PLAN

Operations and Maintenance Plan

The Sherwin-Williams Company
1450 Sherwin Avenue
Emeryville, California

Prepared For:

The Sherwin-Williams Company
101 Prospect Avenue NW
Cleveland, OH 44115

Prepared By:

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December 11, 2012

CDM Smith

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Section 1
Introduction

This Operation and Maintenance (O&M) Plan is for the continued management of remedy implemented and for the residual contaminants of concern (COCs) remaining at The Sherwin-Williams Company (S-W) property located at 1450 Sherwin Avenue in Emeryville, California and a portion of the adjacent former Rifkin property, located at 4525 – 4563 Horton Street, to which hazardous substances have migrated from the S-W property. Collectively the S-W property and this portion of the former Rifkin property are referred to as the "Site" within this document. The Site consists of approximately 10 acres. Novartis Vaccines and Diagnostics, Inc. (Novartis) is the current owner of the former Rifkin property.

An O&M Agreement, containing provisions regarding the activities, notification, submittals, emergency response, and communication procedures, will be entered into by S-W and DTSC to implement this O&M Plan.

The remedy implemented at the Site has been documented in the project's Remedy Implementation Completion Report (Completion Report), dated July 25, 2012 (CDM Smith, 2012). The remedy was implemented in accordance with the California Department of Toxic Substances Control (DTSC) Imminent and Substantial Endangerment Determination and Order and Remedial Action Order No. 05/06-007 (the Order) and the Remedial Action Plan (RAP), dated June 14, 2010, and Remedial Design Implementation Plan (RDIP), dated June 29, 2011, for the Site (DTSC, 2006; CDM 2010; and, CDM, 2011). The RAP, RDIP, and Completion Report were approved by DTSC in letters dated June 14, 2010, June 30, 2011, and August 6, 2012, respectively (DTSC, 2010; DTSC, 2011; and, DTSC, 2012a).

The remedy implementation occurred between March 2011 and April 2012, and consisted of the following key components:

- Installation and operation of an air monitoring system and air sampling program to evaluate the effectiveness of Site controls in maintaining the safety of the surrounding community.
- Installation and operation of a temporary soil vapor extraction and treatment system to remove volatile organics from the most impacted vadose zone excavation area.
- Relocation of a high-pressure natural gas line, from under the western sidewalk of Horton Street (i.e., adjacent to the excavation) to the other side of the street.
- Excavation and offsite disposal of vadose zone soil containing arsenic, lead, and/or organic contaminants to support future potential residential use of the Site.
- Removal and offsite disposal of aboveground and underground structures, pipes, and debris containing arsenic, lead, and/or organic contaminants, primarily consisting of the raised cap and former water treatment plant.
- Excavation dewatering, and onsite pre-treatment and discharge to sanitary sewer of extracted water.

- Excavation and offsite disposal of saturated zone soil containing arsenic, lead, and/or organic contaminants to support long-term protection of groundwater.
- Backfill of excavation areas to control groundwater movement within the Site.
- Placement of backfill and gravel cover to re-grade the Site to facilitate storm water drainage.
- Extension of the existing slurry wall along the southwestern portion of the Site.
- Installation of a membrane barrier and interceptor trench to prevent movement of groundwater from the S-W property to the former Rifkin property.
- Removal of portions of the existing slurry wall to control groundwater movement from the Site to offsite, downgradient (western) areas.
- Abandonment of a former underground storage tank (UST) at the Site.
- Abandonment of selected existing groundwater wells no longer required for the project.
- Installation of new groundwater wells required for the post-remedy implementation groundwater monitoring program.
- Development and recording of a Covenant and Agreement by DTSC with Alameda County Clerk-Recorder's Office to protect present or future human health or safety or the environment (Covenant) through identifying specific restrictions and requirements associated with the residual COCs at the S-W property and for maintaining and preserving the integrity of the remedy, as presented in the RAP, RDIP, Completion Report, and this O&M Plan.

The remedy implementation has achieved the project remedial action objectives (RAOs). The following presents the RAOs that were established for the Site in the RAP and remedy component that fulfills the RAO:

Remedial Action Objective (RAO)	*Remedy Component*
▪ Minimize direct contact/ingestion by humans with Site soil containing contaminants of concern (COCs) at concentrations exceeding the cleanup goals.	▪ Removal of vadose zone soil with COC concentrations above cleanup goals. ▪ Development and recording of the Covenant and Agreement to restrict the use of the S-W property (Covenant). ▪ Monitor for possible contamination in areas outside existing removal areas, as identified in this Operation and Maintenance (O&M) Plan and/or subsequent DTSC-approved modifications. ▪ Monitor soil gas conditions, as identified in this O&M Plan and/or subsequent DTSC-approved modifications.
▪ Minimize migration of and/or inhalation of airborne dust by humans from the Site containing COCs at concentrations exceeding the cleanup goals.	▪ Removal of vadose zone soil with COC concentrations above cleanup goals. ▪ Development and recording of the Covenant, controlling intrusive activity at the S-W property.

Remedial Action Objective (RAO)	*Remedy Component*
▪ Minimize exposure to and inhalation by humans of volatile organic COCs at concentrations in indoor air exceeding the cleanup goals.	▪ Removal of vadose zone soil with COC concentrations above cleanup goals. ▪ Development and recording of the Covenant for the S-W property. ▪ Monitor for possible contamination in areas outside existing removal areas, as identified in this O&M Plan and/or subsequent DTSC-approved modifications. ▪ Monitor soil gas conditions, as identified in this O&M Plan and/or subsequent DTSC-approved modifications.
▪ Minimize risk to down-gradient ecological receptors from offsite groundwater migration containing COCs at concentrations exceeding the cleanup goals.	▪ Removal of saturated zone soil with COC concentrations identified as source material. ▪ Backfill to control groundwater movement. ▪ Installation of slurry wall breaches and extension and maintain key portions of existing slurry wall to control groundwater movement. ▪ Grading of the Site to minimize storm water infiltration and prevent ponding. ▪ Monitor groundwater conditions, as identified in this O&M Plan and/or subsequent DTSC-approved modifications.
▪ Minimize onsite human contact with groundwater containing COCs at concentrations exceeding the cleanup goals.	▪ Removal of saturated zone soil with COC concentrations identified as source material. ▪ Development and recording of the Covenant.

Vadose zone soils with COCs above cleanup goals have been removed. Confirmation samples were collected from the vadose zone excavation sidewalls to demonstrate conformance with the cleanup goals as established in the RAP.

The RAOs were met through the implementation of the remedy. The remedy components that remain and require protection in order to maintain and preserve the integrity of the remedy are:

- Portions of Existing Slurry Wall to control groundwater movement
- Slurry Wall Extension to control groundwater movement
- Slurry Wall Breaches to control groundwater movement
- Interceptor Trench to control groundwater movement
- Membrane Barrier to control groundwater movement
- Selective Placement of Low- and High-Permeability Backfill to control groundwater movement

- Grading of the Site to minimize storm water infiltration and prevent ponding
- Groundwater Monitoring Wells to monitor groundwater conditions and evaluate remedy effectiveness

The locations of these components are presented in Attachment A, Drawing 1. All components are located below grade and not visible at the Site surface, except the groundwater monitoring wells, soil gas monitoring points and the Site grading. The tops of groundwater monitoring wells and soil gas monitoring points are visible at the Site surface.

Attachment A, Drawing 4 presents vadose zone confirmation soil sample locations. Attachment B presents the range of COCs in vadose zone samples identified at the Site and their respective cleanup goals. No remaining sample has a COC concentration above its respective cleanup goal.

Groundwater within the Site is expected to continue having COC concentrations above cleanup goals. Groundwater will be monitored, as identified in this O&M Plan and/or subsequent DTSC-approved modifications. Periodic groundwater monitoring reports will be prepared and submitted to DTSC (see Section 3.4.1 for reporting).

Soil gas within the Site will be monitored, as identified in this O&M Plan and/or subsequent DTSC-approved modifications. Periodic soil gas monitoring reports will be prepared and submitted to DTSC (see Section 3.4.1 for reporting).

The following presents the COCs identified for the S-W property and, their cleanup goals by media.

Contaminant of Concern	*DTSC-Approved Cleanup Goals*				
	Vadose Zone Soil (mg/kg)		*Soil Gas (ug/m3)*		
	Commercial Worker	*Unrestricted Resident*	*Commercial Worker*	*Unrestricted Resident*	*Groundwater (mg/L)*
Volatile Organic Compounds					
Acetone	1,800,000	70,000	NA	NA	1.5
Benzene	0.076	0.015	122	36.2	0.0010
2-Butanone	NA	NA	NA	NA	4.2
1,2-Dichloroethane	NA	NA	NA	NA	0.00050
1,2-Dichloropropane	NA	NA	NA	NA	0.0050
4-Chloroaniline	8,200	310	NA	NA	NA
Ethylbenzene	200,000	7,800	1,400	420	0.30
Methyl Isobutyl Ketone	NA	NA	NA	NA	0.12
Methyl Tert Butyl Ether	NA	NA	NA	NA	0.013
Tetrachloroethene	0.32	0.063	NA	NA	NA
Toluene	440	100	NA	NA	0.15
Trichloroethene	NA	NA	NA	NA	0.0050
1,2,3-Trichloropropane	NA	NA	NA	NA	0.0050
1,3,5-Trimethylbenzene	NA	NA	NA	NA	0.46
1,2,4-Trimethylbenzene	NA	NA	NA	NA	0.14
Vinyl Chloride	NA	NA	NA	NA	0.00050

Contaminant of Concern	DTSC-Approved Cleanup Goals				
	Vadose Zone Soil (mg/kg)		Soil Gas (ug/m3)		
	Commercial Worker	Unrestricted Resident	Commercial Worker	Unrestricted Resident	Groundwater (mg/L)
Xylenes	11,000	2,300	NA	NA	0.020
Semivolatile Organic Compounds					
Benzo(a)anthracene	9.5	1.1	NA	NA	NA
Benzo(b)fluoranthene	9.5	1.1	NA	NA	NA
Benzo(b,k)fluoranthene	9.5	1.1	NA	NA	NA
Naphthalene	41,000	1,300	NA	NA	0.017
Phenanthrene	160,000	4,500	NA	NA	NA
Inorganic Compounds					
Antimony	820	31	NA	NA	
Arsenic	24	24	NA	NA	0.036
Barium	140,000	5,500	NA	NA	NA
Cadmium	15	3.1	NA	NA	NA
Chromium (+3)	3,100,000	120,000	NA	NA	NA
Chromium (+6)	41,000	1,600	NA	NA	NA
Iron	NA	NA	NA	NA	0.30
Lead	5,600	250	NA	NA	NA
Manganese	NA	NA	NA	NA	0.050
Selenium	10,000	390	NA	NA	NA
Zinc	610,000	23,000	NA	NA	0.081

Notes:
mg/kg – milligrams per kilogram
ug/m3 – microgram per cubic meter
mg/L – milligram per liter
NA - not applicable; contaminant is not of concern in this media

The cleanup goals for the contaminants of concerns were established in the Remedial Action Plan (RAP) and approved by the DTSC. For vadose zone soil, cleanup goals are compared to the 95% upper confidence limits of the averages of the detections (95 UCL) from Site samples to demonstrate conformance with the cleanup goals. For soil gas and groundwater, cleanup goals are compared to detections in samples from Site monitoring points. With DTSC's approval of the Remedy Implementation Completion Report, DTSC confirmed that the vadose zone soil cleanup goals at the Site have been met.

Section 2
Site Operations

The operations of the remedy components that remain at the Site are passive and predominately underground. These remedy components are listed in Section 1 of this O&M Plan. By passive, it is meant that the components are static and do not require any power. However, they must remain whole in order to continue operating as designed. Future construction, development, and/or operations at the Site cannot constrain the objectives of each component without first evaluating its effects and obtaining DTSC approval prior to any modifications to the components, as provided in the Covenant.

The current Site conditions and operations require the placement of a Covenant on the S-W property to protect present or future human health or safety or the environment, and identify specific restrictions and requirements associated with the residual COCs at the S-W property and for maintaining and preserving the integrity of the remedy.

An assessment will be conducted annually to assure that Site construction/operations are not impacting the effectiveness of the remedy components. This assessment shall be made by every April and a report will be submitted to DTSC (see Section 3.4.1 for assessment reporting).

Section 3

Site Maintenance and Monitoring

3.1 Site Maintenance

The remedy components as described in Section 1.0 are passive and require no regular maintenance, except for the groundwater well and soil gas monitoring points. However, they must remain whole in order to continue operating as designed. Future construction, development, and/or operations at the Site cannot constrain the objectives of each component without first evaluating its effects and obtaining DTSC approval prior to any modifications to the components, as provided in the Covenant.

Monitoring Network Inspection and Maintenance

At the time of water level measurement, groundwater sampling, and/or soil gas sampling, the condition of each monitoring point will be documented in a field book, or an equivalent document. Condition items may be identified through visual inspection of the monitoring point, changes in monitoring point performance from those observed during previous monitoring events, and/or unexplained changes in field parameter measurements. Deficiencies or problems identified for a given monitoring point will be addressed within an appropriate timeframe.

Routine maintenance items (i.e., items that require minimal effort) will be addressed in a timely manner. Examples of routine items include darkening the datum mark for a monitoring point, replacement of bolts or seals, and lock replacement. Non-routine maintenance items typically require more extensive effort. Examples of non-routine items include repair of concrete pads surrounding the monitoring point, grading, and cracked casings; and for groundwater monitoring wells possible redevelopment. Items requiring more extensive effort, and that are not addressed in this O&M Plan, will be evaluated on an individual monitoring point basis and may require preparation of a work plan for DTSC review and approval.

In addition to the monitoring point inspection, the total depth of conventional monitoring points without dedicated equipment will be measured at least triennially. Total depth of conventional monitoring points with dedicated equipment will be measured if the equipment is removed from the casing or if there is an indication of a problem with the point. Total depth measurements will be documented in the field log book, or equivalent field document. The total depth will be compared against the depth listed in Appendix B and Appendix D, and previous total depth measurements. If significant sediment accumulation is observed, the point may warrant redevelopment.

3.2 Groundwater Monitoring

Attachment A, Drawing 2 presents the project groundwater well locations. Attachment C presents the groundwater monitoring program.

As needed, the program will be revised based on the Site conditions after DTSC approval.

3.3 Soil Gas Evaluation

Attachment A, Drawing 3 presents the project soil gas monitoring point locations. Attachment D presents the soil gas evaluation strategy.

After completion of the remedy implementation activities, soil gas monitoring wells were installed to collect and analyze soil gas samples. Soil gas samples have been collected in June 2012 and their results presented in Attachment D. The next scheduled soil gas monitoring event is in December 2012. After the December 2012 event, the June and December 2012 results will be evaluated and a report submitted to DTSC. After evaluation of the soil gas conditions, DTSC and Sherwin-Williams will determine whether additional action is needed.

3.4 Reporting

The following presents anticipated post-remedy implementation reporting for the Site through the first Five-Year Review in 2016.

3.4.1 Groundwater

The first post-remedy implementation groundwater monitoring report was submitted to DTSC on July 30, 2012, for the reporting period of March 1, 2012 through June 30, 2102 (ARCADIS, 2012). DTSC approved this report on September 25, 2012 (DTSC, 2012b). Subsequent reports will be provided to DTSC per the following schedule and annually thereafter unless modified through DTSC approval letter:

Groundwater Reporting Period	Submittal of Report to DTSC
July 1, 2012 through December 31, 2012	January 31, 2013
January 1, 2013 through June 30, 2013	July 31, 2013
July 1, 2013 through December 31, 2013	January 31, 2014
January 1, 2014 through June 30, 2014	July 31, 2014
July 1, 2014 through June 30, 2015	July 31, 2015
July 1, 2015 through June, 2016	July 31, 2016

The groundwater monitoring reports will include all information collected from assessment and monitoring events during the previous period. As needed, submittals may be made more frequently on individual topics to maintain the protection of the remedy and/or if the effectiveness of the remedy is in question. The reports will contain summaries of the monitoring program, groundwater elevation data, groundwater quality data, sampling methods utilized, and quality control and quality assurance data. The reports will include figures presenting interpreted groundwater movement and spatial representation of the dissolved arsenic in groundwater sample data. As appropriate with the collection of sufficient data over time, the reports will assess the effectiveness of the remedy.

3.4.2 Soil Gas

Following the collection and analysis of soil gas samples from the December 2012 event, a data summary and evaluation report will be submitted to DTSC. The report will be submitted by the later of January 31, 2013 or within six weeks after receipt of all analytical reports from the laboratory. The report will contain summaries of the monitoring program, deviations, if any, from the strategy and/or methodology presented in this O&M Plan, and soil gas sample results. The report will evaluate if the results are above cleanup goals and, if needed, present recommendations for continued soil gas evaluation.

3.4.3 Five-Year Review

The first Five-Year Review for the remedial action will be conducted for the period from remedy implementation through December 31, 2015. The purpose of the review is to determine if human health and the environment are being protected by the remedial action.

A draft work plan for the Five-Year Review will be submitted to DTSC by September 1, 2015 so that a final work plan can be completed and approved by DTSC by December 31, 2015. The work plan will present

- an outline for the Five-Year Review report,
- information on Site background
- information on Site construction, development, changes, and/or planned future use,
- a summary of the data and information gathered and documents/records completed since remedy implementation,
- a summary of additional remedial actions implemented, if any,
- deviations from the O&M Plan, if any, and
- a preliminary discussion of remedy effectiveness/protectiveness, including the remedy components, controls, and Covenant restrictions and requirements.

A draft Five-Year Review report will be submitted to DTSC by the later of (1) February 28, 2016 or (2) 45 days following DTSC approval of the work plan. The draft report will include a protectiveness statement, provide recommendations for continued evaluation, propose follow-up actions (if any), and outline future reporting requirements. It is anticipated the final report will be completed and approved by DTSC by June 30, 2016.

Section 4

Soil and/or Groundwater Management

Prior to intrusive activities at the Site, the following regulatory agencies must be notified and/or consulted:

- DTSC
- Bay Area Air Quality Management District (BAAQMD), depending on the scope of the proposed activities.

During such intrusive activities (i.e., drilling, well sampling, re-development of the Site properties, etc.) soil and/or groundwater potentially containing residual COCs may be encountered. In addition, the activities may have the potential to affect infiltration rate of storm water to underlying groundwater.

After notification/consultation with the above regulatory agencies, a soil and/or groundwater management plan may be required prior to implementing any activities, as provided in the Covenant. The plan could include, but not be limited to, the following elements:

- Dust and vapor controls,
- Storm water controls,
- Excavated soil stockpile management,
- Stockpile soil sampling procedures,
- Soil and/or groundwater disposal procedures, and
- Groundwater dewatering, treatment, and/or discharge.

Health and Safety

Attachment E presents health and safety plans (HASPs) for workers conducting activities presented in this O&M Plan, excluding management of potentially impacted soils during implementation of future activities. Those implementing such future activity will be responsible for preparing a specific HASP in accordance with Occupational Health and Safety Administration (OSHA) 29 CFR 1910.120 guidelines and Title 8 CCR Section 5192.

Section 5
References

API, 2003. Groundwater Remediation Strategies Tool, Regulatory Analysis & Scientific Affairs Department, Publication Number 4730. December 2003.

ARCADIS, 2012. Data Summary Report for Groundwater Monitoring Activities for the Period from March 1, 2012 through June 30, 2012. ARCADIS U.S., Inc. July 30, 2012.

CDM, 2011. Final Remedial Design Implementation Plan, Sherwin-Williams Company, Emeryville, California. Camp Dresser & McKee Inc. June 29, 2011.

CDM, 2010. Final Remedial Action Plan, Sherwin-Williams Company, Emeryville, California. Camp Dresser & McKee Inc. June 14, 2010.

CDM, 2009. Feasibility Study, Sherwin-Williams Company, Emeryville, California. Camp Dresser & McKee Inc. April 1, 2009.

CDM Smith, 2012. Remedy Implementation Completion Report, Sherwin-Williams Company, Emeryville, California. CDM Smith Inc. July 25, 2012.

DTSC, 2012a. Letter providing approval of the July 27, 2012 Remedy Implementation Completion Report. California Environmental Protection Agency, Department of Toxic Substances Control. August 6, 2012.

DTSC, 2012b. Letter providing approval of the July 30, 2012 Data Summary Report for Groundwater Monitoring Activities for the Period from March 1, 2012 through June 30, 2012. California Environmental Protection Agency, Department of Toxic Substances Control. September 25, 2012.

DTSC, 2011. Letter providing approval of the June 29, 2011 Final Remedial Design and Implementation Plan. California Environmental Protection Agency, Department of Toxic Substances Control. June 30, 2011.

DTSC, 2010. Letter providing approval of the June 14, 2010 Final Remedial Action Plan. California Environmental Protection Agency, Department of Toxic Substances Control. June 14, 2010.

DTSC, 2006. Imminent and Substantial Endangerment Determination and Order and Remedial Action Order. Docket No. IS/E 05/06-007. California Environmental Protection Agency, Department of Toxic Substances Control. May 10, 2006.

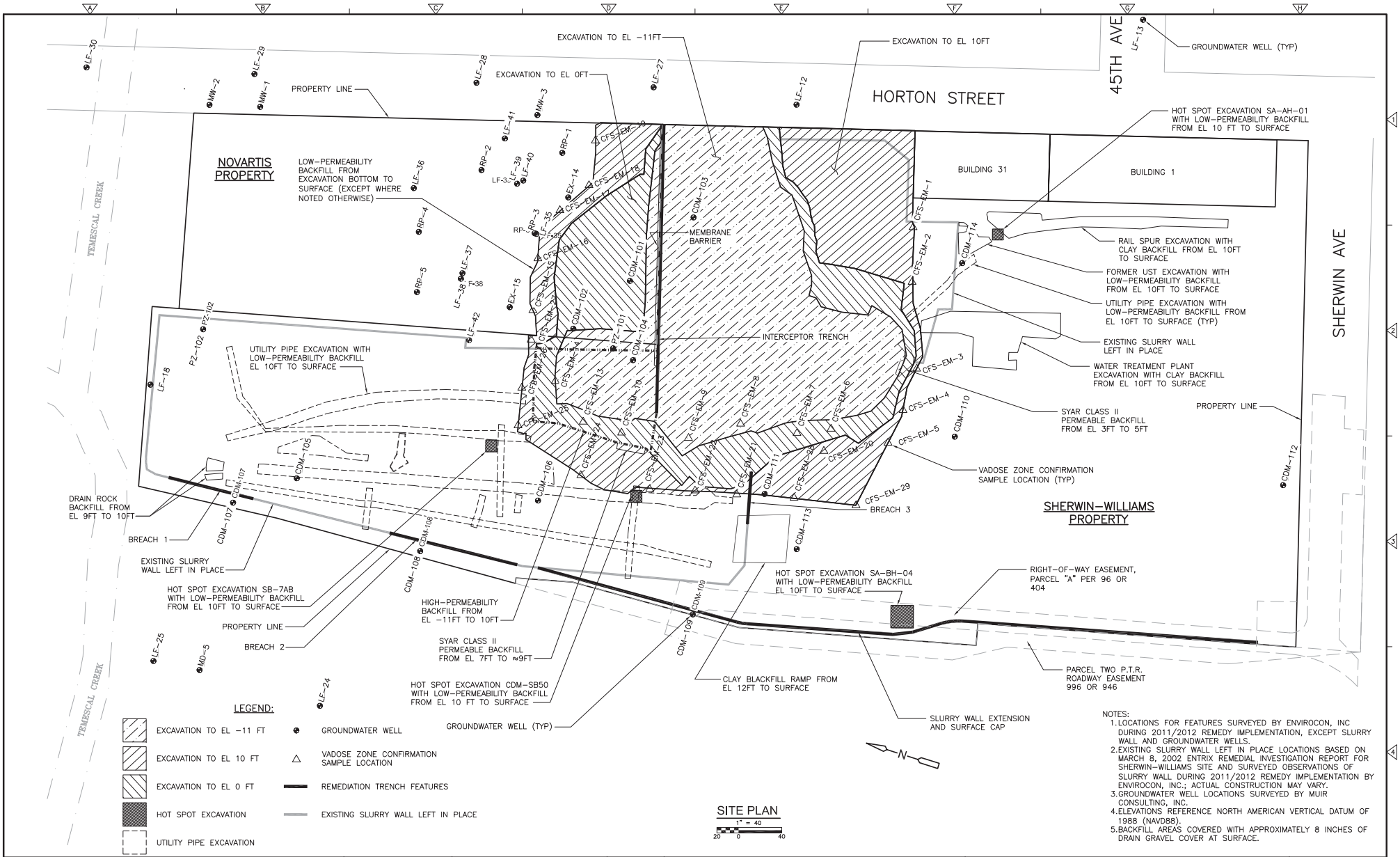
LFR, 2011. Combined Groundwater and NPDES Self-Monitoring Report, Sherwin-Williams Facility, 1450 Sherwin Avenue, Emeryville, California. LFR Inc. April 29, 2011.

LFR, 2006a. Groundwater Monitoring Plan Assessment, Sherwin-Williams Site, 1450 Sherwin Avenue, Emeryville, California. LFR Inc. June 28, 2006.

LFR, 2006b. Quality Assurance Project Plan, Sherwin-Williams Facility, 1450 Sherwin Avenue, Emeryville, California. LFR Inc. July 13, 2006.

Attachment A

Drawings



NOTES:
1. LOCATIONS FOR FEATURES SURVEYED BY ENVIROCON, INC DURING 2011/2012 REMEDY IMPLEMENTATION, EXCEPT SLURRY WALL AND GROUNDWATER WELLS.
2. EXISTING SLURRY WALL LEFT IN PLACE LOCATIONS BASED ON MARCH 8, 2002 ENTRIX REMEDIAL INVESTIGATION REPORT FOR SHERWIN–WILLIAMS SITE AND SURVEYED OBSERVATIONS OF SLURRY WALL DURING 2011/2012 REMEDY IMPLEMENTATION BY ENVIROCON, INC.; ACTUAL CONSTRUCTION MAY VARY.
3. GROUNDWATER WELL LOCATIONS SURVEYED BY MUIR CONSULTING, INC.
4. ELEVATIONS REFERENCE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).
5. BACKFILL AREAS COVERED WITH APPROXIMATELY 8 INCHES OF DRAIN GRAVEL COVER AT SURFACE.

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: x
DRAWN BY: x
SHEET CHK'D BY: x
CROSS CHK'D BY: x
APPROVED BY:
DATE: MAY 2012

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VERIFY SCALE
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SHERWIN-WILLIAMS COMPANY

SITE REMEDIATION
EMERYVILLE, CALIFORNIA

ASBUILT SITE PLAN

PROJECT NO. 13452–81494
FILE NAME: sw as–built.dwg
SHEET NO. 1

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APPROVED BY:
DATE: MAY 2012

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SHERWIN-WILLIAMS COMPANY

SITE REMEDIATION
EMERYVILLE, CALIFORNIA

GROUNDWATER WELL LOCATIONS

PROJECT NO. 13452–81494
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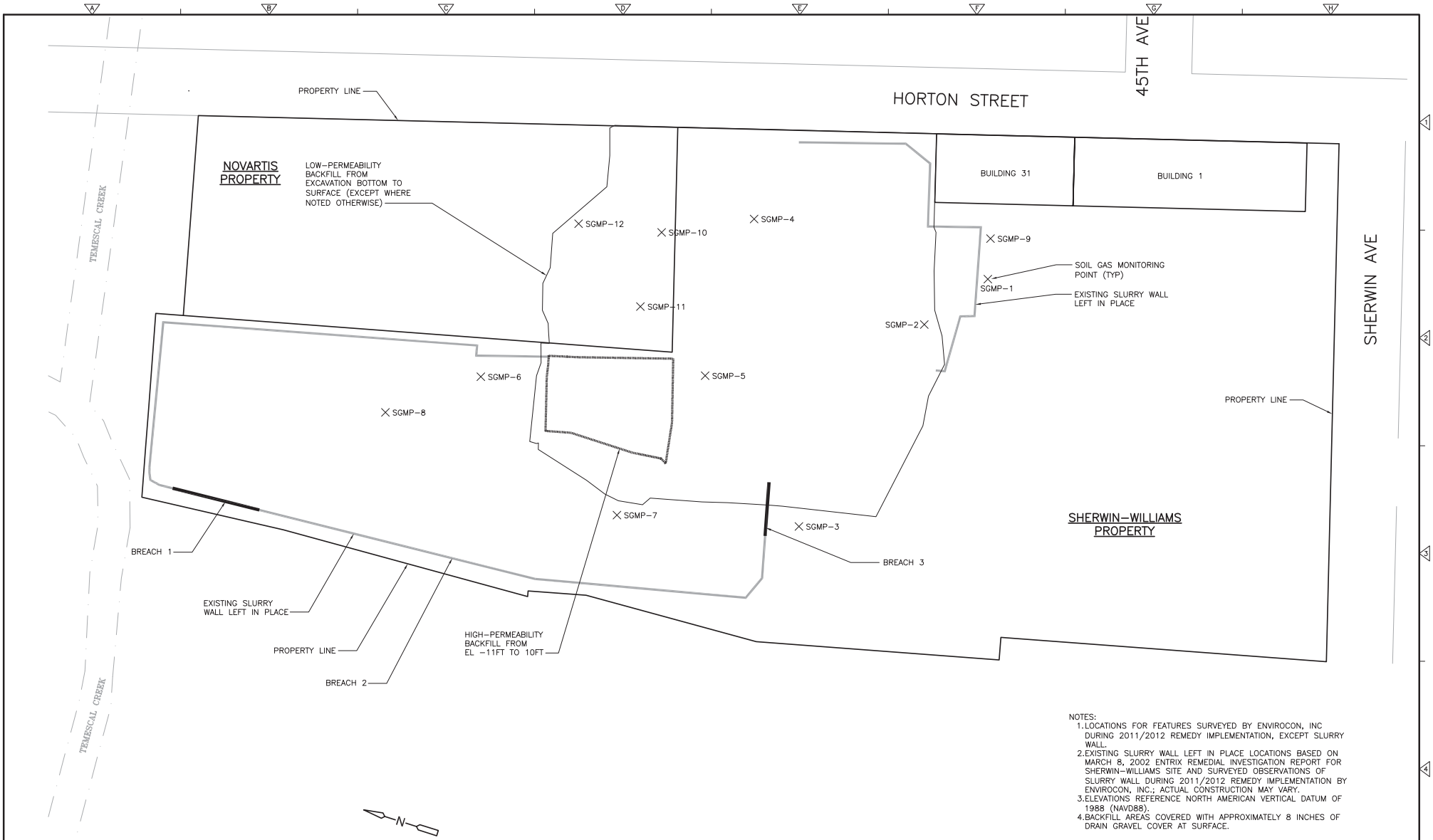

SITE PLAN

1" = 40

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NOTES:
1. LOCATIONS FOR FEATURES SURVEYED BY ENVIROCON, INC DURING 2011/2012 REMEDY IMPLEMENTATION, EXCEPT SLURRY WALL.
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EMERYVILLE, CALIFORNIA

SOIL GAS MONITORING POINTS

PROJECT NO. 13452-81494
FILE NAME: sw as-built1a.dwg

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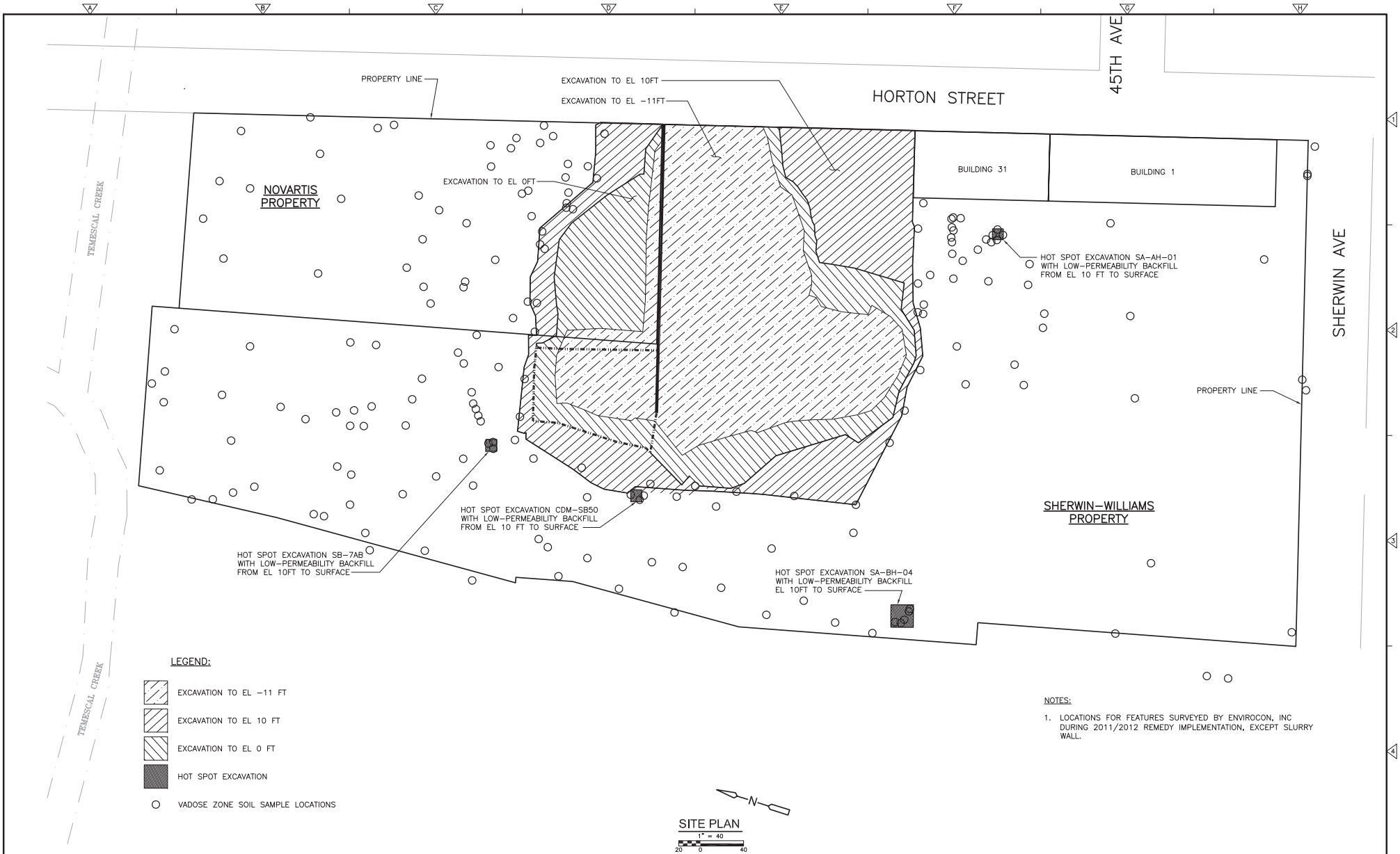

NOTES:

1. LOCATIONS FOR FEATURES SURVEYED BY ENVIROCON, INC DURING 2011/2012 REMEDY IMPLEMENTATION, EXCEPT SLURRY WALL.

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SHERWIN-WILLIAMS COMPANY

SITE REMEDIATION
EMERYVILLE, CALIFORNIA

VADOSE ZONE SOIL SAMPLE LOCATIONS

PROJECT NO. 13452-81494
FILE NAME: FIGURE 4
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P:\13452 Sherwin-Williams\81494 Emeryville\Completion Report\CAD\ FIGURE 4 08/21/12 11:16 talbotwk XREFS: CDM_2234, swexutil, swextopo, swexbndy, XR-SLRY-WALL, WELLS, (2011-04-14)SW topo, ACAD-WELLS, Aerialtoposh01
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Attachment B

Summary Residual Concentrations of Chemicals of Concern in Vadose Zone Soil

Attachment B
Summary of Chemicals of Concern in Vadose Zone Soil
Sherwin-Williams Emeryville Operation and Maintenance Plan

Chemical of Concern in RAP	*DTSC-Approved Cleanup Goal (mg/kg)*		*Samples Analyzed*	*Detections*	*Minimum Detection (mg/kg)*	*Maximum Detection (mg/kg)*	*95UCL (mg/kg)*
	Commercial Worker	*Unrestricted Resident*					
Volatile Organic Compounds							
Acetone	1800000	70000	69	20	ND	0.28	--
Benzene	0.076	0.015	69	1	ND	0.010	--
4-Chloroaniline	8200	310	69	1	ND	0.200	--
Ethylbenzene	200000	7800	89	27	ND	520	--
Tetrachloroethene	0.32	0.063	69	0	ND	ND	--
Toluene	440	100	87	24	ND	14	--
Xylenes	11000	2300	58	27	ND	1600	--
Semivolatile Organic Compounds							
Benzo(a)anthracene	9.5	1.1	68	0	ND	0	--
Benzo(b)fluoranthene	9.5	1.1	39	3	ND	0.96	--
Benzo(b,k)fluoranthene	9.5	1.1	39	2	ND	0.68	--
Naphthalene	41000	1300	81	21	ND	10	--
Phenanthrene	160000	4500	68	2	ND	1.7	--
Inorganic Compounds							
Antimony	820	31	41	2	ND	6.4	--
Arsenic	24	24	128	128	2.0	64	12
Barium	140000	5500	48	48	29	390	--
Cadmium	15	3.1	54	22	ND	7.2	2.1
Chromium (+3)	3100000	120000	48	48	9.6	61	--
Chromium (+6)	41000	1600					
Lead	5600	250	76	76	3.8	490	55
Selenium	10000	390	45	35	ND	1.6	--
Zinc	610000	23000	84	84	29	4070	--

Notes:

mg/kg - milligram per kilogram

ND - not detected

The cleanup goals for the chemicals of concerns, except arsenic, are site-specific risk-based threshold levels presented in the Remedial Action Plan (RAP).

The cleanup goal for arsenic in soil is its naturally occurring background concentration, as presented in RAP.

Site analyses were for total chromium (sum of +3 and +6 species); maximum total chromium detection is less than both chromium cleanup goals.

For chemicals of concern with maximum detections above their respective cleanup goals, the 95% upper confidence limits of the averages of the detections (95 UCL) are presented to demonstrate conformance with the cleanup goals; "--" is presented where this analysis is not warranted. This approach is consistent with the cleanup goals presented in the RAP.

Attachment C

Groundwater Monitoring Program

Attachment C

Groundwater Monitoring Program

The Groundwater Monitoring Program outlines provisions for a long term groundwater monitoring program to collect data to evaluate the effectiveness of the soil excavation, backfill, and slurry wall breaches/extension. The effectiveness of the final remedy will be evaluated based on its ability: (1) to promote natural attenuation of residual chemicals of concern (COCs) in groundwater, primarily arsenic; (2) to achieve Site cleanup goals within a reasonable timeframe; and (3) to control groundwater movement through the Site without producing long-term groundwater mounding.

The groundwater monitoring program consists of:

- Designation of a well network;
- Collection and evaluation of depths to groundwater and concentrations of COCs in groundwater in the well network;
- Development of criteria and methodologies to evaluate data that are collected; and
- Development of contingency actions with a decision framework for their initiation.

Statistical analysis will be used to evaluate trends in the concentration data. The depth to groundwater, and COC concentrations and concentration trends will be evaluated to determine if contingency action(s) are needed to achieve Site cleanup goals (see Section 1 of this Operation and Maintenance (O&M) Plan).

Based on the timing and nature of future redevelopment and future construction activities, and/or results from the groundwater monitoring program, it may be necessary to modify the groundwater monitoring network or monitoring requirements at some point in the future. As such, at any time after implementation of the remedy, The Sherwin-Williams Company (S-W) may request modifications to the groundwater monitoring program presented in this document. S-W will implement the changes to the groundwater monitoring program only after approval by the California Department of Toxic Substances Control (DTSC).

C.1 Groundwater Monitoring Well Locations

Attachment A, Drawing 2 of this Operation and Maintenance (O&M) Plan presents the locations of these monitoring wells and piezometers. Table C-1 provides a summary of construction details and a summary of the monitoring program after remedy implementation.

C.2 Monitoring Frequency and Sample Analysis

This section presents the monitoring and analysis programs 1) during remedy implementation and 2) for the first four years after remedy implementation.

C.2.1 Groundwater Quality Sampling and Analysis

Site groundwater monitoring program for the first four years after remedy implementation will be in accordance with Table C-1, and/or subsequent DTSC-approved modifications.

With the exception of wells CDM-112, CDM-113, and CDM-114, which will be sampled annually, S-W will sample all new monitoring wells installed on the S-W property on a semi-annual basis for the first two years after remedy implementation. Following these two years, S-W will use the data from the well samples and the data quality objectives to determine if semi-annual sampling should continue or whether the frequency can be reduced to annual.

