potential, to usually much smaller environmental doses.

When occupational epidemiological data are used to generate a carcinogenic potency or a health protective level for a non-carcinogen, less uncertainty is involved in the extrapolation from workplace exposures to environmental exposures. When using human data, no interspecies extrapolation is necessary eliminating a significant source of uncertainty. However, children are a subpopulation with hematological, nervous, endocrine, and immune systems that are still developing and may be more sensitive to the effects of toxicants. The worker population and risk estimates based on occupational epidemiological data are more uncertain for children than adults. Current risk assessment guidelines include procedures designed to address the possibly greater sensitivity of infants and children, but there are only a few compounds for which these effects have actually been measured experimentally. In most cases, the adjustment relies on default assumptions which may either underestimate or overestimate the true risks faced by infants and children exposed to toxic substances or carcinogens.

Risk estimates generated by an HRA should not be interpreted as the expected rates of disease in the exposed population but rather as estimates of potential for disease, based on current knowledge and a number of assumptions.

In the Hot Spots program, cancer risk is often expressed as the maximum number of new cases of cancer projected to occur in a population of one million people due to exposure to the cancer-causing substance over a 30-year residential period. However, there is uncertainty associated with the cancer risk estimate. An individual's risk of contracting cancer from exposure to facility emissions may be less or more than the risk calculated in the risk assessment. An individual's risk not only depends on the individual's exposure to a specific chemical but also on his or her genetic background, health, diet, lifestyle choices and other environmental and workplace exposures. OEHHA uses health-protective exposure assumptions to avoid underestimating risk. For example, the risk estimate for airborne exposure to chemical emissions uses the health-protective assumption that the individual has a high breathing rate and exposure began early in life when cancer risk is highest.

A Reference Exposure Level (REL) is the concentration level at or below which no adverse non-cancer health effects are anticipated for the specified exposure duration. RELs are based on the most sensitive, relevant, adverse health effect reported in the medical and toxicological literature. RELs are designed to protect the most sensitive individuals in the population by the inclusion of factors that account for uncertainties as well as individual differences in human susceptibility to chemical exposures. The factors used in the calculation of RELs are meant to err on the side of public health

protection in order to avoid underestimation of non-cancer hazards. Exceeding the REL does not automatically indicate an adverse health impact. However, increasing concentrations above the REL value increases the likelihood that the health effect will occur.

Risk assessments under the Hot Spots program are often used to compare one source with another and to prioritize concerns. Consistent approaches to risk assessment are necessary to fulfill this function.

1.7 Tiered Approach to Risk Assessment

OEHHA developed a tiered approach to accommodate consideration of site-specific data that may be more appropriate for a given facility than the default variate. The first tier is the simplest point estimate approach to estimating exposure to facility emissions. Tier 1 is the first step in conducting a comprehensive risk assessment using algorithms and point estimates of input values described in the *Technical Support Document for Exposure Assessment and Stochastic Analysis*. (OEHHA, 2012) Each facility conducts a Tier 1 risk assessment to promote consistency across the state in facility risk assessments and facilitate comparisons across facilities. To be health-protective, high-end estimates for the key intake exposure variates are used for the dominant exposure pathways.

Tier 2 allows use of site-specific point estimates of exposure variates as long as these estimates can be justified. For example, if there are data indicating that consumption of fish from an impacted body of water is lower than the OEHHA-recommended fish consumption rate, then the facility can use that data to generate a point estimate for sport-fish consumption from that body of water. The risk assessor must supply the data and methods used for the site-specific estimates, and the site-specific estimates must be reproducible and approved by both the District and OEHHA.

Tier 3 risk assessment involves stochastic analysis of exposure using data-based distributions for the key exposure variates compiled in the OEHHA (2012) *Technical Support Document*. Since a stochastic approach to risk assessment provides more information about the range of risk estimates based on the range of exposures, Tier 3 can serve as a useful supplement to the Tier 1 and 2 approaches. Variance propagation methods (e.g., Monte Carlo analysis) are used to derive a range of cancer risk estimates reflecting the known variability in the inputs. Finally, a Tier 4 approach would use distributions of exposure variates that may be more appropriate for a site, such as the distribution of fish consumption rates for a specific body of water impacted by a facility. As in a Tier 2 approach, the risk assessment must supply the data and methods used for the site-specific distributions for exposure variates, and the site-specific estimates must be justified to and reproducible by the Districts and OEHHA.

1.8 References

CAPCOA, 1990. *CAPCOA Air Toxics Hot Spots Program Facility Prioritization Guidelines.* California Air Pollution Control Officers Association, July 1990.

OEHHA, 2003. Air Toxics Hot Spots Risk Assessment Guidelines: The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments.

OEHHA, 2008. Air Toxics Hot Spots Risk Assessment Guidelines Technical Support Document for the Derivation of Noncancer Reference Exposure Levels. Available online at: http://www.oehha.ca.gov

OEHHA, 2009. Technical Support Document for Cancer Potency Factors: Methodologies for derivation, listing of available values, and adjustments to allow for early life stage exposures. May 2009. Available online at: http://www.oehha.ca.gov

OEHHA, 2012. Air Toxics Hot Spots Program Risk Assessment Guidelines; Technical Support Document for Exposure Assessment and Stochastic Analysis. Available online at http://www.oehha.ca.gov

2 - Overview of Health Risk Assessment

2.1 The Model for Risk Assessment

The standard approach currently used for health risk assessment (HRA) was originally proposed by the National Academy of Sciences in the 1983 book: *Risk Assessment in the Federal Government: Managing the Process* (NAS, 1983) and was updated in the Academy's 1994 book: *Science and Judgment in Risk Assessment* (NAS, 1994). In 2009 the National Academy published *Science and Decisions: Advancing Risk Assessment* (NAS, 2009), in which a number of recommendations are made on improving the risk assessment process and expanding it to include community concerns and cumulative risks. The four steps involved in the risk assessment process are 1) hazard identification, 2) exposure assessment, 3) dose-response assessment, and 4) risk characterization. These four steps are briefly discussed below.

2.2 Hazard Identification

For air toxics sources, hazard identification involves the pollutant(s) of concern emitted by a facility, and the types of adverse health effects associated with exposure to the chemical(s), including whether a pollutant is a potential human carcinogen or is associated with other types of adverse health effects. For the Air Toxics Hot Spots Program (Hot Spots), the emitted substances that are addressed in a risk assessment are found in the list of substances designated in the ARB's *Emission Inventory Criteria and Guidelines Regulations (Title 17, California Code of Regulations, Sections 93300-93300.5), and the Emission Inventory Criteria and Guidelines Report* (EICG Report), which is incorporated by reference therein (ARB, 2007*)*. This list of substances is contained in Appendix A of this document and the EICG Report. The list of substances also identifies those substances that are considered human carcinogens or potential human carcinogens.

2.3 Exposure Assessment

The purpose of the exposure assessment is to estimate the extent of public exposure to emitted substances. For the Hot spots program, in practice this means estimating exposures for those emitted substances for which potential cancer risk or noncancer health hazards for acute, repeated 8-hour, and chronic exposures will be evaluated. This involves emission quantification, modeling of environmental transport, evaluation of environmental fate, identification of exposure routes, identification of exposed populations, and estimation of short-term (e.g., 1-hour maximum), 8-hour average, and long-term (annual) exposure levels. These activities are described in Chapters 4 and 5. Chapter 5 also discusses the tiered approach to risk assessment.

The ARB's Emission Inventory Criteria and Guidelines (EICG) Report provides assistance in determining those substances that must be evaluated in an HRA and the reporting requirements of facilities, while the Hot Spots Analysis and Reporting Program (HARP) software can be used to model ground level concentrations at specific off-site

locations resulting from facility emissions. The United States Environmental Protection Agency (U.S. EPA) has adopted the AERMOD air dispersion model into its list of regulatory approved models, in place of the previously used ISCST3 model. AERMOD is a steady-state plume model that incorporates air dispersion based on planetary boundary layer turbulence structure and scaling concepts, including treatment of both surface and elevated sources, and both simple and complex terrain (U.S. EPA, 2009). The Air Resources Board recommends AERMOD for Hot Spots risk assessments. The AERMOD air modeling software will be incorporated into the HARP software, which allows the user to input all dispersion parameters directly into the program to generate air dispersion data. Alternatively, the air dispersion data may be generated separately from HARP using other air dispersion models, and then imported into HARP to generate risk estimates. Data imported into HARP must already be in the format required by HARP. HARP has the flexibility to generate a summary of the risk data necessary for an HRA by either of the above approaches.

Most of the toxicants assessed under the Hot Spots program are volatile organic compounds that remain as gases when emitted into the air. These chemicals are not subject to appreciable deposition to soil, surface waters, or plants. Therefore, human exposure via ingestion or dermal exposure, at least at concentrations typically encountered in the ambient air, is not considered for volatile organic compounds in the Hot Spots risk assessments. While some models indicate potential for dermal exposure to certain volatile organic compounds, at this time, the Hot spots program does not consider this pathway. Significant exposure to volatile organic toxicants emitted into the air occurs through the inhalation pathway, and this pathway is the primary consideration in the Hot Spots risk assessments. A small subset of Hot Spots substances consists of semi-volatile organic and metal toxicants emitted partially or totally as particles subject to deposition. Ingestion and dermal pathways as well as the inhalation pathway must be evaluated for these chemicals. A few of these semi-volatile organic and metal toxicants must also include the breast milk ingestion pathway. Additional ingestion pathways may also need to be evaluated depending on the pathways of exposure for the specific receptor of interest. Table 5.1 in Chapter 5, Table 6.4 in Chapter 6, and Table 7.1 in Chapter 7 list the substances that must be evaluated for multipathway impacts. HARP is designed to assess potential health impacts posed by substances that must be analyzed by a multipathway approach.

2.4 Dose-Response Assessment

Dose-response assessment is the process of characterizing the relationship between exposure to an agent and incidence of an adverse health effect in exposed populations. In quantitative carcinogenic risk assessment, the dose-response relationship is expressed in terms of a potency slope that is used to calculate the probability or risk of cancer associated with an estimated exposure. Cancer potency factors are expressed as the 95th percent upper confidence limit of the slope of the dose response curve estimated assuming continuous lifetime exposure to a substance. Typically, potency factors are expressed as units of inverse dose (e.g., $(mg/kg\ BW/day)^{-1}$) or inverse concentration (e.g., $(\mu g/m^3)^{-1}$). It is assumed in cancer risk assessments that risk is directly proportional to dose and that there is no threshold for carcinogenesis.

The Office of Environmental Health Hazard Assessment (OEHHA) has compiled cancer potency factors, which should be used in risk assessments for the Hot Spots program, in Table 7.1. Cancer potency factors listed in Table 7.1 were derived either by the U.S. EPA or by OEHHA, underwent public and peer-review, and were adopted for use in the program. Chapter 8 describes procedures for use of potency values in estimating excess cancer risk. For a detailed description of cancer potency factors, refer to the *Technical Support Document for Cancer Potency Factors* (OEHHA, 2009).

For noncarcinogenic effects, dose-response data developed from animal or human studies are used to develop acute, 8-hour, and chronic noncancer Reference Exposure Levels (RELs). The acute, 8-hour and chronic RELs are defined as the concentration at which no adverse noncancer health effects are anticipated even in sensitive members of the general population, with infrequent one hour exposures, repeated 8-hour exposures over a significant fraction of a lifetime, or continuous exposure over a significant fraction of a lifetime, respectively. The most sensitive health effect is chosen to develop the REL if the chemical affects multiple organ systems. Unlike cancer health effects, noncancer health effects are generally assumed to have thresholds for adverse effects. In other words, injury from a pollutant will not occur until exposure to that pollutant has reached or exceeded a certain concentration (i.e., threshold) and/or dose. The acute, 8-hour, and chronic RELs are air concentrations intended to be below the threshold for health effects for the general population.

The actual threshold for health effects in the general population is generally not known with any precision. Uncertainty factors are applied to the Lowest Observed Adverse Effects Level (LOAEL) or No Observed Adverse Effects Level (NOAEL) or Benchmark Concentration values from animal or human studies to help ensure that the chronic, 8-hour and acute REL values are below the threshold for human health for nearly all individuals. This guidance manual provides the acute, 8-hour, and chronic Reference Exposure Levels in Tables 6.1 through 6.3. Some substances that pose a chronic or repeated 8-hour inhalation hazard may also present a chronic hazard via non-inhalation routes of exposure (e.g., ingestion of contaminated water, foods, or soils, and dermal absorption). The oral RELs for these substances are presented in Table 6.4. The methodology and derivations for acute, 8-hour, and chronic, RELs are described in the *Technical Support Document for the Derivation of Noncancer Reference Exposure Levels* (OEHHA, 2008).

2.5 Risk Characterization

This is the final step of risk assessment. In this step, modeled concentrations and exposure information, which are determined through exposure assessment, are combined with potency factors and RELs that are developed through dose-response assessment. The use of cancer potency factors to assess total cancer risk and the use of the hazard index approach for evaluating the potential for noncarcinogenic health effects are described in Chapter 8. Example calculations for determining (inhalation) cancer risk and noncancer acute, 8-hour, and chronic hazard quotients and hazard indices are presented in Appendix I. Chapter 9 provides an outline that specifies the content and recommended format of HRA results.

Under the Hot Spots Act, health risk assessments are to quantify both individual and population-wide health impacts (Health and Safety Code, Section 44306) (Appendix B). The health risk assessments are facility specific and the calculated risk should be combined for all pollutants emitted by a single facility. For example, cancer risk from multiple carcinogens is considered additive. For exposures to multiple non-carcinogen pollutants, a hazard index approach is applied for air contaminants affecting the same organ system. All substances emitted by the facility that are on the Hot Spots Act list of substances must be identified in the HRA, including those on the list that do not have a potency value or REL.

For assessing risk, OEHHA has developed two methods for determining dose via inhalation, dermal absorption, and ingestion pathways. These two methods, the point estimate approach and the stochastic exposure assessment approach, are described below and in Chapters 5 and 8. Detailed presentations of these methods can be found in*: Technical Support Document for Exposure Assessment and Stochastic Analysis* (OEHHA, 2012*)*.

2.5.1 *Point Estimate Approach*

OEHHA provides information in this document on average and high-end values for key exposure pathways (e.g., breathing rate for the inhalation exposure pathway). The average and high-end of point estimates in this document are defined in terms of the probability distribution of values for that variate. The mean represents the average values for point estimates and the 95th percentiles represent the high-end point estimates from the distributions identified in OEHHA (2012). Thus, within the limitations of the data, average and high-end point estimates are supported by the distribution.

Tier 1 of the tiered approach to risk assessment, which is briefly discussed in Section 2.5.3 and presented in more detail in Chapter 8, utilizes a combination of the average and high-end point estimates to more realistically estimate exposure in multipathway risk assessments. This method uses high-end exposure estimates for the pathways that are the main drivers of exposure and the average point estimate for the other non-driving exposure pathways. This approach will lessen the issue of compounding high-end exposure estimates, while retaining a health-protective approach for the more important exposure pathways. It is unlikely that an individual receptor would be on the high-end of exposure for all exposure pathways. See Chapter 8 for detailed discussions of how this multipathway methodology is applied to cancer and noncancer calculations. The HARP software can perform this analysis (referred to as the derived approach in the HARP software).

In addition to using an estimate of average and high-end consumption rates, cancer risk evaluations at individual receptors are presented for 9, 30, and 70-year exposure durations. The 9 and 30-year durations correspond to the average and high-end of residency time recommended by U.S. EPA (1997). The California data presented in Appendix L of the Exposure TSD (OEHHA, 2012) are generally supportive of the nationwide data. The 9 and 70-year exposure durations present potential impacts over the range of residency periods, while the 30-year exposure duration is recommended

for use as the basis for estimating cancer risk at the MEIR in all HRAs. Population-wide impacts should use the 70-year exposure duration.

The parameters used for all exposure durations assume exposure begins in the last trimester of pregnancy and progresses through the exposure duration of interest (e.g., 9, 30, or 70 years). These assumptions are thus protective of children. Children have higher intake rates on a per kilogram body weight basis (e.g., they breathe, drink and eat more per kg body weight than adults) and thus receive a higher dose from contaminated media. See Chapter 5 for the point estimates that can be used to estimate impacts for children. Chapters 5 and 8 discuss how to calculate cancer risk based on various exposure durations and point estimates. Appendix I contains an example calculation and Chapter 9 clarifies how to present the findings in an HRA.

2.5.2 *Stochastic Exposure Assessment*

OEHHA was directed under the Air Toxics "Hot Spots" program (SB 1731, Calderon, stat. 1992; Health and Safety Code Section 44360(b)(2)) to develop a "likelihood of risk" approach to risk assessment. To satisfy this requirement, OEHHA developed a stochastic approach to risk assessment that utilizes distributions for exposure variates such as breathing rate and water consumption rate rather than a single point estimate. The variability in exposure can be propagated through the risk assessment model using the distributions as input and a Monte Carlo or similar method. The result of such an analysis is a range of risks that at least partially characterizes variability in exposure.

Distributions of key exposure variates that are presented in the *Technical Support Document for Exposure Assessment and Stochastic Analysis* (OEHHA, 2012) were taken from the literature, if adequate, or developed from raw data of original studies. Intake variates such as vegetable consumption are relatively data rich; for these variates reasonable probability distributions can be constructed. However, the data necessary to characterize the variability in risk assessment variates are not always available. For example, for the fate and transport variates (e.g., fish bioaccumulation factors), there are only a few measurements for a given chemical available which precludes the adequate characterization of a probability distribution. We only developed distributions for those key exposure variates that were adequately characterized by data. Development of distributions is described in detail in the *Technical Support Document for Exposure Assessment and Stochastic Analysis* (OEHHA, 2012).

2.5.3 *Tiered Approach to Risk Assessment*

OEHHA recommends using a tiered approach to risk assessment. Tier 1 is a standard point estimate approach using the recommended point estimates presented in this document. If site-specific information is available to modify some point estimates developed in the *Technical Support Document for Exposure Assessment and Stochastic Analysis* (OEHHA, 2012) and is more appropriate to use than the recommended point estimates in this document, then Tier 2 allows use of that site-specific information. Site-specific information should be presented to the District before being used. The District may contact OEHHA for additional advice. Note that all non-default variates need to be adequately justified to OEHHA and the Districts to be used. In Tier 3, a stochastic approach to exposure assessment is used with the data distributions developed in the TSD (OEHHA, 2012) and presented in this document. Tier 4 is also a stochastic approach but allows for utilization of site-specific distributions, if they are justifiable (to OEHHA and the Districts) and more appropriate for the site under evaluation than those recommended in this document. Persons preparing an HRA that has a Tier 2 through Tier 4 evaluation must also include the results of a Tier 1 evaluation. Tier 1 evaluations are required for all HRAs prepared for the Hot Spots Program to promote consistency across the state for all facility risk assessments and allow comparisons across facilities. Chapter 8 provides a summary of the tiered approach and the TSD (OEHHA, 2012) discusses it in detail. Chapter 9 provides an outline that specifies the content and recommended format of HRA results.

2.6 References

ARB, 2007. *Emission Inventory Criteria and Guidelines Regulations (Title 17, California Code of Regulations, Sections 93300-93300.5), and the Emission Inventory Criteria and Guidelines Report* (EICG Report).

NAS, 1983. National Academy of Sciences. *Risk Assessment in the Federal Government: Managing the Process*. National Research Council. National Academy Press, Washington D.C.

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U.S. EPA (2009). AERMOD Implementation Guide. Last Revised: March 19, 2009.

U.S. EPA, 1997. *Exposure Factors Handbook, Volume I, General Factors*. EPA/600/P-95/002Fa.

AERMOD Implementation Workgroup, U. S. Environmental Protection Agency. Online at: http://www.epa.gov/ttn/scram/7thconf/aermod/aermod_implmtn_guide_19March2009.pdf

3 - Hazard Identification - Air Toxics Hot Spots Emissions

3.1 The Air Toxics Hot Spots List of Substances and Emissions Inventory

For air toxics sources, hazard identification involves identifying pollutants of concern and whether these pollutants are potential human carcinogens or associated with other types of adverse health effects. For the Air Toxics Hot Spots (Hot Spots) Program, the emitted substances that are addressed in a health risk assessment (HRA) are found in the list of hazardous substances designated in the Air Resources Board's (ARB's) *Emission Inventory Criteria and Guidelines Regulations (Title 17, California Code of Regulations, Sections 93300-93300.5), and the Emission Inventory Criteria and Guidelines Report* (EICG Report), which is incorporated by reference therein (ARB, 2007). This list of substances is contained in both Appendix A of this document and the EICG Report. The list of substances also identifies those substances that are considered human carcinogens or potential human carcinogens.

The substances included on the Hot Spots Program list of substances are defined in the statute as those substances found on lists developed by the following sources:

- International Agency for Research on Cancer (IARC);
- U.S. Environmental Protection Agency (U.S. EPA);
- U.S. National Toxicology Program (NTP);
- ARB Toxic Air Contaminant Identification Program List;
- Hazard Evaluation System and Information Service (HESIS) (State of California);
- Proposition 65 (Safe Drinking Water and Toxic Enforcement Act of 1986) list of carcinogens and reproductive toxicants (State of California);
- Any additional substance recognized by the State Board as presenting a chronic or acute threat to public health when present in the ambient air.

All substances emitted by the facility that are on the Hot Spots Act list of substances must be identified in the HRA.

The ARB EICG Report (ARB, 2007) specifies that each facility subject to the Hot Spots Act must submit an Emission Inventory Report to the local air pollution control or air quality management district. This Emission Inventory Report must identify and account for all listed substances used, manufactured, formulated, or released by the facility. All routine, predictable releases must be reported. These inventory reports include the emission data necessary to estimate off-site levels of facility-released Hot Spots substances. These inventory reports will be discussed in further detail in Chapter 4. See Chapter 9 for an outline that specifies the content and recommended format for presenting the air dispersion modeling and HRA results. As presented in Appendix A, the EICG Report divides the list into three groups for reporting purposes. Potency or severity of toxic effects and potential for facility emission were considered in placing compounds into the three groups.

For the first group (listed in these guidelines in Appendix A-I), all emissions of these substances must be quantified in the HRA. For substances in the second group (listed in these guidelines in Appendix A-II), emissions are not quantified; however, facilities must report whether the substance is used, produced, or otherwise present on-site (i.e., these substances are simply listed in a table in the HRA). Lastly, substances in the third group (Appendix A-III) also only need to be reported in a table in the HRA if they are manufactured by the reporting facility.

Facilities that must comply with the Resource Conservation and Recovery Act and Comprehensive Environmental Response, Compensation and Liability Act (RCRA/CERCLA) requirements for risk assessment need to consult the California Department of Toxic Substances Control (DTSC) Remedial Project Manager to determine which substances must be evaluated in their risk assessment. Some RCRA/CERCLA facilities may emit substances which are not currently listed under the Hot Spots Program but which may require evaluation in a RCRA/CERCLA risk assessment.

3.2 References

ARB, 2007. *Emission Inventory Criteria and Guidelines Regulations (Title 17, California Code of Regulations, Sections 93300-93300.5), and the Emission Inventory Criteria and Guidelines Report* (EICG Report).

4 - Air Dispersion Modeling

The information contained in this section is primarily an abbreviated version of the material found in Chapter 2 of the Air Toxics Hot Spots Risk Assessment Guidelines; Exposure Assessment and Stochastic Analysis Technical Support Document (OEHHA, 2012). Several references have been included in this section to indicate those areas that are covered in more detail in Chapter 2 of the Technical Support Document. However, some air dispersion concepts and procedures have been added to assist the reader in the health risk assessment (HRA) process. In particular, a brief summary of the Hot Spots Analysis and Reporting Program (HARP) software applicability to air dispersion analysis has been included. The HARP software has been developed by the Air Resources Board (ARB), in consultation with OEHHA and Air Pollution Control or Air Quality Management District (District) representatives. The HARP software is the recommended model for calculating and presenting HRA results for the Air Toxics Hot Spots Program (Hot Spots). Information on obtaining the HARP software can be found under the Hot Spots Program on the ARB's web site at *www.arb.ca.gov*. See Chapter 9 for an outline that specifies the content and recommended format for presenting the air dispersion modeling and HRA results.

The U.S. EPA has adopted the AERMOD air dispersion model into their list of regulatory approved models, in place of the previously used ISCST3 model. AERMOD is a steady-state plume model that incorporates air dispersion based on planetary boundary layer turbulence structure and scaling concepts, including treatment of both surface and elevated sources, and both simple and complex terrain (U.S. EPA, 2009). The Air Resources Board recommends AERMOD for Hot Spots risk assessments.

4.1 Air Dispersion Modeling in Exposure Assessment: Overview

Estimates of air concentrations of emitted toxicants in the surrounding community from a facility's air emissions are needed in order to determine cancer and noncancer risks. One approach to determining the concentration of air pollutants emitted from the facility is to do air monitoring in the surrounding community. However, there are a number of disadvantages to this approach. Ambient air monitoring is costly because good estimates of an annual average concentration typically require monitoring at least one day in six over a year. Because it is costly, monitoring is usually limited to a select number of pollutants, and a limited number of sites. There can be significant risks from some chemicals at or even below the monitoring detection limit, which can add considerable uncertainty to risk estimates if many of the measurements are below or near the detection limit. Monitoring measures not only facility emissions but also general ambient background as well. It can be difficult and expensive to distinguish between the two using monitoring, particularly if general ambient background levels are high relative to the contribution of facility emissions. These limitations often make it impractical to use monitoring in a program such as the Air Toxics Hot Spots program with hundreds of facilities.

Air dispersion models have several advantages over monitoring. Modeling can provide greater spatial detail and the costs are relatively cheap by comparison. For example, dispersion models can estimate the pollutant concentration in air at many receptor locations (hundreds to thousands) and for a multitude of averaging periods. Air dispersion models have been validated using air monitoring.

There are, however, uncertainties associated with the typical usage of air dispersion modeling. The use of meteorological data from the nearest airport may not ideally be the best representation of localized conditions. Gaussian plume air dispersion models ignore calm hours. This can bias model predictions towards underestimation. Some dispersion models offer limited chemical reactions within the algorithms; however, we generally assume the pollutant is inert for the near-field atmospheric travel time. This may bias estimated concentrations towards over-prediction for those pollutants that are highly reactive in the atmosphere. Air dispersion model results are only as good as the emissions estimates and emissions estimates can be uncertain. However, on the whole, the advantages of air dispersion modeling for a program like the Air Toxics Hot Spots far outweigh the disadvantages.

Professional judgment is required throughout the dispersion modeling process. The local air quality district has final authority on modeling protocols. The following guidance is intended to assist in the understanding of dispersion modeling for risk assessments.

Air dispersion modeling includes the following steps (see Figure 1):

1. Create an emission inventory of the toxic releases (Section 4.2)
2. Identify the source types (Section 4.3)
3. Identify the terrain type and land use (Section 4.4)
4. Determine the detail needed for the analysis: screening or refined (Section 4.5)
5. Identify the population exposure (Section 4.6)
6. Identify the receptor network (Section 4.7)
7. Obtain meteorological data (for refined air dispersion modeling only) (Section 4.8)
8. Select an air dispersion model (Section 4.9)
9. Prepare a modeling protocol and submit to the local Air District (hereafter referred to as “the District”) (Section 4.14)
10. Complete the air dispersion analysis
11. If necessary, redefine the receptor network and return to Step 10

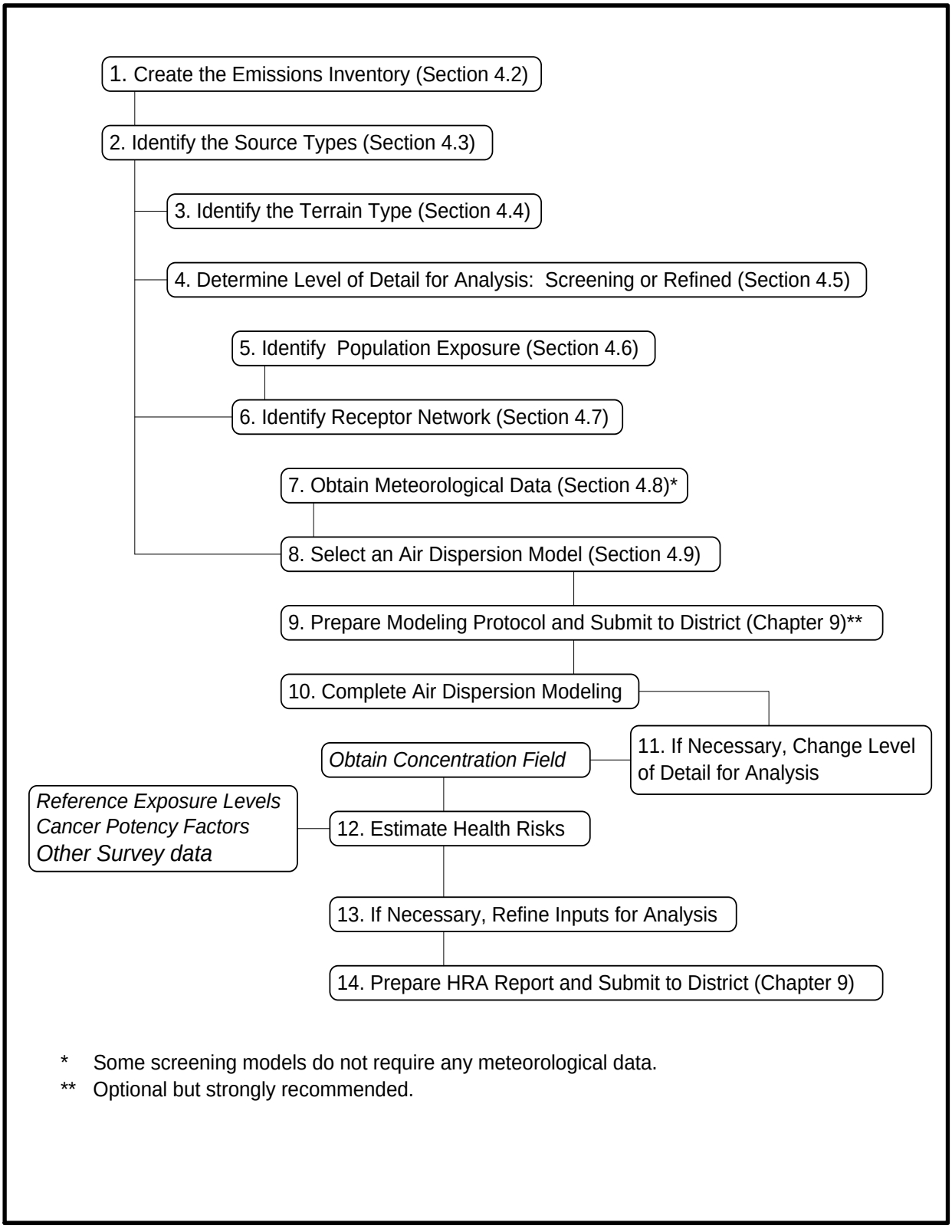
12. Complete the risk assessment

13. If necessary, refine the inputs and/or the model selection and return to Step 8

14. Present the HRA results (Chapter 9 provides an outline that specifies the content and recommended format of HRA results).

The output of the air dispersion modeling analysis includes a receptor field of ground level concentrations of the pollutant in ambient air. These concentrations can be used to estimate an inhaled or ingested dose for the estimation of multipathway cancer risk, or used to determine a hazard index for acute (inhalation), and chronic noncancer multipathway risks. It should be noted that in the Air Toxics "Hot Spots" program, facilities simulate the dispersion of the chemical emitted as an inert compound, and do not model any atmospheric transformations or dispersion of products from such reactions. The U.S. EPA Guideline on Air Quality Models (U.S. EPA, 2005) should be consulted when evaluating reactive pollutants for other regulatory purposes.

Figure 1 Overview of the Air Dispersion Modeling Process.



* Some screening models do not require any meteorological data.
** Optional but strongly recommended.

4.2 Emission Inventories

The Emission Inventory Reports (Inventory Reports) developed under the Hot Spots Program provide data to be used in the HRA and in the air dispersion modeling process. The Inventory Reports contain information regarding emission sources, emitted substances, emission rates, emission factors, process rates, and release parameters (area and volume sources may require additional release data beyond that generally available in Emissions Inventory reports). This information is developed according to the ARB's *Emission Inventory Criteria and Guidelines Regulations (Title 17, California Code of Regulations, Sections 93300-93300.5)*, and the *Emission Inventory Criteria and Guidelines Report* (EICG Report), which is incorporated by reference therein (ARB, 2007*)*.

Updated emission data for process changes, emission factor changes, material/fuel changes, or shutdown must be approved by the District prior to the submittal of the health risk assessment (HRA). Ideally, the District review of updated emissions could be completed within the modeling protocol. In addition, it must be stated clearly in the risk assessment if the emission estimates are based on updated or revised emissions (e.g., emission reductions). This section summarizes the requirements that apply to the emission data which are used for Air Toxics "Hot Spots" Act risk assessments.

4.2.1 *Air Toxics Hot Spots Emissions*

As noted in Chapter 3, Hazard Identification, the HRA should identify all substances emitted by the facility, which are on the Hot Spots Act list of substances (see Appendix A of the Guidance Manual or the EICG Report). The EICG Report specifies that Inventory Reports must identify and account for all listed substances used, manufactured, formulated, or released by the facility. All routine, predictable releases must be reported. Under the regulations, the list is divided into three groups for reporting purposes. The first group (listed in Appendix A-I of the Inventory Guidelines Report) has all pollutants whose emissions must be quantified. The second group (listed in Appendix A-II of the Inventory Guidelines Report) includes substances where emissions do not need to be quantified; however, facilities must report whether the substance is used, produced, or otherwise present on-site. The third group (listed in Appendix A-III of the Emissions Inventory Guidelines Report) includes substances whose emissions need not be reported unless the substance is manufactured by the facility. Chemicals or substances in the second and third groups should be listed in a table in the risk assessment.

Facilities that must comply with the Resource Conservation and Recovery Act and Comprehensive Environmental Response, Compensation and Liability Act (RCRA/CERCLA) requirements for risk assessment need to consult the Department of Toxic Substances Control (DTSC) Remedial Project Manager to determine which substances must be evaluated in their risk assessment in addition to the list of "Hot Spots" chemicals. Some RCRA/CERCLA facilities may emit chemicals that are not currently listed under the "Hot Spots" Program. Chapter 9 provides an outline that specifies the content and recommended format of HRA results.

4.2.1.1 Emission Estimates Used in the Risk Assessment

The HRA must include emission estimates for all substances that are required to be quantified in the facility's emission inventory report. Specifically, HRAs should include both annual average emissions and maximum 1-hour emissions for each pollutant. Maximum 1-hour emissions are used for acute noncancer health impacts while annual emissions are used for chronic exposures (i.e., chronic and 8-hour noncancer health impacts or cancer risk assessment).

Emissions for each substance must be reported for individual emitting processes associated with unique devices within a facility. Total facility emissions for an individual air contaminant will be the sum of emissions, reported by process, for that facility. Information on daily and annual hours of operation, and relative monthly activity, must be reported for each emitting process. Devices and emitting processes must be clearly identified and described and must be consistent with those reported in the emissions inventory report.

The HRA should include tables that present the emission information (i.e., emission rates for each substance released from each process) in a clear and concise manner. The District may allow the facility operator to base the HRA on more current emission estimates than those presented in the previously submitted emission inventory report (i.e., actual enforceable emission reductions realized by the time the HRA is submitted to the District). If the District allows the use of more current emission estimates, the District must review and approve the new emissions estimates prior to use in the HRA. The HRA report must clearly state what emissions are being used and when any reductions became effective. Specifically, a table presenting emission estimates included in the previously submitted emission inventory report as well as those used for the HRA should be presented. The District should be consulted concerning the specific format for presenting the emission information. Chapter 9 provides an outline that specifies the content and recommended format of HRA results. A revised emission inventory report must be submitted to the District prior to submitting the HRA and forwarded by the District to the ARB, if revised emission data are used.

4.2.1.1.1 Molecular Weight Adjustments for the Emissions of Metal Compounds

For most of the Hot Spots toxic metals, the OEHHA cancer potency factors, acute and chronic RELs apply to the weight of the toxic metal atom contained in the overall compound. Some of the Hot Spots compounds contain various elements along with the toxic metal atom (e.g., "Nickel hydroxide", CAS number 12054-48-7, has a formula of H_2NiO_2). Therefore, an adjustment to the reported pounds of the overall compound is needed before applying the OEHHA cancer potency factor for "Nickel and compounds" to such a compound. This ensures that the cancer potency factor, acute or chronic REL is applied only to the fraction of the overall weight of the emissions that are associated with health effects of the metal. In other cases, the Hot Spots metals are already reported as the metal atom equivalent (e.g., CAS 7440-02-0, "Nickel"), and these cases do not use any further molecular weight adjustment. (Refer to Note [7] in Appendix A,

List of Substances in the EICG Report for further information on how the emissions of various Hot Spots metal compounds are reported.)

The appropriate molecular weight adjustment factors (MWAF) to be used along with the OEHHA cancer potency factors, acute and chronic RELs for Hot Spots metals can be found in the MWAF column[1] of the table containing OEHHA/ARB Approved Health Values for use in Hot Spots Facility Risk Assessments that is in Appendix L of this document.

As an example, the compound "Nickel hydroxide" has a molecular formula of H_2NiO_2. The atomic weight of each of the elements in this compound, and the fraction they represent of the total weight, are therefore as follows:

Element	Number of atoms	Atomic Weight	Fraction of Total Weight = MWAF
1 x Nickel (Ni)	1 x	58.70	58.70 / 92.714 = **0.6332** (MWAF for Nickel)
2 x Oxygen (O)	2 x	15.999	
2 x Hydrogen (H)	2 x	1.008	
Total Molecular Weight of H_2NiO_2:		92.714	

So, for example, assume that 100 pounds of "Nickel hydroxide" emissions are reported under CAS number 12054-48-7. To get the Nickel atom equivalent of these emissions, multiply by the listed MWAF (0.6332) for Nickel hydroxide:

- 100 pounds x 0.6332 = 63.32 pounds of Nickel atom equivalent.

This step should be completed prior to applying the OEHHA cancer potency factor for "Nickel and compounds" in a calculation for a prioritization score or risk assessment calculation. (Note - The HARP software automatically applies the appropriate MWAF for each Hot Spots chemical (by CAS number), so the emissions should not be manually adjusted when using HARP. Therefore, if using HARP, you would use 100 pounds for Nickel hydroxide and HARP will make the MWAF adjustment for you. If not using HARP, you would use 63.32 pounds.)

[1] The value listed in the MWAF column for Asbestos is not a molecular weight adjustment. This is a conversion factor for adjusting mass and fibers or structures. See Appendix C for more information on Asbestos reporting and risk assessment information or see the EICG report for reporting guidance.

4.2.1.2 Release Parameters

Emission release parameters (e.g., stack height and inside diameter, stack gas exit velocity, release temperature and emission source location in UTM coordinates) are needed as inputs to the air dispersion model. The Inventory Guidelines specify the release parameters that must be reported for each stack, vent, ducted building, exhaust site, or other site of exhaust release. Additional information may be required to characterize releases from non-stack (volume and area) sources; see U.S. EPA dispersion modeling guidelines or specific user's manuals. This information should also be included in the air dispersion section of the risk assessment. This information must be presented in tables included in the risk assessment. Note that some dimensional units needed for the dispersion model may require conversion from the units reported in the Inventory Report (e.g., Kelvin (K) vs. degrees Fahrenheit (°F)). Chapter 9 provides an outline that specifies the content and recommended format of HRA results.

4.2.1.3 Operation Schedule

The HRA should include a discussion of the facility operation schedule and daily emission patterns. For AB2588 purposes, emissions should be reported based on routine and predictable operations. Weekly or seasonal emission patterns may vary and should be discussed. This is especially important in a refined HRA. Diurnal emission patterns should be simulated in the air dispersion model because of diurnal nature of meteorological observations. Diurnal evaluations are important to include since diurnal weather patterns and emission releases may cause significant differences in the concentration at a receptor of interest.

A table should be included listing the emission schedule on an hourly and yearly basis. In addition, the emission schedule and exposure schedule should corroborate any exposure adjustment factors used for approximating an inhaled dose. For more information about exposure adjustment factors, see Section 4.8.1. Alternatively, exposure adjustments can be made through refining the air dispersion analysis. See Section 4.11.1.2(h) for special case modeling or Appendix M. An alternative to including modeling that addresses diurnal influences would be to include a sensitivity study showing, and/or text explaining, the reason(s) why there are no significant differences due to diurnal influences on the emissions from the facility or at the receptor(s) of interest. For more guidance, you can contact the district or reviewing authority**.** Chapter 9 provides an outline that specifies the content and recommended format of HRA results.

4.2.1.4 Emission Controls

The HRA should include a description of control equipment, the emitting processes it serves, and its efficiency in reducing emissions of substances on the Air Toxics “Hot Spots” list. The EICG Report requires that this information be included in the Inventory Reports, along with the emission data for each emitting process. If the control equipment did not operate full-time throughout the year, then the reported overall control efficiency must be adjusted to account for any predictable downtime of the

control equipment. Any entrainment of toxic substances to the atmosphere from control equipment should be accounted for; this includes fugitive releases during maintenance and cleaning of control devices (e.g., baghouses and cyclones). Contact the District for guidance with control equipment adjustments. Recommended default deposition rates that are used when calculating potential noninhalation health impacts are listed in Section 5.3.2. Chapter 9 provides an outline that specifies the content and recommended format of HRA results.

4.2.2 *Landfill Emissions*

Emission estimates for landfill sites should be based on testing required under Health and Safety Code, Section (HSC) 41805.5 (AB 3374, Calderon) and any supplemental AB 2588 source tests or emission estimates used to characterize air toxics emissions from landfill surfaces or through off-site migration. The District should be consulted to determine the specific Calderon data to be used in the HRA. The "Hot Spots" Program HRA for landfills should also include emissions of listed substances for all applicable power generation and maintenance equipment at the landfill site. Processes that need to be addressed include stationary internal combustion engines, flares, evaporation ponds, composting operations, boilers, and gasoline dispensing systems.

4.3 Source Characterization

Pollutants are released into the atmosphere in many different ways. The release conditions need to be properly identified and characterized to appropriately use the air dispersion models.

4.3.1 *Source Type*

Source types can be identified as point, line, area, or volume sources for input to the air dispersion model. Several air dispersion models have the capability to simulate more than one source type.

4.3.1.1 Point Sources

Point sources are probably the most common type of source and most air dispersion models have the capability to simulate them. Typical examples of point sources include exhaust stacks. Isolated vents from buildings are special examples of point sources.

4.3.1.2 Line Sources

The version 12345 or newer of the AERMOD can accommodate line sources. Line sources can be also treated as a special case of either an area or a volume source. Examples of line sources include: conveyor belts and rail lines, freeways, and busy roadways. Not all mobile sources may be subject to the Hot Spots program; however, non-motor vehicles that operate within a facility (e.g., ships, trains, and cranes, etc.) are subject to the Hot Spots program. For more information, see the ARB's Emission Inventory and Criteria Guidelines document or ARB's interpretation and guidance

memorandum to CAPCOA regarding mobile sources which are subject to the "Hot Spots" program. This memo can be found at http://www.arb.ca.gov/ab2588/motorv.pdf.

Mobile sources and rail lines are required to be evaluated under SB 352. SB 352 requires a risk assessment performed under the Hot Spots risk assessment guidance for proposed school sites within 500 feet of a busy roadway. Dedicated air dispersion models are available for motor vehicle emissions from roadways which are a special type of line source. These models (i.e., CALINE3, CAL3QHCR, and CALINE4) are designed to simulate the mechanical turbulence and thermal plume rise due to the motor vehicle activity on the roadway. However, these dedicated models use the Pasquill-Gifford dispersion stability classes for dispersion; the AERMOD dispersion model uses a more advanced continuous stability estimation method based on observations. The limitation with AERMOD is that the user needs to estimate initial mixing (Szo and Syo) for mechanical turbulence and thermal plume rise. Consult with the District prior to conducting roadway modeling to determine model use.

For practical information on how to simulate roadway emission dispersion using these models, see the California Air Pollution Control Officer's Association (CAPCOA) website at http://www.capcoa.org or the Sacramento Metropolitan AQMD (SMAQMD) website at http://www.airquality.org/ceqa/RoadwayProtocol.shtml. The SMAQMD has a document titled, "Recommended Protocol for Evaluating the Location of Sensitive Land Uses Adjacent to Major Roadways"(January, 2010). The ARB recommends this document for SB-352 risk assessments.

4.3.1.3 Area Sources

Emissions that are to be modeled as area sources are typical of fugitive sources characterized by non-buoyant emissions containing negligible vertical extent (e.g., no plume rise or emissions distributed over a large horizontal area).

Fugitive particulate (PM2.5, PM10, TSP) emission sources include areas of disturbed ground (e.g., open pits, parking lots) which may be present during operational phases of a facility's life. Also included are areas of exposed material (e.g., storage piles and slag dumps) and segments of material transport where potential fugitive emissions may occur (uncovered haul trucks or rail cars, emissions from unpaved roads). Fugitive emissions may also occur during stages of material handling where particulate material is exposed to the atmosphere (uncovered conveyors, hoppers, and crushers).

Other fugitive emissions emanating from many points of release may be modeled as area sources. Examples include fugitive emissions from valves, flanges, venting, and other connections that occur at ground level or at an elevated level or deck if on a building or structure. Modern dispersion models include an option for an initial vertical extent (Szo) where needed.

Modeling portable equipment as an area source is a case-by-case situation that should be discussed with the District or reviewing authority. Situations may exist where this type of operation is best represented as another type of release.

4.3.1.4 Volume Sources

Non-point sources with emissions containing an initial vertical extent should be modeled as volume sources. The initial vertical extent may be due to plume rise or a vertical distribution of numerous smaller sources over a given area. Examples of volume sources include buildings with natural fugitive or passive ventilation, and line sources such as conveyor belts and rail lines.

4.3.2 *Quantity of Sources*

The number of sources at a facility may influence the selection of the air dispersion model. Some dispersion models are capable of simulating only one source at a time, and are therefore referred to as single-source models (e.g., AERSCREEN).

In some cases, for screening purposes, single-source models may be used in situations involving more than one source using one of the following approaches:

- Combining all sources into one single “representative” source

In order to be able to combine all sources into one single source, the individual sources must have similar release parameters. For example, when modeling more than one stack as a single “representative” stack, the stack gas exit velocities and temperatures must be similar. In order to obtain a conservative estimate, the values leading to the higher concentration estimates should typically be used (e.g., the lowest stack gas exit velocity and temperature, the height of the shortest stack, and a receptor distance and spacing that will provide maximum concentrations, etc.).

- Running the model for each individual source and superimposing results

Superimposition of results of single sources of emissions is the actual approach followed by all the Gaussian models capable of simulating more than one source. Simulating sources in this manner may lead to conservative estimates if worst-case meteorological data are used or if the approach is used with a model that automatically selects worst-case meteorological conditions, especially wind direction. The approach will typically be more conservative the farther apart the sources are because each run would use a different worst-case wind direction.

Additional guidance regarding source merging is provided by the U.S. EPA (1995a). It should be noted that depending upon the population distribution, the total burden can actually increase when pollutants are more widely dispersed. If the total burden from the facility or zone of impact (see Section 4.6.1) could increase for the simplifying modeling assumptions described above, the District should be consulted.

4.4 Terrain Type

Two types of terrain characterizations are required to select the appropriate model. One classification is made according to land type and another one according to terrain topography.

4.4.1 *Terrain Type – Land Use*

Some air dispersion models (e.g., CALINE) use different dispersion coefficients (sigmas) depending on the land use over which the pollutants are being transported. The land use type is also used by some models to select appropriate wind profile exponents. Traditionally, the land type has been categorized into two broad divisions for the purposes of dispersion modeling: urban and rural. Accepted procedures for determining the appropriate category are those suggested by Irwin (1978): one based on land use classification and the other based on population.

The land use procedure is generally considered more definitive. Population density should be used with caution and should not be applied to highly industrialized areas where the population density may be low. For example, in low population density areas a rural classification would be indicated, but if the area is sufficiently industrialized the classification should already be "urban" and urban dispersion parameters should be used.

If the facility is located in an area where land use or terrain changes abruptly, for example, on the coast, the District should be consulted concerning the classification. If need be, the model should be run in both urban and rural modes and the District may require a classification that biases estimated concentrations towards over prediction. As an alternative, the District may require that receptors be grouped according to the terrain between source and receptor.

AERMOD is the U.S. EPA's preferred dispersion model for a wide range of applications in rural or urban conditions. The users should refer to section 5.0 of the AERMOD Implementation Guide to determine urban or rural conditions.

The Land Use and the Population Density Procedures discussed above are described as follows.

4.4.1.1 Land Use Procedure

(1) Classify the land use within the total area A, circumscribed by a 3 km radius circle centered at the source using the meteorological land use typing scheme proposed by Auer (1978) and shown in Table 4.1.

(2) If land use types I1, I2, C1, R2 and R3 account for 50 percent or more of the total area *A* described in (1), use urban dispersion coefficients. Otherwise, use appropriate rural dispersion coefficients.

4.4.1.2 Population Density Procedure

(1) Compute the average population density (*p*) per square kilometer with *A* as defined in the Land Use procedure described above. (Population estimates are also required to determine the exposed population; for more information see Section 4.6.3.)

(2) If *p* is greater than 750 people/km^2 use urban dispersion coefficients, otherwise, use appropriate rural dispersion coefficients.

Table 4.1 Identification and classification of land use types (Auer, 1978)

Used to define rural and urban dispersion coefficients in certain models.

Type	Use and Structures	Vegetation
I1	*Heavy Industrial* Major chemical, steel and fabrication industries; generally 3-5 story buildings, flat roofs	Grass and tree growth extremely rare; <5% vegetation
I2	*Light-moderate industrial* Rail yards, truck depots, warehouses, industrial parks, minor fabrications; generally 1-3 story buildings, flat roofs	Very limited grass, trees almost totally absent; <5% vegetation
C1	*Commercial* Office and apartment buildings, hotels; >10 story heights, flat roofs	Limited grass and trees; <15% vegetation
R1	*Common residential* Single family dwelling with normal easements; generally one story, pitched roof structures; frequent driveways	Abundant grass lawns and light-moderately wooded; >70% vegetation
R2	*Compact residential* Single, some multiple, family dwelling with close spacing; generally <2 story, pitched roof structures; garages (via alley), no driveways	Limited lawn sizes and shade trees; <30% vegetation
R3	*Compact residential* Old multi-family dwellings with close (<2 m) lateral separation; generally 2 story, flat roof structures; garages (via alley) and ashpits, no driveways	Limited lawn sizes, old established shade trees; <35% vegetation
R4	*Estate residential* Expansive family dwelling on multi-acre tracts	Abundant grass lawns and lightly wooded; >80% vegetation
A1	*Metropolitan natural* Major municipal, state, or federal parks, golf courses, cemeteries, campuses; occasional single story structures	Nearly total grass and lightly wooded; >95% vegetation
A2	Agricultural rural	Local crops (e.g., corn, soybean); >95% vegetation
A3	*Undeveloped* Uncultivated; wasteland	Mostly wild grasses and weeds, lightly wooded; >90% vegetation
A4	Undeveloped rural	Heavily wooded; >95% vegetation
A5	*Water surfaces* Rivers, lakes	

4.4.2 *Terrain Type - Topography*

Surface conditions and topographic features generate turbulence, modify vertical and horizontal winds, and change the temperature and humidity distributions in the boundary layer of the atmosphere. These in turn affect pollutant dispersion and models differ in their need to take these factors into account.

The classification according to terrain topography should ultimately be based on the topography at the receptor location with careful consideration of the topographical features between the receptor and the source. Differentiation of simple versus complex terrain is unnecessary with AERMOD. In complex terrain, AERMOD employs the well-known dividing-streamline concept in a simplified simulation of the effects of plume-terrain interactions. For other plume models, topography can be classified as follows:

4.4.2.1 Simple Terrain (also referred to as "Rolling Terrain")

Simple terrain is all terrain located below stack height including gradually rising terrain (i.e., rolling terrain). Note that *Flat Terrain* also falls in the category of simple terrain.

4.4.2.2 Intermediate Terrain

Intermediate terrain is terrain located above stack height and below plume height. The recommended procedure to estimate concentrations for receptors in intermediate terrain is to perform an hour-by-hour comparison of concentrations predicted by simple and complex terrain models. The higher of the two concentrations should be reported and used in the risk assessment.

4.4.2.3 Complex Terrain

Complex terrain is terrain located above plume height. Complex terrain models are necessarily more complicated than simple terrain models. There may be situations in which a facility is "overall" located in complex terrain but in which the nearby surroundings of the facility can be considered simple terrain. In such cases, receptors close to the facility in this area of simple terrain will "dominate" the risk analysis and there may be no need to use a complex terrain model. It is unnecessary to determine which terrain dominates the risk analysis for users of AERMOD.

4.5 Level of Detail: Screening vs. Refined Analysis

Air dispersion models can be classified according to the level of detail which is used in the assessment of the concentration estimates as "screening" or "refined". Refined air dispersion models use more robust algorithms capable of using representative meteorological data to predict more representative and usually less conservative estimates. Refined air dispersion models are, however, more resource intensive than their screening counterparts. It is advisable to first use a screening model to obtain conservative concentration estimates and calculate health risks. If the health risks are estimated to be above the threshold of concern, then use of a refined model to calculate

more representative concentration and health risk estimates would be warranted. There are situations when screening models represent the only viable alternative (e.g., when representative meteorological data are not available). The district or reviewing authority should be consulted to determine the appropriate method for determining the level of detail in the modeling analysis. The HARP software will incorporate the capability of using either representative meteorological data from AERMOD or the default meteorological conditions from the AERSCREEN model.

It is acceptable to use a refined air dispersion model in a "screening" mode for this program's health risk assessments. In this case, a refined air dispersion model is used:

- with worst-case meteorology instead of representative meteorology;

- with a conservative averaging period conversion factor to calculate longer term concentration estimates (see Section 4.10 for more discussion on screening air dispersion models and adjustments factors).

Note that use of worst case meteorology in a refined model is not the normal practice in New Source Review or Ambient Air Quality Standard evaluation modeling.

4.6 Population Exposure

The level of detail required for the analysis (e.g., screening or refined), and the procedures to be used in determining geographic resolution and exposed population require case-by-case analysis and professional judgment. The District should be consulted before beginning the population exposure estimates, and as results are generated, further consultation may be necessary. Some suggested approaches and methods for handling the breakdown of population and performance of a screening or detailed risk analysis are provided in this section.

In addition to estimating individual cancer risk at specific points such as the MEI (maximally exposed individual), OEHHA recommends determining the number of people who reside within the 1×10^{-6}, 1×10^{-5}, $1x\ 10^{-4}$, and higher cancer risk isopleths. For noncancer population evaluations, the number of people who reside within the 0.5, one, five, or higher hazard index isopleths should be reported. The HARP software can provide population exposure estimates as cancer burden or as the number of persons exposed to a selected (user identified) health risk/impact level. Information on obtaining the HARP software can be found under the Hot Spots Program on the ARB's web site at *www.arb.ca.gov*. Chapter 9 provides an outline that specifies the content and recommended format of HRA results.

4.6.1 *Zone(s) of Impact*

As part of the estimation of the population exposure for the cancer risk analysis, it is necessary to determine the geographic area affected by the facility's emissions. An initial approach to define a "zone of impact" surrounding the source is to generate an isopleth where the total excess lifetime cancer risk from inhalation exposure to all emitted carcinogens is greater than 10^{-6} (one in 1,000,000).

For noncarcinogens, a second, third, and fourth isopleth (to represent the chronic, 8-hour, and acute impacts) should be created to define the zone of impact for the hazard index from both inhalation and noninhalation pathways greater than or equal to 1.0. For clarity these isopleths may need to be presented on separate maps in the HRA.

Contact the District or reviewing authority to discuss inclusion of isopleth maps if all potential health risks fall within the facility boundary and no receptors have, or will ever, be present within the boundary (also see Section 4.7.1 for a discussion of on-site receptors).

The initial "zone of impact" can be determined as follows:

- Use a screening dispersion model (e.g., AERSCREEN) to obtain concentration estimates for each emitted pollutant at varying receptor distances from the source. Several screening models feature the generation of an automatic array of receptors which is particularly useful for determining the zone of impact. In order for the model to generate the array of receptors the user needs to provide some information normally consisting of starting distance, increment and number of intervals.

- Calculate total cancer risk and hazard index (HI) for each receptor location by using the methods provided in the risk characterization sections in Chapter 8 of the Air Toxics Hot Spots Risk Assessment Guidance Manual.

- Find the distance where the total inhalation cancer risk is equal to 10^{-6}; this may require redefining the receptor array in order to have two receptor locations that bound a total cancer risk of 10^{-6}. Next, find the distance where the chronic, 8-hour, and acute health hazard indices are declared significant by the District (e.g., acute, 8-hour, or chronic HI = 1.0).

Some Districts may prefer to use a cancer risk of 10^{-7} or an HI of 0.5 as the zone of impact. Therefore, the District should be consulted before modeling efforts are initiated. If the zone of impact is greater than 25 km from the facility at any point, then the District should be consulted. The District may specify limits on the area of the zone of impact. Ideally, these preferences would be presented in the modeling protocol (see Section 4.14).

Note that when depicting the risk assessment results, risk isopleths must present the total cancer and noncancer risk from both inhalation and noninhalation pathways. The zone of impact should be clearly shown on a map with geographic markers of adequate resolution (see Section 4.6.3.1). The text below discusses methodology for defining the zone of impact and has format recommendations. Chapter 9 provides an outline that specifies the content and recommended format of all HRA results.

The zone of impact can be defined once the exposure assessment (air dispersion modeling) process has determined the pollutant concentrations at each designated off-site receptor and a risk analysis (see Chapter 8) has been performed. For clarity, the cancer and noncancer zone(s) of impact should be presented on separate maps. A

map illustrating the carcinogenic zone of impact is required. The District may at its discretion ask for the map illustrating the potential carcinogenic zone of impact to identify the zone of impact for the minimum exposure pathways (inhalation, soil, dermal, and mother's milk) and the zone of impact for all applicable pathways of exposure (minimum pathways plus site/route dependent pathways). Two maps may be needed to accomplish this. The legend of these maps should state the level(s) used for the zone of impact and identify the exposure pathways that were included in the assessment.

The noncancer maps should also clearly identify the noncancer zones of impact. These include the acute (inhalation) zone of impact, 8-hour (inhalation) zone of impact and the chronic (including both inhalation, multipathway) zone of impact. The District may at its discretion require separate chronic inhalation and chronic multipathway zones of impact maps. For clarity, presentation of the two chronic zones of impact may also require two or more maps. The legend of these maps should state the level(s) used for the zone of impact and identify the exposure pathways (and target organs) that were included in the assessment. Further information regarding the methods for determination of hazard indices and cancer risk are discussed in Chapter 8 and Appendix I.

4.6.2 *Screening Population Estimates for Risk Assessments*

A screening risk assessment should include an estimate of the maximum exposed population. For screening risk assessments, a detailed description of the exposed population is not required. The impact area to be considered should be selected to be health protective (i.e., will not underestimate the number of exposed individuals). A health-protective assumption is to assume that all individuals within a large radius of the facility are exposed to the maximum concentration. If a facility must also comply with the RCRA/CERCLA risk assessment requirements, health effects to on-site workers may also need to be addressed. The DTSC's Remedial Project Manager should be consulted on this issue. The District should be consulted to determine the population estimate that should be used for screening purposes. Guidance for one screening method is presented here.

1. Use a screening dispersion model (e.g., AERSCREEN) to obtain concentration estimates for each emitted pollutant at varying receptor distances from the source. Several screening models feature the generation of an automatic array of receptors that is particularly useful for determining the zone of impact. In order for the model to generate the array of receptors, the user needs to provide some information normally consisting of starting distance, increment, and number of intervals.

2. Calculate the potential cancer risk and hazard index for each receptor location by using the methods provided in the risk characterization sections of this document (Chapter 8).

3. Find the distance where the potential cancer risk is equal to District specified levels (e.g., 10^{-6}); this may require redefining the receptor array in order to have

two receptor locations that bound a total cancer risk of 10^{-6}. This exercise should be repeated for the noncancer health impacts.

4. Calculate cancer burden by estimating the number of people in the grid and stipulate that all are exposed at the highest level.

4.6.3 *Refined Population Estimates for Risk Assessments*

The refined HRA requires a detailed analysis of the population exposed to emissions from the facility. Where possible, a detailed population exposure analysis provides estimates of the number of individuals in residences and offsite workplaces, as well as at sensitive receptor sites such as schools, daycare centers and hospitals. The District may require that locations with high densities of sensitive individuals be identified (e.g., schools, daycare centers, hospitals). These population analyses can include exposure estimates for workers and residents through the use of land use maps or other tools. The overall exposed residential and worker populations should be apportioned into smaller geographic subareas. The information needed for each subarea is:

1. The number of exposed persons, and
2. The receptor location at which the calculated ambient air concentration is assumed to be representative of the exposure to the entire population in the subarea.

A multi-tiered approach is suggested for the population analysis. Census tracts, which the facility could significantly impact, should be identified (see Section 4.6.3.1). A census tract should be divided into smaller subareas if it is close to the facility where ambient concentrations vary widely. The District may determine that census tracts provide sufficient resolution near the facility to adequately characterize population exposure or they may prefer the census information to be evaluated using smaller blocks. Further downwind where ambient concentrations are less variable, the census tract level may be acceptable to the District. The District may determine that the aggregation of census tracts (e.g., when the census tracts making up a city are combined) is appropriate for receptors that are considerable distances from the facility.

If a facility must also comply with the RCRA/CERCLA HRA requirements, health effects to on-site workers may also need to be addressed. The DTSC's Remedial Project Manager should be consulted on this issue. In some cases it may be appropriate to evaluate risks to on-site receptors. The district should be consulted about special cases for which evaluation of on-site receptors is appropriate, such as facilities frequented by the public or where people may reside (e.g., military facilities).

4.6.3.1 Census Tracts

For a refined risk assessment, the boundaries of census tracts can be used to define the geographic area to be included in the population exposure analysis. Digital maps showing the census tract boundaries in California can be obtained from "The Thomas

Guide"® on the World Wide Web. Statistics for each census tract can be obtained from the U.S. Census Bureau. The website address for the U.S. Census Bureau is http://www.census.gov. Numerous additional publicly accessible or commercially available sources of census data can be found on the World Wide Web. A specific example of a census tract is given in Appendix K. The HARP software includes U.S. census data and is a recommended tool for performing population exposure estimates.

The two basic steps in defining the area under analysis are:

(1) Identify the "zone of impact" (as defined previously in Section 4.6.1) on a map detailed enough to provide for resolution of the population to the subcensus tract level. (The U.S. Geological Survey (USGS) 7.5-minute series maps and the maps within the HARP software provide sufficient detail.) This is necessary to clearly identify the zone of impact, location of the facility, and sensitive receptors within the zone of impact. If significant development has occurred since the USGS survey, this should be indicated. A specific example of a 7.5-minute series map is given in Appendix K.

(2) Identify all census tracts within the zone of impact using a U.S. Bureau of Census or equivalent map (e.g., Thomas Brothers, HARP Software). If only a portion of the census tract lies within the zone of impact, then only the population that falls within the isopleth should be used in the population estimate or burden calculation. To determine this level of detail, local planning and zoning information may need to be collected. When this more detailed information is not available, then a less refined approach is to include the census data if the centroid of the census block falls within the isopleths of interest. The census tract boundaries should be transferred to a map, such as a USGS map (referred to hereafter as the "base map".)

An alternative approach for estimating population exposure in heavily populated urban areas is to apportion census tracts to a Cartesian grid cell coordinate system. This method allows a Cartesian coordinate receptor concentration field to be merged with the population grid cells. This process can be computerized and minimizes manual mapping of centroids and census tracts. The HARP software includes this function and will provide population estimates that are consistent with the methodology discussed here.

The District may determine that aggregation of census tracts (e.g., which census tracts making up a city can be combined) is appropriate for receptors that are located at considerable distances from the facility. If the District permits such an approach, it is suggested that the census tract used to represent the aggregate be selected in a manner to ensure that the approach is health protective. For example, the census tract included in the aggregate that is nearest (downwind) to the facility should be used to represent the aggregate.

4.6.3.1.1 Subcensus Tract

Within each census tract are smaller population units. These units [urban block groups (BG) and rural enumeration districts (ED)] contain about 1,100 persons. BGs are

further broken down into statistical units called blocks. Blocks are generally bounded by four streets and contain an average of 70 to 100 persons. However, this range in population is an average and population units may vary significantly. In some cases, the EDs are very large and identical to a census tract.

The area requiring detailed (subcensus tract) resolution of the exposed residential and worker population will need to be determined on a case-by-case basis through consultation with the District. The District may determine that census tracts provide sufficient resolution near the facility to adequately characterize population exposure.

Employment population data can be obtained at the census tract level from the U.S. Census Bureau or from local planning agencies. This degree of resolution will generally not be sufficient for most risk assessments. For the area requiring detailed analysis, zoning maps, general plans, and other planning documents should be consulted to identify subareas with worker populations.

The boundaries of each residential and employment population area should be transferred to the base map.

4.6.4 *Sensitive Receptor Locations*

Individuals who may be more sensitive to toxic exposures than the general population are distributed throughout the total population. Sensitive populations may include young children and chronically ill individuals. The District may require that locations with high densities of sensitive individuals be identified (e.g., schools, nursing homes, residential care facilities, daycare centers, and hospitals). The HRA should state what the District requirements are regarding identification of sensitive receptor locations.

Although protection of sensitive individuals is incorporated into OEHHA's risk assessment methodology in both cancer risk and noncancer risk assessment, the assessment of risk at the specific location of such sensitive individuals (e.g., schools, hospitals, or nursing homes) may be useful to assure the public that such individuals are being considered in the analysis. For some chemicals (e.g., mercury and manganese) children have been specifically identified as the sensitive subpopulation for noncancer health impacts, so it can be particularly appropriate to assess school sites.

4.7 Receptor Siting

4.7.1 *Receptor Points*

The modeling analysis should contain a network of receptor points with sufficient detail (in number and density) to permit the estimation of the maximum concentrations. Locations that must be identified include:

- The maximum estimated off-site impact or point of maximum impact (PMI),
- The maximum exposed individual at an existing residential receptor (MEIR),
- The maximum exposed individual at an existing occupational worker receptor (MEIW).

Note that some situations may also require that on-site receptor (worker or residential) locations be evaluated. The risk assessor can contact the District or reviewing authority for guidance if on-site exposure situations are present at the emitting facility. However, these on-site locations should be included in the HRA. Some examples where the health impacts of on-site receptors may be appropriate could be military base housing, prisons, universities, day care facilities, or locations where the public may have regular access for the appropriate exposure period (e.g., a lunch time café or museum for acute exposures). When a receptor lives and works on the facility, site, or property, then these receptors should be evaluated and reported under both residential and worker scenarios and the one that is most health protective should be used for risk management decisions. The cancer risk estimates for the onsite residents may use a 30-year exposure duration while the 25-year exposure duration is used for a worker. Under a Tier 2 analysis, alternate exposure durations may be evaluated and presented with all assumptions supported.

All of these locations (i.e., PMI, MEIR, and MEIW) must be identified for potential multipathway carcinogenic and noncarcinogenic effects. It is possible that the estimated PMI, MEIR, and MEIW risk for cancer, chronic noncancer, 8-hour, and acute noncarcinogenic risks occur at different locations or that some of these evaluations may not be necessary (e.g., the receptor does not exist). For example, some facilities will not have off-site workers in the vicinity of the facility and will not need to evaluate worker exposure, or the exposure situation may only require the evaluation of short-term carcinogenic or acute noncancer impacts (see Section 8.2.10 for a discussion of short-term projects). The approval to revise the exposure assessment for a receptor, or to omit the MEIW receptor, should be verified in writing with the District or reviewing authority and included in the HRA.

Other sensitive receptor locations may also be of interest and required to be included in the HRA. The District or reviewing authority should be consulted to determine which sensitive receptor locations must be included.

The results from a screening model (if available) can be used to identify the area(s) where the maximum concentrations are likely to occur. Receptor points should also be located at the population centroids (see Section 4.7.2) and sensitive receptor locations (see Section 4.6.4). The exact configuration of the receptor array used in an analysis will depend on the topography, population distribution patterns, and other site-specific factors. All receptor locations should be identified in the HRA using UTM (Universal Transverse Mercator) coordinates and receptor number. The receptor numbers in the summary tables should match receptor numbers in the computer output (e.g., HARP output files). In addition to actual UTM coordinates, the block/street locations (i.e., north side of 3,000 block of Smith Street) should be provided in the HRA for the PMI, MEIR, and MEIW for carcinogenic and noncarcinogenic health effects. Chapter 9 provides an outline that specifies the content and recommended format of HRA results.

4.7.1.1 Receptor Height

To evaluate localized impacts, receptor height should be taken into account at the point of maximum impact on a case-by-case basis. For example, receptor heights may have to be included to account for receptors significantly above ground level. Flagpole receptors at the height of the breathing zone of a person may need to be considered when the source receptor distance is less than a few hundred meters. Consideration must also be given to the noninhalation pathway analysis which requires modeling of chemical deposition onto soil or water at ground level. For the inhalation pathway, a health protective approach is to select a receptor height from 0 meters to 1.8 meters that will result in the highest predicted downwind concentration. Final approval of this part of the modeling protocol should be with the District or reviewing authority.

4.7.2 *Centroid Locations*

For each subarea analyzed, a centroid location (the location at which a calculated ambient concentration is assumed to represent the entire subarea) should be determined. When population is uniformly distributed within a population unit, a geographic centroid based on the shape of the population unit can be used. If only a portion of the census tract lies within the isopleth or area of interest, then only the population that falls within the isopleth should be used in the calculation for population exposure. To determine this level of detail, local planning and zoning information may need to be collected. Where populations are not uniformly distributed, a population-weighted centroid may be used. Another alternative uses the concentration at the point of maximum impact within that census tract as the concentration to which the entire population of that census tract is exposed. While this less refined approach is commonly accepted, Districts should be contacted to approve this method prior to its use in a risk assessment.

The centroids represent locations that should be included as receptor points in the dispersion modeling analysis. Annual average concentrations should be calculated at each centroid using the modeling procedures presented in this chapter.

For census tracts and BG/EDs, judgments can be made using census tracts maps and street maps to determine the centroid location. At the block level, a geographic centroid is sufficient.

4.7.3 *Spatial Averaging*

Since the inception of the “Hot Spots” and California’s Air Toxics Programs, HRA results for an individual receptor have typically been based on air dispersion modeling results at a single point or location. With a few exceptions, this method has been traditionally used for all types of receptors (e.g., PMI, MEIR, MEIW, pathway receptors, etc.). The assumptions used in risk assessment are designed to prevent underestimation of health impacts to the public resulting in a health protective approach. However, basing risk estimates on a single highest point (PMI, MEIR, or MEIW) does not take into account that a person does not remain at one location on their property, or in one location at the

workplace over an extended period of time. Therefore, the average air concentration over a small area is likely to be more representative than using the air concentration at a single point, particularly in those situations where concentrations fall off rapidly around that single point. The concept of averaging air concentrations over a small area is known as spatial averaging.

In order to understand how spatial averaging can impact air dispersion modeling results with various types of facilities, the ARB, in conjunction with the OEHHA, performed sensitivity analyses to evaluate the impacts of spatially averaging air dispersion modeling results (see Appendix C of the Air Toxics Hot Spots Program Risk Assessment Guidelines: Technical Support Document for Exposure Assessment and Stochastic Analysis (EASA)). Based on these sensitivity analyses, it is reasonable and appropriate to include spatial averaging techniques in air toxic risk assessments as supplemental information to Tier 1 information (i.e., modeling results that are based on the air concentration from a single point or location). While all risk assessments must include results based on Tier 1 methodology, the spatially averaged concentrations around the point of interest (e.g., PMI, MEIR, MEIW, multipathway exposure evaluations, etc.) could also be included as an option in risk assessments and acceptable for risk management decisions subject to approval by the District or reviewing agency. Spatial averaging is an option for the purpose of additional refinement to the risk assessment.

A few reasons that support the inclusion of spatially averaged modeled concentrations in risk assessment include the following:

- Averaging results over a small domain will give a more representative picture of individual exposure and risk than an estimate based on one single location within their property.
- Spatial averaging will allow air dispersion modeling and risk assessment results to be characterized as the estimated concentration and risk in a discrete area of interest, rather than an exact value for a single location.
- From a risk communication standpoint, the ARB and OEHHA feel it is more appropriate to present the modeling output and the calculated health impacts as the potential impacts within a small or discrete area, rather than an exact value at a specific point on a grid or map.
- Spatial averaging is the recommended procedure in ARB's Lead Risk Management Guidelines (2001) and has been used in several complex source HRAs [e.g., Roseville Railyard (2004), Ports of LA/LB (2006), Port of Oakland (2008)].
- Spatially averaging the deposition concentrations over pasture land, a garden, or a water body for multipathway exposure scenarios is a planned upgrade for the HARP Software. This will provide an option that will refine multipathway exposure assessments. Average deposition on these types of areas (e.g., a water body) is not necessarily well represented by the single highest point of deposition, or deposition at the geographic center of the water body. Likewise, since produce is grown over the entire surface of the garden and cows graze the

entire pasture, deposition is better estimated by evaluating the entire area rather than using a single point.

4.7.3.1 Spatial Averaging Methodology

The spatial averaging sensitivity study in Appendix C of the EASA is based on simulating emissions from point, volume, area, and line sources. Most source types (e.g., point) are simulated as a small, medium or large source. Line sources are only simulated as small and large. In addition, meteorological data collected at five different locations in California were used. Nested spatial average grids of various domains were used to study the differences on the spatial average concentration. In the case of the 20 meter by 20 meter spatial average nested grid, the spatial average concentration showed little change over the PMI for medium and large sources. In the case for small sources, the spatial average concentration is approximately 45% to 80% of the PMI concentration. Individual source type and meteorological conditions will cause variations in these results.

The results of the spatial averaging sensitivity study in Appendix C of the EASA shows that sources with low plume rise that result in a PMI, MEIW, or MEIR located at or near the property fence line are most sensitive to spatial averaging. Source types with high plume rise (e.g., tall stacks) show a PMI far downwind where the concentration gradient is more gradual and therefore spatial averaging has a lesser effect. While spatial averaging can be used regardless of source size or the location of the PMI, the following conditions generally apply when a source is a good candidate for spatial averaging:

- The MEIR, MEIW, or PMI is located at the fence line or close to the emission source.
- The concentration gradient is high near the PMI. This is more associated with low level plumes such as fugitive, volume, area, or short stacks.
- A long term average is being calculated to represent a multi-year risk analysis based on one to five years of meteorological data. Note that spatial averaging should **not** be used for short term (acute) calculations.

In general, the method for calculating the spatial average in air toxic risk assessments includes the following steps:

1. Locate the point(s) of interest and receptor(s) (i.e., PMI, MEIW, MEIR, and any additional receptor locations of interest or concern) with a grid resolution spacing of no greater than five meters. To achieve this, two or more modeling runs with successively finer nested grid resolutions may be needed to find the final location where the nested grid that will be used for spatial averaging will be placed.

2. Center the spatial average nested grid on the each receptor's location of interest determined in step 1. Limit the nested grid to no larger than 20 meters by 20 meters or 400 square meters. Note that if a portion of the centered and nested grid falls within the facility boundary and the receptor location of interest is outside of the boundary, then adjustments to the nested grid to obtain the spatially-averaged concentration for the offsite receptor are reasonable. This may be done by either repositioning the nested grid to cover 400 square meters of off-boundary area surrounding the receptor or center the nested grid and delete any on-site grid points so that only the offsite grid points surrounding the receptor are used in the spatially averaged concentration. The grid resolution spacing should be no greater than five meters. With a five meter grid resolution, the 20 meter by 20 meter domain will result in 25 receptors. The size, shape, and placement of the domain and the resolution of points are subject to approval by the District, ARB, or other reviewing authority. See the Sections 4.7.3.1.2 and 4.7.3.1.3 below for additional discussion on domain sizing and grid spacing at worksites, pastures, gardens, and water bodies.

3. Some configurations of source activity and meteorological conditions result in a predominant downwind plume center line that is significantly askew from one of the four ordinate directions. In this case, a tilted nested grid is necessary to coincide with the dominant plume centerline. Polar receptors are easier to implement than a tilted rectangular grid. The domain of the polar receptor field should be limited to a 15 meter radius. See Appendix C of the EASA for detailed instructions on tilted polar receptors.

4. Calculate the arithmetic mean of the long term period average concentration (e.g., annual average) of the nested grid of receptors to represent the spatial average. This average is used in the risk calculations.

5. Document and include all methods, assumptions, data, maps, and files used in the spatial averaging analysis and clearly present this information in the risk assessment following the requirements of the District or reviewing authority. Note that in the update to the HARP software, functionality will be included that will assist with spatial averaging and the methodology discussed.

The following sections discuss the use of spatial averaging for various receptor types and exposure pathways.

4.7.3.1.1 Residential Receptors

Follow the steps in Section 4.7.3 outlining the spatial averaging methodology. To remain health protective when evaluating a residential receptor, spatial averaging should not take place using large nested domains. The domain used for spatial averaging should be no larger than 20 meters by 20 meters with a maximum grid spacing resolution of equal to or less than five meters. This domain represents an area

that is approximately the size of a small urban lot. The size of the domain and resolution of points shall be subject to approval by the District, ARB, or other reviewing authority.

4.7.3.1.2 Worker Receptors

Offsite worker locations (e.g. MEIW) may also be a candidate for spatial averaging. However, workers can be at the same location during almost their entire daily work shift (e.g., desk/office workers). When this is the situation, then the traditional method of using a single location and corresponding modeled concentration is appropriate. If spatial averaging is used, care should be taken to determine the proper domain size and grid resolution. Follow the steps in Section 4.7.3 outlining the spatial averaging methodology. To be consistent with the residential receptor assumptions and remain health protective, a modeling domain size no larger than 20 meters by 20 meters is recommended with a grid spacing resolution of equal to or less than five meters. However, if workers routinely and continuously move throughout the worksite over a space greater than 20 meters by 20 meters, then a larger domain may be considered.

The HRA or modeling protocol shall support all assumptions used, including, but not limited to, documentation for all workers showing the area where each worker routinely performs their duties and the percentage of time spent in those areas. The final domain size should not be greater than the smallest area of worker movement. Other considerations for determining domain size and grid spacing resolution may include an evaluation of the concentration gradients across the worker area. The grid spacing used within the domain to find the concentration that will be used to calculate health impacts should be sufficient in number and detail to obtain a representative concentration across the area of interest. The size of the domain and resolution of points shall be subject to approval by the District, ARB, or other reviewing authority.

4.7.3.1.3 Pastures, Gardens, or Water Bodies

The simplified approach of using the concentration (deposition rate) at the centroid, a specific point of interest, or the PMI location for an area being evaluated for noninhalation exposures (e.g., a body of water used for fishing, a pasture used for grazing, area of a garden, etc.) is acceptable for use in HRA. However, evaluating deposition concentrations over pasture land, a garden, or a water body for multipathway exposure scenarios using spatial averaging could give more representative estimates of the overall deposition rate. Use of spatial averaging in this application is subject to approval by the District, ARB, or other reviewing authority.

If spatial averaging will be done, follow the steps in Section 4.7.3.1 outlining the spatial averaging methodology. When using spatial averaging over the deposition area, care should be taken to determine the proper domain size to make sure it includes all reasonable areas of potential deposition. The size and shape of the area of interest (e.g., pasture or water body) should be identified and used for the modeling domain. The grid spacing or resolution used within the domain should be sufficient in detail to obtain a representative deposition concentration across the area of interest. One way

to determine the grid resolution is to include an evaluation of the concentration gradients across the deposition area. The HRA or modeling protocol shall support all assumptions used, including, but not limited to, documentation of the deposition area (e.g., size and shape of the pasture, garden, or water body, maps, representative coordinates, grid resolution, concentration gradients, etc.). The size of the domain and grid resolution is subject to approval by the reviewing authority.

In lieu of following the details in the paragraph above, the approach used for the other receptors (e.g., MEIR, MEIW) that uses a domain size not greater than 20 meters by 20 meters, located on the PMI within the area of interest, with a maximum grid spacing resolution of five meters, can be used. This default refined approach would apply to deposition areas greater than 20 meters by 20 meters. For smaller deposition areas, the simplified approach of using the PMI for the area, the concentration at the centroid or a specific point of interest, or averaging over the actual smaller domain can be used. This again is subject to approval by the reviewing authority.

The HRA or modeling protocol shall support all assumptions used, including, but not limited to, documentation of the deposition area (e.g., size and shape of the water body, pasture, or garden; all data; maps; representative coordinates, and etc.), and the details clarifying how and where the averaging was done (e.g., location and magnitude of concentration gradients, the grid spacing used).

4.8 Meteorological Data

Refined air dispersion models require hourly meteorological data. The first step in obtaining meteorological data should be to check with the District and the ARB for data availability. Other sources of data include the National Weather Service (NWS), National Climatic Data Center (NCDC), Asheville, North Carolina, ARB meteorological database (METDB), military stations and private networks. Meteorological data for a subset of NWS stations are available from the U.S. EPA Support Center for Regulatory Air Models (SCRAM). The SCRAM can be accessed at www.epa.gov/scram001/main.htm. All meteorological data sources should be approved by the District. Data not obtained directly from the District or the ARB should be checked for quality, representativeness, and completeness. It should be approved by the District before use. U.S. EPA provides guidance (U.S. EPA, 1995e) for these data. Meteorological data may need further processing. Data users can consult with the District or the ARB on how to process the raw meteorological data. The risk assessment should indicate if the District required the use of a specified meteorological data set. All memos indicating District approval of meteorological data should be attached in an appendix. If no representative meteorological data are available, screening procedures should be used as indicated in Section 4.10.

The analyst should acquire enough meteorological data to ensure that the worst-case meteorological conditions are represented in the model results. The US-EPA Guideline on Air Quality Models (U.S. EPA 2005) prefers that the latest five years of consecutive meteorological data be used to represent long term averages (i.e., cancer and chronic impacts). Previous OEHHA guidance allowed the use of the worst-case year to save

computer time. The processing speed of modern computers has increased to the point where processing five years of data over one year is no longer burdensome. However, the District may determine that one year of representative meteorological data is sufficient to adequately characterize the facility's impact. This may especially be the case when five years of quality consecutive data are not available.

To determine long term average concentrations the data can be averaged. For calculation of the one-hour maximum concentrations needed to evaluate acute effects, the worst-case year should be used in conjunction with the maximum hourly emission rate. For example, the long term average concentration and one-hour maximum concentration at a single receptor for five years of meteorological data are calculated below:

Year	Annual Average ($\mu g/m^3$)	Maximum One-Hour ($\mu g/m^3$)
1	7	100
2	5	80
3	9	90
4	8	110
5	6	90
5-year average	7	

In the above example, the long-term average concentration over five years is 7 $\mu g/m^3$. Therefore, 7 $\mu g/m^3$ should be used to evaluate carcinogenic and chronic effects (i.e., annual average concentration). The one-hour maximum concentration is the highest one-hour concentration in the five-year period. Therefore, 110 $\mu g/m^3$ is the peak one-hour concentration that should be used to evaluate acute effects.

The higher hourly concentration usually occurs when meteorological dispersion conditions become worse, such as, calm or light wind, inversion, etc. Inversion usually happens in late afternoon through early morning. As the sun goes down, the atmospheric temperature near surface starts to fall, usually faster than the temperature in the upper atmosphere causing a temperature inversion layer to form and extend downward. This inversion layer usually sustains throughout the night, and remains until early morning. Because of the inversion (cold air sitting on warm air at the top of the inversion layer), pollutant vertical mixing is very low in the morning.

When predicted concentrations are high and the mixing height is very low for the corresponding averaging period, the modeling results deserve additional consideration. For receptors in the near field, it is within the model formulation to accept a very low mixing height for short durations. However, it would be unlikely that the very low mixing height would persist long enough for the pollutants to travel into the far field. In the

event that the analyst identifies any of these time periods, they should be discussed with the District on a case-by-case basis.

4.8.1 *Meteorological Data Formats*

Most short-term dispersion models require input of hourly meteorological data in a format which depends on the model. U.S. EPA provides software for processing meteorological data for use in U.S. EPA recommended dispersion models. U.S. EPA recommended meteorological processors include the Meteorological Processor for Regulatory Models (MPRM), PCRAMMET, and AERMET. Use of these processors will ensure that the meteorological data used in an U.S. EPA recommended dispersion model will be processed in a manner consistent with the requirements of the model.

Meteorological data for a subset of NWS stations are available on the World Wide Web at the U.S. EPA SCRAM address, http://www.epa.gov/scram001.

4.8.2 *Treatment of Calms*

Calms are hours when the wind speed is below the starting threshold of the anemometer. Gaussian plume models require a wind speed and direction to estimate plume dispersion in the downwind direction.

U.S. EPA's policy is to disregard calms until such time as an appropriate analytical approach is available. The recommended U.S. EPA models contain a routine that eliminates the effect of the calms by nullifying concentrations during calm hours and recalculating short-term and annual average concentrations. Certain models lacking this built-in feature can have their output processed by U.S. EPA's CALMPRO program (U.S. EPA, 1984a) to achieve the same effect. Because the adjustments to the concentrations for calms are made by either the models or the postprocessor, actual measured on-site wind speeds should always be input to the preprocessor. These actual wind speeds should then be adjusted as appropriate under the current U.S. EPA guidance by the preprocessor.

Following the U.S. EPA methodology, measured on-site wind speeds of less than 1.0 m/s, but above the instrument threshold, should be set equal to 1.0 m/s by the preprocessor when used as input to Gaussian models. Calms are identified in the preprocessed data file by a wind speed of 1.0 m/s and a wind direction equal to the previous hour. For input to AERMOD, no adjustment should be made to the site specific wind data. AERMOD can produce model estimates for conditions when the wind speed may be less than 1 m/s but still greater than the instrument threshold. Some air districts provide pre-processed meteorological data for use in their district that treats calms differently. Local air districts should be consulted for available meteorological data. In addition, to reduce the number of calms and missing winds in the surface data, EPA has developed a pre-processor – AERMINUTE – to process 1-minute ASOS wind data for generating hourly average wind speed and directions for input to AERMET in Stage 2. The details can be found in the EPA's AERMINUTE User's Instructions at:

http://www.epa.gov/ttn/scram/models/aermod/aerminute_userguide_v11059_draft.pdf

If the fraction of calm hours is excessive, then an alternative approach may need to be considered to characterize dispersion. The Calpuff model modeling system can simulate calm winds as well as complex wind flow and therefore is a viable alternative. The local air district should be consulted for alternative approaches.

4.8.3 *Treatment of Missing Data*

Missing data refer to those hours for which no meteorological data are available from the primary on-site source for the variable in question. When missing values arise, they should be handled in one of the following ways listed below, in the following order of preference:

(1) If there are other on-site data, such as measurements at another height, they may be used when the primary data are missing. If the height differences are significant, corrections based on established vertical profiles should be made. Site-specific vertical profiles based on historical on-site data may also be appropriate to use if their determination is approved by the reviewing authority. If there is question as to the representativeness of the other on-site data, they should not be used.

(2) If there are only one or two missing hours, then linear interpolation of missing data may be acceptable, however, caution should be used when the missing hour(s) occur(s) during day/night transition periods.

(3) If representative off-site data exist, they may be used. In many cases this approach may be acceptable for cloud cover, ceiling height, mixing height, and temperature. This approach will rarely be acceptable for wind speed and direction. The representativeness of off-site data should be discussed and agreed upon in advance with the reviewing authority.

(4) An imputation methodology may be acceptable, provided it is well-documented, sufficiently justified, and properly applied.

(5) Failing any of the above, the data field should be coded as missing using missing data codes appropriate to the applicable meteorological pre-processor.

Appropriate model options for treating missing data, if available in the model, should be employed. Substitutions for missing data should only be made in order to complete the data set for modeling applications, and should not be used to attain the “regulatory completeness” requirement of 90%. That is, the meteorological data base must be 90% complete on a monthly basis (before substitution) in order to be acceptable for use in air dispersion modeling. The use of any data substitution technique should be thoroughly documented to provide the District or reviewing authority with all the information necessary to determine its approvability.

If the recommended methods for addressing missing meteorological data cannot be achieved as described, then alternative approaches should be discussed and developed in conjunction with the District or reviewing authority.

4.8.4 *Representativeness of Meteorological Data*

The atmospheric dispersion characteristics at an emission source need to be evaluated to determine if the collected meteorological data can be used to adequately represent atmospheric dispersion for the project.

Such determinations are required when the available meteorological data are acquired at a location other than that of the proposed source. In some instances, even though meteorological data are acquired at the location of the pollutant source, they still may not correctly characterize the important atmospheric dispersion conditions.

Considerations of representativeness are always made in atmospheric dispersion modeling whether the data base is "on-site" or "off-site." These considerations call for the judgment of a meteorologist or an equivalent professional with expertise in atmospheric dispersion modeling. If in doubt, the District should be consulted.

4.8.4.1 Spatial Dependence

The location where the meteorological data are acquired should be compared to the source location for similarity of terrain features. For example, in complex terrain, the following considerations should be addressed in consultation with the District:

- Aspect ratio of terrain, i.e., ratio of:
    - Height of valley walls to width of valley;
    - Height of ridge to length of ridge; and
    - Height of isolated hill to width of hill at its base
- Slope of terrain
- Ratio of terrain height to stack/plume height
- Distance of source from terrain (i.e., how close to valley wall, ridge, isolated hill)
- Correlation of terrain feature to prevailing meteorological conditions

Likewise, if the source is located on a plateau or plain, the source of meteorological data used should be from a similar plateau or plain.

Judgments of representativeness should be made only when sites are climatologically similar. Sites in nearby, but different air sheds, often exhibit different weather patterns. For instance, meteorological data acquired along a shoreline are not normally representative of inland sites and vice versa.

Meteorological data collected need to be examined to determine if drainage, transition, and synoptic flow patterns are characteristics of the source, especially those critical to the regulatory application. Consideration of orientation, temperature, and ground cover should be included in the review.

An important aspect of space dependence is height above the ground. Where practical, meteorological data should be acquired at the release height, as well as above or below, depending on the buoyancy of the source's emissions. AERMOD at a minimum requires wind observations at a height above ground between seven times the local surface roughness height and 100 meters.

4.8.4.2 Temporal Dependence

To be representative, meteorological data must be of sufficient duration to define the range of sequential atmospheric conditions anticipated at a site. As a minimum, one full year of on-site meteorological data is necessary to prescribe this time series. Multiple years of data are used to describe variations in annual and short-term impacts. Consecutive years from the most recent, readily available 5-year period are preferred to represent these yearly variations.

4.8.4.3 Further Considerations

It may be necessary to recognize the non-homogeneity of meteorological variables in the air mass in which pollutants disperse. This non-homogeneity may be essential in correctly describing the dispersion phenomena. Therefore, measurements of meteorological variables at multiple locations and heights may be required to correctly represent these meteorological fields. Such measurements are generally required in complex terrain or near large land-water body interfaces.

It is important to recognize that, although certain meteorological variables may be considered unrepresentative of another site (for instance, wind direction or wind speed), other variables may be representative (such as temperature, dew point, cloud cover). Exclusion of one variable does not necessarily exclude all. For instance, one can argue that weather observations made at different locations are likely to be similar if the observers at each location are within sight of one another - a stronger argument can be made for some types of observations (e.g., cloud cover) than others. Although by no means a sufficient condition, the fact that two observers can “see” one another supports a conclusion that they would observe similar weather conditions.

Other factors affecting representativeness include change in surface roughness, topography and atmospheric stability. Currently there are no established analytical or statistical techniques to determine representativeness of meteorological data. The establishment and maintenance of an on-site data collection program generally fulfills the requirement for “representative” data. If in doubt, the District should be consulted.

4.8.5 *Alternative Meteorological Data Sources*

It is necessary, in the consideration of most air pollution problems, to obtain data on site-specific atmospheric dispersion. Frequently, an on-site measurement program must be initiated. As discussed in Section 4.8.3, representative off-site data may be used to substitute for missing periods of on-site data. There are also situations where current or past meteorological records from a National Weather Service station may suffice. These considerations call for the judgment of a meteorologist or an equivalent professional with expertise in atmospheric dispersion modeling. More information on Weather Stations including: National Weather Service (NWS), military observations, supplementary airways reporting stations, upper air and private networks, is provided in "On-Site Meteorological Program Guidance for Regulatory Modeling Applications" (U.S. EPA, 1995e).

4.8.5.1 Recommendations

On-site meteorological data should be processed to provide input data in a format consistent with the particular models being used. The input format for U.S. EPA short-term regulatory models is defined in U.S. EPA's MPRM. The input format for AERMOD is defined in the AERMET meteorological pre-processor. Processors are available on the SCRAM web site. The actual wind speeds should be coded on the original input data set. Wind speeds less than 1.0 m/s but above the instrument threshold should be set equal to 1.0 m/s by the preprocessor when used as input to Gaussian models. Wind speeds below the instrument threshold of the cup or vane, whichever is greater, should be considered calm, and are identified in the preprocessed data file by a wind speed of 1.0 m/s and a wind direction equal to the previous hour. For input to AERMOD, no adjustment should be made to the site specific wind data. AERMOD can produce model estimates for conditions when the wind speed may be less than 1 m/s but still greater than the instrument threshold.

If data are missing from the primary source, they should be handled as follows, in order of preference: (1) substitution of other representative on-site data; (2) linear interpolation of one or two missing hours; (3) substitution of representative off-site data; (4) use of a well-documented and justified imputation methodology; or (5) coding as a missing data field, according to the discussions in Section 4.8.3. The use of any data substitution technique should be thoroughly documented to provide the District or reviewing authority with all the information necessary to determine its approvability.

If the data processing recommendations in this section cannot be achieved, then alternative approaches should be discussed and developed in conjunction with the District or reviewing authority.

4.8.6 *Quality Assurance and Control*

The purpose of quality assurance and maintenance is the generation of a representative amount (90% of hourly values for a year on a monthly basis) of valid data. For more information on data validation consult reference U.S. EPA (1995e). Maintenance may

be considered the physical activity necessary to keep the measurement system operating as it should. Quality assurance is the management effort to achieve the goal of valid data through plans of action and documentation of compliance with the plans.

Quality assurance (QA) will be most effective when following a QA Plan which has been signed-off by appropriate project or organizational authority. The QA Plan should contain the following information (paraphrased and particularized to meteorology from Lockhart):

1. Project description - how meteorology data are to be used
2. Project organization - how data validity is supported
3. QA objective - how QA will document validity claims
4. Calibration method and frequency - for data
5. Data flow - from samples to archived valid values
6. Validation and reporting methods - for data
7. Audits - performance and system
8. Preventive maintenance
9. Procedures to implement QA objectives - details
10. Management support - corrective action and reports

It is important for the person providing the quality assurance (QA) function to be independent of the organization responsible for the collection of the data and the maintenance of the measurement systems. Ideally, the QA auditor works for a separate company.

4.9 Model Selection

There are several air dispersion models that can be used to estimate pollutant concentrations and new ones are likely to be developed. U.S. EPA added AERMOD, which incorporates the PRIME downwash algorithm, to the list of preferred models in 2005 as a replacement to ISCST3. CalPuff was added in 2003. The latest version of the U.S. EPA recommended models can be found at the SCRAM Bulletin board located at http://www.epa.gov/scram001. However, any model, whether a U.S. EPA guideline model or otherwise, must be approved for use by the local air district. Recommended models and guidelines for using alternative models are presented in this section. All air dispersion models used to estimate pollutant concentrations for risk assessment analyses must be in the public domain. Classification according to terrain, source type and level of analysis is necessary before selecting a model (see Section 4.4). The selection of averaging times in the modeling analysis is based on the health effects of concern. Annual average concentrations are required for an analysis of carcinogenic or other chronic effects. One-hour maximum concentrations are required for analysis of acute effects.

4.9.1 *Recommended Models*

Recommended air dispersion models to estimate concentrations for risk assessment analyses are generally referenced in US EPA's Guideline on Air Quality Models

available at http://www.epa.gov/scram001. Currently AERMOD is recommended for most refined risk assessments in flat or complex terrain and in rural or urban environments[1]. In addition, CalPuff is available where spatial wind fields are highly variable or transport distances are large (e.g., 50 km). AERSCREEN is a screening model based on AERMOD. AERSCREEN can be used when representative meteorological data are unavailable. CTSCREEN is available for screening risk assessments in complex terrain. The most current version of the models should be used for risk assessment analysis. Some facilities may also require models capable of special circumstances such as dispersion near coastal areas. For more information on modeling special cases see Sections 4.12 and 4.13.

Most air dispersion models contain provisions that allow the user to select among alternative algorithms to calculate pollutant concentrations. Only some of these algorithms are approved for regulatory application such as the preparation of health risk assessments. The sections in this guideline that provide a description of each recommended model contain information on the specific switches and/or algorithms that must be selected for regulatory application.

To further facilitate the model selection, the District should be consulted for additional recommendations on the appropriate model(s) or a protocol submitted for District review and approval (see Section 4.14.1).

4.9.2 *Alternative Models*

Alternative models are acceptable if applicability is demonstrated or if they produce results identical or superior to those obtained using one of the preferred models referenced in Section 4.9.1. For more information on the applicability of alternative models refer to the following documents:

- U.S. EPA (2005). "Guideline on Air Quality Models" Section 3.2.2
- U.S. EPA (1992). "Protocol for Determining the Best Performing Model"
- U.S. EPA (1985a). "Interim Procedures for Evaluating Air Quality Models – Experience with Implementation"
- U.S. EPA (1984b). "Interim Procedures for Evaluating Air Quality Models (Revised)"

4.10 Screening Air Dispersion Models

A screening model may be used to provide a maximum concentration that is biased toward overestimation of public exposure. Use of screening models in place of refined modeling procedures is optional unless the District specifically requires the use of a refined model. Screening models are normally used when no representative meteorological data are available and may be used as a preliminary estimate to determine if a more detailed assessment is warranted.

[1] AERMOD was promulgated by U.S. EPA as a replacement to ISCST3 on November 9, 2006.

Some screening models provide only 1-hour average concentration estimates. Other averaging periods can be estimated based on the maximum 1-hour average concentration in consultation and approval of the responsible air district. Because of variations in local meteorology, the exact factor selected may vary from one district to another. Table 4.2 provides guidance on the range and typical values applied. The conversion factors are designed to bias predicted longer term averaging periods towards overestimation.

Table 4.2 Recommended Factors to Convert Maximum 1-hour Avg. Concentrations to Other Averaging Periods (U.S. EPA, 2011, 1995a; ARB, 1994).

Averaging Time	Range	Typical SCREEN3 Recommended	AERSCREEN Recommended
3 hours	0.8 - 1.0	0.9	1.0
8 hours	0.5 - 0.9	0.7	0.9
24 hours	0.2 - 0.6	0.4	0.6
30 days	0.2 - 0.3	0.3	
Annual	0.06 - 0.1	0.08	0.1

AERSCREEN automatically provides the converted concentration for longer than 1-hour averaging periods. For area sources, the AERSCREEN 3, 8, and 24-hour average concentration are equal to the 1-hour concentration. No annual average concentration is calculated. SCREEN3 values are shown for comparison purposes.

4.10.1 *AERSCREEN*

The AERSCREEN (U.S. EPA, 2011) model is now available and should be used in lieu of SCREEN3 with approval of the local District. AERSCREEN is a screening level air quality model based on AERMOD. AERSCREEN does not require the gathering of hourly meteorological data. Rather, AERSCREEN requires the use of the MAKEMET program which generates a site specific matrix of meteorological conditions for input to the AERMOD model. MAKEMET generates a matrix of meteorological conditions based on local surface characteristics, ambient temperatures, minimum wind speed, and anemometer height.

AERSCREEN is currently limited to modeling a single point, capped stack, horizontal stack, rectangular area, circular area, flare, or volume source. More than one source may be modeled by consolidating the emissions into one emission source.

4.10.2 *Valley Screening*

The Valley model is designed to simulate a specific worst-case condition in complex terrain, namely that of a plume impaction on terrain under stable atmospheric conditions. The algorithms of the VALLEY model are included in other models such as SCREEN3 and their use is recommended in place of the VALLEY model. The usefulness of the VALLEY model and its algorithms is limited to pollutants for which only long-term average concentrations are required. For more information on the Valley model consult the user's guide (Burt, 1977).

4.10.2.1 Regulatory Options

Regulatory application of the Valley model requires the setting of the following values during a model run:

- Class F Stability (rural) and Class E Stability (urban)
- Wind Speed = 2.5 m/s
- 6 hours of occurrence of a single wind direction (not exceeding a 22.5 deg sector)
- 2.6 stable plume rise factor

4.10.3 *CTSCREEN*

The CTSCREEN model (Perry et al., 1990) is the screening mode of the Complex Terrain Dispersion Model (CTDMPLUS). CTSCREEN can be used to model single point sources only. It may be used in a screening mode for multiple sources on a case by case basis in consultation with the District. CTSCREEN is designed to provide conservative, yet theoretically sounder, worst-case 1-hour concentration estimates for receptors located on terrain above stack height. Internally-coded time-scaling factors are applied to obtain other averages (see Table 4.3). These factors were developed by comparing the results of simulations between CTSCREEN and CTDMPLUS for a variety of scenarios and provide conservative estimates (Perry et al., 1990). CTSCREEN produces identical results as CTDMPLUS if the same meteorology is used in both models. CTSCREEN accounts for the three-dimensional nature of the plume and terrain interaction and requires detailed terrain data representative of the modeling domain. A summary of the input parameters required to run CTSCREEN is given in Table 4.4. The input parameters are provided in three separate text files. The terrain topography file (TERRAIN) and the receptor information file (RECEPTOR) may be generated with a preprocessor that is included in the CTSCREEN package. In order to generate the terrain topography file the analyst must have digitized contour information.

Table 4.3 Time-scaling factors internally coded in CTSCREEN

Averaging Period	Scaling Factor
3 hours	0.7
24 hour	0.15
Annual	0.03

Table 4.4 Input Parameters Required to Run CTSCREEN

Parameter	File
Miscellaneous program switches	CTDM.IN
Site Latitude and Longitude (degrees)	CTDM.IN
Site TIME ZONE	CTDM.IN
Meteorology Tower Coordinates (user units)	CTDM.IN
Source Coordinates: x and y (user units)	CTDM.IN
Source Base Elevation (user units)	CTDM.IN
Stack Height (m)	CTDM.IN
Stack Diameter (m)	CTDM.IN
Stack Gas Temperature (K)	CTDM.IN
Stack Gas Exit Velocity (m/s)	CTDM.IN
Emission Rate (g/s)	CTDM.IN
Surface Roughness for each Hill (m)	CTDM.IN
Meteorology: Wind Direction (optional)	CTDM.IN
Terrain Topography	TERRAIN
Receptor Information (coordinates and associated hill number)	RECEPTOR

4.11 Refined Air Dispersion Models

Refined air dispersion models are designed to provide more representative concentration estimates than screening models. In general, the algorithms of refined models are more robust and have the capability to account for site-specific meteorological conditions. For more information regarding general aspects of model selection see Section 4.9.

4.11.1 *AERMOD*

For a wide variety of applications in all types of terrain, the recommended model is AERMOD. AERMOD is a steady-state plume dispersion model for assessment of pollutant concentrations from a variety of sources. AERMOD simulates transport and dispersion from multiple point, area, or volume sources based on an up-to-date characterization of the atmospheric boundary layer. Sources may be located in rural or urban areas and receptors may be located in simple or complex terrain. AERMOD accounts for building wake effects (i.e., plume downwash) based on the PRIME building downwash algorithms. The model employs hourly sequential preprocessed meteorological data to estimate concentrations for averaging times from one hour to one year (also multiple years). AERMOD is designed to operate in concert with two pre-processor codes: AERMET processes meteorological data for input to AERMOD, and AERMAP processes terrain elevation data and generates receptor information for input to AERMOD. Guidance on input requirements may be found in the AERMOD Users Guide.

4.11.1.1 Regulatory Options

U.S. EPA regulatory application of AERMOD requires the selection of specific switches (i.e., algorithms) during a model run. All the regulatory options can be set by selecting the DFAULT keyword. The U.S. EPA regulatory options, automatically selected when the DFAULT keyword is used, are:

- Stack-tip downwash
- Incorporates the effects of elevated terrain
- Includes calms and missing data processing routines
- Does not allow for exponential decay for applications other than a 4-hour half life for SO_2

Additional information on these options is available in the AERMOD User's Guide.

4.11.1.2 Special Cases

a. Building Downwash:
AERMOD automatically determines if the plume is affected by the wake region of buildings when their dimensions are given. The specification of building dimensions does not necessarily mean that there will be downwash. See

Section 4.13.1 for guidance on how to determine when downwash is likely to occur.

b. Area Sources:
The area source algorithm in AERMOD estimates source emission strength by integrating an area upwind of the receptor location. Receptors may be placed within the area itself, downwind of the area or adjacent to the area. However, since the vertical distribution parameter (σ_z) goes to zero as the downwind distance goes to zero, the plume function solution is infinite for a downwind receptor distance of zero. In order to avoid such singularity in the plume function solution, the AERMOD model arbitrarily sets the plume function to zero when the receptor distance is less than one meter. As a result, the area source algorithm will not provide reliable solutions for receptors located within or adjacent to very small areas, with dimensions on the order of a few meters across. In these cases, the receptor should be placed at least one meter outside of the area.

c. Volume Sources:
The volume source algorithms in AERMOD require an estimate of the initial distribution of the emission source. The initial distribution of emissions for a volume source is in the horizontal and vertical directions. When modeling volume source emissions, one needs to provide initial horizontal (σ_{y0}) and vertical (σ_{z0}) dimensions as accurate as possible so that pollutant buoyancy and dispersion are also calculated accurately. US EPA's AERMOD User Guide provides suggested procedures to estimate these initial dimensions based on source type (Table 3-1) (U.S. EPA, 2004a).

d. Line Sources:
Examples of line sources include conveyor belts or roads. Depending on the source, these can be modeled three ways; as a line source, as a series of volume sources, or as an elongated area source. Where the emission source is neutrally buoyant, such as a conveyor belt, AERMOD can be used according to the user guide. In the event that the line source is a roadway, then additional considerations are required.

At the present time, CALINE (CALINE3, CAL3QHCR, and CALINE4) is the only model dedicated to modeling the enhanced mechanical and thermal turbulence created by motor vehicles traveling on a roadway. Of these, CAL3QHCR is the only model that accepts hourly meteorological data and can estimate annual average concentrations. However, CALINE uses the Pasquill-Gifford stability categories which are used in the ISCST model. AERMOD is now the preferred plume model over ISCST3 with continuous plume dispersion calculations based on observations but AERMOD does not include the enhanced roadway turbulence. Therefore, in the case where roadway emissions dominate the risk assessment, it may be most important to simulate the enhanced thermal and mechanical turbulence from motor vehicles with the CAL3QHCR model.

In the case where roadway emissions are a subset of all emissions for the risk assessment, including roadway emissions along with facility emissions, it may be best to use AERMOD for all emissions, roadway and facility, in order to maintain continuity with one dispersion model for the risk assessment. If AERMOD is used, it is important to consider that a major freeway may act similar to a large building which can cause some mixing and therefore initial vertical dispersion. This dispersion could be estimated with sensitivity studies based on wind speed, wind angle, roadway orientation, roadway width, and etc. This could be a complex estimation and needs very adept modeling skills. Roadway modeling should be evaluated on a case-by-case basis in consultation with the District or the reviewing authority.

Line sources inputs include a composite fleetwide emission factor, roadway geometry, hourly vehicle activity (i.e., diurnal vehicle per hour pattern), hourly meteorological data, and receptor placement. For practical information on how to simulate roadway emissions using these models, see CAPCOA's website at http://www.capcoa.org or the Sacramento Metropolitan AQMD (SMAQMD) website at http://www.airquality.org/ceqa/RoadwayProtocol.shtml. The SMAQMD has a document titled, "Recommended Protocol for Evaluating the Location of Sensitive Land Uses Adjacent to Major Roadways"(January, 2010).

e. Complex Terrain:
AERMOD uses the Dividing Streamline (Hc) concept for complex terrain. Above Hc, the plume is assumed to be "terrain following" in the convective boundary layer. Below Hc, the plume is assumed to be "terrain impacting" in the stable boundary layer. AERMOD computes the concentration at any receptor as a weighted function between the two plume states (U.S. EPA, 2004b).

f. Deposition:
AERMOD contains algorithms to model settling and deposition and requires additional information to do so including particle size distribution. For more information consult the AERMOD User's Guide (U.S. EPA, 2004a).

g. Diurnal Considerations:
Systematic diurnal changes in atmospheric conditions are expected along the coast (or any large body of water) or in substantially hilly terrain. The wind speed and direction are highly dependent on time of day as the sun rises and begins to heat the Earth. The sun heats the surface of the land faster than the water surface. Therefore the air above the land warms up sooner than over water. This creates a buoyant effect of warm air rising over land and the cool air from over water moves in to fill the void. Near large bodies of water (e.g., the ocean) this is known as a sea breeze. In complex terrain this is known as upslope flow as the hot air follows the terrain upwards. When the sun sets and the surface of the land begins to cool, the air above also cools and creates a draining effect. Near the water this is the land breeze; in complex terrain this is known as downslope or drainage flow. In addition, for the sea breeze, the atmospheric

conditions change rapidly from neutral or stable conditions over water to unstable conditions over land.

Near the large bodies of water the sea breeze is typical in the afternoon and the land breeze is typical for the early morning before sunrise. In complex terrain upslope flow is typical in the afternoon, while drainage flow is typical at night. Diurnal profiles need to be evaluated in conjunction with the facility emissions since sources can have varied emission profiles (e.g., some sources are continuously emitting while others are intermittent). These intermittent emission profiles may be influenced by diurnal patterns; therefore, they need to be evaluated to properly estimate potential exposures. For these reasons, it is especially important to simulate facility emissions with a hourly diurnal pattern reflective of source activity so that the risk assessment is representative of daily conditions.

h. 8-hour Modeling for the Offsite Worker's Exposure and Residential Exposure: If the ground level air concentrations from a facility operating 5 days a week, 8 hours per day have been estimated by a 24 hour per day annual average, an adjustment factor can be applied to estimate the air concentration that an offsite worker with the same schedule would be exposed to. The 24-hour annual average concentration is multiplied times 4.2.

If the meteorology during the time that the facility is emitting is used, hourly model simulations need to be post-processed to cull out the data needed for the offsite worker exposure. See Appendix M for information on how to calculate the refined offsite worker concentrations using the hourly raw results from the AERMOD air dispersion model. For more discussion on worker exposure, see Section 4.8.1.

Eight-hour exposure modeling can be used to evaluate the potential for health impacts (including effects of repeated exposures) in children and teachers exposed during school hours. Although not required in the HRA, 8-hour exposure modeling could also be performed at the discretion of the District to a residential scenario (i.e., the MEIR) where a facility operates only a portion of the day and exposure to residences are not adequately reflected by averaging concentrations over a 24 hour day.

4.11.1.3 HARP Dispersion Analysis

It is highly recommended that air dispersion analysis be performed using the HARP software. HARP can perform refined dispersion analysis by utilizing the U.S. EPA standard program AERMOD. In the future, the updated version of HARP will link the AERMOD outputs with risk assessment modules.

4.11.2 *CTDMPLUS*

CTDMPLUS is a Gaussian air quality model for use in all stability conditions in complex terrain. In comparison with other models, CTDMPLUS requires considerably more

detailed meteorological data and terrain information that must be supplied using specifically designed preprocessors. CTDMPLUS was designed to handle up to 40 point sources.

4.12 Modeling to Obtain Concentrations used for Various Health Impacts

The following section outlines how emissions and air dispersion modeling results are used or adjusted for a receptor that is exposed to either a non-continuous or continuously emitting source.

4.12.1 *Emission Rates for Cancer, Chronic, and Acute Health Impacts*

As discussed in Section 4.2.1.1, the HRA should include both annual average emissions and maximum 1-hour emissions for each pollutant emitted by the facility. Maximum 1-hour emissions are used for acute noncancer health impacts while annual emissions are used for chronic exposures (i.e., chronic and 8-hour noncancer health impacts or cancer risk assessment). When applying the emission rates in the air dispersion analysis, it is important not to artificially inflate or deplete the reported emission inventory.

For annual average emissions, the emissions are spread evenly over the entire year for continuous emitting sources. However, for sources where the emission patterns vary (i.e., non-continuous emitting sources), the emission rate should also account for the facility's emission schedule. If appropriate, the variable emissions rate option (e.g., hour-of-day) should be used in the air dispersion analysis. For more information consult the AERMOD User's Guide (U.S. EPA, 2004a). Also, when calculating emission rates for acute health impacts, it is important the emission rates never exceed the reported maximum 1-hour emissions.

4.12.2 *Modeling and Adjustments for Inhalation Cancer Risk at a Worksite*

Modeled long-term averages are typically used for cancer risk assessments for residents and workers. In an inhalation cancer risk assessment for an offsite worker, the long-term average should represent what the worker breathes during their work shift. However, the long-term averages calculated from AERMOD typically represent exposures for receptors that were present 24 hours a day and seven days per week (i.e., the schedule of a residential receptor). To estimate the offsite worker's concentration, there are two approaches. The more refined, complex, and time consuming approach is to post-process the hourly raw dispersion model output and examine the hourly concentrations that fall within the offsite worker's shift. See Appendix M for information on how to simulate the long-term concentration for the offsite worker that can be used to estimate inhalation cancer risk.

In lieu of post-processing the hourly dispersion model output, the more typical approach is to obtain the long-term average concentration as you would for modeling a residential receptor and approximate the worker's inhalation exposure using an adjustment factor. The actual adjustment factor that is used to adjust the concentration may differ from the example below based on the specifics of the source and worker receptor

(e.g., work-shift overlap). Once the worker's inhalation concentration is determined, the inhalation dose is calculated using additional exposure frequency and duration adjustments. See Chapter 5 for more information on the inhalation dose equation.

4.12.2.1 Non-Continuous Sources

When modeling a non-continuously emitting source (e.g., operating for eight hours per day and five days per week), the modeled long-term average concentrations are based on 24 hours a day and seven days per week for the period of the meteorological data set. Even though the emitting source is modeled using a non-continuous emissions schedule, the long-term concentration is still based on 24 hours a day and seven days per week. Thus, this concentration includes the zero hours when the source was not operating. For the offsite worker inhalation risk, we want to determine the long-term concentration the worker is breathing during their work shift. Therefore, the long-term concentration needs to be adjusted so it is based only on the hours when the worker is present. For example, assuming the emitting source and worker's schedules are the same, the adjustment factor is 4.2 = (24 hours per day/8 hours per shift)x(7 days in a week/5 days in a work week). In this example, the long term residential exposure is adjusted upward to represent the exposure to a worker. Additional concentration adjustments may be appropriate depending on the work shift overlap. These adjustments are discussed below.

The calculation of the adjustment factor from a non-continuous emitting source is summarized in the following steps.

a. Obtain the long-term concentrations from air dispersion modeling as is typical for residential receptors (all hours of a year for the entire period of the meteorological data set).

b. Determine the coincident hours per day and days per week between the source's emission schedule and the offsite worker's schedule.

c. Calculate the worker adjustment factor (WAF) using Equation 4.1. When assessing inhalation cancer health impacts, a discount factor (*DF*) may also be applied if the offsite worker's schedule partially overlaps with the source's emission schedule. The discount factor is based on the number of coincident hours per day and days per week between the source's emission schedule and the offsite worker's schedule (see Equation 4.2). The DF is always less than or equal to one.

Please note that worker adjustment factor does not apply if the source's emission schedule and the offsite worker's schedule do not overlap. Since the worker is not present during the time that the source is emitting, the worker is not exposed to the source's emission (i.e., the DF in Equation 4.2 becomes 0).

$$WAF = \frac{H_{residentid}}{H_{source}} \times \frac{D_{residentid}}{D_{source}} \times DF \qquad \text{Eq. 4.1}$$

Where:
WAF = the worker adjustment factor
$H_{residential}$= the number of hours per day the long-term residential concentration is based on (always 24 hours)
H_{source} = the number of hours the source operates per day
$D_{residential}$ = the number of days per week the long-term residential concentration is based on (always 7 days)
D_{source}= the number of days the source operates per week
DF = a discount factor for when the offsite worker's schedule partially overlaps the source's emission schedule. Use 1 if the offsite worker's schedule occurs within the source's emission schedule. If the offsite worker's schedule partially overlaps with the source's emission schedule, then calculate the discount factor using Equation 4.2 below.

$$DF = \frac{H_{coincident}}{H_{worker}} \times \frac{D_{coincident}}{D_{worker}} \qquad \text{Eq. 4.2}$$

Where:
DF = the discount factor for assessing cancer impacts
$H_{coincident}$ = the number of hours per day the offsite worker's schedule and the source's emission schedule overlap
$D_{coincident}$= the number of days per week the offsite worker's schedule and the source's emission schedule overlap
H_{worker} = the number of hours the offsite worker works per day
D_{worker}= the number of days the offsite worker works per week

d. The final step is to estimate the offsite worker's inhalation concentration by multiplying the worker adjustment factor with the long-term residential concentration. The worker's concentration is then plugged into the dose equation and risk calculation.

The HARP software has the ability to calculate worker impacts using an approximation factor and, in the future, it will have the ability to post-process refined worker concentrations using the hourly raw results from an air dispersion analysis.

4.12.2.2 Continuous Sources

If the source is continuously emitting, then the worker is assumed to breathe the long-term annual average concentration during their work shift. Equation 4.1 becomes one and no concentration adjustments are necessary in this situation when estimating the inhalation cancer risk. Note however, if an assessor does not wish to apply the assumption the worker breathes the long-term annual average concentration during the work shift, then a refined concentration can be post-processed as described in Appendix M. All alternative assumptions should be approved by the reviewing authority and supported in the presentation of results.

4.12.3 *Modeling and Adjustments for Noncancer 8-Hour RELs*

For 8-hour noncancer health impacts, we evaluate if the receptor (e.g., worker or resident) is exposed to an 8 hour average concentration, occurring daily, that exceeds the 8-hour REL. The 8 hour RELs were derived primarily for the offsite worker scenario. Although not required in an HRA, residential receptors can be evaluated with an 8-hour

REL at the discretion of the District or Reviewing authority. For ease, we use a worker receptor in this discussion and in the discussion below for a non-continuously emitting source. The daily average concentration is intended to represent the long-term average concentration the worker is breathing during the work shift. In general, there are two approaches for estimating the concentration used for the 8-hour hazard index. The more refined, complex, and time consuming approach is to post-process the hourly dispersion model output and use only the hourly concentrations that are coincident with the offsite worker hours to obtain the long-term concentration. See Appendix M for information on how to simulate the daily average concentration through air dispersion modeling.

Before proceeding through a refined analysis described in Appendix M, the assessor may wish to approximate the long-term concentration, as described below, and calculate the 8-hour hazard index. In lieu of post-processing the hourly dispersion model output described in Appendix M, the more typical approach is to obtain the long-term average concentration as you would for modeling a residential receptor and approximate the worker's inhalation concentration using an adjustment factor. The method for applying the adjustment factor is described in the section below.

The results from the 8-hour hazard index calculations should not be combined with the chronic or acute hazard indices. Each of the potential noncancer health impacts should be reported independently. See Chapter 8 for more discussion on calculating health impacts.

4.12.3.1 Non-Continuous Sources

When modeling a non-continuously emitting source (e.g., operating for eight hours per day and five days per week), the modeled long-term average concentrations are based on 24 hours a day and seven days per week for the period of the meteorological data set. Even though the emitting source is modeled using a non-continuous emissions schedule, the long-term concentration is still based on 24 hours a day and seven days per week. Thus, this concentration includes the zero hours when the source was not operating. For the offsite worker 8-hour hazard index, we want to determine the long-term average daily concentration the worker may be breathing during their work shift. This is similar to the cancer approximation adjustment method with one difference; there is no adjustment for partial overlap between the worker's schedule and the source's emission schedule. The reason for this difference in methodology is because the 8-hour REL health factors are designed for repeated 8-hour exposures and cannot readily be adjusted to other durations of exposure. The 8-hour RELs should be used for typical daily work shifts of 8-9 hours. For further questions, assessors should contact OEHHA, the District, or reviewing authority to determine if the 8-hour RELs should be used in your HRA. Any discussions or directions to exclude the 8-hour REL evaluation should be documented in the HRA.

When calculating the long-term average daily concentration for the 8-hour REL comparison, the long-term residential concentration needs to be adjusted so it is based only on the operating hours of the emitting source with the assumption the offsite

worker's shift falls within the emitting source's schedule. For example, assuming the emitting source operates 8 hours per day, 5 days per week and the offsite worker's schedules falls anywhere within this period of emissions, then the adjustment factor is 4.2 = (24 hours per day/8 hours of emissions per day)x(7 days in a week/5 days of emissions per week). In this example, the long term residential exposure is adjusted upward to represent the 8-hour exposure to a worker. No adjustments are applied for partial work shift overlap with the emitting source. If the source emits at night, then see Appendix N for additional recommendations.

Using the approximation factor is a screening method. If the 8-hour hazard index is above a threshold of concern with this method, the district or assessor should contact OEHHA for further guidance regarding the substance of concern. If necessary, further evaluation can be performed using the refined daily average modeling methodology discussed in Appendix M.

The calculation of the adjustment factor from a non-continuous emitting source is summarized in the following steps.

b. Obtain the long-term concentrations from air dispersion modeling as is typical for residential receptors (all hours of a year for the entire period of the meteorological data set).

c. Calculate the worker adjustment factor (WAF) using Equation 4.3. The source's emission schedule is assumed to overlap offsite worker's schedule. Note that the worker adjustment factor and the 8-hour inhalation REL do not apply if the source's emission schedule and the offsite worker's schedule do not overlap at some point.

$$WAF = \frac{H_{residentid}}{H_{source}} \times \frac{D_{residentid}}{D_{source}} \qquad \text{Eq. 4.3}$$

Where:

WAF = the worker adjustment factor
$H_{residential}$= the number of hours per day the long-term residential concentration is based on (always 24 hours)
H_{source} = the number of hours the source operates per day
$D_{residential}$ = the number of days per week the long-term residential concentration is based on (always 7 days).
D_{source}= the number of days the source operates per week.

d. The final step is to estimate the offsite worker's daily average inhalation concentration by multiplying the WAF with the long-term residential concentration. The worker's concentration is then used to calculate the 8-hour hazard index. This method using the approximation factor is a screening method. If the 8-hour hazard index is above a threshold of concern, the district or assessor should contact OEHHA for further guidance regarding the substance of concern.

In the future, the HARP software will have the ability to use 8-hour RELs, calculate worker impacts using an approximation factor, and to post-process worker concentrations using the hourly raw results from an air dispersion analysis.

4.12.3.2 Continuous Sources

If the source is continuously emitting, then the worker is assumed to breathe the long-term annual average concentration during their work shift and no concentration adjustments are made when estimating 8-hour health impacts. Note however, if an assessor does not wish to assume the worker breathes the long-term annual average concentration during the work shift, then a refined concentration can be post-processed as described in Appendix M. All alternative assumptions should be approved by the reviewing authority and supported in the presentation of results.

Note that 8-hour RELs are not typically used for continuously emitting sources for residential receptors. In this situation it is only necessary to estimate a chronic Hazard Index using the annual average concentrations and chronic RELs. However, there may be situations where the District may wish to assess an 8-hour Hazard Index, for example, where there are significant differences in modeled concentration of emissions during the day due to diurnal wind patterns.

4.12.4 *Modeling and Adjustment Factors for Noncancer Chronic RELs*

Potential chronic noncancer health impacts use the long-term annual average concentration regardless of the emitting facility's schedule. No adjustment factors should be used to adjust this concentration. Chronic RELs are used to assess not only residential health impacts, but in many cases worker health impacts as well. There are currently only a limited number of substances with an 8-hour inhalation REL, and a facility may emit only, or mostly, substances that currently have just a chronic REL. Until there are 8-hour RELs for all the Hot Spots substances emitted from a specified facility, we recommend determining the chronic HI for the MEIW to adequately protect the offsite worker.

The results from the chronic hazard index calculations are not combined with the 8-hour or acute hazard indices. All potential noncancer results should be reported independently. See Chapter 8 for more discussion on calculating health impacts.

4.12.5 *Modeling and Adjustments for Oral Cancer Potencies and Oral RELs*

When estimating the cancer risk or noncancer health impacts from noninhalation pathways, no adjustment is made to the long-term annual average concentration regardless of the emitting facility's schedule. Since the media (e.g., soil) at the receptor location where deposition takes place for noninhalation pathways is continuously present, the concentrations used for all noninhalation pathways are not adjusted (up or down) by an adjustment factor. However, some adjustments are made to the concentration once the pollutants reach the media, for example, pollutants undergo decay in soils. In addition, when the dose for each pathway is calculated, exposure adjustments may also be made. See Chapter 5 of this document and the Technical

Support Document for Exposure Assessment and Stochastic Analysis (OEHHA, 2012) to get more information on these types of adjustments. Oral cancer potencies and oral RELs are used to assess both residential or worker health impacts.

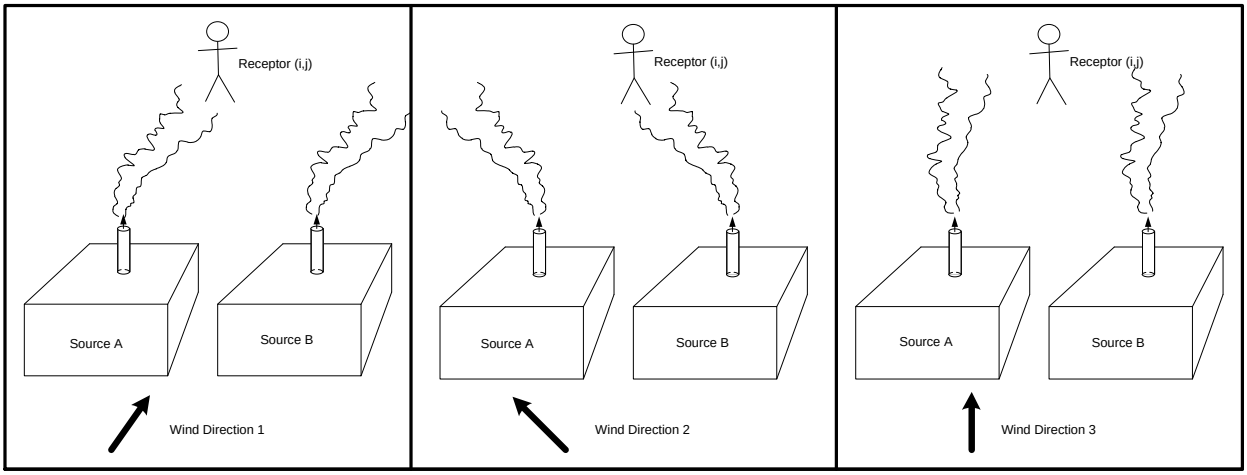
4.12.6 *Modeling One-Hour Concentrations using Simple and Refined Acute Calculations*

Modeled one-hour concentrations are needed for the acute health hazard index calculations. HARP has two methods to calculate this concentration: Simple and Refined. As an aid to understanding the differences between Simple and Refined, Figure 2 shows three possible conditions showing how wind direction may vary and impact a downwind receptor (i,j) differently from just two sources (A and B).

For the Simple calculation, HARP stores only the maximum one-hour concentration at each receptor (i,j) from each source (A and B) as the dispersion model marches down each hour of the simulation (e.g., one to five years of hourly data). At the end of the simulation period, HARP reports back only the maximum impacts at each receptor from each source regardless of which hour of the simulation period this occurred. For example, the Simple Maximum Acute Impacts would be the summation of Source A impacts from Wind Direction 1 and Source B impacts from Wind Direction 2 as shown in Figure 2.

For the Refined simulation, HARP stores each hourly concentration at each receptor (i,j) from each source. At the end of the simulation period, HARP evaluates the coincident impact at each receptor from all sources for each hour of the simulation period. In this case the maximum impacts will be identified by a particular hour of the period with associated wind speed, direction, and atmospheric conditions. For example, the Refined Maximum Acute impact from Sources A and B on receptor (i,j) could be from any wind direction (1,2, or 3) as shown in Figure 2. Since HARP stores all simulations for all sources – at all receptors – for all hours to calculate the refined impacts, there is great potential to fill large amounts of disk storage space. The Refined simulation provides a more representative picture of the maximum acute hazard index from a facility. The Simple calculation will provide an upper bound to the acute hazard index.

Figure 2 Acute Scenarios



4.13 Modeling Special Cases; Specialized Models

Special situations arise in modeling some sources that require considerable professional judgment; a few are outlined below. It is recommended that the reader consider retaining professional consultation services if the procedures are unfamiliar. The following sections, taken mostly from the document "On-Site Meteorological Program Guidance for Regulatory Modeling Applications" (U.S. EPA, 1995e), provide general information on data formats and representativeness. Some Districts may have slightly different recommendations from those given here.

4.13.1 *Building Downwash*

The entrainment of a plume in the wake of a building can result in the "downwash" of the plume to the ground. This effect can increase the maximum ground-level concentration downwind of the source. Therefore, stack sources must be evaluated to determine whether building downwash is a factor in the calculation of maximum ground-level concentrations.

The PRIME algorithm, included with AERMOD, has several advances in modeling building downwash effects including enhanced dispersion in the wake, reduced plume rise due to streamline deflection and increased turbulence, and continuous treatment of the near and far wakes (Schulman, 2000).

Complicated situations involving more than one building may necessitate the use of the Building Profile Input Program (BPIP) which can be used to generate the building dimension section of the input file of the ISC models (U.S. EPA, 1993). The BPIP program calculates each building's direction-specific projected width. The Building Profile Input Program for PRIME (BPIPPRM) is the same as BPIP but includes an algorithm for calculating downwash values for input into the PRIME algorithm which is contained in such models as AERMOD. The input structure of BPIPPRM is the same as that of BPIP.

4.13.2 *Deposition*

There are two types of deposition: wet deposition and dry deposition. Wet deposition is the incorporation of gases and particles into rain-, fog- or cloud water followed by a precipitation event and also rain scavenging of particles during a precipitation event. Wet deposition of gases is therefore more important for water soluble chemicals; particles (and hence particle-phase chemicals) are efficiently removed by precipitation events (Bidleman, 1988). Dry deposition refers to the removal of gases and particles from the atmosphere.

In the Air Toxics "Hot Spots" program, deposition is quantified for particle-bound pollutants and not gases. Wet deposition of water-soluble gas phase chemicals is thus not considered. When calculating pollutant mass deposited to surfaces without including depletion of pollutant mass from the plume, airborne concentrations remaining in the plume and deposition to surfaces can be overestimated, thereby resulting in overestimates of both the inhalation and multi-pathway risk estimates. However, neglecting deposition in the air dispersion model, while accounting for it in the multipathway health risk assessment, is a conservative, health protective approach (CAPCOA, 1987; Croes, 1988). Misapplication of plume depletion can also lead to possible underestimates of multi-pathway risk and for that reason no depletion is the default assumption. If plume depletion is incorporated, then some consideration for possible resuspension is warranted. An alternative modeling methodology accounting for plume depletion can be discussed with the Air District and used in an approved modeling protocol.