Rifkin Guard Well RP-1 and RP4, and well MW-3, will be sampled for arsenic analysis on a quarterly basis as the arsenic concentrations at these wells during remedy implementation increased above their respective historical maximum detections. Quarterly sampling for each of these three wells will continue until statistical analysis of the results demonstrates that the arsenic concentration for each respective well is stable or decreasing; the frequency of sampling for the well will then be adjusted to semi-annual.

S-W will collect groundwater samples in accordance with the methodology for well sampling presented in the existing project Groundwater Monitoring Plan Assessment (LFR, 2006a) and Quality Assurance Project Plan (LFR, 2006b). The samples will be sent to a certified laboratory chosen by S-W and analyzed for arsenic by EPA Method 6010B, volatile organic compounds (VOCs) by EPA Method 8260B, and/or total petroleum hydrocarbons (TPH) as gasoline (TPH-G) by EPA Method 8260 and TPH as diesel and motor oil (TPH-D/MO) by EPA Method 8015M with silica gel cleanup (SGC). In addition, S-W will measure the following field parameters during purging and sample collection:

- Temperature
- pH
- Turbidity
- Dissolved Oxygen
- Specific Conductivity
- Oxidation-Reduction Potential

S-W will use field parameter results to support the representativeness of the well samples and monitor the relative distribution of oxidizing/reducing conditions.

C.2.2 Depth to Groundwater Measurements

Site groundwater monitoring program for the first four years after remedy implementation will be in accordance with Table C-1, and/or subsequent DTSC-approved modifications.

As the remedy has been designed to control groundwater movement, S-W will collect groundwater elevation data monthly for the first year from monitoring wells and piezometers to monitor whether groundwater movement patterns are consistent with projected design groundwater model conditions for the remedy, as presented in the Feasibility Study (FS) (CDM, 2009). S-W will use the first year's data set to evaluate the effectiveness of the slurry wall segments to divert groundwater, and the effectiveness of the slurry wall breaches to facilitate groundwater movement. After the first year, if groundwater

elevations and movement patterns are consistent with projected design conditions, the frequency of groundwater elevation monitoring will be revised to quarterly. S-W will utilize the quarterly elevation monitoring data sets to continue evaluation of potential seasonal variation in groundwater movement. S-W will evaluate the frequency of groundwater elevation monitoring annually.

Should future construction activities affect groundwater movement or rates of infiltration (e.g., redevelopment of the former Rifkin property or S-W property), S-W will initiate monthly monitoring during and post-construction for a period of at least one year to monitor whether groundwater movement patterns continue to be consistent with projected design groundwater model conditions. If groundwater elevations and movement patterns are consistent with projected design conditions, groundwater elevation monitoring will return to its previously established frequency.

Changes to the frequency of groundwater elevation monitoring resulting from a determination that groundwater movement patterns are inconsistent with projected design conditions are further discussed in Section C.5.3.

C.3 Groundwater Quality Effectiveness Criteria

S-W will analyze the analytical results from sampling of the groundwater monitoring wells to evaluate the effectiveness of the remedy. Table C-2 provides a summary of the groundwater quality effectiveness criteria that S-W will utilize to evaluate the effectiveness of the remedy. The criteria are discussed below.

C.3.1 Excavated and Backfilled Area on Former Rifkin Property

It is anticipated that COC concentrations in groundwater within this area will fluctuate after remedy implementation, as the groundwater comes into equilibrium with the backfill material and surrounding groundwater conditions. S-W will collect analytical samples from wells CDM-101 and CDM-102. Analytical results from a certified laboratory will be used to evaluate whether COC concentrations in groundwater in this area are stable or decreasing by no later than four years after remedy implementation. In addition, S-W will use analytical data of samples from these wells to evaluate whether arsenic concentrations in this area are less than 5,000 micrograms per liter (µg/L) by no later than four years after remedy implementation.

C.3.2 Excavated and Backfilled Area on S-W Property

It is anticipated that COC concentrations in groundwater within this area will fluctuate after remedy implementation, as the groundwater comes into equilibrium with the backfill material and surrounding groundwater conditions. Therefore, S-W will use analytical results of samples from wells CDM-103 and CDM-104 to evaluate whether COC concentrations in groundwater in this area are stable or decreasing by no later than four years after remedy implementation.

C.3.3 North Side on Former Rifkin Property

S-W will analyze analytical results of samples from the Rifkin Guard Wells to evaluate whether arsenic concentration trends are statistically stable or decreasing after remedy implementation.

C.3.4 Central Site on S-W Property

S-W will analyze analytical results of samples from wells CDM-105 and CDM-106 to determine if there is potential movement of COCs in groundwater toward the west side groundwater monitoring wells CDM-107 and CDM-108.

S-W will analyze results of analytical samples from wells CDM-110, CDM-111, CDM-113, and CDM-114 to determine if there is potential change in groundwater quality outside of the area affected by the excavated and backfilled area.

C.3.5 West Side on S-W Property

S-W will analyze results of analytical samples from wells CDM-107 and CDM-108 to evaluate whether trends of COC concentrations in groundwater migrating offsite through the slurry wall breaches toward the Union Pacific Railroad property are statistically stable or decreasing, and whether arsenic concentrations exceed 250 µg/L for CDM-107 or 500 µg/L for CDM-108. These arsenic concentration criteria are based on protection of Temescal Creek channel and further discussed in Section C.6.1.2.

S-W will analyze results of analytical samples from well CDM-109 to evaluate the effectiveness of the slurry wall extension in containing the onsite groundwater plume and to evaluate whether trends of COC concentrations in groundwater present outside the slurry wall are statistically stable or decreasing.

C.3.6 West Side on Union Pacific Railroad Property

S-W will analyze results of analytical samples from wells LF-24 and LF-25 to evaluate whether COC concentrations in groundwater near the Temescal Creek channel are less than Site cleanup goals or whether their trends are statistically stable or decreasing. Since installation in 1996, arsenic concentrations in samples from these wells have been stable or decreasing. Arsenic concentrations in samples from monitoring well LF-24 since the time of installation in 1996 have been less than 36 µg/L. Arsenic concentrations for LF-25 have been less than 36 µg/L since 2006 and are currently demonstrating a decreasing trend.

C.3.7 North Side on S-W Property

S-W will analyze results of analytical samples from well LF-18 to evaluate whether COC concentrations in groundwater near the Temescal Creek channel are less than Site cleanup goals or whether their trends are statistically stable or decreasing.

C.3.8 South Side on Sherwin Avenue

S-W will analyze results of analytical samples from well CDM-112 to evaluate whether COC concentrations in groundwater in this area are less than Site cleanup goals or whether their trends are statistically stable or decreasing.

C.4 Groundwater Movement Effectiveness Criteria

Table C-2 provides a summary of the groundwater movement criteria to be utilized to monitor the effectiveness of the remedy. The criteria are further discussed below.

C.4.1 Groundwater Movement Patterns

S-W will monitor the measurements of depths to groundwater in Site wells to determine if long-term groundwater movement patterns within the S-W property are consistent with projected design groundwater model conditions for the remedy, as presented in the FS (CDM, 2009), and are included at the end of this Attachment C. These projected design conditions include groundwater movement towards the slurry wall breaches and the absence of long-term, localized groundwater mounding.

C.4.2 Depths to Groundwater

S-W will evaluate groundwater elevation measurements to determine if the depths to groundwater are sufficient to minimize potential inundation of subsurface utility corridors.

C.4.3 Arsenic Mass Flux between CDM-101, CDM-102, CDM-104, and PZ-101

S-W will evaluate groundwater elevation measurements, along with concentrations of arsenic in groundwater, from CDM-101, CDM-102, CDM-104, and/or PZ-101 to determine if the net arsenic mass flux within the excavated and backfilled area between the locations of these proposed wells is towards the S-W property west of the former Rifkin property.

As appropriate, the criterion of net mass flux towards the S-W property could be evaluated using other COCs.

C.5 Remedy Effectiveness Evaluation

After remedy implementation, S-W will utilize the groundwater monitoring data sets to evaluate the effectiveness of the remedy and determine if contingency action(s) are needed to achieve Site cleanup goals. The following text summarizes the evaluation process and criteria to be used to determine the need for contingency actions.

C.5.1 Groundwater Quality for Wells CDM-101 thru CDM-104, CDM-107 thru CDM-109, CDM-112, LF-18, LF-24, LF-25, and Rifkin Guard Wells

S-W will evaluate COC concentration trends for these 17 wells by statistical testing, including but not limited to the Mann-Kendall (Gilbert, 1997) nonparametric statistical test. Consistent with U.S. EPA guidance (EPA, 1994), S-W will use a significance level of 0.05 (i.e., a 95% confidence level) in applying the Mann-Kendall nonparametric test. If an increasing COC concentration trend is found, S-W will increase the frequency of monitoring for the well to monthly for three months and use the 95% UCL concentrations from these four events (the previous scheduled event and subsequent three monthly events) in the Mann-Kendall nonparametric test in place of the previous quarterly event result. If this re-evaluation demonstrates a return to a stable or decreasing COC concentration trend, S-W will return the frequency of monitoring for the well to its previously established frequency listed in Table C-1. Otherwise, S-W will provide written recommendations to DTSC for implementation of a contingency action (see Section C.6).

If during establishment of a statistical arsenic concentration trend for wells CDM-107 and CDM-108, arsenic concentrations exceed 250 µg/L for CDM-107 or 500 µg/L for CDM-108, S-W will provide written recommendations to DTSC for implementation of a contingency action (see Section C.6). These arsenic concentration criteria are based on protection of Temescal Creek channel and are further discussed in Section C.6.1.

C.5.2 Groundwater Quality for Wells CDM-101 and CDM-102

If four years after remedy implementation the arsenic concentration threshold criterion of 5,000 µg/L is exceeded in samples from either wells CDM-101 or CDM-102, S-W will provide written recommendations to DTSC for implementation of a contingency action (see Section C.6).

C.5.3 Groundwater Movement Patterns

S-W will perform an estimate of groundwater flow direction and hydraulic gradient following each groundwater elevation monitoring event. S-W will then compare the groundwater flow direction and

measured hydraulic gradient to the projected design groundwater model conditions for the remedy, as presented in the FS (CDM, 2009), or as updated during preparation of the RDIP, and are included at the end of this Attachment C. As discussed in Section C.2, S-W will conduct the first assessment of this criterion after the first year of monthly groundwater elevation monitoring. The groundwater movement conditions that will be monitored as part of the annual assessment will include:

- The slurry wall extension controls groundwater movement to the north and south, in the area of CDM-111 and CDM-113;
- Net groundwater movement within the Excavated and Backfilled Area on S-W property is toward the interceptor trench or the wall breaches near the Union Pacific Railroad property, and not toward Horton Street;
- Net groundwater movement within Excavated and Backfilled Area on former Rifkin property is to the north-northwest;
- Net groundwater movement from the high permeability fill area surrounding CDM-104 is toward the slurry wall breaches near the Union Pacific Railroad property, and not toward the former Rifkin property; and
- Mounding of groundwater, to the extent it occurs, is seasonal and generally follows above average precipitation events and does not result in net groundwater movement toward the Rifkin property, movement of water over the top of the slurry wall, or flow around the slurry wall extension.

If the first assessment determines that groundwater movement patterns are consistent with projected design conditions and DTSC concurs, S-W will perform groundwater elevation monitoring quarterly as discussed in Section C.2.

If the first assessment or any subsequent annual assessment determines that groundwater movement patterns differ significantly from projected design conditions, S-W will provide written recommendation to DTSC for either implementation of additional monitoring/investigation steps or a contingency action.

Additional monitoring/investigation may include but is not limited to continued/return to monthly groundwater monitoring for an additional year, at which time a follow up assessment would be made and the monitoring revised as appropriate. Possible contingency action is discussed in Section C.6.

C.5.4 Depths to Groundwater

If one year after remedy implementation the depth to groundwater in any well is measured at or less than four (4) feet bgs, S-W will reinitiate monthly monitoring for the well to determine if depth to groundwater is exhibiting a rising trend. If the depth to groundwater from three consecutive monthly events is greater than four (4) feet bgs, S-W will return the frequency of monitoring for the well to its previously established frequency. Otherwise, monthly monitoring will continue. If the depth to groundwater in any well is measured at or less than three (3) feet bgs, S-W will provide written recommendations to DTSC for implementation of a contingency action (see Section C.6).

C.5.5 Arsenic Mass Flux between CDM-101, CDM-102, CDM-104, and PZ-101

The projected groundwater model design conditions are intended to prevent long-term (steady-state) groundwater and residual COC movement within the excavated and backfilled area between the

locations of these proposed wells towards the former Rifkin property. This additional criterion for monitoring the effectiveness of the remedy includes maintaining a positive mass flux from the former Rifkin property to the S-W property for each COC. As discussed in Section C.4.3, this criterion is anticipated to apply only to arsenic.

After each groundwater elevation monitoring event for the three wells and one piezometer, S-W will calculate the hydraulic gradient within the excavated and backfilled area on the former Rifkin property and the contiguous backfilled area to the west, on the S-W property. S-W will use the transect method (API, 2003) to calculate the arsenic mass flux in groundwater through the cross-sectional area underlying the Rifkin/S-W property line between these wells for each event using the following equation:

$w = (C)(K)(i)(A)(CF)$

where, w = chemical mass flux through the transect (g/day)

C = concentration of chemical through the transect (mg/L)

K = hydraulic conductivity at the transect (cm/sec)

i = hydraulic gradient at the transect (cm/cm)

A = cross-sectional area associated with the transect (ft3)

CF = conversion factor, 80.3 (ft/cm)/(sec/day)(L/ft3)(g/mg)

The calculated mass flux, w, value for each event will include both the magnitude and direction. The direction will be based on assigning a positive hydraulic gradient, i, if groundwater movement is toward Rifkin and negative for movement away from Rifkin. The concentration, C, for each event will be either (1) the concentration of CDM-104 if the groundwater movement is toward Rifkin, or (2) the average of the arsenic concentration of CDM-101 and CDM-102 if groundwater movement is away from Rifkin.

Due to the uncertainty introduced by variations in percent recovery; quality control; and matrix interferences, there will be inherent variations in the precision and bias of laboratory analytical results for the groundwater samples from the wells used in the flux calculations. Therefore, S-W will use a default tolerance limit of 20 percent to determine if concentrations are considered different for use in calculating mass flux, i.e., mass flux, w, will be set at zero for each event where arsenic concentrations from wells CDM-101, 102, and CDM-104 differ by or less than 20 percent. As appropriate, S-W will apply this criterion to other COCs, if concentrations of other COCs for these three wells differ by more than 20 percent.

After the first year of monthly groundwater monitoring, S-W will sum the monthly arsenic mass flux values to calculate the annual net arsenic mass flux. Each of the monthly mass flux values will represent an approximately equal duration (i.e., one month). If this first year net arsenic mass flux is negative (movement of arsenic away from Rifkin), S-W will proceed to quarterly groundwater monitoring, as discussed in Section C.2.

If the net arsenic mass flux during the first year or any subsequent year is positive (movement of arsenic toward Rifkin), S-W will provide written recommendation to DTSC for either implementation of additional monitoring/investigation steps or a contingency action.

Additional monitoring/investigation may include, but is not limited to, continued/return to monthly groundwater monitoring at these wells for an additional year, at which time a follow up assessment would be made and the monitoring revised as appropriate. Possible contingency action is discussed in Section C.6.

If the net arsenic mass flux during the first year or any subsequent year exceeds the equivalent to arsenic concentrations of 500 µg/L with a groundwater migration rate of 1 foot/day, S-W will provide written recommendation to DTSC for contingency action (see Section C.6).

C.6 Contingency Action

Section C.5 presented the criteria for which written recommendations to DTSC for contingency action will be required. The recommendations for contingency action will be consistent with best engineering practices to minimize the potential for any further spread of the COCs and to strive to restore a stable or decreasing groundwater plume. Such contingency action may include, but not be limited to: additional soil excavation and backfill; modifications to permeability of placed fill; in-situ groundwater treatment or in-place geochemistry modifications within the Site or at the slurry wall breaches; modification to the groundwater containment system; and/or active groundwater extraction and treatment.

The submittal to DTSC for the recommended contingency action would also include effectiveness evaluation criteria for the contingency action. S-W would implement the contingency action after approval by DTSC.

C.6.1 Active Groundwater Extraction and Treatment

Criteria for Rifkin Guard Wells

If verified arsenic concentrations in samples from any Rifkin Guard Well during evaluation of the contingency action exceed the criteria listed in Table C-3, S-W will provide written recommendations to DTSC to implement active groundwater extraction and treatment with disposal/reuse of treated water. The objective of the groundwater extraction contingency action, to address exceedance of the Rifkin Guard Well criteria, would be to prevent further migration of arsenic contaminated groundwater onto the former Rifkin property. For this action, further arsenic migration is defined as northerly groundwater movement across the alignment of the Rifkin Guard Wells.

The submittal to DTSC for active groundwater extraction would also include criteria for evaluating the effectiveness of the extraction. Consistent with existing DTSC procedures, S-W would implement active groundwater extraction and evaluate its effectiveness. This evaluation would include consideration of (1) terminating active groundwater extraction and returning to the original remedy (i.e., natural attenuation of arsenic in groundwater) if criteria listed in Table C-4 are met, or (2) implementation of additional contingency action, if criteria listed in Table C-4 are not met.

Criteria for Wells CDM-107 and CDM-108

If verified arsenic concentrations in samples from CDM-107 or CDM-108 during evaluation of the contingency action exceed the criteria listed in Table C-3, S-W will provide written recommendations to DTSC to implement active groundwater extraction and treatment with disposal/reuse of treated water. The objective of the groundwater extraction contingency action, to address exceedance of the CDM-107/108 criteria, would be to prevent further migration of arsenic contaminated groundwater through one or both of the slurry wall breaches along the Union Pacific Railroad property, as necessary, to maintain protection of Temescal Creek channel. Supporting information for the contingency action

criteria for arsenic listed in Table C-3 for CDM-107 and CDM-108 is presented in the Remedial Action Plan (RAP) (CDM, 2010).

The submittal to DTSC for active groundwater extraction would also include criteria for evaluating the effectiveness of the extraction. Consistent with existing DTSC procedures, S-W would implement active groundwater extraction and evaluate its effectiveness. This evaluation would include consideration of (1) terminating active groundwater extraction and returning to the original remedy (i.e., natural attenuation of arsenic in groundwater) if criteria listed in Table C-4 are met, or (2) implementation of additional contingency action if criteria listed in Table C-4 are not met.

Implementation of Active Groundwater Extraction

The objective of the active groundwater extraction contingency action would be to control further migration of arsenic impacted groundwater on the former Rifkin property or through the slurry wall breaches. A contingency action that includes groundwater extraction would be implemented within the area of the higher permeability backfill on the S-W property, and would be consistent with evaluation presented in the Remedial Action Plan (CDM, 2010) and/or subsequent DTSC-approved modifications. The uniform nature of this higher permeability backfill would facilitate enhanced hydraulic communication with surrounding native materials, backfill in the remainder of the Site, and the interceptor trench.

Using the groundwater model for the Unit A aquifer (A-zone) developed for the FS (CDM, 2009), as updated during preparation of the RDIP, a groundwater extraction scenario has been evaluated for conditions anticipated to be present after implementation of the preferred remedy. Based on the groundwater model simulation results, a single groundwater extraction well within the higher permeability backfill on the S-W property would be sufficient to simultaneously meet the objectives of contingency actions for both the former Rifkin property and the slurry wall breaches. Under this selected groundwater extraction scenario, a pumping rate of approximately 3.1 gallons per minute (gpm) from this well would be sufficient to maintain a hydraulic capture zone that extends to the Rifkin Guard Wells and the downgradient slurry wall breach nearest to the source area. The model indicates that of the two downgradient slurry wall breaches along the Union Pacific Railroad property, the one associated with well CDM-108 is the more likely to first have potential increases in COC concentrations that would trigger a need for contingency action.

The groundwater model simulation results include a presentation of the steady-state potentiometric surface contours and particle tracking showing groundwater movement in the A-zone that would develop due to pumping from this single groundwater extraction well within the high permeability backfill on the S-W property. The results demonstrate that this contingency groundwater extraction action would adequately provide control of migration of COCs in groundwater.

C.7 References

API, 2003. Groundwater Remediation Strategies Tool, Regulatory Analysis & Scientific Affairs Department, Publication Number 4730. December 2003.

CDM, 2010. Final Remedial Action Plan, Sherwin-Williams Company, Emeryville, California. Camp Dresser & McKee Inc. June 14, 2010.

CDM, 2009. Feasibility Study, Sherwin-Williams Company, Emeryville, California. Camp Dresser & McKee Inc. April 1, 2009.

LFR, 2006a. Groundwater Monitoring Plan Assessment, Sherwin-Williams Site, 1450 Sherwin Avenue, Emeryville, California. LFR Inc. June 28, 2006.

LFR, 2006b. Quality Assurance Project Plan, Sherwin-Williams Facility, 1450 Sherwin Avenue, Emeryville, California. LFR Inc. July 13, 2006.

Table C-1
Groundwater Well Construction Details and Monitoring Program
Sherwin-Williams Emeryville Operation and Maintenance Plan

Well Number	**Well Construction Details**										***Well Monitoring Program After Excavation/Backfill*** [1]				
	Date Constructed	***Top of Casing Elevation*** (feet NAVD88)	***Total Depth*** (feet bgs)	***Casing Material***	***Casing Diameter*** (inches)	***Screen Slot Size*** (inches)	***Screen Interval Depths*** Top (feet toc)	Bottom (feet toc)	***Screen Interval Elevations*** Top (feet NAVD88)	Bottom (feet NAVD88)	***Depth To Groundwater*** [2]	***Arsenic by EPA Method 6010B***	***Volatile Organic Compounds by EPA Method 8260B***	***Field Parameters*** [3]	***TPH-G by EPA Method 8260 AND TPH-D/MO by EPA Method 8015M with SGC***
Existing Wells															
Horton Street - City of Emeryville															
LF-12	11/2/1989	17.65	18	PVC	4	0.020	7.5	17.5	10.2	0.1	Monthly/Quarterly	Annually	Annually	Each Event	Annually
LF-13	11/2/1989	17.48	18	PVC	4	0.020	7.0	17.0	10.5	0.5	Well retained for possible future monitoring, if needed				
LF-27	12/22/1997	17.83	18	PVC	2	0.010	10.0	18.0	7.8	-0.2	Well retained for possible future monitoring, if needed				
LF-28	12/22/1997	17.09	18	PVC	2	0.010	6.5	18.0	10.6	-0.9	Monthly/Quarterly	Annually	Annually	Each Event	Annually
LF-29	12/23/1997	16.40	20	PVC	2	0.010	6.0	19.0	10.4	-2.6	Well retained for possible future monitoring, if needed				
LF-30	12/23/1997	15.86	19	PVC	2	0.010	6.0	18.5	9.9	-2.6	Well retained for possible future monitoring, if needed				
Former Rifkin Property - Novartis Vaccines and Diagnostics, Inc.															
RP-1[a]	7/26/1994	17.84	13	PVC	2	0.010	7.0	12.0	10.8	5.8	Monthly/Quarterly	Quarterly [4]	Annually	Each Event	--
RP-2[a]	7/25/1994	17.94	15	PVC	2	0.010	8.5	14.5	9.4	3.4	Monthly/Quarterly	Semi-Annually	Annually	Each Event	--
RP-3	7/26/1994	17.87	13	PVC	2	0.010	8.0	12.5	9.9	5.4	Monthly/Quarterly	Semi-Annually	Annually	Each Event	--
RP-4[a]	7/25/1994	17.83	17	PVC	2	0.010	7.0	17.0	10.8	0.8	Monthly/Quarterly	Quarterly [4]	Annually	Each Event	--
RP-5[a]	7/25/1994	17.74	15	PVC	2	0.010	7.0	15.0	10.7	2.7	Monthly/Quarterly	Semi-Annually	Annually	Each Event	--
LF-35	9/21/199	18.93	27	PVC	2	0.010	24.0	27.0	-5.1	-8.1	Monthly/Quarterly	Annually	Annually	Each Event	--
LF-36[a]	1/3/2000	18.87	16	PVC	2	0.020	7.0	16.0	11.9	2.9	Monthly/Quarterly	Semi-Annually	Annually	Each Event	--
LF-37	1/4/2000	18.54	16	PVC	2	0.020	7.0	16.0	11.5	2.5	Monthly/Quarterly	Semi-Annually	Annually	Each Event	--
LF-38	1/4/2000	18.51	27	PVC	2	0.020	20.0	27.0	-1.5	-8.5	Monthly/Quarterly	Annually	Annually	Each Event	--
LF-39	1/3/2000	18.97	26	PVC	2	0.020	18.0	26.0	1.0	-7.0	Monthly/Quarterly	Annually	Annually	Each Event	--
LF-40	1/4/2000	18.84	15	PVC	2	0.020	7.0	15.0	11.8	3.8	Monthly/Quarterly	Semi-Annually	Annually	Each Event	--
LF-41[a]	12/29/1999	18.24	15	PVC	2	0.020	7.0	15.0	11.2	3.2	Monthly/Quarterly	Semi-Annually	Annually	Each Event	--
EX-14	12/29/1999	18.74	16	SS	6	0.010	5.5	15.5	13.2	3.2	Well retained for possible future monitoring, if needed				
EX-15	12/29/1999	17.88	17	SS	6	0.010	7.0	17.0	10.9	0.9	Well retained for possible future monitoring, if needed				
MW-1	12/9/1994	16.48	19	PVC	2	0.010	7.0	17.0	9.5	-0.5	Well retained for possible future monitoring, if needed				
MW-2	12/8/1994	16.29	19	PVC	2	0.010	5.0	17.0	11.3	-0.7	Well retained for possible future monitoring, if needed				
MW-3	12/8/1994	17.30	20	PVC	2	0.010	6.5	19.5	10.8	-2.2	Monthly/Quarterly	Quarterly [4]	Annually	Each Event	--
Sherwin-Williams Property															
LF-18	2/5/1996	15.75	19	PVC	2	0.010	8.0	18.0	7.8	-2.3	Monthly/Quarterly	Annually	Annually	Each Event	--
LF-42	1/5/2000	17.29	16	PVC	2	0.020	7.0	15.0	10.3	2.3	Monthly/Quarterly	Semi-Annually	Annually	Each Event	--
Union Pacific Railroad Property															
LF-24	4/4/1996	12.92	17	PVC	2	0.010	7.0	17.0	5.9	-4.1	Annually	Annually	Annually	Each Event	--
LF-25	4/4/1996	14.01	18	PVC	2	0.010	8.0	18.0	6.0	-4.0	Annually	Annually	Annually	Each Event	--
Offsite Property - Madison Bay Street, LLC															
MD-5	4/4/2003	12.03	16	PVC	0.75	0.010	6.0	16.0	6.0	-4.0	Monthly/Quarterly	--	--	--	--

Table C-1
Groundwater Well Construction Details and Monitoring Program
Sherwin-Williams Emeryville Operation and Maintenance Plan

Well Number	Well Construction Details										Well Monitoring Program After Excavation/Backfill [1]				
	Date Constructed	Top of Casing Elevation (feet NAVD88)	Total Depth (feet bgs)	Casing Material	Casing Diameter (inches)	Screen Slot Size (inches)	Screen Interval Depths Top (feet toc)	Screen Interval Depths Bottom (feet toc)	Screen Interval Elevations Top (feet NAVD88)	Screen Interval Elevations Bottom (feet NAVD88)	Depth To Groundwater [2]	Arsenic by EPA Method 6010B	Volatile Organic Compounds by EPA Method 8260B	Field Parameters [3]	TPH-G by EPA Method 8260 AND TPH-D/MO by EPA Method 8015M with SGC
New Wells															
Former Rifkin Property - Novartis Vaccines and Diagnostics, Inc.															
CDM-101	3/8/2012	18.97	21	PVC	2	0.010	10.7	20.7	8.3	-1.7	Monthly/Quarterly	Semi-Annually	Semi-Annually	Each Event	--
CDM-102	3/8/2012	17.61	20	PVC	2	0.010	10.5	20.5	8.1	-1.9	Monthly/Quarterly	Semi-Annually	Semi-Annually	Each Event	--
Sherwin-Williams Property															--
CDM-103	3/7/2012	20.56	20	PVC	2	0.010	12.8	22.8	7.8	-2.2	Monthly/Quarterly	Semi-Annually	Annually	Each Event	--
CDM-104	3/9/2012	18.60	18	PVC	2	0.010	10.8	20.8	7.8	-2.2	Monthly/Quarterly	Semi-Annually	Annually	Each Event	--
CDM-105	3/7/2012	15.83	15	PVC	2	0.010	7.6	17.6	8.2	-1.8	Monthly/Quarterly	Semi-Annually/Annually [5]	Annually	Each Event	--
CDM-106	3/7/2012	16.21	15.5	PVC	2	0.010	8.3	18.3	7.9	-2.1	Monthly/Quarterly	Semi-Annually/Annually [5]	Annually	Each Event	--
CDM-107	2/20/2012	17.38	16.5	PVC	2	0.010	9.5	19.5	7.9	-2.1	Monthly/Quarterly	Semi-Annually	Semi-Annually	Each Event	--
CDM-108	2/20/2012	17.71	17	PVC	2	0.010	9.6	19.6	8.1	-1.9	Monthly/Quarterly	Semi-Annually	Semi-Annually	Each Event	--
CDM-109	2/20/2012	15.44	15	PVC	2	0.010	7.1	17.1	8.4	-1.6	Monthly/Quarterly	Semi-Annually/Annually [5]	Annually	Each Event	--
CDM-110	3/12/2012	15.62	18	PVC	2	0.010	7.6	17.6	8.0	-2.0	Monthly/Quarterly	Semi-Annually/Annually [5]	Annually	Each Event	Annually
CDM-111	3/9/2012	18.14	17	PVC	2	0.010	10.3	20.3	7.8	-2.2	Monthly/Quarterly	Semi-Annually/Annually [5]	Annually	Each Event	Annually
CDM-112	3/8/2012	15.70	18	PVC	2	0.010	7.7	17.7	8.1	-2.0	Monthly/Quarterly	Annually	Annually	Each Event	--
CDM-113	3/8/2012	15.47	18	PVC	2	0.010	7.5	17.5	8.0	-2.0	Monthly/Quarterly	Annually	Annually	Each Event	--
CDM-114	3/12/2012	14.72	17.5	PVC	2	0.010	6.7	16.7	8.0	-2.0	Monthly/Quarterly	Annually	Annually	Each Event	Annually
New Piezometers															
Sherwin-Williams Property															--
PZ-101	3/9/2012	19.01	19	PVC	1	0.010	11.5	21.5	7.5	-2.5	Monthly/Quarterly	--	--	--	--
PZ-102	3/12/2012	16.64	19	PVC	1	0.010	8.6	18.6	8.0	-2.0	Monthly/Quarterly	--	--	--	--

Notes:

NADV88: North American Vertical Datum of 1988

bgs: below ground surface

toc: top of casing

PVC: polyvinyl chloride

SS: stainless steel

a - Designated Rifkin Guard Well.

1 - Monitoring program is only for the first four years after remedy implementation.

2 - Depth to groundwater measured monthly for first year and then quarterly for next three years; should there be a change in the rate of infiltration that affects groundwater flow conditions, monthly monitoring would be reinitiated for at least one year.

3 - Field parameters include: temperature, pH, turbidity, dissolved oxygen, oxidation-reduction potential, and specific conductivity.

4 - Frequency of monitoring for arsenic for this well will be quarterly as arsenic concentration for this well increased above its historical maximum detection during remedy implementation.

5 - Frequency of monitoring for arsenic for this well will be semi-annually for the first two years; if after two years arsenic concentration is stable to decreasing, frequency of monitoring will be modified to annually after DTSC concurrence; otherwise, it will remain semi-annually.

Table C-2

Remedy Effectiveness Evaluation Criteria

Sherwin-Williams Emeryville Operation and Maintenance Plan

Groundwater Quality Effectiveness Criteria [1]	
Well	**Remedy Effectiveness Evaluation Criteria**
Former Rifkin Property	
CDM-101	COC concentrations are less than Site cleanup goals or their trends are statistically stable to decreasing four years after remedy implementation, and arsenic is less than 5,000 ug/L four years after remedy implementation
CDM-102	COC concentrations are less than Site cleanup goals or their trends are statistically stable to decreasing four years after remedy implementation, and arsenic is less than 5,000 ug/L four years after remedy implementation
RP-1[a]	Arsenic concentrations are less than Site cleanup goals or their trends are statistically stable to decreasing
RP-2[a]	Arsenic concentrations are less than Site cleanup goals or their trends are statistically stable to decreasing
RP-4[a]	Arsenic concentrations are less than Site cleanup goals or their trends are statistically stable to decreasing
RP-5[a]	Arsenic concentrations are less than Site cleanup goals or their trends are statistically stable to decreasing
LF-36[a]	Arsenic concentrations are less than Site cleanup goals or their trends are statistically stable to decreasing
LF-41[a]	Arsenic concentrations are less than Site cleanup goals or their trends are statistically stable to decreasing
Sherwin-Williams Property	
LF-18	COC concentrations are less than Site cleanup goals or their trends are statistically stable to decreasing
CDM-103	COC concentrations are less than Site cleanup goals or their trends are statistically stable to decreasing
CDM-104	COC concentrations are less than Site cleanup goals or their trends are statistically stable to decreasing
CDM-107	COC concentrations are less than Site cleanup goals or their trends are statistically stable to decreasing
CDM-108	COC concentrations are less than Site cleanup goals or their trends are statistically stable to decreasing
CDM-109	COC concentrations are less than Site cleanup goals or their trends are statistically stable to decreasing
CDM-112	COC concentrations are less than Site cleanup goals or their trends are statistically stable to decreasing
Union Pacific Property	
LF-24	COC concentrations are less than Site cleanup goals or their trends are statistically stable to decreasing
LF-25	COC concentrations are less than Site cleanup goals or their trends are statistically stable to decreasing

Groundwater Movement Effectiveness Criteria
1. Long-term groundwater flow patterns are consistent with projected design groundwater model conditions.
2. Long-term arsenic in groundwater mass flux at the Rifkin/S-W property line between CDM-101/CDM-102 and PZ-101/CDM-104 is westward, from the former Rifkin property to the S-W property.
3. Absence of long-term groundwater mounding at the Site.
4. Depths to groundwater at all wells are more than 3 feet below ground surface.

Notes:

COC: chemical of concern

ug/L: microgram per liter

a - Designated Rifkin Guard Well.

1 - Wells not presented do not have groundwater quality remedy effectiveness evaluation criteria.

Table C-3

Criteria for Implementing Active Groundwater Extraction

Sherwin-Williams Emeryville Operation and Maintenance Plan

Well	Criteria for Implementing Active Groundwater Extraction [1]	*Maximum Arsenic Concentration Detected from Well thru February 2012* [2]
Former Rifkin Property (Guard) Wells		
RP-1[a]	Increasing arsenic concentration trend with concentration greater than higher of 150 ug/L or 150% of the maximum arsenic concentration detected for the well prior to or during remedy implementation	140
RP-2[a]	Increasing arsenic concentration trend with concentration greater than higher of 75 ug/L or 150% of the maximum arsenic concentration detected for the well prior to or during remedy implementation	42
RP-4[a]	Increasing arsenic concentration trend with concentration greater than higher of 75 ug/L or 150% of the maximum arsenic concentration detected for the well prior to or during remedy implementation	25
RP-5[a]	Increasing arsenic concentration trend with concentration greater than higher of 75 ug/L or 150% of the maximum arsenic concentration detected for the well prior to or during remedy implementation	38
LF-36[a]	Increasing arsenic concentration trend with concentration greater than higher of 75 ug/L or 150% of the maximum arsenic concentration detected for the well prior to or during remedy implementation	65
LF-41[a]	Increasing arsenic concentration trend with concentration greater than higher of 150 ug/L or 150% of the maximum arsenic concentration detected for the well prior to or during remedy implementation	97
Sherwin-Williams Property Wells		
CDM-107	Increasing arsenic concentration trend with concentration greater than 250 ug/L	Not applicable [3]
CDM-108	Increasing arsenic concentration trend with concentration greater than 500 ug/L	Not applicable [3]

Notes:

COC: chemical of concern

ug/L: microgram per liter

a - Designated Rifkin Guard Well.

1 - Wells not presented do not have criteria for implementing active groundwater extraction.

2 - CDM Smith, 2012. Remedy Implementation Completion Report, Sherwin-Williams Company, Emeryville, California. July 25.

Table C-4

Criteria to Terminate Active Groundwater Extraction

Sherwin-Williams Emeryville Operation and Maintenance Plan

Well	*Criteria to Terminate Active Groundwater Extraction and Return to Monitored Natural Attenuation* [1]	*Maximum Arsenic Concentration Detected from Well thru April 2011* [2]
Former Rifkin Property		
RP-1[a]	Arsenic concentration less than higher of 100 ug/L or maximum arsenic concentration detected prior to or during remedy implementation	95
RP-2[a]	Arsenic concentration less than higher of 50 ug/L or maximum arsenic concentration detected prior to or during remedy implementation	42
RP-4[a]	Arsenic concentration less than higher of 50 ug/L or maximum arsenic concentration detected prior to or during remedy implementation	19
RP-5[a]	Arsenic concentration less than higher of 50 ug/L or maximum arsenic concentration detected prior to or during remedy implementation	38
LF-36[a]	Arsenic concentration less than higher of 65 ug/L or maximum arsenic concentration detected prior to or during remedy implementation	65
LF-41[a]	Arsenic concentration less than higher of 100 ug/L or maximum arsenic concentration detected prior to or during remedy implementation	97
Sherwin-Williams Property		
CDM-107	Arsenic concentration less than 250 ug/L	Not applicable [3]
CDM-108	Arsenic concentration less than 500 ug/L	Not applicable [3]

Notes:

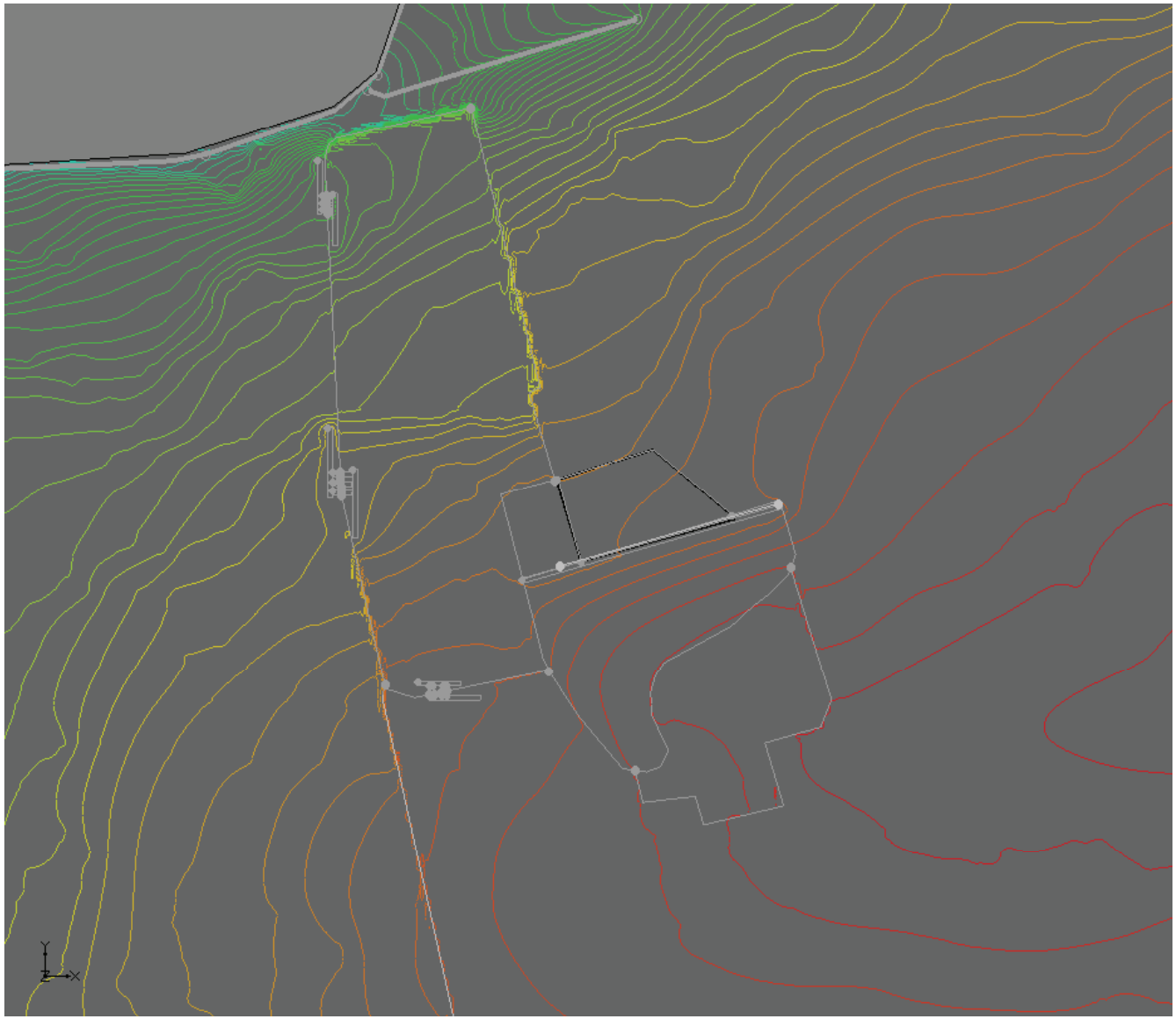
ug/L: microgram per liter

a - Designated Rifkin Guard Well.