Although not generally used, several air dispersion models can provide downwind concentration estimates that take into account the upwind deposition of pollutants to surfaces and the consequential reduction of mass remaining in the plume. Air dispersion models having deposition and plume depletion algorithms require particle distribution data that are not always readily available. These variables include particle size, mass fraction, and density for input to AERMOD. In addition, the meteorological fields need to include additional parameters including relative humidity, precipitation, cloud cover, and surface pressure. Consequently, depletion of pollutant mass from the plume often is not taken into account.

In conclusion, multipathway risk assessment analyses normally incorporate deposition to surfaces in a screening mode, specifically by assigning a default deposition velocity of 2 cm/s for controlled sources and 5 cm/s for uncontrolled sources in lieu of actual measured size distributions (ARB, 1989). For particles (and particle-phase chemicals), the deposition velocity depends on particle size and is minimal for particles of diameter approximately 0.1-1 micrometer; smaller and larger particles are removed more rapidly.

4.13.3 *Short Duration Emissions*

Short-duration emissions (i.e., much less than an hour) require special consideration. In general, "puff models" provide a better characterization of the dispersion of pollutants having short-duration emissions. Continuous Gaussian plume models have traditionally

been used for averaging periods as short as about 10 minutes and are not recommended for modeling sources having shorter continuous emission duration.

4.13.4 *Fumigation*

Fumigation occurs when a plume that was originally emitted into a stable layer in the atmosphere is mixed rapidly to ground-level when unstable air below the plume reaches plume level. Fumigation can cause very high ground-level concentrations. Typical situations in which fumigation occurs are:

- Breaking up of a nocturnal radiation inversion by solar warming of the ground surface (rising warm unstable air); note that the break-up of a nocturnal radiation inversion is a short-lived event and should be modeled accordingly.

- Shoreline fumigation caused by advection of pollutants from a stable marine environment to an unstable inland environment

- Advection of pollutants from a stable rural environment to a turbulent urban environment

SCREEN3 incorporates concentrations due to inversion break-up and shoreline fumigation and is limited to maximum hourly evaluations. The Offshore and Coastal Dispersion Model incorporates overwater plume transport and dispersion as well as changes that occur as the plume crosses the shoreline – hourly meteorological data are needed from both offshore and onshore locations.

4.13.5 *Raincap on Stack*

The presence of a raincap or any obstacle at the top of the stack hinders the momentum of the exiting gas. The extent of the effect is a function of the distance from the stack exit to the obstruction and of the dimensions and shape of the obstruction.

On the conservative side, the stack could be modeled as having a non-zero, but negligible exiting velocity, effectively eliminating any momentum rise. Such an approach would result in final plume heights closer to the ground and therefore higher concentrations nearby. There are situations where such a procedure might lower the actual population-dose and a comparison with and without reduced exit velocity should be examined.

Plume buoyancy is not strongly reduced by the occurrence of a raincap. Therefore, if the plume rise is dominated by buoyancy, it is not necessary to adjust the stack conditions. (The air dispersion models determine plume rise by either buoyancy or momentum, whichever is greater.)

The stack conditions should be modified when the plume rise is dominated by momentum and in the presence of a raincap or a horizontal stack. Sensitivity studies with the SCREEN3 model, on a case-by-case basis, can be used to determine whether

plume rise is dominated by buoyancy or momentum. The District should be consulted before applying these procedures.

- Set exit velocity to 0.001 m/sec
- Turn stack tip downwash off
- Reduce stack height by 3 times the stack diameter

Stack tip downwash is a function of stack diameter, exit velocity, and wind speed. The maximum stack tip downwash is limited to three times the stack diameter in the AERMOD air dispersion model. In the event of a horizontal stack, stack tip downwash should be turned off and no stack height adjustments should be made. Note: This approach may not be valid for large (several meter) diameter stacks.

An alternative, more refined, approach could be considered for stack gas temperatures which are slightly above ambient (e.g., ten to twenty degrees Fahrenheit above ambient). In this approach, the buoyancy and the volume of the plume remain constant and the momentum is minimized.

- Turn stack tip downwash off
- Reduce stack height by 3 times the stack diameter ($3D_o$)
- Set the stack diameter (D_b) to a large value (e.g., 10 meters)
- Set the stack velocity to $V_b = V_o (D_o/D_b)^2$

Where V_o and D_o are the original stack velocity and diameter and V_b and D_b are the alternative stack velocity and diameter for constant buoyancy. This approach is advantageous when $D_b >> D_o$ and $V_b << V_o$ and should only be used with District approval.

In the presence of building downwash and in the event that PRIME downwash is being utilized in AERMOD, an alternative approach is recommended. PRIME algorithms use the stack diameter to define initial plume radius and to solve conservation laws. The user should input the actual stack diameter and exit temperature but set the exit velocity to a nominally low value (e.g., 0.001 m/s). Also since PRIME does not explicitly consider stack-tip downwash, no adjustments to stack height should be made.

Currently U.S. EPA is BETA testing options for capped and horizontal releases in AERMOD. It is expected that these options will replace the above guidance when BETA testing is complete.

4.13.6 *Landfill Sites*

Landfills should be modeled as area sources. The possibility of non-uniform emission rates throughout the landfill area should be investigated. A potential cause of non-uniform emission rates would be the existence of cracks or fissures in the landfill cap (where emissions may be much larger). If non-uniform emissions exist, the landfill should be modeled with several smaller areas assigning an appropriate emission factor to each one of them, especially if there are nearby receptors (distances on the same order as the dimensions of the landfill).

4.14 Specialized Models

Some models have been developed for application to very specific conditions. Examples include models capable of simulating sources where both land and water surfaces affect the dispersion of pollutants and models designed to simulate emissions from specific industries.

4.14.1 *Buoyant Line and Point Source Dispersion Model (BLP)*

BLP is a Gaussian plume dispersion model designed for the unique modeling problems associated with aluminum reduction plants, and other industrial sources where plume rise and downwash effects from stationary line sources are important.

4.14.1.1 Regulatory Application

Regulatory application of BLP model requires the selection of the following options:

- rural (IRU=l) mixing height option;
- default (no selection) for all of the following: plume rise wind shear (LSHEAR), transitional point source plume rise (LTRANS), vertical potential temperature gradient (DTHTA), vertical wind speed power law profile exponents (PEXP), maximum variation in number of stability classes per hour (IDELS), pollutant decay (DECFAC), the constant in Briggs' stable plume rise equation (CONST2), constant in Briggs' neutral plume rise equation (CONST3), convergence criterion for the line source calculations (CRIT), and maximum iterations allowed for line source calculations (MAXIT); and
- terrain option (TERAN) set equal to 0.0, 0.0, 0.0, 0.0, 0.0, 0.0.

For more information on the BLP model consult the user's guide (Schulman and Scire, 1980).

4.14.2 *Offshore and Coastal Dispersion Model (OCD)*

OCD (DiCristofaro and Hanna, 1989) is a straight-line Gaussian model developed to determine the impact of offshore emissions from point, area or line sources on the air quality of coastal regions. OCD incorporates "over-water" plume transport and dispersion as well as changes that occur as the plume crosses the shoreline. Hourly meteorological data are needed from both offshore and onshore locations. Additional data needed for OCD are water surface temperature, over-water air temperature, mixing height, and relative humidity.

Some of the key features include platform building downwash, partial plume penetration into elevated inversions, direct use of turbulence intensities for plume dispersion, interaction with the overland internal boundary layer, and continuous shoreline fumigation.

4.14.2.1 Regulatory Application

OCD has been recommended for use by the Minerals Management Service for emissions located on the Outer Continental Shelf (50 FR 12248; 28 March 1985). OCD is applicable for over-water sources where onshore receptors are below the lowest source height. Where onshore receptors are above the lowest source height, offshore plume transport and dispersion may be modeled on a case-by-case basis in consultation with the District.

4.14.3 *Shoreline Dispersion Model (SDM)*

SDM (PEI, 1988) is a hybrid multipoint Gaussian dispersion model that calculates source impact for those hours during the year when fumigation events are expected using a special fumigation algorithm and the MPTER regulatory model for the remaining hours.

SDM may be used on a case-by-case basis for the following applications:

- tall stationary point sources located at a shoreline of any large body of water;
- rural or urban areas;
- flat terrain;
- transport distances less than 50 km;
- 1-hour to 1-year averaging times.

4.15 Interaction with the District

The risk assessor must contact the District to determine if there are any specific requirements. Examples of such requirements may include, but are not limited to: specific receptor location guidance, specific usage of meteorological data, and specific report format (input and output). See Chapter 9 for more information on the format and content of modeling protocols and HRAs.

4.15.1 *Submittal of Modeling Protocol*

It is strongly recommended that a modeling protocol be submitted to the District for review and approval prior to extensive analysis with an air dispersion model. The modeling protocol is a plan of the steps to be taken during the air dispersion modeling process. Following is an example of the format that may be followed in the preparation of the modeling protocol. **Consult with the District to confirm format and content requirements or to determine the availability of District modeling guidelines before submitting the protocol.**

Outline for a Modeling Protocol

I. Introduction

Include the facility name, address, and a brief overview describing the facility's operations.

- Provide a description of the terrain and topography surrounding the facility and potential receptors.

- Indicate the format in which data will be provided. Ideally, the report and summary of data will be on paper and all data and model input and output files will be provided electronically (e.g., compact disk or CD).

- Identify the guidelines used to prepare the protocol (e.g., District Guidelines).

II. Emissions

For each pollutant and process whose emissions are required to be quantified in the HRA, list the annual average emissions (pounds/year and grams/second) and the maximum one-hour emissions (pounds/hour and grams/second)[2]. Maximum 1-hour emissions are used for acute noncancer health impacts while annual emissions are used for chronic exposures (i.e., chronic and 8-hour noncancer health impacts or cancer risk assessment).

- Identify the reference and method(s) used to determine emissions (e.g., source tests, emission factors, etc.). Clearly indicate any emission data that are not reflected in the previously submitted emission inventory report. In this event, a revised emission inventory report will need to be submitted to the District.

- Identify if this will be a multipathway assessment based on emitted substances.

III. Models / Modeling Assumptions

Specify the model and modeling assumptions

- Identify the model(s) to be used, including the version number.

- Identify the model options that will be used in the analysis.

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[2] Except radionuclides, for which annual and hourly emissions are reported in Curies/year and millicuries/hour, respectively.

- Identify the modeling domain(s) and the spacing of receptor grid(s). Grid spacing should be sufficient in number and detail to capture the concentration at all of the receptors of interest.

- Indicate complex terrain options that may be used, if applicable.

- Identify the source type(s) that will be used to represent the facility's operations (e.g., point, area, or volume sources, flare options or other).

- Indicate the preliminary source characteristics (e.g., stack height, gas temperature, exit velocity, dimensions of volume source, etc.).

- Identify and support the use of urban or rural dispersion coefficients for those models that require dispersion coefficients. For other models, identify and support the parameters required to characterize the atmospheric dispersion due to land characteristics (e.g., surface roughness, Monin-Obukhov length).

IV. Meteorological Data

Specify the type, source, and year(s) of hourly meteorological data (e.g., hourly surface data, upper air mixing height information).

- State how the data are representative for the facility site.

- Describe QA/QC procedures.

- Identify any gaps in the data; if gaps exist, describe how the data gaps are filled.

V. Deposition

- Specify the method to calculate deposition (if applicable).

VI. Receptors

Specify the type and location of receptors. Include all relevant information describing how the individual and population-related receptors will be evaluated.

- Identify and describe the location(s) of known or anticipated potential sensitive receptors, the point of maximum impact (PMI), and the maximum exposed individual residential (MEIR) and worker (MEIW) receptors. Identify any special considerations or grids that will be used to model these receptors. This information should correspond with information provided in Section III (e.g., fine receptor spacing of 20 meters at the fence line and centered on the maximum impacts; coarse receptor spacing of 100 meters out to 2,000 meters; extra coarse spacing of 1,000 meters out to 20,000 meters).

- Identify if spatial averaging will be used. Include necessary background information on each receptor including how the domain and spacing will be determined for each receptor or exposure pathway.

- Describe how the cancer burden or population impact estimates are calculated. Clarify the same information for the presentation of noncancer population impacts (e.g., centroids of the census tracts in the area within the zone of impact).

- Specify that actual UTM coordinates and the block/street locations (i.e., north side of 3,000 block of Smith Street), where possible, will be provided for specified receptor locations.

- Identify and support the use of any exposure adjustments (e.g., time a location, diurnal).

- Include the list of anticipated exposure pathways that will be included and indicate which substance will be evaluated in the multipathway assessment. Identify if sensitive receptors are present and which receptors will be evaluated in the HRA.

VII. Maps

Identify how the information will be graphically presented.

- Indicate which cancer risk isopleths will be plotted for the cancer zone of impact (e.g., 10^{-7}, 10^{-6} see Section 4.6.1).

- Indicate the hazard quotients or hazard indices to be plotted for the noncancer acute, 8 hour, and chronic zones of impact (e.g., 0.5, 1.0, etc.).

4.16 Health Risk Assessment Report

This section describes the information related to the air dispersion modeling process that needs to be reported in the risk assessment. This section is also presented in Chapter 9, Summary of the Requirements for a Modeling Protocol and a Health Risk Assessment Report, in Section 9.2. The District may have specific requirements regarding format and content (see Section 4.15). Sample calculations should be provided at each step to indicate how reported emissions data were used. Reviewing agencies must receive input, output, and supporting files of various model analyses on computer-readable media (e.g., CD).

4.16.1 *Information on the Facility and its Surroundings*

Report the following information regarding the facility and its surroundings:

- Facility Name

- Location (UTM coordinates and street address)
- Land use type (see Section 2.4)
- Local topography
- Facility plot plan identifying:
  - source locations
  - property line
  - horizontal scale
  - building heights
  - emission sources

4.16.2 *Source and Emission Inventory Information*[3]

4.16.2.1 Release Parameters

Report the following information for each release location in table format:

- Release location identification number
- Release name
- Release type (e.g., point, volume, area, line, pit, etc.)
- Source identification number(s) used by the facility that emit out of this release location
- Release location using UTM coordinates
- Release parameters by release type (e.g., shown for point source):
  - Stack height (m), stack diameter (building dimensions for downwash), exhaust gas exit velocity (m/s), exhaust gas volumetric flow rate (ACFM), exhaust gas exit temperature (K), etc.

4.16.2.2 Source Description and Operating Schedule

The description and operating schedule for each source should be reported in table form including the following information:

- Source identification number used by the facility
- Source name
- Number of operating hours per day and per year (e.g., 0800-1700, 2700 hr/yr)
- Number of operating days per week (e.g., Mon-Sat)
- Number of operating days or weeks per year (e.g., 52 wk/yr excluding major holidays)
- Release point identification number(s) for where source emissions are released

[3] Health and Safety Code section 44346 authorizes facility operators to designate certain "Hot Spots" information as trade secret. Section 44361(a) requires districts to make health risk assessments available for public review upon request. Section 44346 specifies procedures to be followed upon receipt of a request for the release of trade secret information. See also the Inventory Guidelines Report regarding the designation of trade secret information in the Inventory Reports.

- Fraction of source emissions emitted at each release point by release point ID number

4.16.2.3 Emission Control Equipment and Efficiency

Report emission control equipment and efficiency by source and by substance

4.16.2.4 Emissions Data Grouped By Source

Report emission rates for each toxic substance, grouped by source (i.e., emitting device or process identified in Inventory Report), in table form including the following information:

- Source name
- Source identification number
- Substance name and CAS number (from Inventory Guidelines)
- Annual average emissions for each substance (lb/yr)
- Hourly maximum emissions for each substance (lb/hr)

4.16.2.5 Emissions Data Grouped by Substance

Report facility total emission rate by substance for all emitted substances listed in the Air Toxics “Hot Spots” Program including the following information:

- Substance name and CAS number (from Inventory Guidelines)
- Annual average emissions for each substance (lb/yr)
- Hourly maximum emissions for each substance (lb/hr)

4.16.2.6 Emission Estimation Methods

Report the methods used in obtaining the emissions data indicating whether emissions were measured or estimated. Clearly indicate any emission data that are not reflected in the previously submitted emission inventory report and submit a revised emission inventory report to the district. A reader should be able to reproduce the risk assessment without the need for clarification.

4.16.2.7 List of Substances

Include tables listing all "Hot Spots" Program substances which are emitted, plus any other substances required by the District. Indicate substances to be evaluated for cancer risks and noncancer health impacts.

4.16.3 *Exposed Population and Receptor Location*

Report the following information regarding exposed population and receptor locations. See Chapter 9 and specific sections within this chapter for more detailed information.

- Description of zone of impact including map showing the location of the facility, boundaries of zone of impact, census tracts, emission sources, sites of maximum exposure, and the location of all appropriate receptors. This should be a true map (one that shows roads, structures, etc.), drawn to scale, and not just a schematic drawing. USGS 7.5 minute maps or GIS based maps are usually the most appropriate choices. (If significant development has occurred since the user's survey, this should be indicated.)
- Separate maps for the cancer risk zone of impact and the hazard index (noncancer) zone of impact(s). The cancer zone of impact should include isopleths down to at least the 1/1,000,000 risk level. Because some districts use a level below 1/1,000,000 to define the zone of impact, the District should be consulted. Three separate maps (to represent both chronic, 8-hour, and acute HI) should be created to define the zone of impact for the hazard index from both inhalation and noninhalation pathways greater than or equal to 0.5. The point of maximum impact (PMI), maximum exposed individual at a residential receptor (MEIR), the maximum exposed individual worker (MEIW), and any other locations of interest for both cancer and noncancer risks should be located on the maps.
- Tables identifying population units and sensitive receptors (UTM coordinates, receptor IDs, and street addresses of specified receptors).
- Heights or elevations of the receptor points.
- For each receptor type (e.g., PMI, MEIR, MEIW, and any other location(s) of interest) that will utilize spatial averaging, the domain size and grid resolution must be clearly identified. If another domain or grid resolution other than 20 meters by 20 meters with 5-meter grid spacing will be used for a receptor, then care should be taken to determine the proper domain size and grid resolution that should be used. For a worker, the HRA shall support all assumptions used, including, but not limited to, documentation for all workers showing the area where each worker routinely performs their duties. The final domain size should not be greater than the smallest area of worker movement. Other considerations for determining domain size and grid spacing resolution may include an evaluation of the concentration gradients across the worker area. The grid spacing used within the domain should be sufficient in number and detail to obtain a representative concentration across the area of interest. When spatial averaging over the deposition area of a pasture, garden, or water body, care should be taken to determine the proper domain size to make sure it includes all reasonable areas of potential deposition. The size and shape of the pasture, garden, or water body of interest should be identified and used for the modeling domain. The grid spacing or resolution used within the domain should be sufficient in detail to obtain a representative deposition concentration across the area of interest. One way to determine the grid resolution is to include an evaluation of the concentration gradients across the deposition area. The HRA shall support all assumptions used, including, but not limited to, documentation of the deposition area (e.g., size and shape of the pasture or water body, maps,

representative coordinates, grid resolution, concentration gradients, etc.). The use or spatial averaging is subject to approval by the reviewing authority. This includes the size of the domain and grid resolution that is used for spatial averaging of a worksite or multipathway deposition area.

4.16.4 *Meteorological Data*

If meteorological data were not obtained directly from the District, then the report must clearly indicate the data source and time period used. Meteorological data not obtained from the District must be submitted in electronic form along with justification for their use including information regarding representativeness and quality assurance.

The risk assessment should indicate if the District required the use of a specified meteorological data set. All memos indicating the District's approval of meteorological data should be attached in an appendix.

4.16.5 *Model Selection and Modeling Rationale*

The report should include an explanation of the model chosen to perform the analysis and any other decisions made during the modeling process. The report should clearly indicate the name of the models that were used, the level of detail (screening or refined analysis) and the rationale behind the selection.

Also report the following information for each air dispersion model used:

- version number
- selected options and parameters in table form
- Identify the modeling domain(s) and the spacing of receptor grid(s). Grid spacing should be sufficient in number and detail to capture the concentration at all receptors of interest.

4.16.6 *Air Dispersion Modeling Results*

- Maximum hourly and annual average concentrations of chemicals at appropriate receptors such as the residential and worker MEI receptors
- Annual average and maximum one-hour (and 30-day average for lead only) concentrations of chemicals at appropriate receptors listed and referenced to computer printouts of model outputs
- Model printouts (numbered), annual concentrations, maximum hourly concentrations
- Disk with input/output files for air dispersion program (e.g., the AERMOD input file containing the regulatory options and emission parameters, receptor locations, meteorology, etc.)
- Include tables that summarize the annual average concentrations that are calculated for all the substances at each site. The use of tables that present the relative contribution of each emission point to the receptor concentration is recommended. (These tables should have clear reference to the computer

model which generated the data. It should be made clear to any reader how data from the computer output were transferred to these tables.) [As an alternative, the above two tables could contain just the values for sites of maximum impact (i.e., PMI, MEIR and MEIW), and sensitive receptors, if required. All the values would be found in the Appendices.]

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5 - Exposure Assessment
Estimation of Concentration and Dose

5.1 Introduction

This chapter provides a summary of how toxicant ground level air concentrations estimated from air dispersion modeling or monitoring results are used to determine dose at receptors of interest. This chapter includes all the algorithms and data (e.g., point estimates, distributions, and transfer factors) that are needed to determine the substance-specific concentration in exposure media and the dose at a receptor of interest. The determination of exposure concentration and dose precedes the calculations of potential health impacts. See Chapter 8 and Appendix I for information on calculating potential health impacts.

At a minimum, three receptors are evaluated in Hot Spots health risk assessments (HRA) (see Section 4.7); these are:

- the Point of Maximum Impact (PMI),
- the Maximally Exposed Individual Resident (MEIR), and
- the Maximally Exposed Individual Worker (MEIW).

The PMI is defined as the receptor point(s) with the highest acute, 8-hour, chronic, or cancer health impact outside the facility boundary. The facility boundary is defined as the property line. Often the fence is on the property line. The MEIR is typically defined as the existing off-site residence(s) (i.e., house, apartment or other dwelling) with the highest acute, chronic, or cancer health impact. Calculating an 8-hour hazard index is not required for the MEIR, but can be performed at the discretion of the District. The MEIW is typically defined as the existing offsite workplace with the highest acute, 8-hour, chronic, or cancer health impact.

In addition, it may be necessary to determine risks at sensitive receptors (e.g., schools, day care centers, elder care centers, and hospitals). The District or reviewing authority should be consulted in order to determine the appropriate sensitive receptors for evaluation. Some situations may require that on-site receptor (worker or residential) locations be evaluated. Some examples where the health impacts of on-site receptors may be appropriate could be military base housing, prisons, universities, or locations where the public may have regular access for the appropriate exposure period (e.g., a lunch time café or museum for acute exposures). The risk assessor should contact the Air Pollution Control or Air Quality Management District (the District) for guidance about any on-site exposure situations at the emitting facility. These on-site locations should be included in the health risk assessment (HRA). If the facility emits multiple substances from two or more stacks, the acute, 8-hour, chronic, and cancer health impacts at the PMI may be located at different physical locations. The MEIR or MEIW cancer, acute, 8-hour, and chronic receptors may also be at different locations.

The process for determining dose at the receptor location, and ultimately potential health impacts, will likely include air dispersion modeling, and, with less frequency, air monitoring data. Air dispersion modeling combines the facility emissions and release parameters and uses default or site-specific meteorological conditions to estimate downwind, ground-level concentrations at various (user-defined) receptor locations. Air dispersion modeling is described in Chapter 4 and is presented in detail in the *Air Toxics Hot Spots Program Risk Assessment Guidelines; Technical Support Document for Exposure Assessment and Stochastic Analysis (OEHHA, 2012a*).

In summary, the process of using air dispersion modeling results as the basis of an HRA follows these four steps:

- Air dispersion modeling is used to estimate annual average and maximum one-hour ground level concentrations (GLC). The air dispersion modeling results are expressed as an air concentration or in terms of (Chi over Q) for each receptor point. (Chi over Q) is the modeled downwind air concentration (Chi) based on an emission rate of one gram per second (Q). (Chi over Q) is expressed in units of micrograms per cubic meter per gram per second, or ($\mu g/m^3$)/(g/s). (Chi over Q) is sometimes written as (χ/Q) and is sometimes referred to as the dilution factor.

- When multiple substances are evaluated, the χ/Q is normally utilized since it is based on an emission rate of one gram per second. The χ/Q at the receptor point of interest is multiplied by the substance-specific emission rate (in g/s) to yield the substance-specific ground-level concentration (GLC) in units of $\mu g/m^3$. The following equations illustrate this point.

$$\mathbf{GLC} = \left(\frac{\chi}{\mathbf{Q}}\right) \mathbf{x} \left(\mathbf{Q}_{\mathbf{substance}}\right)$$

$$\frac{\chi}{\mathbf{Q}} = \mathbf{(Chi\ \ over\ \ Q)\ in} \left(\frac{\frac{\mu \mathbf{g}}{\mathbf{m}^3}}{\frac{\mathbf{g}}{\mathbf{s}}} \right), \mathbf{\ from\ model\ results\ with\ unit\ emission\ rate}$$

$$\mathbf{Q}_{\mathbf{substance}} = \mathbf{\ substance\ specific\ emission\ rate} \left(\frac{\mathbf{g}}{\mathbf{s}}\right)$$

- The applicable exposure pathways (e.g., inhalation, soil contact, fish consumption) are identified for the emitted substances, and the receptor locations are identified. This determines which exposure algorithms in this chapter are ultimately used to estimate dose. After the exposure pathways are identified, the fate and transport algorithms described in this chapter are used to estimate concentrations in the applicable exposure media (e.g., soil or water) and the exposure algorithms are used to determine the substance-specific dose.

- The dose is used with cancer and noncancer health values to calculate the potential health impacts for the receptor (Chapter 8). An example calculation

using the high-end point-estimates for the inhalation (breathing) exposure pathway can be found in Appendix I. Appendix I and Chapters 5 (this Section) and 8 also contain information on how the annual average and maximum one-hour ground level concentrations are used for chronic, 8-hour, and acute health risk calculations.

The algorithms in this chapter are also used to calculate media concentrations and dose in the rare instance, for the Hot Spots program, when monitoring equipment was used rather than air dispersion modeling to obtain a receptor's substance-specific GLC. One situation that is specific to monitored data is the treatment of results below the sampling method level of detection (LOD). In short, it is standard risk assessment practice when monitoring results are reported both above and below the LOD to use one-half of the LOD for those sample concentrations reported below the LOD. If all testing or monitoring results fall below the LOD, then assessors should contact the District for appropriate procedures. For more information about reporting emissions under the Hot Spots Program, see the ARB's *Emission Inventory Criteria and Guidelines Regulations (Title 17, California Code of Regulations, Sections 93300-93300.5),* and the *Emission Inventory Criteria and Guidelines Report* (EICG Report), which is incorporated by reference therein (ARB, 2007*)*.

The recommended model for calculating and presenting HRA results for the Hot Spots Program is the HARP software, available from the Air Resources Board (ARB). More information on HARP and directions for downloading the software can be found on the ARB's web site at http://www.arb.ca.gov/toxics/harp/downloads.htm.

5.2 Criteria for Exposure Pathway Evaluation

In order to determine total dose to the receptor the applicable pathways of exposure need to be identified. The inhalation pathway must be evaluated for all Hot Spots substances emitted by the facility. A small subset of Hot Spots substances is subject to deposition onto soil, plants, and water bodies. These substances need to be evaluated by the appropriate noninhalation pathways, as well as by the inhalation pathway, and the results must be presented in all HRAs. These substances include semi-volatile organic chemicals and heavy metals. Such substances are referred to as multipathway substances. Two steps are necessary to determine if a substance should be evaluated for multipathway impacts:

1. Determine whether the substance or its group (e.g., dioxins, PAHs) is listed in Table 5.1.
2. Determine if the substance has an oral reference exposure level (REL) listed in Table 6.4, or if it has an oral cancer slope factor listed in Table 7.1. Two other references for checking the presence of oral health factors are OEHHA's website (OEHHA, 2012b) and the *Consolidated Table of OEHHA/ARB Approved Risk Assessment Health Values* on the Air Resources Board website (ARB, 2012). Oral or noninhalation exposure pathways include the ingestion of soil, angler-caught fish, drinking water from surface water sources, mother's milk,

homegrown produce, beef, pork, chicken, eggs and cow's milk. The dermal pathway is also evaluated via contact with contaminated soil.

For all multipathway substances, the minimum exposure pathways that must be evaluated at every residential site (in addition to inhalation) are soil ingestion and dermal exposure. If dioxins, furans, PCBs, PAHs or lead are emitted, then the breast-milk consumption pathway also becomes mandatory. The other exposure pathways (e.g., the ingestion of homegrown produce or angler-caught fish) are evaluated on a site-by-site basis. If the resident can be exposed through an impacted exposure pathway, then it must be included in the HRA. However, if there are no vegetable gardens or fruit trees within the zone of impact for a facility, for example, then the produce pathways need not be evaluated. Note that on-site residential receptors are potentially subject to inhalation and noninhalation exposure pathways. Table 8.2 identifies the residential and worker receptor exposure pathways that are mandatory and those that are dependent on the site-specific decisions. While residents can be exposed though several exposure pathways, worker receptors are only evaluated for inhalation, soil ingestion, and dermal exposure using point estimates.

Table 5.1 shows the multipathway substances that, based on available scientific data, can be considered for each noninhalation exposure pathway. The exposure pathways that are evaluated for a substance depend on two factors: 1) whether the substance is considered a multipathway substance for the Hot Spots Program (Table 5.1), and 2) what the site-specific conditions are. A multipathway substance may be excluded from a particular exposure pathway because its physical-chemical properties can preclude significant exposure via the pathway. For example, some water-soluble substances do not appreciably bioaccumulate in fish; therefore, the fish pathway is not appropriate. In addition, if a particular exposure pathway is not impacted by the facility or is not present at the receptor site, then the pathway is not evaluated. For example, if a fishable water body is not impacted by the facility, or the water source is impacted but no receptor uses it for fishing, then the angler-caught fish pathway is not evaluated.

Table 5.1 Specific Pathways to be Analyzed for Each Multipathway Substance

Substance	Soil Ingestion	Dermal	Meat, Milk & Egg Ingestion	Fish Ingestion	Exposed Vegetable Ingestion	Leafy Vegetable Ingestion	Protected Vegetable Ingestion	Root Vegetable Ingestion	Water Ingestion	Breast Milk Ingestion
Inorganic chemicals										
Arsenic & compounds	X	X	X	X	X	X	X	X	X	
Beryllium & compounds	X	X	X	X	X	X	X	X	X	
Cadmium & compounds	X	X	X	X	X	X	X	X	X	
Chromium VI & compounds	X	X	X[a]	X	X	X	X	X	X	
Fluorides (soluble compounds)	X	X	X		X	X	X	X	X	
Lead & compounds	X	X	X	X	X	X	X	X	X	X
Mercury & compounds	X	X	X	X	X	X	X	X	X	
Nickel & compounds	X	X	X	X	X	X	X	X	X	
Selenium & compounds	X	X	X	X	X	X	X	X	X	
Organic chemicals										
Creosotes	X	X	X	X	X	X			X	X
Diethylhexylphthalate	X	X	X	X	X	X			X	
Hexachlorobenzene	X	X	X	X	X	X			X	
Hexachlorocyclohexanes	X	X	X	X	X	X			X	
4,4'-Methylene dianiline	X	X			X	X			X	
Pentachlorophenol[b]										
PCBs	X	X	X	X	X	X			X	X
Polychlorinated dibenzo-p-dioxins and dibenzofurans	X	X	X	X	X	X			X	X
PAHs	X	X	X	X	X	X			X	X

[a] Cow's milk only; no multipathway analysis for meat and egg ingestion

[b] To be evaluated by pathway in future amendments to the Hot Spots Program

5.3 Estimation of Concentrations in Air, Soil, and Water

Once emissions exit the source, the substances emitted will be dispersed in the air. The substances in the exhaust gas with high vapor pressures will remain largely in the vapor phase, and substances with lower vapor pressures will tend to adsorb to fly ash or other particulate matter. The emission plume may contain both vapor phase substances and particulates. A semivolatile organic toxicant can partition into both vapor and particulate phases. Particulates will deposit on vegetation, on soil, and in water at a rate that is dependent on the particle size. Use the 0.02 m/s deposition rate for emission sources that have verifiable particulate matter control devices or for emission sources that may be uncontrolled but only emit particulate matter that is less than 2.5 microns (e.g., internal combustion engines). The following algorithms are used to estimate concentrations in environmental media including air, soil, water, vegetation, and animal products.

5.3.1 *Air*

The ground level concentration (GLC, or C_{air} as shown in EQ 5.3.1) of a substance in air is a function of the facility emission rate and the dilution factor (χ/Q) at the points under evaluation.

A. Equation 5.3.1: $$C_{air} = Q_{substance} \times \chi/Q$$

1. C_{air} = Ground level concentration ($\mu g/m^3$)
2. $Q_{substance}$ = Substance emission rate (g/sec)
3. χ/Q = Dilution factor provided by dispersion modeling ($\mu g/m^3$/g/sec)

a. Recommended values for EQ 5.3.1:

1. $Q_{substance}$ = Facility-specific, substance emission rate
2. χ/Q = For point of interest, site specific, from dispersion modeling

b. Assumptions for EQ 5.3.1:

1. No plume depletion
2. Emission rate is constant, i.e., assumes steady state

5.3.2 *Soil*

The average concentration of the substance in soil (C_s) is a function of the deposition, accumulation period, chemical specific soil half-life, mixing depth, and soil bulk density. For simplicity and health protection, the Tier 1 default assumes 70-year soil deposition for the accumulation period at end of 70-year facility lifetime. The risk assessor may also choose a supplemental Tier 2 approach, subject to District approval or reviewing authority approval, in which the assessor applies a soil accumulation period based on the facility's start date of operation (e.g., historical date when emissions began), or the current exposure conditions, and the expected duration of operation.

A. Equation 5.3.2 A: $$C_s = Dep \times X / (K_s \times SD \times BD \times T_t)$$

1. C_s = Average soil concentration over the evaluation period ($\mu g/kg$)
2. Dep = Deposition on the affected soil area per day ($\mu g/m^2$-d)
3. X = Integral function for soil accumulation (d), see **EQ 5.3.2 C** below
4. K_s = Soil elimination constant (d^{-1})
5. SD = Soil mixing depth (m)
6. BD = Soil bulk density (kg/m^3)
7. T_t = Soil exposure duration or soil accumulation period (d)

a: Recommended default values for EQ 5.3.2 A:

1. Dep = Calculated in EQ 5.3.2 B
2. X = Calculated in EQ 5.3.2 C
3. K_s = Calculated in EQ 5.3.2 D
4. SD = 0.01 (m) for playground setting (soil ingestion and dermal pathways) and 0.15 (m) for agricultural setting (produce and meat pathways)
5. BD = 1,333 (kg/m^3)
6. T_t = 25,550 (d) = 70 years

b: Assumptions for EQ 5.3.2 A:

1. Substances are uniformly mixed in soil.
2. Substances are not leached or washed away, except where evidence exists to the contrary.
3. It is assumed that toxicants accumulate in the soil for 70 years from deposition over the 70 year lifespan of the facility. Use 70-year soil accumulation (T_t) for Tier 1 estimation of 9-, 30- and 70-year residential exposure, and 25-year off-site worker exposure.
4. For a receptor ingesting mother's milk, the mother is exposed from birth to 25 years of age; the infant is then born and receives mother's milk for one year. Default assumes 70-year soil accumulation for mother's milk pathway. See Table 5.1 for information on which substances or groups of substances must be evaluated by the mother's milk pathway.

B. Equation 5.3.2 B: $$\mathbf{Dep = C_{air} \times Dep\text{-}rate \times 86{,}400}$$

1. C_{air} = Ground level concentration ($\mu g/m^3$)
2. Dep-rate = Vertical rate of deposition (m/sec)
3. 86,400 = Seconds per day conversion factor (sec/d)

a: Recommended default values for EQ 5.3.2 B:

1. C_{air} = Calculated above in EQ 5.3.1 A
2. Dep-rate = Use 0.02 meters/second for controlled sources, or 0.05 meters/second for uncontrolled sources.

b: Assumptions for EQ 5.3.2 B:

1. Deposition rate remains constant. A deposition rate must be used when determining potential noninhalation health impacts. In the absence of facility specific information on the size of the emitted particles, the default values for deposition rate should be used. Currently, the default value of 0.02 meters per second is used for emission sources that have verifiable particulate matter control devices or for emission sources that may be uncontrolled but only emit particulate matter that is less than 2.5 microns

(e.g., internal combustion engines). The 0.05 meters per second default value is used for risk assessment if the emissions are uncontrolled. If other deposition rate factors are used, sufficient support documentation must be included with the HRA.

C. Equation 5.3.2 C: $$X = [\{e^{-Ks * Tf} - e^{-Ks * To}\} / K_s] + T_t$$

1. e = 2.718
2. K_s = Soil elimination constant
3. T_f = End of soil accumulation evaluation period (d)
4. T_o = Beginning of soil accumulation evaluation period (d)
5. T_t = Total days of soil exposure (soil accumulation period) T_f-T_o (d)

a: Recommended default values for EQ 5.3.2 C:

1: K_s = Calculated in EQ 5.3.2 D
2: T_f = 25,550 (d) = 70 years. Total soil exposure time at end of facility operation
3: T_o = 0 (d) The initial time (start period) of soil exposure to all receptors that are impacted by the soil pathway.

Note: Under a Tier 2 scenario, the risk assessor may also adjust T_f and T_t, subject to District approval, to replicate current soil accumulation and expected accumulation at the end of facility operation.

D. Equation 5.3.2 D: $$K_s = 0.693 / t_{1/2}$$

1. 0.693 = Natural log of 2
2. $t_{1/2}$ = Chemical specific soil half-life (d)

a: Recommended default values for EQ 5.3.2 D:

1. $t_{1/2}$ = Chemical-specific. See Table 5.2

5.3.3 *Water*

The water pathway is evaluated if a standing water body (e.g., pond or lake) is impacted by facility emissions and is used as a source for drinking water by food-producing animals or humans, or is a source of angler-caught fish. The average concentration of the substance in water (C_w) is a function of direct deposition and material carried in by surface run-off. However, only the contribution from direct deposition will be considered at this time.

A. Equation 5.3.3 A: $$C_w = C_{depw}$$

1. C_w = Average concentration in water (μg/kg)
2. C_{depw} = Contribution due to direct deposition (μg/kg)

B. Equation 5.3.3 B: $C_{depw} = Dep \times SA \times 365 / (WV \times VC)$

1. Dep = Deposition on water body per day ($\mu g/m^2/d$)
2. SA = Water surface area (m^2)
3. 365 = Days per year (d/yr)
4. WV = Water volume (kg)
5. VC = Number of volume changes per year

a: Recommended default values for EQ 5.3.3 B:

1. Dep = Calculated above in EQ 5.3.2 B
2. SA = Site specific water surface area (m^2)
3. WV = Site specific water volume in (kg) (1L = 1 kg)
4. VC = Site specific number of volume changes per year (SA, WV, and VC values can be obtained from the appropriate Department of Water Resources (DWR) Regional office)

b: Assumptions for EQ 5.3.3 B:

1. With the exception of dilution via number of volume changes per year, all material deposited into the water remains suspended or dissolved in the water column and is available for bioaccumulation in fish.

5.3.4 *Estimation of Concentrations in Vegetation, Animal Products, and Mother's Milk*

Estimates of the concentration of the substance in vegetation, animal products and mother's milk require the use of the results of the air, water, and soil environmental fate evaluation. Plants, animals and nursing mothers will be exposed to the substances at the concentrations previously calculated in Section 5.31 to 5.33 above.

5.3.4.1 Vegetation

The average concentration of a substance in and on vegetation (C_v) is a function of direct deposition of the substance onto the vegetation and of root translocation or uptake from soil contaminated by the substance. We currently recommend root translocation only for the inorganic compounds.

A. Equation 5.3.4.1 A: $C_v = C_{depv} + C_{trans}$

1. C_v = Average concentration in and on specific types of vegetation ($\mu g/kg$)
2. C_{depv} = Concentration due to direct deposition ($\mu g/kg$)
3. C_{trans} = Concentration in vegetation due to root translocation or uptake ($\mu g/kg$) – see EQ 5.3.4.1 C below

B. Equation 5.3.4.1 B: $C_{depv} = [Dep \times IF / (k \times Y)] \times (1 - e^{-kT})$

1. Dep = Deposition on affected vegetation per day ($\mu g/m^2/d$)
2. IF = Interception fraction
3. k = Weathering constant (d^{-1})
4. Y = Yield (kg/m^2)
5. e = Base of natural logarithm (2.718)
6. T = Growth period (d)

a: Recommended default values for EQ 5.3.4.1 B:

1. Dep = Calculated above in EQ 5.3.2 B
2. IF = Crop specific:
    - a: Root crops = 0.0
    - b: Leafy crops = 0.2
    - c: Protected crops = 0.0
    - d: Exposed crops = 0.1
    - e: Pasture = 0.7
3. k = 0.1 (d^{-1})
4. Y = 2 (kg/m^2) for root, leafy, protected, exposed and pasture [CA Department of Food and Agriculture dot maps]
5. T = 45 (d) for leafy crops
   T = 90 (d) for exposed crops

b: Crop-type definitions for EQ 5.3.4.1 B:

1. **Leafy** crop category consists of broad-leafed vegetables in which the leaf is the edible part. Examples include spinach, lettuce, cabbage, and kale.
2. **Root** crop category includes vegetables in which the edible portion is underground. Examples are potato, radish, and carrot.
3. **Exposed** produce category consists of crops with a small surface area subject to air deposition. Examples include strawberries, tomato, cucumber, zucchini, green bean and bell pepper.
4. **Protected** produce category consists of crops in which the edible part is not exposed to air deposition (e.g., the exposed skin of the crop is removed and not eaten). Examples are corn, pea, pumpkin and oranges.

Tables H-9 through H-15 in Appendix H provide more examples of various leafy, root, exposed and protected crop types.

c: Assumptions for EQ 5.3.4.1 B:

1. No deposition on root or protected crops
2. No uptake and translocation of deposited chemicals onto crops

C. Equation 5.3.4.1 C: (for inorganic compounds)

$$C_{trans} = C_s \times UF_2$$

1. C_s = Average soil concentration (μg/kg)
2. UF_2 = Uptake factor based on soil concentration

a: Recommended default values for EQ 5.3.4.1 C:

1. C_s = Calculated above in EQ 5.3.2 A
2. UF_2 = See Table 5.2

D. Equation 5.3.4.1 D: (for organic compounds)

$$UF_2 = [(0.03 \times K_{ow}^{0.77}) + 0.82] / [(K_{oc})(F_{oc})]$$

1. 0.03 = Empirical constant
2. K_{ow} = Octanol:water partition factor
3. 0.77 = Empirical constant
4. 0.82 = Empirical constant
5. K_{oc} = Organic carbon partition coefficient
6. F_{oc} = Fraction organic carbon in soil

a: Recommended default values for EQ 5.3.4.1 D:

1. K_{ow} = Chemical specific, see Table 5.2
2. K_{oc} = Chemical specific, see Table 5.2
3. F_{oc} = 0.1

b: Assumptions for EQ 5.3.4.1 D:

1. OEHHA currently has no recommended root uptake factors for organic compounds listed in Table 5.2. Evidence suggests this route is insignificant compared to airborne deposition. Nevertheless, if it becomes necessary in specific cases to assess root uptake for an organic compound, Equation 5.3.4.1 D would be the algorithm OEHHA recommends using to assess root uptake.

5.3.4.2 Animal Products

The average concentration of the substance in animal products (C_{fa}) depends on which routes of exposure exist for the animals. Animal exposure routes include inhalation, soil ingestion, ingestion of contaminated feed and pasture, and ingestion of contaminated water.

A. Equation 5.3.4.2:

$$C_{fa} = (\text{Inhalation} + \text{Water ingestion} + \text{Feed ingestion} + \text{Pasture/Grazing ingestion} + \text{Soil ingestion}) * Tco$$

1. C_{fa} = Average concentration in farm animals and their products (μg/kg)
2. Inhalation, water ingestion, etc. = Dose through inhalation, water ingestion, etc. (μg/d)
3. Tco = Chemical-specific transfer coefficient of contaminant from diet to animal product (d/kg)

a: Recommended default values for EQ 5.3.4.2:

1. Tco = See Tables 5.3a and 5.3b

b: Assumptions for EQ 5.3.4.2:

1. The Tco for a given chemical is the same for all exposure routes

5.3.4.2.1 Inhalation

A. Equation 5.3.4.2.1: $\text{Inhalation} = BR_a \times C_{air}$

1. Inhalation = Dose through inhalation (μg/d)
2. BR_a = Breathing rate for animal (m^3/d)
3. C_{air} = Ground-level concentration (μg/m^3)

a: Recommended default values for EQ 5.3.4.2.1:

1. BR_a = See Table 5.4
2. C_{air} = Calculated above in EQ 5.3.1 A

b: Assumptions for EQ 5.3.4.2.1:

1. All material inhaled is 100% absorbed

5.3.4.2.2 Water Ingestion

The water ingestion pathway is applied if there are surface water sources of drinking water, such as springs, ponds or lakes, which are exposed to airborne deposition of facility emissions. Due to the site-specific nature for this exposure pathway, OEHHA recommends that the risk assessor conduct a survey at the site to estimate the fraction of contaminated drinking water ingested by the animals, if such sources exist.

A. Equation 5.3.4.2.2: **Water ingestion = $WI_a \times FSW \times C_w$**

1. Water ingestion = Dose through water ingestion (μg/d)
2. WI_a = Water ingestion for animal (kg/d)
3. FSW = Fraction of water ingested from a contaminated body of water (site-specific)
4. C_w = Average concentration in water (μg/kg)
   For water 1 kg = 1 L

a: Recommended default values for EQ 5.3.4.2.2:

1. WI_a = See Table 5.4
2. FSW = Site specific fraction, need to survey water ingestion practices in affected area
3. C_w = Calculated above in EQ 5.3.3 A

5.3.4.2.3 Feed Ingestion

The fraction of feed intake by cattle, pigs and poultry that is contaminated by facility emissions can vary considerably depending on the manner in which the animals are raised. Due to the site-specific nature for this exposure pathway, OEHHA recommends that the risk assessor conduct a survey at the site to estimate the fraction of contaminated feed eaten by the animals. For a Tier 1 assessment, default values are provided by OEHHA (see Table 5.4 and Table 5.4 footnotes) for estimation of exposure to the animals.

Agricultural mixing depth should be used for calculating soil concentration for feed and pasture contamination.

5.3.4.2.3.1 Feed Ingestion

A. Equation 5.3.4.2.3.1: **Feed ingestion = $(1.0 - FG) \times FI \times L \times C_v$**

1. Feed ingestion = Dose through the ingestion of feed (μg/d) that is harvested after it is impacted by source emissions
2. FG = Fraction of diet provided by grazing (site-specific)
3. FI = Feed ingestion rate (kg/d)
4. L = Fraction of locally grown (source impacted) feed that is not pasture (site-specific)
5. C_v = Concentration in feed (μg/kg)

a: Recommended default values EQ 5.3.4.2.3.1:

1. FG = Default values in Table 5.4 footnote b, although a site-specific survey for the fraction of diet provided by grazing is recommended
2. FI = See Table 5.4
3. L = Default values in Table 5.4 footnote b, although a site-specific survey for fraction of locally grown (source impacted) feed that is not pasture is recommended
4. C_v = As calculated above in EQ 5.3.4.1 A

b: Assumptions for EQ 5.3.4.2.3.1:

1. Feed (FI) transported from an off-site location (i.e., not grown locally) is not contaminated by facility emissions.

5.3.4.2.3.2 Pasture/Grazing ingestion

A. Equation 5.3.4.2.3.2: **Pasture/Grazing ingestion = FG × C_v × FI**

1. Pasture/Grazing ingestion = Dose through pasture/grazing (μg/d)
2. FG = Fraction of diet provided by grazing (site-specific)
3. C_v = Concentration in pasture/grazing material (μg/kg)
4. FI = Feed ingestion rate (kg/d)

a: Recommended default values EQ 5.3.4.2.3.2:

1. FG = Default values in Table 5.4 for fraction of diet provided by grazing, although a site-specific survey is recommended
2. C_v = As calculated above in EQ 5.3.4.1 A
3. FI = See Table 5.4

5.3.4.2.4 Soil ingestion

The feeds provided to dairy and beef cattle may contain small quantities of soil. A larger fraction of soil by weight of food is taken up during grazing. Rooting behavior by pigs with access to soil will result in soil ingestion. Likewise, poultry with free access to soil or pasture will also ingest soil. Defaults for soil ingestion are shown in Table 5.4.

A. Equation 5.3.4.2.4 A: **Soil ingestion = SI_a × C_s**

1. Soil ingestion = Dose through soil ingestion (μg/d)
2. SI_a = Soil ingestion rate for animal (kg/d)
3. C_s = Average soil concentration (μg/kg)

a: Recommended default values for EQ 5.3.4.2.4 A:

1. SI_a = Calculated below
2. C_s = Calculated above in EQ 5.3.2 A

B. Equation 5.3.4.2.4 B: $SI_a = [(1 - FG) \times FS_f \times FI] + [FG \times FS_p \times FI]$

1. FG = Fraction of diet provided by grazing
2. FS_f = Soil ingested as a fraction of feed ingested
3. FI = Feed ingestion rate (kg/d)
4. FS_p = Soil ingested as a fraction of pasture ingested

a: Recommended default values for EQ 5.3.4.2.4 B:

1. FG = Site specific fraction of diet provided by grazing
2. FS_f = See Table 5.4
3. FI = See Table 5.4
4. FS_p = See Table 5.4

b: Assumptions for EQ 5.3.4.2.4 B:

1. The transfer coefficient is the same for all exposure routes.
2. Soil ingested in feed (FS_f) transported from an off-site location (i.e., not grown locally) is assumed not to be contaminated by facility emissions.

5.3.4.3 Bioaccumulation in Angler-Caught Fish

The average concentration in fish (C_f) is based on the concentration in water and a chemical-specific bioaccumulation factor.

A. Equation 5.3.4.3: $Ct = Cw \times BAF$

1. Ct = Concentration in wet weight tissue (muscle) of fish (µg/kg)
2. Cw = Concentration in water (µg/kg)
3. BAF = Fish bioaccumulation factor (unitless)

a: Recommended default values for Equation 5.3.4.3:

1. Cw = As calculated above in Equation 5.3.3 A
2. BAF = Chemical-specific; see Table 5.2

b: Assumptions for Equation 5.3.4.3:

1. For conversion of a chemical concentration in a volume of water shown as µg/L, 1 L water = 1 kg water; thus, for concentration of chemical in water, µg/L = µg/kg.
2. For organic chemicals, BAFs lipid-normalized to adult rainbow trout with 4% lipid content in muscle tissue
3. For organic chemicals, BAFs based on the freely dissolved fraction in water under conditions of average particulate organic carbon and dissolved organic carbon in U.S. lakes and other water bodies
4. For inorganic compounds, BAFs based on wet weight muscle tissue concentration and on the total water concentration of the inorganic compound in water.
5. Contaminant concentrations are uniform in water based on dispersion

5.3.4.4 Bioaccumulation in Mother's Milk

The average concentration of a chemical in mother's milk (C_m) is a function of the mother's exposure through all exposure routes (i.e., inhalation, ingestion via food, drinking water, and soil, and dermal absorption via skin contact with soil contaminated with the chemical), the contaminant half-life in the mother's body, and transfer of absorbed chemical to mother's milk. The contaminant half-life in the body and transfer to mother's milk is incorporated in biotransfer coefficients (Tco) in Equation 5.3.4.4. See the TSD (OEHHA, 2012a), Appendix J for details on development of biotransfer factors. The substances assessed by the mother's milk pathway are shown in Table 5.1.

A. Equation 5.3.4.4: $$C_m = [(D_{inder} \times Tco_{m\_inder}) + (D_{ing} \times Tco_{m\_ing})] \times BW$$

1. C_m = Concentration in mother's milk (mg/kg-milk)
2. D_{inder} = The sum of DOSEair + DOSEdermal through inhalation and dermal absorption (mg/kg-BW-day)
3. D_{ing} = The sum of DOSEfood + DOSEsoil + DOSEwater through ingestion (mg/kg-BW-day)
4. Tco_{m_inder} = Biotransfer coefficient from inhalation and dermal absorption to mother's milk (d/kg-milk)
5. Tco_{m_ing} = Biotransfer coefficient from ingestion to mother's milk (d/kg-milk)
6. BW = Body weight of mother (Kg)

a: Recommended cancer risk default values for EQ 5.3.4.4:

1. D_{ing} = As calculated through ingestion of soil in EQ 5.4.3.1.1 + home-grown produce in EQ 5.4.3.2.1 + home-raised animal products in EQ 5.4.3.2.2 + drinking water in EQ 5.4.3.3.1 + angler-caught fish in EQ 5.4.3.4.1
2. D_{inder} = As calculated through inhalation in EQ 5.4.1.1 + dermal exposure in EQ 5.4.2.1
3. Tco_{m_inder} = See Table 5.5
4. Tco_{m_ing} = See Table 5.5

b: Recommended noncancer risk default values for EQ 5.3.4.4:

1. D_{ing} = As calculated through ingestion of soil in EQ 5.4.3.1.2 + home-grown produce and home-raised animal products in EQ 5.4.3.2.3 + drinking water in EQ 5.4.3.3.2 + angler-caught fish in EQ 5.4.3.4.2
2. D_{inder} = As calculated through inhalation in EQ 5.4.1.1 + dermal exposure in EQ 5.4.2.2
3. Tco_{m_inder} = See Table 5.5
4. Tco_{m_ing} = See Table 5.5

c: Assumptions for EQ 5.3.4.4:

1. Default age of mother at birth is 25 years of age, then nurses the infant for 1 year; Use 16<30 year old high-end (95th percentile) daily breathing rate and intake rates for D_{ing} and D_{inder} for estimating dose to mother.
2. For inhalation dose to mother's milk, it is recommended that the EF variate in EQ 5.4.1.1 is left out for calculation of inhalation dose in the mother's milk pathway.
3. Biotransfer coefficient, Tco_{m_inder}, the same for both inhalation and dermal pathways based on lack of first-pass metabolism through the liver for both of these pathways.
4. Biotransfer coefficient, Tco_{m_ing}, the same for all ingestion pathways based on first-pass metabolism through the liver.
5. For chemicals in Table 5.5 lacking either an oral or inhalation Tco, use the oral Tco for the absent inhalation Tco (i.e., for PCDDs and PCDFs and dioxin-like PCBs), or the inhalation Tco for the absent oral Tco (i.e., for lead) in Equation 5.3.4.4.
6. The concentration in the mother's milk is determined using the derived approach to risk assessment. This method allows use of the high-end dose point estimate for driving exposure pathways and the average dose point estimates for other exposure pathways. See Sections 8.2.6 (cancer) and 8.3.3 (noncancer) for the description of the methodology on how to implement the derived methodology.

Table 5.2a Substance-Specific Default Values for Organic Multipathway Substances

				Root Uptake Factors					
Multipathway Substance	**Log K_{oc}**	**Log K_{ow}**	**Fish BAF**	**Root**	**Leafy**	**Exposed**	**Protected**	**GRAF[2]**	**Soil HalfLife (days)**
Creosotes	NA	NA	$8 \times 10^{+2}$	NA	NA	NA	NA	1.0	$4.3 \times 10^{+2}$
Diethylhexyl-phthalate	5.34[1]	7.63[1]	$4 \times 10^{+1}$	NA	NA	NA	NA	1.0	$1.5 \times 10^{+1}$
Dioxins and Furans	NA	NA	$3 \times 10^{+5}$	NA	NA	NA	NA	0.43	$7.0 \times 10^{+3}$
Hexachlorobenzene	NA	NA	$8 \times 10^{+4}$	NA	NA	NA	NA	1.0	$1.0 \times 10^{+8}$
Hexachlorocyclo-hexanes	NA	NA	$3 \times 10^{+3}$	NA	NA	NA	NA	1.0	$9.4 \times 10^{+1}$
4,4'-Methylene dianiline	2.24[3]	1.59[4]	NA	NA	NA	NA	NA	1.0	$4.6 \times 10^{+2}$
Pentachlorophenol[5]									
Polycyclic Aromatic Hydrocarbons (PAHs)	NA	NA	$8 \times 10^{+2}$	NA	NA	NA	NA	1.0	$4.3 \times 10^{+2}$
Polychlorinated Biphenyls	NA	NA	$2 \times 10^{+6}$	NA	NA	NA	NA	1.0	$3.2 \times 10^{+3}$

(1) Averaged log Kow and Koc values determined by most reliable methods (Staples et al., 1997)

(2) GRAF (Gastrointestinal Relative Absorption Factor). The guidelines allow for adjusting for bioavailability where the evidence warrants. For example, there are good data which indicate that dioxin is not as available to an organism when bound to soil or fly ash matrices relative to when it is in solution or in food. Therefore, a bioavailability factor is incorporated into the model to account for this difference. When information becomes available for other chemicals of concern, this type of bioavailability will be incorporated into the model.

(3) Measured by Hansch et al. (1985)

(4) Estimated according to methodology of Lyman et al. (1990)

(5) To be evaluated for specific default values in future amendments to the Hot Spots Program.

NA - Data Not Available or Not Applicable

Table 5.2b Substance-Specific Default Values for Inorganic Multipathway Substances

				Root Uptake Factors					
Multipathway Substance	**Log K_{oc}**	**Log K_{ow}**	**Fish BAF**	**Root**	**Leafy**	**Exposed**	**Protected**	**GRAF[1]**	**Soil HalfLife (days)**
Arsenic & Inorganic Compounds	NA	NA	$2 \times 10^{+1}$	8×10^{-3}	1×10^{-2}	2×10^{-2}	7×10^{-2}	1.0	$1.0 \times 10^{+8}$
Beryllium & Compounds	NA	NA	$4 \times 10^{+1}$	5×10^{-3}	2×10^{-4}	8×10^{-3}	3×10^{-4}	1.0	$1.0 \times 10^{+8}$
Cadmium & Compounds	NA	NA	$4 \times 10^{+1}$	8×10^{-2}	1×10^{-1}	2×10^{-2}	1×10^{-2}	1.0	$1.0 \times 10^{+8}$
Chromium VI & Compounds	NA	NA	$2 \times 10^{+1}$	$3 \times 10^{+0}$	3×10^{-1}	2×10^{-2}	7×10^{-2}	1.0	$1.0 \times 10^{+8}$
Fluorides (soluble compounds)	NA	NA	NA	9×10^{-3}	4×10^{-2}	4×10^{-3}	4×10^{-3}	1.0	$1.0 \times 10^{+8}$
Lead & Compounds	NA	NA	$2 \times 10^{+1}$	4×10^{-3}	8×10^{-3}	7×10^{-3}	3×10^{-3}	1.0	$1.0 \times 10^{+8}$
Mercury & Inorganic Compounds[2]	NA	NA	$8 \times 10^{+1}$	2×10^{-2}	2×10^{-2}	9×10^{-3}	1×10^{-2}	1.0	$1.0 \times 10^{+8}$
Nickel and compounds	NA	NA	$2 \times 10^{+1}$	6×10^{-3}	1×10^{-2}	3×10^{-3}	3×10^{-2}	1.0	$1.0 \times 10^{+8}$
Selenium & compounds	NA	NA	$1 \times 10^{+3}$	7×10^{-2}	6×10^{-2}	4×10^{-2}	3×10^{-1}	1.0	$1.0 \times 10^{+8}$

(1) GRAF (Gastrointestinal Relative Absorption Factor). The guidelines allow for adjusting for bioavailability where the evidence warrants. For example, there are good data which indicate that dioxin is not as available to an organism when bound to soil or fly ash matrices relative to when it is in solution or in food. Therefore, a bioavailability factor is incorporated into the model to account for this difference. When information becomes available for other chemicals of concern, this type of bioavailability will be incorporated into the model.

(2) Methyl mercury (MeHg) is not represented in the category “mercury & inorganic compounds”. The BAF for methyl mercury is orders of magnitude higher than for inorganic mercury. Assessment of MeHg for the fish pathway is not directly applicable to the Hot Spots program, as no facilities are known to emit MeHg directly into the air (OEHHA, 2012; OEHHA, 2006), but it may be formed by action of microbes in sediment. Assessing the methylation of mercury deposited into a water body is difficult, and is also very water body-specific. At this time OEHHA cannot address this issue in the Hot Spots program, but will consider addressing this problem in future amendments of the Guidance.

NA - Data Not Available or Not Applicable.

Table 5.3a Animal Transfer Coefficients for Persistent Organic Chemicals

Organic Chemical	Tco (d/kg)[a]				
	Cow's Milk	Chicken Egg	Chicken Meat	Cattle Meat	Pig Meat
Diethylhexylphthalate	9×10^{-5}	0.04	0.002	6×10^{-4}	5×10^{-4}
Hexachlorobenzene	0.02	20	10	0.2	0.08
Hexachlorocyclohexanes	0.01	7	5	0.2	0.09
PAHs	0.01	0.003	0.003	0.07	0.06
Polychlorinated biphenyls					
Congener 77	0.001	6	4	0.07	0.4
81	0.004	10	7	0.2	0.4
105	0.01	10	7	0.6	0.7
114	0.02	10	7	0.9	0.7
118	0.03	10	7	1	0.7
123	0.004	10	7	0.2	0.7
126	0.04	10	7	2	0.7
156	0.02	10	8	0.9	2
157	0.01	10	8	0.5	2
167	0.02	10	8	1	2
169	0.04	10	8	2	2
189	0.005	10	8	0.2	1
Unspeciated (PCB 126)[b]	0.04	10	7	2	0.7
PCDD/Fs					
Congener 2,3,7,8-TCDD	0.02	10	9	0.7	0.1
1,2,3,7,8-PeCDD	0.01	10	9	0.3	0.09
1,2,3,4,7,8-HxCDD	0.009	10	6	0.3	0.2
1,2,3,6,7,8-HxCDD	0.01	10	6	0.4	0.1
1,2,3,7,8,9-HxCDD	0.007	7	3	0.06	0.02
1,2,3,4,6,7,8-HpCDD	0.001	5	2	0.05	0.2
OCDD	0.0006	3	1	0.02	0.1
2,3,7,8-TCDF	0.004	10	6	0.1	0.02
1,2,3,7,8-PeCDF	0.004	30	10	0.1	0.01
2,3,4,7,8-PeCDF	0.02	10	8	0.7	0.09
1,2,3,4,7,8-HxCDF	0.009	10	5	0.3	0.1
1,2,3,6,7,8-HxCDF	0.009	10	6	0.3	0.09
2,3,4,6,7,8-HxCDF	0.008	5	3	0.3	0.06
1,2,3,7,8,9-HxCDF	0.009	3	3	0.3	0.03
1,2,3,4,6,7,8-HpCDF	0.002	3	1	0.07	0.06
1,2,3,4,7,8,9-HpCDF	0.003	3	1	0.1	0.02
OCDF	0.002	1	0.6	0.02	0.03
Unspeciated (2,3,7,8-TCDD)[b]	0.02	10	9	0.7	0.1

[a] All Tco values were rounded to the nearest whole number.

[b] For unspeciated mixtures, use PCB 126 Tcos to represent the class of PCBs, and 2378-TCDD Tcos to represent the class of PCDDs/Fs.

Table 5.3b Animal Transfer Coefficients for Inorganic Chemicals

Inorganic Metals and Chemicals	Tco (d/kg)[a]				
	Cow's Milk	Chicken Egg	Chicken Meat	Cattle Meat	Pig Meat
Arsenic	5×10^{-5}	0.07	0.03	2×10^{-3}	0.01[b]
Beryllium	9×10^{-7}	0.09	0.2	3×10^{-4}	0.001
Cadmium	5×10^{-6}	0.01	0.5	2×10^{-4}	0.005
Chromium (VI)	9×10^{-6}	NA[c]	NA	NA	NA
Fluoride	3×10^{-4}	0.008	0.03	8×10^{-4}	0.004[b]
Lead	6×10^{-5}	0.04	0.4	3×10^{-4}	0.001[b]
Mercury	7×10^{-5}	0.8	0.1	4×10^{-4}	0.002[b]
Nickel	3×10^{-5}	0.02	0.02	3×10^{-4}	0.001
Selenium	0.009	3	0.9	0.04	0.5

[a] All Tco values were rounded to the nearest whole number.

[b] The meat Tco was estimated using the metabolic weight adjustment ratio of 4.8 from cattle to pig

[c] NA – no data available or was not applicable

Table 5.4 Point Estimates for Animal Pathway

Parameter	Beef Cattle	Lactating Dairy Cattle	Pigs	Meat Poultry	Egg-laying Poultry
BW (body weight in kg)	533	575	55	1.7	1.6
BR_a (inhalation rate in m^3/d)	107	115	7	0.4	0.4
WI_a (water consumption in kg/d)	45	110	6.6	0.16	0.23
FI (Food Intake in kg/d) DMI[a] and/or pasture grazing[b]	9	22	2.4	0.13	0.12
FS_f (soil fraction of feed)	0.01	0.01	NA	NA	NA
FS_p (soil fraction of pasture)	0.05	0.05	0.04	0.02	0.02

[a] Dry matter intake

[b] For beef and dairy cattle, pasture grazing is assumed to be leafy vegetation (grasses, including greenchop) and accounts for half of the cattle's diet (FG=0.5 in Section 5.3.4.2.3). The default assumes on-site pasture grazing contaminated by facility emissions. Fraction of feed or dry matter intake (e.g., hay, grain) grown on-site is assumed to be contaminated by facility emissions and fraction of feed that is grown off-site is not assumed to be contaminated. A default may be used that assumes all feed is grown off-site (L=0 in Section 5.3.4.2.3), but a survey is recommended to verify the fractions of feed grown on-site and off-site.

For pigs with access to soil, but usually confined to a pen, default assumes no pasture grazing (FG=0 in Section 5.3.4.2.3). For feed, estimated intake consists of equal portions of all plant types including exposed, leafy, protected and root in which 10% (L=0.1 in Section 5.3.4.2.3) of the diet is homegrown and contaminated by facility emissions. The fraction of feed that was transported from an off-site location is assumed not to be contaminated by facility emissions.

For poultry including egg-laying and broiler chickens that have access to soil, default assumes no pasture grazing (FG=0 in Section 5.3.4.2.3). Estimated feed intake is composed of equal proportions of all plant types with 5% (L=0.05 in Section 5.3.4.2.3) homegrown and contaminated by facility emissions. The fraction of feed grown off-site and transported to the receptor was not contaminated by facility emissions.

NA - Not applicable. Assume FS_f is equal to zero.

Table 5.5 Mother's Milk Transfer Coefficients (Tco_m)[a]

Chemical/chem. group	Tco_m (day/kg-milk)
PCDDs - oral[b]	3.7
PCDFs - oral[b]	1.8
Dioxin-like PCBs - oral[b]	1.7
PAHs – inhalation[c]	1.55
PAHs – oral	0.401
Lead - inhalation[d]	0.064

[a] These compound classes represent the chemicals of greatest concern for the mother's milk pathway under the Hot Spots program. It is expected that additional transfer coefficients will be developed for other multipathway chemicals in the Hot Spots Program as data becomes available and is reviewed.

[b] Use the oral Tco_m for the inhalation and dermal pathways. The PCDD, PCDF and dioxin-like PCB Tcos were derived using a Random-effects model from individual Tco_m estimates for 7 PCDDs, 9 PCDFs and 12 dioxin-like PCBs (See OEHHA, 2012, Appendix J).

[c] Use the inhalation Tco_m for the dermal pathway

[d] Use the inhalation Tco_m for the ingestion and dermal pathways

5.4 Estimation of Dose

Once the concentrations of substances are estimated in air, soil, water, plants, and animal products, they are used to evaluate estimated exposure to people. Exposure is evaluated by calculating the daily dose in milligrams per kilogram body weight per day (mg/kg/d). The following algorithms calculate this dose for exposure through inhalation, dermal absorption, and ingestion pathways. All chemicals must be assessed for exposure through inhalation. If there are emissions of one or more of the subset of semi- or non-volatile multipathway substances, the soil ingestion pathway and the dermal soil exposure pathway are also assessed. The mother's milk pathway may also be a mandatory pathway depending on the multipathway substance released (See Table 5.1). The other exposure pathways may also need to be assessed if a survey of the exposure site shows they are present (e.g., ingestion of water, home-grown crops, home-raised animal products, and angler-caught fish).

This section contains average and high-end point estimates and data distributions for adults and children for many exposure pathways. The point-estimates and data distributions for children fall within the 3rd trimester, 0<2, 2<9, and 2<16 year age groupings. The point-estimates and data distributions for adults fall within the 16<30 and 16-70 year age groupings. When evaluating 9-, 30-, and 70-year exposure durations for cancer risk assessment, assessors will use distributions starting at the third trimester.

Workers are assessed for cancer risk as adults using 8-hour breathing rate point estimates (See Table 5.8). Point estimates for workers are listed under "offsite worker." OEHHA has not developed stochastic distributions for worker exposure. Therefore, there is no Tier 3 stochastic approach for offsite worker cancer risk assessment.

5.4.1 *Estimation of Exposure through Inhalation*

The dose through the inhalation route is estimated for cancer risk assessment and noncancer hazard assessment. Both residential and offsite worker exposures are considered. Since residential exposure includes near-continuous long-term exposure at a residence and workers are exposed only during working hours (i.e., 8 hours/day), different breathing rate distributions are used.

5.4.1.1 Residential Inhalation Dose for Cancer Risk Assessment

Exposure through inhalation is a function of the breathing rate, the exposure frequency, and the concentration of a substance in the air. For residential exposure, the breathing rates are determined for specific age groups, so inhalation dose (Dose-air) is calculated for each of these age groups, 3rd trimester, 0<2, 2<9, 2<16, 16<30 and 16-70 years. OEHHA used the mother's breathing rates to estimate dose for the 3rd trimester fetus assuming the dose to the fetus during the 3rd trimester is the same as the mother's dose. These age-specific groupings are needed in order to properly use the age sensitivity factors for cancer risk assessment (see Chapter 8). A Tier 1 evaluation uses the high-end point estimate (i.e., the 95th percentiles) breathing rates for the inhalation

pathway in order to avoid underestimating cancer risk to the public, including children. A possible exception for using high-end breathing rates are when there is exposure to multipathway substances and two of the non-inhalation pathways drive the risk, rather than the inhalation pathway (see Chapter 8).

A. Equation 5.4.1.1: $$\text{Dose-air} = C_{air} \times \{BR/BW\} \times A \times EF \times 10^{-6}$$

1. Dose-air = Dose through inhalation (mg/kg/d)
2. C_{air} = Concentration in air ($\mu g/m^3$)
3. {BR/BW} = Daily Breathing rate normalized to body weight (L/kg body weight - day)
4. A = Inhalation absorption factor (unitless)
5. EF = Exposure frequency (unitless), days/365 days
6. 10^{-6} = Micrograms to milligrams conversion, liters to cubic meters conversion

a: Recommended default values for EQ 5.4.1.1:

1. {BR/BW} = Daily breathing rates by age groupings, see As supplemental information, the assessor may wish to evaluate the inhalation dose by using the mean point estimates in Table 5.6 to provide a range of breathing rates for cancer risk assessment to the risk manager.
2. Table (point estimates) and Table 5.7 (parametric model distributions for Tier III stochastic risk assessment). For Tier 1 residential estimates, use 95th percentile breathing rates in Table 5.6.
3. A = 1
4. EF = 0.96 (350 days/365 days in a year for a resident)

b: Assumption for EQ 5.4.1.1:

1. The fraction of chemical absorbed (A) is the same fraction absorbed in the study on which the cancer potency or Reference Exposure Level is based.

As supplemental information, the assessor may wish to evaluate the inhalation dose by using the mean point estimates in Table 5.6 to provide a range of breathing rates for cancer risk assessment to the risk manager.

Table 5.6 Point Estimates of Residential Daily Breathing Rates for 3rd trimester, 0<2, 2<9, 2<16, 16<30 and 16-70 years (L/kg BW-day)

	3rd Trimester[a]	0<2 years	2<9 years	2<16 years	16<30 years	16<70 years
	L/kg-day					
Mean	225	658	535	452	210	185
95th Percentile	361	1090	861	745	335	290

[a] 3rd trimester **breathing rates** based on breathing rates of pregnant women using the assumption that the dose to the fetus during the 3rd trimester is the same as that to the mother.

Table 5.7 Daily Breathing Rate Distributions by Age Group for Residential Stochastic Analysis (L/kg BW-day)

	3rd Trimester	0<2 years	2<9 years	2<16 years	16<30 years	16-70 years
Distribution	Max extreme	Max extreme	Max extreme	Log-normal	Logistic	Logistic
Minimum	78	196	156	57	40	13
Maximum	491	2,584	1,713	1,692	635	860
Scale	59.31	568.09	125.59		40.92	36.19
Likeliest	191.50	152.12	462.61			
Location				-144.06		
Mean	225	658	535	452	210	185
Std Dev	72	217	168	172	75	67
Skewness	0.83	2.01	1.64	1.11	0.83	1.32
Kurtosis	3.68	10.61	7.88	6.02	5.17	10.83
Percentiles						
5%	127	416	328	216	96	86
10%	142	454	367	259	118	104
25%	179	525	427	331	161	141
50%	212	618	504	432	207	181
75%	260	723	602	545	252	222
80%	273	758	631	572	261	233
90%	333	934	732	659	307	262
95%	361	1090	861	745	335	290
99%	412	1430	1140	996	432	361

5.4.1.2 Offsite Worker (MEIW) Inhalation Dose for Cancer Risk Assessment

For worker exposure, the default assumes working age begins at 16 years, and that exposures to facility emissions occur during the work shift, typically up to 8 hours per day during work days. Breathing rates that occur over an 8-hour period vary depending on the intensity of the activity (See Table 5.8), and are used to estimate the inhalation dose. The 8-hour breathing rates may also be useful for cancer risk assessment of children and teachers exposed at schools during school hours.

Another risk management consideration for the offsite worker scenario for cancer assessment of a Hot Spots facility is whether there are women of child-bearing age at the MEIW location and whether the MEIW has a daycare center. Since the third trimester is only a short segment of the 25 year exposure duration used for the MEIW, the resulting risk estimate would not differ significantly. An exception to this assumption is high exposure to carcinogens over a short period, as might occur during short-term projects (see Section 8.2.10). In this case, risk assessment during the third trimester may be warranted. However, if there is onsite daycare at the MEIW, then the risks to the children will be underestimated using the offsite adult worker scenario due to increased exposure (per kg body weight) and increased sensitivity to carcinogen exposure (see Section 8.2.1). In this case, the Districts may wish to include a calculation of inhalation dose for the children in the onsite daycare, assuming they could be there from 0 to age 6 years.

Exposed workers may be engaged in activities ranging from desk work, which would reflect breathing rates of sedentary/passive or light activities, to farm worker activities, which would reflect breathing rates of moderate intensity (See Table 5.9). OEHHA recommends default (Tier 1) point estimate 8-hour breathing rates in L/kg-8-hrs based on the mean and 95th percentile of moderate intensity activities, 170 and 230 L/kg-8-hrs, respectively, for adults 16-70 years old.

Many facilities operate non-continuously, as in only 8-10 hours per day, but the air dispersion modeling is performed as if the emissions were uniformly emitted over 24 hours a day, 7 days per week. The air dispersion computer model used, including AERMOD and other models, typically calculate an annual average air concentration based on actual operating conditions but also include the hours of nonoperation in the average concentration.

Therefore, there are two components that determine the worker exposure to facility emissions:

1) What is the estimated concentration the worker is exposed to (i.e., breathes), during the work shift, and

2) What is the amount of time the offsite worker's schedule overlaps with the facility's emission schedule?

There are two approaches to estimating the modeled concentration the worker is breathing during the work shift. The first approach uses a worker adjustment factor (i.e.,

the WAF) to approximate what the worker is breathing based on the modeling run used for residential receptors. The second approach uses a special modeling run with the hourly raw results from an air dispersion analysis and is described in Appendix M.

The first and more basic approach is to obtain the long term average concentration as you would for modeling a residential receptor, then adjusting this exposure concentration using the calculated WAF (EQ 5.4.1.2 B) to estimate the concentration the offsite worker is exposed to during the work shift (shown as (C_{air} × WAF) in EQ 5.4.1.2 A). This method is characteristic of a default approach used in a Tier 1 assessment. Once the exposure concentration is determined, the worker's inhalation dose (Dose-air) can be calculated as shown in EQ 5.4.1.2 A.

The second approach for determining the air concentration the worker is exposed to uses a refined modeling run where the hourly raw dispersion model output are post processed to examine the hourly concentrations that fall within the offsite worker's shift. This method provides a more representative estimate of the air concentration, but is more complex, and time consuming than the first method. See Appendix M for information on how to simulate the long term concentration for the offsite worker that can be used to estimate inhalation cancer risk.

The HARP software has the ability to calculate worker impacts using an approximation factor and, in the future, it will have the ability to post process refined worker concentrations using the hourly raw results from an air dispersion analysis.

If the off-site worker's shift does not completely overlap the emission schedule of the facility, then a Discount Factor (DF) may be applied to the WAF. Calculation of the DF is shown in EQ 5.4.1.2 C. The default assumption is that the offsite worker's shift falls completely within the emission schedule of the facility, in which case DF=1. Use of a DF less than 1 requires a survey at the MIEW to verify that some portion of the off-site worker shift is not subject to the facility emissions.

A. Equation 5.4.1.2 A: $\textbf{Dose-air} = (C_{air} \times WAF) \times \{BR/BW\} \times A \times EF \times 10^{-6}$

1. Dose-air = Dose through inhalation (mg/kg/d)
2. C_{air} = Annual average concentration in air ($\mu g/m^3$)
3. WAF = Worker air concentration adjustment factor (unitless)
4. {BR/BW} = Eight-hour breathing rate normalized to body weight (L/kg body weight - day)
5. A = Inhalation absorption factor (unitless)
6. EF = Exposure frequency (unitless), days/365 days)
7. 10^{-6} = Micrograms to milligrams conversion, Liters to cubic meters conversion

a: Recommended default values for EQ 5.4.1.2 A:

1. WAF = See EQ. 5.4.1.2 B for formula to calculate WAF, or App. M for refined post-processing modeling to calculate WAF.
2. {BR/BW} = For workers, use age16-70 year, 95th percentile, moderate intensity 8-hour point estimate breathing rates (see Table 5.8). No worker breathing rate distributions exist for stochastic risk assessment.
3. A = 1
4. EF = 0.68 (250 days / 365 days). Equivalent to working 5 days/week, 50 weeks/year.

b: Assumption for EQ 5.4.1.2 A:

1. The fraction of chemical absorbed (A) through the lungs is the same fraction absorbed in the study on which the cancer potency factor is based.
2. The source emits during the daylight hours. Calculate WAF (EQ 5.4.1.2 B) if a special post-processing modeling run described in App. M was not completed. For nighttime emissions and exposure scenarios, see Appendix N.

B. Equation 5.4.1.2 B: $$WAF = (H_{res} / H_{source}) \times (D_{res} / D_{source}) \times DF$$

1. WAF = Worker adjustment factor (unitless)
2. H_{res} = Number of hours per day the annual average residential air concentration is based on (always 24 hours)
3. H_{source} = Number of hours the source operates per day
4. D_{res} = Number of days per week the annual average residential air concentration is based on (always 7 days)
5. D_{source} = Number of days the emitting source operates per week
6. DF = Discount factor, for when the offsite worker's schedule partially overlaps the source's emission schedule

b: Recommended default values for EQ 5.4.1.2 B:

1. DF = 1 for offsite worker's schedule occurring within the source's emission schedule. A site-specific survey may be used to adjust the DF using EQ 5.4.1.2 C.

C. Equation 5.4.1.2 C: $$DF = (H_{coincident} / H_{worker}) \times (D_{coincident} / D_{worker})$$

1. $H_{coincident}$ = Number of hours per day the offsite worker's schedule and the source's emission schedule coincide
2. H_{worker} = Number of hours the offsite worker works per day
3. $D_{coincident}$ = Number of days per week the offsite worker's schedule and the source's emission schedule coincide
4. D_{worker} = Number of days the offsite worker works per week

Tier 2 adjustments for EQ 5.4.1.2 A-C may be used for:

1. Eight-hour breathing rate. Point estimates in Table 5.8 for lower breathing rates of sedentary/passive and light intensity work activities may be substituted in site-specific Tier 2 scenarios. Table 5.9 can be used to estimate breathing rate intensities for various job activities. Use of different breathing rates requires a survey of the exposed workplace and approval by Air District, ARB and OEHHA.
2. Discount Factor (DF) in EQ 5.4.1.2 C. If a site-specific survey of the offsite worker schedule only partially overlaps with the source's emission schedule, then a DF less than 1 may be calculated. Use of a DF less than 1 requires a survey of the exposed workplace and approval by the Air District or ARB.

The 8-hour breathing rates are based on minute ventilation rates derived by U.S. EPA (2009). U.S. EPA employed a metabolic equivalent (METS) approach for estimating breathing rates. This method determines daily time-weighted averages of energy expenditure (expressed as multipliers of the basal metabolic rate) across different levels of physical activity. The 8-hour breathing rates shown in Table 5.8 are divided into three categories:

Sedentary & Passive Activities (METS $\leq$ 1.5)

Light Intensity Activities (1.5 < METs $\leq$ 3.0)

Moderate Intensity Activities (3.0 < METs $\leq$ 6.0)

For example, a METS = 1 is roughly equivalent to energy expenditure during sleep and is close to the basal metabolic rate. A METS activity that is two to three times greater (METS = 2 to 3) is characteristic of light intensity activities, such as administrative office work or sales work as shown in Table 5.9.

Under a Tier 1 scenario, the risk assessor may simply use the 95th percentile breathing rate for moderate intensity activities of 230 L/kg-8 hrs in Eq. 5.4.1.2 A to calculate the daily dose via the inhalation route to the worker. In an example of a Tier 2 scenario, the risk assessor surveys the workplace and determines that the worker(s) at the MEIW receptor are primarily sitting at a desk performing administrative-type work on a computer. Referring to Table 5.9, this activity corresponds most closely to "administrative office work" with a mean activity level of 1.7 and a SD = 0.3. This level of activity is considered "light intensity activity" (i.e., 1.5 < METs $\leq$ 3.0). With the prior approval of the Air District or ARB, the risk assessor may then use the 95th percentile breathing rate of 100 L/kg-8 hr for light intensity activities in Equation 5.4.1.2 A.

Table 5.8. Eight-Hour Breathing Rate (L/kg per 8 Hrs) Point Estimates for Males and Females Combined[a,b]

	0<2 years	2<9 years	2<16 years	16<30 years	16-70 years
	Sedentary & Passive Activities (METS $\leq$ 1.5)				
Mean	200	100	80	30	30
95th Percentile	250	140	120	40	40
	Light Intensity Activities (1.5 < METs $\leq$ 3.0)				
Mean	490	250	200	80	80
95th Percentile	600	340	270	100	100
	Moderate Intensity Activities (3.0 < METs $\leq$ 6.0)				
Mean	890	470	380	170	170
95th Percentile	1200	640	520	240	230

[a] For pregnant women, OEHHA recommends using the mean and 95th percentile 8-hour breathing rates based on moderate intensity activity of 16<30 year-olds for 3rd trimester.
[b.] Breathing rates in the table may be used for worker, school, or residential exposures

Table 5.9. METS Distributions for Workplace and Home Activities

Activity Description	Mean	Median	SD	Min	Max
Workplace Activities					
Administrative office work	1.7	1.7	0.3	1.4	2.7
Sales work	2.9	2.7	1.0	1.2	5.6
Professional	2.9	2.7	1.0	1.2	5.6
Precision/production/craft/repair	3.3	3.3	0.4	2.5	4.5
Technicians	3.3	3.3	0.4	2.5	4.5
Private household work	3.6	3.5	0.8	2.5	6.0
Service	5.2	5.3	1.4	1.6	8.4
Machinists	5.3	5.3	0.7	4.0	6.5
Farming activities	7.5	7.0	3.0	3.6	17.0
Work breaks	1.8	1.8	0.4	1.0	2.5
Household/Neighborhood Activities					
Sleep or nap	0.9	0.9	0.1	0.8	1.1
Watch TV	1.0	1.0	-	1.0	1.0
General reading	1.3	1.3	0.2	1.0	1.6
Eat	1.8	1.8	0.1	1.5	2.0
Do homework	1.8	1.8	-	1.8	1.8
General personal needs and care	2.0	2.0	0.6	1.0	3.0
Indoor chores	3.4	3.0	1.4	2.0	5.0
Care of plants	3.5	3.5	0.9	2.0	5.0
Clean house	4.1	3.5	1.9	2.2	5.0
Home repairs	4.7	4.5	0.7	4.0	6.0
General household chores	4.7	4.6	1.3	1.5	8.0
Outdoor chores	5.0	5.0	1.0	2.0	7.0
Walk/bike/jog (not in transit) age 20	5.8	5.5	1.8	1.8	11.3
Walk/bike/jog (not in transit) age 30	5.7	5.7	1.2	2.1	9.3
Walk/bike/jog (not in transit) age 40	4.7	4.7	1.8	2.3	7.1

Table 5.10 lists some WAFs for a few typical scenarios. For example, if the source is continuously emitting, then the offsite worker is assumed to breathe the long-term annual average concentration during their work shift. The WAF then becomes one and no concentration adjustments are necessary in this situation when estimating the inhalation cancer risk. If the source is non-continuously emitting for 8 hours/day, 5 days/week and the offsite worker's shift completely overlaps the emitting facility's operating schedule, then the WAF would be 4.2:

$$(24 \text{ hrs/day} / 8 \text{ hrs/day}) \times (7 \text{ days/week} / 5 \text{ days/week}) = 4.2$$

If the offsite worker's 8 hour/day shift only overlaps the emitting facility's operation schedule for 4 hrs/day, then the WAF is 2.1 because the DF = 0.5 will reduce the WAF by half: DF = (4 hrs/day / 8 hrs/day) x (5 days/week / 5 days/week) = 0.5

Table 5.10: Example Worker Adjustment Factors (WAF) to Convert a Long-Term Daily Average Emission Concentration to an Off-Site Worker Receptor Exposure

Off-Site Workers' Shift Overlap with Facility's Emission Schedule[a]	Facility Operating Schedule	Adjustment Factor
8 hrs/day, 5 days/week	Continuous (24 hrs/7 days/week)	1.0
8 hrs/day, 5 days/week[b]	Non-continuous (8 hrs/5 days/week)	4.2
4 hrs/day, 5 days/week	Non-continuous (8 hrs/5 days/week)	2.1

[a] Worker works 8 hours per day, 5 days per week
[b] Workers' work hours completely overlap the facilities operating hours

5.4.1.3 Inhalation Dose for Children at Schools and Daycare Facilities for Cancer Risk Assessment

The 8-hour breathing rates and inhalation dose equations (EQ 5.4.1.2 A-C) may also be used to estimate risk to children when exposures occur while at school or at day care facilities. Breathing rate point estimates to use in Table 5.8 depend on the ages of the children at the exposed schools and day cares. As a Tier 1 default, moderate intensity breathing rates are recommended. Equations 5.4.1.2 A-C is used in the same way to estimate dose in children as it is for workers.

5.4.1.4 Non-Cancer Inhalation Exposure for Workers and Residents

For typical daily work shifts of 8-9 hours, acute, 8-hour and chronic Reference Exposure Levels (RELs) described in Chapter 8 are used in health risk assessments to characterize the noncancer risks using the Hazard Index approach described in Chapter 8 and in OEHHA (2008). Uncertainty factors are already incorporated into the RELs used to assess noncancer risk, as explained in Chapter 8, so all that is needed to evaluate the noncancer hazard is the air concentration that the worker is exposed to. The modeled maximum 1-hour air concentration is determined for acute hazard assessment and the annual average air concentration is determined for chronic hazard assessment. The modeled average air concentration during a work shift is determined for 8-hour hazard assessment using the adjusted annual average air concentration described below.

The 8-hour RELs are primarily designed to address offsite worker inhalation exposure at the MEIW because they better characterize the daily intermittent exposures of workers than the chronic RELs do. They are used in estimating the 8 hour Hazard Index for offsite workers. The 8-hour RELs should be used for typical daily work shifts of 8-9 hours. For further questions, assessors should contact OEHHA, the District, or reviewing authority to determine if the 8-hour RELs should be used in your HRA. Any discussions or directions to exclude the 8-hour REL evaluation should be documented in the HRA.

Note, however, there are only a handful of 8-hour RELs currently adopted for use in the Hot Spots program. Therefore, we also recommend performing chronic noncancer exposure assessment for the offsite worker (MEIW) based on the annual average air concentration at the MEIW. Evaluation of the chronic Hazard Index should help protect workers who routinely work longer than 8 hour shifts. Exposure to multipathway substances also requires noncancer hazard assessment for the dermal and oral soil exposure pathways for offsite workers. Because there are few 8-hour RELs currently available, hazard assessment for the noninhalation pathways for multipathway substances is only applied when estimating the chronic Hazard Index.

In addition, the Districts may wish to determine if there is an onsite daycare at the MEIW and include a calculation of the chronic and 8-hour inhalation dose for children, although onsite hazard assessment is not a requirement for a Hot Spots risk assessment.

As explained in Section 5.4.1.2 for cancer risk, the modeled annual average air concentration is adjusted to the air concentration that the worker is actually exposed to if the facility operates non-continuously. The typical method for this adjustment is by calculating the Worker Adjustment Factor (WAF) shown in EQ 5.4.1.4 B and multiplying this value by the annual average air concentration (C_{air}, in $\mu g/m^3$) in EQ 5.4.1.4 A.

Unlike cancer risk assessment, no discount factor (DF) is applied in noncancer assessment for partial overlap between the worker's schedule and the source's emission schedule. Adjustments for worker vacations, work shifts for shortened weeks (e.g., 1 - 4 days), and worker time away on weekends are also not appropriate.

An alternative refined post-processing method, described in Appendix M, may be used to estimate the air concentration the worker is exposed to during their work schedule. OEHHA may be consulted about the particular chemical involved if it is important to make a more refined analysis.

The equation to adjust the annual average air concentration to a worker 8-hour exposure concentration (i.e., the adjusted annual average ground level concentration) is expressed as:

A. Equation 5.4.1.4 A: $$\text{Adjusted } C_{air} \ (\mu g/m^3) = C_{air} \times WAF$$

Where WAF is determined as:

B. Equation 5.4.1.4 B: $$WAF = (H_{res} / H_{source}) \times (D_{res} / D_{source})$$

a: Assumptions for EQ 5.4.1.4 B:

1. No adjustment of the WAF allowed for partial overlap of the worker's schedule and the source's emission schedule.

Alternatives for calculating off-site worker Adjusted C_{air} in EQ 5.4.1.4 A-B:

1. Rather than calculate the WAF for a non-continuous emitting facility, a post-processing of the hourly raw dispersion model output and examination of the hourly concentrations that fall within the offsite worker's shift can be conducted to estimate the air concentration the worker is exposed to. This method is a more refined, complex, and time consuming approach, but should result in a more representative exposure concentration. See Appendix M for information on how to simulate the exposure concentration for the off-site worker.
2. For continuously-emitting facilities (i.e., 24 hrs/day, 7 days/week), if an assessor does not wish to assume the worker breathes the long-term annual average concentration during the work shift, then a refined concentration can also be post-processed as described in Appendix M. All alternative assumptions should be approved by the reviewing authority and supported in the presentation of results.

For residential exposure to non-continuously operating facilities, the modeled maximum 1-hour and chronic air concentrations at the MEIR are determined for noncancer hazard assessment. Hazard assessment for repeated 8-hour exposure at the MEIR is not required. Chronic exposure assessment based on the annual average air concentration should adequately protect individuals, in part because residents are considered to be present at the MEIR at or near 24 hrs per day. Many facilities operate for periods longer than 8 hours per day and the hazards are better characterized based on chronic exposure. Nevertheless, differences between 8-hour and chronic exposures (i.e., higher daily 8-hour exposures vs. lower longer daily exposure 24 hrs/day) may result in different toxicological responses including potentially greater toxicological responses with either 8-hour or chronic exposure. There may also be cases such as special meteorological situations (e.g., significant diurnal-nocturnal meteorological differences) where the 8-hour REL will be more protective than the chronic REL. Thus, the air districts may also elect to have an 8-hour hazard assessment performed at the MEIR, using daily 8 hour exposures and the 8 hr RELs.

Eight-hour exposure assessment is not recommended for continuously emitting sources for residential receptors. In this situation it is only necessary to estimate chronic exposure based on the annual average concentration. However, there may be situations where the air district may wish to assess an 8-hour residential exposure to continuously operating facilities, for example, where there are significant differences in modeled concentration of emissions during the day due to diurnal wind patterns.

For estimating the air concentration from non-continuously operating facilities, EQ 5.4.1.4.A is also used to adjust the annual average concentration to what the residents are exposed to. This is the air concentration that the 8-hour REL will be compared to as discussed in Chapter 8. The alternative refined post-processing method described in Appendix M may also be used to estimate residential exposure.

In summary, the requirements for noncancer hazard assessment using the Hazard Index approach at the MEIW and MEIR are as follows.

For offsite worker exposure:

- Acute hazard assessment based on the maximum 1-hour air concentrations and 1-hour RELs
- Eight-hour hazard assessment based on daily average 8-hour exposure (estimated using adjusted annual average air concentration in EQ 5.4.1.4 A and B or by post-processing method in App. M) for those substances with 8-hour RELs
- Chronic hazard assessment based on annual average exposure and chronic RELs, and oral chronic RELs for noninhalation routes of multipathway substances

For residential exposure:

- Acute hazard assessment based on the maximum 1-hour air concentration and 1-hour RELs
- Eight-hour hazard assessment based on daily average 8-hour exposure not required, but can be performed at the discretion of the air districts for exposure to non-continuously operating facilities based on the adjusted annual average air concentration (EQ 5.4.1.4 A and B or method in App. M). Eight-hour assessments not recommended for exposure to continuously operating facilities
- Chronic hazard assessment based on annual average exposure and chronic RELs, and oral chronic RELs for noninhalation routes of multipathway substances

5.4.1.5 Exposure Frequency and Age Groupings for Noncancer Hazard Assessment

For cancer risk, the basic assumption is that risk is associated with cumulative dose of carcinogen. Thus, the dose used to estimate cancer risk can be adjusted for exposure frequency, as well as time spent within the MEIR or MEIW location. Chronic RELs are not necessarily related to cumulative dose. Thus, adjusting the estimated dose used to calculate hazard index for exposure frequency or time away from the MEIR or MEIW is not appropriate.

The average daily dose for chronic noncancer assessment is based on exposure beginning at birth to 70 years of age, necessitating calculation of a time-weighted average for age 0-2, 2-16 and 16-70 years. Since we are not applying Age Sensitivity Factors for assessing non-cancer hazard, the 3rd trimester is not explicitly called out for determining dose, as it is for cancer risk assessment. Rather adult exposure is considered, which would include pregnant women in any trimester. Both inhalation and oral RELs incorporate safety factors to protect sensitive human populations.

5.4.2 *Estimation of Exposure through Dermal Absorption*

Exposure through dermal absorption (dose-dermal) is a function of the soil or dust loading of the exposed skin surface, the amount of skin surface area exposed, and the concentration and availability of the substance. In the previous edition of OEHHA's

exposure guidelines document (OEHHA, 2000), we recommended using specified average and high-end point estimate values for four of the variates (body weight, exposed surface area of skin, soil load on skin and frequency of exposure) in the stochastic analysis for dermal dose. This equation required multiplying values together, which could lead to overly conservative exposure estimates when high-end values were used. By combining information from the four variates into one composite distribution, over-conservatism may be avoided.

To this end, OEHHA created a new variate, "annual dermal load", or ADL, which is a composite of the body surface area (BSA) per kg body weight, exposure frequency, and soil adherence variates. Point estimates from the composite "annual dermal load" can be used for point estimate assessments while parameters and information on the type of distribution (e.g., lognormal) can be used for Tier III stochastic risk assessments. For details on the development of the ADL, refer to the Technical Support Document for Exposure and Stochastic Analysis (OEHHA, 2012).

5.4.2.1 Dermal Dose for Cancer Risk Assessment

The dose through residential dermal exposure to contaminated soil varies by age and is calculated for each age group (e.g., 3rd trimester, 0<2 yrs, 2<9 yrs, 2<16 yrs, 16<30 and 16-70 yrs). These age-specific groupings are needed in order to properly use the age sensitivity factors for cancer risk assessment (see Chapter 8). This pathway is also assessed for exposure to offsite workers; a separate ADL for offsite workers is presented in Table 5.11. Children at a MEIW daycare, if present, may also be assessed for exposure if the District deems it advisable.

A. Equation 5.4.2.1: $$\mathbf{Dose_{dermal} = ADL \times Cs \times ABS \times 10^{-9} / 365}$$

1. $Dose_{dermal}$ = Exposure dose through dermal absorption (mg/kg-d)
2. ADL = Annual dermal load (mg soil/kg BW-yr)
3. C_s = Average soil concentration (μg/kg)
4. ABS = Fraction absorbed across skin (unitless)
5. 10^{-9} = Conversion factor for chemical & soil (μg to mg, mg to kg)
6. 1/365 = Conversion factor for ADL from yrs to days

a: Recommended default values for EQ 5.4.2.1:

1. ADL = See Table 5.11 (point estimates) & Table 5.12 a-d (distributions)
2. C_s = Calculated above in EQ 5.3.2 A
3. ABS = See Table 5.13

b: Assumption for EQ 5.4.2.1:

1. The ADL for the third trimester of the fetus is based on the ADL of the mother; when normalized to body weight, we assume that exposure to the

mother and the fetus will be the same. The mother's exposure is based on that of adults 16-30 years of age in Table 5.11 and 5.12d.

2. Exposure frequency (EF) for vacation time spent away from exposure does not appear as a variate in EQ 5.4.2.1, as it is incorporated in the ADL and includes a 2-week vacation per year away from dermal soil exposure for both residents and offsite workers.

Climate will strongly influence people's choice of clothing. Due to California's varied climatic regions and existing data on clothing choices at different temperatures, three levels of climatic conditions, warm, mixed, and cold, are used to describe California's climate regions:

1. A warm climate is characteristic of Southern California areas such as Los Angeles, which can have warm to hot temperatures throughout the year.
2. A "mixed" climate is one that has warm-to-hot temperatures during much of the year (daily highs over 80 degrees are common), roughly from April to October, and cold temperatures (lows near or below freezing) during the remainder of the year. The mountains and central valley are examples of a mixed climate.
3. A cold climate is representative of San Francisco, Eureka, and other northern coastal communities, which have cool temperatures (daily highs of less than 65 degrees) for the majority of the year and can receive a considerable amount of fog and rainfall.

OEHHA recommends consulting the local air district for assistance on selecting the most appropriate climate.

Table 5.11 Recommended Annual Dermal Load Point Estimates (in mg/kg-yr) for Dermal Exposure

	3rd Trimester[a]	Children 0<2 yrs	Children 2<9 yrs	Children 2<16 yrs	Adults[b]	Offsite Worker[c]
Warm climate						
Mean	1.2×10^3	3.6×10^3	7.5×10^3	6.4×10^3	1.2×10^3	2.6×10^3
95th percentile	2.6×10^3	4.3×10^3	9.1×10^3	8.5×10^3	2.6×10^3	5.0×10^3
Mixed climate						
Mean	1.1×10^3	2.2×10^3	6.6×10^3	5.7×10^3	1.1×10^3	2.6×10^3
95th percentile	2.4×10^3	2.9×10^3	8.7×10^3	8.1×10^3	2.4×10^3	5.0×10^3
Cold climate						
Mean	0.7×10^3	1.2×10^3	3.1×10^3	2.8×10^3	0.7×10^3	2.6×10^3
95th percentile	2.1×10^3	1.9×10^3	5.2×10^3	5.1×10^3	2.1×10^3	5.0×10^3

[a] The ADL for the 3rd trimester of the fetus is based on the ADL of the mother; when normalized to body weight, we assume that exposure to the mother and the fetus will be the same

[b] Residential adult ADLs are for both 16<30 and 16-70 year age groups

[c] Assumes exposure only to face, hands and forearms regardless of climate region

Tables 5.12a - d Annual Dermal Load Distributions by Age Group and Climate for Stochastic Analysis

Table 5.12a Annual Dermal Load (mg/kg-yr) Distributions for the 0<2 Year Age Group

Climate Type	Warm climate	Mixed climate	Cold climate
Distribution	Student's t	Logistic	Triangular
Minimum			0.2×10^3
Likeliest			0.7×10^3
Maximum			2.6×10^3
Scale	0.41	0.28	
Deg. freedom	3		
Midpoint	3.6×10^3		
Mean	3.6×10^3	2.2×10^3	1.2×10^3
50th percentile	3.6×10^3	2.2×10^3	0.9×10^3
90th percentile	4.1×10^3	2.8×10^3	1.9×10^3
95th percentile	4.3×10^3	2.9×10^3	1.9×10^3
99th percentile	4.7×10^3	3.1×10^3	2.1×10^3

Table 5.12b Annual Dermal Load (mg/kg-yr) Distributions for the 2<9 Year Age Group

Climate Type	Warm climate	Mixed climate	Cold climate
Distribution	Min extreme	Min extreme	Triangular
Minimum			0.4×10^3
Likeliest	8.0×10^3	7.3×10^3	1.9×10^3
Maximum			6.9×10^3
Scale	0.1	1.3	
Mean	7.5×10^3	6.6×10^3	3.1×10^3
50th percentile	7.7×10^3	6.5×10^3	2.3×10^3
90th percentile	8.7×10^3	8.4×10^3	5.1×10^3
95th percentile	9.1×10^3	8.7×10^3	5.2×10^3
99th percentile	9.7×10^3	9.4×10^3	5.7×10^3

Table 5.12c Annual Dermal Load (mg/kg-yr) Distributions for the 2<16 Year Age Group

Climate Type	Warm climate	Mixed climate	Cold climate
Distribution	Min extreme	Logistic	Triangular
Minimum			0.3×10^3
Likeliest	7.2×10^3		1.6×10^3
Maximum			6.9×10^3
Scale	1.29	0.91	
Mean	6.4×10^3	5.7×10^3	2.8×10^3
50th percentile	6.6×10^3	5.7×10^3	2.2×10^3
90th percentile	8.1×10^3	7.7×10^3	4.8×10^3
95th percentile	8.5×10^3	8.1×10^3	5.1×10^3
99th percentile	9.3×10^3	8.9×10^3	5.6×10^3

Table 5.12d Annual Dermal Load (mg/kg-yr) Distributions for Residential Adults (Age 16-30 and 16-70 Years)[a] and Offsite Workers

Receptor	Residential Adult			Offsite Worker
Climate Type	Warm	Mixed	Cold	All Climates[b]
Distribution	Beta	Beta	Gamma	Lognormal
Minimum	0.2×10^3	0.02×10^3		
Maximum	3.3×10^3	0.3×10^3		
Scale			0.07	
Mean	1.2×10^3	1.1×10^3	0.7×10^3	2.6×10^3
50th percentile	1.2×10^3	1.0×10^3	0.5×10^3	2.3×10^3
90th percentile	2.4×10^3	2.1×10^3	1.6×10^3	4.5×10^3
95th percentile	2.6×10^3	2.4×10^3	2.1×10^3	5.0×10^3
99th percentile	2.9×10^3	2.6×10^3	2.3×10^3	6.4×10^3

[a] The ADL distribution for the 3rd trimester is based on the ADL distribution of the mother; we assume the same ADL distribution for residential adult (the mother) and the fetus

[b] Face, hands and forearms are exposed only, regardless of climate

Table 5.13 Dermal Absorption Fraction Factors (ABS) as Percent from Soil for Semi-Volatile and Solid Chemicals under the OEHHA "Hot Spots" Program

Chemical	ABS
Inorganic chemicals	
Arsenic	6
Beryllium	3
Cadmium	0.2
Chromium (VI)	2
Fluorides (soluble compounds)	3
Lead	3
Mercury	4
Nickel	2
Selenium	3
Organic chemicals	
Creosotes	13
Diethylhexylphthalate	9
Hexachlorobenzene	4
Hexachlorocyclohexanes	3
4,4'methylene dianiline	10
Pentachlorophenol	[a]
Polychlorinated biphenyls	14
Polychlorinated dibenzo-p-dioxins and dibenzofurans	3
Polycyclic aromatic hydrocarbons	13

[a] To be determined in future amendments to the Hot Spots Program

Skin permeability is related to the solubility or strength of binding of the chemical in the delivery matrix (soil or other particles) versus the receptor matrix, the skin's stratum corneum. Fractional dermal absorption point estimate values were derived by OEHHA from available literature sources for the semi-volatile and nonvolatile chemicals in the "Hot Spots" program. The rationale for the chemical-specific dermal absorption fraction values, and the use of default values in cases where sufficient data are lacking, can be found in Appendix F of the Technical Support Document for Exposure and Stochastic Analysis (OEHHA, 2012).

5.4.2.2 Chronic Noncancer Dermal Dose

Dermal exposure, and thus annual dermal load (ADL), varies by age group. Therefore, a time-weighted average ADL for age 0-70 years (0-2, 2-16, and 16-70 years) is estimated for chronic residential exposure using ADL values in Table 5.12. This exposure pathway is also assessed for offsite workers using the offsite worker ADL values in Table 5.12d. Children at a MEIW daycare, if present, may also be assessed for exposure if the District deems it advisable. The contribution to the dermal dose is determined for each age group in EQ 5.4.2.2:

A. Equation 5.4.2.2: $\mathbf{Dose_{dermal} = ADL \times Cs \times ABS \times 10^{-9} \times ED/AT \times (1/350)}$

1. $Dose_{dermal}$ = Exposure dose through dermal absorption (mg/kg/d)
2. ADL = Annual dermal load (mg/kg-yr), age-specific
3. Cs = Average soil concentration (μg/kg)
4. ABS = Fraction absorbed across skin (unitless)
5. 10^{-9} = Conversion factor for chemical & soil (μg to mg, mg to kg)
6. 1/350 = Conversion factor for ADL from yrs to days (Note: this conversion is needed to remove EF, expressed as 350 days/365 days, from the ADLs in Table 5.12a-d)
7. ED = Exposure duration for specified age groups: 2 yrs for 0<2, 14 yrs for 2<16, 54 yrs for 16-70 for residential exposure,
8. AT = Averaging time for residential exposure – 70 yrs

a: Recommended default values for EQ 5.4.2.2:

1. ADL = See Table 5.11 for point estimates by age group, climate region and receptor type (resident or worker)
2. Cs = Calculated above in EQ 5.3.2 A
3. ABS = See Table 5.13

b: Recommended off-site worker default modifications to EQ 5.4.2.2:

1. Chronic dermal dose to the off-site worker assumes only adult exposure and is incorporated into the off-site worker ADL in Table 5.12d.
2. A time-weighted average estimate of dose is not necessary and the ED and AT variates are left out of EQ 5.4.2.2 for dermal dose to the worker.

c: Recommended nursing mother default modifications to EQ 5.4.2.2:

1. For dermal dose to mother's milk, use the ADL for age 16-30 years in Table 5.12d.
2. The ED and AT variates in EQ 5.4.2.2 are left out for dermal dose in the mother's milk pathway.

d: Assumptions for EQ 5.4.2.2:

1. For cancer risk assessment, Exposure Frequency (EF) for vacation time away from exposure is incorporated into the ADLs shown in Tables 5.11 and 5.12 using the basic assumption that cancer risk is associated with cumulative dose of carcinogen. The dose used to estimate cancer risk can be adjusted for EF, and for time spent within the MEIR or MEIW location. Chronic RELs are not necessarily related to cumulative dose. Thus, adjusting the estimated dose for EF at the MEIR or MEIW is not appropriate, and the unadjusted daily rate is used in EQ 5.4.2.2.
2. For worker exposure, the annual average concentration should not be adjusted to account for worker and facility emission schedules, as done for

inhalation cancer risk assessment. The pollutant will be deposited and accumulate in the soil in the absence or presence of the worker; therefore, the total deposition and soil concentration will be dependent on the annual average air concentration.

For residential chronic exposure, the dermal dose contribution for each age group is summed together to obtain the time-weighted average daily dermal dose for chronic hazard assessment:

(ADL age 0<2 × Cs × ABS × 10^{-9} × 2 / 70 × (1/350)) +

(ADL age 2<16 × Cs × ABS × 10^{-9} × 14 / 70 × (1/350)) +

(ADL age 16-70 × Cs × ABS × 10^{-9} × 54 / 70 × (1/350)) = Chronic $Dose_{dermal}$

5.4.3 *Estimation of Exposure through Ingestion*

Exposure through ingestion is a function of the concentration of the substance in the ingested soil, water, and food, the gastrointestinal absorption of the substance, and the amount ingested.

5.4.3.1 Exposure through Ingestion of Soil

There are no distributions for soil ingestion currently recommended. Tier III stochastic risk assessments should include a high-end point estimate of soil ingestion, soil loading, exposure frequency and soil area.

5.4.3.1.1 Soil Ingestion Dose for Cancer Risk

The exposure dose through residential soil ingestion varies by age and is calculated for each age group ((e.g., 3rd trimester, 0<2 yrs, 2<9 yrs, 2<16 yrs, 16<30 and 16-70 yrs). These age-specific groupings are needed in order to properly use the age sensitivity factors for cancer risk assessment (see Chapter 8). This pathway is also assessed for exposure to off-site workers. Children at a MEIW daycare, if present, may also be assessed for exposure if the District deems it advisable. The dose from inadvertent soil ingestion can be estimated by the point estimate approach using the following general equation:

A. Equation 5.4.3.1.1: $DOSE_{soil} = C_{soil} \times GRAF \times SIR \times 10^{-9} \times EF$

1. $DOSE_{soil}$ = Dose from soil ingestion (mg/kg BW-day)
2. 10^{-9} = Conversion factor (μg to mg, mg to kg)
3. C_{soil} = Concentration of contaminant in soil (μg/kg)
4. GRAF = Gastrointestinal relative absorption fraction, chemical-specific (unitless)
5. SIR = Soil ingestion rate (mg/kg BW-day)
6. EF = Exposure frequency (unitless), (days/365 days)

a: Recommended default values for EQ 5.4.3.1.1:

1. C_{soil} = Calculated above in EQ 5.3.2 A
2. GRAF = See Table 5.2
3. SIR = See Table 5.14
4. EF = 350 d/year resident, 250 d/year worker

In this approach, it is assumed that the soil ingested contains a representative concentration of the contaminant(s) and the concentration is constant over the exposure period.

The term **GRAF**, or gastrointestinal relative absorption factor, is defined as the fraction of contaminant absorbed by the GI tract relative to the fraction of contaminant absorbed from the matrix (feed, water, other) used in the study(ies) that is the basis of either the cancer potency factor (CPF) or the Reference Exposure Level (REL). If no data are available to distinguish absorption in the toxicity study from absorption from the environmental matrix in question (i.e., soil), then GRAF = 1. The GRAF allows for adjustment for absorption from a soil matrix if it is known to be different from absorption across the GI tract in the study used to calculate the CPF or REL. In most instances, the GRAF will be 1.

Table 5.14 Recommended Soil Ingestion Rate (SIR) Estimates for Adults and Children (mg/kg-day)*

Age Groups (years)	Mean (mg/kg-day)	95th % (mg/kg-day)
3rd Trimester[a]	0.7	3
0<2	20	40
2<9	5	20
2<16	3	10
16<30	0.7	3
16 to 70	0.6	3
PICA adult	NR	-

[a] Assumed to be the mother's soil ingestion rate (adult age 16 <30)
* Soil includes outdoor settled dust
NR = No recommendation

5.4.3.1.2 Chronic Noncancer Dose for Soil Ingestion

The soil ingestion rate varies by age. A time-weighted average approach is used to combine soil intake rates of the age groupings (i.e., 0<2 yrs, 2<16 yrs, and 16-70 yrs) to determine the residential soil ingestion dose for chronic noncancer hazard assessment. This pathway is also assessed for exposure to offsite workers using the adult intake values for age 16-70 years in Table 5.14. Children at a MEIW daycare, if present, may also be assessed for exposure if the District deems it advisable. The contribution to the soil ingestion dose by each age group is determined in EQ 5.4.3.1.2:

A. Equation 5.4.3.1.2: $$DOSE_{soil} = C_{soil} \times GRAF \times SIR \times 10^{-9} \times ED/AT$$

1. $DOSE_{soil}$ = Dose from soil ingestion (mg/kg BW-day)
2. 10^{-9} = Conversion factor (μg to mg, mg to kg)
3. C_{soil} = Concentration of contaminant in soil (μg/kg)
4. GRAF = Gastrointestinal relative absorption fraction, unitless; chemical-specific
5. SIR = Soil ingestion rate (mg/kg BW-day)
6. ED = Exposure duration for a specified age group: 2 yrs for 0<2, 14 yrs for 2<16, 54 yrs for 16-70
7. AT = Averaging time for lifetime exposure – 70 yrs

a: Recommended default values for EQ 5.4.3.1.2:

1. C_{soil} = Calculated above in EQ 5.3.2 A
2. GRAF = See Table 5.2
3. SIR = See Table 5.14; use 16-70 age group SIR for workers

b: Recommended off-site worker default modifications to EQ 5.4.3.1.2:

1. A time-weighted average estimate of dose is not necessary and the ED and AT variates are left out of EQ 5.4.3.1.2 for oral soil dose to the worker.

c: Recommended nursing mother default modifications to EQ 5.4.3.1.2:

1. For mother's ingested soil dose to milk, use the SIR for age 16-30 years in Table 5.14.
2. The ED and AT variates in EQ 5.4.3.1.2 are left out for soil ingestion dose in the mother's milk pathway.

d: Assumptions for EQ 5.4.3.1.2:

1. For worker exposure, the annual average concentration should not be adjusted to account for overlap of worker and facility emission schedules. The pollutant will be deposited and accumulate in the soil in the absence or presence of the worker; therefore, the total deposition and soil concentration will be dependent on the annual average air concentration.

For residential exposure, the soil ingestion dose contribution for each age group is summed together to obtain the time-weighted average daily soil intake dose for chronic hazard assessment:

(SIR for age 0<2 yrs × C_{soil} × GRAF × 10^{-9} × 2 / 70) +

(SIR for age 2<16 yrs × C_{soil} × GRAF × 10^{-9} × 14 / 70) +

(SIR for age 16-70 yrs × C_{soil} × GRAF × 10^{-9} × 54 / 70) = Chronic $Dose_{soil}$

5.4.3.2 Exposure through Ingestion of Food

The exposure through food ingestion can be through ingestion of home-grown plant products (categorized as leafy, protected, exposed and root produce), home-raised animals (categorized as meat, cow's milk and eggs), angler-caught fish and mother's milk. When a specific food pathway is a dominant pathway (e.g., homegrown produce), and multiple pathways such as home raised meat, milk, and eggs categories all need to be assessed, the 95th percentile default consumption rate for the driving exposure pathway is used, while the mean consumption values for the remaining exposure pathways (i.e., food categories) are used. See Section 8.2.6 for a complete discussion of the methodology on how to implement the derived methodology.

5.4.3.2.1 Dose for Cancer Risk from Home-Grown Produce

Exposure through ingesting home-grown produce (DOSEp) is a function of the type of crop (i.e., exposed, leafy, protected, root), gastrointestinal relative absorption factor, bioavailability and the fraction of plant ingested that is homegrown. The calculation is done for each type of crop, then summed to get total dose for this pathway. The

exposure dose through ingestion of home-grown produce varies by age and is calculated for each age group (e.g., 3rd trimester, 0<2 yrs, 2<9 yrs, 2<16 yrs, 16<30 and 16-70 yrs). These age-specific groupings are needed in order to properly use the age sensitivity factors for cancer risk assessment (see Chapter 8).

A. Equation 5.4.3.2.1: $$DOSEp = C_v \times IP \times GRAF \times L \times EF \times 10^{-6}$$

1. DOSEp = Exposure dose through ingestion of home-grown produce (mg/kg/d)
2. C_v = Concentration in specific type of crop, i.e., exposed, leafy, protected, root (μg/kg)
3. IP = Consumption of specific type of crop (g/kg BW*day)
4. GRAF = Gastrointestinal relative absorption factor (unitless)
5. L = Fraction of plant type consumed that is home-grown or locally grown (unitless)
6. EF = Exposure frequency (unitless, days/365 days)
7. 10^{-6} = Conversion factors (μg/kg to mg/g)

a: Recommended default values for Equation 5.4.3.2.1:

1. C_v = Calculated above in EQ 5.3.4.1 A
2. IP = See Table 5.15 (point estimates) and 5.16a-e (distributions)
3. GRAF = See Table 5.2
4. L = Site-specific survey is recommended. Otherwise, see Table 5.17 for Tier I default values
5. EF = 0.96 (350 d/365 d in a yr)

Once the dose for each type of crop that applies is calculated (See Section 5.3.4.1 for definition of crops types), the doses are summed to get the total dose for the home-grown produce pathway:

Total DOSEp = DOSEp (leafy) + DOSEp (root) + DOSEp (exposed) + DOSEp (protected)

The total home-grown produce dose will need to be calculated for each age group that applies.

5.4.3.2.2 Dose for cancer risk from home-raised meat, eggs, and cow's milk

Exposure through ingesting home-raised or farm animal products ($DOSE_{fa}$) is a function of the type of food (meat, eggs and cow's milk), gastrointestinal relative absorption factor, bioavailability and the fraction of food ingested that is home-raised. The only meat sources considered here are beef, pork and poultry. Unlike the home-grown produce pathway, the dose is calculated and presented separately for each type of home-raised food. The age-specific groupings to determine dose (3rd trimester, 0<2 yrs, 2<9 yrs, 2<16 yrs, 16<30 yrs or 16-70 yrs) is needed in order to properly use the age sensitivity factors for cancer risk assessment (see Chapter 8).

A. Equation 5.4.3.2.2: $DOSE_{fa} = C_{fa} \times I_{fa} \times GRAF \times L \times EF \times 10^{-6}$

1. $DOSE_{fa}$ = Exposure dose through ingestion of home-raised animal product (mg/kg/d)
2. C_{fa} = Concentration in animal product, e.g., beef, pork, poultry, dairy, eggs (μg/kg)
3. I_{fa} = Consumption of animal product (g/kg BW-day)
4. GRAF = Gastrointestinal relative absorption factor (unitless)
5. L = Fraction of animal product consumed that is home-raised or locally produced (unitless)
6. EF = Exposure frequency (unitless, days/365 days)
7. 10^{-6} = Conversion factors (μg/kg to mg/g)

a: Recommended default values for EQ 5.4.3.2.2:

1. C_{fa} = Calculated above in EQ 5.3.4.2 A
2. I_{fa} = See Table 5.15 (point estimates) and Table 5.16a-e (distributions)
3. GRAF = See Table 5.2
4. L = Site-specific survey is recommended. Otherwise, see Table 5.17 for Tier I default values
5. EF = 0.96 (350 days / 365 days in a year)

5.4.3.2.3 Chronic Noncancer Dose for Ingestion of Food

For oral noncancer hazard assessment, a time-weighted average approach is used to combine food ingestion rates for the age groups (i.e., 0<2, 2<16 and 16-70 yrs) to estimate the chronic dose for residential exposure. The equation used to estimate dose through home-grown produce and home-raised meat/eggs/cow's milk is similar and is shown below in one equation. Similar to the cancer risk dose calculation, home-grown produce is presented as a total dose for all types of crops (See Section 5.4.3.2.1) and home-raised animal product dose is presented separately for each type of animal product that applies (See Section 5.4.3.2.2).

The contribution to the food intake dose is determined for each age group in EQ 5.4.3.2.3:

A. Equation 5.4.3.2.3: $\mathbf{DOSE_{food} = C_{food} \times I_{food} \times GRAF \times L \times 10^{-6} \times ED/AT}$

1. $DOSE_{food}$ = Exposure dose through ingestion of home-grown produce or home-raised animal product (mg/kg/d)
2. C_{food} = Concentration (μg/kg) in produce (e.g., exposed, leafy, protected, root) or animal product (e.g., beef, pork, poultry, dairy, eggs)
3. I_{food} = Consumption of produce or animal product (g/kg BW-day)
4. GRAF = Gastrointestinal relative absorption factor (unitless)
5. L = Fraction of produce or animal product consumed that is home-grown (unitless)
6. 10^{-6} = Conversion factors (μg/kg to mg/g)
7. ED = Exposure duration for a specified age group (2 yrs for 0<2, 14 yrs for 2<16, 54 yrs for 16-70
8. AT = Averaging time for lifetime exposure: 70 yrs

a: Recommended default values for EQ 5.4.3.2.3:

1. C_{food} = Calculated above in EQ 5.3.4.1 A (for home-grown produce) or EQ 5.3.4.2 A (for home-raised animal products)
2. I_{food} = Age-specific, see Table 5.15 for point estimates
3. GRAF = See Table 5.2
4. L = Site-specific survey is recommended. Otherwise, see Table 5.17 for Tier I default values

b: Recommended nursing mother default modifications to EQ 5.4.3.2.3:

1. For the mother's dose to milk through ingested food, use the food intake rates for age 16-30 years in Table 5.15 and 5.16d.
2. The ED and AT variates in EQ 5.4.3.2.3 are left out for ingested food dose in the mother's milk pathway.

Following calculation of the intake dose contributions for each age group, the intake rates for home-grown produce and the intake rates for home-raised animal products are summed separately to obtain the residential time-weighted average intake dose for chronic residential exposure to home-grown produce and to home-raised animal products:

(I_{food} for age 0<2 yrs × C_{food} × GRAF × L × 10^{-6} × 2 / 70) +

(I_{food} for age 2<16 yrs × C_{food} × GRAF × L × 10^{-6} × 14 / 70) +

(I_{food} for age 16-70 yrs × C_{food} × GRAF × L × 10^{-6} × 54 / 70) = Chronic $Dose_{food}$

Table 5.15 Recommended Average and High End Point Estimate Values for Home Produced Food Consumption (g/kg-day)

Food Category	Third Trimester		Ages 0<2		Ages 2<9	
Produce	Avg.	High End	Avg.	High End	Avg.	High End
Exposed	1.9	5.9	11.7	30.2	7.4	21.7
Leafy	0.9	3.2	3.8	10.8	2.5	7.9
Protected	1.7	5.8	5.9	17.5	4.7	13.3
Root	1.7	4.6	5.7	15.3	3.9	10.8
Meat						
Beef	2.0	4.8	3.9	11.3	3.5	8.6
Poultry	0.9	2.9	2.9	10.5	2.2	7.8
Pork	1.8	4.7	4.5	11.4	3.7	9.0
Milk	5.4	15.9	50.9	116	23.3	61.4
Eggs	1.6	4.2	6.1	15.0	3.9	9.4
	Ages 2>16		Ages 16<30		Ages 16-70	
Produce	Avg.	High End	Avg.	High End	Avg.	High End
Exposed	1.9	5.9	1.9	5.9	1.8	5.6
Leafy	0.9	3.2	0.9	3.2	1.1	3.4
Protected	1.7	5.8	1.7	5.8	1.6	5.2
Root	1.7	4.6	1.7	4.6	1.5	4.2
Meat						
Beef	2.0	4.8	2.0	4.8	1.7	4.4
Poultry	0.9	2.9	0.9	2.9	0.9	2.8
Pork	1.8	4.7	1.8	4.7	1.5	3.8
Milk	5.4	15.9	5.4	15.9	4.3	13.2
Eggs	1.6	4.2	1.6	4.2	1.3	3.4

[a] Food consumption values for 3rd trimester calculated by assuming that the fetus receives the same amount of contaminated food on a per kg BW basis as the mother (adult age 16 to less than 30).

Table 5.16a - e Parametric Models of Per Capita Food Consumption by Age Group for Stochastic Analysis

Table 5.16a Per Capita Food Consumption (g/kg-day) for Ages 0<2

Food Category	Distrib. Type	Anderson-Darling Statistic	Mean	Std. Dev	Location	Scale	Shape	Like-liest
Produce								
Exposed	Gamma	60			0.01	6.56	0.830	
Leafy	Gamma	167			0.01	3.30	1.161	
Protected	LogN	67	6.03	7.31				
Root	Gamma	83			0.06	4.44	1.28	
Meat								
Beef	LogN	16	1.97	1.73				
Poultry	LogN	58	4.5	4.08				
Pork	LogN	230	3.00	4.46				
Dairy	Max Ext.	169				27.82		33.79
Eggs	LogN	172	6.11	4.21				

Table 5.16b Per Capita Food Consumption (g/kg-day) for Ages 2<9

Food Category	Distribution Type	Anderson-Darling Statistic	Mean	Std. Dev	Location	Scale	Shape	Rate
Produce								
Exposed	Exponential	206						0.14
Leafy	LogN	127	2.64	3.89				
Protected	Weibull	68			0.02	4.76	1.063	
Root	LogN	60	3.95	3.85				
Meat								
Beef	LogN	35	3.55	2.79				
Poultry	LogN	17	3.71	2.67				
Pork	LogN	66	2.25	2.84				
Milk	LogN	12	23.4	20.78				
Eggs	LogN	38	3.93	3.00				

Table 5.16c Per Capita Food Consumption (g/kg-day) for Ages 2<16

Food Category	Distribution Type	Anderson-Darling Statistic	Mean	Std. Dev	Location	Scale	Shape
Produce							
Exposed	Gamma	60			0.01	6.54	0.8325
Leafy	LogN	68	1.83	2.91			
Protected	Gamma	47			0.00	3.69	0.9729
Root	LogN	51	3.10	3.44			
Meat							
Beef	LogN	10	2.96	2.49			
Poultry	LogN	27	2.98	2.52			
Pork	LogN	48	1.84	2.79			
Milk	LogN	35	16.8	19.2			
Eggs	LogN	71	3.16	2.95			

Table 5.16d Per Capita Food Consumption (g/kg-day) for Ages 16-30[a]

Food Category	Distribution Type	Anderson-Darling Statistic	Mean	Std. Dev	Location	Scale	Shape
Produce							
Exposed	Gamma	70			0.01	2.05	0.9220
Leafy	Weibull	191			0.00	0.88	0.8732
Protected	LogN	93	1.81	3.31			
Root	LogN	43	1.69	1.69			
Meat							
Beef	LogN	26	1.98	1.54			
Poultry	LogN	26	1.80	1.42			
Pork	LogN	242	1.01	1.74			
Milk	Gamma	22			0.02	5.66	0.9421
Eggs	LogN	29	1.55	1.36			

[a] These distributions are also recommended for the third trimester. Food consumption values for 3rd trimester are calculated by assuming that the fetus receives the same amount of contaminated food on a per kg BW basis as the mother (adult age 16<30).

Table 5.16e Per Capita Food Consumption (g/kg-day) for Ages 16-70

Food Category	Distribution Type	Anderson-Darling Statistic	Mean	Std. Dev	Location	Scale	Shape
Produce							
Exposed	Gamma	148			0.01	2.07	0.8628
Leafy	Gamma	83			0.00	1.15	0.9713
Protected	Gamma	78			0.01	1.90	0.8325
Root	Gamma	14			0.00	1.28	1.166
Meat							
Beef	LogN	20	1.75	1.40			
Poultry	LogN	18	1.53	1.18			
Pork	LogN	190	0.97	1.59			
Milk	Gamma	20			0.00	4.50	0.9627
Eggs	LogN	30	1.3	1.01			

Table 5.17 Default Values for L in EQs 5.4.3.2.1., 5.4.3.2.2 and 5.4.3.2.3: Fraction of Food Intake that is Home-Produced

Food Type	Households that Garden[a]	Households that Farm[a]
Avg. Total Veg & Fruits	0.137	0.235
	Households that Garden/Hunt[b]	**Households that Farm[b]**
Beef	0.485	0.478
Pork	0.242	0.239
Poultry	0.156	0.151
Eggs	0.146	0.214
Total Dairy (Cow's milk)	0.207	0.254

[a] As a default for home-produced leafy, exposed, protected and root produce, OEHHA recommends 0.137 as the fraction of produce that is home-grown. The households that grow their own vegetables and fruits are the population of concern. In rural situations where the receptor is engaged in farming, OEHHA recommends 0.235 as the default value for fraction of leafy, exposed, protected and root produce that is home-grown.

[b] OEHHA recommends the fraction home-raised under "Households that raise animals/hunt" (for beef, pork, poultry (chicken), eggs and dairy (cow's milk), with the exception of rural household receptors engaged in farming. OEHHA recommends that the fractions listed under "Households that farm" be used for the rural household receptors.

5.4.3.3 Exposure through Ingestion of Water

Intake of drinking water varies by age on a ml per kg body weight per day basis resulting in differences in exposure dose by age. The age-specific groupings to determine dose are needed in order to properly use the age sensitivity factors for

cancer risk assessment (see Chapter 8) and to calculate a time-weighted average dose for chronic noncancer assessment.

5.4.3.3.1 Dose for Cancer Risk through Ingestion of Water

$DOSE_{water}$ is calculated for each age group (i.e., 3rd trimester, 0<2 yrs, 2<9 yrs, 2<16 yrs, 16<30 yrs and 16-70 yrs), then incorporated into EQ 8.2.5 in Chapter 8 to determine cancer risk through exposure in drinking water.

A. Equation 5.4.3.3.1: $$\mathbf{DOSE_{water} = C_w \times WIR \times ABS_{wa} \times Fdw \times EF \times 10^{-6}}$$

1. $DOSE_{water}$ = Exposure dose through ingestion of water (mg/kg BW/d)
2. C_w = Water concentration (μg/L)
3. WIR = Water ingestion rate (ml/kg BW-day)
4. ABS_{wa} = Gastrointestinal relative absorption factor (unitless)
5. Fdw = Fraction of drinking water from contaminated source
6. EF = Exposure frequency (unitless, days/365 days)
7. 10^{-6} = Conversion factors (mg/μg)(L/ml)

a: Recommended default values for EQ 5.4.3.3.1:

1. C_w = Calculated above 5.3.3 A
2. WIR = See 5.18 (point estimates) and Table 5.19 (distributions)
3. ABS_{wa} = Default set to 1
4. Fdw = Default set to 1, although a site-specific survey is recommended for this variate
5. EF = 0.96 (350 days/365 days in a year)

5.4.3.3.2 Chronic Noncancer Dose through Ingestion of Water

Because water intake varies by age group, a time-weighted average intake approach is used to determine the daily water ingestion dose for chronic residential exposure. The contribution to the water ingestion dose is determined for each age group (i.e., 0<2, 2<16 and 16-70 yrs) in EQ 5.4.3.3.2.