1 - Wells not presented do not have criteria to terminate active groundwater extraction and return to monitored natural attenuation.

2 - LFR Inc. 2011. Combined Groundwater and NPDES Self-Monitoring Report, Sherwin-Williams Facility, 1450 Sherwin Avenue, Emeryville, California. April 29.

Projected Design Groundwater Model Conditions From Appendix B of 2009 Feasibility Study



See Figure 6-18 for Location and Description of Site Features for this Alternative

CDM

Figure 6-19
Alternative 6 Simulated Potentiometric Surface
Sherwin-Williams Company – Emeryville, California

From Appendix B of 2009 Feasibility Study

Figure 6-20
Alternative 6 Simulated Particle Tracks
Sherwin-Williams Company – Emeryville, California

From Appendix B of 2009 Feasibility Study

Attachment D

Soil Gas Evaluation Strategy

Attachment D

Soil Gas Evaluation

After completion of remediation implementation activities, S-W installed soil gas monitoring points at the Site to collect and analyze soil gas samples. This section provides the objective and methodology for sample collection. Table D-1 provides a summary of construction details of the installed soil gas monitoring points.

The monitoring points were installed at locations in proximity to previous soil gas sample locations at the Site, which were conducted in November and December 2006 and reported in CDM's January 30, 2007 report to DTSC. Attachment A, Drawing 3 of this Operation and Maintenance (O&M) Plan presents the locations for these monitoring points.

In order to have representative sample collection of steady-state conditions in the vadose zone after completion of backfill activities and evaluate potential seasonal variability, soil gas samples will be collected in June 2012 and December 2012.

Following the collection and analysis of soil gas samples from the December 2012 event, a data summary and evaluation report will be submitted to DTSC. The report will be submitted by the later of January 31, 2013 or within six weeks after receipt of all analytical reports from the laboratory. The report will contain summaries of the monitoring program, deviations, if any, from the strategy and/or methodology presented in this O&M Plan, and soil gas sample results. The report will evaluate if the results are above cleanup goals and, if needed, present recommendations for continued soil gas evaluation.

The results from the June 2012 event were provided to DTSC following this event, and without evaluation. The June 2012 results are included in Table D-2.

The O&M Plan will be amended, as needed, to include appropriate engineering controls that would be implemented as part of redevelopment if post-excavation sampling reveals that residual soil gas is present above indoor air protective levels. Engineering controls could include: increased building indoor air ventilation; sub-slab depressurization; and/or vapor barriers in combination with other controls.

Whether engineering controls are deemed necessary to address potential indoor vapor intrusion concerns, a long-term soil gas monitoring program may still be appropriate for continued evaluation.

D.1 Soil Gas Sample Collection and Analysis

Soil gas monitoring points were installed at 12 locations at the Site. These locations are in proximity to previous soil gas sample locations at the Site, see Attachment A, Drawing 3 of this O&M Plan.

D.2 Pre-Sampling Activities

Prior to installation of the soil gas monitoring points, installation permits were obtained from Alameda County Public Works Agency (ACPWA) and Underground Service Alert (USA) was contacted at least 72 hours prior to beginning fieldwork to determine the locations of any subsurface utilities. At potential

monitoring points outside of the excavation, S-W coordinated with S-W and Novartis personnel to assist in locating underground utilities.

D.3 Soil Gas Monitoring Point Installation

Methods to penetrate the subsurface for installation of soil gas monitoring points consisted of Concrete Coring (as necessary) and Direct Push. Overlying soil at portions of the Site may be paved asphalt and require coring prior to drilling.

The events for soil gas monitoring point installation were in the following order:

1. Used a concrete coring unit to penetrate the asphalt, where present, at the proposed locations.

2. Used a direct push rig to penetrate through soil with 1.5-inch outside diameter hardened steel rods to approximately 5 feet below ground surface (bgs), or the desired target depth depending on depth to groundwater. Retracted rods slightly to expose soil formation and set monitoring point. As the locations are to be within backfill from the remediation implementation or previous investigation areas, soil cores were not collected.

3. Attached a measured length of 1/8-inch outside diameter Nylaflow tubing to a soil gas sampling point. The point consisted of a six-inch stainless steel soil gas implant screen. The point was hung through the rods via the tubing and placed one foot above the bottom of the borehole. The point was surrounded with #2/12 sand (or equivalent) to two feet above the bottom of the borehole; with the point centered in the sand. As the rods were retracted, one foot of dry bentonite chips was placed above the sand, and then hydrated bentonite slurry placed to 0.5 foot of the surface. The bentonite sealed the point from the ground surface.

4. The monitoring point was completed with sand to the surface and a flush mounted vault.

The monitoring points were installed by a licensed driller: TEG, Inc. The completed monitoring points were allowed to equilibrate for at least 24 hours prior to sampling.

As stated above, the depth of the monitoring point placements was 4 feet bgs or shallower. DTSC guidelines specify 5 feet bgs as an appropriate depth to collect soil gas samples in order to minimize effects from atmospheric conditions, including changes in barometric pressure, temperature, and/or breakthrough of ambient air from the surface. Due to the shallow groundwater table (encountered at 4 to 7 feet bgs), S-W installed monitoring points at 5 feet bgs or shallower in order to minimize moisture content in the soil gas samples. No deeper soil gas samples will be collected. At locations where shallower groundwater was encountered, S-W installed monitoring points as shallow as 3 feet bgs, as necessary. S-W did not install monitoring points at locations with groundwater at or shallower than 4 feet bgs. Table D-1 provides a summary of construction details of the installed soil gas monitoring points.

D.4 Soil Gas Sampling Methodology

The soil gas sampling methodology is in accordance with the Remedial Design Implementation Plan (RDIP) (CDM Smith, 2012) and is consistent with applicable portions of the following guidance documents:

Advisory – Soil Gas Investigations. California Environmental Protection Agency, Department of Toxic Substances Control, Los Angeles Regional Water Quality Control Board, and San Francisco Regional Water Quality Control Board. April 2012.

Final Guidance for the Evaluation and Mitigation of Subsurface Vapor Intrusion to Indoor Air (Vapor Intrusion Guidance). California Environmental Protection Agency, Department of Toxic Substances Control, October 2011.

A schematic of the sampling train is shown in Figure D-1. Swagelock® fittings or equivalent will be used for all connections. After assembly, the sampling train will be tested for leaks by performing a vacuum shut-in test. The downhole valve will be closed and a test vacuum of at least 100 inches of water column (in-H2O) will be placed on the sampling train for at least one minute with a mechanical or hand pump, dedicated purge vacuum container, or equivalent. The test will be monitored using a vacuum gauge connected to the train. After the shut-in test, three volumes of air will be purged using a 200 milliliter per minute (mL/min) flow regulator, in order to minimize partitioning or short circuiting of soil gas flow paths, and monitored with a vacuum gauge connected to the train.

Helium gas will be used as a leak check compound to ensure that the bentonite seal is intact. After the shut-in test, a shroud will be placed over the monitoring point and shut-off valve. The atmosphere inside the shroud will be filled with helium. The shroud will have weather stripping along its base in order to maintain a constant leak check concentration in the atmosphere around the sampling location. The helium concentration within the shroud will be monitored using a portable helium detector.

The leak check analysis will be performed during the three volume purge test. After purging 1.5 volumes, the purge will be stopped, and a clean 50 cc disposable, syringe will be used to draw sample from a sample port in the line, see Figure D-1. The syringe sample will be pushed into the helium detector to test for helium. The presence of helium in the sample would be indicative of leak in the seal. If not detected, the purge will continue again to complete the remaining purge. After completing the three volume purge, one more sample will be drawn with a syringe and pushed into the helium detector to check for leak.

After completion of the two leak checks and three volume purge, soil gas will be collected in a 1-liter Summa canister using a flow regulator of less than 150 mL/min, in order to minimize partitioning or short circuiting of soil gas flow paths. Each Summa canister will consist of a stainless steel canister that will be under absolute vacuum (29 in. Hg). All canisters will be provided by and samples will be submitted to a certified air quality laboratory. All sample canisters will be purged and certified by the laboratory to be free of VOCs at the specified detection limits.

If the shut-in test cannot maintain a vacuum and/or helium is detected during purging, the seals will be checked and corrected if necessary and the test(s) repeated. If the problem(s) cannot be corrected, the monitoring point will be abandoned without sample collection and sealed, and a new point installed at a new location.

D.5 Sample Analysis

Soil gas samples will be analyzed, within 14 days of collection, at an analytical laboratory for VOCs by EPA Method TO-15. The samples will also be analyzed for helium by ASTM D-1946 (modified). Additionally, samples will be analyzed for oxygen, carbon dioxide, and methane by ASTM D-1946 (modified). Samples will be handled under standard chain of custody (COC) protocol at all times.

D.6 Quality Assurance and Quality Control

The Quality Assurance/Quality Control (QA/QC) plan for the soil gas evaluation was included with the RDIP in its Appendix C (CDM, Smith 2012). The plan provides methodology to manage overall quality control of sample collection, collection of original data recorded in field notebooks, sample identification tags, chain-of-custody records, data quality, equipment calibrations, and quality control tests. The plan also provides details on the project organization structure and identifies the duties and responsibilities of key personnel.

D.6.1 Field Samples

Field quality control/quality assurance (QA/QC) samples will be collected and analyzed to establish confidence in the sample collecting procedures. One duplicate sample will be collected over the each soil gas sampling event. This sample will be subject to the same sample analysis as the original sample. In addition a trip blank sample will be collected to ensure the integrity of sample canisters during shipping and handling. A trip blank sample will be a 1-liter Summa canister that will travel from the laboratory to the Site, will remain at the Site during each sampling event, and travel back to the laboratory for analysis. The trip blank canister will not be exposed to atmosphere. Equipment blanks will not be collected.

If field samples are found to have been impacted with helium after sample analysis, such samples will be considered to be invalid and require re-sampling at minimum, and may also require re-installation of the point.

D.6.2 Decontamination Procedures

All down-hole equipment will be decontaminated before and after each use. Decontamination will be accomplished by steam cleaning or washing in a solution of Alconox or equivalent non-phosphate detergent, followed by a double rinsing with clean water. Decontamination water will be containerized in 55-gallon drums, labeled, and retained at the Site until characterized for proper disposal.

D.7 Sample Labeling

Samples will be labeled with a unique identification name, date, time, location, and sampler's initials. The identification name will consist of the location name and sample date: Location Name – Sample Type – Sample Date.

D.8 Characterization and Disposal of Investigation Derived Waste

Soil cuttings and waste water will be containerized in separate 55-gallon drums, labeled, and held at a paved portion of the Site until characterized for proper disposal. Within 90 days from the generation of the waste, S-W will arrange for pickup and disposal.

D.9 Monitoring Point Sealing

After the completion of all soil gas sampling events, the monitoring points will be abandoned by pulling out the implant tubing. Since the boreholes are completed above the water table and contain bentonite seals, installation of additional subsurface seals is not anticipated. In accordance with ACPWA abandonment requirements, the vaults will be removed after abandonment and each borehole will be sealed at the surface with a mixture of Portland cement and bentonite slurry. The slurry will be

troweled flush with the surface, and as needed for selected locations, coated with a blackening material for blending with the asphalt.

D.10 References

CDM Smith, 2012. Remedy Implementation Completion Report, Sherwin-Williams Company, Emeryville, California. CDM Smith Inc. July 25, 2012.

Table D-1
Soil Gas Monitroing Point Construction Details
Sherwin-Williams Emeryville Operation and Maintenance Plan

Well Number	**Well Construction Details**					
	Date Constructed	*Total Depth* (feet bgs)	*Tubing Material*	*Tubing Diameter* (inches)	*Screen Interval Depths* Top (feet toc)	Bottom (feet toc)
Former Rifkin Property - Novartis Vaccines and Diagnostics, Inc.						
SGMP-10	7/26/1994	5	Nyaflow	1/8	4.5	5.0
SCMP-11	7/25/1994	5	Nyaflow	1/8	4.5	5.0
SCMP-12	7/26/1994	5	Nyaflow	1/8	4.5	5.0
Sherwin-Williams Property						
SGMP-01	2/5/1996	3	Nyaflow	1/8	2.5	3.0
SGMP-02	1/5/2000	5	Nyaflow	1/8	4.5	5.0
SGMP-03	3/7/2012	4	Nyaflow	1/8	3.5	4.0
SGMP-04	3/7/2012	5	Nyaflow	1/8	4.5	5.0
SGMP-05	2/20/2012	5	Nyaflow	1/8	4.5	5.0
SGMP-06	2/20/2012	5	Nyaflow	1/8	4.5	5.0
SGMP-07	2/20/2012	3.5	Nyaflow	1/8	3.0	3.5
SGMP-08	3/12/2012	3.5	Nyaflow	1/8	3.0	3.5
SGMP-09	3/9/2012	3	Nyaflow	1/8	2.5	3.0

Notes:
bgs: below ground surface
toc: top of casing

Table D-2
Sherwin-Williams Emeryville Remediation Project
SOIL GAS SAMPLE RESULTS - June 6 and 7, 2012

Chemical	Unit	Action Level	Soil Gas Monitoring Point (SGMP)													Ambient Condition	Trip Blank
			SGMP-01	SGMP-02	SGMP-03	SGMP-04	SGMP-05	SGMP-06	SGMP-07	SGMP-08	SGMP-09	SGMP-10	SGMP-10 Duplicate	SGMP-11	SGMP-12		
Fixed Gases by ASTM-D1946																	
Helium	% v/v	5	<0.039	**0.38**	<0.038	<0.041	<0.041	<0.043	<0.040	**0.05**	**0.51**	<0.040	<0.042	<0.042	<0.036	<0.020	<0.020
Carbon Dioxide	% v/v	--	**0.015 J**	**7.9**	**25**	**7.1**	**7.3**	**8**	**18**	**0.07**	**0.071**	**18**	**18**	**13**	**24**	**0.046**	<0.010
Methane	% v/v	4.4 - 17	**0.00026 J**	**0.00052**	**40**	**0.047**	**0.38**	**3.8**	**12**	**0.34**	**0.00096**	**0.19**	**0.19**	**4.6**	**0.17**	**0.00023 J**	**0.00014 J**
Nitrogen	% v/v	--	**77**	**80**	**33**	**87**	**87**	**81**	**66**	**86**	**75**	**77**	**77**	**78**	**72**	**75**	**97**
Oxygen	% v/v	--	**19**	**7.1**	**0.94**	**1.7**	**1.2**	**2.2**	**1.1**	**10**	**20**	**1.7**	**1.3**	**1.3**	**1.4**	**22**	<0.20

Table D-2
Sherwin-Williams Emeryville Remediation Project
SOIL GAS SAMPLE RESULTS - June 6 and 7, 2012

Chemical	Unit	Action Level	Soil Gas Monitoring Point (SGMP)													Ambient Condition	Trip Blank
			SGMP-01	SGMP-02	SGMP-03	SGMP-04	SGMP-05	SGMP-06	SGMP-07	SGMP-08	SGMP-09	SGMP-10	SGMP-10 Duplicate	SGMP-11	SGMP-12		
Volatile Organic Compounds (VOCs) by TO-15 in ppm v/v																	
1,1,1-Trichloroethane	ppm v/v	179	<0.0003	**0.00028 J**	<0.0072	<0.0003	<0.0003	<0.08	<0.72	<0.022	<0.0003	<0.00076	<0.00078	<0.00066	<0.0017	<0.0003	<0.0003
1,1,2,2-Tetrachloroethane	ppm v/v	--	<0.0004	<0.0004	<0.0096	<0.0004	<0.0004	<0.11	<0.96	<0.03	<0.0004	<0.001	<0.001	<0.00088	<0.0022	<0.0004	<0.0004
1,1,2-Trichloro-1,2,2-trifluoroethane	ppm v/v	--	**0.00022 J**	<0.0004	<0.0096	<0.0004	<0.0004	<0.11	<0.96	<0.03	<0.0004	<0.001	<0.001	<0.00088	<0.0022	<0.0004	<0.0004
1,1,2-Trichloroethane	ppm v/v	--	<0.0004	<0.0004	<0.0096	<0.0004	<0.0004	<0.11	<0.96	<0.03	<0.0004	<0.001	<0.001	<0.00088	<0.0022	<0.0004	<0.0004
1,1-Dichloroethane	ppm v/v	--	<0.0003	<0.0003	<0.0072	<0.0003	<0.0003	<0.08	<0.72	<0.022	<0.0003	<0.00076	<0.00078	<0.00066	<0.0017	<0.0003	<0.0003
1,1-Dichloroethene	ppm v/v	--	<0.0008	<0.0008	<0.019	<0.0008	<0.0008	<0.21	<1.9	<0.059	<0.0008	<0.002	<0.0021	<0.0018	<0.0045	<0.0008	<0.0008
1,2,4-Trichlorobenzene	ppm v/v	--	<0.0025	<0.0025	<0.06	<0.0025	<0.0025	<0.67	<6	<0.19	<0.0025	<0.0063	<0.0065	<0.0055	<0.014	<0.0025	<0.0025
1,2,4-Trimethylbenzene	ppm v/v	--	**0.00071 J**	**0.011**	<0.06	**0.011**	**0.00067 J**	**0.39 J**	<6	**0.034 J**	**0.0032**	**0.013**	**0.012**	**0.004 J**	**0.011 J**	<0.0025	<0.0025
1,2-Dibromoethane (EDB)	ppm v/v	--	<0.0008	<0.0008	<0.019	<0.0008	<0.0008	<0.21	<1.9	<0.059	<0.0008	<0.002	<0.0021	<0.0018	<0.0045	<0.0008	<0.0008
1,2-Dichloro-1,1,2,2-tetrafluoroethane	ppm v/v	--	<0.0004	<0.0004	<0.0096	<0.0004	<0.0004	<0.11	<0.96	<0.03	<0.0004	<0.001	<0.001	<0.00088	<0.0022	<0.0004	<0.0004
1,2-Dichlorobenzene	ppm v/v	--	<0.0004	<0.0004	<0.0096	<0.0004	<0.0004	<0.11	<0.96	<0.03	<0.0004	<0.001	<0.001	<0.00088	<0.0022	<0.0004	<0.0004
1,2-Dichloroethane	ppm v/v	0.012	<0.0008	<0.0008	<0.019	<0.0008	<0.0008	<0.21	<1.9	<0.059	<0.0008	<0.002	<0.0021	<0.0018	<0.0045	<0.0008	<0.0008
1,2-Dichloropropane	ppm v/v	--	<0.0004	<0.0004	<0.0096	<0.0004	<0.0004	<0.11	<0.96	<0.03	<0.0004	<0.001	<0.001	<0.00088	<0.0022	<0.0004	<0.0004
1,3,5-Trimethylbenzene	ppm v/v	--	<0.0004	**0.0045**	<0.0096	**0.004**	**0.00032 J**	**0.18**	<0.96	**0.023 J**	**0.001**	**0.0041**	**0.0039**	**0.0013**	**0.0038**	<0.0004	<0.0004
1,3-Dichlorobenzene	ppm v/v	--	<0.0004	<0.0004	<0.0096	<0.0004	<0.0004	<0.11	<0.96	<0.03	<0.0004	<0.001	<0.001	<0.00088	<0.0022	<0.0004	<0.0004
1,4-Dichlorobenzene	ppm v/v	--	<0.0004	<0.0004	<0.0096	<0.0004	<0.0004	<0.11	<0.96	<0.03	<0.0004	<0.001	<0.001	<0.00088	<0.0022	<0.0004	<0.0004
2-Butanone (MEK)	ppm v/v	--	**0.0037**	**0.0019**	<0.019	**0.0039**	**0.0027**	<0.21	<1.9	<0.059	**0.0069**	**0.0046**	**0.0046**	**0.0017 J**	<0.0045	**0.00065 J**	**0.00042 J**
2-Hexanone	ppm v/v	--	<0.0004	<0.0004	<0.0096	<0.0004	<0.0004	<0.11	**3.7**	<0.03	<0.0004	<0.001	<0.001	<0.00088	<0.0022	<0.0004	<0.0004
4-Ethyltoluene	ppm v/v	--	**0.00041**	**0.0095**	<0.0096	**0.0084**	**0.00054**	**0.29**	<0.96	**0.026 J**	**0.0019**	**0.0087**	**0.0087**	**0.0029**	**0.0084**	<0.0004	<0.0004
4-Methyl-2-pentanone (MIBK)	ppm v/v	--	<0.0004	**0.0059**	<0.0096	**0.0097**	**0.0037**	<0.11	<0.96	<0.03	**0.0037**	**0.0072**	**0.0069**	**0.0024**	**0.0089**	<0.0004	<0.0004
Acetone	ppm v/v	--	**0.018**	**0.0092**	<0.019	**0.015**	**0.012**	<0.21	<1.9	**0.1**	**0.027**	**0.024**	**0.025**	**0.009**	**0.0085**	<0.0008	<0.0008
Benzene	ppm v/v	0.011	**0.0057**	**0.039**	**0.035**	**0.11**	**0.072**	**0.21**	<0.72	**0.013 J**	**0.018**	**0.14**	**0.14**	**0.042**	**0.20**	<0.0003	<0.0003
Benzyl chloride	ppm v/v	--	<0.0008	<0.0008	<0.019	<0.0008	<0.0008	<0.21	<1.9	<0.059	<0.0008	<0.002	<0.0021	<0.0018	<0.0045	<0.0008	<0.0008
Bromodichloromethane	ppm v/v	--	<0.0003	<0.0003	<0.0072	<0.0003	<0.0003	<0.08	<0.72	<0.022	**0.00023 J**	<0.00076	<0.00078	<0.00066	<0.0017	<0.0003	<0.0003
Bromoform	ppm v/v	--	<0.0004	<0.0004	<0.0096	<0.0004	<0.0004	<0.11	<0.96	<0.03	<0.0004	<0.001	<0.001	<0.00088	<0.0022	<0.0004	<0.0004
Bromomethane	ppm v/v	--	<0.0008	<0.0008	<0.019	<0.0008	<0.0008	<0.21	<1.9	<0.059	<0.0008	<0.002	<0.0021	<0.0018	<0.0045	<0.0008	<0.0008
Carbon disulfide	ppm v/v	--	**0.0018**	**0.0086**	<0.019	**0.0015**	**0.001**	<0.21	<1.9	**0.041 J**	**0.014**	**0.0046**	**0.0046**	**0.0032**	**0.0067**	<0.0008	<0.0008
Carbon tetrachloride	ppm v/v	0.0039	<0.0008	<0.0008	<0.019	<0.0008	<0.0008	<0.21	<1.9	<0.059	<0.0008	<0.002	<0.0021	<0.0018	<0.0045	<0.0008	<0.0008
Chlorobenzene	ppm v/v	--	<0.0003	<0.0003	<0.0072	<0.0003	<0.0003	**0.19**	<0.72	**0.02 J**	<0.0003	<0.00076	<0.00078	<0.00066	<0.0017	<0.0003	<0.0003
Chloroethane	ppm v/v	--	<0.0008	<0.0008	<0.019	<0.0008	<0.0008	<0.21	<1.9	<0.059	**0.00045 J**	<0.002	<0.0021	**0.0026**	<0.0045	**0.00073 J**	**<0.0008**
Chloroform	ppm v/v	--	**0.0013**	**0.00055**	<0.0072	**0.00019 J**	**0.00014 J**	<0.08	<0.72	<0.022	**0.11**	**0.00051 J**	**0.00053 J**	**0.00043 J**	<0.0017	<0.0003	<0.0003
Chloromethane	ppm v/v	--	**0.00031 J**	**0.00031 J**	<0.019	**0.00035 J**	**0.00046 J**	<0.21	<1.9	<0.059	**0.00041 J**	**0.00056 J**	**0.00064 J**	<0.0018	<0.0045	<0.0008	<0.0008
cis-1,2-Dichloroethene	ppm v/v	3.9	<0.0004	<0.0004	<0.0096	<0.0004	<0.0004	**0.1 J**	<0.96	<0.03	<0.0004	<0.001	<0.001	<0.00088	<0.0022	<0.0004	<0.0004
cis-1,3-Dichloropropene	ppm v/v	--	<0.0004	<0.0004	<0.0096	<0.0004	<0.0004	<0.11	<0.96	<0.03	<0.0004	<0.001	<0.001	<0.00088	<0.0022	<0.0004	<0.0004
Dibromochloromethane	ppm v/v	--	<0.0004	<0.0004	<0.0096	<0.0004	<0.0004	<0.11	<0.96	<0.03	<0.0004	<0.001	<0.001	<0.00088	<0.0022	<0.0004	<0.0004
Dichlorodifluoromethane	ppm v/v	--	**0.00057**	**0.00048**	<0.0096	**0.00056**	**0.00067**	<0.11	<0.96	<0.03	**0.00052**	**0.00075 J**	**0.00069 J**	**0.00069 J**	<0.0022	**0.00063**	**<0.0004**
Ethylbenzene	ppm v/v	0.095	**0.0005**	**0.0086**	**0.0054 J**	**0.0068**	**0.00068**	**2.6**	<0.96	**0.084**	**0.0018**	**0.0067**	**0.0069**	**0.0024**	**0.0071**	<0.0004	<0.0004
Hexachlorobutadiene	ppm v/v	--	<0.0004	<0.0004	<0.0096	<0.0004	<0.0004	<0.11	<0.96	<0.03	<0.0004	<0.001	<0.001	<0.00088	<0.0022	<0.0004	<0.0004
m,p-Xylene	ppm v/v	72	**0.0016**	**0.031**	**0.022**	**0.025**	**0.0022**	**4.1**	<1.9	**0.32**	**0.0061**	**0.027**	**0.028**	**0.0098**	**0.026**	<0.0008	<0.0008

Table D-2
Sherwin-Williams Emeryville Remediation Project
SOIL GAS SAMPLE RESULTS - June 6 and 7, 2012

Chemical	Unit	Action Level	Soil Gas Monitoring Point (SGMP)													Ambient Condition	Trip Blank
			SGMP-01	SGMP-02	SGMP-03	SGMP-04	SGMP-05	SGMP-06	SGMP-07	SGMP-08	SGMP-09	SGMP-10	SGMP-10 Duplicate	SGMP-11	SGMP-12		
Methylene chloride	ppm v/v	--	<0.0004	**0.0041**	<0.0096	**0.0019**	**0.00028 J**	<0.11	<0.96	<0.03	**0.0034**	**0.00068 J**	**0.00063 J**	**0.00064 J**	**0.0022**	<0.0004	<0.0004
Naphthalene	ppm v/v	0.0060	**0.003**	<0.002	<0.048	**1.6 J**	<0.002	<0.53	<4.8	<0.15	<0.002	<0.005	<0.0052	<0.0044	<0.011	NR	<0.002
o-Xylene	ppm v/v	71	**0.00042**	**0.0088**	<0.0096	**0.008**	**0.00078**	**0.075 J**	<0.96	**0.095**	**0.0019**	**0.0091**	**0.0093**	**0.0035**	**0.0087**	<0.0004	<0.0004
Styrene	ppm v/v	--	<0.0004	<0.0004	<0.0096	<0.0004	<0.0004	<0.11	<0.96	<0.03	<0.0004	<0.001	<0.001	<0.00088	<0.0022	<0.0004	<0.0004
Tetrachloroethene	ppm v/v	0.026	**0.0015**	<0.0004	<0.0096	<0.0004	<0.0004	<0.11	<0.96	<0.03	<0.0004	<0.001	<0.001	<0.00088	<0.0022	<0.0004	<0.0004
Toluene	ppm v/v	35	**0.0022**	**0.023**	**0.0097**	**0.025**	**0.0037**	**0.1 J**	<0.96	**1.1**	**0.0091**	**0.026**	**0.027**	**0.008**	**0.027**	**0.00020 J**	**<0.0004**
trans-1,2-Dichloroethene	ppm v/v	7.9	<0.0004	<0.0004	<0.0096	<0.0004	<0.0004	<0.11	<0.96	<0.03	<0.0004	<0.001	<0.001	<0.00088	<0.0022	<0.0004	<0.0004
trans-1,3-Dichloropropene	ppm v/v	--	<0.0004	<0.0004	<0.0096	<0.0004	<0.0004	<0.11	<0.96	<0.03	<0.0004	<0.001	<0.001	<0.00088	<0.0022	<0.0004	<0.0004
Trichloroethene	ppm v/v	0.097	<0.0004	<0.0004	<0.0096	<0.0004	<0.0004	<0.11	<0.96	<0.03	<0.0004	<0.001	<0.001	<0.00088	<0.0022	<0.0004	<0.0004
Trichlorofluoromethane	ppm v/v	--	**0.002**	**0.0073**	<0.0096	**0.0019**	**0.0011**	<0.11	<0.96	<0.03	**0.00048**	**0.01**	**0.01**	**0.033**	**0.002 J**	**0.00031 J**	**<0.0004**
Vinyl acetate	ppm v/v	--	<0.0008	<0.0008	<0.019	<0.0008	<0.0008	<0.21	<1.9	<0.059	<0.0008	<0.002	<0.0021	<0.0018	<0.0045	<0.0008	<0.0008
Vinyl chloride	ppm v/v	0.0051	<0.0002	<0.0002	<0.0048	<0.0002	<0.0002	<0.053	<0.48	<0.015	<0.0002	<0.0005	<0.00052	**0.0021**	<0.0011	<0.0002	<0.0002

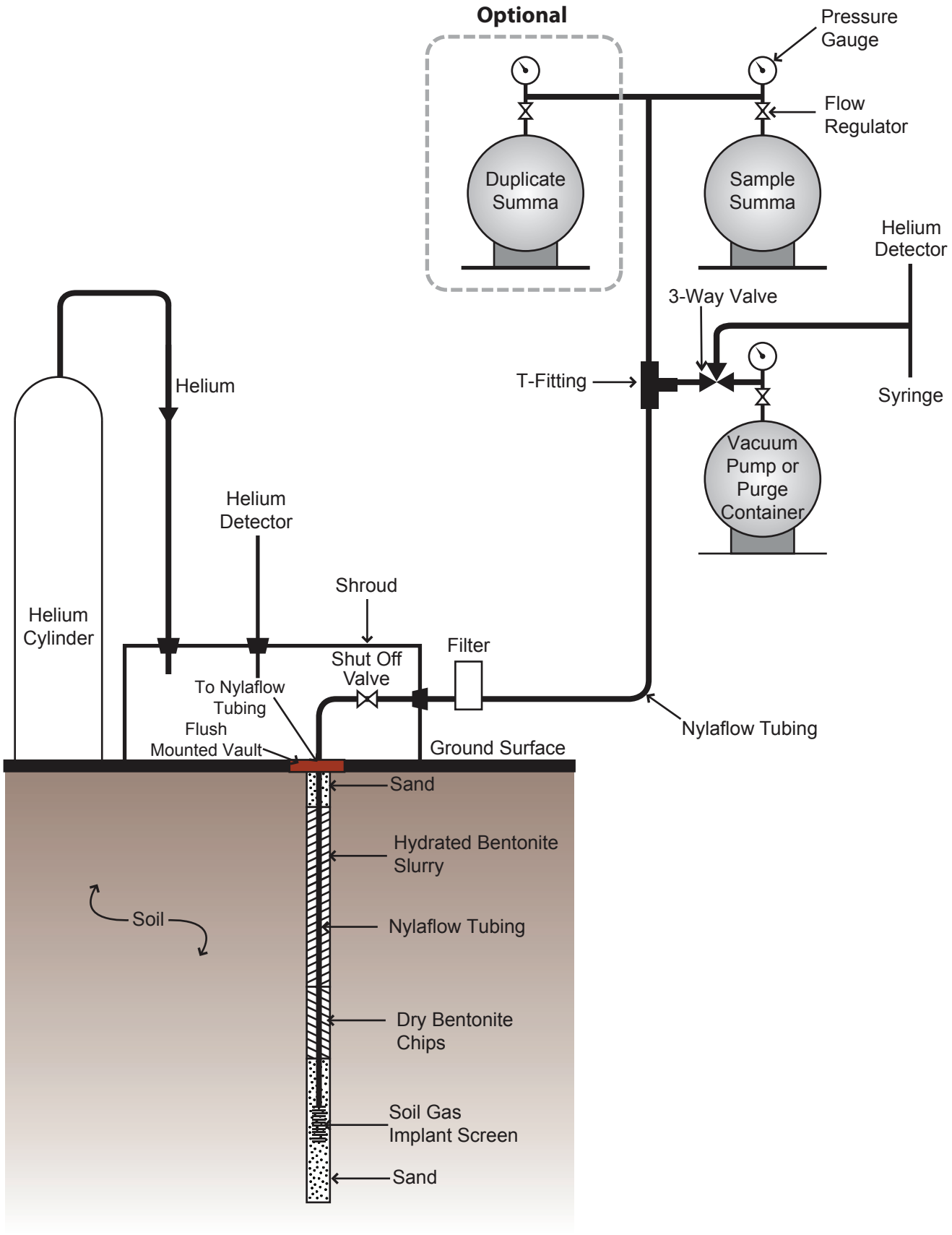
Table D-2
Sherwin-Williams Emeryville Remediation Project
SOIL GAS SAMPLE RESULTS - June 6 and 7, 2012

Chemical	Unit	Action Level	Soil Gas Monitoring Point (SGMP)													Ambient Condition	Trip Blank
			SGMP-01	SGMP-02	SGMP-03	SGMP-04	SGMP-05	SGMP-06	SGMP-07	SGMP-08	SGMP-09	SGMP-10	SGMP-10 Duplicate	SGMP-11	SGMP-12		
Volatile Organic Compounds (VOCs) by TO-15 in ug/m3																	
1,1,1-Trichloroethane	ug/m3	991000	<1.6	**1.5 J**	<39	<1.6	<1.6	<440	<3900	<120	<1.6	<4.1	<4.3	<3.6	<9.1	NR	<1.6
1,1,2,2-Tetrachloroethane	ug/m3	--	<2.7	<2.7	<66	<2.7	<2.7	<730	<6600	<200	<2.7	<6.9	<7.2	<6.1	<15	NR	<2.7
1,1,2-Trichloro-1,2,2-trifluoroethane	ug/m3	--	**1.7 J**	<3.1	<74	<3.1	<3.1	<820	<7300	<230	<3.1	<7.7	<8.0	<6.8	<17	NR	<3.1
1,1,2-Trichloroethane	ug/m3	--	<2.2	<2.2	<52	<2.2	<2.2	<580	<5200	<160	<2.2	<5.5	<5.7	<4.8	<12	NR	<2.2
1,1-Dichloroethane	ug/m3	--	<1.2	<1.2	<29	<1.2	<1.2	<320	<2900	<90	<1.2	<3.1	<3.2	<2.7	<6.8	NR	<1.2
1,1-Dichloroethene	ug/m3	--	<3.2	<3.2	<76	<3.2	<3.2	<850	<7600	<230	<3.2	<8.0	<8.3	<7.0	<18	NR	<3.2
1,2,4-Trichlorobenzene	ug/m3	--	<19	<19	<450	<19	<19	<5000	<44000	<1400	<19	<47	<48	<41	<100	NR	<19
1,2,4-Trimethylbenzene	ug/m3	--	**3.5 J**	**56**	<290	**53**	**3.3 J**	**1900 J**	<29000	**170 J**	**16**	**63**	**61**	**20 J**	**55 J**	NR	<12
1,2-Dibromoethane (EDB)	ug/m3	--	<6.1	<6.1	<150	<6.1	<6.1	<1600	<15000	<450	<6.1	<15	<16	<14	<34	NR	<6.1
1,2-Dichloro-1,1,2,2-tetrafluoroethane	ug/m3	--	<2.8	<2.8	<67	<2.8	<2.8	<750	<6700	<210	<2.8	<7.0	<7.3	<6.2	<16	NR	<2.8
1,2-Dichlorobenzene	ug/m3	--	<2.4	<2.4	<58	<2.4	<2.4	<640	<5700	<180	<2.4	<6.1	<6.3	<5.3	<13	NR	<2.4
1,2-Dichloroethane	ug/m3	49.6	<3.2	<3.2	<78	<3.2	<3.2	<860	<7700	<240	<3.2	<8.2	<8.5	<7.2	<18	NR	<3.2
1,2-Dichloropropane	ug/m3	--	<1.8	<1.8	<44	<1.8	<1.8	<490	<4400	<140	<1.8	<4.7	<4.8	<4.1	<10	NR	<1.8
1,3,5-Trimethylbenzene	ug/m3	--	<2.0	**22**	<47	**20**	**1.6 J**	**880**	<4700	**110 J**	**5.0**	**20**	**19**	**6.5**	**18**	NR	<2.0
1,3-Dichlorobenzene	ug/m3	--	<2.4	<2.4	<58	<2.4	<2.4	<640	<5700	<180	<2.4	<6.1	<6.3	<5.3	<13	NR	<2.4
1,4-Dichlorobenzene	ug/m3	--	<2.4	<2.4	<58	<2.4	<2.4	<640	<5700	<180	<2.4	<6.1	<6.3	<5.3	<13	NR	<2.4
2-Butanone (MEK)	ug/m3	--	**11**	**5.7**	<57	**11**	**7.9**	<630	<5600	<170	**20**	**14**	**14**	**5.0 J**	<13	NR	**1.2 J**
2-Hexanone	ug/m3	--	<1.6	<1.6	<39	<1.6	<1.6	<440	**15000**	<120	<1.6	<4.1	<4.3	<3.6	<9.1	NR	<1.6
4-Ethyltoluene	ug/m3	--	**2.0**	**47**	<47	**41**	**2.7**	**1400**	<4700	**130 J**	**9.3**	**43**	**43**	**14**	**42**	NR	<2.0
4-Methyl-2-pentanone (MIBK)	ug/m3	--	<1.6	**24**	<39	**40**	**15**	<440	<3900	<120	**15**	**30**	**28**	**9.9**	**36**	NR	<1.6
Acetone	ug/m3	--	**44**	**22**	<46	**36**	**29**	<510	<4500	**250**	**65**	**57**	**60**	**21**	**20**	NR	<1.9
Benzene	ug/m3	36.2	**18**	**120**	**110**	**350**	**230**	**660**	<2300	**40 J**	**57**	**440**	**460**	**130**	**620**	NR	<0.96
Benzyl chloride	ug/m3	--	<4.1	<4.1	<99	<4.1	<4.1	<1100	<9900	<310	<4.1	<10	<11	<9.2	<23	NR	<4.1
Bromodichloromethane	ug/m3	--	<2.0	<2.0	<48	<2.0	<2.0	<540	<4800	<150	**1.5 J**	<5.1	<5.2	<4.4	<11	NR	<2.0
Bromoform	ug/m3	--	<4.1	<4.1	<99	<4.1	<4.1	<1100	<9900	<310	<4.1	<10	<11	<9.1	<23	NR	<4.1
Bromomethane	ug/m3	--	<3.1	<3.1	<75	<3.1	<3.1	<830	<7400	<230	<3.1	<7.8	<8.1	<6.9	<17	NR	<3.1
Carbon disulfide	ug/m3	--	**5.7**	**27**	<60	**4.6**	**3.3**	<670	<6000	**130 J**	**44**	**14**	**14**	**10**	**21**	NR	<2.5
Carbon tetrachloride	ug/m3	25.1	<5.0	<5.0	<120	<5.0	<5.0	<1300	<12000	<370	<5.0	<13	<13	<11	<28	NR	<5.0
Chlorobenzene	ug/m3	--	<1.4	<1.4	<33	<1.4	<1.4	**870**	<3300	**94 J**	<1.4	<3.5	<3.6	<3.0	<7.7	NR	<1.4
Chloroethane	ug/m3	--	<2.1	<2.1	<51	<2.1	<2.1	<560	<5000	<160	**1.2 J**	<5.3	<5.5	**6.8**	<12	NR	<2.1
Chloroform	ug/m3	--	**6.4**	**2.7**	<35	**0.91 J**	**0.70 J**	<390	<3500	<110	**540**	**2.5 J**	**2.6 J**	**2.1 J**	<8.2	NR	<1.5
Chloromethane	ug/m3	--	**0.65 J**	**0.64 J**	<40	**0.73 J**	**0.94 J**	<440	<3900	<120	**0.85 J**	**1.2 J**	**1.3 J**	<3.7	<9.2	NR	<1.7
cis-1,2-Dichloroethene	ug/m3	15900	<1.6	<1.6	<38	<1.6	<1.6	**410 J**	<3800	<120	<1.6	<4.0	<4.1	<3.5	<8.8	NR	<1.6
cis-1,3-Dichloropropene	ug/m3	--	<1.8	<1.8	<44	<1.8	<1.8	<480	<4300	<130	<1.8	<4.6	<4.7	<4.0	<10	NR	<1.8
Dibromochloromethane	ug/m3	--	<3.4	<3.4	<82	<3.4	<3.4	<910	<8100	<250	<3.4	<8.6	<8.9	<7.5	<19	NR	<3.4
Dichlorodifluoromethane	ug/m3	--	**2.8**	**2.4**	<47	**2.7**	**3.3**	<530	<4700	<150	**2.6**	**3.7 J**	**3.4 J**	**3.4 J**	<11	NR	<2.0
Ethylbenzene	ug/m3	420	**2.2**	**37**	**24 J**	**29**	**2.9**	**11000**	<4200	**360**	**8.0**	**29**	**30**	**10**	**31**	NR	<1.7
Hexachlorobutadiene	ug/m3	--	<4.3	<4.3	<100	<4.3	<4.3	<1100	<10000	<320	<4.3	<11	<11	<9.4	<24	NR	<4.3
m,p-Xylene	ug/m3	317000	**6.7**	**140**	**96**	**110**	**9.7**	**18000**	<8300	**1400**	**26**	**120**	**120**	**43**	**110**	NR	<3.5

Table D-2
Sherwin-Williams Emeryville Remediation Project
SOIL GAS SAMPLE RESULTS - June 6 and 7, 2012

Chemical	Unit	Action Level	Soil Gas Monitoring Point (SGMP)													Ambient Condition	Trip Blank
			SGMP-01	SGMP-02	SGMP-03	SGMP-04	SGMP-05	SGMP-06	SGMP-07	SGMP-08	SGMP-09	SGMP-10	SGMP-10 Duplicate	SGMP-11	SGMP-12		
Methylene chloride	ug/m3	--	<1.4	**14**	<33	**6.8**	**0.98 J**	<370	<3300	<100	**12**	**2.4 J**	**2.2 J**	**2.2 J**	**7.6**	NR	<1.4
Naphthalene	ug/m3	31.9	**16**	<10	<250	**8.4 J**	<10	<2800	<25000	<780	<10	<26	<27	<23	<59	NR	<10
o-Xylene	ug/m3	315000	**1.8**	**38**	<42	**35**	**3.4**	**330 J**	<4200	**410**	**8.1**	**40**	**40**	**15**	**38**	NR	<1.7
Styrene	ug/m3	--	<1.7	<1.7	<41	<1.7	<1.7	<450	<4100	<130	<1.7	<4.3	<4.4	<3.8	<9.5	NR	<1.7
Tetrachloroethene	ug/m3	180	**9.9**	<2.7	<65	<2.7	<2.7	<720	<6500	<200	<2.7	<6.8	<7.1	<6.0	<15	NR	<2.7
Toluene	ug/m3	135000	**8.4**	**87**	**37**	**92**	**14**	**380 J**	<3600	**4100**	**34**	**99**	**100**	**30**	**100**	NR	<1.5
trans-1,2-Dichloroethene	ug/m3	31900	<1.6	<1.6	<38	<1.6	<1.6	<420	<3800	<120	<1.6	<4.0	<4.1	<3.5	<8.8	NR	<1.6
trans-1,3-Dichloropropene	ug/m3	--	<1.8	<1.8	<44	<1.8	<1.8	<480	<4300	<130	<1.8	<4.6	<4.7	<4.0	<10	NR	<1.8
Trichloroethene	ug/m3	528	<2.1	<2.1	<52	<2.1	<2.1	<570	<5100	<160	<2.1	<5.4	<5.6	<4.8	<12	NR	<2.1
Trichlorofluoromethane	ug/m3	--	**11**	**41**	<54	**10**	**6.2**	<600	<5400	<170	**2.7**	**57**	**58**	**180**	**11 J**	NR	<2.2
Vinyl acetate	ug/m3	--	<2.8	<2.8	<68	<2.8	<2.8	<750	<6700	<210	<2.8	<7.1	<7.4	<6.2	<16	NR	<2.8
Vinyl chloride	ug/m3	13.3	<0.51	<0.51	<12	<0.51	<0.51	<140	<1200	<38	<0.51	<1.3	<1.3	**5.5**	<2.9	NR	<0.51

Notes:
Samples collected on June 6 and 7, 2012.
Action Levels based on the following:
Lower and Upper Explosion Limit (LEL/UEL) for methane at 25 degrees Celsius.
Acceptable presence of helium (leak-test gas) without compromising sample integrity and representiveness of soil gas, per Cal/EPA Advisory - Active Soil Gas Investigation (April 2012).
California Human Health Screening Level (CHHSL) for VOCs in soil gas under residential use, where applicable, per Cal/EPA guidance document (January 2005, revised November 2009).
ppm = parts per million and v/v = volume over volume ratio
ug/m3 = micrograms per cubic meter
NR = not reported by laboratory
Bold indicates detection above method detection limit (MDL).
Detections below laboratory reporting limit (RL) presented with J flag preceding result.
Yellow highlight indicates detection above action level.
Grey highlight indicates reporting limit above action level for VOCs or methane detected above UEL.
Green highlight indicates detection above CHHSL under industrial/commercial use (0.039 ppm v/v, 122 ug/m3 for benzene and 0.32 ppm v/v, 1400 ug/m3 for ethylbenzene).



K:\GIS\13452_Sherwin-Williams\69712\OriginalData\Figure11-2_Soil Gas Sampling Schematic.ai 05/13/11 KAS

Figure D-1

Soil Gas Sampling Schematic

Sherwin-Williams Company - Emeryville, California

Attachment E

Health and Safety Plans

HEALTH AND SAFETY PLAN FORM

This document is for the exclusive use of CDM Smith and its subcontractors

CDM Smith Health and Safety Program

CDM Smith PROJECT DOCUMENT #:

PROJECT NAME	SW 1450 Sherwin	**PROJECT#**	13452-58958	**REGION**	NSG-COU
SITE ADDRESS	1450 Sherwin Street Emeryville, CA	**CLIENT ORGANIZATION** **CLIENT CONTACT** **CLIENT CONTACT PHONE #**		The Sherwin Williams Company Mr. Larry Mencin (216) 566-1007	

( ) AMENDMENT TO EXISTING APPROVED H&SP?

( ) H&SP AMENDMENT NUMBER? _____ **( ) DATE OF PREVIOUS H&SP APPROVAL** _____

OBJECTIVES OF FIELD WORK:
(e.g. collect surface soil samples):

1). Install and sample soil vapor wells with direct push
2). Sample and abandon soil vapor wells 3). Annual site visit

SITE TYPE: *Check as many as applicable*

Active	()	Landfill	( )	Unknown	( )
Inactive	**(X)**	Uncontrolled	( )	Military	( )
Secure	**(X)**	Industrial	()	Other (specify)	
Unsecure	( )	Recovery	( )		
Enclosed space	( )	Well Field	( )		

All requirements described in the **CDM Health and Safety Manual** are incorporated in this health and safety plan by reference.

PERSONNEL AND RESPONSIBILITIES NAMES OF WORK CREW MEMBERS	COMPANY or DIVISION	SUPERVISORY TRAINED?	PROJECT OR SITE RESPONSIBILITIES	Tasks On Site?
Pawan Sharma	CDM Smith	C-S	Primary Site Technical Project Manager/Engineer Primary Site	1,2,3
Stefanie Mysel	CDM Smith	D	Site Geologist	1,2,3
Pawan Sharma	CDM Smith	C-S	Site Health and Safety Coordinator	1,2,3
Pawan Sharma	CDM Smith	C-S	Site Engineer	1.2.3

BACKGROUND REVIEW: (X) Complete ( ) Incomplete

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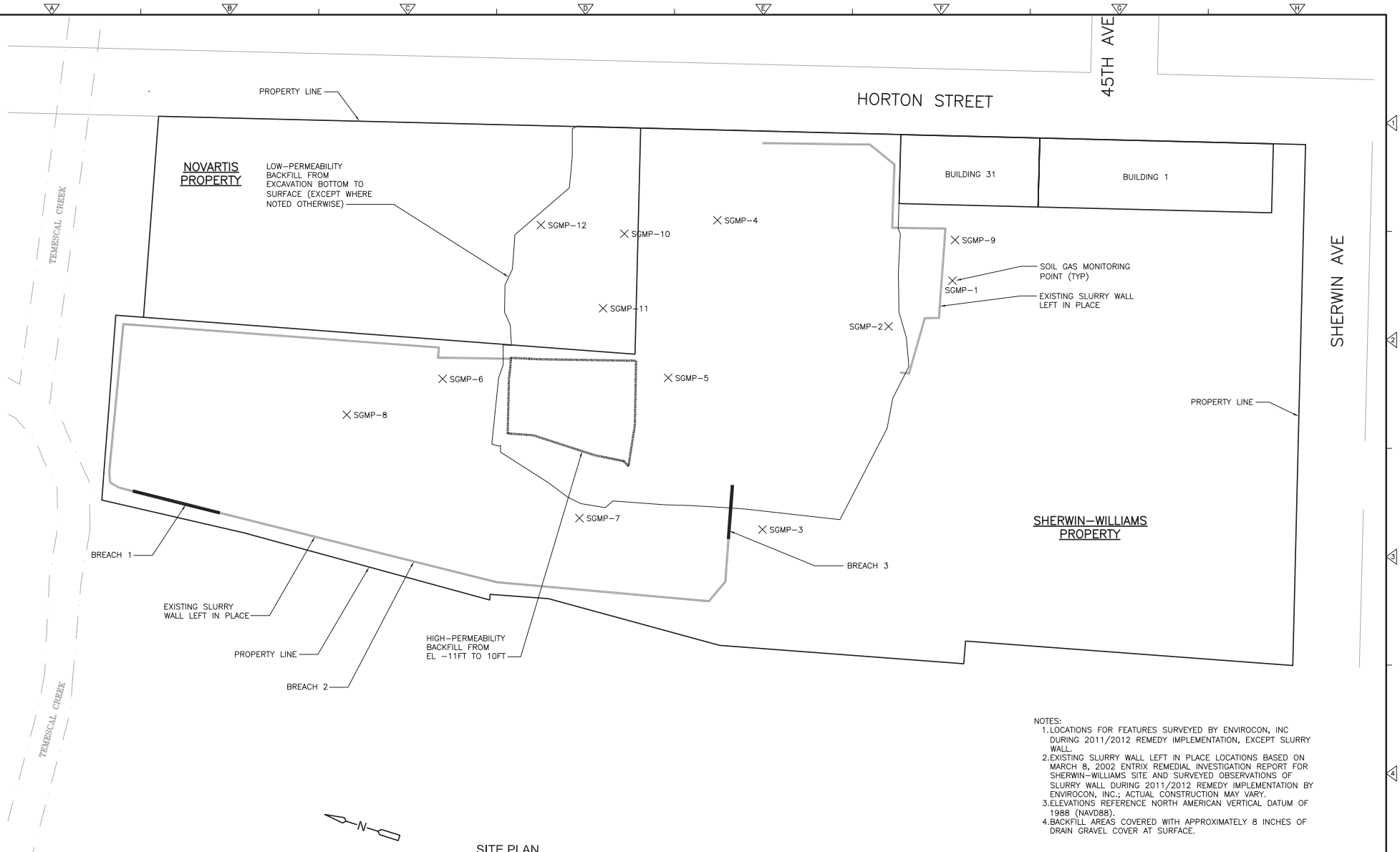

SITE PLAN
1" = 40
20 0 40

NOTES:
1. LOCATIONS FOR FEATURES SURVEYED BY ENVIROCON, INC DURING 2011/2012 REMEDY IMPLEMENTATION, EXCEPT SLURRY WALL.
2. EXISTING SLURRY WALL LEFT IN PLACE LOCATIONS BASED ON MARCH 8, 2002 ENTRIX REMEDIAL INVESTIGATION REPORT FOR SHERWIN-WILLIAMS SITE AND SURVEYED OBSERVATIONS OF SLURRY WALL DURING 2011/2012 REMEDY IMPLEMENTATION BY ENVIROCON, INC.; ACTUAL CONSTRUCTION MAY VARY.
3. ELEVATIONS REFERENCE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).
4. BACKFILL AREAS COVERED WITH APPROXIMATELY 8 INCHES OF DRAIN GRAVEL COVER AT SURFACE.

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: x
DRAWN BY: x
SHEET CHK'D BY: x
CROSS CHK'D BY: x
APPROVED BY:
DATE: MAY 2012

CDM Smith
100 Pringle Avenue, Suite 300
Walnut Creek, CA 94596
Tel: (925) 933-2900

VERIFY SCALE
THIS BAR IS ONE INCH LONG AT FULL SCALE

SHERWIN-WILLIAMS COMPANY
SITE REMEDIATION
EMERYVILLE, CALIFORNIA

SOIL GAS MONITORING POINTS

PROJECT NO. 13452-81494
FILE NAME: sw as-built1a.dwg
SHEET NO.

HEALTH AND SAFETY PLAN FORM	*This document is for the exclusive*	**CDM Smith**	
CDM Smith Health and Safety Program	*use of CDM Smith and its subcontractors*	**PROJECT DOCUMENT #:**	0

HISTORY: *Summarize conditions that relate to hazard. Include citizen complaints, spills, previous investigations or agency actions, known injuries, etc.*

Sherwin-Williams began operations at the Site in 1919. Coating products were manufactured since operations began, but also included the production of lead-arsenate pesticides from the 1920s until 1948. Sherwin-Williams produced oil-based paints until 1987 and has since only produced water-based coating materials until 2009 when the facility was decommissioned. A slurry wall was installed around the source area of lead-arsenate contamination on the Sherwin-Williams property in 1980s. Groundwater extraction wells were installed within the slurry wall to prevent contaminated groundwater from migrating downgradient. Groundwater is treated at the on-site treatment facility and then discharged to Temescal Creek. Contamination from the upgradient former Shell Development property, underground storage tanks from the downgradient former Southern Pacific Railroad also contribute to groundwater and soil contamination at the Site. In 2011/2012, the agency approved remedial action was implemented at the site.

WASTE TYPES: (X) Liquid (X) Solid ( ) Sludge ( ) Gas ( ) Unknown ( ) Other, specify:

WASTE CHARACTERISTICS: *Check as many as applicable.*

( ) Corrosive () Flammable ( ) Radioactive

(X) Toxic **(X) Volatile** ( ) Reactive
( ) Inert Gas ( ) Unknown
( ) Other: _____

WORK ZONES:

The entire Site will be considered a work area and all PPE will be required with the fenced area. Specific work zones will be based on location of boring. When drilling, the exclusion zone (CRZ) is 1.5X the mast height of the drill rig. The contamination reduction zone is along the perimeter of the exclusion zone at the inside edge of the fenced work area. All protective equipment will be removed in the CRZ.

HAZARDS OF CONCERN: *Check as many as applicable.*

(X) Heat Stress CDM Guideline
( ) Cold Stress CDM Guideline
(X) Explosive/Flammable
( ) Oxygen Deficient
( ) Radiological
(X) Biological ticks
(X) Noise CDM Guideline
(X) Inorganic Chemicals
( ) Organic Chemicals
( ) Motorized Traffic
(X) Heavy Machinery
(X) Slips & Falls CDM Guideline

FACILITY'S PAST AND PRESENT DISPOSAL METHODS AND PRACTICES:

Soil produced during installation of wells will be containerized in 55-gallon drums. Soil will be characterized and disposed offsite.

This plan incorporates CDM's procedure for: *(Click on the relevant topics to download the hazard guideline. Delete irrelevant topics.)*

Housekeeping
Traffic and Work Zone Safety
Tools and Power Equipment
Working Around Heavy Equipment
Hazardous Waste Site Controls
Hazardous Waste Site Decontamination
Working Safely Around Drill Rigs

HEALTH AND SAFETY PLAN FORM	*This document is for the exclusive*	CDM Smith	
CDM Smith Health and Safety Program	*use of CDM Smith and its subcontractors*	PROJECT DOCUMENT #:	0

DESCRIPTION AND FEATURES: *Include principal operations and unusual features (containers, buildings, dikes, power lines, hillslopes, rivers, etc.)*

The site is occupied by two building associated with past operations of manufacturing paints, pigments, and pesticides. Subsequent to demolition activities that concluded in late November 2007 and cleanup activities that concluded in April 2012, the property is now covered by asphalt/concrete paved areas and gravel cover areas. Paved area are mainly foundations for several demolished buildings. The former Rifkin property is located along the western side of Horton Street, adjacent to the north and east of portions of the S-W property. The portion of the former Rifkin property included as part of the Site is currently covered by asphalt and serves as a parking lot.

SURROUNDING POPULATION: (X) Residential ( ) Industrial (X) Commercial ( ) Rural ( ) Urban OTHER:

HAZARDOUS MATERIAL SUMMARY: ***Highlight or bold waste types and estimate amounts by category.***

CHEMICALS: *Amount/Units:*	**SOLIDS:** *Amount/Units:*	**SLUDGES:** *Amount/Units:*	**SOLVENTS:** *Amount/Units:*	**OILS:** *Amount/Units:*	**OTHER:** *Amount/Units:*
Acids	Flyash	Paints	Ketones	**Oily Wastes**	Laboratory
Pickling Liquors	Mill or Mine Tailings	Pigments	Aromatics	**Gasoline**	Pharmaceutical
Caustics	Asbestos	Metals Sludges	Hydrocarbons	**Diesel Oil**	Hospital
Pesticides	Ferrous Smelter	POTW Sludge	Alcohols	Lubricants	Radiological
Dyes or Inks	Non-Ferrous Smelter	Distillation Bottoms	**Halogenated (chloro, bromo)**	Polynuclear Aromatics	Municipal
Cyanides	**Metals**	Aluminum	Esters	PCBs	Construction
Phenols	Dioxins		Ethers	Heating Oil	Munitions
Halogens					
Other - *specify*	Other - *specify*	Other - *specify*	Other - *specify*	Other - *specify*	Other - *specify*
	Perchlorate		**Non-halogenated**		**Arsenic**

KNOWN CONTAMINANTS	HIGHEST OBSERVED CONCENTRATION	PEL/TLV *ppm or mg/m3* *(specify)*	IDLH *ppm or mg/m3* *(specify)*	Warning Concentration *(in ppm)*	SYMPTOMS & EFFECTS OF ACUTE EXPOSURE	PHOTO IONIZATION POTENTIAL

PLEASE SEE ATTACHED WORD FILE FOR THIS INFORMATION

*** State of California Public Health goal**

NA = Not Available **NE = None Established** **U = Unknown**

Carc. = Carcinogenic

Verify your access to an MSDS for each chemical you will use at the site.

S = Soil SW = Surface Water T = Tailings W = Waste TK = Tanks SD = Sediment
A = Air GW = Ground Wate SL = Sludge D = Drums L = Lagoons OFF = Off-Site

KNOWN OR POTENTIAL CONTAMINANTS	HIGHEST OBSERVED CONCENTRATION IN SHALLOW GROUNDWATER	HIGHEST OBSERVED CONCENTRATION IN SHALLOW SOIL	PEL/TLV ppm or mg/m^3 *(specify)*	IDLH ppm or mg/m^3 *(specify)*	SYMPTOMS/EFFECTS OF ACUTE EXPOSURE	Photo Ionization Potential (eV)
Chemicals of Concern most likely encountered in air as respirable dust and organic vapor						
Arsenic	**820 mg/L**	**13,000 mg/kg**	**10 µg/m³**	**5 mg/m³**	**Nasal ulcers, fever, bronchitis, melanosis, peripheral neuropathy, dermatitis gastrointestinal disturbances, respiratory irritation**	**Dust**
Lead	**0.15 mg/L**	**500 mg/kg**	**50 µg/m³**	**100 mg/m³**	**Pallor, colic, insomnia, lassitude (weakness, exhaustion), constipation, abdominal pain, irritation of eyes**	**Dust**
1,2,4-Trimethylbenzene	**620 ug/L (0.620ppm)**	**0.95 mg/kg**	**25 ppm**	**NE**	**Eye, skin, nose & throat & respiratory system irritation, pneumonia; bronchitis; hypochromatic anemia; headache, drowsiness, lassitude, dizziness, nausea, incoordination; vomit, confusion**	**NA**
1,3,5-Trimethylbenzene	**190 ug/L (0.190ppm)**	**0.23**	**25 ppm**	**NE**	**Eye, skin, nose & throat & respiratory system irritation, pneumonia; bronchitis; hypochromatic anemia; headache, drowsiness, lassitude, dizziness, nausea, incoordination; vomit, confusion**	**NA**
1,2 Dichloroethane (Ethylened dichloride)	**240 ug/L (0.240ppm)**	**NA**	**50 ppm**	**26 ppm**	**Irritated skin, eyes, corneal opacity; nausea, vomit; dermatitis; CNS depression; liver, kidney, lung damage**	**11.05**
Benzene	**950 ug/L (0.950ppm)**	**0.02 mg/kg**	**0.5 ppm**	**500 ppm**	**Irritated skin, eyes, nose, respiratory system; dizziness; headache, nausea, staggered gait; anorexia, lassitude, dermatitis; CNS depression; liver, kidney, lung damage**	**9.25**
Ethylbenzene	**9,800 ug/L (9.80ppm)**	**140 mg/kg**	**100 ppm**	**800 ppm**	**Irritated skin, eyes, mucous membrane; headache, dermatitis, narcosis, coma; CNS depression; liver, kidney, lung damage**	**9.25**
Tetrachloroethene	**45,000 ug/L (45.0ppm)**	**NA**	**25 ppm**	**150 ppm**	**Irritated eyes, nose, throat, skin, and respiratory system; nausea; incoordination, headache, drowsiness; skin erythema; flushed face & neck, dizziness**	**8.76**

Toluene (skin)	330,000 ug/L (330ppm)	270 mg/kg	50 ppm	500 ppm	Irritated skin, eyes, nose; lassitude, confusion, euphoria, dizziness, headache; dilated pupils, lacrimation; anxiety, muscle fatigue, insomnia; paresthesia, dermatitis; CNS depression; liver, kidney, lung damage	8.82
Trichloroethene	8,200 ug/L (8.20ppm)	NA	50 ppm	1,000 ppm	Irritation in eyes, skin; lassitude, dizziness, tremor, nausea, vomit; dermatitis; cardiac arrhythmias, paresthesia; liver injury; vertigo, visual disturbance, headache, drowsiness	9.45
Vinyl Chloride *	17 ug/L (0.017ppm)	NA	1 ppm	NE	Lassitude;gastrointestinal bleeding; enlarged liver; pallor or cyanosis of extremities; frostbite (liquid), abdominal pain, CNS depression	10.00
Xylenes (total)	210,000 ug/L	580 mg/kg	100 ppm	900 ppm	Irritated skin, eyes, nose, throat; dizziness, excitement, drowsiness, incoordination, staggering gait; corneal vacuolization; anorexia, nausea, vomit, abdominal pain; dermatitis CNS depression; liver, kidney, lung damage	8.44
Other Chemicals of Concern at site						
Beryllium	0.01 mg/L	0.69 mg/kg	2 µg/m^3	4 mg/m^3	Respiratory symptoms, weakness, weight loss	Dust
Cadmium	0.42 mg/L	11 mg/kg	5 µg/m^3	9 mg/m^3	Pulmonary edema, tight chest, chills	Dust
Copper	2.10 mg/L	383 mg/kg	1 mg/m^3	NE	Nasal perforation, metal taste	Dust
Iron	1,200 mg/L	NA	5 mg/m^3	2,500 mg/m^3	Benign pneumoconiosis, cough	Dust
Manganese	88 mg/L	NA	0.2 mg/m^3	500 mg/m^3	"Dead face", dry throat, cough metal fume fever, pneumonia	Dust
Nickel	2.03 mg/L	110 mg/kg	1 mg/m^3	10 mg/m^3	Skin sensitivity, chest pain, "asthma"	Dust
Thallium	0.15 mg/L	0.87 mg/kg	100 µg/m^3	15 mg/m^3	Nausea, diarrhea, stomach pain	NA
Zinc	230 mg/L	53,000 mg/kg	5 mg/m^3	NE	Sweet metal taste, dry throat, cough, tight chest, chills	Dust
1,1,2,2-Tetrachloroethane	18 ug/L (0.018ppm)	NA	100 ppm	150 ppm	Irritated eyes, nose, throat, flushed face and neck, dizziness	9.32

1,2-Dichloropropane	270 ug/L (0.270ppm)	NA	75 ppm	400 ppm	Eye irritation, drowsiness, lightheadedness	10.87
2-Butanone	1,700 mg/L	NA	200 ppm	3,000 ppm	Irritated eyes, dizziness, vomiting	9.53
Acetone	2,500 mg/L	0.28 mg/kg	500 ppm	2,500 ppm	Irritated eyes, headache, dizziness	9.69
Carbon Tetrachloride	290 ug/L (0.290ppm)	NA	2 ppm	200 ppm	Central nervous system depression, nausea, liver damage	11.5
Chloroform	270 ug/L (0.270ppm)	NA	2 ppm	500 ppm	Mental dullness, headaches, anesthesia, dizziness	11.4
1,2-Dichloroethene (cis)	100 ug/L (0.100ppm)	NA	200 ppm	1,000 ppm	Irritated eyes, CNS depression	10
Methyl Tert Butyl Ether	22 ug/L (0.022ppm)	NA	40 ppm	NE	Drowsiness, eye irritation, incoordination, rapid breathing	<9.40
o-Xylenes	4,400 ug/L (4.40ppm)	NA	100 ppm	900 ppm	Eye, nose & throat irritation, drowsiness, nausea, incoordination	8.44
1,2 Dichloroethene (trans)	100 ug/L (0.100ppm)	NA	200 ppm	1000 ppm	Irritated skin, CNS depression; liver, kidney, lung damage	9.65
4-Methylphenol	1,000 ug/L (1.00ppm)	NA	5 ppm	250 ppm	Skin corrosive, eye irritant, muscle aches, dark urine	8.5
Acenaphthene	390 ug/L (0.390ppm)	NA	0.20 ppm	NE	Irritant to eyes, skin, throat; coughing, wheezing, vomiting	
Naphthalene	650 ug/L (0.650ppm)	10 mg/kg	10 ppm	250 ppm	Eye irritation, headache, confusion, excitement, nausea	8.12
TPH (diesel)	1,900 mg/L	71 mg/kg	300 ppm	NE	Vomiting, diarrhea, insomnia, dizziness, headache	NA
TPH (gasoline)	1,900 mg/L	300 mg/kg	300 ppm	NE	Vomiting, diarrhea, insomnia, dizziness, headache	NA
NA = Not Available S = Soil A = Air L = Lagoon * = Suspected Carcinogen	NE = None Established SW = Surface Water SL = Sludge FL = Fly ash		U = Undetected GW = Ground Water D = Drums T = Tailings	TK = Tanks mg/L = milligram per liter ug/L = microgram per liter	PEL = Permissible Exposure Limit TLV = Threshold Limit Value IDLH = Immediately Dangerous to Life and Health mg/m^3 = milligram per cubic meter ppm = parts per million	

SPECIFIC TASK DESCRIPTIONS	Disturbing the Waste?	TASK - SPECIFIC HAZARDS	HAZARD & SCHEDULE
1 Install and sample soil vapor wells	**Intrusive** Non-intrusive	Noise, slips, trips, and falls, heavy equipment operation, mechanical injuries, heat stress, biological hazards, contact with contaminants	Low Hazard Spring
2 Sample and abandon soil vapor wells	**Intrusive** Non-intrusive	Noise, slips, trips, and falls, heavy equipment operation, mechanical injuries, heat stress, biological hazards, contact with contaminants	Low Hazard Fall
3 Annual Site visit	Intrusive **Non-intrusive**	Slips, trips, and falls, heat stress, biological hazards	Low Hazard TBD

SPECIALIZED TRAINING REQUIRED:	SPECIAL MEDICAL SURVEILLANCE REQUIREMENTS:
None	**None**

OVERALL HAZARD EVALUATION: ( ) High ( ) Medium (X) Low ( ) Unknown *(Where tasks have different hazards, evaluate each.)*

JUSTIFICATION: Appropriate work practices and monitoring to be used during intrusive activities. PPE will be upgraded if necessary.

FIRE/EXPLOSION POTENTIAL: ( ) High ( ) Medium (X) Low ( ) Unknown

PROTECTIVE EQUIPMENT: *Specify by task. Indicate type and/or material, as necessary. Group tasks if possible. Use copies of this sheet if needed.*

BLOCK A

TASKS: 1,2,3
LEVEL: **D**
(X) Primary ( ) Contingency

Respiratory: **(X) Not needed**
( ) SCBA, Airline:
( ) APR:
( ) Cartridge:
( ) Escape Mask:
( ) Other:

Head and Eye: ( ) Not needed
(X) Safety Glasses:
( ) Face Shield:
( ) Goggles:
(X) Hard Hat:
( ) Other:

Boots: ( ) Not needed

(X) Steel-Toe ( ) Steel Shank
( ) Rubber **(x) Leather**
( ) Overboots:

Prot. Clothing: ( ) Not needed
( ) Encapsulated Suit:
( ) Splash Suit
( ) Apron:
( ) Tyvek Coverall
( ) Saranex Coverall
( ) Cloth Coverall:
(X) Other: Work clothes

Gloves: ( ) Not needed
(X) Undergloves: Nitrile
( ) Gloves:
( ) Overgloves:

( ) Other: specify below

(X) Sun screen
(X) Hearing protection
(X) Safety Vest
( ) Flotation Device

BLOCK B

TASKS: 1,2,3
LEVEL: **C**
( ) Primary **(X) Contingency**

Respiratory: ( ) Not needed
( ) SCBA, Airline:
(X) APR: Full or Half Face
(X) Cartridge:
( ) Escape Mask:
( ) Other:

Head and Eye: ( ) Not needed
(X) Safety Glasses:
( ) Face Shield:
( ) Goggles:
(X) Hard Hat:
( ) Other:

Boots: ( ) Not needed

(X) Steel-Toe ( ) Steel Shank
( ) Rubber **(X) Leather**
( ) Overboots: Latex

Prot. Clothing: ( ) Not needed
( ) Encapsulated Suit:
( ) Splash Suit
( ) Apron:
(X) Tyvek Coverall
( ) Saranex Coverall
( ) Cloth Coverall:
( ) Other:

Gloves: ( ) Not needed
(X) Undergloves: Nitrile
( ) Gloves:
( ) Overgloves:

Other: specify below

(X) Sun screen
(X) Hearing protection
(X) Bug repellant
( ) Flotation Device

BLOCK C

TASKS: 1 - 2 - 3
LEVEL: **LEAVE SITE**
( ) Primary **(X) Contingency**

Respiratory: ( ) Not needed
( ) SCBA, Airline:
( ) APR:
( ) Cartridge:
( ) Escape Mask:
( ) Other:

Head and Eye: ( ) Not needed
( ) Safety Glasses:
( ) Face Shield:
( ) Goggles:
( ) Hard Hat:
( ) Other:

Boots: ( ) Not needed

( ) Steel-Toe ( ) Steel Shank
( ) Rubber ( ) Leather
( ) Overboots:

Prot. Clothing: ( ) Not needed
( ) Encapsulated Suit:
( ) Splash Suit
( ) Apron:
( ) Tyvek Coverall
( ) Saranex Coverall
( ) Cloth Coverall:
( ) Other:

Gloves: ( ) Not needed
( ) Undergloves:
( ) Gloves:
( ) Overgloves:

Other: specify below

LEAVE SITE

BLOCK D

TASKS: 1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10
LEVEL: A - B - C - D - Modified
( ) Primary ( ) Contingency

Respiratory: ( ) Not needed
( ) SCBA, Airline:
( ) APR:
( ) Cartridge:
( ) Escape Mask:
( ) Other:

Head and Eye: ( ) Not needed
( ) Safety Glasses:
( ) Face Shield:
( ) Goggles:
( ) Hard Hat:
( ) Other:

Boots: ( ) Not needed

( ) Steel-Toe ( ) Steel Shank
( ) Rubber ( ) Leather
( ) Overboots:

Prot. Clothing: ( ) Not needed
( ) Encapsulated Suit:
( ) Splash Suit
( ) Apron:
( ) Tyvek Coverall
( ) Saranex Coverall
( ) Cloth Coverall:
( ) Other:

Gloves: ( ) Not needed
( ) Undergloves:
( ) Gloves:
( ) Overgloves:

Other: specify below

( ) Tick Spray
( ) Flotation Device
( ) Hearing Protection
( ) Sun Screen

This health and safety plan form constitutes hazard analysis per 29 CFR 1910.132

HEALTH AND SAFETY PLAN FORM CDM Smith Health and Safety Program		*This document is for the exclusive use of CDM Smith and its subcontractors*		CDM Smith PROJECT DOCUMENT #: 0
MONITORING EQUIPMENT:		*Specify by task. Indicate type as necessary. Attach additional sheets if needed.*		
INSTRUMENT	**TASK**	**ACTION GUIDELINES**		**COMMENTS**
Combustible Gas Indicator	1-2-3-4-5-6-7-8	0-10% LEL	*No explosion hazard*	(X) Not Needed
		10-25% LEL	*Potential explosion hazard; notify SHSC*	
		>25% LEL	*Explosion hazard; interrupt task/evacuate*	
		21.0% O2	*Oxygen normal*	
		<21.0% O2	*Oxygen deficient; notify SHSC*	
		<19.5% O2	*Interrupt task/evacuate*	
Radiation Survey Meter	1-2-3-4-5-6-7-8	3 x Background:	*Notify HSM*	(X) Not Needed
		>2mR/hr:	*Establish REZ*	
5 Gas Multi Gas Detector **__10.6___eV Lamp** Type ___MultiRae 2000_	**1,2**	*Specify:*		**Needed** **Will be on site during soil vapor installation, sampling and abandonment.**
		0-10% LEL	*No explosion hazard*	
		10-25% LEL	*Potential explosion hazard; notify SHSC*	
		>25% LEL	*Explosion hazard; interrupt task/evacuate*	
		21.0% O2	*Oxygen normal*	
		<21.0% O2	*Oxygen deficient; notify SHSC*	
		<19.5% O2	*Interrupt task/evacuate*	
		<1 ppm VOC	*Continue work in level D ppe*	
		>1 ppm VOC	*Stop work and determine if need to up grade ppe*	
Flame Ionization Detector Type_____	1-2-3-4-5-6-7-8	*Specify:*		(X) Not Needed
Single Gas Type_____ Type_____	1-2-3-4-5-6-7-8	*Specify:*		(X) Not Needed
Respirable Dust Monitor Type_____ Type_____	1-2-3-4-5-6-7-8	*Specify:*		(X) Not Needed
Other *Specify:* Type_____ Type_____	1-2-3-4-5-6-7-8	*Specify:*		( ) Not Needed
Other *Specify:* **DUST** Type_____ Type_____	**1,2**	*Specify:*	**Stop work if visible dust can't be controlled**	**Needed** **Control all visible dust**

DECONTAMINATION PROCEDURES

ATTACH SITE MAP INDICATING EXCLUSION, DECONTAMINATION, & SUPPORT ZONES AS PAGE TWO

Personnel Decontamination	**Sampling Equipment Decontamination**	**Heavy Equipment Decontamination**
Summarize below or attach diagram;	*Summarize below or attach diagram;*	*Summarize below or attach diagram;*
Team members will remove their protective clothing in the following order: # Equipment drop # Hard hat removal # Glove removal # Hand and face wash # Shower as soon as possible ( ) Not Needed	Decontamination of sampling equipment will consist of a soap /tap water wash, tap water rinse and deionized water rinse. ( ) Not Needed	Digging and Drilling equipment will be decontaminated by steam cleaner on the drill rig. ( ) Not Needed
Containment and Disposal Method	**Containment and Disposal Method**	**Containment and Disposal Method**
Wash water will not be contained.	Wash water will be contained in 55-gallon drum.	Residual drill cuttings and decon water will be contained in 55-gallon drums for characterization and offsite disposal.

HAZARDOUS MATERIALS TO BE BROUGHT ONSITE

Preservatives		*Decontamination*		*Calibration*	
( ) Hydrochloric Acid	( ) Zinc Acetate	(X) Alconox TM	( ) Hexane	( ) 100 ppm isobutylene	( ) Hydrogen Sulfide
( ) Nitric Acid	( ) Ascorbic Acid	( ) Liquinox TM	( ) Isopropanol	( ) Methane	( ) Carbon Monoxide
( ) Sulfuric Acid	( ) Acetic Acid	( ) Acetone	( ) Nitric Acid	( ) Pentane	( ) pH Standards
( ) Sodium Hydroxide	( ) Other:	( ) Methanol	( ) Other:	( ) Hydrogen	( ) Conductivity Std
		( ) Mineral Spirits		( ) Propane	( ) Other:

HEALTH AND SAFETY PLAN FORM *This document is for the exclusive* **CDM Smith**

CDM Smith Health and Safety Program *use of CDM Smith and its subcontractors* **PROJECT DOCUMENT #:** 0

EMERGENCY CONTACTS

Water Supply	N/A
Site Telephone Autodialer	510-420-7200
EPA Release Report #:	800 / 424 - 8802
CDM 24-Hour Emergency #:	CED 732 / 539 - 8128
Facility Management	
Other (specify) CAL-OSHA	N/A
CHEMTREC Emergency #:	800 / 424 - 9300

SAFETY NARRATIVE: *Summarize below*

CDM Smith shall ensure utility locates are performed prior to intrusive activities. Drilling and sampling personnel shall also be closely monitored for cleanliness duruing activities. If soil or water is observed on work clothing, the SSO will direct the workers to don Tyvek or similar disposable protective clothing.

Emergency Response Plan (ERP)

Prior to start of task activities, this plan will be discussed and signed by each person working at the Site. Site information, associated hazards, intended work and emergency procedures will be presented.
Two people will be present onsite during task activities. In the event of personnel injury, the uninjured person will direct emergency activities and implementation of the ERP.
In an event of a life threatening injury where there is insufficient time to wait for an ambulance, the field vehicle will be used to transport the injured personnel to the Kaiser Foundation Hospital (280 West Macarthur Boulevard, Oakland, CA).
If additional emergency personnel must be summoned to the Site the southeast corner of the site (entrance to building) will be used as the contact area.
A first aid kit will be available onsite for minor injuries, (i.e., scrapes, cuts, etc.) Call 911 for other emergencies.
Reporting of incidents to pertinent local, state, and federal agencies will be performed by appropriate CDM Smith representatives after report by field personnel. Review and follow up will be directed by said CDM Smith representatives.
No additional emergency or PPE will be kept at the Site for emergencies nor will emergency personnel require PPE during emergency response.
Emergency services will be contacted by cellular telephone.

Local Emergency Contacts

Pre-activity meetings with local officials and/or other local emergency and public safety agencies (e.g., fire, police, and local health officials) is not necessary. Coordination with these agencies will be carried out during emergencies only.
Contacting the local medical facility prior to commencement of work will not be necessary for remedial action activities. Map to hospital is attached. Assembly areas are not required as all personnel onsite will be together at all times.
Emergency decontamination of injured workers will not vary from normal decontamination procedures. Nitrile gloves will be removed. Hands and face may be washed once the injured worker has reached the emergency facility.

HEALTH AND SAFETY PLAN APPROVALS (H&S Mgr must sign each plan)

Prepared by	Stefanie Mysel	Date	5/23/2012
HSC Signature		Date	
HSM Signature		Date	5/29/12

EMERGENCY CONTACTS	NAME	PHONE
Health and Safety Manager	Paul Opem	(303) 383-2483
Project Manager	Pawan Sharma	(925) 296-8074
Site Safety Coordinator	Pawan Sharma	(925) 296-8074
Client Contact	Mr. Larry Mencin	(216) 566-1007
Site Contact	Luis Banaag	(510) 420-7200
Environmental Agency		
State Spill Number	California	(800) 852-7550
Fire Department		911
Police Department		911
State Police		911
Health Department		
Poison Control Center	Nationwide	800 / 222 - 1222
Occupational Physician	Dr. Jerry Berke	800 / 350-4511

MEDICAL EMERGENCY	PHONE
Hospital Name: Foundatio	(510) 752-1000
Hospital Address 280 West Macarthur Blvd, Oakland, CA 94611	
Name of Contact at Hospital: N/A	
Name of 24-Hour Ambulance: Emergency	911
Route to Hospital: see attached map	

Head east on Sherwin St. to Horton Street. (161 feet), turn right on Horton St. (0.2 mi), turn left on 40th St. (0.8 mi), turn right on Market St. (0.2 mi), turn left at W. Macarthur Blvd. (0.9 mi), arrive at 280 W. Macarthur Blvd.