A. Equation 5.4.3.3.2:

$$\mathbf{DOSE_{water} = C_w \times WIR \times ABS_{wa} \times Fdw \times 10^{-6} \times ED/AT}$$

1. $DOSE_{water}$ = Exposure dose through ingestion of water (mg/kg BW/d)
2. C_w = Water concentration (μg/L)
3. WIR = Water ingestion rate (ml/kg BW-day)
4. ABS_{wa} = Gastrointestinal absorption factor
5. Fdw = Fraction of drinking water from contaminated source (site-specific)
6. 10^{-6} = Conversion factors (mg/μg)(L/ml)
7. ED = Exposure duration for a specified age group: 2 yrs for 0<2, 14 yrs for 2<16, 54 yrs for 16-70
8. AT = Averaging time for residential exposure: 70 yrs

a: Recommended default values for EQ 5.4.3.3.2:

1. C_w = Calculated above in 5.3.3 A
2. WIR = See 5.18 (point estimates)
3. ABS_{wa} = Default set to 1
4. Fdw = Default set to 1, although a site-specific survey is recommended for this variate

b: Recommended nursing mother default modifications to EQ 5.4.3.3.2:

1. For the dose to mother's milk through water ingestion, use the WIR for age 16-30 years in Table 5.18.
2. The ED and AT variates in EQ 5.4.3.3.2 are left out for ingested water dose in the mother's milk pathway.

The water intake dose contribution for each age group is summed together to obtain the time-weighted average daily residential water ingestion dose:

(WIR for age 0<2 yrs × C_w × ABS_{wa} × Fdw × 10^{-6} × 2 / 70) +

(WIR for age 2<16 yrs × C_w × ABS_{wa} × Fdw × 10^{-6} × 14 / 70) +

(WIR for age 16-70 yrs × C_w × ABS_{wa} × Fdw × 10^{-6} × 54 / 70) = Chronic $Dose_{water}$

Table 5.18 Recommended Point Estimate Tap Water Intake Rates (ml/kg-day)

Point Estimates				
Using Mean Values	**For the Age Period**	**9-year scenario**	**30-year scenario**	**70-year scenario**
	3rd trimester	18	18	18
	0<2 years	113	113	113
	2<9 years	26	-	-
	2<16 years	-	24	24
	16-30 years	-	18	-
	16-70 years	-	-	18
Using 95th-percentile values	**For the Age Period**	**9-year scenario**	**30-year scenario**	**70-year scenario**
	3rd trimester	47	47	47
	0<2 years	196	196	196
	2<9 years	66	-	-
	2<16 years	-	61	61
	16-30 years	-	47	-
	16-70 years	-	-	45

Table 5.19 Recommended Distributions of Tap Water Intake Rates (ml/kg-day) for Stochastic Risk Assessment

	9-year scenario	**30-year scenario**	**70-year scenario**
0<2 years	**Max Extreme** Likeliest = 93 Scale = 35	**Max Extreme** Likeliest = 93 Scale = 35	**Max Extreme** Likeliest = 93 Scale = 35
2<9 years	**Weibull** Location = 0.02 Scale = 29 Shape = 1.3		
2<16 years		**Gamma** Location = 0.19 Scale = 15.0 Shape = 1.6	**Gamma** Location = 0.19 Scale = 15.0 Shape = 1.6
16-30 years		**Gamma** location=0.49 scale=13.6 shape=1.26	
16-70 years			**Beta** min=0.17 max=178 alpha=1.5 beta= 12.9

5.4.3.4 Exposure through Ingestion of Angler-caught Fish

Exposure through ingestion of angler-caught fish ($DOSE_{fish}$) is a function of the fraction of fish ingested that is caught in the exposed water body, which differs for each age grouping, and the gastrointestinal absorption factor. Ingestion of angler-caught fish on a mg/kg body weight per day basis varies by age resulting in differences in exposure dose by age. The age-specific groupings to determine dose is needed primarily to properly use the age sensitivity factors for cancer risk assessment (see Chapter 8) and to calculate a time-weighted average dose for chronic noncancer assessment.

5.4.3.4.1 Cancer Risk Dose via Ingestion of Angler-Caught Fish

$DOSE_{fish}$ is calculated for each age group separately (i.e., 3rd trimester, 0<2 yrs, 2<9 yrs, 2<16 yrs, 16<30 yrs and 16-70 yrs), then incorporated into EQ 8.2.5 in Chapter 8 to determine cancer risk through exposure to angler-caught fish.

A. Equation 5.4.3.4.1: $$DOSE_{fish} = C_t \times I_{fish} \times Gf \times L \times EF \times 10^{-6}$$

1. $DOSE_{fish}$ = Dose via ingestion of angler-caught fish (mg/kg BW-day)
2. C_t = Concentration in fish muscle tissue (μg/kg)
3. I_{fish} = Angler-caught fish ingestion rate (g/kg BW per day)
4. Gf = Gastrointestinal absorption factor (unitless)
5. L = Fraction of fish caught at exposed site (unitless)
6. EF = Exposure frequency (days/365 days)
7. 10^{-6} = Conversion factor (mg/μg, kg/g)

a: Recommended default values for Equation 5.4.3.4.1:

1. C_t = Calculated above in Equation 5.3.4.7
2. I_{fish} = See Table 5.20 (point estimates) and Table 5.21 (distributions)
3. Gf = Default set to 1
4. L = Default set to 1 for fraction of fish caught locally, although a site-specific survey is recommended for this variate
5. EF = 0.96 (350 days/365 days in a yr)

5.4.3.4.2 Chronic Noncancer Dose via Ingestion of Angler-Caught Fish

Angler-caught fish consumption varies by age group. A time-weighted average intake for residential consumption over 70 years is used to determine dose for average and high-end exposure. The contribution to the angler-caught fish consumption dose is determined for each age group in EQ 5.4.3.4.2:

A. Equation 5.4.3.4.2: $\mathbf{DOSE_{fish} = C_t \times I_{fish} \times Gf \times L \times 10^{-6} \times ED/AT}$

1. $DOSE_{fish}$ = Dose via ingestion of angler-caught fish (mg/kg BW-day)
2. C_t = Concentration in fish muscle tissue (μg/kg)
3. I_{fish} = Angler-caught fish ingestion rate (g/kg BW per day)
4. Gf = Gastrointestinal absorption factor (unitless)
5. L = Fraction of fish caught at exposed site (unitless)
6. 10^{-6} = Conversion factor (mg/μg, kg/g)
7. ED = Exposure duration for a specified age group: 2 yrs for 0<2, 14 yrs for 2<16 and 54 yrs for 16-70
8. AT = Averaging time for chronic exposure – 70 yrs

a: Recommended default values for Equation 5.4.3.4.2:

1. C_t = Calculated above in Equation 5.3.4.7
2. I_{fish} = See Table 5.20 (point estimates)
3. Gf = Default set to 1
4. L = Default set to 1 for fraction of fish caught locally, although a site-specific survey is recommended for this variate

b: Recommended nursing mother default modifications to EQ 5.4.3.4.2:

1. For the dose to mother's milk through fish consumption, use the I_{fish} for age 16-30 years in Table 5.20.
2. The ED and AT variates in EQ 5.4.3.4.2 are left out for the dose via fish consumption in the mother's milk pathway.

Following calculation of the angler-caught fish consumption dose contribution for each age group, 0<2 yr, 2<16 yr and 16-70 yr fish consumption doses are summed together to obtain the residential chronic dose:

(I_{fish} for age 0<2 yrs × C_t × Gf × L × 10^{-6} × 2 / 70) +

(I_{fish} for age 2<16 yrs × C_t × Gf × L × 10^{-6} × 14 / 70) +

(I_{fish} for age 16-70 yrs × C_t × Gf × L × 10^{-6} × 54 / 70) = Chronic $Dose_{fish}$

Table 5.20 Point Estimate Values for Angler-Caught Fish Consumption (g/kg-day) by Age Group

	Third Trimester	0 <2 Years	2<9 Years	2<16 Years	16<30 Years	16-70 Years
Mean	0.38	0.18	0.36	0.36	0.38	0.36
95th Percentile	1.22	0.58	1.16	1.16	1.22	1.16

Table 5.21 Empirical Distribution for Angler-Caught Fish Consumption (g/kg-day)

Mean	Percentile									
	10th	20th	30th	40th	50th	60th	70th	80th	90th	95th
Third trimester, 2<9, 2<16, 16<30 and 16-70-year age groups										
0.36	0.06	0.09	0.12	0.16	0.21	0.27	0.36	0.50	0.79	1.16
0<2-year age group										
0.18	0.03	0.05	0.06	0.08	0.11	0.14	0.18	0.25	0.40	0.58

5.4.3.5 Mother's Milk

Exposure through mother's milk ingestion (Dose-Im) is a function of the average concentration of the substance in mother's milk and the amount of mother's milk ingested. The minimum pathways that the nursing mother is exposed to include inhalation, soil ingestion, and dermal, since the chemicals evaluated by the mother's milk pathway are multipathway chemicals. Other pathways may be appropriate depending on site conditions (e.g., the presence of vegetable gardens or home grown chickens). The compounds currently considered for the mother's milk pathway are:

1. Dioxins and Furans (PCDDS and PCDFs)
2. Polychlorinated biphenyls (PCBs)
3. Polycyclic Aromatic Hydrocarbons (PAHs), including creosotes
4. Lead

These compound classes represent the chemicals of greatest concern for the mother's milk pathway under the Hot Spots program, and for which data are available to estimate transfer coefficients. It is expected that additional transfer coefficients will be developed for other multipathway chemicals in the Hot Spots Program as data becomes available and is reviewed. The nursing mother in the mother's milk pathway is not herself subject to the mother's milk pathway. The summed average daily dose (mg/kg BW-day) from all pathways is calculated for the nursing mother using the equations that follow.

5.4.3.5.1 Cancer Risk Dose to Infant via Mother's Milk

A. Equation 5.4.3.5.1: $$\textbf{Dose-Im} = C_m \times BMI_{bw} \times EF \times 10^{-3}$$

1. Dose-Im = Dose to infant through ingestion of mother's milk (mg/kg BW per day)
2. C_m = Concentration of contaminant in mother's milk (mg/kg milk)
3. BMI_{bw} = Daily breast-milk ingestion rate (g/kg BW-day)
4. EF = Frequency of exposure (days / 365 days)
5. 10^{-3} = Conversion factor (kg to g)

a: Recommended default values for EQ 5.4.3.5.1:

1. C_m = See EQ 5.3.4.8
2. BMI_{bw} = See Table 5.22 for point estimates. For distribution (parametric model) for Tier 3 stochastic risk assessments see Table 5.23.
3. EF = 1 (all 365 days of the first year of birth)

b: Assumptions for EQ 5.4.3.5.1:

1. For the MEIR, mother is exposed from birth up to 25 years of age when the infant is born. The exposed infant is then fully breastfed only during the first year of life.
2. For cancer risk assessment, exposure of breast-feeding infants to contaminants in breast milk applies only to the first year of the 0<2 yr age group for calculation of risk to this group, which then can be summed with the risk calculated for the other age groups (See Chapter 8).

5.4.3.5.2 Chronic Noncancer Dose to Infant via Mother's Milk

For oral noncancer hazard assessment, exposure of the infant through mother's milk ingestion occurs during the first year of life. After one year of age, the mother's milk pathway is not a factor for noncancer assessment.

A. Equation 5.4.3.5.2: $\text{Dose-Im} = C_m \times BMI_{bw} \times 10^{-3}$

1. Dose-Im = Dose to infant through ingestion of mother's milk (mg/kg BW/d)
2. C_m = Concentration of contaminant in mother's milk (mg/kg milk)
3. BMI_{bw} = Daily breast-milk ingestion rate (g/kg BW-day)
4. 10^{-3} = Conversion factor (kg to g)

a: Recommended default values for EQ 5.4.3.5.2:

1. C_m = See EQ 5.3.4.8
2. BMI_{bw} = See Table 5.22 for point estimates

Table 5.22 Default Point Estimates for Breast Milk Intake (BMI_{bw}) for Breastfed Infants

Infant Group	Intake (g/kg-day)
Fully breastfed over the first year (i.e., fed in accordance with AAP recommendations)	
Mean	101
95th percentile	139

Table 5.23 Recommended Distribution of Breast Milk Intake Rates Among Breastfed Infants for Stochastic Assessment* (Averaged Over an Individual's First Year of Life)

	Mean (SD)	Percentile							
		5	10	25	50	75	90	95	99
Intake (g/kg-day)	101 (23)	62	71	85	101	116	130	139	154

* For stochastic analysis, the mother's milk data are normally distributed.

5.5 References

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6 - Dose-Response Assessment for Noncarcinogenic Endpoints

6.1 Derivation of Toxicity Criteria for Noncancer Health Effects

Dose-response assessment describes the quantitative relationship between the amount of exposure to a substance (the dose) and the incidence or occurrence of an adverse health impact (the response). Dose-response information for noncancer health effects is used to determine Reference Exposure Levels (RELs). Inhalation RELs are air concentrations or doses at or below which adverse noncancer health effects are not expected even in sensitive members of the general population under specified exposure scenarios. The acute RELs are for infrequent 1 hour exposures that occur no more than once every two weeks in a given year, although this time frame of exposure does not necessarily apply to chemicals that can bioaccumulate (e.g., dioxins and furans, PCBs, and various metals). The chronic RELs are for 24 hour per day exposures for at least a significant fraction of a lifetime, defined as about 8 years (≥12 percent of a 70-year lifespan). The 8-hour RELs are for repeated 8-hour exposures for a significant fraction of a lifetime such as the exposures that offsite workers might typically receive. Eight-hour RELs are only available for 10 chemicals at present, but OEHHA will develop 8-hour RELs as we re-evaluate our existing RELs to ensure they are protective of children's health, and as we develop RELs for new chemicals. There are oral chronic RELs for some chemicals in the Hot Spots program that are semivolatile or nonvolatile and thus subject to deposition and oral ingestion or dermal exposure. The methodology for developing RELs is similar to that used by U.S. EPA in developing the inhalation Reference Concentrations (RfCs) and oral Reference Doses (RfDs).

Review and revision of RELs to take into account new information and sensitive subpopulations including infants and children is an ongoing process. All draft RELs for individual chemicals revised under the current noncancer methodology will undergo public comment and peer review, as mandated by the Hot Spots Act. .

The first step in determining an acute, 8-hour, or chronic REL is to determine a point of departure. The point of departure is preferably determined by the benchmark concentration procedure applied to human or animal studies, but if this method of calculation cannot be used with a particular data set, a no observed adverse effect level (NOAEL) or lowest observed adverse effect level (LOAEL) may be used as the point of departure. The benchmark concentration method (also referred to as the benchmark dose method for oral exposures) is a preferred method to estimate a point of departure because it takes all of the available dose-response data into account to statistically estimate, typically, a 5 percent response rate.

Dosimetric or toxicokinetic adjustments are often made to the point of departure to adjust for differences in dosimetry or kinetics across species or among humans. Time adjustments are generally applied to adjust experimental exposure to the exposure of

interest for the REL (e.g., 1 hour for acute, continuous for chronic). A modified Haber's equation is used where needed to adjust studies with different exposure times to the one-hour period needed for acute RELs. A simple Haber's law (C x T) adjustment for exposure period duration is used for most 8-hour and chronic RELs.

The time and dosimetry adjusted point of departure is divided by uncertainty factors that reflect the limitations in the current toxicology of the chemical. For example, an interspecies uncertainty factor is applied to account for the differences between humans and animals when an animal study is used. An intraspecies uncertainty factor is usually included to account for differences in susceptibility among the human population. In addition, where benchmark dose modeling is not suitable and a NOAEL is not available, a LOAEL to NOAEL uncertainty factor may be applied when the LOAEL serves as the point of departure. If a chronic study is not available to serve as a basis for a chronic REL, then a subchronic uncertainty factor (for chronic and 8-hour RELs only) may also be applied. Finally, if there are data deficiencies, for example, lack of a developmental toxicity study for a chemical, then a database deficiency factor may be applied. The individual uncertainty factors, which range from 2 to 10 depending on the limitations in the data, are multiplied together for a total uncertainty factor. The point of departure is then divided by the total UF to obtain the REL.

The most sensitive toxicological end point is selected as the basis for the REL when there are multiple adverse health effects. The selection of the most sensitive endpoint as the basis for a REL helps ensure that the REL is protective for all health effects. The use of uncertainty factors helps ensure that the REL is protective for nearly all individuals, including sensitive subpopulations, within the limitations of current scientific knowledge. For detailed information on the methodology and derivations for RELs, including guidance on selection of uncertainty factors, see the Air Toxics Hot Spots Risk Assessment Guidelines Technical Support Document for the Derivation of Noncancer Reference Exposure Levels (OEHHA, 2008).

It should be emphasized that exceeding the acute or chronic REL does not necessarily indicate that an adverse health impact will occur. The REL is not the threshold where population health effects would first be seen. However, levels of exposure above the REL have an increasing but undefined probability of resulting in an adverse health impact, particularly in sensitive individuals (e.g., depending on the toxicant, the very young, the elderly, pregnant women, and those with acute or chronic illnesses). The significance of exceeding the REL is dependent on the seriousness of the health endpoint, the strength and interpretation of the health studies, the magnitude of combined safety factors, and other considerations. In addition, there is a possibility that a REL may not be protective of certain small, unusually sensitive human subpopulations. Such subpopulations can be difficult to identify and study because of their small numbers, lack of knowledge about toxic mechanisms, and other factors. It may be useful to consult OEHHA staff when a REL is exceeded (hazard quotient or hazard index is greater than 1.0). Chapter 8 discusses the methods used for determining potential noncancer health impacts and Appendix I presents example calculations used to determine a hazard quotient (HQ) and hazard indices (HI).

Tables 6.1 through 6.3 list the currently adopted acute, 8-hour, and chronic inhalation RELs. Some substances that pose a long-term inhalation hazard may also present a chronic hazard via non-inhalation (oral, dermal) routes of exposure. The oral RELs for these substances are presented in Table 6.3. Appendix L provides a consolidated listing of all the acute, 8-hour, and chronic RELs with the respective target organs that are approved for use by OEHHA and ARB for the Hot Spots Program. Periodically, new or updated RELs are adopted by OEHHA and these guidelines will be updated to reflect those changes. See OEHHA's web site at *www.oehha.ca.gov* (look under "Air", then select "Hot Spots Guidelines") to determine if any new or updated RELs have been adopted since the last guideline update.

6.2 Acute Reference Exposure Levels

OEHHA developed acute RELs for assessing potential noncancer health impacts for short-term, one-hour peak exposures to facility emissions (OEHHA, 2008; http://www.oehha.ca.gov/air/allrels.html). By definition, an acute REL is an exposure that is not likely to cause adverse health effects in a human population, including sensitive subgroups, exposed to that concentration (in units of micrograms per cubic meter or $\mu g/m^3$) for the specified exposure duration on an intermittent basis.

The target organ systems and the acute RELs for each substance are presented in Table 6.1. Many acute RELs are based on mild adverse effects, such as mild irritation of the eyes, nose, or throat, or may result in other mild adverse physiological changes. For most individuals, it is expected that the mild irritation and other adverse physiological changes will not persist after exposure ceases. For RELs that have been recently developed or revised, the notation "sensory irritation" has been added in parenthesis in Table 6.1 for those chemicals that have an acute REL based on sensory irritation of the respiratory system (i.e., nose , throat) and/or eyes.

Other acute RELs are based on reproductive/developmental endpoints, such as teratogenicity or fetotoxicity, which are considered severe adverse effects. The inhalation pathway is the only pathway to assess for acute exposure. Other non-inhalation pathways of exposure are evaluated for worker and residential scenarios where the exposures are chronic or repeated daily in nature. The oral RELs are used to evaluate the non-inhalation pathways of exposure. Noninhalation (oral) RELs are discussed in Section 6.5. Chapter 8 discusses the methods used for determining noncancer acute health impacts. Appendix I presents an example calculation used to determine an HQ and HI.

Table 6.1 Acute Inhalation Reference Exposure Levels (RELs) and Acute Hazard Index Target Organ System(s)

Substance	Chemical Abstract Service Number (CAS)	Acute Inhalation REL ($\mu g/m^3$)	Acute Hazard Index Target Organ Systems(s)
Acetaldehyde	75-07-0	$4.7 \times 10^{+2}$	Eyes; Respiratory System (sensory irritation)
Acrolein	107-02-8	$2.5 \times 10^{+0}$	Eyes; Respiratory System (sensory irritation)
Acrylic Acid	79-10-7	$6.0 \times 10^{+3}$	Eyes; Respiratory System
Ammonia	7664-41-7	$3.2 \times 10^{+3}$	Eyes; Respiratory System
Arsenic and Inorganic Arsenic Compounds (including arsine)	7440-38-2	2.0×10^{-1}	Development; Cardiovascular System; Nervous System
Benzene	71-43-2	$2.7 \times 10^{+1}$	Reproductive/Developmental; Immune System; Hematologic System
Benzyl Chloride	100-44-7	$2.4 \times 10^{+2}$	Eyes; Respiratory System
1,3-Butadiene	106-99-0	$6.6 \times 10^{+2}$	Development
Caprolactam	105-60-2	$5.0 \times 10^{+1}$	Eyes (sensory irritation)
Carbon Disulfide	75-15-0	$6.2 \times 10^{+3}$	Nervous System; Reproductive/Developmental
Carbon Monoxide [a]	630-08-0	$2.3 \times 10^{+4}$	Cardiovascular System
Carbon Tetrachloride	56-23-5	$1.9 \times 10^{+3}$	Alimentary System (Liver); Nervous System Reproductive/Developmental
Chlorine	7782-50-5	$2.1 \times 10^{+2}$	Eyes; Respiratory System
Chloroform	67-66-3	$1.5 \times 10^{+2}$	Nervous System; Respiratory System; Reproductive/Developmental
Chloropicrin	76-06-2	$2.9 \times 10^{+1}$	Eyes; Respiratory System
Copper and Compounds	7440-50-8	$1.0 \times 10^{+2}$	Respiratory System
1,4-Dioxane	123-91-1	$3.0 \times 10^{+3}$	Eyes; Respiratory System
Epichlorohydrin	106-89-8	$1.3 \times 10^{+3}$	Eyes; Respiratory System
Ethylene Glycol Monobutyl Ether	111-76-2	$1.4 \times 10^{+4}$	Eyes; Respiratory System
Ethylene Glycol Monoethyl Ether	110-80-5	$3.7 \times 10^{+2}$	Reproductive/Developmental
Ethylene Glycol Monoethyl Ether Acetate	111-15-9	$1.4 \times 10^{+2}$	Nervous System; Reproductive/Developmental
Ethylene Glycol Monomethyl Ether	109-86-4	$9.3 \times 10^{+1}$	Reproductive/Developmental
Formaldehyde	50-00-0	$5.5 \times 10^{+1}$	Eyes (sensory irritation)
Hydrogen Chloride	7647-01-0	$2.1 \times 10^{+3}$	Eyes; Respiratory System
Hydrogen Cyanide	74-90-8	$3.4 \times 10^{+2}$	Nervous System
Hydrogen Fluoride	7664-39-3	$2.4 \times 10^{+2}$	Eyes; Respiratory System
Hydrogen Selenide	7783-07-5	$5.0 \times 10^{+0}$	Eyes; Respiratory System
Hydrogen Sulfide [a]	7783-06-4	$4.2 \times 10^{+1}$	Nervous System
Isopropanol	67-63-0	$3.2 \times 10^{+3}$	Eyes; Respiratory System
Mercury and Inorganic Mercury Compounds	7439-97-6	6.0×10^{-1}	Nervous System; Development
Methanol	67-56-1	$2.8 \times 10^{+4}$	Nervous System
Methyl Bromide	74-83-9	$3.9 \times 10^{+3}$	Nervous System; Respiratory System; Reproductive/Developmental

Substance	Chemical Abstract Service Number (CAS)	Acute Inhalation REL ($\mu g/m^3$)	Acute Hazard Index Target Organ Systems(s)
Methyl Chloroform	71-55-6	$6.8 \times 10^{+4}$	Nervous System
Methyl Ethyl Ketone	78-93-3	$1.3 \times 10^{+4}$	Eyes; Respiratory System
Methylene Chloride	75-09-2	$1.4 \times 10^{+4}$	Nervous System; Cardiovascular System
Nickel and Nickel Compounds	7440-02-0	2.0×10^{-1}	Immune System
Nitric Acid	7697-37-2	$8.6 \times 10^{+1}$	Respiratory System
Nitrogen Dioxide [a]	10102-44-0	$4.7 \times 10^{+2}$	Respiratory System
Ozone [a]	10028-15-6	$1.8 \times 10^{+2}$	Eyes; Respiratory System
Perchloroethylene (Tetrachloroethylene)	127-18-4	$2.0 \times 10^{+4}$	Eyes; Nervous System; Respiratory System
Phenol	108-95-2	$5.8 \times 10^{+3}$	Eyes; Respiratory System
Phosgene	75-44-5	$4.0 \times 10^{+0}$	Respiratory System
Propylene Oxide	75-56-9	$3.1 \times 10^{+3}$	Eyes; Respiratory System; Reproductive/Developmental
Sodium Hydroxide	1310-73-2	$8.0 \times 10^{+0}$	Eyes; Skin; Respiratory System
Styrene	100-42-5	$2.1 \times 10^{+4}$	Eyes; Respiratory System; Reproductive/Developmental
Sulfates [a]	N/A	$1.2 \times 10^{+2}$	Respiratory System
Sulfur Dioxide [a]	7446-09-5	$6.6 \times 10^{+2}$	Respiratory System
Sulfuric Acid and Oleum	7664-93-9 8014-95-7	$1.2 \times 10^{+2}$	Respiratory System
Tetrachloroethylene (Perchloroethylene)	127-18-4	$2.0 \times 10^{+4}$	Eyes; Nervous System; Respiratory System
Toluene	108-88-3	$3.7 \times 10^{+4}$	Nervous System; Respiratory System; Eyes; Reproductive/Developmental
Triethylamine	121-44-8	$2.8 \times 10^{+3}$	Nervous System; Eyes
Vanadium Pentoxide	1314-62-1	$3.0 \times 10^{+1}$	Eyes; Respiratory System
Vinyl Chloride	75-01-4	$1.8 \times 10^{+5}$	Nervous System; Eyes; Respiratory System
Xylenes (m,o,p-isomers)	1330-20-7	$2.2 \times 10^{+4}$	Eyes; Respiratory System; Nervous System

[a] California Ambient Air Quality Standard

6.3 8-hour Reference Exposure Levels

OEHHA has developed 8-hour RELs for assessing potential noncancer health impacts for exposures to the general public that occur on a recurrent basis, but only during a portion of each day (OEHHA, 2008; http://www.oehha.ca.gov/air/allrels.html). Eight-hour RELs are compared to air concentrations that represent an average (daily) 8-hour exposure. They were designed to address off-site worker exposure at the MEIW, but may also be used at the Districts' discretion to characterize 8-hour residential noncancer exposures, particularly for non-continuous facility operations where exposure is based on air concentrations during facility operation (i.e., the zero emission hours are not included) rather than averaged over 24-hours/day, 7 days/week as assessed for chronic exposure. The 8-hour RELs can also be used to assess exposure of students and teachers while at school (OEHHA, 2008). These RELs were developed because of concerns that applying the chronic REL in some scenarios was

overly conservative. By definition, an 8-hour REL is an exposure that is not likely to cause adverse health effects in a human population, including sensitive subgroups, exposed to that concentration (in units of micrograms per cubic meter or $\mu g/m^3$) for an 8-hour exposure duration on a regular (including daily) basis.

The RELs, target organ systems, and the averaging time for substances that can present a potential hazard from inhalation for 8 hours on a daily basis are presented in Table 6.2. Chapter 8 discusses the methods used for determining noncancer 8-hour health impacts. Appendix I presents an example calculation used to determine an HQ and HI.

Any substances in Table 6.2 with Development or Reproductive System as a target organ system are represented in HARP and in the Appendix L REL tables under the single endpoint "Reproductive/Development".

Table 6.2 Eight-Hour Inhalation Reference Exposure Levels (RELs) and 8-Hour Hazard Index Target Organ System(s)

Substance	Chemical Abstract Service Number (CAS)	Chronic Inhalation REL ($\mu g/m^3$)	Chronic Inhalation Hazard Index Target Organ System(s)
Acetaldehyde	75-07-0	$3.0 \times 10^{+2}$	Respiratory System
Acrolein	107-02-8	7.0×10^{-1}	Respiratory System
Arsenic & Inorganic Arsenic Compounds	7440-38-2	1.5×10^{-2}	Cardiovascular System; Development; Nervous System; Respiratory System; Skin
Benzene	71-43-2	$3.0 \times 10^{+0}$	Hematologic System
1,3-Butadiene	106-99-0	$9.0 \times 10^{+0}$	Reproductive System
Caprolactam	105-60-2	$7.0 \times 10^{+0}$	Respiratory System
Formaldehyde	50-0-0	$9.0 \times 10^{+0}$	Respiratory System
Manganese & Manganese Compounds	7439-96-5	1.7×10^{-1}	Nervous System
Mercury & Inorganic Mercury Compounds	7439--97-6	6.0×10^{-2}	Nervous System; Development; Kidney
Nickel & Nickel Compounds	7440-02-0	6.0×10^{-2}	Respiratory System; Immune System

6.4 Chronic Reference Exposure Levels

OEHHA has developed chronic RELs for assessing noncancer health impacts from long-term exposure. (OEHHA, 2008; see also http://www.oehha.ca.gov/air/allrels.html) A chronic REL is a concentration level (expressed in units of micrograms per cubic meter ($\mu g/m^3$) for inhalation exposure and in a dose expressed in units of milligrams per kilogram-day (mg/kg-day) for oral exposures) at or below which no adverse health effects are anticipated following long-term exposure. Long-term exposure for these purposes has been defined by U.S. EPA as at least 12% of a lifetime, or about eight years for humans. Table 6.3 lists the chronic noncancer RELs that should be used in

the assessment of chronic health effects from inhalation exposure. Appendix L provides a consolidated listing of all the acute, 8-hour and chronic RELs and target organs that are approved for use by OEHHA and ARB for the Hot Spots Program. Periodically, new or updated RELs are adopted by OEHHA. See OEHHA's web site http://www.oehha.ca.gov/air/allrels.html to determine if any new or updated RELs have been adopted since the last guideline update.

The organ system(s) associated with each chronic REL are also presented in Table 6.3. Any substances in Table 6.3 with Development or Reproductive System as a target organ system are represented in HARP and in the Appendix L REL tables under the single endpoint "Reproductive/Development". Chapter 8 discusses the methods used for determining potential noncancer health impacts and Appendix I presents example calculations used to determine a HQ and HI.

Table 6.3 Chronic Inhalation Reference Exposure Levels (RELs) and Chronic Hazard Index Target Organ System(s)

Substance	Chemical Abstract Service Number (CAS)	Chronic Inhalation REL ($\mu g/m^3$)	Chronic Inhalation Hazard Index Target Organ System(s)
Acetaldehyde [a]	75-07-0	$1.4 \times 10^{+2}$	Respiratory System
Acrolein	107-02-8	3.5×10^{-1}	Respiratory System
Acrylonitrile	107-13-1	$5.0 \times 10^{+0}$	Respiratory System
Ammonia	7664-41-7	$2.0 \times 10^{+2}$	Respiratory System
Arsenic & Inorganic Arsenic Compounds	7440-38-2	1.5×10^{-2}	Cardiovascular System; Development; Nervous System; Respiratory System; Skin
Benzene	71-43-2	$3.0 \times 10^{+0}$	Hematologic System
Beryllium and Beryllium Compounds	7440-41-7	7.0×10^{-3}	Immune System; Respiratory System
1,3-Butadiene	106-99-0	$2.0 \times 10^{+0}$	Reproductive System
Cadmium and Cadmium Compounds	7440-43-9	2.0×10^{-2}	Kidney; Respiratory System
Caprolactam	105-60-2	$2.2 \times 10^{+0}$	Respiratory System
Carbon Disulfide	75-15-0	$8.0 \times 10^{+2}$	Nervous System; Reproductive System
Carbon Tetrachloride	56-23-5	$4.0 \times 10^{+1}$	Alimentary System (Liver); Development; Nervous System
Chlorine	7782-50-5	2.0×10^{-1}	Respiratory System
Chlorine Dioxide	10049-04-4	6.0×10^{-1}	Respiratory System
Chlorinated Dibenzo-*p*-dioxins [b]			
2,3,7,8-Tetrachlorodibenzo-*p*-dioxin [b]	1746-01-6	4.0×10^{-5}	Alimentary System (Liver); Development; Endocrine System; Hematologic System; Reproductive System; Respiratory System
1,2,3,7,8-Pentachlorodibenzo-*p*-dioxin [b]	40321-76-4	4.0×10^{-5}	
1,2,3,4,7,8-Hexachlorodibenzo-*p*-dioxin [b]	39227-28-6	4.0×10^{-4}	
1,2,3,6,7,8-Hexachlorodibenzo-*p*-dioxin [b]	57653-85-7	4.0×10^{-4}	
1,2,3,7,8,9-Hexachlorodibenzo-*p*-dioxin [b]	19408-74-3	4.0×10^{-4}	
1,2,3,4,6,7,8-Heptachlorodibenzo-*p*-dioxin [b]	35822-46-9	4.0×10^{-3}	
1,2,3,4,6,7,8,9-Octachlorodibenzo-*p*-dioxin [b]	3268-87-9	1.3×10^{-1}	

Table 6.3 Chronic Inhalation Reference Exposure Levels (RELs) and Chronic Hazard Index Target Organ System(s)

Substance	Chemical Abstract Service Number (CAS)	Chronic Inhalation REL ($\mu g/m^3$)	Chronic Inhalation Hazard Index Target Organ System(s)
Chlorinated Dibenzofurans [b]			
2,3,7,8-Tetrachlorodibenzofuran [b]	5120-73-19	4.0×10^{-4}	Alimentary System (Liver); Development; Endocrine System; Hematologic System; Reproductive System; Respiratory System
1,2,3,7,8-Pentachlorodibenzofuran [b]	57117-41-6	1.3×10^{-3}	
2,3,4,7,8-Pentachlorodibenzofuran [b]	57117-31-4	1.3×10^{-4}	
1,2,3,4,7,8-Hexachlorodibenzofuran [b]	70648-26-9	4.0×10^{-4}	
1,2,3,6,7,8-Hexachlorodibenzofuran [b]	57117-44-9	4.0×10^{-4}	
1,2,3,7,8,9-Hexachlorodibenzofuran [b]	72918-21-9	4.0×10^{-4}	
2,3,4,6,7,8-Hexachlorodibenzofuran [b]	60851-34-5	4.0×10^{-4}	
1,2,3,4,6,7,8-Heptachlorodibenzofuran [b]	67562-39-4	4.0×10^{-3}	
1,2,3,4,7,8,9-Heptachlorodibenzofuran [b]	55673-89-7	4.0×10^{-3}	
1,2,3,4,6,7,8,9-Octachlorodibenzofuran [b]	39001-02-0	1.3×10^{-1}	
Chlorobenzene	108-90-7	$1.0 \times 10^{+3}$	Alimentary System (Liver); Kidney; Reproductive System
Chloroform	67-66-3	$3.0 \times 10^{+2}$	Alimentary System (Liver); Development; Kidney
Chloropicrin	76-06-2	4.0×10^{-1}	Respiratory System
Chromium VI & Soluble Chromium VI Compounds (except chromic trioxide)	18540-29-9	2.0×10^{-1}	Respiratory System
Chromic Trioxide (as chromic acid mist)	1333-82-0	2.0×10^{-3}	Respiratory System
Cresol Mixtures	1319-77-3	$6.0 \times 10^{+2}$	Nervous System
1,4-Dichlorobenzene	106-46-7	$8.0 \times 10^{+2}$	Alimentary System (Liver); Kidney; Nervous System; Respiratory System
1,1-Dichloroethylene (Vinylidene Chloride)	75-35-4	$7.0 \times 10^{+1}$	Alimentary System (Liver)
Diesel Exhaust [a]	N/A	$5.0 \times 10^{+0}$	Respiratory System
Diethanolamine	111-42-2	$3.0 \times 10^{+0}$	Hematologic System; Respiratory System
N,N-Dimethylformamide	68-12-2	$8.0 \times 10^{+1}$	Alimentary System (Liver); Respiratory System
1,4-Dioxane	123-91-1	$3.0 \times 10^{+3}$	Alimentary System (Liver); Cardiovascular System; Kidney
Epichlorohydrin	106-89-8	$3.0 \times 10^{+0}$	Eyes; Respiratory System
1,2-Epoxybutane	106-88-7	$2.0 \times 10^{+1}$	Cardiovascular System; Respiratory System
Ethylbenzene	100-41-4	$2.0 \times 10^{+3}$	Alimentary System (Liver); Kidney; Development; Endocrine System
Ethyl Chloride	75-00-3	$3.0 \times 10^{+4}$	Alimentary System (Liver); Development
Ethylene Dibromide	106-93-4	8.0×10^{-1}	Reproductive System
Ethylene Dichloride	107-06-2	$4.0 \times 10^{+2}$	Alimentary System (Liver)
Ethylene Glycol	107-21-1	$4.0 \times 10^{+2}$	Development; Kidney; Respiratory System
Ethylene Glycol Monoethyl Ether	110-80-5	$7.0 \times 10^{+1}$	Hematologic System; Reproductive System
Ethylene Glycol Monoethyl Ether Acetate	111-15-9	$3.0 \times 10^{+2}$	Development

Table 6.3 Chronic Inhalation Reference Exposure Levels (RELs) and Chronic Hazard Index Target Organ System(s)

Substance	Chemical Abstract Service Number (CAS)	Chronic Inhalation REL ($\mu g/m^3$)	Chronic Inhalation Hazard Index Target Organ System(s)
Ethylene Glycol Monomethyl Ether	109-86-4	$6.0 \times 10^{+1}$	Reproductive System
Ethylene Glycol Monomethyl Ether Acetate	110-49-6	$9.0 \times 10^{+1}$	Reproductive System
Ethylene Oxide	75-21-8	$3.0 \times 10^{+1}$	Nervous System
Fluorides (except hydrogen fluoride)	N/A	$1.3 \times 10^{+1}$	Bone and Teeth; Respiratory System
Formaldehyde	50-00-0	$9.0 \times 10^{+0}$	Respiratory System
Glutaraldehyde	111-30-8	8.0×10^{-2}	Respiratory System
Hexane (n-)	110-54-3	$7.0 \times 10^{+3}$	Nervous System
Hydrazine	302-01-2	2.0×10^{-1}	Alimentary System (Liver); Endocrine System
Hydrogen Chloride	7647-01-0	$9.0 \times 10^{+0}$	Respiratory System
Hydrogen Cyanide	74-90-8	$9.0 \times 10^{+0}$	Cardiovascular System; Endocrine System; Nervous System
Hydrogen Fluoride	7664-39-3	$1.4 \times 10^{+1}$	Bone and Teeth; Respiratory System
Hydrogen Sulfide	7783-06-4	$1.0 \times 10^{+1}$	Respiratory System
Isophorone	78-59-1	$2.0 \times 10^{+3}$	Alimentary System (Liver); Development
Isopropanol	67-63-0	$7.0 \times 10^{+3}$	Development; Kidney
Maleic Anhydride	108-31-6	7.0×10^{-1}	Respiratory System
Manganese & Manganese Compounds	7439-96-5	9.0×10^{-2}	Nervous System
Mercury & Inorganic Mercury Compounds	7439-97-6	3.0×10^{-2}	Nervous System; Development; Kidney
Methanol	67-56-1	$4.0 \times 10^{+3}$	Development
Methyl Bromide	74-83-9	$5.0 \times 10^{+0}$	Development; Nervous System; Respiratory System
Methyl Chloroform	71-55-6	$1.0 \times 10^{+3}$	Nervous System
Methyl Isocyanate	624-83-9	$1.0 \times 10^{+0}$	Reproductive System; Respiratory System
Methyl tertiary-Butyl Ether	1634-04-4	$8.0 \times 10^{+3}$	Alimentary System (Liver); Eyes; Kidney
Methylene Chloride	75-09-2	$4.0 \times 10^{+2}$	Cardiovascular System; Nervous System
4,4'-Methylene Dianiline (& its dichloride)	101-77-9	$2.0 \times 10^{+1}$	Alimentary System (Liver); Eyes
Methylene Diphenyl Isocyanate	101-68-8	7.0×10^{-1}	Respiratory System
Naphthalene	91-20-3	$9.0 \times 10^{+0}$	Respiratory System
Nickel & Nickel Compounds (except nickel oxide)	7440-02-0	1.4×10^{-2}	Hematologic System; Respiratory System
Nickel Oxide	1313-99-1	2.0×10^{-2}	Respiratory System
Perchloroethylene (Tetrachloroethylene)[a]	127-18-4	$3.5 \times 10^{+1}$	Alimentary System (Liver); Kidney
Phenol	108-95-2	$2.0 \times 10^{+2}$	Alimentary System (Liver); Cardiovascular System; Kidney; Nervous System
Phosphine	7803-51-2	8.0×10^{-1}	Alimentary System (Liver); Hematologic System; Kidney; Nervous System; Respiratory System

Table 6.3 Chronic Inhalation Reference Exposure Levels (RELs) and Chronic Hazard Index Target Organ System(s)

Substance	Chemical Abstract Service Number (CAS)	Chronic Inhalation REL ($\mu g/m^3$)	Chronic Inhalation Hazard Index Target Organ System(s)
Phosphoric Acid	7664-38-2	$7.0 \times 10^{+0}$	Respiratory System
Phthalic Anhydride	85-44-9	$2.0 \times 10^{+1}$	Respiratory System
Polychlorinated biphenyls (PCBs)[b]			
3,3',4,4'-Tetrachlorobiphenyl (77) [b]	35298-13-3	4.0×10^{-1}	Alimentary System (Liver); Developmental; Endocrine System; Hematologic System; Reproductive System; Respiratory System
3,4,4',5-Tetrachlorobiphenyl (81) [b]	70362-50-4	1.3×10^{-1}	
2,3,3',4,4'- Pentachlorobiphenyl (105) [b]	32598-14-4	$1.3 \times 10^{+0}$	
2,3,4,4'5- Pentachlorobiphenyl (114) [b]	74472-37-0	$1.3 \times 10^{+0}$	
2,3'4,4',5- Pentachlorobiphenyl (118) [b]	31508-00-6	$1.3 \times 10^{+0}$	
2',3,4,4',5- Pentachlorobiphenyl (123) [b]	65510-44-3	$1.3 \times 10^{+0}$	
3,3',4,4',5- Pentachlorobiphenyl (126) [b]	57465-28-8	4.0×10^{-4}	
2,3,3',4,4',5-Hexachlorobiphenyl (156) [b]	38380-08-4	$1.3 \times 10^{+0}$	
2,3,3',4,4',5'-Hexachlorobiphenyl (157) [b]	69782-90-7	$1.3 \times 10^{+0}$	
2,3',4,4',5,5'-Hexachlorobiphenyl (167) [b]	52663-72-6	$1.3 \times 10^{+0}$	
3,3',4,4'5,5'- Hexachlorobiphenyl (169) [b]	32774-16-6	1.3×10^{-3}	
2,3,3'4,4',5,5'-Heptachlorobiphenyl (189) [b]	39635-31-9	$1.3 \times 10^{+0}$	
Propylene	115-07-1	$3.0 \times 10^{+3}$	Respiratory System
Propylene Glycol Monomethyl Ether	107-98-2	$7.0 \times 10^{+3}$	Alimentary System (Liver)
Propylene Oxide	75-56-9	$3.0 \times 10^{+1}$	Respiratory System
Selenium and Selenium compounds (other than Hydrogen Selenide)	7782-49-2	$2.0 \times 10^{+1}$	Alimentary System (Liver); Cardiovascular System; Nervous System
Silica (crystalline, respirable)	N/A	$3.0 \times 10^{+0}$	Respiratory System
Styrene	100-42-5	$9.0 \times 10^{+2}$	Nervous System
Sulfuric Acid	7664-93-9	$1.0 \times 10^{+0}$	Respiratory System
Toluene	108-88-3	$3.0 \times 10^{+2}$	Development; Nervous System; Respiratory System
2,4-Toluene Diisocyanate	584-84-9	7.0×10^{-2}	Respiratory System
2,6-Toluene Diisocyanate	91-08-7	7.0×10^{-2}	Respiratory System
Trichloroethylene [a]	79-01-6	$6.0 \times 10^{+2}$	Eyes; Nervous System
Triethylamine	121-44-8	$2.0 \times 10^{+2}$	Eyes
Vinyl Acetate	108-05-4	$2.0 \times 10^{+2}$	Respiratory System
Xylenes (m, o, p-isomers)	1330-20-7	$7.0 \times 10^{+2}$	Nervous System; Respiratory System; Eyes

[a] These peer-reviewed values were developed under the Toxic Air Contaminant (TAC) Program mandated by AB1807 (California Health and Safety Code Sec. 39650 *et seq*.).

[b] The OEHHA has adopted the World Health Organization Toxicity Equivalency Factor (TEF) scheme for evaluating the cancer risk and noncancer hazard due to exposure to samples containing mixtures of polychlorinated dibenzo-*p*-dioxins (PCDD) (also referred to as chlorinated dioxins and dibenzofurans), polychlorinated dibenzofurans (PCDF) and polychlorinated biphenyls (PCBs). The TEF values are revised from time to time to reflect new data and increased scientific knowledge. Currently OEHHA recommends use of the 2005 revision to the WHO TEF values (WHO_{05}-TEF). See Appendix E for more information about the scheme and for the methodology for calculating 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD) equivalents for PCDD and PCDFs. For

convenience, OEHHA has calculated chronic REL values for speciated PCDDs, PCDFs and PCBs based on the WHO_{05} TEF values and the chronic REL for 2,3,7,8-TCDD using the procedure discussed in Appendix E. The chronic REL values can be used to calculate a hazard index when the mixtures are speciated from individual congener ground level concentrations. In those cases where speciation of dioxins and furans has not been performed, then 2,3,7,8-TCDD serves as the surrogate for dioxin and furan emissions.

N/A Not Applicable

6.5 Chronic Oral (Noninhalation) Reference Exposure Levels

As specified throughout the guidelines, estimates of long-term exposure resulting from facility air emissions of specific compounds must be analyzed for both inhalation and noninhalation (multipathway) pathways of exposure for humans. Facilities often emit substances under high temperature and pressure in the presence of particulate matter. While some of these substances are expected to remain in the vapor phase, other substances such as metals and semi-volatile organics can be either emitted as particles, form particles after emission from the facility, or adhere to existing particles. Some substances will partition between vapor and particulate phases. Substances in the particulate phase can be removed from the atmosphere by settling and, thus, potentially present a significant hazard via noninhalation pathways.

Particulate-associated chemicals can be deposited directly onto soil, onto the leaves or fruits of crops, or onto surface waters. Exposure via the oral route is the predominant noninhalation pathway, resulting in the noninhalation RELs being referred to as 'oral RELs' in this document. The oral RELs are used for both ingestion and dermal exposures, and are applied using the chronic non-inhalation exposures in the residential scenario and the worker scenarios. The oral RELs are expressed as doses in milligrams of substance (consumed and dermally absorbed) per kilogram body weight per day (mg/kg-day).

Table 6.4 lists the chronic noncancer RELs to be used in the assessment of chronic health effects from noninhalation pathways of exposure. Any substances in Table 6.4 with Development or Reproductive System as a target organ system are represented in HARP and in the Appendix L REL tables under the single endpoint "Reproductive/Development". Appendix L provides a consolidated listing of all chronic RELs and target organs that are approved for use by OEHHA and ARB for the Hot Spots Program. Periodically, new or updated RELs are adopted by OEHHA and these guidelines will be updated to reflect those changes. See OEHHA's web page at http://www.oehha.ca.gov/air/allrels.html to determine if any new or updated RELs have been adopted since the last guideline update. Chapter 8 discusses the methods used for determining potential noncancer health impacts and Appendix I presents example calculations used to determine a HQ and HI.

Table 6.4 Chronic Noninhalation 'Oral' Reference Exposure Levels (RELs) and Chronic Hazard Index Target Organ System(s)

Substance	Chemical Abstract Service No. (CAS)	Chronic Oral REL (mg/kg-day)	Chronic Oral Hazard Index Target Organ System(s)
Arsenic & Inorganic Arsenic Compounds	7440-38-2	3.5×10^{-6}	Development; Nervous System; Respiratory System; Cardiovascular System; Skin
Beryllium and Beryllium Compounds	7440-41-7	2.0×10^{-3}	Alimentary System (Gastrointestinal Tract)
Cadmium and Cadmium Compounds	7440-43-9	5.0×10^{-4}	Kidney
Chlorinated Dibenzo-*p*-dioxins [a]			
2,3,7,8-Tetrachlorodibenzo-*p*-dioxin [a]	1746-01-6	1.0×10^{-8}	Alimentary System (Liver); Developmental; Endocrine System; Hematologic System; Reproductive System; Respiratory System
1,2,3,7,8-Pentachlorodibenzo-*p*-dioxin [a]	40321-76-4	1.0×10^{-8}	
1,2,3,4,7,8-Hexachlorodibenzo-*p*-dioxin [a]	39227-28-6	1.0×10^{-7}	
1,2,3,6,7,8-Hexachlorodibenzo-*p*-dioxin [a]	57653-85-7	1.0×10^{-7}	
1,2,3,7,8,9-Hexachlorodibenzo-*p*-dioxin [a]	19408-74-3	1.0×10^{-7}	
1,2,3,4,6,7,8-Heptachlorodibenzo-*p*-dioxin [a]	35822-46-9	1.0×10^{-6}	
1,2,3,4,6,7,8,9-Octachlorodibenzo-*p*-dioxin [a]	3268-87-9	3.3×10^{-5}	
Chlorinated Dibenzofurans [a]			
2,3,7,8-Tetrachlorodibenzofuran [a]	5120-73-19	1.0×10^{-7}	Alimentary System (Liver); Development; Endocrine System; Hematologic System; Reproductive System; Respiratory System
1,2,3,7,8-Pentachlorodibenzofuran [a]	57117-41-6	3.3×10^{-7}	
2,3,4,7,8-Pentachlorodibenzofuran [a]	57117-31-4	3.3×10^{-8}	
1,2,3,4,7,8-Hexachlorodibenzofuran [a]	70648-26-9	1.0×10^{-7}	
1,2,3,6,7,8-Hexachlorodibenzofuran [a]	57117-44-9	1.0×10^{-7}	
1,2,3,7,8,9-Hexachlorodibenzofuran [a]	72918-21-9	1.0×10^{-7}	
2,3,4,6,7,8-Hexachlorodibenzofuran [a]	60851-34-5	1.0×10^{-7}	
1,2,3,4,6,7,8-Heptachlorodibenzofuran [a]	67562-39-4	1.0×10^{-6}	
1,2,3,4,7,8,9-Heptachlorodibenzofuran [a]	55673-89-7	1.0×10^{-6}	
1,2,3,4,6,7,8,9-Octachlorodibenzofuran [a]	39001-02-0	3.3×10^{-5}	
Chromium VI & Soluble Chromium VI Compounds (including chromic trioxide)	18540-29-9	2.0×10^{-2}	Hematologic System
Fluorides (including hydrogen fluoride)	7664-39-3	4.0×10^{-2}	Bone and Teeth
Mercury & Mercury Inorganic Compounds	7439-97-6	1.6×10^{-4}	Kidney; Nervous System; Development
Nickel & Nickel Compounds (including nickel oxide)	7440-02-0	1.1×10^{-2}	Development
Polychlorinated biphenyls (PCBs) (speciated)[a]			
3,3',4,4'-Tetrachlorobiphenyl (77)[a]	35298-13-3	1.0×10^{-4}	Alimentary System (Liver); Developmental; Endocrine System; Hematologic System; Reproductive System; Respiratory System
3,4,4',5-Tetrachlorobiphenyl (81)[a]	70362-50-4	3.3×10^{-5}	
2,3,3',4,4'- Pentachlorobiphenyl (105)[a]	32598-14-4	3.3×10^{-4}	
2,3,4,4'5- Pentachlorobiphenyl (114)[a]	74472-37-0	3.3×10^{-4}	
2,3'4,4',5- Pentachlorobiphenyl (118)[a]	31508-00-6	3.3×10^{-4}	
2',3,4,4',5- Pentachlorobiphenyl (123)[a]	65510-44-3	3.3×10^{-4}	
3,3',4,4',5- Pentachlorobiphenyl (126)[a]	57465-28-8	1.0×10^{-7}	
2,3,3',4,4',5-Hexachlorobiphenyl (156)[a]	38380-08-4	3.3×10^{-4}	
2,3,3',4,4',5'-Hexachlorobiphenyl (157)[a]	69782-90-7	3.3×10^{-4}	
2,3',4,4',5,5'-Hexachlorobiphenyl (167)[a]	52663-72-6	3.3×10^{-4}	
3,3',4,4'5,5'- Hexachlorobiphenyl (169)[a]	32774-16-6	3.3×10^{-7}	
2,3,3'4,4',5,5'- Heptachlorobiphenyl (189)[a]	39635-31-9	3.3×10^{-4}	

Table 6.4 Chronic Noninhalation 'Oral' Reference Exposure Levels (RELs) and Chronic Hazard Index Target Organ System(s)

Substance	Chemical Abstract Service No. (CAS)	Chronic Oral REL (mg/kg-day)	Chronic Oral Hazard Index Target Organ System(s)
Selenium and Selenium Compounds (other than hydrogen selenide)	7782-49-2	5.0×10^{-3}	Alimentary System (Liver); Cardiovascular System; Nervous System

a The OEHHA has adopted the World Health Organization Toxicity Equivalency Factor (TEF) scheme for evaluating the cancer risk and noncancer risk due to exposure to samples containing mixtures of polychlorinated dibenzo-*p*-dioxins (PCDD) (also referred to as chlorinated dioxins and dibenzofurans), polychlorinated dibenzofurans (PCDF), and polychlorinated biphenyls (PCBs). The TEF values are revised from time to time to reflect new data and increased scientific knowledge. Currently OEHHA recommends use of the 2005 revision to the WHO TEF values (WHO_{05}-TEF). See Appendix E for more information about the scheme and for the methodology for calculating 2,3,7,8-equivalents for PCDD and PCDFs. For convenience, OEHHA has calculated chronic 'oral' REL values for speciated PCDDs, PCDFs, and PCBs based on the WHO_{05} TEF values and the chronic 'oral' REL for 2,3,7,8-tetrachlorodibenzo-*p*-dioxin using the procedure discussed in Appendix E. The chronic 'oral' REL values can be used to calculate a hazard index when the mixtures are speciated from individual congener ground level concentrations. In those cases where speciation of dioxins and furans has not been performed, then 2,3,7,8-TCDD serves as the surrogate for dioxin and furan emissions.

6.6 References

OEHHA, 2008. Air Toxics Hot Spots Risk Assessment Guidelines Technical Support Document for the Derivation of Noncancer Reference Exposure Levels. Available online at: http://www.oehha.ca.gov

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7 - Dose-Response Assessment for Carcinogens

7.1 Introduction

Dose-response assessment characterizes the quantitative relationship between the amount of exposure to a substance (the dose) and the incidence or occurrence of injury (the response). The process often involves establishing a toxicity value or criterion to use in assessing potential health risk. The toxicity criterion, or health guidance value, for carcinogens is the cancer potency slope (potency factor), which describes the potential risk of developing cancer per unit of average daily dose over a 70-year lifetime. Cancer inhalation and oral potency factors have been derived by the Office of Environmental Health Hazard Assessment (OEHHA) or by the United States Environmental Protection Agency (U.S. EPA) and approved by the State's Scientific Review Panel on Toxic Air Contaminants. They are available for many of the substances listed in Appendix A (List of Substances) as carcinogens. Table 7.1 and Appendix L list the inhalation and oral cancer potency factors that should be used in multipathway health risk assessments (HRAs) for the Hot Spots Program.

The details on the methodology of dose-response assessment for carcinogens and the approved cancer potency factors are provided in the Air Toxics Hot Spots Risk Assessment Guidelines. Part II. Technical Support Document for Cancer Potency Factors: Methodologies for derivation, listing of available values, and adjustments to allow for early life stage exposures. May, 2009. (OEHHA, 2009; see http://www.oehha.ca.gov/air/hot_spots/tsd052909.html).

7.2 Carcinogenic Potency

Cancer potency factors used for both the inhalation and oral routes in the Hot Spots program are generally the 95% upper confidence limits (UCL) on the modeled dose-response slope at the low dose range. The cancer slope factor assumes continuous lifetime exposure to a substance, and is expressed in units of inverse dose [i.e., $(mg/kg/day)^{-1}$]. Another common potency expression is in units of inverse concentration [$(\mu g/m^3)^{-1}$)] when the slope is based on exposure concentration rather than dose; this is termed the unit risk factor. To accommodate the use of age-specific exposure variates, the Hot Spots program has translated the unit risk factors based on concentration to units of inverse dose. This allows calculation of risk for age groupings, as exposure varies with age. It also allows for application of Age Sensitivity Factors for early life exposures.

It is assumed in cancer risk assessments that risk is directly proportional to dose and that, for most carcinogens, there is no threshold for carcinogenesis. The derivation of inhalation and oral cancer potency factors takes into account information on pharmacokinetics, when available, and on the mechanism of carcinogenic action.

Table 7.1 and Appendix L list inhalation and oral cancer potency factors that should be used in risk assessments for the Hot Spots Program. Chapter 8 describes procedures for use of potency factors in estimating potential cancer risk.

7.2.1 *Inhalation Cancer Potency Factors*

The risk assessment methodology and algorithms presented in Chapter 8 express the inhalation cancer slope factors in units of inverse dose (i.e., $(mg/kg/day)^{-1}$). Breathing rates, expressed in units of liters per kilogram of body weight-day (L/kg-day), are multiplied with the air concentrations, coupled with the appropriate unit conversion factor, to estimate dose in mg/kg-day. This allows estimation of average and high-end cancer risk point estimates. Estimation of a distribution of cancer risk based on variability in breathing rate can be obtained by Monte Carlo methods using the distributions of breathing rates in L/kg-day, which can then be converted to a dose distribution in mg/kg BW based on the intake rate. Unit risk factors [in the units of inverse concentration (i.e., $(\mu g/m^3)^{-1}$], which were used in previous guidelines for the Hot Spots program, are still listed in the TSD (OEHHA, 2009) and may prove useful in other risk assessment applications.

The average daily inhalation dose (mg/kg-day) multiplied by the cancer potency factor $(mg/kg\text{-}day)^{-1}$ will give the inhalation cancer risk (unitless), which is an expression of the chemical's cancer risk during a 70-year lifespan of exposure. For example, an inhalation cancer risk of 5×10^{-6} is the same as stating that an individual has an estimated probability of developing cancer from their exposure of 5 chances per million people exposed. A more complete description of how potential cancer risk is calculated from the exposure dose and cancer potency factors is provided in Chapter 8. Appendix I presents an example calculation for determining cancer risk.

A list of current inhalation potency factors is provided in Table 7.1. Periodically, new or revised cancer potency factors will be peer reviewed by the State's Scientific Review Panel on Toxic Air Contaminants (SRP) and adopted by the Director of OEHHA. For new or updated numbers, consult the OEHHA web site at (http://www.oehha.ca.gov/air/hot_spots/tsd052909.html) to determine if any new or updated cancer potency factors have been adopted since this guideline update. New cancer potency factors that have been approved by the SRP and adopted by the Director of OEHHA should be incorporated into Hot Spots risk assessment for facilities that emit those chemicals.

7.2.2 *Oral Cancer Potency Factors*

Under the Hot Spots Program, a few substances are evaluated for exposure and risk from non-inhalation pathways – these are referred to as multipathway substances. Multipathway substances have the potential to impact a receptor through inhalation and noninhalation (oral and dermal) exposure routes. These substances include heavy metals and semi-volatile organic substances such as dioxins, furans, and polycyclic aromatic hydrocarbons (PAHs). These substances commonly exist in the particle

phase or partially in the particle phase when emitted into the air. They can therefore be deposited onto soil, vegetation, and water. Noninhalation exposure pathways considered under the Hot Spots Program include the ingestion of soil, homegrown produce, meat, milk, surface water, breast milk, and fish as well as dermal exposure to contaminants deposited in the soil. See Table 5.1 for a list of the multipathway substances.

Table 7.1 and Appendix L list oral cancer potency factors in units of $(mg/kg\text{-}day)^{-1}$ that should be used for assessing the potential cancer risk for these substances through noninhalation exposure pathways. The cancer risk from these individual pathways is calculated by multiplying the dose (mg/kg-day) times the oral cancer potency factor $(mg/kg\text{-}day)^{-1}$ to yield the potential cancer risk (unitless) from non-inhalation exposures. Chapter 5 provides all of the algorithms to calculate exposure dose through all of the individual exposure pathways. Appendix I provides a sample calculation for dose and cancer risk using the inhalation exposure pathway.

Three carcinogens (cadmium, beryllium, and nickel), although subject to deposition, are only treated as carcinogenic by the inhalation route and not by the oral route. Therefore, there are no oral cancer potency factors for these substances. However, the oral doses of these substances need to be estimated because of their noncancer toxicity. See Chapters 6 and 8, and Appendices I and L for dose-response factors, and calculations to address these substances.

Table 7.1 Inhalation and Oral Cancer Potency Factors

Substance	Chemical Abstract Service Number (CAS)	Inhalation Potency Factor $(mg/kg\text{-}day)^{-1}$	Oral Slope Factor $(mg/kg\text{-}day)^{-1}$
Acetaldehyde	75-07-0	1.0×10^{-2}	
Acetamide	60-35-5	7.0×10^{-2}	
Acrylamide	79-06-1	$4.5 \times 10^{+0}$	
Acrylonitrile	107-13-1	$1.0 \times 10^{+0}$	
Allyl chloride	107-05-1	2.1×10^{-2}	
2-Aminoanthraquinone	117-79-3	3.3×10^{-2}	
Aniline	62-53-3	5.7×10^{-3}	
Arsenic (inorganic)	7440-38-2	$1.2 \times 10^{+1}$	$1.5 \times 10^{+0}$
Asbestos [#]	1332-21-4	$2.2 \times 10^{+2}$ [#]	
Benz[*a*]anthracene [BaP]	56-55-3	3.9×10^{-1}	$1.2 \times 10^{+0}$
Benzene	71-43-2	1.0×10^{-1}	
Benzidine	92-87-5	$5.0 \times 10^{+2}$	
Benzo[*a*]pyrene	50-32-8	$3.9 \times 10^{+0}$	$1.2 \times 10^{+1}$
Benzo[*b*]fluoranthrene [BaP]	205-99-2	3.9×10^{-1}	$1.2 \times 10^{+0}$
Benzo[*j*]fluoranthrene [BaP]	205-82-3	3.9×10^{-1}	$1.2 \times 10^{+0}$
Benzo[*k*]fluoranthrene [BaP]	207-08-9	3.9×10^{-1}	$1.2 \times 10^{+0}$
Benzyl chloride	100-44-7	1.7×10^{-1}	
Beryllium	7440-41-7	$8.4 \times 10^{+0}$	
Bis(2-chloroethyl) ether	111-44-4	$2.5 \times 10^{+0}$	
Bis(chloromethyl)ether	542-88-1	$4.6 \times 10^{+1}$	
1,3-Butadiene	106-99-0	6.0×10^{-1}	
Cadmium (and compounds)	7440-43-9	$1.5 \times 10^{+1}$	
Carbon tetrachloride	56-23-5	1.5×10^{-1}	
Chlorinated Dibenzo-p-dioxins [A]			
2,3,7,8-Tetrachlorodibenzo-*p*-dioxin	1746-01-6	$1.3 \times 10^{+5}$	$1.3 \times 10^{+5}$
1,2,3,7,8-Pentachlorodibenzo-*p*-dioxin	40321-76-4	$1.3 \times 10^{+5}$	$1.3 \times 10^{+5}$
1,2,3,4,7,8-Hexachlorodibenzo-*p*-dioxin	39227-28-6	$1.3 \times 10^{+4}$	$1.3 \times 10^{+4}$
1,2,3,6,7,8-Hexachlorodibenzo-*p*-dioxin	57653-85-7	$1.3 \times 10^{+4}$	$1.3 \times 10^{+4}$
1,2,3,7,8,9-Hexachlorodibenzo-*p*-dioxin	19408-74-3	$1.3 \times 10^{+4}$	$1.3 \times 10^{+4}$
1,2,3,4,6,7,8-Heptachlorodibenzo-*p*-dioxin	35822-46-9	$1.3 \times 10^{+3}$	$1.3 \times 10^{+3}$
1,2,3,4,,6,7,8,9-Octachlorodibenzo-*p*-dioxin	3268-87-9	$3.9 \times 10^{+1}$	$3.9 \times 10^{+1}$
Chlorinated Dibenzofurans [A]			
2,3,7,8-Tetrachlorodibenzofuran	5120-73-19	$1.3 \times 10^{+4}$	$1.3 \times 10^{+4}$
1,2,3,7,8-Pentachlorodibenzofuran	57117-41-6	$3.9 \times 10^{+3}$	$3.9 \times 10^{+3}$
2,3,4,7,8-Pentachlorodibenzofuran	57117-31-4	$3.9 \times 10^{+4}$	$3.9 \times 10^{+4}$
1,2,3,4,7,8-Hexachlorodibenzofuran	70648-26-9	$1.3 \times 10^{+4}$	$1.3 \times 10^{+4}$
1,2,3,6,7,8-Hexachlorodibenzofuran	57117-44-9	$1.3 \times 10^{+4}$	$1.3 \times 10^{+4}$
1,2,3,7,8,9-Hexachlorodibenzofuran	72918-21-9	$1.3 \times 10^{+4}$	$1.3 \times 10^{+4}$
2,3,4,6,7,8-Hexachlorodibenzofuran	60851-34-5	$1.3 \times 10^{+4}$	$1.3 \times 10^{+4}$

Table 7.1 Inhalation and Oral Cancer Potency Factors

Substance	Chemical Abstract Service Number (CAS)	Inhalation Potency Factor $(mg/kg\text{-}day)^{-1}$	Oral Slope Factor $(mg/kg\text{-}day)^{-1}$
1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562-39-4	$1.3 \times 10^{+3}$	$1.3 \times 10^{+3}$
1,2,3,4,7,8,9-Heptachlorodibenzofuran	55673-89-7	$1.3 \times 10^{+3}$	$1.3 \times 10^{+3}$
1,2,3,4,,6,7,8,9-Octachlorodibenzofuran	39001-02-0	$3.9 \times 10^{+1}$	$3.9 \times 10^{+1}$
Chlorinated paraffins	108171-26-2	8.9×10^{-2}	
Chloroform	67-66-3	1.9×10^{-2}	
4-Chloro-*o*-phenylenediamine	95-83-0	1.6×10^{-2}	
p-Chloro-*o*-toluidine	95-69-2	2.7×10^{-1}	
Chromium (hexavalent)	18540-29-9	$5.1 \times 10^{+2}$	5×10^{-1}
Chrysene [BaP]	218-01-9	3.9×10^{-2}	1.2×10^{-1}
Creosote	8001-58-9	*	
p-Cresidine	120-71-8	1.5×10^{-1}	
Cupferron	135-20-6	2.2×10^{-1}	
2,4-Diaminoanisole	615-05-4	2.3×10^{-2}	
2,4-Diaminotoluene	95-80-7	$4.0 \times 10^{+0}$	
Dibenz[*a,h*]acridine [BaP]	226-36-8	3.9×10^{-1}	$1.2 \times 10^{+0}$
Dibenz[*a,j*]acridine [BaP]	224-42-0	3.9×10^{-1}	$1.2 \times 10^{+0}$
Dibenz[*a,h*]anthracene [BaP]	53-70-3	$4.1 \times 10^{+0}$	$4.1 \times 10^{+0}$
Dibenzo[*a,e*]pyrene [BaP]	192-65-4	$3.9 \times 10^{+0}$	$1.2 \times 10^{+1}$
Dibenzo[*a,h*]pyrene [BaP]	189-64-0	$3.9 \times 10^{+1}$	$1.2 \times 10^{+2}$
Dibenzo[*a,l*]pyrene [BaP]	189-55-9	$3.9 \times 10^{+1}$	$1.2 \times 10^{+2}$
Dibenzo[*a,l*]pyrene [BaP]	191-30-0	$3.9 \times 10^{+1}$	$1.2 \times 10^{+2}$
7H-Dibenzo[*c,g*]carbazole [BaP]	194-59-2	$3.9 \times 10^{+0}$	$1.2 \times 10^{+1}$
1,2-Dibromo-3-chloropropane	96-12-8	$7.0 \times 10^{+0}$	
1,4-Dichlorobenzene	106-46-7	4.0×10^{-2}	
3,3'-Dichlorobenzidine	91-94-1	$1.2 \times 10^{+0}$	
1,1-Dichloroethane	75-34-3	5.7×10^{-3}	
Diesel exhaust [B]	NA	$1.1 \times 10^{+0}$	
Diethylhexylphthalate	117-81-7	8.4×10^{-3}	8.4×10^{-3}
p-Dimethylaminoazobenzene	60-11-7	$4.6 \times 10^{+0}$	
7,12-Dimethylbenz[*a*]anthracene [BaP]	57-97-6	$2.5 \times 10^{+2}$	$2.5 \times 10^{+2}$
1,6-Dinitropyrene [BaP]	42397-64-8	$3.9 \times 10^{+1}$	$1.2 \times 10^{+2}$
1,8-Dinitropyrene [BaP]	42397-65-9	$3.9 \times 10^{+0}$	$1.2 \times 10^{+1}$
2,4-Dinitrotoluene	121-14-2	3.1×10^{-1}	
1,4-Dioxane	123-91-1	2.7×10^{-2}	
Epichlorohydrin	106-89-8	8.0×10^{-2}	
Ethyl benzene	100-41-4	8.7×10^{-3}	1.1×10^{-2}
Ethylene dibromide	106-93-4	2.5×10^{-1}	
Ethylene dichloride	107-06-2	7.2×10^{-2}	
Ethylene oxide	75-21-8	3.1×10^{-1}	

Table 7.1 Inhalation and Oral Cancer Potency Factors

Substance	Chemical Abstract Service Number (CAS)	Inhalation Potency Factor $(mg/kg\text{-}day)^{-1}$	Oral Slope Factor $(mg/kg\text{-}day)^{-1}$
Ethylene thiourea	96-45-7	4.5×10^{-2}	
Formaldehyde	50-00-0	2.1×10^{-2}	
Hexachlorobenzene	118-74-1	$1.8 \times 10^{+0}$	
Hexachlorocyclohexanes (technical grade)	608-73-1	$4.0 \times 10^{+0}$	$4.0 \times 10^{+0}$
Hydrazine	302-01-2	$1.7 \times 10^{+1}$	$3.0 \times 10^{+0}$
Indeno[1,2,3-*cd*]pyrene [BaP]	193-39-5	3.9×10^{-1}	$1.2 \times 10^{+0}$
Lead and lead compounds	7439-92-1	4.2×10^{-2}	8.5×10^{-3}
Lindane	58-89-9	$1.1 \times 10^{+0}$	$1.1 \times 10^{+0}$
Methyl tertiary-butyl ether	1634-04-4	1.8×10^{-3}	
3-Methylcholanthrene [BaP]	56-49-5	$2.2 \times 10^{+1}$	$2.2 \times 10^{+1}$
5-Methylchrysene [BaP]	3697-24-3	$3.9 \times 10^{+0}$	$1.2 \times 10^{+1}$
4, 4'-Methylene bis(2-chloroaniline) (MOCA)	101-14-4	$1.5 \times 10^{+0}$	
Methylene chloride	75-09-2	3.5×10^{-3}	
4,4'-Methylenedianiline	101-77-9	$1.6 \times 10^{+0}$	$1.6 \times 10^{+0}$
Michler's ketone	90-94-8	8.6×10^{-1}	
Naphthalene	91-20-3	1.2×10^{-1}	
Nickel (and compounds)	7440-02-0	9.1×10^{-1}	
5-Nitroacenaphthene [BaP]	602-87-9	1.3×10^{-1}	1.3×10^{-1}
6-Nitrochrysene [BaP]	7496-02-8	$3.9 \times 10^{+1}$	$1.2 \times 10^{+2}$
2-Nitrofluorene [BaP]	607-57-8	3.9×10^{-2}	1.2×10^{-1}
1-Nitropyrene [BaP]	5522-43-0	3.9×10^{-1}	$1.2 \times 10^{+0}$
4-Nitropyrene [BaP]	57835-92-4	3.9×10^{-1}	$1.2 \times 10^{+0}$
N-Nitroso-n-butylamine	924-16-3	$1.1 \times 10^{+1}$	
N-Nitroso-N-methylethylamine	10595-95-6	$2.2 \times 10^{+1}$	
N-Nitrosodi-*n*-propylamine	621-64-7	$7.0 \times 10^{+0}$	
N-Nitrosodiethylamine	55-18-5	$3.6 \times 10^{+1}$	
N-Nitrosodimethylamine	62-75-9	$1.6 \times 10^{+1}$	
N-Nitrosodiphenylamine	86-30-6	9.0×10^{-3}	
p-Nitrosodiphenylamine	156-10-5	2.2×10^{-2}	
N-Nitrosomorpholine	59-89-2	$6.7 \times 10^{+0}$	
N-Nitrosopiperidine	100-75-4	$9.4 \times 10^{+0}$	
N-Nitrosopyrrolidine	930-55-2	$2.1 \times 10^{+0}$	
Pentachlorophenol	87-86-5	1.8×10^{-2}	
Perchloroethylene	127-18-4	2.1×10^{-2}	5.1×10^{-2}
Polychlorinated biphenyls (PCBs) (unspeciated mixture)	1336-36-3		
(high risk) [P1]		$2.0 \times 10^{+0}$	$2.0 \times 10^{+0}$
(low risk) [P2]		4.0×10^{-1}	4.0×10^{-1}
(lowest risk) [P3]		7.0×10^{-2}	7.0×10^{-2}

Table 7.1 Inhalation and Oral Cancer Potency Factors

Substance	Chemical Abstract Service Number (CAS)	Inhalation Potency Factor $(mg/kg\text{-}day)^{-1}$	Oral Slope Factor $(mg/kg\text{-}day)^{-1}$
Polychlorinated biphenyls[P4] (PCBs) (speciated)			
3,3',4,4'-Tetrachlorobiphenyl (77)	35298-13-3	$1.3 \times 10^{+1}$	$1.3 \times 10^{+1}$
3,4,4',5-Tetrachlorobiphenyl (81)	70362-50-4	$3.9 \times 10^{+1}$	$3.9 \times 10^{+1}$
2,3,3',4,4'- Pentachlorobiphenyl (105)	32598-14-4	$3.9 \times 10^{+0}$	$3.9 \times 10^{+0}$
2,3,4,4'5- Pentachlorobiphenyl (114)	74472-37-0	$3.9 \times 10^{+0}$	$3.9 \times 10^{+0}$
2,3'4,4',5- Pentachlorobiphenyl (118)	31508-00-6	$3.9 \times 10^{+0}$	$3.9 \times 10^{+0}$
2',3,4,4',5- Pentachlorobiphenyl (123)	65510-44-3	$3.9 \times 10^{+0}$	$3.9 \times 10^{+0}$
3,3',4,4',5- Pentachlorobiphenyl (126)	57465-28-8	$1.3 \times 10^{+4}$	$1.3 \times 10^{+4}$
2,3,3',4,4',5-Hexachlorobiphenyl (156)	38380-08-4	$3.9 \times 10^{+0}$	$3.9 \times 10^{+0}$
2,3,3',4,4',5'-Hexachlorobiphenyl (157)	69782-90-7	$3.9 \times 10^{+0}$	$3.9 \times 10^{+0}$
2,3',4,4',5,5'-Hexachlorobiphenyl (167)	52663-72-6	$3.9 \times 10^{+0}$	$3.9 \times 10^{+0}$
3,3',4,4'5,5'- Hexachlorobiphenyl (169)	32774-16-6	$3.9 \times 10^{+3}$	$3.9 \times 10^{+3}$
2,3,3'4,4',5,5'- Heptachlorobiphenyl (189)	39635-31-9	$3.9 \times 10^{+0}$	$3.9 \times 10^{+0}$
Potassium bromate	7758-01-2	4.9×10^{-1}	
1,3-Propane sultone	1120-71-4	$2.4 \times 10^{+0}$	
Propylene oxide	75-56-9	1.3×10^{-2}	2.4×10^{-1}
1,1,2,2-Tetrachloroethane	79-34-5	2.0×10^{-1}	
Thioacetamide	62-55-5	$6.1 \times 10^{+0}$	
2,4-Toluene diisocyanate	584-84-9	3.9×10^{-2}	
2,6-Toluene diisocyanate	91-08-7	3.9×10^{-2}	
1,1,2-Trichloroethane (vinyl trichloride)	79-00-5	5.7×10^{-2}	
Trichloroethylene	79-01-6	7.0×10^{-3}	1.5×10^{-2}
2,4,6-Trichlorophenol	88-06-2	7.0×10^{-2}	
Urethane	51-79-6	$1.0 \times 10^{+0}$	
Vinyl chloride	75-01-4	2.7×10^{-1}	

Notes for Table 7.1

Asbestos: [100 PCM fibers/m^3]$^{-1}$ A unit risk factor of 2.7 x 10^{-6} ($\mu g/m^3$)$^{-1}$ and an inhalation cancer potency factor of 2.2 x 10^{+2} (mg/kg BW*day)$^{-1}$ are available (see Appendix C for explanation).

BaP PAHs and PAH Derivatives: Many have potency equivalency factors relative to benzo[*a*]pyrene (see Appendix G). For multipathway chemicals, including PAHs, the oral slope factor is considered the same as the inhalation potency factor unless otherwise noted in the Table.

A Polychlorinated Dibenzo-*p*-dioxins, Polychlorinated Dibenzofurans and speciated poly chlorinated biphenyls: (see Appendix E). For convenience, OEHHA has calculated cancer potency factors for speciated polychlorinated dibenzo-*p*-dioxin, polychlorinated dibenzofuran and polychlorinated biphenyl congeners using the procedure in Appendix E.

B Diesel Exhaust is listed as a Toxic Air Contaminant by the Air Resources Board as "Particulate Matter from Diesel-Fueled Engines". (See Appendix D)

***** Creosote: Can be calculated using Potency Equivalency Factors contained in the benzo[*a*]pyrene Toxic Air Contaminant document and in Appendix G of these guidelines.

P1 Polychlorinated Biphenyls (PCBs): High Risk is for use in cases where congeners with more than four chlorines do not comprise less (are greater) than one-half percent of total PCBs. The high risk number is the default for unspeciated PCB mixtures.

P2 The low risk number is generally not applicable to the Hot Spots program. The Hot Spots program addresses PCBs emitted by stationary facilities. It cannot be assumed that such emissions would occur by simple evaporation. There is a dermal absorption factor applied in evaluation of the dermal pathway for PCBs so the medium risk would not apply to dermal exposure (OEHHA, 2009). The water pathway does not include an assumption that PCB isomers are water soluble, so the medium number would not apply to the water pathway.

P3 Polychlorinated Biphenyls (PCBs): Lowest Risk is for use in cases where congeners with more than four chlorines comprise less than one-half percent of total PCBs. In order for the low number to be used, scientific justification needs to be presented.

P4 Number in parentheses is the IUPAC #, the PCB nomenclature is IUPAC. For multipathway chemicals, including PCBs, the oral slope factor is considered the same as the inhalation potency factor unless otherwise noted in the Table.

7.3 References

OEHHA, 2009. Air Toxics Hot Spots Risk Assessment Guidelines. Part II. Technical Support Document for Cancer Potency Factors: Methodologies for derivation, listing of available values, and adjustments to allow for early life stage exposures. May, 2009. Available online at: http://www.oehha.ca.gov/air/hot_spots/tsd052909.html

8 - Risk Characterization for Carcinogens and Noncarcinogens and the Requirements for Hot Spots Risk Assessments

8.1 Introduction

Risk characterization is the final step of the health risk assessment (HRA). In this step, information developed through the exposure assessment is combined with information from the dose-response assessment to characterize risks to the general public from emissions. In the Hot Spots program, OEHHA conducts the dose-response assessment during the development of cancer potency factors and Reference Exposure Levels. These are used in conjunction with the exposure estimates to estimate cancer risk and evaluate hazard from noncancer toxicity of emitted chemicals. Under the Air Toxics Hot Spots (Hot Spots) Act, risk characterizations should present both individual and population-wide health risks (Health and Safety Code Section (HSC) 44306). Persons preparing HRAs for the Hot Spots Program should consult the local Air Pollution Control or Air Quality Management District (District) to determine if the District has special guidelines to assist with HRA format or other requirements of the Hot Spots Program.

OEHHA is recommending that a 30-year exposure duration be used as the basis for estimating cancer risk at the maximum exposed individual resident (MEIR) in the Hot Spots Program. This exposure duration represents the time of residency for 90 to 95% of Californians at a single location and should provide adequate public health protection against individual risk. We also recommend including the 9 and 70-year cancer risk at the MEIR as supplemental information. Note that a 70-year exposure duration is required to estimate cancer burden or provide an estimate of population-wide risk.

This chapter provides guidance on how to evaluate the risk characterization component of risk assessments required by the Hot Spots Program. A general summary of the risk characterization components includes the following items and information.

- The locations of the point of maximum impact (PMI), the MEIR, and the maximum exposed individual worker (MEIW) are to be identified. The PMI, MEIW, and MEIR for cancer risk and for noncancer hazard indices (averaging times for acute 1-hour, repeated 8-hour, and chronic hazard indices) may not be the same location; all should be identified.

- The location of any specified sensitive receptors (e.g., schools, hospitals, daycare, or eldercare facilities - contact the District or reviewing authority for more information) should be identified

- Estimates of population-wide cancer risk and noncancer hazard

This information must be clearly presented in cross-referenced text, tables, figures, and maps. Chapter 9 provides an outline that specifies the content and recommended format of HRA results. The HARP software is the recommended model for calculating HRA results for the Hot Spots Program. Information on obtaining the HARP software can be found under the Air Toxics Program on the ARB's web site at *www.arb.ca.gov*.

8.1.1 *Tiered Approach to Risk Assessment*

The tiered approach for risk assessment that is presented in detail in the TSD (OEHHA, 2012) and summarized here should be reviewed prior to conducting the health risk assessment. The tiered approach to risk assessment and the health impacts evaluation described here are included in the HARP software.

The tiered approach provides a risk assessor with flexibility and allows consideration of site-specific differences (Table 8.1). The four-tiered approach to risk assessment is intended to primarily apply to residential cancer risk assessment, both for inhalation and noninhalation pathways. Risk assessors can tailor the level of effort and refinement of an HRA by using either the point estimate exposure assumptions as the basis of the exposure and risk assessment, or both the point estimate and a stochastic treatment of exposure factor distributions.

Table 8.1 The Tiered Approach to Risk Assessment

Tier	Description	When Applied
Tier 1	Utilizes OEHHA default point estimates of exposure variates	All risk assessments must include a Tier 1 assessment
Tier 2	Utilizes site-specific point estimates for exposure variates (justified, and approved by OEHHA)	A Tier 2 approach may be presented in addition to Tier 1
Tier 3	Utilizes OEHHA distributions of exposure variates	A Tier 3 approach may be presented in addition to Tier 1
Tier 4	Utilizes site-specific distributions of exposure variates (justified, and approved by OEHHA)	A Tier 4 approach may be presented in addition to Tier 1

Tier 1 is a standard point estimate approach that uses the recommended exposure variate (e.g., breathing or water ingestion rate) point estimates presented in this document. Derivations of these values are described in detail in OEHHA (2012). The results of the Tier 1 evaluations are required to be presented in the risk characterization section for all HRAs prepared for the Hot Spots Program. Thus, persons preparing an HRA using Tier 2 through Tier 4 evaluations must also include the risk characterization results of a Tier 1 evaluation in the HRA.

As discussed in OEHHA (2012), if the risk characterization results from a Tier 1 assessment are above a regulatory level of concern, the risk assessor may want to proceed with more site-specific analysis as described in Tier 2, or use a more resource-intensive stochastic modeling effort described in Tier 3 and Tier 4 (for cancer risk). While further evaluation may provide more information to the risk manager on which to base decisions, the Tier 1 evaluation is useful in comparing risks among a large number of facilities and must be included in all HRAs.

Tier 2 analysis allows the use of available and justifiable site-specific exposure variates (e.g., fish consumption), when presenting the potential health impacts. The site-specific information applied in a Tier 2 assessment must be adequately justified and approved by OEHHA and the District. In Tier 3, a stochastic approach to exposure assessment is taken using the distributions for the exposure pathways presented in the TSD (OEHHA, 2012) and in Chapter 5 of this Guidance Manual. The exposure distributions apply only to a residential receptor and are used only for the determination of cancer risk. OEHHA has not developed exposure intake distributions for workers to use in the offsite worker exposure scenario. Tier 4 is also a stochastic approach for the residential exposure scenario but allows for utilization of site-specific exposure variate distributions if they are justifiable and more appropriate for the site under evaluation than those derived in OEHHA (2012). Alternative site-specific distributions must be approved by OEHHA and the District. For an off-site worker cancer risk evaluation, Tiers 3 and 4 do not apply. Tier 3 and Tier 4 analyses show what a distribution of potential cancer risk may be to an individual or population based on a distribution of exposure inputs (e.g., water ingestion rate) rather than specific point estimates of exposure.

Table 8.2 summarizes OEHHA's recommendations for use of the four Tiers in cancer and noncancer risk assessment.

Table 8.2 Tiers for Residential and Offsite Worker Cancer and Noncancer Hot Spots Risk Assessments

Tier	Cancer		Non Cancer Chronic and 8-Hour	
	Inhalation	Noninhalation	Inhalation	Noninhalation
Tier-1	X	X	X	X
Tier-2	X	X		X[b]
Tier-3	X[a]	X[a]		
Tier-4	X[a]	X[a]		

[a] Applies to residential exposure scenario only
[b] Applies to chronic noncancer exposure only

OEHHA has not developed a stochastic approach (Tier 3 or 4) for estimating noncancer health impacts using acute, 8-hour, and chronic Reference Exposure Levels (RELs). Tier 1 is the only option for determining noncancer health impacts from inhalation exposure since calculating the hazard quotient involves dividing the ground level air concentrations for the specified exposure duration by the appropriate RELs. However, chronic noninhalation noncancer risks involve a calculation of dose from oral or dermal pathways to which site-specific evaluations could be considered under a Tier 2 approach.

Small foot-print facilities – Tier 2 or Tier 4

Some facilities subject to the Air Toxics Hot Spots Act (e.g., some in the industry-wide categories such as gas stations or dry cleaners) have very small zones of impact. In some of these instances, there will be very few receptors within the zone of impact. It isn't possible to develop special recommendations for exposure variates for all possible exposure scenarios. Alternative breathing rates (point estimates or distributions) may be used as part of Tier 2 or Tier 4 risk assessments with appropriate supporting justification in the case of a very small zone of impact. OEHHA is willing to work with risk managers at ARB and the Districts on this issue.

8.2 Risk Characterization for Carcinogens

Cancer risk is calculated by multiplying the daily inhalation or oral dose (calculated in Chapter 5), by a cancer potency factor, the age sensitivity factor, the frequency of time spent at home (for residents only), and the exposure duration divided by averaging time, to yield the excess cancer risk (see section 8.2.4). As described below, the excess cancer risk is calculated separately for each age grouping and then summed to yield cancer risk at the receptor location. A brief description of the age sensitivity factors, exposure duration, and frequency of time spent at home are included in Sections 8.2.1 to 8.2.3 below. These factors are discussed in detail in OEHHA (2009) and OEHHA (2012).

8.2.1 *Adjustment for Early Life Stage Exposures to Carcinogens*

Studies have shown that young animals are more sensitive than adult animals to exposure to many carcinogens (OEHHA, 2009). Therefore, OEHHA developed age sensitivity factors (ASFs) to take into account the increased sensitivity to carcinogens during early-in-life exposure (Table 8.3). These factors were developed and described in detail in OEHHA (2009). In the absence of chemical-specific data, OEHHA recommends a default ASF of 10 for the third trimester to age 2 years, and an ASF of 3 for ages 2 through 15 years to account for potential increased sensitivity to carcinogens during childhood.

Table 8.3 Age Sensitivity Factors by Age Group for Cancer Risk Assessment

Age Group	Age Sensitivity Factor (unitless)
3rd Trimester	10
0<2 years	10
2<9 years	3
2<16 years	3
16<30 years	1
16-70 years	1

For specific carcinogens where data indicate enhanced sensitivity during life stages other than the immediate postnatal and juvenile periods, or for which data demonstrate ASFs different from the default ASFs, the chemical-specific data should be used in order to adequately protect public health.

The risk assessments generated under the Air Toxics Hot Spots Act are reviewed by OEHHA. If a risk assessor had data indicating there are no windows of susceptibility early in life or that a different ASF should be used for a specific carcinogen and wanted to use these data, OEHHA would review the material as part of the review of the risk assessment.

8.2.2 *Fraction of Time Spent at Home for Cancer Risk Assessment*

OEHHA and ARB evaluated information from activity patterns databases to estimate the fraction of time at home (FAH) during the day (OEHHA, 2012). This information can be used to adjust exposure duration and cancer risk from a specific facility's emissions, based on the assumption that exposure to the facility's emissions are not occurring away from home. From the third trimester to age <2 years, 85% of time is spent at home (Table 8.4). From age 2 through <16 years, 72% of time is spent at home. From age 16 years and greater, 73% of time is spent at home. Facilities with any school within the 1×10^{-6} (or greater) isopleth should use FAH = 1 for the child age groups (3rd Trimester, 0<2 years, and 2<16 years). See Appendix I for an example calculation using the FAH.

Table 8.4 Recommendations for Fraction of Time at Home (FAH) for Evaluating Residential Cancer Risk

Age Range	Fraction of Time at Residence
3rd Trimester, and 0<2 years	0.85[1]
2<16 years[2]	0.72[1]
16-70 years[3]	0.73

[1] Use FAH = 1 if a school is within the 1×10^{-6} (or greater) cancer risk isopleth

[2] Also use FAH = 0.72 for 2<9 yr age group.
[3] Also use FAH = 0.73 for 16<30 yr age group.

The FAH is calculated based on a diary of trips taken over a 24-hour period on the survey day. Ninety-five percent of the diary days were on weekdays. Participants can select "vacation" as one of their trips. However, vacation time represented only a fraction (0.68%) of the over 175,000 trips recorded in the survey. Because much of these vacation trips were presumed to be within-day trips and were only a small fraction of total trips, there is likely little overlap with the Exposure Frequency (EF) variate used in the dose equations in Chapter 5.

8.2.3 *Exposure Duration for Estimating Cancer Risk to Residents and Off-Site Workers*

OEHHA recommends that an exposure duration (residency time) of 30 years be used to estimate individual cancer risk for the maximally exposed individual resident (MEIR) (Table 8.5). OEHHA also recommends that the 30-year exposure duration be used as the basis for public notification and risk reduction audits and plans. The Districts, however, may opt to use the 70 year cancer risk for notification and risk reduction audits and plans.

Note that the 30-year exposure duration starts in the third trimester to accommodate the increased susceptibility of exposures in early life (OEHHA, 2009), and would apply to both the point estimate and stochastic approaches.

Table 8.5 Summary of Recommendations for Exposure Duration for Individual Cancer Risk at the MEIR and MEIW

Receptor	***Recommendation***
Resident (MEIR)	30 years
Resident (supplemental Information)	9 years for central tendency; 70 years for maximum (lifetime)
Worker (MEIW)	25 years

Exposure durations of 9-years and 70-years are also recommended to be evaluated for the MEIR to show the range of cancer risk based on residency periods. If a facility is notifying the public regarding cancer risk, the 9- and 70-year cancer risk estimates are useful for people who have resided in their current residence for periods shorter and longer than 30 years.

The 9-, 30-, and 70-year exposures are chosen to coincide with U.S. EPA's estimates of the average (9 years), high-end estimates (30-years) of residence time, and a lifetime residency (70 years). These estimates are also consistent with what is known about residence time in California. Together, the 9-, 30-, and 70-year cancer risk calculations provide a useful presentation of cancer risk and the relationship to duration of residency and, thus, exposure to a facility's emissions.

For the maximally exposed individual worker (MEIW), OEHHA recommends using an exposure duration of 25 years to estimate individual cancer risk for the off-site worker scenario (Table 8.5). This duration represents approximately the 95th percentile of job tenure with the same employer in the U.S.

8.2.4 *Calculating Residential and Offsite Worker Inhalation Cancer Risk*

Residential Receptors

For residential inhalation exposure, cancer risk must be separately calculated for specified age groups (Eq. 8.2.4A, see Section 8.2.1), because of age differences in sensitivity to carcinogens and age differences in intake rates (per kg body weight). Separate risk estimates for these age groups provide a health-protective estimate of cancer risk by accounting for greater susceptibility in early life, including both age-related sensitivity and amount of exposure. The following equation illustrates the formula for calculating residential inhalation cancer risk. See Appendix I for a detailed example calculation.

A. Equation 8.2.4 A: $$RISK_{inh\text{-}res} = DOSE_{air} \times CPF \times ASF \times ED/AT \times FAH$$

7. $RISK_{inh\text{-}res}$ = Residential inhalation cancer risk
8. $DOSE_{air}$ = Daily inhalation dose (mg/kg-day)
9. CPF = Inhalation cancer potency factor ($mg/kg\text{-}day^{-1}$)
10. ASF = Age sensitivity factor for a specified age group (unitless)
11. ED = Exposure duration (in years) for a specified age group
12. AT = Averaging time for lifetime cancer risk (years)
13. FAH = Fraction of time spent at home (unitless)

a: Recommended default values for EQ 8.2.4 A:

5. $DOSE_{air}$ = Calculated for each age group from Eq. 5.4.1
6. CPF = Substance-specific (see Table 7.1)
7. ASF = See Section 8.2.1
8. ED = 0.25 years for 3rd trimester, 2 years for 0<2, 7 years for 2<9, 14 years for 2<16, 14 years for 16<30, 54 years for 16-70
9. AT = 70 years*
10. FAH = See Table 8.4

*Although AT actually sums to 70.25 years when the 3rd trimester (0.25 years) is included, OEHHA recommends rounding AT = 70 years (and rounding residential exposure durations at 9- and 30-years rather than 9.25- and 30.25-years) to simplify the calculation without causing a significant adjustment. Note that the dose for the 3rd trimester is based on the breathing rate of pregnant women using the assumption that the dose to the fetus during the 3rd trimester is the same as that to the mother.

Cancer risks calculated above for individual age groups are summed to estimate cancer risk for 9-, 30- and 70-year exposures as shown below. Note that this example includes the Fraction of Time Spent at Home (FAH) for each age grouping.

Calculation of Inhalation Cancer Risk from the Third Trimester to Age Nine:

$$RISK_{inh\text{-}res} = (DOSE_{air}\ third\ trimester \times CPF \times 10 \times 0.25/70\ years \times FAH_{3rd\ tri\ <2}) + (DOSE_{air}\ age\ 0<2 \times CPF \times 10 \times 2/70 \times FAH_{3rd\ tri\ <2}) + (DOSE_{air}\ age\ 2<9 \times CPF \times 3 \times 7/70\ years \times FAH_{2<9})$$

Calculation of Inhalation Cancer Risk from Third Trimester to Age 30:

$$RISK_{inh\text{-}res} = (DOSE_{air}\ third\ trimester \times CPF \times 10 \times 0.25/70\ years \times FAH_{3rd\ tri\ <2}) + (DOSE_{air}\ age\ 0<2 \times CPF \times 10 \times 2/70 \times FAH_{3rd\ tri\ <2}) + (DOSE_{air}\ age\ 2<16 \times CPF \times 3 \times 14/70 \times FAH_{2<16}) + (DOSE_{air}\ age\ 16<30 \times CPF \times 1 \times 14/70\ years \times FAH_{16\text{-}30})$$

Calculation of Inhalation Cancer Risk from Third Trimester to Age 70:

$$RISK_{inh\text{-}res} = (DOSE_{air}\ third\ trimester \times CPF \times 10 \times 0.25/70\ years \times FAH_{3rd\ tri\ <2}) + (DOSE_{air}\ age\ 0<2 \times CPF \times 10 \times 2/70 \times FAH_{3rd\ tri\ <2}) + (DOSE_{air}\ age\ 2<16 \times CPF \times 3 \times 14/70 \times FAH_{2<16}) + (DOSE_{air}\ age\ 16<70 \times CPF \times 1 \times 54/70\ years \times FAH_{16\text{-}70})$$

Expressing cancer risk in "chances per million" is useful as a risk communication tool for the public, but cancer risk can also be expressed in other ways, such as "chances per 100,000" (cancer risk × 10^5) or "chances per 10 million" (cancer risk × 10^7). To convert the resulting cancer risk estimate to chances of developing cancer per million individuals exposed, multiply the cancer risk by 10^6:

$$Cancer\ risk \times 10^6 = chances\ per\ million$$

For exposure to multiple carcinogenic substances, Table 8.7 and Table I.5 in Appendix I are examples of how cancer risks of individual substances are summed to determine the total cancer risk.

Worker Receptors

For assessment of off-site worker cancer risk at the MEIW, the default assumes working age begins at 16 years. Note that the residential FAH factor in Eq. 8.2.4.A above does not apply for workers. The daily inhalation dose ($DOSE_{air}$) (as calculated in Chapter 5, EQ 5.4.1.2) is based on the adjusted 8-hour concentration at the MEIW (for non-continuous sources) and amount of time the offsite worker's schedule overlaps with the facility's emission schedule. The duration of exposure at the MEIW receptor is 25 years, as discussed in the TSD (OEHHA, 2012).

B. Equation 8.2.4 B: $RISK_{inh\text{-}work} = DOSE_{air} \times CPF \times ASF \times ED/AT$

1. $RISK_{inh\text{-}work}$ = Worker inhalation cancer risk

a: Recommended default values for EQ 8.2.4 B:

1. $DOSE_{air}$ = Calculated for workers in Eq. 5.4.1.2
2. CPF = Substance specific (see Table 7.1)
3. ASF = 1 for working age 16-70 yrs (See Section 8.2.1)
4. ED = 25 years
5. AT = 70 yrs for lifetime cancer risk

Work Locations with Daycare Facilities:

An additional risk management consideration for offsite worker cancer risk assessment of a Hot Spots facility is whether there are women of child bearing age at the MEIW location and whether the MEIW has a daycare center. In the case of women of child-bearing age at the MEIW, the Districts may wish to treat the off-site MEIW in the same way as the residential scenario to account for the higher susceptibility during the third trimester of pregnancy (i.e., use of an ASF=10 for third trimester exposure). If there is onsite daycare at the MEIW, then the risks to the children will be underestimated using the offsite adult worker scenario. In this case, the Districts may wish to include a cancer risk assessment for the children in the onsite daycare, assuming they could be there from 0 to age 6 years (ED = 6 years) and using the appropriate exposure factors to calculate $DOSE_{air}$, fraction of time at worksite (e.g., hrs at daycare per 24 hrs), and ASFs in EQ 8.2.4 B to account for the higher susceptibility of infants and children to carcinogens.

Children at a MEIW daycare may also be assessed for noninhalation exposures. Typically, soil ingestion and dermal exposure will be the most common noninhalation pathways. However, all pathways that are present at the daycare should be included. See section 8.2.6 for more discussion of multipathway risk assessment methods.

8.2.5 *Calculation of Noninhalation Cancer Risk*

A small subset of Hot Spots substances is subject to deposition onto the soil, plants, and water bodies (see Table 5.1). These substances need to be evaluated by the appropriate noninhalation pathways, as well as by the inhalation pathway, and the risk characterization results must be presented in all HRAs. These substances include semi-volatile organic chemicals and heavy metals.

For all multipathway substances, the exposure pathways that must be evaluated at every residential and worker site (in addition to inhalation) are soil ingestion and dermal exposure. If PAHs (and creosotes), lead, dioxins, furans, or PCBs are emitted, then the breast-milk consumption pathway becomes mandatory for residential receptors. OEHHA has developed transfer coefficients for these chemicals from the mother to breast milk (see OEHHA, 2012 for details). The other exposure pathways (e.g.,

ingestion of homegrown produce or fish) are only evaluated for residential receptors if the facility impacts that exposure medium and the receptor under evaluation can be exposed to that medium or pathway. For example, if the facility does not impact a fishable body of water within the isopleth of the facility, or the impacted water body does not sustain fish that are consumed by fishers, then the fish pathway will not be considered for that facility or receptor.

Table 8.6 identifies the residential receptor exposure pathways that are mandatory and those that are dependent on the available routes of exposure. Table 8.6 also identifies the three exposure pathways that are relevant for a worker receptor. The cancer risk estimates should be presented in the risk characterization section of the risk assessment for all the appropriate pathways.

Table 8.6 Mandatory and Site/Route Dependent Exposure Pathways

Mandatory Exposure Pathways	Site/Route Dependent Exposure Pathways
• Inhalation[w] • Soil Ingestion[w] • Dermal Exposure to Contaminated Soil[w] • Breast Milk Consumption[*]	• Homegrown Produce Ingestion • Angler-Caught Fish Ingestion • Drinking Water Ingestion • Home-Raised Animal Product Ingestion (Dairy (Cow's) Milk, Meat (Beef, Pork, Chicken) and Egg).

(w) Identifies the appropriate exposure pathways that should be evaluated for a worker. These pathways are inhalation, dermal exposure, and the soil ingestion pathway.

(*) If PAHs (including creosotes), lead, dioxins, furans, or PCBs are emitted, then the breast-milk consumption pathway becomes mandatory.

The noninhalation residential cancer risk is calculated using the same steps as inhalation cancer risk described in Section 8.2.4. A dose (see Chapters 4 and 5) from the pathway under evaluation (e.g., soil ingestion) is multiplied by the substance-specific oral slope factor, expressed in units of inverse dose (i.e., $(mg/kg/day)^{-1}$) (Table 7.1), the appropriate age sensitivity factor (ASF), and exposure duration divided by averaging time to yield the cancer risk for a specified age grouping. Cancer risk for each age group is summed as appropriate for the exposure duration. The FAH factor is relevant only to the inhalation pathway and is not appropriate to use in the noninhalation pathways.

Equation 8.2.5 illustrates the formula for calculating noninhalation cancer risk. Details (data, algorithms, and guidance) for each exposure pathway are presented in Chapter 5 and in OEHHA (2012).

A. Equation 8.2.5: $RISK_{noninh} = DOSE_{noninh} \times CPF_{oral} \times ASF \times ED/AT$

1. $RISK_{noninh}$ = Noninhalation pathway cancer risk
2. $DOSE_{noninh}$ = Daily dose (mg/kg-day) for a specified non-inhalation pathway for each age group
3. CPF_{oral} = Oral cancer potency (slope) factor (mg/kg-day^{-1})
4. ASF = Age sensitivity factor for a specified age group (unitless)
5. ED = Exposure duration (in years) for a specified age group
6. AT = Averaging time for lifetime cancer risk

a: Recommended default values for EQ 8.2.5:

1. $DOSE_{noninh}$ = Calculated in Chapter 5 dose algorithms for each age group and for each noninhalation route in Table 8.6 the receptor is exposed to
2. CPF_{oral} = Substance-specific (see Table 7.1)
3. ASF = See Section 8.2.1
4. ED = Residents: 0.25 years for 3rd trimester, 2 years for 0<2, 7 years for 2<9, 14 years for 2<16, 14 years for 16<30, 54 years for 16-70
   = Offsite worker: 25 yrs
5. AT = 70 years

Estimating cancer risk for 9-, 30- and 70-years by summing the individual age-group cancer risks is the same as that shown for the inhalation route in Section 8.2.4. The exception is that the FAH variate is only appropriate for the residential inhalation pathway and is not a factor for oral and dermal exposure pathways.

Calculation of Noninhalation Cancer Risk from Third Trimester to Age 30:

$RISK_{noninh\text{-}res}$ = ($DOSE_{noninh}$ third trimester × CPF × 10 × 0.25/70 years) + ($DOSE_{noninh}$ age 0<2 × CPF × 10 × 2/70) + ($DOSE_{noninh}$ age 2<16 × CPF × 3 × 14/70) + ($DOSE_{noninh}$ age 16<30 × CPF × 1 × 14/70 years)

To convert this estimated probability of risk to chances per million of developing cancer, multiply the estimated cancer risk for each noninhalation exposure route by 10^6. This result is useful communication tool to compare risks for each pathway of exposure.

$$\text{Cancer risk} \times 10^6 = \text{cancer risk expressed as chances per million}$$

For assessment of the offsite worker the typical noninhalation pathways that apply for worker cancer risk are the dermal exposure pathway and the soil ingestion pathway.

Children at a MEIW daycare may also be assessed for noninhalation exposures. Typically, soil ingestion and dermal exposure will be the most common noninhalation pathways. However, all pathways that are present at the daycare should be included.

8.2.6 *Multipathway Cancer Risk Methodology*

Under a Tier 1 assessment, it is necessary to calculate the total cancer risk from both inhalation and noninhalation exposures if multipathway substances are emitted from the facility. The calculation of cancer risk that includes exposure to a multipathway substance or substances has three steps:

1) Calculate cancer risk for the inhalation pathway (EQ 8.2.4 A for residents, EQ 8.2.4 B for off-site workers) for all substances, and the noninhalation pathways that apply (EQ 8.2.5) for all multipathway substances, using high-end point estimates of intake rates.
2) For each multipathway substance, identify the two exposure pathways with the highest risk. These are the dominant pathways that are to be assessed using high-end point estimates of intake rates for the total cancer risk. For all other pathways, the average point estimate of intake rates may be used to calculate the pathway cancer risk (See OEHHA (2012) for more information).
3) To calculate total cancer risk, all inhalation and noninhalation pathways are summed together for all substances.

The final cancer risk calculation using a combination of high-end and average exposure parameters is referred to as the derived risk in the HARP software. This is described in Chapter 1, Section 1.4.1 of OEHHA (2012). The inhalation route is almost always one of the two dominant pathways in a multipathway cancer risk assessment. Therefore, in most cases only one noninhalation pathway would be calculated using a high-end dose point estimate. For all other pathways, the average point estimate may be used to calculate the pathway cancer risk.

For example, if dermal exposure and soil ingestion risks are calculated, then the cancer risks from these pathways would be summed along with the inhalation cancer risks to give the total cancer risk for the single multipathway substance:

Cancer Risk (inhalation) + Cancer Risk (dermal) + Cancer Risk (soil) = Total Risk

The mother's milk pathway also becomes a mandatory pathway to assess risk in nursing infants if the mother is exposed to specific substances (see Table 5.1).

Many facilities will emit multiple carcinogenic substances. If multiple substances are emitted, the substance-specific cancer risks for all exposure pathways are summed to give the (total) multipathway cancer risk at the receptor location. The HARP software will display not only the multipathway risk for each carcinogenic substance, but also show a breakdown of the cancer risk from each exposure pathway. Table 8.7 shows the results of a multipathway risk assessment for a hypothetical facility. While not presented in the following table, it is critical to identify the driving exposure pathways and the driving substances in a multipathway cancer risk assessment when summarizing and presenting the HRA results. See Chapter 9 for more information.

Table 8.7 Multipathway Assessment of a Hypothetical Facility 30-Year Cancer Risk

Substance	Cancer Risk[a]	Cancer risk[b] (chances per million)
Arsenic	1.1×10^{-5} (i) 3×10^{-7} (ni)	11 (i) 0.3 (ni)
Benzene	2.92×10^{-4} (i)	292 (i)
2,3,7,8-TCDD (dioxin)	1.06×10^{-4} (i) 5.7×10^{-5} (ni)	106 (i) 57 (ni)
1,3-Butadiene	6.0×10^{-6} (i)	6 (i)
Total Facility Cancer Risk	**4.723×10^{-4}**	**472**

[a] As calculated in EQ 8.2.4 A or EQ 8.2.5
[b] Calculated as: cancer risk × 10^6 = chances per million
i = inhalation pathway contribution
ni = noninhalation pathway contribution

Cancer risk in Table 8.7 for the multipathway substances, arsenic and 2,3,7,8-TCDD, is arranged by the inhalation pathway risk and the sum of all noninhalation pathway risks. The total facility multipathway cancer risk is the sum of all inhalation and noninhalation pathways.

Cancer risks from different substances are treated additively in risk assessment generally, and in the Hot Spots Program in part because many carcinogens act through the common mechanism of DNA damage. The additive assumption is reasonable from a public health point of view. Other possible interactions of multiple carcinogens include synergism (effects are greater than additive) or antagonism (effects are less than additive). The type of interaction is both chemical and dose dependent and in most cases the data are not available to adequately characterize these interactions.

8.2.7 *Multipathway Cancer Risk for Infant Exposure to Mother's Milk*

The mother' milk pathway becomes mandatory if the nursing mother is exposed to one or more of the following multipathway substances: dioxins and furans, PCBs, PAHs including creosotes, and lead. The default assumption inherent in the intake rate is that the infant's only source of food is breast for the first year (e.g., is fully breastfed, see OEHHA, 2012, for details), which is one-half of the 0<2 year age group used in the Hot Spots program. Thus, the cancer risk by the mother's milk pathway will need to be calculated with a modified cancer risk equation using a different exposure duration:

A. Equation 8.2.7: $\mathbf{RISK_{mm} =}$ Dose-Im $\mathbf{\times CPF_{oral} \times ASF \times ED/AT}$

1. $RISK_{mm}$ = Infant cancer risk via mother's milk pathway
2. Dose-Im = Daily dose (mg/kg-day) to infant from mother's milk
3. CPF_{oral} = Oral cancer slope factor (mg/kg-day^{-1})
4. ASF = Age sensitivity factor for infant (unitless)
5. ED = Exposure duration (in years) for infant
6. AT = Averaging time for lifetime cancer risk

a: Recommended default values for EQ 8.2.7:

6. Dose-Im = Calculated from EQ 5.4.3.5.2, dose to infant via mother's milk
7. CPF_{oral} = Substance-specific (see Table 7.1)
8. ASF = 10 (See Section 8.2.1)
9. ED = 1 yr (1st yr of 0<2 yr age group)
10. AT = 70 years

Once the cancer risk is determined for the mother's milk pathway for each applicable substance, the pathway risk is summed with other pathway risks.

For Tier 1, the derived approach for cancer risk assessment should be used if the mother's milk pathway applies. As outlined in Section 8.2.6, the two dominant pathways will be calculated using high-end point estimates of intake rates; all additional pathways may be calculated using average point estimates of intake rates. There will be four mandatory pathways to assess (inhalation, mother's milk, soil ingestion and dermal exposure) for cancer risk when exposure to dioxins/furans, PCBs, PAHs including creosotes, and/or lead occurs. Therefore, if the infant is exposed to no other additional site-specific noninhalation pathway(s), only the two dominant pathways among the four will be assessed for cancer risk using high-end point estimates of intake rates; and the others would be assessed using the average point estimate of intake rate.

In short, multipathway cancer risk for a substance is estimated by summing the potential inhalation and noninhalation cancer risks for the receptor location of interest. See the discussion of Tier 1 in Section 8.2.6 or the TSD for more information on the method used to determine the multipathway cancer risk.

8.2.8 *Cancer Risk Characterization for Stochastic Risk Assessment*

Risk characterization for a stochastic risk assessment is similar to that described for the point-estimate approach. However, the stochastic risk assessment produces a distribution of risk that accounts for some of the natural variability in exposure-related factors, such as breathing rates or water intake. The cancer risk distribution for inhalation cancer risk, for example, is generated by multiplying randomly selected values from the breathing rate distribution by the ground level air concentration, and the cancer potency factor. A variation of the Monte Carlo method called Latin hypercube sampling is the method by which the values from the breathing rate distribution are

selected. If noninhalation pathways need to be evaluated, the same process is followed for each pathway and the risk is summed to give an overall inhalation and noninhalation cancer risk distribution. Further, the specification of Age Sensitivity Factors and the need to separately calculate risks require that a Monte Carlo sampling be conducted for each age group and the cancer risk distributions are then summed across age groups.

The HARP software will perform an HRA using a Monte Carlo analysis with either OEHHA-provided or user-provided data distributions and will include the statistics for the distributions. In risk assessments that have chosen to use the distribution of exposure variates, the cancer risk distribution for a 30-year residential exposure duration (MEIR) should be presented in the risk characterization section We also recommend including the 9 and 70-year cancer risk at the MEIR as supplemental information. Note that a 70-year exposure duration is required to estimate cancer burden or provide an estimate of population-wide risk. A stochastic approach has not been developed for acute, 8-hour, and chronic noncancer health impacts or worker (MEIW) exposures.

8.2.9 *Use of Individual Cancer Risk and Population-wide Cancer Risk*

Cancer risk for an individual receptor and a representation of population-wide cancer risk are both important components of a risk assessment. The individual receptor approach reflects the exposures that may occur to an individual receptor over a period of time at a specific location. The individual cancer risk approach has some inherent limitations in terms of illustrating and potentially protecting population-based public health. For example, a facility with a small emissions footprint may impact a few individuals with a high individual potential cancer risk; whereas, a facility with a larger emission footprint may have a lower potential cancer risk for an individual receptor but expose many more people to those levels. Since this larger emitting facility can impact many more people, the population-wide health impacts are magnified due to the larger number of people exposed to the facility's emissions. This potential for higher population impacts is not captured by the individual receptor risk methodology. Therefore, the individual and population-wide heath impacts should be presented for all facilities to provide a more complete illustration of the facility's health impacts.

8.2.9.1 Population Risk

For facilities with large emission footprints (e.g., refineries, ports, or rail yards, etc.), population-based health impacts are critical to provide a better illustration of the potential impacts of emissions since large numbers of people may be exposed to the emissions. The individual cancer risk approach has some inherent limitations in terms of protecting public health. A small facility with a single stack can impact a few individuals with an individual cancer risk that is unacceptable, whereas a large facility may have an individual cancer risk that is below the acceptable limit for individual risk but exposes many more people. Thus, the population-wide impacts are larger for the large facility. Population-wide risk is independent of individual risk, and assumes that a population (not necessarily the same individuals) will live in the impacted zone over a

70-year period. Thus, a 70-year exposure duration is required for estimates of population-wide risks.

To evaluate population risk, one method that regulatory agencies have used is the cancer burden method to account for the number of excess cancer cases that could occur in a population.

Cancer Burden

The cancer burden can be calculated by multiplying the cancer risk at a census block centroid by the number of people who live in the census block, and adding up the estimated number of potential cancer cases across the zone of impact. The result of this calculation is a single number that is intended to estimate of the number of potential cancer cases within the population that was exposed to the emissions for a lifetime (70 years).

The cancer burden is calculated on the basis of lifetime (70-year) risks (whereas individual cancer risk at the MEIR is based on 30-year residential exposure). Cancer burden is independent of how many people move in or out of the vicinity of an individual facility. For example, if 10,000 people are exposed to a carcinogen at a concentration with a 1×10^{-5} cancer risk for a lifetime the cancer burden is 0.1, and if 100,000 people are exposed to a 1×10^{-5} risk the cancer burden is 1.

Estimate of Population Wide Risk

An estimate of the number of people exposed at various cancer risk levels can provide perspective on the magnitude of the potential public health threat posed by a facility. This approach is intended as a replacement for or addition to the cancer burden calculation used by some Districts in the past. The new approach provides a much easier way for the general public to interpret results when compared to cancer burden estimates. A facility in a sparsely populated area can have a public health impact different from the same facility in a highly populated area; however, under the cancer burden method, those differences may not be seen. Some suggested approaches and methods for performance of a screening or refined population exposure analyses are provided in Section 4.6.

The District or reviewing authority should be consulted before beginning the population exposure estimates and, as results are generated, further consultation may be necessary. Note that a 70-year exposure duration is required to estimate cancer burden or provide an estimate of population-wide risk.

The zone of impact for estimating the number of persons exposed to a cancer risk from facility emissions should be set at a minimum of a 10^{-6} cancer risk level (see Section 4.6.1). Some Districts may prefer to use a cancer risk of 10^{-7} to define the carcinogenic zone of impact. The total number of persons exposed to a series of potential risk levels can be presented to aid risk managers in understanding the magnitude of the potential public health impacts.

The HARP software can provide population-level risk estimates as cancer burden or as the number of persons exposed to a selected (user-identified) cancer risk level at block level centroids.

8.2.9.2 Population Estimates for Noncancer Health Impacts

A noncancer chronic, 8-hour, and acute population estimate of the number of people exposed to acute, 8-hour, and chronic HQs or HIs exceeding 0.5 or 1.0, in increments of 1.0, should also be presented. For example, a facility with a maximum chronic HI of 4.0 would present the number of people exposed to a chronic HI of 0.5, 1.0, 2.0, 3.0, and 4.0. The isopleths used in this determination should be drawn using the smallest feasible grid size. The same methods that are described in Chapter 4 and Section 8.2.9 (for the population exposure estimate for cancer risk) should be used in the chronic, 8-hour and acute population estimates. Population estimates for acute, 8-hour, and chronic health impacts should be presented separately.

8.2.9.3 Factors That Can Impact Population Risk – Cumulative Impacts

Although the Hot Spots program is designed to address the impacts of single facilities and not aggregate or cumulative impacts, there are a number of known factors that influence the susceptibility of the exposed population and thus may influence population risk. Socioeconomic status influences access to health care, nutrition, and outcome after cancer diagnosis. Community unemployment can affect exposure and residency time near a facility. Factors that affect the vulnerability of the population are discussed in the report *Cumulative Impacts: Building a Scientific Foundation* (OEHHA, 2010). Information on many of these factors is relatively easy to obtain at the census tract level. The OEHHA recommends that these types of factors be considered by the risk manager, along with the quantitative measures of population risk. OEHHA is in the process of developing guidance on quantification of the impact of these factors.

8.2.10 *Cancer Risk Evaluation of Short Term Projects*

The local air pollution control districts sometimes use the risk assessment guidelines for the Hot Spots program in permitting decisions for short-term projects such as construction or waste site remediation. Frequently, the issue of how to address cancer risks from short-term projects arises.

Cancer potency factors are based on animal lifetime studies or worker studies where there is long-term exposure to the carcinogenic agent. There is considerable uncertainty in trying to evaluate the cancer risk from projects that will only last a small fraction of a lifetime. There are some studies indicating that dose rate changes the potency of a given dose of a carcinogenic chemical. In others words, a dose delivered over a short time period may have a different potency than the same dose delivered over a lifetime.

The OEHHA's evaluation of the impact of early-in-life exposure has reduced some of the uncertainty in evaluating the cancer risk to the general population for shorter-term exposures, as it helps account for susceptibility to carcinogens by age at exposure (OEHHA, 2009).

Due to the uncertainty in assessing cancer risk from very short-term exposures, we do not recommend assessing cancer risk for projects lasting less than two months at the MEIR. We recommend that exposure from projects longer than 2 months but less than 6 months be assumed to last 6 months (e.g., a 2-month project would be evaluated as if it lasted 6 months). Exposure from projects lasting more than 6 months should be evaluated for the duration of the project. In all cases, for assessing risk to residential receptors, the exposure should be assumed to start in the third trimester to allow for the use of the ASFs (OEHHA, 2009). Thus, for example, if the District is evaluating a proposed 5-year mitigation project at a hazardous waste site, the cancer risks for the residents would be calculated based on exposures starting in the third trimester through the first five years of life.

For the MEIW, we recommend using the same minimum exposure requirements used for the residential receptor (i.e., no evaluation for projects less than 2 months; projects longer than 2 months but less than 6 months are assumed to last 6 months; projects longer than 6 months would be evaluated for the duration of the project). Although the off-site worker scenario assumes that the workers are 16 years of age or older with an Age-Sensitivity Factor of 1, another risk management consideration for short-term project cancer assessment is whether there are women of child bearing age at the worksite and whether the MEIW receptor has a daycare center. In this case, the Districts may wish to treat the off-site MEIW in the same way as the residential scenario to account for the higher susceptibility during the third trimester of pregnancy, and for higher susceptibility of infants and children.

Finally, the risk manager may want to consider a lower cancer risk threshold for risk management for very short-term projects. Typical District guidelines for evaluating risk management of Hot Spots facilities range around a cancer risk of 1 per 100,000 exposed persons as a trigger for risk management. Permitting thresholds also vary for each District. There is valid scientific concern that the rate of exposure may influence the risk – in other words, a higher exposure to a carcinogen over a short period of time may be a greater risk than the same total exposure spread over a much longer time period. In addition, it is inappropriate from a public health perspective to allow a lifetime acceptable risk to accrue in a short period of time (e.g., a very high exposure to a carcinogen over a short period of time resulting in a 1×10^{-5} cancer risk). Thus, consideration should be given for very short term projects to using a lower cancer risk trigger for permitting decisions.

8.3 Noncancer Acute, 8-Hour, and Chronic Inhalation Health Impacts – the Hazard Index Approach

All substances in the Hot Spots Program that have noncancer health impacts at a receptor must be evaluated through the inhalation pathway. Estimates of noncancer inhalation health impacts are determined by dividing an airborne concentration at the receptor by the appropriate Reference Exposure Level (REL). This is termed the Hazard Index Approach. A REL is used as an indicator of potential noncancer health impacts and is defined as the concentration at which no adverse noncancer health effects are anticipated. When a health impact calculation is performed for a single substance, then it is called the hazard quotient (HQ). Each REL for a substance will have one or more target organ systems (e.g., respiratory system, nervous system, etc.) where the substance can have a noncancer health impact. Thus, all HQs have specified target organ systems associated with them. The sum of the Hazard Quotients of all chemicals emitted that impact the same target organ is termed the Hazard Index. Inhalation RELs for noncancer health impacts have been developed for acute, 8-hour, and chronic exposures to a number of Hot Spots substances. Acute RELs are designed to protect against the maximum 1-hour ground level concentration at the receptor. Eight-hour RELs are designed to protect people with daily 8-hour schedules, such as offsite workers, in an impacted zone. The 8-hour RELs should be used for typical daily work shifts of 8-9 hours. For further questions, assessors should contact OEHHA, the District, or reviewing authority to determine if the 8-hour RELs should be used in your HRA. Any discussions or directions to exclude the 8-hour REL evaluation should be documented in the HRA. Chronic RELs protect against long-term exposure to the annual average air concentration spread over 24 hours/day, 7 days/week.

OEHHA has added 8-hour RELs to the set of noncancer RELs that were previously comprised of acute and chronic RELs (OEHHA, 2008). Specifically, 8-hour RELs are air concentrations at or below which health impacts would not be expected even for sensitive subpopulations in the general population with repeated daily 8-hour exposures over a significant fraction of a lifetime. The 8-hour RELs can be used to evaluate the potential for health impacts (including effects of repeated exposures) in offsite workers, and to children and teachers exposed during school hours. Although not required in the HRA, they could also be applied by the Districts to a residential scenario where a facility operates only a portion of the day and exposure to residences is not adequately reflected by averaging concentrations over a 24 hour day. The number of chemicals with 8-hour RELs will increase as OEHHA re-evaluates RELs for chemicals under SB-25 to ensure that they are protective of children's health.

Acute, 8-hour, and chronic RELs are needed because the dose metrics and even the health impact endpoints may be different with the different exposure durations of acute, daily 8-hour, and chronic exposures. Also, although chronic REL values are lower or set the same as 8-hour RELs, there are some cases such as special meteorological situations (e.g., significant diurnal-nocturnal meteorological differences) or intermittent exposures where the 8-hour REL may be more protective than the chronic REL.

Chapter 4 describes air dispersion modeling and both Chapter 6 and Appendix L list the needed dose-response information to evaluate non-cancer hazards. Appendix I presents sample calculations for determining acute HQs and HIs, 8-hour HQs and HIs, and chronic multipathway HQs and HIs. Chapter 9 provides an outline of information required for risk characterization. The HARP software will calculate the HQ and HI for Hot Spots risk assessments.

8.3.1 *Calculation of Noncancer Inhalation Hazard Quotient and Hazard Index*

To calculate the acute HQ, the maximum 1-hour ground level concentration (in $\mu g/m^3$) of a substance at a receptor is divided by the acute 1-hour REL (in $\mu g/m^3$) for the substance:

$$\text{Acute Hazard Quotient} = \frac{\text{1-Hour Max Concentration } (\mu g/m^3)}{\text{Acute REL } (\mu g/m^3)}$$

To calculate the chronic HQ, the annual average ground level concentration of a substance is divided by the chronic REL for the substance:

$$\text{Chronic Hazard Quotient} = \frac{\text{Annual Average Concentration } (\mu g/m^3)}{\text{Chronic REL } (\mu g/m^3)}$$

To calculate the 8-hour HQ, the adjusted annual average ground level concentration of a substance (represented as "Adjusted C_{air}" in EQ 5.4.1.4 A) is divided by the 8-hour REL for the substance:

$$\text{8-hour Hazard Quotient} = \frac{\text{Adjusted Annual Average Concentration } (\mu g/m^3)}{\text{8-hour REL } (\mu g/m^3)}$$

The daily 8-hour average ground level concentrations used for calculating the 8-hour HQs are derived as described in Chapter 4.

An HQ of 1.0 or less indicates that adverse health effects are not expected to result from exposure to emissions of that substance. As the HQ increases above one, the probability of human health effects increases by an undefined amount. However, it should be noted that a HQ above one is not necessarily indicative of health impacts due to the application of uncertainty factors in deriving the RELs.

If a receptor is exposed to multiple substances that target the same organ system, then the HQs for the individual substances are summed to obtain a Hazard Index (HI) for that target organ.

Table 8.8 is an example of an HRA spreadsheet showing acute inhalation HQs arranged by target organ system for several substances. The bottom row shows the summed HQs by target organ system to derive the HIs.

Table 8.8 Individual Hazard Quotients and Total Hazard Index for Acute Inhalation Exposure

Substance	Reproductive/ Developmental	Nervous System	Cardiovascular System	Respiratory System	Eye
Ammonia				0.6	0.6
Arsenic	0.2	0.2	0.2		
Benzene	0.02				
Chlorine				0.7	0.7
Total Hazard Index	**0.22**	**0.2**	**0.2**	**1.3**	**1.3**

A more detailed example of calculating HQs and HIs and of determining noncancer health impacts is shown in Appendix I.

Hazard quotients or HIs for different target organs are not summed together (e.g., do not add the impacts for the eye to the cardiovascular system). Chapter 6 and Appendix L have lists of the organ systems affected by each substance. Unlike the cancer risk algorithms, no exposure duration adjustment (e.g., 9 yrs / 70 yrs) should be made for noncancer assessments.

There are limitations to this method of assessing cumulative noncancer health impacts. The impact on organ systems may not be additive if health effects occur by different mechanisms. However, the impact on organ systems could also be synergistic. An analysis by a trained health professional familiar with the substance's toxicological literature is usually needed to determine the public health significance of an HQ or HI above one. It is recommended that the Air District contact OEHHA if this situation presents itself. For assessing the noncancer health impacts of lead, different procedures are used; please see Appendix F.

8.3.2 *Calculating Noninhalation (oral) Noncancer Hazard Quotient and Hazard Index*

Similar to the situation with multipathway carcinogenic substances, multipathway substances that present a noncancer hazard are assessed by noninhalation routes of exposure (see Table 8.6). Noninhalation routes of exposure are assessed only for chronic exposure. There are no oral acute RELs since it is generally anticipated that health effects from a single exposure via the oral route at typical environmental levels resulting from deposition of facility emissions would be insignificant relative to the inhalation route. The multipathway substances with noninhalation RELs, called chronic oral RELs, are shown in Table 6.4. Similar to inhalation exposure, the hazard quotient

for a noninhalation pathway is obtained by dividing the dose in milligrams per kilogram-day (mg/kg-day) by the oral REL also expressed in units of mg/kg-day:

$$\text{Chronic Non-inhalation HQ} = \frac{\text{Chronic Noninhalation Dose (mg/kg-day)}}{\text{Chronic Oral REL (mg/kg-day)}}$$

The calculated chronic oral HQs are combined with the chronic inhalation HQs for determining the chronic HIs for each affected target organ (see Section 8.3.4). The point estimates and algorithms for calculating the oral dose for all applicable exposure pathways and receptors (e.g., workers or residents) are explained in Chapter 5.

The chronic oral dose calculated in mg/kg-day is based on a time-weighted average 70-year residential exposure combining the 0<2, 2<16 and 16-70 year age groups. Unlike the assessment of cancer risk, no exposure duration adjustment should be made when estimating HQs. In other words, the variates ED and AT in the cancer risk EQ 8.2.5 in Section 8.2.5 are not used for estimating the noncancer HQs. See Appendix I for an example calculation.

8.3.3 *Multipathway Noncancer Risk Methodology*

To determine multipathway chronic noncancer health impacts, it is necessary to calculate the total hazard index from both inhalation and noninhalation exposures. The calculation of HIs has several steps:

1) First, the inhalation HQ is calculated for each substance emitted (Section 8.3.1).
2) Second, if the substance has an oral REL, then the non-inhalation HQ is calculated as shown above using high-end point-estimates for intake rates for each noninhalation pathway that applies.
3) Third, if there are more than two noninhalation pathways to consider for a multipathway substance, then the oral HQ is calculated using high-end point estimates in the dose equation for the two dominant pathways. For any additional noninhalation pathways, the HQs are calculated using average point estimates in the dose equation. This step applies only to residential receptors.
4) Fourth, all noninhalation pathway HQs for a multipathway substance are then summed together by target organ to obtain the total noninhalation HQ for a multipathway substance.
5) The final step is to sum the inhalation and noninhalation HQs together by target organ to determine the HIs. This step is displayed in Table 8.9. If there is only one substance, then the multipathway HQ is the same as the HI.

Table 8.9 Substance-Specific Chronic Inhalation and Noninhalation Hazard Quotients and the Hazard Index by Target Organ System

Substance	Respiratory System	Hematologic System	Alimentary System	Endocrine System	Development	Reproductive System	Nervous System	Cardiovascular System	Skin
Ammonia	0.8								
Arsenic					0.04(i) 0.1(ni)		0.04(i) 0.1(ni)	0.04(i) 0.1(ni)	0.04(i) 0.1(ni)
Benzene		0.08			0.08		0.08		
2,3,7,8-TCDD (dioxin)	0.1(i) 0.2(ni)	0.1(i) 0.2(ni)	0.1(i) 0.2(ni)	0.1(i) 0.2(ni)	0.1(i) 0.2(ni)	0.1(i) 0.2(ni)			
Nickel	0.4(i)	0.4(i)	0.1(ni)						
Hazard Index	**1.50**	**0.78**	**0.40**	**0.3**	**0.52**	**0.30**	**0.22**	**0.14**	**0.14**

i = inhalation pathway contribution

ni = noninhalation pathway contribution

Table 8.9 shows the calculated chronic HIs by combining the chronic inhalation HQs and chronic oral HQs. The HQs or HIs for different target organs are not added together (e.g., do not add the impacts for the respiratory system to the nervous system). The noninhalation pathways for TCDD and arsenic in Table 8.9 have all the noninhalation pathways that apply incorporated into their HQ values. For example, the noninhalation value for arsenic (HQs = 0.1) includes at least the soil ingestion and dermal soil pathways in the HQs because these are the mandatory noninhalation pathways to take into account with exposure to a multipathway substance. For TCDD, the mother's milk pathway is an additional mandatory noninhalation pathway to take into account (See Table 5.1). If there are exposures to any of the site-specific pathways, then these would be included too. A more detailed example calculation of HIs is shown in Appendix I.

When exposure to more than two noninhalation pathways occur, using the high-end point estimates of intake rates for only the two dominant noninhalation pathways will lessen the issue of compounding high-end exposure estimates, while retaining a health-protective approach for the more important exposure pathways. It is unlikely that an individual receptor would be on the high-end of exposure for all the non-inhalation intake parameters (exposure pathways).