Distance to Hospital 2.1 miles (10 minutes)

16.12 Tools and Power Equipment

16.12.1 Hand Tools

CDM Smith employees who have a need to use basic hand tools should use the following work practices:

- All tools used on CDM Smith projects, regardless of ownership, shall be of an approved type and maintained in good condition. Tools are subject to inspection at any time. The project manager has the authority and responsibility to condemn unserviceable tools, regardless of ownership.
- Tag defective tools to prevent their use or removal from the job site.
- Use the proper tool for the job performed.
- Do not use hammers with metal handles, screwdrivers, knives with metal continuing through the handle, and metallic measuring tapes on or near energized electrical circuits or equipment.
- Do not throw tools from place to place or from person to person. Tools that must be raised or lowered from one elevation to another shall be placed in tool buckets or firmly attached to hand lines.
- Do not place tools unsecured on elevated places.
- Dress, repair, or replace all impact tools such as chisels, punches, drift pins, etc., that become mushroomed or cracked before further use.
- Use suitable holders or tongs, not the hands, to hold chisels, drills, punches, ground rods, or pipes that are struck by another employee.
- Do not use shims to make a wrench fit.
- Do not use wrenches with sprung or damaged jaws.
- Do not use pipe or other means to extend a wrench handle for added leverage unless the wrench was designed for such use.
- Use tools only for the purposes for which they have been designed.
- Store and handle tools with sharp edges so that they will not cause injury or damage. They shall not be carried in pockets.
- Use eye protection when using or working around impact type tools (e.g., hammer, chisel, ax, hatchet, etc.).
- Replace wooden handles that are loose, cracked, or splintered. The handle shall not be taped, glued, or lashed with wire.

- Keep all cutting tools such as saws, wood chisels, knives, or axes in suitable guards or in special compartments.

- When using such tools as screwdrivers and wrenches, avoid using your wrists in a bent, flexed, extended, or twisted position for long periods of time. Employees should maintain their wrists in a neutral or straight position.

- Do not leave tools lying around where they may cause a person to trip or stumble.

- When working on or above open grating, use a canvas or other suitable covering to cover the grating to prevent tools or parts from dropping to a lower level where others are present, or barricade or guard the danger area.

- Do not depend on the insulation on hand tools to protect users from shock.

16.12.2 Electric Tools

CDM Smith employees who have a need to use electric power tools should use the following work practices:

- The non-current carrying metal parts of portable electric tools such as drills, saws, and grinders shall be effectively grounded when connected to a power source unless the tool is an approved double-insulated type or the tool is connected to the power supply by means of an isolating transformer or other isolated power supply, such as a 24-volt DC system.

- All power tools shall be examined before use to ensure general serviceability and the presence of all applicable safety devices. The electric cord and components shall be given a thorough examination for cracks, exposed wires, or other defects.

- Power tools shall be used only within their capability and shall be operated in accordance with the manufacturers' instructions.

- The use of eye protection is required when using or working around power tools.

- Operators should take care to use appropriate hand positions on cutting tools such as saws, drills, or grinders to avoid hand injury.

- All tools shall be kept in good repair and disconnected from the power source while repairs are being made.

- Electrical tools shall not be used where there is a hazard of flammable vapors, gases, or dusts until that hazard is firmly under control.

- GFCI should be used with all electric power tools.

- All guards and safety interlocks with which the tools were purchased shall be in place and in working order.

- Any tool that is identified as defective should be tagged "not for use," and set aside for repair and/or discarded.
- Do not wear loose or frayed clothing while operating power tools and equipment. Hair should not stick out from hard hats.
- Do not use electrical cords to transport, suspend, hoist, or lower tools.
- Do not allow power cords to lie in water.
- Disconnect rotating tools from the power source before adjusting, servicing, or cleaning them. Follow the lockout procedure described in Section 16.5.
- Do not modify tools.

16.12.3 Pneumatic Tools

CDM Smith employees that use pneumatic power tools should use the following work practices:

- Compressed air and compressed air tools shall be used with caution.
- Pneumatic tools shall never be pointed at another person.
- Pneumatic hose connections should be secured by some positive means to prevent them from becoming accidentally disconnected. Chicago fittings have wire holes to allow such security.
- Pneumatic power tools shall be secured to the hose by some positive means to prevent the tool from becoming accidentally disconnected.
- Safety clips or retainers shall be securely installed and maintained on pneumatic impact tools to prevent attachments from being accidentally expelled.
- Compressed air shall not be used for cleaning purposes except when reduced to less than 30 psi and then only with effective chip guarding and PPE.
- Compressed air shall not be used to blow dust or dirt from clothing (or skin).
- The manufacturer's safe operating pressure for hoses, pipes, valves, filters, and other fittings shall not be exceeded.
- The use of hoses for hoisting or lowering tools shall not be permitted.
- All compressed air hoses exceeding 30 psi shall have a safety device at the source of supply or branch line to reduce pressure in case of hose failure or disengagement of a connection.

- Before making adjustments or changing air tools, the air shall be shut off at the air supply valve ahead of the hose. The hose shall be bled at the tool before breaking the connection. Disconnection at the quick-change connectors is one way to meet this goal.
- Eye protection is required when using or working around pneumatic tools.
- Use hearing protection if noise exposure is a concern (i.e., if it is too loud to conduct a normal conversation).
- Pneumatic tools shall be operated only by persons trained in their use.
- A pneumatic tool used where it may contact exposed live electrical parts shall have a nonconductive hose and an accumulator to collect moisture.
- Employees shall not use any part of their bodies to locate or attempt to stop an air leak.
- All guards and safety interlocks must be in place and functional.

16.12.4 Engine-Powered Tools

CDM Smith employees that use engine-powered tools should use the following work practices:

- Stop the engine and allow it to cool before refueling, servicing, or maintenance.
- Use care in refueling. Clean up any small spills of fuel or oil immediately.
- The use of eye protection is required when using or working around engine-powered tools.
- Use hearing protection if noise exposure is a concern (i.e., if it is too loud to conduct a normal conversation).
- If possible, disconnect the spark plug before performing an adjustment, maintenance, or service.
- Use tools in well ventilated areas to eliminate any accumulation of fumes.
- Do not use tools in a flammable or explosive atmosphere.
- Equip engines with spark-arresting mufflers.
- Avoid contact with hot engine components.
- All guards and safety interlocks should be in place and functional.

16.15 Working Around Heavy Equipment

Good work practices while working around heavy equipment include:

- Assume the operator cannot see you. The operator's vision may be blocked by blind spots. He or she is frequently concentrating on their work and equipment and may not notice a site visitor.
- If you must approach the operator, be sure you have made eye contact with the operator and they know you will be approaching them before approaching the equipment. Verbal contact, direct or by radio, is even better. Do not approach if the equipment is moving or in operation.
- Stay clear of pinch points and swing areas of equipment. At CDM Smith projects, these areas should be taped or barricaded off; however, when equipment moves frequently, you cannot count on other organizations to mark these zones.
- Do not walk near a moving piece of equipment. It could turn or rotate any minute. Modern construction equipment moves fast and in any direction.
- On a noisy site, you may not notice the equipment's back-up alarm. Keep aware of what is happening around you.
- Never walk under a load on a crane or hoist. Indeed, avoid the area under the hook or bucket.
- Do not cut across the path of equipment backing up.
- Wear your hardhat and safety glasses. The safety glasses protect your eyes from dust and debris and the hardhat provides protection for your head and makes you more visible on the site.
- On sites where there is frequent vehicle or construction equipment movement, wear high-visibility clothing.
- Maintain a clearance of at least 10 feet between any part of the machine or its load and any electrical line or apparatus carrying up to 50,000 volts. One foot of additional clearance is required for every additional 30,000 volts.

16.18 Safety Working Around Drill Rigs

The use of mechanical drill rigs to collect soil samples and install monitoring wells presents significant hazards to operators and helpers, as well as technicians and engineers who may work in proximity to such rigs. CDM Smith employees that manage or oversee drilling operations should be aware of the basic hazards of drilling equipment and operations and have an awareness of safe drilling work practices. The guidelines and work practices described below should be implemented on all projects where mechanical drill rigs are used.

16.18.1 Preparation

- Contract documentation with drillers contracted with CDM Smith should include CDM Smith's standard contract between "Engineer & Subcontractor for Drilling Services," and "Health and Safety Protocol for Subcontractors" available on the Office of General Council's page of contract forms at http://cdmweb/legalforms/inc.htm.

- Before drilling or other subsurface operations, a survey should be conducted to identify any overhead or underground utilities, unexploded ordnance, tanks, pipes, or other underground structures. The local agency or organization for utility location should be contacted to identify underground utilities. In some cases, ground penetrating radar or magnetometer studies may be needed to identify the location of underground obstructions.

- The work area for the drill rig and crew should be cleared of sticks, logs, brush, and trash. Inspect the area for any potential tripping hazards and remove them. If they cannot be removed, they should be identified with caution tape or cones.

- Before rig setup, the planned arrangement of equipment should be such that it does not present a dangerous condition. Take into account slopes of hills, mud, standing water, overhead power lines, etc.

- OSHA regulations require that any part of the rig must be at least 10 feet away from power lines under 50kV or less. For higher voltage lines, 1 foot of additional clearance is required for every additional 30,000 volts.

- If working in an area of moving vehicular traffic, appropriate traffic control systems should be in place. Contact local police or traffic control officer, before placing any traffic control equipment (Section 16.22).

- Define an exclusion zone around the drill rig that is at least 1.5 times the height of the mast. Only personnel necessary for the immediate task being performed should be inside the exclusion zone.

16.18.2 Drill Rig Inspection

- After the rig is set up, but before operation, the work area should be inspected for eye, bump, and tripping hazards.
- The driller should inspect the rig daily before operation of the rig. The inspection should include the following:
    - Condition of the vehicle. Brakes should work and tires should have adequate tread. It should have a back-up alarm. If it is driven over the road, it should have all necessary brake lights, headlights, horn, license plates, etc.
    - All welds should be solid, with no sign of visible cracks.
    - All gauges should be functional and legible.
    - All machine guards should be in place.
    - Emergency kill switches should be functional. All site personnel should be aware of the location and function of the kill switches. Have the driller review these with site personnel.
    - Cable and wire rope should be inspected for fraying, decay, "bird caging," broken strands, kinking, or flattening.
    - All hoses should be secure and in good shape. They should not be loose, bulging, or leaking.
    - High-pressure fittings should be secure and have whip checks (a pin or wire to prevent the hose whipping in the event of a failure of the connection).
    - High-pressure relief valves should be in working order.
    - Wire rope loops should be secure with at least two clamps.
    - The rig should have a fire extinguisher and first aid kit.
    - All tools should be clean and in good working condition. Hooks, eyes, pins, etc. should not be corroded or bent. Rod clamps should be in good condition.
    - If a cathead is used, it should be clean and free of burrs. The cathead rope should be in good condition and not be frayed or have excessive wear.
    - Back-up alarms should be functional.
    - Vehicles should have all lug nuts and they should all be tight.

16.18.3 Work Practices

- All personnel working around drilling operations should wear appropriate PPE including a hard hat, safety glasses, and hard-toed work boots.
- Drill crews should wear work gloves.
- On hazardous waste sites, additional PPE such as respirators, protective clothing, gloves, etc. may also be required.
- In areas where there is vehicular traffic, personnel should also wear high-visibility vests or clothing.
- Maintain an organized work area free from tripping hazards.
- Drill rods or other equipment should not be stored leaning up against equipment.
- Drill holes should be completed or secured before leaving the site for the day. Drill holes should not be left open at an unattended site.
- Boring locations should be placed to minimize the possibility of contacting underground utilities or structures. Clearance should be obtained from the site project manager before drilling begins.
- Do not move the rig with the mast in the upright position.
- Use a spotter when moving the rig from one location to another on the site.
- When sampling activities require working in proximity with heavy equipment or drill rigs, sampling personnel will stand clear of the equipment until sampling is required. They will notify the operator they are going to take a sample and must receive acknowledgment from the operator.
- Do not wear loose clothing such as hooded sweatshirts, parkas, or clothing with hanging drawstrings around drill rigs.
- Monitor weather conditions. Drilling operations should be terminated and the area near the drill rig evacuated during high winds and or storms with the potential for lightning strikes. The lead driller should be consulted to help assess if weather conditions are safe for drilling.
- Drill crew personnel should wear a personal fall arrest harness, connected to a secure tie-off point, when climbing the mast or working where fall exposures exceed 6 feet.
- Hearing protection should be worn during operations that produce significant noise exposures. (If you cannot hold a conversation using a normal voice with someone within 3 feet of you because of background noise, the use of personal hearing protection is recommended.)

16.21 Decontamination at Hazardous Waste Sites

Proper decontamination helps protect employees and prevents the contamination of uncontaminated areas. Decontamination protects all site personnel by minimizing the transfer of harmful materials into clean areas. It helps prevent mixing of incompatible chemicals and protects the community by preventing uncontrolled transportation of contaminants from the site.

16.21.1 Prevention of Contamination

To prevent contamination, crew members should:

- Follow procedures for proper dressing before entry into the exclusion zone. Proper dressing will minimize the potential for contaminants to bypass the PPE and escape decontamination.
- Protect monitoring and sampling instruments by bagging. Make openings in the bags for sample ports and sensors that must contact site materials, or cover equipment and tools with a strippable coating, which can be removed during decontamination.
- Encase any source of contaminants on the site with barriers (e.g., plastic sheeting or over packs).
- Stress work practices that minimize contact with hazardous substances. Use remote sampling, handling, and container-opening techniques.

16.21.2 Decontamination Equipment Selection

In selecting decontamination equipment, consider whether the equipment must be decontaminated for reuse or can be easily disposed. Recommended equipment for decontamination includes:

- Storage tanks or appropriate treatment systems
- Drains or pumps
- Long-handled brushes
- Wash solutions appropriate for the contaminants present
- Rinse solutions appropriate for the contaminants present
- Pressurized sprayers for washing and rinsing
- Curtains, enclosures, or spray booths
- Long-handled rods and shovels
- Containers to hold contaminants and contaminated soils
- Wash and rinse buckets
- Brooms
- Containers for the storage and disposal of contaminated material

16.21.3 Decontamination Design

Decontamination facilities should be located in the CRZ, i.e., the area between the exclusion zone (the contaminated area) and the support zone (the clean area), and described in the site HSP.

- Site-specific factors that affect the decontamination facility design must be considered. Typical factors include:
  - The chemical, physical, and toxicological properties of the wastes
  - The pathogenicity of infectious wastes
  - The amount, location, and containment of contaminants
  - The potential for and location of exposure based on assigned worker duties, activities, and functions
  - The potential for wastes to permeate, degrade, or penetrate materials used for personal protective clothing and equipment, vehicles, tools, buildings, and structures
  - The proximity of incompatible wastes
  - The movement of personnel and/or equipment among different zones
  - The emergencies that may arise
  - The methods available for protecting workers during decontamination
  - The impact of the decontamination process and compounds on worker H&S
- Decontamination Line
  - Decontamination should be an organized process by which levels of contamination are reduced.
  - The decontamination process consists of a series of steps performed in a specific sequence. For example, outer, more heavily contaminated items are decontaminated first, followed by the decontamination and removal of inner, less contaminated items.
  - Each step should be performed at separate stations to prevent cross contamination.
  - Decontamination stations should allow enough separation to prevent cross contamination and should be arranged in order of decreasing contamination.
  - Separate decontamination areas should be provided to isolate workers from different contamination zones containing incompatible wastes or decontamination processes.
  - Entry and exit points should be conspicuously marked. Preferably the entry to the CRZ from the exclusion zone should be separate from the entry to the exclusion zone from the CRZ.
  - Dress-out stations for entry to the CRZ should be separate from redressing areas for exit from the CRZ.
  - Personnel who wish to enter clean areas of the decontamination facility, such as locker rooms, must be appropriately decontaminated first.
  - Examples of decontamination lines and procedures for personnel wearing various levels of protection are provided in Exhibits 16A and B.

16.21.4 PPE for Decontamination Workers

A rule of thumb is that decontamination workers wear a level of protection one level below the level of protection worn in the exclusion zone. However, consideration should be given to the following when determining the level of protection for a given project.

- The nature of site contamination
- Degree of contamination expected on workers leaving the exclusion zone
- The results of wipe tests and onsite air monitoring

Some site-specific cases may require that decontamination personnel wear the same level of PPE as workers in the exclusion zone. Cases include:

- Workers using a steam jet may need a different type of respiratory protection than other decontamination personnel because of the high moisture content of the steam jets.

- Cleaning solutions used and wastes removed during decontamination may generate harmful vapors, requiring a different type of respiratory or clothing protection.

16.21.5 Decontamination Methods

All personnel, clothing, equipment, and samples leaving the contaminated area of a site should be decontaminated to remove any harmful chemicals, radioactive material, or infectious organisms that may have adhered to them. The extent of decontamination will vary depending on the nature of site activity, site contamination, and other factors.

- Decontamination methods available include:

    - Physical removal
    - Chemical detoxification or disinfections/sterilization
    - A combination of both physical and chemical methods

- The selected decontamination method should be reviewed for any safety and health hazards. If the selected method poses a direct health hazard, measures shall be taken to protect both the decontamination personnel and the workers to be decontaminated.

- Physical Removal

    - Physical methods using high pressure and/or heat should be used with caution.
    - Loose contaminants can be removed by using a soap and water rinse with a soft bristle brush to remove dust and vapors that cling to equipment and workers, or that are trapped in small openings, such as clothing or fabric weaving.

- Adhering contaminants can be removed by:

    - Scraping, brushing, and wiping.
    - Solidifying.
    - Freezing (using dry ice or ice water).
    - Adsorption or absorption (e.g., kitty litter or powdered lime).
    - Melting.

- Volatile liquid contaminants can be removed from PPE or equipment by evaporation followed by a water rinse. Evaporation may be expedited by the use of steam jets.

- Chemical Removal

  - Decontamination using chemicals should only be done if recommended by an industrial hygienist or other qualified professional.
  - Any chemical used in the decontamination process must be chemically compatible with the equipment or clothing being decontaminated.
  - Halogenated solvents should only be used for decontamination in extreme cases where other cleaning agents will not remove the contaminant.

- Chemical removal types include the following:

  - Surface contaminants can be dissolved in a solvent.
  - Solidification of liquid or gel contaminants can enhance their physical removal. Typical solidification processes are moisture removal using adsorbents such as grounded clay or powdered lime; and chemical reactions using polymerization chemicals and/or chemical reagents.

16.21.6 Personnel Decontamination

Different levels of personnel protection, as discussed in the PPE guidelines, may be used at any given site. The following is a description of the decontamination process for each level of protection.

- **Level D**

  - An area should be designated for the gross removal of dirt and mud from gloves and boot covers. Paper towels and buckets of rinse water can be made available for this purpose.
  - Typical decontamination steps for Level D operations are provided in Exhibit 16-B.
  - Soap and water should be used to wash hands and face before leaving the site.
  - Laundering of personal clothing should be completed as soon as possible once offsite.

- **Level C and B**

  - A decontamination line should be established.
  - Site-specific procedures should be outlined in the site HSP. The recommended procedure for this layout is listed in Exhibit 16-C.

- **Level A** - It is not anticipated CDM Smith will directly participate in Level A operations. If required, site-specific procedures will be developed in coordination with the division HSM.

16.21.7 Sampling and Monitoring Equipment Decontamination

Sampling equipment often becomes grossly contaminated. Often trowels or drum thieves (coliwassas) are dedicated to a particular site. These should be left in the exclusion zone and disposed of as contaminated waste at the end of site work. Sampling equipment such as split spoons or other equipment that is used to collect several samples must be cleaned and decontaminated between samples to prevent cross contamination. These items should be cleaned and decontaminated in accordance with the project operations or sampling

plan. Dirt and wash solutions from sampling equipment decontamination should be collected and disposed of as investigation-derived waste.

Once grossly contaminated, testing and monitoring instrumentation can be difficult to decontaminate without causing damage to the instrument. Care should be taken in the field to prevent gross contamination of field instruments by avoiding direct contact between the instrument and contaminated soils, water, or surfaces. In some cases it may be necessary to place instruments in plastic bags, leaving small openings for sampling ports, detectors, and exhaust ports. The plastic bags can then be removed as the instrument comes out of the exclusion zone. The outside of instruments can be wiped down with paper towels or brushed off with clean soft brushes.

16.21.8 Heavy Equipment Decontamination

Drill rigs, trucks, backhoes, and other heavy equipment can be difficult to decontaminate. The method generally used is to wash them with water under pressure and scrub accessible areas with soap and warm water. Hot water and steam systems can be effective but may increase air concentrations of contaminants, exposing decontamination workers. Particular care should be taken where equipment comes into direct contact with contaminated soils such as tires, buckets, or treads. In severe cases, tires may need to be replaced or parts sand blasted clean or disposed of. Equipment should be visually inspected to be sure it is free of any visible signs of contamination. In some cases, wipe tests or other methods may be needed to confirm equipment has been adequately decontaminated before leaving the site.

16.21.9 Decontamination Solutions, Disposable PPE, and Site Wastes

Potentially contaminated equipment, disposable PPE, respirator cartridges, disposable sampling equipment, brushes, buckets, waste decontamination solutions, etc. should be secured in drums and labeled. Disposal methods for these materials may depend on client requirements and/or results of site investigation data. The confirmed presence of hazardous materials on the site may require disposal of investigation-derived wastes as hazardous wastes.

Care should be taken during work and decontamination activities to minimize waste materials generated.

Exhibit 16-B
Minimum Measures For Level D Decontamination

Station 1 - Equipment Drop	Deposit equipment used on plastic drop cloths. Segregation at the drop reduces the probability of cross contamination. During hot weather, a cool down station may be set up in this area.
Station 2 - Outer Garment, Boots, and Gloves Wash and Rinse	Scrub outer boots, outer gloves, and suit with decontamination solution or detergent/water. Rinse off using copious amounts of water.
Station 3 - Hard Hat, Outer Boot, and Glove Removal	Remove hard hat, outer boots, and gloves.
Station 4 - Boots, Gloves, and Outer Garment Removal	Remove boots, suit, and inner gloves and deposit in separate containers lined with plastic.
Station 5 - Field Wash	Wash hands and face.

Exhibit 16-C
Minimum Measures For Level B, And C Decontamination

Station 1 - Equipment Drop	Deposit equipment used on plastic drop cloths. Segregation at the drop reduces the probability of cross contamination. During hot weather, a cool down station may be set up in this area.
Station 2 - Outer Garment, Hard Hat, Boots, and Gloves Wash and Rinse	Scrub outer boots, hard hat, outer gloves, and suit with decontamination solution or detergent/water. Rinse off using copious amounts of water.
Station 3 - Tank/Air Canister Change	If a worker leaves the exclusion zone to change an air tank, air canister, or mask, this is the last step in the decontamination procedure. Worker's air tank is exchanged, new outer gloves and boots donned, and joints tapped. Worker returns to duty.
Station 4 - Outer Boots, and Glove Removal	Remove outer boots and gloves. Deposit in container with plastic liner.
Station 5 - SCBA/Respirator Removal	SCBA backpack and facepiece/respirator is removed (avoid touching face with fingers). SCBA or respirator is deposited on plastic sheets.
Station 6 - Inner Gloves and Outer Garment Removal	Remove suit and inner gloves and deposit in separate containers lined with plastic.
Station 7 - Field Wash	Shower if highly toxic, skin-corrosive, or skin-absorbable materials are known or suspected to be present. Wash hands and face.

16.22 Traffic and Work Zone Safety

These guidelines apply whenever CDM Smith employees or subcontractors work in areas exposed to vehicular traffic on public streets or highways.

- Where vehicular traffic hazards exist because of work at locations near public streets or roads, a system of traffic and work zone controls should be developed to mitigate the hazard. The system should meet the requirements of Part 6 of the Manual of Uniform Traffic Control Devices (MUTCD) published by the Federal Highway Administration, or the applicable state version of the MUTCD.

- In general, when the MUTCD allows the use of traffic safety direction devices, such as cones, CDM Smith will supplement those direction devices with a physical barrier, such as a truck.

- All traffic control systems on public roads must be coordinated with local traffic control officials as required by applicable law.

- Periodically evaluate effectiveness of temporary traffic control setups by walking or riding the job area looking for evidence of poor controls and near misses such as swerving traffic, motorists braking quickly, skid marks, blind spots, etc.

- Give motorists plenty of advanced warning of upcoming work zones.

- All employees working within designated work zones or near vehicular traffic should wear high-visibility clothing such as orange, yellow, or yellow-green shirts, jackets, or vests. During wet or inclement weather, similarly colored rainwear should be worn.

- During night work, between the hours of sunset and sunrise, high-visibility clothing should incorporate reflective striping or fabric and be visible at a distance of 1,000 feet. This clothing should meet ANSI standard #107 for High Visibility Safety Apparel.

- All employees working near traffic and vehicles must maintain situational awareness at all times. Stay mindful that warning signs and cones inform drivers to take action but that some drivers may not pay attention, and vehicles may still enter the work zone.

16.2 Housekeeping

These guidelines are for the establishment and administration of a clean and orderly work environment at field project sites. A continuous housekeeping program strongly tends to prevent accidents. A clean and orderly work environment can be achieved and maintained through ongoing housekeeping efforts undertaken by personnel at all levels. Project managers shall initiate participation in housekeeping activities and good work habits, not only at the end of a work assignment, but throughout the evolution of the project.

- To achieve these benefits, the team shall plan the location of equipment and storage facilities to allow the easy flow of personnel, equipment, materials, fire hazards, and to prevent the obstruction of evacuation, fire fighting, or rescue activities.

- Store materials in a manner that facilitates access of material handling equipment and personnel handling limitations. Lack of sufficient workspace and storage capacity leads to the potential for accidents and decreases efficiency.

- Avoid storage of flammable liquids, such as paints and thinners unless they are required for specific project needs. If needed, such storage shall be within a metal storage cabinet that has been labeled and approved for the storage of flammable liquids.

- Continuously maintain work areas in a neat and orderly manner.

- Containers should be provided for the collection of waste, trash, and other non-hazardous refuse. Investigation-derived waste and other waste materials that are potentially hazardous should be stored and labeled in accordance with project specific procedures that meet regulatory and client requirements.

- Deploy leads, hoses, and extension cords so they do not present tripping hazards, and are not subject to contact with moisture or physical stress. Where possible they should be hung overhead with non-conductive material and kept away from walkways, doors, stairs, and ladders.

- Protect protruding rebar and anchor bolts and conspicuously mark them.

- Clean small spills that create slip hazards and or flammability hazards immediately and not leave them unattended.

- Keep walkways, aisles, stairways, and passageways in a clear and unobstructed condition.

- Prohibit eating and drinking in work areas where there is potential exposure to toxic or hazardous materials. Smoking is limited to designated smoking areas where there is no such exposure.

16.20 Hazardous Waste Site Controls

Work sites designated as Hazardous Waste Sites must control access to the work area to only authorized personnel and conform to general work practices expected at hazardous waste site operations as required by the OSHA Standard for Hazardous Waste Operations, 29 CFR 1910.120. The following concepts should be reflected in the health and safety plan for the project.

16.20.1 Access Control

Controlled access to hazardous waste site work areas is required to protect personnel working on the site as well as to limit the potential for transporting contaminants off site. Depending on the size of the work site, hazards and contaminants present, and complexity of the work, access control may range from verbally cautioning non-authorized personnel to stay away from the work area, to a program including site security, signs, or formal sign in and sign out procedures. Details of site-specific access control procedures should be included in the site-specific health and safety plan. Some general work practices for access control are noted below:

For small-scale site investigations that are short-term projects (i.e. days not weeks or months), identify a work area to the work crew and keep persons not associated with the job site out of the work area. If the site is in an area where non-authorized persons are likely to be encountered, traffic cones, caution tape, and signs identifying the area as a controlled access area may be used.

For more extensive projects where work may be done for weeks or longer, the team the should deploy more extensive access controls. They should:

- Set up physical barriers and hire security personnel to prevent non-authorized persons from entering the work site.
- Keep the number of personnel and equipment on site to the minimum required to do the project effectively and safely.
- Establish work zones within the site,(see the next section- work zones).
- Establish controlled access points to be used by authorized personnel.
- Track the entry and exit of personnel through a check-in, checkout system.
- Establish a formal decontamination corridor from exclusion zones.

16.20.2 Work Zones

Field project managers, working under health and safety plans for hazardous waste operations are required to establish work zones to prevent or reduce the spread of site contaminants to non-contaminated areas on or off site. Movement between zones should be restricted to those that need access to a specific area, and entry and exit between zones should be through designated access control points. A description of the three work-zone system for hazardous wastes is provided below.

Exclusion Zone – The exclusion zone should include any area where contamination is known or suspected. Areas of air, water, or soil that are contaminated with hazardous

materials (biohazards, radioactive materials, chemicals) should be included in the exclusion zone. The zone should be well known to site workers. On smaller projects, this can be a verbal identification to site workers, such as "A 20-foot radius around the drill rig". On larger projects, or in areas that may be encountered by observers or the general public, the zone may need to be defined with caution tape, traffic cones or in some instances, fencing and barriers. The need will be site specific and the specific method should be identified in the site-specific health and safety plan. Some work practices that should be followed in the exclusion zone include:

- Employees in the exclusion zone must wear the PPE designated in the site health and safety plan for tasks executed within the zone.
- No eating, drinking, chewing gum or tobacco, smoking, application of cosmetics, including application of lip balm, sunscreen, or insect repellant is allowed in the exclusion zone.
- Sitting or kneeling in areas of high concentrations of contaminants should be avoided.
- If any PPE becomes defective, the employee should leave the work area via the designated egress area, decontaminate as needed, and replace the defective PPE before returning to work in the exclusion zone.
- Prescription drugs should not be used within the exclusion zone unless approved by CDM's medical consultant. The use of illegal drugs or consumption of alcohol is prohibited.
- When leaving the exclusion zone, employees should exit via the designated access/egress point(s) and follow decontamination procedures described in the site health and safety plan.

Contaminant Reduction Zone (CRZ)– A CRZ is established to provide a transition between the exclusion zone and the support zone. The CRZ is set up at the access control points of the exclusion zone and will vary in size depending on the complexity of activities that need to occur within the zone. For small site investigations, the CRZ may simply be a designated area near containers set up to collect used disposable PPE and some soap and water. For larger projects, the CRZ may include specific decontamination points and be staffed by personnel specifically designated to participate in the decontamination of personnel and equipment exiting the exclusion zone. Depending on the site contaminants, level of contamination, and decontamination procedures, personnel in the CRZ may be required to wear protective clothing, gloves, or respirators. The specific requirements will be outlined in the site health and safety plan. The CRZ should be placed in an area that is not contaminated at the boundary of the exclusion zone.

Support Zone – The support zone is established near the entrance to the site and is far enough from the exclusion zone and CRZ that specialized protective clothing or respirators are not used. The use of normal field PPE such as hard hats, safety glasses, and safety work boots is expected except for areas such as office trailers, break and lunch areas, or other areas designated as having no known or anticipated hazards. Operational support activities and equipment storage and maintenance areas are located

in the support zone. No equipment or personnel should go from the exclusion zone to the support zone without passing through the CRZ and being decontaminated in accordance with the site health and safety plan.

Mobile Work Zone – For those projects that involve brief periods of work in multiple locations, a specific area may be designated as the exclusion zone for the duration of the work performed in that area. The exclusion zone can be terminated (provided there are no ongoing hazards or potential exposures to contaminants) and moved to the next area of work. For example, during soil borings or well installation, the exclusion zone can be defined as, "1.5 times the mast height" of the drill rig. Once the boring has been closed, or well installed and secured, and all drill cuttings have been secured, the area can be opened up and a new exclusion zone established around the next boring location.

16.20.3 Considerations When Establishing Work Zones

Work zones should be large enough to perform tasks within the zone safely, with no exposure to hazards to personnel outside the zone, but they should also be small enough to be able to secure and control access. Some considerations in establishing work zones include:

- Physical and topographical features of the site.
- Dimensions of the contaminated area.
- Weather.
- Physical, chemical, and toxicological characteristics of contaminants and chemicals used in the zone.
- Potential for exposure to site contaminants.
- Known and estimated concentrations of contaminants.
- Air dispersion of contaminants.
- Fire and explosion potential.
- Planned operations and space needed to perform the work safely.
- Surrounding areas.
- Decontamination procedures.
- History of job site.

16.20.4 General Hazardous Waste Site Work Practices

- **Buddy System -** Work should be scheduled so that no person works unobserved within the exclusion zone at any time. Each worker within the exclusion zone should maintain visual contact with at least one other worker on the site. All site personnel should remain aware of each other and monitor each other's condition.

- **Eating, drinking, chewing gum or tobacco, and smoking** - are prohibited within the contaminant reduction and exclusion zones. (Exception for heat stress: Squirt bottles of water, Gatorade, or other fluids may be consumed via squirt bottles in the

contaminant reduction zone with the approval of the health and safety manager. Open bottles, cups, etc. should not be permitted.)

- Sitting or kneeling should be avoided in areas of known or suspected areas of contamination.
- Hands and face should be thoroughly washed when leaving the work area.
- Defective PPE should be repaired or replaced immediately.

Sections 5,6, 7, 9, and 11 of this manual are particularly in applicable to health and safety at hazardous waste sites.

Google maps

Directions to Kaiser Permanente Medical Center-Oakland: Hospital
280 West Macarthur Boulevard, Oakland, CA 94611 - (510) 752-1000
2.4 mi – about **9 mins**
Direction from Sherwin Williams Company Emeryville Site to Nearest Hospital - Kaiser Permanente Medical Center - Oakland - (510)752-1000

A 1450 Sherwin Ave, Emeryville, CA 94608

1.	Head **east** on **Sherwin St** toward **Horton St**	go 276 ft total 276 ft
2.	Turn **right** at **Horton St** About 1 min	go 0.2 mi total 0.2 mi
3.	Take the 2nd **left** onto **40th St** About 7 mins	go 1.9 mi total 2.1 mi
4.	Turn **right** at **Howe St**	go 0.2 mi total 2.3 mi
5.	Take the 1st **right** onto **W MacArthur Blvd**	go 364 ft total 2.4 mi

B Kaiser Permanente Medical Center-Oakland: Hospital
280 West Macarthur Boulevard, Oakland, CA 94611 - (510) 752-1000

These directions are for planning purposes only. You may find that construction projects, traffic, weather, or other events may cause conditions to differ from the map results, and you should plan your route accordingly. You must obey all signs or notices regarding your route.

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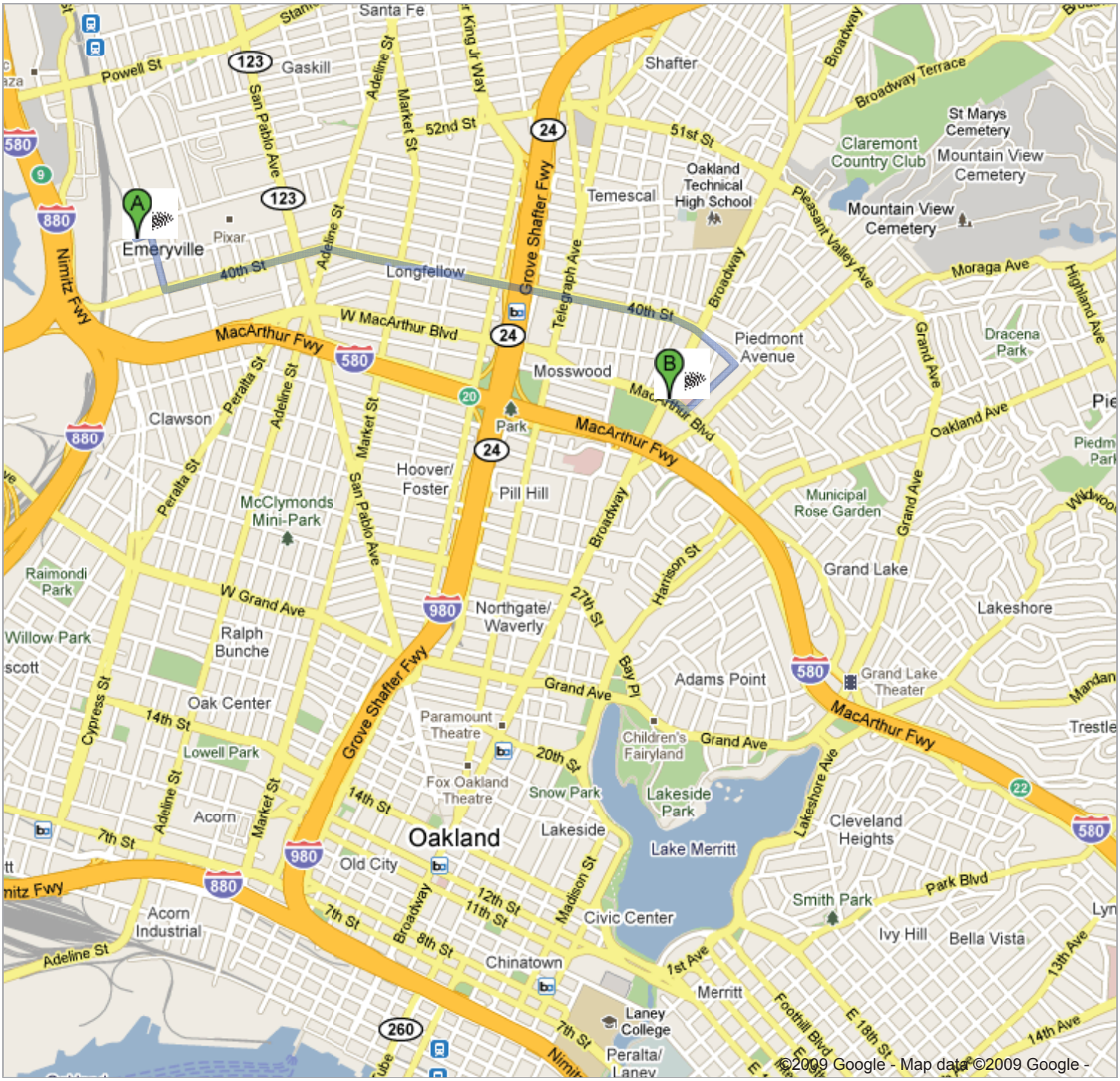
Google maps

To see all the details that are visible on the screen,use the "Print" link next to the map.



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HEALTH AND SAFETY PLAN SIGNATURE FORM

CDM Smith Health and Safety Plan

All site personnel must sign this form indicating receipt of the H&SP. Keep this original on site. It becomes part of the permanent project files. Send a copy to the Health and Safety Manager (HSM).

SITE NAME/NUMBER: The Sherwin-Williams Company

DIVISION/LOCATION: Emeryville, CA

CERTIFICATION:

I understand, and agree to comply with, the provisions of the above referenced H&SP for work activities on this project. I agree to report any injuries, illnesses or exposure incidents to the site Health and Safety Coordinator (SHSC). I agree to inform the SHSC about any drugs (legal and illegal) that I take within three days of site work.