8.3.4 *Summary - Acute, 8-Hour and Chronic Hazard Index Calculation at the MEIR and MEIW*

Eight-hour RELs were developed principally for exposure of individuals during 8-hour work schedules. The 8-hour RELs should be used for typical daily work shifts of 8-9 hours. For further questions, assessors should contact OEHHA, the District, or reviewing authority to determine if the 8-hour RELs should be used in your HRA. Any discussions or directions to exclude the 8-hour REL evaluation should be documented in the HRA. There are currently only a limited number of substances with an 8-hour inhalation REL. Over time as the science supporting REL values for individual substances is reviewed and the RELs are revised by OEHHA, more 8-hour RELs will be developed.

Therefore, for the MEIR, we recommend:

- Estimating the acute Hazard Index based on the maximum 1-hour air concentration and 1-hour RELs
- Estimating the chronic Hazard Index based on the annual average air concentration and the chronic RELs, and the oral RELs for multipathway substances

An 8-hour hazard index based on the daily average 8-hour exposure is not required for the MEIR, but can be performed at the discretion of the District for exposure to non-continuously operating facilities using the adjusted annual average air concentration (See EQ 5.4.1.4 A and B or method in App. M). Eight-hour hazard assessments are not recommended for exposure to continuously operating facilities.

For the MEIW, we recommend:

- Estimating the acute Hazard Index based on the maximum 1-hour air concentration and 1-hour RELs
- Estimating the 8-hour Hazard Index based on daily average 8-hour exposure for those chemicals with 8-hour RELs
- Estimating the chronic Hazard Index based on the annual average air concentration and chronic RELs, and oral RELs for multipathway substances

Until there are 8-hour RELs for many of the Hot Spots substances that have a chronic REL value, we recommend determining the chronic HI for the MEIW to adequately protect the offsite worker.

8.3.5 *Evaluation of Background Criteria Pollutants*

The District should be contacted to determine if the contribution of background criteria pollutants to respiratory health effects is required to be included in an HRA for the Hot Spots Program. If inclusion is required, the methods for calculating the health impact from acute and chronic exposure (respiratory endpoint) is the standard HI approach (see Sections 8.3.1 and 8.3.4). There are currently no 8-hour RELs for criteria

pollutants, so 8-hour health impacts from criteria pollutants are not assessed in HRAs. The background criteria pollutant contribution should be calculated if the HI from the facility's emissions exceeds 0.5 in either the acute or chronic assessment for the respiratory endpoint.

The most recent criteria pollutant concentration data should be obtained from the ARB's ambient air monitoring network and can be found in the *California Almanac of Emissions and Air Quality* on their web site at www.arb.ca.gov. For determining the criteria pollutant contribution in HI calculations, the annual average concentration data should be taken from a monitoring site near the facility. If background contributions are unavailable, the District may direct the risk assessor to make an alternative assumption. The criteria pollutants that should be included in acute and chronic assessments for the respiratory endpoint are ozone, nitrogen dioxide, sulfur dioxide, sulfates, and hydrogen sulfide.

8.4 Uses of Exposure Duration Adjustments for Onsite Receptors

Onsite workers are protected by CAL OSHA and typically are not evaluated under the Hot Spots program. Exceptions may include a worker who also lives on the facility property such as at prisons, military bases, and universities that have worker housing within the facility. Another scenario where the District may require assessment of on-site worker exposure and risk is when a facility (e.g., airport) has multiple businesses owned by different entities within the facility/property (e.g., rental car agencies, restaurants, etc.). In these situations the evaluation of onsite cancer risks, and/or acute, 8-hour, and chronic noncancer hazard indices is appropriate under the Hot Spots program. If the onsite receptor under evaluation can be exposed through a noninhalation exposure pathway, then that exposure pathway must also be included. When a receptor lives and works on the facility, site, or property, then these receptors should be evaluated and reported under both residential and worker scenarios and the one that is most health-protective should be used for risk management decisions.

The cancer risk estimates for the on-site residents may use a 30-year exposure duration while the 25-year exposure duration is used for a worker. Under a Tier 2 analysis, alternate exposure durations may be evaluated and presented with all assumptions supported. See section 8.2.10 for more discussion of short-term exposures.

Other situations that may require on-site receptor assessment include the presence of locations where the public may have regular access for the appropriate exposure period (e.g., a lunchtime café, store, or museum for acute exposures). The District or reviewing authority should be consulted on the appropriate evaluations for the risk for all onsite receptors.

8.5 References

ERG, 2008. Summary Report of the Peer Review Meeting: EPA's Draft Framework for Determining a Mutagenic Mode of Action for Carcinogenicity. Final Report. Submitted to Risk Assessment Forum, Office of the Science Advisor, U.S. Environmental Protection Agency, Washington, DC., by Eastern Research Group. May 23, 2008.

OEHHA, 2010. *Cumulative Impacts: Building a Scientific Foundation*. Available online at: http://www.oehha.ca.gov

OEHHA, 2008. *Air Toxics Hot Spots Program Risk Assessment Guidelines*. Technical Support Document for Deriving Noncancer Refernce Exposure Levels. Office of Environmental Health Hazard Assessment, California Environmental Protection Agency. Available online at: http://www.oehha.ca.gov

OEHHA, 2009. *Air Toxics Hot Spots Program Risk Assessment Guidelines. Technical Support Document for Cancer Potency Factors: Methodologies for derivation, listing of available values, and adjustments to allow for early life stage exposures*. Office of Environmental Health Hazard Assessment, California Environmental Protection Agency. May 2009. Available online at: http://www.oehha.ca.gov

OEHHA, 2012. *Air Toxics Hot Spots Program Risk Assessment Guidelines; Technical Support Document for Exposure Assessment and Stochastic Analysis*. Office of Environmental Health Hazard Assessment, California Environmental Protection Agency. Available online at http://www.oehha.ca.gov

U.S. EPA, 2005a. Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens EPA/630/R-03/003F March 2005.

U.S.EPA, 2005b. Guidelines for Carcinogen Risk Assessment. Risk Assessment Forum, Washington, DC. EPA/630/P-03/001F.

9 - Summary of the Requirements for a Modeling Protocol and a Health Risk Assessment Report

The AB 2588 program is a community right-to-know act. Although risk assessment is a technical field, AB 2588 risk assessments need to be clear and understandable to the educated lay person. An Executive Summary that explains the process and the results of the risk assessment in lay terms is necessary. Clear risk communication is imperative in situations where the facility is required to notify the surrounding community. In addition, the risk assessment is by law reviewed by the local Air Pollution Control or Air Quality Management District (District) and OEHHA in order to ensure that AB 2588 risk assessment procedures have been followed. This chapter clarifies the type of information that is needed for District and OEHHA review of modeling protocols and health risk assessments (HRAs).

The material presented here is intended to promote transparent, consistent presentation and efficient review of the modeling protocol and the health risk assessment report (products). We recommend that persons preparing these products consult with the local District to determine if the District has modeling or HRA guidelines that supersede these products. If the District does not have guidelines for these products, then we recommend Section 9.1 be used for modeling protocols and Section 9.2 be used for the presentation of HRAs. Persons preparing modeling protocols and HRAs should specify the guidelines that were used to prepare their products.

9.1 Submittal of a Modeling Protocol

It is strongly recommended that a modeling protocol be submitted to the District for review and approval prior to extensive analysis with an air dispersion model. The modeling protocol is a plan of the steps to be taken during the air dispersion modeling and risk assessment process. We encourage people who are preparing protocols to take advantage of the protocol step and fully discuss anticipated methodologies for any portion of your project that may need special consideration. Below, we have provided an example of the format that may be followed in the preparation of the modeling protocol. **Consult with the District to confirm format and content requirements or to determine the availability of District modeling guidelines before submitting the protocol.**

9.1.1 *Outline for a Modeling Protocol*

I. Introduction

Include the facility name, address, and a brief overview describing the facility's operations.

- Provide a description of the terrain and topography surrounding the facility and potential receptors.

- Indicate the format in which data will be provided. Ideally, the report and summary of data will be on paper and all data and model input and output files will be provided electronically (e.g., compact disk or CD).

- Identify the guidelines used to prepare the protocol (e.g., District Guidelines).

II. Emissions

For each pollutant and process whose emissions are required to be quantified in the HRA, list the annual average emissions (pounds/year and grams/second) and the maximum one-hour emissions (pounds/hour and grams/second)[1]. Maximum 1-hour emissions are used for acute noncancer health impacts while annual emissions are used for chronic exposures (i.e., chronic and 8-hour noncancer health impacts or cancer risk assessment).

- Identify the reference and method(s) used to determine emissions (e.g., source tests, emission factors, etc.). Clearly indicate any emission data that are not reflected in the previously submitted emission inventory report. In this event, a revised emission inventory report will need to be submitted to the District.

- Identify if this will be a multipathway assessment based on emitted substances.

[1] Except radionuclides, for which annual and hourly emissions are reported in Curies/year and millicuries/hour, respectively.

III. Models / Modeling Assumptions

Specify the model and modeling assumptions

- Identify the model(s) to be used, including the version number.
- Identify the model options that will be used in the analysis.
- Identify the modeling domain(s) and the spacing of receptor grid(s). Grid spacing should be sufficient in number and detail to capture the concentration at all of the receptors of interest.
- Indicate complex terrain options that may be used, if applicable.
- Identify the source type(s) that will be used to represent the facility's operations (e.g., point, area, or volume sources, flare options or other).
- Indicate the preliminary source characteristics (e.g., stack height, gas temperature, exit velocity, dimensions of volume source, etc.).
- Identify and support the use of urban or rural dispersion coefficients for those models that require dispersion coefficients. For other models, identify and support the parameters required to characterize the atmospheric dispersion due to land characteristics (e.g., surface roughness, Monin-Obukhov length).

IV. Meteorological Data

Specify the type, source, and year(s) of hourly meteorological data (e.g., hourly surface data, upper air mixing height information).

- State how the data are representative for the facility site.
- Describe QA/QC procedures.
- Identify any gaps in the data; if gaps exist, describe how the data gaps are filled.

V. Deposition

- Specify the method to calculate deposition (if applicable).

VI. Receptors

Specify the type and location of receptors. Include all relevant information describing how the individual and population-related receptors will be evaluated.

- Identify and describe the location(s) of known or anticipated potential sensitive receptors, the point of maximum impact (PMI), the maximum exposed individual residential (MEIR), and worker (MEIW) receptors. Identify any special considerations or grids that will be used to model these receptors. This information should correspond with information provided in Section III (e.g., fine receptor spacing of 20 meters at the fence line and centered on the maximum impacts; coarse receptor spacing of 100 meters out to 2,000 meters; extra coarse spacing of 1,000 meters out to 20,000 meters).

- Identify if spatial averaging will be used. Include necessary background information on each receptor including how the domain and spacing will be determined for each receptor or exposure pathway.

- Describe how the cancer burden or population impact estimates are calculated. Clarify the same information for the presentation of noncancer population impacts (e.g., centroids of the census tracts in the area within the zone of impact).

- Specify that actual UTM coordinates and the block/street locations (i.e., north side of 3,000 block of Smith Street), where possible, will be provided for specified receptor locations.

- Identify and support the use of any exposure adjustments (e.g., time at location, diurnal).

- Include the list of anticipated exposure pathways that will be included and indicate which substance will be evaluated in the multipathway assessment. Identify if sensitive receptors are present and which receptors will be evaluated in the HRA.

VII. Maps

Identify how the information will be graphically presented.

- Indicate which cancer risk isopleths will be plotted for the cancer zone of impact (e.g., 10^{-7}, 10^{-6} see Section 4.6.1).

- Indicate the hazard quotients or hazard indices to be plotted for the noncancer acute, 8 hour, and chronic zones of impact (e.g., 0.5, 1.0, etc.).

9.2 Health Risk Assessment Report

The purpose of this section is to provide an outline to assist with the preparation and review of HRAs. This outline specifies the key components that should be included in HRAs. All information used for the report must be presented in the HRA. Ideally, the HRA report and a summary of data used in the HRA will be on paper and all data and model input and output files will be provided electronically (e.g., CD). Persons preparing HRAs for the Hot Spots Program should consult the District to determine if HRA guidelines or special formats are to be followed when preparing and presenting the HRA's results.

If District guidelines or formats do not exist that supersede this outline, then the HRA should follow the format presented here. If the HRA is prepared for other programs, the reviewing authority should be consulted for clarification of format and content. We recommend that those persons preparing HRAs specify the guidelines that were used to prepare their product. **The HRA may be considered deficient by the reviewing authority if components that are listed here are not included**.

9.2.1 *Outline for the Health Risk Assessment Report*

I. Table of Contents

- Section headings with page numbers indicated.
- Tables of tables and Table of figures with page numbers indicated.
- Appendices with page numbers indicated.

II. Executive Summary

Overview of all relevant information regarding the project or facility.

- Facility identifier number (consult the District).

- Description of facility operations and a list identifying emitted substances including table of maximum 1-hour emissions, and annual average emissions.

- Provide a brief description of acute, 8-hour, chronic, and cancer health impacts of the emitted substances, based on OEHHA's descriptions in the appropriate Technical Support Documents.

- Text presenting overview of dispersion modeling and exposure assessment.

- Text describing estimated cancer risk for carcinogens, noncancer Hazard Quotients and Hazard Indices and a table showing target organ systems by substance for noncancer impacts.

- Summarize the individual and population-wide health impacts including the driving substance(s) and the driving exposure pathways:

    - Location (block/street location; e.g., north side of 3,000 block of Smith Street) and description of the off-site point of maximum impact (PMI), maximum exposed individual resident (MEIR), and maximum exposed individual worker (MEIW).

    - Location (block/street location; e.g., north side of 3,000 block of Smith Street) and description of any on-site receptors that were evaluated at the facility (consult District or agency).

    - Location (block/street location; e.g., north side of 3,000 block of Smith Street) and description of any sensitive receptors that are required by the district or reviewing authorities (consult District or agency).

      NOTE: When presenting information described in the following bullets, cancer risk should be presented separately for a residential 30-year, Tier–1 analysis. Results of other exposure assumptions (e.g., 9 or 70-year) or other tier evaluations should also be presented, and must be clearly labeled. For the Hot Spots Program, while the 30-year exposure duration is recommended as the basis for public notification and risk reduction audits and plans, the District has discretion to use the 70 year exposure scenario for its decisions. In addition, the 70 year cancer risk must be calculated to estimate population-wide impacts.

    - Text presenting an overview of the total cancer risk (including multipathway substances, if present) at the PMI, MEIR, MEIW, and sensitive receptors. Provide a table of cancer risk by substance for the MEIR and MEIW (if applicable). Include a statement indicating which of the substances appear to contribute most to (drive) the potential health impacts. In addition, identify the exposure pathways evaluated in the HRA.

    - Provide a map of the facility and surroundings and identify the location of the MEIR, MEIW, PMI, and other locations or receptors of interest.

    - Provide a map of 30-year and 70-year cancer risk zone of impact(s), if applicable.

    - Text presenting an overview of the acute and chronic noncancer hazard quotients and the (total) hazard indices for the PMI, MEIR, MEIW, and sensitive receptors. Additionally, include 8-hour hazard quotients and hazard indices for the MEIW. Include separate statements (for acute, 8-hour, and chronic exposures) indicating which

of the substances appear to drive the potential health impacts. In addition, clearly identify the primary target organ(s) that are impacted from acute, 8-hour, and chronic exposures.

- Identify any sensitive subpopulations (e.g., child daycare facilities, schools, nursing homes) of concern.

- Table and text presenting an overview of estimates of population exposure (e.g., cancer burden or population estimates from HARP) (consult District or agency) (see Section 8.4).

- Version of the Risk Assessment Guidelines and computer program(s) used to prepare the risk assessment (e.g., HARP).

III. Risk Assessment Procedures

A. Hazard identification

- Table and text identifying all substances emitted from the facility, plus any other substances required by the District or reviewing authority. Include the CAS number of the substance and the physical form of the substance if possible. [The Hot Spots substances are listed in Appendix A, and also in the ARB's Emission Inventory Criteria and Guidelines Regulations (Title 17, California Code of Regulations, Sections 93300-93300.5), and the Emission Inventory Criteria and Guidelines Report (EICG Report), which is incorporated by reference therein (ARB, 1997)].

- Table and text identifying all substances that are evaluated for cancer risk and/or noncancer acute, 8-hour, and chronic health impacts. In addition, identify any multipathway substances that present a cancer risk or chronic noncancer hazard via noninhalation routes of exposure.

- Describe the types and amounts of continuous or intermittent predictable emissions from the facility that occurred during the reporting year. As required by statute, releases from a facility include spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping (fugitive), leaching, dumping, or disposing of a substance into ambient air. Include the substance(s) released and a description of the processes that resulted in long-term and continuous releases.

B. Exposure Assessment

This section describes the information related to the air dispersion modeling process that needs to be reported in the risk assessment; the information is also presented in Chapter 4 (see Section 4.15). The District may have specific requirements regarding format and content (see Section 4.14). Sample calculations should be provided at each step to indicate how reported emissions

data were used. Reviewing agencies must receive input, output, and supporting files of various model analyses on computer-readable media (e.g., CD).

1. Information on the Facility and its Surroundings

Report the following information regarding the facility and its surroundings:

- Facility Name
- Location (UTM coordinates and street address)
- Land use type (see Section 2.4)
- Local topography
- Facility plot plan identifying:
  - source locations
  - property line
  - horizontal scale
  - building heights
  - emission sources

2. Source and Emission Inventory Information

a. Release Parameters

Report the following information for each release location in table format:

- Release location identification number
- Release name
- Release type (e.g., point, volume, area, line, pit, etc.)
- Source identification number(s) used by the facility for sources that emit out of this release location
- Release location using UTM coordinates
- Release parameters by release type (e.g., shown for point source):
- Stack height (m), stack diameter (building dimensions for downwash, exhaust gas exit velocity (m/s), exhaust gas volumetric flow rate (ACFM), exhaust gas exit temperature (K), etc.

b. Source Description and Operating Schedule

The description and operating schedule for each source should be reported in table form including the following information:

- Source identification number used by the facility
- Source name
- Number of operating hours per day and per year (e.g., 0800-1700, 2700 hr/yr)
- Number of operating days per week (e.g., Mon-Sat)

- Number of operating days or weeks per year (e.g., 52 wk/yr excluding major holidays)
- Release point identification number(s) for where source emissions are released
- Fraction of source emissions emitted at each release point by release point ID number

c. *Emission Control Equipment and Efficiency*

- Report emission control equipment and efficiency by source and by substance

d. *Emissions Data Grouped By Source*

Report emission rates for each toxic substance, grouped by source (i.e., emitting device or process identified in Inventory Report), in table form including the following information:

- Source name
- Source identification number
- Substance name and CAS number (from Inventory Guidelines)
- Annual average emissions for each substance (lb/yr)
- Hourly maximum emissions for each substance (lb/hr)

e. *Emissions Data Grouped by Substance*

Report facility total emission rate by substance for all emitted substances listed in the Air Toxics “Hot Spots” Program including the following information:

- Substance name and CAS number (from Inventory Guidelines)
- Annual average emissions for each substance (lb/yr)
- Hourly maximum emissions for each substance (lb/hr)

f. *Emission Estimation Methods*

Report the methods used in obtaining the emissions data indicating whether emissions were measured or estimated. Clearly indicate any emission data that are not reflected in the previously submitted emission inventory report and submit a revised emission inventory report to the district. A reader should be able to reproduce the risk assessment without the need for clarification.

g. List of Substances

Include tables listing all "Hot Spots" Program substances which are emitted, plus any other substances required by the District. Indicate substances to be evaluated for cancer risks and noncancer effects.

h. Exposed Population and Receptor Location

Report the following information regarding exposed population and receptor locations:

- Description of zone of impact including map showing the location of the facility, boundaries of zone of impact, census tracts, emission sources, sites of maximum exposure, and the location of all appropriate receptors. This should be a true map (one that shows roads, structures, etc.), drawn to scale, and not just a schematic drawing. USGS 7.5 minute maps or GIS based maps are usually the most appropriate choices. (If significant development has occurred since the user's survey, this should be indicated.)

- Separate maps for the cancer risk zone of impact and the hazard index (noncancer) zone of impact(s). The cancer zone of impact should include isopleths down to at least the 1/1,000,000 risk level. Because some districts use a level below 1/1,000,000 to define the zone of impact, the District should be consulted. For the noncancer zone of impact, three separate isopleths (to represent chronic, 8-hour, and acute HI) should be created to define the zone of impact for the hazard index from both inhalation and noninhalation pathways greater than or equal to 0.5. The point of maximum impact (PMI), maximum exposed individual at a residential receptor (MEIR), and maximum exposed individual worker (MEIW) for both cancer and noncancer risks should be located on the maps.

- Tables identifying population units and sensitive receptors (UTM coordinates, receptor IDs or index from the modeling, and street addresses of specified receptors)

- Heights or elevations of the receptor points.

- **Spatial averaging**: For each receptor type (e.g., PMI, MEIR, and MEIW, or other location of interest) that will utilize spatial averaging, the domain size and grid resolution must be clearly identified. If another domain or grid resolution other than 20 meters by 20 meters with 5-meter grid spacing will be used for a receptor, then care should be taken to determine the proper domain size and grid resolution that should be used. For a worker, the HRA shall support all assumptions used, including, but not limited to, documentation for all workers

showing the area where each worker routinely performs their duties. The final domain size should not be greater than the smallest area of worker movement. Other considerations for determining domain size and grid spacing resolution may include an evaluation of the concentration gradients across the worker area. The grid spacing used within the domain should be sufficient in number and detail to obtain a representative concentration across the area of interest. When spatial averaging over the deposition area of a pasture, garden, or water body, care should be taken to determine the proper domain size to make sure it includes all reasonable areas of potential deposition. The size and shape of the pasture, garden, or water body of interest should be identified and used for the modeling domain. The grid spacing or resolution used within the domain should be sufficient in detail to obtain a representative deposition concentration across the area of interest. One way to determine the grid resolution is to include an evaluation of the concentration gradients across the deposition area. The HRA shall support all assumptions used, including, but not limited to, documentation of the deposition area (e.g., size and shape of the pasture or water body, maps, representative coordinates, grid resolution, concentration gradients, etc.). The use or spatial averaging is subject to approval by the reviewing authority. This includes the size of the domain and grid resolution that is used for spatial averaging of a worksite or multipathway deposition area.

3. Meteorological Data

If meteorological data were not obtained directly from the District, then the report must clearly indicate the data source and time period used. Meteorological data not obtained from the District must be submitted in electronic form along with justification for their use including information regarding representativeness and quality assurance.

The risk assessment should indicate if the District required the use of a specified meteorological data set. All memos indicating the District's approval of meteorological data should be attached in an appendix.

4. Model Selection and Modeling Rationale

The report should include an explanation of the model chosen to perform the analysis and any other decisions made during the modeling process. The report should clearly indicate the name of the models that were used, the level of detail (screening or refined analysis) and the rationale behind the selection.

Also report the following information for each air dispersion model used:

- Version number
- Selected options and parameters in table form

- Identify the modeling domain(s) and the spacing of receptor grid(s). Grid spacing should be sufficient in number and detail to capture the concentration at all receptors of interest.

5. Air Dispersion Modeling Results

The report should include tables, text, and appendices that clearly present all of the following information

- Maximum hourly and annual average concentrations of chemicals at appropriate receptors such as the residential and worker MEI receptors

- Annual average and maximum one-hour (and 30-day average for lead only) concentrations of chemicals at appropriate receptors listed and referenced to computer printouts of model outputs

- Model printouts (numbered), annual concentrations, maximum hourly concentrations

- Disk with input/output files for air dispersion program (e.g., the AERMOD input file containing the regulatory options and emission parameters, receptor locations, meteorology, etc.)

- Include tables that summarize the annual average concentrations that are calculated for all the substances at each site. The use of tables that present the relative contribution of each emission point to the receptor concentration is recommended. (These tables should have clear reference to the computer model which generated the data. It should be made clear to any reader how data from the computer output were transferred to these tables.) [As an alternative, the above two tables could contain just the values for sites of maximum impact (i.e., PMI, MEIR and MEIW), and sensitive receptors, if required. All the values would be found in the Appendices.]

C. ***Health Values Used in Dose-Response and Dose Estimates***

- Provide tables of the acute, 8-hour and chronic inhalation RELs, chronic oral RELs (if applicable), and cancer potency factors for each substance that is quantified in the HRA.

- Identify the guidelines (title and date) that were used to obtain these factors, or indicate whether newly approved values obtained from the OEHHA website were used.

- Provide a table of target organ systems for each noncancer substance, including acute (1 hour), 8-hour, and chronic inhalation, and chronic oral (if applicable).

- Include tables of the estimated dose for each substance by each exposure pathway at the PMI, MEIR, MEIW, and at any sensitive receptor locations (required by the District).

D. ***Risk Characterization***

The Hot Spots Analysis and Reporting Program (HARP) will generate the risk characterization data needed for the outline below. Any data needed to support the risk characterization findings should be clearly presented and referenced in the text and appendices. A listing of HARP output files that meet these HRA requirements is provided in this outline under the section entitled "Appendices". All HARP files should be included in the HRA. Ideally, the HRA report and a summary of data used in the HRA will be on paper and all data and model input and output files will be provided electronically (e.g., CD). Information on obtaining copies of HARP is available on the California Air Resources Board's Internet web site under the Air Toxics Program at *www.arb.ca.gov.*

NOTE: The cancer risk for the PMI, MEIR, and sensitive receptors of interest must be presented in the HRA's text, tables, and maps. OEHHA recommends that cancer risk for a 30-year exposure duration be presented for the MEIR, and that cancer risk for 9-year and 70-year exposure durations for the MEIR be presented to provide the risk managers with supplemental information. Note that the assessment of population impacts must be based on a 70-year exposure duration; thus all risk assessments need to estimate cancer risk for a 70-year exposure duration in order to report the number of individuals residing in the risk isopleths, or to calculate cancer burden if the District so requires. In addition, some Districts may opt to make risk management decisions based on a 70-year exposure duration. The MEIW location should use a 25-year exposure period.

All HRAs must include the results of a Tier-1 exposure assessment (see Chapter 2 and 8, or the 2012 TSD). If the reviewing authority specifies that additional exposure periods should be presented, or if persons preparing the HRA would like to present additional information (i.e., exposure duration adjustments or the inclusions of risk characterizations using Tier-2 through Tier-4 exposure data), then this information should be presented in separate, clearly titled, sections, tables, and text.

The following information should be presented in this section of the HRA. If not fully presented here, then by topic, clearly identify the section(s) and pages within the HRA where this information is presented.

- Description of receptors to be quantified.

- Table and text providing the location [UTM coordinates, receptor ID number or index from the modeling, and the block/street address

(e.g., north side of 3,000 block of Smith Street)] and description of the PMI, MEIR, and MEIW for both cancer and noncancer risks.

- Separate tables and text providing description of the PMI and MEIR for 30-year cancer risk, and 9- or 70-year cancer risk.

- Tables and text describing MEIW 25-year cancer risk.

- Table and text providing the location [UTM coordinates, receptor ID number or index from the modeling, and the block/street address (e.g., north side of 3,000 block of Smith Street)] and description of any sensitive receptor that is of interest to the District or reviewing authorities (consult District or agency).

- Provide any exposure information that is used for risk characterization (e.g., concentrations at receptors, emissions information, census information, figures, zone of impact maps, etc.). If multipathway substances are emitted, identify the site/route dependent exposure pathways (e.g., water ingestion) for the receptor(s), where appropriate (e.g., MEIR).

- Provide a summary of the site-specific inputs used for each exposure pathway (e.g., water or grazing intake assumptions). This information may be presented in an appendix with the information clearly presented and cross-referenced to the text. In addition, provide reference to the appendix (section and page number) that contains the modeling (i.e., HARP/dispersion modeling) files that show the same information.

- If any exposure parameters were used other than those provided in the Air Toxics Risk Assessment Guidelines: Technical Support Document for Exposure Assessment and Stochastic Analysis (2012), they must be presented in detail. The derivation and data used must be presented so that it is clear to the reviewer. The justification for using site-specific exposure parameters must be clearly presented.

- Table and text presenting the potential multipathway cancer risk by substance, by pathway, and total, at the PMI, MEIR, MEIW, and sensitive receptor locations (required by the District).

- Table and text presenting the acute (inhalation only) and chronic noncancer (inhalation and oral) hazard quotients (by substance, exposure pathways, and target organs) and the (total) hazard indices by substance and target organs for the PMI, MEIR, MEIW, and sensitive receptors. For 8-hour exposure at the MEIW (inhalation only), table and text presenting hazard quotients (by substance, exposure pathways, and target organs) and the (total) hazard indices by substance and target organs. Note:

Chronic noncancer results should be shown with inhalation and oral contributions (shown separately) and for the combined (multipathway) impact.

- Identify any sensitive subpopulations (e.g., child daycare facilities, schools, nursing homes) of concern.

- Table and text presenting estimates of population exposure (e.g., population exposure estimates or cancer burden from HARP) (consult District or agency). Tables should indicate the number of persons exposed to a (total) cancer risk greater than 10^{-7}, 10^{-6}, 10^{-5}, 10^{-4}, etc., and total hazard quotient or hazard index greater than 0.5, 1.0, 2.0, and 3.0, etc. Provide a table that shows excess cancer burden for each population unit and the total excess cancer burden, if cancer burden calculation is required.

- Provide maps that illustrate the HRA results for the three sub-bullet points below. These maps should be an actual street map of the area impacted by the facility with elevation contours and actual UTM coordinates, and the facility boundaries clearly labeled. In some cases the elevation contours will make the map too crowded and should therefore not appear. This should be a true map (one that shows roads, structures, etc.), drawn to scale, and not just a schematic drawing. USGS 7.5-minute maps are usually the most appropriate choice (see Section 4.6).

    - The facility (emission points and boundaries), the locations of the PMI, MEIR, MEIW, and sensitive receptors.

    - Maps of the cancer zone of impacts (e.g., 10^{-6} or 10^{-7} levels - consult District or Agency). The map should clearly identify the zone of impact for the inhalation pathway, the minimum exposure pathways (soil ingestion, dermal exposure, and breast-milk consumption) if multipathway substances are emitted, and the zone of impact for all the applicable exposure pathways (minimum exposure pathways plus any additional site/route specific pathways) for multipathway analyses. Two maps may be needed to accomplish this. The legend of these maps should state the level(s) used for the zone of impact and identify the exposure pathways that were included in the assessment.

    - Maps of the noncancer hazard index (HI) zone of impacts (e.g., 0.5 or 1.0 - consult District or Agency). The noncancer maps should clearly identify the noncancer zones of impact. These include the acute (inhalation), 8-hour (inhalation), chronic (inhalation), and chronic (multipathway) zones of impact. For clarity, presentation of the noncancer zones of impact may require two or more maps. The

legend of these maps should state the level(s) used for the zone of impact and identify the exposure pathways.

- The risk assessor may want to include a discussion of the strengths and weaknesses of the risk analyses and associated uncertainty directly related to the facility HRA.

- If appropriate, comment on the possible alternatives for control or remedial measures. How do the risks compare?

- If possible, identify any community concerns that influence public perception of risk.

- Sample calculations may be needed for all analyses in the HRA if proprietary software other than HARP was used. The District should be consulted. These calculations should be clearly presented and referenced to the findings they are supporting in the HRA text.

- Version of the Risk Assessment Guidelines and computer program used to prepare the risk assessment.

- If software other than HARP is used for the health assessment modeling, all supporting material must be included with the HRA (e.g., all algorithms and parameters used in a clear, easy to review format).

E. ***References***

Include any references used for the HRA in this section.

F. ***Appendices***

The appendices should contain all data, sample calculations, assumptions, and all modeling and risk assessment files that are needed to reproduce the HRA results. Ideally, a summary of data used in the HRA will be on paper and all data and model input and output files will be provided electronically (e.g., CD), unless otherwise specified by the district or reviewing authority. All appendices and the information they contain should be referenced, clearly titled, and paginated.

Potential Appendix Topics (if not presented elsewhere in the HRA report):

- List of all receptors locations (UTM coordinates, receptor ID number or index from the modeling, and the block/street address (e.g., north side of 3,000 block of Smith Street)) for the PMI, MEIR, MEIW, and sensitive receptors.
- List of all emitted substances.
- All emissions files.

- List of dose-response factors (Reference Exposure Levels and cancer potency factors).
- All air dispersion modeling input and output files. Detailed discussions of meteorological data, regulatory options, emission parameters, receptor locations, etc.
- Census data.
- Maps.
- Identify the site/route dependent exposure pathways for the receptor(s), where appropriate (e.g., MEIR). Provide a summary of the site-specific inputs used for each pathway (e.g., water or grazing intake assumptions) and the data to support them.
- All calculations used to determine emissions, concentrations, and potential health impacts at the PMI, MEIR, MEIW, and sensitive receptors.
- All HRA model input and output (HARP) files for receptors of concern.
- (Total) cancer and noncancer impacts by receptor, substance, and exposure pathway (by endpoint for noncancer) at all receptors.
- Presentation of alternate risk assessment methods (e.g., alternate exposure durations, or Tier-2 to Tier-4 evaluations with supporting information).

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List of Abbreviations

A - Area
AB2588 - Air Toxics “Hot Spots” Information and Assessment Act, 1987
ACFM - Actual Cubic Feet per Minute
ADL - Annual Dermal Load
AQMD - Air Quality Management District (District)
ARB - Air Resources Board
ASF - Age Sensitivity Factor
AT - Average Time for Lifetime Cancer Risk
BAF - Bioaccumulation Factor
BG - Urban Block Groups
BLP - Buoyant Line and Point Source Dispersion Model
BMI - Breast Milk Intake
BPIP - Building Profile Input Program
BPIPPRM - Building Profile Input Program for PRIME
BSA - Body Surface Area
BW - Bodyweight
C_{air} - annual average air concentration
CALMPRO - Calms processor program
CAPCOA - California Air Pollution Control Officer’s Association
CAS - Chemical Abstracts Service
CERCLA - Comprehensive Environmental Response, Compensation and Liability Act
C_f - Average concentration of a substance in fish
C_m - Average concentration of a substance in mother’s milk (mislabeled on 114 as Cf)
C_{fa} - Average concentration of a substance in animal products
CONST2 - Constant in the Briggs’ stable plume rise equation using BLP
CONST3 - Constant in the Briggs’ neutral plume rise equation using BLP
CPF - Cancer Potency Factor
CRIT - Convergence criterion for the line source calculations using BLP
Cs - Concentration of Substance in the Soil
CTDMPLUS - Complex Terrain Dispersion Model
CTSCREEN - Complex Terrain Screening Model
Cv - Average concentration of a substance in and on vegetation
Cw - Concentration of a Substance in the Water
DECFAC - Pollutant decay factor for use with BLP
DF - Discount Factor
$DOSE_{air}$ - Daily inhaled dose
$DOSE_{fa}$ - Exposure through ingesting home-raised or farm animal products
$DOSE_{fish}$ - Exposure through ingestion of angler-caught fish
Dose-Im - Exposure through mother’s milk ingestion
$DOSE_p$ - Exposure through ingesting home-grown produce
$DOSE_{water}$ - Exposure through ingesting water

DTHTA - Vertical potential temperature gradient
DTSC - Department of Toxic Substance Control
EASA - Exposure Assessment and Stochastic Analysis
ED - Rural Enumeration Districts or Exposure Duration (in years)
EF - Exposure Frequency
EICG - Emission Inventory Criteria and Guidelines
EPA - Environmental Protection Agency
EQ - Equation
F - Fahrenheit
FAH - Fraction of Time at Home
FG - Fraction of diet provided by grazing
GIS - Geographic Information Systems
GLC - Ground-Level Concentrations
GRAF - Gastrointestinal Relative Absorption Factor
HARP - Hot Spots Analysis and Reporting Program
HESIS - Hazard Evaluation System and Information Service
HI - Hazard Index
HQ - Hazard Quotient
HRA - Health Risk Assessment
HSC - Health and Safety Code
IARC - International Agency for Research on Cancer
IDELS - Maximum variation in number of stability classes per hour (BLP option)
ISCST3 - Industrial Source Complex Short Term
IUPAC - International Union of Pure and Applied Chemistry
K - Kelvin
L - Fraction of locally-grown (source-impacted) feed that is not pasture (site-specific)
LOAEL - Lowest Observed Adverse Effects Level
LOD - Level of Detection
LSHEAR - Plume rise wind shear (BLP option)
LTRANS - Transitional point source plume rise (BLP option)
MAXIT - Maximum iterations allowed for line source calculations (BLP option)
MEIR - Maximally Exposed Individual Resident
MEIW - Maximally Exposed Individual Worker
METDB - Meteorological Database
METS - Metabolic Equivalents
MPRM - Meteorological Processor for Regulatory Models
MWAF - Molecular Weight Adjustment Factor
NAS - National Academy of Sciences
NCDC - National Climatic Data Center
NOAEL-No Observed Adverse Effects Level
NTP - National Toxicology Program
NWS - National Weather Station
OCD - Offshore and Coastal Dispersion Model
OEHHA - Office of Environmental Health Hazard Assessment
p - Population density
PAH - Polycyclic Aromatic Hydrocarbons

PCB - Polychlorinated Biphenyl
PCDD - Polychlorinated dibenzo-p-dioxins
PCDF - Polychlorinated dibenzofurans
PEXP - Vertical wind speed power law profile exponents
PM2.5 - Particulate Matter less than 2.5 microns in diameter
PM10 - Particulate Matter less than 10 microns in diameter
PMI - Point of Maximum Impact
QA - Quality Assurance
QC - Quality Control
RCRA - Resource Conservation and Recovery Act
REL - Reference Exposure Level
RfC - Reference Concentration
RfD - Reference Dose
SCRAM - Support Center for Regulatory Air Models
SDM - Shoreline Dispersion Model
SIR - Soil Ingestion Rate
SMAQMD - Sacramento Metropolitan Air Quality Management District
SRP - Scientific Review Panel
TAC - Toxic Air Contaminant
Tco – Biotransfer coefficient
TEF - Toxic Equivalency Factor
TERAN – Terrain option in BLP
TSD - Technical Support Document
TSP - Total Suspended Particulates
UCL - Upper Confidence Limits
USGS - U.S. Geological Survey
UTM - Universal Transvers Mercator
WAF - Worker Adjustment Factor
WHO - World Health Organization

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Update of Environmental Activities
6701, 6705, and 6707 Shellmound Street
Emeryville, California
Fuel leak Case No. RO0000548
Geotracker Global Id T0600100894

This summary has been prepared on behalf of Anton Emeryville, LLC (Anton) by PES Environmental, Inc. (PES) to provide an update on historic and planned environmental activities for the property located at 6701, 6705, and 6707 Shellmound Street, Emeryville, California (collectively, the subject property or site). The site is under the regulatory oversight by the Alameda County Department of Environmental Health (ACDEH) for the investigation and cleanup related to unauthorized releases from underground storage tanks. Anton and PES are working with ACDEH to further assess the site with respect to historic site uses and fill material and develop appropriate mitigation measures to be utilized during redevelopment of the property and to ensure post-redevelopment conditions do not pose unacceptable conditions to future occupants and workers.

A list of environmental activities conducted by Anton and PES during 2015 to facilitate site redevelopment activities at the subject property is provided below:

Conceptual Site Model, 6701 – 6707 Shellmound Street, Emeryville, California, Fuel leak Case No. RO0000548, Geotracker Global Id T0600100894, dated February 6, 2015.

Site Mitigation and Contingency Plan for Redevelopment Construction, 6701 – 6707 Shellmound Street, Emeryville, California, dated May 19, 2015.

The Site Mitigation and Contingency Plan for Redevelopment Construction contained:

- The 2015 Soil Vapor Investigation (Appendix B);
- *Human Health Risk Assessment Report, 6701 – 6707 Shellmound Street, Emeryville, California* prepared by SLR International Corporation (Appendix C); and
- Health and Safety Plan, 6701 – 6707 Shellmound Street, Emeryville, California (Appendix D).

Revised Work Plan for Pre-Construction Subsurface Investigation, 6701 – 6707 Shellmound Street, Emeryville, California, *Fuel leak Case No. RO0000548, Geotracker Global Id T0600100894*, dated August 28, 2015.

Additional environmental activities that will be conducted by PES and Anton at the subject property in 2015 and 2016 prior to closure of the site by ACDEH include:

- Conduct Pre-Construction Subsurface Investigation;
- Update Human Health Risk Assessment;

- Update Conceptual Site Model;
- Update Site Mitigation and Contingency Plan;
- Prepare and Record Land Use Covenant;
- Develop Vapor Intrusion Mitigation Plans;
- Construct Project Development and Vapor Intrusion Mitigation System; and
- Prepare As-Built Vapor Intrusion Mitigation System Plans.

Upon review and approval of the above listed documents that verify that there is a low risk to human health and the environment due to residual contamination remaining and implementation of appropriate mitigation measures, ACDEH will issue a public notification of potential case closure. During the 30-day public comment period the public will be provided a link to the electronic case file and invited to review and comment on the potential closure of the site.

A summary of the above-referenced environmental activities is provided below.

2015 Soil Vapor and Sub-Slab Vapor Survey

In April 2015, a limited soil vapor and sub-slab investigation was conducted by PES to further evaluate subsurface conditions in the vicinity of the former underground storage tanks (USTs) and beneath concrete slab of the existing warehouse building. The additional investigation included conducting soil gas and sub-slab vapor sampling for volatile organic compounds (VOCs), methane, carbon dioxide, and oxygen in order to advance the open Spills, Leaks, Investigation and Cleanup (SLIC) case towards closure and assess the site for potential vapor intrusion concerns. Accordingly, PES and its subcontractor collected soil gas samples from three exterior locations at approximate depths of 5 and 10 feet bgs and sub-slab vapor samples from four interior locations at the site for analysis of VOCs (including methyl ethyl ketone [MEK] and methyl isobutyl ketone [MIBK]), methane, carbon dioxide, and oxygen. Samples of vapor within the shroud and soil vapor samples were also analyzed for the leak detection compound, 1,1-difluoroethane (1,1-DFA).

Soil Vapor Sampling and Analysis Results

The soil vapor analytical results indicate residual levels of VOCs, including benzene, toluene, ethylbenzene, and xylenes (collectively, BTEX compounds), MEK, and MIBK, are present in soil gas at approximate depths of 5 and 10 feet bgs in the vicinity of the former USTs. Benzene was detected in one soil gas sample (location SV2 at a depth of 5 feet bgs) at a concentration above applicable ESLs developed for a residential setting, but well below the respective ESLs developed for commercial/industrial settings. Other VOCs detected in soil gas were below applicable residential ESLs. Although vinyl chloride was not detected above laboratory reporting limits, the reporting limit for vinyl chloride for sample SV3 at 10 feet bgs was above the applicable residential ESL. Methane was not detected in the soil vapor samples at or above the laboratory reporting limit, carbon dioxide was detected at levels ranging

from 4.52 percent by volume (%volume) to 13.6 %volume, and oxygen levels ranged from 6.53 %volume to 15.9 %volume. The leak detection compound, 1,1-DFA, was not detected at or above the laboratory reporting limit in any of the soil gas samples.

Sub-Slab Vapor Sampling and Analysis Results

Low levels of VOCs, including tetrachloroethene (PCE), 1,1,1-trichloroethane (1,1,1-TCA), styrene, and MEK were detected in sub-slab vapor samples collected beneath the warehouse building. Using the California Department of Toxic Substances Control (DTSC) recommended attenuation factor of 0.05 for estimation of indoor air concentrations based on sub-slab vapor analytical results, PCE reported in sample SSV1 is above the concentration which would theoretically result in an indoor air concentration above the applicable residential ESL. The result is also slightly above the concentration which would theoretically result in an indoor air concentration above the applicable commercial/industrial ESL. The reported results for other VOCs are well below the concentrations which would theoretically result in indoor air concentrations above applicable ESLs. Methane was not detected in the sub-slab vapor samples at or above the laboratory reporting limit, carbon dioxide was detected in three of the four samples at levels ranging from 0.272 % volume to 4.25 %volume, and oxygen levels ranged from 8.97 %volume to 19.1 %volume. The leak detection compound, 1,1-DFA, was not detected at, or above, the laboratory reporting limit in any of the sub-slab vapor samples.

Pre-Construction Subsurface Investigation

On August 28, 2015, PES prepared a *Revised Work Plan for Pre-Construction Subsurface Investigation* (Revised Work Plan) at the request of ACDEH. ACDEH had requested additional characterization of soil gas and soil which may remain in-place beneath future landscaped areas or be disturbed by future intrusive earthwork activities conducted during proposed redevelopment activities at the site. The Revised Work Plan supersedes the *Work Plan for Additional Soil Gas Investigation* dated July 14, 2015, prepared by PES. ACDEH conditionally approved the Revised Work Plan in correspondence dated September 4, 2015. A copy of the ACDEH letter providing conditional approval of the Revised Work Plan is attached.

The objective of the proposed pre-construction subsurface investigation is to evaluate the subsurface for the presence of VOCs, total petroleum hydrocarbons (TPH), semi-volatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), metals, and/or asbestos-containing material (ACM) related to historical deposition of fill material beneath the site or previous industrial activities conducted at the site. The primary components of the proposed investigation include:

- A soil gas survey to further address potential vapor intrusion concerns beneath former industrial features, existing buildings, and proposed future building areas including first-floor residential units and common areas;

- Additional confirmation soil gas sampling to assess conditions associated with VOCs or elevated laboratory detection limits for VOCs reported for soil gas and sub-slab vapor samples collected in April 2015;

- Shallow soil sampling to assess the condition of soil anticipated to be disturbed during site redevelopment, including: (1) soil to be excavated to accommodate the future building foundation, pavement sections, landscape and surface water infiltration features; and (2) soil within proposed utility trenches. Assessment of soil in these areas will provide additional data to facilitate future construction worker safety and proper management of disturbed soil;

- Shallow soil sampling to assess the condition of soil beneath proposed exterior landscaped and play areas to confirm no concerns exist with respect to potential future residential occupant exposure; and

- Confirmation soil sampling within the former UST area to assess soil conditions associated with benzene reported in one soil gas sample collected in April 2015.

A description of the methods and procedures of the subsurface investigation will be presented in the pre-construction subsurface investigation report along with the results of the sampling activities. The report will also provide tabulated data, illustrations showing select contaminant concentrations, laboratory reports, findings of the completed scope of work, and recommendations, as appropriate. Additionally, the report will include revised geologic cross-sections showing the results of the additional soil gas and soil sampling and the proposed development, including locations of the building foundation, residential units, and utility trenches, to the extent practicable based on available information.

Update Human Health Risk Assessment

The results of the pre-construction subsurface investigation will be evaluated along with the results of previous investigations and remediation in a revised human health risk assessment (Revised HHRA) for the subject property to support case closure and planned site residential redevelopment as multi-story apartments and associated parking. The Revised HHRA will be conducted using a two-step process and will evaluate potential exposure to future site users (e.g., residents, commercial workers, and maintenance workers) and construction workers. The HHRA will include a screening evaluation where chemical concentrations from the subject property in three media (soil, soil gas, and groundwater) are compared with relevant California Regional Water Quality Control Board, San Francisco Bay Region, Environmental Screening Levels (ESLs). Chemicals with maximum detected concentrations above relevant ESLs will then be further evaluated in a second step, which includes toxicity assessment, dose estimation, and risk characterization. A report will be prepared documenting the methods, assumptions, and results of the Revised HHRA. The report will include a discussion of the proposed requirements for future invasive work that will be included in the land use covenant and Site Management and Contingency Plan for the subject property. The Revised HHRA will be

submitted to ACDEH and submitted for peer review and approval by a qualified toxicologist . The final Revised HHRA will be submitted to ACDEH for review and approval.

Update Conceptual Site Model

The results of the pre-construction subsurface investigation will be utilized to update the conceptual site model (Revised CSM) that was previously prepared for the subject property. The Revised CSM will identify potential human receptors and potentially complete exposure pathways at the site. The Revised CSM will schematically present the relationship between chemical sources and receptors at the site, and identify potentially complete pathways through which receptors may be exposed to the analytes present in soil, soil gas, and groundwater. This will be accomplished by considering the site characteristics, as well as the fate and transport characteristics of analytes identified in soil, soil gas, and groundwater at the site. The Revised CSM will be submitted to ACDEH for review and approval.

Update Site Management and Contingency Plan

The results of the pre-construction subsurface investigation, the Revised HHRA, and Revised CSM will be used to update the Site Management and Contingency Plan (Revised SMP). The Revised SMP will also reference a land use covenant to be recorded on the subject property. The Revised SMP will be submitted to ACDEH for review and approval. The purpose of the Revised SMP is to summarize existing and new soil and groundwater data for the site, identify safety and training requirements for construction workers, establish procedures for assessing and managing contaminated soil and groundwater that could be encountered during construction activities (e.g., demolition, grading, and excavation), and identify mitigation and contingency measures to be implemented post-construction. The SMP will contain the following information:

A detailed description of the site and summary of previous investigations, inclusive of the proposed pre-construction subsurface investigation, and previous remedial activities, including information on areas and contaminants subject to soil management requirements;

Provisions for site redevelopment activities (e.g., building demolition and foundation slab removal, asphalt parking lot removal/installation, site grading/excavation activities, building and parking structure foundation construction, and roadway and utility trench construction);

A Health and Safety Plan (HASP) for use by contractors performing demolition and construction activities (exclusive of asbestos-containing materials or other hazardous materials in existing building materials);

Field screening protocols;

Soil matrix sampling/characterization protocols;

Soil and groundwater management practices (e.g., segregation/storage/transportation of soils and groundwater, dust control, and decontamination procedures);

A soil and groundwater management and contingency plan;

A Post-Construction Operations & Management Plan; and

A schedule of future activities.

Land Use Covenant

A land use covenant (LUC) will be prepared using a Model Alameda County Covenant and Environmental Restriction in accordance with ACDEH requirements. The LUC will identify the contamination encapsulated at the site, restrictions on development and use of the site, restrictions on use of underlying groundwater, and requirements for maintenance of the site cover and vapor intrusion mitigation system, and required notifications to ACDEH. The LUC will be submitted to ACDEH for review and approval. The final approved LUC will be recorded at the Alameda County Recorder's Office and will be a part of closure documentation.

Public Comment Period

Following ACDEH approval of the Revised SMP, a Public Notice will be submitted to the surrounding community and required mailing list developed by ACDEH. The Public Notice will notify recipients that the SLIC case is being considered for closure and that a Revised SMP has been developed and is available for review and comment. Upon approval by ACDEH, the Public Notice will be distributed to the surrounding community located within a 750 foot radius of the subject property and the required mailing list. Following a 30-day public comment period, responses to comments will be prepared, if needed.

Conditional Case Closure

Following completion of the 30-day public comment period, ACDEH will conditionally close the open SLIC and LUST cases on the subject property. Final case closure will be contingent upon successful development, approval of the vapor intrusion mitigation plan, and installation and acceptance of the vapor intrusion mitigation system.

Develop Vapor Intrusion Mitigation Plan

If warranted on the basis of the previous investigations and the proposed and approved pre-construction subsurface investigation, PES will design, and prepare plans and specifications for the subsurface vapor intrusion mitigation system to be installed at the planned new multi-story residential building. The vapor mitigation system would be installed to mitigate the potential for intrusion of volatile organic vapors into the ground floor residential, common, and amenity areas. The method for subsurface vapor intrusion mitigation is anticipated to consist of

installing a vapor barrier membrane system and a passive vent system beneath the building slab at the ground floor residential, common and amenity areas. These systems are commonly employed to mitigate vapor intrusion in new building construction. The combined installation of the systems will provide a continuous vapor intrusion barrier beneath the ground floor residential, common and amenity areas of the building, providing a low resistance mechanism to passively vent soil gas from beneath those portions of the building, and offer increased flexibility should additional mitigation measures become necessary in the future (e.g., active subslab depressurization or active venting).

The vapor barrier is anticipated to consist of an impermeable membrane that is installed beneath the building slab to reduce the potential for subsurface vapors entering the building. The membrane is anticipated to consist of a sprayed-in-place continuous bituminous barrier system, such as the Geo-Seal system by Land Science Technologies. Use of a sprayed flexible membrane provides the ability to adhere to concrete footings and utility penetrations, and to create a seamless membrane layer beneath the concrete slab. A sub-slab vent system is anticipated to be installed beneath the vapor barrier. The vent system is anticipated to be passive (i.e., venting will occur via natural processes, without powered blowers). The anticipated sub-slab vent system will consist of a connected array of low profile vent piping installed in a high permeability layer (i.e., crushed rock or gravel) beneath the building slab. The purpose of sub-slab venting is to provide a low resistance pathway for any accumulated subsurface vapors beneath the barrier to escape to the atmosphere. The vent piping will be connected to vent exhaust stacks. The passive venting system is anticipated to be constructed such that it can be converted to an active system, if necessary in the future, with the addition of a vacuum blower.

The plans will include: (1) physical specifications of the vapor barrier membrane and sub-slab vent system; (2) plan view of the first floor showing vapor intrusion mitigation system components; (3) design details including the location and depth of the membrane with respect to the foundation slab, protective layers above and below the membrane, and interior and perimeter penetration seals; (4) quality control testing procedures to demonstrate that the system has been properly constructed, will function as intended, and is eligible for available manufacturer's warranty, as applicable; and (5) contingency plans for restoring the barrier integrity in the event that future tenant improvements require penetration of the sub-slab vapor barrier, or in the event of any suspected vapor barrier failure. The plans will be submitted to ACDEH for review and approval prior to construction.

Final Case Closure

Following approval and installation of the vapor intrusion mitigation plan, ACDEH will issue final case closure for the SLIC case on the subject property.

Construct Project Development and Vapor Intrusion Mitigation System

Following acquisition of necessary permits and agency approvals, construction of the planned redevelopment project will be initiated. During construction, PES, along with the selected

contractor, will work with Anton's architect and general contractor to install the vapor intrusion mitigation system. The vapor intrusion mitigation system will be constructed in accordance with the approved plans, to the extent practicable. The construction of the vapor intrusion mitigation system will be documented by PES staff and any deviation from the plan will be recorded and submitted to ACDEH prior to case closure. Quality control testing of the vapor intrusion mitigation system, such as smoke testing during installation of the membrane, will be conducted by the selected contractor during the installation to verify proper construction and operation of the system. The results of the testing will be documented by PES staff and submitted to ACDEH prior to case closure.

Prepare As-Built Vapor Intrusion Mitigation System Plans

Following construction of the vapor intrusion mitigation system, as-built vapor intrusion mitigation system plans (As-Built Plans) will be prepared by PES to document the actual construction of the system. Any deviations from the approved plans and specifications for the vapor intrusion mitigation system will be documented in the As-Built Plans. The As-Built Plans will be submitted to ACDEH for review and approval prior to case closure.

CHARLES M. SALTER ASSOCIATES INC.

ACOUSTICS

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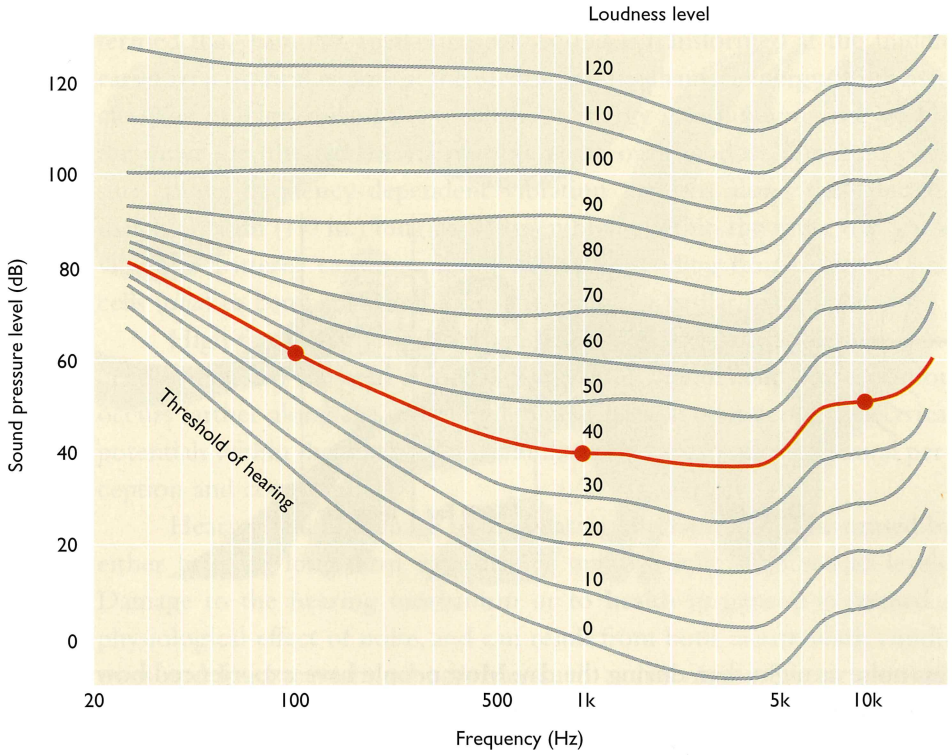


Figure 3.3 Equal-loudness contours for pure tones (Fletcher-Munson Graph). The contour lines indicate equal loudness levels (phons) relative to a 1 kHz frequency. Refer to text for discussion of red dots on the 40 phon contour line.

The equivalence between pitch and frequency becomes more complicated with real sound sources. For example, musicians commonly modulate frequency over time using a technique known as vibrato. Although the frequency is varied as much as a semitone at a rate of 5 to 8 Hz, a single pitch is perceived.

100 Hz sounds equally loud as 40 dB at 1 kHz, and 50 dB at 10 kHz. The frequency weighting filters built into sound level meters described in Chapter 4 physically approximate these contours.

Not surprisingly, the contours that exhibit maximal sensitivity are at those frequencies associated with speech (approximately 200 Hz to 5 kHz). At medium and high sound levels, the contours are relatively linear, while at lower levels, the contours indicate that sensitivity to low frequencies is less than at high frequencies. Thus, the relationship between physical and perceptual scales is dependent on both frequency and sound pressure level. Another measurement of loudness is the *sone* scale. A sound with a loudness of 40 phons is equal to 1 sone. This is an arithmetic scale such that a doubling in sones is equivalent to a doubling of loudness. The formula for relating sones and phons is: $\text{sones} = 2^{(\text{phons} - 40)/10}$.

For community noise assessment, certain sound sources that are considered to be noisy by one group of people may not be a problem for another group. A general procedure in such assessments is that the average person's level of annoyance needs to be considered. About 10 percent of any population can be expected to object to any noise not of their own making. This group is referred to as hypersensitive. About 25 percent are practically imperturbable. This group is insensitive to noise. The remaining two-thirds group are considered people who have what is called normal sensitivity. Some people will object to certain noises through association; for example, the fear of having an aircraft crash into one's house can motivate objection to aircraft sound, while another type of sound at the same sound level may not be perceived as disturbing.

One type of psychoacoustic measure is known as a *just noticeable difference* (JND). An example of a JND as applied to environmental acoustics is in Table 3.2, which shows the expected response to an increase in noise level.

Increase in noise level (dB)	Expected response
1	Possibly detectable under laboratory conditions
6	Some individual comment and reaction is expected but no group action is likely
10	Perceived as twice as loud
20	Perceived as four times as loud

Table 3.2 Expected response to increase in noise level.

Timbre and Spatial Location

The spectrum of a sound source is largely responsible for the perceptual quality of *timbre,* or "tone color." Timbre is sometimes defined in terms of what it is not, for example, "the quality of sound that distinguishes it from other sounds of the same pitch and loudness." Our ability to discriminate between different timbres is very complicated and not fully understood, but the main cues seem to involve the change in a sound's spectrum over time.

Spatial location is also an important perceptual quality of sound. The audible difference in level between the ears as the location of a sound moves relative to a listener is termed an *interaural level difference*, and is the same cue manipulated by a stereo sound system. For instance, if you snap your fingers to the right of your head, the level will be louder at the right ear than at the left ear. High frequencies above 1.5 kHz are shielded from the opposite ear by the head. Another cue for spatial hearing is the *interaural time difference.* The wave reaches the right ear before the left ear, since the path length to that ear is shorter. This time difference cue is most effective for frequencies below 1.5 kHz.

Besides level and time differences, another cue for localization is the spectral modification caused by the outer ears (the pinnae). For every sound source position relative to a listener, the pinnae cause a unique spectral modification that acts as an acoustic signature, as shown in Figure 3.4. These spectral modifications are especially important in perceiving the up/down and front/back locations of a sound source.

The Precedence Effect

The *precedence effect* (also called the "Haas effect") explains an important inhibitory mechanism of the auditory system that allows one to hear

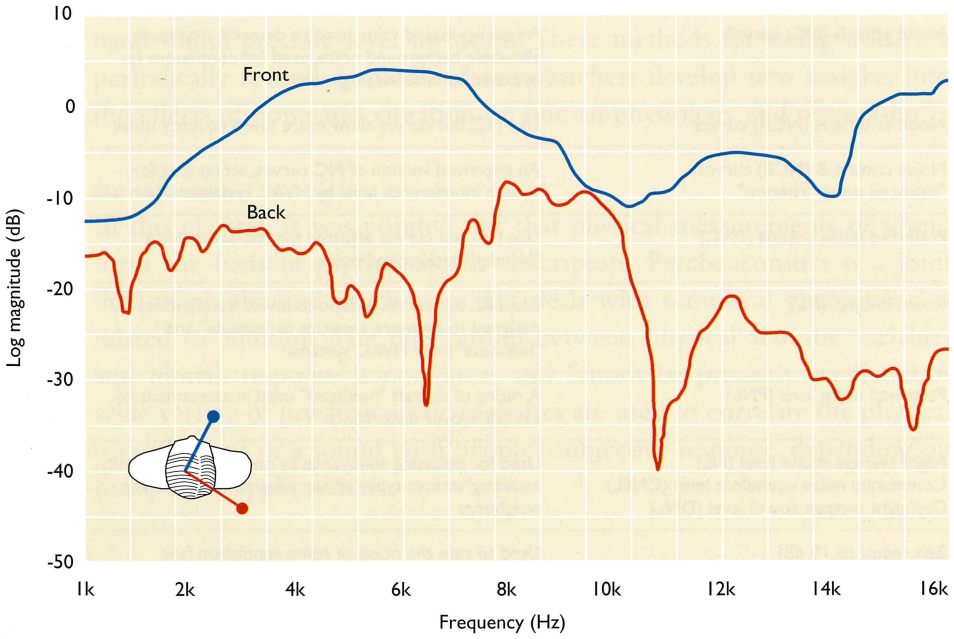


Figure 3.4 Spectral modification caused by the pinnae for two positions. Notice how the sound is brighter in front and more attenuated in back. *Inset:* overhead view showing sound source positions.

In the 1980s, jet engine manufacturers began building turbofan Stage 3 aircraft, which are about 10 dB quieter than Stage 2 aircraft. With Stage 3 aircraft, the jet exhaust noise is minimal and the primary sources are turbomachinery associated with the various rotating components of the engines. Stage 3 noise reduction also comes from increased power, which allows for steeper climbs during departure.

Aircraft noise prediction models are periodically modified as aircraft designs change. These models require the following input: aircraft volume, time of day/night, flight tracks, climb profiles, and meteorological data. The computer programs establish a grid system, calculate the composite noise exposure at grid locations, and extrapolate from the data to draw noise contours.

Trains (Heavy Rail and Rapid Transit). Heavy rail consists of large diesel-electric locomotives and freight or passenger cars. These trains have three main noise sources: the engine, cars, and whistle. The locomotive engine is usually the dominant source. Noise emanates from both the engine casing and the exhaust stack. The noise output of the engine is virtually independent of the train speed but is affected by grade.

Freight and passenger car noise comes from the wheel/rail interaction. Factors affecting the wheel/rail noise are jointed versus welded tracks, presence of grade crossings, wheel irregularities, passage over bridges, and short radius curves.[4] Figure 5.5 shows a time history of a train passby.

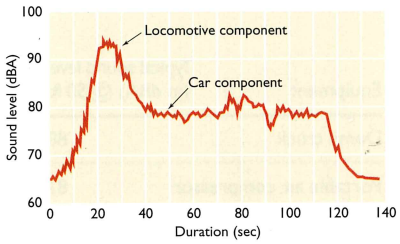


Figure 5.5 A-weighted time history of heavy rail passby, measured 100 ft. from track.

Rapid rail and light rail refer to urban and interurban transportation systems that use electric engines. Rapid rail includes transit systems such as the Bay Area Rapid Transit (BART) in northern California, the Chicago Transit Authority (CTA), and the New York City Transit Authority (NYCTA). Light rail refers to street cars or traditional trolley systems such as the Municipal Railway System (MUNI) in San Francisco.

For rapid rail and light rail vehicles, the noise during travel is primarily from the wheel/rail interaction. Other sources are the engines, brakes, and horns. Noise levels increase with speed. At a stop, the dominant source is auxiliary equipment such as air conditioning systems.[5]

In addition to airborne noise, rail activity generates vibration in the ground. This vibration creates low-frequency rumbling noise and is usually felt as shaking in buildings.

There are several models available to predict train noise. The models generally use the following input: number of engines, number of cars, grade, speed, rail construction (jointed or continuously welded), grade crossings (horn blasts), and presence of elevated structures. Table 5.4 shows the noise levels for various rail transit components.

Transit sources	Typical sound level (in dBA) @ 50 ft.
Rail cars	80
Locomotives, diesel	88
Locomotives, electric	86
Monorail	80
Locomotive horns	105
Transit car horns	90
Auxiliary equipment	65
Locomotive idling	80
Rail transit idling	70
Buses idling	75
Curve squeal	100
Crossing signals	73
Substations	63

Table 5.4 Sound levels for various transit sources.

Construction. Construction is often recognized as a disturbance and assessed as a part of environmental impact studies. Common sources of construction noise are bulldozers, trucks, pile drivers, and compressors. Table 5.5 lists the noise levels of construction equipment.

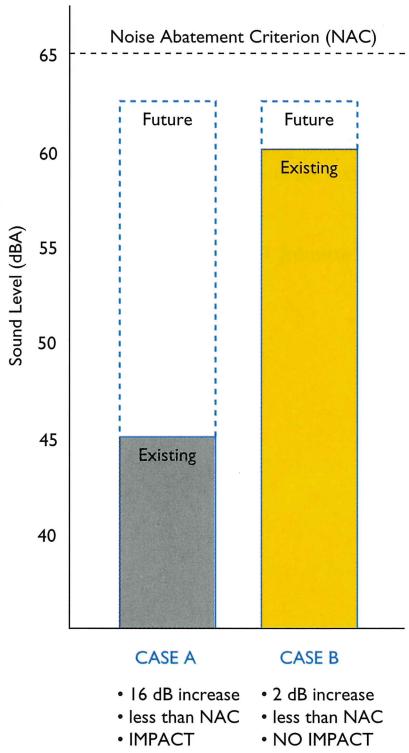


Figure 5.8 How "substantial increase" criterion affects noise impact assessment.

The FHWA "substantial increase" criteria allows individual states to interpret the criterion as they see fit. The information in Table 5.7 shows that some states consider a substantial increase to be 6 dBA, while for others the increase must be at least 15 dBA. On a local level, changes of 3 to 5 dBA may be deemed significant by a city or county.

Schultz performed studies that synthesized the response of people to varying levels of environmental noise.[16] Although he endeavored to create models that accurately estimate human response to noise, one of his reports about aircraft noise states: "even in quiet zones...about 10 percent of the people interviewed complained about aircraft noise; these same people complain about other aspects of their environment in general and may be habitual complainers. We recall, too, that about 25 to 30 percent of the people never complain even in extremely noisy environments."[17] Thus, a wide variety of responses can be expected due to changes in a community's acoustical environment.

How to Determine Which Criteria Apply to a Project. Each project may have one or more applicable criteria. Knowing the criteria in the early phases of a project is vital to formulating a correct approach and minimizing unnecessary measurements or analyses. A good starting point would be the planning code of the governing agency, which usually contains criteria for land use compatibility. Criteria are also contained in the municipal or zoning code as a noise ordinance. Noise ordinances often address mechanical noise, construction noise, or amplified sound systems.

Noise Impact Studies

Noise impact studies typically follow a fairly uniform format. First, applicable acoustic criteria are identified. Second, the noise at the project site is quantified. The next step is to predict future noise levels of the project. The future levels are then compared to the applicable criteria, which are based on: (1) "Land Use Compatibility"—how a project will be affected by the environment at a proposed location. These criteria are typically in terms of absolute levels such as DNL; and (2) "Impacts of the Project on Adjacent Land Uses"—these impacts can be both in terms of absolute levels and change in noise levels.

If the predicted levels exceed the criteria, then there is an impact. If an impact is identified, then feasible ways to reduce or eliminate the impact (mitigation) are specified.

One technique that can help with impact assessment is preparation of noise contours. These contours, usually in terms of DNL, are plotted on a site map. The contours are then compared with various land uses in the study area. Noise contours are shown in Case Study No. 13, Chapter 17.

EIS and EIR. Federal and state environmental laws require noise studies. The National Environmental Policy Act (NEPA) specifies that an Environmental Impact Statement (EIS) be prepared if a federally funded project has the potential to significantly affect the environment. The California Environ-

mental Quality Act (CEQA) requires that an Environmental Impact Report (EIR) be prepared for most new building projects.[18] An EIS is similar to an EIR and tends to follow the typical format for impact studies. In cases where a project has federal funding and is in California, both documents can be combined to form an EIS/EIR.

In general, these impact reports must answer the following two questions: (1) will the project significantly increase existing noise levels? and (2) will the project expose people to severe noise or vibration?

The EIS/EIR must assess future levels with respect to applicable absolute standards as well as determine any significant changes that the project would create. The NEPA and CEQA guidelines, however, along with many governmental planning codes, do not provide specific numerical goals for "significant increase." It leaves room for interpretation.

In the absence of specific governmental criteria, one approach to determine whether an increase is significant can be found in a document from the Urban Mass Transit Administration (UMTA).[19] UMTA adopts the commonly accepted notion that a 3 dBA increase is barely noticeable, a 5 dBA increase is noticeable but not dramatic, and a 10 dBA increase is perceived as a doubling of loudness. Table 5.8 contains the UMTA noise impact criteria.

One aspect of an EIS/EIR that can be confusing is the assessment of alternatives to the project and "no build" scenario. This assessment is accomplished by calculating noise levels for all future scenarios, including alternatives, and then comparing them with the existing conditions. The differences are then compared to the "increase" standards shown in Table 5.8 to determine impact.

1.	Generally not significant
a.	No noise sensitive sites are located in the project area
b.	Increases in noise levels with implementation of the project are projected to be 3 dBA (L_{eq}) or less at noise sensitive sites and proposed project would not result in violations of noise ordinances or standards.
2.	Possibly significant
	Increases in noise levels with implementation of the project are expected to be no greater than 5dBA (L_{eq}). Determination of significance must consider existing noise levels and the presence of noise-sensitive sites.
3.	Generally significant
a.	Proposed project would cause noise standards / ordinances to be exceeded.
b.	Proposed project would cause an increase in noise levels of 6–10 dBA (L_{eq}) in built up areas.

Table 5.8 Significance of noise impact based upon change in noise levels.

Mitigation Measures

If impacts are identified in a noise study, mitigation measures must be presented. Individual mitigation measures are provided so that the project will meet specific acoustic criteria. For example, if an existing roadway generates excessive noise at the site of a proposed project, the developer of the project may be required to provide a noise barrier to control outdoor sound levels to meet acoustic criteria.

Since a project's design is usually at a schematic level during the environmental review phase, it may not be feasible to provide detailed recommendations for all mitigation measures. For environmental studies, it is usually sufficient to determine a range of possible mitigation measures that will allow the project to meet the criterion. For example, a study may recommend that sound-rated windows be specified to meet a criterion. Although the specific rating of each window is not specified, the study should make it clear to decision makers that the project can feasibly meet the criterion with sound-rated windows.

Enough information should be provided to the decision makers so they can determine if the mitigation is commensurate with the community goals. The developer must then decide if the mitigation will still allow the project to be economically viable.

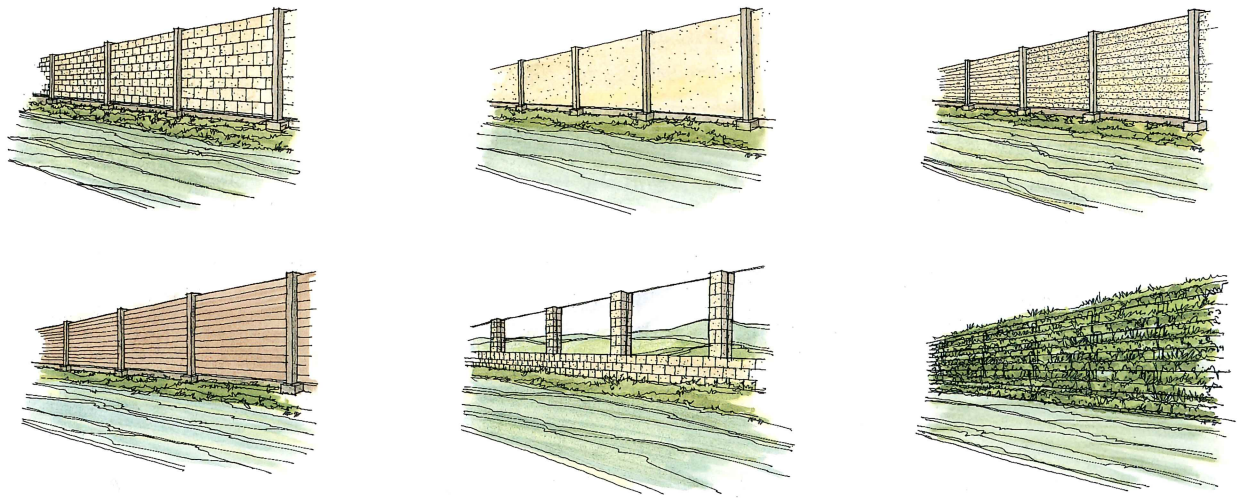


Figure 5.11 Alternate barrier designs: (*top: left to right*) concrete; plaster; steel; wood; glass; earthen wall.

Indoor Noise Control

The reduction provided by a building facade is a composite of the individual components. Indoor noise control is usually accomplished by improving the windows since they are acoustically the weakest link in an exterior wall. Roofs, doors, and attic vents are also important when designing for aircraft flyovers.

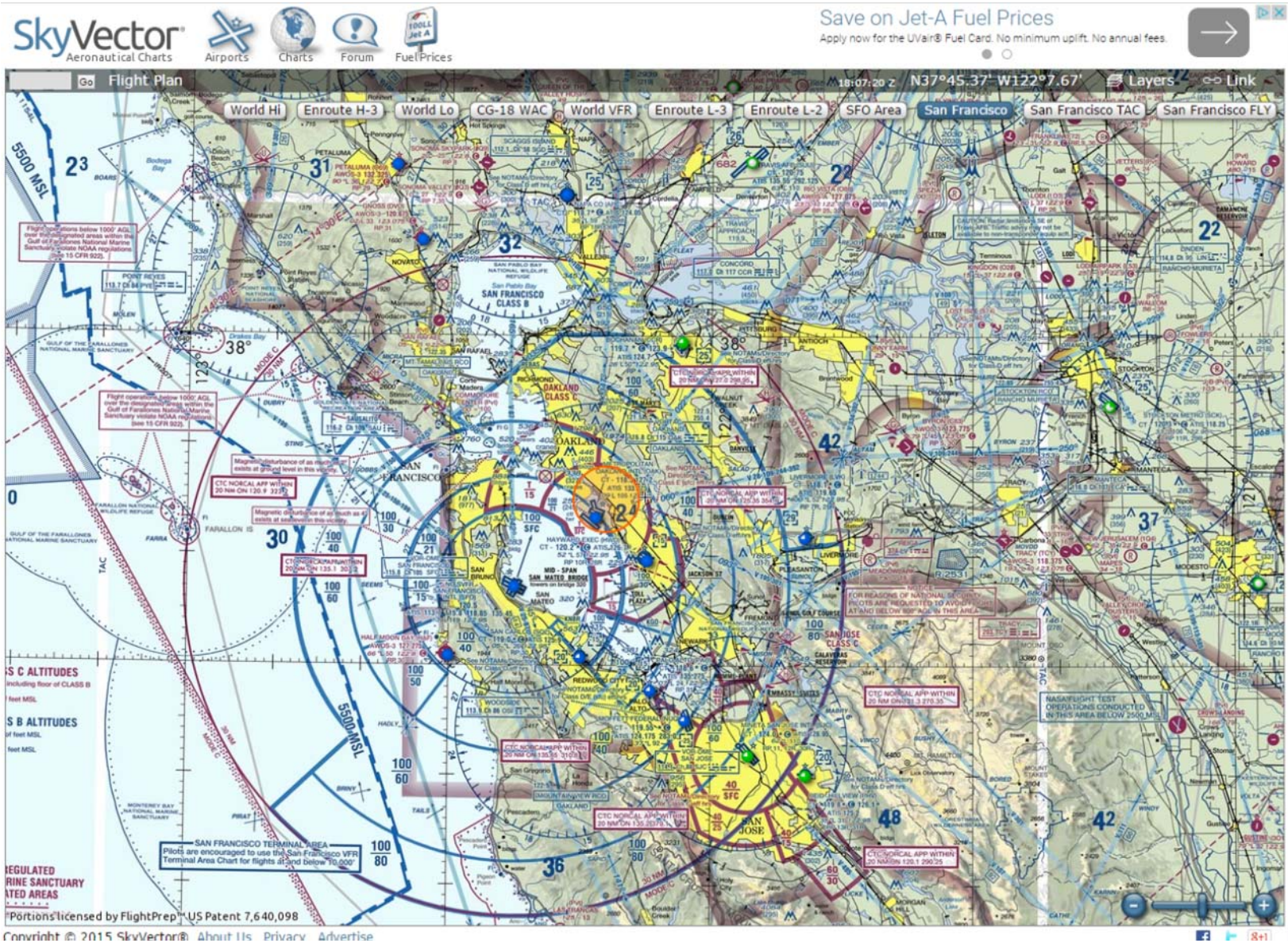
Windows. Sound travels both through the glass and around the window frame. A typical facade will reduce noise by approximately 25 dBA with the windows closed; when opened, the facade reduces the sound entering a building by 10 to 15 dBA. The acoustical performance of the window can be improved by increasing the glass thickness and airtightness of the weather-stripping.

Exterior Walls. Many buildings have single stud exterior walls with one layer of gypsum board on the interior and wood siding or stucco on the exterior. This wall reduces noise by about 40 dBA. If more reduction is needed, alternatives such as additional layers of gypsum board, resilient channels, staggered or double-stud construction can be incorporated. Heavier and thicker wall constructions may be required near rail lines or major roadways.

Roof Vents and Other Considerations. Roof vents and air intakes for mechanical ventilation systems can be significant sources of sound leaks. Internally lined ducts at air intakes and discharges may be needed to limit exterior noise intrusion.

Conclusion

As people live closer to noise sources, and each other, control of environmental noise has become increasingly important. With proper planning considerations for environmental noise, our acoustic environment can be improved.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ALAMEDA COUNTY
CLEANUP PROGRAM SITE
PRINTABLE CASE SUMMARY / CSM REPORT

CLEANUP OVERSIGHT AGENCIES
ALAMEDA COUNTY LOP *(LEAD) - CASE #: RO0000548*
CASEWORKER: *MARK DETTERMAN*
SAN FRANCISCO BAY RWQCB (REGION 2) - *CASE #: 01-0971*
CASEWORKER: *Cherie McCaulou*

Regulatory Profile

CLEANUP STATUS - DEFINITIONS

OPEN - REMEDIATION AS OF 7/1/1990 - CLEANUP STATUS HISTORY

POTENTIAL CONTAMINANTS OF CONCERN
OTHER SOLVENT OR NON-PETROLEUM HYDROCARBON

POTENTIAL MEDIA AFFECTED
OTHER GROUNDWATER (USES OTHER THAN DRINKING WATER)

FILE LOCATION
ALL FILES ARE ON GEOTRACKER

BENEFICIAL USE
GW - MUNICIPAL AND DOMESTIC SUPPLY

DWR GROUNDWATER SUB-BASIN NAME
Santa Clara Valley - East Bay Plain (2-9.04)

RB WATERSHED NAME
Bay Bridges - Berkeley (203.30)

Site History

From 1963 to 1979 the site was occupied by Dymo Industries, a lable tape and lable tape punch manufacturer. Dymo used and stored MIBK and MEK in six USTs at the site. From 1979 to 1989 Mike Roberts Color Production occupied the site and manufactured and printed color postcards and expanded to color printing, lithography, and off-set printing using inks, solvents cleaning compounds and color pigments. Beginning in 1990 Nady Systems occupied the site, largely using it as a warehouse. Six areas of environmental concern were identified and investigated at the site Up to 10 wells and 15 soil bores have been installed at the site.

Not all historic documents for the fuel leak case may be available on GeoTracker. A more complete historic case file for this site is located on the Alameda County Environmental Health website at: http://ehgis.acgov.org/dehpublic/dehpublic.jsp.

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1995 to 2012 Diversion Rates by Jurisdiction

Jurisdiction	1995	1996	1997	1998	1999	2000	2005	2006	2007	2008	2009	2010	2011	2012
Alameda	48%	48%	56%	59%	64%	65%	68%	66%	66%	67%	71%	75%	72%	76%
Albany	42%	52%	61%	60%	56%	62%	70%	70%	71%	77%	78%	83%	79%	84%
Berkeley	41%	41%	41%	42%	50%	49%	59%	57%	62%	66%	72%	76%	74%	73%
Dublin	26%	37%	43%	31%	33%	54%	55%	56%	61%	66%	73%	75%	73%	76%
Emeryville	51%	61%	49%	41%	42%	48%	64%	75%	63%	74%	70%	77%	65%	70%
Fremont	49%	54%	50%	47%	57%	62%	63%	64%	64%	68%	71%	74%	73%	72%
Hayward	41%	39%	44%	45%	44%	52%	62%	65%	56%	68%	68%	67%	71%	72%
Livermore	26%	25%	45%	37%	38%	50%	63%	63%	60%	64%	71%	73%	74%	77%
Newark	27%	34%	49%	50%	48%	53%	62%	66%	67%	72%	75%	69%	72%	73%
Oakland	27%	34%	39%	40%	41%	52%	58%	59%	57%	66%	67%	65%	65%	66%
Piedmont	47%	47%	50%	52%	60%	63%	64%	66%	68%	72%	84%	75%	69%	71%
Pleasanton	28%	35%	47%	50%	43%	48%	53%	53%	55%	61%	71%	71%	73%	70%
San Leandro	34%	37%	45%	46%	42%	51%	59%	65%	64%	73%	61%	69%	77%	62%
Union City	49%	53%	62%	61%	59%	61%	62%	64%	71%	76%	77%	77%	75%	77%
Unincorporated[a]	56%	51%	59%	58%	63%	65%	60%	69%	60%	63%	59%	67%	76%	72%
County-Wide Weighted Rate[b]	37%	42%	47%	46%	48%	54%	59%	61%	61%	67%	69%	70%	72%	72%

*Diversion rates calculated based on data submitted to CalRecycle by jurisdictions

a. Unincorporated area includes Castro Valley Sanitary District and Oro Loma Sanitary District.

b. The County-wide rate prior to 2007 was derived using a calculated diversion rate equal to total tons disposed in Alameda County divided by tons generated in Alameda County, based on data from each jurisdiction's annual reports submitted to the CIWMB. Beginning 2007, the County-wide rate was calculated using a different methodology, with a weighted average diversion rate based on the population of each jurisdiction and its target disposal per capita.

DP04

SELECTED HOUSING CHARACTERISTICS

2009-2013 American Community Survey 5-Year Estimates

Supporting documentation on code lists, subject definitions, data accuracy, and statistical testing can be found on the American Community Survey website in the Data and Documentation section.

Sample size and data quality measures (including coverage rates, allocation rates, and response rates) can be found on the American Community Survey website in the Methodology section.

Although the American Community Survey (ACS) produces population, demographic and housing unit estimates, it is the Census Bureau's Population Estimates Program that produces and disseminates the official estimates of the population for the nation, states, counties, cities and towns and estimates of housing units for states and counties.

Subject	Emeryville city, California			
	Estimate	Margin of Error	Percent	Percent Margin of Error
HOUSING OCCUPANCY				
Total housing units	6,591	+/-431	6,591	(X)
Occupied housing units	5,890	+/-339	89.4%	+/-3.2
Vacant housing units	701	+/-237	10.6%	+/-3.2
Homeowner vacancy rate	6.3	+/-3.4	(X)	(X)
Rental vacancy rate	4.2	+/-3.3	(X)	(X)
UNITS IN STRUCTURE				
Total housing units	6,591	+/-431	6,591	(X)
1-unit, detached	469	+/-142	7.1%	+/-2.0
1-unit, attached	286	+/-87	4.3%	+/-1.3
2 units	597	+/-245	9.1%	+/-3.7
3 or 4 units	344	+/-108	5.2%	+/-1.7
5 to 9 units	152	+/-87	2.3%	+/-1.3
10 to 19 units	256	+/-108	3.9%	+/-1.6
20 or more units	4,424	+/-426	67.1%	+/-4.5
Mobile home	63	+/-96	1.0%	+/-1.4
Boat, RV, van, etc.	0	+/-19	0.0%	+/-0.5
YEAR STRUCTURE BUILT				
Total housing units	6,591	+/-431	6,591	(X)
Built 2010 or later	0	+/-19	0.0%	+/-0.5
Built 2000 to 2009	1,979	+/-306	30.0%	+/-3.8
Built 1990 to 1999	783	+/-235	11.9%	+/-3.5
Built 1980 to 1989	922	+/-194	14.0%	+/-2.7
Built 1970 to 1979	1,189	+/-192	18.0%	+/-2.7
Built 1960 to 1969	269	+/-188	4.1%	+/-2.8
Built 1950 to 1959	195	+/-107	3.0%	+/-1.6
Built 1940 to 1949	264	+/-102	4.0%	+/-1.6
Built 1939 or earlier	990	+/-208	15.0%	+/-3.3
ROOMS				
Total housing units	6,591	+/-431	6,591	(X)
1 room	779	+/-299	11.8%	+/-4.5
2 rooms	742	+/-186	11.3%	+/-2.8

Subject	Emeryville city, California			
	Estimate	Margin of Error	Percent	Percent Margin of Error
3 rooms	1,860	+/-396	28.2%	+/-5.5
4 rooms	2,077	+/-307	31.5%	+/-4.9
5 rooms	640	+/-190	9.7%	+/-2.7
6 rooms	406	+/-185	6.2%	+/-2.7
7 rooms	31	+/-26	0.5%	+/-0.4
8 rooms	6	+/-10	0.1%	+/-0.2
9 rooms or more	50	+/-45	0.8%	+/-0.7
Median rooms	3.5	+/-0.2	(X)	(X)
BEDROOMS				
Total housing units	6,591	+/-431	6,591	(X)
No bedroom	833	+/-298	12.6%	+/-4.5
1 bedroom	3,225	+/-422	48.9%	+/-5.3
2 bedrooms	2,074	+/-337	31.5%	+/-5.1
3 bedrooms	393	+/-155	6.0%	+/-2.3
4 bedrooms	54	+/-41	0.8%	+/-0.6
5 or more bedrooms	12	+/-19	0.2%	+/-0.3
HOUSING TENURE				
Occupied housing units	5,890	+/-339	5,890	(X)
Owner-occupied	2,100	+/-286	35.7%	+/-4.1
Renter-occupied	3,790	+/-305	64.3%	+/-4.1
Average household size of owner-occupied unit	1.65	+/-0.13	(X)	(X)
Average household size of renter-occupied unit	1.78	+/-0.13	(X)	(X)
YEAR HOUSEHOLDER MOVED INTO UNIT				
Occupied housing units	5,890	+/-339	5,890	(X)
Moved in 2010 or later	2,071	+/-300	35.2%	+/-5.4
Moved in 2000 to 2009	3,030	+/-409	51.4%	+/-5.7
Moved in 1990 to 1999	516	+/-184	8.8%	+/-3.0
Moved in 1980 to 1989	201	+/-73	3.4%	+/-1.2
Moved in 1970 to 1979	61	+/-47	1.0%	+/-0.8
Moved in 1969 or earlier	11	+/-17	0.2%	+/-0.3
VEHICLES AVAILABLE				
Occupied housing units	5,890	+/-339	5,890	(X)
No vehicles available	641	+/-220	10.9%	+/-3.6
1 vehicle available	3,716	+/-443	63.1%	+/-5.3
2 vehicles available	1,342	+/-246	22.8%	+/-4.6
3 or more vehicles available	191	+/-117	3.2%	+/-2.1
HOUSE HEATING FUEL				
Occupied housing units	5,890	+/-339	5,890	(X)
Utility gas	2,529	+/-325	42.9%	+/-5.2
Bottled, tank, or LP gas	0	+/-19	0.0%	+/-0.6
Electricity	3,099	+/-381	52.6%	+/-5.4
Fuel oil, kerosene, etc.	0	+/-19	0.0%	+/-0.6
Coal or coke	0	+/-19	0.0%	+/-0.6
Wood	70	+/-80	1.2%	+/-1.4
Solar energy	12	+/-19	0.2%	+/-0.3
Other fuel	25	+/-30	0.4%	+/-0.5
No fuel used	155	+/-95	2.6%	+/-1.6
SELECTED CHARACTERISTICS				
Occupied housing units	5,890	+/-339	5,890	(X)
Lacking complete plumbing facilities	0	+/-19	0.0%	+/-0.6
Lacking complete kitchen facilities	156	+/-166	2.6%	+/-2.8
No telephone service available	202	+/-96	3.4%	+/-1.6

Subject	Emeryville city, California			
	Estimate	Margin of Error	Percent	Percent Margin of Error
OCCUPANTS PER ROOM				
Occupied housing units	5,890	+/-339	5,890	(X)
1.00 or less	5,707	+/-380	96.9%	+/-1.8
1.01 to 1.50	69	+/-73	1.2%	+/-1.3
1.51 or more	114	+/-73	1.9%	+/-1.3
VALUE				
Owner-occupied units	2,100	+/-286	2,100	(X)
Less than $50,000	144	+/-107	6.9%	+/-4.9
$50,000 to $99,999	9	+/-14	0.4%	+/-0.7
$100,000 to $149,999	80	+/-73	3.8%	+/-3.5
$150,000 to $199,999	255	+/-115	12.1%	+/-5.2
$200,000 to $299,999	581	+/-155	27.7%	+/-6.7
$300,000 to $499,999	830	+/-198	39.5%	+/-7.4
$500,000 to $999,999	193	+/-84	9.2%	+/-3.8
$1,000,000 or more	8	+/-13	0.4%	+/-0.6
Median (dollars)	296,000	+/-31,355	(X)	(X)
MORTGAGE STATUS				
Owner-occupied units	2,100	+/-286	2,100	(X)
Housing units with a mortgage	1,646	+/-262	78.4%	+/-6.4
Housing units without a mortgage	454	+/-149	21.6%	+/-6.4
SELECTED MONTHLY OWNER COSTS (SMOC)				
Housing units with a mortgage	1,646	+/-262	1,646	(X)
Less than $300	0	+/-19	0.0%	+/-2.1
$300 to $499	0	+/-19	0.0%	+/-2.1
$500 to $699	0	+/-19	0.0%	+/-2.1
$700 to $999	45	+/-38	2.7%	+/-2.4
$1,000 to $1,499	256	+/-110	15.6%	+/-6.0
$1,500 to $1,999	488	+/-161	29.6%	+/-8.9
$2,000 or more	857	+/-205	52.1%	+/-8.8
Median (dollars)	2,035	+/-131	(X)	(X)
Housing units without a mortgage	454	+/-149	454	(X)
Less than $100	0	+/-19	0.0%	+/-7.4
$100 to $199	9	+/-14	2.0%	+/-3.3
$200 to $299	0	+/-19	0.0%	+/-7.4
$300 to $399	29	+/-42	6.4%	+/-9.2
$400 or more	416	+/-147	91.6%	+/-8.3
Median (dollars)	668	+/-89	(X)	(X)
SELECTED MONTHLY OWNER COSTS AS A PERCENTAGE OF HOUSEHOLD INCOME (SMOCAPI)				
Housing units with a mortgage (excluding units where SMOCAPI cannot be computed)	1,638	+/-262	1,638	(X)
Less than 20.0 percent	397	+/-140	24.2%	+/-7.6
20.0 to 24.9 percent	297	+/-166	18.1%	+/-9.4
25.0 to 29.9 percent	268	+/-112	16.4%	+/-6.1
30.0 to 34.9 percent	165	+/-95	10.1%	+/-5.9
35.0 percent or more	511	+/-137	31.2%	+/-7.8
Not computed	8	+/-13	(X)	(X)
Housing unit without a mortgage (excluding units where SMOCAPI cannot be computed)	454	+/-149	454	(X)
Less than 10.0 percent	123	+/-104	27.1%	+/-18.1
10.0 to 14.9 percent	76	+/-49	16.7%	+/-9.6
15.0 to 19.9 percent	69	+/-59	15.2%	+/-12.5

Subject	Emeryville city, California			
	Estimate	Margin of Error	Percent	Percent Margin of Error
20.0 to 24.9 percent	46	+/-41	10.1%	+/-9.1
25.0 to 29.9 percent	12	+/-22	2.6%	+/-4.8
30.0 to 34.9 percent	18	+/-30	4.0%	+/-6.4
35.0 percent or more	110	+/-73	24.2%	+/-15.2
Not computed	0	+/-19	(X)	(X)
GROSS RENT				
Occupied units paying rent	3,716	+/-306	3,716	(X)
Less than $200	0	+/-19	0.0%	+/-0.9
$200 to $299	27	+/-42	0.7%	+/-1.1
$300 to $499	59	+/-73	1.6%	+/-2.0
$500 to $749	176	+/-121	4.7%	+/-3.2
$750 to $999	257	+/-112	6.9%	+/-3.0
$1,000 to $1,499	1,155	+/-242	31.1%	+/-5.8
$1,500 or more	2,042	+/-254	55.0%	+/-5.7
Median (dollars)	1,587	+/-94	(X)	(X)
No rent paid	74	+/-56	(X)	(X)
GROSS RENT AS A PERCENTAGE OF HOUSEHOLD INCOME (GRAPI)				
Occupied units paying rent (excluding units where GRAPI cannot be computed)	3,653	+/-299	3,653	(X)
Less than 15.0 percent	443	+/-162	12.1%	+/-4.2
15.0 to 19.9 percent	351	+/-127	9.6%	+/-3.4
20.0 to 24.9 percent	533	+/-156	14.6%	+/-4.3
25.0 to 29.9 percent	514	+/-218	14.1%	+/-5.8
30.0 to 34.9 percent	270	+/-165	7.4%	+/-4.4
35.0 percent or more	1,542	+/-308	42.2%	+/-8.1
Not computed	137	+/-83	(X)	(X)

Data are based on a sample and are subject to sampling variability. The degree of uncertainty for an estimate arising from sampling variability is represented through the use of a margin of error. The value shown here is the 90 percent margin of error. The margin of error can be interpreted roughly as providing a 90 percent probability that the interval defined by the estimate minus the margin of error and the estimate plus the margin of error (the lower and upper confidence bounds) contains the true value. In addition to sampling variability, the ACS estimates are subject to nonsampling error (for a discussion of nonsampling variability, see Accuracy of the Data). The effect of nonsampling error is not represented in these tables.

The median gross rent excludes no cash renters.

In prior years, the universe included all owner-occupied units with a mortgage. It is now restricted to include only those units where SMOCAPI is computed, that is, SMOC and household income are valid values.

In prior years, the universe included all owner-occupied units without a mortgage. It is now restricted to include only those units where SMOCAPI is computed, that is, SMOC and household income are valid values.

In prior years, the universe included all renter-occupied units. It is now restricted to include only those units where GRAPI is computed, that is, gross rent and household Income are valid values.

Median calculations for base table sourcing VAL, MHC, SMOC, and TAX should exclude zero values.

The 2007, 2008, 2009, 2010, 2011, 2012, and 2013 plumbing data for Puerto Rico will not be shown. Research indicates that the questions on plumbing facilities that were introduced in 2008 in the stateside American Community Survey and the 2008 Puerto Rico Community Survey may not have been appropriate for Puerto Rico.

Telephone service data are not available for certain geographic areas due to problems with data collection. See Errata Note #93 for details.

While the 2009-2013 American Community Survey (ACS) data generally reflect the February 2013 Office of Management and Budget (OMB) definitions of metropolitan and micropolitan statistical areas; in certain instances the names, codes, and boundaries of the principal cities shown in ACS tables may differ from the OMB definitions due to differences in the effective dates of the geographic entities.

Estimates of urban and rural population, housing units, and characteristics reflect boundaries of urban areas defined based on Census 2010 data. As a result, data for urban and rural areas from the ACS do not necessarily reflect the results of ongoing urbanization.

Source: U.S. Census Bureau, 2009-2013 5-Year American Community Survey

Explanation of Symbols:

1. An '**' entry in the margin of error column indicates that either no sample observations or too few sample observations were available to compute a standard error and thus the margin of error. A statistical test is not appropriate.
2. An '-' entry in the estimate column indicates that either no sample observations or too few sample observations were available to compute an estimate, or a ratio of medians cannot be calculated because one or both of the median estimates falls in the lowest interval or upper interval of an open-ended distribution.
3. An '-' following a median estimate means the median falls in the lowest interval of an open-ended distribution.
4. An '+' following a median estimate means the median falls in the upper interval of an open-ended distribution.
5. An '***' entry in the margin of error column indicates that the median falls in the lowest interval or upper interval of an open-ended distribution. A statistical test is not appropriate.
6. An '*****' entry in the margin of error column indicates that the estimate is controlled. A statistical test for sampling variability is not appropriate.
7. An 'N' entry in the estimate and margin of error columns indicates that data for this geographic area cannot be displayed because the number of sample cases is too small.
8. An '(X)' means that the estimate is not applicable or not available.

California Regional Water Quality Control Board
San Francisco Bay Region
Municipal Regional Stormwater NPDES Permit

Order R2-2009-0074
NPDES Permit No. CAS612008
October 14, 2009



California Regional Water Quality Control Board
San Francisco Bay Region
Municipal Regional Stormwater NPDES Permit

ORDER R2-2009-0074
NPDES PERMIT NO. CAS612008

Issuing Waste Discharge Requirements and National Pollutant Discharge Elimination System (NPDES) Permit for the discharge of stormwater runoff from the municipal separate storm sewer systems (MS4s) of the following jurisdictions and entities, which are permitted under this San Francisco Bay Municipal Regional Stormwater Permit (MRP):

The cities of Alameda, Albany, Berkeley, Dublin, Emeryville, Fremont, Hayward, Livermore, Newark, Oakland, Piedmont, Pleasanton, San Leandro, and Union City, Alameda County, the Alameda County Flood Control and Water Conservation District, and Zone 7 of the Alameda County Flood Control and Water Conservation District, which have joined together to form the Alameda Countywide Clean Water Program (Alameda Permittees)

The cities of Clayton, Concord, El Cerrito, Hercules, Lafayette, Martinez, Orinda, Pinole, Pittsburg, Pleasant Hill, Richmond, San Pablo, San Ramon, and Walnut Creek, the towns of Danville and Moraga, Contra Costa County, the Contra Costa County Flood Control and Water Conservation District, which have joined together to form the Contra Costa Clean Water Program (Contra Costa Permittees)

The cities of Campbell, Cupertino, Los Altos, Milpitas, Monte Sereno, Mountain View, Palo Alto, San Jose, Santa Clara, Saratoga, and Sunnyvale, the towns of Los Altos Hills and Los Gatos, the Santa Clara Valley Water District, and Santa Clara County, which have joined together to form the Santa Clara Valley Urban Runoff Pollution Prevention Program (Santa Clara Permittees)

The cities of Belmont, Brisbane, Burlingame, Daly City, East Palo Alto, Foster City, Half Moon Bay, Menlo Park, Millbrae, Pacifica, Redwood City, San Bruno, San Carlos, San Mateo, and South San Francisco, the towns of Atherton, Colma, Hillsborough, Portola Valley, and Woodside, the San Mateo County Flood Control District, and San Mateo County, which have joined together to form the San Mateo Countywide Water Pollution Prevention Program (San Mateo Permittees)

The cities of Fairfield and Suisun City, which have joined together to form the Fairfield-Suisun Urban Runoff Management Program (Fairfield-Suisun Permittees)

The City of Vallejo and the Vallejo Sanitation and Flood Control District (Vallejo Permittees)

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The California Regional Water Quality Control Board, San Francisco Bay Region, (hereinafter referred to as the Water Board) finds that:

FINDINGS

Incorporation of Fact Sheet

1. The Fact Sheet for the San Francisco Bay Municipal Regional Stormwater National Pollutant Discharge Elimination System (NPDES) Permit (Appendix I) includes cited regulatory and legal references and additional explanatory information in support of the requirements of this Permit. This information, including any supplements thereto, and any response to comments on the Tentative Orders, is hereby incorporated by reference.

Existing Permits

2. **Alameda County—**The cities of Alameda, Albany, Berkeley, Dublin, Emeryville, Fremont, Hayward, Livermore, Newark, Oakland, Piedmont, Pleasanton, San Leandro, and Union City, Alameda County (Unincorporated area), the Alameda County Flood Control and Water Conservation District, and Zone 7 of the Alameda County Flood Control and Water Conservation District have joined together to form the Alameda Countywide Clean Water Program (hereinafter collectively referred to as the Alameda Permittees) and have submitted a permit application (Report of Waste Discharge), dated July 26, 2007, for reissuance of their waste discharge requirements under the NPDES permit to discharge stormwater runoff from storm drains and watercourses within the Alameda Permittees' jurisdictions. The Alameda Permittees are currently subject to NPDES Permit No. CAS0029831 issued by Order No. R2-2003-0021 on February 19, 2003, and amended by Order No. R2-2007-0025 on March 14, 2007, to the Alameda Permittees to discharge stormwater runoff from storm drains and watercourses within their jurisdictions.

3. **Contra Costa County—**The cities of Clayton, Concord, El Cerrito, Hercules, Lafayette, Martinez, Orinda, Pinole, Pittsburg, Pleasant Hill, Richmond, San Pablo, San Ramon, and Walnut Creek, the towns of Danville and Moraga, Contra Costa County, and the Contra Costa County Flood Control and Water Conservation District have joined together to form the Contra Costa Clean Water Program (hereinafter collectively referred to as the Contra Costa Permittees) and have submitted a permit application (Report of Waste Discharge), dated September 30, 2003, for reissuance of their waste discharge requirements under the NPDES permit to discharge stormwater runoff from storm drains and watercourses within the Contra Costa Permittees' jurisdictions. The Contra Costa Permittees are currently subject to NPDES Permit No. CAS0029912 issued by Order No. 99-058 on July 21, 1999, amended by Order No. R2-2003-0022 on February 9, 2003, amended by Order Nos. R2-2004-059 and R2-2004-0061 on July 21, 2004, and amended by Order No. R2-2006-0050 on July 12, 2006, to the Contra Costa Permittees to discharge stormwater runoff from storm drains and watercourses within their jurisdictions.

4. **San Mateo County—**The cities of Belmont, Brisbane, Burlingame, Daly City, East Palo Alto, Foster City, Half Moon Bay, Menlo Park, Millbrae, Pacifica, Redwood City, San Bruno, San Carlos, San Mateo, and South San Francisco, the towns of Atherton, Colma, Hillsborough, Portola Valley, and Woodside, the San Mateo County Flood Control District and San Mateo County have joined together to form the San Mateo Countywide Water Pollution Prevention

Program (hereinafter collectively referred to as the San Mateo Permittees) and have submitted a permit application (Report of Waste Discharge), dated January 23, 2004, for reissuance of their waste discharge requirements under the NPDES permit to discharge stormwater runoff from storm drains and watercourses within the San Mateo Permittees' jurisdictions. The San Mateo Permittees are currently subject to NPDES Permit No. CAS0029921 issued by Order No. 99-059 on July 21, 1999, amended by Order No. R2-2003-0023 on February 19, 2003, amended by Order Nos. R2-2004-0060 and R2-2004-0062 on July 21, 2004, and amended by Order R2-2007-0027 on March 14, 2007, to the San Mateo Permittees to discharge stormwater runoff from storm drains and watercourses within their jurisdictions.

5. **Santa Clara County—**The cities of Campbell, Cupertino, Los Altos, Milpitas, Monte Sereno, Mountain View, Palo Alto, San Jose, Santa Clara, Saratoga, and Sunnyvale, the towns of Los Altos Hills and Los Gatos, the Santa Clara Valley Water District, and the County of Santa Clara have joined together to form the Santa Clara Valley Urban Runoff Pollution Prevention Program (hereinafter collectively referred to as the Santa Clara Permittees) and have submitted a permit application (Report of Waste Discharge), dated February 25, 2005, for reissuance of their waste discharge requirements under the NPDES permit to discharge stormwater runoff from storm drains and watercourses within the Santa Clara Permittees' jurisdictions. The Santa Clara Permittees are currently subject to NPDES Permit No. CAS029718 issued by Order No. 01-024 on April 21, 2001, amended by Order No. 01-119 on October 17, 2001, and Order No. R2-2005-0035 on July 20, 2005, to the Santa Clara Permittees to discharge stormwater runoff from storm drains and watercourses within their jurisdictions.

6. **Fairfield-Suisun—**The cities of Fairfield and Suisun City have joined together to form the Fairfield-Suisun Urban Runoff Management Program (hereinafter referred to as the Fairfield-Suisun Permittees) and have submitted a permit application (Report of Waste Discharge), dated October 17, 2007, for reissuance of their waste discharge requirements under the NPDES permit to discharge stormwater runoff from storm drains and watercourses within the Fairfield-Suisun Permittees' jurisdictions. The Fairfield-Suisun Permittees are currently subject to NPDES Permit No. CAS0612005 issued by Order No. R2-2003-0034 on April 16, 2003, and amended by Order R2-2007-0026 on March 14, 2007, to the Fairfield-Suisun Permittees to discharge stormwater runoff from storm drains and watercourses within their jurisdictions.

7. **Vallejo—**The City of Vallejo and the Vallejo Sanitary District (hereinafter referred to as the Vallejo Permittees) are currently subject to NPDES Permit No. CAS612006 issued by the United States Environmental Protection Agency (USEPA) on April 27, 1999, and that became effective on May 30, 1999, for the discharge of stormwater runoff from storm drains and watercourses within the Vallejo Permittees' jurisdictions.

8. The Alameda, Contra Costa, San Mateo, Santa Clara, Fairfield-Suisun, and Vallejo Permittees are hereinafter referred to in this Order as the Permittees.

Applicable Federal, State and Regional Regulations

9. Section 402(p) of the federal Clean Water Act (CWA), as amended by the Water Quality Act of 1987, requires NPDES permits for stormwater discharges from municipal separate storm sewer systems (MS4s), stormwater discharges associated with industrial activity (including construction activities), and designated stormwater discharges, which are considered significant contributors of pollutants to waters of the United States. On November 16, 1990, USEPA published regulations (40 CFR Part 122), which prescribe permit application requirements for MS4s pursuant to CWA 402(p). On May 17, 1996, USEPA published an Interpretive Policy

Memorandum on Reapplication Requirements for Municipal Separate Storm Sewer Systems, which provided guidance on permit application requirements for regulated MS4s.

10. The Water Quality Control Plan for the San Francisco Bay Basin (Basin Plan) is the Water Board's master water quality control planning document. It designates beneficial uses and water quality objectives for waters of the State, including surface waters and groundwater. It also includes programs of implementation to achieve water quality objectives. The Basin Plan was duly adopted by the Water Board and approved by the State Water Resources Control Board (State Board), Office of Administrative Law and the USEPA, where required.

11. The Water Board finds stormwater discharges from urban and developing areas in the San Francisco Bay Region to be significant sources of certain pollutants that cause or may be causing or threatening to cause or contribute to water quality impairment in waters of the Region. Furthermore, as delineated in the CWA section 303(d) list, the Water Board has found that there is a reasonable potential that municipal stormwater discharges cause or may cause or contribute to an excursion above water quality standards for the following pollutants: mercury, PCBs, furans, dieldrin, chlordane, DDT, and selenium in San Francisco Bay segments; pesticide associated toxicity in all urban creeks; and trash and low dissolved oxygen in Lake Merritt, in Alameda County. In accordance with CWA section 303(d), the Water Board is required to establish TMDLs for these pollutants to these waters to gradually eliminate impairment and attain water quality standards. Therefore, certain early pollutant control actions and further pollutant impact assessments by the Permittees are warranted and required pursuant to this Order.

12. The San Francisco Estuary Project, established pursuant to CWA Section 320, culminated in June 1993 with completion of its Comprehensive Conservation and Management Plan (CCMP) for the preservation, restoration, and enhancement of the San Francisco Bay-Delta Estuary. The 2007 update of the CCMP includes new and revised actions, while retaining many of the original plan's actions. The CCMP includes recommended actions in the areas of aquatic resources, wildlife, wetlands, water use, pollution prevention and reduction, dredging and waterway modification, land use, public involvement and education, and research and monitoring. Recommended actions which may, in part, be addressed through implementation of this Permit include, but are not limited to, the following:

    (1) ACTION AR-9.1 (New 2007)
    Improve understanding of sources, types, and impacts of marine debris in the Estuary.

    (5) ACTION AR-9.2 (New 2007)
    Expand existing marine debris prevention and cleanup programs and develop new initiatives to reduce discharge of debris to waterways.

    (10) ACTION PO-1.2 (Revised 2007)
    Recommend institutional and financial changes needed to place more focus on pollution prevention.

    (12) ACTION PO-1.6 (Revised 2007)
    Implement a comprehensive strategy to reduce pesticides coming into the Estuary.

    (13) ACTION PO-1.7.1 (New 2007)
    Develop product stewardship program for new commercial products to minimize future pollutant releases.

(14) ACTION PO-1.8 (New 2007)
Develop and implement programs to prevent pollution of the Estuary by other harmful pollutants like trash, bacteria, sediments, and nutrients.

(15) ACTION PO-2.1 (Revised 2007)
Pursue a mass emissions strategy to reduce pollutant discharges into the Estuary from point and nonpoint sources and to address the accumulation of pollutants in estuarine organisms and sediments.

(16) ACTION PO-2.4 (Revised 2007)
Improve the management and control of urban runoff from public and private sources.

(18) ACTION PO-3.3 (New 2007)
Accomplish large-scale improvements to Bay-Delta area infrastructure and implement pollution prevention strategies to prevent pollution threats to public health and wildlife.

(19) ACTION PO-4.1 (New 2007)
Increase regulatory incentives for municipalities, through urban runoff and other programs, to invest in projects that restore or enhance stream and wetland functions.

(20) ACTION LU-1.1 (Revised 2007)
Local land use jurisdiction's General Plans should incorporate watershed protection goals for wetlands and stream environments and to reduce pollutants in runoff.

(21) ACTION LU-1.1.1 (New 2007): Provide assistance to local agencies to ensure that applicable nonpoint source control elements are incorporated into local government and business practices.

(22) ACTION LU-1.5 (LU-3.2 in 1993 CCMP; Revised 2007)
Provide incentives and promote the use of building, planning, and maintenance guidelines for site planning and implementation of best management practices (BMPs) as related to stormwater and encourage local jurisdictions to adopt these guidelines as local ordinances.

(23) ACTION LU-1.6 (New 2007)
Continue and enhance training and certification for planners, public works departments, consultants, and builders on sustainable design and building practices with the goal of preventing or minimizing alteration of watershed functions (e.g., flood water conveyance, groundwater infiltration, stream channel and floodplain maintenance), and preventing construction-related erosion and post-construction pollution.

(24) ACTION LU-2.7 (New 2007)
Adopt and implement policies and plans that protect and restore water quality, flood water storage, and other natural functions of stream and wetland systems.

(25) ACTION LU-3.1 (New 2007)
Promote, encourage, and support collaborative partnerships with broad stakeholder representation, such as watershed councils, in order to develop diverse community-based approaches to long-term stewardship.

(26) ACTION LU-4.1 (Revised 2007)
Educate the public about how human actions impact the Estuary and its watersheds.

(28) ACTION PI-2.5 (Revised 2007)
Assist in the development of long-term educational programs designed to prevent pollution to the Estuary's ecosystem and provide assistance to other programs as needed.

13. Under section 13389 of the California Water Code, this action to adopt an NPDES permit is exempt from the provisions of Chapter 3 of the California Environmental Quality Act (CEQA).

Nature of Discharges and Sources of Pollutants

14. Stormwater runoff is generated from various land uses in all the hydrologic sub basins in the Basin and discharges into watercourses, which in turn flow into Central, Lower and South San Francisco Bay.

15. The quality and quantity of runoff discharges vary considerably and are affected by hydrology, geology, land use, season, and sequence and duration of hydrologic events. Pollutants of concern in these discharges are certain heavy metals; excessive sediment production from erosion due to anthropogenic activities; petroleum hydrocarbons from sources such as used motor oil; microbial pathogens of domestic sewage origin from illicit discharges; certain pesticides associated with acute aquatic toxicity; excessive nutrient loads, which can cause or contribute to the depletion of dissolved oxygen and/or toxic concentrations of dissolved ammonia; trash, which impairs beneficial uses including, but not limited to, support for aquatic life; and other pollutants which can cause aquatic toxicity in the receiving waters.

16. Federal, State or regional entities within the Permittees' boundaries, not currently named in this Order, operate storm drain facilities and/or discharge stormwater to the storm drains and watercourses covered by this Order. The Permittees may lack jurisdiction over these entities. Consequently, the Water Board recognizes that the Permittees should not be held responsible for such facilities and/or discharges. The Water Board will consider such facilities for coverage under its NPDES permitting scheme pursuant to US EPA Phase II stormwater regulations. Under Phase II, the Water Board can permit these federal, State, and regional entities through use of the Statewide Phase II NPDES General Permit.

17. Certain pollutants present in stormwater and/or urban runoff can be derived from extraneous sources over which the Permittees have limited or no direct jurisdiction. Examples of such pollutants and their respective sources are polycyclic aromatic hydrocarbons (PAHs), which are products of internal combustion engine operation and other sources; heavy metals, such as copper from vehicle brake pad wear and zinc from vehicle tire wear; dioxins as products of combustion; polybrominated diphenyl ethers that are incorporated in many household products as flame retardants; mercury resulting from atmospheric deposition; and naturally occurring minerals from local geology. All these pollutants, and others, can be deposited on paved surfaces, rooftops, and other impervious surfaces as fine airborne particles—thus yielding stormwater runoff pollution that is unrelated to the activity associated with a given project site.

18. The Water Board will notify interested agencies and interested persons of the availability of reports, plans, and schedules, including Annual Reports, and will provide interested persons with an opportunity for a public hearing and/or an opportunity to submit their written views and recommendations. The Water Board will consider all comments and may modify the reports, plans, or schedules or may modify this Order in accordance with applicable law. All submittals required by this Order conditioned with acceptance by the Water Board will be subject to these notification, comment, and public hearing procedures.

19. This Order supersedes and rescinds Order Nos. 99-058, 99-059, 01-024, R2-2003-0021, R2-2003-0034, and supersedes NPDES Permit Nos. CAS0029831, CAS0029912, CAS0029921, CAS029718, CAS0612005, and CAS612006.

    This Order serves as a NPDES permit, pursuant to CWA section 402, or amendments thereto, and shall become effective December 1, 2009, provided the Regional Administrator, USEPA, Region 9, has no objections.

IT IS HEREBY ORDERED that the Permittees, in order to meet the provisions contained in Division 7 of the California Water Code and regulations adopted hereunder and the provisions of the Clean Water Act as amended and regulations and guidelines adopted hereunder, shall comply with the following:

A. DISCHARGE PROHIBITIONS

A.1. The Permittees shall, within their respective jurisdictions, effectively prohibit the discharge of non-stormwater (materials other than stormwater) into, storm drain systems and watercourses. NPDES-permitted discharges are exempt from this prohibition. Provision C.15 describes a tiered categorization of non-stormwater discharges based on potential for pollutant content that may be discharged upon adequate assurance that the discharge contains no pollutants of concern at concentrations that will impact beneficial uses or cause exceedances of water quality standards.

A.2. It shall be prohibited to discharge rubbish, refuse, bark, sawdust, or other solid wastes into surface waters or at any place where they would contact or where they would be eventually transported to surface waters, including flood plain areas.

B. RECEIVING WATER LIMITATIONS

B.1. The discharge shall not cause the following conditions to create a condition of nuisance or to adversely affect beneficial uses of waters of the State:

- **a.** Floating, suspended, or deposited macroscopic particulate matter, or foam;
- **b.** Bottom deposits or aquatic growths;
- **c.** Alteration of temperature, turbidity, or apparent color beyond present natural background levels;
- **d.** Visible, floating, suspended, or deposited oil or other products of petroleum origin; and
- **e.** Substances present in concentrations or quantities that would cause deleterious effects on aquatic biota, wildlife, or waterfowl, or that render any of these unfit for human consumption.

B.2. The discharge shall not cause or contribute to a violation of any applicable water quality standard for receiving waters. If applicable water quality objectives are adopted and approved by the State Board after the date of the adoption of this Order, the Water Board may revise and modify this Order as appropriate.

C.1. Compliance with Discharge Prohibitions and Receiving Water Limitations

The Permittees shall comply with Discharge Prohibitions A.1 and A.2 and Receiving Water Limitations B.1 and B.2 through the timely implementation of control measures and other actions as specified in Provisions C.2 through C.15.

If exceedance(s) of water quality standards or water quality objectives (collectively, WQSs) persist in receiving waters, the Permittees shall comply with the following procedure:

C.1.a. Upon a determination by either the Permittee(s) or the Water Board that discharges are causing or contributing to an exceedance of an applicable WQS, the Permittee(s) shall notify, within no more than 30 days, and thereafter, except for any exceedances of WQSs for pesticides, trash, mercury, polychlorinated biphenols, copper, polybrominated diphenyl ethers, and selenium that are addressed pursuant to Provisions C.8 through C.14 of this Order, submit a report to the Water Board that describes BMPs that are currently being implemented, and the current level of implementation, and additional BMPs that will be implemented, and/or an increased level of implementation, to prevent or reduce the discharge of pollutants that are causing or contributing to the exceedance of WQSs. The report may be submitted in conjunction with the Annual Report, unless the Water Board directs an earlier submittal, and shall constitute a request to the Water Board for amendment of this NPDES Permit. The report and application for amendment shall include an implementation schedule. The Water Board may require modifications to the report and application for amendment; and

C.1.b. Submit any modifications to the report required by the Water Board within 30 days of notification.

As long as the Permittees have complied with the procedures set forth above, they do not have to repeat the same procedure for continuing or recurring exceedances of the same WQSs unless directed by the Water Board to develop additional control measures and BMPs and reinitiate the Permit amendment process.

C.2. Municipal Operations

The purpose of this provision is to ensure development and implementation of appropriate BMPs by all Permittees to control and reduce non-stormwater discharges and polluted stormwater to storm drains and watercourses during operation, inspection, and routine repair and maintenance activities of municipal facilities and infrastructure.

C.2.a. Street and Road Repair and Maintenance

i. Task Description – Asphalt/Concrete Removal, Cutting, Installation and Repair - The Permittees shall develop and implement appropriate BMPs at street and road repair and/or maintenance sites to control debris and waste materials during road and parking lot installation, repaving or repair maintenance activities, such as those described in the California Stormwater Quality Association's Handbook for Municipal Operations.

ii. Implementation Levels

(1) The Permittees shall require proper management of concrete slurry and wastewater, asphalt, pavement cutting, and other street and road maintenance materials and wastewater to avoid discharge to storm drains from such work sites. The Permittees shall coordinate with sanitary sewer agencies to determine if disposal to the sanitary sewer system is available for the wastewater generated from these activities provided that appropriate approvals and pretreatment standards are met.

(2) The Permittees shall require sweeping and/or vacuuming to remove debris, concrete, or sediment residues from such work sites upon completion of work. The Permittees shall require cleanup of all construction remains, spills and leaks using dry methods (e.g., absorbent materials, rags, pads, and vacuuming), as described in the Bay Area Stormwater Management Agencies Association's (BASMAA's) Blueprint for a Clean Bay.

iii. Reporting – The Permittees shall report on implementation of and compliance with these BMPs in the Annual Report

C.2.b. Sidewalk/Plaza Maintenance and Pavement Washing

i. Task Description – The Permittees shall implement, and require to be implemented, BMPs for pavement washing, mobile cleaning, pressure wash operations in such locations as parking lots and garages, trash areas, gas station fueling areas, and sidewalk and plaza cleaning, which prohibit the discharge of polluted wash water and non-stormwater to storm drains. The Permittees shall implement the BMPs included in BASMAA's Mobile Surface Cleaner Program. The Permittees shall coordinate with sanitary sewer agencies to determine if disposal to the sanitary sewer is available for the wastewater generated from these activities provided that appropriate approvals and pretreatment standards are met.

ii. Reporting – The Permittees shall report on implementation of and compliance with these BMPs in their Annual Report.

C.2.c. Bridge and Structure Maintenance and Graffiti Removal

i. Task Description

(1) The Permittees shall implement appropriate BMPs to prevent polluted stormwater and non-stormwater discharges from bridges and structural maintenance activities directly over water or into storm drains.

(2) The Permittees shall implement BMPs for graffiti removal that prevent non-stormwater and wash water discharges into storm drains.

ii. Implementation Levels

(1) The Permittees shall prevent all debris, including structural materials and coating debris, such as paint chips, or other debris and pollutants generated in bridge and structure maintenance or graffiti removal from entering storm drains or water courses.

(2) The Permittees shall protect nearby storm drain inlets before removing graffiti from walls, signs, sidewalks or other structures. The Permittees shall prevent any discharge of debris, cleaning compound waste, paint waste or wash water due to graffiti removal from entering storm drains or watercourses.

(3) The Permittees shall determine the proper disposal method for wastes generated from these activities. The Permittees shall train their employees and/or specify in contracts about these proper capture and disposal methods for the wastes generated.

iii. Reporting – The Permittees shall report on implementation of and compliance with these BMPs in their Annual Report.

C.2.d. Stormwater Pump Stations

The objective of this sub-provision is to prevent the discharge of water with low dissolved oxygen (DO) from pump stations, and to explore the use of pump stations for trash capture and removal from waters to protect beneficial uses of receiving waters.

i. Task Description – Operation and Maintenance of Stormwater Pump Stations – The Permittees shall develop and implement measures to operate, inspect, and maintain these facilities to eliminate non-stormwater discharges containing pollutants, and to reduce pollutant loads in the stormwater discharges to comply with WQSs.

ii. Implementation Levels – The Permittees shall comply with the following implementation measures to reduce polluted water discharges from Permittee-owned or operated pump stations:

(1) Complete an inventory of pump stations within each Permittee's jurisdiction, including locations, and key characteristics[1] by March 1, 2010.

(2) Inspect and collect DO data from all pump stations twice a year during the dry season after July 1, starting in 2010. DO monitoring is exempted where all discharge from a pump station remains in the stormwater collection system or infiltrates into a dry creek immediately downstream.

(3) If DO levels are at or below 3 milligrams per liter (3 mg/L), apply corrective actions, such as continuous pumping at a low flow rate, aeration, or other appropriate methods to maintain DO concentrations of the discharge above 3 mg/L. Verify corrective actions are effective by increasing DO monitoring interval to weekly until two weekly samples are above 3 mg/L.

(4) Starting in fall 2010, inspect pump stations a minimum of two times during the wet season in the first business day after ¼-inch and larger storm events after a minimum of a two week antecedent period with no precipitation. Post-storm inspections shall collect and report presence and quantity estimates of trash, including presence of odor, color, turbidity, and floating hydrocarbons. Remove debris and trash and replace any oil absorbent booms, as needed.

iii. Reporting – The Permittees shall report information resulting from C.2.d.ii.(2)-(4), including DO monitoring data and subsequent corrective actions taken to verify compliance with the 3 mg/L implementation level, in their Annual Report, and maintain records of inspection and maintenance activities and volume or mass of waste materials removed from pump stations.

C.2.e. Rural Public Works Construction and Maintenance

i. Task Description – Rural Road and Public Works Construction and Maintenance - For the purpose of this provision, rural means any watershed or portion thereof that is developed with large lot home-sites, such as one acre or larger, or with primarily agricultural, grazing or open space uses. The Permittees shall implement and require contractors to implement BMPs for erosion and sediment control during and after construction for maintenance activities on rural roads, particularly in or adjacent to stream channels or wetlands. The Permittees shall notify the Water Board, the California Department of Fish and Game and the U.S. Army Corps of Engineers, where applicable, and obtain appropriate agency permits for rural public works activities before work in or near creeks and wetlands.

[1] Characteristics include name of pump station, latitude and longitude in WGS 84, number of pumps, drainage area in acres, dominant land use(s), first receiving water body, maximum pumping capacity of station in gallons per minute (gpm), flow measurement capability (Y or N), flow measurement method, average wet season discharge rate in gpm, dry season discharge (Y, N, or unknown), nearest municipal wastewater treatment plant, wet well storage capacity in gallons, trash control (Y or N), trash control measure, and date built or last updated.

ii. Implementation Level

(1) The Permittees shall develop, where they do not already exist, and implement BMPs for erosion and sediment control measures during construction and maintenance activities on rural roads, including developing and implementing appropriate training and technical assistance resources for rural public works activities, by April 1, 2010.

(2) The Permittees shall develop and implement appropriate BMPs for the following activities, which minimize impacts on streams and wetlands in the course of rural road and public works maintenance and construction activities:

(a) Road design, construction, maintenance, and repairs in rural areas that prevent and control road-related erosion and sediment transport;

(b) Identification and prioritization of rural road maintenance on the basis of soil erosion potential, slope steepness, and stream habitat resources;

(c) Construction of roads and culverts that do not impact creek functions. New or replaced culverts shall not create a migratory fish passage barrier, where migratory fish are present, or lead to stream instability;

(d) Development and implementation of an inspection program to maintain rural roads' structural integrity and prevent impacts on water quality;

(e) Maintenance of rural roads adjacent to streams and riparian habitat to reduce erosion, replace damaging shotgun culverts and excessive erosion;

(f) Re-grading of unpaved rural roads to slope outward where consistent with road engineering safety standards, and installation of water bars as appropriate; and

(g) Replacement of existing culverts or design of new culverts or bridge crossings shall use measures to reduce erosion, provide fish passage and maintain natural stream geomorphology in a stable manner.

(3) The Permittees shall develop or incorporate existing training and guidance on permitting requirements for rural public works activities so as to stress the importance of proper planning and construction to avoid water quality impacts.

(4) The Permittees shall provide training incorporating these BMPs to rural public works maintenance staff at least twice within this Permit term.

iii. Reporting – The Permittees shall report on the implementation of and compliance with BMPs for the rural public works construction and maintenance activities in their Annual Report, including reporting on increased maintenance in priority areas.

C.2.f. Corporation Yard BMP Implementation

i. Task Description – Corporation Yard Maintenance

(1) The Permittees shall prepare, implement, and maintain a site specific Stormwater Pollution Prevention Plan (SWPPP) for corporation yards, including municipal vehicle maintenance, heavy equipment and maintenance vehicle parking areas, and material storage facilities to comply with water quality standards. Each SWPPP shall incorporate all applicable BMPs that are described in the California Stormwater Quality Association's Handbook for Municipal Operations and the Caltrans Storm Water Quality Handbook Maintenance Staff Guide, May 2003, and its addenda, as appropriate.

(2) The requirements in this provision shall apply only to facilities that are not already covered under the State Board's Industrial Stormwater NPDES General Permit.

(3) The site specific SWPPPs for corporation yards shall be completed by July 1, 2010.

ii. Implementation Level

(1) Implement BMPs to minimize pollutant discharges in stormwater and prohibit non-stormwater discharges, such as wash waters and street sweeper, vactor, and other related equipment cleaning wash water. Pollution control actions shall include, but not be limited to, good housekeeping practices, material and waste storage control, and vehicle leak and spill control.

(2) Routinely inspect corporation yards to ensure that no non-stormwater discharges are entering the storm drain system and, during storms, pollutant discharges are prevented to the maximum extent practicable. At a minimum, an inspection shall occur before the start of the rainy season.

(3) Plumb all vehicle and equipment wash areas to the sanitary sewer after coordination with the local sanitary sewer agency and equip with a pretreatment device (if necessary) in accordance with the requirements of the local sanitary sewer agency.

(4) Use dry cleanup methods when cleaning debris and spills from corporation yards. If wet cleaning methods must be used (e.g., pressure washing), the Permittee shall ensure that wash water is collected and disposed in the sanitary sewer after coordination with the local sanitary sewer agency and in accordance with the requirements of the local sanitary sewer agency. Any private companies hired by the Permittee to perform cleaning activities on Permittee-owned property shall follow the same requirements. In areas where sanitary sewer connection is not available, the Permittees shall collect and haul the wash water to a municipal

wastewater treatment plant, or implement appropriate BMPs and dispose of the wastewater to land in a manner that does not adversely impact surface water or groundwater.

(5) Outdoor storage areas containing waste pollutants shall be covered and/or bermed to prevent discharges of polluted stormwater runoff or run-on to storm drain inlets.

iii. Reporting – The Permittees shall report on implementation of SWPPPs, the results of inspections, and any follow-up actions in their Annual Report.

C.3. New Development and Redevelopment

The goal of Provision C.3 is for the Permittees to use their planning authorities to include appropriate source control, site design, and stormwater treatment measures in new development and redevelopment projects to address both soluble and insoluble stormwater runoff pollutant discharges and prevent increases in runoff flows from new development and redevelopment projects. This goal is to be accomplished primarily through the implementation of low impact development (LID) techniques.

C.3.a. New Development and Redevelopment Performance Standard Implementation

i. Task Description – At a minimum each Permittee shall:

(1) Have adequate legal authority to implement all requirements of Provision C.3;

(2) Have adequate development review and permitting procedures to impose conditions of approval or other enforceable mechanisms to implement the requirements of Provision C.3. For projects discharging directly to CWA section 303(d)-listed waterbodies, conditions of approval must require that post-development runoff not exceed pre-development levels for such pollutants that are listed;

(3) Evaluate potential water quality effects and identify appropriate mitigation measures when conducting environmental reviews, such as under CEQA;

(4) Provide training adequate to implement the requirements of Provision C.3 for staff, including interdepartmental training;

(5) Provide outreach adequate to implement the requirements of Provision C.3, including providing education materials to municipal staff, developers, contractors, construction site operators, and owner/builders, early in the planning process and as appropriate;

(6) For all new development and redevelopment projects that are subject to the Permittee's planning, building, development, or other comparable review, but not regulated by Provision C.3, encourage the inclusion of adequate site design measures that may include minimizing land disturbance and impervious surfaces (especially parking lots); clustering of structures and pavement; directing roof runoff to vegetated areas; use of micro-detention, including distributed landscape-based detention; preservation of open space; protection and/or restoration of riparian areas and wetlands as project amenities;

(7) For all new development and redevelopment projects that are subject to the Permittee's planning, building, development, or other comparable review, but not regulated by Provision C.3, encourage the inclusion of adequate source control measures to limit pollutant generation, discharge, and runoff. These source control measures should include:

- Storm drain stenciling.

- Landscaping that minimizes irrigation and runoff, promotes surface infiltration where possible, minimizes the use of pesticides and fertilizers, and incorporates appropriate sustainable landscaping practices and programs such as Bay-Friendly Landscaping.
- Appropriate covers, drains, and storage precautions for outdoor material storage areas, loading docks, repair/maintenance bays, and fueling areas.
- Covered trash, food waste, and compactor enclosures.
- Plumbing of the following discharges to the sanitary sewer, subject to the local sanitary sewer agency's authority and standards:
  - Discharges from indoor floor mat/equipment/hood filter wash racks or covered outdoor wash racks for restaurants.
  - Dumpster drips from covered trash and food compactor enclosures.
  - Discharges from outdoor covered wash areas for vehicles, equipment, and accessories.
  - Swimming pool water, if discharge to onsite vegetated areas is not a feasible option.
  - Fire sprinkler test water, if discharge to onsite vegetated areas is not a feasible option.

(8) Revise, as necessary, General Plans to integrate water quality and watershed protection with water supply, flood control, habitat protection, groundwater recharge, and other sustainable development principles and policies (e.g., referencing the Bay-Friendly Landscape Guidelines).

ii. Implementation Level – Most of the elements of this task should already be fully implemented because they are required in the Permittees' existing stormwater permits.

Due Dates for Full Implementation – Immediate for C.3.a.i.(1)-(5), May 1, 2010 for C.3.a.i.(6)-(7), and December 1, 2010 for C.3.a.i.(8). For Vallejo Permittees: December 1, 2010 for C.3.a.i.(1)-(8)

iii. Reporting – Provide a brief summary of the method(s) of implementation of Provisions C.3.a.i.(1)–(8) in the 2011 Annual Report.

C.3.b. Regulated Projects

i. Task Description – The Permittees shall require all projects fitting the category descriptions listed in Provision C.3.b.ii below (hereinafter called Regulated Projects) to implement LID source control, site design, and stormwater treatment onsite or at a joint stormwater treatment facility[2] in accordance with Provisions C.3.c and C.3.d, unless the Provision C.3.e alternate compliance options are evoked. For adjacent Regulated Projects that will discharge runoff to a joint stormwater treatment facility, the treatment facility must be completed by

[2] **Joint stormwater treatment facility** – Stormwater treatment facility built to treat the combined runoff from two or more Regulated Projects located adjacent to each other,

the end of construction of the first Regulated Project that will be discharging runoff to the joint stormwater treatment facility.

Regulated Projects, as they are defined in this Provision, do not include detached single-family home projects that are not part of a larger plan of development.

ii. Regulated Projects are defined in the following categories:

(1) **Special Land Use Categories**

(a) **New Development or redevelopment projects** that fall into one of the categories listed below and that create and/or replace 10,000 square feet or more of impervious surface (collectively over the entire project site). This category includes development projects of the following four types on public or private land that fall under the planning and building authority of a Permittee:

(i) Auto service facilities, described by the following Standard Industrial Classification (SIC) Codes: 5013, 5014, 5541, 7532-7534, and 7536-7539;

(ii) Retail gasoline outlets;

(iii) Restaurants (SIC Code 5812); or

(iv) Uncovered parking lots that are stand-alone or part of any other development project. This category includes the top uncovered portion of parking structures unless drainage from the uncovered portion is connected to the sanitary sewer along with the covered portions of the parking structure.

(b) For redevelopment projects in the categories specified in Provision C.3.b.ii.(1)(a)(i)-(iv), specific exclusions are:

(i) Interior remodels;

(ii) Routine maintenance or repair such as:

- roof or exterior wall surface replacement,
- pavement resurfacing within the existing footprint.

(c) Where a redevelopment project in the categories specified in Provision C.3.b.ii.(1)(a)(i)-(iv) results in an alteration of **more than 50 percent** of the impervious surface of a previously existing development that was not subject to Provision C.3, the entire project, consisting of all existing, new, and/or replaced impervious surfaces, must be included in the treatment system design (i.e., stormwater treatment systems must be designed and sized to treat stormwater runoff from the entire redevelopment project).

(d) Where a redevelopment project in the categories specified in Provision C.3.b.ii.(1)(a)(i)-(iv) results in an alteration of **less than 50 percent** of the impervious surface of a previously existing development that was not subject to Provision C.3, only the new and/or replaced impervious surface of the project must be included in the treatment system design (i.e., stormwater treatment systems must be designed and sized to treat stormwater runoff from the new and/or replaced impervious surface of the project).

(e) For any private development project in the categories specified in Provisions C.3.b.ii.(1)(a)(i)-(iv) for which a planning application has been deemed complete by a Permittee on or before the Permit effective date, the lower 5000 square feet impervious surface threshold (for classification as a Regulated Project) shall not apply so long as the project applicant is diligently pursuing the project. Diligent pursuance may be demonstrated by the project applicant's submittal of supplemental information to the original application, plans, or other documents required for any necessary approvals of the project by the Permittee. If during the time period between the Permit effective date and the required implementation date of December 1, 2011, for the 5000 square feet threshold, the project applicant has not taken any action to obtain the necessary approvals from the Permittee, the project will then be subject to the lower 5000 square feet impervious surface threshold specified in Provision C.3.b.ii.(1).

(f) For any private development project in the categories specified in Provisions C.3.b.ii.(1)(a)(i)-(iv) with an application deemed complete after the Permit effective date, the lower 5000 square feet impervious surface threshold (for classification as a Regulated Project) shall not apply if the project applicant has received final discretionary approval for the project before the required implementation date of December 1, 2011, for the 5000 square feet threshold.

(g) For public projects for which funding has been committed and construction is scheduled to begin by December 1, 2012, the lower 5000 square feet of impervious surface threshold (for classification as a Regulated Project) shall not apply.

Effective Date – Immediate, except December 1, 2010, for Vallejo Permittees.

Beginning December 1, 2011, all references to 10,000 square feet in Provision C.3.b.ii.(1) change to 5,000 square feet.

(2) **Other Development Projects**

New development projects that create 10,000 square feet or more of impervious surface (collectively over the entire project site) including commercial, industrial, residential housing subdivisions (i.e., detached single-family home subdivisions, multi-family attached subdivisions (town homes), condominiums, and apartments), mixed-use, and public projects. This category includes development projects on public or private land that fall under the planning and building authority of a Permittee. Detached single-family home projects that are not part of a larger plan of development are specifically excluded.

Effective Date – Immediate, except December 1, 2010, for Vallejo Permittees.

(3) **Other Redevelopment Projects**

Redevelopment projects that create and/or replace 10,000 square feet or more of impervious surface (collectively over the entire project site) including commercial, industrial, residential housing subdivisions (i.e., detached single-family home subdivisions, multi-family attached subdivisions (town homes), condominiums, and apartments), mixed-use, and public projects. Redevelopment is any land-disturbing activity that results in the creation, addition, or replacement of exterior impervious surface area on a site on which some past development has occurred. This category includes redevelopment projects on public or private land that fall under the planning and building authority of a Permittee.

Specific exclusions to this category are:

- Interior remodels.
- Routine maintenance or repair such as:
  - roof or exterior wall surface replacement, or
  - pavement resurfacing within the existing footprint.

(a) Where a redevelopment project results in an alteration of **more than 50 percent** of the impervious surface of a previously existing development that was not subject to Provision C.3, the entire project, consisting of all existing, new, and/or replaced impervious surfaces, must be included in the treatment system design (i.e., stormwater treatment systems must be designed and sized to treat stormwater runoff from the entire redevelopment project).

(b) Where a redevelopment results in an alteration **of less than 50 percent** of the impervious surface of a previously existing development that was not subject to Provision C.3, only the new and/or replaced impervious surface of the project must be included in the treatment system design (i.e., stormwater treatment systems must be designed and sized to treat stormwater runoff from the new and/or replaced impervious surface of the project).

Effective Date – Immediate, except December 1, 2010, for Vallejo Permittees.

(4) **Road Projects**

Any of the following types of road projects that create 10,000 square feet or more of newly constructed contiguous impervious surface and that fall under the building and planning authority of a Permittee:

(a) Construction of new streets or roads, including sidewalks and bicycle lanes built as part of the new streets or roads.

(b) Widening of existing streets or roads with additional traffic lanes.

(i) Where the addition of traffic lanes results in an alteration of **more than 50 percent** of the impervious surface of an existing street or road that was not subject to Provision C.3, **the entire project, consisting of all existing, new, and/or replaced impervious surfaces, must be included in the treatment system design** (i.e.,

stormwater treatment systems must be designed and sized to treat stormwater runoff from the entire street or road that had additional traffic lanes added).

(ii) Where the addition of traffic lanes results in an alteration **of less than 50 percent** of the impervious surface of an existing street or road that was not subject to Provision C.3, **only the new and/or replaced impervious surface of the project must be included in the treatment system design** (i.e., stormwater treatment systems must be designed and sized to treat stormwater runoff from only the new traffic lanes). However, if the stormwater runoff from the existing traffic lanes and the added traffic lanes cannot be separated, any onsite treatment system must be designed and sized to treat stormwater runoff from the entire street or road. If an offsite treatment system is installed or in-lieu fees paid in accordance with Provision C.3.e, the offsite treatment system or in-lieu fees must address only the stormwater runoff from the added traffic lanes.

(c) Construction of impervious trails that are greater than 10 feet wide or are creek-side (within 50 feet of the top of bank).

(d) Specific exclusions to Provisions C.3.b.ii.(4)(a)-(c) are:

- Sidewalks built as part of new streets or roads and built to direct stormwater runoff to adjacent vegetated areas.
- Bicycle lanes that are built as part of new streets or roads but are not hydraulically connected to the new streets or roads and that direct stormwater runoff to adjacent vegetated areas.
- Impervious trails built to direct stormwater runoff to adjacent vegetated areas, or other non-erodible permeable areas, preferably away from creeks or towards the outboard side of levees.
- Sidewalks, bicycle lanes, or trails constructed with permeable surfaces.[3]
- Caltrans highway projects and associated facilities.

(e) For any private road or trail project described by Provisions C.3.b.ii.(4)(b) or (c) for which a planning application has been deemed complete by a Permittee on or before the Permit effective date, the requirements of Provisions C.3.b.ii.(4)(b) or (c) to classify the project as a Regulated Project shall not apply so long as the project applicant is diligently pursuing the project. Diligent pursuance may be demonstrated by the project applicant's submittal of supplemental information to the original application, plans, or other documents required for any necessary approvals of the project by the Permittee. If during the time period between the Permit effective date and the required implementation date of December 1, 2011, for Provisions C.3.b.ii.(4)(b) and (c), the project applicant has not taken

[3] **Permeable surfaces** include pervious concrete, porous asphalt, unit pavers, and granular materials.

any action to obtain the necessary approvals from the Permittee, the project will then be classified as a Regulated Project under Provisions C.3.b.ii.(4)(b) or (c).

(f) For any private road or trail project with an application deemed complete after the Permit effective date, the requirements of Provisions C.3.b.i.(4)(b) or (c) to classify the project as a Regulated Project shall not apply if the project applicant has received final discretionary approval for the project before the required implementation date of December 1, 2011, for Provisions C.3.b.ii.(4)(b) and (c).

(g) For any public road or trail project for which funding has been committed and construction is scheduled to begin by December 1, 2012, the requirements of Provisions C.3.b.i.(4)(b) or (c) to classify the project as a Regulated Project shall not apply.

Effective Date – Immediate for C.3.b.ii.(4)(a) and (d)-(g), and December 1, 2011, for C.3.b.ii.(4)(b) and (c). For Vallejo Permittees: Immediate for C.3.b.ii.(4)(d)-(g), and December 1, 2011 for C.3.b.ii.(4)(a)-(c).

iii. Green Street Pilot Projects

The Permittees shall cumulatively complete ten pilot green street projects that incorporate LID techniques for site design and treatment in accordance with Provision C.3.c and that provide stormwater treatment sized in accordance with Provision C.3.d. It is also desirable that they meet or exceed the Bay-Friendly Landscape Scorecard minimum requirements (see www.BayFriendly.org).

(1) Parking lot projects that provide LID treatment in accordance with Provisions C.3.c and Provision C.3.d. for stormwater runoff from the parking lot and street may be considered pilot green street projects.

(2) A Regulated Project (as defined in Provision C.3.b.ii) may not be counted as one of the ten pilot green street projects.

(3) At least two pilot green street projects must be located in each of the following counties: Alameda, Contra Costa, San Mateo, and Santa Clara.

(4) The Permittees shall construct the ten pilot green street projects in such a manner that they, as a whole:

(a) Are representative of the various types of streets: arterial, collector, and local; and

(b) Contain the following key elements:

(i) Stormwater storage for landscaping reuse or stormwater treatment and/or infiltration for groundwater replenishment through the use of natural feature systems;

(ii) Creation of attractive streetscapes that enhance neighborhood livability by enhancing the pedestrian environment and introducing park-like elements into neighborhoods;

(iii) Service as an urban greenway segment that connects neighborhoods, parks, recreation facilities, schools, mainstreets, and wildlife habitats;

(iv) Parking management that includes maximum parking space requirements as opposed to minimum parking space requirements, parking requirement credits for subsidized transit or shuttle service, parking structures, shared parking, car sharing, or on-street diagonal parking;

(v) Meets broader community goals by providing pedestrian and, where appropriate, bicycle access; and

(vi) Located in a Priority Development Area as designated under the Association of Bay Area Government's and Metropolitan Transportation Commission's FOCUS[4] program.

(5) The Permittees shall conduct appropriate monitoring of these projects to document the water quality benefits achieved. Appropriate monitoring may include modeling using the design specifications and specific site conditions.

Due Date – All pilot green street projects shall be completed by December 1, 2014.

iv. Implementation Level – All elements of Provision C.3.b.i.-iii shall be fully implemented by the effective/due dates set forth in their respective sub-provision, and a database or equivalent tabular format shall be developed and maintained that contains all the information listed under Reporting (Provision C.3.b.v.).

Due Dates for Full Implementation – See specific Effective Dates listed under Provisions C.3.b.ii& iii. .The database or equivalent tabular format required by Provision C.3.b.iv shall be developed by December 1, 2010. (For Vallejo Permittees: December 1, 2011)

v. Reporting

(1) **Annual Reporting – C.3.b.ii. Regulated Projects**

For each Regulated Project approved during the fiscal year reporting period, the following information shall be reported electronically in the fiscal year Annual Report, in tabular form (as set forth in the attached Provision C.3.b. Sample Reporting Table):

(a) Project Name, Number, Location (cross streets), and Street Address;

(b) Name of Developer, Phase No. (if project is being constructed in phases, each phase should have a separate entry), Project Type (e.g., commercial, industrial, multiunit residential, mixed-use, public), and description;

(c) Project watershed;

(d) Total project site area and total area of land disturbed;

[4] FOCUS is a regional incentive-based development and conservation strategy for the Bay Area.

(e) Total new impervious surface area and/or total replaced impervious surface area;

(f) If redevelopment or road widening project, total pre-project impervious surface area and total post-project impervious surface area;

(g) Status of project (e.g., application date, application deemed complete date, project approval date);

(h) Source control measures;

(i) Site design measures;

(j) All post-construction stormwater treatment systems installed onsite, at a joint stormwater treatment facility, and/or at an offsite location;

(k) Operation and maintenance responsibility mechanism for the life of the project.

(l) Hydraulic Sizing Criteria used;

(m) Alternative compliance measures for Regulated Project (if applicable)

(i) If alternative compliance will be provided at an offsite location in accordance with Provision C.3.e.i.(1), include information required in Provision C.3.b.v.(a) – (l) for the offsite project; and

(ii) If alternative compliance will be provided by paying in-lieu fees in accordance with Provision C.3.e.i.(2), provide information required in Provision C.3.b.v.(a) – (l) for the Regional Project. Additionally, provide a summary of the Regional Project's goals, duration, estimated completion date, total estimated cost of the Regional Project, and estimated monetary contribution from the Regulated Project to the Regional Project; and

(n) Hydromodification (HM) Controls (see Provision C.3.g.) – If not required, state why not. If required, state control method used.

(2) **Pilot Green Streets Project Reporting - Provision C.3.b.iii.**

(a) On an annual basis, the Permittees shall report on the status of the pilot green street projects.

(b) For each completed project, the Permittees shall report the capital costs, operation and maintenance costs, legal and procedural arrangements in place to address operation and maintenance and its associated costs, and the sustainable landscape measures incorporated in the project including, if relevant, the score from the Bay-Friendly Landscape Scorecard.

(c) The 2013 Annual Report shall contain a summary of all green street projects completed by January 1, 2013. The summary shall include for each completed project the following information:

(i) Location of project

(ii) Size of project, including total impervious surface treated

(iii) Map(s) of project showing areas where stormwater runoff will be treated by LID measures

(iv) Specific type(s) of LID treatment measures included

(v) Total and specific costs of project

(vi) Specific funding sources for project and breakdown of percentage paid by each funding source

(vii) Lessons learned, including recommendations to facilitate funding and building of future projects

(viii) Identification of responsible party and funding source for operation and maintenance.

C.3.c. Low Impact Development (LID)

The goal of LID is to reduce runoff and mimic a site's predevelopment hydrology by minimizing disturbed areas and impervious cover and then infiltrating, storing, detaining, evapotranspiring, and/or biotreating stormwater runoff close to its source. LID employs principles such as preserving and recreating natural landscape features and minimizing imperviousness to create functional and appealing site drainage that treats stormwater as a resource, rather than a waste product. Practices used to adhere to these LID principles include measures such as rain barrels and cisterns, green roofs, permeable pavement, preserving undeveloped open space, and biotreatment through rain gardens, bioretention units, bioswales, and planter/tree boxes.

Task Description

i. The Permittees shall, at a minimum, implement the following LID requirements:

(1) **Source Control Requirements**

Require all Regulated Projects to implement source control measures onsite that at a minimum, shall include the following:

(a) Minimization of stormwater pollutants of concern in urban runoff through measures that may include plumbing of the following discharges to the sanitary sewer, subject to the local sanitary sewer agency's authority and standards:

- Discharges from indoor floor mat/equipment/hood filter wash racks or covered outdoor wash racks for restaurants;
- Dumpster drips from covered trash, food waste and compactor enclosures;
- Discharges from covered outdoor wash areas for vehicles, equipment, and accessories;
- Swimming pool water, if discharge to onsite vegetated areas is not a feasible option; and
- Fire sprinkler test water, if discharge to onsite vegetated areas is not a feasible option;

(b) Properly designed covers, drains, and storage precautions for outdoor material storage areas, loading docks, repair/maintenance bays, and fueling areas;

(c) Properly designed trash storage areas;

(d) Landscaping that minimizes irrigation and runoff, promotes surface infiltration, minimizes the use of pesticides and fertilizers, and incorporates other appropriate sustainable landscaping practices and programs such as Bay-Friendly Landscaping;

(e) Efficient irrigation systems; and

(f) Storm drain system stenciling or signage.

(2) **Site Design and Stormwater Treatment Requirements**

(a) Require each Regulated Project to implement at least the following design strategies onsite:

(i) Limit disturbance of natural water bodies and drainage systems; minimize compaction of highly permeable soils; protect slopes and channels; and minimize impacts from stormwater and urban runoff on the biological integrity of natural drainage systems and water bodies;

(ii) Conserve natural areas, including existing trees, other vegetation, and soils;

(iii) Minimize impervious surfaces;

(iv) Minimize disturbances to natural drainages; and

(v) Minimize stormwater runoff by implementing one or more of the following site design measures:

- Direct roof runoff into cisterns or rain barrels for reuse.
- Direct roof runoff onto vegetated areas.
- Direct runoff from sidewalks, walkways, and/or patios onto vegetated areas.
- Direct runoff from driveways and/or uncovered parking lots onto vegetated areas.
- Construct sidewalks, walkways, and/or patios with permeable surfaces.[3]
- Construct driveways, bike lanes, and/or uncovered parking lots with permeable surfaces.[3]

(b) Require each Regulated Project to treat 100% of the amount of runoff identified in Provision C.3.d for the Regulated Project's drainage area with LID treatment measures onsite or with LID treatment measures at a joint stormwater treatment facility.

(i) LID treatment measures are harvesting and re-use, infiltration, evapotranspiration, or biotreatment.

(ii) A properly engineered and maintained biotreatment system may be considered only if it is infeasible to implement harvesting and re-use, infiltration, or evapotranspiration at a project site.

(iii) Infeasibility to implement harvesting and re-use, infiltration, or evapotranspiration at a project site may result from conditions including the following:

- Locations where seasonal high groundwater would be within 10 feet of the base of the LID treatment measure.
- Locations within 100 feet of a groundwater well used for drinking water.
- Development sites where pollutant mobilization in the soil or groundwater is a documented concern.
- Locations with potential geotechnical hazards.
- Smart growth and infill or redevelopment sites where the density and/or nature of the project would create significant difficulty for compliance with the onsite volume retention requirement.
- Locations with tight clay soils that significantly limit the infiltration of stormwater.

(iv) By May 1, 2011, the Permittees, collaboratively or individually, shall submit a report on the criteria and procedures the Permittees shall employ to determine when harvesting and re-use, infiltration, or evapotranspiration is feasible and infeasible at a Regulated Project site. This report shall, at a minimum, contain the information required in Provision C.3.c.iii.(1).

(v) By December 1, 2013, the Permittees, collaboratively or individually, shall submit a report on their experience with determining infeasibility of harvesting and re-use, infiltration, or evapotranspiration at Regulated Project sites. This report shall, at a minimum, contain the information required in Provision C.3.iii.(2).

(vi) Biotreatment systems shall be designed to have a surface area no smaller than what is required to accommodate a 5 inches/hour stormwater runoff surface loading rate. The planting and soil media for biotreatment systems shall be designed to sustain plant growth and maximize stormwater runoff retention and pollutant removal. By December 1, 2010, the Permittees, working collaboratively or individually, shall submit for Water Board approval, a proposed set of model biotreatment soil media specifications and soil infiltration testing methods to verify a long-term infiltration rate of 5 to 10 inches/hour. This submittal to the Water Board shall, at a minimum, contain the information required in Provision C.3.c.iii.(3). Once the Water Board approves biotreatment soil media specifications and soil infiltration testing methods, the Permittees shall ensure that biotreatment systems installed to meet the requirements of Provision C.3.c and d comply with the Water Board-approved minimum specifications and soil infiltration testing methods.

(vii) Green roofs may be considered biotreatment systems that treat roof runoff only if they meet certain minimum specifications. By May 1, 2011, the Permittees shall submit for Water Board approval, proposed minimum specifications for green roofs.

This submittal to the Water Board shall, at a minimum, contain the information required in Provision C.3.c.iii.(4). Once the Water Board approves green roof minimum specifications, the Permittees shall ensure that green roofs installed to meet the requirements of Provision C.3.c and d comply with the Water Board-approved minimum specifications.

(c) Require any Regulated Project that does not comply with Provision C.3.c.i.(2)(b) above to meet the requirements established in Provision C.3.e for alternative compliance.

ii. Implementation Level – All elements of the tasks described in Provision C.3.c.i shall be fully implemented.

Due Date for Full Implementation – December 1, 2011

(1) For any private development project for which a planning application has been deemed complete by a Permittee on or before the Permit effective date, Provision C.3.c.i shall not apply so long as the project applicant is diligently pursuing the project. Diligent pursuance may be demonstrated by the project applicant's submittal of supplemental information to the original application, plans, or other documents required for any necessary approvals of the project by the Permittee. If during the time period between the Permit effective date and the required implementation date of December 1, 2011, the project applicant has not taken any action to obtain the necessary approvals from the Permittee, the project will then be subject to the requirements of Provision C.3.c.i.

(2) For any private development project with an application deemed complete after the Permit effective date, the requirements of Provision C.3.c.i shall not apply if the project applicant has received final discretionary approval for the project before the required implementation date of December 1, 2011.

(3) For public projects for which funding has been committed and construction is scheduled to begin by December 1, 2012, the requirements of Provision C.3.c.i shall not apply.

iii. Reporting

(1) Feasibility/Infeasibility Criteria Report - By May 1, 2011, the Permittees, collaboratively or individually, shall submit a report to the Water Board containing the following information:

- Literature review and discussion of documented cases/sites, particularly in the Bay Area and California, where infiltration, harvesting and reuse, or evapotranspiration have been demonstrated to be feasible and/or infeasible.
- Discussion of proposed feasibility and infeasibility criteria and procedures the Permittees shall employ to make a determination of when biotreatment will be allowed at a Regulated Project site.

(2) Status Report on Application of Feasibility/Infeasibility Criteria – By December 1, 2013, the Permittees shall submit a report to the Water Board containing the following information:

- Discussion of the most common feasibility and infeasibility criteria employed since implementation of Provision C.3.c requirements, including site-specific examples;
- Discussion of barriers, including institutional and technical site specific constraints, to implementation of harvesting and reuse, infiltration, or evapotranspiration, and proposed strategies for removing these identified barriers;
- If applicable, discussion of proposed changes to feasibility and infeasibility criteria and rationale for the changes; and
- Guidance for the Permittees to make a consistent and appropriate determination of the feasibility of harvesting and reuse, infiltration, or evapotranspiration for each Regulated Project.

(3) Model Biotreatment Soil Media Specifications - By December 1, 2010, the Permittees, collaboratively or individually, shall submit a report to the Water Board containing the following information:

- Proposed soil media specifications for biotreatment systems;
- Proposed soil testing methods to verify a long-term infiltration rate of 5-10 inches/hour;
- Relevant literature and field data showing the feasibility of the minimum design specifications;
- Relevant literature, field, and analytical data showing adequate pollutant removal and compliance with the Provision C.3.d hydraulic sizing criteria; and
- Guidance for the Permittees to apply the minimum specifications in a consistent and appropriate manner.

(4) Green Roof Minimum Specifications - By May 1, 2011, the Permittees, collaboratively or individually, shall submit a report to the Water Board containing the following information:

- Proposed minimum design specifications for green roofs;
- Relevant literature and field data showing the feasibility of the minimum design specifications;
- Relevant literature, field, and analytical data showing adequate pollutant removal and compliance with the Provision C.3.d hydraulic sizing criteria;
- Discussion of data and lessons learned from already installed green roofs;
- Discussion of barriers, including institutional and technical site specific constraints, to installation of green roofs and proposed strategies for removing these identified barriers; and

- Guidance for the Permittees to apply the minimum specifications in a consistent and appropriate manner.

(5) Report the method(s) of implementation of Provisions C.3.c.i above in the 2012 Annual Report. For specific tasks listed above that are reported using the reporting tables required for Provision C.3.b.v, a reference to those tables will suffice.

C.3.d. Numeric Sizing Criteria for Stormwater Treatment Systems

i. Task Description – The Permittees shall require that stormwater treatment systems constructed for Regulated Projects meet at least one of the following hydraulic sizing design criteria:

(1) **Volume Hydraulic Design Basis** – Treatment systems whose primary mode of action depends on volume capacity shall be designed to treat stormwater runoff equal to:

(a) The maximized stormwater capture volume for the area, on the basis of historical rainfall records, determined using the formula and volume capture coefficients set forth in Urban Runoff Quality Management, WEF Manual of Practice No. 23/ASCE Manual of Practice No. 87, (1998), pages 175–178 (e.g., approximately the 85th percentile 24-hour storm runoff event); or

(b) The volume of annual runoff required to achieve 80 percent or more capture, determined in accordance with the methodology set forth in Section 5 of the California Stormwater Quality Association's Stormwater Best Management Practice Handbook, New Development and Redevelopment (2003), using local rainfall data.

(2) **Flow Hydraulic Design Basis** – Treatment systems whose primary mode of action depends on flow capacity shall be sized to treat:

(a) 10 percent of the 50-year peak flowrate;

(b) The flow of runoff produced by a rain event equal to at least two times the 85th percentile hourly rainfall intensity for the applicable area, based on historical records of hourly rainfall depths; or

(c) The flow of runoff resulting from a rain event equal to at least 0.2 inches per hour intensity.

(3) **Combination Flow and Volume Design Basis** – Treatment systems that use a combination of flow and volume capacity shall be sized to treat at least 80 percent of the total runoff over the life of the project, using local rainfall data.

ii. Implementation Level – The Permittees shall immediately require the controls in this task.

Due Date for Full Implementation – Immediate, except December 1, 2010, for Vallejo Permittees.

iii. Reporting – Permittees shall use the reporting tables required in Provision C.3.b.v.

iv. Limitations on Use of Infiltration Devices in Stormwater Treatment Systems

(1) For Regulated Projects, each Permittee shall review planned land use and proposed treatment design to verify that installed stormwater treatment systems with no under-drain, and that function primarily as infiltration devices, should not cause or contribute to the degradation of groundwater quality at project sites. An infiltration device is any structure that is deeper than wide and designed to infiltrate stormwater into the subsurface and, as designed, bypass the natural groundwater protection afforded by surface soil. Infiltration devices include dry wells, injection wells, and infiltration trenches (includes french drains).

(2) For any Regulated Project that includes plans to install stormwater treatment systems which function primarily as infiltration devices, the Permittee shall require that:

(a) Appropriate pollution prevention and source control measures are implemented to protect groundwater at the project site, including the inclusion of a minimum of two feet of suitable soil to achieve a maximum 5 inches/hour infiltration rate for the infiltration system;

(b) Adequate maintenance is provided to maximize pollutant removal capabilities;

(c) The vertical distance from the base of any infiltration device to the seasonal high groundwater mark is at least 10 feet. (Note that some locations within the Permittees' jurisdictions are characterized by highly porous soils and/or high groundwater tables. In these areas, a greater vertical distance from the base of the infiltration device to the seasonal high groundwater mark may be appropriate, and treatment system approvals should be subject to a higher level of analysis that considers the potential for pollutants (such as from onsite chemical use), the level of pretreatment to be achieved, and other similar factors in the overall analysis of groundwater safety);

(d) Unless stormwater is first treated by a method other than infiltration, infiltration devices are not approved as treatment measures for runoff from areas of industrial or light industrial activity; areas subject to high vehicular traffic (i.e., 25,000 or greater average daily traffic on a main roadway or 15,000 or more average daily traffic on any intersecting roadway); automotive repair shops; car washes; fleet storage areas (e.g., bus, truck); nurseries; and other land uses that pose a high threat to water quality;

(e) Infiltration devices are not placed in the vicinity of known contamination sites unless it has been demonstrated that increased infiltration will not increase leaching of contaminants from soil, alter groundwater flow conditions affecting contaminant migration in groundwater, or adversely affect remedial activities; and

(f) Infiltration devices are located a minimum of 100 feet horizontally away from any known water supply wells, septic systems, and

underground storage tanks with hazardous materials. (Note that some locations within the Permittees' jurisdictions are characterized by highly porous soils and/or high groundwater tables. In these areas, a greater horizontal distance from the infiltration device to known water supply wells, septic systems, or underground storage tanks with hazardous materials may be appropriate, and treatment system approvals should be subject to a higher level of analysis that considers the potential for pollutants (such as from onsite chemical use), the level of pretreatment to be achieved, and other similar factors in the overall analysis of groundwater safety).

C.3.e. Alternative or In-Lieu Compliance with Provision C.3.c.

i. The Permittees may allow a Regulated Project to provide alternative compliance with Provision C.3.c in accordance with one of the two options listed below:

(1) **Option 1: LID Treatment at an Offsite Location**
Treat a portion of the amount of runoff identified in Provision C.3.d for the Regulated Project's drainage area with LID treatment measures onsite or with LID treatment measures at a joint stormwater treatment facility **and** treat the remaining portion of the Provision C.3.d runoff with LID treatment measures at an offsite project in the same watershed. The offsite LID treatment measures must provide hydraulically-sized treatment (in accordance with Provision C.3.d) of an equivalent quantity of both stormwater runoff and pollutant loading and achieve a net environmental benefit.

(2) **Option 2: Payment of In-Lieu Fees**
Treat a portion of the amount of runoff identified in Provision C.3.d for the Regulated Project's drainage area with LID treatment measures onsite or with LID treatment measures at a joint stormwater treatment facility **and** pay equivalent in-lieu fees[5] to treat the remaining portion of the Provision C.3.d runoff with LID treatment measures at a Regional Project.[6] The Regional Project must achieve a net environmental benefit.

(3) For the alternative compliance options described in Provision C.3.e.i.(1) and (2) above, offsite projects must be constructed by the end of construction of the Regulated Project. If more time is needed to construct the offsite project, for each additional year, up to three years, after the construction of the Regulated Project, the offsite project must provide an additional 10% of the calculated equivalent quantity of both stormwater runoff and pollutant loading. Regional Projects must be completed within three years after the end of construction of the Regulated Project. However, the timeline for completion of the Regional Project may be

[5] **In-lieu fees** – Monetary amount necessary to provide both hydraulically-sized treatment (in accordance with Provision C.3.d) with LID treatment measures of an equivalent quantity of stormwater runoff and pollutant loading, and a proportional share of the operation and maintenance costs of the Regional Project.

[6] **Regional Project –** A regional or municipal stormwater treatment facility that discharges into the same watershed that the Regulated Project does.

extended, up to five years after the completion of the Regulated Project, with prior Executive Officer approval. Executive Officer approval will be granted contingent upon a demonstration of good faith efforts to implement the Regional Project, such as having funds encumbered and applying for the appropriate regulatory permits.

ii. Special Projects

(1) When considered at the watershed scale, certain types of smart growth, high density, and transit-oriented development can either reduce existing impervious surfaces, or create less "accessory" impervious areas and automobile-related pollutant impacts. Incentive LID treatment reduction credits approved by the Water Board may be applied to these types of Special Projects.

(2) By December 1, 2010, the Permittees shall submit a proposal to the Water Board containing the following information:

- Identification of the types of projects proposed for consideration of LID treatment reduction credits and an estimate of the number and cumulative area of potential projects during the remaining term of this Permit for each type of project;
- Identification of institutional barriers and/or technical site-specific constraints to providing 100% LID treatment onsite that justify the allowance for non-LID treatment measures onsite;
- Specific criteria for each type of Special Project proposed, including size, location, minimum densities, minimum floor area ratios, or other appropriate limitations;
- Identification of specific water quality and environmental benefits provided by these types of projects that justify the allowance for non-LID treatment measures onsite;
- Proposed LID treatment reduction credit for each type of Special Project and justification for the proposed credits. The justification shall include identification and an estimate of the specific water quality benefit provided by each type of Special Project proposed for LID treatment reduction credit; and
- Proposed total treatment reduction credit for Special Projects that may be characterized by more than one category and justification for the proposed total credit.

iii. Effective Date – December 1, 2011.

iv. Implementation Level

(1) For any private development project for which a planning application has been deemed complete by a Permittee on or before the Permit effective date, Provisions C.3.e.i-ii shall not apply so long as the project applicant is diligently pursuing the project. Diligent pursuance may be demonstrated by the project applicant's submittal of supplemental information to the original application, plans, or other documents required for any necessary

approvals of the project by the Permittee. If during the time period between the Permit effective date and the required implementation date of December 1, 2011, the project applicant has not taken any action to obtain the necessary approvals from the Permittee, the project will then be subject to the requirements of Provision C.3.e.i-ii.

(2) For public projects for which funding has been committed and construction is scheduled to begin by December 1, 2012, the requirements of Provisions C.3.e.i-ii shall not apply.

(3) Provisions C.3.e.i-ii supersede any Alternative Compliance Policies previously approved by the Executive Officer

(4) For all offsite projects and Regional Projects installed in accordance with Provision C.3.e.i-ii, the Permittees shall meet the Operation & Maintenance (O&M) requirements of Provision C.3.h.

v. Reporting –The Permittees shall submit the ordinance/legal authority and procedural changes made, if any, to implement Provision C.3.e with their 2012 Annual Report. Annual reporting thereafter shall be done in conjunction with reporting requirements under Provision C.3.b.v.

Any Permittee choosing to require 100% LID treatment onsite for all Regulated Projects and not allow alternative compliance under Provision C.3.e, shall include a statement to that effect in the 2012 Annual Report and all subsequent Annual Reports.

C.3.f. Alternative Certification of Stormwater Treatment Systems

i. Task Description – In lieu of reviewing a Regulated Project's adherence to Provision C.3.d, a Permittee may elect to have a third party conduct detailed review and certify the Regulated Project's adherence to Provision C.3.d. The third party reviewer must be a Civil Engineer or a Licensed Architect or Landscape Architect registered in the State of California, or staff of another Permittee subject to the requirements of this Permit.

ii. Implementation Level – Any Permittee accepting third-party reviews must make a reasonable effort to ensure that the third party has no conflict of interest with regard to the Regulated Project in question. That is, any consultant or contractor (or his/her employees) hired to design and/or construct a stormwater treatment system for a Regulated Project shall not also be the certifying third party. The Permittee must verify that the third party certifying any Regulated Project has current training on stormwater treatment system design (within three years of the certification signature date) for water quality and understands the groundwater protection principles applicable to Regulated Project sites.

Training conducted by an organization with stormwater treatment system design expertise (such as a college or university, the American Society of Civil Engineers, American Society of Landscape Architects, American Public Works Association, California Water Environment Association (CWEA), BASMAA, National Association of Flood & Stormwater Management Agencies, California

Stormwater Quality Association (CASQA), or the equivalent, may be considered qualifying training.

iii. Reporting – Projects reviewed by third parties shall be noted in reporting tables for Provision C.3.b.

C.3.g. Hydromodification Management

i. Hydromodification Management (HM) Projects are Regulated Projects that create and/or replace one acre or more of impervious surface and are not specifically excluded within the requirements of Attachments B–F. A project that does not increase impervious surface area over the pre-project condition is not an HM Project. All HM Projects shall meet the Hydromodification Management Standard of Provision C.3.g.ii.

ii. HM Standard

Stormwater discharges from HM Projects shall not cause an increase in the erosion potential of the receiving stream over the pre-project (existing) condition. Increases in runoff flow and volume shall be managed so that post-project runoff shall not exceed estimated pre-project rates and durations, where such increased flow and/or volume is likely to cause increased potential for erosion of creek beds and banks, silt pollutant generation, or other adverse impacts on beneficial uses due to increased erosive force. The demonstration that post-project stormwater runoff does not exceed estimated pre-project runoff rates and durations shall include the following:

(1) **Range of Flows to Control:** For Alameda, Contra Costa, San Mateo, and Santa Clara Permittees, HM controls shall be designed such that post-project stormwater discharge rates and durations match pre-project discharge rates and durations from 10 % of the pre-project 2-year peak flow[7] up to the pre-project 10-year peak flow. For Fairfield-Suisun Permittees, HM controls shall be designed such that post-project stormwater discharge rates and durations shall match from 20 percent of the 2-year peak flow up to the pre-project 10-year peak flow. Contra Costa Permittees, when using pre-sized and pre-designed Integrated Management Practices (IMPs) per Attachment C of this Order, are not required to meet the low-flow criterion of 10% of the 2-year peak flow. These IMPs are designed to control 20% of the 2-year peak flow. After the Contra Costa Permittees conduct the required monitoring specified in Attachment C, the design of these IMPs will be reviewed.

(2) **Goodness of Fit Criteria:** The post-project flow duration curve shall not deviate above the pre-project flow duration curve by more than 10 percent

[7] Where referred to in this Order, the 2-year peak flow is determined using a flood frequency analysis based on USGS Bulletin 17 B to obtain the peak flow statistically expected to occur at a 2-year recurrence interval. In this analysis, the appropriate record of hourly rainfall data (e.g., 35-50 years of data) is run through a continuous simulation hydrologic model, the annual peak flows are identified, rank ordered, and the 2-year peak flow is estimated. Such models include USEPA's Hydrologic Simulation Program—Fortran (HSPF), U.S. Army Corps of Engineers' Hydrologic Engineering Center-Hydrologic Modeling System (HEC-HMS), and USEPA's Storm Water Management Model (SWMM).

over more than 10 percent of the length of the curve corresponding to the range of flows to control.

(3) **Precipitation Data:** Precipitation data used in the modeling of HM controls shall, at a minimum, be 30 years of hourly rainfall data representative of the area being modeled. Where a longer rainfall record is available, the longer record shall be used.

(4) **Calculating Post-Project Runoff:** Retention and detention basins shall be considered impervious surfaces for purposes of calculating post-project runoff. Pre- and post-project runoff shall be calculated and compared for the entire site, without separating or excluding areas that may be considered self-retaining.

(5) **Existing HM Control Requirements:** The Water Board has adopted HM control requirements for all Permittees (except for the Vallejo Permittees), and these adopted requirements are attached to this Order as listed below. The Permittees shall comply with all requirements in their own Permittee-specific Attachment, unless otherwise specified by this Order. In all cases, the HM Standard shall be achieved.

- Attachment B for Alameda Permittees
- Attachment C for Contra Costa Permittees
- Attachment D for Fairfield-Suisun Permittees
- Attachment E for San Mateo Permittees
- Attachment F for Santa Clara Permittees

iii. Types of HM Controls

Projects shall meet the HM Standard using any of the following HM controls or a combination thereof.

(1) **Onsite HM controls** are flow duration control structures and hydrologic source controls that collectively result in the HM Standard being met at the point(s) where stormwater runoff discharges from the project site.

(2) **Regional HM controls** are flow duration control structures that collect stormwater runoff discharge from multiple projects (each of which shall incorporate hydrologic source control measures as well) and are designed such that the HM Standard is met for all the projects at the point where the regional HM control discharges.

(3) **In-stream measures** shall be an option only where the stream, which receives runoff from the project, is already impacted by erosive flows and shows evidence of excessive sediment, erosion, deposition, or is a hardened channel.

In-stream measures involve modifying the receiving stream channel slope and geometry so that the stream can convey the new flow regime without increasing the potential for erosion and aggradation. In-stream measures are intended to improve long-term channel stability and prevent erosion by reducing the erosive forces imposed on the channel boundary.

In-stream measures, or a combination of in-stream and onsite controls, shall be designed to achieve the HM Standard from the point where the project(s) discharge(s) to the stream to the mouth of the stream or to achieve an equivalent degree of flow control mitigation (based on amount of impervious surface mitigated) as part of an in-stream project located in the same watershed. Designing in-stream controls requires a hydrologic and geomorphic evaluation (including a longitudinal profile) of the stream system downstream and upstream of the project. As with all in-stream activities, other regulatory permits must be obtained by the project proponent.[8]

iv. Reporting

For each HM Project approved during the reporting period, the following information shall be reported electronically in tabular form. This information shall be added to the required reporting information specified in Provision C.3.b.v.

(1) Device(s) or method(s) used to meet the HM Standard, such as detention basin(s), biodetention unit(s), regional detention basin, or in-stream control;

(2) Method used by the project proponent to design and size the device or method used to meet the HM Standard; and

(3) Other information as required in the Permittee's existing HM requirements, as shown in Attachments B–F.

v. Vallejo Permittees shall complete the following tasks in lieu of complying with Provisions C.3.g.i-iv.

(1) Develop a Hydrograph Modification Management Plan (HMP) for meeting the requirements of Provisions C.3.g.i–iv. The Vallejo Permittees' HMP shall be subject to approval by the Water Board.

(2) Vallejo Permittees shall include the following in their HMP:

(a) A map of the City of Vallejo, delineating areas where the HM Standard applies. The HM Standard shall apply in all areas except where a project:

- discharges stormwater runoff into creeks or storm drains that are concrete-lined or significantly hardened (e.g., with rip-rap, sackrete) downstream to their outfall in San Francisco Bay;
- discharges to an underground storm drain discharging to the Bay; or
- is located in a highly developed watershed.[9]

[8] In-stream control projects require a Stream Alteration Agreement from the California Department of Fish & Game, a CWA section 404 permit from the U.S. Army Corps of Engineers, and a section 401 certification from the Water Board. Early discussions with these agencies on the acceptability of an in-stream modification are necessary to avoid project delays or redesign.

[9] Within the context of Provision C.3.g., "highly developed watersheds" refers to catchments or subcatchments that are 65% impervious or more.

However, plans to restore a creek reach may reintroduce the applicability of HM controls, and would need to be addressed in the HMP;

(b) A thorough technical description of the methods project proponents may use to meet the HM Standard. Vallejo Permittees shall use the same methodologies, or similar methodologies, to those already in use in the Bay Area to meet the HM Standard. Contra Costa sizing charts may be used on projects up to ten acres after any necessary modifications are made to the sizes to control runoff rates and durations from ten percent of the pre-project 2-year peak flow to the pre-project 10-year peak flow, and adjustments are made for local rainfall and soil types;

(c) A description of any land use planning measures the City of Vallejo will take (e.g., stream buffers and stream restoration activities, including restoration-in-advance of floodplains, revegetation, and use of less-impacting facilities at points of discharge) to allow expected changes in stream channel cross sections, stream vegetation, and discharge rates, velocities, and/or durations without adverse impacts on stream beneficial uses;

(d) A description of how the Vallejo Permittees will incorporate these requirements into their local approval processes, and a schedule for doing so; and

(e) Guidance for City of Vallejo project proponents explaining how to meet the HM Standard.

(3) Vallejo Permittees shall complete the HMP according to the schedule below. All required documents shall be submitted acceptable to the Executive Officer, except the HMP, which shall be submitted to the Water Board for approval. Vallejo Permittees shall report on the status of HMP development and implementation in each Annual Report and shall also provide a summary of projects incorporating measures to address Provision C.3.g and the measures used.

- By April 1, 2011, submit a detailed workplan and schedule for completion of the information required in Provision C.3.g.v.(2).
- By December 1, 2011, submit the map required in Provision C.3.g.v.(2)(a).
- By April 1, 2012, submit a draft HMP.
- By December 1, 2012, provide responses to Water Board comments on the draft HMP so that the final HMP is submitted for Water Board approval by July 1, 2013.
- Upon adoption by the Water Board, implement the HMP, which shall include the requirements of this measure. Before approval of the HMP by the Water Board, Vallejo Permittees shall encourage early implementation of measures likely to be included in the HMP.

C.3.h. Operation and Maintenance of Stormwater Treatment Systems

i. Task Description – Each Permittee shall implement an Operation and Maintenance (O&M) Verification Program.

ii. Implementation Level – At a minimum, the O&M Verification Program shall include the following elements:

(1) Conditions of approval or other legally enforceable agreements or mechanisms for all Regulated Projects that, at a minimum, require at least one of the following from all project proponents and their successors in control of the Project or successors in fee title:

(a) The project proponent's signed statement accepting responsibility for the O&M of the installed onsite, joint, and/or offsite stormwater treatment system(s) and HM control(s) (if any) until such responsibility is legally transferred to another entity;

(b) Written conditions in the sales or lease agreements or deed for the project that requires the buyer or lessee to assume responsibility for the O&M of the onsite, joint, and/or offsite installed stormwater treatment system(s) and HM control(s) (if any) until such responsibility is legally transferred to another entity;

(c) Written text in project deeds, or conditions, covenants and restrictions (CCRs) for multi-unit residential projects that require the homeowners association or, if there is no association, each individual owner to assume responsibility for the O&M of the installed onsite, joint, and/or offsite stormwater treatment system(s) and HM control(s) (if any) until such responsibility is legally transferred to another entity; or

(d) Any other legally enforceable agreement or mechanism, such as recordation in the property deed, that assigns the O&M responsibility for the installed onsite, joint, and/or offsite treatment system(s) and HM control(s) (if any) to the project owner(s) or the Permittee.

(2) Coordination with the appropriate mosquito and vector control agency with jurisdiction to establish a protocol for notification of installed stormwater treatment systems and HM controls.

(3) Conditions of approval or other legally enforceable agreements or mechanisms for all Regulated Projects that require the granting of site access to all representatives of the Permittee, local mosquito and vector control agency staff, and Water Board staff, for the sole purpose of performing O&M inspections of the installed stormwater treatment system(s) and HM control(s) (if any).

(4) A written plan and implementation of the plan that describes O&M (including inspection) of all Regional Projects and regional HM controls that are Permittee-owned and/or operated.

(5) A database or equivalent tabular format of all Regulated Projects (public and private) that have installed onsite, joint, and/or offsite stormwater

treatment systems. This database or equivalent tabular format shall include the following information for each Regulated Project:

(a) Name and address of the Regulated Project;

(b) Specific description of the location (or a map showing the location) of the installed stormwater treatment system(s) and HM control(s) (if any);

(c) Date(s) that the treatment system(s) and HM controls (if any) is/are installed;

(d) Description of the type and size of the treatment system(s) and HM control(s) (if any) installed;

(e) Responsible operator(s) of each treatment system and HM control (if any);

(f) Dates and findings of inspections (routine and follow-up) of the treatment system(s) and HM control(s) (if any) by the Permittee; and

(g) Any problems and corrective or enforcement actions taken.

(6) A prioritized plan for inspecting all installed stormwater treatment systems and HM controls. At a minimum, this prioritized plan must specify the following for each fiscal year:

(a) Inspection by the Permittee of all newly installed stormwater treatment systems and HM controls within 45 days of installation to ensure approved plans have been followed;

(b) Inspection by the Permittee of at least 20 percent of the total number (at the end of the preceding fiscal year) of installed stormwater treatment systems and HM controls;

(c) Inspection by the Permittee of at least 20 percent of the total number (at the end of the preceding fiscal year) of installed vault-based systems; and

(d) Inspection by the Permittee of all installed stormwater treatment systems subject to Provision C.3, at least once every five years.

iii. Maintenance Approvals: The Permittees shall ensure that onsite, joint, and offsite stormwater treatment systems and HM controls installed by Regulated Projects are properly operated and maintained for the life of the projects. In cases where the responsible party for a stormwater treatment system or HM control has worked diligently and in good faith with the appropriate State and federal agencies to obtain approvals necessary to complete maintenance activities for the treatment system or HM control, but these approvals are not granted, the Permittees shall be deemed to be in compliance with this Provision. Permittees shall ensure that constructed wetlands installed by Regulated Projects and used for urban runoff treatment shall abide by the Water Board's Resolution No. 94-102: Policy on the Use of Constructed Wetlands for Urban Runoff Pollution Control and the O&M requirements contained therein.

Due Date for Full Implementation: Immediate for Provisions C.3.h.i, C.3.h.ii.(1), and C.3.h.iii, and December 1, 2010, for Provisions C.3.h.ii.(2)-(6). For Vallejo Permittees: December 1, 2010, for Provisions C.3.h.i-iii.

iv. Reporting: Beginning with the 2010 Annual Report

(1) For each Regulated Project inspected during the reporting period (fiscal year) the following information shall be reported to the Water Board electronically in tabular form as part of the Annual Report (as set forth in the Provision C.3.h. Sample Reporting Table attached):

- Name of facility/site inspected.
- Location (street address) of facility/site inspected.
- Name of responsible operator for installed stormwater treatment systems and HM controls.
- For each inspection:
  - Date of inspection.
  - Type of inspection (e.g., initial, annual, follow-up, spot).
  - Type(s) of stormwater treatment systems inspected (e.g., swale, bioretention unit, tree well, etc.) and an indication of whether the treatment system is an onsite, joint, or offsite system.
  - Type of HM controls inspected.
  - Inspection findings or results (e.g., proper installation, proper operation and maintenance, system not operating properly because of plugging, bypass of stormwater because of improper installation, maintenance required immediately, etc.).
  - Enforcement action(s) taken, if any (e.g., verbal warning, notice of violation, administrative citation, administrative order).

(2) On an annual basis, before the wet season, provide a list of newly installed (installed within the reporting period) stormwater treatment systems and HM controls to the local mosquito and vector control agency and the Water Board. This list shall include the facility locations and a description of the stormwater treatment measures and HM controls installed.

(3) Each Permittee shall report the following information in the Annual Report each year:

(a) A discussion of the inspection findings for the year and any common problems encountered with various types of treatment systems and/or HM controls. This discussion should include a general comparison to the inspection findings from the previous year.

(b) A discussion of the effectiveness of the Permittee's O&M Program and any proposed changes to improve the O&M Program (e.g., changes in prioritization plan or frequency of O&M inspections, other changes to improve effectiveness of program).

C.3.i. Required Site Design Measures for Small Projects and Detached Single-Family Home Projects

i. Task Description – The Permittees shall require all development projects, which create and/or replace $\geq$ 2500 ft^2 to < 10,000 ft^2 of impervious surface, and

detached single-family home projects,[10] which create and/or replace 2,500 square feet or more of impervious surface, to install one or more of the following site design measures:

- Direct roof runoff into cisterns or rain barrels for reuse.
- Direct roof runoff onto vegetated areas.
- Direct runoff from sidewalks, walkways, and/or patios onto vegetated areas.
- Direct runoff from driveways and/or uncovered parking lots onto vegetated areas.
- Construct sidewalks, walkways, and/or patios with permeable surfaces.[3]
- Construct bike lanes, driveways, and/or uncovered parking lots with permeable surfaces.[3]

This provision applies to all development projects that require approvals and/or permits issued under the Permittee's' planning, building, or other comparable authority.

ii. **Implementation Level** – All elements of this task shall be fully implemented by December 1, 2012.

iii. **Reporting** – On an annual basis, discuss the implementation of the requirements of Provision C.3.i, including ordinance revisions, permit conditions, development of standard specifications and/or guidance materials, and staff training.

iv. **Task Description** – The Permittees shall develop standard specifications for lot-scale site design and treatment measures (e.g., for roof runoff and paved areas) as a resource for single-family homes and small development projects.

v. **Implementation Level** – This task may be fulfilled by the Permittees cooperating on a countywide or regional basis.

Due Date for Full Implementation – December 1, 2012.

vi. **Reporting** – A report containing the standard specifications for lot-scale treatment BMPs shall be submitted by December 1, 2012.

[10] **Detached single-family home project** – The building of one single new house or the addition and/or replacement of impervious surface to one single existing house, which is not part of a larger plan of development.

C.4. Industrial and Commercial Site Controls

Each Permittee shall implement an industrial and commercial site control program at all sites which could reasonably be considered to cause or contribute to pollution of stormwater runoff, with inspections and effective follow-up and enforcement to abate actual or potential pollution sources consistent with each Permittee's respective Enforcement Response Plan (ERP), to prevent discharge of pollutants and impacts on beneficial uses of receiving waters. Inspections shall confirm implementation of appropriate and effective BMPs and other pollutant controls by industrial and commercial site operators.

C.4.a. Legal Authority for Effective Site Management

i. Task Description – Permittees shall have sufficient legal enforcement authority to obtain effective stormwater pollutant control on industrial sites. Permittees shall have the ability to inspect and require effective stormwater pollutant control and to escalate progressively stricter enforcement to achieve expedient compliance and pollutant abatement at commercial and industrial sites within their jurisdiction.

ii. Implementation Level

(1) Permittees shall have the legal authority to oversee, inspect, and require expedient compliance and pollution abatement at all industrial and commercial sites which may be reasonably considered to cause or contribute to pollution of stormwater runoff. Permittees shall have the legal authority to require implementation of appropriate BMPs at industrial and commercial to address pollutant sources associated with outdoor process and manufacturing areas, outdoor material storage areas, outdoor waste storage and disposal areas, outdoor vehicle and equipment storage and maintenance areas, outdoor parking areas and access roads, outdoor wash areas, outdoor drainage from indoor areas, rooftop equipment, and contaminated and erodible surface areas, and other sources determined by the Permittees or Water Board Executive Officer to have a reasonable potential to contribute to pollution of stormwater runoff.

(2) Permittees shall notify the discharger of any actual or potential pollutant sources and violations and require problem correction within a reasonably short and expedient time frame commensurate with the threat to water quality. Permittees shall require timely correction of problems involving rapid temporary repair, and may allow longer time periods for implementation of more permanent solutions, if these require significant capital expenditure or construction. Violations shall be corrected prior to the next rain event or within 10 business days after the violations are noted. If more than 10 business days are required for correction, a rationale shall be given in the tabulated sheets.

C.4.b. Industrial and Commercial Business Inspection Plan (Inspection Plan)

i. Task Description – Permittees shall develop and implement an inspection plan that will serve as a prioritized inspection workplan. This inspection plan will allow inspection staff to categorize the commercial and industrial sites within the Permittee's jurisdiction by pollutant threat and inspection frequency, change inspection frequency based on site performance, and add and remove sites as businesses open and close.

The Inspection Plan shall contain the following information:

(1) Total number and a list of industrial and commercial facilities requiring inspection, within each Permittee's jurisdiction, to be determined on the basis of a prioritization criteria designed to assign a more frequent inspection schedule to the highest priority facilities per Section C.4.b.ii. below.

(2) A description of the process for prioritizing inspections and frequency of inspections. If any geographical areas are to be targeted for inspections due to high potential for stormwater pollution, these areas should be indicated in the Inspection Plan. A mechanism to include newly opened businesses that warrant inspection shall be included.

ii. Implementation Level – Each Permittee shall annually update and maintain a list of industrial and commercial facilities in the Inspection Plan to inspect that could reasonably be considered to cause or contribute to pollution of stormwater runoff. The following are some of the functional aspects of businesses and types of businesses that shall be included in the Inspection Plans:

(1) Sites that include the following types of functions that may produce pollutants when exposed to stormwater include, but are not limited to:
   (a) Outdoor process and manufacturing areas
   (b) Outdoor material storage areas
   (c) Outdoor waste storage and disposal areas
   (d) Outdoor vehicle and equipment storage and maintenance areas
   (e) Outdoor wash areas
   (f) Outdoor drainage from indoor areas
   (g) Rooftop equipment
   (h) Other sources determined by the Permittee or Water Board to have a reasonable potential to contribute to pollution of stormwater runoff

(2) The following types of Industrial and Commercial businesses that have a reasonable likelihood to be sources of pollutants to stormwater and non-stormwater discharges:
   (a) Industrial facilities, as defined at 40 CFR 122.26(b)(14), including those subject to the State General NPDES Permit for Stormwater Discharges Associated with Industrial Activity (hereinafter the Industrial General Permit);

(b) Vehicle Salvage yards;

(c) Metal and other recycled materials collection facilities, waste transfer facilities;

(d) Vehicle mechanical repair, maintenance, fueling, or cleaning;

(e) Building trades central facilities or yards, corporation yards;

(f) Nurseries and greenhouses;

(g) Building material retailers and storage;

(h) Plastic manufacturers; and

(i) Other facilities designated by the Permittee or Water Board to have a reasonable potential to contribute to pollution of stormwater runoff.

(3) **Prioritization of Facilities**

Facilities of the types described in Provision 4.b.ii.(2) above and identified by the Permittees as having the reasonable potential to contribute to pollution of stormwater runoff shall be prioritized on the basis of the potential for water quality impact using criteria such as pollutant sources on site, pollutants of concern, proximity to a waterbody, violation history of the facility, and other relevant factors.

(4) **Types/Contents of Inspections**

Each Permittee shall conduct inspections to determine compliance with its ordinances and this Permit. Inspections shall include but not be limited to the following:

(a) Prevention of stormwater runoff pollution or illicit discharge by implementing appropriate BMPs;

(b) Visual observations for evidence of unauthorized discharges, illicit connections, and potential discharge of pollutants to stormwater;

(c) Noncompliance with Permittee ordinances and other local requirements; and

(d) Verification of coverage under the Industrial General Permit, if applicable.

(5) **Inspection Frequency** – Permittees shall establish appropriate inspection frequencies for facilities based on Provision 4.b.ii (3) priority, potential for contributing pollution to stormwater runoff, and commensurate with the threat to water quality.

(6) **Record Keeping** – For each facility identified in Provision 4.b.ii, the Permittee shall maintain a database or equivalent of the following information at a minimum:

(a) Name and address of the business and local business operator;

(b) A brief description of business activity including SIC code;

(c) Inspection priority and inspection frequency; and

(d) If coverage under the Industrial General Permit is required.

iii. Reporting – The Permittees shall include the following in the Annual Report:

(1) The list of facilities identified in Provision 4.b.ii in the 2010 Annual Report and revisions or updates in subsequent annual reports; and

(2) The list of facilities scheduled for inspection during the current fiscal year.

C.4.c. Enforcement Response Plan (ERP)

i. Task Description – Permittees shall develop and implement an ERP that will serve as a reference document for inspection staff to take consistent actions to achieve timely and effective compliance from all commercial and industrial site operators.

ii. Implementation Level – The ERP shall contain the following:

(1) **Required enforcement actions** – including timeframes for corrections of problems – for various field violation scenarios. The ERP will provide guidance on appropriate use of the various enforcement tools, such as verbal and written notices of violation, citations, cleanup requirements, administrative and criminal penalties.

(2) **Timely Correction of Violations** – All violations must be corrected in a timely manner with the goal of correcting them before the next rain event but no longer than 10 business days after the violations are discovered. If more than 10 business days are required for compliance, a rationale shall be recorded in the electronic database or equivalent tabular system.

A description of the Permittee's procedures for follow-up inspections and enforcement actions or referral to another agency, including appropriate time periods for each level of corrective action.

(3) **Referral and Coordination with Water Board** – Each Permittee shall enforce its stormwater ordinances as necessary to achieve compliance at sites with observed violations. For cases in which Permittee enforcement tools are inadequate to remedy the noncompliance, the Permittee shall refer the case to the Water Board, district attorney or other relevant agencies for additional enforcement.

(4) **Recordkeeping** – Permittees shall maintain adequate records to demonstrate compliance and appropriate follow-up enforcement responses for facilities inspected.

Permittees shall maintain an electronic database or equivalent tabular system that contains the following information regarding industrial commercial site inspections:

(a) Name of Facility/Site Inspected
(b) Inspection Date
(c) Industrial General Permit coverage required (Yes or No)
(d) Compliance Status
(e) Type of Enforcement (if applicable)
(f) Type of Activity or Pollutant Source

Examples: Outdoor process/manufacturing areas, Outdoor material storage areas, Outdoor waste storage/disposal areas, outdoor vehicle and equipment storage/maintenance areas, Outdoor parking areas and access roads, Outdoor wash areas, Rooftop equipment, Outdoor drainage from indoor areas

(g) Specific Problems

(h) Problem Resolution

(i) Additional Comments

The electronic database or equivalent tabular system shall be made readily available to the Executive Officer and during inspections and audits by the Water Board staff or its representatives.

(5) The ERP shall be developed and implemented by April 1, 2010.

iii. Reporting – Permittees shall include the following information in each Annual Report:

(1) Number of inspections conducted, Number of violations issued (excluding verbal warnings), Percentage of sites inspected in violation, and number and percent of violations resolved within 10 working days or otherwise deemed resolved in a longer but still timely manner;

(2) Frequency and Types/categories of violations observed, Frequency and type of enforcement conducted;

(3) Summary of types of violations noted by business category; and

(4) Facilities that are required to have coverage under the Industrial General Permit, but have not filed for coverage.

C.4.d. Staff Training

i. Task Description

Permittees shall provide focused training for inspectors annually. Trainings may be Program-wide, Region-wide, or Permittee-specific.

ii. Implementation Level

At a minimum, train inspectors, within the 5-year term of this Permit, in the following topics:

(1) Urban runoff pollution prevention;

(2) Inspection procedures;

(3) Illicit Discharge Detection, Elimination and follow-up; and

(4) Implementation of typical BMPs at Industrial and Commercial Facilities.

Permittees, either countywide or regionally, if they have not already done so, are encouraged to create or adopt guidance for inspectors or reference existing inspector guidance including the California Association of Stormwater Quality Agencies (CASQA) Industrial BMP Handbook.

iii. Reporting

The Permittees shall include the following information in the Annual Report:

(1) Dates of trainings;

(2) Training topics that have been covered; and

(3) Percentage of Permittee inspectors attending training.

C.5. Illicit Discharge Detection and Elimination

The purpose of this provision is to implement the illicit discharge prohibition and to ensure illicit discharges are detected and controlled that are not otherwise controlled under provision C4, Industrial and Commercial Site Controls and C6, Construction Site Controls. Permittees shall develop and implement an illicit discharge program that includes an active surveillance component and a centralized complaint collection and follow-up component to target illicit discharge and non-stormwater sources. Permittees shall maintain a complaint tracking and follow-up data system as their primary accountability reporting for this provision.

C.5.a. Legal Authority

i. Task Description – Permittees shall have the legal authority to prohibit and control illicit discharges and escalate stricter enforcement to achieve expedient compliance.

ii. Implementation Level

(1) Permittees shall have adequate legal authority to address stormwater and non-stormwater pollution associated with, but not limited to the following:

(a) Sewage;

(b) Discharges of wash water resulting from the cleaning of exterior surfaces and pavement, or the equipment and other facilities of any commercial business, or any other public or private facility;

(c) Discharges of runoff from material storage areas, including containing chemicals, fuels, or other potentially polluting or hazardous materials;

(d) Discharges of pool or fountain water containing chlorine, biocides, or other chemicals; discharges of pool or fountain filter backwash water;

(e) Discharges of sediment, pet waste, vegetation clippings, or other landscape or construction-related wastes; and

(f) Discharges of food-related wastes (e.g., grease, fish processing, and restaurant kitchen mat and trash bin wash water, etc.).

(2) Permittees shall have adequate legal authority to prohibit, discover through inspection and surveillance, and eliminate illicit connections and discharges to storm drains.

(3) Permittees shall have adequate legal authority to control the discharge of spills, dumping, or disposal of materials other than storm water to storm drains.

C.5.b. Enforcement Response Plan (ERP)

i. Task Description – Permittees shall develop and implement an ERP that will serve as guidance for inspection staff to take consistent actions to achieve timely and effective abatement of illicit discharges.

ii. Implementation Level – The ERP shall contain the following:

(1) Recommended responses and enforcement actions – including timeframes for corrections of problems – for various types and degree of violations. The ERP shall provide guidelines on when to employ the range of regulatory responses from warnings, citations and cleanup and cost recovery, to administrative or criminal penalties.

(2) Timely Correction of Violations: All violations must be corrected in a timely manner with the goal of correcting them before the next rain event but no longer than 10 business days after the violations are discovered. If more than 10 business days are required for compliance, a rationale shall be recorded in the electronic database or equivalent tabular system. Immediate correction can be temporary and short-term if a long-term, permanent correction will involve significant resources and construction time. An example would be replumbing of a wash area to the sanitary sewer, which would involve an immediate short-term, temporary fix followed by permanent replumbing.

(3) If corrective actions are not implemented promptly or if there are repeat violations, Permittees shall escalate responses as needed to achieve compliance, including referral to other agencies were necessary.

(4) The ERP shall be developed and implemented by April 1, 2010.

C.5.c. Spill and Dumping Response, Complaint Response, and Frequency of Inspections

i. Task Description – Permittees shall have a central contact point, including a phone number for complaints and spill reporting, and publicize this number to both internal Permittee staff and the public. If 911 is selected, also maintain and publicize a staffed, non-emergency phone number with voicemail, which is checked during normal business hours.

Permittees shall develop a spill/dumping response flow chart and phone tree or contact list for internal use that shows the various responsible agencies and their contacts, who would be involved in illicit discharge incident response that goes beyond the Permittees immediate capabilities. The list shall be maintained and updated as changes occur.

Permittees shall conduct reactive inspections in response to complaints and follow-up inspections as needed to ensure that corrective measures have been implemented to achieve and maintain compliance.

ii. Implementation Level – Permittees will have the phone number and contact information available and integrated into training and outreach both to Permittee staff and the public by July 1, 2010.

iii. Reporting – Submit the complaint and spill response phone number and spill contact list with the 2010 Annual Report and update annually if changes occur.

C.5.d. Control of Mobile Sources

i. Task Description – The purpose of this section is to establish oversight and control of pollutants associated with mobile business sources.

ii. Implementation Level – Each Permittee shall develop and implement a program to reduce the discharge of pollutants from mobile businesses.

(1) The program shall include the following:

(a) Development and implementation of minimum standards and BMPs to be required for each of the various types of mobile businesses such as automobile washing, power washing, steam cleaning, and carpet cleaning. This guidance can be developed via county-wide or regional collaboration.

(b) Development and implementation of an enforcement strategy which specifically addresses the unique characteristics of mobile businesses.

(c) Outreach to mobile businesses operating within the Permittee's jurisdiction with minimum standards and BMP requirements and local ordinances through an outreach and education strategy.

(d) Inspection of mobile businesses as needed.

(2) Permittees should cooperate regionally in developing and implementing their programs for mobile businesses, including sharing of mobile business inventories, BMP requirements, enforcement action information, and education.

iii. Reporting – Permittees shall report on implementation of minimum standards and BMPs for mobile business and their enforcement strategy in each Annual Report.

C.5.e. Collection System Screening - Municipal Separate Storm Sewer System (MS4) Map Availability

i. Task Description – Permittees shall perform routine surveys for illicit discharges and illegal dumping in above ground check points in the collection system including elements that are typically inspected for other maintenance purposes, such as end of pipes, creeks, flood conveyances, storm drain inlets and catch basins, in coordination with public works/flood control maintenance surveys, video inspections of storm drains, and during other routine Permittee maintenance and inspection activities when Permittee staff are working in or near the MS4 system.

ii. Implementation Level – Permittees shall develop and implement a screening program utilizing the USEPA/Center for Watershed Protection publication, "Illicit Discharge Detection and Elimination: A Guidance Manual for Program Development and Technical Assessment." Permittees shall implement the screening program by conducting a survey of strategic collection system check points (one screening point per square mile of Permittee urban and suburban jurisdiction area, less open space) including some key major outfalls draining industrial areas as defined in 40 CFR 122.26 (b)(5) once each year in dry weather conditions meaning no significant rainfall within the past 3 weeks. Routine surveys that occur on an ongoing basis during regular conveyance system inspections may be credited toward this requirement. Make maps of the MS4 publicly available, either electronically or in hard copy by July 1, 2010. The public availability shall be through a publicized single point of contact that

is convenient for the public, such as a staffed counter or web accessible maps. The MS4 map availability shall be publicized through Permittee directories and web pages.

iii. Reporting – Permittees shall provide a summary of their collection screening program, a summary of problems found during collection system screening, and any changes to the screening program in each Annual Report.

C.5.f. Tracking and Case Follow-up

i. Task Description – All incidents or discharges reported to the complaint/spill system that might pose a threat to water quality shall be logged to track follow-up and response through problem resolution. The data collected shall be sufficient to demonstrate escalating responses for repeated problems, and inter/intra-agency coordination, where appropriate.

ii. Implementation Level – Create and maintain a water quality spill and discharge complaint tracking and follow-up in an electronic database or equivalent tabular system by April 1, 2010.

The spill and discharge complaint tracking system shall contain the following information:

(1) Complaint information:
   (a) Date and time of complaint
   (b) Type of pollutant
   (c) Problem Status (potential or actual discharge.)

(2) Investigation information:
   (a) Date and time started
   (b) Type of pollutant
   (c) Entered storm drain and/or receiving water
   (d) Date abated
   (e) Type of enforcement (if applicable)

(3) Response time (days)
   (a) Call to investigation
   (b) Investigation to abatement
   (c) Call to abatement

The electronic database or equivalent tabular system shall be made available to Water Board staff as needed for review of enforcement response through problem resolution.

iii. Reporting – Permittees shall provide the following information in the Annual Report:

(1) Number of discharges reported;

(2) Number of discharges reaching storm drains and/or receiving waters;

(3) Number and percentage of discharges resolved in a timely manner; and

(4) Summary of major types of discharges and complaints.

C.6. Construction Site Control

Each Permittee shall implement a construction site inspection and control program at all construction sites, with follow-up and enforcement consistent with each Permittee's respective Enforcement Response Plan (ERP), to prevent construction site discharges of pollutants and impacts on beneficial uses of receiving waters. Inspections shall confirm implementation of appropriate and effective erosion and other construction pollutant controls by construction site operators/developers; and reporting shall demonstrate the effectiveness of this inspection and problem solution activity by the Permittees.

C.6.a. Legal Authority for Effective Site Management

i. Task Description – Permittees shall have the ability to require effective stormwater pollutant controls, and escalate progressively stricter enforcement to achieve expedient compliance and clean up at all public and private construction sites.

ii. Implementation Level

(1) Permittees shall have the legal authority to require at all construction sites year round effective erosion control, run-on and runoff control, sediment control, active treatment systems (as appropriate), good site management, and non storm water management through all phases of construction (including but not limited to site grading, building, and finishing of lots) until the site is fully stabilized by landscaping or the installation of permanent erosion control measures.

(2) Permittees shall have the legal authority to oversee, inspect, and require expedient compliance and clean up at all construction sites year round.

iii. Reporting – Permittees shall certify adequacy of their respective legal authority in the 2010 Annual Report.

C.6.b. Enforcement Response Plan (ERP)

i. Task Description – Permittees shall develop and implement an ERP that will serve as a reference document for inspection staff to take consistent actions to achieve timely and effective compliance from all public and private construction site owners/operators.

ii. Implementation Level

(1) The ERP shall include required enforcement actions – including timeframes for corrections of problems – for various field violation scenarios. All violations must be corrected in a timely manner with the goal of correcting them before the next rain event but no longer than 10 business days after the violations are discovered. If more than 10 business days are required for compliance, a rationale shall be recorded in the electronic database or equivalent tabular system.

(2) If site owners/operators do not implement appropriate corrective actions in a timely manner, or if violations repeat, Permittees shall take progressively stricter responses to achieve compliance. The ERP shall include the structure for progressively stricter responses and various violation scenarios that evoke progressively stricter responses.

(3) The ERP shall be developed and implemented by April 1, 2010.

C.6.c. Best Management Practices Categories

i. Task Description – Permittees shall require all construction sites to have site specific, and seasonally- and phase-appropriate, effective Best Management Practices (BMPs) in the following six categories:

- Erosion Control
- Run-on and Run-off Control
- Sediment Control
- Active Treatment Systems (as necessary)
- Good Site Management
- Non Stormwater Management.

Theses BMP categories are listed in State General NPDES Permit for Stormwater Discharges Associated with Construction Activities (hereinafter the Construction General Permit).

ii. Implementation Level

The BMPs targeting specific pollutants within the six categories listed in C.6.c.i. shall be site specific. Site specific BMPs targeting specific pollutants from the six categories listed in C.6.c.i. can be a combination of BMPs from:

- California BMP Handbook, Construction, January 2003.
- Caltrans Stormwater Quality Handbooks, Construction Site Best Management Practices Manual, March 2003, and addenda.
- California Regional Water Quality Control Board, San Francisco Bay Region, Erosion and Sediment Control Field Manual, 2002.
- New BMPs available since the release of these Handbooks.

C.6.d. Plan Approval Process

i. Task Description – Permittees shall review erosion control plans for consistency with local requirements, appropriateness and adequacy of proposed BMPs for each site before issuance of grading permits for projects. Permittees shall also verify that sites disturbing one acre or more of land have filed a Notice of Intent for coverage under the Construction General Permit.

ii. Implementation Level – Before approval and issuance of local grading permits, each Permittee shall perform the following:

(1) Review the site operator's/developer's erosion/pollution control plan or Stormwater Pollution Prevention Plan (SWPPP) to verify compliance with the Permittee's grading ordinance and other local requirements. Also review the site operator's/developer's erosion/pollution control plan or SWPPP to verify that seasonally appropriate and effective BMPs for the six categories listed in C.6.c.i. are planned;

(2) For sites disturbing one acre or more of soil, verify that the site operators/developers have filed a Notice of Intent for permit coverage under the Construction General Permit; and

(3) Provide construction stormwater management educational materials to site operators/developers, as appropriate.

C.6.e. Inspections

i. Task Description – Permittees shall conduct inspections to determine compliance with local ordinances (grading and stormwater) and determine the effectiveness of the BMPs in the six categories listed in C.6.c.i.; and Permittees shall require timely corrections of all actual and threatened violations of local ordinances observed.

ii. Implementation Level

(1) **Wet Season Notification**

By September 1st of each year, each Permittee shall remind all site developers and/or owners disturbing one acre or more of soil to prepare for the upcoming wet season.

(2) **Frequency of Inspections**

Inspections shall be conducted monthly during the wet season[11] at the following sites:

(a) All construction sites disturbing one or more acre of land; and

(b) **High Priority Sites** – Other sites determined by the Permittee or the Water Board as significant threats to water quality. In evaluating threat to water quality, the following factors shall be considered:

(i) Soil erosion potential or soil type;

(ii) Site slope;

(iii) Project size and type;

(iv) Sensitivity or receiving waterbodies;

(v) Proximity to receiving waterbodies;

(vi) Non-stormwater discharges; and

(vii) Any other relevant factors as determined by the local agency or the Water Board.

[11] For the purpose of inspections, the wet season is defined as October through April, but sites need to implement seasonally appropriate BMPs in the six categories listed in C.6.c.i throughout the year.

(3) **Contents of Inspections**

Inspections shall focus on the adequacy and effectiveness of the site specific BMPs implemented for the six categories listed in C.6.c.i. Permittees shall require timely corrections of all actual and potential problems observed. Inspections of construction sites shall include, but are not limited to, the following:

(a) Assessment of compliance with Permittee's ordinances and permits related to urban runoff, including the implementation and maintenance of the verified erosion/pollution control plan or SWPPP (from C.6.d.ii.(1));

(b) Assessment of the adequacy and effectiveness of the site specific BMPs implemented for the six categories listed in C.6.c.i.;

(c) Visual observations for:

- actual discharges of sediment and/or construction related materials into stormdrains and/or waterbodies.
- evidence of sediment and/or construction related materials discharges into stormdrains and/or waterbodies.
- illicit connections.
- potential illicit connections.

(d) Education on stormwater pollution prevention, as needed.

(4) **Tracking**

All inspections must be recorded on a written or electronic inspection form. Inspectors shall follow the ERP if a violation is noted and shall require timely corrections of all actual and threatened violations of local ordinances observed. All violations must be corrected in a timely manner with the goal of correcting them before the next rain event but no longer than 10 business days after the violations are discovered. If more than 10 business days are required for compliance, a rationale shall be recorded on the inspection form.

Permittees shall track in an electronic database or tabular format all inspections. This electronic database or tabular format shall be made readily available to the Executive Officer and during inspections and audits by the Water Board staff or its representatives. This electronic database or tabular format shall record the following information for each site inspection:

(a) Site name;

(b) Inspection date;

(c) Weather during inspection;

(d) Has there been rainfall with runoff since the last inspection?;

(e) Enforcement Response Level (Use ERP);

(f) Problem(s) observed using Illicit Discharge and the six BMP categories listed in C.6.c.i.;

(g) Specific Problem(s) (List the specific problem(s) within the BMP categories);

(h) Resolution of Problems noted using the following three standardized categories: Problems Fixed, Need More Time, and Escalate Enforcement; and

(i) Comments, which shall include all Rationales for Longer Compliance Time, all escalation in enforcement discussions, and any other information that may be relevant to that site inspection.

iii. Reporting

(1) In each Annual Report, each Permittee shall summarize the following information:

(a) Total number of active sites disturbing less than one acre of soil requiring inspection;

(b) Total number of active sites disturbing 1 acre or more of soil;

(c) Total number of inspections conducted;

(d) Number and percentage[12] of violations in each of the six categories listed in C.6.c.i.;

(e) Number and percentage[13] of each type of enforcement action taken as listed in each Permittee's ERP;

(f) Number of discharges, actual and those inferred through evidence, of sediment or other construction related materials;

(g) Number of sites with discharges, actual and those inferred through evidence, of sediment or other construction related materials;

(h) Number and percentage[14] of violations fully corrected prior to the next rain event but no longer than 10 business days after the violations are discovered or otherwise considered corrected in a timely, though longer period; and

(i) Number and percentage[15] of violations not fully corrected 30 days after the violations are discovered.

(2) In each Annual Report, each Permittee shall evaluate its respective electronic database or tabular format and the summaries produced in C.6.e.ii.(4) above. This evaluation shall include findings on the program's strength, comparison to previous years' results, as well as areas that need

[12] Percentage shall be calculated as number of violations in each category divided by total number of violations in all six categories.

[13] Percentage shall be calculated as number of each type of enforcement action divided by the total number of enforcement actions.

[14] Percentage shall be calculated as follows: number of violations fully corrected prior to the goal of the next rain event but no later than10 business days after the violations are discovered divided by the total number of violations for the reporting year.

[15] Percentage shall be calculated as follows: number of violations not fully corrected 30 days after the violations are discovered divided by the total number of violations for the reporting year.

more focused education for site owners, operators, and developers the following year.

(3) The Executive Officer may require that the information recorded and tracked by C.6.e.ii.(4) be submitted electronically or in a tabular format. Permittees shall submit the information within 10-working days of the Executive Officer's requirement. Submittal of the information in tabular form for the reporting year is not required in each Annual Report but encouraged.

C.6.f. Staff Training

i. Task Description – Permittees shall provide training or access to training for staff conducting construction stormwater inspections.

ii. Implementation Level – Permittees shall provide training at least every other year to municipal staff responsible for conducting construction site stormwater inspections. Training topics will include information on correct uses of specific BMPs, proper installation and maintenance of BMPs, Permit requirements, local requirements, and ERP.

iii. Reporting – Permittees shall include in each Annual Report the following information: training topics covered, dates of training, and the percentage of Permittees' inspectors attending each training. If no training in that year, so state.

C.7. Public Information and Outreach

Each Permittee shall increase the knowledge of the target audiences regarding the impacts of stormwater pollution on receiving water and potential solutions to mitigate the problems caused; change the waste disposal and runoff pollution generation behavior of target audiences by encouraging implementation of appropriate solutions; and involve various citizens in mitigating the impacts of stormwater pollution.

C.7.a. Storm Drain Inlet Marking

i. Task Description – Permittees shall mark and maintain at least 80 percent of municipally-maintained storm drain inlets with an appropriate stormwater pollution prevention message, such as "No dumping, drains to Bay" or equivalent. At least 80% of municipally-maintained storm drain inlet markings shall be inspected and maintained at least once per 5-year permit term. For newly approved, privately maintained streets, Permittees shall require inlet marking by the project developer upon construction and maintenance of markings through the development maintenance entity. Markings shall be verified prior to acceptance of the project.

ii. Implementation Level

(1) Inspect and maintain markings of at least 80 percent of municipality maintained inlets to ensure they are legibly labeled with a no dumping message or equivalent once per permit term.

(2) Verify that newly developed streets are marked prior to acceptance of the project.

iii. Reporting

(1) In the 2013 Annual Report, each Permittee shall report prior years' annual percentages of municipality maintained inlet markings inspected and maintained as legible with a no dumping message or equivalent.

(2) In the 2013 Annual Report, each Permittee shall report prior years' annual number of projects accepted after inlet markings were verified.

C.7.b. Advertising Campaigns

i. Task Description – Permittees shall participate in or contribute to advertising campaigns on trash/litter in waterways and pesticides with the goal of significantly increasing overall awareness of stormwater runoff pollution prevention messages and behavior changes in target audience.

ii. Implementation Level

(1) Target a broad audience with two separate advertising campaigns, one focused on reducing trash/litter in waterways and one focused on reducing the impact of urban pesticides. The advertising campaigns may be coordinated regionally or county-wide.

(2) Permittees shall conduct a pre-campaign survey and a post-campaign survey to identify and quantify the audiences' knowledge, trends, and

attitudes and/or practices; and to measure the overall population's awareness of the messages and behavior changes achieved by the two advertising campaigns. These surveys may be done regionally or county-wide.

iii. Reporting

(1) In the Annual Report following the pre-campaign survey, each Permittee (or the Countywide Program, if the survey was done county-wide or regionally) shall provide a report of the survey completed, which at a minimum, shall include the following:

- A summary of how the survey was implemented.
- A copy of the survey.
- A copy of the survey results.
- An analysis of the survey results.
- A discussion of the outreach strategies based on the survey results.
- A discussion of the planned or future advertising campaigns to influence awareness and behavior changes regarding trash/litter and pesticides.

(2) In the Annual Report following the post campaign survey, each Permittee (or the Countywide Program, if survey was done county-wide or regionally) shall provide a report of the survey completed, which at minimum shall include the information required in the pre-campaign report (C.7.b.iii.(1)) and the following:

- A discussion of the campaigns.
- A discussion of the measurable changes in awareness and behavior achieved.
- An update of outreach strategies based on the survey results.

C.7.c. Media Relations – Use of Free Media

i. Task Description – Permittees shall participate in or contribute to a media relations campaign. Maximize use of free media/media coverage with the objective of significantly increasing the overall awareness of stormwater pollution prevention messages and associated behavior change in target audiences, and to achieve public goals.

ii. Implementation Level – Conduct a minimum of six pitches (e.g., press releases, public service announcements, and/or other means) per year at the county-wide program, regional, and/or local levels.

iii. Reporting – In each Annual Report, each Permittee (or the Countywide Program, if the media relations campaign was done county-wide or regionally) shall include the details of each media pitch, such as the medium, date, and content of the pitch.

C.7.d. Stormwater Point of Contact

i. Task Description – Permittees shall individually or collectively create and maintain a point of contact, e.g., phone number or website, to provide the public with information on watershed characteristics and stormwater pollution prevention alternatives.

ii. Implementation Level – Maintain and publicize one point of contact for information on stormwater issues. Permittees may combine this function with the complaint/spill contact required in C.5.

iii. Reporting – In the 2010 Annual Report, each Permittee shall discuss how this point of contact is publicized and maintained. If any change occurs in this contact, report in subsequent annual report.

C.7.e. Public Outreach Events

i. Task Description – Participate in and/or host events such as fairs, shows, workshops, (e.g., community events, street fairs, and farmers' markets), to reach a broad spectrum of the community with both general and specific stormwater runoff pollution prevention messages. Pollution prevention messages shall include encouraging residents to (1) wash cars at commercial car washing facilities, (2) use minimal detergent when washing cars, and (3) divert the car washing runoff to landscaped area.

ii. Implementation Level – Each Permittee shall annually participate and/or host the number of events according to its population, as shown in the table below:

Table 7.1 Public Outreach Events[16]

Permittee Population	Number of Outreach Events
< 10,000	2
10,001– 40,000	3
40,001 – 100,000	4
100,001 – 175,000	5
175,001 – 250,000	6
> 250,000	8
Non-population-based Permittees[17]	6

Should a public outreach event contain significant citizen involvement elements, the Permittee may claim credit for both Public Outreach Events (C.7.e.) and Citizen Involvement Events (C.7.g.).

iii. Reporting – In each Annual Report, each Permittee shall list the events (name of event, event location, and event date) participated in and assess the effectiveness

[16] Permittees may claim individual credits for all events in which their Countywide Program or BASMAA participates, supports, and/or hosts, which are publicized to reach the Permittees jurisdiction.

[17] Alameda County Flood Control and Water Conservation District, Contra Costa Flood Control and Water Conservation District, Santa Clara Valley Water District, Vallejo Sanitation and Flood Control District, and Zone 7 of the Alameda County Flood Control and Water Conservation District

of efforts with appropriate measures (e.g., success at reaching a broad spectrum of the community, number of participants compared to previous years, post-event survey results, quantity/volume materials cleaned up and comparisons to previous efforts).

C.7.f. Watershed Stewardship Collaborative Efforts

i. Task Description – Permittees shall individually or collectively encourage and support watershed stewardship collaborative efforts of community groups such as the Contra Costa Watershed Forum, the Santa Clara Basin Watershed Management Initiative, "friends of creek" groups, and other organizations that benefit the health of the watershed such as the Bay-Friendly Landscaping and Gardening Coalition. If no such organizations exist, encourage and support development of grassroots watershed groups or engagement of an existing group, such as a neighborhood association, in watershed stewardship activities. Coordinate with existing groups to further stewardship efforts.

ii. Implementation Level – Annually demonstrate effort.

iii. Reporting – In each Annual Report, each Permittee shall state the level of effort, describe the support given, state what efforts were undertaken and the results of these efforts, and provide an evaluation of the effectiveness of these efforts.

C.7.g. Citizen Involvement Events

i. Task Description – Permittees shall individually or collectively, support citizen involvement events, which provide the opportunity for citizens to directly participate in water quality and aquatic habitat improvement, such as creek/shore clean-ups, adopt-an-inlet/creek/beach programs, volunteer monitoring, service learning activities such as storm drain inlet marking, community riparian restoration activities, community grants, other participation and/or host volunteer activities.

ii. Implementation Level – Each Permittee shall annually sponsor and/or host the number of citizen involvement events according to its population, as shown in the table below:

Table 7.2 Community Involvement Events[18]

Permittee Population	Number of Involvement Events
< 10,000	1
10,001 – 40,000	1
40,001 – 100,000	2
100,001 – 175,000	3
175,001 – 250,000	4
> 250,000	5
Non-population-based Permittees	2

[18] Permittees can claim individual credit for all events sponsored or hosted by their Countywide Program or BASMAA, which are publicized to reach the Permittee's jurisdiction.

Should a citizen involvement event contain significant public outreach elements, the Permittee may claim credit for both Citizen Involvement Events (C.7.g.) and Public Outreach Events (C.7.e.).

iii. Reporting – In each Annual Report, each Permittee shall list the events (name of event, event location, and event date) participated in and assess the effectiveness of efforts with appropriate measures (e.g., success at reaching a broad spectrum of the community, number of participants compared to previous years, post-event survey results, number of inlets/creeks/shores/parks/and such adopted, quantity/volume materials cleaned up, data trends, and comparisons to previous efforts).

C.7.h. School-Age Children Outreach

i. Task Description – Permittees shall individually or collectively implement outreach activities designed to increase awareness of stormwater and/or watershed message(s) in school-age children (K through 12).

ii. Implementation Level – Implement annually and demonstrate effectiveness of efforts through assessment.

iii. Reporting – In each Annual Report, each Permittee shall state the level of effort, spectrum of children reached, and methods used, and provide an evaluation of the effectiveness of these efforts.

C.7.i. Outreach to Municipal Officials

i. Task Description – Permittees shall conduct outreach to municipal officials. One alternative means of accomplishing this is through the use of the Nonpoint Education for Municipal Officials program (NEMO) to significantly increase overall awareness of stormwater and/or watershed message(s) among regional municipal officials.

ii. Implementation Level – At least once per permit cycle, or more often.

iii. Reporting – Permittees shall summarize efforts in the 2013 Annual Report.

C.8. Water Quality Monitoring

C.8.a. Compliance Options

i. Regional Collaboration – All Permittees shall comply with the monitoring requirements in C.8, however, Permittees may choose to comply with any requirement of this Provision through a collaborative effort to conduct or cause to be conducted the required monitoring in their jurisdictions. Where all or a majority of the Permittees collaborate to conduct water quality monitoring, this shall be considered a regional monitoring collaborative.

Where an existing collaborative body has initiated plans, before the adoption of this Permit, to conduct monitoring that would fulfill a requirement(s) of this Provision, but the monitoring would not meet this Provision's due date(s) by a year or less, the Permittees may request the Executive Officer adjust the due date(s) to synchronize with such efforts.

The types, quantities, and quality of data required within Provision C.8 establish the minimum level-of-effort that a regional monitoring collaborative must achieve. Provided these data types, quantities, and quality are obtained, a regional monitoring collaborative may develop its own sampling design. For Pollutants of Concern and Long-Term monitoring required under C.8.e, an alternative approach may be pursued by Permittees provided that: either similar data types, data quality, data quantity are collected with an equivalent level of effort described under C.8.e; or an equivalent level of monitoring effort is employed to answer the management information needs stated under C.8.e.

ii. Implementation Schedule – Monitoring conducted through a regional monitoring collaborative shall commence data collection by October 2011. All other Permittee monitoring efforts shall commence data collection by October 2010. By July 1, 2010, each Permittee shall provide documentation to the Water Board, such as a written agreement, letter, or similar document that confirms whether the Permittee will conduct monitoring individually or through a regional monitoring collaborative.[19]

iii. Permittee Responsibilities – A Permittee may comply with the requirements in Provision C.8 by performing the following:

(1) Contributing to its stormwater countywide program, as determined appropriate by the Permittee members, so that the stormwater countywide Program conducts monitoring on behalf of its members;

(2) Contributing to a regional collaborative effort;

[19] This documentation will allow the Water Board to know when monitoring will commence for each Permittee. Permittees who commit to monitoring individually may join the regional monitoring collaborative at any time. Any Permittee who discontinues monitoring through the regional collaborative must commence complying with all requirements of Provision C.8 immediately.

(3) Fulfilling monitoring requirements within its own jurisdictional boundaries; or

(4) A combination of the previous options, so that all requirements are fulfilled.

iv. Third-party Monitoring – Permittees may choose to fulfill requirements of Provision C.8 using data collected by citizen monitors or other third-party organizations, provided the data are demonstrated to meet the data quality objectives described in Provision C.8.h. Where an existing third-party organization has initiated plans to conduct monitoring that would fulfill a requirement(s) of this Provision, but the monitoring would not meet this Provision's due date(s) by a year or less, the Permittees may request that the Executive Officer adjust the due date(s) to synchronize with such efforts.

C.8.b. San Francisco Estuary Receiving Water Monitoring

With limited exceptions, urban runoff from the Permittees' jurisdictions ultimately discharges to the San Francisco Estuary. Monitoring of the Estuary is intended to answer questions[20] such as:

- Are chemical concentrations in the Estuary potentially at levels of concern and are associated impacts likely?
- What are the concentrations and masses of contaminants in the Estuary and its segments?
- What are the sources, pathways, loadings, and processes leading to contaminant related impacts in the Estuary?
- Have the concentrations, masses, and associated impacts of contaminants in the Estuary increased or decreased?
- What are the projected concentrations, masses, and associated impacts of contaminants in the Estuary?

Permittees shall participate in implementing an Estuary receiving water monitoring program, at a minimum equivalent to the San Francisco Estuary Regional Monitoring Program for Trace Substances (RMP), by contributing their fair-share financially on an annual basis.

C.8.c. Status Monitoring/Rotating Watersheds

i. Status Monitoring is intended to answer these questions: Are water quality objectives, both numeric and narrative, being met in local receiving waters,

[20] These are the management questions approved by the Regional Monitoring Program's Steering Committee on May 9, 2008, and stated at http://www.sfei/rmp/rmp_steering_meetings/rmp_steering_meeting_5_09_08/Item%2010a%20Attachment%201%20%20Draft%20RMP%20Management%20Questions%2005-02-08%20Annotated.pdf. While the stated objectives may change over time, the intent of this provision is for Permittees to continue contributing financially and as stakeholders in such a program as the RMP, which monitors the quality of San Francisco Bay.

including creeks, rivers and tributaries? Are conditions in local receiving waters supportive of or likely to be supportive of beneficial uses?

ii. Parameters and Methods – Permittees shall conduct Status Monitoring using the parameters, methods, occurrences, durations, and minimum number of sampling sites as described in Table 8.1. Spring sampling shall be conducted during the April - June timeframe; dry weather sampling shall be conducted during the July - September timeframe. Minor variations of the parameters and methods may be allowed with Executive Officer concurrence.

iii. Frequency – Permittees shall complete the Status Monitoring in Table 8.1 at the following frequencies:

- Alameda Permittees – annually
- Contra Costa Permittees – annually
- Fairfield-Suisun Permittees – twice during the Permit term
- San Mateo Permittees – annually
- Santa Clara Permittees – annually
- Vallejo Permittees – once during the Permit term

Table 8.1 Status Monitoring Elements

Status Monitoring Parameter	**Sampling and/or Analytical Method**[21]	**Minimum Sampling Occurrence**[22]	**Duration of Sampling**	**Minimum # Sample Sites to Monitor/Yr**[23] Santa Clara & Alameda Permittees/ Contra Costa & San Mateo Permittees/ Fairfield-Suisun & Vallejo Permittees	**Result(s) that Trigger a Monitoring Project in Provision C.8.d.i.**
Biological Assessment[24] (Includes Physical Habitat Assessment and General Water Quality Parameters[25]) Nutrients (total phosphorus, dissolved orthophosphate, total nitrogen, nitrate, ammonia, silica, chloride,	SWAMP Std Operating Procedure[26,27,28] for Biological Assessments & PHab; SWAMP	1/yr (Spring Sampling)	Grab sample	Spring 20 / 10 / 4	BMI metrics that indicate substantially degraded community as per Attachment H, Table H-1 For Nutrients: 20% of results in one waterbody exceed one or more water quality standard

21 Refers to field protocol, instrumentation and/or laboratory protocol.

22 Refers to the number of sampling events at a specific site in a given year.

23 The number of sampling sites shown is based on the relative population in each Regional Stormwater Countywide Program and is listed in this order: Santa Clara & Alameda Countywide / Contra Costa & San Mateo Countywide / Vallejo & Fairfield-Suisun Programs.

24 The same general location must be used to collect benthic community, sediment chemistry, and sediment toxicity samples. General Water Quality Parameters need not be collected twice, where it is collected by a multi-parameter probe at a subset of these sample sites (see next row of Table 8.1).

25 Includes dissolved oxygen, temperature, conductivity, and pH.

26 Ode, P.R. 2007. Standard Operating Procedures for Collecting Benthic Macroinvertebrate Samples and Associated Physical and Chemical Data for Ambient Bioassessments in California, California State Water Resources Control Board Surface Water Ambient Monitoring Program (SWAMP), as subsequently revised (http://www.waterboards.ca.gov/water_issues/programs/swamp/docs/phab_sopr6.pdf). Permittees may coordinate with Water Board staff to modify their sampling procedures if these referenced procedures change during the Permit term.

27 Biological assessments shall include benthic macroinvertebrates and algae. Bioassessment sampling method shall be multihabitat reach-wide. Macroinvertebrates shall be identified according to the Standard Taxonomic Effort Level I of the Southwestern Association of Freshwater Invertebrate Taxonomists, using the most current SWAMP approved method. Current methods are documented in (1) SWAMP Standard Operating Procedure (SOP) and Interim Guidance on Quality Assurance for SWAMP Bioassessments, Memorandum to SWAMP Roundtable from Beverly H. van Buuren and Peter R. Ode, 5-21-07, and (2) Amendment to SWAMP Interim Guidance on Quality Assurance for SWAMP Bioassessments, Memorandum to SWAMP Roundtable from Beverly H. van Buuren and Peter R. Ode, 9-17-08. For algae, include mass (ash-free dry weight), chlorophyll a, diatom and soft algae taxonomy, and reachwide algal percent cover. Physical Habitat (PHab) Assessment shall include the SWAMP basic method plus 1) depth and pebble count + CPOM, 2) cobble embeddedness, 3) discharge measurements, and 4) in-stream habitat. Permittees may coordinate with Water Board staff to modify these sampling procedures if SWAMP procedures change during the Permit term.

28 Algae shall be collected in a consistent timeframe as Regional SWAMP. For guidance on algae sampling and evaluation: Fetscher, A. and K. McLaughlin, May 16, 2008. Incorporating Bioassessment Using Freshwater Algae into California's Surface Water Ambient Monitoring Program (SWAMP). Technical Report 563 and current SWAMP-approved updates to Standard Operating Procedures therein. Available at http://www.waterboards.ca.gov/water_issues/programs/swamp/docs/reports/563_periphyton_bioassessment.pdf.

Status Monitoring Parameter	**Sampling and/or Analytical Method**[21]	**Minimum Sampling Occurrence**[22]	**Duration of Sampling**	**Minimum # Sample Sites to Monitor/Yr**[23] Santa Clara & Alameda Permittees/ Contra Costa & San Mateo Permittees/ Fairfield-Suisun & Vallejo Permittees	**Result(s) that Trigger a Monitoring Project in Provision C.8.d.i.**
dissolved organic carbon, suspended sediment concentration)	comparable methods for Nutrients				or established threshold
General Water Quality[29]	Multi-Parameter Probe	2/yr (Concurrent with bioassessment & during the Aug. - Sept. timeframe)	15-minute intervals for 1-2 weeks	3 / 2 / 1	20% of results in one waterbody exceed one or more water quality standard or established threshold
Chlorine (Free and Total)	USEPA Std. Method 4500 Cl F[30]	2/yr Spring & Dry Seasons	Grab sample	Spring 20 / 10 / 2 Dry 3 / 2 / 1	After immediate resampling, concentrations remain > 0.08 mg/L
Temperature	Digital Temperature Logger	60-minute intervals	60-minute intervals April through Sept.	8 / 4 / 1	20% of results in one waterbody exceed applicable temperature threshold[31]
Toxicity – Water Column[32]	Applicable SWAMP Comparable Method	2/yr (1/Dry Season & 1 Storm Event)	Grab or composite sample	3 / 2 / 1	If toxicity results < 50% of control results, repeat sample. If 2nd sample yields < 50% of control results, proceed to C.8.d.i.

[29] Includes dissolved oxygen, temperature, conductivity, and pH.

[30] The method of analysis shall achieve a method detection limit at least as low as that achieved by the Amperometric Titration Method (4500-Cl from *Standard Methods for Examination of Water and Wastewater*, Edition 20).

[31] If temperatures exceed applicable threshold (e.g., Maximum Weekly Average Temperature, Sullivan K., Martin, D.J., Cardwell, R.D., Toll, J.E., Duke, S. 2000. *An Analysis of the Effects of Temperature on Salmonids of the Pacific Northwest with Implications for Selecting Temperature Criteria, Sustainable Ecosystem Institute*) or spike with no obvious natural explanation observed.

[32] *US EPA three species toxicity tests: Selenastrum* growth and *Ceriodaphnia* and *Pimephales* with lethal and sublethal endpoints. Also H*yalella azteca with lethal endpoint.*

Status Monitoring Parameter	**Sampling and/or Analytical Method**[21]	**Minimum Sampling Occurrence**[22]	**Duration of Sampling**	**Minimum # Sample Sites to Monitor/Yr**[23] Santa Clara & Alameda Permittees/ Contra Costa & San Mateo Permittees/ Fairfield-Suisun & Vallejo Permittees	**Result(s) that Trigger a Monitoring Project in Provision C.8.d.i.**
Toxicity– Bedded Sediment, Fine-grained[33]	Applicable SWAMP Comparable Method	1/yr	Grab sample	3 / 2 / 1 At fine-grained depositional area at bottom of watershed	See Attachment H, Table H-1
Pollutants – Bedded Sediment,[34] fine-grained	Applicable SWAMP Comparable Method inc. grain size	1/yr	Grab sample	3 / 2 / 1 At fine-grained depositional area at bottom of watershed	See Attachment H, Table H-1
Pathogen Indicators[35]	U.S. EPA protocol[36]	1/yr (During Summer)	Follow U.S. EPA protocol	5 / 5 / * *Fairfield-Suisun & Vallejo Permittees: 3 sites twice in permit term	Exceedance of USEPA criteria
Stream Survey (stream walk & mapping)[37]	USA[38] or equivalent	1 waterbody/yr	N/A	9 / 6 / 3 stream miles/year	N/A

[33] Bedded sediments should be fine-grain from depositional areas. Grain size and TOC must be reported. Coordinate with TMDL Provision requirements as applicable.

[34] Bedded sediments should be fine-grain from depositional areas. Grain size and TOC must be reported. Analytes shall include all of those reported in MacDonald et al. 2000 (including copper, nickel, mercury, PCBs, DDT, chlordane, dieldrin) as well as pyrethroids (see Table 8.4 for list of pyrethroids). Coordinate with TMDL Provision requirements as applicable. MacDonald, D.D., G.G. Ingersoll, and T.A. Berger. 2000. Development and Evaluation of Consensus-based Sediment Quality Guidelines for Freshwater Ecosystems. *Archives of Environ. Contamination and Toxicology* 39(1):20–31.

[35] Includes fecal coliform and *E. Coli.*

[36] Rather than collecting samples over five separate days, Permittees may use Example #2, pg. 54, of USEPA's *Implementation Guidance for Ambient Water Quality Criteria for Bacteria*, March 2004 Final.

[37] The Stream Surveys need not be repeated on a watershed if a Stream Survey was completed on that waterbody within the previous five years. The number of stream miles to be surveyed in any given year may be less than that shown in Table 8-1 in order to avoid repeating surveys at areas surveyed during the previous five years.

[38] Center for Watershed Protection, Manual 10: *Unified Stream Assessment: A User's Manual*, February 2005.

iv. Locations – For each sampling year (per C.8.c.iii.), Permittees shall select at least one waterbody to sample from the applicable list below. Locations shall be selected so that sampling is sufficient to characterize segments of the waterbody(s). For example, Permittees required to collect a larger number of samples should sample two or more waterbodies, so that each sampling effort represents a reasonable segment length and/or type. Samples shall be collected in reaches that receive urban stormwater discharges, except in possible infrequent instances where non-urban-impacted stream samples are needed for comparison[39]. Waterbody selection shall be based on factors such as watershed area, land use, likelihood of urban runoff impacts, and existing monitoring data.

Table 8.2 Status Monitoring Locations – Waterbodies

SCVURPPP	ACCWP	CCCWP	SMCWPPP	FSUMRP	VALLEJO
Coyote Creek and tributaries	Arroyo Valle (below Livermore or lower)	Kirker Creek	San Pedro Creek and tributaries	Laurel Creek	Chabot Creek
Guadalupe River and tributaries	Arroyo Mocho	Mt. Diablo Creek	Pilarcitos Creek	Ledgewood Creek	Austin Creek & tributaries
San Tomas Creek and tributaries	Tassajara Creek	Walnut Creek and tributaries	Colma Creek		
Calabazas Creek	Alamo Creek	Rodeo Creek	San Bruno Creek and tributaries		
Permanente Creek and tributaries	Arroyo de la Laguna	Pinole Creek	Millbrae Creek and tributaries		
Stevens Creek and tributaries	Alameda Creek (at Fremont or below)	San Pablo Creek	Mills Creek and tributaries		
Matadero Creek and tributaries	San Lorenzo Creek & tribs	Alhambra Creek	Easton Creek and tributaries		
Adobe Creek	San Leandro Creek & tribs	Wildcat Creek	Sanchez Creek and tributaries		
Lower Penitencia Creek and tributaries	Oakland, Berkeley, or Albany Creeks		Burlingame Creek and tributaries		
Barron Creek			San Mateo Creek (below dam only)		
San Francisquito Creek & tributaries			Borel Creek & tributaries		
			Laurel Creek & tribs		
			Belmont Creek & tribs		
			Pulgas Creek & tribs		
			Cordilleras & tributaries		
			Redwood Creek & tribs		
			Atherton Creek & tribs		
			San Francisquito Creek and tributaries		

[39] Sampling efforts shall focus on stream reaches with urban stormwater system discharges. Sampling upstream of urban outfalls is not precluded where needed to meet sampling plan objectives.

v. Status Monitoring Results – When Status Monitoring produces results such as those described in the final column of Table 8.1, Permittees shall conduct Monitoring Project(s) as described in C.8.d.i.

C.8.d. Monitoring Projects – Permittees shall conduct the Monitoring Projects listed below.

i. Stressor/Source Identification – When Status results trigger a follow-up action as indicated in Table 8.1, Permittees shall take the following actions, as also required by Provision C.1. If the trigger stressor or source is already known, proceed directly to step 2. The first follow-up action shall be initiated as soon as possible, and no later than the second fiscal year after the sampling event that triggered the Monitoring Project.

(1) Conduct a site specific study (or non-site specific if the problem is wide-spread) in a stepwise process to identify and isolate the cause(s) of the trigger stressor/source. This study should follow guidance for Toxicity Reduction Evaluations (TRE)[40] or Toxicity Identification Evaluations (TIE).[41] A TRE, as adapted for urban stormwater data, allows Permittees to use other sources of information (such as industrial facility stormwater monitoring reports) in attempting to determine the trigger cause, potentially eliminating the need for a TIE. If a TRE does not result in identification of the stressor/source, Permittees shall conduct a TIE.

(2) Identify and evaluate the effectiveness of options for controlling the cause(s) of the trigger stressor/source.

(3) Implement one or more controls.

(4) Confirm the reduction of the cause(s) of trigger stressor/source.

(5) Stressor/Source Identification Project Cap: Permittees who conduct this monitoring through a regional collaborative shall be required to initiate no more than ten Stressor/Source Identification projects during the Permit term in total, and at least two must be toxicity follow-ups, unless monitoring results do not indicate the presence of toxicity. If conducted through a stormwater countywide program, the Santa Clara and Alameda

[40] USEPA. August 1999. *Toxicity Reduction Evaluation Guidance for Municipal Wastewater Treatment Plants*. EPA/833B-99/002. Office of Wastewater Management, Washington, D.C.

[41] Select TIE methods from the following references after conferring with SWAMP personnel: For sediment: (1) Ho KT, Burgess R., Mount D, Norberg-King T, Hockett, RS. 2007. *Sediment toxicity identification evaluation: interstitial and whole methods for freshwater and marine sediments*. USEPA, Atlantic Ecology Division/Mid-Continental Ecology Division, Office of Research and Development, Narragansett, RI, or (2) Anderson, BS, Hunt, JW, Phillips, BM, Tjeerdema, RS. 2007. *Navigating the TMDL Process: Sediment Toxicity*. Final Report- 02-WSM-2. Water Environment Research Federation. 181 pp. For water column: (1) USEPA. 1991. *Methods for aquatic toxicity identification evaluations. Phase I Toxicity Characterization Procedures.* EPA 600/6-91/003. Office of Research and Development, Washington, DC., (2) USEPA. 1993. *Methods for aquatic toxicity identification evaluations. Phase II Toxicity Identification Procedures for Samples Exhibiting Acute and Chronic Toxicity.* EPA 600/R-92/080. Office of Research and Development, Washington, DC., or (3) USEPA. 1996. *Marine Toxicity Identification Evaluation (TIE), Phase I Guidance Document.* EPA/600/R-95/054. Office of Research and Development, Washington, DC.

Permittees each shall be required to initiate no more than five (two for toxicity); the Contra Costa and San Mateo Permittees each shall be required to initiate no more than three (one for toxicity); and the Fairfield-Suisun and Vallejo Permittees each shall be required to initiate no more than one Stressor/Source Identification project(s) during the Permit term.

(6) As long as Permittees have complied with the procedures set forth above, they do not have to repeat the same procedure for continuing or recurring exceedances of the same receiving water limitations unless directed to do so by the Water Board.

ii. BMP Effectiveness Investigation – Investigate the effectiveness of one BMP for stormwater treatment or hydrograph modification control. Permittees who do this project through a regional collaborative are required to initiate no more than one BMP Effectiveness Investigation during the Permit term. If conducted through a stormwater countywide program, the Santa Clara, Alameda, Contra Costa, and San Mateo Permittees shall be required to initiate one BMP Effectiveness Investigation each, and the Fairfield-Suisun and Vallejo Permittees shall be exempt from this requirement. The BMP(s) used to fulfill requirements of C.3.b.iii., C.11.e. and C.12.e. may be used to fulfill this requirement, provided the BMP Effectiveness Investigation includes the range of pollutants generally found in urban runoff. The BMP Effectiveness Investigation will not trigger a Stressor/Source Identification Project. Data from this Monitoring Project need not be SWAMP-comparable.

iii. Geomorphic Project – This monitoring is intended to answer the questions: How and where can our creeks be restored or protected to cost-effectively reduce the impacts of pollutants, increased flow rates, and increased flow durations of urban runoff?

Permittees shall select a waterbody/reach, preferably one that contains significant fish and wildlife resources, and conduct one of the following projects within each county, except that only one such project must be completed within the collective Fairfield-Suisun and Vallejo Permittees' jurisdictions:

(1) Gather geomorphic data to support the efforts of a local watershed partnership[42] to improve creek conditions; or

(2) Inventory locations for potential retrofit projects in which decentralized, landscape-based stormwater retention units can be installed; or

(3) Conduct a geomorphic study which will help in development of regional curves which help estimate equilibrium channel conditions for different-sized drainages. Select a waterbody/reach that is not undergoing changing land use. Collect and report the following data:

- Formally surveyed channel dimensions (profile), planform, and cross-sections. Cross-sections shall include the topmost floodplain terrace and

[42] A list of local watershed partnerships may be obtained from Water Board staff.

be marked by a permanent, protruding (not flush with ground) monument.

- Contributing drainage area.
- Best available information on bankfull discharges and width and depth of channel formed by bankfull discharges.
- Best available information on average annual rainfall in the study area.

Permittees shall complete the selected geomorphic project so that project results are reported in the Integrated Monitoring Report (see Provision C.8.g.v).

C.8.e. Pollutants of Concern and Long-Term Trends Monitoring

Pollutants of Concern (POC) monitoring is intended to assess inputs of Pollutants of Concern to the Bay from local tributaries and urban runoff, assess progress toward achieving wasteload allocations (WLAs) for TMDLs and help resolve uncertainties associated with loading estimates for these pollutants. In particular, there are four priority management information needs toward which POC monitoring must be directed: 1) identifying which Bay tributaries (including stormwater conveyances) contribute most to Bay impairment from pollutants of concern; 2) quantifying annual loads or concentrations of pollutants of concern from tributaries to the Bay; 3) quantifying the decadal-scale loading or concentration trends of pollutants of concern from small tributaries to the Bay; and 4) quantifying the projected impacts of management actions (including control measures) on tributaries and identifying where these management actions should be implemented to have the greatest beneficial impact.

Permittees shall implement the following POC monitoring components or pursue an alternative approach that addresses each of the aforementioned management information needs. An alternative approach may be pursued by Permittees provided that: either similar data types, data quality, data quantity are collected with an equivalent level of effort described; or an equivalent level of monitoring effort is employed to answer the management information needs.

Long-Term monitoring is intended to assess long-term trends in pollutant concentrations and toxicity in receiving waters and sediment, in order to evaluate if stormwater discharges are causing or contributing to toxic impacts on aquatic life. Permittees shall implement the following Long-Term monitoring components or, following approval by the Executive Officer, an equivalent monitoring program.

i. Pollutants of Concern Loads Monitoring Locations – Permittees shall conduct Pollutants of Concern monitoring at stations listed below. Permittees may install these stations in two phases providing at least half of the stations are monitored in the water year beginning October 2010, and all the stations are monitored in the water year beginning October 2012. Upon approval by the Executive Officer, Permittees may use alternate POC monitoring locations.

(1) Castro Valley Creek S3 at USGS gauging station in Castro Valley

(2) Guadalupe River

(3) Zone 4 Line A at Chabot Road in Hayward

(4) Rheem Creek at Giant Road in Richmond

(5) Walnut Creek at a downstream location

(6) Calabazas Creek at Lakeside Drive in Sunnyvale, at border with Santa Clara

(7) San Mateo Creek at downstream location

(8) Laurel Creek at Laurie Meadows park, off Casanova Drive in City of San Mateo.

ii. Long-Term Monitoring Locations – Permittees shall conduct Long-Term monitoring at stations listed below. After conferring with the Regional SWAMP program, and upon approval by the Executive Officer, Permittees may use alternate Long-Term monitoring locations.

Table 8.3. Long-Term Monitoring Locations

Stormwater Countywide Program	Waterbody	Suggested Location
Alameda Permittees	Alameda Creek OR	East of Alvarado Blvd*
	Lower San Leandro Creek	Empire Road*
Contra Costa Permittees	Kirker Creek OR	Floodway*
	Walnut Creek	Concord Avenue*
Santa Clara Permittees	Guadalupe River OR	USGS Gaging Station 11169025*
	Coyote Creek	Montague*
San Mateo Permittees	San Mateo Creek	Gateway Park*

* SWAMP is scheduled to collect sediment toxicity and sediment chemistry samples annually at these stations during the month of June.

iii. Parameters and Frequencies – Permittees shall conduct Pollutants of Concern sampling pursuant to Table 8.4, Categories 1 and 2. In Table 8.4, Category 1 pollutants are those for which the Water Board has active water quality attainment strategies (WQAS), such as TMDL or site-specific objective projects. Category 2 pollutants are those for which WQAS are in development. The lower monitoring frequency for Category 2 pollutants is sufficient to develop preliminary loading estimates for these pollutants.

Permittees shall conduct Long-Term monitoring pursuant to Table 8.4, Category 3. SWAMP has scheduled collection of Category 3 data at the Long-Term monitoring locations stated in C.8.e.ii. As stated in Provision C.8.a.iv., Permittees may use SWAMP data to fulfill Category 3 sampling requirements.

iv. Protocols – At a minimum, sampling and analysis protocols shall be consistent with 40 CFR 122.21(g)(7)(ii).

v. Methods – Methyl mercury samples shall be grab samples collected during storm events that produce rainfall of at least 0.10 inch, shall be frozen immediately upon collection, and shall be kept frozen during transport to the laboratory. All other Category 1 and 2 samples shall be wet weather flow-weighted composite samples, collected during storm events that produce rainfall of at least 0.10 inch. Sampled storms should be separated by 21 days of dry weather, but, at a minimum, sampled storms must have 72 hours of antecedent dry weather. Samples must include the first rise in the hydrograph. Category 3 monitoring data shall be SWAMP-comparable.

Table 8.4 Pollutants of Concern Loads & Long-Term Monitoring Elements

Category/Parameter	Sampling Years	Minimum Sampling Occurrence	Sampling Interval
Category 1 • Total and Dissolved Copper • Total Mercury[43] • Methyl Mercury • Total PCBs[44] • Suspended Sediments (SSC) • Total Organic Carbon • Toxicity – Water Column • Nitrate as N • Hardness	Annually	Average of 4 wet weather events per year For methyl mercury only: average of 2 wet & 2 dry weather events per year	Flow-weighted composite For methyl mercury only: grab samples collected during the first rise in the hydrograph of a storm event.
Category 2 • Total and Dissolved Selenium • Total PBDEs (Polybrominated Diphenyl Ethers) • Total PAHs (Poly-Aromatic Hydrocarbons) • Chlordane • DDTs (Dichloro-Diphenyl-Trichloroethane) • Dieldrin • Nitrate as N • Pyrethroids - bifenthrin, cyfluthrin, beta-cyfluthrin, cypermethrin, deltamethrin, esfenvalerate, lambda-cyhalothrin, permethrin, and tralomethrin • Carboryl and fipronil • Total and Dissolved Phosphorus	Oct. 2010 - 2011 water year and Oct. 2012 - 2013 water year	2 times per year	Flow-weighted composite
Category 3 Toxicity – Bedded Sediment, fine-grained[45]	Biennially, Coordinate	Once per year, during April-June,	Grab sample

[43] The monitoring type and frequency shown for mercury is not sufficient to determine progress toward achieving TMDL load allocations. Progress toward achieving load allocations will be accomplished by assessing loads avoided resulting from treatment, source control, and pollution prevention actions.

[44] The monitoring type and frequency shown for PCBs is not sufficient to determine progress toward achieving TMDL load allocations. Progress toward achieving load allocations will be accomplished by assessing loads avoided resulting from treatment, source control, and pollution prevention actions.

Category/Parameter	Sampling Years	Minimum Sampling Occurrence	Sampling Interval
Pollutants – Bedded Sediment, fine-grained	with SWAMP	coordinate with SWAMP	

vi. Sediment Delivery Estimate/Budget – The objective of this monitoring is to develop a strong estimate of the amount of sediment entering the Bay from local tributaries and urban drainages. By July 1, 2011, Permittees shall develop a design for a robust sediment delivery estimate/sediment budget in local tributaries and urban drainages. Permittees shall implement the study by July 1, 2012.

vii. Emerging Pollutants – Permittees shall develop a work plan and schedule for initial loading estimates and source analyses for emerging pollutants: endocrine-disrupting compounds, PFOS/PFAS (Perfluorooctane Sulfonates (PFOS), Perfluoroalkyl sulfonates (PFAS); these perfluorocompounds are related to Teflon products), and NP/NPEs (nonylphenols/nonylphenol esters —estrogen-like compounds). This work plan, which is to be implemented in the next Permit term, shall be submitted with the Integrated Monitoring Report (see Provision C.8.g.).

C.8.f. Citizen Monitoring and Participation

i. Permittees shall encourage Citizen Monitoring.

ii. In developing Monitoring Projects and evaluating Status & Trends data, Permittees shall make reasonable efforts to seek out citizen and stakeholder information and comment regarding waterbody function and quality.

iii. Permittees shall demonstrate annually that they have encouraged citizen and stakeholder observations and reporting of waterbody conditions. Permittees shall report on these outreach efforts in the annual Urban Creeks Monitoring Report.

C.8.g. Reporting

i. Water Quality Standard Exceedence – When data collected pursuant to C.8.a.-C.8.f. indicate that stormwater runoff or dry weather discharges are or may be causing or contributing to exceedance(s) of applicable water quality standards, including narrative standards, a discussion of possible pollutant sources shall be included in the Urban Creeks Monitoring Report. When data collected pursuant to C.8.a.-C.8.f. indicate that discharges are causing or contributing to an exceedance of an applicable water quality standard, Permittees shall notify the Water Board within no more than 30 days of such a determination and submit a follow-up report in accordance with Provision C.1 requirements. The preceding reporting requirements shall not apply to

[45] If Ceriodaphnia, H*yalella azteca,* or Pimephales survival or Selenastrum growth is < 50% of control results, repeat wet weather sample. If 2nd sample yields < 50% of control results, proceed to C.8.d.i.

continuing or recurring exceedances of water quality standards previously reported to the Water Board or to exceedances of pollutants that are to be addressed pursuant to Provisions C.8 through C.14 of this Order in accordance with Provision C.1.

ii. Status Monitoring Electronic Reporting – Permittees shall submit an Electronic Status Monitoring Data Report no later than January 15 of each year, reporting on all data collected during the foregoing October 1–September 30 period. Electronic Status Monitoring Data Reports shall be in a format compatible with the SWAMP database.[46] Water Quality Objective exceedances shall be highlighted in the Report.

iii. Urban Creeks Monitoring Report – Permittees shall submit a comprehensive Urban Creeks Monitoring Report no later than March 15 of each year, reporting on all data collected during the foregoing October 1–September 30 period, with the initial report due March 15, 2012, unless the Permittees choose to monitor through a regional collaborative, in which case the due date is March 15, 2013. Each Urban Creeks Monitoring Report shall contain summaries of Status, Long-Term, Monitoring Projects, and Pollutants of Concern Monitoring including, as appropriate, the following:

(1) Maps and descriptions of all monitoring locations;

(2) Data tables and graphical data summaries; Constituents that exceed applicable water quality standards shall be highlighted;

(3) For all data, a statement of the data quality;

(4) An analysis of the data, which shall include the following:

- Calculations of biological metrics and physical habitat endpoints.
- Comparison of biological metrics to:
  - Each other
  - Any applicable, available reference site(s)
  - Any applicable, available index of biotic integrity
  - Physical habitat endpoints.
- Identification and analysis of any long-term trends in stormwater or receiving water quality.

(5) A discussion of the data for each monitoring program component, which shall:

- Discuss monitoring data relative to prior conditions, beneficial uses and applicable water quality standards as described in the Basin Plan, the Ocean Plan, or the California Toxics Rule or other applicable water quality control plans.

[46] See http://mpsl.mlml.calstate.edu/swdataformats.htm. Permittees shall maintain an information management system that will support electronic transfer of data to the Regional Data Center of the ***California Environmental Data Exchange Network*** **(*CEDEN*)**, located within the San Francisco Estuary Institute.

- Where appropriate, develop hypotheses to investigate regarding pollutant sources, trends, and BMP effectiveness.
- Identify and prioritize water quality problems.
- Identify potential sources of water quality problems.
- Describe follow-up actions.
- Evaluate the effectiveness of existing control measures.
- Identify management actions needed to address water quality problems.

iv. Monitoring Project Reports – Permittees shall report on the status of each ongoing Monitoring Project in each annual Urban Creeks Monitoring Report. In addition, Permittees shall submit stand-alone summary reports within six months of completing BMP Effectiveness and Geomorphic Projects; these reports shall include: a description of the project; map(s) of project locations; data tables and summaries; and discussion of results.

v. Integrated Monitoring Report – No later than March 15, 2014, Permittees shall prepare and submit an Integrated Monitoring Report through the regional collaborative monitoring effort on behalf of all participating Permittees, or on a countywide basis on behalf of participating Permittees, so that all monitoring conducted during the Permit term is reported.[47] This report shall be in lieu of the Annual Urban Creeks Monitoring Report due on March 15, 2014.

The report shall include, but not be limited to, a comprehensive analysis of all data collected pursuant to Provision C.8., and may include other pertinent studies. For Pollutants of Concern, the report shall include methods, data, calculations, load estimates, and source estimates for each Pollutant of Concern Monitoring parameter. The report shall include a budget summary for each monitoring requirement and recommendations for future monitoring. This report will be part of the next Report of Waste Discharge for the reissuance of this Permit.

vi. Standard Report Content –All monitoring reports shall include the following:

- The purpose of the monitoring and briefly describe the study design rationale.
- Quality Assurance/Quality Control summaries for sample collection and analytical methods, including a discussion of any limitations of the data.
- Brief descriptions of sampling protocols and analytical methods.
- Sample location description, including waterbody name and segment and latitude and longitude coordinates.
- Sample ID, collection date (and time if relevant), media (e.g., water, filtered water, bed sediment, tissue).
- Concentrations detected, measurement units, and detection limits.

[47] Permittees who do not participate in the Regional Monitoring Group or in a stormwater countywide program must submit an individual Integrated Receiving Water Impacts Report.

- Assessment, analysis, and interpretation of the data for each monitoring program component.
- Pollutant load and concentration at each mass emissions station.
- A listing of volunteer and other non-Permittee entities whose data are included in the report.
- Assessment of compliance with applicable water quality standards.
- A signed certification statement.

vii. Data Accessibility – Permittees shall make electronic reports available through a regional data center, and optionally through their web sites. Permittees shall notify stakeholders and members of the general public about the availability of electronic and paper monitoring reports through notices distributed through appropriate means, such as an electronic mailing list.

C.8.h. Monitoring Protocols and Data Quality

Where applicable, monitoring data must be SWAMP comparable. Minimum data quality shall be consistent with the latest version of the SWAMP Quality Assurance Project Plan (QAPP)[48] for applicable parameters, including data quality objectives, field and laboratory blanks, field duplicates, laboratory spikes, and clean techniques, using the most recent Standard Operating Procedures. A Regional Monitoring Collaborative may adapt the SWAMP QAPP for use in conducting monitoring in the San Francisco Bay Region, and may use such QAPP if acceptable to the Executive Officer.

[48] The current SWAMP QAPP at the time of Permit issuance is dated September 1, 2008, and is available at http://www.waterboards.ca.gov/water_issues/programs/swamp/docs/qapp/swamp_qapp_master090108a.pdf.

C.9. Pesticides Toxicity Control

To prevent the impairment of urban streams by pesticide-related toxicity, the Permittees shall implement a pesticide toxicity control program that addresses their own and others' use of pesticides within their jurisdictions that pose a threat to water quality and that have the potential to enter the municipal conveyance system. This provision implements requirements of the TMDL for Diazinon and Pesticide related Toxicity for Urban Creeks in the region. The TMDL includes urban runoff allocations for Diazinon of 100 ng/l and for pesticide related toxicity of 1.0 Acute Toxicity Units (TUa) and 1.0 Chronic Toxicity Units (TUc) to be met in urban creek waters. However, urban runoff management agencies (i.e., the Permittees) are not solely responsible for attaining the allocations because their authority to regulate pesticide use is constrained by federal and State law. Accordingly, the Permittees' requirements for addressing the allocations are set forth in the TMDL implementation plan and are included in this provision.

Pesticides of concern include: organophosphorous pesticides (chlorpyrifos, diazinon, and malathion); pyrethroids (bifenthrin, cyfluthrin, beta-cyfluthrin, cypermethrin, deltamethrin, esfenvalerate, lambda-cyhalothrin, permethrin, and tralomethrin); carbamates (e.g., carbaryl); and fipronil. The Permittees may coordinate with BASMAA, the Urban Pesticide Pollution Prevention Project, the Urban Pesticide Committee, the Bay-Friendly Landscaping and Gardening Coalition, and other agencies and organizations in carrying out these activities.

C.9.a. Adopt an Integrated Pest Management (IPM) Policy or Ordinance

i. Task Description – In their IPM policies or ordinances, the Permittees shall include provisions to minimize reliance on pesticides that threaten water quality and to require the use of IPM in municipal operations and on municipal property.

ii. Implementation Level – If not already in place, the Permittees shall adopt IPM policies or ordinances no later than July 1, 2010.

iii. Reporting – The Permittees shall submit a copy of their IPM ordinance(s) or policy(s) in their 2010 Annual Report.

C.9.b. Implement IPM Policy or Ordinance

i. Task Description – The Permittees shall establish written standard operating procedures for pesticide use that ensure implementation of the IPM policy or ordinance and require municipal employees and contractors to adhere to the IPM standard operating procedures.

ii. Reporting

(1) In their Annual Reports, the Permittees shall report on IPM implementation by showing trends in quantities and types of pesticide used, and suggest reasons for increases in use of pesticides that threaten water quality, specifically organophosphorous pesticides, pyrethroids, carbaryl, and fipronil.

(2) The Permittees shall maintain pesticide application standard operating procedures and submit them upon request.

C.9.c. Train Municipal Employees

i. Task Description – The Permittees shall ensure that all municipal employees who, within the scope of their duties, apply or use pesticides that threaten water quality are trained in IPM practices and the Permittee's IPM policy. This training may also include other training opportunities such as Bay-Friendly Landscape Maintenance Training & Qualification Program and EcoWise Certified.

ii. Reporting

(1) In their Annual Reports, the Permittees shall report the percentage of municipal employees who apply pesticides who have received training in IPM policy and IPM standard operating procedures within the last three years.

(2) The Permittees shall submit training materials (e.g., course outline, date, attendees) upon request.

C.9.d. Require Contractors to Implement IPM

i. Task Description – The Permittees shall hire IPM-certified contractors or include contract specifications requiring contractors to implement IPM no later than July 1, 2010.

ii. Reporting – In their Annual Reports, the Permittees shall submit documentation to confirm compliance, such as the Permittee's standard contract specification or copy of contractors' certification(s).

C.9.e. Track and Participate in Relevant Regulatory Processes (may be done jointly with other Permittees, such as through CASQA or BASMAA and/or the Urban Pesticide Pollution Prevention Project)

i. Task Description

(1) The Permittees shall track USEPA pesticide evaluation and registration activities as they relate to surface water quality, and when necessary, encourage USEPA to coordinate implementation of the Federal Insecticide, Fungicide, and Rodenticide Act and the CWA and to accommodate water quality concerns within its pesticide registration process;

(2) The Permittees shall track California Department of Pesticide Regulation (DPR) pesticide evaluation activities as they relate to surface water quality, and when necessary, encourage DPR to coordinate implementation of the California Food and Agriculture Code with the California Water Code and to accommodate water quality concerns within its pesticide evaluation process;

(3) The Permittees shall assemble and submit information (such as monitoring data) as needed to assist DPR and County Agricultural Commissioners in

ensuring that pesticide applications comply with water quality standards; and

(4) As appropriate, the Permittees shall submit comment letters on USEPA and DPR re-registration, re-evaluation, and other actions relating to pesticides of concern for water quality.

ii. Reporting – In their Annual Reports, the Permittees who participate in a regional effort to comply with C.9.e. may reference a regional report that summarizes regional participation efforts, information submitted, and how regulatory actions were affected. All other Permittees shall list their specific participation efforts, information submitted, and how regulatory actions were affected.

C.9.f. Interface with County Agricultural Commissioners

i. Task Description – The Permittees shall maintain regular communications with county agricultural commissioners (or other appropriate State and/or local agencies) to (1) get input and assistance on urban pest management practices and use of pesticides, (2) inform them of water quality issues related to pesticides, and (3) report violations of pesticide regulations (e.g., illegal handling) associated with stormwater management.

ii. Reporting – In their Annual Reports, the Permittees shall summarize improper pesticide usage reported to county agricultural commissioners and report follow-up actions to correct violations.