PRINTED NAME	SIGNATURE	DATE

ARCADIS
Infrastructure · Water · Environment · Buildings

Site Specific Health and Safety Plan

Revision 11 9/20/2012

Project Name: The Sherwin Williams Company
1450 Sherwin Avenue
Emeryville, California

Project Number: EM002616
Client Name: Sherwin Williams Company
Date: 11/19/2012
Revision: 2012 Update

Approvals:

HASP Developer: Erica Whiting

HASP Reviewer: Ron Goloubow

Project Manager: Lucas Goldstein

Emergency Information

Site Address: 1450 Sherwin Avenue
Emeryville, California

Emergency Phone Numbers:

Emergency (fire, police, ambulance)		911
Emergency (facility specific, if applicable):		
King Security (24 Hr onsite safety)		510-385-0459
Emergency Other (specify)		
Client Contact	Larry Mencin	216.566.1768
WorkCare (non-lifethreatening injury/illness)		1-800-455-6155
Project H&S	Lucas Goldstein	510.596.9535/510.541.6897
Task Manager	Erica Whiting	206.726.4743/303.903.3505
Project Manager	Lucas Goldstein	510.596.9535/510.541.6897
Corporate H&S Specialist	Alec MacAdam	248-994-2259
Corporate H&S Director	Rebecca Lindeman	408-834-0368

Hospital Name and Address: Alta Bates Hospital
2450 Ashby Avenue
Berkeley, California 94705

Hospital Phone Number: (510) 204-4444

Incident Notification Process

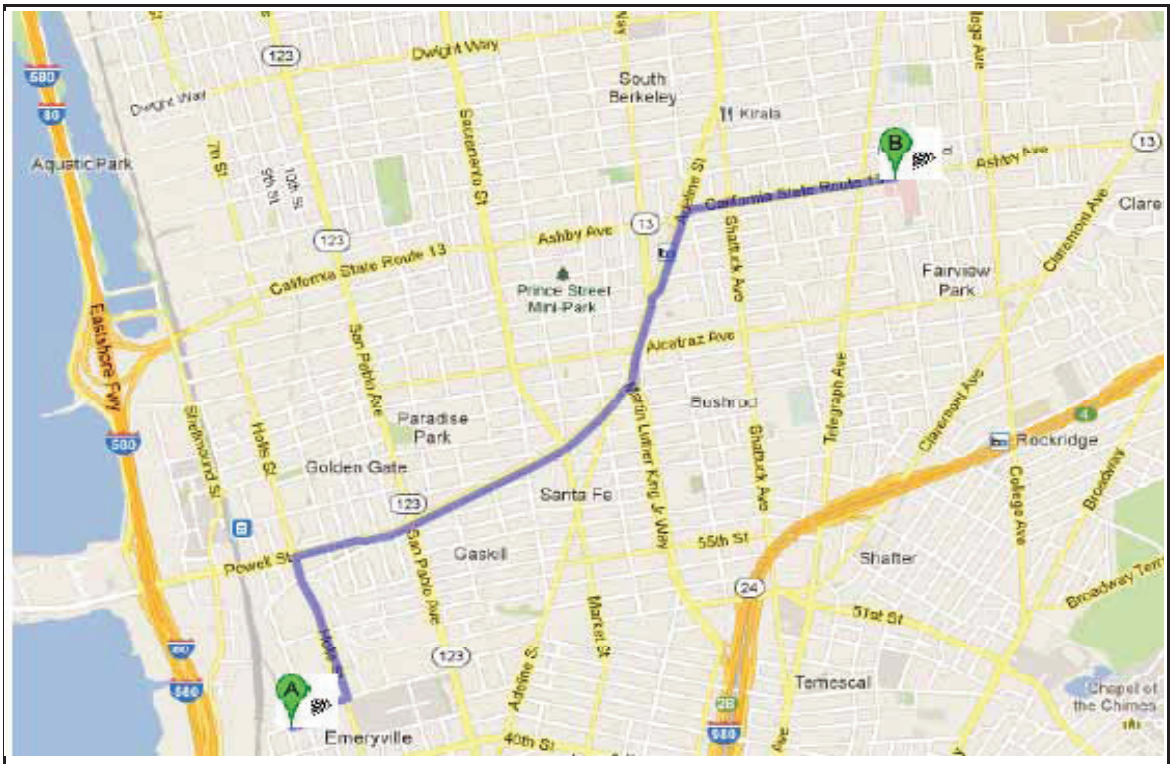
1 Dial 911/Facility Emergency Number/WorkCare as applicable
2 Contact PM/Supervisor — Lucas Goldstein
3 Contact Corporate H&S — Rebecca Lindeman
4 Contact Client — Larry Mencin

Complete below, as applicable, or clear cell contents:

Location of Assembly Area(s): On-site assembly area: Security Office at Sherwin Building

Nearest Storm Shelter: Onsite Sherwin Building

Route to the Hospital



A 1450 Sherwin St, Emeryville, CA 94608

	1. **Head east** on **Sherwin St** toward **Horton St**	go 279 ft total 279 ft
↰	2. Turn left onto **Horton St**	go 200 ft total 479 ft
↱	3. Take the 1st right onto **45th St**	go 0.1 mi total 0.2 mi
↰	4. Take the 1st left onto **Hollis St** About 2 mins	go 0.5 mi total 0.7 mi
↱	5. Turn right onto **Powell St** About 54 secs	go 0.3 mi total 1.0 mi
	6. Continue onto **Stanford Ave** About 3 mins	go 0.8 mi total 1.8 mi
↰	7. Turn left onto **Adeline St** About 2 mins	go 0.6 mi total 2.4 mi
↗	8. Slight right at down to **Adeleine** onto **Ashby Ave/California State Route 13** Destination will be on the right About 2 mins	go 0.6 mi total 3.0 mi

B **Alta Bates Medical Center**
2450 Ashby Avenue, Berkeley, CA 94705

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General Information

Site Type (select all applicable where work will be conducted):

- ☐ Active
- ☐ Bridge
- ☐ Buildings
- ☐ Commercial
- ☐ Construction
- ☐ Government
- ☑ Inactive
- ☐ Industrial
- ☐ Landfill
- ☐ Marine
- ☐ Mining
- ☑ Parking Lot/Private Roadway
- ☑ Railroad
- ☐ Remote Area
- ☐ Residential
- ☐ Retail
- ☑ Roadway (public, inlcuing right-of-way)
- ☑ Secure
- ☐ Unknown
- ☐ Unsecured
- ☐ Utility
- ☐ Other (specify): _____

Surrounding Area and Topography (select one):

☑ Surrounding area and topography are presented in the project work plan
☐ Surrounding area and topography (*briefly describe*):
The area is relatively flat and paved for the most part. Urban setting.

Site Background (select one):

☑ Site background is presented in the project work plan
☐ Site background (*briefly describe)* :
This HSP is for routine periodic groundwater monitoring.

Project Tasks
The following tasks are identified for this project:

Examples: "Drilling/soil sampling", "Surveying", "General Inspections", "Construction Management/Inspections"

1 General Site Work
2 Groundwater Monitoring (water level measurement and collecting groundwater samples)
3
4
5

☐ Subcontractor H&S information is attached
☐ Utility clearance required.
☐ ARCADIS Standards apply to augment JSA *[list standard(s) below]*
☐ ARCADIS Field H&S Handbook sections apply *(list below)*
Comments:

Roles and Responsibilities

	Name	*Role*	*Additional Responsibilities (Describe)*
1	Lucas Goldstein	PM	
2	Erica Whiting	TM	
3	William Semel/Michael Daniels	Field Lead	
4	William Semel/Michael Daniels	SSO	
5			
6			

Training

All ARCADIS employees are required to have the following training:	*Selected ARCADIS employees are required to have the following additional training:*	Names or Numbers from above
☑ 40 hr HAZWOPER w current refresh.	☐ Not applicable	
☐	☑ First aid/CPR/BBP	Michael Daniels; at least one person who is at the site must have first aid training
☐ 24 hr HAZWOPER		
10 hr Construction	☐ 30 hr Construction	
☑ HazMat #1 (Ground/Air/MOT)	☐ 10 hr Construction	
☐ HazMat #4 (MOT)	☐ HazMat #1 (Gr./Air/MOT)	
☐ HazCom/Emergency Action Plan	☐ HazMat #4 (MOT)	
☑ H&S Orientation (classroom); or	☐ Confined space entrant	
☐ H&S Orientation (on-line)	☐ Confined space rescue	
☑ PPE	☐ Excavation CP	
☐ Respiratory protection	☐ Electrical (NFPA 70E)	
☐ MSHA	☐ Lockout/Tagout	
☑ Smith System (on-line)	☐ H&S Orientation (class)	
☐	☑ OTS/eRailsafe	Michael Daniels and any personnel working in railroad right of way.
☐ OTS/eRailsafe		
Client specific:	☐ Smith Sys. (hands on)	
	☐ Boating safety	
☑ Other: Online Flagger Training	☐ Other:	

Hazard Analysis

Risk Assessment Matrix		Likelihood Ratings** (likelihood that incident would occur)			
Consequences Ratings*		A	B	C	D
People	Property	0 Almost impossible	1 Possible but unlikely	2 Likely to happen	3 Almost certain to happen
1 - Slight or no health	Slight or no damage	0 - Low	1 - Low	2 - Low	3 - Low
2 - Minor health effect	Minor damage	0 - Low	2 - Low	4 - Medium	6 - Medium
3 - Major health effect	Local damage	0 - Low	3 - Low	6 - Medium	9 - High
4 - Fatalities	Major damage	0 - Low.	4 - Medium.	8 - High	12 - High

Division
Environment

Business Unit
All Categories

Task 1: General Site Work

Hazardous Activity #1

General-Vehicle -motor vehicle operation (all types on roadways)

Hazard Types (unmitigated ranking H-High, M-Medium, L-Low):

Biological	-	Chemical	-	Driving	M	Electrical	-
Environmental	-	Gravity	-	Mechanical	-	Motion	-
Personal Safety	-	Pressure	-	Radiation	-	Sound	-

Overall Unmitigated Risk: Medium Mitigated Risk: Low if utilizing:

Primary Controls: TRACK Smith System (on line) Inspections

Secondary Controls: JSAs Admin. Controls

Hazardous Activity #2

Groundwater monitoring - water level measurements & collection of groundwater samples

Hazard Types (unmitigated ranking H-High, M-Medium, L-Low):

Biological	-	Chemical	-	Driving	L	Electrical	L
Environmental	L	Gravity	-	Mechanical	-	Motion	L
Personal Safety	L	Pressure	-	Radiation	-	Sound	L

Overall Unmitigated Risk: Low Mitigated Risk: Low if utilizing:

Primary Controls: TRACK Smith System (on line)

Secondary Controls: JSAs Admin. Controls

Hazardous Activity #3

Field-Ambient environment - exposure heat, cold, sun, weather, etc

Hazard Types (unmitigated ranking H-High, M-Medium, L-Low):

Biological	-	Chemical	-	Driving	M	Electrical	L
Environmental	L	Gravity	H	Mechanical	-	Motion	L
Personal Safety	M	Pressure	-	Radiation	-	Sound	-

Overall Unmitigated Risk: Medium Mitigated Risk: Medium if utilizing:

Primary Controls: TRACK PPE (see HASP "PPE" section) Field H&S Handbook

Secondary Controls: H&S Standards Engineering Controls Admin. Controls Specialized Equipment

Hazardous Activity #4

Field-Railroad - work in the vicinity of moving trains (non-rail yard inspection and field activities)

Hazard Types (unmitigated ranking H-High, M-Medium, L-Low):

Biological	-	Chemical	-	Driving	M	Electrical	-
Environmental	-	Gravity	M	Mechanical	H	Motion	H
Personal Safety	H	Pressure	-	Radiation	-	Sound	L

Overall Unmitigated Risk: High Mitigated Risk: Medium if utilizing:

Primary Controls: TRACK Client Training/Briefing On Track Safety Training Specialized Checklist/Forms eRailsafe PPE (see HASP "PPE" section)

Secondary Controls: JSAs HASP Job Briefing/Site Awareness Cont/Emerg. Planning Engineering Controls Admin. Controls PPE (see HASP "PPE" section) Specialized Equipment Inspections H&S Standards

Risk Assessment Matrix		Likelihood Ratings** (likelihood that incident would occur)			
Consequences Ratings*		A	B	C	D
People	Property	0 Almost impossible	1 Possible but unlikely	2 Likely to happen	3 Almost certain to happen
1 - Slight or no health	Slight or no damage	0 - Low	1 - Low	2 - Low	3 - Low
2 - Minor health effect	Minor damage	0 - Low	2 - Low	4 - Medium	6 - Medium
3 - Major health effect	Local damage	0 - Low	3 - Low	6 - Medium	9 - High
4 - Fatalities	Major damage	0 - Low.	4 - Medium.	8 - High	12 - High

Task 2: Groundwater Monitoring (water level measurement and collecting groundwater samples)

Hazardous Activity #1

Chemical -Carcinogens - exposure to these materials

Hazard Types (unmitigated ranking H-High, M-Medium, L-Low):

Biological	-	Chemical	L	Driving	-	Electrical	-
Environmental	-	Gravity	-	Mechanical	-	Motion	-
Personal Safety	-	Pressure	-	Radiation	-	Sound	-

Overall Unmitigated Risk: Low Mitigated Risk: Low if utilizing:

Primary Controls: TRACK HASP Engineering Controls PPE (see HASP "PPE" section)

Secondary Controls: Job Briefing/Site Awareness Hazcom Training MSDS (see also HASP Hazcom section) Client Training/Briefing Specialized Equipment

Hazardous Activity #2

Field-Measurement - water levels and well sounding

Hazard Types (unmitigated ranking H-High, M-Medium, L-Low):

Biological	-	Chemical	L	Driving	-	Electrical	-
Environmental	-	Gravity	L	Mechanical	-	Motion	M
Personal Safety	-	Pressure	-	Radiation	-	Sound	-

Overall Unmitigated Risk: Low Mitigated Risk: Low if utilizing:

Primary Controls: TRACK JSAs PPE (see HASP "PPE" section)

Secondary Controls: Job Briefing/Site Awareness

Hazardous Activity #3

Field-Sampling - monitoring well sampling - manual (bailer, check valve)

Hazard Types (unmitigated ranking H-High, M-Medium, L-Low):

Biological	-	Chemical	L	Driving	-	Electrical	-
Environmental	-	Gravity	L	Mechanical	-	Motion	M
Personal Safety	-	Pressure	-	Radiation	-	Sound	-

Overall Unmitigated Risk: Low Mitigated Risk: Low if utilizing:

Primary Controls: TRACK JSAs Engineering Controls Job Rotation PPE (see HASP "PPE" section)

Secondary Controls: Job Briefing/Site Awareness Admin. Controls

Hazardous Activity #4

Field-Sampling - sample cooler preparation

Hazard Types (unmitigated ranking H-High, M-Medium, L-Low):

Biological	-	Chemical	M	Driving	-	Electrical	-
Environmental	-	Gravity	M	Mechanical	L	Motion	L
Personal Safety	M	Pressure	-	Radiation	-	Sound	-

Overall Unmitigated Risk: Medium Mitigated Risk: Low if utilizing:

Primary Controls: TRACK JSAs Engineering Controls PPE (see HASP "PPE" section) See HASP "Monitoring" section

Secondary Controls: Job Briefing/Site Awareness Admin. Controls Work Plan

Hazard Communication (HazCom)/Global Harmonization System (GHS)

☐ HAZCOM/GHS for this project is managed by the client or general contractor

List the chemicals anticipated to be used by ***ARCADIS*** *on this project per HazCom/GHS requirements.*
(Modify quantities as needed)

	Acids/Bases	Qty
☐	Not applicable	
☑	Hydrochloric acid	<500 ml
☑	Nitric acid	<500 ml
☐	Sulfuric acid	<500 ml
☐	Sodium hydroxide	<500 ml
☐	Zinc acetate	<500 ml
☐	Ascorbic acid	<500 ml
☐	Acetic acid	<500 ml
☐	Other:	

	Decontamination	Qty
☐	Not applicable	
☑	Alconox	≤ 5 lbs
☐	Liquinox	≤ 1 gal
☐	Acetone	≤ 1 gal
☐	Methanol	≤ 1 gal
☐	Hexane	≤ 1 gal
☑	Isopropyl alcohol	≤ 4 gal
☐	Nitric acid	≤ 1 L
☐	Other:	

	Calibration	Qty.
☐	Not applicable	
☐	Isobutylene/air	1 cyl
☐	Methane/air	1 cyl
☐	Pentane/air	1 cyl
☐	Hydrogen/air	1 cyl
☐	Propane/air	1 cyl
☐	Hydrogen sulfide/air	1 cyl
☐	Carbon monoxide/air	1 cyl
☑	pH standards (4,7,10)	≤ 1 gal
☑	Conductivity standards	≤ 1 gal
☑	Other: ORP standard	

	Fuels	Qty.
☐	Not applicable	
☑	Gasoline	≤ 5 gal
☐	Diesel	≤ 5 gal
☐	Kerosene	≤ 5 gal
☐	Propane	1 cyl
☐	Other:	

	Kits	Qty.
☐	Not applicable	
☐	Hach (specify):	1 kit
☐	DTECH (specify):	1 kit
☐	EPA 5035 Soil (specify kit):	1 kit
☐	Other:	

	Remediation	Qty.
☑	Not applicable	
☐		
☐		
☐		
☐		
☐		

	Other:	Qty.
☑	Not applicable	
☐	Spray paint	≤ 6 cans
☐	WD-40	≤ 1 can
☐	Pipe cement	≤ 1 can
☐	Pipe primer	≤ 1 can
☐	Mineral spirits	≤ 1 gal

		Qty.
☐		
☐		
☐		
☐		
☐		
☐		

Material safety data sheets (MSDSs)/Safety Data Sheets (SDSs) must be available to field staff.
Indicate below how MSDS information will be provided:

☐ Not applicable
☐ Printed copy in company vehicle
☐ Printed copy in the project trailer/office
☑ Printed copy attached
☐ Electronic copy on field computer

☐ Contractor MSDSs/SDSs are not applicable
☐ Contractor MSDSs/SDSs are attached
☐ Contractor MSDSs/SDSs will be on site and located: _____

☐ Bulk quantities of the following materials will be stored: _____

Contact the project H&S contact for information in determining code and regulatory requirements associated with bulk storage of materials.

Monitoring

☑ Chemical air monitoring is not required for this project.

For projects requiring air monitoring, list the relevant constituents representing a hazard to site workers.

Constituent	Max. Conc.	Units	TWA	Units	STEL	Units	IDLH	Units	LEL/UEL (%)	VD Air=1	VP (mm Hg)	IP (eV)
None			9999	-	0	-	0	-	0	0	0	0
None			9999	-	0	-	0	-	0	0	0	0
None			9999	-	0	-	0	-	0	0	0	0
None			9999	-	0	-	0	-	0	0	0	0
None			9999	-	0	-	0	-	0	0	0	0
None			9999	-	0	-	0	-	0	0	0	0

Notes: TWAs are ACGIH 8 hr-TLVs unless noted.

p-ppm m-mg/m3
s- skin c-ceiling
r- resipirable i-inhalable

c2- ceiling (2 hr) se-sensitizer
"9999" - NA O-OSHA PEL
N-NIOSH 10 hr REL

"#N/A" -Constituent is not in database, manually enter information

Monitoring Equipment and General Protocols

Air monitoring is required for any task or activity where employees have potential exposure to vapors or particulates above the TWA. Action levels below are appropriate for most situations. Contact the project H&S contact for all stop work situations. Select monitoring frequency and instruments to be used.

Monitoring Frequency:

Indicator Tube/Chip Frequency: Indicator tube/chip monitoring not required

	Instrument	Action Levels			Actions
☐	Photoionization Detector		<	0.000	Continue work
		0.000	-	0.0	Sustained >5 min. continuous monitor, review eng. controls and PPE, proceed with caution
	Lamp (eV):		>	0.0	Sustained >5 min. stop work, contact SSO
☐	Flame Ionization Detector (FID)		<	0.0	Continue work
		0.0	-	0.0	Sustained >5 min. continuous monitor, review eng. controls and PPE, use caution
			>	0.0	Sustained >5 min. stop work, contact SSO
☐	LEL/O2 Meter	0-5% LEL			Continue work
		>5-10% LEL			Continuous monitor, review eng. controls, proceed with caution
		>10% LEL			Stop work, evacuate, contact SSO
		19.5%-23.5% O2			Normal, continue work
		<19.5% O2			O2 deficient, stop work, evacuate, cont. SSO
		>23.5% O2			O2 enriched, stop work, evacuate, contact SSO
☐	Indicator: ☐tube ☐hip	≤PEL/TLV			Continue work
		>PEL/TLV			Stop work, review eng. controls and PPE, contact SSO
	Compound(s):				
☐	Particulate Monitor (mists, aerosols, dusts in mg/m^3)		<	2.5	Continue work
		2.5	-	5.00	Use engineering controls, monitor continuously
			>	5.00	Stop work, review controls, contact SSO
☐	Other:	Specify:			Specify:

Personal Protective Equipment (PPE)

See JSA for the task being performed for PPE requirements. *If the work is not conducted under a JSA, refer to the governing document for PPE requirements. At a minimum, the following checked PPE is required for all tasks during field work not covered by a JSA on this project:*

Level D or Level D Modified:

							Specify Type:
☑	Hard hat	☐	Snake chaps/guards	☐	Coveralls:		
☑	Safety glasses	☐	Briar chaps	☐	Apron:		
☐	Safety goggles	☐	Chainsaw chaps	☐	Chem. resistant gloves:		
☐	Face shield	☐	Sturdy boot	☑	Gloves other:		nitrile
☐	Hearing protection	☑	Steel toe boot	☐	Chemical boot:		
☐	Rain suit	☐	Metatarsal boot	☐	Boot other:		
☐	Other:			☑	Traffic vest:		
				☐	Life vest:		

Task specific PPE:

Comments:

Medical Surveillance (*check all that apply*)

- ☐ Medical Surveillance is not required for this project.
- ☑ HAZWOPER medical surveillance applies to all ARCADIS site workers on the project.
- ☐ HAZWOPER medical surveillance applies to all subcontractors on the project.
- ☐ HAZWOPER medical surveillance applies to all site workers on the project except:

- ☐ Other medical surveillance required (describe type and who is required to participate):

- ☐ Client drug and/or alcohol testing required.

Hazardous Materials Shipping and Transportation (*check all that apply*)

- ☐ Not applicable, no materials requiring a Shipping Determination will be transported or shipped
- ☐ A Shipping Determination has been reviewed and provided to field staff
- ☐ A Shipping Determination is attached
- ☑ All HazMat will be transported under Materials of Trade by ARCADIS
- ☐ Other (specify):

Roadway Work Zone Safety (*check all that apply*)

- ☐ Not applicable for this project
- ☐ All or portions of the work conducted under a TCP
- ☐ All or portions of the work conducted under a STAR Plan
- ☐ TCP or STAR Plan provided to field staff
- ☑ TCP or STAR Plan attached
- ☐ Other (specify):

ARCADIS Commercial Motor Vehicles (CMVs)

This section is applicable to ARCADIS operated vehicles only

- ☑ This project will **not** utilize CMV drivers
- ☐ This project will utilize CMV drivers

Site Control (*check all that apply*)

- [x] Not applicable for this project.
- [ ] Site control protocols are addressed in JSA or other supporting document (attach)
- [ ] Maintain an exclusion zone of _____ ft. around the active work area
- [ ] Site control is integrated into the STAR Plan or TCP for the project
- [ ] Level C site control - refer to Level C Supplement attached
- [ ] Other (specify):

Decontamination (*check all that apply*)

- [ ] Not applicable for this project.
- [ ] Decontamination protocols are addressed in JSA or other governing document (attach)
- [x] Level D work- wash hands and face prior to consuming food, drink or tobacco.
- [ ] Level D Modified work- remove coveralls and contain, wash hands and face prior to consuming food, drink or tobacco. Ensure footwear is clean of site contaminants
- [ ] Level C work - refer to the Level C supplement attached.
- [ ] Other (specify):

Sanitation *(check all that apply)*

- [x] Mobile operation with access to off-site restrooms and potable water
- [ ] Restroom facilities on site provided by client or other contractor
- [ ] Project to provide portable toilets (1 per 20 workers)
- [ ] Potable water available on site
- [ ] Project to provide potable water (assume 1 gal./person/day)
- [ ] Project requires running water (hot and cold, or tepid) with soap and paper towels

Safety Briefings (*check all that apply*)

- [x] Safety briefing required daily
- [ ] Safety briefing required twice a day
- [ ] Safety briefings required at the following frequency: _____
- [x] Subcontractors to participate in ARCADIS safety briefings
- [x] ARCADIS to participate in client/contractor safety briefings
- [ ] Other (specify):

Safety Equipment and Supplies

Safety equipment/supply requirements are addressed in the JSA for the task being performed. *If work is not performed under a JSA, the following safety equipment is required to be present on site in good condition (Check all that apply):*

- [x] First aid kit
- [ ] Bloodborne pathogens kit
- [x] Fire extinguisher
- [ ] Eyewash (ANSI compliant)
- [x] Eyewash (bottle)
- [x] Drinking water
- [ ] Other: _____
- [x] Insect repellent
- [x] Sunscreen
- [ ] Air horn
- [x] Traffic cones
- [ ] 2-way radios
- [ ] Heat stress monitor

_____

_____

H&S Program (*check all that apply*)

- ☐ H&S metrics are provided on the account level, refer to account guidance
- ☑ TIP required at the following frequency on this project:
  Select One: _____ mhrs _____ time(s) _____ Define: 1 per quarter
- ☐ H&S Field Assessment required at the following frequency on this project:
  Select One: _____ mhrs _____ time(s) _____ Define: _____
- ☐ Other (specify):

List tasks anticipated for TIP activity:

TIP will be performed during groundwater
Groundwater monitoring activities

Signatures

I have read, understand and agree to abide by the requirements presented in this health and safety plan. I understand that I have the absolute right to stop work if I recognize an unsafe condition affecting my work until corrected.

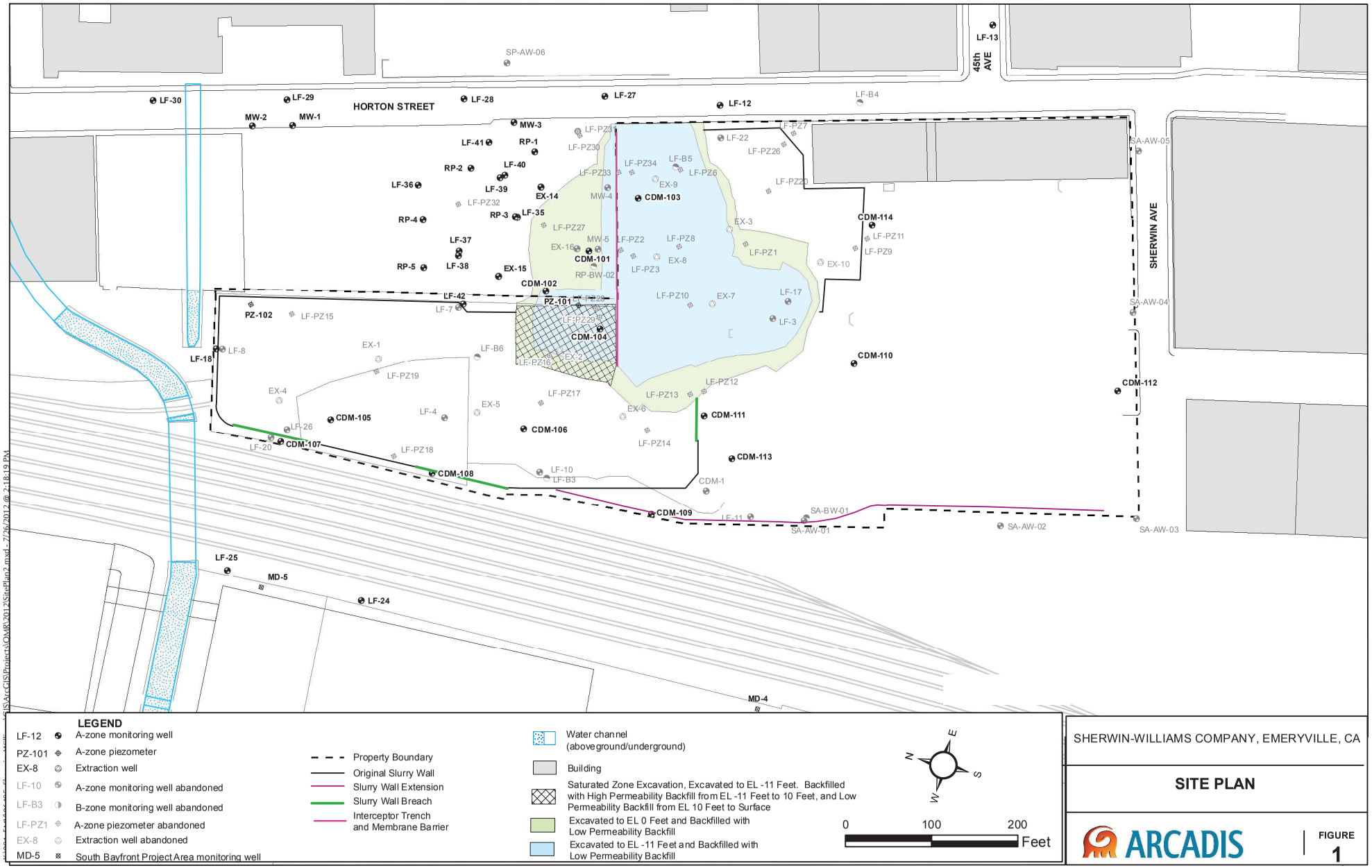
Printed Name	Signature	Date

Add additional sheets if necessary

- ☐ Subcontractor Acknowledgement Form attached

You have an absolute right to STOP WORK if unsafe conditions exist!

Attachments



LEGEND

LF-12	A-zone monitoring well
PZ-101	A-zone piezometer
EX-8	Extraction well
LF-10	A-zone monitoring well abandoned
LF-B3	B-zone monitoring well abandoned
LF-PZ1	A-zone piezometer abandoned
EX-8	Extraction well abandoned
MD-5	South Bayfront Project Area monitoring well

- Property Boundary
- Original Slurry Wall
- Slurry Wall Extension
- Slurry Wall Breach
- Interceptor Trench and Membrane Barrier

- Water channel (aboveground/underground)
- Building
- Saturated Zone Excavation, Excavated to EL -11 Feet. Backfilled with High Permeability Backfill from EL -11 Feet to 10 Feet, and Low Permeability Backfill from EL 10 Feet to Surface
- Excavated to EL 0 Feet and Backfilled with Low Permeability Backfill
- Excavated to EL -11 Feet and Backfilled with Low Permeability Backfill

N E S W

0 100 200 Feet

SHERWIN-WILLIAMS COMPANY, EMERYVILLE, CA

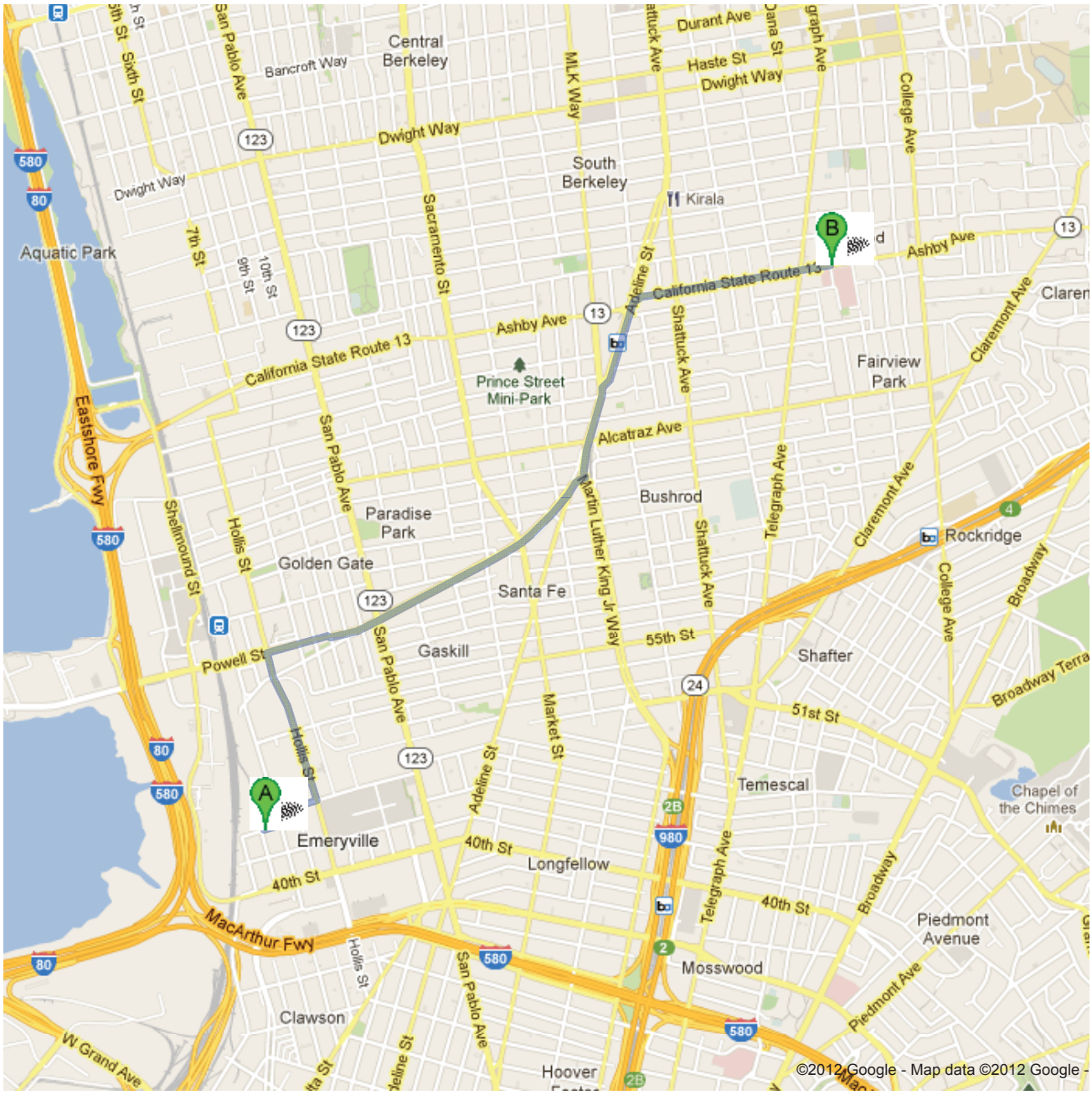
SITE PLAN

ARCADIS

FIGURE 1

I:\GIS\ArcGIS\Projects\OMR\2012\SitePlan2.mxd - 7/26/2012 @ 2:18:19 PM

Directions to Alta Bates Medical Center
2450 Ashby Avenue, Berkeley, CA 94705
3.0 mi – about **10 mins**



1450 Sherwin St, Emeryville, CA 94608

	1. Head **east** on **Sherwin St** toward **Horton St**	go 279 ft total 279 ft
	2. Turn left onto **Horton St**	go 200 ft total 479 ft
	3. Take the 1st right onto **45th St**	go 0.1 mi total 0.2 mi
	4. Take the 1st left onto **Hollis St** About 2 mins	go 0.5 mi total 0.7 mi
	5. Turn right onto **Powell St** About 54 secs	go 0.3 mi total 1.0 mi
	6. Continue onto **Stanford Ave** About 3 mins	go 0.8 mi total 1.8 mi
	7. Turn left onto **Adeline St** About 2 mins	go 0.6 mi total 2.4 mi
	8. Slight right at **down to Adeleine** onto **Ashby Ave/California State Route 13** Destination will be on the right About 2 mins	go 0.6 mi total 3.0 mi

Alta Bates Medical Center
2450 Ashby Avenue, Berkeley, CA 94705

These directions are for planning purposes only. You may find that construction projects, traffic, weather, or other events may cause conditions to differ from the map results, and you should plan your route accordingly. You must obey all signs or notices regarding your route.

Map data ©2012 Google

Directions weren't right? Please find your route on maps.google.com and click "Report a problem" at the bottom left.

ARCADIS

HASP Addendum Page

This form should be completed for new tasks associated with the project. The project manager and/or task manager should revise the Project Hazard Analysis Worksheet with the new task information and attach to this addendum sheet. JLAs should be developed for any new tasks and attached as well.

Review the addendum with all site staff, including subcontractors, during the daily tailgate briefing, and complete the tailgate briefing form as required. Attach a copy of the addendum to all copies of the HASP including the site copy, and log in the Addendum Log Table A-1 on the next page.

Addendum Number: 2012 Revision 1 Project Number: EM002616

Date of Changed Conditions: 11/19/12 Date of Addendum: 11/19/12

Description of Change that Results in Modifications to HASP:

Update to new ARCADIS template. Groundwater extraction and treatment system no longer in operation

Signed: _____ Project Manager

Signed: _____ Site Safety Officer

Signed: _____ H&S Plan Writer

Signed: _____ H&S Plan Reviewer

ARCADIS

T R A C K

Project Health & Safety Pre-Planning Form

This form will assist a project or task manager in the proper, proactive planning for H&S on a project or job task level. It can be used during the proposal stage of a project and during the pre-planning after project award. This does not take the place of a project HASP but can be used to help determine the contents of the project HASP.

Project Name:		Project Number:	Project Location:
Sherwin Williams Periodic Groundwater monitoring		EM002616	Emeryville, CA
Date:	**Duration:**	**Completed by:**	**Assisted by** (consult others when completing this form):
11/19/2012		Erica Whiting	
Client:		**Client Contact:**	**Subcontractor companies:**
Sherwin Williams		Larry Mencin	

T hink through the Tasks — TRACKing Project Planning

List the major jobs or activities for the project:

1 Water level measurements
2 collection of groundwater samples
3
4
5
6

T hink through the Tasks — Other Hazardous Activities

☐ Check the box if there are any other ARCADIS, Client or other party activities that may pose hazards to ARCADIS operations

If there are none, write "None" here:

If yes, describe them here:

How could they be controlled?

Prework Authorization - check activities to be conducted that may require permit issuance or completion of a checklist or similar before work begins:

		Doc #			Doc #			Doc #
X	Not applicable		☐	Working at Height		☐	Confined Space	
☐	Energy Isolation (LOTO)		☐	Excavation/Trenching		☐	Hot Work	
☐	Mechanical Lifting Ops		☐	Overhead & Buried Utilities		☐	Other (may be client required)	

Consider the following (to help with appropriately and adequately resourcing the project)

☐ What level of HASP will be needed?	☐ Any unique H&S issues?	☐ Understand client requirements?
☐ Have subcontractors been qualified?	☐ Level of H&S support needed?	☐ Will we use subcontractors?
☐ Lessons learned from other jobs?	☐ Training Requirements?	☐ Audits and assessments budgeted?
		☐ Travel-related Issues / International?

Comments:

R ecognize the hazards

A ssess the Risks

Low, **M**edium, **H**igh - Use the drop down menu in the box to identify & rank risks applicable to the project. Examples are provided.

L Gravity (i.e., ladder, scaffold, trips)	M Motion (i.e., traffic, moving water) medium	L Mechanical (i.e., augers, motors)
L Electrical (i.e., utilities, lightning)	L Pressure (i.e., gas cylinders, wells)	L Environment (i.e., heat, cold, ice)
L Chemical (i.e., fuel, acid, paint)	L Biological (i.e., ticks, poison ivy)	L Radiation (i.e., alpha, sun, laser)
L Sound (i.e., machinery, generators)	L Personal (i.e. alone, night, not fit)	M Driving (i.e. car, ATV, boat, dozer)

Continue TRACK Process on Page 2

C ontrol the hazards

Check all and discuss those methods to control the hazards to be considered for the project: Review the Hazard Assessment and previous work similar to this project. Discuss any additional control processes that should be considered.

[ ] Elimination	[ ] Substitution	[ ] Isolation
[ ] Engineering controls	[ ] Worker Rotation	[X] Exposure Monitoring
[ ] General PPE Usage	[ ] Hearing Conservation	[ ] Respiratory Protection
[X] Personal Hygiene	[X] Exposure Guidelines	[X] Decon Procedures
[ ] Emergency Action Plan (EAP)	[X] Fall Protection	[ ] Work Zones/Site Control
[ ] JLA to be developed/used ***(specify)***	[ ] LPOs	[X] Traffic Control
[ ] Training (see below)	[ ] Utility Clearance	[ ] Site Monitors
[X] Medical Surveillance (see below)	[ ] Work/Rest Regimes	[ ] Other ***(specify)***

C ontrol the hazards Training Requirements and Needs

Check what training is required for completion of the project. Consider the hazards to be encountered and whether ARCADIS staff or subcontractor staff will do the work. The H&S Training matrix found on the Training Center site will assist in this.

[X] Smith Hands-On	[ ] Full LPS	[ ] Client-Specific
[X] 40 Hour HazWoper	[ ] 24 Hour HazWoper	[ ] HazWoper Site Supervisor
[ ] 10 Hour OSHA Construction	[ ] 30 Hour OSHA Construction	[ ] Respiratory Protection
[X] PPE	[ ] Hazard Communication	[ ] RCRA
[X] First Aid/CPR	[ ] DOT/IATA Haz Mat	[ ] MSHA
[X] FRA / Railroad / eRailsafe	[ ] Bloodborne Pathogen	[ ] Confined Space (Awareness or Entry)
[ ] Lockout/Tagout (Hazardous Energy)	[ ] Utility Clearance	[ ] Electrical / Arc Flash
[X] Fire Extinguisher	[ ] Heat and Cold Stress	[ ] Fall Protection
[ ] Noise / Hear Conservation	[ ] Forklifts	[ ] Asbestos
[ ] H2S	[ ] Boating and/or Water Safety	[ ] Lead
[ ] Cadmium or other toxic metals	[X] Benzene	[ ] SPCC
[ ] Process Safety Management	[ ] Radiation Safety	[ ] Troxler / Nuclear Density Gauges
[ ] Other (Specify)	[ ] Other (Specify)	[ ] Other (Specify)

C ontrol the hazards Medical Surveillance Requiremants and Needs

Check what medical surveillance is required for completion of the project. Consider the hazards to be encountered and whether ARCADIS staff or subcontractor staff will do the work. The H&S group and WorkCare can assist in this determination.