C.9.g. Evaluate Implementation of Source Control Actions Relating to Pesticides

i. Task Description – The Permittees shall evaluate the effectiveness of the control measures implemented, evaluate attainment of pesticide concentration and toxicity targets for water and sediment from monitoring data (Provision C.8.), and identify improvements to existing control measures and/or additional control measures, if needed, to attain targets with an implementation time schedule.

ii. Reporting – In their 2013 Annual Reports, the Permittees shall report the evaluation results, and if needed, submit a plan to implement improved and/or new control measures.

C.9.h. Public Outreach (may be done jointly with other Permittees, such as through CASQA or BASMAA and/or the Urban Pesticide Pollution Prevention Project or the Bay-Friendly Landscaping and Gardening Coalition).

i. Point of Purchase Outreach: The Permittees shall:

(1) Conduct outreach to consumers at the point of purchase;

(2) Provide targeted information on proper pesticide use and disposal, potential adverse impacts on water quality, and less toxic methods of pest prevention and control; and

(3) Participate in and provide resources for the "Our Water, Our World" program or a functionally equivalent pesticide use reduction outreach program.

ii. Reporting – In their Annual Reports, the Permittees who participate in a regional effort to comply with C.9.h.i. may reference a report that summarizes these actions. All other Permittees shall summarize activities completed and document any measurable awareness and behavior changes resulting from outreach.

iii. Pest Control Contracting Outreach: The Permittees shall conduct outreach to residents who use or contract for structural or landscape pest control and shall:

(1) Provide targeted information on proper pesticide use and disposal, potential adverse impacts on water quality, and less toxic methods of pest prevention and control, including IPM;

(2) Incorporate IPM messages into general outreach;

(3) Provide information to residents about "Our Water, Our World" or functionally equivalent program;

(4) Provide information to residents about EcoWise Certified IPM certification in Structural Pest Management, or functionally equivalent certification program; and

(5) Coordinate with household hazardous-waste programs to facilitate appropriate pesticide waste disposal, conduct education and outreach, and promote appropriate disposal.

iv. Reporting – In their 2013 Annual Reports, the Permittees who participate in a regional effort to comply with C.9.h.iii. may reference a report that summarizes these actions. All other Permittees shall document the effectiveness of their actions in their 2013 Annual Reports. This documentation may include percentages of residents hiring certified IPM providers and the change in this percentage.

v. Outreach to Pest Control Operators: The Permittees shall conduct outreach to pest control operators (PCOs) and landscapers; Permittees are encouraged to work with DPR, county agricultural commissioners, UC-IPM, BASMAA, the Urban Pesticide Committee, the EcoWise Certified Program (or functionally equivalent certification program), the Bio-integral Resource Center and others to promote IPM to PCOs and landscapers.

vi. Reporting – In each Annual Report, the Permittees who participate in a regional effort to comply with C.9.h.v. may reference a report that summarizes these actions. All other Permittees shall summarize how they reached PCOs and landscapers and reduced pesticide use.

C.10. Trash Load Reduction

The Permittees shall demonstrate compliance with Discharge Prohibition A.2 and trash-related Receiving Water Limitations through the timely implementation of control measures and other actions to reduce trash loads from municipal separate storm sewer systems (MS4s) by 40% by 2014, 70% by 2017, and 100% by 2022 as further specified below.

During this permit term, the Permittees shall develop and implement a Short-Term Trash Load Reduction Plan. This includes implementation of a mandatory minimum level of trash capture; cleanup and abatement progress on a mandatory minimum number of Trash Hot Spots; and implementation of other control measures and best management practices, such as trash reduction ordinances, to prevent or remove trash loads from MS4s to attain a 40% reduction in trash loads by July 1, 2014. The Permittees shall also develop and begin implementation of a Long-Term Trash Load Reduction Plan to attain a 70% reduction in trash loads from their MS4s by 2017 and 100% by 2022. Flood management agencies, which are non-population-based Permittees that do not have jurisdiction over urban watershed land, are not subject to these trash reduction requirements except for minimum full trash capture and Trash Hot Spot requirements, as specified in subsections C.10.a.iii and C.10.b below.

C.10.a. Short-Term Trash Load Reduction

i. Short-Term Trash Loading Reduction Plan – Each Permittee shall submit a Short-Term Trash Load Reduction Plan, including an implementation schedule, to the Water Board by February 1, 2012. The Plan shall describe control measures and best management practices, including any trash reduction ordinances, that are currently being implemented and the current level of implementation and additional control measures and best management practices that will be implemented, and/or an increased level of implementation designed to attain a 40% trash load reduction from its MS4 by July 1, 2014.

The Short-Term Trash Load Reduction Plan shall account for required mandatory minimum Full Trash Capture devices called for in Provision C.10.a.iii and Trash Hot Spot Cleanup called for in Provision C.10.b.

ii. Baseline Trash Load and Trash Load Reduction Tracking Method – Each Permittee, working collaboratively or individually, shall determine the baseline trash load from its MS4 to establish the basis for trash load reductions and submit the determined load level to the Water Board by February 1, 2012, along with documentation of methodology used to determine the load level. The submittal shall also include a description of the trash load reduction tracking method that will be used to account for trash load reduction actions and to demonstrate progress and attainment of trash load reduction levels. The submittal shall account for the drainage areas of a Permittee's jurisdiction that are associated with the baseline trash load from its MS4, and the baseline trash load level per unit area by land use type and drainage area characteristics used to derive the total baseline trash load level for each Permittee.

In the determination of applicable areas that generate trash loads for inclusion in the Baseline Trash Load, the Permittees may propose areas for exclusion, with supporting documentation, which meet Discharge Prohibition A.2 and trash-

related Receiving Water Limitations. Documentation demonstrating no material trash presence or adverse impact may include data from the maintenance of existing trash capture devices, data from trash flux measurements in the MS4 and the water column of streams during wet weather, Trash Hot Spot assessments, and litter audits of street curb and gutter areas in high pedestrian traffic and high commercial activity areas.

If proposed areas for exclusion are commercial, industrial, or high density residential areas, or adjacent to schools or event venues, the Permittee shall collect and submit by February 1, 2013, an additional year of documentation to further support the basis for the exclusion. If the data continue to support the exclusion determination, further trash reduction actions are not required in these areas, unless the Water Board notifies the Permittee otherwise.

Each Permittee shall submit a progress report by February 1, 2011, that indicates whether it is determining its baseline trash load and trash load reduction method individually or collaboratively with other Permittees and a summary of the approach being used. The report shall also include the types and examples of documentation that will be used to propose exclusion areas, and the land use characteristics and estimated area of potentially excluded areas.

iii. Minimum Full Trash Capture – Except as excluded below, population-based Permittees shall install and maintain a mandatory minimum number of full trash capture devices by July 1, 2014, to treat runoff from an area equivalent to 30% of Retail/Wholesale Land[49] that drains to MS4s within their jurisdictions (see Table 10.1 in Attachment J). If the sum of the areas that generate trash loads determined pursuant to C.10.a.ii above is a smaller acreage than the required trash capture acreage, a population-based Permittee may reduce its minimum full trash capture requirement to the smaller acreage. A population-based Permittee with a population less than 12,000 and retail/wholesale land less than 40 acres, or a population less than 2000, is exempt from this trash capture requirement. The minimum number of trash capture devices required to be installed and maintained by non-population-based Permittees is included in Attachment J.

All installed devices that meet the following full trash capture definition may be counted toward this requirement regardless of date of installation. A full capture system or device is any single device or series of devices that traps all particles retained by a 5 mm mesh screen and has a design treatment capacity of not less than the peak flow rate Q resulting from a one-year, one-hour, storm in the sub-drainage area.

C.10.b. Trash Hot Spot Selection and Cleanup

Trash Hot Spots in receiving waters shall be cleaned annually to achieve the multiple benefits of beginning abatement of these impacts as mitigation and to learn more about the sources and patterns of trash loading.

[49] [http://quake.abag.ca.gov/mitigation/pickdbh2.html] and Association of Bay Area Governments, 2005 ABAG Land Use Existing Land Use in 2005: Report and Data for Bay Area Counties

i. **Hot Spot Cleanup and Definition** – The Permittees shall cleanup selected Trash Hot Spots to a level of "no visual impact" at least one time per year for the term of the permit. Trash Hot Spots shall be at least 100 yards of creek length or 200 yards of shoreline length.

ii. **Hot Spot Selection** – Population-based Permittees shall identify high trash-impacted locations on State waters totaling at least one Trash Hot Spot per 30,000 population, or one per 100 acres of Retail/Wholesale Commercial Land Area, within their jurisdictions based on Association of Bay Area Governments (ABAG) 2005 data1, whichever is greater. If the hot spot number by one of the two determination methods is more than twice that determined by the other method, double the smaller hot spot number shall be used. Otherwise, the larger hot spot number determined by the two methods shall be the Trash Hot Spot assignment for a population-based Permittee. Each population-based Permittee shall select at least one Trash Hot Spot. The Permittees shall each submit selected Trash Hot Spots to the Water Board by July 1, 2010. The list should include photo documentation (one photo per 50 feet) and initial assessment results for the proposed hot spots. The minimum number of Trash Hot Spots per Permittee is included in Attachment J for population and non-population-based Permittees. The Permittees shall proceed with cleanup of selected Trash Hot Spots unless informed otherwise by the Water Board.

iii. **Hot Spot Assessments** – The Permittees shall quantify the volume of material removed from each Trash Hot Spot cleanup, and identify the dominant types of trash (e.g., glass, plastics, paper) removed and their sources to the extent possible. Documentation shall include the trash condition before and after clean up of the entire hot spot using photo documentation with a minimum of one photo per 50 feet of hot spot length. Trash Hot Spots may also be assessed using either the Rapid Trash Assessment (RTA v.8) or the SCVURPPP Urban RTA variation of that method.

C.10.c. Long-Term Trash Load Reduction

Each Permittee shall submit a Long-Term Trash Load Reduction Plan, including an implementation schedule, to the Water Board by February 1, 2014. The Plan shall describe control measures and best management practices, including any trash reduction ordinances, that are being implemented and the level of implementation and additional control measures and best management practices that will be implemented, and/or an increased level of implementation designed to attain a 70% trash load reduction from its MS4 by July 1, 2017, and 100% by July 1, 2022.

C.10.d. Reporting

i. In each Annual Report, each Permittee shall provide a summary of its trash load reduction actions (control measures and best management practices) including the types of actions and levels of implementation, the total trash loads and dominant types of trash removed by its actions, and the total trash loads and dominant types of trash for each type of action. The latter shall include each Trash Hot Spot selected pursuant to C.10.b. Beginning with the 2012 Annual

Report, each Permittee shall also report its percent annual trash load reduction relative to its Baseline Trash Load.

ii. The Permittees shall retain records for review providing supporting documentation of trash load reduction actions and the volume and dominant type of trash removed from full trash capture devices, from each Trash Hot Spot cleanup, and from additional control measures or best management practices implemented. Data may be combined for specific types of full trash capture devices deployed in the same drainage area. These records shall have the specificity required for the trash load reduction tracking method established pursuant to subsection C.10.a.iii.

C.11. Mercury Controls

The Permittees shall implement the following control programs for mercury. The Permittees shall perform the control measures and provide reporting on those control measures according to the provisions below. The purpose of this provision is to implement the urban runoff requirements of the San Francisco Bay mercury TMDL and reduce mercury loads to make substantial progress toward achieving the urban runoff mercury load allocation established for the TMDL. The aggregate, regionwide, urban runoff wasteload load allocation is 82 kg/yr. This allocation should be achieved by February 2028 and, as a way to measure progress, an interim loading milestone of 120 kg/yr, halfway between the current load and the allocation, should be achieved by February 2018. If the interim loading milestone is not achieved, the Permittees shall demonstrate reasonable and measurable progress toward achieving the milestone. The Permittees may comply with any requirement of this provision through a collaborative effort.

C.11.a. Mercury Collection and Recycling Implemented throughout the Region

i. Task Description – The Permittees shall promote, facilitate, and/or participate in collection and recycling of mercury containing devices and equipment at the consumer level (e.g., thermometers, thermostats, switches, bulbs).

ii. Reporting – The Permittees shall report on these efforts in their Annual Report, including an estimate of the mass of mercury collected.

C.11.b. Monitor Methylmercury

i. Task Description – The Permittees shall monitor methymercury in runoff discharges. The objective of the monitoring is to investigate a representative set of drainages and obtain seasonal information and to assess the magnitude and spatial/temporal patterns of methylmercury concentrations.

ii. Implementation Level – The Permittees shall analyze aqueous grab samples already being collected for total mercury analysis for methylmercury as specified in Provision C.8.f.

iii. Reporting – The Permittees shall report monitoring results annually beginning with their 2010 Annual Report.

C.11.c. Pilot Projects To Investigate and Abate Mercury Sources in Drainages, Including Public Rights-Of-Way, and Stormwater Conveyances with Accumulated Sediment that Contains Elevated Mercury Concentrations.

i. Task Description – The Permittees shall investigate and abate mercury sources in or to their storm drain systems in conjunction with the Water Board and other appropriate regulatory agencies with investigation and cleanup authorities. The purpose of this task is to implement and evaluate the benefit of a suite of abatement measures at five pilot project locations. The Permittees shall document the knowledge and experience gained through pilot implementation,

and this documentation will provide a basis for determining the scope of abatement implementation in subsequent permit terms. The Permittees shall also quantify and report the amount of mercury loads abated resulting from implementation of these measures.

ii. Implementation Level – Reducing loads of PCBs is the main pilot location selection factor for this Provision, and reducing loads of mercury is a secondary criterion. Accordingly, for PCB pilot project locations selected as part of Provision C.12.c, the Permittees shall conduct reconnaissance in the pilot project drainage areas. The Permittees shall test sediments in storm drains and conveyances to characterize the extent and magnitude of mercury concentrations. They shall evaluate monitoring data and determine if a mercury sediment abatement program would reduce mercury loading significantly. If so determined, the Permittees shall cause abatement activities to be conducted at those sites under Permittee jurisdiction with identified remedial activities. When contamination is located on private property, a Permittee must either exercise direct authority to require cleanup or notify and request other appropriate authorities to exercise their cleanup authority.

iii. Reporting – Report on mercury-related aspects of work and loads abated as part of reporting requirements for Provision C.12.c.

C.11.d. Pilot Projects to Evaluate and Enhance Municipal Sediment Removal and Management Practices

i. Task Description – The Permittees shall jointly evaluate ways to enhance mercury load reduction benefits of operation and maintenance actives that remove or manage sediment. The purpose of this task is to implement these management practices at the pilot scale in five drainages during this permit term. The knowledge and experience gained through pilot implementation will be used to determine the implementation scope of enhanced sediment removal and management practices in subsequent permit terms. The Permittees shall document the knowledge and experience gained through pilot implementation, and this documentation will provide a basis for determining the implementation scope of enhanced sediment removal management practices in subsequent permit terms. The Permittees shall also quantify and report the amount of mercury loads removed or avoided resulting from implementation of these measures.

ii. Implementation Level – In all pilot program drainages selected as part of Provision C.12.c, the Permittees shall jointly evaluate ways to enhance existing sediment removal and management practices such as municipal street sweeping, curb clearing parking restrictions, inlet cleaning, catch basin cleaning, stream and stormwater conveyance system maintenance, and pump station cleaning via increased effort and/or retrofits for the control of mercury. This evaluation shall also include consideration of street flushing and capture, collection, or routing to the sanitary sewer (in coordination and consultation with local sanitary sewer agencies) as a potential enhanced management practice in coordination and consultation with local sanitary sewer agencies.

Beginning July 1, 2011, the Permittees shall implement pilot studies for the most potentially effective measures(s) based on the evaluation of Provision C.11.d.ii in all drainages for which PCB pilot projects are being conducted.

iii. Reporting

(1) The Permittees shall present a progress report on the results of the evaluation in their 2010 Annual Report and the final evaluation results in their 2011 Annual Report.

(2) In their March 15, 2014 Integrated Monitoring Report, the Permittees shall report the effectiveness of enhanced practices pilot implementation, report estimates of loads reduced, and present a plan and schedule for possible expanded implementation for subsequent permit terms.

C.11.e. Conduct Pilot Projects to Evaluate On-Site Stormwater Treatment via Retrofit

i. Task Description – The Permittees shall evaluate and quantify the removal of mercury by on-site treatment systems via retrofit of such systems into existing storm drain systems. The purpose of this task is to implement on-site treatment projects at the pilot scale in ten locations during this permit term. The Permittees shall document the knowledge and experience gained through pilot implementation, and this documentation will provide a basis for determining the implementation scope of on-site treatment retrofits in subsequent permit terms. The Permittees shall also quantify and report the amount of mercury loads removed or avoided resulting from implementation of these measures.

ii. Implementation Level – The Permittees, working collaboratively, shall identify at least ten locations throughout the Permittees' jurisdictions that present opportunities to install and evaluate[50] on-site treatment systems (e.g., detention basins, bioretention units, sand filters, infiltration basins, treatment wetlands) and shall assess best treatment options for those locations. Every county (San Mateo, Contra Costa, Alameda, Santa Clara, and Solano) should have at least one location. This effort shall identify potential locations draining a variety of land uses; evaluate technical feasibility; and discuss economical feasibility. The pilot locations may be the same as those chosen for Provision C.12.e, but consideration should be given to areas of elevated mercury concentrations.

On the basis of the Provision C.11.e.ii report, the Permittees shall select sites to perform pilot studies and shall conduct pilot studies in ten selected locations. Pilot studies shall span treatment types and drainage characteristics.

iii. Reporting –

(1) In their 2011 Annual Report, the Permittees shall report on candidate locations and types of treatment retrofit for each location. The report shall include assessment of at least ten locations.

[50] Permittees may evaluate a maximum of two pre-existing treatment systems of the ten total required systems to be evaluated provided that these existing treatment systems are applicable to the intent of this provision..

(2) In their March 15, 2014 Integrated Monitoring Report, the Permittees shall report status, results, mercury removal effectiveness, and lessons learned from the ten pilot studies and their plan for implementing this type of treatment on an expanded basis throughout their jurisdictions during the next permit term.

C.11.f. Diversion of Dry Weather and First Flush Flows to Publicly Owned Treatment Works (POTWs)

i. Task Description – The Permittees shall evaluate the reduced loads of mercury from diversion of dry weather and first flush stormwater flows to sanitary sewers. The Permittees shall document the knowledge and experience gained through pilot implementation, and this documentation will provide a basis for determining the implementation scope of urban runoff diversion projects in subsequent permit terms. The Permittees shall also quantify and report the amount of mercury loads removed or avoided resulting from implementation of these measures.

ii. Implementation Level – The Permittees shall implement pilot projects to divert dry weather and first flush flows to POTWs to address these flows as a source of PCBs and mercury to receiving waters. The Permittees are strongly encouraged to make use of stormwater pump stations in this effort because pump station characterization work performed pursuant to Provisions C.2 and C.10, addressing dissolved oxygen depletion and trash impacts, may be efficiently leveraged for the initial phase of these diversion pilot projects. The objectives of this Provision are to: implement five pilot projects for urban runoff diversion from stormwater pump stations to POTWs; evaluate the reduced loads of mercury and PCBs resulting from each diversion; and gather information to guide the selection of additional diversion projects in future permits. Collectively, the Permittees shall select five stormwater pump stations and five alternates by evaluating drainage characteristics and the feasibility of diverting flows to the sanitary sewer.

(1) The Permittees should work with local POTWs on a watershed, county, or regional level to evaluate feasibility and to establish cost sharing agreements. The feasibility evaluation shall include, but not be limited to, costs, benefits, and impacts on the stormwater and wastewater agencies and the receiving waters relevant to the diversion and treatment of the dry weather and first flush flows.

(2) From this feasibility evaluation, the Permittees shall select five pump stations and five alternates for pilot diversion studies. At least one urban runoff diversion pilot project shall be implemented in each of the five counties (San Mateo, Contra Costa, Alameda, Santa Clara, and Solano). The pilot and alternate locations should be located in industrially-dominated catchments where elevated PCB concentrations are documented.

(3) The Permittees shall implement flow diversion to the sanitary sewer at five pilot pump stations. As part of the pilot studies, the Permittees shall monitor, measure, and report mercury load reduction.

iii. Reporting

(1) The Permittees shall summarize the results of the feasibility evaluation in their 2010 Annual Report, including:

- Selection criteria leading to the identification of the five candidate and five alternate pump stations for pilot studies.
- Time schedules for conducting the pilot studies.
- A proposed method for distributing mercury load reductions to participating wastewater and stormwater agencies.

(2) The Permittees shall report annually on the status of the pilot studies in each subsequent Annual Report.

(3) The Permittees shall include in their March 15, 2014 Integrated Monitoring Report:

- Evaluation of pilot program effectiveness.
- Mercury loads reduced.
- Updated feasibility evaluation procedures to guide future diversion project selection.

C.11.g. Monitor Stormwater Mercury Pollutant Loads and Loads Reduced

i. Task Description – The Permittees shall develop and implement a monitoring program to quantify mercury loads and loads reduced through source control, treatment and other management measures as required in Provision C.8.f.

ii. Implementation Level – The Permittees shall demonstrate progress toward (a) the interim loading milestones, or (b) attainment of the program area allocations, by using the following methods:

(1) Quantify through estimates the annual average mercury load reduced by implementing pollution prevention, source control and treatment control efforts required by the provisions of this permit or other relevant efforts; or

(2) Quantify the mercury load as a rolling five-year annual average using data on flow and water column mercury concentrations; or

(3) Quantitatively demonstrate that the mercury concentration of suspended sediment that best represents sediment discharged with urban runoff is below the target of 0.2 mg mercury/kg dry weight.

iii. Reporting

(1) The Permittees shall report in their 2010 Annual Report methods used to assess progress toward meeting WLA goals and a full description of the

measurement and estimation methodology and rationale for the approaches.

(2) The Permittees shall report in their March 15, 2014 Integrated Monitoring Report results of chosen monitoring/measurement approach concerning loads assessment and estimation of loads reduced.

C.11.h. Fate and Transport Study of Mercury in Urban Runoff

i. Task Description – The Permittees shall conduct or cause to be conducted studies aimed at better understanding the fate, transport, and biological uptake of mercury discharged in urban runoff to San Francisco Bay and tidal areas.

ii. Implementation Level – The specific information needs include understanding the in-Bay transport of mercury discharged in urban runoff, the influence of urban runoff on the patterns of food web mercury accumulation, and the identification of drainages where urban runoff mercury is particularly important in food web accumulation.

iii. Reporting – The Permittees shall submit in their 2010 Annual Report a work plan describing the specific manner in which these information needs will be accomplished and describing the studies to be performed with a schedule. The Permittees shall report on status of these studies in their 2010, 2011, and 2012 Annual Reports. In the March 15, 2014 Integrated Monitoring Report, the Permittees shall report the findings and results of the studies completed, planned, or in progress as well as implications of studies on potential control measures to be investigated, piloted or implemented in future permit cycles.

C.11.i. Development of a Risk Reduction Program Implemented Throughout the Region.

i. Task Description – The Permittees shall develop and implement or participate in effective programs to reduce mercury-related risks to humans and quantify the resulting risk reductions from these activities.

ii. Implementation Level – The risk reduction activities shall include investigating ways to address public health impacts of mercury in San Francisco Bay/Delta fish, including activities that reduce actual and potential exposure of health impacts to those people and communities most likely to be affected by mercury in San Francisco Bay-caught fish, such as subsistence fishers and their families. Such strategies should include public participation in developing effective programs in order to ensure their effectiveness. The Permittees may include studies needed to establish effective exposure reduction activities and risk communication messages as part of their planning. The risk reduction activities may be performed by a third party if the Permittees wish to provide funding for this purpose. This requirement may be satisfied by a combination of related efforts through the Regional Monitoring Program or other similar collaborative efforts.

iii. Reporting – The Permittees shall submit in their 2010 Annual Report the specific manner in which these risk reduction activities will be accomplished and describe the studies to be performed with a schedule. The Permittees shall report on the status of the risk reduction efforts in their 2011 and 2012 Annual Reports. The Permittees shall report the findings and results of the studies completed, planned, or in progress as well as the status of other risk reduction actions in their March 15, 2014 Integrated Monitoring Report.

C.11.j. Develop Allocation Sharing Scheme with Caltrans.

i. Task Description – The wasteload allocations for urban stormwater developed through the San Francisco Bay mercury TMDL implicitly include California Department of Transportation (Caltrans) roadway and non-roadway facilities within the geographic boundaries of urban runoff management agencies. Consistent with the TMDL, the Permittees are required to develop an equitable mercury allocation-sharing scheme in consultation with Caltrans to address the Caltrans facilities in the program area, and report the details to the Water Board. Alternatively, Caltrans may choose to implement mercury load reduction actions on a watershed or regionwide basis in lieu of sharing a portion of an urban runoff management agencies' mercury allocation. In such a case, the Water Board will consider a separate allocation for Caltrans for which it may demonstrate progress toward attaining an allocation or load reduction in the same manner as municipal programs.

ii. Reporting – The Permittees shall report on the status of the efforts to develop this allocation sharing scheme in their 2010, 2011, and 2012 Annual Reports. The Permittees shall submit in their March 15, 2014 Integrated Monitoring Report the manner in which the urban runoff mercury TMDL allocation will be shared between the Permittees and Caltrans.

C.12. Polychlorinated Biphenyls (PCBs) Controls

The Permittees shall implement the following control programs for PCBs. The Permittees shall perform the control measures and provide reporting on those control measures according to the provisions below. The purpose of these provisions is to implement the urban runoff requirements of the PCBs TMDL and reduce PCBs loads to make substantial progress toward achieving the urban runoff PCBs load allocation. The Permittees may comply with any requirement of this Provision through a collaborative effort.

C.12.a. Implement Project throughout Region to Incorporate PCBs and PCB-Containing Equipment Identification into Existing Industrial Inspections

i. Task Description – The Permittees shall develop training materials and train municipal industrial building inspectors to identify, in the course of their existing inspections, PCBs or PCB-containing equipment. The Permittees shall incorporate such PCB identification into industrial inspection programs.

ii. Implementation Level – Where inspectors identify during inspections PCBs or PCB-containing equipment, the Permittees shall document incidents in inspection reports and refer to appropriate regulatory agencies (e.g. county health departments, Department of Toxic Substances Control, California Department of Public Health, and the Water Board) as necessary.

iii. Reporting – The Permittees shall report the results of training in their 2010 Annual Report and report on both ongoing training development and inspections for PCB identification in their 2011, and following, Annual Reports.

C.12.b. Conduct Pilot Projects to Evaluate Managing PCB-Containing Materials and Wastes during Building Demolition and Renovation (e.g., Window Replacement) Activities

i. Task Description – The Permittees shall evaluate potential presence of PCBs at construction sites, current material handling and disposal regulations/programs (e.g., municipal ordinances, RCRA, TSCA) and current level of implementation.

ii. Implementation Level –

(1) The Permittees shall develop a sampling and analysis plan to evaluate PCBs at construction sites that involve demolition activities (including research on when, where, and which materials potentially contained PCBs).

(2) The Permittees shall implement a sampling and analysis plan at a minimum of 10 sites distributed throughout the combined Permittees' jurisdiction areas.

(3) The Permittees shall develop/select BMPs to reduce or prevent discharges of PCBs during demolition/remodeling. The BMPs will focus on methods

to identify, handle, contain, transport and dispose of PCB-containing building materials.

(4) The Permittees shall develop model ordinances or policies, train and deploy inspectors, and pilot test BMPs at 5 sites.

iii. Reporting –

(1) In their 2010 Annual Report, the Permittees shall submit the sampling and analysis plan (of Provision C.12.b.ii.).

(2) In their 2010 Annual Report, the Permittees shall submit a status report on sampling and analysis along with whatever sampling results are available.

(3) In their 2011 Annual Report, the Permittees shall submit the results of the evaluation (Provision C.12.b.i.) of current regulations, level of implementation, and regulatory gaps as well as the final sampling and analysis report, a list of appropriate BMPs, BMP training program, and model ordinances and policies to prevent PCB discharges from building demolition and improvement activities.

(4) In the March 15, 2014 Integrated Monitoring Report, the Permittees shall submit the results of pilot program effectiveness evaluation.

C.12.c. Pilot Projects to Investigate and Abate On-land Locations with Elevated PCB Concentrations, Including Public Rights-of-way, and Stormwater Conveyances with Accumulated Sediments with Elevated PCBs Concentrations.

i. Task Description – The Permittees shall investigate and abate PCBs sources in or to their storm drain systems in conjunction with the Water Board and other appropriate regulatory agencies with investigation and cleanup authorities. The purpose of this task is to implement and evaluate the benefit of a suite of abatement measures at five pilot project locations. The Permittees shall document the knowledge and experience gained through pilot implementation, and this documentation will provide a basis for determining the implementation scope of abatement projects in subsequent permit terms. The Permittees shall also quantify and report the amount of PCBs loads abated resulting from implementation of these measures.

ii. Implementation Level –

(1) The Permittees, working collaboratively, shall identify 5 drainage areas that contain high levels of PCBs and conduct pilot projects to investigate and abate these high PCB concentrations. To accomplish this, the Permittees shall interview municipal staff and review municipal databases, data collected or compiled through grant-funded efforts, other agency files, and other available information to identify potential PCB source areas and areas where PCB-contaminated sediment accumulates, including within stormwater conveyances. The Permittees shall qualitatively rank and map potential PCB source areas within each drainage. Investigation of mercury (Provision C.11.c.) shall be included in these efforts unless not

appropriate. When contamination is located on private property, the Permittees must either exercise direct authority to require cleanup or notify and request other appropriate authorities to exercise their cleanup authority.

(2) The Permittees shall conduct reconnaissance surveys of the identified drainages and gather information concerning past or current use of PCBs to further identify potential source areas and determine whether runoff from such locations is likely to convey soils/sediments with PCBs to municipal stormwater conveyances.

(3) The Permittees shall validate existence of elevated PCB concentrations through surface soil/sediment sampling and analysis where visual inspections and/or other information suggest potential source areas within each drainage.

Where data confirm significantly elevated PCB concentrations in surface soils/sediments within the subject pilot drainage, the Permittees shall provide available information on current site conditions and owner/operators and other potentially responsible parties to Water Board and other appropriate regulatory agencies to facilitate their issuance of orders for further investigation and remediation of subject sites. The Permittees shall assist the Water Board and other appropriate agencies to identify/evaluate funding to perform abatement and/or responsible parties and abatement options.

(4) The Permittees shall identify areas for expedited abatement on the basis of loading potential including factors such as PCB concentration, mass of sediment, and mobilization potential and/or human health protection thresholds, such as California Human Health Screening Levels.

(5) The Permittees shall conduct an abatement program in portions of drainages under their jurisdiction in conjunction with the Water Board and other appropriate agencies.

iii. Reporting

(1) The Permittees shall report on the identified suspect drainage areas [Provision C.12.c.ii (1)] in their 2010 Annual Report and results of the surveys [Provision C.12.c.ii.(2)] in their 2011 Annual Report.

(2) The Permittees shall report sampling and chemical analysis results at pilot locations [Provision C.12.c.ii.(3)] in their 2011 Annual Reports.

(3) The Permittees shall report on proposed abatement opportunities and activities [Provision C.12.c.ii.(4) and (5)], responsible parties, funding, agency oversight, and schedules in their 2012 Annual Report.

(4) The Permittees shall report results of abatement program effectiveness and estimates of loads reduced (see C.11.g) in the March 15, 2014 Integrated Monitoring Report.

C.12.d. Conduct Pilot Projects to Evaluate and Enhance Municipal Sediment Removal and Management Practices

i. **Task Description** – The Permittees shall jointly evaluate ways to enhance PCBs load reduction benefits of operation and maintenance activities that remove or manage sediment. The purpose of this task is to implement these management practices at the pilot scale in five drainages during this permit term. The Permittees shall document the knowledge and experience gained through pilot implementation, and this documentation will provide a basis for determining the implementation scope of enhanced sediment removal and management practices in subsequent permit terms. The Permittees shall also quantify and report the amount of PCBs loads removed or avoided resulting from implementation of these measures.

ii. **Implementation Level** – In all pilot program drainages selected as part of Provision C.12.c, the Permittees shall jointly evaluate ways to enhance existing sediment removal and management practices such as municipal street sweeping, curb clearing parking restrictions, inlet cleaning, catch basin cleaning, stream and stormwater conveyance system maintenance, and pump station cleaning via increased effort and/or retrofits. This evaluation shall also include consideration of street flushing and capture, collection, or routing to the sanitary sewer (in coordination and consultation with local sanitary sewer agency) as a potential enhanced management practice. The Permittees shall also jointly evaluate existing information on high-efficiency street sweepers. The goal is to evaluate the cost-effectiveness of high-efficiency street sweeping relative to reducing pollutant loads. The Permittees shall develop recommendations for follow-up studies to be conducted.

iii. **Reporting** – The Permittees shall submit a progress report on the results of these two evaluations in their 2010 Annual Report and the final evaluation results in their 2011 Annual Report.

iv. Beginning July 1, 2011, the Permittees shall implement pilot studies for the most potentially effective measure(s) based on the evaluation of Provision C.12.d. ii. throughout the region.

v. **Reporting** – The Permittees shall report effectiveness of enhanced practices pilot implementation in the March 15, 2014 Integrated Monitoring Report, and their plan for implementing enhanced practices in the next permit term.

C.12.e. Conduct Pilot Projects to Evaluate On-Site Stormwater Treatment via Retrofit

i. **Task Description** – The Permittees shall evaluate and quantify the removal of PCBs by on-site treatment systems via retrofit of such systems into existing storm drain systems. The purpose of this task is to implement on-site treatment projects at the pilot scale in ten locations during this permit term. The Permittees shall document the knowledge and experience gained through pilot implementation, and this documentation will provide a basis for determining the implementation scope of on-site treatment retrofits in subsequent permit terms.

ii. Implementation Level – The Permittees, working collaboratively, shall identify at least 10 locations throughout the Permittees' jurisdictions that present opportunities to install and evaluate[51] on-site treatment systems (e.g., detention basins, bioretention units, sand filters, infiltration basins, treatment wetlands) and shall assess the best treatment options for those locations. Every county (San Mateo, Contra Costa, Alameda, Santa Clara, and Solano) should have at least one location. This assessment shall identify potential locations draining a variety of land uses, discuss technical feasibility, and discuss economical feasibility. The Permittees shall choose pilot study locations primarily on the basis of elevated PCBs concentrations with additional consideration to mercury concentrations.

iii. On the basis of the Provision C.12.e.ii. report, the Permittees shall select sites to perform pilot studies and shall conduct pilot studies in selected locations. Taken as a group, these 10 pilot study locations should span treatment types and drainage characteristics.

iv. Reporting –

(1) In their 2011 Annual Report, the Permittees shall report on candidate locations with types of treatment retrofit for each location. The report shall include assessment of at least 10 locations.

(2) In the March 15, 2014 Integrated Monitoring Report, the Permittees shall report status, results, PCBs-removal effectiveness, and lessons learned from the pilot studies and their plan for implementing this type of treatment on an expanded basis throughout the region during the next permit term.

C.12.f. Diversion of Dry Weather and First Flush Flows to POTWs

i. Task Description – The Permittees shall evaluate the reduced loads of PCBs from diversion of dry weather and first flush stormwater flows to sanitary sewers. The knowledge and experience gained through pilot implementation will be used to determine the implementation scope of urban runoff diversion in subsequent permit terms. The Permittees shall document the knowledge and experience gained through pilot implementation, and this documentation will provide a basis for determining the implementation scope of urban runoff diversion projects in subsequent permit terms.

ii. Implementation Level – The Permittees shall implement pilot projects to address the role of pump stations as a source of pollutants of concern (primarily PCBs and secondarily mercury). This work is in addition to Provisions C.2 and C.10 that address dissolved oxygen depletion and trash impacts in receiving waters. The objectives of this provision are: to implement five pilot projects for urban runoff diversion from stormwater pump stations to POTWs; evaluate the reduced loads of mercury and PCBs resulting from the diversion; and gather

[51] The Permittees may evaluate a maximum of two pre-existing treatment systems of the ten total required systems to be evaluated provided that these existing treatment systems are applicable to the intent of this provision.

information to guide the selection of additional diversion projects required in future permits. Collectively, the Permittees shall select 5 stormwater pump stations and 5 alternates by evaluating drainage characteristics and the feasibility of diverting flows to the sanitary sewer.

(1) The Permittees should work with the local POTW on a watershed, program, or regional level to evaluate feasibility and to establish cost sharing agreements. The feasibility evaluation shall include, but not be limited to, costs, benefits, and impacts on the stormwater and wastewater agencies and the receiving waters relevant to the diversion and treatment of the dry weather and first flush flows.

(2) From this feasibility evaluation, the Permittees shall select 5 pump stations and 5 alternates for pilot diversion studies. At least one urban runoff diversion pilot project shall be implemented in each of the five counties (San Mateo, Contra Costa, Alameda, Santa Clara, and Solano). The pilot and alternate locations should be located in industrially dominated catchments where elevated PCB concentrations are documented.

(3) The Permittees shall implement flow diversion to the sanitary sewer at the 5 pilot pump stations. As part of the pilot studies, they shall monitor and measure PCBs load reduction.

iii. Reporting –

(1) The Permittees shall summarize the results of the feasibility evaluation in their 2010 Annual Report, including:

- Selection criteria leading to the identification of the 5 candidate and 5 alternate pump station for pilot studies.
- Time schedules for conducting the pilot studies.
- A proposed method for distributing PCBs load reductions to participating wastewater and stormwater agencies.

(2) The Permittees shall report annually on the status of the pilot studies in each subsequent annual report.

(3) The March 15, 2014 Integrated Monitoring Report shall include:

- Evaluation of pilot program effectiveness.
- PCBs loads reduced.
- Updated feasibility evaluation procedures to guide future diversion project selection.

C.12.g. Monitor Stormwater PCB Pollutant Loads and Loads Reduced

The Permittees shall develop and implement a monitoring program as required in Provision C.8.f to quantify PCBs loads and loads reduced (see C.11.g for details) through the source control, treatment and other management measures implemented as part of the pilot studies of C.12.a through C.12.f.

C.12.h. Fate and Transport Study of PCBs in Urban Runoff

i. Task Description – The Permittees shall conduct or cause to be conducted studies aimed at better understanding the fate, transport, and biological uptake of PCBs discharged in urban runoff.

ii. Implementation Level – The specific information needs include understanding the in-Bay transport of PCBs discharged in urban runoff, the influence of urban runoff on the patterns of food web PCBs accumulation, and the identification of drainages where urban runoff PCBs are particularly important in food web accumulation.

iii. Reporting – The Permittees shall submit in their 2010 Annual Report a workplan describing the specific manner in which these information needs will be accomplished and describing the studies to be performed with a schedule. The Permittees shall report on status of the studies in their 2011 and 2012 Annual Reports. The Permittees shall report in the March 15, 2014 Integrated Monitoring Report the findings and results of the studies completed, planned, or in progress as well as implications of studies on potential control measures to be investigated, piloted or implemented in future permit cycles.

C.12.i. Development of a Risk Reduction Program Implemented throughout the Region

i. Task Description – The Permittees shall develop and implement or participate in effective programs to reduce PCBs-related risks to humans and quantify the resulting risk reductions from these activities.

ii. Implementation Level – The risk reduction activities shall include investigating ways to address public health impacts of PCBs in San Francisco Bay/Delta fish, including activities that reduce actual and potential exposure of health impacts to those people and communities most likely to be affected by PCBs in San Francisco Bay-caught fish, such as subsistence fishers and their families. Such strategies should include public participation in developing effective programs in order to ensure their effectiveness. The Permittees may include studies needed to establish effective exposure reduction activities and risk communication messages as part of their planning. The risk reduction activities may be performed by a third party if the Permittees wish to provide funding for this purpose. This requirement may be satisfied by a combination of related efforts through the Regional Monitoring Program or other similar collaborative efforts.

iii. Reporting – The Permittees shall submit in their 2010 Annual Report the specific manner in which these risk reduction activities will be accomplished and describe the studies to be performed with a schedule. The Permittees shall report on status of the studies in their 2011 and 2012 Annual Reports. The Permittees shall report the findings and results of the studies completed, planned, or in progress as well as the status of other risk reduction actions in the March 15, 2014 Integrated Monitoring Report.

C.13. Copper Controls

The control program for copper is detailed below. The Permittees shall implement the control measures and accomplish the reporting on those control measures according to the provisions below. The purpose of these provisions is to implement the control measures identified in the Basin Plan amendment necessary to support the copper site-specific objectives in San Francisco Bay. The Permittees may comply with any requirement of C.13 Provisions through a collaborative effort.

C.13.a. Manage Waste Generated from Cleaning and Treating of Copper Architectural Features, Including Copper Roofs, during Construction and Post-Construction.

i. Task Description – The Permittees shall ensure that local ordinance authority is established to prohibit the discharge of wastewater to storm drains generated from the installation, cleaning, treating, and washing of the surface of copper architectural features, including copper roofs to storm drains.

ii. Implementation Level

(1) The Permittees shall develop BMPs on how to manage the waste during and post-construction.

(2) The Permittees shall require use of appropriate BMPs when issuing building permits.

(3) The Permittees shall educate installers and operators on appropriate BMPs.

(4) The Permittees shall enforce against noncompliance.

iii. Reporting

(1) The Permittees shall certify adequate legal authority in their 2011 Annual Report or otherwise provide justification for schedule not to exceed one year to comply.

(2) The Permittees shall report annually, starting with their 2012 Annual Report, on training, permitting and enforcement activities.

(3) In their 2013 Annual Report, the Permittees shall evaluate the effectiveness of these measures, including BMP implementation and propose any additional measures to address this source.

C.13.b. Manage Discharges from Pools, Spas, and Fountains that Contain Copper-Based Chemicals

i. Task Description – By adopting local ordinances, the Permittees shall prohibit discharges to storm drains from pools, spas, and fountains that contain copper-based chemicals.

ii. Implementation Level – The Permittees shall either: 1) require installation of a sanitary sewer discharge connection for pools, spas, and fountains, including

connection for filter backwash, with a proper permit from the POTWs; or 2) require diversion of discharge for use in landscaping or irrigation.

iii. Reporting – The Permittees shall certify adequate legal authority in their 2011 Annual Report or otherwise provide justification for schedule not to exceed one year to comply.

C.13.c. Vehicle Brake Pads

i. Task Description – The Permittees shall engage in efforts to reduce the copper discharged from automobile brake pads to surface waters via urban runoff.

ii. Implementation Level – The Permittees shall participate in the Brake Pad Partnership (BPP) process to develop California legislation phasing out copper from certain automobile brake pads sold in California.

iii. Reporting – The Permittees shall report on legislation development and implementation status in Annual Reports during the permit term. In their 2013 Annual Report, the Permittees shall assess status of copper water quality issues associated with automobile brake pads and recommend brake pad-related actions for inclusion in subsequent permits if needed.

C.13.d. Industrial Sources

i. Task Description – The Permittees shall ensure industrial facilities do not discharge elevated levels of copper to storm drains by ensuring, through industrial facility inspections, that proper BMPs are in place.

ii. Implementation Level –

(1) As part of industrial site controls required by Provision C.4, the Permittees shall identify facilities likely to use copper or have sources of copper (e.g., plating facilities, metal finishers, auto dismantlers) and include them in their inspection program plans.

(2) The Permittees shall educate industrial inspectors on industrial facilities likely to use copper or have sources of copper and proper BMPs for them.

(3) As part of the industrial inspection, inspectors shall ensure that proper BMPs are in place at such facilities to minimize discharge of copper to storm drains, including consideration of roof runoff that might accumulate copper deposits from ventilation systems on-site.

iii. Reporting

The Permittees shall highlight copper reduction results in the industrial inspection component in the C.13 portion of each Annual Report beginning September 2010.

C.13.e. Studies to Reduce Copper Pollutant Impact Uncertainties

i. Task Description – The Permittees shall conduct or cause to be conducted technical studies to investigate possible copper sediment toxicity and technical studies to investigate sub-lethal effects on salmonids.

ii. Implementation Level – Technical uncertainties regarding copper effects in the Bay are described in the Basin Plan's implementation program for copper site-specific objectives. These uncertainties include toxicity to Bay benthic organisms possibly caused by high copper concentrations as well as possible impacts to the olfactory system of salmonids. The Permittees shall ensure that these studies are supported and conducted. Similar requirements are included in NPDES permits for wastewater discharges. The Permittees shall submit in their 2010 Annual Report the specific manner in which these information needs will be accomplished and describe the studies to be performed with a schedule. The Permittees shall report the findings and results of the studies completed, planned, or in progress in their 2012 Annual Report.

C.14. Polybrominated Diphenyl Ethers (PBDE), Legacy Pesticides and Selenium

The control program for PBDEs, legacy pesticides, and selenium is detailed below. The Permittees shall perform the control measures and accomplish the reporting on those control measures according to the provisions below. The purpose of these provisions is to gather concentration and loading information on a number of pollutants of concern (e.g., PBDEs, DDT, dieldrin, chlordane, selenium) for which TMDLs are planned or are in the early stages of development. The Permittees may comply with any requirement of C.14 Provisions through a collaborative effort.

C.14.a. Control Program for PBDEs, Legacy Pesticides, and Selenium.

i. Task Description – To determine if urban runoff is a conveyance mechanism associated with the possible impairment of San Francisco Bay for PBDEs, legacy pesticides (such as DDT, dieldrin, and chlordane), and selenium, the Permittees shall work with the other municipal stormwater management agencies in the Bay Region to implement a plan (PBDEs/Legacy Pesticides/Selenium Plans) to identify, assess, and manage controllable sources of PBDEs, legacy pesticides, and selenium found in urban runoff, if any. The Water Board recognizes that these three pollutants are distinct in terms of origin and transport, but they have been grouped into a single permit provision because the requirements are identical. The Water Board anticipates that some of the control measures that are developed for PCBs consistent with aforementioned efforts warrant consideration for the control of PBDEs and possibly legacy pesticides.

ii. Implementation Level – The PBDEs/Legacy Pesticides/Selenium Plan shall include actions to do the following:

Characterize the representative distribution of PBDEs, legacy pesticides, and selenium in the urban areas of the Bay Region covered by this permit to determine:

(1) If PBDEs, legacy pesticides, and selenium are present in urban runoff;

(2) If PBDEs, legacy pesticides, or selenium are distributed relatively uniformly in urban areas; and

(3) Whether storm drains or other surface drainage pathways are sources of PBDEs, legacy pesticides, or selenium in themselves, or whether there are specific locations within urban watersheds where prior or current uses result in land sources contributing to discharges of PBDEs, legacy pesticides, or selenium to San Francisco Bay via urban runoff conveyance systems.

iii. Report on progress in 2010 and 2011 Annual Reports. Submit in the 2012 Annual Report a report with the results of the characterization of PBDEs, legacy pesticides, and selenium in urban areas throughout the Bay Region.

iv. Provide information to allow calculation of PBDEs, legacy pesticides, and selenium loads to San Francisco Bay from urban runoff conveyance systems.

v. Submit in the 2013 Annual Report a report with the information required to compute such loads to San Francisco Bay of PBDEs, legacy pesticides, and selenium from urban runoff conveyance systems throughout the Bay.

vi. Identify control measures and/or management practices to eliminate or reduce discharges of PBDEs, legacy pesticides, or selenium conveyed by urban runoff conveyance systems.

vii. Submit in the 2013 Annual Report a report identifying such control measures/management practices.

C.15. Exempted and Conditionally Exempted Discharges

The objective of this provision is to exempt unpolluted non-stormwater discharges from Discharge Prohibition A.1 and to conditionally exempt non-stormwater discharges that are potential sources of pollutants. In order for non-stormwater discharges to be conditionally exempted from Discharge Prohibition A.1, the Permittees must identify appropriate BMPs, monitor the non-stormwater discharges where necessary, and ensure implementation of effective control measures – as listed below – to eliminate adverse impacts to waters of the State consistent with the discharge prohibitions of the Order.

C.15.a. Exempted Non-Stormwater Discharges (Exempted Discharges):

i. Discharge Type – In carrying out Discharge Prohibition A.1, the following unpolluted discharges are exempted from prohibition of non-stormwater discharges:

(1) Flows from riparian habitats or wetlands;

(2) Diverted stream flows;

(3) Flows from natural springs;

(4) Rising ground waters;

(5) Uncontaminated and unpolluted groundwater infiltration;

(6) Single family homes' pumped groundwater, foundation drains, and water from crawl space pumps and footing drains;

(7) Pumped groundwater from drinking water aquifers; and

(8) NPDES permitted discharges (individual or general permits).

ii. Implementation Level – The non-stormwater discharges listed in Provision C.15.a.i above are exempted unless they are identified by the Permittees or the Executive Officer as sources of pollutants to receiving waters. If any of the above categories of discharges, or sources of such discharges, are identified as sources of pollutants to receiving waters, such categories or sources shall be addressed as conditionally exempted discharges in accordance with Provision C.15.b below.

C.15.b. Conditionally Exempted Non-Stormwater Discharges:

The following non-stormwater discharges are also exempt from Discharge Prohibition A.1 if they are either identified by the Permittees or the Executive Officer as not being sources of pollutants to receiving waters, or if appropriate control measures to eliminate adverse impacts of such sources are developed and implemented in accordance with the tasks and implementation levels of each category of Provision C.15.b.i-viii below.

i. Discharge Type – Pumped Groundwater, Foundation Drains, and Water from Crawl Space Pumps and Footing Drains

(1) **Pumped Groundwater from Non Drinking Water Aquifers** –

Groundwater pumped from monitoring wells, used for groundwater basin management, which are owned and/or operated by the Permittees who pump groundwater as drinking water. These aquifers tend to be shallower, when compared to drinking water aquifers.

(a) **Implementation Level** – Twice a year (once during the wet season and once during the dry season), representative samples shall be taken from each aquifer that potentially will discharge or has discharged into a storm drain. Samples collected and analyzed for compliance in accordance with self-monitoring requirements of other NPDES permits or sample data collected for drinking water regulatory compliance may be submitted to comply with this requirement as long as they meet the following criteria:

(i) The water samples shall meet water quality standards consistent with the existing effluent limitations in the Water Board's NPDES General Permits, such as NPDES Nos. CAG912002 and CAG912003 for Discharge or Reuse of Extracted and Treated Groundwater Resulting from the Cleanup of Groundwater Polluted by fuel and VOCs, respectively, and NPDES No. CAG912004 for discharges of low-level, incidental, and potentially contaminated groundwater.

(ii) The water samples shall be analyzed using approved USEPA Methods (e.g., (a) USEPA Method 160.2 for total suspended solids; (b) USEPA Method 8015 Modified for total petroleum hydrocarbons; (c) USEPA Method 8260B and 8270C or equivalent for volatile and semi-volatile organic compounds; and (d) USEPA Method 3005 for metals.

(iii) The water samples shall be analyzed for pH and turbidity.

(iv) If a Permittee is unable to comply with the above criteria, the Permittee shall notify the Water Board upon becoming aware of the compliance issue.

(b) **Required BMPs** – When uncontaminated (meeting the criteria in C.15.b.i.(1)(a)(i)) groundwater is discharged from these monitoring wells, the following shall be implemented:

(i) Discharges shall be properly controlled and maintained to prevent erosion at the discharge point and at a rate that avoids scouring of banks and excess sedimentation in the receiving waterbody.

(ii) Appropriate BMPs shall be implemented to remove total suspended solids and silt to allowable discharge levels. Appropriate BMPs may include filtration, settling, coagulant application with no residual coagulant discharge, minor odor or color removal with activated carbon, small scale peroxide addition, or other minor treatment.

(iii) Turbidity of the discharged groundwater shall be maintained below 50 NTUs for discharges to dry creeks, 110 percent of the

ambient stream turbidity for a flowing stream with turbidities greater than 50 NTU, or 5 NTU above ambient turbidity for flowing streams with turbidities less than or equal to 50 NTU.

(iv) pH of the discharged groundwater shall be maintained within the range of 6.5 to 8.5.

(c) **Reporting** – The Permittees shall maintain records of these discharges, BMPs implemented, and any monitoring data collected.

(2) **Pumped[52] Groundwater, Foundation Drains, and Water from Crawl Space Pumps and Footing Drains**

(a) Proposed new discharges of uncontaminated groundwater at flows of 10,000 gallons/day or more and all new discharges of potentially contaminated groundwater shall be reported to the Water Board so that they can be subject to NPDES permitting requirements.

(b) Proposed new discharges of uncontaminated groundwater at flows of less than 10,000 gallons/day shall be encouraged to discharge to a landscaped area or bioretention unit that is large enough to accommodate the volume.

(c) If the discharge options in C.15.b.i.(2)(b) above are not feasible and these discharges must enter a storm drain, sampling shall be done to verify that the discharge is uncontaminated.

(i) The discharge shall meet water quality standards consistent with the existing effluent limitations in the Water Board's NPDES General Permits, such as NPDES Nos. CAG912002 and CAG912003 for Discharge or Reuse of Extracted and Treated Groundwater Resulting from the Cleanup of Groundwater Polluted by fuel and VOCs, respectively, and NPDES No. CAG912004 for discharges of low-level, incidental, and potentially contaminated groundwater.

(ii) The Permittees shall require that water samples from these discharge types be analyzed using approved USEPA Methods (e.g., (a) USEPA Method 160.2 for total suspended solids; (b) USEPA Method 8015 Modified for total petroleum hydrocarbons; (c) USEPA Method 8260B and 8270C or equivalent for volatile and semi-volatile organic compounds; and (d) USEPA Method 3005 for metals.

(d) **Required BMPs** – When the discharge has been verified as uncontaminated per sampling completed in C.15.b.i.(2)(c) above, the Permittees shall require the following during discharge:

(i) Proper control and maintain to prevent erosion at the discharge point and at a rate that avoids scouring of banks and excess sedimentation in the receiving waterbody.

(ii) Appropriate BMPs to render pumped groundwater free of pollutants and therefore exempted from prohibition may include

[52] Pumped groundwater not exempted in C.15.a or conditionally exempted in C.15.b.i.(1).

the following: filtration, settling, coagulant application with no residual coagulant discharge, minor odor or color removal with activated carbon, small scale peroxide addition, or other minor treatment.

(iii) Testing of water samples for turbidity and pH on the first two consecutive days of dewatering.

(iv) Turbidity of discharged groundwater shall be maintained below 50 NTU for discharges to dry creeks, 110 percent of the ambient stream turbidity for a flowing stream with turbidities greater than 50 NTU, or 5 NTU above ambient turbidity for a flowing stream with turbidities less than or equal to 50 NTU.

(v) pH of discharged water shall be maintained within the range of 6.5 to 8.5.

(e) If a Permittee determines that a discharger or a project proponent is unable to comply with the above criteria, the discharger shall be directed to obtain approval or permits directly from the Water Board.

(f) **Reporting** – The Permittees shall maintain records of these discharges, BMPs implemented, and any monitoring data collected.

ii. Discharge Type – Air Conditioning Condensate

Required BMPs – Condensate from air conditioning units shall be directed to landscaped areas or the ground. Discharge to a storm drain system may be allowed if discharge to landscaped areas or the ground is not feasible.

iii. Discharge Types – Planned,[53] Unplanned,[54] and Emergency Discharges of the Potable Water System

(1) **Planned Discharges** – Planned discharges are routine operation and maintenance activities in the potable water distribution system that can be scheduled in advance, such as disinfecting water mains, testing fire hydrants, storage tank maintenance, cleaning and lining pipe sections, routine distribution system flushing, reservoir dewatering, and water main dewatering activities. The following requirements only apply to those Permittees that are water purveyors and pertain to their planned discharges of potable water to their storm drain systems.

(a) **Required BMPs[55]** – The Permittees shall implement appropriate BMPs for dechlorination, and erosion and sediment controls for all planned potable water discharges.

[53] Planned discharges typically result from required routine operation and maintenance activities that can be scheduled in advance. Planned discharges are easier to control than unplanned discharges, and the BMPs are significantly easier to plan and implement.

[54] Unplanned discharges are non-routine, the result of accidents or incidents that cannot be scheduled or planned for in advance.

[55] Reference for BMPs, monitoring methods: *Guidelines for the Development of Your BMP Manual for Drinking Water System Releases.* Developed by the California-Nevada Sections of the American Water Works Association (CA-NV AWWA), Environmental Compliance Committee (ECC) 2005.

(b) **Notification Requirements**

(i) The Permittees shall notify the Water Board staff at least one week in advance for planned discharges with a flow rate of 250,000 gallons per day or more, or a total volume of 500,000 gallons or more. The Permittees shall also notify other interested parties who may be impacted by planned discharges, such as flood control agencies, downstream jurisdictions, and non-governmental organizations such as creek groups, before discharge. The notification shall include the following information, but is not limited to: (1) project name; (2) type of discharges; (3) receiving waterbody(ies); (4) date of discharge; (5) time of discharge (in military time); (6) estimated volume (gallons); and (7) estimated flow rate (gallons per day); and (8) monitoring plan of the discharges and receiving water. If receiving water monitoring is infeasible or is not practicable, justification shall be provided.

(c) **Monitoring and Reporting Requirements**

(i) The Permittees shall monitor planned discharges for pH, chlorine residual, and turbidity.

(ii) The following discharge benchmarks shall be used to evaluate the effectiveness of BMPs for all planned discharges:

- Chlorine residual 0.05 mg/L using the field test (Standard Methods 4500-Cl F and F) or equivalent
- pH ranges between 6.5 and 8.5
- Turbidity of 50 NTU post-BMPs or limit increase in turbidity above background level as follows:

Receiving Water Background	Incremental Increase
Dry Creek	50 NTU
< 50 NTU	5 NTU
50–100 NTU	10 NTU
> 100 NTU	10% of background

(iii) The Permittees shall submit the following information with the Annual Report in tabular form for all planned discharges. Reporting content shall include, but is not limited to the following parameters: (1) project name; (2) type of discharge; (3) receiving waterbody(ies); (4) date of discharge; (5) duration of discharge (in military time); (6) estimated volume (gallons); (7) estimated flow rate (gallons per day); (8) chlorine residual (mg/L); (9) pH; (10) turbidity (NTU) for receiving water where feasible and point of discharge, and (11) description of implemented BMPs or corrective actions.

(2) **Unplanned Discharges** – Unplanned discharges are non-routine activities such as water line breaks, leaks, overflows, fire hydrant shearing, and emergency flushing. The following requirements only apply to those Permittees that are water purveyors and pertain to their unplanned discharges of potable water to their storm drain systems.

(a) **Required BMPs** – The Permittees shall implement appropriate BMPs for dechlorination and erosion and sediment control for all unplanned discharges upon containing the discharge and attaining safety of the discharge site.

(b) **Administrative BMPs** – In some instances, the Permittees shall implement Administrative BMPs, such as source control measures, managerial practices, operations and maintenance procedures, or other measures to reduce or prevent potential pollutants from being discharged during unplanned discharges upon containing the discharge and attaining safety of the discharge site.

(c) **Notification Requirements**

(i) The Permittees shall report to the State Office of Emergency Services as soon as possible, but no later than two hours after becoming aware of (1) any aquatic impacts (e.g., fish kill) as a result of the unplanned discharges, or (2) when the discharge might endanger or compromise public health and safety.

(ii) The Permittees shall report to Water Board staff, by telephone or email as soon as possible, but no later than 24 hours after becoming aware of any unplanned discharges, where the total chlorine residual is greater than 0.05 mg/L and the total volume is approximately 50,000 gallons or more.

- Within five working days after the 24-hour telephone or email report, the Permittees shall submit a report documenting the discharge and corrective actions taken to Water Board staff and other interested parties.

(d) Monitoring and Reporting Requirements

(i) The Permittees shall monitor at least 10% of their unplanned discharges for pH and chlorine residual, and visually assess each discharge for turbidity immediately downstream of implemented BMPs to demonstrate their effectiveness. After the implementation of appropriate BMPs, the discharge pH levels outside the discharge ranges (below 6.5 and above 8.5), chlorine residual above 0.05 mg/l, or moderate and high turbidity shall trigger BMP improvement. If the Permittees monitor more than 10% of the unplanned discharges, all monitoring results shall be included in the Annual Report.

(ii) The Permittees shall submit the following information with the Annual Report in tabular form for all unplanned discharges. The reporting format and content shall be as described in Provision C.15.b.ii.(1)(c)(iii) of the Planned Discharges above. In addition, these reports shall also state the time of discharge discovery, notification time, inspector arrival time, and responding crew arrival time.

(iii) After 18 months of consecutive data gathering, a Permittee may propose, to the Executive Officer, a reduced monitoring plan targeting specific "high-risk" or "environmentally sensitive"

areas (i.e., areas that are prone to erosion and excess sedimentation at high flows, support rare or endangered species, or provide aquatic habitat with proven effective BMPs). Until the Executive Officer approves the reduced monitoring plan, the Permittee shall continue the monitoring plan prescribed in C.15.b.iii.(2)(d)(i).

(3) **Emergency Discharges** – Emergency discharges are the result of firefighting, unauthorized hydrant openings, natural or man-made disasters (e.g., earthquakes, floods, wildfires, accidents, terrorist actions).

Required BMPs

(a) The Permittees shall implement or require fire fighting personnel to implement BMPs for emergency discharges. However, the BMPs should not interfere with immediate emergency response operations or impact public health and safety. BMPs may include, but are not limited to, the plugging of the storm drain collection system for temporary storage, the proper disposal of water according to jurisdictional requirements, and the use of foam where there may be toxic substances on the property the fire is located.

(b) During emergency situations, priority of efforts shall be directed toward life, property, and the environment (in descending order). The Permittees or fire fighting personnel shall control the pollution threat from their activities to the extent that time and resources allow.

(c) **Reporting Requirements** – Reporting requirements will be determined by Water Board staff on a case-by-case basis, such as for fire incidents at chemical plants.

iv. Discharge Type – Individual Residential Car Washing

Required BMPs

(1) The Permittees shall discourage through outreach efforts individual residential car washing within their jurisdictional areas that discharge directly into their MS4s.

(2) The Permittees shall encourage individuals to direct car wash waters to landscaped areas, use as little detergent as necessary, wash cars at commercial car wash facilities, etc.

v. Discharge Type – Swimming Pool, Hot Tub, Spa, and Fountain Water Discharges

(1) **Required BMPs**

(a) The Permittees shall prohibit discharge of water that contains chlorine residual, copper algaecide, filter backwash or other pollutants to storm drains or to waterbodies. Such polluted discharges from pools, hot tubs, spas, and fountains shall be directed to the sanitary sewer (with the local sanitary sewer agency's approval) or to landscaped areas that can accommodate the volume.

(b) Discharges from swimming pools, hot tubs, spas and fountains shall be allowed into storm drain collection systems only if there are no

other feasible disposal alternatives (e.g., disposal to sanitary sewer or landscaped areas) and if the discharge is properly dechlorinated to non-detectable levels of chlorine consistent with water quality standards.

(c) The Permittees shall require that new or rebuilt swimming pools, hot tubs, spas and fountains within their jurisdictions have a connection[56] to the sanitary sewer to facilitate draining events. The Permittees shall coordinate with local sanitary sewer agencies to determine the standards and requirements necessary for the installation of a sanitary sewer discharge location to allow draining events for pools, hot tubs, spas, and fountains to occur with the proper permits from the local sanitary sewer agency.

(d) The Permittees shall improve their public outreach and educational efforts and ensure implementation of the required BMPs and compliance in commercial, municipal, and residential facilities.

(e) The Permittees shall implement the Illicit Discharge Enforcement Response Plan from C.5.b for polluted (contains chlorine, copper algaecide, filter backwash, or other pollutants) swimming pool, hot tub, spa, or fountain waters that get discharged into the storm drain.

(2) **Reporting** – The Permittees shall keep records of the authorized major discharges of dechlorinated pool, hot tubs, spa and fountain water to the storm drain, including BMPs employed; such records shall be available for inspection by the Water Board.

vi. Discharge Type – Irrigation Water, Landscape Irrigation, and Lawn or Garden Watering

(1) **Required BMPs** – The Permittees shall promote measures that minimize runoff and pollutant loading from excess irrigation via the following:

(a) Promoting and/or working with potable water purveyors to promote conservation programs that minimize discharges from lawn watering and landscape irrigation practices;

(b) Promoting outreach messages regarding the use of less toxic options for pest control and landscape management;

(c) Promoting and/or working with potable water purveyors to promote the use of drought tolerant, native vegetation to minimize landscape irrigation demands;

(d) Promoting and/or working with potable water purveyors to promote outreach messages that encourage appropriate applications of water needed for irrigation and other watering practices; and,

(e) Implementing the Illicit Discharge Enforcement Response Plan from C.5.b, as necessary, for ongoing, large-volume landscape irrigation runoff to their MS4s.

[56] This connection could be a drain in the pool to the sanitary sewer or a sanitary sewer clean out located close enough to the pool so that a hose can readily direct the pool discharge into the sanitary sewer clean out.

(2) **Reporting** – The Permittees shall provide implementation summaries in their Annual Report.

vii. Additional Discharge Types –The Permittees shall identify and describe additional types and categories of discharges not yet listed in Provision C.15.b that they propose to conditionally exempt from Prohibition A.1 in periodic submissions to the Executive Officer. For each such category, the Permittees shall identify and describe, as necessary and appropriate to the category, either documentation that the discharges are not sources of pollutants to receiving waters or circumstances in which they are not found to be sources of pollutants to receiving waters. Otherwise, the Permittees shall describe control measures to eliminate adverse impacts of such sources, procedures and performance standards for their implementation, procedures for notifying the Water Board of these discharges, and procedures for monitoring and record management.

viii. Permit Authorization for Exempted Non-Stormwater Discharges

(1) Discharges of non-stormwater from sources owned or operated by the Permittees are authorized and permitted by this Permit, if they are in accordance with the conditions of this provision.

(2) The Water Board may require dischargers of non-stormwater, other than the Permittees, to apply for and obtain coverage under an NPDES permit and to comply with the control measures pursuant to Provision C.15.b. Non-stormwater discharges that are in compliance with such control measures may be accepted by a Permittee and are not subject to Prohibition A.1.

(3) The Permittees may propose, as part of their annual updates consistent with the requirements of Provision C.15.b of this Permit, additional categories of non-stormwater discharges with BMPs, to be included in the exemption to Prohibition A.1. Such proposals may be subject to approval by the Executive Officer as a minor modification of the Permit.

C.16. Annual Reports

C.16.a. The Permittees shall submit Annual Reports electronically and in paper copy upon request by September 15 of each year. Each Annual Report shall report on the previous fiscal year beginning July 1 and ending June 30. The annual reporting requirements are set forth in Provisions C.1 – C.15. The Permittees shall retain documentation as necessary to support their Annual Report. The Permittees shall make this supporting information available upon request within a timely manner, generally no more that ten business days unless otherwise agreed to by the Executive Officer.

C.16.b. The Permittees shall collaboratively develop a common annual reporting format for acceptance by the Executive Officer by April 1, 2010. The resulting Annual Report Form, once approved, shall be used by all Permittees. The Annual Report Form may be changed by April 1 of each year for the following annual report, to more accurately reflect the reporting requirements of Provisions C.1 – C.15, with the agreement of the Permittees and by the approval of the Executive Officer.

C.16.c. The Permittees shall certify in each Annual Report that they are in compliance with all requirements of the Order. If a Permittee is unable to certify compliance with a requirement, it must submit in the Annual Report the reason for failure to comply, a description and schedule of tasks necessary to achieve compliance, and an estimated date for achieving full compliance.

C.17. Modifications to this Order

This Order may be modified, or alternatively, revoked or reissued, before the expiration date as follows:

C.17.a. To address significant changed conditions identified in the technical or Annual Reports required by the Water Board, or through other means or communication, that were unknown at the time of the issuance of this Order;

C.17.b. To incorporate applicable requirements of statewide water quality control plans adopted by the State Board or amendments to the Basin Plan approved by the State Board; or

C.17.c. To comply with any applicable requirements, guidelines, or regulations issued or approved under section 402(p) of the CWA, if the requirement, guideline, or regulation so issued or approved contains different conditions or additional requirements not provided for in this Order. The Order as modified or reissued under this paragraph shall also contain any other requirements of the CWA then applicable.

C.18. Standard Provisions

Each Permittee shall comply with all parts of the Standard Provisions contained in Attachment K of this Order.

C.19. Expiration Date

This Order expires on November 30, 2014, five years from the effective date of this Order. The Permittees must file a Report of Waste Discharge in accordance with Title 23, California Code of Regulations, not later than 180 days in advance of such date as application for reissuance of waste discharge requirements.

C.20. Rescission of Old Orders

Order Nos. 99-058, 99-059, 01-024, R2-2003-0021, and R2-2003-0034 are hereby rescinded on the effective date of this Order, which shall be December 1, 2009, provided that the Regional Administrator of USEPA, Region IX, does not object.

C.21. Effective Date

The Effective Date of this Order and Permit shall be December 1, 2009, provided that the Regional Administrator of USEPA, Region IX, does not object.

I, Bruce H. Wolfe, Executive Officer, do hereby certify that the foregoing is a full, true, and correct copy of an Order adopted by the California Regional Water Quality Control Board, San Francisco Bay Region, on October 14, 2009.

_____

Bruce H. Wolfe
Executive Officer

Appendix I: Municipal Regional Stormwater Permit Fact Sheet
Attachment A: Provision C.3.b. Sample Reporting Table
Attachment B: Provision C.3.g. Alameda Permittees Hydromodification Requirements
Attachment C: Provision C.3.g. Contra Costa Permittees Hydromodification Requirements
Attachment D: Provision C.3.g. Fairfield-Suisun Permittees Hydromodification Requirements
Attachment E: Provision C.3.g. San Mateo Permittees Hydromodification Requirements
Attachment F: Provision C.3.g. Santa Clara Permittees Hydromodification Requirements
Attachment G: Provision C.3.h. Sample Reporting Table
Attachment H: Provision C.8. Status & Long-Term Monitoring Follow-up Analysis and Actions
Attachment I: Provision C.8. Standard Monitoring Provisions
Attachment J: Provision C.10. Minimum Trash Capture Areas and Minimum Number of Trash Hot Spots
Attachment K: Standard NPDES Stormwater Permit Provisions

ACRONYMS & ABBREVIATIONS

ACCWP	Alameda Countywide Clean Water Program
BAHM	Bay Area Hydrology Model
Basin Plan	Water Quality Control Plan for the San Francisco Bay Basin
BASMAA	Bay Area Stormwater Management Agencies Association
BMPs	Best Management Practices
CASQA	California Stormwater Quality Association
CCC	California Coastal Commission
CCCWP	Contra Costa Clean Water Program
CDFG	California Department of Fish and Game
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CSBP	California Stream Bioassessment Procedures
CWA	Federal Clean Water Act
CWC	California Water Code
DCIA	Directly Connected Impervious Area
ERP	Enforcement Response Plan
FR	Federal Register
GIS	Geographic information System
HBANC	Homebuilders Association of Northern California
HM	Hydromodification Management
HMP	Hydromodification Management Plan
IC/ID	Illicit Connections and Illicit Discharges
IPM	Integrated Pest Management
LID	Low Impact Development
MEP	Maximum Extent Practicable
MRP	Municipal Stormwater Regional Permit
MS4	Municipal Separate Storm Sewer System
MTC	Metropolitan Transportation Commission

NAFSMA	National Association of Flood & Stormwater Management Agencies
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NRDC	Natural Resources Defense Council
O&M	Operation and Maintenance
PBDE	Polybrominated Diphenyl Ether
POTW	Publicly Owned Treatment Works
RCRA	Resource Conservation and Recovery Act
RMP	Regional Monitoring Program
ROWD	Report of Waste Discharge
RTA	Rapid Trash Assessment
SARA	Superfund Amendments and Reauthorization Act
SCURTA	Santa Clara Urban Rapid Trash Assessment
SCVURPPP	Santa Clara Valley Urban Runoff Pollution Prevention Program
SFRWQCB	San Francisco Bay Regional Water Quality Control Board
SIC	Standard Industrial Classification
SMWPPP	San Mateo Countywide Water Pollution Prevention Program
SOP	Standard Operating Procedure
SWAMP	Surface Water Ambient Monitoring Program
SWPPP	Stormwater Pollution Prevention Plan
SWRCB	State Water Resources Control Board
TIE	Toxicity Identification Evaluation
TMDLs	Total Maximum Daily Loads
TSCA	Toxic Substances Control Act
USEPA	Unites States Environmental Protection Agency
Water Board	San Francisco Bay Regional Water Quality Control Board
WLAs	Wasteload Allocations

GLOSSARY

Arterial Roads	Freeways, multilane highways, and other important roadways that supplement the Interstate System. Arterial roads connect, as directly as practicable, principal urbanized areas, cities, and industrial centers.
Beneficial Uses	The uses of water of the state protected against degradation, such as domestic, municipal, agricultural and industrial supply; power generation; recreation; aesthetic enjoyment; navigation and preservation of fish and wildlife, and other aquatic resources or preserves.
Collector Roads	Major and minor roads that connect local roads with arterial roads. Collector roads provide less mobility than arterial roads at lower speeds and for shorter distances.
Commercial Development	Development or redevelopment to be used for commercial purposes, such as office buildings, retail or wholesale facilities, restaurants, shopping centers, hotels, and warehouses.
Construction Site	Any project, including projects requiring coverage under the General Construction Permit, that involves soil disturbing activities including, but not limited to, clearing, grading, paving, disturbances to ground such as stockpiling, and excavation. Construction sites are all sites with disturbed or graded land area not protected by vegetation, or pavement, that are subject to a building or grading permit.
Conditionally Exempted Non-Stormwater Discharge	Non-stormwater discharges that are prohibited by A.1. of this permit, unless such discharges are authorized by a separate NPDES permit or are not in violation of water quality standards because appropriate BMPs have been implemented to reduce pollutants to the maximum extent practicable, consistent with Provision C.15.
Discharger	Any responsible party or site owner or operator within the Permittees' jurisdiction whose site discharges stormwater runoff, or a non-stormwater discharge
Detached Single-family Home Project	The building of one single new house or the addition and/or replacement of impervious surface associated with one single existing house, which is not part of a larger plan of development.
Development	Construction, rehabilitation, redevelopment, or reconstruction of any public or private residential project (whether single-family, multi-unit, or planned unit development); or industrial, commercial, retail or other nonresidential project, including public agency projects.
Estate Residential Development	Development zoned for a minimum 1 acre lot size
Emerging Pollutants	Pollutants in water that either: (1) May not have been thoroughly studied to date but are suspected by the scientific community to be a source of impairment of beneficial uses and/or present a health risk; or (2) Are not yet part of a monitoring program.
Erosion	The diminishing or wearing away of land due to wind, or water. Often the eroded debris (silt or sediment) becomes a pollutant via stormwater runoff. Erosion occurs

	naturally, but can be intensified by land disturbing and grading activities such as farming, development, road building, and timber harvesting.
Full Trash Capture Device	Full trash capture systems are defined as "any device or series of devices that traps all particles retained by a 5mm mesh screen and has a design treatment capacity of not less than the peak flow rate resulting from a one-year, one-hour, storm in the tributary drainage catchment area." Trash collection booms and sea curtains do not meet this definition, but are effective for removal of floating trash if properly maintained. Because these devices do not meet the Full Trash Capture Device definition, only ¼ of the catchment area treated by these measures is credited toward meeting the trash management area requirement of C.10.a.
General Permits	Waste Discharge Requirements or NPDES Permits containing requirements that are applicable to a class or category of dischargers. The State of California has general stormwater permits for construction sites that disturb soil of 1 acre or more; industrial facilities; `Phase II smaller municipalities (including nontraditional Small MS4s, which are governmental facilities, such as military bases, public campuses, and prison and hospital complexes); and small linear underground/overhead projects disturbing at least 1 acre, but less than 5 acres (including trenching and staging areas).
Grading	The cutting and/or filling of the land surface to a slope or elevation.
Hydrologic source control measures	Site design techniques that minimize and/or slow the rate of stormwater runoff from the site.
Hydromodification	The modification of a stream's hydrograph, caused in general by increases in flows and durations that result when land is developed (e.g., made more impervious). The effects of hydromodification include, but are not limited to, increased bed and bank erosion, loss of habitat, increased sediment transport and deposition, and increased flooding.
Illicit Discharge	Any discharge to a municipal separate storm sewer (storm drain) system (MS4) that is prohibited under local, state, or federal statutes, ordinances, codes, or regulations. The term *illicit discharge* includes all non-stormwater discharges not composed entirely of stormwater and discharges that are identified under Section A. (Discharge Prohibitions) of this Permit. The term illicit discharge does not include discharges that are regulated by an NPDES permit (other than the NPDES permit for discharges from the MS4) or authorized by the Regional Water Board Executive Officer.
Impervious Surface	A surface covering or pavement of a developed parcel of land that prevents the land's natural ability to absorb and infiltrate rainfall/stormwater. Impervious surfaces include, but are not limited to, roof tops; walkways; patios; driveways; parking lots; storage areas; impervious concrete and asphalt; and any other continuous watertight pavement or covering. Landscaped soil and pervious pavement, including pavers with pervious openings and seams, underlain with pervious soil or pervious storage material, such as a gravel layer sufficient to hold at least the C.3.d volume of rainfall runoff are not impervious surfaces. Open, uncovered retention/detention facilities shall not be considered as impervious surfaces for purposes of determining whether a project is a Regulated Project under

	Provisions C.3.b. and C.3.g. Open, uncovered retention/detention facilities shall be considered impervious surfaces for purposes of runoff modeling and meeting the Hydromodification Standard.
Industrial Development	Development or redevelopment of property to be used for industrial purposes, such as factories; manufacturing buildings; and research and development parks.
Infill Site	A site in an urbanized area where the immediately adjacent parcels are developed with one or more qualified urban uses or at least 75% of the perimeter of the site adjoins parcels that are developed with qualified urban uses and the remaining 25% of the site adjoins parcels that have previously been developed for qualified urban uses and no parcel within the site has been created within the past 10 years.
Infiltration Device	Any structure that is deeper than wide and designed to infiltrate stormwater into the subsurface, and, as designed, bypass the natural groundwater protection afforded by surface soil. These devices include dry wells, injection wells, and infiltration trenches (includes French drains).
Joint Stormwater Treatment Facility	A stormwater treatment facility built to treat the combined runoff from two or more Regulated Projects located adjacent to each other,
Local Roads	Roads that provide limited mobility and are the primary access to residential areas, businesses, farms, and other local areas. Local roads offer the lowest level of mobility and usually contain no bus routes. Service to through traffic movement usually is deliberately discouraged in local roads.
Maximum Extent Practicable (MEP)	A standard for implementation of stormwater management actions to reduce pollutants in stormwater. Clean Water Act (CWA) 402(p)(3)(B)(iii) requires that municipal stormwater permits "shall require controls to reduce the discharge of pollutants to the maximum extent practicable, including management practices, control techniques and system, design and engineering methods, and such other provisions as the Administrator or the State determines appropriate for the control of such pollutants." Also see State Board Order WQ 2000-11.
Mixed-use Development or Redevelopment	Development or redevelopment of property to be used for two or more different uses, all intended to be harmonious and complementary. An example is a high-rise building with retail shops on the first 2 floors, office space on floors 3 through 10, apartments on the next 10 floors, and a restaurant on the top floor.
Municipal Separate Storm Sewer System (MS4)	A conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, manmade channels, or storm drains), as defined in 40 CFR 122.26(b)(8): (1) Owned or operated by a state, city, town, borough, county, parish, district, association, or other public body (created by or pursuant to State law...including special districts under State law such as a sewer district, flood control district or drainage district, or similar entity, or an Indian tribe or an authorized Indian tribal organization or a designated and approved management agency under section 208 of the CWA) that discharges into waters of the United States; (2) Designed or used for collecting or conveying stormwater; (3) Which is not a combined sewer; and (4) Which is not part of a Publicly Owned Treatment Works (POTW), as defined in

	40 CFR 122.2.
Municipal Corporation Yards, Vehicle Maintenance/Material Storage Facilities/	Any Permittee-owned or -operated facility, or portion thereof, that: (1) Conducts industrial activity, operates or stores equipment, and materials; (2) Performs fleet vehicle service/maintenance including repair, maintenance, washing, or fueling; (3) Performs maintenance and/or repair of machinery/equipment;
National Pollutant Discharge Elimination System (NPDES)	A national program for issuing, modifying, revoking and reissuing, terminating, monitoring and enforcing permits, and imposing and enforcing pretreatment requirements, under sections 307, 402, 318, and 405 of the CWA.
Notice of Intent (NOI)	The application form by which dischargers seek coverage under General Permits, unless the General Permit requires otherwise.
Parking Lot	Land area or facility for the parking or storage of motor vehicles used for business, commerce, industry, or personal use.
Permittee/Permittees	Municipal agency/agencies that are named in and subject to the requirements of this Permit.
Permit Effective Date	The date at least 45 days after Permit adoption, provided the Regional Administrator of U.S. EPA Region 9 has no objection, whichever is later.
Pervious Pavement	Pavement that stores and infiltrates rainfall at a rate equal to immediately surrounding unpaved, landscaped areas, or that stores and infiltrates the rainfall runoff volume described in C.3.d.
Point Source	Any discernible, confined, and discrete conveyance including, but not limited to, any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operations, landfill leachate collection systems, vessel, or other floating craft, from which pollutants are or may be discharged. This term does not include return flows from irrigated agriculture or agricultural stormwater runoff.
Pollutants of Concern	Pollutants that impair waterbodies listed under CWA section 303(d), pollutants associated with the land use type of a development, including pollutants commonly associated with urban runoff. Pollutants commonly associated with stormwater runoff include, but are not limited to, total suspended solids; sediment; pathogens (e.g., bacteria, viruses, protozoa); heavy metals (e.g., copper, lead, zinc, and cadmium); petroleum products and polynuclear aromatic hydrocarbons; synthetic organics (e.g., pesticides, herbicides, and PCBs); nutrients (e.g., nitrogen and phosphorus fertilizers); oxygen-demanding substances (e.g., decaying vegetation and animal waste) litter and trash.
Potable Water	Water that is safe for domestic use, drinking, and cooking.
Pre-Project Runoff Conditions	Stormwater runoff conditions that exist onsite immediately before development activities occur. This definition is not intended to be interpreted as that period before any human-induced land activities occurred. This definition pertains to redevelopment as well as initial development.
Public Development	Any construction, rehabilitation, redevelopment or reconstruction of any public agency project, including but not limited to, libraries, office buildings, roads, and

	highways.
Redevelopment	Land-disturbing activity that results in the creation, addition, or replacement of exterior impervious surface area on a site on which some past development has occurred.
Regional Monitoring Program (RMP)	A monitoring program aimed at determining San Francisco Bay Region receiving water conditions. The program was established in 1993 through an agreement among the Water Board, wastewater discharger agencies, dredgers, Municipal Stormwater Permittees and the San Francisco Estuary Institute to provide regular sampling of Bay sediments, water, and organisms for pollutants. The program is funded by the dischargers and managed by San Francisco Estuary Institute.
Regional Project	A regional or municipal stormwater treatment facility that discharges into the same watershed that the Regulated Project does.
Regulated Projects	Development projects as defined in Provision C.3.b.ii.
Residential Housing Subdivision	Any property development of multiple single-family homes or of dwelling units intended for multiple families/households (e.g., apartments, condominiums, and town homes).
Retrofitting	Installing improved pollution control devices at existing facilities to attain water quality objectives.
Sediments	Soil, sand, and minerals washed from land into water, usually after rain.
Solid Waste	All putrescible and nonputrescible solid, semisolid, and liquid wastes as defined by California Government Code Section 68055.1 (h).
Source Control BMP	Land use or site planning practices, or structural or nonstructural measures, that aim to prevent runoff pollution by reducing the potential for contact with rainfall runoff at the source of pollution. Source control BMPs minimize the contact between pollutants and urban runoff.
Standard Industrial Classification (SIC)	A federal system for classifying establishments by the type of activity in which they are engaged using a four-digit code.
Stormwater Pumping Station	Mechanical device (or pump) that is installed in MS4s or pipelines to discharge stormwater runoff and prevent flooding.
Stormwater Treatment System	Any engineered system designed to remove pollutants from stormwater runoff by settling, filtration, biological degradation, plant uptake, media absorption/adsorption or other physical, biological, or chemical process. This includes landscape-based systems such as grassy swales and bioretention units as well as proprietary systems.
Surface Water Ambient Monitoring Program (SWAMP)	The State Water Board's program to monitor surface water quality; coordinate consistent scientific methods; and design strategies for improving water quality monitoring, assessment, and reporting.
Total Maximum Daily Loads (TMDLs)	The maximum amount of a pollutant that can be discharged into a waterbody from all sources (point and nonpoint) and still maintain water quality standards. Under CWA section 303(d), TMDLs must be developed for all waterbodies that do not meet water quality standards even after application of technology-based controls,

	more stringent effluent limitations required by a state or local authority, and other pollution control requirements such as BMPs.
Toxicity Identification Evaluation (TIE)	TIE is a series of laboratory procedures used to identify the chemical(s) responsible for toxicity to aquatic life. These procedures are designed to decrease, increase, or transform the bioavailable fractions of contaminants to assess their contributions to sample toxicity. TIEs are conducted separately on water column and sediment samples.
Trash and Litter	Trash consists of litter and particles of litter. California Government Code Section 68055.1 (g) defines litter as all improperly discarded waste material, including, but not limited to, convenience food, beverage, and other product packages or containers constructed of steel, aluminum, glass, paper, plastic, and other natural and synthetic materials, thrown or deposited on the lands and waters of the state, but not including the properly discarded waste of the primary processing of agriculture, mining, logging, sawmilling, or manufacturing.
Treatment	Any method, technique, or process designed to remove pollutants and/or solids from polluted stormwater runoff, wastewater, or effluent.
Waste Load Allocations (WLAs)	A portion of a receiving water's TMDL that is allocated to one of its existing or future point sources of pollution.
Water Quality Control Plan (Basin Plan)	The Water Quality Control Plan for the San Francisco Bay Basin (Basin Plan) is the Board's master water quality control planning document. It designates beneficial uses and water quality objectives for waters of the State within the Region, including surface waters and groundwater. It also includes programs of implementation to achieve water quality objectives and discharge prohibitions. The Basin Plan was duly adopted and approved by the State Water Resources Control Board, U.S. EPA, and the Office of Administrative Law where required. The latest version is effective as of December 22, 2006.
Water Quality Objectives	The limits or levels of water quality elements or biological characteristics established to reasonably protect the beneficial uses of water or to prevent pollution problems within a specific area. Water quality objectives may be numeric or narrative.
Water Quality Standards	State-adopted and USEPA-approved water quality standards for waterbodies. The standards prescribe the use of the waterbody and establish the water quality criteria that must be met to protect designated uses. Water quality standards also include the federal and state anti-degradation policy.
Wet Season	October 1 through April 30 of each year

APPENDIX I

MUNICIPAL REGIONAL STORMWATER PERMIT

FACT SHEET

FACT SHEET/RATIONALE
TECHNICAL REPORT

for

ORDER NO. R2-2009-0074

NPDES Permit No. CAS612008

Municipal Regional Stormwater NPDES Permit
and
Waste Discharge Requirements

for

The cities of Alameda, Albany, Berkeley, Dublin, Emeryville, Fremont, Hayward, Livermore, Newark, Oakland, Piedmont, Pleasanton, San Leandro, and Union City, Alameda County, the Alameda County Flood Control and Water Conservation District, and Zone 7 of the Alameda County Flood Control and Water Conservation District, which have joined together to form the Alameda Countywide Clean Water Program

The cities of Clayton, Concord, El Cerrito, Hercules, Lafayette, Martinez, Orinda, Pinole, Pittsburg, Pleasant Hill, Richmond, San Pablo, San Ramon, and Walnut Creek, the towns of Danville and Moraga, Contra Costa County, and the Contra Costa County Flood Control and Water Conservation District, which have joined together to form the Contra Costa Clean Water Program

The cities of Campbell, Cupertino, Los Altos, Milpitas, Monte Sereno, Mountain View, Palo Alto, San Jose, Santa Clara, Saratoga, and Sunnyvale, the towns of Los Altos Hills and Los Gatos, the Santa Clara Valley Water District, and Santa Clara County, which have joined together to form the Santa Clara Valley Urban Runoff Pollution Prevention Program

The cities of Belmont, Brisbane, Burlingame, Daly City, East Palo Alto, Foster City, Half Moon Bay, Menlo Park, Millbrae, Pacifica, Redwood City, San Bruno, San Carlos, San Mateo, and South San Francisco, the towns of Atherton, Colma, Hillsborough, Portola Valley, and Woodside, the San Mateo County Flood Control District, and San Mateo County, which have joined together to form the San Mateo Countywide Water Pollution Prevention Program

The cities of Fairfield and Suisun City, which have joined together to form the Fairfield-Suisun Urban Runoff Management Program

The City of Vallejo and the Vallejo Sanitation and Flood Control District

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I. CONTACT INFORMATION

Water Board Staff Contact: Dale Bowyer, 1515 Clay Street, Suite 1400, Oakland, CA 94612, 510-622-2323, 510-622-2501 (fax), email: dbowyer@waterboards.ca.gov

The Permit and other related documents can be downloaded from the Water Board website at: http://www.waterboards.ca.gov/sanfranciscobay/mrp.htm

Comments can be electronically submitted to mrp@waterboards.ca.gov.

All documents referenced in this Fact Sheet and in the Order are available for public review at the Water Board office, located at the address listed above. Public records are available for inspection during regular business hours, from 9:00 am to 4:00 pm, Monday through Friday, 12 - 1 pm excluded. Per the Governor's order calling for furloughs, the Water Board office will be closed the first three Fridays of each month through June 2010. To schedule an appointment to inspect public records, contact Melinda Wong at 510-622-2430.

II. PERMIT GOALS AND PUBLIC PROCESS

Goals

The Goals for the Municipal Regional Stormwater Permit (hereinafter, the Permit) Development Process include:

1. Consolidate six Phase I municipal stormwater NPDES permits into one consistent permit which is regional in scope.
2. Include more specificity in NPDES permit order language and requirements. Create (A) required stormwater management actions, (B) a specific level of implementation for each action or set of actions, and (C) reporting and effectiveness evaluation requirements for each action sufficient to determine compliance.
3. Incorporate the Stormwater Management Plan level of detail and specificity into the Permit. Stormwater Management Plans have always been considered integral to the municipal stormwater NPDES permits, but have not received the level of public review in the adoption process necessary relative to their importance in adequate stormwater pollutant management implementation.
4. Implement and enhance actions to control 303(d) listed pollutants, pollutants of concern, and achieve Waste Load Allocations adopted under Total Maximum Daily Loads.
5. Implement more specific and comprehensive stormwater monitoring, including monitoring for 303(d) listed pollutants.

Public Process

Water Board staff conducted a series of stakeholder meetings and workshops with the Permittees and other interested parties to develop this Permit over the past 3 years. These meetings included Water Board staff, representatives of the Permittees, representatives of

environmental groups, homebuilders, private citizens, and other interested parties. The following is a summary of the lengthy stakeholder process.

(2004–2005) Water Board staff and the Bay Area Stormwater Management Agencies Association (BASMAA) agreed to develop a municipal regional stormwater permit. Board staff and BASMAA held monthly meetings to agree on the regional permit approach and developed concepts and ground rules for a Steering Committee. The Steering Committee for the Permit began regular monthly meetings, and there was agreement to form work groups to develop options for permit program components in table format.

(2006) Water Board staff, BASMAA, and nongovernmental groups met and discussed the Performance Standard (i.e., actions, implementation levels, and reporting requirements) tables from six workgroups. In addition to the Steering Committee, Work Group Stakeholder meetings focused on the six program elements to complete the Performance Standard Tables and discuss other issues in preparation for creating the first Draft Permit Provisions. Two large public workshops were held in November with all interested stakeholders to discuss Work Group products.

(2007) The Water Board held a public workshop in March to receive public input. Board staff distributed an Administrative Draft Permit dated May 1, 2007, held multiple meetings and received comment.

(2007- 2008) On December 14, 2007, Board staff distributed the Tentative Order for a 77-day written public comment period ending February 29, 2008. A public hearing for oral testimony was held on March 11, 2008. During the remainder of 2008 there were additional meetings with stakeholders, and Board staff worked on revisions to the Tentative Order and produced responses to both written comments received by February 29, 2008, and oral comments received at the March 11, 2008, hearing. The Revised Tentative Order for the MRP was released on February 11, 2009, and a May 13, 2009, hearing before the Water Board was scheduled. Written comments on the revisions to the Tentative Order were received until April 3, 2009.

(2009) After the May 2009 MRP Public Hearing, Water Board staff held numerous meetings with the Permittees (via the Bay Area Stormwater Management Agencies Association) and other key stakeholders including Save the Bay, NRDC, the Northern California Homebuilders, S.F. BayKeeper and the U.S. EPA. These meetings have been focused on discussion of revisions to the MRP Tentative Order in response to comments received, in an effort to resolve issues primarily related to Provisions C.3 New Development, C.8 Monitoring, C.10 Trash Load Reduction, C.11 Mercury Controls, C.12 PCBs Controls, and C.15 Exempt Non-Stormwater Discharges.

Implementation

It is the Water Board's intent that this Permit shall ensure attainment of applicable water quality objectives and protection of the beneficial uses of receiving waters and associated habitat. This Permit requires that discharges shall not cause exceedances of water quality objectives nor shall they cause certain conditions to occur that create a condition of nuisance or water quality impairment in receiving waters. Accordingly, the Water Board is

requiring that these standard requirements be addressed through the implementation of technically and economically feasible control measures to reduce pollutants in stormwater discharges to the maximum extent practicable as provided in Provisions C.1 through C.15 of this Permit and section 402(p) of the CWA. Compliance with the Discharge Prohibitions, Receiving Water Limitations, and Provisions of this Permit is deemed compliance with the requirements of this Permit. If these measures, in combination with controls on other point and nonpoint sources of pollutants, do not result in attainment of applicable water quality objectives, the Water Board may invoke Provision C.1. and may reopen this Permit pursuant to Provisions C.1 and C.15 of this Permit to impose additional conditions that require implementation of additional control measures.

Each of the Permittees is individually responsible for adoption and enforcement of ordinances and policies, for implementation of assigned control measures or best management practices (BMPs) needed to prevent or reduce pollutants in stormwater, and for providing funds for the capital, operation, and maintenance expenditures necessary to implement such control measures/BMPs within its jurisdiction. Each Permittee is also responsible for its share of the costs of the area-wide component of the countywide program to which the Permittee belongs. Enforcement actions concerning non-compliance with the Permit will be pursued against individual Permittee(s) responsible for specific violations of the Permit.

III. BACKGROUND

Early Permitting Approach

The federal Clean Water Act (CWA) was amended in 1987 to address urban stormwater runoff pollution of the nation's waters. One requirement of the amendment was that many municipalities throughout the United States were obligated for the first time to obtain National Pollutant Discharge Elimination System (NPDES) permits for discharges of urban runoff from their Municipal Separate Storm Sewer Systems (MS4s). In response to the CWA amendment (and the pending federal NPDES regulations which would implement the amendment), the Water Board issued a municipal storm water Phase I permits in the early 1990s. These permits were issued to the entire county-wide urban areas of Santa Clara, Alameda, San Mateo and Contra Costa Counties, rather than to individual cities over 100,000 population threshold. The cities chose to collaborate in countywide groups, to pool resources and expertise, and share information, public outreach and monitoring costs, among other tasks.

During the early permitting cycles, the county-wide programs developed many of the implementation specifics which were set forth in their Stormwater Pollution Prevention Management Plans (Plans). The permit orders were relatively simple documents that referred to the stormwater Plans for implementation details. Often specific aspects of permit and Plan implementation evolved during the five year permit cycle, with relatively significant changes approved at the Water Board staff level without significant public review and comment.

Merging Permit Requirements and Specific Requirements Previously Contained in Stormwater Management Plans

US EPA stormwater rules for Phase I stormwater permits envisioned a process in which municipal stormwater management programs contained the detailed BMP and specific level of implementation information, and are reviewed and approved by the permitting agency before the municipal NPDES stormwater permits are adopted. The current and previous permits established a definition of a stormwater management program and required each Permittee to submit an urban runoff management plan and annual work plans for implementing its stormwater management program. An advantage to this approach was that it provided flexibility for Permittees to tailor their stormwater management programs to reflect local priorities and needs. However, Water Board staff found it difficult to determine Permittees' compliance with the current permits, due to the lack of specific requirements and measurable outcomes of some required actions. Furthermore, federal stormwater regulations require that modifications to stormwater management programs, such as annual revisions to urban runoff management plans, be approved through a public process.

Recent court decisions have reiterated that federal regulations and State law require that the implementation specifics of Municipal Stormwater NPDES permits be adopted after adequate public review and comment, and that no significant change in the permit requirements except minor modifications can occur during the permit term without a similar level of public review and comment.

This Permit introduces a modification to these previous approaches by establishing the stormwater management program requirements and defining up front, as part of the Permit Development Process, the minimum acceptable elements of the municipal stormwater management program. The advantages of this approach are that it satisfies the public involvement requirements of both the federal Clean Water Act and the State Water Code. An advantage for Permittees and the public of this approach is that the permit requirements are known at the time of permit issuance and not left to be determined later through iterative review and approval of work plans. While it may still be necessary to amend the Permit prior to expiration, any need to this should be minimized.

This Permit does not include approval of all Permittees' stormwater management programs or annual reports as part of the administration of the Permit. To do so would require significantly increased staff resources. Instead, minimum measures have been established to simplify assessment of compliance and allow the public to more easily assess each Permittee's compliance. Each Permit provision and its reporting requirements are written with this in mind. That is, each provision establishes the required actions, minimum implementation levels (i.e., minimum percentage of facilities inspected annually, escalating enforcement, reporting requirements for tracking projects, number of monitoring sites, etc.), and specific reporting elements to substantiate that these implementation levels have been met. Water Board staff will evaluate each individual Permittee's compliance through annual report review and the audit process.

The challenge in drafting the Permit is to provide the flexibility described above considering the different sizes and resources while ensuring that the Permit is still enforceable. To achieve this, the Permit frequently prescribes minimum measurable

outcomes, while providing Permittees with flexibility in the approaches they use to meet those outcomes. Enforceability has been found to be a critical aspect of the Permit. To avoid these types of situations, a balance between flexibility and enforceability has been crafted into the Permit.

Current Permit Approach

In the previous permit issuances, the detailed actions to be implemented by the Permittees were contained in Stormwater Management Plans, which were separate from the NPDES permits, and incorporated by reference. Because those plans were legally an integral part of the permits and were subject to complete public notice, review and comment, this permit reissuance incorporates those plan level details in the permit, thus merging the Permittees' stormwater management plans into the permit in one document. This Permit specifies the actions necessary to reduce the discharge of pollutants in stormwater to the maximum extent practicable, in a manner designed to achieve compliance with water quality standards and objectives, and effectively prohibit non-stormwater discharges into municipal storm drain systems and watercourses within the Permittees' jurisdictions. This set of specific actions is equivalent to the requirements that in past permit cycles were included in a separate stormwater management plan for each Permittee or countywide group of Permittees. With this permit reissuance, that level of specific compliance detail is integrated into permit language and is not a separate document.

The Permit includes requirements for the following components:

- Municipal Operations
- New Development and Redevelopment
- Industrial and Commercial Site Controls
- Illicit Discharge and Elimination
- Construction Site Controls
- Public Information and Outreach
- Water Quality Monitoring
- Pesticides Toxicity Controls
- Trash Reduction
- Mercury Controls
- PCBs Controls
- Copper Controls
- Polybrominated Diphenyl Ethers (PBDE), Legacy Pesticides, and Selenium
- Exempt and Conditionally Exempt Discharges

IV. ECONOMIC ISSUES

Economic discussions of urban runoff management programs tend to focus on costs incurred by municipalities in developing and implementing the programs. This is appropriate, and these costs are significant and a major issue for the Permittees. However, when considering the cost of implementing the urban runoff programs, it is also important

to consider the alternative costs incurred by not fully implementing the programs, as well as the benefits which result from program implementation.

It is very difficult to ascertain the true cost of implementation of the Permittees' urban runoff management programs because of inconsistencies in reporting by the Permittees. Reported costs of compliance for the same program element can vary widely from Permittee to Permittee, often by a very wide margin that is not easily explained.[57] Despite these problems, efforts have been made to identify urban runoff management program costs, which can be helpful in understanding the costs of program implementation.

In 1999, United States Environmental Protection Agency (USEPA) reported on multiple studies it conducted to determine the cost of urban runoff management programs. A study of Phase II municipalities determined that the annual cost of the Phase II program was expected to be $9.16 per household. USEPA also studied 35 Phase I municipalities, finding costs to be similar to those anticipated for Phase II municipalities, at $9.08 per household annually.[58]

A study on program cost was also conducted by the Los Angeles Regional Water Quality Control Board (LARWQCB), where program costs reported in the municipalities' annual reports were assessed. The LARWQCB estimated that average per household cost to implement the MS4 program in Los Angeles County was $12.50.

The State Water Resources Control Board (State Water Board) also commissioned a study by the California State University, Sacramento to assess costs of the Phase I MS4 program. This study is current and includes an assessment of costs incurred by the City of Encinitas in implementing its program. Annual cost per household in the study ranged from $18-46, with the City of Encinitas representing the upper end of the range.[59] The cost of the City of Encinitas' program is understandable, given the City's coastal location, reliance on tourism, and consent decree with environmental groups regarding its program. For these reasons, as well as the general recognition the City of Encinitas receives for implementing a superior program, the City's program cost can be considered as the high end of the spectrum for Permittee urban runoff management program costs.

It is important to note that reported program costs are not all attributable to compliance with MS4 permits. Many program components, and their associated costs, existed before any MS4 permits were issued. For example, street sweeping and trash collection costs cannot be solely or even principally attributable to MS4 permit compliance, since these practices have long been implemented by municipalities. Therefore, true program cost resulting from MS4 permit requirements is some fraction of reported costs. The California State University, Sacramento study found that only 38% of program costs are new costs fully attributable to MS4 permits. The remainder of program costs were either pre-existing or resulted from enhancement of pre-exiting programs.[60] The County of Orange found that even lesser amounts of program costs are solely attributable to MS4 permit compliance, reporting that the amount attributable to implement its Drainage Area Management Plan, its municipal

[57] LARWQCB, 2003. Review and Analysis of Budget Data Submitted by the Permittees for Fiscal Years 2000-2003.p.2
[58] Federal Register / Vol. 64, No. 235 / Wednesday, December 8, 1999 / Rules and Regulations. P. 68791-68792.
[59] State Water Board, 2005. NPDES Stormwater Cost Survey. P. ii
[60] Ibid. P. 58.

stormwater permit requirements, is less than 20% of the total budget. The remaining 80% is attributable to pre-existing programs.[61]

It is also important to acknowledge that the vast majority of costs that will be incurred as a result of implementing the Order are not new. Urban runoff management programs have been in place in this region for over 15 years. Any increase in cost to the Permittees will be incremental in nature.

Urban runoff management programs cannot be considered in terms of their costs only. The programs must also be viewed in terms of their value to the public. For example, household willingness to pay for improvements in fresh water quality for fishing and boating has been estimated by USEPA to be $158-210.[62] This estimate can be considered conservative, since it does not include important considerations such as marine waters benefits, wildlife benefits, or flood control benefits. The California State University, Sacramento study corroborates USEPA's estimates, reporting annual household willingness to pay for statewide clean water to be $180.[63] When viewed in comparison to household costs of existing urban runoff management programs, these household willingness to pay estimates exhibit that per household costs incurred by Permittees to implement their urban runoff management programs remain reasonable.

Another important way to consider urban runoff management program costs is to consider the implementation cost in terms of costs incurred by not improving the programs. Urban runoff in southern California has been found to cause illness in people bathing near storm drains.[64] A study of south Huntington Beach and north Newport Beach found that an illness rate of about 0.8% among bathers at those beaches resulted in about $3 million annually in health-related expenses.[65] Extrapolation of such numbers to the beaches and other water contact recreation in San Francisco Bay and the tributary creeks of the region could result in huge expenses to the public.

Urban runoff and its impact on receiving waters also places a cost on tourism. the California Division of Tourism has estimated that each out-of-state visitor spends $101.00 a day. The experience of Huntington Beach provides an example of the potential economic impact of poor water quality. Approximately 8 miles of Huntington Beach were closed for two months in the middle of summer of 1999, impacting beach visitation and the local economy.

Finally, it is important to consider the benefits of urban runoff management programs in conjunction with their costs. A recent study conducted by USC/UCLA assessed the costs and benefits of implementing various approaches for achieving compliance with the MS4 permits in the Los Angeles Region. The study found that non-structural systems would cost $2.8 billion but provide $5.6 billion in benefit. If structural systems were determined to be needed, the study found that total costs would be $5.7 to $7.4 billion, while benefits could

[61] County of Orange, 2000. A NPDES Annual Progress Report. P. 60. More current data from the County of Orange is not used in this discussion because the County of Orange no longer reports such information.

[62] Federal Register / Vol. 64, No. 235 / Wednesday, December 8, 1999 / Rules and Regulations. P. 68793.

[63] State Water Board, 2005. NPDES Stormwater Cost Survey. P. iv.

[64] Haile, R.W., et al, 1996. An Epidemiological Study of Possible Adverse Health Effects of Swimming in Santa Monica Bay. Santa Monica Bay Restoration Project.

[65] Los Angeles Times, May 2, 2005. Here's What Ocean Germs Cost You: A UC Irvine Study Tallies the Cost of Treatment and Lost Wages for Beachgoers Who Get Sick.

reach $18 billion.[66] Costs are anticipated to be borne over many years – probably ten years at least. As can be seen, the benefits of the programs are expected to considerably exceed their costs. Such findings are corroborated by USEPA, which found that the benefits of implementation of its Phase II storm water rule would also outweigh the costs.[67]

V. LEGAL AUTHORITY

The following statutes, regulations, and Water Quality Control Plans provide the basis for the requirements of Order No. R2-2009-0074: CWA, California Water Code (CWC), 40 CFR Parts 122, 123, 124 (National Pollutant Discharge Elimination System Permit Application Regulations for Storm Water Discharges, Final Rule), Part II of 40 CFR Parts 9, 122, 123, and 124 (National Pollutant Discharge Elimination System – Regulations for Revision of the Water Pollution Control Program Addressing Storm Water Discharges; Final Rule), Water Quality Control Plan – Ocean Waters of California (California Ocean Plan), Water Quality Control Plan for the San Francisco Bay Basin (Basin Plan), 40 CFR 131Water Quality Standards; Establishment of Numeric Criteria for Priority Toxic Pollutants for the State of California; Rule (California Toxics Rule), and the California Toxics Rule Implementation Plan.

The legal authority citations below generally apply to directives in Order No. R2-2009-0074, and provide the Water Board with ample underlying authority to require each of the directives of Order No. R2-2009-0074.. Legal authority citations are also provided with each permit provision in this Fact Sheet.

CWA 402(p)(3)(B)(ii) – The CWA requires in section 402(p)(3)(B)(ii) that permits for discharges from municipal storm sewers "shall include a requirement to effectively prohibit non-stormwater discharges into the storm sewers."

CWA 402(p)(3)(B)(iii) – The CWA requires in section 402(p)(3)(B)(iii) that permits for discharges from municipal storm sewers "shall require controls to reduce the discharge of pollutants to the maximum extent practicable, including management practices, control techniques and system, design and engineering methods, and such other provisions as the Administrator or the State determines appropriate for the control of such pollutants."

40 CFR 122.26(d)(2)(i)(B,C,E, and F) – Federal NPDES regulations 40 CFR 122.26(d)(2)(i)(B,C,D,E, and F) require that each Permittee's permit application "shall consist of: (i) Adequate legal authority. A demonstration that the applicant can operate pursuant to legal authority established by statute, ordinance or series of contracts which authorizes or enables the applicant at a minimum to: […] (B) Prohibit through ordinance, order or similar means, illicit discharges to the municipal separate storm sewer; (C) Control through ordinance, order or similar means the discharge to a municipal separate storm sewer of spills, dumping or disposal of materials other than storm water; (D) Control through interagency agreements among co-applicants the contribution of pollutants from one portion of the municipal system to another portion of the municipal system; (E) Require compliance with condition in ordinances, permits, contracts or orders; and (F) Carry out all

[66] LARWQCB, 2004. Alternative Approaches to Stormwater Control.
[67] Federal Register / Vol. 64, No. 235 / Wednesday, December 8, 1999 / Rules and Regulations. P. 68791.

inspection, surveillance and monitoring procedures necessary to determine compliance and noncompliance with permit conditions including the prohibition on illicit discharges to the municipal separate storm sewer."

40 CFR 122.26(d)(2)(iv) – Federal NPDES regulation 40 CFR 122.26(d)(2)(iv) requires "a comprehensive planning process which involves public participation and where necessary intergovernmental coordination, to reduce the discharge of pollutants to the maximum extent practicable using management practices, control techniques and system, design and engineering methods, and such other provisions which are appropriate. The program shall also include a description of staff and equipment available to implement the program. […] Proposed programs may impose controls on a system wide basis, a watershed basis, a jurisdiction basis, or on individual outfalls. […] Proposed management programs shall describe priorities for implementing controls."

40 CFR 122.26(d)(2)(iv)(A -D) – Federal NPDES regulations 40 CFR 122.26(d)(2)(iv)(A - D) require municipalities to implement controls to reduce pollutants in urban runoff from new development and significant redevelopment, construction, and commercial, residential, industrial, and municipal land uses or activities. Control of illicit discharges is also required.

CWC 13377 – CWC section 13377 requires that "Notwithstanding any other provision of this division, the state board or the regional boards shall, as required or authorized by the CWA, as amended, issue waste discharge requirements and dredged or fill material permits which apply and ensure compliance with all applicable provisions of the act and acts amendatory thereof or supplementary, thereto, together with anymore stringent effluent standards or limitation necessary to implement water quality control plans, or for the protection of beneficial uses, or to prevent nuisance."

Order No. R2-2009-0074 is an essential mechanism for achieving the water quality objectives that have been established for protecting the beneficial uses of the water resources in the San Francisco Bay Region. Federal NPDES regulation 40 CFR 122.44(d)(1) requires MS4 permits to include any requirements necessary to "achieve water quality standards established under CWA section 303, including State narrative criteria for water quality." The term "water quality standards" in this context refers to a water body's beneficial uses and the water quality objectives necessary to protect those beneficial uses, as established in the Basin Plan.

State Mandates

This Permit does not constitute an unfunded local government mandate subject to subvention under Article XIIIB, Section (6) of the California Constitution for several reasons, including, but not limited to, the following. First, this Permit implements federally mandated requirements under CWA section 402, subdivision (p)(3)(B). (33 U.S.C. § 1342(p)(3)(B).) This includes federal requirements to effectively prohibit non-stormwater discharges, to reduce the discharge of pollutants to the maximum extent practicable, and to include such other provisions as the Administrator or the State determines appropriate for the control of such pollutants. Federal cases have held that these provisions require the development of permits and permit provisions on a case-by-case basis to satisfy federal requirements. (Natural Resources Defense Council, Inc. v. USEPA

(9th Cir. 1992) 966 F.2d 1292, 1308, fn. 17.) The authority exercised under this Permit is not reserved state authority under the CWA's savings clause (cf. Burbank v. State Water Resources Control Bd. (2005) 35 Cal.4th 613, 627-628 [relying on 33 U.S.C. § 1370, which allows a state to develop requirements that are not less stringent than federal requirements]), but instead, is part of a federal mandate to develop pollutant reduction requirements for MS4. To this extent, it is entirely federal authority that forms the legal basis to establish the permit provisions. (See, City of Rancho Cucamonga v. Regional Water Quality Control Bd.-Santa Ana Region (2006) 135 Cal.App.4th 1377, 1389; Building Industry Association of San Diego County v. State Water Resources Control Bd. (2004) 124 Cal.App.4th 866, 882-883.)

Likewise, the provisions of this Permit to implement total maximum daily loads (TMDLs) are federal mandates. The CWA requires TMDLs to be developed for waterbodies that do not meet federal water quality standards. (33 U.S.C. § 1313(d).) Once USEPA or a state develops a TMDL, federal law requires that permits must contain effluent limitations consistent with the assumptions of any applicable WLA. (40 CFR 122.44(d)(1)(vii)(B).)

Second, the local agencies' (Permittees') obligations under this Permit are similar to, and in many respects less stringent than, the obligations of nongovernmental dischargers who are issued NPDES permits for stormwater discharges. With a few inapplicable exceptions, the CWA regulates the discharge of pollutants from point sources (33 U.S.C. § 1342) and the Porter-Cologne regulates the discharge of waste (Water Code, section 13263), both without regard to the source of the pollutant or waste. As a result, the costs incurred by local agencies to protect water quality reflect an overarching regulatory scheme that places similar requirements on governmental and nongovernmental dischargers. (See County of Los Angeles v. State of California (1987) 43 Cal.3d 46, 57-58 [finding comprehensive workers compensation scheme did not create a cost for local agencies that was subject to state subvention].)

The CWA and the Porter-Cologne Water Quality Control Act largely regulate stormwater with an even hand, but to the extent that there is any relaxation of this evenhanded regulation, it is in favor of the local agencies. Except for MS4s, the CWA requires point source dischargers, including discharges of stormwater associated with industrial or construction activity, to comply strictly with water quality standards. (33 U.S.C. § 1311(b)(1)(C), Defenders of Wildlife v. Browner (1999) 191 F.3d 1159, 1164-1165 [noting that industrial stormwater discharges must strictly comply with water quality standards].) As discussed in prior State Water Board decisions, this Permit does not require strict compliance with water quality standards. (SWRCB Order No. WQ 2001-15, p. 7.) The Permit, therefore, regulates the discharge of waste in municipal stormwater more leniently than the discharge of waste from nongovernmental sources.

Third, the Permittees have the authority to levy service charges, fees, or assessments sufficient to pay for compliance with this Permit. The fact sheet demonstrates that numerous activities contribute to the pollutant loading in the MS4. Permittees can levy service charges, fees, or assessments on these activities, independent of real property ownership. (See, e.g., Apartment Association of Los Angeles County, Inc. v. City of Los Angeles (2001) 24 Cal.4th 830, 842 [upholding inspection fees associated with renting property].) The ability of a local agency to defray the cost of a program without raising

taxes indicates that a program does not entail a cost subject to subvention. (County of Fresno v. State of California (1991) 53 Cal.3d 482, 487-488.)

Fourth, the Permittees have requested permit coverage in lieu of compliance with the complete prohibition against the discharge of pollutants contained in CWA section 301, subdivision (a) (33 U.S.C. § 1311(a)) and in lieu of numeric restrictions on their discharges. To the extent Permittees have voluntarily availed themselves of the Permit, the program is not a state mandate. (Accord County of San Diego v. State of California (1997) 15 Cal.4th 68, 107-108.) Likewise, the Permittees have voluntarily sought a program-based municipal stormwater permit in lieu of a numeric limits approach. (See City of Abilene v. USEPA (5th Cir. 2003) 325 F.3d 657, 662-663 [noting that municipalities can choose between a management permit or a permit with numeric limits].) The Permittees' voluntary decision to file a report of waste discharge proposing a program-based permit is a voluntary decision not subject to subvention. (See Environmental Defense Center v. USEPA (9th Cir. 2003) 344 F.3d 832, 845-848.)

Fifth, the Permittees' responsibility for preventing discharges of waste that can create conditions of pollution or nuisance from conveyances that are within their ownership or control under State law predates the enactment of Article XIIIB, Section (6) of the California Constitution.

This Permit is based on the federal CWA, the Porter-Cologne Water Quality Control Act (Division 7 of the CWC, commencing with Section 13000), applicable State and federal regulations, all applicable provisions of statewide Water Quality Control Plans and Policies adopted by the State Water Board, the Basin Plan, the California Toxics Rule, and the California Toxics Rule Implementation Plan.

Discussion: In 1987, Congress established CWA Amendments to create requirements for storm water discharges under the NPDES program, which provides for permit systems to regulate the discharge of pollutants. Under the Porter-Cologne Water Quality Control Act, the State Water Board and Regional Water Quality Control Boards (Water Boards) have primary responsibility for the coordination and control of water quality, including the authority to implement the CWA. Porter-Cologne (section 13240) directs the Water Boards to set water quality objectives via adoption of Basin Plans that conform to all state policies for water quality control. As a means for achieving those water quality objectives, Porter-Cologne (section 13243) further authorizes the Water Boards to establish waste discharge requirements (WDRs) to prohibit waste discharges in certain conditions or areas. Since 1990, the Water Board has issued area-wide MS4 NPDES permits. The Permit will re-issue Order Nos. 99-058, 99-059, 01-024, R2-2003-0021, R2-2003-0034 to comply with the CWA and attain water quality objectives in the Basin Plan by limiting the contributions of pollutants conveyed by urban runoff. Further discussions of the legal authority associated with the prohibitions and directives of the Permit are provided in section V. of this document.

This Permit supersedes NPDES Permit Nos. CAS029718, CAS029831, CAS029912, CAS029921, CAS612005, and CAS612006.

Basin Plan

The Urban Runoff Management, Comprehensive Control Program section of the Basin Plan requires the Permittees to address existing water quality problems and prevent new problems associated with urban runoff through the development and implementation of a comprehensive control program focused on reducing current levels of pollutant loading to storm drains to the maximum extent practicable. The Basin Plan comprehensive program requirements are designed to be consistent with federal regulations (40 CFR Parts 122-124) and are implemented through issuance of NPDES permits to owners and operators of MS4s. A summary of the regulatory provisions is contained in Title 23 of the California Code of Regulations at section 3912. The Basin Plan identifies beneficial uses and establishes water quality objectives for surface waters in the Region, as well as effluent limitations and discharge prohibitions intended to protect those uses. This Permit implements the plans, policies, and provisions of the Water Board's Basin Plan.

Statewide General Permits

The State Water Board has issued NPDES general permits for the regulation of stormwater discharges associated with industrial activities and construction activities. To effectively implement the New Development (and significant redevelopment) and Construction Controls, Illicit Discharge Controls, and Industrial and Commercial Discharge Controls components in this Permit, the Permittees will conduct investigations and local regulatory activities at industrial and construction sites covered by these general permits. However, under the CWA, the Water Board cannot delegate its own authority to enforce these general permits to the Permittees. Therefore, Water Board staff intends to work cooperatively with the Permittees to ensure that industries and construction sites within the Permittees' jurisdictions are in compliance with applicable general permit requirements and are not subject to uncoordinated stormwater regulatory activities.

Regulated Parties

Each of the Permittees listed in this Permit owns or operates a MS4, through which it discharges urban runoff into waters of the United States within the San Francisco Bay Region. These MS4s fall into one or more of the following categories: (1) a medium or large MS4 that services a population of greater than 100,000 or 250,000 respectively; or (2) a small MS4 that is "interrelated" to a medium or large MS4; or (3) an MS4 which contributes to a violation of a water quality standard; or (4) an MS4 which is a significant contributor of pollutants to waters of the United States.

Permit Coverage

The Permittees each have jurisdiction over and maintenance responsibility for their respective MS4s in the Region. Federal, State or regional entities within the Permittees' boundaries, not currently named in this Permit, operate storm drain facilities and/or discharge stormwater to the storm drains and watercourses covered by this Permit. The Permittees may lack jurisdiction over these entities. Consequently, the Water Board recognizes that the Permittees should not be held responsible for such facilities and/or discharges. The Water Board will consider such facilities for coverage under NPDES permitting pursuant to USEPA Phase II stormwater regulations. Under Phase II, the Water

Board intends to permit these federal, State, and regional entities through use of a Statewide Phase II NPDES General Permit.

Discussion: Section 402 of the CWA prohibits the discharge of any pollutant to waters of the United States from a point source, unless that discharge is authorized by a NPDES permit. Though urban runoff comes from a diffuse source, it is discharged through MS4s, which are point sources under the CWA. Federal NPDES regulation 40 CFR 122.26(a) (iii) and (iv) provide that discharges from MS4s, which service medium or large populations greater than 100,000 or 250,000 respectively, shall be required to obtain a NPDES permit. Federal NPDES regulation 40 CFR 122.26(a)(v) also provides that a NPDES permit is required for "A [storm water] discharge which the Director, or in States with approved NPDES programs, either the Director or the USEPA Regional Administrator, determines to contribute to a violation of a water quality standard or is a significant contributor of pollutants to waters of the United States." Such sources are then designated into the program.

VI. PERMIT PROVISIONS

A. Discharge Prohibitions

Prohibition A.1. Legal Authority – CWA 402(p)(3)(B)(ii) – The CWA requires in section 402(p)(3)(B)(ii) that permits for discharges from municipal storm sewers "shall include a requirement to effectively prohibit non-stormwater discharges into the storm sewers."

Prohibition A.2. Legal Authority – San Francisco Bay Basin Plan, 2006 Revision, Chapter 4 Implementation, Table 4-1, Prohibition 7.

B. Receiving Water Limitations

Receiving Water Limitation B.1. Legal Authority – Receiving Water Limitations are retained from previous Municipal Stormwater Runoff NPDES permits. They reflect applicable water quality standards from the Basin Plan.

Receiving Water Limitation B.2. Legal Authority – Receiving Water Limitations are retained from previous Municipal Stormwater Runoff NPDES permits. They reflect applicable water quality standards from the Basin Plan.

C. Provisions

C.1. Compliance with Discharge Prohibitions and Receiving Water Limitations

Legal Authority

Broad Legal Authority: CWA sections 402(p)(3)(B)(ii-iii), CWC section 13377, and Federal NPDES regulations 40 CFR 122.26(d)(2)(i)(B, C, E, and F) and 40 CFR 122.26(d)(2)(iv).

Specific Legal Authority: The Water Board's Water Quality Control Plan for the San Francisco Bay Basin (Basin Plan) contains the following waste discharge prohibition: "The discharge of waste to waters of the state in a manner causing, or threatening to cause a condition of pollution, contamination, or nuisance as defined in California Water Code Section 13050, is prohibited."

California Water Code section 13050(l) states "(1) 'Pollution' means an alteration of the quality of waters of the state by waste to a degree which unreasonably affects either of the following: (A) The water for beneficial uses. (B) Facilities which serve beneficial uses. (2) 'Pollution' may include "contamination."

California Water Code section 13050(k) states "'Contamination' means an impairment of the quality of waters of the state by waste to a degree which creates a hazard to public health through poisoning or through the spread of disease. 'Contamination' includes any equivalent effect resulting from the disposal of waste, whether or not waters of the state are affected."

California Water Code section 13050(m) states "'Nuisance' means anything which meets all of the following requirements: (1) Is injurious to health, or is indecent or offensive to the senses, or an obstruction to the free use of property, so as to interfere with the comfortable enjoyment of life or property. (2) Affects at the same time an entire community or neighborhood, or any considerable number of persons, although the extent of the annoyance or damage inflicted upon individuals may be unequal. (3) Occurs during, or as a result of, the treatment or disposal of wastes."

California Water Code section 13241 requires each water board to "establish such water quality objectives in water quality control plans as in its judgment will ensure the reasonable protection of beneficial uses and the prevention of nuisance […]."

California Water Code Section 13243 provides that a water board, "in a water quality control plan or in waste discharge requirements, may specify certain conditions or areas where the discharge of waste, or certain types of waste, will not be permitted."

California Water Code Section 13263(a) provides that waste discharge requirements prescribed by the water board implement the Basin Plan.

Federal NPDES regulations 40 CFR 122.26(d)(2)(iv)(A -D) require municipalities to implement controls to reduce pollutants in urban runoff from commercial, residential, industrial, and construction land uses or activities.

Federal NPDES regulations 40 CFR 122.26(d)(2)(i)(A -D) require municipalities to have legal authority to control various discharges to their MS4.

Federal NPDES regulation 40 CFR 122.44(d)(1) requires municipal storm water permits to include any requirements necessary to "[a]chieve water quality standards established under section 303 of the CWA, including State narrative criteria for water quality."

Federal NPDES regulation 40 CFR 122.44(d)(1)(i) requires NPDES permits to include limitations to "control all pollutants or pollutant parameters (either conventional, nonconventional, or toxic pollutants) which the Director determines are or may be discharged at a level which will cause, have reasonable potential to cause, or contribute to an excursion above any State water quality standard, including State narrative criteria for water quality."

State Water Resources Control Board ("State Water Board") Order WQ 1999-05, is a precedential order requiring that municipal stormwater permits achieve water quality standards and water quality standard based discharge prohibitions through the implementation of control measures, by which Permittees' compliance with the permit can be determined. The State Water Board Order specifically requires that Provision C.1 include language that Permittees shall comply with water quality standards based discharge prohibitions and receiving water limitations through timely implementation of control measures and other actions to reduce pollutants in the discharges. State Water Board Order WQ 2001-15 refines Order 1999-05 by requiring an iterative approach to compliance with water quality standards that involves ongoing assessments and revisions.

C.2. Municipal Operations

Legal Authority

The following legal authority applies to Provision C.2:

Broad Legal Authority: CWA sections 402(p)(3)(B)(ii-iii), California Water Code (CWC) section 13377, and Federal NPDES regulations 40 CFR 122.26(d)(2)(i)(B, C, E, and F) and 40 CFR 122.26(d)(2)(iv).

Specific Legal Authority: Federal NPDES regulation 40 CFR 122.26(d)(2)(iv)(A)(1) requires, "A description of maintenance activities and a maintenance schedule for structural controls to reduce pollutants (including floatables) in discharges from municipal separate storm sewers."

Federal NPDES regulation 40 CFR 122.26(d)(2)(iv)(A)(3) requires, "A description for operating and maintaining public streets, roads and highways and procedures for reducing the impact on receiving waters of discharges from municipal storm sewer systems, including pollutants discharged as a result of deicing activities."

Federal NPDES regulation 40 CFR 122.26(d)(2)(iv)(A)(4) requires, "A description of procedures to assure that flood management projects assess the impacts on the water quality of receiving waterbodies and that existing structural flood control devices have been evaluated to determine if retrofitting the device to provide additional pollutant removal from storm water is feasible."

Federal NPDES regulation 40 CFR 122.26(d)(2)(iv)(A)(5) requires, "A description of a program to monitor pollutants in runoff from operating or closed municipal landfills or other treatment, storage or disposal facilities for municipal waste, which shall identify priorities and procedures for inspections and establishing and implementing control measures for such discharges."

Federal NPDES regulation 40 CFR 122.26(d)(2)(iv)(A)(6) requires, "A description of a program to reduce to the maximum extent practicable, pollutants in discharges from municipal separate storm sewers associated with the application of pesticides, herbicides, and fertilizer which will include, as appropriate, controls such as educational activities, permits, certifications, and other measures for commercial applicators and distributors, and controls for application in public right-of-ways and at municipal facilities."

Federal NPDES regulation 40 CFR 122.44(d)(1)(i) requires NPDES permits to include limitations to "control all pollutants or pollutant parameters (either conventional, nonconventional, or toxic pollutants) which the Director determines are or may be discharged at a level which will cause, have reasonable potential to cause, or contribute to an excursion above any State water quality standard, including State narrative criteria for water quality."

Fact Sheet Findings in Support of Provision C.2

C.2-1 Municipal maintenance activities are potential sources of pollutants unless appropriate inspection, pollutant source control, and cleanup measures are implemented during routine maintenance works to minimize pollutant discharges to storm drainage facilities.

Sediment accumulated on paved surfaces, such as roads, parking lots, parks, sidewalks, landscaping, and corporation yards, is the major source of point source pollutants found in urban runoff. Thus, Provision C.2 requires the Permittees to designate minimum BMPs for all municipal facilities and activities as part of their ongoing pollution prevention efforts as set forth in this Permit. Such prevention measures include, but are not limited to, activities as described below. The work of municipal maintenance personnel is vital to minimize stormwater pollution, because personnel work directly on municipal storm drains and other municipal facilities. Through work such as inspecting and cleaning storm drain drop inlets and pipes and conducting municipal construction and maintenance activities upstream of the storm drain, municipal maintenance personnel are directly responsible for preventing and removing pollutants from the storm drain. Maintenance personnel also play an important role in educating the public and in reporting and cleaning up illicit discharges.

C.2-2 Road construction and other activities can disturb the soil and drainage patterns to streams in undeveloped areas, causing excess runoff and thereby erosion and the release of sediment. In particular, poorly designed roads can act as man-made drainages that carry runoff and sediment into natural streams, impacting water quality.

Provision C.2 also requires the Permittees to implement effective BMPs for the following rural works maintenance and support activities: (a) Road design, construction, maintenance, and repairs in rural areas that prevent and control road-related erosion and sediment transport; (b)Identification and prioritization of rural roads maintenance on the basis of soil erosion potential, slope steepness, and stream habitat resources; (c) Road and culvert construction designs that do not impact creek functions. New or replaced culverts shall not create a migratory fish passage barrier, where migratory fish are present, or lead to stream instability; (d) Development and implement an inspection program to maintain roads structural integrity and prevent impacts on water quality; (e) Provide adequate maintenance of rural roads adjacent to streams and riparian habitat to reduce erosion, replace damaging shotgun culverts, re-grade roads to slope outward where consistent with road engineering safety standards, and install water bars; and (f) When replacing existing culverts or redesigning new culverts or bridge crossings use measures to reduce erosion, provide fish passage and maintain natural stream geomorphology in a stable manner.

Road construction, culvert installation, and other rural maintenance activities can disturb the soil and drainage patterns to streams in undeveloped areas, causing excess runoff and thereby erosion and the release of sediment. Poorly

designed roads can act as preferential drainage pathways that carry runoff and sediment into natural streams, impacting water quality. In addition, other rural public works activities, including those the BMP approach would address, have the potential to significantly affect sediment discharge and transport within streams and other waterways, which can degrade the beneficial uses of those waterways. This Provision would help ensure that these impacts are appropriately controlled.

Specific Provision C.2 Requirements

Provision C.2.a-f. (Operation and Maintenance of Municipal Separate Storm Sewer Systems (MS4) facilities) requires that the Permittees implement appropriate pollution control measures during maintenance activities and to inspect and, if necessary, clean municipal facilities such as conveyance systems, pump stations, and corporation yards, before the rainy season. The requirements will assist the Permittees to prioritize tasks, implement appropriate BMPs, evaluate the effectiveness of the implemented BMPs, and compile and submit annual reports.

Provision C.2.d. (Stormwater Pump Stations) In late 2005, Board staff investigated the occurrence of low salinity and dissolved oxygen conditions in Old Alameda Creek (Alameda County) and Alviso Slough (Santa Clara County) in September and October of 2005. Board staff became aware of this problem in their review of receiving water and discharge sampling conducted by the U.S. Geological Survey as part of its routine monitoring on discharges associated with the former salt ponds managed by the U.S. Fish and Wildlife Service in Santa Clara County and the California Department of Fish and Game in Alameda County.

In the case of Old Alameda Creek, discharge of black-colored water from the Alvarado pump station to the slough was observed at the time of the data collection on September 7, 2005, confirming dry weather urban runoff as the source of the documented violations of the 5 mg/L dissolved oxygen water quality objective. Such conditions were measured again on September 21, 2005.

On October 17, 2005, waters in Alviso Slough were much less saline than the salt ponds and had the lowest documented dissolved oxygen of the summer, suggesting a dry weather urban runoff source. The dissolved oxygen sag was detected surface to bottom at 2.3 mg/L at a salinity of less than 1 part per thousand (ppt), mid-day, when oxygen levels should be high at the surface. The sloughs have a typical depth of 6 feet.

Board staff's investigations of these incidents, documented in a memorandum,[68] found that "storm water pump stations, universally operated by automatic float triggers, have been confirmed as the cause in at least one instance, and may represent an overlooked source of controllable pollution to the San Francisco Bay Estuary and its tidal sloughs. . . . the discharges of dry weather urban runoff from these pump stations are not being

[68] Internal Water Board Memo dated December 2, 2005: "Dry Weather Urban Weather Urban Runoff Causing or Contributing to Water Quality Violations: Low Dissolved Oxygen (DO) in Old Alameda Creek and Alviso Slough"

managed to protect water quality, and [that] surveillance monitoring has detected measurable negative water quality consequences of this current state of pump station management."

Pump station discharges of dry weather urban runoff can cause violations of water quality objectives. These discharges are controllable point sources of pollution that are virtually unregulated. The Water Board needs a complete inventory of dry weather urban runoff pump stations and to require BMP development and implementation for these discharges now. In the long term, Water Board staff should prioritize the sites from the regional inventory for dry weather diversion to sanitary sewers and encourage engineering feasibility studies to accomplish the diversions in a cost-effective manner. Structural treatment alternatives should be explored for specific pump stations.

To address the short term goals identified in the previous paragraph, Provision C.2.g. requires the Permittees to implement the following measures to reduce pollutant discharges to stormwater runoff from Permittee-owned or operated pump stations:

1. Establish an inventory of pump stations within each Permittee's jurisdiction, including pump station locations and key characteristics, and inspection frequencies.
2. Inspect these pump stations regularly, but at least two times a year, to address water quality problems, including trash control and sediment and debris removal.
3. Inspect trash racks and oil absorbent booms at pump stations in the first business day after ¼-inch within 24 hours and larger storm events. Remove debris in trash racks and replace oil absorbent booms, as needed.

C.3. New Development and Redevelopment

Legal Authority

Broad Legal Authority: CWA Sections 402(p)(3)(B)(ii-iii), CWA Section 402(a), CWC Section 13377, and Federal NPDES regulations 40 CFR 122.26(d)(2)(i)(B, C, E, and F), 40 CFR 131.12, and 40 CFR 122.26(d)(2)(iv).

Fact Sheet Findings in Support of Provision C.3

C.3-1 Urban development begins at the land use planning phase; therefore, this phase provides the greatest cost-effective opportunities to protect water quality in new development and redevelopment. When a Permittee incorporates policies and principles designed to safeguard water resources into its General Plan and development project approval processes, it has taken a critical step toward the preservation and most of local water resources for current and future generations.

C.3-2 Provision C.3. is based on the assumption that Permittees are responsible for considering potential stormwater impacts when making planning and land use decisions. The goal of Provision C.3. is for Permittees to use their planning authority to include appropriate source control, site design, and stormwater treatment measures to address both soluble and insoluble stormwater runoff pollutant discharges and prevent increases in runoff flow from new development and redevelopment projects. This goal is to be accomplished primarily through the implementation of low impact development (LID) techniques. Neither Provision C.3. nor any of its requirements are intended to restrict or control local land use decision-making authority.

C.3-3 Certain control measures implemented or required by Permittees for urban runoff management might create a habitat for vectors (e.g., mosquitoes and rodents) if not properly designed or maintained. Close collaboration and cooperative efforts among Permittees, local vector control agencies, Water Board staff, and the State Department of Public Health are necessary to minimize potential nuisances and public health impacts resulting from vector breeding.

C.3-4 The Water Board recognized in its Policy on the Use of Constructed Wetlands for Urban Runoff Pollution Control (Resolution No. 94-102) that urban runoff treatment wetlands that are constructed and operated pursuant to that Resolution and are constructed outside a creek or other receiving water are stormwater treatment systems and, as such, are not waters of the United States subject to regulation pursuant to Sections 401 or 404 of the federal Clean Water Act. Water Board staff is working with the California Department of Fish and Game (CDFG) and U.S. Fish and Wildlife Service (USFWS) to identify how maintenance for stormwater treatment controls required under permits such as this Permit can be appropriately streamlined, given CDFG and USFWS requirements, and particularly those that address special status species. This Permit requires Permittees to ensure that constructed wetlands installed by

Regulated Projects are consistent with Resolution No. 94-102 and the operation and maintenance requirements contained therein.

C.3-5 The Permit requires Permittees to ensure that onsite, joint, and offsite stormwater treatment systems and HM controls installed by Regulated Projects are properly operated and maintained for the life of the projects. In cases where the responsible parties for the treatment systems or HM controls have worked diligently and in good faith with the appropriate state and federal agencies to obtain approvals necessary to complete maintenance activities for the treatment systems or HM controls, but these approvals are not granted, the Permittees shall be considered by the Water Board to be in compliance with Provision C.3.h.iii. of the Permit.

Specific Provision C.3 Requirements

Provision C.3.a. (New Development and Redevelopment Performance Standard Implementation) sets forth essentially the same legal authority, development review and permitting, environmental review, training, and outreach requirements that are contained in the existing permits. This Provision also requires the Permittees to encourage all projects not regulated by Provision C.3., but that are subject to the Permittees' planning, building, development , or other comparable review, to include adequate source control and site design measures, which include discharge of appropriate wastestreams to the sanitary sewer, subject to the local sanitary agency's authority and standards. Lastly, this Provision requires Permittees to revise, as necessary, their respective General Plans to integrate water quality and watershed protection with water supply, flood control, habitat protection, groundwater recharge, and other sustainable development principles and policies. Adequate implementation time has been allocated to Provisions C.3.a.i.(6)-(8), which may be considered new requirements.

Provision C.3.b. (Regulated Projects) establishes the different categories of new development and redevelopment projects that Permittees must regulate under Provision C.3. These categories are defined on the basis of the land use and the amount of impervious surface created and/or replaced by the project because all impervious surfaces contribute pollutants to stormwater runoff and certain land uses contribute more pollutants. Impervious surfaces can neither absorb water nor remove pollutants as the natural, vegetated soil they replaced can. Also, urban development creates new pollution by bringing higher levels of car emissions that are aerially deposited, car maintenance wastes, pesticides, household hazardous wastes, pet wastes, and trash, which can all be washed into the storm sewer.

Provision C.3.b.ii.(1) lists Special Land Use Categories that are already regulated under the current stormwater permits. Therefore, extra time is not necessary for the Permittees to comply with this Provision, so the Permit Effective Date is set as the required implementation date. For these categories, the impervious surface threshold (for classification as a Regulated Project subject to Provision C.3.) will be decreased from the current 10,000 ft^2 to 5,000 ft^2 beginning two years from the Permit Effective Date. These special land use categories represent land use types

that may contribute more polluted stormwater runoff. Regulation of these special land use categories at the lower impervious threshold of 5,000 square feet is considered the maximum extent practicable and is consistent with State Board guidance, court decisions, and other Water Boards' requirements. In the precedential decision contained in its WQ Order No. 2000-11, the State Board upheld the SUSMP (Standard Urban Stormwater Mitigation Plan) requirements issued by the Los Angeles Water Board's Executive Officer on March 8, 2000, and found that they constitute MEP for addressing pollutant discharges resulting from Priority Development Projects. The State Board re-affirmed that SUSMP requirements constitute MEP in their Order WQ 2001-15. Provision C.3.b.ii.(1)'s requirement that development projects in the identified Special Land Use Categories adding and/or replacing > 5000 ft^2 of impervious surface shall install hydraulically sized stormwater treatment systems is consistent with the SUSMP provisions upheld by the State Board. Provision C.3.b.ii.(1) is also consistent with Order No. R9-2007-0001 issued by the San Diego Water Board, Order Nos. R4-2009-0057 and R4-2001-182 issued by the Los Angeles Water Board, Order No. 2009-0030 issued by the Santa Ana Water Board, and State Board's Order WQ 2003-0005 issued to Phase II MS4s. Under Order WQ 2003-0005, Phase II MS4s with populations of 50,000 and greater must apply the lower 5000 ft^2 threshold for requiring stormwater treatment systems by April 2008. The MRP allows two years from the MRP effective date for the Permittees to implement the lower 5000 ft^2 threshold for the special land use categories, three and half years later than the Phase II MS4s. However, the additional time is necessary for the Permittees to revise ordinances and permitting procedures and conduct training and outreach.

This Provision contains a "grandfathering" clause, which allows any private development project in a special land use category for which a planning application has been deemed complete by a Permittee on or before the Permit effective date to be exempted from the lower 5,000 square feet impervious surface threshold (for classification as a Regulated Project) as long as the project applicant is diligently pursuing the project. Diligent pursuance may be demonstrated by the project applicant's submittal of supplemental information to the original application, plans, or other documents required for any necessary approvals of the project by the Permittee. If during the time period between the Permit effective date and the required implementation date of December 1, 2011, for the 5000 square feet threshold, the project applicant has not taken any action to obtain the necessary approvals from the Permittee, the project will then be subject to the lower 5000 square feet impervious surface threshold specified in Provision C.3.b.ii.(1).

For any private development project in a special land use category with an application deemed complete after the Permit effective date, the lower 5000 square feet impervious surface threshold (for classification as a Regulated Project) shall not apply if the project applicant has received final discretionary approval for the project before the required implementation date of December 1, 2011 for the 5000 square feet threshold.

Previous stormwater permits also used the "application deemed complete" date as the date for determining Provision C.3. applicability, but it was tied to the implementation date for new requirements and not the Permit effective date. The Permit Streamlining Act requires that a public agency must determine whether a permit application is complete within 30 days after receipt; if the public agency does not make this determination, the application is automatically deemed complete after 30 days. Data we have collected from audits and file reviews as well as reported to us by Permittees confirm that in many cases, the development permit applications have indeed not been reviewed for compliance with Provision C.3. requirements and yet have automatically been deemed complete 30 days after the application submittal date. As soon as the Permit is adopted, there is certainty about any new requirements that must be implemented during the Permit term. Therefore, the "application deemed complete" date should only be used to exempt projects that have reached this milestone by the Permit effective date and not years later at a new requirement's implementation date. However, this change requires consideration of those applications that are deemed complete after the Permit effective date. Because there is certainty with regard to new requirements as soon as the Permit becomes effective, we have tied the "final discretionary approval" date to a new requirement's implementation date for determining whether to exempt the projects with applications deemed complete after the Permit effective date. After a project receives "final discretionary approval" it would be too late in the permitting process to implement new requirements, particularly since this type of approval requires actions by city councils or boards of supervisors. Therefore, the "grandfathering" language is a hybrid that makes use of both the "application deemed complete" date and the "final discretionary approval" date, two known and recognized milestones in development planning.

As for private projects, public projects should be far enough along in the design and approval process to warrant being grandfathered and essentially exempted from complying with the lower 5000 ft^2 threshold when it becomes effective. Previous stormwater permits grandfathered projects that only had funds committed by the new threshold's effective date, which was too early because projects can be held for years before design can begin, well after funding commitments have been made. Conversely, application of the grandfathering exemption to projects that have construction scheduled to begin by the threshold effective date (or 2 years after the MRP effective date) may be too late in the permitting process to implement new threshold requirements, particularly since this type of approval requires actions by city councils or boards of supervisors. Therefore, the Permit provides the grandfathering exemption for projects that have construction set to begin within 1 year of the threshold effective date (or 3 years after the MRP effective date).

Provisions C.3.b.ii.(2)-(3) describe land use categories that are already regulated under the current stormwater permits; therefore, extra time is not necessary for the Permittees to comply with these Provisions and the implementation date is the Permit effective date. Because the Vallejo Permittees do not have post-

construction requirements in their current stormwater permit, the Permit allows an extra year for them to comply with these Provisions.

Provision C.3.b.ii.(4) applies to road projects adding and/or replacing 10,000 ft^2 of impervious surface, which include the construction of new roads and sidewalks and bicycle lanes built as part of the new roads; widening of existing roads with additional traffic lanes; and construction of impervious trails that are greater than 10 feet wide or are creekside (within 50 feet of the top of bank). Although widening existing roads with bike lanes and sidewalks increases impervious surface and therefore increases stormwater pollutants because of aerial deposition, they have been excluded from this Provision because we recognize the greater benefit that bike lanes and sidewalks provide by encouraging less use of automobiles. Likewise, this Provision also contains specific exclusions for: sidewalks built as part of a new road and built to direct stormwater runoff to adjacent vegetated areas; bike lanes built as part of a new road but not hydraulically connected to the new road and built to direct stormwater runoff to adjacent vegetated areas; impervious trails built to direct stormwater runoff to adjacent vegetated areas, or other non-erodible permeable areas, preferably away from creeks or towards the outboard side of levees; and sidewalks, bike lanes, or trails constructed with permeable surfaces.

In the case of road widening projects where additional lanes of traffic are added, the 50% rule also applies. That is, the addition of traffic lanes resulting in an alteration of more than 50 percent of the impervious surface of an existing street or road that was not subject to Provision C.3, the entire project, consisting of all existing, new, and/or replaced impervious surfaces, must be included in the treatment system design (i.e., stormwater treatment systems must be designed and sized to treat stormwater runoff from the entire street or road that had additional traffic lanes added).

Where the addition of traffic lanes results in an alteration of less than 50 percent of the impervious surface of an existing street or road that was not subject to Provision C.3, only the new and/or replaced impervious surface of the project must be included in the treatment system design (i.e., stormwater treatment systems must be designed and sized to treat stormwater runoff from only the new traffic lanes). However, if the stormwater runoff from the existing traffic lanes and the added traffic lanes cannot be separated, any onsite treatment system must be designed and sized to treat stormwater runoff from the entire street or road. If an offsite treatment system is installed or in-lieu fees paid in accordance with Provision C.3.e., the offsite treatment system or in-lieu fees must address only the stormwater runoff from the added traffic lanes.

Because road widening and trail projects belong to a newly added category of Regulated Projects, adequate implementation time has been included as well as "grandfathering" language. (See discussion under Provision C.3.b.ii.(1).)

Provision C.3.b.iii. requires that the Permittees cumulatively complete 10 pilot "green street" projects within the Permit term. This Provision was originally intended to require stormwater treatment for road rehabilitation projects on

arterial roads that added and/or replaced > 10,000 ft^2 of impervious surface. We acknowledge the logistical difficulties in retrofitting roads with stormwater treatment systems as well as the funding challenges facing municipalities in the Bay Area. However, we are aware that some cities have or will have funding for "green street" retrofit projects that will provide water quality benefits as well as meet broader community goals such as fostering unique and attractive streetscapes that protect and enhance neighborhood livability, serving to enhance pedestrian and bike access, and encouraging the planting of landscapes and vegetation that contribute to reductions in global warming. Therefore, instead of requiring post-construction treatment for all road rehabilitation of arterial streets, this Provision requires the completion of 10 pilot "green street" projects by the Permittees within the Permit term. These projects must incorporate LID techniques for site design and treatment in accordance with Provision C.3.c. and provide stormwater treatment pursuant to Provision C.3.d. and must be representative of the three different types of streets: arterial, collector, and local. To ensure equity and an even distribution of projects, at least two pilot projects must be located in each of the following counties: Alameda, Contra Costa, San Mateo, and Santa Clara. Parking lot projects are acceptable as pilot projects as long as both parking lot and street runoff is addressed. Because these are pilot projects, we have not specified a minimum or maximum size requirement and the details of which cities will have these projects are to be determined by the Permittees.

Provision C.3.c (Low Impact Development (LID)) recognizes LID as a cost-effective, beneficial, holistic, integrated stormwater management strategy[69]. The goal of LID is to reduce runoff and mimic a site's predevelopment hydrology by minimizing disturbed areas and impervious cover and then infiltrating, storing, detaining, evapotranspiring, and/or biotreating stormwater runoff close to its source. LID employs principles such as preserving and recreating natural landscape features and minimizing imperviousness to create functional and appealing site drainage that treat stormwater as a resource, rather than a waste product. Practices used to adhere to these LID principles include measures such as preserving undeveloped open space, rain barrels and cisterns, green roofs, permeable pavement, and biotreatment through rain gardens, bioretention units, bioswales, and planter/tree boxes.

This Provision sets forth a three-pronged approach to LID with source control, site design, and stormwater treatment requirements. The concepts and techniques for incorporating LID into development projects, particularly for site design, have been extensively discussed in BASMAA's Start at the Source manual (1999) and its companion document, Using Site Design Techniques to Meet Development Standards for Stormwater Quality (May 2003), as well as in various other LID reference documents.

Provision C.3.c.i.(1) lists source control measures that must be included in all Regulated Projects as well as some that are applicable only to certain types of

[69] USEPA, *Reducing Stormwater Costs through Low Impact Development (LID) Strategies and Practices* **(**Publication Number EPA 841-F-07-006, December 2007) http://www.epa.gov/o**wow/nps/lid/costs07)**

businesses and facilities. These measures are recognized nationwide as basic, effective techniques to minimize the introduction of pollutants into stormwater runoff. The current stormwater permits also list these methods; however, they are encouraged rather than required. By requiring these source control measures, this Provision sets a consistent, achievable standard for all Regulated Projects and allows the Board to more systematically and fairly measure permit compliance. This Provision retains enough flexibility such that Regulated Projects are not forced to include measures inappropriate, or impracticable, to their projects. This Provision does not preclude Permittees from requiring additional measures that may be applicable and appropriate.

Provision C.3.c.i.(2)(a) lists site design elements that must be implemented at all Regulated Projects. These design elements are basic, effective techniques to minimize pollutant concentrations in stormwater runoff as well as the volume and frequency of discharge of the runoff. On the basis of the Board staff's review of the Permittees' Annual Reports and CWA section 401 certification projects, these measures are already being done at many projects. One design element requires all Regulated Projects to include at least one site design measure from a list of six which includes recycling of roof runoff, directing runoff into vegetated areas, and installation of permeable surfaces instead of traditional paving. All these measures serve to reduce the amount of runoff and its associated pollutants being discharged from the Regulated Project.

Provision C.3.c.i.(2)(b) requires each Regulated Project to treat 100% of the Provision C.3.d. runoff with LID treatment measures onsite or with LID treatment measures at a joint stormwater treatment facility. LID treatment measures are harvesting and re-use, infiltration, evapotranspiration, or biotreatment. A properly engineered and maintained biotreatment system may be considered only if it is infeasible to implement harvesting and re-use, infiltration, or evapotranspiration at a project site. Infeasibility may result from conditions including the following:

- Locations where seasonal high groundwater would be within 10 feet of the base of the LID treatment measure.
- Locations within 100 feet of a groundwater well used for drinking water.
- Development sites where pollutant mobilization in the soil or groundwater is a documented concern.
- Locations with potential geotechnical hazards.
- Smart growth and infill or redevelopment sites where the density and/or nature of the project would create significant difficulty for compliance with the onsite volume retention requirement.
- Locations with tight clay soils that significantly limit the infiltration of stormwater.

This Provision recognizes the benefits of harvesting and reuse, infiltration and evapotranspiration and establishes these methods at the top of the LID treatment hierarchy. This Provision also acknowledges the challenges, both institutional and technical, to providing these LID methods at all Regulated Projects. There

are certainly situations where biotreatment is a valid LID treatment measure and this Provision allows Permittees the flexibility to make this determination so that Regulated Projects are not forced to include measures inappropriate or impracticable to the project sites. However, Permittees are required to submit a report within 18 months of the Permit effective date and prior to the required implementation date on the criteria and procedures that Permittees will employ to determine when harvesting and re-use, infiltration, or evapotranspiration is feasible and infeasible at a Regulated Project site. The Permittees are also required to submit a second report two years after implementing the new LID requirements that documents their experience with determining the feasibility and infeasibility of harvesting and reuse, infiltration, and evapotranspiration at Regulated Project sites. This report shall also discuss barriers, including institutional and technical site specific constraints, to implementation of infiltration, harvesting and reuse, or evapotranspiration and proposed strategies for removing these identified barriers.

This Provision specifies minimum specifications for biotreatment systems to be considered as LID treatment and requires Permittees to develop soil media specifications. Because this Provision recognizes green roofs as biotreatment systems for roof runoff, it also requires Permittees to develop minimum specifications for green roofs.

Provision C.3.c.ii. establishes the implementation date for the new LID requirements of Provision C.3.c.i. to be two years after the Permit effective date. Grandfathering language consistent with Provision C.3.b.ii.(1) has been included in this Provision to exempt private development projects (that are far along in their permitting and approval process) and public projects (that are far along in their funding and design) from the requirements of Provision C.3.c.i.

Provision C.3.d (Numeric Sizing Criteria for Stormwater Treatment Systems) lists the hydraulic sizing design criteria that the stormwater treatment systems installed for Regulated Projects must meet. The volume and flow hydraulic design criteria are the same as those required in the current stormwater permits. These criteria ensure that stormwater treatment systems will be designed to treat the optimum amount of relatively smaller-sized runoff-generating storms each year. That is, the treatment systems will be sized to treat the majority of rainfall events generating polluted runoff but will not have to be sized to treat the few very large annual storms as well. For many projects, such large treatment systems become infeasible to incorporate into the projects. Provision C.3.d. also adds a new combined flow and volume hydraulic design criteria to accommodate those situations where a combination approach is deemed most efficient.

Provision C.3.d.iv. defines infiltration devices and establishes limits on the use of stormwater treatment systems that function primarily as infiltration devices The intent of the Provision is to ensure that the use of infiltration devices, where feasible and safe from the standpoint of structural integrity, must also not cause or contribute to the degradation of groundwater quality at the project sites. This Provision requires infiltration devices to be located a minimum of 10 feet

(measured from the base) above the seasonal high groundwater mark and a minimum of 100 feet horizontally away from any known water supply wells, septic systems, and underground storage tanks with hazardous materials, and other measures to ensure that any potential threat to the beneficial uses of ground water is appropriately evaluated and avoided.

Provision C.3.e (Alternative or In-Lieu Compliance with Provision C.3.c.) recognizes that not all Regulated Projects may be able to install LID treatment systems onsite because of site conditions, such as existing underground utilities, right-of-way constraints, and limited space.

Provision C.3.e.i. In keeping with LID concepts and strategies, we expect new development projects to provide LID treatment onsite and to allocate the appropriate space for these systems because they do not have the site limitations of redevelopment and infill site development in the urban core. However, this Provision does not restrict alternative compliance to redevelopment and infill projects because the Permittees have requested flexibility to make the determination of when alternative compliance is appropriate. Based on the lack of offsite alternative compliance projects installed during the current stormwater permit terms, it seems that having to find offsite projects is already a great disincentive. Therefore, this Provision allows any Regulated Project to provide LID treatment for up to 100% of the required Provision C.3.d. stormwater runoff at an offsite location or pay equivalent in-lieu fees to provide LID treatment at a Regional Project, as long as the offsite and Regional Projects are in the same watershed as the Regulated Project.

For the LID Treatment at an Offsite Location alternative compliance option, offsite projects must be constructed by the end of construction of the Regulated Project. We acknowledge that a longer timeframe may be required to complete construction of offsite projects because of administrative, legal, and/or construction delays. Therefore, up to 3 years additional time is allowed for construction of the offsite project; however, to offset the untreated stormwater runoff from the Regulated Project that occurs while construction of the offsite project is taking place, the offsite project must be sized to treat an additional 10% of the calculated equivalent quantity of both stormwater runoff and pollutant loading for each year that it is delayed. Permittees have commented that for projects that are delayed, requiring treatment of an additional (10-30)% of stormwater runoff may result in costly re-design of treatment systems. In those cases, payment of in-lieu fees to provide the additional treatment at a Regional Project is a viable alternative.

For the Payment of In-Lieu Fees to a Regional Project alternative compliance option, the Regional Project must be completed within 3 years after the end of construction of the Regulated Project. We acknowledge that a longer timeframe may be required to complete construction of Regional Projects because they may involve a variety of public agencies and stakeholder groups and a longer planning and construction phase. Therefore, the timeline for completion of a Regional Project may be extended, up to 5 years after the completion of the Regulated

Project, with prior Water Board Executive Officer approval. Executive Officer approval will be granted contingent upon a demonstration of good faith efforts to implement the Regional Project, such as having funds encumbered and applying for the appropriate regulatory permits.

Provision C.3.e.ii. (Special Projects) When considered at the watershed scale, certain types of smart growth, high density, and transit-oriented development can either reduce existing impervious surfaces, or create less "accessory" impervious areas and auto-related pollutant impacts. Incentive LID treatment reduction credits approved by the Water Board may be applied to these types of Special Projects.

This Provision requires that by December 1, 2010, Permittees shall submit a proposal to the Water Board containing the following information:

- Identification of the types of projects proposed for consideration of LID treatment reduction credits and an estimate of the number and cumulative area of potential projects during the remaining term of this permit for each type of project..
- Identification of institutional barriers and/or technical site specific constraints to providing 100% LID treatment onsite that justify the allowance for non-LID treatment measures onsite.
- Specific criteria for each type of Special Project proposed, including size, location, minimum densities, minimum floor area ratios, or other appropriate limitations.
- Identification of specific water quality and environmental benefits provided by these types of projects that justify the allowance for non-LID treatment measures onsite.
- Proposed LID treatment reduction credit for each type of Special Project and justification for the proposed credits. The justification shall include identification and an estimate of the specific water quality benefit provided by each type of Special Project proposed for LID treatment reduction credit.
- Proposed total treatment reduction credit for Special Projects that may be characterized by more than one category and justification for the proposed total credit.

Provision C.3.f (Alternative Certification of Adherence to Numeric Sizing Criteria for Stormwater Treatment Systems) allows Permittees to have a third-party review and certify a Regulated Project's compliance with the hydraulic design criteria in Provision C.3.d. Some municipalities do not have the staffing resources to perform these technical reviews. The third-party review option addresses this staffing issue. This Provision requires Permittees to make a reasonable effort to ensure that the third-party reviewer has no conflict of interest with regard to the Regulated Project being reviewed. That is, any consultant, contractor or their employees hired to design and/or construct a stormwater treatment system for a Regulated Project can not also be the certifying third party.

Provision C.3.g. (Hydromodification Management, HM) requires that certain new development projects manage increases in stormwater runoff flow and volume so that post-project runoff shall not exceed estimated pre-project runoff rates and durations, where such increased flow and/or volume is likely to cause increased potential for erosion of creek beds and banks, silt pollutant generation, or other adverse impacts on beneficial uses due to increased erosive force.

Background for Provision C.3.g. Based on Hydrograph Modification Management Plans prepared by the Permittees, the Water Board adopted hydromodification management (HM) requirements for Alameda Permittees (March 2007), Contra Costa Permittees (July 2006), Fairfield-Suisun Permittees (March 2007), Santa Clara Permittees (July 2005), and San Mateo Permittees (March 2007). Within Provision C.3.g, the major common elements of these HM requirements are restated. Attachments B–F contain the HM requirements as adopted by the Water Board, with some changes to correct minor errors and to provide consistency across the Region. Attachment F contains updated HM requirements for the Santa Clara Permittees. Permittees will continue to implement their adopted HM requirements; where Provision C.3.g. contradicts the Attachments, Provision C.3.g. shall be implemented. Additional requirements and/or options contained in the Attachments, above and beyond what is specified in Provision C.3.g., remain unaltered by Provision C.3.g. In all cases, the HM Standard must be achieved.

The Alameda, Santa Clara and San Mateo Permittees have adapted the Western Washington Hydrology Model[70] for modeling runoff from development project sites, sizing flow duration control structures, and determining overall compliance of such structures and other HM control structures (HM controls) in controlling runoff from the project sites to manage hydromodification impacts as described in the Permit. The adapted model is called the Bay Area Hydrology Model (BAHM).[71] All Permittees may use the BAHM if its inputs reflect actual conditions at the project site and surrounding area, including receiving water conditions. As Permittees gain experience in designing and operating HM controls, the Programs may make adjustments in the BAHM to improve its function in controlling excess runoff and managing hydromodification impacts. Notification of all such changes shall be given to the Water Board and the public through such mechanism as an electronic email list.

The Contra Costa Permittees have developed sizing charts for the design of flow duration control devices. Attachment C requires the Contra Costa Permittees to conduct a monitoring program to verify the performance of these devices. Following the satisfactory conclusion of this monitoring program, or conclusion of other study(s) that demonstrate devices built according to Attachment C specifications satisfactorily protect streams from excess erosive flows, the Water Board intends to allow the use of the Contra Costa sizing charts, when tailored to local conditions, by other stormwater programs and Permittees. Similarly, any other control strategies or criteria approved by the Board would be made available across the Region. This would be accomplished

[70] http://www.ecy.wa.gov/programs/wq/stormwater/wwhm_training/wwhm/wwhm_v2/instructions_v2.html
[71] See www.bayareahydrologymodel.org , Resources.

through Permit amendment or in another appropriate manner following appropriate public notification and process.

The Fairfield-Suisun Permittees have developed design procedures, criteria, and sizing factors for infiltration basins and bioretention units. These procedures, criteria, and sizing factors have been through the public review process already, and are not subject to public review at this time. Water Board staff's technical review found that the procedures, criteria, and sizing factors are acceptable in all ways except one: they are based on an allowable low flow rate that exceeds the criteria established in this Permit. Fairfield-Suisun Permittees may choose to change the design criteria and sizing factors to the allowable criterion of 20 percent of the 2-year peak flow, and seek Executive Officer approval of the modified sizing factors. This criterion, which is greater than the criterion allowed for other Bay Area Stormwater Countywide Programs, is based on data collected from Laurel and Ledgewood Creeks and technical analyses of these site-specific data. Following approval by the Executive Officer and notification of the public through such mechanism as an email list-serve, project proponents in the Fairfield-Suisun area may meet the HM Standard by using the Fairfield-Suisun Permittees' design procedures, criteria, and sizing factors for infiltration basins and/or bioretention units.

Attachments B and F allow the Alameda and Santa Clara Permittees to prepare a user guide to be used for evaluating individual receiving waterbodies using detailed methods to assess channel stability and watercourse critical flow. This user guide would reiterate and collate established stream stability assessment methods that have been presented in these Programs' HMPs, which have undergone Water Board staff review and been made available for public review. After the Programs have collated their methods into user guide format, received approval of the user guide from the Executive Officer, and informed the public through such process as an email list-serve, the user guide may be used to guide preparation of technical reports for: implementing the HM standard using in-stream or regional measures; determining whether certain projects are discharging to a watercourse that is less susceptible (from point of discharge to the Bay) to hydromodification (e.g., would have a lower potential for erosion than set forth in this Permit); and/or determining if a watercourse has a higher critical flow and project(s) discharging to it are eligible for an alternative Qcp[72] for the purpose of designing on-site or regional measures to control flows draining to these channels (i.e., the actual threshold of erosion-causing critical flow is higher than 10 percent of the 2-year pre-project flow).

The Water Board recognizes that the collective knowledge of management of erosive flows and durations from new and redevelopment is evolving, and that the topics listed below are appropriate topics for further study. Such a study may be initiated by Water Board staff, or the Executive Officer may request that all Bay Region municipal stormwater Permittees jointly conduct investigations as appropriate. Any future

[72] Qcp is the allowable low flow discharge from a flow control structure on a project site. It is a means of apportioning the critical flow in a stream to individual projects that discharge to that stream, such that cumulative discharges do not exceed the critical flow in the stream.

proposed changes to the Permittees' HM provisions may reflect improved understanding of these issues:

- Potential incremental costs, and benefits to waterways, from controlling a range of flows up to the 35- or 50-year peak flow, versus controlling up to the 10-year peak flow, as required by this Permit;
- The allowable low-flow (also called Qcp and currently specified as 10–20 percent of the pre-project 2-year runoff from the site) from HM controls;
- The effectiveness of self-retaining areas for management of post-project flows and durations; and/or
- The appropriate basis for determining cost-based impracticability of treating stormwater runoff and controlling excess runoff flows and durations.

Within Attachments B-F, this Permit allows for alternative HM compliance when on-site and regional HM controls and in-stream measures are not practicable. Alternative HM compliance includes contributing to or providing mitigation at other new or existing development projects that are not otherwise required by this Permit or other regulatory requirements to have HM controls. The Permit provides flexibility in the type, location, and timing of the mitigation measure. The Board recognizes that handling mitigation funds may be difficult for some municipalities because of administrative and legal constraints. The Board intends to allow flexibility for project proponents and/or Permittees to develop new or retrofit stormwater treatment or HM control projects within a broad area and reasonable time frame. Toward the end of the Permit term, the Board will review alternative projects and determine whether the impracticability criteria and options should be broadened or made narrower.

Provision C.3.g.i. defines the subset of Regulated Projects that must install hydromodification controls (HM controls). This subset, called HM Projects, are Regulated Projects that create and/or replace one acre or more of impervious surface and are not specifically excluded within Attachments B–F of the Permit. Within these Attachments, the Permittees have identified areas where the potential for single-project and/or cumulative development impacts to creeks is minimal, and thus HM controls are not required. Such areas include creeks that are concrete-lined or significantly hardened (e.g., with concrete) from point of discharge and continuously downstream to their outfall into San Francisco Bay; underground storm drains discharging to the Bay; and construction of infill projects in highly developed watersheds.[73]

Provision C.3.g.ii. establishes the standard hydromodification controls must meet. The HM Standard is based largely on the standards proposed by Permittees in their Hydrograph Modification Management Plans. The method for calculating post-project runoff in regards to HM controls is standard practice in Washington State and is equally applicable in California.

[73] Within the context of Provision C.3.g., "highly developed watersheds; refer to catchments or sub-catchments that are 65 percent impervious or more.

Provision C.3.g.iii. identifies and defines three methods of hydromodification management.

Provision C.3.g.iv. sets forth the information on hydromodification management to be submitted in the Permittees' Annual Reports.

Provision C.3.g.v. requires the Vallejo Permittees to develop a Hydromodification Management Plan (HMP), because the Vallejo Permittees have not been required to address HM impacts to date. Vallejo's current permit was issued by USEPA and does not require the Vallejo Permittees' to develop an HMP. The Vallejo Permittees may choose to adopt and implement one or a combination of the approaches in Attachments B–F.

Provision C.3.h (Operation and Maintenance of Stormwater Treatment Systems) establishes permitting requirements to ensure that proper maintenance for the life of the project is provided for all onsite, joint, and offsite stormwater treatment systems installed. The Provision requires Permittees to inspect at least 20% of these systems annually, at least 20% of all vault-based systems annually, and every treatment system at least once every 5 years. Requiring inspection of at least 20% of the total number of treatment and HM controls serves to prevent failed or improperly maintained systems from going undetected until the 5th year. We have the additional requirement to inspect at least 20% of all installed vault-based systems because they require more frequent maintenance and problems arise when the appropriate maintenance schedules are not followed. Also, problems with vault systems may not be as readily identified by the projects' regular maintenance crews. Neither of these inspection frequency requirements interferes with the Permittees' current ability to prioritize their inspections based on factors such as types of maintenance agreements, owner or contractor maintained systems, maintenance history, etc. This Provision also requires the development of a database or equivalent tabular format to track the operation and maintenance inspections and any necessary enforcement actions against Regulated Projects and submittal of Reporting Table C.3.h., which requires standard information that should be collected on each operation and maintenance inspection. We require this type of information to evaluate a Permittee's inspection and enforcement program and to determine compliance with the Permit. Summary data alone without facility-specific inspection findings does not allow us to determine whether Permittees are doing timely follow-up inspections at problematic facilities and taking appropriate enforcement actions.

Stormwater treatment system maintenance has been identified as a critical aspect of addressing urban runoff from Regulated Projects by many prominent urban runoff authorities, including CASQA, which states that "long-term performance of BMPs [stormwater treatment systems] hinges on ongoing and proper maintenance."[74] USEPA also stresses the importance of BMP [stormwater treatment system] maintenance,

[74] California Stormwater Quality Association, 2003. Stormwater Best Management Practice Handbook – New Development and Redevelopment, p. 6-1.

stating that "Lack of maintenance often limits the effectiveness of stormwater structure controls such as detention/retention basins and infiltration devices."[75]

Provision C.3.i. (Required Site Design Measures for Small Project and Detached Single-Family Homes Projects) introduces new requirements on single-family home projects that create and/or replace 2500 square feet or more of impervious surface and small development projects that create and/or replace > 2500 ft^2 to <10,000 ft^2 impervious surface (collectively over the entire project). A detached single-family home project is defined as the building of one single new house or the addition and/or replacement of impervious surface to one single existing house, which is not part of a larger plan of development.

This Provision requires these projects to select and implement one or more stormwater site design measures from a list of six. These site design measures are basic methods to reduce the amount and flowrate of stormwater runoff from projects and provide some pollutant removal treatment of the runoff that does leave the projects. Under this Provision, only projects that already require approvals and/or permits under the Permittees' current planning, building, or other comparable authority are regulated. Hence this Provision does not require Permittees to regulate small development and single-family home projects that would not otherwise be regulated under the Permittees' current ordinances or authorities. Water Board staff recognizes that the stormwater runoff pollutant and volume contribution from each one of these projects may be small; however, the cumulative impacts could be significant. This Provision serves to address some of these cumulative impacts in a simple way that will not be too administratively burdensome on the Permittees. To assist these small development and single-family home projects, this Provision also requires the Permittees to develop standard specifications for lot-scale site design and treatment measures.

[75] USEPA. 1992. *Guidance Manual for the Preparation of Part II of the NPDES Permit Application for Discharges from Municipal Separate Storm Sewer Systems*. EPA 833-B-92-002.

C.4. Industrial and Commercial Site Controls

Legal Authority

Broad Legal Authority: CWA sections 402(p)(3)(B)(ii-iii), CWC section 13377, and Federal NPDES regulations 40 CFR 122.26(d)(2)(i)(B, C, D, E, and F) and 40 CFR 122.26(d)(2)(iv).

Specific Legal Authority: Federal NPDES regulation 40 CFR 122.26(d)(2)(iv)(C) requires, "A description of a program to monitor and control pollutants in storm water discharges to municipal systems from municipal landfills, hazardous waste treatment, disposal and recovery facilities, industrial facilities that are subject to section 313 of title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA), and industrial facilities that the municipal permit applicant determines are contributing a substantial pollutant loading to the municipal storm sewer system."

Specific Provision C.4. Requirements

Provision C.4.a (Legal Authority for Effective Site Management)

Federal NPDES regulation 40 CFR 122.26(d)(2)(i)(A) provides that each Permittee must demonstrate that it can control "through ordinance, permit, contract, order or similar means, the contribution of pollutants to the municipal storm sewer by storm water discharges associated with industrial activity and the quality of storm water discharged from site of industrial activity." This section also describes requirements for effective follow-up and resolution of actual or threatened discharges of either polluted non-stormwater or polluted stormwater runoff from industrial/commercial sites.

Provision C.4.b (Inspection Plan)

Federal NPDES regulation 40 CFR 122.26(d)(2)(iv)(C)(1) provides that Permittees must "identify priorities and procedures for inspections and establishing and implementing control measures for such discharges." The Permit requires Permittees to implement an industrial and commercial site controls program to reduce pollutants in runoff from all industrial and commercial sites/sources.

Provision C.4.b.ii.(1) (Commercial and Industrial Source Identification)

Federal NPDES regulation 40 CFR 122.26(d)(2)(ii) provides that Permittees "Provide an inventory, organized by watershed of the name and address, and a description (such as SIC codes) which best reflects the principal products or services provided by each facility which may discharge, to the municipal separate storm sewer, storm water associated with industrial activity."

USEPA requires "measures to reduce pollutants in storm water discharges to municipal separate storm sewers from municipal landfills, hazardous waste treatment, disposal and recovery facilities, industrial facilities that are subject to section 313 of title III of the Superfund Amendments and Reauthorization Act of

1986 (SARA)."[76] USEPA "also requires the municipal storm sewer Permittees to describe a program to address industrial dischargers that are covered under the municipal storm sewer permit."[77] To more closely follow USEPA's guidance, this Permit also includes operating and closed landfills, and hazardous waste treatment, disposal, storage and recovery facilities.

The Permit requires Permittees to identify various industrial sites and sources subject to the General Industrial Permit or other individual NPDES permit. USEPA supports the municipalities regulating industrial sites and sources that are already covered by an NPDES permit:

> Municipal operators of large and medium municipal separate storm sewer systems are responsible for obtaining system-wide or area permits for their system's discharges. These permits are expected to require that controls be placed on storm water discharges associated with industrial activity which discharge through the municipal system. It is anticipated that general or individual permits covering industrial storm water discharges to these municipal separate storm sewer systems will require industries to comply with the terms of the permit issued to the municipality, as well as other terms specific to the Permittee.[78]

And:

> Although today's rule will require industrial discharges through municipal storm sewers to be covered by separate permit, USEPA still believes that municipal operators of large and medium municipal systems have an important role in source identification and the development of pollutant controls for industries that discharge storm water through municipal separate storm sewer systems is appropriate. Under the CWA, large and medium municipalities are responsible for reducing pollutants in discharges from municipal separate storm sewers to the maximum extent practicable. Because storm water from industrial facilities may be a major contributor of pollutants to municipal separate storm sewer systems, municipalities are obligated to develop controls for storm water discharges associated with industrial activity through their system in their storm water management program.[79]

Provision C.4.b.ii.(5) (Inspection Frequency)
USEPA guidance[80] says, "management programs should address minimum frequency for routine inspections." The USEPA Fact Sheet—Visual Inspection[81] says, "To be effective, inspections must be carried out routinely."

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[76] *Federal Register*. Vol. 55, No. 222, Friday, November 16, 1990. Rules and Regulations. P. 48056.
[77] Ibid.
[78] *Federal Register*. Vol. 55, No. 222, Friday, November 16, 1990, Rules and Regulations. P. 48006.
[79] Ibid. P. 48000
[80] USEPA. 1992. Guidance 833-8-92-002, section 6.3.3.4 "Inspection and Monitoring".
[81] USEPA. 1999. 832-F-99-046, "Storm Water Management Fact Sheet – Visual Inspection".

Provision C.4.c (Enforcement Response Plan) requires the Permittees to establish an Enforcement Response Plan (ERP) that ensures timely response to actual or potential stormwater pollution problems discovered in the course of industrial/commercial stormwater inspections. The ERP also provides for progressive enforcement of violations of ordinances and/or other legal authorities. The ERP will provide guidance on the appropriate use of the various enforcement tools, such as verbal and written notices of violation, when to issue a citations, and require cleanup requirements, cost recovery, and pursue administrative or and criminal penalties. All violations must be corrected in a timely manner with the goal of correcting them before the next rain event but no longer than 10 business days after the violations are discovered.

Provision C.4.d (Staff Training) section of the Permit requires the Permittees to conduct annual staff trainings for inspectors. Trainings are necessary to keep inspectors current on enforcement policies and current MEP BMPs for industrial and commercial stormwater runoff discharges.

C.5. Illicit Discharge Detection and Elimination

Legal Authority

The following legal authority applies to section C.5:

Broad Legal Authority: CWA sections 402(p)(3)(B)(ii-iii), CWC section 13377, and Federal NPDES regulations 40 CFR 122.26(d)(2)(i)(B, C, D, E, and F) and 40 CFR 122.26(d)(2)(iv).

Specific Legal Authority: Federal NPDES regulations 40 CFR 122.26(d)(1)(iii)(B)(1) provides that the Permittee shall include in their application, "the location of known municipal storm sewer system outfalls discharging to waters of the United States."

Federal NPDES regulations 40 CFR 122.26(d)(1)(iii)(B)(5) provides that the Permittee shall include in their application, "The location of major structural controls for storm water discharge (retention basins, detention basins, major infiltration devices, etc."

Federal NPDES regulations 40 CFR 122.26(d)(2)(i)(B) provides that the Permittee shall have, "adequate legal authority to prohibit through ordinance, order or similar means, illicit discharges to the municipal separate storm sewer."

Federal NPDES regulations 40 CFR 122.26(d)(2)(i)(B) provides that the Permittee shall, "Carry out all inspection, surveillance and monitoring procedures necessary to determine compliance and noncompliance with permit conditions including the prohibition on illicit discharges to the municipal separate storm sewer."

Federal NPDES regulations 40 CFR 122.26(d)(2)(iv)(B) requires, "shall be based on a description of a program, including a schedule, to detect and remove (or require the discharger to the municipal storm sewer to obtain a separate NPDES permit for) illicit discharges and improper disposal into the storm sewer."

Federal NPDES regulation 40 CFR 122.26(d)(2)(iv)(B)(1) requires, "a program, including inspections, to implement and enforce an ordinance, orders or similar means to prevent illicit discharges to the municipal storm sewer system."

Federal NPDES regulation 40 CFR 122.26(d)(2)(iv)(B)(2) requires, "a description of procedures to conduct on-going field screening activities during the life of the permit, including areas or locations that will be evaluated by such field screens."

Federal NPDES regulation 40 CFR 122.26(d)(2)(iv)(B)(3) requires, "procedures to be followed to investigate portions of the separate storm sewer system that, based on the results of the field screen, or other appropriate information, indicate a reasonable potential of containing illicit discharges or other sources of non-storm water."

Federal NPDES regulations 40 CFR 122.26(d)(2)(iv)(B)(4) requires, "a description of procedures to prevent, contain, and respond to spills that may discharge into the municipal separate storm sewer."

Federal NPDES regulations 40 CFR 122.26(d)(2)(iv)(B)(5) requires, "a description of a program to promote, publicize, and facilitate public reporting of the presence of illicit discharges or water quality impacts associated with discharges from municipal separate storm sewers."

Federal NPDES regulations 40 CFR 122.26(d)(2)(iv)(B)(7) requires, "a description of controls to limit infiltration of seepage from municipal sanitary sewers to municipal separate storm sewer systems where necessary."

Fact Sheet Findings in Support of Provision C.5

C.5-1 Illicit and inadvertent connections to MS4 systems result in the discharge of waste and chemical pollutants to receiving waters. Every Permittee must have the ability to discover, track, and clean up stormwater pollution discharges by illicit connections and other illegal discharges to the MS4 system.

C.5-2 Illicit discharges to the storm drain system can be detected in several ways. Permittee staff can detect discharges during their course of other tasks, and business owners and other aware citizens can observe and report suspect discharges. The Permittee must have a direct means for these reports of suspected polluted discharges to receive adequate documentation, tracking, and response through problem resolution.

Specific Provision C.5 Requirements

Provision C.5.a (Legal Authority) requires each Permittee have adequate legal authority to effectuate cessation, abatement, and/or clean up of non-exempt non-stormwater discharges per Federal NPDES regulations 40 CFR 122.26(d)(2)(i)(B). Illicit and inadvertent connections to MS4 systems result in the discharge of waste and chemical pollutants to receiving waters. Every Permittee must have the ability to discover, track, and clean up stormwater pollution discharges by illicit connections and other illegal discharges to the MS4 system.

Provision C.5.b (ERP) requires Permittees to establish an ERP that ensures timely response to illicit discharges and connections to the MS4 and provides progressive enforcement of violations of ordinances and/or other legal authorities. This section also requires Permittees to establish criteria for triggering follow-up investigations. Additional language has been added to this section to clarify the minimum level of effort and time frames for follow-up investigations when violations are discovered. Timely investigation and follow up when action levels are exceeded is necessary to identify sources of illicit discharges, especially since many of the discharges are transitory. The requirements for all violations to be corrected before the next rain event but no longer than 10 business days when there is evidence of illegal non-stormwater discharge, dumping, or illicit connections having reached municipal storm drains is necessary to ensure timely response by Permittees.

Provision C.5.c (Spill and Dumping Response, Complaint Response, and Frequency of Inspections) Federal NPDES regulations 40 CFR 122.26(d)(2)(iv)(B)(4) requires, "a description of procedures to prevent, contain, and respond to spills that may discharge into the municipal separate storm sewer." This Provision of the Permit requires the Permittees to establish and maintain a central point of contact including phone numbers for spill and complaint reporting. Reports from the public are an essential tool in discovering and investigating illicit discharge activities. Maintaining contact points will help ensure that there is effective reporting to assist with the discovery of prohibited discharges. Each Permittee must have a direct means for these reports of suspected polluted discharges to receive adequate documentation, tracking, and response through problem resolution.

Provision C.5.d (Control of Mobile Sources) requires each Permittee to develop and implement a program to reduce the discharge of pollutants from mobile businesses. The purpose of this section is to establish oversight and control of pollutants associated with mobile business sources to the MEP.

Provision C.5.e (Collection System Screening and MS4 Map Availability) Federal NPDES regulation 40 CFR 122.26(d)(2)(iv)(B)(3) requires, "procedures to be followed to investigate portions of the separate storm sewer system that, based on the results of the field screen, or other appropriate information, indicate a reasonable potential of containing illicit discharges or other sources of non-storm water." This Provision of the Permit requires the Permittees to conduct follow up investigations and inspect portions of the MS4 for illicit discharges and connections. Permittees shall implement a program to actively seek and eliminate illicit connections and discharges during their routine collection system screening and during screening surveys at strategic check points. Additional wording has been added to this section to clarify and ensure that all appropriate municipal personnel are used in the program to observe and report these illicit discharges and connections when they are working the system.

This section also requires the Permittees to develop or obtain a map of their entire MS4 system and drainages within their jurisdictions and provide the map to the public for review. As part of the permit application process federal NPDES regulations 40 CFR 122.26(d)(1)(iii)(B)(1) and 40 CFR 122.26(d)(1)(iii)(B)(5) specify that dischargers must identify the location of any major outfall that discharges to waters of the United States, as well as the location of major structural controls for stormwater discharges. A major outfall is any outfall that discharges from a single pipe with an inside diameter of 36 inches or more or its equivalent (discharge from a single conveyance other than a circular pipe which is associated with a drainage area of more than 50 acres) or; for areas zoned for industrial activities, any pipe with a diameter of 12 inches or more or its equivalent (discharge from other than a circular pipe associated with a drainage area of 2 acres or more). The permitting agency may not process a permit until the applicant has fully complied with the application requirements.[82] If, at the time of application, the information is unavailable, the Permit must require implementation of a program to meet the application requirements.[83] The requirement in this Provision of the Permit for

[82] 40 CFR 124.3 (applicable to state programs, see section 123.25).
[83] 40 CFR. 122.26(d)(1)(iv)(E).

Permittees to prepare maps of the MS4 system will help ensure that Permittees comply with federal NPDES permit application requirements that are more than 10 years old.

Provision C.5.f (Tracking and Case Follow-up) section of the Permit requires Permittees to track and monitor follow-up for all incidents and discharges reported to the complaint/spill response system that could pose a threat to water quality. This requirement is included so Permittees can demonstrate compliance with the ERP requirements of Section C.5.b and to ensure that illicit discharge reports receive adequate follow up through to resolution.

C.6. Construction Site Control

Legal Authority

The following legal authority applies to section C.6:

Broad Legal Authority: CWA sections 402(p)(3)(B)(ii-iii), CWC section 13377, and Federal NPDES regulations 40 CFR 122.26(d)(2)(i)(B, C, D, E, and F) and 40 CFR 122.26(d)(2)(iv).

Specific Legal Authority: Federal NPDES regulation 40 CFR 122.26(d)(2)(iv)(D) requires, "A description of a program to implement and maintain structural and non-structural best management practices to reduce pollutants in storm water runoff from construction sites to the municipal storm sewer system."

Federal NPDES regulation 40 CFR 122.26(d)(2)(iv)(D)(1) requires, "A description of procedures for site planning which incorporate consideration of potential water quality impacts."

Federal NPDES regulation 40 CFR 122.26(d)(2)(iv)(D)(2) requires, "A description of requirements for nonstructural and structural best management practices."

Federal NPDES regulation 40 CFR 122.26(d)(2)(iv)(D)(3) requires, "A description of procedures for identifying priorities for inspecting sites and enforcing control measures which consider the nature of the construction activity, topography, and the characteristics of soils and receiving water quality."

Federal NPDES regulation 40 CFR 122.26(d)(2)(iv)(D)(4) requires, "A description of appropriate educational and training measures for construction site operators."

Federal NPDES regulation 40 CFR 122.26(d)(2)(i)(A) provides that each Permittee must demonstrate that it can control, "through ordinance, permit, contract, order or similar means, the contribution of pollutants to the municipal storm sewer by storm water discharges associated with industrial activity and the quality of storm water discharged from site of industrial activity."

Federal NPDES regulation 40 CFR 122.26(b)(14) provides that, "The following categories of facilities are considered to be engaging in 'industrial activity' for the purposes of this subsection: […] (x) Construction activity including cleaning, grading and excavation activities […]."

Federal NPDES regulation 40 CFR 122.44(d)(1)(i) requires NPDES permits to include limitations to, "control all pollutants or pollutant parameters (either conventional, non-conventional, or toxic pollutants) which the Director determines are or may be discharged at a level which will cause, have reasonable potential to cause, or contribute

to an excursion above any State water quality standard, including State narrative criteria for water quality."

Fact Sheet Findings in Support of Provision C.6.

C.6-1 Vegetation clearing, mass grading, lot leveling, and excavation expose soil to erosion processes and increase the potential for sediment mobilization, runoff and deposition in receiving waters. Construction sites without adequate BMP implementation result in sediment runoff rates that greatly exceed natural erosion rates of undisturbed lands, causing siltation and impairment of receiving waters.

C.6-2 Excess sediment can cloud the water, reducing the amount of sunlight reaching aquatic plants, clog fish gills, smother aquatic habitat and spawning areas, and impede navigation in our waterways. Sediment also transports other pollutants such as nutrients, metals, and oils and grease. Permittees are on-site at local construction sites for grading and building permit inspections, and also have in many cases dedicated construction stormwater inspectors with training in verifying that effective BMPs are in place and maintained. Permittees also have effective tools available to achieve compliance with adequate erosion control, such as *stop work* orders and citations.

C.6-3 Mobilized sediment from construction sites can flow into receiving waters. According to the 2004 National Water Quality Inventory[84], States and Tribes report that sediment is one of the top 10 causes of impairment of assessed rivers and streams, next to pathogens, habitat alteration, organic enrichment or oxygen depletion, nutrients, metals, etc.. Sediment impairs 35,177 river and stream miles (14% of the impaired river and stream miles). Sources of sedimentation include agriculture, urban runoff, construction, and forestry. Sediment runoff rates from construction sites, however, are typically 10 to 20 times greater than those of agricultural lands, and 1,000 to 2,000 times greater than those of forest lands. During a short period of time, construction sites can contribute more sediment to streams than can be deposited naturally during several decades.[85]

Specific Provision C.6 Requirements

Provision C.6.a. Legal Authority for Effective Site Management. Federal NPDES regulation 40 CFR 122.26(d)(2)(i)(A) requires that each Permittee demonstrate that it can control "through ordinance, permit, contract, order or similar means, the contribution of pollutants to the municipal storm sewer by storm water discharges associated with industrial activity and the quality of storm water discharged from site of industrial activity." This section of the Permit requires each Permittee to have the

[84] http://www.epa.gov/owow/305b/2004report/2004_305Breport.pdf

[85] USEPA. December 2005. *Stormwater Phase II Final Rule Fact Sheet Series – Construction Site Runoff Control Minimum Control Measure*. EPA 833-F-00-008. Fact Sheet 2.6.

authority to require year-round, seasonally and phase appropriate effective erosion control, run-on and runoff control, sediment control, active treatment systems, good site management, and non stormwater management through all phases of site grading, building, and finishing of lots. All Permittees should already have this authority. Permittees shall certify adequacy of their respective legal authority in the 2010 Annual Report.

Inspectors should have the authority to take immediate enforcement actions when appropriate. Immediate enforcement will get the construction site's owner/operator to quickly implement corrections to violations, thereby minimizing and preventing threats to water quality. When inspectors are unable to take immediate enforcement actions, the threat to water quality continues until an enforcement incentive is issued to correct the violation. In its Phase II Compliance Assistance Guidance, USEPA says that, "Inspections give the MS4 operator an opportunity to provide additional guidance and education, issue warnings, or assess penalties."[86] To issue warnings and assess penalties during inspections, inspectors must have the legal authority to conduct enforcement.

Provision C.6.b. Enforcement Response Plan (ERP). This section requires each Permittee to develop and implement an escalating enforcement process that serves as reference for inspection staff to take consistent actions to achieve timely and effective corrective compliance from all public and private construction site owners/operators. Under this section, each Permittee develops its own unique ERP tailored for the specific jurisdiction; but all ERPs must make it a goal to correct all violations before the next rain event but no longer than 10 business days after the violations are discovered. In a few cases, such as slope inaccessibility, it may require longer than 10 days before crews can safely access the eroded area. The Permittees' tracking data need to provide a rationale for the longer compliance timeframe.

Water Board staff has noted deficiencies in the Permittees' enforcement procedures and implementation during inspections. The most common issues found were that enforcement was not firm and appropriate to correct the violation, and that repeat violations did not result in escalated enforcement procedures. USEPA supports enforcement of ordinances and permits at construction sites stating, "Effective inspection and enforcement requires […] penalties to deter infractions and intervention by the municipal authority to correct violations."[87] In addition, USEPA expects permits issued to municipalities to address "weak inspection and enforcement."[88] For these reasons, the enforcement requirements in this section have been established, while providing sufficient flexibility for each Permittee's unique stormwater program.

Provision C.6.c. Best Management Practices Categories. This section requires all Permittees to require all construction sites to have year-round seasonally appropriate effective Best Management Practices (BMPs) in the following six categories: (1)

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[86] USEPA. 2000. 833-R-00-002, Storm Water Phase II Compliance Assistance Guide, P.4-31
[87] USEPA. 1992. Guidance 833-8-92-002. Section 6.3.2.3.
[88] *Federal Register*. Vol. 55, No. 222, Friday, November 16, 1990. Rules and Regulations. p. 48058.

erosion control, (2) run-on and runoff control, (3) sediment control, (4) active treatment systems, (5) good site management, and (6) non stormwater management. These BMP categories are listed in the State General NPDES Permit for Stormwater Discharges Associated with Construction Activities (General Construction Permit). The Water Board staff decided it was too prescriptive and inappropriate to require a specific set of BMPs that are to be applicable to all sites. Every site is different with regards to terrain, soil type, soil disturbance, and proximity to a waterbody. The General Construction Permit recognizes these different factors and requires site specific BMPs through the Storm Water Pollution Prevention Plan that addresses the six specified BMP categories. This Permit allows Permittees the flexibility to determine if the BMPs for each construction site are effective and appropriate. This Permit also allows the Permittees and the project proponents the necessary flexibility to make immediate decisions on appropriate, cutting-edge technology to prevent the discharge of construction pollutants into stormdrains, waterways, and right-of-ways. Appropriate BMPs for the different site conditions can be found in different handbooks and manuals. Therefore, this Permit is consistent with the General Construction Permit in its requirements for BMPs in the six specified categories.

Vegetation clearing, mass grading, lot leveling, and excavation expose soil to erosion processes and increase the potential for sediment mobilization, runoff and deposition in receiving waters. Construction sites without adequate BMP implementation result in sediment runoff rates that greatly exceed natural erosion rates of undisturbed lands, causing siltation and impairment of receiving waters. This can even occur in conjunction with unexpected rain events during the so-called *dry-season*. Although rare, significant rains can occur in the San Francisco Bay Region during the dry season. Therefore, Permittees should ensure that construction sites have materials on hand for rapid rain response during the dry season.

Normally, stormwater restrictions on grading should be implemented during the wet season from October 1st through April 30th. Section C.6.c.ii.(1).d of the Permit requires, "project proponents to minimize grading during the wet season and scheduling of grading with seasonal dry weather periods to the extent feasible." If grading does occur during the wet season, Permittees shall require project proponents to (1) implement additional BMPs as necessary, (2) keep supplies available for rapid response to storm events, and (3) minimize wet-season, exposed, and graded areas to the absolute minimum necessary.

Slope stabilization is necessary on all active and inactive slopes during rain events regardless of the season, except in areas implementing advanced treatment. Slope stabilization is also required on inactive slopes throughout the rainy season. These requirements are needed because unstabilized slopes at construction sites are significant sources of erosion and sediment discharges during rainstorms. "Steep slopes are the most highly erodible surface of a construction site, and require special attention."[89] USEPA emphasizes the importance of slope stabilization when it states, "slope length

[89] Schueler, T., and H. Holland. 2000. *Muddy Water In—Muddy Water Out*? The Practice of Watershed Protection. p. 6.

and steepness are key influences on both the volume and velocity of surface runoff. Long slopes deliver more runoff to the base of slopes and steep slopes increase runoff velocity; both conditions enhance the potential for erosion to occur."[90] In lieu of vegetation preservation or replanting, soil stabilization is the most effective measure in preventing erosion on slopes. Research has shown that effective soil stabilization can reduce sediment discharge concentrations up to six times, as compared to soils without stabilization.[91] Slope stabilization at construction sites for erosion control is already the consensus among the regulatory community and is found throughout construction BMP manuals and permits. For these reasons, Permittees must ensure that slope stabilization is implemented on sites, as appropriate.

It is also necessary that Permittees ensure that construction sites are revegetated as early as feasible. Implementation of revegetation reduces the threat of polluted stormwater discharges from construction sites. Construction sites should permanently stabilize disturbed soils with vegetation at the conclusion of each phase of construction.[92] A survey of grading and clearing programs found one-third of the programs without a time limit for permanent revegetation, "thereby increasing the chances for soil erosion to occur."[93] USEPA states "the establishment and maintenance of vegetation are the most important factors to minimizing erosion during development."[94]

To ensure the MEP standard and water quality standards are met, advanced treatment systems may be necessary at some construction sites. In requiring the implementation of advanced treatment for sediment at construction sites, Permittees should consider the site's threat to water quality. In evaluating the threat to water quality, the following factors shall be considered: (1) soil erosion potential; (2) the site's slopes; (3) project size and type; (4) sensitivity of receiving waterbodies; (5) proximity to receiving waterbodies; (6) non-stormwater discharges; and (7) any other relevant factors. Advanced treatment is a treatment system that employs chemical coagulation, chemical flocculation, or electro coagulation in order to reduce turbidity caused by fine suspended sediment.[95] Advanced treatment consists of a three part treatment train of coagulation, sedimentation, and polishing filtration. Advanced treatment has been effectively implemented extensively in the other states and in the Central Valley Region of California.[96] In addition, Water Board's inspectors have observed advanced treatment being effectively implemented at both large sites greater than 100 acres, and at small, 5-acre sites. Advanced treatment is often necessary for Permittees to ensure that discharges from construction sites are not causing or contributing to a violation of water quality standards.

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90 USEPA. 1990. *Sediment and Erosion Control: An Inventory of Current Practices*. p. II-1.

91 Schueler, T., and H. Holland. 2000. "Muddy Water In—Muddy Water Out?" *The Practice of Watershed Protection.* p. 5.

92 Ibid.

93 Ibid. p. 11.

94 USEPA. 1990. *Sediment and Erosion Control: An Inventory of Current Practices*. p. II-1.

95 SWCRB. September 2, 2009. *NPDES General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities – Order No. 2009-0009-DWQ.*

96 SWRCB. 2004. Conference on Advanced Treatment at Construction Sites.

Provision C.6.d. Plan Approval Process. This section of the Permit requires the Permittees to review project proponents' stormwater management plans for compliance with local regulations, policies, and procedures. USEPA states that it is often easier and more effective to incorporate stormwater quality controls during the site plan review process or earlier.[97] In the Phase I stormwater regulations, USEPA states that a primary control technique is good site planning.[98] USEPA goes on to say that the most efficient controls result when a comprehensive stormwater management system is in place.[99] To determine if a construction site is in compliance with construction and grading ordinances and permits, USEPA states that the "MS4 operator should review the site plans submitted by the construction site operator before ground is broken."[100] Site plan review aids in compliance and enforcement efforts since it alerts the "MS4 operator early in the process to the planned use or non-use of proper BMPs and provides a way to track new construction activities."[101]

Provision C.6.e. (Inspections) The Water Board allows flexibility on the exact legal authority language, ERP, and BMPs required on a site. This section of the Permit pulls together the accountability of the whole Provision through regular inspections, consistent enforcement, and meaningful tracking. These three elements will help ensure that effective construction pollutant controls are in place in order to minimize construction polluted runoff to the stormdrain and waterbodies.

Currently, Annual Reports show that some Permittees provide no information on its construction inspection and enforcement programs; some Permittees only provide information on pre rainy season inspections; another group of Permittees conduct inspections through December and provide just the date each site was inspected; yet another group of Permittees provides a very brief summary of their respective overall inspection program; and there is a small group of Permittees who report meaningful inspection and enforcement information. Inspections of construction sites by Water Board staff have noted deficiencies in stormwater inspections and enforcement. Therefore, this section clearly identifies the level of effort necessary by all Permittees to minimize construction pollutant runoff into stormdrains and ultimately, waterbodies.

This section requires monthly inspections during the wet season of all construction sites disturbing one or more acre of land and at all high priority sites as determined by the Permittee or the Water Board as significant threats to water quality. Inspections shall focus on the adequacy and effectiveness of the site specific BMPs implemented for the six BMP categories. Permittees shall implement its ERP and require timely corrections of all actual and potential problems observed. All violations must be corrected in a timely manner with the goal of correcting them before the next rain event but no longer

[97] USEPA. 2000. *Storm Water Phase II Compliance Assistance Guide*. EPA 833-R-00-002. Section 6.3.2.1.
[98] *Federal Register*. Vol. 55, No. 222, Friday, November 16, 1990. Rules and Regulations. p. 48034.
[99] Ibid.
[100] USEPA. 2000. *Storm Water Phase II Compliance Assistance Guide*. EPA 833-R-00-002. Section 4.6.2.4, pp. 4–30.
[101] Ibid. pp. 4–31.

than 10 business days after the violations are discovered. All inspections shall be recorded on a written or electronic inspection form, and also tracked in an electronic database or tabular format. The tracked information provides meaningful data for evaluating compliance. An example tabular format is included as Table 6 – Construction Inspection Data. Submittal of this Table is not required in each Annual Report but encouraged. Each Permittee will need to use the information in the electronic database or tabular format to compile its Annual Reports. The Executive Officer may require that the tracked information be submitted electronically or in a tabular format. When required, Permittees shall submit that data within 10-working days of the requirement. The recommended submittal format is in Table 6 – Construction Inspection Data.

Provision C.6.f. Staff Training. This section of the Permit requires Permittees to conduct annual staff trainings for municipal staff. These trainings have been found to be extremely effective means to educate inspectors and to inform them of any changes to local ordinances and state laws. Trainings provide valuable opportunity for Permittees to network and share strategies used for effective enforcement and management of erosion control practices.

Table 6 – Construction Inspection Data

Facility/Site Inspected	Inspection Date	Weather During Inspection	Inches of Rain Since Last Inspection	Enforcement Response Level	Problem(s) Observed							Specific Problem(s)	Resolution			Comments/ Rationale for Longer Compliance Time
					Erosion Control	Run-on and Runoff Control	Sediment Control	Active Treatment System	Good Site Management	Non Stormwater Management	Illicit Discharge		Problems Fixed	Need More Time	Escalate Enforcement	
Panoramic Views	9/30/08	Dry	0	Written Notice			x					Driveway not stabilized				
Panoramic Views	10/15/08	Dry	0.5										x			50' of driveway rocked.
Panoramic Views	11/15/08	Rain	3	Stop Work	x		x				x	Uncovered graded lots eroding; Sediment entering a stormdrain that didn't have adequate protection.				
Panoramic Views	11/15/08	Drizzling	0.25										x			Lots blanketed. Storm drains pumped. Street cleaned.
Panoramic Views	12/1/08	Dry	4	Verbal Warning					x			Porta potty next to stormdrain.	x			Porta potty moved away from stormdrain.
Panoramic Views	1/15/08	Rain	3.25	Written Warning	x					x		Fiber rolls need maintenance; Tire wash water flowing into street				
Panoramic Views	1/25/09	Dry	0										x			Fiber rolls replaced.

Facility/Site Inspected	Inspection Date	Weather During Inspection	Inches of Rain Since Last Inspection	Enforcement Response Level	Problem(s) Observed							Specific Problem(s)	Resolution			Comments/ Rationale for Longer Compliance Time
					Erosion Control	Run-on and Runoff Control	Sediment Control	Active Treatment System	Good Site Management	Non Stormwater Management	Illicit Discharge		Problems Fixed	Need More Time	Escalate Enforcement	
Panoramic Views	2/28/09	Rain	2.4	Stop Work	x		x				x	Slope erosion control failed. Fiber rolls at the bottom of the hill flattened. Sediment laden discharge skipping protected stormdrains and entering unprotected stormdrains.				
Panoramic Views	2/28/09	Rain	0.1											x		Fiber rolls replaced. Silt fences added. More stormdrains protected. Streets cleaned. Slope too soggy to access.
Panoramic Views	3/15/09	Dry	1	Citation with Fine					x		x	Paint brush washing not designated	x			Street and storm drains cleaned. Slopes blanketed.
Panoramic Views	4/1/09	Dry	0.5	Citation with Fine							x	Concrete washout overflowed; Evidence of illicit discharge				
Panoramic Views	4/15/09	Dry	0										x			Concrete washout replaced; Storm drain and line cleaned.

C.7. Public Information and Outreach

Legal Authority

The following legal authority applies to section C.7:

Broad Legal Authority: CWA sections 402(p)(3)(B)(ii-iii), CWC section 13377, and Federal NPDES regulations 40 CFR 122.26(d)(2)(i)(B, C, E, and F) and 40 CFR 122.26(d)(2)(iv).

Specific Legal Authority: Federal NPDES regulation 40 CFR 122.26(d)(2)(iv)(A)(6) requires, "A description of a program to reduce to the maximum extent practicable, pollutants in discharges from municipal separate storm sewers associated with the application of pesticides, herbicides, and fertilizer which will include, as appropriate, controls such as educational activities, permits, certifications, and other measures for commercial applicators and distributors, and controls for application in public right-of-ways and at municipal facilities."

Federal NPDES regulation 40 CFR 122.26(d)(2)(iv)(B)(5) requires , "a description of a program to promote, publicize, and facilitate public reporting of the presence of illicit discharges or water quality impacts associated with discharges from municipal separate storm sewers."

Federal NPDES regulation 40 CFR 122.26(d)(2)(iv)(B)(6) requires, "A description of educational activities, public information activities, and other appropriate activities to facilitate the proper management and disposal of used oil and toxic materials."

Fact Sheet Finding in Support of Provision C.7.

C.7-1 An informed and knowledgeable community is critical to the success of a stormwater program since it helps ensure greater support for the program as the public gains a greater understanding of stormwater pollution issues.

C.7-2 An informed community also ensures greater compliance with the program as the public becomes aware of the personal responsibilities expected of them and others in the community, including the individual actions they can take to protect or improve the quality of area waters.

C.7-3 The public education programs should use a mix of appropriate local strategies to address the viewpoints and concerns of a variety of audiences and communities, including minority and disadvantaged communities, as well as children.[102]

[102] USEPA. 2000. Storm Water Phase II Compliance Assistance Guide. EPA 833-R-00-002.

C.7-4 Target audiences should include (1) government agencies and official to achieve better communication, consistency, collaboration, and coordination at the federal, state, and local levels and (2) K-12/Youth Groups.103

C.7-5 Citizen involvement events should make every effort to reach out and engage all economic and ethnic groups.[104]

Specific Provision C.7 Requirements

Provision C.7.a. Storm Drain Inlet Marking. Storm drain inlet marking is a long-established program of outreach to the public on the nature of the storm drain system, providing the information that the storm drain system connects directly to creeks and the Bay and does not receive treatment. Past public awareness surveys have demonstrated that this BMP has achieved significant impact in raising awareness in the general public and meets the MEP standard as a required action. Therefore, it is important to set a goal of ensuring that all municipally-maintained inlets are legible labeled with a no dumping message. If storm drain marking can be conducted as a volunteer activity, it has additional public involvement value.

Provision C.7.b. Advertising Campaigns. Use of various electronic and/or print media on trash/litter in waterways and pesticides. Advertising campaigns are long-established outreach management practices. Specifically, the Bay Area Management Agencies Association (BASMAA) already implements an advertising campaign on behalf of the Permittees. While the Permittees have been successful at reaching certain goals for its Public Information/Participation programs, it must continue to increase public awareness of specific stormwater issues. This Permit also requires a pre-campaign survey and a post-campaign survey. These two surveys will help identify and quantify the audiences' knowledge, trends, and attitudes and/or practices; and to measure the overall population awareness of the messages and behavioral changes.

Provision C.7.c. Media Relations. Public service media time is available and allows the Permittees to leverage expensive media purchases to achieve broader outreach goals.

Provision C.7.d. Stormwater Point of Contact. As the public has become more aware, citizens are more frequently calling their local jurisdictions to report spills and other polluting behavior impacting stormwater runoff and causing non-stormwater prohibited discharges. Permittees are required to have a centralized, easily accessible point of contact both for citizen reports and to coordinate reports of problems identified by Permittee staff, permitting follow-up and pollution cleanup or prevention. Often the follow-up, cleanup, and/or prevention provide the opportunity to educate the immediate neighborhood through established public outreach mechanisms such as distributing door hangers in the neighborhood describing the remedy for the problem discovered. Permittees already have existing published stormwater point of contacts.

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103 State Water Board. 1994. Urban Runoff Technical Advisory Committee Report and Recommendations. Nonpoint Source Management Program.

104 USEPA. 2000. Storm Water Phase II Compliance Assistance Guide. EPA 833-R-00-002.

Provision C.7.e. Public Outreach Events. Staffing tables or booths at fairs, street fairs or other community events are a long-established outreach mechanism employed by Permittees to reach large numbers of citizens with stormwater pollution prevention information in an efficient and convenient manner. These have been ongoing in the Region for several municipal stormwater permit cycles and are MEP outreach actions. Permittees shall continue with such outreach events utilizing appropriate outreach materials, such as printed materials, newsletter/journal articles, and videos. Permittees shall also utilize existing community outreach events such as the Bringing Back the Natives Garden Tour.

Provision C.7.f. Watershed Stewardship Collaborative Efforts. Watershed and Creek groups are comprised of active citizens, but they often need support from the local jurisdiction and certainly need to coordinate actions with Permittees such as flood districts and cities.

Provision C.7.g. Citizen Involvement Events. Citizen involvement and volunteer efforts both accomplish needed creek cleanups and restorations, and serve to raise awareness and provide outreach opportunities. These have been ongoing in the Region for several municipal stormwater permit cycles and are MEP outreach actions.

In previous municipal stormwater permits, Public Information/Participation encompassed both Citizen Involvement Events and Public Outreach Events. Citizen Involvement Events are important because they provide the community opportunities to actively practice being good stewards of our environment. Therefore, this Permit separates out the Public Outreach Events from the Citizen Involvement Events to ensure that citizens in all Bay Area communities are given the opportunity to be involved. In addition, the Permit allows Permittees to claim both Public Outreach and Citizen Involvement credits if the event contains significant elements of both. The combined specified number of events for Public Outreach and Citizen Involvement are very close to current performance standards and/or level of effort for respective Public Information/Participation Programs.

Provision C.7.h. School-Age Children Outreach. Outreach to school children has proven to be a particularly successful program with an enthusiastic audience who are efficient to reach. School children also take the message home to their parents, neighbors, and friends. In addition, they are the next generation of decision makers and consumers.

Provision C.7.i. Outreach to Municipal Officials. It is important for Permittee staff to periodically inform Municipal Officials of the permit requirements and also future planning and resource needs driven by the permit and stormwater regulations.

C.8. Water Quality Monitoring

Legal Authority

Broad Legal Authority: CWA sections 402(p)(3)(B)(ii-iii); CWC section 13377; Federal
NPDES regulations 40 CFR 122.26(d)(2)(iv)

Specific Legal Authority: Permittees must conduct a comprehensive monitoring program as required under Federal NPDES regulations 40 CFR 122.48, 40 CFR 122.44(i), 40 CFR 122.26.(d)(1)(iv)(D), and 40 CFR 122.26(d)(2)(ii)-(iv).

Fact Sheet Findings in Support of Provision C.8

C.8-1 In response to questions regarding the type of water quality-based effluent limitations that are most appropriate for NPDES stormwater permits, and because of the nature of stormwater discharges, USEPA established the following approach to stormwater monitoring:

> Each storm water permit should include a coordinated and cost-effective monitoring program to gather necessary information to determine the extent to which the permit provides for attainment of applicable water quality standards and to determine the appropriate conditions or limitations for subsequent permits. Such a monitoring program may include ambient monitoring, receiving water assessment, discharge monitoring (as needed), or a combination of monitoring procedures designed to gather necessary information.[105]

According to USEPA, the benefits of stormwater runoff monitoring include, but are not limited to, the following:

- Providing a means for evaluating the environmental risk of stormwater discharges by identifying types and amounts of pollutants present;
- Determining the relative potential for stormwater discharges to contribute to water quality impacts or water quality standard violations;
- Identifying potential sources of pollutants; and
- Eliminating or controlling identified sources more specifically through permit conditions.[106]

C.8-2 Provision C.8 requires Permittees to conduct water quality monitoring, including monitoring of receiving waters, in accordance with 40 CFR 122.44(i) and 122.48. One purpose of water quality monitoring is to demonstrate the effectiveness of the Permittees' stormwater management

[105] USEPA. 1996. Interim Permitting Approach for Water Quality-Based Effluent Limitations in Stormwater Permits. Sept. 1, 1996. http://www.epa.gov/npdes/pubs/swpol.pdf
[106] USEPA. 1992. NPDES Storm Water Sampling Guidance Document. EPA/833-B-92-001.

actions pursuant to this Permit and, accordingly, demonstrate compliance with the conditions of the Permit. Other water quality monitoring objectives under this Permit include:

- Assess the chemical, physical, and biological impacts of urban runoff on receiving waters;
- Characterize stormwater discharges;
- Assess compliance with Total Maximum Daily Loads (TMDLs) and Wasteload Allocations (WLAs) in impaired waterbodies;
- Assess progress toward reducing receiving water concentrations of impairing pollutants;
- Assess compliance with numeric and narrative water quality objectives and standards;
- Identify sources of pollutants;
- Assess stream channel function and condition, as related to urban stormwater discharges;
- Assess the overall health and evaluate long-term trends in receiving water quality; and
- Measure and improve the effectiveness of the Permittees' urban runoff control programs and the Permittees' implemented BMPs.

C.8-3 Monitoring programs are an essential element in the improvement of urban runoff management efforts. Data collected from monitoring programs can be assessed to determine the effectiveness of management programs and practices, which is vital for the success of the iterative approach, also called the "continuous improvement" approach, used to meet the MEP standard. When water quality data indicate that water quality standards or objectives are not being met, particular pollutants, sources, and drainage areas can be identified and targeted for urban runoff management efforts. The iterative process in Provision C.1, Water Quality Standards Exceedances, could potentially be triggered by monitoring results. Ultimately, the results of the monitoring program must be used to focus actions to reduce pollutant loadings to comply with applicable WLAs, and protect and enhance the beneficial uses of the receiving waters in the Permittees' jurisdictions and the San Francisco Bay.

C.8-4 Water quality monitoring requirements in previous permits were less detailed than the requirements in this Permit. Under previous permits, each program could design its own monitoring program, with few permit guidelines. A decision by the California Superior Court[107] regarding two of the programs' permits stated:

Federal law requires that all NPDES permits specify "[r]equired monitoring including type, intervals, and frequency sufficient to yield

[107] San Francisco Baykeeper vs. Regional Water Quality Control Board, San Francisco Bay Region, Consolidated Case No. 500527, filed Nov. 14, 2003.

data which are representative of the monitored activity." 40 C.F.R. § 122.48(b). Here, there is no monitoring program set forth in the Permit. Instead, an annual Monitoring Program Plan is to be prepared by the dischargers to set forth the monitoring program that will be used to demonstrate the effectiveness of the Stormwater Management Plan. This does not meet the regulatory requirements that a monitoring program be set forth including the types, intervals, and frequencies of the monitoring.

The water quality monitoring requirements in Provision C.8 comply with 40 CFR 122.44(i) and 122.48(b), and the Superior Court decision.

C.8-5 The Water Quality Monitoring Provision is intended to provide answers to five fundamental management questions, outlined below. Monitoring is intended to progress as iterative steps toward ensuring that the Permittees' can fully answer, through progressive monitoring actions, each of the five management questions:

- Are conditions in receiving waters protective, or likely to be protective, of beneficial uses?
- What is the extent and magnitude of the current or potential receiving water problems?
- What is the relative urban runoff contribution to the receiving water problem(s)?
- What are the sources of urban runoff that contribute to receiving water problem(s)?
- Are conditions in receiving waters getting better or worse?

C.8-6 On April 15, 1992, the Water Board adopted Resolution No. 92-043 directing the Executive Officer to implement the Regional Monitoring Program for San Francisco Bay. Subsequent to a public hearing and various meetings, Board staff requested major permit holders in the Region, under authority of CWC section 13267, to report on the water quality of the Estuary. These permit holders, including the Permittees, responded to this request by participating in a collaborative effort through the San Francisco Estuary Institute. This effort has come to be known as the San Francisco Estuary Regional Monitoring Program for Trace Substances (RMP). The RMP involves collection and analysis of data on pollutants and toxicity in water, sediment and biota of the Estuary. The Permittees are required to continue to report on the water quality of the Estuary, as presently required. Compliance with the requirement through participation in the RMP is considered to be adequate compliance.

C.8-7 The Surface Water Ambient Monitoring Program (SWAMP) is a statewide monitoring effort, administered by the State Water Board, designed to assess the conditions of surface waters throughout California. One purpose of SWAMP is to integrate existing water quality monitoring activities of the State Water Board and the Regional Water Quality Control Boards, and to coordinate with other monitoring programs. Provision C.8 contains a

framework, referred to as a regional monitoring collaborative, within which Permittees can elect to work cooperatively with SWAMP to maximize the value and utility of both the Permittees' and SWAMP's monitoring resources.

C.8-8 In 1998 BASMAA published *Support Document for Development of the Regional Stormwater Monitoring Strategy*,[108] a document describing a possible strategy for coordinating the monitoring activities of BASMAA member agencies. The document states:

> BASMAA's member agencies are connected not only by geography but also by an overlapping set of environmental issues and processes and a common regulatory structure. It is only natural that the evolution of their individual stormwater management programs has led toward increasing amounts of information sharing, cooperation, and coordination.
>
> This same concept is found in the optional provision for Permittees to form a regional monitoring collaborative. Such a group is meant to provide efficiencies and economies of scale by performing certain tasks (e.g., planning, contracting, data quality assurance, data management and analysis, and reporting) at the regional level. Further benefits are expected from closer cooperation between this group, the Regional Monitoring Program, and SWAMP.

C.8-9 This Permit includes monitoring requirements to verify compliance with adopted TMDL WLAs and to provide data needed for TMDL development and/or implementation. This Permit incorporates the TMDLs' WLAs adopted by the Water Board as required under CWA section 303(d).

C.8-10 SB1070 (California Legislative year 2005/2006) found that there is no single place where the public can go to get a look at the health of local waterbodies. SB1070 also states that all information available to agencies shall be made readily available to the public via the Internet. This Permit requires water quality data to be submitted in a specified format and uploaded to a centralized Internet site so that the public has ready access to the data.

Specific Provision C.8 Requirements

Each of the components of the monitoring provision is necessary to meet the objectives and answer the questions listed in the findings above. Justifications for each monitoring component are discussed below.

Provision C.8.a. Compliance Options. Provision C.8.a. provides Permittees options for obtaining monitoring data through various organizational structures, including use of data obtained by other parties. This is intended to

[108] EcoAnalysis, Inc. & Michael Drennan Assoc., Inc., *Support Document for Development of the Regional Stormwater Monitoring Strategy*, prepared for Bay Area Stormwater Management Agencies Association, March 2, 1998.

- Promote cost savings through economies of scale and elimination of redundant monitoring by various entities;
- Promote consistency in monitoring methods and data quality;
- Simplify reporting; and
- Make data and reports readily publicly available.

In the past, each Stormwater Countywide Program has conducted water quality monitoring on behalf of its member Permittees, and some data were collected by wider collaboratives, such as the Regional Monitoring Program. In this Permit, all the Stormwater Countywide Programs are encouraged to work collaboratively to conduct all or most of the required monitoring and reporting on a region-wide basis. For each monitoring component that is conducted collaboratively, one report would be prepared on behalf of all contributing Permittees; separate reports would not be required from each Program. Cost savings could result also from reduced contract and oversight hours, fewer quality assurance/quality control samples, shared sampling labor costs, and laboratory efficiencies.

Provision C.8.b. San Francisco Estuary Receiving Water Monitoring. The San Francisco Estuary is the ultimate receiving water for most of the urban runoff in this region. For this reason and because of the high value of its beneficial uses, Provision C.8.b requires focused monitoring on the Estuary to continue. Since the mid-1990s, Permittees have caused this monitoring to be conducted by contributing financially and with technical expertise, to the San Francisco Estuary Regional Monitoring Program for Trace Substances. Provision C.8.b requires such monitoring to continue.

Provisions C.8.c. & C.8.e.ii. Status Monitoring and Long-Term Monitoring. Status Monitoring and Long-Term Monitoring serve as surrogates to monitoring the discharge from all major outfalls, of which the Permittees have many. By sampling the sediment and water column in urban creeks, the Permittees can determine where water quality problems are occurring in the creeks, then work to identify which outfalls and land uses are causing or contributing to the problem. In short, Status and Long-Term Monitoring are needed to identify water quality problems and assess the health of streams; they are the first step in identifying sources of pollutants and an important component in evaluating the effectiveness of an urban runoff management program.

Provisions C.8.c.i. and C.8.e.iii. Parameters and Methods
Status & Long-Term parameters and methods reflect current accepted practices, based on the knowledge and experience of personnel responsible for water quality monitoring, including state and Regional SWAMP managers, Permittee representatives, and citizen monitors. Many Status and Long-Term Monitoring parameters are consistent with parameters the Permittees have been monitoring to date. The following parameters are new for some of the Permittees:

- Biological Assessment—to provide site-specific information about the health and diversity of freshwater benthic communities within a specific reach of a creek, using standard procedures developed and/or used by the State Water

Resources Control Board Surface Water Ambient Monitoring Program.[109] It consists of collecting samples of benthic communities and conducting a taxonomic identification to measure community abundance and diversity, which is then compared to a reference creek to assess benthic community health. This monitoring can also provide information on cumulative pollutant exposure/impacts because pollutant impacts to the benthic community accumulate and occur over time.

- Chlorine—to detect a release of potable water or other chlorinated water sources, which are toxic to aquatic life.
- Nutrients—recent monitoring data indicate nutrients, which can increase algal growth and decrease dissolved oxygen concentrations, are present in significant concentrations in Bay area creeks.
- Toxicity and Pollutants in Bedded Sediment—to determine the presence of, and identify, chemicals and compounds that bind to sediment in a creek bed and are toxic to aquatic life.
- Pathogen Indicators—to detect pathogens in waterbodies that could be sources of impairment to recreational uses at or downstream of the sampling location.
- Stream Survey (stream walk and mapping)—to assess the overall physical health of the stream and to gain information potentially useful in interpreting monitoring results.

In consideration of economic impacts to Permittees, the minimum number of Status & Long-Term samples ("Minimum # Sample Sites" columns in Tables 8.1 and 8.3) reflects the Programs' populations, not waterbody size. Permittees must select exact sample locations that will yield adequate information on the status of their waterbodies; in some cases, additional sampling above the minimum might be necessary.

Provisions C.8.c.ii. and C.8.e.iii. Frequency

Status Monitoring continues to be an annual requirement for the Permittees, except for two much smaller Permittees, Fairfield-Suisun and Vallejo. In considering costs, the frequency of Status Monitoring is established at twice per Permit term for Fairfield-Suisun, and once per Permit term for Vallejo. It is common for Permit terms to be extended through a lengthy Permit reissuance process. Thus, these frequencies are considered the minimum; costs are minimized while data necessary for successful stormwater management are obtained.

Long-Term Monitoring is required every second year (biennially), rather than annually, in order to balance data needs and Permittee costs. To further reduce costs, the Fairfield-Suisun and Vallejo Permittees have no Long-Term Monitoring requirements.

Provisions C.8.c.iii. and C.8.e.ii. Locations

Status Monitoring is to be conducted on a rotating-watershed basis, in similar fashion to the Statewide SWAMP. Provision C.8.c.iii. identifies the major waterbodies, and Permittees are to select which of these waterbodies will be sampled during the Permit

[109] Ode, P.R. 2007. Standard Operating Procedures for Collecting Macroinvertebrate Samples and Associated Physical and Chemical Data for Ambient Bioassessments in California, California State Water Resources Control Board Surface Water Ambient Monitoring Program (SWAMP), as subsequently revised.

term. The exact sample locations within each waterbody are critical in terms of determining the monitoring program's effectiveness. If correctly sited, the stations are expected to be very useful in answering the monitoring program's management questions and meeting its goals. For this reason, Provision C.8.c.iii. requires sample locations to be based on surrounding land use, likelihood of urban runoff impacts, existing data gaps, and similar considerations. This will help maximize the utility of the sample locations, while also providing the Permittees with adequate flexibility to ultimately choose practical Status Monitoring locations.

Long-Term Monitoring is to be conducted at fixed stations, which are intended to be lower reaches of urban creeks. This monitoring is intended to help assess progress toward reducing receiving water concentrations of impairing pollutants, among other purposes. Provision C.8.e.ii. establishes the waterbodies on which to locate fixed stations, and suggests that fixed stations be co-located with SWAMP fixed stations so that Permittees can use SWAMP data to fulfill some of their monitoring requirements. However, Permittees may select alternate locations based on their knowledge of such factors as site access and stream characteristics and provided that similar data types, data quality, and data quantity are collected.

Provision C.8.d. Monitoring Projects. Monitoring Projects are necessary to meet several water quality monitoring objectives under this Permit, including characterize stormwater discharges; identify sources of pollutants; identify new or emerging pollutants; assess stream channel function and condition; and measure and improve the effectiveness of Stormwater Countywide Programs and implemented BMPs. In consideration of economic impacts to Permittees, the number of Monitoring Projects required reflects the Permittees' populations.

Provision C.8.d.i. Stressor/Source Identification
Minimizing sources of pollutants that could impair water quality is a central purpose of urban runoff management programs. Monitoring which enables the Permittees to identify sources of water quality problems aids the Permittees in focusing their management efforts and improving their programs. In turn, the Permittees' programs can abate identified sources, which will improve the quality of urban runoff discharges and receiving waters. This monitoring is needed to address the management question, "What are the sources to urban runoff that contribute to receiving water problems?"

When Status or Long-Term Monitoring results indicate an exceedance of a water quality objective, toxicity threshold, or other "trigger", Permittees must identify the source of the problem and take steps to reduce any pollutants discharged from or through their municipal storm sewer systems. This requirement conforms to the process, outlined in Provision C.1., of complying with the Discharge Prohibition and Receiving Water Limitations. If multiple "triggers" are identified through monitoring, Permittees must focus on the highest priority problems; a cap on the total number of source identification projects conducted within the Permit term is provided to cap Permittees' potential costs.

Provision C.8.d.ii. BMP Effectiveness Investigation
U.S. EPA's stated approach to NPDES stormwater permitting uses BMPs in first-round permits, and expanded or better-tailored BMPs in subsequent permits, where necessary, to provide for the attainment of water quality standards.[110] The purpose of this monitoring project is to investigate the effectiveness of one currently in-use BMP to determine how it might be improved. Permittees may choose the particular stormwater treatment or hydromodification control BMP to investigate. As with other monitoring requirements, Permittees may work collaboratively to conduct one investigation on a region-wide basis, or each stormwater countywide program may conduct an investigation.

Provision C.8.d.iii. Geomorphic Project
The physical integrity of a stream's bed, bank and riparian area is integral to the stream's capacity to withstand the impacts of discharged pollutants, including chemical pollutants, sediment, excess discharge volumes, increased discharge velocities, and increased temperatures. At present, various efforts are underway to improve geomorphic conditions in creeks, primarily through local watershed partnerships. In addition, local groups are undertaking *green stormwater projects* with the goal of minimizing the physical and chemical impacts of stormwater runoff on the receiving stream. Such efforts ultimately seek to improve the integrity of the waterbodies that receive urban stormwater runoff.

The purpose of the Geomorphic Project is to contribute to these ongoing efforts in each Stormwater Countywide Program area. Permittees may select the geomorphic project from three categories specified in the Permit.

C.8.e. Pollutants of Concern[111] Monitoring. Federal CWA section 303(d) TMDL requirements, as implemented under the CWC, require a monitoring plan designed to measure the effectiveness of the TMDL point and nonpoint source control measures and the progress the waterbody is making toward attaining water quality objectives. Such a plan necessarily includes collection of water quality data. Provision C.8.e. establishes a monitoring program to measure of the effectiveness of TMDL control measures in progressing toward WLAs. Locations, parameters, methods, protocols, and sampling frequencies for this monitoring are specified. A sediment delivery estimate/budget is also required to improve the Permittees' estimates of their loading estimates. In addition, a workplan is required for estimating loads and analyzing sources of emerging pollutants, which are likely to be present in urban runoff, in the next Permit term.

C.8.f. Citizen Monitoring and Participation. CWA section 101(e) and 40 CFR Part 25 broadly require public participation in all programs established pursuant to the CWA, to foster public awareness of environmental issues and decision-making processes. Provision C.8.f. is intended to do the following:

[110] USEPA. 1996. *Interim Permitting Approach for Water Quality-Based Effluent Limitations in Stormwater Permits*. Sept. 1, 1996. http://www.epa.gov/npdes/pubs/swpol.pdf
[111] See section C.9, C.11, C.12, and C.13 of this Fact Sheet for more information on Pollutants of Concern.

- Support current and future creek stewardship efforts by providing a framework for citizens and Permittees to share their collective knowledge of creek conditions; and
- Encourage Permittees to use and report data collected by creek groups and other third-parties when the data are of acceptable quality.

C.8.g. Reporting. CWC section 13267 provides authority for the Water Board to require technical water quality reports. Provision C.8.g. requires Permittees to submit electronic and comprehensive reports on their water quality monitoring activities to (1) determine compliance with monitoring requirements; (2) provide information useful in evaluating compliance with all Permit requirements; (3) enhance public awareness of the water quality in local streams and the Bay; and (4) standardize reporting to better facilitate analyses of the data, including for the CWA section 303(d) listing process.

C.9. – C.14. Pollutants of Concern including Total Maximum Daily Loads

Provisions C.9 through C.14 pertain to pollutants of concern, including those for which TMDLs are being developed or implemented.

Legal Authority

The following legal authority applies to provisions C.9 through C.14:

Broad Legal Authority: CWA sections 402(p)(3)(B)(ii-iii), CWC section 13377, and Federal NPDES regulations 40 CFR 122.26(d)(2)(i)(B, C, E, and F) and 40 CFR 122.26(d)(2)(iv).

Specific Legal Authority: Federal NPDES regulation 40 CFR 122.44(d)(1) requires municipal stormwater permits to include any requirements necessary to, "[a]chieve water quality standards established under section 303 of the CWA, including State narrative criteria for water quality."

Federal NPDES regulation 40 CFR 122.44(d)(1)(i) requires NPDES permits to include limitations to, "control all pollutants or pollutant parameters (either conventional, nonconventional, or toxic pollutants) which are or may be discharged at a level which will cause, have reasonable potential to cause, or contribute to an excursion above any State water quality standard, including State narrative criteria for water quality."

Basin Plan Requirements: Section 4.8 of the Region's Water Quality Control Plan (Basin Plan) requires that stormwater permits include requirements to prevent or reduce discharges of pollutants that cause or contribute to violations of water quality objectives. In the first phase, the Water Board requires implementation of technically and economically feasible control measures to reduce pollutants in stormwater to the MEP. If this first phase does not result in attainment of water quality objectives, the Water Board will consider permit conditions that might require implementation of additional control measures. For example, the control measures required as a result of TMDLs may go beyond the measures required in the first phase of the program.

General Strategy for Sediment-Bound Pollutants (Mercury, PCBs, legacy pesticides, PBDEs)

The control measures for mercury are intended to implement the urban runoff requirements stemming from TMDLs for this pollutant. The control measures required for PCBs are intended to implement those that are consistent with control measures in the PCBs TMDL implementation plan that has been approved by the Water Board and is pending approval by the State Board, the Office of Administrative Law, and U.S. EPA. The urban runoff management requirements in the PCBs TMDL implementation plan call for permit-term requirements based on an assessment of controls to reduce

PCBs to the MEP, and that is the intended approach of the required provisions for all pollutants of concern. Many of the control actions addressing PCBs and mercury will result in reductions of a host of sediment-bound pollutants, including legacy pesticides, mercury, PBDEs, and PCBs. The strategy for these pollutants is to use PCBs control guide decisions concerning where to focus effort, but implementation of the control efforts would taken into account the benefits for controlling other pollutants of concern. Further, because many of the control strategies addressing these pollutants of concern are relatively untested, the Water Board will implement control measures in the following modes:

1. Full-scale implementation throughout the region.
2. Focused implementation in areas where benefits are most likely to accrue.
3. Pilot-testing in a few specific locations.
4. Other: This may refer to experimental control measures, Research and Development, desktop analysis, laboratory studies, and/or literature review.

The logic of such categorization is that, as actions are tested and confidence is gained regarding level of experience and confidence in the control measure's effectiveness, the control measure may be implemented with a greater scope. For example, an untested control measure for which the effectiveness is uncertain may be implemented as a pilot project in a few locations during this permit term. If benefits result, and the action is deemed effective, it will be implemented in subsequent permit terms in a focused fashion in more locations or perhaps fully implemented throughout the Region, depending upon the nature of the measure. On the other hand there may be some control measures in which there is sufficient confidence, on the basis of prior experience, that the control action should be implemented in all applicable locations and/or situations. By conducting actions in this way and gathering information about effectiveness and cost, we will advance our understanding and be able to perform an updated assessment of the suite of actions that will constitute MEP for the following permit term. In fact, in additional to implementing control measures, gathering the necessary information about control measure effectiveness is a vital part of what needs to be accomplished by Permittees during this permit term. In the next permit term, control measures will be implemented on the basis of what we learn in this term, and we will, thus, achieve iterative refinement and improvement through time.

Background on Specific Provisions: Provisions C.9 through C.14 contain both technology-based requirements to control pollutants to the MEP and water quality based requirements to prevent or reduce discharges of pollutants that may cause or contribute to violations of water quality standards. Provisions C.9 and C.11 of the Permit incorporate requirements for the two TMDLs that have been fully approved and are effective for the Permittees. These TMDLs are for pesticide-related toxicity in urban creeks and mercury in San Francisco Bay. Additionally, Provision C.12 contains measures that address PCBs. The Regional Water Board has adopted a PCB TMDL, but it is still pending approval by State Board, the Office of Administrative Law, and U.S. EPA. This PCBs TMDL includes requirements that would be consistent with this

provision. Finally, Provision C.13 contains measures to implement the copper site-specific objective in San Francisco Bay.

Where a TMDL has been approved, NPDES permits must contain effluent limitations and conditions consistent with the requirements and assumptions in the TMDL.[112] Effluent limitations are generally expressed in numerical form. However, USEPA recommends that for NPDES-regulated municipal and small construction stormwater discharges, effluent limitations should be expressed as BMPs or other similar requirements rather than as numeric effluent limitations.[113] Consistent with USEPA's recommendation, this section implements WQBELs expressed as an iterative BMP approach capable of meeting the WLAs in accordance with the associated compliance schedule. The Permit's WQBELs include the numeric WLA as a performance standard and not as an effluent limitation. The WLA can be used to assess if additional BMPs are needed to achieve the TMDL Numeric Target in the waterbody.

[112] 40 CFR 122.44(d)(1)(vii)(B)

[113] USEPA, 2002. Establishing Total Maximum Daily Load (TMDL) Wasteload Allocations (WLAs) for Storm Water Sources and NPDES Permit Requirements Based on Those WLAs. P. 4.

C.9. Pesticides Toxicity Control

Fact Sheet Findings in Support of Provision C.9.

C.9-1 This Permit fulfills the Basin Plan amendments the Water Board adopted that establish a Water Quality Containment Strategy and TMDL for diazinon and pesticide-related toxicity for Bay Area urban creeks on November 16, 2005, and approved by the State Water Board on November 15, 2006. The Water Quality Containment Strategy requires urban runoff management agencies to minimize their own pesticide use, conduct outreach to others, and lead monitoring efforts. Control measures implemented by urban runoff management agencies and other entities (except construction and industrial sites) shall reduce pesticides in urban runoff to the MEP.

C.9-2 **(Allocations):** The TMDL is allocated to all urban runoff, including urban runoff associated with MS4s, Caltrans facilities, and industrial, construction, and institutional sites. The allocations are expressed in terms of toxic units and diazinon concentrations.

Specific Provision C.9 Requirements

C.9 provisions fully implement the TMDL for Urban Creeks Pesticide Toxicity. All C.9 provisions are stated explicitly in the implementation plan for this TMDL. Permittees are encouraged to coordinate activities with the Urban Pesticide Pollution Prevention Project, the Urban Pesticide Committee, and other agencies and organizations. The Urban Pesticide Pollution Prevention (UP3) Project has been funded by a grant from the State Water Board and its goal is to prevent water pollution from urban pesticide use. The Urban Pesticides Committee serves as an information clearinghouse and as a forum for coordinating pesticide TMDL implementation.

The UP3 Project provides resources and information on integrated pest management (IPM) and tools to municipalities to support their efforts to reduce municipal pesticide use and to conduct outreach to their communities on less-toxic methods of pest control. In addition, it provides technical assistance to municipalities to encourage the U.S. Environmental Protection Agency and the California Department of Pesticide Regulation to prevent water quality problems from pesticides. It also maintains and manages the Urban Pesticides Committee, a statewide network of agencies, nonprofits, industry, and other stakeholders that are working to solve water quality problems from pesticides.

Specific tools provided by the UP3 Project that relate to permit requirements include:

- Guidance and resources to help agencies create contracts and bid documents for structural pest management services that help them meet their integrated pest management goals
- IPM policies and ordinances
- IPM training workshops and materials

- Outreach program design resources
- Resources for evaluating effectiveness

Provisions C.9.a through C.9.d are designed to insure that integrated pest management (IPM) is adopted and implemented as policy by all municipalities. IPM is a pest control strategy that uses an array of complementary methods: natural predators and parasites, pest-resistant varieties, cultural practices, biological controls, various physical techniques, and pesticides as a last resort. If implemented properly, it is an approach that can significantly reduce or eliminate the use of pesticides. The implementation of IPM will be assured through training of municipal employees and the requirement that municipalities only hire IPM-certified contractors.

Provision C.9.e requires that municipalities (through cooperation or participation with BASMAA) track and participate in pesticide regulatory processes like the USEPA pesticide evaluation and registration activities related to surface water quality, and the California Department of Pesticide Regulation (DPR) pesticide evaluation activities. The goal of these efforts is to encourage both the state and federal pesticide regulatory agencies to accommodate water quality concerns within the pesticide regulation or registration process. Through these efforts, it could be possible to prevent pesticide-related water quality problems from happening by affecting which products are brought to market.

Provision C.9.g is critical to the success of municipal efforts to control pesticide-related toxicity. Future permits must be based on an updated assessment of what is working and what is not. With every provision comes the responsibility to assess its effectiveness and report on these findings through the permit. The particulars of assessment will depend on the nature of the control measure.

Provision C.9.h directs the municipalities to conduct outreach to consumers at point of purchase and provide targeted information on proper pesticide use and disposal, potential adverse impacts on water quality, and less toxic methods of pest prevention and control. One way in which this can be accomplished is for the Permittees to participate in and provide resources for the "Our Water, Our World" program (www.ourwaterourworld.org) or a functionally equivalent pesticide use reduction outreach program. The "Our Water, Our World" program has developed a Web site with many resources, "to assist consumers in managing home and garden pests in a way that helps protect" the environment.

C.10. Trash Load Reduction

Legal Authority

The following legal authority applies to section C.10:

Broad Legal Authority: CWA sections 402(p)(3)(B)(ii-iii), CWC section 13377, and Federal NPDES regulations 40 CFR 122.26(d)(2)(i)(B, C, D, E, and F) and 40 CFR 122.26(d)(2)(iv).

Specific Legal Authority: Federal NPDES regulations 40 CFR 122.26(d)(2)(iv)(B) requires, "shall be based on a description of a program, including a schedule, to detect and remove (or require the discharger to the municipal storm sewer to obtain a separate NPDES permit for) illicit discharges and improper disposal into the storm sewer."

Federal NPDES regulation 40 CFR 122.26(d)(2)(iv)(B)(2) requires, "a description of procedures to conduct on-going field screening activities during the life of the permit, including areas or locations that will be evaluated by such field screens."

Federal NPDES regulation 40 CFR 122.26(d)(2)(iv)(B)(3) requires, "a description of procedures to be followed to investigate portions of the separate storm sewer system that, based on the results of the field screen, or other appropriate information, indicate a reasonable potential of containing illicit discharges or other sources of non-storm water."

Federal NPDES regulations 40 CFR 122.26(d)(2)(iv)(B)(4) requires, "a description of procedures to prevent, contain, and respond to spills that may discharge into the municipal separate storm sewer."

San Francisco Bay Basin Plan, Chapter 4 – Implementation, Table 4-1 Prohibitions, Prohibition 7, which is consistent with the State Water Board's Enclosed Bays and Estuaries Policy, Resolution 95-84, prohibits the discharge of rubbish, refuse, bark, sawdust, or other solid wastes into surface waters or at any place where they would contact or where they would be eventually transported to surface waters, including flood plain areas. This prohibition was adopted by the Water Board in the 1975 Basin Plan, primarily to protect recreational uses such as boating.

Fact Sheet Findings in Support of Provision C.10

C.10-1 Trash and litter are a pervasive problem near and in creeks and in San Francisco Bay. Controlling trash is one of the priorities for this Permit reissuance not only because of the trash discharge prohibition, but also because trash and litter cause particularly major impacts on our enjoyment of creeks and the Bay. There are also significant impacts on aquatic life and habitat in those waters and eventually to the global ocean ecosystem, where plastic often floats, persists in the environment for hundreds of years, if not

forever, concentrates organic toxins, and is ingested by aquatic life. There are also physical impacts, as aquatic species can become entangled and ensnared and can ingest plastic that looks like prey, losing the ability to feed properly.

For the purposes of this provision, trash is defined to consist of litter and particles of litter. Man made litter is defined in California Government Code section 68055.1 (g): *Litter* means all improperly discarded waste material, including, but not limited to, convenience food, beverage, and other product packages or containers constructed of steel, aluminum, glass, paper, plastic, and other natural and synthetic materials, thrown or deposited on the lands and waters of the state, but not including the properly discarded waste of the primary processing of agriculture, mining, logging, sawmilling, or manufacturing.

C.10-2 Data collected by Water Board staff using the SWAMP Rapid Trash Assessment (RTA) Protocol,[114] over the 2003–2005 period,[115] suggest that the current approach to managing trash in waterbodies is not reducing the adverse impact on beneficial uses. The levels of trash in the waters of the San Francisco Bay Region are alarmingly high, considering the Basin Plan prohibits discharge of trash and that littering is illegal with potentially large fines. Even during dry weather conditions, a significant quantity of trash, particularly plastic, is making its way into waters and being transported downstream to San Francisco Bay and the Pacific Ocean. On the basis of 85 surveys conducted at 26 sites throughout the Bay Area, staff have found an average of 2.93 pieces of trash for every foot of stream, and all the trash was removed when it was surveyed, indicating high return rates of trash over the 2003–2005 study period. There did not appear to be one county within the Region with higher trash in waters—the highest wet weather deposition rates were found in western Contra Costa County, and the highest dry weather deposition was found in Sonoma County. Results of the trash in waterbodies assessment work by staff show that rather than adjacent neighborhoods polluting the sites at the bottom of the watershed, these areas, which tend to have lower property values, are subject to trash washing off with urban stormwater runoff cumulatively from the entire watershed.

C.10-3 A number of key conclusions can be made on the basis of the trash measurement in streams:

- Lower watershed sites have higher densities of trash.
- All watersheds studied in the San Francisco Bay Region have high levels of trash.
- There are trash source hotspots, usually associated with parks, schools, or poorly kept commercial facilities, near creek channels, that appear to contribute a significant portion of the trash deposition at lower watershed sites.

[114] SWAMP Rapid Trash Assessment Protocol, Version 8
[115] SWAMP S.F. Bay Region Trash Report, January 23, 2007

- Dry season deposition of trash, associated with wind and dry season runoff, contributes measurable levels of trash to downstream locations.
- The majority of trash is plastic at lower watershed sites where trash accumulates in the wet season. This suggests that urban runoff is a major source of floatable plastic found in the ocean and on beaches as marine debris.
- Parks that have more evident management of trash by city staff and local volunteers, including cleanup within the creek channel, have measurably less trash pieces and higher RTA scores.

C.10-4 The ubiquitous, unacceptable levels of trash in waters of the San Francisco Bay Region warrant a comprehensive and progressive program of education, warning, and enforcement, and certain areas warrant consideration of structural controls and treatment.

C.10-5 Trash in urban waterways of coastal areas can become *marine debris*, known to harm fish and wildlife and cause adverse economic impacts.[116] Trash is a regulated water pollutant that has many characteristics of concern to water quality. It accumulates in streams, rivers, bays, and ocean beaches throughout the San Francisco Bay Region, particularly in urban areas.

C.10-6 Trash adversely affects numerous beneficial uses of waters, particularly recreation and aquatic habitat. Not all litter and debris delivered to streams are of equal concern with regards to water quality. Besides the obvious negative aesthetic effects, most of the harm of trash in surface waters is imparted to wildlife in the form of entanglement or ingestion.[117,118] Some elements of trash exhibit significant threats to human health, such as discarded medical waste, human or pet waste, and broken glass.[119] Also, some household and industrial wastes can contain toxic batteries, pesticide containers, and fluorescent light bulbs that contain mercury. Large trash items such as discarded appliances can present physical barriers to natural stream flow, causing physical impacts such as bank erosion. From a management perspective, the persistent accumulation of trash in a waterbody is of particular concern, and signifies a priority for prevention of trash discharges. Also of concern are trash *hotspots* where illegal dumping, littering, and/or accumulation of trash occur.

C.10-7 The narrative water quality objectives applicable to trash are Floating Material (Waters shall not contain floating material, including solids, liquids, foams, and scum, in concentrations that cause nuisance or adversely

[116] Moore, S.L., and M.J. Allen. 2000. Distribution of anthropogenic and natural debris on the mainland shelf of the Southern California Bight. *Mar. Poll. Bull*. 40:83-88.

[117] Laist, D. W. and M. Liffmann. 2000. *Impacts of marine debris: research and management needs.* Issue papers of the International Marine Debris Conference, Aug. 6-11, 2000. Honolulu, HI, pp. 16–29.

[118] McCauley, S.J. and K.A. Bjorndahl. 1998. Conservation implications of dietary dilution from debris ingestion: sublethal effects in post-hatchling loggerhead sea turtles. *Conserv. Biol.* 13(4):925-929.

[119] Sheavly, S.B. 2004. *Marine Debris: an Overview of a Critical Issue for our Oceans.* 2004 International Coastal Cleanup Conference, San Juan, Puerto Rico. The Ocean Conservancy.

affect beneficial uses), Settleable Material (Waters shall not contain substances in concentrations that result in the deposition of material that cause nuisance or adversely affect beneficial uses), and Suspended Material (Waters shall not contain suspended material in concentrations that cause nuisance or adversely affect beneficial uses).

C.10-8 The Water Board, at its February 11, 2009 hearing, adopted a resolution proposing that 26 waterbodies in the region be added to the 303(d) list for the pollutant trash. The adopted Resolution and supporting documents are contained in Attachment 10.1 – 303(d) Trash Resolution and Staff Report Feb 2009.

Specific Provision C.10 Requirements

Provision C.10. Permittees shall demonstrate compliance with Discharge Prohibition A.2 and trash-related Receiving Water Limitations through the timely implementation of control measures and other actions to reduce trash loads from municipal separate storm sewer systems (MS4s) by 40% by 2014, 70% by 2017, and 100% by 2022 as further specified below.

C.10.a.i. Short-Term Trash Load Reduction Plan
The Short-Term Trash Load Reduction Plan is intended to describe actions to incrementally reduce trash loads toward the 2014 requirement of a 40% reduction and eventual abatement of trash loads to receiving waters.

C.10.a.ii. Baseline Trash Load and **Trash Load Reduction Tracking Method**
In order to achieve the incremental trash load reductions in an accountable manner, the Permittees will propose Baseline Trash Loads and a Trash Load Reduction Tracking Method. The Tracking will account for additional trash load reducing actions and BMPs the Permittees implement. Permittees are also able to propose, with documentation, areas for exclusion from the Tracking Method accounting, by demonstrating that these areas already meet the Discharge Prohibition A.2 and have no trash loads.

C.10.a.iii. Minimum Full Trash Capture
Installation of full trash capture systems to prevent trash loads through the MS4 is MEP as demonstrated by the significant implementation of these systems occurring in the Los Angeles region. The minimum full trash capture installation requirements in this permit represent a moderate initial step toward employing this tool for trash load reduction.

C.10.b.i, ii. Trash Hot Spot Selection and Clean Up
Trash Hot Spots must be cleaned up as an interim measure until complete abatement of trash loads occurs. Eventually, with adequate source controls and trash loading abatement, trash hot spots will not occur in the receiving waters. In addition, Permittees will be credited for trash volume removed from hot spots in the trash load reduction tracking.

C.10.b.iii. Hot Spot Assessments
Trash Hot Spot assessments have been simplified and streamlined. Rather than counting individual trash items, which can vary in size from small plastic of glass particles to shopping carts, volume of material removed is measured, along with dominant types of trash removed. Photographs are recorded both before and after cleanup, to add to the record and verify cleanup.

C.10.c. Long Term Trash Load Reduction
Each Permittee will submit a Plan to achieve the incremental progress of 70% trash load reduction by 2017 during the following permit term, and the 100% reduction of trash loading by 2022.

C.10.d. Reporting
This sub-provision sets forth the reporting required in this provision, including the specific submittals and reports, and the annual reporting requirements.

Costs of Trash Control

Costs for either enhanced trash management measure implementation or installation and maintenance of trash capture devices are significant, but when spread over several years, and when viewed on a per-capita basis, are reasonable. Also, Trash capture devices have been installed by cities in California and in the Bay Region.

Trash and litter are costly to remove from our aquatic resource environments. Staff from the California Coastal Commission report that the Coastal Cleanup Day budget statewide: $200,000-250,000 for staff Coastal Commission staff, and much more from participating local agencies. The main component of this event is the 18,000 volunteer-hours which translates to $3,247,200 in labor, and so is equivalent to $3,250,000-3,500,000 per year to clean up 903,566 pounds of trash and recyclables at $3.60 to $3.90 per pound. This is one of the most cost-effective events because of volunteer labor and donations. The County of Los Angeles spends $20 million per year to sweep beaches for trash, according to Coastal Commission staff.

In Oakland, the Lake Merritt Institute is currently budgeted at $160,000 per year, with trash and litter removal from the Lake as a major task. The budget has increased from about $45,000 in 1996 to current levels. In the period of 1996-2005 the Lake Merritt Institute staff, utilizing significant volunteer resources, and accomplishing other education tasks, removed 410,859 pounds of trash from the Lake at cost of $951,725 at $2.3 per pound.

The City of Oakland reports that installation of two vortex and screen separators, titled by their brand name of CDS units, which cost, according to the table below, $821,000 for installations that treat tributary catchments of 192 acres before discharge to Lake Merritt at $4,276 per acre.

City of Oakland—CDS Unit Overview 9-07

Existing CDS unit location	Outfall number	Treatment area (acres)	Cost of implementation	Sizing	Maintenance requirements	Comments
Intersection of 27th and Valdez Streets	56*	71	$203,000 to contactor; plus ~$100,000 City costs	73 cfs peak flow; 36" stormdrain; Unit sizing: 18'6'6' box with 10'11"diam x 9'6" long cylinder	Visually inspect CDS Unit; remove trash and debris with Hydro Flusher bi-monthly	Installed in 2006. Required relocation of electrical conduit. Water main and gas line were also in the way; the box was adjusted to accommodate these conflicts.
Intersection of 22nd and Valley Streets	56*	121	$368,000 to contactor; plus ~$150,000 City costs	115 cfs peak flow; 54" stormdrain; Unit sizing: 18'8.5'6' box with 12'diam x 9'6" long cylinder	Visually inspect CDS Unit; remove trash and debris with Hydro Flusher bi-monthly	Installed in 2006. Installation costs were higher than anticipated. Sewer lines and PGE facilities were exposed that were not known before. Unit had to be modified and poured-in-place.

* The city is treating 192 acres or 72 percent of the 252 acres draining to outfall 56.

Mr. Morad Sedrak, the TMDL Implementation Program Manager, Bureau of Sanitation, Department of Public Works, City of Los Angeles, reports that the City plans to invest $72 million dollars for storm drain catch basin based capture device installation primarily, for a City of 4 million population, for a per-capita cost of $18 dollars. This effort is occurring over a span of over five years, for an annual per-capita cost of under $4.

Mr. Sedrak reports that O&M costs are not anticipated to increase, as the City of L.A. is already budgeted for 3 catch basin cleanings per year. He also states that catch basin inserts installed inside the catch basin in front of the lateral pipe, which have been certified by the Los Angeles Regional Water Board as total capture trash control devices, cost approximately $800 to $3,000 depending on the depth of the catch basin. The price quoted includes installation and the insert is made of Stainless Steel 316.

Furthermore, the price for catch basin opening screen covers, which are designed to retain trash at the street level for removal by sweepers, and also to open if there is a potential flooding blockage, ranges roughly from $800 to $4,500, depending on the opening size of the catch basin.

The City of Los Angeles has currently spent 27 million dollars on a retrofit program to install catch basin devices in approximately 30% of its area, with either inserts or screens

or both. Mr. Sedrak states that Los Angeles plans to spend $45 million over the next 3 years to retrofit the remaining catch basins within the City. The total number of catch basins within the City is approximately 52,000.

Here are some links to information about the Los Angeles trash control approach:

http://www.lastormwater.org/Siteorg/program/TMDLs/trashtmdl.htm

http://www.lastormwater.org/Siteorg/download/pdfs/general_info/Request-Certification-10-06.pdf)

http://www.lastorhttp://www.lastormwater.org/Siteorg/download/pdfs/general_info/Request-Certification-10-06.pdfmwater.org/Siteorg/program/poll_abate/cbscreens.htm)

http://www.lastormwater.org/Siteorg/program/poll_abate/cbinserts.htm

http://www.lastormwater.org/Siteorg/program/poll_abate/cbscreens.htm

Additional cost information on various trash capture devices are included in the Santa Clara Valley Urban Runoff Pollution Prevention Program (SCVURPPP) BMP Trash Toolbox (July 2007). The Toolbox contains cost information for both trash capture devices and enhanced trash management measure implementation, covers a broad range of options and also discusses operation and maintenance costs. Catch basin screens are included with an earlier estimate by the City of Los Angeles of $44 million over 10 years to install devices in 34,000 inlets.

Litter booms are also discussed with an example from the City of Oakland. The Damon Slough litter boom or sea curtain cost $36,000 for purchase and installation, including slough side access improvements for maintenance and trash removal. Annual maintenance costs have been $77,000 for weekly maintenance, which includes use of a crane for floating trash removal.

The costs of the full trash capture device installation required in the Order is significantly less than the previous tentative orders requirements for trash capture, as set forth in the table below.

Trash Capture Cost Estimates – Final TO versus previous TOs

Trash Capture Device Requirement	Acres of Capture	Cost for Trash Capture Installation	Percent of Retail/Wholesale Commercial (ABAG 2005)	Per capita $, Population = 4,533,634
Final TO: Implemented in Year 4 – 30% of Retail/Wholesale Commercial	5527	**$ 27,635,000**	30%	$6.06
Previous TOs: Implement in Year 4, 5% of Urban/suburban land	0.05 X 529,712 = 26,485 (BASMAA) or ABAG 0.05 X 655,015 = 32,750	$132,425,000 or $163,750,000	5% of Urban/suburban land	$29 or $36

30**%** X 18,426 acres = 5527 acres X $5000/acre = **$27,635,000** for four counties for installation; maintenance will add an additional cost. The Permittees may work cooperatively to achieve this capture installation requirement, and there is the potential for Regional revenue development. The previous requirement was 5% of (.05 X 655,015) (529,712 by BASMAA's count) acres of urban land (from ABAG 2005 table) = 32,750 acres, ((26,486 according to BASMAA) X $5000 = $132,000,000).

C.11. Mercury Controls

Fact Sheet Findings in Support of Provision C.11

C.11-1 On August 9, 2006, the Water Board adopted a Basin Plan amendment including a revised TMDL for mercury in San Francisco Bay, two new water quality objectives, and an implementation plan to achieve the TMDL. The State Water Board has approved this Basin Plan amendment, and USEPA approval is pending. C.11-2 through C.11-6 are components of the Mercury TMDL implementation plan relevant to implementation through the municipal stormwater permit.

C.11-2 The 2003 load of mercury from urban runoff is 160 kg/yr, and the aggregate WLAs for urban runoff is 80 kg/yr and shall be implemented through the NPDES stormwater permits issued to urban runoff management agencies and Caltrans. The urban stormwater runoff allocations implicitly include all current and future permitted discharges, not otherwise addressed by another allocation, and unpermitted discharges within the geographic boundaries of urban runoff management agencies (collectively, *source category*) including, but not limited to, Caltrans roadway and non-roadway facilities and rights-of-way, atmospheric deposition, public facilities, properties proximate to stream banks, industrial facilities, and construction sites.

C.11-3 The allocations for this source category shall be achieved within 20 years, and, as a way to measure progress, an interim loading milestone of 120 kg/yr, halfway between the current load and the allocation, should be achieved within 10 years. If the interim loading milestone is not achieved, NPDES-permitted entities shall demonstrate reasonable and measurable progress toward achieving the 10-year loading milestone.

C.11-4 The NPDES permits for urban runoff management agencies shall require the implementation of BMPs and control measures designed to achieve the allocations or accomplish the load reductions derived from the allocations. In addition to controlling mercury loads, BMPs or control measures shall include actions to reduce mercury-related risks to humans and wildlife. Requirements in the permit issued or reissued and applicable for the term of the permit shall be based on an updated assessment of control measures intended to reduce pollutants in stormwater runoff to the MEP and remain consistent with the section of this chapter titled, *Surface Water Protection and Management—Point Source Control—Stormwater Discharges*.

C.11-5 The following additional requirements are or shall be incorporated into NPDES permits issued or reissued by the Water Board for urban runoff management agencies.

a. Evaluate and report on the spatial extent, magnitude, and cause of contamination for locations where elevated mercury concentrations exist;

b. Develop and implement a mercury source control program;

c. Develop and implement a monitoring system to quantify either mercury loads or loads reduced through treatment, source control, and other management efforts;

d. Monitor levels of methylmercury in discharges;

e. Conduct or cause to be conducted studies aimed at better understanding mercury fate, transport, and biological uptake in San Francisco Bay and tidal areas;

f. Develop an equitable allocation-sharing scheme in consultation with Caltrans (see below) to address Caltrans roadway and non-roadway facilities in the program area, and report the details to the Water Board;

g. Prepare an Annual Report that documents compliance with the above requirements and documents either mercury loads discharged, or loads reduced through ongoing pollution prevention and control activities; and

h. Demonstrate progress toward (a) the interim loading milestone, or (b) attainment of the allocations shown in Individual WLAs (see Table 4-w of the Basin Plan amendment), by using one of the following methods:

(1) Quantify the annual average mercury load reduced by implementing

i. Pollution prevention activities, and
ii. Source and treatment controls. The benefit of efforts to reduce mercury-related risk to wildlife and humans should also be quantified. The Water Board will recognize such efforts as progress toward achieving the interim milestone and the mercury-related water quality standards upon which the allocations and corresponding load reductions are based. Loads reduced as a result of actions implemented after 2001 (or earlier if actions taken are not reflected in the 2001 load estimate) may be used to estimate load reductions.

(2) Quantify the mercury load as a rolling 5-year annual average using data on flow and water column mercury concentrations.

(3) Quantitatively demonstrate that the mercury concentration of suspended sediment that best represents sediment discharged with urban runoff is below the suspended sediment target.

C.11-6 Urban runoff management agencies have a responsibility to oversee various discharges within the agencies' geographic boundaries. However, if it is determined that a source is substantially contributing to mercury loads to the Bay or is outside the jurisdiction or authority of an agency, the Water Board will consider a request from an urban runoff management agency that may include an allocation, load reduction, and/or other regulatory requirements for the source in question.

Specific Provision C.11 Requirements

The C.11 provisions implement the mercury TMDL and follow the general approach for sediment-bound pollutants discussed above where we seek to build our understanding and level of certainty concerning control actions by implementing actions in a phased approach. We then expand implementation of those actions that prove effective, and perhaps scale back or discontinue those that are not effective. Accordingly, there are some provisions that will be implemented throughout the Region, some that will be tested on a limited basis first before making the decision to expand region-wide in the next permit term. Some of the measures are companion measures for efforts targeting PCBs.

Provision C.11.a. Mercury is found in a wide variety of consumer products (e.g., fluorescent bulbs) that are subject to recycling requirements. These recycling efforts are already happening throughout the Region, and Provision C.11.a requires promotion, facilitation and/or participation in these region-wide recycling efforts to increase effectiveness and public participation.

Provision C.11.b. The remand resolution of the SF Bay Mercury TMDL made it clear that methyl mercury monitoring must be required of all NPDES Permittees. Methyl mercury is the most toxic form of mercury, and there is very little information, if any, regarding the concentrations of methyl mercury found in urban runoff. The purpose of the monitoring required through this provision is to obtain seasonal information and to assess the magnitude and spatial/temporal patterns of methylmercury concentrations in urban runoff.

Provisions C.11.c through Provision C.11.f relate to identical C.12 Provisions for PCBs. For each of these, sites for pilot studies will primarily be chosen on the basis of the potential for reducing PCB loads, but consideration will be given to mercury removal in the final design and implementation of the studies. For more information, see the fact sheet discussions for
Provisions C.12.c, d, e, and f and Provision C.2.g.

Provision C.11.g implements the TMDL requirement that Permittees measure mercury loads and loads reduced from program activities. There are three options for accomplishing this requirement: quantifying mercury loads reduced through implemented control measures, quantify mercury loading into the Bay from urban runoff, or demonstrating that the concentration of mercury on suspended sediment particles is below the sediment target of 0.2 ppm. It is likely that the first option will be chosen, and this will require development of an accounting system to establish what load reductions result from program activities. This will not be difficult for those measures that involve capture and measurement of mercury-containing sediment, but it will be more challenging for efforts that do not involve direct measurement.

Provision C.11.h is equivalent to Provision C.12.h for PCBs and is motivated by the same remaining technical uncertainties.

Provision C.11.i requires actions that manage human health risk due to mercury and PCBs. These may include efforts to communicate the health risks of eating Bay fish and other efforts aimed at high risk-communities.

Provision C.11.j requires an allocation sharing scheme to be developed in cooperation with Caltrans. The urban runoff TMDL allocation implicitly includes loads from Caltrans facilities.

C.12. PCBs Controls

The C.12 provisions are consistent with the regulatory approach and implementation plan of the San Francisco Bay PCBs TMDL adopted by the Water Board. They follow the general approach for sediment-bound pollutants discussed above where we seek to build our understanding and level of certainty concerning control actions by implementing actions in a phased approach. We then expand implementation of those actions that prove effective, and perhaps scale back or discontinue those that are not effective. Accordingly, there are some provisions that will be implemented throughout the region, some that will be tested on a limited basis first before making the decision to expand region-wide in the next permit term.

Fact Sheet Findings in Support of Provision C.12

C.12-2 On February 13, 2008, the Water Board adopted a Basin Plan amendment establishing a TMDL for PCBs in San Francisco Bay and an implementation plan to achieve the TMDL. Approval by the State Water Board and USEPA is pending. The following excerpts from the TMDL implementation plan are relevant to implementation of the municipal stormwater permit.

"Stormwater runoff wasteload allocations shall be achieved within 20 years and shall be implemented through the NPDES stormwater permits issued to stormwater runoff management agencies and the California Department of Transportation (Caltrans). The urban stormwater runoff wasteload allocations implicitly include all current and future permitted discharges, not otherwise addressed by another allocation, and unpermitted discharges within the geographic boundaries of stormwater runoff management agencies including, but not limited to, Caltrans roadway and non-roadway facilities and rights-of-way, atmospheric deposition, public facilities, properties proximate to stream banks, industrial facilities, and construction sites.

Requirements in each NPDES permit issued or reissued shall be based on an updated assessment of best management practices and control measures intended to reduce PCBs in urban stormwater runoff. Control measures implemented by stormwater runoff management agencies and other entities (except construction and industrial sites) shall reduce PCBs in stormwater runoff to the maximum extent practicable. Control measures for construction and industrial sites shall reduce discharges based on best available technology economically achievable. All permits shall remain consistent with Section 4.8 - Stormwater Discharges.

In the first five-year permit term, stormwater Permittees will be required to implement control measures on a pilot scale to determine their effectiveness and technical feasibility. In the second permit term, stormwater Permittees will be required to implement effective control measures, that will not cause significant adverse environmental impacts, in strategic locations, and to develop a plan to fully implement control measures that will result in

attainment of allocations, including an analysis of costs, efficiency of control measures and an identification of any significant environmental impacts. Subsequent permits will include requirements and a schedule to implement technically feasible, effective and cost efficient control measures to attain allocations. If, as a consequence, allocations cannot be attained, the Water Board will take action to review and revise the allocations and these implementation requirements as part of adaptive implementation.

In addition, stormwater Permittees will be required to develop and implement a monitoring system to quantify PCBs urban stormwater runoff loads and the load reductions achieved through treatment, source control and other actions; support actions to reduce the health risks of people who consume PCBs-contaminated San Francisco Bay fish; and conduct or cause to be conducted monitoring, and studies to fill critical data needs identified in the adaptive implementation section.

Stormwater runoff management agencies have a responsibility to oversee various discharges within the agencies' geographic boundaries. However, if it is determined that a source is substantially contributing to PCBs loads to the Bay or is outside the jurisdiction or authority of an agency the Water Board will consider a request from an stormwater runoff management agency which may include an allocation, load reduction, and/or other regulatory requirements for the source in question."

C.12-3 Some PCB congeners have dioxin-like properties. Dioxins are persistent, bioaccumulative, toxic compounds that are produced from the combustion of organic materials in the presence of chlorine. Dioxins enter the air through fuel and waste emissions, including diesel and other motor vehicle exhaust fumes and trash incineration, and are carried in rain and contaminate soil. Dioxins bioaccumulate in fat, and most human exposure occurs through the consumption of animal fats, including those from fish. Therefore, the actions targeting PCBs will likely have the simultaneous benefit of addressing a portion of the dioxin impairment resulting from dioxin-like PCBs.

Specific Provision C.12 Requirements

Provision C.12.a. PCBs were used in a variety of electrical devices and equipment, some of which still can be found during industrial inspections. Provision C.12.a requires the stormwater management agencies to ensure that industrial inspectors can identify PCBs or PCB-containing equipment during their inspections and make sure appropriate agencies are notified if they are found. There is enough experience and/or background knowledge about the presence of such PCB-containing equipment that this measure should be implemented region-wide during this permit term.