[X] HazWoper Medical Exam	[ ] Respirator-related exam if not	[ ] Client-Specific
[ ] Drug and Alcohol (client-required)	[ ] Hearing test	[ ] Vaccinations to travel
[ ] Hepatitis B if providing 1st Aid/CPR	[ ] Other (Specify)	[ ] Other (Specify)

C ontrol the hazards Additional Comments about controlling the hazards on this project

Post Project Activities Review - Review at end of project (Check those applicable and explain:)

- [ ] Lessons learned / best practices learned: _____
- [ ] Incidents that occurred : _____
- [ ] Stop Work interventions? _____
- [ ] Corrective/Preventive Actions needed for future work: _____
- [ ] Any other H&S issues: _____

K eep H&S 1st in all things Remember to Share any Lessons Learned through H&S Moments or Safety Shares

ARCADIS

Document Control Number:TGM - _____

TGM + *project number plus date as follows: xxxxxxxx.xxxx.xxxxx - dd/mm/year*

TAILGATE HEALTH & SAFETY MEETING FORM

This form documents the tailgate meeting conducted in accordance with the Project HASP. Personnel who perform work operations on-site during the day are required to attend this meeting and to acknowledge their attendance, at least daily.

Project Name:			**Project Location:**
Date:	**Time:**	**Conducted by:**	**Signature/Title:**
Client:		**Client Contact:**	**Subcontractor companies:**

TRACKing the Tailgate Meeting

Think through the Tasks (list the tasks for the day):

1 _____ 3 _____ 5 _____

2 _____ 4 _____ 6 _____

Other Hazardous Activities - Check the box if there are any other ARCADIS, Client or other party activities that may pose hazards to ARCADIS operations ☐ If there are none, write "None" here: _____

If yes, describe them here: _____

How will they be controlled? _____

Prework Authorization - check activities to be conducted that require permit issuance or completion of a checklist or similar before work begins:

	Doc #		Doc #		Doc #
☐ Not applicable		☐ Working at Height		☐ Confined Space	
☐ Energy Isolation (LOTO)		☐ Excavation/Trenching		☐ Hot Work	
☐ Mechanical Lifting Ops		☐ Overhead & Buried Utilities		☐ Other permit	

Discuss following questions (for some review previous day's post activities). **Check if yes :**

☐ Incidents from day before to review?	☐ Lessons learned from the day before?	☐ Any Stop Work Interventions yesterday?
☐ Any corrective actions from yesterday?	☐ Will any work deviate from plan?	☐ If deviations, notify PM & client
☐ JLAs or procedures are available?	☐ Field teams to "dirty" JLAs, as needed?	☐ All equipment checked & OK?
☐ Staff has appropriate PPE?	☐ Staff knows Emergency Plan (EAP)?	☐ Staff knows gathering points?

Comments: _____

Recognize the hazards (check all those that are discussed) (Examples are provided) and **Assess** the Risks (Low, Medium, High - circle risk level) - Provide an overall assessment of hazards to be encountered today and briefly list them under the hazard category.

☐ Gravity (i.e., ladder, scaffold, trips) (L M H)	☐ Motion (i.e., traffic, moving water) (L M H)	☐ Mechanical (i.e., augers, motors) (L M H)
☐ Electrical (i.e., utilities, lightning) (L M H)	☐ Pressure (i.e., gas cylinders, wells) (L M H)	☐ Environment (i.e., heat, cold, ice) (L M H)
☐ Chemical (i.e., fuel, acid, paint) (L M H)	☐ Biological (i.e., ticks, poison ivy) (L M H)	☐ Radiation (i.e., alpha, sun, laser) (L M H)
☐ Sound (i.e., machinery, generators) (L M H)	☐ Personal (i.e. alone, night, not fit) (L M H)	☐ Driving (i.e. car, ATV, boat, dozer) (L M H)

Continue TRACK Process on Page 2

TAILGATE HEALTH & SAFETY MEETING FORM - Pg. 2

Control the hazards (Check all and discuss those methods to control the hazards that will be implemented for the day): Review the HASP, applicable JLAs, and other control processes. Discuss and document any additional control processes.

☒	**STOP WORK AUTHORITY** (Must be addressed in every Tailgate meeting - (*See statements below*)		
☐	Elimination	☐ Substitution	☐ Isolation
☐	Engineering controls	☐ Administrative controls	☐ Monitoring
☐	General PPE Usage	☐ Hearing Conservation	☐ Respiratory Protection
☐	Personal Hygiene	☐ Exposure Guidelines	☐ Decon Procedures
☐	Emergency Action Plan (EAP)	☐ Fall Protection	☐ Work Zones/Site Control
☐	JLA to be developed/used ***(specify)***	☐ LPO conducted ***(specify job/JLA)***	☐ Traffic Control
☐		☐	☐ Other ***(specify)***
☐		☐	☐

Signature and Certification Section - Site Staff and Visitors

Name/Company/Signature	Initial & Sign in Time	Initial & Sign out Time	I have read and understand the

Important Information and Numbers

All site staff should arrive fit for work. If not, they should report to the supervisor any restrictions or concerns.

In the event of an injury, employees will call WorkCare at 1.800.455.6155 and then notify the field supervisor who will, in turn, notify Corp H&S at 1.720.344.3844.

In the event of a motor vehicle accident, employees will notify the field supervisor who will then notify Corp H&S at 1.720.344.3844 and then Corp Legal at 1.720.344.3756.

In the event of a utility strike or other damage to property of a client or 3rd party, employees will immediately notify the field supervisor, who will then immediately notify Corp Legal at 1.678.373.9556 and Corp H&S at

Visitor Name/Co - not involved in work

In	Out
In	Out
In	Out
In	Out

I will STOP the job any time anyone is concerned or uncertain about health & safety or if anyone identifies a hazard or additional mitigation not recorded in the site, project, job or task hazard assessment.

I will be alert to any changes in personnel, conditions at the work site or hazards not covered by the original hazard assessments.

If it is necessary to **STOP THE JOB,** I will perform **TRACK**; and then amend the hazard assessments or the HASP as needed.

I will not assist a subcontractor or other party with their work unless it is absolutely necessary and then only after I have done TRACK and I have thoroughly controlled the hazard.

Post Daily Activities Review - Review at end of day or before next day's work (Check those applicable and explain:)

- ☐ Lessons learned and best practices learned today: _____
- ☐ Incidents that occurred today: _____
- ☐ Any Stop Work interventions today? _____
- ☐ Corrective/Preventive Actions needed for future work: _____
- ☐ Any other H&S issues: _____

Keep H&S 1st in all things

WorkCare - 1.800.455.6155

Real Time Exposure Monitoring Data Collection Form

Document all air monitoring conducted on the Site below. Keep this form with the project file.

Site Name: _____ Date: _____

Instrument: _____ Model: _____ Serial #: _____

Calibration Method: (Material used settings, etc.)	
Calibration Results:	
Calibrated By:	

Activity Being Monitored	Compounds/Hazards Monitored	Time	Reading	Action Required? Y/N

Describe Any Actions Taken as a Result of this Air Monitoring and Why (does it match Table 5-1):

_____

_____

Employee Signature Form

I certify that I have read, understand, and will abide by the safety requirements outlined in this HASP.

Printed Name	Signature	Date

Subcontractor Acknowledgement: Receipt of HASP Signature Form

ARCADIS claims no responsibility for the use of this HASP by others although subcontractors working at the site may use this HASP as a guidance document. In any event, ARCADIS does not guarantee the health and/or safety of any person entering this site. Strict adherence to the health and safety guidelines provided herein will reduce, but not eliminate, the potential for injury at this site. To this end, health and safety becomes the inherent responsibility of personnel working at the site.

Printed Name	Company	Signature	Date

Visitor Acknowledgement and Acceptance of HASP Signature Form

By signing below, I waive, release and discharge the owner of the site and ARCADIS and their employees from any future claims for bodily and personal injuries which may result from my presence at, entering, or leaving the site and in any way arising from or related to any and all known and unknown conditions on the site.

Name	Company	Reason for Visit	Date/Time On Site	Date/Time Off Site

Hazardous Materials Transportation Form

	Vehicle (place X in box)	Type (pick-up, car, box truck, etc.)
Personal		
Rental		
ARCADIS owned/leased		
Government owned		
Trailer		

Materials Transported	Quantity	Storage/Transport Container

List Trained Drivers:

_____

_____

Hazardous Materials Shipment Form

Material Description and Proper Shipping Name (per DOT or IATA)	Shipment Quantity	DOT Hazard Classification	Shipment Method (air/ground)

List Shipper (i.e., who we are offering the shipment to):

_____

_____

List Trained Employee(s):

_____

_____

HAZARDOUS MATERIALS SHIPPING/TRANSPORTATION DETERMINATION FORM

Materials of Trade Template for use with the Standard HASP 8/10/2012

Date:	11/19/2012
Project Name:	Sherwin Williams
Project Number:	EM002616
Supplemental Information:	MSDS

Description of the Material to be Transported or Shipped:

Checked materials in the *HAZCOM* worksheet, *Monitoring* worksheet, *Safety Supplies and Equipment* section and *Level C Supplement* (if applicable) of the standard HASP for this project will be transported under the Materials of Trade Exception (49 CFR 143.6) in ARCADIS owned, leased or rented vehicles or vendor vehicles.

Special Instructions:

1) All containers will be maintained in an upright condition with lids or other openings secure. Containers will be protected against movement during transport and have adequate cushioning for protection
2) Cylinders will have valves removed during transport.
3) Batteries regardless of type or size, will have terminal protected and each battery will be protected from crushing, pressure or other condition that may affect the integrity of the battery.
4) Fire extinguishers will be mounted and secure in company owned or leased vehicles.

Limitations

1) No more than 440 pounds (combined gross weight) of materials subject to this shipping determination are permitted on a transport vehicle and individual container limits are specified in DOT Facts-108a and must not be exceeded. Gasoline, if transported, will be in metal safety cans no larger than 8 gallon capacity.
2) No more than 400 gallons of dilute Class 9 materials (<2% concentration) may be transported on a vehicle.
3) Materials that are radioactive or explosive are not eligible for MOT Exception and separate shipping determinations will be required for those materials.

References and Rationale for the Determination:

49 CFR 173.6 DOT Facts-108a
These materials are used in support of ARCADIS work.

Determination performed by: Erica Whiting

Determination QA/QC performed by: Ron Goloubow

Site Traffic Awareness and Response (STAR) Plan
Revision 1, 1/3/2011

1.0 General

Project Name:	Sherwin Williams Emeryville
Project Number:	EM002616
STAR Plan Developer Name:	Erica Whiting
Reviewed By:	Ron Goloubow
Duration of Work (hours or days):	8 hr days
Time Restrictions (describe below):	Daylight

Comments:

Day Light Savings time is in effect; Sunset is around 4:30 PM. Please plan accordingly.

2.0 Work Description

Modify the following statement as appropriate:
Site is a former paint factory and adjacent parking lot for local business. Groundwater monitoring including water level gauging and collection of groundwater samples will occur within site boundary, and adjacent Rifkin Parking lot where individuals may encounter moving cars in parking lot. Additionally, a few monitoring wells are on public streets.

☐ Work is planned on off site properties but not in the public right-of-way.

To facilitate identification of traffic controls to use, check all that apply to this project:

Short Duration Work (<1 hour)

- ☑ Water-level gauging and well sounding
- ☐ Surface soil sampling using manual methods
- ☐ Intermediate depth soil sampling using DPT
- ☑ Shallow monitor well purging and sampling
- ☐ Product recovery using manual methods
- ☐ Surveying
- ☐ Other (specify):

Intermediate Duration Work (1-8 hours)

- ☐ Intermediate/deep or > 2 in. diameter well sampling
- ☐ Slug testing and similar tests
- ☐ Deep handauger sampling (>20 ft depth)
- ☐ Manual soil sampling through concrete/asphalt
- ☐ Deep soil sampling using DPT (>40 ft depth)
- ☐ Soil sampling using other automated drilling method
- ☐ Other (specify):

Long Duration Work (>8 hours)

- ☐ Deep monitor well installation (>50 ft depth)
- ☐ Monitor wells with surface casing installation
- ☐ Intermediate depth monitor wells ≥ 4 in. diam.
- ☐ Long term product recovery using equipment
- ☐ Long term pump testing
- ☐ Other (specify):

Comments:

Traffic Type:

Check all that apply:

- ☑ Automobiles
- ☑ Straight truck
- ☑ Semi truck
- ☐ Forklifts
- ☑ Bicycles
- ☑ Pedestrian
- ☐ Construction equipment
- ☐ Other:

3.0 Traffic Control Layout

The following DOT Fact Sheets and/or configurations are applicable to this project:
Notes: DOT Fact Sheets have numbered scenarios, select the appropriate scenario(s) for the project and indicate duration [Short (S), Intermediate (I), Long (L)]. Manually revise diagrams, if needed to convey requirements.

		1 2 3 4 5 6 7 8 9	S	I	L
☐	DOT Facts-302a Retail Gas Station/Small Business Parking Lot (<1 Hour)				
☐	With Truck ☐ Without Truck	☐☐☐☐☐			
☐	DOT Facts-302b Retail Gas Station/Small Business Parking Lot (1-8 Hours)	☐☐☐☐			
☐	DOT Facts-302c Retail Gas Station/Small Business (>8 Hours)	☐☐☐			
☐	DOT Facts-302e Multi-business Parking Lot	☐☐☐☐☐☐☐☐☐	☐	☐	☐
☑	DOT Facts-302e Facility Parking Area	☐☐☐☐☐☐☐☐☐	☐	☑	☐
☐	Parking Garage (develop drawing for controls)				
☐	Other (specify): _____				
☐	Controls to the right will be used (copy and paste from STAR Select)				

How will the above documents be communicated to field staff? (excludes STAR Select)

☐ The above documents are attached to this STAR Plan
☐ The above documents are appropriate without significant modification and are available to field staff in the

Field Guide for Roadway Work Zone Safety.

4.0 Required Traffic Control Devices and Phasing

Tasks on this project may be implemented both individually or concurrently. Selection and number of traffic control devices required will be dependent on the scope of work. In all cases, a minimum of 4 x42 inch channelizer cones with flags will be available on site for any field work. Based on recommendations in DOT Fact Sheet applicable to the work being performed, indicate any additional traffic control devices for the current project below.

Traffic control device help: DOT Facts-302d

Check all that apply:	Number:
☐ Channelizer cone (42 inch height, 10 lb base)	
☐ Channelizer cone (42 inch height, 30 lb base)	
☑ Traffic cones (≥ 18 inches tall)	6
☐ Barricade ☐ Type I ☐ Type II	
☐ Flags for cones	
☐ Lights (for night work)	
☐ Plastic fencing (rolls)	
☐ Caution tape (rolls)	
☐ Other (specify): _____	

Phasing:
1) Position truck as shield, if practical
2) Deploy traffic control devices
3) Affix flags, caution tape or fencing as prescribed in fact sheet
4) Unload project equipment
5) Commence work
6) SSO to maintain controls
7) Remove controls in opposite order

☐ Additional client requirements are attached

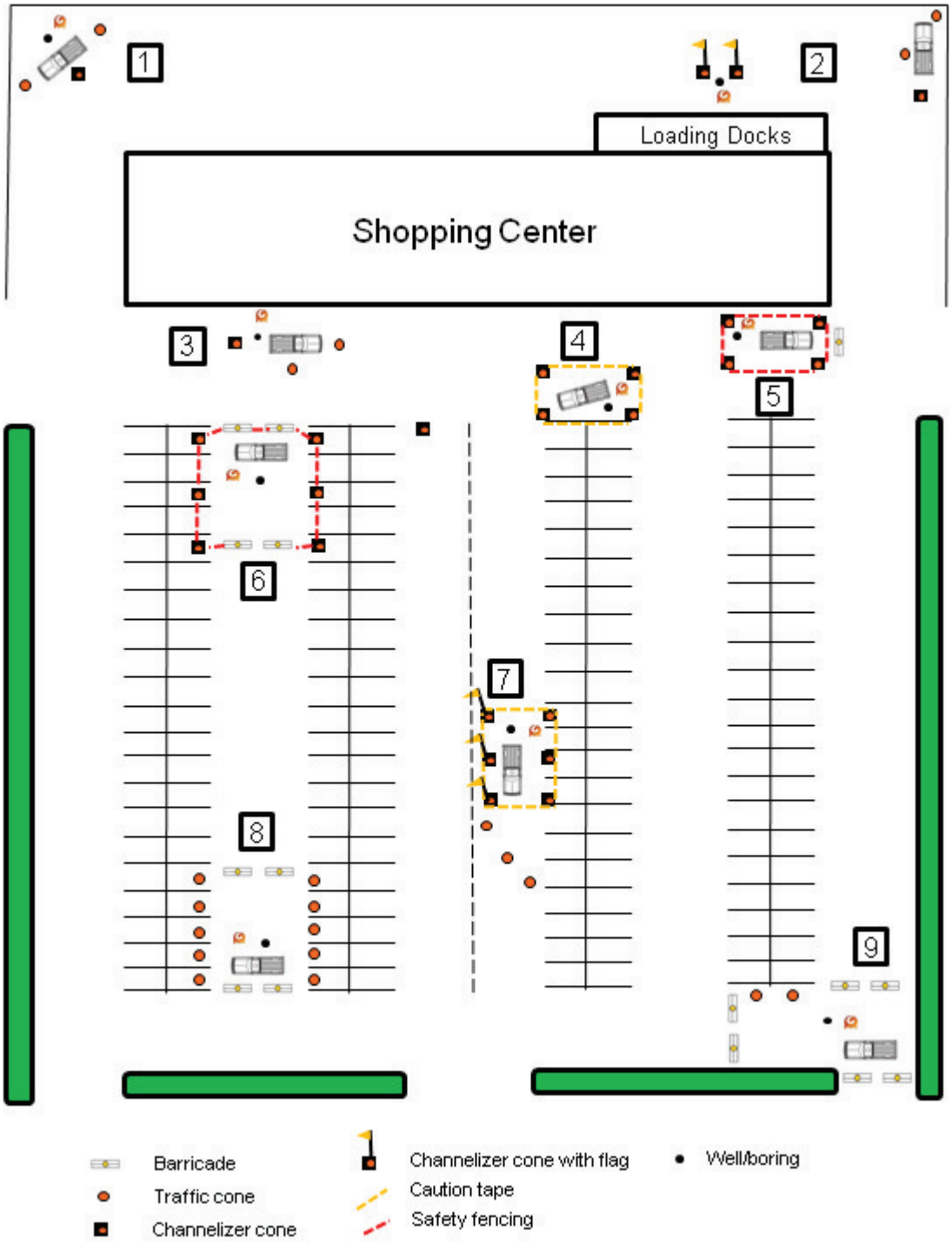
If vehicle equipped with high intensity strobe or rotating lights, the lights should be utilized during work. If the vehicle is not equipped with supplemental lighting devices, use vehicle flashers (be aware of battery drain when using any of the lighting devices).
Personal protective equipment required for this work is listed in the applicable project Job Loss Analysis (JLA) or project specific HASP. A Class II (minimum) high visibility vest is required.

5.0 Approvals

	Printed Name	Date	Signature
Plan Developer:	Erica Whiting	11/19/2012	
Plan Reviewer:	Ron Goloubow	11/25/2012	

DOT Facts-302e
Recommended Best Practices for Multiple Business and Large Facility Parking Areas

The following configurations should be considered for traffic protection in retail parking areas for multiple businesses (strip malls, etc) and large facility parking lots.



Revision 1, 1/15/10

General Guidelines for Safety:

- **Use the vehicle as a shield when possible. Orient the rear of the ARCADIS vehicle away from site entrances and areas of increased backing or movement of other vehicles, when practical. Traffic cones used in scenarios above in conjunction with the parked vehicle should be consistent with the ARCADIS Cone and Spotter Program (see ARC HSGE-024 for more information)**
- **All channelizer cones shall be at least 42 inches in height**
- **Always work facing the area with greatest traffic movement and least protection**
- **Always assume vehicles will move in either direction (frontwards or backwards)**
- **Always use TRACK to predict traffic movement and stage vehicle and Control Zones in manner that offers protection without impairing site entrance or blocking access to loading docks when possible. STAR Plan requirements should be reviewed against HASP exclusion zone requirements for consistency.**
- **If there is a perceived drivable space or if there is an unused parking space, you must assume that someone will attempt to access or drive to/through the location. Plan, deploy and work accordingly. Block off parking spaces with cones during off hours to ensure no vehicles will occupy the planned work zone.**
- **Class II high visibility vest (minimum) to be worn at all times (refer to HASP or JLA for additional requirements, if any).**
- **Discuss with site operator or manager times of lower traffic volume and attempt to schedule work activity during traffic lulls. When working near dumpsters and loading docks find out when the dumpsters are emptied and avoid loading docks during planned delivery times.**
- **Warning lights shall be used for night work on both the channelizer drums and barricades, if used. Cones used during night work for taper purposes must have retroflective tape.**
- **Areas in green above may appear to be site property but may actually be within the roadway right-or way. Work performed in the right-of-way has additional requirements. See ARC DOT-301 for more information.**

Scenario Descriptions:

1) **Locations to the rear of strip malls and similar operations generally have low traffic volume and low pedestrian activities. Use the truck as a shield to the extent possible and deploy channelizer cone in direction of expected traffic exposure. This scenario may be used for short duration (< 1 hour) and intermediate duration (1-8 hours) daylight work activities. Since deliveries by larger vehicles are generally performed during night hours, long duration (>8 hours) and night time work should employ recommendations described in scenario #5 below, even in these low traffic areas.**
2) **Locations near loading docks involve large vehicle backing with limited visibility. Tight space and work zone proximity to other active operations may preclude the use of the vehicle as a shield in these areas. Work in these areas should use channelizer cones with flags to increase work zone awareness even if the vehicle is being used as a shield. When backing activities are occurring, work should be suspended and employees should leave the area until the backing operations are complete (leaving the traffic control devices in place).**
3) **Short duration work (<1 hour) in high traffic and pedestrian areas should use the vehicle as a shield with the front of the vehicle facing oncoming traffic. A channelizer cone should be deployed in the vicinity of the work zone near the ARCADIS employee's work area**
4) **Intermediate duration work (1-8 hours) in high traffic and pedestrian areas should use the vehicle as a shield with the front of the vehicle facing oncoming traffic. The work zone**

should be defined with channelizer cones (10 pound base weight recommended) and caution tape. Leave sufficient space to allow access to all areas of the vehicle.

5) **Long duration work (> 8 hours) and night work in high traffic and pedestrian areas should use the vehicle as a shield with the front of the vehicle facing oncoming traffic. Utilize standard orange plastic safety fencing and channelizing cones (30 pound base weight recommended) to delineate the work zone. Use of lighted barricades (Type I or II preferred) on the end facing oncoming traffic is recommended, if work is performed near site entrances.**
6) **Complete lane closure in areas of higher traffic and pedestrian flow should utilize barricades (Type I or II preferred) in sufficient number to clearly indicate the lanes are closed. Signs may be used in conjunction with the barricades to further communicate the closure. Channelizer cones should be used in conjunction with caution tape (intermediate duration) and safety fencing (long duration) closure. Place the vehicle as a shield in the area of highest exposure to traffic (at the lane entrance end as shown in the example above) and create adequate buffer zone on the end with lower traffic exposure.**
7) **Large parking areas may have a central thoroughfare leading to a red light at the city street. These areas may have increased traffic control, have wider lanes and traffic may drive in these areas at higher speeds. Work zones in these areas should use the vehicle as a shield with the front of the vehicle facing oncoming traffic. Channelizer cones should be used in conjunction with caution tape (intermediate duration) and safety fencing (long duration) lane closure. If parking spaces across the lanes are useable, use flags with the channelizer cones to increase awareness of the work zone to backing drivers. A taper, using standard traffic cones, may be used to help control traffic control through the area. If these locations have high volumes of traffic, consider using flaggers.**
8) **Work zones away from the active business area of the site and having low traffic and pedestrian flow may be configured using lesser requirements. Use barricades (Type I or II preferred) to close lanes and orient vehicle as a shield in the area of highest traffic exposure. Create a buffer between the work area and the area of lesser traffic exposure. Standard traffic cones may be used to delineate the work zone. Use of this scenario requires an understanding of traffic flow and patterns throughout the planned duration of the work activity. If conditions change, use of controls as described in scenario #6 should be used.**
9) **Complete lane closure involving an entrance should rely on barricades as the primary method of traffic control. Type I, II or III barricades should be used at the site entrance (Type III if the entrance has high traffic volume) for both intermediate and long duration work. Type I or II barricades are recommended for lane closures. Use the vehicle as a shield in the area of highest traffic exposure (usually the entrance). If vehicle or pedestrian traffic is persistent or heavy, controls using caution tape or safety fencing should be employed in conjunction with additional barricades or channelizer cones.**

Traffic Control Plan

Revision 1, January 6, 2011

1.0 General

Project Name:	Sherwin Williams
Project Number:	EM002616
TCP Developer Name:	Erica Whiting
Engineering Judgment (EJ) Review By[1]:	Ron Goloubow
Duration of Work (hours or days):	2 hours
Roadway Work Zone Start Point	Horton street and Sherwin Avenue
Roadway Work Zone End Point	Horton Street past Rifkin Lot
Posted Speed Limit (roadway)	25 mph
Number of Lanes (each direction)	1
Time Restrictions (describe below)[2]:	none

Comments:

1) Need help evaluating 3rd Party TCPs? 3rd Party TCP Evaluation Process

2) Coordinate with site operator on delivery times, dumpster emptying times, etc. to avoid problems.

2.0 Work Description

Modify the following statement as appropriate:

Work will include groundwater gauging and sampling at monitoring wells on 45th avenue, and horton street.

Check all that apply:

- ☐ Work is planned on off-site properties.
- ☐ TCP was developed by a 3rd party on behalf of and under contract to ARCADIS, see attached.
- ☐ Regulatory permit/authorization attached.

To facilitate identification of traffic controls to use, check all that apply to this project:

STAR Short Duration Work (<1 hour)	STAR Intermediate Duration Work (1-8 hours)
☑ Water-level gauging and well sounding	☐ Intermediate/deep or >2 in. diameter well sampling
☐ Surface soil sampling using manual methods	☐ Slug testing and similar tests
☐ Intermediate depth soil sampling using DPT	☐ Deep handauger sampling (>20 ft depth)
☑ Shallow monitor well purging and sampling	☐ Manual soil sampling through concrete/asphalt
☐ Product recovery using manual methods	☐ Deep soil sampling using DPT (>40 ft depth)
☐ Surveying	☐ Soil sampling using other automated drilling method
☐ Other (specify):	☐ Other (specify):

STAR Long Duration Work (>8 hours)

- ☐ Deep monitor well installation (>50 ft depth)
- ☐ Monitor wells with surface casing installation
- ☐ Intermediate depth monitor wells ≥ 4 inch diameter
- ☐ Long term product recovery using equipment
- ☐ Long term pump testing
- ☐ Other (specify):

Roadway Work Type (*check all that apply*):

- ☐ Off shoulder
- ☐ On shoulder
- ☐ Travel lane
- ☐ Other:
- ☐ Turn lane
- ☐ Intersection
- ☐ Sidewalk
- ☐ Mobile operation
- ☐ Road closure
- ☐ Bicycle lane
- ☐ See attached TCP

STAR (*check all that apply*):

- ☑ Automobiles
- ☑ Straight truck
- ☑ Semi truck
- ☐ Other:
- ☐ Forklifts
- ☑ Bicycles
- ☑ Pedestrian
- ☐ Construction equipment

3.0 Traffic Control Layout

The following are applicable to this project:

Notes: DOT Fact Sheets have numbered scenarios, select the appropriate scenario(s) for the project and indicate duration [Short (S), Intermediate (I), Long (L)]. Manually revise diagrams, if needed to convey requirements.

STAR

1 2 3 4 5 6 7 8 9 S I L

- ☐ DOT Facts-302a Retail Gas Station/Small Business Parking Lot (<1 Hour)
  - ☐ With truck ☐ Without truck
- ☐ DOT Facts-302b Retail Gas Station/Small Business Parking Lot (1-8 Hours)
- ☐ DOT Facts-302c Retail Gas Station/Small Business (>8 Hours)
- ☐ DOT Facts-302e Multi-business Parking Lot
- ☐ DOT Facts-302e Facility Parking Area
- ☐ Parking Garage (develop drawing for controls)
- ☐ Other (specify):
- ☐ Controls to the right will be used (copy/paste from STAR Select)

Roadway

- ☐ DOT Facts-301i Off Shoulder Work
- ☐ DOT Facts-301j On Shoulder Work
- ☐ DOT Facts-301k On Shoulder Mobile or Short Duration Work
- ☐ DOT Facts-301m On Shoulder Work with Minor Encroachment
- ☐ DOT Facts-301n Lane Closure, 2 Lane Road, with Flagger
- ☑ DOT Facts-301o Lane Closure, 2 Lane Low Volume Road
- ☐ DOT Facts-301p Temporary Road Closure
- ☐ DOT Facts-301r Work in Center of Low Volume Road
- ☐ DOT Facts-301t Lane Closure on Urban Minor Street
- ☐ NA Major Intersection, High Volume Road (attach drawing)
- ☐ NA Lane Closure, Urban High Volume Street (attach drawing)
- ☐ DOT Facts-301u Other Atypical Application (attach drawing)

TRACK

How will the above documents be communicated to field staff?

- ☑ The above documents or modified documents are attached to this TCP, and/or
- ☐ The above documents are appropriate without significant modification and are available to field staff in the Field Guide for Roadway Work Zone Safety. (Read printing instructions)

4.0 Required Traffic Control Devices and Phasing

Modify statements as appropriate:

STAR Tasks:

Tasks on this project may be implemented both individually or concurrently. Selection and number of traffic control devices required will be dependent on the scope of work. In all cases, a minimum of 4 x 42 inch channelizer cones with flags will be available on site for any field work. Based on recommendations in DOT

Fact Sheet(s) applicable to the work being performed, indicate any additional traffic control devices for the current project below.

Roadway Tasks:

Regardless of TCP responsibility for this project, all ARCADIS vehicles in a RWZ will, at a minimum, have a functioning high intensity strobe or rotating orange light. All ARCADIS employees in the RWZ will wear, at a minimum, a retroflective high visibility vest meeting Class II or III requirements and other PPE required by JLA or HASP. ARCADIS employees will not enter a 3rd party RWZ if observed to be deficient or inconsistent with the ARCADIS RWZ Safety Program.

ARCADIS RWZ requirements stipulated in this TCP from above selected DOT Fact Sheet(s) or through attached document require the following traffic control devices to be present on site during work in the roadway or right-of-way:

Need sign help?	DOT Facts-301d	Need help determining cone needs:
Need channelizing device help?	DOT Facts-301e	ARCADIS Cone Calculator
Need Flagger help?	DOT Facts-301f	
View Flagger training requirements by state:	DOT Facts-301w	

Check all that apply:	*Wording or Pictogram*	*Number:*
☑ Warning signs	road work ahead	1
☐ Warning signs		
☐ Warning signs		
☐ Stop/Slow paddle		
☐ Red flag		
☐ Drums		
☑ Channelizer cone (42 inch height, 10 lb base)		4
☐ Channelizer cone (42 inch height, 30 lb base)		
☐ Traffic cones (≥ 18 inches tall)		
☐ Barricade ☐ Type I ☐ Type II		
☑ Flags for cones		4
☐ Lights (for night work)		
☐ Plastic fencing (rolls)		
☐ Caution tape (rolls)		
☐ Other (specify):		

STAR Phasing:

1) Position truck as shield, if practical
2) Deploy traffic control devices
3) Affix flags, caution tape or fencing as prescribed in fact sheet
4) Unload project equipment
5) Commence work
6) SSO to maintain controls
7) Remove controls in reverse order

TCP Phasing:

1) Deploy warning signs at first approach, if required
2) Deploy subsequent approach warning signs, if required
3) Deploy channeling devices, if required, starting with first approach
4) Deploy "End Road Work" signs, if required
5) Position vehicle as shield to the extent practical
6) Commence work, SSO or designated contractor to maintain devices
7) Remove devices in reverse order

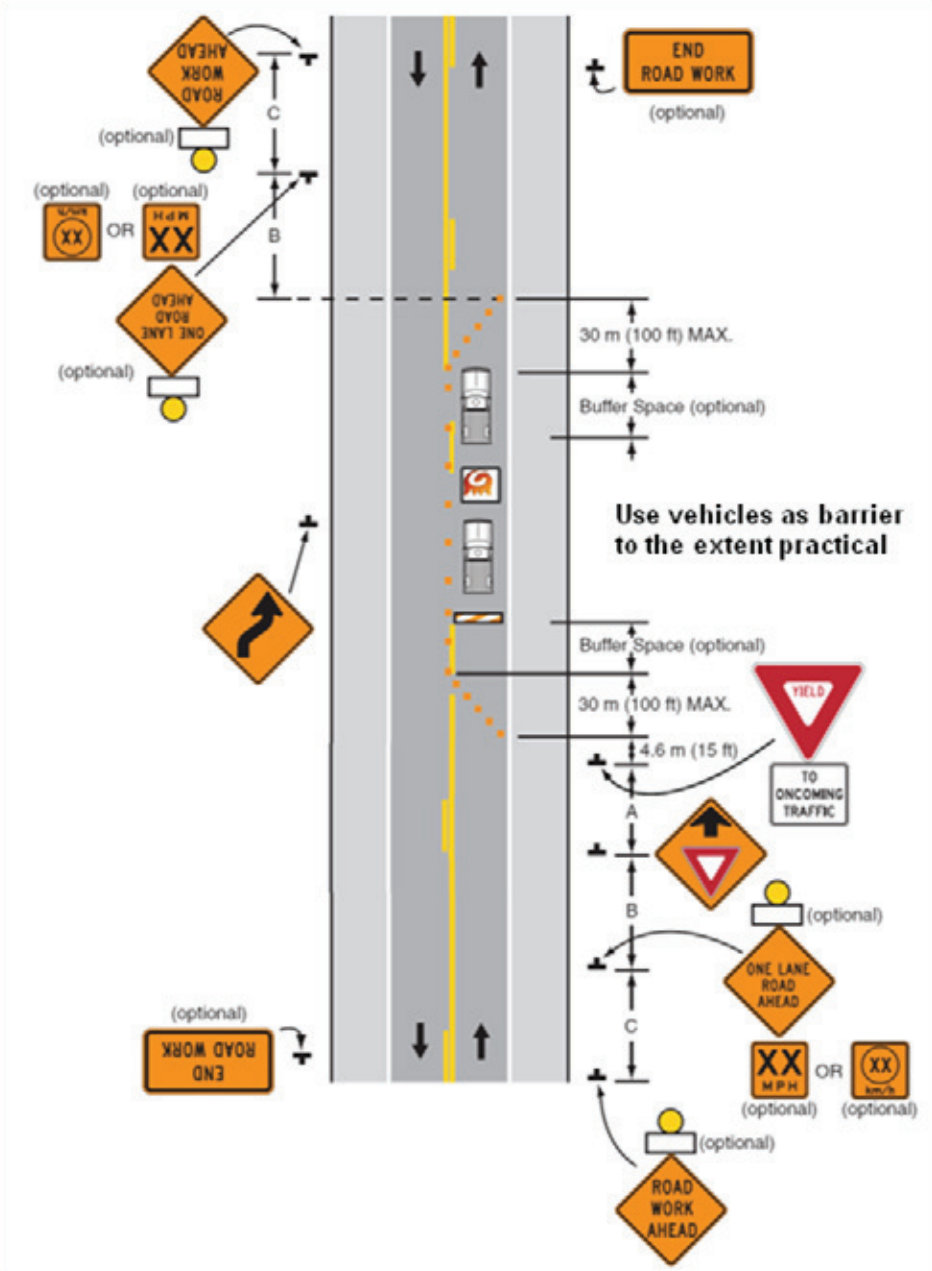
5.0 Approvals

	Printed Name	Date	Signature
Plan Developer:	Erica Whiting	11/19/2012	
Reviewer:	Ron Goloubow	11/25/2012	
☐ EJ signature on attached TCP			

You have the absolute right to stop work if unsafe conditions exist!

DOT Facts-301o
Lane Closure on Two-Lane Road with Low Traffic Volumes

The following configuration may be used for lane closure on two-lane roads with low traffic volumes:



Road Type	"A" (m/ft)	"B" (m/ft)	"C" (m/ft)
Urban (Low Speed)	30/100	30/100	30/100
Urban (High Speed)	100/350	100/350	100/350
Rural	150/500	150/500	150/500

Guidance:

G1. This RWZ application may be used as an alternate to the RWZ application shown in DOT Facts-301n (using flaggers) when the following conditions exist:

a. Vehicular traffic volume is such that sufficient gaps exist for vehicular traffic that must yield.

b. Road users from both directions are able to see approaching vehicular traffic through and beyond the work site and have sufficient visibility of approaching vehicles.

G2. The Type B flashing warning lights may be placed on the ROAD WORK AHEAD and the ONE LANE ROAD AHEAD signs whenever a night lane closure is necessary.

Job Safety Analysis

General

JSA ID		**Status**	(1) Intitial
Job Name	Environmental-Other	**Created Date**	11/19/2012
Task Description	Driving	**Completed Date**	
Template		**Auto Closed**	

Client / Project

Client	The Sherwin Williams Company
Project Number	EM002616
Project Name	Sherwin Williams Emeryville
PIC	Michael Paczkowski
Project Manager	Lucas Goldstein

User Roles

Role	Employee	Due Date	Completed Date	Supervisor	Active
Developer	Erica Whiting			Lucas Goldstein	☑
HASP Reviewer	Ron Goloubow				☑
Quality Reviewer					☑

Job Steps

Job Step No.	Job Step Description		Potential Hazard	Critical Action	H&S Reference
1	Performing Pre-trip inspections	1	Cuts scrapes to hands and fingers checking engine fluids	Use Track to plan inspection activity in the engine compartment. Wear protective gloves if reaching in poorly illuminated areas of the engine	
		2	Pinch crush hazards to hands and fingers checking engine fluids or closing doors.	Identify and keep hands fingers away from pinch hazards from doors and vehicle hood or tailgate (if present).	
		3	Awkward body positions checking tires, spare tire, undercarriage, or engine compartment	Maintain neutral body positions and avoid awkward reaches under the vehicle or in engine compartment	
		4	Failure to inspect vehicle emergency equipment may result in extensive vehicle damage or delay treatment in the event of injury	Conduct equipment inspections by visibly inspecting fire extinguisher and first aid kit for cleanliness, in date items/tags, readiness for use.	
2	Vehicle loading and unloading	1	Object placement obstructing rear, side or blind spot view.	Avoid placing objects in a manner that obstructs your view, brake equipment down to a smaller more manageable size to keep low profile in vehicle, If hanging clothes in vehicle, place in manner that does not obstruct blind spots.	
		2	Unsecure objects causing pedal, steering or gear shift obstruction or injury during vehicle operation	Secure all loads in vehicle (both in the bed of trucks and in passenger cabin) to prevent unanticipated movement or shifting that could injure driver, passenger or affect safe operation of vehicle	
		3	Obstruction of vehicle safety equipment caused by object placement in vehicle	Keep emergency equipment clear and unobstructed to ensure ready availability.	
3	Vehicle operation	1	Failure to use Smith System “5-Keys” increases risk of accident	Use Smith System “5-Keys”. Maintain space cushion around vehicle, maintain 4 second rule and add (second for each additional hazard (wet loads, snow, etc) Brake gradual, keep eyes moving, check mirrors every 6-8 seconds, use turn signals, focus on relevant objects. Use early lane positioning when approaching turns.	