Provision C.12.b. PCBs are used in a variety of building materials like caulks and adhesives. PCBs contained in such materials can be liberated and transported in runoff during and after demolition and renovation activities. At this point, it is not known how extensive this type of PCB contamination is in the region. Therefore, the expectation for

this permit term is that Permittees conduct pilot studies (Provision C.12.b) that includes evaluation of the presence of PCBs in such materials, sampling and analysis, and BMP development to prevent PCBs in these materials from being released into the environment during demolition and renovation. Conducting these pilot tests and reporting results will help determine if control measures for PCBs from these sources should be implemented in a more widespread fashion in the next permit term.

Provisions C.12.c and C.12.d form the core of PCB-related efforts for this permit term, and these efforts are crucial for the iterative development of effective control measures for PCBs and other sediment-bound pollutants in future permit terms. The overarching purpose of these two provisions is to conduct five comprehensive pilot studies in locations known to contain high levels of PCBs. The pilot studies will involve a combination of efforts including abatement of the on-land PCB contamination (Provision C.12.c) as well as exploration of sediment management practices (C.12.d) that can be implemented by municipalities to control migration of the PCBs away from the source of contamination. We expect that a suite of control measures will be applied in these five pilot regions to determine the optimum suite of measures for controlling PCB contamination and preventing its transport through the storm drain system. The lessons learned through these pilot efforts will inform the direction of future efforts targeting contaminated zones throughout the Region in subsequent permit terms.

Provision C.12.e. One promising management practice for addressing a wide range of sediment-bound contaminants, including PCBs is on-site treatment. Provision C.12.e requires selection of 10 locations for pilot studies spanning treatment types as described in the Provision. This effort can be conducted in conjunction with Provision C.12.d such that on-site treatment efforts conducted as part of C.12.d can be counted toward accomplishing C.12.e requirements.

Provision C.12.f. Another promising management practice is the diversion of certain flows to the sanitary sewers to be treated by the local POTWs. Provision C.12.f requires an evaluation of locations for diversion pilot studies and implementation of pilot studies at five pump stations. This effort can be conducted in conjunction with Provision C.12.d such that POTW diversion efforts conducted as part of C.12.d can be counted toward accomplishing C.12.f requirements. Also see discussion under Provision C.2.g.

Provision C.12.g requires, consistent with the approach taken in the PCBs TMDL, development of a monitoring system to quantify PCBs loads and loads reduced through source control, treatment and other management measures. This monitoring system will be used to determine progress toward meeting TMDL load allocations. This system should establish the baseline loading or loads reduced against which to compare future loading and load reductions.

Provision C.12.h. There are still uncertainties surrounding the magnitude and nature of PCBs reaching the Bay in urban runoff and the ultimate fate of such PCBs, including biological uptake. Provision C.12.h requires that Permittees ensure that fate and transport studies of PCBs in urban runoff are completed.

Provision C.12.i. requires actions that manage human health risk due to mercury and PCBs. These may include efforts to communicate the health risks of eating Bay fish and other efforts aimed at high risk-communities.

C.13. Copper Controls

Chronic and acute site-specific objectives (SSOs) for dissolved copper have been established in all segments of San Francisco Bay. The plan to implement the SSOs and ensure the achievement and ongoing maintenance of the SSOs in the entire Bay includes two types of actions for urban runoff management agencies. These actions from the SSO implementation are implemented through this permit as provisions to control urban runoff sources of copper as well as measures to resolve remaining technical uncertainties for copper fate and effects in the Bay.

The control measures for urban runoff target significant sources of copper identified in a report produced in 2004 for the Clean Estuary Partnership.[120] This report updated information on sources of copper in urban runoff, loading estimates and associated level of uncertainty, and summarized feasible control measures and priorities for further investigation. Accordingly, the permit provisions target major sources of copper including vehicle brake pads, architectural copper, copper pesticides, and industrial copper use.

Fact Sheet Findings in Support of Provision C.13.

C.13-1 Urban runoff is a conveyance mechanism by which copper reaches San Francisco Bay.

C.13-2 Copper has the reasonable potential to cause or contribute to exceedances of copper water quality standards in San Francisco Bay.

C.13-3 Site specific water quality objectives for dissolved copper have already been adopted for South San Francisco Bay will soon be adopted for the rest of the Bay.

C.13-4 The Permit requirements to control copper to the MEP are necessary to implement and support ongoing achievement of the site-specific water quality objectives.

Specific Provision C.13. Requirements

Provision C.13.a. Copper is used as an architectural feature in roofs, gutters and downspouts. When these roofs are cleaned with aggressive cleaning solutions, substantial amounts of copper can be liberated. The provision C.13.a for architectural copper involves a variety of strategies ranging from BMPs to prohibition against discharge of these cleaning wastes to the storm drain.

[120] TDC (TDC Environmental). 2004. *Copper Sources in Urban Runoff and Shoreline Activities*. Prepared for the Clean Estuary Partnership.

Provision C.13.b. Copper is commonly used as an algaecide in pools, spas, and fountains. The provision C.13.b prohibits discharge to the storm drain of copper-containing wastewater from such amenities.

Provision C.13.c. Vehicle brake pads are a large source of copper to the urban environment. There are cooperative efforts (e.g., the Brake Pad Partnership) evaluating the potential effects of brake wear debris on water quality. This cooperative effort could result in voluntary actions to reduce the amount of copper in automobile brake pads. However, this voluntary reduction is uncertain, and some aftermarket brake pads are possibly unaffected by the voluntary action. Moreover, the benefits of copper content reduction might be slowly realized because there is a great deal of wear debris already deposited on watersheds, and this wear debris will continue to be deposited as long as copper-containing brake pads are in use. Therefore, there might need to be additional measures addressing copper-containing wear debris on the part of urban stormwater management agencies. Provision C.13.c requires ongoing participation in the cooperative efforts of the Partnership.

Provision C.13.d Some industrial facilities likely use copper or have sources of copper (e.g., plating facilities, metal finishers, auto dismantlers). This control measure requires municipalities to include these facilities in their inspection program plans.

The most recent Staff Report[121] for the SSOs north of the Dumbarton Bridge also describes several areas of remaining technical uncertainty, and **Provision C.13.e** requires studies to address these uncertainties. Two of these areas are of particular concern, and urban runoff management agencies are required to conduct or cause to be conducted studies to help resolve these two uncertainties.

The first uncertainty concerns copper's tendency, even at low concentrations, to cause a variety of sublethal (not resulting in death, but in impaired function) effects. The studies documenting such effects have, so far, been conducted in the laboratory in experiments modeling freshwater systems, and many of them have not yet been published. A number of uncertainties need to be resolved before interpretation and extension to marine or estuarine systems can be attempted.[122]

The second uncertainty is that surface sediment samples have exhibited toxicity to test organisms at a number of sites throughout the Bay. Research has shown that sediment toxicity to bivalve embryos is caused by "elevated concentrations of divalent cations….with copper as the most probable cause of toxicity." Additional studies are needed to further examine whether water and sediment toxicity tests used in the RMP are accurate predictors of impacts on the Bay's aquatic and benthic communities.

[121] SFBRWQCB (San Francisco Bay Regional Water Quality Control Board). 2007. *Copper Site-Specific Objectives in San Francisco Bay: Proposed Basin Plan Amendment and Draft Staff Report.* June.
[122] Ibid.

C.14. Polybrominated Diphenyl Ethers (PBDE), Legacy Pesticides and Selenium

This section is predicated on the fact that legacy pesticides, PBDEs, and selenium are either known to impair or potentially impair Bay and tributary beneficial uses. Further, urban stormwater is a likely or potential cause or contributor to such impairment. The requirements for this permit term are primarily information gathering consistent with Provision C.1. Namely, this provision requires that Permittees gather information on a number of pollutants of concern (e.g., PBDEs, DDT, dieldrin, chlordane, selenium) for which TMDLs are planned or are in the early stages of development.

The goals of the provisions in this section are the following: One goal is to determine the concentrations and distribution of these pollutants and if urban runoff is a conveyance mechanism associated with their possible impairment of San Francisco Bay.

A second goal is to gather and provide information to allow calculation of PBDEs, legacy pesticides, and selenium loads to San Francisco Bay from urban runoff conveyance systems. A third goal is to identify control measures and/or management practices to eliminate or reduce discharges of PBDEs, legacy pesticides, or selenium conveyed by urban runoff conveyance systems. The Permittees are encouraged to work with the other municipal stormwater management agencies in the Bay Region to implement a plan to identify, assess, and manage controllable sources of these pollutants in urban runoff. The control actions initiated for PCBs will form the core of initial actions targeting sediment bound pollutants like these. It is very likely that some of these PCB control measures (see Provision C.12) warrant consideration for the control of sediment bound pollutants like PBDEs, legacy pesticides, and possibly others as well.

C.15. Exempted and Conditionally Exempted Discharges

Legal Authority

Broad Legal Authority: CWA section 402(p)(3)(B)(ii-iii), CWC section 1337, and Federal NPDES regulation 40 CFR 122.26(d)(2)(i)(B, C, D, E, and F) and 40 CFR 122.26(d)(2)(iv).

Specific Legal Authority: Federal NPDES regulations 40 CFR 122.26(d)(2)(iv)(B) requires MS4 operators, "to detect and remove (or require the discharger to the municipal separate storm sewer to obtain a separate NPDES permit for) illicit discharges and improper disposal into the storm sewer."

Federal NPDES regulation 40 CFR 122.26(d)(2)(iv)(B)(1) provides that the Permittees shall prevent all types of illicit discharges into the MS4 except for certain non-stormwater discharges.

Fact Sheet Findings in Support of Provision C.15.

Prohibition A.1. effectively prohibits the discharge of non-stormwater discharges into the storm sewer system. However, we recognize that certain types of non-stormwater discharges may be exempted from this prohibition if they are unpolluted and do not violate water quality standards. Other types of non-stormwater discharges may be conditionally exempted from Prohibition A.1. if the discharger employs appropriate control measures and BMPs prior to discharge, and monitors and reports on the discharge.

Specific Provision C.15. Requirements

Provision C.15.a. Exempted Non-Stormwater Discharges. This section of the Permit identifies the types of non-stormwater discharges that are exempted from Discharge Prohibition A.1. if such discharges are unpolluted and do not violate water quality standards. If any exempted non-stormwater discharge is identified as a source of pollutants to receiving waters, the discharge shall be addressed as a conditionally exempted discharge and must meet the requirements of Provision C.15.b.

Provision C.15.b. Conditionally Exempted Non-Stormwater Discharges. This section of the Permit identifies the types of non-stormwater discharges that are conditionally exempted from Discharge Prohibition A.1. if they are identified by Permittees or the Executive Officer as not being sources of pollutants to receiving waters. To eliminate adverse impacts from such discharges, project proponents shall develop and implement appropriate pollutant control measures and BMPs, and where applicable, shall monitor and report on the discharges in accordance with the requirements specified in Provision C.15.b. The intent of Provision C.15.b.'s requirements is to facilitate Permittees in regulating these non-stormwater discharges to the storm drains since the Permittees have ultimate responsibility for what flows in those storm drains to receiving waters. For all planned discharges, the nature and characteristic of the discharge must be verified prior to the discharge so that effective

pollution control measures are implemented, if deemed necessary. Such preventative measures are cheaper by far than post-discharge cleanup efforts.

Provision C.15.b.i.(1). Pumped Groundwater from Non Drinking Water Aquifers. These aquifers tend to be shallower than drinking water aquifers and more subject to contamination. The wells must be purged prior to sample collection. Since wells are purged regularly, this section of the Permit requires twice a year monitoring of these aquifers. Pumped groundwater from non drinking water aquifers, which are owned and/or operated by Permittees who pump groundwater as drinking water, are conditionally exempted as long as the discharges meet the requirements in this section of the Permit.

Provision C.15.b.i.(2). Pumped Groundwater, Foundation Drains, and Water from Crawl Space Pumps and Footing Drains. This section of the Permit encourages these types of discharges to be directed to landscaped areas or bioretention units, when feasible. If the discharges cannot be directed to vegetated areas, it requires testing to determine if the discharge is uncontaminated. Uncontaminated discharges shall be treated, if necessary, to meet specified discharge limits for turbidity and pH.

Provision C.15.b.ii. Air Conditioning Condensate. Small air conditioning units are usually operated during the warm weather months. The condensate from these units are uncontaminated and unlikely to reach a storm drain or waters of the State because they tend to be low in volume and tend to evaporate or percolate readily. Therefore, condensate from small air conditioning units should be discharged to landscaped areas or the ground. Commercial and industrial air conditioning units tend to produce year-round continuous flows of condensate. It may be difficult to direct a continuous flow to a landscaped area large enough to accommodate the volume. While the condensate tends to be uncontaminated, it picks up contaminates on its way to the storm drain and/or waters of the State and can contribute to unnecessary dry weather flows. Therefore, discharges from new commercial and industrial air conditioning units should be discharged to landscaped areas, if they can accommodate the continuous volume, or to the sanitary sewer, with the local sanitary sewer agency's approval. If none of these options are feasible, air conditioning condensate can be directly discharged into the storm drain. If descaling or anti-algal agents are used to treat the air conditioning units, residues from these agents must be properly disposed of.

Provision C.15.b.iii. Planned, Unplanned, and Emergency Discharges of the Potable Water System.. Potable water discharges contribute pollution to water quality in receiving waters because they contain chlorine or chloramines, two very toxic chemicals to aquatic life. Potable water discharges can cause erosion and scouring of stream and creek banks, and sedimentation can result if effective BMPs are not implemented. Therefore, appropriate dechlorination and monitoring of chlorine residual, pH and turbidity, particularly for planned discharges of potable water, are crucial to prevent adverse impacts in the receiving waters.

This section of the Permit requires Permittees to notify Water Board staff at least one week in advance for planned discharges of potable water with a flowrate of 250,000 gpd or more or a total 500,000 gallons or more. These planned discharges must meet specified discharge benchmarks for chlorine residual, pH, and turbidity.

To address unplanned discharges of potable water such as non-routine water line breaks, leaks, overflows, fire hydrant shearing, and emergency flushing, this section of the Permit requires Permittees to implement administrative BMPs such as source control measures, managerial practices, operations and maintenance procedures or other measures to reduce or prevent potential pollutants from being discharged during these events. This Provision also contains specific notification and monitoring requirements to assess immediate and continued impacts to water quality when these events happen.

This section of the Permit acknowledges that in cases of emergency discharge, such as from firefighting and disasters, priority of efforts shall be directed toward life, property, and the environment, in that order. Therefore, Permittees are required to implement BMPs that do not interfere with immediate emergency response operations or impact public health and safety. Reporting requirements for such events shall be determined by Water Board staff on a case-by-case basis.

Provision C.15.b.iv. Individual Residential Car Washing. Soaps and automotive pollutants such as oil and metals can be discharged into storm drains and waterbodies from individual residential car washing activities. However, it is not feasible to prohibit individual residential car washing because it would require too much resources for the Permittees to regulate the prohibition. This section of the Permit requires Permittees to encourage residents to implement BMPs such as directing car washwaters to landscaped areas, using as little detergent as possible, and washing cars at commercial car washing facilities.

Provision C.15.b.v. Swimming Pool, Hot tub, Spa, and Fountain Water Discharges. These types of discharges can potentially contain high levels of chlorine and copper. Permittees shall prohibit the discharge of such waters that contain chlorine residual, copper algaecide, filter backwash, or other pollutants to the storm drains or to waterbodies. High flow rates into the storm drain or waterbody could cause erosion and scouring of the stream or creek banks. These types of discharges should be directed to landscaped areas large enough to accommodate the volume or to the sanitary sewer, with the local sanitary sewer's approval. If these discharge options are not feasible and the swimming pool, hot tub, spa, or fountain water discharges must enter the storm drain, they must be dechlorinated to non-detectable levels of chlorine and they must not contain copper algaecide. Flow rate should be regulated to minimize downstream erosion and scouring. We strongly encourage local sanitary sewer agencies to accept these types of non-stormwater discharges, especially for new and rebuilt ones where a connection could be achieved with marginal effort. This Provision also requires Permittees to coordinate with local sanitary agencies in these efforts.

Provision C.15.b.v.i. Irrigation Water, Landscape Irrigation, and Lawn or Garden Watering. Fertilizers and pesticides can be washed off of landscaping and discharged into storm drains and waterbodies. However, it is not feasible to prohibit excessive irrigation because it would require too much resource for the Permittees to regulate such a prohibition. It is also not feasible for individual Permittees to ban the use fertilizers and pesticides. This section of the Permit requires Permittees to promote and/or work with potable water purveyors to promote measures that minimize runoff and pollutant loading from excess irrigation, such as conservation programs, outreach regarding overwatering and less toxic options for pest control and landscape management, the use of drought tolerant and native vegetation, and to implement appropriate illicit discharge response and enforcement for ongoing, large-volume landscape irrigation runoff to the storm drains.

Provision C.15.b.vii. requires Permittees to identify and describe additional types and categories of discharges not listed in Provision C.15.b., that they propose to conditionally exempt from Prohibition A.1., in periodic submittals to the Executive Officer.

Provision C.15.b.viii. establishes a mechanism to authorize under the Permit non-stormwater discharges owned or operated by the Permittees.

Attachment J: Standard NPDES Stormwater Permit Provisions

The following legal authority applies to Attachment J:

Broad Legal Authority: CWA sections 402(p)(3)(B)(ii-iii), CWC section 13377, and federal NPDES regulations 40 CFR 122.26(d)(2)(i)(B, C, D, E, and F) and 40 CFR 122.26(d)(2)(iv).

Specific Legal Authority: Standard provisions, reporting requirements, and notifications are consistent to all NPDES permits and are generally found in federal NPDES regulation 40 CFR 122.41.

Attachment J includes Standard Provisions. These Standard Provisions ensure that NPDES stormwater permits are consistent and compatible with USEPA's federal regulations. Some Standard Provision sections specific to publicly owned sewage treatment works are not included in Attachment J.

Fact Sheet Attachment 6.1

Construction Inspection Data

Construction Inspection Data

Facility/Site Inspected	Inspection Date	Weather During Inspection	Inches of Rain Since Last Inspection	Enforcement Response Level	Problem(s) Observed							Specific Problem(s)	Resolution			Comments/ Rationale for Longer Compliance Time
					Erosion Control	Runon and Runoff Control	Sediment Control	Active Treatment System	Good Site Management	Non Stormwater Management	Illicit Discharge		Problems Fixed	Need More Time	Escalate Enforcement	
Panoramic Views	9/30/08	Dry	0	Written Notice			x					Driveway not stabilized				
Panoramic Views	10/15/08	Dry	0.5										x			50' of driveway rocked.
Panoramic Views	11/15/08	Rain	3	Stop Work	x		x				x	Uncovered graded lots eroding; Sediment entering a stormdrain that didn't have adequate protection.				
Panoramic Views	11/15/08	Drizzling	0.25										x			Lots blanketed. Storm drains pumped. Street cleaned.
Panoramic Views	12/1/08	Dry	4	Verbal Warning					x			Porta potty next to stormdrain.	x			Porta potty moved away from stormdrain.
Panoramic Views	1/15/08	Rain	3.25	Written Warning	x					x		Fiber rolls need maintenance; Tire wash water flowing into street				
Panoramic Views	1/25/09	Dry	0										x			Fiber rolls replaced.

Facility/Site Inspected	Inspection Date	Weather During Inspection	Inches of Rain Since Last Inspection	Enforcement Response Level	Problem(s) Observed							Specific Problem(s)	Resolution			Comments/ Rationale for Longer Compliance Time
					Erosion Control	Runon and Runoff Control	Sediment Control	Active Treatment System	Good Site Management	Non Stormwater Management	Illicit Discharge		Problems Fixed	Need More Time	Escalate Enforcement	
Panoramic Views	2/28/09	Rain	2.4	Stop Work	x		x				x	Slope erosion control failed. Fiber rolls at the bottom of the hill flattened. Sediment laden discharge skipping protected stormdrains and entering unprotected stormdrains.				
Panoramic Views	2/28/09	Rain	0.1											x		Fiber rolls replaced. Silt fences added. More stormdrains protected. Streets cleaned. Slope too soggy to access.
Panoramic Views	3/15/09	Dry	1	Citation with Fine					x		x	Paint brush washing not designated	x			Street and storm drains cleaned. Slopes blanketed.
Panoramic Views	4/1/09	Dry	0.5	Citation with Fine							x	Concrete washout overflowed; Evidence of illicit discharge				
Panoramic Views	4/15/09	Dry	0										x			Concrete washout replaced; Storm drain and line cleaned.

Fact Sheet Attachment 10.1

303(d) Trash Resolution and Staff Report February 2009

Available at
http://www.waterboards.ca.gov/sanfranciscobay/board_decisions/adopted_orders/2009/R2-2009-0008.pdf

ATTACHMENT A

Provision C.3.b.
Sample Reporting Table

Provision C.3.b. Sample Reporting Table
Regulated Projects Approved During the Reporting Period 07/08 to 06/09
City of Eden Annual Report FY 2008-09

Project Name, Project Number, Location, Street Address,	Name of Developer, Project Phase No.,[1] Project Type & Description	Project Watershed[2]	Total Site Area, Total Area of Land Disturbed	Total New and/or Replaced Impervious Surface Area[3]	Total Pre- and Post-Project Impervious Surface Area[4]	Status of Project[5]	Source Control Measures	Site Design Measures	Treatment Systems Installed[6]	Operation & Maintenance Responsibility Mechanism	Hydraulic Sizing Criteria	Alternative Compliance Measures[7,8]	HM Controls[9,10]
Private Projects													
Nirvana Estates; Project #05-122; Property bounded by Paradise Lane, Serenity Drive, and Eternity Circle; Eden, CA	Heavenly Homes; Phase 1; Construction of 156 single-family homes and 45 townhomes with commercial shops and underground parking.	Runoff from site drains to Babbling Brook	25 acres site area, 21 acres disturbed	20 acres new	20 acres post-project	Application submitted 12/29/07, Application deemed complete 1/30/08, Project approved 7/16/08	Stenciled inlets, street sweeping, covered parking, car wash pad drains to sanitary sewer	Pervious pavement for all driveways, sidewalks, and commercial plaza	vegetated swales, detention basins,	Conditions of Approval require Homeowners Association to perform regular maintenance. Written record will be made available to City inspectors.	WEF Method	n/a	Contra Costa sizing charts used to design detention basin at Peace Park. Also contributed to in-stream projects in Babbling Brook
Barter Heaven; Project #05-345; Shoppers Lane & Bargain Avenue; 14578 Shoppers Lane, Eden, CA	Deals Galore Development Co.; Demolition of strip mall and parking lot and construction of 500-unit 5-story shopping mall with underground parking and limited outdoor parking.	Runoff from site drains to Bargain River	5 acres site area, 3 acres disturbed	1 acre new, 2 acres replaced	3.5 acres pre-project, 4.5 acres post-project	Application submitted 7/9/08, Application deemed complete 8/2/08, Project approved 12/12/08	Stenciled inlets, trash enclosures, underground parking, street sweeping	One-way aisles to minimize outdoor parking footprint; roof drains to planter boxes	tree wells with bioretention; planter boxes with bioretention	Conditions of Approval require property owner (landlord) to perform regular maintenance. Written record will be made available to City inspectors.	BMP Handbook Method	$ 250,000 paid to Renew Regional Project sponsored by Riverworks Foundation, 243 Water Way, Eden, CA 408-345-6789	Renew Project includes treatment and HM Controls

Provision C.3.b. Sample Reporting Table
Regulated Projects Approved During the Reporting Period 07/08 to 06/09
City of Eden Annual Report FY 2008-09

Project Name, Project Number, Location, Street Address,	Name of Developer, Project Phase No.,[1] Project Type & Description	Project Watershed[2]	Total Site Area, Total Area of Land Disturbed	Total New and/or Replaced Impervious Surface Area[3]	Total Pre- and Post-Project Impervious Surface Area[4]	Status of Project[5]	Source Control Measures	Site Design Measures	Treatment Systems Installed[6]	Operation & Maintenance Responsibility Mechanism	Hydraulic Sizing Criteria	Alternative Compliance Measures[7,8]	HM Controls[9,10]
New Beginnings; Project No. #05-456; Hope Street & Chance Road; 567 Hope Boulevard, Eden, CA	Fresh Start Corporation; Demolition of abandoned warehouse and construction of a 5-story building with 250 low-income rental housing units.	Runoff from site drains to Poor Man Creek	5 acres site area, 100,000 ft^2 disturbed	1 acre replaced	2 acres pre-project, 1 acre post-project	Application submitted 2/9/09, Application deemed complete 4/10/09; Project approved 6/30/09	Trash enclosures, underground parking, street sweeping, car wash pad drains to sanitary sewer	roof drains to landscaping	parking runoff flows to six bioretention units/gardens	Conditions of Approval require property owner (landlord) to perform regular maintenance. Written record will be made available to City inspectors.	BMP Handbook Method	n/a	n/a
Public Projects													
Gridlock Relief, Project No. #05-99, ABC Blvd between Main and Huett Streets, Eden, CA	City of Eden. Widening of ABC Blvd from 4 to 6 lanes	Runoff from site drains to Congestion River	6 acres site area, 3 acres disturbed	2 acres new, 1 acre replaced	4 acres pre-project, 6 acres post-project	Application submitted 7/9/06, Application deemed complete 10/6/08, Project approved 12/9/08, Construction scheduled to begin 7/10/09	none	ABC Blvd sloped to drain runoff into landscaped areas in median	Runoff leaving underdrain system of landscaped median is pumped to bioretention gardens along either side of ABC Blvd	Signed statement from City of Eden assuming post-construction responsibility for treatment BMP maintenance.	WEF Method	n/a	BAHM used to design and size stormwater treatment units so that increased runoff is detained.

Sample Reporting Table C.3.b. Footnotes

1. If a project is being constructed in Phases, use a separate row entry for each Phase.
2. State the watershed(s) that the Regulated Project drains to. Optional but recommended: Also state the downstream watershed(s).
3. State both the total new impervious surface area and the total replaced impervious surface area, as applicable.
4. For redevelopment projects state both the pre-project impervious surface area and the post-project impervious surface area.
5. State project application date; application deemed complete date; and final, major, staff-level discretionary review and approval date.
6. List stormwater treatment system(s) installed onsite or at a joint stormwater treatment system facility.
7. For Alternative Compliance at an offsite location in accordance with Provision C.3.e.i.(1), on a separate page, give a discussion of the alternative compliance site including the information specified in Provision C.3.b.v.(1)(m)(i) for the offsite project.
8. For Alternative Compliance by paying in-lieu fees in accordance with Provision C.3.e.i.(2), on a separate page, provide the information specified in Provision C.3.b.v.(1)(m)(ii) for the Regional Project.
9. If HM control is not required, state why not.
10. If HM control is required, state control method used (e.g., method to design and size device(s) or method(s) used to meet the HM Standard, and description of device(s) or method(s) used, such as detention basin(s), biodetention unit(s), regional detention basin, or in-stream control).

Instructions for Provision C.3.b. Sample Reporting Table

1. **Project Name, Number, Location, and Street Address** – Include the following information:
   - Name of the project
   - Number of the project (if applicable)
   - Location of the project with cross streets
   - Street address of the project (if available)

2. **Name of Developer, Project Phase Number, Project Type, and Project Description** – Include the following information:
   - Name of the developer
   - Project phase name and/or number (only if the project is being developed in phases) – each phase should have a separate row entry
   - Type of development (i.e., new and/or redevelopment)
   - Description of development (e.g., 5-story office building, residential with 160 single-family homes with five 4-story buildings to contain 200 condominiums, 100 unit 2-story shopping mall, mixed use retail and residential development (apartments), industrial warehouse)

3. **Project Watershed**
   - State the watershed(s) that the Project drains into
   - Optional but recommended: Also state the downstream watershed(s)

4. **Total Site Area and Total Area of Land Disturbed** – State the total site area and the total area of land disturbed.

5. **Total New and/or Replaced Impervious Surface Area**
   - State the total new impervious surface area
   - State the total replaced impervious surface area, as applicable

6. **Total Pre- and Post-Project Impervious Surface Area –** For redevelopment projects, state both the pre-project impervious surface area and the post-project impervious surface area.

7. **Status of Project –** Include the following information:
   - Project application submittal date
   - Project application deemed complete date
   - Final, major, staff-level discretionary review and approval date

8. **Source Control Measures** – List all source control measures that have been or will be included in the project.

9. Site Design Measures – List all site design measures that have been or will be included in the project.

10. Treatment Systems Installed – List all post-construction stormwater treatment system(s) installed onsite and/or at a joint stormwater treatment system facility.

11. Operation and Maintenance Responsibility Mechanism – List the legal mechanism(s) that have been or will be used to assign responsibility for the maintenance of the post-construction stormwater treatment systems.

12. Hydraulic Sizing Criteria Used – List the hydraulic sizing criteria used for the Project.

13. Alternative Compliance Measures

- **Option 1: LID Treatment at an Offsite Location (Provision C.3.e.i.(1))** – On a separate page, give a discussion of the alternative compliance project including the information specified in Provision C.3.b.v.(1)(m)(i) for the offsite project.
- **Option 2: Payment of In-Lieu Fees (Provision C.3.e.i.(2))** – On a separate page, provide the information specified in Provision C.3.b.v.(1)(m)(ii).

14. HM Controls

- If HM control is not required, state why not
- If HM control is required, state control method used (e.g., method to design and size device(s), method(s) used to meet the HM Standard, and description of device(s) or method(s) used, such as detention basin(s), biodetention unit(s), regional detention basins, or in-stream control)

ATTACHMENT B

Provision C.3.g.
Alameda Permittees
Hydromodification Management Requirements

Alameda Permittees Hydromodification Management Requirements

1. On-site and Regional Hydromodification Management (HM) Control Design Criteria

a. *Range of flows to control*: Flow duration controls shall be designed such that post-project stormwater discharge rates and durations match pre-project discharge rates and durations from 10 percent of the pre-project 2-year peak flow[123] up to the pre-project 10-year peak flow, except where the lower endpoint of this range is modified as described in Section 6 of this Attachment.

b. *Goodness of fit criteria*: The post-project flow duration curve shall not deviate above the pre-project flow duration curve by more than 10 percent over more than 10 percent of the length of the curve corresponding to the range of flows to control.

c. *Allowable low flow rate*: Flow control structures may be designed to discharge stormwater at a very low rate that does not threaten to erode the receiving waterbody. This flow rate (also called *Qcp*[124]) shall be no greater than 10 percent of the pre-project 2-year peak flow unless a modified value is substantiated by analysis of actual channel resistance in accordance with an approved User Guide as described in Section 6 of this Attachment.

d. *Standard HM modeling*: On-site and regional HM controls designed using the Bay Area Hydrology Model (BAHM[125]) and site-specific input data shall be considered to meet the HM Standard. Such use must be consistent with directions and options set forth in the most current BAHM User's Manual.[126] Permittees shall demonstrate to the satisfaction of the Executive Officer that any modifications of the BAHM made are consistent with the requirements of this Attachment and Provision C.3.f.

e. *Alternate HM modeling and design*: The project proponent may use a continuous simulation hydrologic computer model[127] to simulate pre-project and post-project runoff and to design HM controls. To use this method, the project proponent shall compare the

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[123] Where referred to in this Order, the 2-year peak flow is determined using a flood frequency analysis procedure based on USGS Bulletin 17 B to obtain the peak flow statistically expected to occur at a 2-year recurrence interval. In this analysis, the appropriate record of hourly rainfall data (e.g., 35–50 years of data) is run through a continuous simulation hydrologic model, the annual peak flows are identified, rank ordered, and the 2-year peak flow is estimated. Such models include USEPA's Hydrologic Simulation Program—Fortran (HSPF), U.S. Army Corps of Engineers' Hydrologic Engineering Center-Hydrologic Modeling System (HEC-HMS), and USEPA's Storm Water Management Model (SWMM).

[124] Qcp is the allowable low flow discharge from a flow control structure on a project site. It is a means of apportioning the critical flow in a stream to individual projects that discharge to that stream, such that cumulative discharges do not exceed the critical flow in the stream.

[125] *The Bay Area Hydrology Model – A Tool for Analyzing Hydromodification Effects of Development Projects and Sizing Solutions*, Bicknell, J., D. Beyerlein, and A. Feng, September 26, 2006. Available at http://www.scvurppp-w2k.com/permit_c3_docs/Bicknell-Beyerlein-Feng_CASQA_Paper_9-26-06.pdf

[126] *The Bay Area Hydrology Model – A Tool for Analyzing Hydromodification Effects of Development Projects and Sizing Solutions*, Bicknell, J., D. Beyerlein, and A. Feng, September 26, 2006. Available at http://www.scvurppp-w2k.com/permit_c3_docs/Bicknell-Beyerlein-Feng_CASQA_Paper_9-26-06.pdf

[127] Such models include US EPA's Hydrologic Simulation Program—Fortran (HSPF), U.S. Army Corps of Engineers Hydrologic Engineering Center-Hydrologic Modeling System (HEC-HMS), and USEPA's Surface Water Management Model (SWMM).

pre-project and post-project model output for a rainfall record of at least 30 years, and shall show that all applicable performance criteria in 1.a-e above are met.

2. Impracticability Provision

Where conditions (e.g., extreme space limitations) prevent a project from meeting the HM Standard for a reasonable cost, *and* where the project's runoff cannot be directed to a regional HM control within a reasonable time frame, *and* where an in-stream measure is not practicable, the project shall use (1) site design for hydrologic source control, *and* (2) stormwater treatment measures that collectively minimize, slow, and detain[128] runoff to the maximum extent practicable. In addition, the project proponent shall provide for or contribute financially to an alternative HM project as set forth below:

a. *Reasonable cost*: To show that the HM Standard cannot be met at a reasonable cost, the project proponent must demonstrate that the total cost to comply with both the HM Standard and the Provision C.3.d treatment requirement exceeds 2 percent of the project construction cost, excluding land costs. Costs of HM and treatment control measures shall not include land costs, soil disposal fees, hauling, contaminated soil testing, mitigation, disposal, or other normal site enhancement costs such as landscaping or grading that are required for other development purposes.

b. *Regional HM controls:* A regional HM control shall be considered available if there is a planned location for the regional HM control and if an appropriate funding mechanism for a regional HM control is in place by the time of project construction.

c. *In-stream measures practicability:* In-stream measures shall be considered practicable when an in-stream measure for the project's watershed is planned and an appropriate funding mechanism for an in-stream measure is in place by the time of project construction.

d. *Financial contribution to an alternative HM project:* The difference between 2 percent of the project construction costs and the cost of the treatment measures at the site (both costs as described in Section 2.a of this Attachment) shall be contributed to an alternative HM project, such as a stormwater treatment retrofit, HM retrofit, regional HM control, or in-stream measure that is not otherwise required by the Water Board or other regulatory agency. Preference shall be given to projects discharging, in this order, to the same tributary, mainstem, watershed, then in the same municipality or county.

3. Record Keeping

Permittees shall collect and retain the following information for all projects subject to HM requirements:

a. Site plans identifying impervious areas, surface flow directions for the entire site, and location(s) of HM measures;

b. For projects using standard sizing charts, a summary of sizing calculations used;

c. For projects using the BAHM, a listing of model inputs;

[128] Stormwater treatment measures that detain runoff are generally those that filter runoff through soil or other media and include bioretention units, bioswales, basins, planter boxes, tree wells, media filters, and green roofs.

d. For projects using custom modeling, a summary of the modeling calculations with corresponding graph showing curve matching (existing, post-project, and post-project with HM controls curves);

e. For projects using the Impracticability Provision, a listing of all applicable costs and a brief description of the alternative HM Project (name, location, date of start up, entity responsible for maintenance); and

f. A listing, summary, and date of modifications made to the BAHM, including technical rationale. Permittees shall submit this list and explanation annually with the Annual Report. This may be prepared at the Countywide Program level and submitted on behalf of participating Permittees.

4. HM Control Areas

Applicable projects shall be required to meet the HM Standard when such projects are in areas of HM applicability shown in the Alameda Permittees' HM Map.[129] (available at http://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/stormwater/muni/mrp/Final%20TO%20HM%20Maps.pdf). Plans to restore a creek reach may reintroduce the applicability of HM requirements; in these instances, Permittees may add, but shall not delete, areas of applicability accordingly.

To assist in location and evaluation of project applicability, the Alameda Permittees' HM Map depicts a number of features including the following:

- Hardened channels and culverts at least 24 inches in diameter (green solid or dashed lines);
- Natural channels (red lines);
- Boundaries of major watersheds (light blue lines); and
- Surface streets and highways (gray or black lines).

These data are of varying age, precision and accuracy and are not intended for legal description or engineering design. Watersheds extending beyond the County boundaries are shown for illustration purposes only. Project proponents are responsible for verifying and describing actual conditions of site location and drainage.

5. Alameda Permittees' HM Map is color-coded as follows:

a. Solid pink areas – Solid pink designates hilly areas, where high slopes (greater than 25 percent) occur. The HM Standard and all associated requirements apply in areas shown in solid pink on the map. In this area, the HM Standard does *not* apply if a project proponent demonstrates that all project runoff will flow through enclosed storm drains, existing concrete culverts, or fully hardened (with bed and banks continuously concrete-lined) channels to the tidal area shown in light gray.

b. Purple/red hatched areas – These are upstream of areas where hydromodification impacts are of concern because of factors such as bank instability, sensitive habitat, or restoration projects. The HM Standard and all associated requirements apply in areas

[129] The watercourses potentially susceptible to hydromodification impacts are identified based on an assessment approach developed by Balance Hydrologics (2003).

shown in purple/red (printer-dependant) hatch marking on the map. Projects in these areas may be subject to additional agency reviews related to hydrologic, habitat or other watershed-specific concerns.

c. Solid white areas – Solid white designates the land area between the hills and the tidal zone. This area may be susceptible to hydromodification unless the site is connected to storm drains that discharge to the tidal area. The HM Standard and all associated requirements apply to projects in solid white areas *unless* a project proponent demonstrates that all project runoff will flow through fully hardened channels.[130] Short segments of engineered earthen channels (length less than 10 times the maximum width of trapezoidal cross-section) can be considered resistant to erosion if located downstream of a concrete channel of similar or greater length and comparable cross-sectional dimensions. Plans to restore a hardened channel may affect the HM Standard applicability in this area.

d. Solid gray areas – Solid gray designates areas where streams or channels are tidally influenced or primarily depositional near their outfall in San Francisco Bay. The HM Standard does not apply to projects in this area. Plans to restore a hardened channel may affect the HM Standard applicability in this area.

e. Dark gray, *Eastern County* area – Dark gray designates the portion of eastern Alameda County that lies outside the discharge area of this NPDES permit. This area is in the Central Valley Regional Water Quality Control Board's jurisdiction.

6. Potential Exceptions to Alameda Permittees' HM Map Designations

The Program may choose to prepare a User Guide[131] to be used for evaluating individual receiving waterbodies using detailed methods to assess channel stability and watercourse critical flow. This User Guide would reiterate and collate established stream stability assessment methods that have been presented in the Program's HMP.[132] After the Program has collated its methods into a User Guide format, received approval of the User Guide from the Executive Officer,[133] and informed the public through such process as an electronic mailing list, the Permittees may use the User Guide to guide preparation of technical reports for the following: implementing the HM Standard using in-stream or regional HM controls; determining whether certain projects are discharging to a watercourse that is less susceptible (from point of discharge to the Bay) to hydromodification (e.g., would have a lower potential for erosion than set forth in these requirements); and/or determining if a watercourse has a higher critical flow and project(s) discharging to it are eligible for an alternative Qcp for the purpose of designing on-site or regional measures to control flows draining to these channels (i.e., the actual threshold of erosion-causing critical flow is higher than 10 percent of the 2-year pre-project flow). In no case shall the design value of Qcp exceed 50 percent of the 2-year pre-project flow.

[130] In this paragraph, *fully hardened channels* include enclosed storm drains, existing concrete culverts, or channels whose bed and banks are continuously concrete-lined to the tidal area shown in light gray on the map.
[131] The User Guide may be offered under a different title.
[132] The Program's HMP has undergone Water Board staff review and been subject to public notice and comment.
[133] The User Guide shall not introduce a new concept, but rather reformat existing methods; therefore, Executive Officer approval is appropriate.

ATTACHMENT C

Provision C.3.g.
Contra Costa Permittees
Hydromodification Management Requirements

Contra Costa Permittees Hydromodification Management Requirements

1. Demonstrating Compliance with the Hydromodification Management (HM) Standard

Contra Costa Permittees shall ensure that project proponents shall demonstrate compliance with the HM Standard by demonstrating that any one of the following four options is met:

a. *No increase in impervious area.* The project proponent may compare the project design to the pre-project condition and show that the project will not increase impervious area and also will not facilitate the efficiency of drainage collection and conveyance.

b. *Implementation of hydrograph modification IMPs.* The project proponent may select and size IMPs to manage hydrograph modification impacts, using the design procedure, criteria, and sizing factors specified in the Contra Costa Clean Water Program's *Stormwater C.3 Guidebook*. The use of flow-through planters shall be limited to upper-story plazas, adjacent to building foundations, on slopes where infiltration could impair geotechnical stability, or in similar situations where geotechnical issues prevent use of IMPs that allow infiltration to native soils. Limited soil infiltration capacity in itself does not make use of other IMPs infeasible.

c. *Estimated post-project runoff durations and peak flows do not exceed pre-project durations and peak flows.* The project proponent may use a continuous simulation hydrologic computer model such as USEPA's Hydrograph Simulation Program—Fortran (HSPF) to simulate pre-project and post-project runoff, including the effect of proposed IMPs, detention basins, or other stormwater management facilities. To use this method, the project proponent shall compare the pre-project and post-project model output for a rainfall record of at least 30 years, using limitations and instructions provided in the Program's *Stormwater C.3 Guidebook*, and shall show that the following criteria are met:

i. For flow rates from 10 percent of the pre-project 2-year runoff event (0.1Q2) to the pre-project 10-year runoff event (Q10), the post-project discharge rates and durations shall not deviate above the pre-project rates and durations by more than 10 percent over more than 10 percent of the length of the flow duration curve.

ii. For flow rates from 0.5Q2 to Q2, the post-project *peak flows* shall not exceed pre-project peak flows. For flow rates from Q2 to Q10, post-project peak flows may exceed pre-project flows by up to 10 percent for a 1-year frequency interval. For example, post-project flows could exceed pre-project flows by up to 10 percent for the interval from Q9 to Q10 or from Q5.5 to Q6.5, but not from Q8 to Q10.

d. *Projected increases in runoff peaks and durations will not accelerate erosion of receiving stream reaches.* The project proponent may show that, because of the specific characteristics of the stream receiving runoff from the project site, or because of proposed stream restoration projects, or both, there is little likelihood that the cumulative impacts from new development could increase the net rate of stream erosion to the extent that beneficial uses would be significantly impacted. To use this option, the project proponent shall evaluate the receiving stream to determine the relative risk of erosion impacts and take the appropriate actions as described below and in Table A-1. Projects 20 acres or larger in total area shall not use the medium risk methodology in *(d)ii* below.

i. ***Low Risk.*** In a report or letter report, signed by an engineer or qualified environmental professional, the project proponent shall show that all downstream channels between the project site and the Bay/Delta fall into one of the following *low-risk* categories.

(1) Enclosed pipes.

(2) Channels with continuous hardened beds and banks engineered to withstand erosive forces and composed of concrete, engineered riprap, sackcrete, gabions, mats, and such. This category excludes channels where hardened beds and banks are not engineered continuous installations (i.e., have been installed in response to localized bank failure or erosion).

(3) Channels subject to tidal action.

(4) Channels shown to be aggrading (i.e., consistently subject to accumulation of sediments over decades) and to have no indications of erosion on the channel banks.

ii. ***Medium Risk.*** Medium risk channels are those where the boundary shear stress could exceed critical shear stress as a result of hydrograph modification but where either the sensitivity of the boundary shear stress to flow is low (e.g., an oversized channel with high width to depth ratios) or where the resistance of the channel materials is relatively high (e.g., cobble or boulder beds and vegetated banks). In *medium-risk* channels, accelerated erosion due to increased watershed imperviousness is not likely but is possible, and the uncertainties can be more easily and effectively addressed by mitigation than by additional study.

In a preliminary report, the project proponent's engineer or qualified environmental professional shall apply the Program's *Basic Geomorphic Assessment*[134] methods and criteria to show each downstream reach between the project site and the Bay/Delta is either at *low-risk* or *medium-risk* of accelerated erosion due to watershed development. In a following, detailed report, a qualified stream geomorphologist[135] shall use the Program's Basic Geomorphic Assessment methods and criteria, available information, and current field data to evaluate each *medium-risk* reach. For *each medium-risk* reach, the detailed report shall show one of the following:

[134] Contra Costa Clean Water Program *Hydrograph Modification Management Plan*, May 15, 2005, Attachment 4, pp. 6-13. This method must be made available in the Program's *Stormwater C.3 Guidebook.*

[135] Typically, detailed studies will be conducted by a stream geomorphologist retained by the lead agency (or, on the lead agency's request, another public agency such as the Contra Costa County Flood Control and Water Conservation District) and paid for by the project proponent.

(1) A detailed analysis, using the Program's criteria, showing the particular reach may be reclassified as *low-risk.*

(2) A detailed analysis, using the Program's criteria, confirming the *medium-risk* classification, and:

(a) A preliminary plan for a mitigation project for that reach to stabilize stream beds or banks, improve natural stream functions, and/or improve habitat values, and

(b) A commitment to implement the mitigation project timely in connection with the proposed development project (including milestones, schedule, cost estimates, and funding), and

(c) An opinion and supporting analysis by one or more qualified environmental professionals that the expected environmental benefits of the mitigation project substantially outweigh the potential impacts of an increase in runoff from the development project, and

(d) Communication, in the form of letters or meeting notes, indicating consensus among staff representatives of regulatory agencies having jurisdiction that the mitigation project is feasible and desirable. In the case of the Regional Water Board, this must be a letter, signed by the Executive Officer or designee, specifically referencing this requirement. (This is a preliminary indication of feasibility required as part of the development project's Stormwater Control Plan. All applicable permits must be obtained before the mitigation project can be implemented.)

iii. ***High Risk.*** High-risk channels are those where the sensitivity of boundary shear stress to flow is high (e.g., incised or entrenched channels, channels with low width-to-depth ratios, and narrow channels with levees) or where channel resistance is low (e.g., channels with fine-grained, erodible beds and banks, or with little bed or bank vegetation). In a *high-risk* channel, it is presumed that increases in runoff flows will accelerate bed and bank erosion.

To implement this option (i.e., to allow increased runoff peaks and durations to a high-risk channel), the project proponent must perform a comprehensive analysis to determine the design objectives for channel restoration and must propose a comprehensive program of in-stream measures to improve channel functions while accommodating increased flows. Specific requirements are developed case-by-case in consultation with regulatory agencies having jurisdiction. The analysis will typically involve watershed-scale continuous hydrologic modeling (including calibration with stream gauge data where possible) of pre-project and post-project runoff flows, sediment transport modeling, collection and/or analysis of field data to characterize channel morphology including analysis of bed and bank materials and bank vegetation, selection and design of in-stream structures, and project environmental permitting.

2. IMP Model Calibration and Validation

The Program shall monitor flow from Hydrograph Modification Integrated Management Practices (IMPs) to determine the accuracy of its model inputs and assumptions. Monitoring

shall be conducted with the aim of evaluating flow control effectiveness of the IMPs. The Program shall implement monitoring where feasible at future new development projects to gain insight into actual versus predicted rates and durations of flow from IMP overflows and underdrains.

At a minimum, Permittees shall monitor five locations for a minimum of two rainy seasons. If two rainy seasons are not sufficient to collect enough data to determine the accuracy of model inputs and assumptions, monitoring shall continue until such time as adequate data are collected.

Permittees shall conduct the IMP monitoring as described in the IMP Model Calibration and Validation Plan in Section 5 of this Attachment. Monitoring results shall be submitted to the Executive Officer by June 15 of each year following collection of monitoring data. If the first year's data indicate IMPs are not effectively controlling flows as modeled in the HMP, the Executive Officer may require the Program to make adjustments to the IMP sizing factors or design, or otherwise take appropriate corrective action. The Permittees shall submit an IMP Monitoring Report by August 30 of the second year[136] of monitoring. The IMP Monitoring Report shall contain, at a minimum, all the data, graphic output from model runs, and a listing of all model outputs to be adjusted, with full explanation for each. Board staff will review the IMP Monitoring Report and require the Program to make any appropriate changes to the model within a 3-month time frame.

3. Stormwater C.3 Guidebook and IMP Design Criteria

The Current Contra Costa Clean Water Program C.3 Guidebook, 4th Edition (September 2008) shall be implemented until the expiration of this permit (November 2014). Any significant changes in the designs of the IMPs, their sizing factors or manner of implementation shall be approved by the Water Board.

4. IMP Model Calibration and Validation Plan Objective

Monitoring shall be conducted with the aim of evaluating flow control effectiveness of the IMPs. The IMPs were redesigned in 2008 to meet a low flow criterion of 0.2Q2, not 0.1Q2, which is current HMP standard for Contra Costa County. The Program shall implement monitoring at future new development projects at a minimum of five locations and for a minimum of two rainy seasons to gain insight into actual versus predicted rates and durations of flow from IMP overflows and underdrains. If two rainy seasons are not sufficient to collect enough data to determine the accuracy of model inputs and assumptions, monitoring shall continue until such time as adequate data are collected.

a. The Dischargers Shall Identify and Establish Monitoring Sites – Program staff shall work with municipal Co-Permittees to identify potential monitoring sites on development projects that implement IMPs. Proposed sites shall be identified during review of planning and zoning applications so that monitoring stations can be designed and constructed as part of the development project. Monitoring shall begin after the development project is complete and the site is in use.

Criteria for appropriate sites include**,** but are not limited to**,** the following:

[136] If the monitoring extends beyond 2 years, an IMP Monitoring Report shall be submitted by August 30 annually until model calibration and validation is complete.

- To ensure applicability of results, the development project and IMPs should be typical of development sites and types of IMPs foreseen throughout the County. In particular, at least one each of the infiltration planter, flow-through planter, and *dry* swale shall be selected for monitoring.
- The area tributary to the IMP should be clearly defined, should contain and direct runoff at all rainfall intensities to the IMP. Two monitoring locations shall contain tributary areas that are a mix of pervious and impervious areas to test the pervious area simplifying assumptions used in the HMP, Table 14, Attachment 2, page 49. If no such locations are constructed by the monitoring period, modeling of mixed (pervious and impervious) tributary areas can substitute for direct monitoring of this type of location.
- The site shall be easily accessible at all times of day and night to allow inspection and maintenance of measurement equipment.
- Hourly rain gauge data representative of the site's location shall be available.

b. Documentation of Monitoring Sites – The Dischargers shall record and report (i.e., document) pertinent information for each monitoring site. Documentation of each monitoring site shall include the following:

- Amount of tributary area;
- Condition of roof or paving;
- Grading and drainage to the IMP, including calculated time of concentration.
- Locations and elevations of inlets and outlets;
- As-built measurements of the IMP including depth of soil and gravel layers, height of underdrain pipe above the IMP floor or native soil;
- Detailed specifications of soil and gravel layers and of filter fabric and other appurtenances; and
- Condition of IMP surface soils and vegetation.

c. Design, Construction, and Operation of Monitoring Sites – The Dischargers shall ensure that IMPs selected for monitoring are equipped with a manhole, vault, or other means to install and access equipment for monitoring flows from IMP overflows and underdrains.

Development of suitable methods for monitoring the entire range of flows may require experiment. The Program and Water Board are interested in the timing and duration of very low flows from underdrains, as well as higher flows from IMP overflows. The Dischargers shall ensure that equipment is configured to measure the entire range of flows and to avoid potential clogging of orifices used to measure low flows.

The Dischargers shall ensure that construction of IMPs is inspected carefully to ensure that IMPs are installed as designed and to avoid potential operational problems. For example, gravel used for underdrain layers should be washed free of fines, and filter fabric should be installed without breaks.

The Dischargers shall ensure that, following construction, artificial flows are applied to the IMP to verify the IMP and monitoring equipment are operating correctly and to resolve any operational problems prior to measuring flows from actual rain storms.

The Dischargers shall ensure that monitoring equipment is properly maintained. Maintenance of monitoring equipment will require, initially, inspections during and after storms that produce runoff. The inspection and maintenance schedule may be adjusted as additional experience is gained.

d. Data to be Obtained – The Dischargers shall collect the following data for each IMP, during the monitoring period:

- Hourly rainfall and more frequent rainfall data where available;
- Hourly IMP outflow and 15-minute outflow for all time periods in which sub-hourly rainfall data are available;
- Hourly IMP inflow (if possible) and more frequent inflow (if possible) when sub-hourly rainfall data are available; and
- Notes and observations.

e. Evaluation of Data – The principal use of the monitoring data shall be a comparison of predicted to actual flows. The Dischargers shall ensure that the HSPF model is set up as it was to prepare the curves in Attachment 2 of the HMP, with appropriate adjustments for the drainage area of the IMP to be monitored and for the actual sizing and configuration of the IMP. Hourly rainfall data from observed storms shall be input to the model, and the resulting hourly predicted output recorded. Where sub-hourly rainfall data are available, the model shall be run with, and output recorded for, 15-minute time steps.

The Dischargers shall compare predicted hourly outflows to the actual hourly outflows. As more data are gathered, the Dischargers may examine aggregated data to characterize deviations from predicted performance at various storm intensities and durations.

Because high-intensity storms are rare, it will take many years to obtain a suitable number of events to evaluate IMP performance under overflow conditions. Underdrain flows will occur more frequently, but possibly only a few times a year, depending on rainfall and IMP characteristics (e.g., extent to which the IMP is oversized, and actual, rather than predicted, permeability of native soils). However, evaluating a range of rainfall events that do *not* produce underflow will help demonstrate the effectiveness of the IMP.

5. Record Keeping and Reporting

Permittees shall collect and retain the following information for all projects subject to HM requirements:

a. Site plans identifying impervious areas, surface flow directions for the entire site, and location(s) of HM measures;

b. For projects using standard sizing charts, a summary of sizing calculations used;

c. For projects using the BAHM, a listing of model inputs;

d. For projects using custom modeling, a summary of the modeling calculations with corresponding graph showing curve matching (existing, post-project, and post-project with HM controls curves);

e. For projects using the Impracticability Provision, a listing of all applicable costs and a brief description of the alternative HM project (name, location, date of start up, entity responsible for maintenance); and

f. A list and thorough technical explanation of any changes in design criteria for HM Controls, including IMPs. Permittees shall submit this list and explanation annually with the Annual Report.

6. The current Contra Costa Clean Water Program C.3 Guidebook, 4th Edition (C.3 Guidebook) (September 2008) design approach and IMPs shall be used to comply with Provision C.3.g flow requirements until this permit expires and is reissued, pending model verification studies as described below. The IMPs shall be an implementation option as the flow control implementation for development projects up to a footprint of 30 acres

By April 1, 2014, the Contra Costa Clean Water Program shall submit a proposal containing one or a combination of the following three options (a.-c.) for implementation after the expiration and reissuance of this permit:

a. Present model verification monitoring results demonstrating that the IMPs are sufficiently overdesigned and perform to meet the 0.1Q2 low flow design criteria; or

b. Present study results of Contra Costa County streams geology and other factors that support the low flow design criteria of 0.2Q2 as the limiting HMP design low flow; or

c. Propose redesigns of the IMPs to meet the low flow design criteria of 0.1Q2 to be implemented during the next permit term.

ATTACHMENT D

Provision C.3.g.
Fairfield-Suisun Permittees
Hydromodification Management Requirements

Fairfield-Suisun Permittees Hydromodification Management Requirements

1. On-site and Regional Hydromodification Management (HM) Control Design Criteria

a. *Range of flows to control*: Flow duration controls shall be designed such that post-project stormwater discharge rates and durations match pre-project discharge rates and durations from 20 percent of the pre-project 2-year peak flow[137] up to the pre-project 10-year peak flow.

b. *Goodness of fit criteria*: The post-project flow duration curve shall not deviate above the pre-project flow duration curve by more than 10 percent over more than 10 percent of the length of the curve corresponding to the range of flows to control.

c. *Allowable low flow rate:* Flow control structures may be designed to discharge stormwater at a very low rate that does not threaten to erode the receiving waterbody. This flow rate (also called Qcp[138]) shall be no greater than 20 percent of the pre-project 2-year peak flow.

d. *Standard HM modeling:* On-site and regional HM controls designed using the Bay Area Hydrology Model (BAHM[139]) and site-specific input data shall be considered to meet the HM Standard. Such use must be consistent with directions and options set forth in the most current BAHM User Manual.[140] Permittees shall demonstrate to the satisfaction of the Executive Officer that any modifications of the BAHM made are consistent with this Attachment and Provision C.3.g.

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[137] Where referred to in this Order, the 2-year peak flow is determined using a flood flow frequency analysis procedure based on USGS Bulletin 17 B to obtain the peak flow statistically expected to occur at a 2-year recurrence interval. In this analysis, the appropriate record of hourly rainfall data (e.g., 35–50 years of data) is run through a continuous simulation hydrologic model, the annual peak flows are identified, rank ordered, and the 2-year peak flow is estimated. Such models include USEPA's Hydrologic Simulation Program—Fortran (HSPF), U.S. Army Corps of Engineers' Hydrologic Engineering Center-Hydrologic Modeling System (HEC-HMS), and USEPA's Storm Water Management Model (SWMM).

[138] Qcp is the allowable low flow discharge from a flow control structure on a project site. It is a means of apportioning the critical flow in a stream to individual projects that discharge to that stream, such that cumulative discharges do not exceed the critical flow in the stream.

[139] See www.bayareahydrologymodel.org , Resources

[140] *The Bay Area Hydrology Model User Manual*is available at http://www.bayareahydrologymodel.org/downloads.html.

e. *Alternate HM modeling and design:* The project proponent may use a continuous simulation hydrologic computer model[141] to simulate pre-project and post-project runoff and to design HM controls. To use this method, the project proponent shall compare the pre-project and post-project model output for a rainfall record of at least 30 years, and shall show that all applicable performance criteria in 1.a–c above are met.

f. *Sizing Charts:* The Program developed design procedures, criteria, and sizing factors for infiltration basins and bioretention units, based on a low flow rate that exceeds the allowable low flow rate. After the Program has modified its sizing factors[142] to the allowable criteria, received approval of the modified sizing factors from the Executive Officer,[143] and informed the public through such mechanism as an electronic mailing list, project proponents may meet the HM Standard by using the Program's design procedures, criteria, and sizing factors for infiltration basins and/or bioretention units.

2. Impracticability Provision

Where conditions (e.g., extreme space limitations) prevent a project from meeting the HM Standard for a reasonable cost, *and* where the project's runoff cannot be directed to a regional HM control within a reasonable time frame, *and* where an in-stream measure is not practicable, the project shall use (1) site design for hydrologic source control, *and* (2) stormwater treatment measures that collectively minimize, slow, and detain[144] runoff to the maximum extent practicable. In addition, if the cost of providing site design for hydrologic source control and treatment measures to the maximum extent practicable does not exceed 2% of the project cost (as defined in "2.a." below), the project proponent shall provide for or contribute financially to an alternative HM project as set forth below:

a. *Reasonable cost*: To show that the HM Standard cannot be met at a reasonable cost, the project proponent must demonstrate that the total cost to comply with both the HM Standard and the Provision C.3.d. treatment requirement exceeds 2 percent of the project construction cost, excluding land costs. Costs of HM and treatment control measures shall not include land costs, soil disposal fees, hauling, contaminated soil testing, mitigation, disposal, or other normal site enhancement costs such as landscaping or grading that are required for other development purposes.

b. *Regional HM controls*: A regional HM control shall be considered available if there is a planned location for the regional HM control and if an appropriate funding mechanism for a regional HM control is in place by the time of project construction.

c. *In-stream measures practicability*: In-stream measures shall be considered practicable when an in-stream measure for the project's watershed is planned and an appropriate funding mechanism for an in-stream measure is in place by the time of project construction.

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[141] Such models include USEPA's Hydrologic Simulation Program—Fortran (HSPF), U.S. Army Corps of Engineers Hydrologic Engineering Center-Hydrologic Modeling System (HEC-HMS), and USEPA's Storm Water Management Model (SWMM).

[142] Current sizing factors and design criteria are shown in Appendix D of the FSURMP HMP.

[143] The modified sizing factors will not introduce a new concept but rather make an existing compliance mechanism more stringent; therefore, Executive Officer approval is appropriate.

[144] Stormwater treatment measures that detain runoff are generally those that filter runoff through soil or other media, and include bioretention units, bioswales, basins, planter boxes, tree wells, media, filters, and green roofs.

d. *Financial contribution to an alternative HM project*: The difference between 2 percent of the project construction costs and the cost of the treatment measures at the site (both costs as described in Section 2.a of this Attachment) shall be contributed to an alternative HM project, such as a stormwater treatment retrofit, HM retrofit, regional HM control, or in-stream measure. Preference shall be given to projects discharging, in this order, to the same tributary, mainstem, watershed, then in the same municipality or county.

3. Record Keeping

Permittees shall collect and retain the following information for all projects subject to HM requirements:

a. Site plans identifying impervious areas, surface flow directions for the entire site, and location(s) of HM measures;

b. For projects using standard sizing charts, a summary of sizing calculations used;

c. For projects using the BAHM, a listing of model inputs;

d. For projects using custom modeling, a summary of the modeling calculations with corresponding graph showing curve matching (existing, post-project, and post-project with HM controls curves);

e. For projects using the Impracticability Provision, a listing of all applicable costs and a brief description of the alternative HM project (name, location, date of start up, entity responsible for maintenance); and

f. A listing, summary, and date of modifications made to the BAHM, including technical rationale. Permittees shall submit this list and explanation annually with the Annual Report.

4. HM Control Areas

Applicable projects shall be required to meet the HM Standard when such projects discharge into the upstream reaches of Laurel or Ledgewood Creeks, as delineated in the Fairfield-Suisun Permittees' HM Maps (available at http://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/stormwater/muni/mrp/Final%20TO%20HM%20Maps.pdf.). Plans to restore a creek reach may reintroduce the applicability of HM requirements; in these instances, Permittees may add, but shall not delete, areas of applicability accordingly.

ATTACHMENT E

Provision C.3.g.
San Mateo Permittees
Hydromodification Management Requirements

San Mateo Permittees Hydromodification Management Requirements

1. On-site and Regional Hydromodification Management (HM) Control Design Criteria

a. *Range of flows to control:* Flow duration controls shall be designed such that post-project stormwater discharge rates and durations match pre-project discharge rates and durations from 10 percent of the pre-project 2-year peak flow[145] up to the pre-project 10-year peak flow.

b. *Goodness of fit criteria*: The post-project flow duration curve shall not deviate above the pre-project flow duration curve by more than 10 percent over more than 10 percent of the length of the curve corresponding to the range of flows to control.

c. *Allowable low flow rate:* Flow control structures may be designed to discharge stormwater at a very low rate that does not threaten to erode the receiving waterbody. This flow rate (also called Qcp[146]) shall be no greater than 10 percent of the pre-project 2-year peak flow.

d. *Standard HM modeling*: On-site and regional HM controls designed using the Bay Area Hydrology Model (BAHM[147]) and site-specific input data shall be considered to meet the HM Standard. Such use must be consistent with directions and options set forth in the

[145] Where referred to in this Order, the 2-year peak flow is determined using a flood flow frequency analysis procedure based on USGS Bulletin 17 B to obtain the peak flow statistically expected to occur at a 2-year recurrence interval. In this analysis, the appropriate record of hourly rainfall data (e.g., 35–50 years of data) is run through a continuous simulation hydrologic model, the annual peak flows are identified, rank ordered, and the 2-year peak flow is estimated. Such models include USEPA's Hydrologic Simulation Program—Fortran (HSPF), U.S. Army Corps of Engineers' Hydrologic Engineering Center-Hydrologic Modeling System (HEC-HMS), and USEPA's Storm Water Management Model (SWMM).

[146] Qcp is the allowable low flow discharge from a flow control structure on a project site. It is a means of apportioning the critical flow in a stream to individual projects that discharge to that stream, such that cumulative discharges do not exceed the critical flow in the stream.

[147] See www.bayareahydrologymodel.org , Resources

most current BAHM User Manual.[148] Permittees shall demonstrate to the satisfaction of the Executive Officer that any modifications of the BAHM made are consistent with the requirements of Provision C.3.g.

e. *Alternate HM modeling and design*: The project proponent may use a continuous simulation hydrologic computer model[149] to simulate pre-project and post-project runoff and to design HM controls. To use this method, the project proponent shall compare the pre-project and post-project model output for a rainfall record of at least 30 years, and shall show that all applicable performance criteria in 1.a.–c. above are met.

2. Impracticability Provision

Where conditions (e.g., extreme space limitations) prevent a project from meeting the HM Standard for a reasonable cost, *and* where the project's runoff cannot be directed to a regional HM control within a reasonable time frame, *and* where an in-stream measure is not practicable, the project shall use (1) site design for hydrologic source control, *and* (2) stormwater treatment measures that collectively minimize, slow, and detain[150] runoff to the maximum extent practicable. In addition, , if the cost of providing site design for hydrologic source control and treatment measures to the maximum extent practicable does not exceed 2% of the project cost (as defined in "2.a." below), the project proponent shall provide for or contribute financially to an alternative HM project as set forth below:

a. *Reasonable cost*: To show that the HM Standard cannot be met at a reasonable cost, the project proponent must demonstrate that the total cost to comply with both the HM Standard and the Provision C.3.d treatment requirement exceeds 2 percent of the project construction cost, excluding land costs. Costs of HM and treatment control measures shall not include land costs, soil disposal fees, hauling, contaminated soil testing, mitigation, disposal, or other normal site enhancement costs such as landscaping or grading that are required for other development purposes.

b. *Regional HM controls:* A regional HM control shall be considered available if there is a planned location for the regional HM control and if an appropriate funding mechanism for a regional HM control is in place by the time of project construction.

c. *In-stream measures practicability:* In-stream measures shall be considered practicable when an in-stream measure for the project's watershed is planned and an appropriate funding mechanism for an in-stream measure is in place by the time of project construction.

d. *Financial contribution to an alternative HM project*: The difference between 2 percent of the project construction costs and the cost of the treatment measures at the site (both costs as described in Section 2.a of this Attachment shall be contributed to an alternative HM project, such as a stormwater treatment retrofit, HM retrofit, regional HM control, or

[148] The Bay Area Hydrology Model User Manualis available at http://www.bayareahydrologymodel.org/downloads.html

[149] Such models include USEPA's Hydrologic Simulation Program—Fortran (HSPF), U.S. Army Corps of Engineers Hydrologic Engineering Center-Hydrologic Modeling System (HEC-HMS), and USEPA's Storm Water Management Model (SWMM).

[150] Stormwater treatment measures that detain runoff are generally those that filter runoff through soil or other media, and include bioretention units, bioswales, basins, planter boxes, tree wells, media filters, and green roofs.

in-stream measure. Preference shall be given to projects discharging, in this order, to the same tributary, mainstem, watershed, then in the same municipality, or county.

3. Record Keeping

Permittees shall collect and retain the following information for all projects subject to HM requirements:

a. Site plans identifying impervious areas, surface flow directions for the entire site, and location(s) of HM measures;

b. For projects using standard sizing charts, a summary of sizing calculations used;

c. For projects using the BAHM, a listing of model inputs;

d. For projects using custom modeling, a summary of the modeling calculations with corresponding graph showing curve matching (existing, post-project, and post-project with HM controls curves);

e. For projects using the Impracticability Provision, a listing of all applicable costs and a brief description of the alternative HM project (name, location, date of startup, entity responsible for maintenance); and

f. A listing, summary, and date of modifications made to the BAHM, including technical rationale. Permittees shall submit this list and explanation annually with the Annual Report. This may be prepared at the Countywide Program level and submitted on behalf of participating Permittees.

4. HM Control Areas

Applicable projects shall be required to meet the HM Standard when such projects are in the HM control areas shown in the San Mateo Permittees' HM Map (available at http://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/stormwater/muni/mrp/Final%20TO%20HM%20Maps.pdf). Plans to restore a creek reach may reintroduce the applicability of HM requirements; in these instances, Permittees may add, but shall not delete, areas of applicability accordingly.

The HM Standard and all associated requirements apply in areas that are shown in green on the map and noted in the map's key as *areas subject to HMP*. The other areas are exempt from the HM Standard because they drain to hardened channels or low gradient channels (a characteristic applicable to San Mateo County's particular shoreline properties), or are in highly developed areas. Plans to restore a hardened channel may affect areas of applicability.

Areas shown in the San Mateo Permittees' HM Map may be modified as follows:

b. **Street Boundary Interpretation** – Streets are used to mark the boundary between areas where the HM Standard must be met and exempt areas. Parcels on the boundary street are considered within the area exempted from the hydromodification requirements. Nonetheless, there might be cases where the drainage from a particular parcel(s) on the boundary street drains westward into the hydromodification required area and, as such, any applicable project on such a parcel(s) would be subject to the hydromodification requirements.

c. Hardened Channel/Drainage to Exempt Area – If drainage leaving a proposed project subject to the HM Standard is determined to flow only through a hardened channel and/or enclosed pipe along its entire length before directly discharging into a waterway in the exempt area or into tidal waters, the project would be exempted from the HM Standard and its associated requirements. The project proponent must demonstrate, in a statement signed by an engineer or qualified environmental professional, that this condition is met.

d. Boundary Re-Opener – If the municipal regional permit or future permit reissuances or amendments modify the types of projects subject to the hydromodification requirements, the appropriate location for an HMP boundary or boundaries will be reevaluated at the same time.

ATTACHMENT F

Provision C.3.g.
Santa Clara Permittees
Hydromodification Management Requirements

Santa Clara Permittees Hydromodification Management Requirements

1. On-site and Regional Hydromodification Management (HM) Control Design Criteria

a. *Range of flows to control:* Flow duration controls shall be designed such that post-project stormwater discharge rates and durations match pre-project discharge rates and durations from 10 percent of the pre-project 2-year peak flow[151] up to the pre-project 10-year peak flow, except where the lower endpoint of this range is modified as described in Section 5 of this Attachment.

b. *Goodness of fit criteria*: The post-project flow duration curve shall not deviate above the pre-project flow duration curve by more than 10 percent over more than 10 percent of the length of the curve corresponding to the range of flows to control.

c. *Allowable low flow rate*: Flow control structures may be designed to discharge stormwater at a very low rate that does not threaten to erode the receiving waterbody. This flow rate (also called *Qcp*[152]) shall be no greater than 10 percent of the pre-project 2-year peak flow unless a modified value is substantiated by analysis of actual channel resistance in accordance with an approved User Guide as described in Section 5 of this Attachment.

d. *Standard HM modeling*: On-site and regional HM controls designed using the Bay Area Hydrology Model (BAHM[153]) and site-specific input data shall be considered to meet the HM Standard. Such use must be consistent with directions and options set forth in the

[151] Where referred to in this Order, the 2-year peak flow is determined using a flood flow frequency analysis procedure based on USGS Bulletin 17B to obtain the peak flow statistically expected to occur at a 2-year recurrence interval. In this analysis, the appropriate record of hourly rainfall data (e.g., 35–50 years of data) is run through a continuous simulation hydrologic model, the annual peak flows are identified, rank ordered, and the 2-year peak flow is estimated. Such models include USEPA's Hydrologic Simulation Program—Fortran (HSPF), U.S. Army Corps of Engineers' Hydrologic Engineering Center-Hydrologic Modeling System (HEC-HMS), and USEPA's Storm Water Management Model (SWMM).

[152] Qcp is the allowable low flow discharge from a flow control structure on a project site. It is a means of apportioning the critical flow in a stream to individual projects that discharge to that stream, such that cumulative discharges do not exceed the critical flow in the stream.

[153] See www.bayareahydrologymodel.org , Resources.

most current BAHM User Manual.[154] Permittees shall demonstrate to the satisfaction of the Executive Officer that any modifications of the BAHM made are consistent with this attachment and Provision C.3.g.

e. *Alternate HM modeling and design*: The project proponent may use a continuous simulation hydrologic computer model[155] to simulate pre-project and post-project runoff and to design HM controls. To use this method, the project proponent shall compare the pre-project and post-project model output for a rainfall record of at least 30 years, and shall show that all applicable performance criteria in 1.a. – c. above are met.

2. Impracticability Provision

Where conditions (e.g., extreme space limitations) prevent a project from meeting the HM Standard for a reasonable cost, *and* where the project's runoff cannot be directed to a Regional HM control[156] within a reasonable time frame, *and* where an in-stream measure is not practicable, the project shall use (1) site design for hydrologic source control, *and* (2) stormwater treatment measures that collectively minimize, slow, and detain[157] runoff to the maximum extent practicable. In addition, if the cost of providing site design for hydrologic source control and treatment measures to the maximum extent practicable does not exceed 2% of the project cost (as defined in "2.a." below), the project shall contribute financially to an alternative HM project as set forth below:

a. *Reasonable cost*: To show that the HM Standard cannot be met at a reasonable cost, the project proponent must demonstrate that the total cost to comply with both the HM Standard and the Provision C.3.d treatment requirement exceeds 2 percent of the project construction cost, excluding land costs. Costs of HM and treatment control measures shall not include land costs, soil disposal fees, hauling, contaminated soil testing, mitigation, disposal, or other normal site enhancement costs such as landscaping or grading that are required for other development purposes.

b. *Regional HM control:* A regional HM control shall be considered available if there is a planned location for the regional HM control and if an appropriate funding mechanism for a regional control is in place by the time of project construction.

c. *In-stream measures practicability:* In-stream measures shall be considered practicable when an in-stream measure for the project's watershed is planned and an appropriate funding mechanism for an in-stream measure is in place by the time of project construction.

d. *Financial contribution to an alternative HM project:* The difference between 2 percent of the project construction costs and the cost of the treatment measures at the site (both costs as described in Section 2.a of this Attachment) shall be contributed to an alternative

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[154] *The Bay Area Hydrology Model User Manual* is available at http://www.bayareahydrologymodel.org/downloads.html.

[155] Such models include USEPA's Hydrologic Simulation Program—Fortran (HSPF), U.S. Army Corps of Engineers Hydrologic Engineering Center-Hydrologic Modeling System (HEC-HMS), and USEPA's Storm Water Management Model (SWMM).

[156] *Regional HM controls* are flow duration control structures that collect stormwater runoff discharge from multiple projects (each of which should incorporate hydrologic source control measures as well) and are designed such that the HM Standard is met for all the projects at the point where the regional control measure discharges.

[157] Stormwater treatment measures that detain runoff are generally those that filter runoff through soil or other media, and include bioretention units, bioswales, basins, planter boxes, sand filters, and green roofs.

HM project, such as a stormwater treatment retrofit, HM retrofit, regional HM control, or in-stream measure. Preference shall be given to projects discharging, in this order, to the same tributary, mainstem, watershed, then in the same municipality or county.

3. Record Keeping

Permittees shall collect and retain the following information for all projects subject to HM requirements:

a. Site plans identifying impervious areas, surface flow directions for the entire site, and location(s) of HM measures;

b. For projects using standard sizing charts, a summary of sizing calculations used;

c. For projects using the BAHM, a listing of model inputs;

d. For projects using custom modeling, a summary of the modeling calculations with corresponding graph showing curve matching (existing, post-project, and post-project with HM controls curves);

e. For projects using the Impracticability Provision, a listing of all applicable costs and a brief description of the alternative HM project (name, location, date of start up, entity responsible for maintenance); and

f. A listing, summary, and date of modifications made to the BAHM, including technical rationale. Permittees shall submit this list and explanation annually with the Annual Report. This may be prepared at the Countywide Program level and submitted on behalf of participating Permittees.

4. HM Control Areas

Applicable projects shall be required to meet the HM Standard when such projects are located in areas of HM applicability as described below and shown in the Santa Clara Permittees' HM Map (available at http://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/stormwater/muni/mrp/Final%20TO%20HM%20Maps.pdf).

a. **Purple areas**: These areas represent catchments that drain to hardened channels that extend continuously to the Bay or to tidally influenced sections of creeks. The HM Standard and associated requirements do not apply to projects in the areas designated in purple on the map.

Plans to restore a creek reach may reintroduce the applicability of HM requirements, unless the creek restoration project is designed to accommodate the potential hydromodification impacts of future development; if this is not the case, in these instances, Permittees may add, but shall not delete, areas of applicability accordingly.

b. **Red areas**: These areas represent catchments and subwatersheds that are greater than or equal to 65% impervious, based on existing imperviousness data sources. The HM Standard and associated requirements do not apply to projects in the areas designated in red on the map.

c. **Pink areas**: These are areas that are under review by the Permittees for accuracy of the imperviousness data. The HM Standard and associated requirements apply to projects in areas designated as pink on the map until such time as a Permittee presents new data that indicate that the actual level of imperviousness of a particular area is greater than or equal

to 65% impervious. Any new data will be submitted to the Water Board in one coordinated submittal within one year of permit adoption.

d. Green area: These areas represent catchments and subwatersheds that are less than 65% impervious and are not under review by the Permittees. The HM Standard and associated requirements apply to projects in areas designated as green on the map.

5. Potential Exceptions to Map Designations

The Program may choose to prepare a User Guide[158] to be used for evaluating individual receiving waterbodies using detailed methods to assess channel stability and watercourse critical flow. This User Guide would reiterate and collate established stream stability assessment methods that have been presented in the Program's HMP.[159] After the Program has collated its methods into User Guide format, received approval of the User Guide from the Executive Officer,[160] and informed the public through such process as an electronic mailing list, the Permittees may use the User Guide to guide preparation of technical reports for the following: implementing the HM Standard using in-stream or regional controls; determining whether certain projects are discharging to a watercourse that is less susceptible (from point of discharge to the Bay) to hydromodification (e.g., would have a lower potential for erosion than set forth in these requirements); and/or determining if a watercourse has a higher critical flow and project(s) discharging to it are eligible for an alternative Qcp for the purpose of designing on-site or regional measures to control flows draining to these channels (i.e., the actual threshold of erosion-causing critical flow is higher than 10 percent of the 2-year pre-project flow). In no case shall the design value of Qcp exceed 50 percent of the 2-year pre-project flow.

[158] The User Guide may be offered under a different title.
[159] The Program's HMP has undergone Water Board staff review and been subject to public notice and comment.
[160] The User Guide will not introduce a new concept, but rather reformat existing methods; therefore, Executive Officer approval is appropriate.

ATTACHMENT G

Provision C.3.h.
Sample Reporting Table

Table C.3.h. – Operation and Maintenance of Stormwater Treatment Systems
City of Eden Annual Report FY 2008-09

Facility/Site Inspected and Responsible Party for Maintenance	Date of Inspection	Type of Inspection (annual, follow-up, etc.)	Type of Treatment System or HM Control Inspected	Inspection Findings or Results	Enforcement Action Taken (Warning, NOV, administrative citation, etc.)	Comments
ABC Company 123 Alphabet Road San Jose	12/06/08	annual	offsite bioretention unit	proper operation	none	Unit is operating properly and is well maintained.
DEF site 234 Blossom Drive Santa Clara	12/17/08	annual	onsite media filter	ineffective filter media	verbal warning	Media filter is clogged and needs to be replaced.
	12/19/08	follow-up	onsite media filter	proper operation	none	New media filter in place and unit is operating properly.
	1/19/09	follow-up	onsite media filter	proper operation	none	Unit is operating properly.
GHI Hotel 1001 Grand Blvd 227 Touring Parkway	12/21/08	annual	onsite swales	proper operation	notice of violation	Bioretention unit #2 is badly eroded because of flow channelization. Stormwater is flowing over the eroded areas, bypassing treatment and running off into parking area.
			onsite bioretention unit #1	proper operation		
			onsite bioretention unit #2	eroded areas due to flow channelization		
	12/27/08	follow-up	onsite bioretention unit #2	proper operation	none	Entire bioretention unit #2 has been replanted and re-graded. Raining heavily but no overflow observed.
Rolling Hills Estates Homeowners' Association 543 Rolling Hill Drive Pleasanton	01/17/09	annual	onsite pond	sediment and debris accumulation	notice of violation	Pond needs sediment removal and check dam needs debris removal.
	01/24/09	follow-up	onsite pond	sediment and debris accumulation	administrative citation $1000	Pond still a mess. Administrative citation requires maintenance within a week.
	01/31/09	follow-up	onsite pond	proper maintenance	none	Pond maintenance completed.
	02/18/09	spot inspection	onsite pond	proper operation and maintenance	none	Proper operation and maintenance.

ATTACHMENT H

Provision C.8.
Status and Long-Term Monitoring
Follow-up Analysis and Actions

Status and Long-Term Monitoring Follow-up Analysis and Actions for Biological Assessment, Bedded Sediment Toxicity, and Bedded Sediment Pollutants

When results from Biological Assessment, Bedded Sediment Toxicity, and/or Bedded Sediment Pollutants monitoring indicate impacts at a monitoring location, Permittees shall evaluate the extent and cause(s) of impacts to determine the potential role of urban runoff as indicated in Table H-1.

Table H-1. Sediment Triad Approach to Determining Follow-Up Actions

Chemistry Results[161]	Toxicity Results[162]	Bioassessment Results[163]	Action
No chemicals exceed Threshold Effect Concentrations (TEC), mean Probable Effects Concentrations (PEC) quotient < 0.5 and pyrethroids < 1.0 Toxicity Unit (TU)[164]	No Toxicity	No indications of alterations	No action necessary
No chemicals exceed TECs, mean PEC quotient < 0.5 and pyrethroids< 1.0 TU	Toxicity	No indications of alterations	(1) Take confirmatory sample for toxicity. (2) If toxicity repeated, attempt to identify cause and spatial extent. (3) Where impacts are under Permittee's control, take management actions to minimize upstream sources causing toxicity; initiate no later than the second fiscal year following the sampling event.

[161] TEC and PEC are found in MacDonald, D.D., G.G. Ingersoll, and T.A. Berger. 2000. Development and Evaluation of Consensus-based Sediment Quality Guidelines for Freshwater Ecosystems. *Archives of Environ. Contamination and Toxicology* 39(1):20–31.

[162] Toxicity is exhibited when *Hyallela* survival statistically different than and < 20 percent of control.

[163] Alterations are exhibited if metrics indicate substantially degraded community.

[164] Toxicity Units (TU) are calculated as follows: TU = Actual concentration (organic carbon normalized) ÷ Reported *H. azteca* LC_{50} concentration (organic concentration normalized). Weston, D.P., R.W. Holmes, J. You, and M.J. Lydy, 2005. Aquatic Toxicity Due to Residential Use of Pyrethroid Insecticides. *Environ. Science and Technology* 39(24):9778–9784.

Chemistry Results[161]	Toxicity Results[162]	Bioassessment Results[163]	Action
No chemicals exceed TECs, mean PEC quotient < 0.5 and pyrethroids< 1.0 TU	No Toxicity	Indications of alterations	Identify the most probable cause(s) of the alterations in biological community. Where impacts are under Permittee's control, take management actions to minimize the impacts causing physical habitat disturbance; initiate no later than the second fiscal year following the sampling event.
No chemicals exceed TECs, mean PEC quotient < 0.5 and pyrethroids< 1.0 TU	Toxicity	Indications of alterations	(1) Identify cause(s) of impacts and spatial extent. (2) Where impacts are under Permittee's control, take management actions to minimize impacts; initiate no later than the second fiscal year following the sampling event.
3 or more chemicals exceed PECs, the mean PEC quotient is > 0.5, or pyrethroids > 1.0 TU	No Toxicity	Indications of alterations	(1) Identify cause of impacts. (2) Where impacts are under Permittee's control, take management actions to minimize the impacts caused by urban runoff; initiate no later than the second fiscal year following the sampling event.
3 or more chemicals exceed PECs, the mean PEC quotient is > 0.5, or pyrethroids > 1.0 TU	Toxicity	No indications of alterations	(1) Take confirmatory sample for toxicity. (2) If toxicity repeated, attempt to identify cause and spatial extent. (3) Where impacts are under Permittee's control, take management actions to minimize upstream sources; initiate no later than the second fiscal year following the sampling event.
3 or more chemicals exceed PECs, the mean PEC quotient is > 0.5, or pyrethroids > 1.0 TU	No Toxicity	No Indications of alterations	If PEC exceedance is Hg or PCBs, address under TMDLs
3 or more chemicals exceed PECs, the mean PEC quotient is > 0.5, or pyrethroids > 1.0 TU	Toxicity	Indications of alterations	(1) Identify cause(s) of impacts and spatial extent. (2) Where impacts are under Permittee's control, take management actions to address impacts.

ATTACHMENT I

Provision C.8.
Standard Monitoring Provisions

All monitoring activities shall meet the following requirements:

1. Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity. [40 CFR 122.41(j)(1)]
2. Permittees shall retain records of all monitoring information, including all calibration and maintenance of monitoring instrumentation, and copies of all reports required by this Order for a period of at least five (5) years from the date of the sample, measurement, report, or application. This period may be extended by request of the Water Board or USEPA at any time and shall be extended during the course of any unresolved litigation regarding this discharge. [40 CFR 122.41(j)(2), CWC section 13383(a)]
3. Records of monitoring information shall include [40 CFR 122.41(j)(3)]:
   a. The date, exact place, and time of sampling or measurements;
   b. The individual(s) who performed the sampling or measurements;
   c. The date(s) analyses were performed;
   d. The individual(s) who performed the analyses;
   e. The analytical techniques or methods used; and,
   f. The results of such analyses.
4. The CWA provides that any person who falsifies, tampers with, or knowingly renders inaccurate any monitoring device or method required to be maintained under this Order shall, upon conviction, be punished by a fine of not more than $10,000, or by imprisonment for not more than two years, or both. If a conviction of a person is for a violation committed after a first conviction of such person under this paragraph, punishment is a fine of not more than $20,000 per day of violation, or by imprisonment of not more than four years, or both. [40 CFR 122.41(j)(5)]
5. Calculations for all limitations which require averaging of measurements shall utilize an arithmetic mean unless otherwise specified in the monitoring Provisions. [40 CFR 122.41(l)(4)(iii)]
6. All chemical, bacteriological, and toxicity analyses shall be conducted at a laboratory certified for such analyses by the California Department of Health Services or a laboratory approved by the Executive Officer.
7. For priority toxic pollutants that are identified in the California Toxics Rule (CTR) (65 Fed. Reg. 31682), the Permittees shall instruct its laboratories to establish calibration standards that are equivalent to or lower than the Minimum Levels (MLs) published in Appendix 4 of the Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California (SIP). If a Permittee can demonstrate that a particular ML is not attainable, in accordance with procedures set forth in 40 CFR 136, the lowest quantifiable concentration of the lowest calibration standard analyzed by a specific analytical procedure (assuming that all the method specified sample weights, volumes, and processing steps have been followed) may be used instead of the ML listed in Appendix 4 of the SIP. The Permittee must submit documentation from the laboratory to the Water Board for approval prior to raising the ML for any priority toxic pollutant.
8. The Clean Water Act provides that any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit, including monitoring reports or reports of compliance or non-

compliance shall, upon conviction, be punished by a fine of not more than $10,000 per violation, or by imprisonment for not more than six months per violation, or by both. [40 CFR 122.41(k)(2)]

9. If the discharger monitors any pollutant more frequently than required by the Permit, unless otherwise specified in the Order, the results of this monitoring shall be included in the calculation and reporting of the data submitted in the reports requested by the Water Board. [40 CFR 122.41(l)(4)(ii)]

ATTACHMENT J

Minimum Trash Capture Area
and
Minimum Number of Trash Hot Spots

Table 10.1 Minimum Trash Capture Area and Trash Hot Spots for Population Based Permittees

Data Source: http://quake.abag.ca.gov/mitigation/pickdbh2.html and Association of Bay Area Governments, 2005 ABAG Land Use Existing Land Use in 2005: Report and Data for Bay Area Counties

	Population	Retail / Wholesale Commercial Acres		**Minimum Trash Capture Catchment Area (Acres)**[165]		# of Trash Hot Spots per 30K Population	# of Trash Hot Spots per 100 Retail / Wholesale Commercial Acres	**Minimum # of Trash Hot Spots**[166]
Alameda County								
San Leandro	73,402	721		**216**		2	7	4
Oakland	420,183	759		**228**		14	8	8
Dublin	46,934	377		**113**		1	3	**3**
Emeryville	9,727	69		**21**		1	1	1
Albany	16,877	95		**28**		1	1	1
Berkeley	106,697	183		**55**		3	1	3
Alameda County Unincorporated.	140,825	375		**112**		4	3	4
Alameda	75,823	402		**121**		2	4	**4**
Fremont	213,512	698		**209**		7	6	7
Hayward	149,205	726		**218**		4	7	**7**
Livermore	83,604	423		**127**		2	4	**4**
Newark	43,872	314		**94**		1	3	**3**
Piedmont	11,100	1		**0.3**		1	1	1
Pleasanton	69,388	366		**110**		2	3	**3**
Union City	73,402	183		**55**		2	1	2

[165] 30% of Retail / Wholesale Commercial Acres

[166] If the hot spot # based on % commercial area is more than twice that based on population, the minimum hot spot # is double the population based #.

	Population	Retail / Wholesale Commercial Acres		**Minimum Trash Capture Catchment Area (Acres)**[165]		# of Trash Hot Spots per 30K Population	# of Trash Hot Spots per 100 Retail / Wholesale Commercial Acres	**Minimum # of Trash Hot Spots**[166]
San Mateo County								
San Mateo County Unincorporated.	65,844	71		**21**		2	1	2
Atherton	7,475	0		**0**		1	1	1
Belmont	26,078	58		**17**		1	1	1
Brisbane	3,861	16		**5**		1	1	1
Burlingame	28,867	123		**37**		1	1	1
Colma	1,613	106		**32**		1	1	1
Portola Valley	4,639	9		**3**		1	1	1
Daly City	106,361	242		**73**		3	2	3
East Palo Alto	32,897	59		**18**		1	1	1
Foster City	30,308	67		**20**		1	1	1
Half Moon Bay	13,046	49		**15**		1	1	1
Hillsborough	11,272	0		**0**		1	1	1
Menlo Park	31,490	83		**25**		1	1	1
Millbrae	21,387	68		**20**		1	1	1
Pacifica	39,616	100		**30**		1	1	1
Redwood City	77,269	309		**93**		2	3	**3**
San Bruno	43,444	137		**41**		1	1	1
San Carlos	28,857	129		**39**		1	1	1
San Mateo	95,776	275		**82**		3	2	3
South San Francisco	63,744	195		**58**		2	1	2
Woodside	5,625	9		**3**		1	1	1

	Population	Retail / Wholesale Commercial Acres		**Minimum Trash Capture Catchment Area (Acres)**[165]		# of Trash Hot Spots per 30K Population	# of Trash Hot Spots per 100 Retail / Wholesale Commercial Acres	**Minimum # of Trash Hot Spots**[166]
Contra Costa County								
Contra Costa County Unincorporated.	173,573	524		**157**		5	5	5
Concord	123,776	1016		**305**		4	10	8
Walnut Creek	65,306	329		**99**		2	3	**3**
Clayton	10,784	21		**6**		1	1	1
Danville	42,629	134		**40**		1	1	1
El Cerrito	23,320	105		**32**		1	1	1
Hercules	24,324	37		**11**		1	1	1
Lafayette	23,962	68		**20**		1	1	1
Martinez	36,144	142		**43**		1	1	1
Moraga	16,138	108		**32**		1	1	1
Orinda	17,542	24		**7**		1	1	1
Pinole	19,193	140		**42**		1	1	1
Pittsburg	63,652	520		**156**		2	5	4
Pleasant Hill	33,377	219		**66**		1	2	**2**
Richmond	103,577	391		**117**		3	3	3
San Pablo	31,190	131		**39**		1	1	1
San Ramon	59,002	274		**82**		1	2	**2**

	Population	Retail / Wholesale Commercial Acres		**Minimum Trash Capture Catchment Area (Acres)**[165]		# of Trash Hot Spots per 30K Population	# of Trash Hot Spots per 100 Retail / Wholesale Commercial Acres	**Minimum # of Trash Hot Spots**[166]
Santa Clara County								
Santa Clara County Unincorporated	99,122	270		**81**		3	3	3
Cupertino	55,551	213		**64**		2	2	2
Los Altos	28,291	65		**20**		1	1	1
Los Altos Hills	8,837	0		**0**		1	1	1
Los Gatos	30,296	163		**49**		1	1	1
Milpitas	69,419	457		**137**		2	4	**4**
Monte Sereno	3,579	0		**0**		1	1	1
Mountain View	73,932	375		**112**		2	3	**3**
Santa Clara	115,503	560		**168**		3	5	**5**
Saratoga	31,592	41		**12**		1	1	1
San Jose	989,496	2983		**895**		32	29	32
Sunnyvale	137,538	548		**164**		3	5	**5**
Palo Alto	63,367	282		**84**		2	2	2
Solano County								
Vallejo	120,416	559		**168**		4	5	**5**
Fairfield	106,142	486		**146**		3	4	**4**
Suisun	28,031	75		**22**		1	1	1
Totals	4,930,339	19057		**5718**		165	184	349

Table 10-2. Non-Population Based Permittee Trash Hot Spot and Trash Capture Assignments

Non population based Permittee	Number of Trash Hot Spots	Trash Capture Requirement
Santa Clara Valley Water District	12	4 trash booms or 8 outfall capture devices (minimum 2 ft. diameter outfall) or equivalent measures
Alameda County Flood Control Agency	9	3 trash booms or 6 outfall capture devices (minimum 2 ft. diameter outfall) or equivalent measures
Alameda Co. Zone 7 Flood Control Agency	3	1 trash boom or 2 outfall capture devices (minimum 2 ft. diameter outfall) or equivalent measures
Contra Costa County Flood Control Agency	6	2 trash booms or 4 outfall capture devices (minimum 2 ft. diameter outfall) or equivalent measures
San Mateo County Flood Control District	2	1 trash booms or 2 outfall capture devices (minimum 2 ft. diameter outfall) or equivalent measures
Vallejo Sanitation and Flood District	1	1 trash boom or 2 outfall capture devices or equivalent measures (minimum 2 ft. diameter outfall)

ATTACHMENT K

Standard NPDES Stormwater Permit Provisions

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD SAN FRANCISCO BAY REGION

Standard Provisions and Reporting Requirements for NPDES Stormwater Discharge Permits

February 2009

A. GENERAL PROVISIONS

1. Neither the treatment nor the discharge of pollutants shall create a pollution, contamination, or nuisance as defined by Section 13050 of the California Water Code.

2. All discharges authorized by this Order shall be consistent with the terms and conditions of this Order.

3. Duty to Comply

a. If a toxic effluent standard or prohibition (including any schedule of compliance specified in such effluent standard or prohibition) is established under Section 307(a) of the Clean Water Act, or amendments thereto, for a toxic pollutant which is present in the discharge authorized herein and such standard or prohibition is more stringent than any limitation upon such pollutant in a Board adopted Order, discharger must comply with the new standard or prohibition. The Board will revise or modify the Order in accordance with such toxic effluent standard or prohibition and so notify the discharger.

b. If more stringent applicable water quality standards are approved pursuant to Section 303 of the Clean Water Act, or amendments thereto, the discharger must comply with the new standard. The Board will revise and modify this Order in accordance with such more stringent standards.

c. The filing of a request by the discharger for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance does not stay any permit condition. [40 CFR 122.41(f)]

4. Duty to Mitigate

The discharger shall take all reasonable steps to minimize or prevent any discharge in violation of this order and permit which has a reasonable likelihood of adversely affecting public health or the environment, including such accelerated or additional monitoring as requested by the Board or Executive Officer to determine the nature and impact of the violation. [40 CFR 122.41(d)]

5. Pursuant to U.S. Environmental Protection Agency regulations the discharger must notify the Water Board as soon as it knows or has reason to believe (1) that they have begun or expect to begin, use or manufacture of a pollutant not reported in the permit application,

or (2) a discharge of toxic pollutants not limited by this permit has occurred, or will occur, in concentrations that exceed the limits specified in 40 CFR 122.42(a).

6. The discharge of any radiological, chemical, or biological warfare agent waste is prohibited.

7. All facilities used for transport, treatment, or disposal of wastes shall be adequately protected against overflow or washout as the result of a 100-year frequency flood.

8. Collection, treatment, storage and disposal systems shall be operated in a manner that precludes public contact with wastewater, except where excluding the public is inappropriate, warning signs shall be posted.

9. Property Rights

This Order and Permit does not convey any property rights of any sort or any exclusive privileges. The requirements prescribed herein do not authorize the commission of any act causing injury to the property of another, nor protect the discharger from liabilities under federal, state or local laws, nor create a vested right for the discharge to continue the waste discharge or guarantee the discharger a capacity right in the receiving water. [40 CFR 122.41(g)]

10. Inspection and Entry

The Board or its authorized representatives shall be allowed:

a. Entry upon premises where a regulated facility or activity is located or conducted, or where records are kept under the conditions of the order and permit;

b. Access to and copy at, reasonable times, any records that must be kept under the conditions of the order and permit;

c. To inspect at reasonable times any facility, equipment (including monitoring and control equipment), practices, or operations regulated or required under the order and permit; and

d. To photograph, sample, and monitor, at reasonable times for the purpose of assuring compliance with the order and permit or as otherwise authorized by the Clean Water Act, any substances or parameters at any locations. [40 CFR 122.41(i)]

11. Permit Actions

This Order and Permit may be modified, revoked and reissued, or terminated in accordance with applicable State and/or Federal regulations. Cause for taking such action includes, but is not limited to any of the following:

a. Violation of any term or condition contained in the Order and Permit;

b. Obtaining the Order and Permit by misrepresentation, or by failure to disclose fully all relevant facts;

c. Endangerment to public health or environment that can only be regulated to acceptable levels by order and permit modification or termination; and

d. Any condition that requires either a temporary or permanent reduction or elimination of the authorized discharge.

12. Duty to Provide Information

The discharger shall furnish, within a reasonable time, any information the Board may request to determine whether cause exists for modifying, revoking and reissuing, or terminating the permit. The discharger shall also furnish to the Board, upon request, copies of records required to be kept by its permit. [40 CFR 122.41(h)]

13. Availability

A copy of this permit shall be maintained at the discharge facility and be available at all times to operating personnel.

14. Continuation of Expired Permit

This permit continues in force and effect until a new permit is issued or the Board rescinds the permit. Only those dischargers authorized to discharge under the expiring permit are covered by the continued permit.

B. GENERAL REPORTING REQUIREMENTS

1. Signatory Requirements

a. All reports required by the order and permit and other information requested by the Board or USEPA Region 9 shall be signed by a principal executive officer or ranking elected official of the discharger, or by a duly authorized representative of that person. [40 CFR 122.22(b)]

b. Certification

All reports signed by a duly authorized representative under Provision E.1.a. shall contain the following certification:
"I certify under penalty of law that this document and all attachments are prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who managed the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. [40 CFR 122.22(d)]

2. Should the discharger discover that it failed to submit any relevant facts or that it submitted incorrect information in any report, it shall promptly submit the missing or correct information. [40 CFR 122.41(l)(8)]

3. False Reporting

Any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit, including monitoring reports or reports of compliance or noncompliance shall be subject to enforcement procedures as identified in Section F of these Provisions.

4. Transfers

a. This permit is not transferable to any person except after notice to the Board. The Board may require modification or revocation and reissuance of the permit to change the name of the Permittee and incorporate such other requirements as may be necessary under the Clean Water Act.

b. Transfer of control or ownership of a waste discharge facility under an National Pollutant Discharge Elimination System permit must be preceded by a notice to the Board at least 30 days in advance of the proposed transfer date. The notice must include a written agreement between the existing discharger and proposed discharger containing specific dates for transfer of responsibility, coverage, and liability between them. Whether an order and permit may be transferred without modification or revocation and reissuance is at the discretion of the Board. If order and permit modification or revocation and reissuance is necessary, transfer may be delayed 180 days after the Board's receipt of a complete application for waste discharge requirements and an NPDES permit.

5. Compliance Reporting

a. Planned Changes

The discharger shall file with the Board a report of waste discharge at least 120 days before making any material change or proposed change in the character, location or volume of the discharge.

b. Compliance Schedules

Reports of compliance or noncompliance with, or any progress reports on, interim and final compliance dates contained in any compliance schedule shall be submitted within 10 working days following each scheduled date unless otherwise specified within this order and permit. If reporting noncompliance, the report shall include a description of the reason for failure to comply, a description and schedule of tasks necessary to achieve compliance and an estimated date for achieving full compliance. A final report shall be submitted within 10 working days of achieving full compliance, documenting full compliance

c. Non-compliance Reporting (Twenty-four hour reporting:)

i. The discharger shall report any noncompliance that may endanger health or the environment. All pertinent information shall be provided orally within 24 hours from the time the discharger becomes aware of the circumstances. A written submission shall also be provided within five working days of the time the discharger becomes aware of the circumstances. The written submission shall contain a description of the noncompliance and its cause; the period of noncompliance, including exact dates and times and, if the noncompliance has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.

C. ENFORCEMENT

1. The provision contained in this enforcement section shall not act as a limitation on the statutory or regulatory authority of the Board.

2. Any violation of the permit constitutes violation of the California Water Code and regulations adopted hereunder and the provisions of the Clean Water Act, and is the basis for enforcement action, permit termination, permit revocation and reissuance, denial of an application for permit reissuance; or a combination thereof.

3. The Board may impose administrative civil liability, may refer a discharger to the State Attorney General to seek civil monetary penalties, may seek injunctive relief or take other appropriate enforcement action as provided in the California Water Code or federal law for violation of Board orders.

4. It shall not be a defense for a discharger in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this order and permit.

5. A discharger seeking to establish the occurrence of any upset (See Definitions, G. 24) has the burden of proof. A discharger who wishes to establish the affirmative defense of any upset in an action brought for noncompliance shall demonstrate, through properly signed contemporaneous operating logs, or other relevant evidence that:

a. an upset occurred and that the Permittee can identify the cause(s) or the upset;

b. the permitted facility was being properly operated at the time of the upset;

c. the discharger submitted notice of the upset as required in paragraph E.6.d.; and

d. the discharger complied with any remedial measures required under A.4.

No determination made before an action for noncompliance, such as during administrative review of claims that noncompliance was caused by an upset, is final administrative action subject to judicial review.
In any enforcement proceeding, the discharger seeking to establish the occurrence of any upset has the burden of proof. [40 CFR 122.41(n)]

D. DEFINITIONS

1. DDT and Derivatives shall mean the sum of the p,p' and o,p' isomers of DDT, DDD (TDE), and DDE.

2. Duly authorized representative is one whose:

a. Authorization is made in writing by a principal executive officer or ranking elected official;

b. Authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity, such as general manager in a partnership, manager, operator of a well or a well field, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters for the company. (A duly authorized representative may thus be either a named individual or any individual occupying a named position.); and

c. Written authorization is submitted to the USEPA Region 9. If an authorization becomes no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements above must be submitted to the Board and USEPA Region 9 prior to

or together with any reports, information, or applications to be signed by an authorized representative.

3. Hazardous substance means any substance designated under 40 CFR 116 pursuant to Section 311 of the Clean Water Act.

4. HCH shall mean the sum of the alpha, beta, gama (Lindane), and delta isomers of hexachlorocyclohexane.

5. Overflow is defined as the intentional or unintentional spilling or forcing out of untreated or partially treated wastes from a transport system (e.g. through manholes, at pump stations, and at collection points) upstream from the plant headworks or from any treatment plant facilities.

6. Priority pollutants are those constituents referred to in 40 CFR S122, Appendix D and listed in the USEPA NPDES Application Form 2C, (dated 6/80) Items V-3 through V-9.

7. Storm Water means storm water runoff, snow melt runoff, and surface runoff and drainage. It excludes infiltration and runoff from agricultural land.

8. Toxic pollutant means any pollutant listed as toxic under Section 307(a)(1) of the Clean Water Act or under 40 CFR S401.15.

9. Total Identifiable Chlorinated hydrocarbons (TICH) shall be measured by summing the individual concentrations of DDT, DDD, DDE, aldrin, BHC, chlordane, endrin, heptachlor, lindane, dieldrin, PCBs and other identifiable chlorinated hydrocarbons.

10. Waste, waste discharge, discharge of waste, and discharge are used interchangeably in this order and permit. The requirements of this order and permit are applicable to the entire volume of water, and the material therein, which is disposed of to surface and ground waters of the State of California.

Order No. R2-2009-0074
Municipal Regional Stormwater Permit
Attachment B

HMP susceptibility map

Alameda Countywide
Clean Water Program
January 26, 2007
(Sept. 2009 correction)

LEGEND (see text also)

- Major highways
- Major watersheds
- County boundary
- Streets

Channel type

- Natural creek or stream (susceptible)
- Earthen channel or connector
- Engineered channel - materials unknown
- Engineered channel - concrete
- Enclosed pipe or culvert

- Special consideration - San Lorenzo & Alameda Creeks
- Special consideration - Codornices Creek
- Hill or high slope region (susceptible)
- Tidally influenced / depositional - exempt
- Not included in HMP

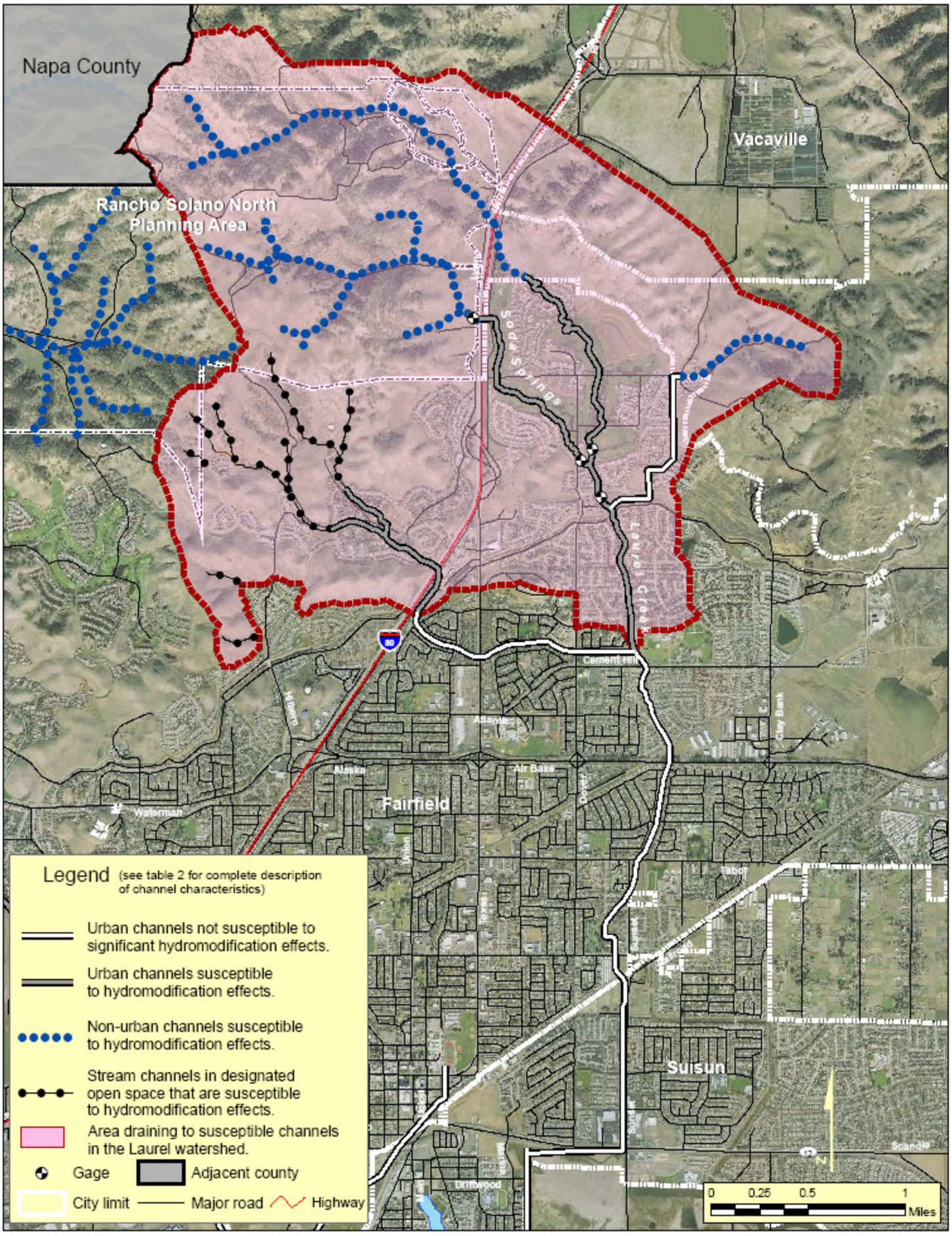
Data sources:
Alameda County Flood Control and Water Conservation District; ACCWP;
Zone 7 Water Agency; U.S. Census Bureau; U.S. Geological Survey;
William Lettis Associates (Oakland Museum creek and watershed mapping project);
Balance Hydrologics and EIP Associates (Proposed test of the approach for the ACCWP HMM Preliminary Map, July 2003)

N W E S

5 0 5 10 15 Miles (approximate scale)

Contra Costa County
Alameda County
Contra Costa County
Alameda County
Alameda County
Santa Clara County
Alameda County
Santa Clara County
Alameda County
San Joaquin County

c:\esri\afproj\hmpviews_map7



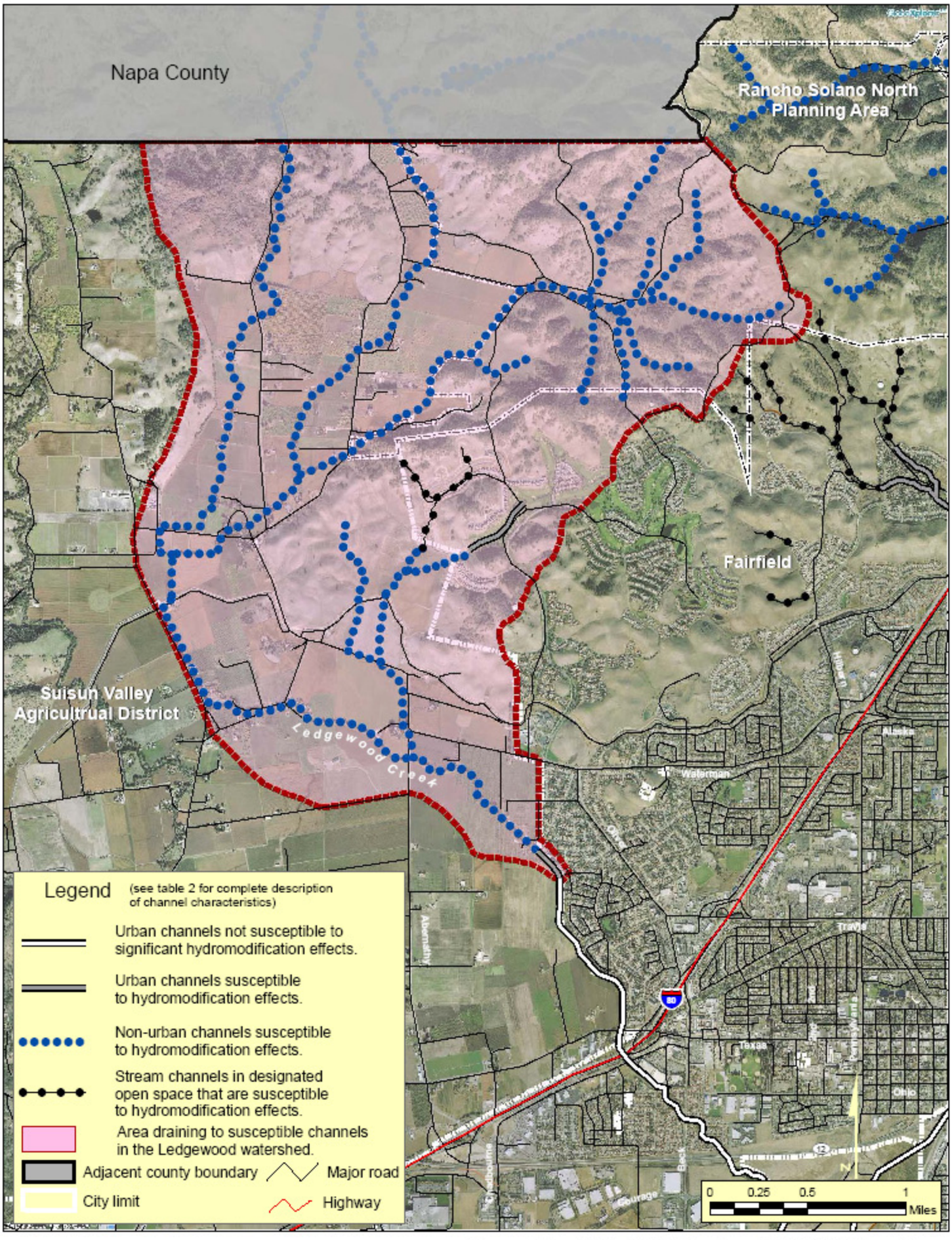
Source: Basemap data provided by Fairfield-Suisun Sewer District. Note that the roads layer does not include the most recently urbanized areas (north of Cement Hill Road, for example).

Balance Hydrologics, Inc.

Figure 2. Map showing HMP channel Classification for the Laurel Creek watershed. The mid- to upper reaches include all channels within the watershed that are susceptible to hydromodification effects (dotted and gray-shaded channels on this map). Hydromodification controls are not required for projects that drain directly to non-susceptible urban channels.

W:\Projects\204126 Fairfield HMP\204003\204126_Figure2_edits.mxd

©2006 Balance Hydrologics, Inc.



Basemap data provided by Fairfield-Suisun Sewer District. Note that the roads layer does not include the most recently urbanized areas, as shown in the aerial photo.

Balance Hydrologics, Inc.

Figure 3. Map showing HMP channel Classification for the Ledgewood Creek watershed. The mid- to upper reaches include all channels within the watershed that are susceptible to hydromodification effects (dotted and gray-shaded channels on this map), however areas outside the City of Fairfield are not included in this permit unless annexed by the city. The non-developed areas within the current city limits are designated open space in relatively steep terrain, and are unlikely to be converted to urban areas however the HMP still applies in these areas.

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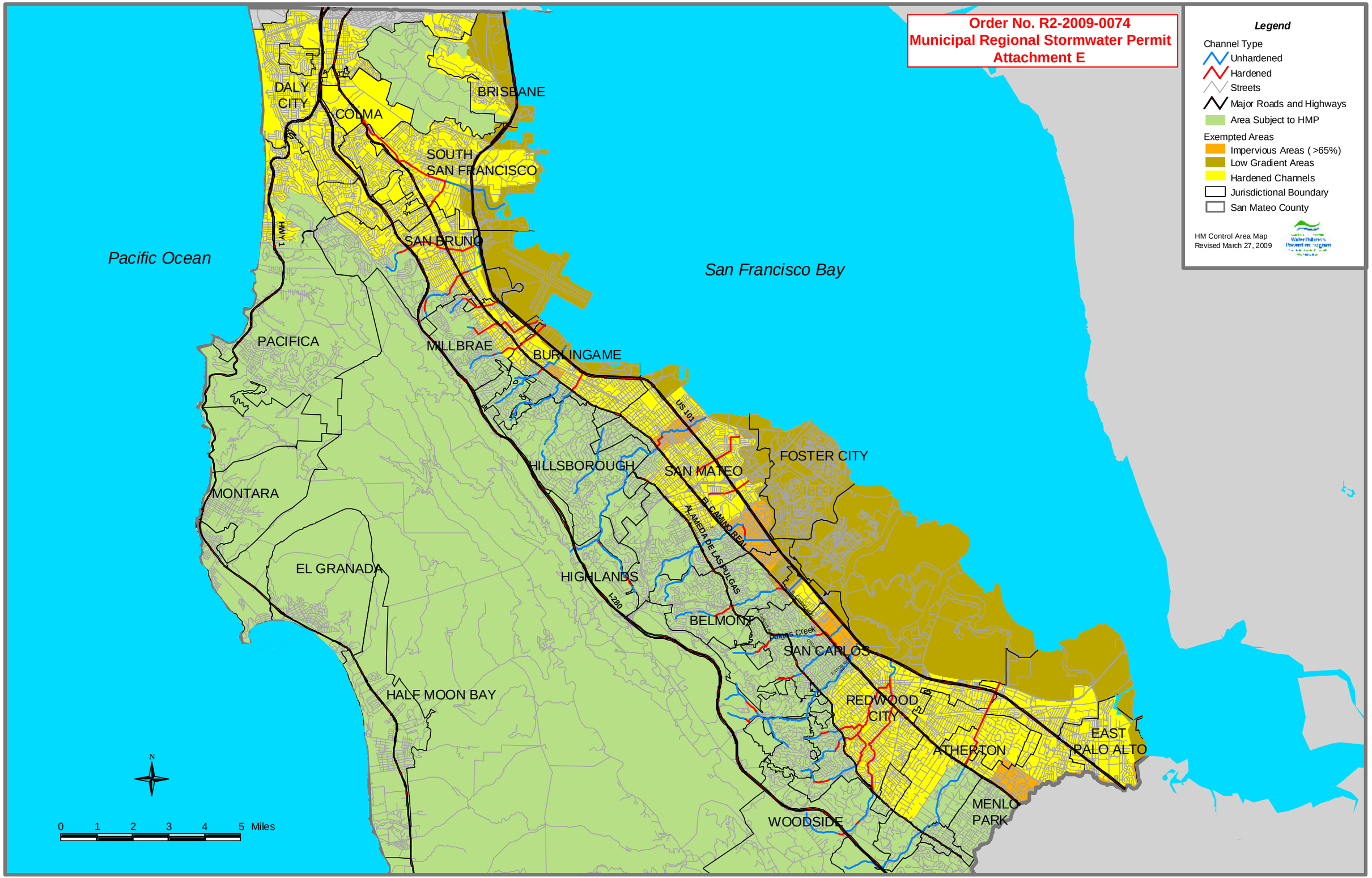
Order No. R2-2009-0074
Municipal Regional Stormwater Permit
Attachment E



Legend

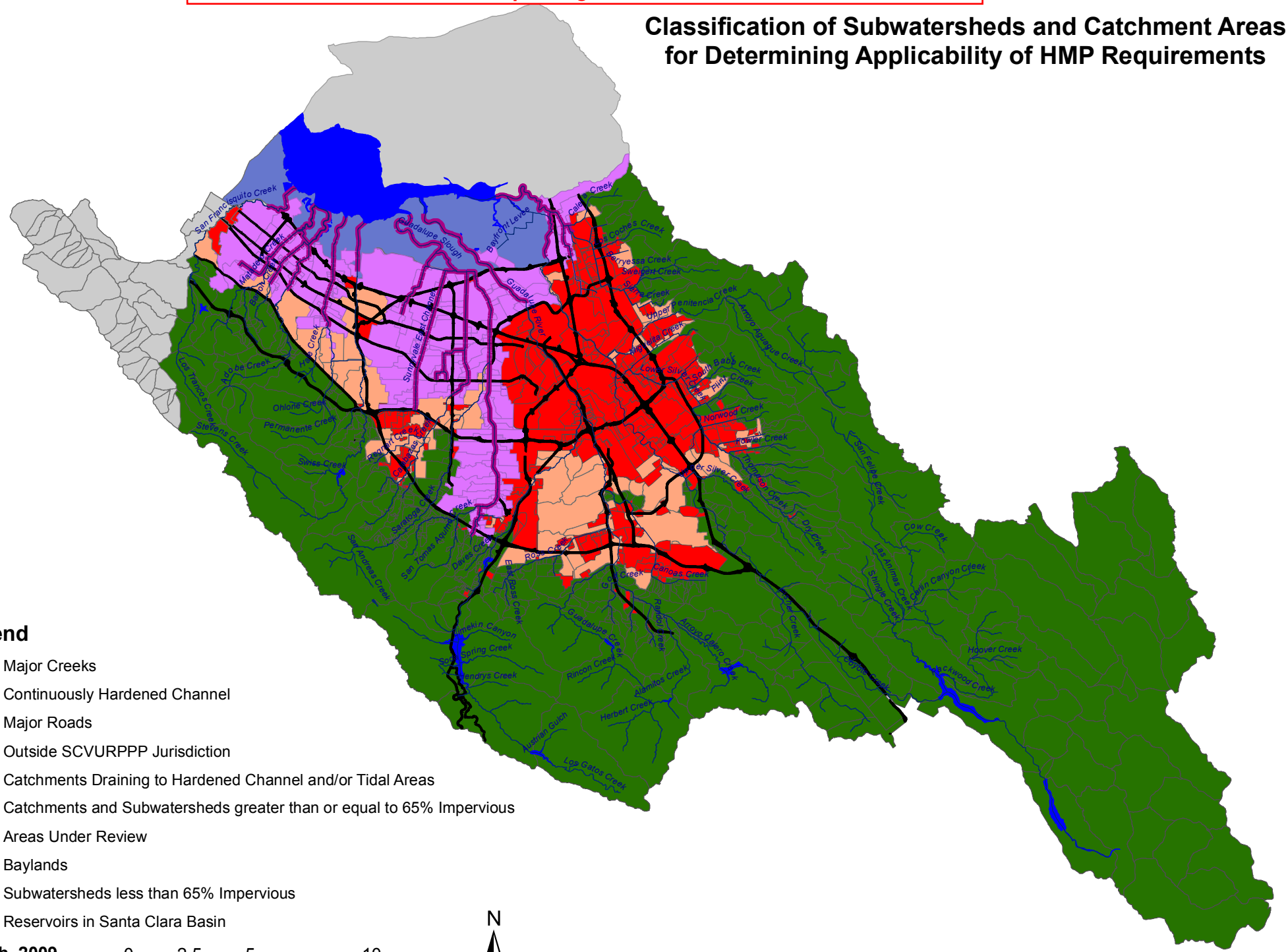
Channel Type
- Unhardened
- Hardened
- Streets
- Major Roads and Highways
- Area Subject to HMP

Exempted Areas
- Impervious Areas (>65%)
- Low Gradient Areas
- Hardened Channels
- Jurisdictional Boundary
- San Mateo County

HM Control Area Map
Revised March 27, 2009

Order No. R2-2009-0074, Municipal Regional Stormwater Permit, Attachment F

Classification of Subwatersheds and Catchment Areas for Determining Applicability of HMP Requirements



This map contains: 1) a revision to the November 2007 version to correct a mapping error; and 2) two revisions to Areas Under Review in Palo Alto and North Santa Clara County to reflect updated impervious surface data, consistent with the HM applicability criteria set forth in Attachment F, Section 4 of the MRP

KB)

Period of Record

- Station Metadata
- Station Metadata Graphics

General Climate Summary Tables
- Temperature
- Precipitation
- Heating Degree Days
- Cooling Degree Days
- Growing Degree Days

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- Spring 'Freeze' Probabilities
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  - Average Maximum
  - Average Minimum
  - Extreme Maximum
  - Extreme Minimum

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- Precipitation Probability by Duration.
- Precipitation Probability by Quantity.
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  - Daily Extreme

Snowfall
- Daily Extreme and Average
- Daily Average
- Monthly Snowfall Listings
  - Monthly Totals

Snowdepth
- Daily Extreme and Average
- Daily Average

Heating Degree Days
- Daily Average
- Monthly HDD Listings
  - Monthly Totals(*)

Cooling Degree Days
- Daily Average
- Monthly CDD Listings

BERKELEY, CALIFORNIA

Period of Record General Climate Summary - Precipitation

Station:(040693) BERKELEY														
From Year=1893 To Year=2012														
	Precipitation											Total Snowfa		
	Mean	High	Year	Low	Year	1 Day Max.		>= 0.01 in.	>= 0.10 in.	>= 0.50 in.	>= 1.00 in.	Mean	High	Ye
	in.	in.	-	in.	-	in.	dd/yyyy or yyyymmdd	# Days	# Days	# Days	# Days	in.	in.	-
January	4.98	15.99	1911	0.22	1984	6.98	04/1982	11	8	4	1	0.1	6.0	19
February	4.07	14.49	1998	0.00	1953	3.20	13/2000	10	7	3	1	0.0	1.0	19
March	3.27	11.74	1983	0.03	1923	3.20	22/1899	9	6	2	1	0.0	0.8	19
April	1.64	6.06	1958	0.00	1933	2.49	24/1896	6	4	1	0	0.0	0.0	18
May	0.75	5.26	1915	0.00	1909	2.16	01/1905	3	2	0	0	0.0	0.0	19
June	0.19	1.24	1907	0.00	1893	1.16	28/2011	1	1	0	0	0.0	0.0	19
July	0.03	1.50	1974	0.00	1893	1.40	08/1974	0	0	0	0	0.0	0.0	19
August	0.06	1.33	1976	0.00	1893	0.84	30/1896	1	0	0	0	0.0	0.0	19
September	0.26	2.62	1959	0.00	1905	2.52	18/1959	1	1	0	0	0.0	0.0	19
October	1.26	7.05	1962	0.00	1905	3.93	13/2009	4	2	1	0	0.0	0.0	19
November	2.79	11.47	1973	0.00	1929	3.89	05/1994	7	5	2	1	0.0	0.0	19
December	4.11	15.04	1955	0.00	1989	4.73	13/2002	10	7	3	1	0.0	0.1	19
Annual	23.41	48.42	1983	9.89	1929	6.98	19820104	63	42	16	6	0.1	6.0	19
Winter	13.15	29.46	1998	2.93	1976	6.98	19820104	30	22	10	4	0.1	6.0	19
Spring	5.67	16.23	1983	0.48	2008	3.20	18990322	18	12	4	1	0.0	0.8	19
Summer	0.27	1.59	1974	0.00	1893	1.40	19740708	2	1	0	0	0.0	0.0	19
Fall	4.31	13.90	1973	0.08	1929	3.93	20091013	13	8	3	1	0.0	0.0	19

Table updated on Oct 31, 2012
For monthly and annual means, thresholds, and sums:
Months with 5 or more missing days are not considered
Years with 1 or more missing months are not considered
Seasons are climatological not calendar seasons
Winter = Dec., Jan., and Feb. Spring = Mar., Apr., and May
Summer = Jun., Jul., and Aug. Fall = Sep., Oct., and Nov.

Western Regional Climate Center, wrcc@dri.edu

KB)

Period of Record

- Station Metadata
- Station Metadata Graphics

General Climate Summary Tables
- Temperature
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- Cooling Degree Days
- Growing Degree Days

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- Daily Average
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  - Monthly Totals

Snowdepth
- Daily Extreme and Average
- Daily Average

Heating Degree Days
- Daily Average
- Monthly HDD Listings
  - Monthly Totals(*)

Cooling Degree Days
- Daily Average
- Monthly CDD Listings

BERKELEY, CALIFORNIA

Period of Record General Climate Summary - Temperature

Station:(040693) BERKELEY														
From Year=1893 To Year=2012														
	Monthly Averages			Daily Extremes				Monthly Extremes				Max. Temp.		Mi
	Max.	Min.	Mean	High	Date	Low	Date	Highest Mean	Year	Lowest Mean	Year	>= 90 F	<= 32 F	<= 32
	F	F	F	F	dd/yyyy or yyyymmdd	F	dd/yyyy or yyyymmdd	F	-	F	-	# Days	# Days	# Da
January	55.9	42.7	49.3	77	26/1899	25	21/1937	53.9	1970	42.0	1937	0.0	0.0	0
February	59.1	45.1	52.2	80	18/1899	29	12/1905	57.3	1963	46.7	1894	0.0	0.0	0
March	61.4	46.0	53.7	87	17/1914	33	03/1966	60.0	2004	47.8	1897	0.0	0.0	0
April	64.0	47.6	55.8	95	27/2004	36	19/1896	59.5	1989	49.8	1967	0.1	0.0	0
May	66.6	50.0	58.3	101	31/2001	36	09/1922	64.2	1997	53.6	1933	0.3	0.0	0
June	70.0	52.5	61.3	107	15/2000	40	16/1913	66.6	1981	56.6	1965	0.6	0.0	0
July	70.3	53.8	62.0	99	23/2006	40	05/1953	66.3	2006	58.3	1944	0.2	0.0	0
August	70.1	54.4	62.3	104	25/2010	42	18/1916	67.2	2003	58.4	1928	0.2	0.0	0
September	71.8	54.7	63.2	106	16/1913	38	27/1916	68.5	1984	58.3	1910	1.1	0.0	0
October	69.6	52.4	61.0	99	01/1980	38	26/1919	65.2	1959	55.4	1916	0.4	0.0	0
November	63.2	48.0	55.6	86	04/1921	33	28/1905	60.5	1932	50.7	1994	0.0	0.0	0
December	56.7	43.7	50.2	80	12/1942	25	09/1972	55.7	1958	45.5	1908	0.0	0.0	0
Annual	64.9	49.2	57.1	107	20000615	25	19370121	59.3	1959	55.2	1893	2.9	0.0	1
Winter	57.2	43.9	50.6	80	18990218	25	19370121	55.0	1970	45.0	1949	0.0	0.0	1
Spring	64.0	47.9	55.9	101	20010531	33	19660303	60.2	2004	53.1	1929	0.3	0.0	0
Summer	70.1	53.6	61.8	107	20000615	40	19130616	65.6	1997	59.0	1924	1.0	0.0	0
Fall	68.2	51.7	59.9	106	19130916	33	19051128	62.6	1959	56.8	1910	1.5	0.0	0

Table updated on Oct 31, 2012
For monthly and annual means, thresholds, and sums:
Months with 5 or more missing days are not considered
Years with 1 or more missing months are not considered
Seasons are climatological not calendar seasons
Winter = Dec., Jan., and Feb. Spring = Mar., Apr., and May
Summer = Jun., Jul., and Aug. Fall = Sep., Oct., and Nov.

Western Regional Climate Center, wrcc@dri.edu

Back to:
State Map | Western U.S. map | Home Page

NOTE:
To print data frame (right side), click on right frame before printing.

1981 - 2010

- Daily Temp. & Precip.
- Daily Tabular data (~23 KB)
- Monthly Tabular data (~1 KB)
- NCDC 1981-2010 Normals (~3 KB)

1971 - 2000

- Daily Temp. & Precip.
- Daily Tabular data (~23 KB)
- Monthly Tabular data (~1 KB)
- NCDC 1971-2000 Normals (~3 KB)

1961 - 1990

- Daily Temp. & Precip.
- Daily Tabular data (~23 KB)
- Monthly Tabular data (~1 KB)
- NCDC 1961-1990 Normals (~3 KB)

Period of Record

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- Station Metadata Graphics

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- Fall 'Freeze' Probabilities
- 'Freeze Free' Probabilities
- Monthly Temperature Listings

BERKELEY, CALIFORNIA (040693)

Period of Record Monthly Climate Summary

Period of Record : 01/01/1893 to 12/31/2014

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
Average Max. Temperature (F)	55.9	59.1	61.4	64.0	66.6	70.0	70.3	70.1	71.8	69.6	6
Average Min. Temperature (F)	42.7	45.1	46.0	47.6	50.0	52.5	53.8	54.4	54.7	52.4	4
Average Total Precipitation (in.)	4.98	4.07	3.27	1.64	0.75	0.19	0.03	0.06	0.26	1.26	2
Average Total SnowFall (in.)	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Average Snow Depth (in.)	0	0	0	0	0	0	0	0	0	0	

Percent of possible observations for period of record.
Max. Temp.: 94.4% Min. Temp.: 94.4% Precipitation: 95.2% Snowfall: 95.2% Snow Depth: 95%
Check Station Metadata or Metadata graphics for more detail about data completeness.

Western Regional Climate Center, wrcc@dri.edu