		2	Injury or death from failure to wear seatbelt	Always wear seatbelts even if driving short distances off of a public roadway.	
		3	Cell phone use increase risk of accident and injury	Avoid using cell phones in any capacity when operation a vehicle, check client for cell use on project sites and follow requirements. Follow all local laws	
		4	Use of radar detectors encourages speeding and resulting in increased risk for accident or injury	Use of radar detectors and similar devices is prohibited	
4	Routine maintenance	1	Pinch crush hazards to hands and fingers replacing engine fluids or closing doors/hood.	Inspect and identify pinch and crush hazards and keep hands/fingers clear when closing hood, tailgates, or doors.	
		2	Burn hazards to hand from checking/replacing fluids in engine compartment	When practical allow engine to cool prior to servicing or adding fluids. Use protective gloves.	
		3	Vehicle damage from improper fuse replacement	Never replace a fuse with higher amperage than the one being replaced. Only replace fuses of the being replaced	

Supplies

Type	Supply	Description	Required
Communication Devices	mobile phone		Required
Miscellaneous	fire extinguisher		Required
	first aid kit		Required
Traffic Control	Other	Roadway Emergency Kit	Required

Review Comments

Reviewer		Comments
Employee: **Role** **Review Type** **Completed Date**		
Employee: **Role** **Review Type** **Completed Date**		
Employee: **Role** **Review Type** **Completed Date**		

Job Safety Analysis

General

JSA ID		**Status**	(1) Intitial
Job Name	Environmental-Drum sampling/handling	**Created Date**	11/19/2012
Task Description	Drum Handling and Sampling	**Completed Date**	
Template		**Auto Closed**	

Client / Project

Client	The Sherwin Williams Company
Project Number	EM002616
Project Name	Sherwin Williams Emeryville
PIC	Michael Paczkowski
Project Manager	Lucas Goldstein

User Roles

Role	Employee	Due Date	Completed Date	Supervisor	Active
Developer	Erica Whiting			Lucas Goldstein	☑
HASP Reviewer	Ron Goloubow				☑
Quality Reviewer					☑

Job Steps

Job Step No.	Job Step Description		Potential Hazard	Critical Action	H&S Reference
1	Inspect Drums for signs of Bulging, Leaking, Crystals, Temperature, and Odor	1	Exposure to chemicals stored in drum or container.	Read drum labels for information about contents. Review all relevant MSDSs about chemical contents. If labels are not attached, call PM or Local H&S Representative.	None
		2	Contents of the drum can cause fire/explosion hazard.	Use air monitoring meters to screen drums. % LEL and VOCs (PPM). If either of the values are above the action levels described in the HASP or MSDS then Stop Work, move away from the area, and reassess the situation. Call PM and H&S staff for support.	
2	Remove lids or bungs from Drums	1	Hand Injuries can occur from sharp edges, pinch points, and from use of hand tools.	Wear appropriate work gloves. When removing ring from drum, fingers can get pinched between ring and drum. Keep fingers clear of this space. Select proper tool for task. If large amount of drums will be encountered, use a speed or drum wrench.	Employee H&S Field book, Section III Subpart II, page 104. Also Section III Subpart L, page 38.
		2	Rapid depressurization from empty or partially full drums can cause flying parts or volatile COCs releasing on staff.	Do not handle or open bulging drums (contact Corp H&S for assistance). Bleed any built up pressure by carefully loosening bung prior to removing ring. Keep face and arms away from bung opening when loosening. Slightly lift lid, insert end of air monitoring device to monitor air inside drum.	
		3	Use of mechanical tools to remove bolts from drum lids causes excessive noise.	Wear hearing protection.	
		4	Splashing can occur if filling drum, or collecting samples.	Wear eye and face protection. Pour liquids into drum slowly to minimize splashing.	
		5	When working with COCs that have fire/explosive properties, sparking or heat could cause fire/explosion.	Use brass or non Spark Hand Tools if such a hazard exists or is suspected.	
3	Sample Contents from Drums	1	Exposure to COCs can occur by contacting impacted contents.	Select proper dermal protection for task, at a minimum nitrile gloves should be worn. Wear appropriate eye face and body protection as outlined in the HASP.	

		2	Staff can be exposed to chemical vapors/fumes when sampling.	Conduct air monitoring as outlined in the HASP, and if required, select appropriate respiratory protection for the task.	
		3	Sharp edges and broken sample containers can cause lacerations.	Discard any broken sample ware or glass properly. Do not over tighten sample containers.	
		4	Chemical burns or skin irritation can occur from contact with sample preservatives.	Wear chemical protective gloves when collecting samples, or when handling damaged sample containers.	
4	Replace drum lids	1	Hand Injuries can occur from sharp edges, pinch points, and from use of hand tools.	see step 2 above	
5	Moving and Storing Drums	1	Drum storage areas can be accessed by the general public, or may not be secure.	Calculate how many drums will be stored in new location. Ensure that drums are not easily accessed by the general public. Do not store such that drums impede pedestrian or vehicular traffic.	
		2	Muscle strain can occur when lifting/pulling/pushing drums.	Drums that are full can weigh as much as 800 lbs. Use a lift assist device whenever possible, and use a team lift approach. When moving soil drum generated by drilling, have drillers use their equipment to move the drums. Using dolly, slightly lift drum away from dolly to install forks under drum. Slowly let drum come back down and rest on dolly. Using hook on top of dolly, ensure it latches on top of drum bung.	
		3	Body parts can be pinched between lift device, or drum and the ground.	Be aware of hand and foot placement during drum staging. Do not hurry through task.	
		4	When moving, the drum can tip or the dolly could become unstable from uneven ground surface.	Plan travel route with drum prior to moving. With drum secure on dolly, have one employee pull back on dolly, and other employee slowly push back on drum toward dolly. Have second worker act as spotter for traffic, pedestrians, and any trip hazards along the way.	

PPE — Personal Protective Equipment

Type	Personal Protective Equipment	Description	Required
Eye Protection	safety goggles		Required
Hand Protection	chemical resistant gloves (specify type)	Nitrile	Required
	work gloves (specify type)		Required

Supplies

Type	Supply	Description	Required
Miscellaneous	Other	dolly	Required

Review Comments

Reviewer		Comments
Employee: **Role** **Review Type** **Completed Date**		
Employee: **Role** **Review Type** **Completed Date**		

Job Safety Analysis

General

JSA ID		**Status**	(1) Intitial
Job Name	Environmental-Other	**Created Date**	11/19/2012
Task Description	Mobilization / Demobilization	**Completed Date**	
Template		**Auto Closed**	

Client / Project

Client	The Sherwin Williams Company
Project Number	EM002616
Project Name	Sherwin Williams Emeryville
PIC	Michael Paczkowski
Project Manager	Lucas Goldstein

User Roles

Role	Employee	Due Date	Completed Date	Supervisor	Active
Developer	Erica Whiting			Lucas Goldstein	☑
HASP Reviewer	Ron Goloubow				☑
Quality Reviewer					☑

Job Steps

Job Step No.	Job Step Description		Potential Hazard	Critical Action	H&S Reference
1	Verify all permits, forms, and trainings have been completed.	1	Administrative function - no hazards anticipated. Action is to ensure health and safety/regulatory compliance	Employees must have the following required training: OSHA 40-Hour HAZWOPER and refresher; First aid/CPR; medical clearance; DOT Hazardous Materials Shipping Training	
2	Mobilization to the Site	1	Collision, injury or death to occupants or other parties; Property damage	1. Secure all equipment in the vehicle prior to driving. 2. Obey all traffic laws and abide by posted speed limits. 3. Be aware of your surroundings and maintain a distance of 4 seconds behind the vehicle ahead. Add distance for adverse weather conditions. 4. Verify that all employees have accurate and understandable directions to the site. Use preprinted map or GPS. 5. Avoid driving when tired. Use cell phones for emergency contact. Do not use cell phones while driving. 6. Complete vehicle inspection checklist.	
		2	Weather Hazards/Road Conditions	Check local and destination forecasts and Road conditions for dates of travel	
3	Loading and unloading materials and equipment	1	Slips, trips, and falls; Lifting hazards and back strain.	Staff should use proper lifting techniques and to request assistance when lifting heavy equipment. Use dolly to transport equipment, if needed.	
		2	Pinch points/lacerations during equipment loading	Identify/avoid pinch points and sharp edges. Wear leather gloves to protect hands/fingers	
		3	Working near vehicles	Be mindful of traffic at all times. Use cones, barricades and signs as appropriate. Wear reflective traffic vests at all times.	
4	Working outdoors	1	Temperature-related illnesses (heat stress); Weather hazards.	Ensure all field staff drinks plenty of fluids; take breaks as needed to avoid overheating, frostbite, etc., dress appropriately for weather conditions. Check local weather forecasts daily, use sunscreen as appropriate, monitor changes in weather, shutdown operations if extreme weather conditions occur; postpone work if lightning is observed or expected.	

		2	Biological hazards (insects and plants)	1. Inspect area for hazardous plants and insects. 2. Apply insect repellent containing DEET during insect season. 3. Check for ticks throughout the day.	
5	Demobilization	1	Slips, trips, and falls; Loss of equipments/supplies from moving vehicle; lifting hazards	Keep all walkways clear of equipment and materials. Follow safe driving procedures (following distances, speed, headlights, safety belts, etc.). Do not use cell phone when driving. Properly secure all equipments and supplies before operating vehicle. Use proper lifting technique.	

PPE — Personal Protective Equipment

Type	Personal Protective Equipment	Description	Required
Dermal Protection	long sleeve shirt/pants		Required
Eye Protection	safety glasses		Required
Foot Protection	Other	Traffic Safety Vest	Required
	steel-toe boots		Required
Hand Protection	work gloves (specify type)		Required

Supplies

Type	Supply	Description	Required
Communication Devices	mobile phone		Required
Miscellaneous	fire extinguisher		Required
	first aid kit		Required
	Other	Traffic cones and flags	Required
Personal	eye wash (specify type)		Required
	insect repellant		Required
	sunscreen		Required

Review Comments

Reviewer		Comments
Employee: **Role** **Review Type** **Completed Date**		
Employee: **Role** **Review Type** **Completed Date**		

Job Safety Analysis

General

JSA ID		**Status**	(1) Intitial
Job Name	Environmental-Other	**Created Date**	11/19/2012
Task Description	Packing coolers with groundwater samples	**Completed Date**	
Template		**Auto Closed**	

Client / Project

Client	The Sherwin Williams Company
Project Number	EM002616
Project Name	Sherwin Williams Emeryville
PIC	Michael Paczkowski
Project Manager	Lucas Goldstein

User Roles

Role	Employee	Due Date	Completed Date	Supervisor	Active
Developer	Erica Whiting			Erica Whiting	☑
HASP Reviewer	Ron Goloubow				☑
Quality Reviewer					☑

Job Steps

Job Step No.	Job Step Description		Potential Hazard	Critical Action	H&S Reference
1	Place samples in cooler for shipment.	1	Contact with broken glass or groundwater if bottles break.	• Place sample containers in bubble wrap or bags provided by laboratory. • Line bottom of cooler with bubble wrap to prevent breakage. • Ensure that sample containers are packed securely in cooler, but do not use excess pressure to force sample containers to fit inside cooler if adequate space is not available. • Wear leather gloves over nitrile gloves to protect hands from glass and/or groundwater if bottles break.	
2	Add ice to sample coolers.	1	Exertion from handling bags of ice.	• Do not lift more than 50 pounds of ice. • Use knees to lift when picking bags of ice off of the ground. • Avoid over-reaching or overextenting your back when placing ice bags into cooler or onto vehicle.	
		2	Contact with ice	• Do not place hands directly on ice bags for extended periods of time. Take breaks as needed to prevent hands from becoming too cold. • Wear leather gloves to provide protection from direct contact with cold ice.	
		3	Slips, trips, fall hazards from packing materials.	• Keep a 10-foot radius clear of packing materials (ice, tape, coolers, etc.). • Keep work area dry - pour excess water/ice onto the ground away from the immediate work area.	
3	Seal cooler with packing tape and custody seal.	1	Contact with cutting devices.	• Use scissors to cut tape. • Wear cut-resistant gloves to protect hands when using cutting devices.	

		2	Exertion/muscle strain from lifting coolers	• Use proper lifting techniques - lift with legs, not back. • Avoid excess twists and turns while moving cooler from one place to another and while placing tape around the cooler. • If cooler weighs more than 50 pounts, use 2-person lift.	
4	Place coolers in vehicle for shipment.	1	• Exertion/muscle strain from lifting coolers.	• Use proper lifting techniques - lift with legs, not back. • Avoid excess twists and turns while moving cooler from one place. • If cooler weighs more than 50 pounts, use 2-person lift.	
		2	Contact with other coolers.	• Avoid getting fingers caught between coolers when moving them. • Wear leather gloves while handling coolers to provide extra hand protection from potential pinch points.	

PPE — Personal Protective Equipment

Type	Personal Protective Equipment	Description	Required
Dermal Protection	long sleeve shirt/pants		Recommended
Eye Protection	safety glasses		Required
Foot Protection	steel-toe boots		Required
Hand Protection	chemical resistant gloves (specify type)	Nitrile	Required
	work gloves (specify type)	Leather or cut-resistant	Required

Supplies

Type	Supply	Description	Required
Communication Devices	mobile phone		Required
Miscellaneous	first aid kit		Required

Review Comments

Reviewer		Comments
Employee: **Role** **Review Type** **Completed Date**		
Employee: **Role** **Review Type** **Completed Date**		
Employee: **Role** **Review Type** **Completed Date**		

Job Safety Analysis

General

JSA ID		**Status**	(1) Intitial
Job Name	Environmental-Groundwater Sampling and	**Created Date**	11/19/2012
Task Description	Water level gauging and groundwater	**Completed Date**	
Template		**Auto Closed**	

Client / Project

Client	The Sherwin Williams Company
Project Number	EM002616
Project Name	Sherwin Williams Emeryville
PIC	Michael Paczkowski
Project Manager	Lucas Goldstein

User Roles

Role	Employee	Due Date	Completed Date	Supervisor	Active
Developer	Erica Whiting			Lucas Goldstein	☑
HASP Reviewer	Ron Goloubow				☑
Quality Reviewer					☑

Job Steps

Job Step No.	Job Step Description		Potential Hazard	Critical Action	H&S Reference
1	Stage at pre-determined sampling location and set up work zone and sampling equipment	1	personnel could be hit by vehicluar traffic.	Set-up cones and establish work area. Position vehicle so that field crew is protected from site traffic. Unload as close to work area as safely possible.	
		2	Sampling equipment, tools and monitoring well covers can cause tripping hazard	Keep equipment picked up and use TRACK to assess and changes	
2	Open wells to equilibrate and gauge wells	1	When squatting down, personnel can be difficult to see by vehicular traffic.	Wear Class II traffic vest if wells are located proximal to vehicular traffic. Use tall cones and the buddy system if practicable.	
		2	Poisionous insects in well vaults i.e. black widdows and walking sticks can bite or spray acid.	Wear elbow length nitrile gloves when opening well vaults where insects are present.Wear proper PPE including safety glasses.	
		3	pinchpoints on well vault can pinch or lacerate fingers.	Use correct tools to open well vault/cap. Wear leather gloves when removing well vault lids, and chemical protective gloves while guaging. Wear proper PPE including safety boots, knee pads and safety glasses.	
		4	Lifting sampling equipment can cause muscle strain	Unload as close to work area as safely possible; use proper lifting and reaching techniques and body positioning; don't carry more than you can handle, and get help moving heavy or awkward objects.	
		5	Pressure can build up inside well causing cap to release under pressure	Keep head away from well cap when removing. If pressure relief valves are on well use prior to opening well	
3	Begin Purging Well and Collecting Parameter Measurements	1	Electrical shock can occur when connecting/disconnecting pump from the battery.	Make sure equipment is turned off when connecting/disconnecting. Wear leather gloves. Use GFCIs when using powered tools and pumps. Do not use in the rain or run electrical cords through wet areas.	
		2	purge water can spill or leak from equipment	Stop purging activities immediately, stop leakage and block any drainage grate with sorbent pads. Call PM to notify them of any reportable spill.	

		3	Water spilling on the ground can cause muddy/slippery conditions	Be careful walking in work area when using plastic around well to protect from spillage	
		4	lacerations can occur when cutting materials such as plastic tubing	When cutting tubing, use tubing cutter. No open fixed blades should ever be used. When possible wear work gloves, leather type.	
		5	purge water can splash into eyes	Pour water slowly into buckets/drums to minimize splashing. Wear safety glasses	
4	Collect GW or Free Product Sample	1	Working with bailer rope can cause rope burns on hands.	Slowly raise and lower the rope or string for the bailer. Wear appropriate gloves for the task.	
		2	sample containers could break or leak preservative	Discard any broken sampleware or glass properly. Do not overtighten sample containers. Wear chemical protective gloves	
5	Recovery of Free Product from well	1	exposure to free product	Additional chemical protection may be necessary based on the type of product. Additionally, safety goggles, a faceshield, or respiratory protection may be required. Verify in the HASP.	
6	Staging of Well Purge water and/or Free Product	1	Muscle strains can occur when moving purge water or drums	If using buckets, do not fill buckets up to the top. Always keep lid on buckets when traveling or moving them to another location. Only half fill buckets so when dumping the buckets weigh less. See drum handling JLA for movement of drums.	Drum handling JLA

PPE — Personal Protective Equipment

Type	Personal Protective Equipment	Description	Required
Eye Protection	safety glasses		Required
Foot Protection	steel-toe boots		Required
Hand Protection	chemical resistant gloves (specify type)	nitrile	Required
	work gloves (specify type)	leather, and elbow or shoulder length	Recommended

Supplies

Type	Supply	Description	Required
Communication Devices	mobile phone		Required
Decontamination	Decon supplies (specify type)	alconox	Required
Miscellaneous	fire extinguisher		Required
	first aid kit		Required
Personal	eye wash (specify type)	bottle	Required
Traffic Control	traffic cones		Required

Review Comments

Reviewer		Comments
Employee: **Role** **Review Type** **Completed Date**		
Employee: **Role** **Review Type** **Completed Date**		

Material Safety Data Sheet Collection
Genium Publishing Corp.
1171 RiverFront Center
Amsterdam, NY 12010
(518) 842-4111

Issue Date: 2000-07

Perchloroethylene
MSDS 313
TET2750

Section 1 - Chemical Product and Company Identification 54.1

Material Name: Perchloroethylene **CAS Number:** 127-18-4
Chemical Formula: C_2Cl_4
Structural Chemical Formula: $Cl_2C=CCl_2$
Synonyms: ANKILOSTIN; ANTISAL 1; ANTISOL 1; CARBON BICHLORIDE; CARBON DICHLORIDE; CZTEROCHLOROETYLEN; DIDAKENE; DILATIN PT; DOW-PER; ENT 1,860; EPA PESTICIDE CHEMICAL CODE 078501; ETHENE,TETRACHLORO-; ETHYLENE TETRACHLORIDE; ETHYLENE,TETRACHLORO-; FEDAL-UN; NEMA; PCE; PER; PERAWIN; PERC; PERCHLOORETHYLEEN,PER; PERCHLOR; PERCHLORAETHYLEN,PER; PERCHLORETHYLENE; PERCHLORETHYLENE,PER; PERCHLOROETHYLENE; PERCLENE; PERCLENE D; PERCLOROETILENE; PERCOSOLV; PERCOSOLVE; PERK; PERKLONE; PERSEC; TETLEN; TETRACAP; TETRACHLOORETHEEN; TETRACHLORAETHEN; TETRACHLORETHYLENE; TETRACHLOROETHENE; 1,1,2,2-TETRACHLOROETHYLENE; TETRACHLOROETHYLENE; TETRACLOROETENE; TETRAGUER; TETRALENO; TETRALEX; TETRAVEC; TETROGUER; TETROPIL
General Use: Used as a drycleaning solvent, a vapor-degreasing solvent; a drying agent for metals and certain other solids. Used also as a heat transfer medium and in the manufacture of fluorocarbons.

Section 2 - Composition / Information on Ingredients

Name	CAS	%
perchloroethylene	127-18-4	100

OSHA PEL
TWA: 100 ppm; STEL: 200 ppm; from Table Z-2. Other Values: 300 mg/m^3; 5 min peak 3hr ppm.

OSHA PEL Vacated 1989 Limits
TWA: 25 ppm; 170 mg/m^3.

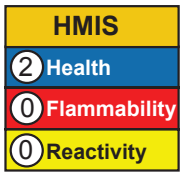
ACGIH TLV
TWA: 25 ppm; 170 mg/m^3; STEL: 100 ppm; 6850 mg/m^3.

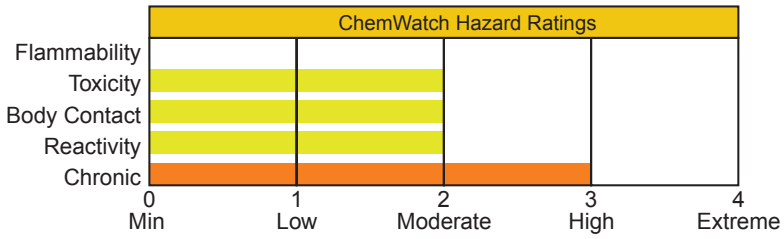
NIOSH REL
No data found.

IDLH Level
150 ppm.

DFG (Germany) MAK
TWA: 50 ppm; 345 mg/m^3.

Section 3 - Hazards Identification





Fire Diamond

ANSI Signal Word
Caution

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Colorless liquid; ether-like odor. Irritating to eyes/skin/respiratory tract. Also causes: headache, dizziness, CNS depression, incoordination, slurred speech. Chronic: liver/kidney damage; possible cancer hazard based on animal studies.

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Potential Health Effects

Primary Entry Routes: inhalation, skin contact, eye contact
Target Organs: liver, kidneys, eyes, upper respiratory system, skin, central nervous system (CNS)
Acute Effects

Inhalation: Acute intoxication by halogenated aliphatic hydrocarbons appears to take place over two stages. Signs of a reversible narcosis are evident in the first stage and in the second stage signs of injury to organs may become evident.
A single organ alone is (almost) never involved.
The vapor is highly discomforting to the upper respiratory tract and lungs.
Inhalation hazard is increased at higher temperatures.
Anesthetic and narcotic effects (with dulling of senses and odor fatigue) are a consequence of exposure to chlorinated solvents.
Individual response varies widely; odor may not be considered objectionable at levels which quickly induce central nervous system effects.
High vapor concentrations may give a feeling of euphoria. This may result in reduced responses, followed by rapid onset of unconsciousness, possible respiratory arrest and death.
Accidental high level exposure has produced lightheadedness, unconsciousness and liver and kidney damage in workers. In at least two cases such exposures were fatal. Subjects exposed to 106 ppm in laboratory studies experienced slight eye irritation; dizziness and sleepiness were reported at 216 ppm; at exposures of 280 ppm or 600 ppm for 10 minutes there was a loss of motor coordination. In another study subjects exposed for 7 hours at 101 ppm complained of eye irritation and subjective symptoms such headache, drowsiness and sleepiness.

Eye: The liquid may produce eye discomfort and is capable of causing temporary impairment of vision and/or transient eye inflammation, ulceration Eye contact may cause lachrymation (tears) and burning sensation.
The vapor is highly discomforting to the eyes.
The material may be irritating to the eye, with prolonged contact causing inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.

Skin: The liquid is highly discomforting to the skin if exposure is prolonged and may cause drying of the skin, which may lead to dermatitis.
Toxic effects may result from skin absorption.
Absorption by skin may readily exceed vapor inhalation exposure.
Symptoms for skin absorption are the same as for inhalation.
Bare unprotected skin should not be exposed to this material.
The material may accentuate any pre-existing skin condition.
The material may produce severe skin irritation after prolonged or repeated exposure, and may produce a contact dermatitis (nonallergic).
This form of dermatitis is often characterized by skin redness (erythema) and swelling (edema) which may progress to vesiculation, scaling and thickening of the epidermis.
Histologically there may be intercellular edema of the spongy layer (spongiosis) and intracellular edema of the epidermis.
Prolonged contact is unlikely, given the severity of response, but repeated exposures may produce severe ulceration.
Industrial experience shows localized skin irritation. Prolonged dermal contact can cause chemical burns and blistering.

Ingestion: Considered an unlikely route of entry in commercial/industrial environments.
The liquid is highly discomforting and toxic if swallowed and may be fatal if swallowed in large quantity.
Ingestion may result in nausea, abdominal irritation, pain and vomiting.
When used in the treatment of hookworm (4.5 to 6.5 gm orally) the only adverse effect is inebriation. Transient hepatotoxicity in patients given single oral doses of up to 5 mL have been recorded.

Carcinogenicity: NTP - Class 2B, Reasonably anticipated to be a carcinogen, sufficient evidence of carcinogenicity from studies in experimental animals; IARC - Group 2B, Possibly carcinogenic to humans; OSHA - Not listed; NIOSH - Listed as carcinogen; ACGIH - Class A3, Animal carcinogen; EPA - Not listed; MAK - Class B, Justifiably suspected of having carcinogenic potential.

Chronic Effects: Prolonged or continuous skin contact with the liquid may cause defatting with drying, cracking, irritation and dermatitis following.
Workers inhaling 232 to 385 ppm for 8 hours/day, 5 days/week for 2 to 6 years have shown abnormal hepatic function, including cirrhosis, with lightheadedness, headache, malaise and dizziness.

Section 4 - First Aid Measures

Inhalation: Remove to fresh air.
Lay patient down. Keep warm and rested.
If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor.

Eye Contact: Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water.
Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.
Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

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Skin Contact: Immediately remove all contaminated clothing, including footwear (after rinsing with water).
Wash affected areas thoroughly with water (and soap if available).
Seek medical attention in event of irritation.
Ingestion: Contact a Poison Control Center.
Do NOT induce vomiting. Give a glass of water.
Avoid giving milk or oils.
Avoid giving alcohol.
After first aid, get appropriate in-plant, paramedic, or community medical support.
Note to Physicians: Treat symptomatically.
Do not administer sympathomimetic drugs as they may cause ventricular arrhythmias.
For acute or short-term repeated exposures to perchloroethylene:
Tetrachloroethylene/perchlorethylene is well absorbed through the lungs with peak levels more important than duration in determining blood concentration.
Lungs excrete most of the absorbed tetrachloroethylene in an unchanged state; about 3% is converted by the liver to form trichloracetic acid and subsequently excreted by the kidney. Exhaled material has a biological half-life of 65 hours.
INHALATION:
The treatment of acute inhalation exposures is supportive with initial attention directed to evaluation/support of ventilation and circulation.
As with all hydrocarbons care must be taken to reduce the risk of aspiration by proper positioning and medical observation.
INGESTION:
1.The ingestion level at which emesis should be induced is difficult to predict in the absence of extensive human studies.
2.The role of charcoal and cathartics remains uncertain.

BIOLOGICAL EXPOSURE INDEX - BEI
These represent the determinants observed in specimens collected from a healthy worker who has been exposed at the Exposure Standard (ES or TLV):

Determinant	Index	Sampling Time	Comments
Perchloroethylene in end-exhaled air	10 ppm	Prior to last shift of work-week	
Perchloroethylene in Blood	1 mg/L	Prior to last shift of work-week	
Trichloroacetic acid in urine	7 mg/L	End of work-week	NS,SQ

NS: Non-specific determinant; also seen after exposure to other materials
SQ: Semi-quantitative determinant - Interpretation may be ambiguous; should be used as a screening test or confirmatory test.

Section 5 - Fire-Fighting Measures

Flash Point: Nonflammable
Autoignition Temperature: 490 °C
LEL: 1.8% v/v
UEL: 11.5% v/v at 740 mm Hg 160 °C
Extinguishing Media: Use extinguishing media suitable for surrounding area.
General Fire Hazards/Hazardous Combustion Products: Nonflammable liquid. However vapor will burn when in contact with high temperature flame. Ignition ceases on removal of flame.
May form a flammable/explosive mixture in an oxygen enriched atmosphere. Heating may cause expansion/vaporization with violent rupture of containers. Decomposes on heating and produces corrosive fumes of hydrochloric acid, carbon monoxide and small amounts of toxic phosgene.

Fire Diamond

Fire Incompatibility: Avoid mixing with strong alkalis or powdered metals, particularly zinc as ignition may result.
Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.
Wear breathing apparatus plus protective gloves for fire only. Prevent, by any means available, spillage from entering drains or waterways.
Use fire fighting procedures suitable for surrounding area.
Do not approach containers suspected to be hot.

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Cool fire-exposed containers with water spray from a protected location.
If safe to do so, remove containers from path of fire.
Equipment should be thoroughly decontaminated after use.

Section 6 - Accidental Release Measures

Small Spills: Clean up all spills immediately.
Wear protective neoprene gloves and chemical goggles.
If risk of overexposure exists, wear NIOSH-approved respirator.
Wipe up and absorb small quantities with vermiculite or other absorbent material.
DO NOT discharge into sewer or waterways.
Place spilled material in clean, dry, sealable, labeled container.
Large Spills: Minor hazard. Clear area of personnel and move upwind.
Contact fire department and tell them location and nature of hazard.
Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways.
No smoking, bare lights or ignition sources. Increase ventilation.
Stop leak if safe to do so. Contain spill with sand, earth or vermiculite.
Collect recoverable product into labeled containers for recycling.
Absorb remaining product with sand, earth or vermiculite.
Collect solid residues and seal in labeled drums for disposal.
Wash area and prevent runoff into drains.
If contamination of drains or waterways occurs, advise emergency services.
Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Avoid generating and breathing mist. Avoid all personal contact, including inhalation.
Wear protective clothing when risk of exposure occurs.
Use in a well-ventilated area. Prevent concentration in hollows and sumps.
DO NOT enter confined spaces until atmosphere has been checked.
DO NOT allow material to contact humans, exposed food or food utensils.
Avoid contact with incompatible materials.
When handling, DO NOT eat, drink or smoke.
Keep containers securely sealed when not in use. Avoid physical damage to containers. Always wash hands with soap and water after handling. Work clothes should be laundered separately.
Launder contaminated clothing before reuse.
Use good occupational work practices. Observe manufacturer's storing and handling recommendations. Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.
Recommended Storage Methods: Check that containers are clearly labeled. Glass container.
Heavy gauge metal packages/heavy gauge metal drums.
Avoid storage with zinc, galvanized or diecast metal (including bungs).
DO NOT use aluminum or galvanized containers.
Packaging as recommended by manufacturer.
Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: CARE: Use of a quantity of this material in confined space or poorly ventilated area, where rapid build-up of concentrated atmosphere may occur, could require increased ventilation and/or protective gear. Use in a well-ventilated area.
Local exhaust ventilation may be required for safe working, i.e., to keep exposures below required standards; otherwise, PPE is required.
If inhalation risk exists, wear NIOSH-approved organic-vapor respirator or air supplied breathing apparatus.
Personal Protective Clothing/Equipment
Eyes: Chemical goggles. Full face shield.
Hands/Feet: Neoprene gloves; Viton gloves.
PVA gloves.
PVC gloves.
Protective footwear.
Respiratory Protection:
Exposure Range >100 to <150 ppm: Supplied Air, Constant Flow/Pressure Demand, Half Mask
Exposure Range 150 to unlimited ppm: Self-contained Breathing Apparatus, Pressure Demand, Full Face
Note: poor warning properties
Other: Overalls. Eyewash unit. Ensure there is ready access to an emergency shower.

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Glove Selection Index:

PE/EVAL/PE	A
VITON/CHLOROBUTYL	A
VITON/NITRILE	A
VITON	A
PVA	A
CPE	A
NITRILE	B
TEFLON	B
NITRILE+PVC	C
SARANEX-23 2-PLY	C
SARANEX-23	C
PVC	C
BUTYL	C
NEOPRENE	C

A: Best selection
B: Satisfactory; may degrade after 4 hours continuous immersion
C: Poor to dangerous choice for other than short-term immersion

Section 9 - Physical and Chemical Properties

Appearance/General Info: Colorless liquid, with a chloroform-like odor. Extremely stable, resists hydrolysis. Miscible with alcohol, ether and oils.

Physical State: Liquid
Vapor Pressure (kPa): 2.11 at 22 °C
Vapor Density (Air=1): 5.83
Formula Weight: 165.82
Specific Gravity (H_2O=1, at 4 °C): 1.63 at 15 °C
Water Solubility: 0.02% by weight
Evaporation Rate: 0.09 Ether=1

pH: Not applicable
pH (1% Solution): Not applicable.
Boiling Point Range: 121 °C (250 °F) at 760 mm Hg
Freezing/Melting Point Range: -19 °C (-2.2 °F)
Volatile Component (% Vol): 100

Section 10 - Stability and Reactivity

Stability/Polymerization: Product is considered stable and hazardous polymerization will not occur.
Storage Incompatibilities: Avoid reaction with oxidizing agents. Segregate from strong alkalis.
Haloalkenes are highly reactive. Some of the more lightly substituted lower members are highly flammable; many members of the group are peroxidizable and polymerizable.
The presenceof 0.5% trichloroethylene as an impurity caused generation of dichloroacetylene during unheated drying over solid sodium hydroxide.
Subsequent fractional distillation produced an explosion.

Section 11 - Toxicological Information

Unless otherwise specified data extracted from RTECS - Registry of Toxic Effects of Chemical Substances

TOXICITY
Oral (rat) LD_{50}: 2629 mg/kg
Inhalation (man) LD_{Lo}: 2857 mg/kg
Inhalation (human) TC_{Lo}: 96 ppm/7 hrs
Inhalation (man) TC_{Lo}: 280 ppm/2 hrs
Inhalation (man) TC_{Lo}: 600 ppm/10 min
Inhalation (rat) LC_{Lo}: 34200 mg/m^3/8 hr

IRRITATION
Skin (rabbit): 810 mg/24h -SEVERE
Eye (rabbit): 162 mg -mild

See NIOSH, *RTECS* KX 3850000, for additional data.

Section 12 - Ecological Information

Environmental Fate: If it is released to soil, it will be subject to evaporation into the atmosphere and to leaching to the groundwater. Biodegradation may be an important process in anaerobic soils based on laboratory tests with methanogenic columns. Slow biodegradation may occur in groundwater where acclimated populations of microorganisms exist. If released to water, it will be subject to rapid volatilization with estimated half-lives ranging from <1 day to several weeks. It will not be expected to significantly biodegrade, bioconcentrate in aquatic organisms or significantly adsorb to sediment. It will not be expected to significantly hydrolyze in soil or water under normal environmental conditions. If released to the atmosphere, it will exist mainly in the gas-phase and it will be subject to photooxidation with estimates of degradation time scales ranging from an approximate half-life of 2 months to complete degradation in an hour. Some in the atmosphere may be subject to washout in rain based on the solubility in water.

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Ecotoxicity: LC_{50} Tanytarsus dissimilis (midge) 30, 840 ug/l/48 hr, static bioassay; LC_{50} Poecilia reticulata (guppy) 18 ppm/7 days /Conditions of bioassay not specified; LC_{50} Daphnia magna (water flea) 18 mg/l/48 hr, static bioassay, at 22 °C; LC_{50} Salmo gairdneri (rainbow trout) 5 mg/l/96 hr, static bioassay at 12 °C
Henry's Law Constant: 2.87 $x10^{-2}$
BCF: fathead minnow 38.9
Biochemical Oxygen Demand (BOD): none
Octanol/Water Partition Coefficient: log K_{ow} = 3.40
Soil Sorption Partition Coefficient: K_{oc} = 209

Section 13 - Disposal Considerations

Disposal: Reclaim solvent at an approved site.
Allow absorbed spillage to evaporate in an open top container, away from habitation.
Incinerate residue at an approved site.
Used containers should be left upside down with bungs out.
Return containers to drum reconditioner or recycler.

Section 14 - Transport Information

DOT Transportation Data (49 CFR 172.101):

Shipping Name: TETRACHLOROETHYLENE
Additional Shipping Information: PERCHLOROETHYLENE
Hazard Class: 6.1(b)
ID No.: 1897
Packing Group: III
Label: Harmful[6]

Section 15 - Regulatory Information

EPA Regulations:
RCRA 40 CFR: Listed U210 Toxic Waste
CERCLA 40 CFR 302.4: Listed per RCRA Section 3001; per CWA Section 307(a) 100 lb (45.35 kg)
SARA 40 CFR 372.65: Listed
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

Research Date: .....1999-11 **Review Date:** 2000-07

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Material Safety Data Sheet Collection
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Amsterdam, NY 12010
(518) 842-4111

Issue Date: 2000-07

Trichloroethylene
MSDS 312
TRI2710

Section 1 - Chemical Product and Company Identification 54.1

Material Name: Trichloroethylene **CAS Number:** 79-01-6
Chemical Formula: C_2HCl_3
Structural Chemical Formula: $ClCH=CCl_2$
Synonyms: ACETYLENE TRICHLORIDE; ALGYLEN; ANAMENTH; BENZINOL; BLACOSOLV; BLANCOSOLV; CECOLENE; CHLORILEN; 1-CHLORO-2,2-DICHLOROETHYLENE; CHLORYLEA; CHLORYLEA,CHORYLEN,CIRCOSOLV,CRAWHASPOL,DOW-TRI,DUKERON,PER-A-CLOR,TRIAD,TRIAL,TRI-PLUS M,VITRAN; CHLORYLEN; CHORYLEN; CIRCOSOLV; CRAWHASPOL; DENSINFLUAT; 1,1-DICHLORO-2-CHLOROETHYLENE; DOW-TRI; DUKERON; EPA PESTICIDE CHEMICAL CODE 081202; ETHENE,TRICHLORO-; ETHINYL TRICHLORIDE; ETHYLENE TRICHLORIDE; ETHYLENE,TRICHLORO-; FLECK-FLIP; FLOCK FLIP; FLUATE; GEMALGENE; GERMALGENE; LANADIN; LETHURIN; NARCOGEN; NARKOGEN; NARKOSOID; NIALK; NSC 389; PERM-A-CHLOR; PERM-A-CLOR; PETZINOL; PHILEX; TCE; THRETHYLEN; THRETHYLENE; TRETHYLENE; TRI; TRIAD; TRIAL; TRIASOL; TRICHLOORETHEEN; TRICHLOORETHYLEEN,TRI; TRICHLORAETHEN; TRICHLORAETHYLEN,TRI; TRICHLORAN; TRICHLOREN; TRICHLORETHENE; TRICHLORETHYLENE; TRICHLORETHYLENE,TRI; TRICHLOROETHENE; 1,1,2-TRICHLOROETHYLENE; TRICHLOROETHYLENE; TRICHLOROETHYLENE; 1,2,2-TRICHLOROETHYLENE; TRI-CLENE; TRICLENE; TRICLORETENE; TRICLOROETILENE; TRIELENE; TRIELIN; TRIELINA; TRIELINE; TRIKLONE; TRILEN; TRILENE; TRILINE; TRIMAR; TRIOL; TRI-PLUS; TRI-PLUS M; VESTROL; VITRAN; WESTROSOL
General Use: Mainly used for vapor degreasing; solvent in textile and electronics industries; for adhesives, lubricants and consumer products (such as spot removers and rug cleaners).
Until recently, it was used to make hop extracts for beer, decaffeinated coffee and spice extracts.

Section 2 - Composition / Information on Ingredients

Name	CAS	%
trichloroethylene	79-01-6	> 99

OSHA PEL
TWA: 100 ppm; STEL: 200 ppm; from Table Z-2. Other Values: 300 mg/m^3; 5 min peak 2hr ppm.

OSHA PEL Vacated 1989 Limits
TWA: 50 ppm; 270 mg/m^3; STEL: 200 ppm; 1080 mg/m^3.

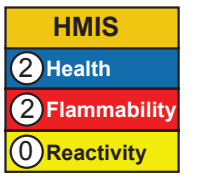
ACGIH TLV
TWA: 50 ppm; 269 mg/m^3; STEL: 100 ppm; 5370 mg/m^3.

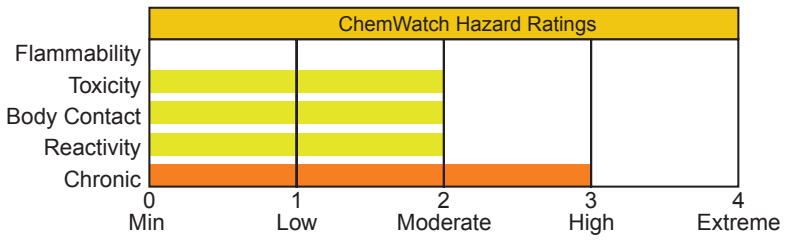
NIOSH REL
No data found.

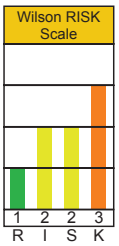
IDLH Level
1000 ppm.

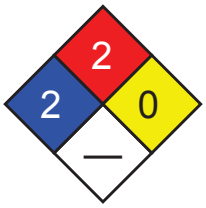
DFG (Germany) MAK
TWA: 50 ppm; 270 mg/m^3.

Section 3 - Hazards Identification









Fire Diamond

ANSI Signal Word
Warning!

Flammable

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☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Clear, colorless liquid; sweet odor. Irritating to eyes/skin/respiratory tract. Inhalation: irregular heart beat, drunkenness. Chronic: heart, liver and kidney damage, dermatitis. Birth defects and cancer may occur based on animal studies. Flammable.

Potential Health Effects

Primary Entry Routes: inhalation, skin contact, eye contact, ingestion (rarely)

Target Organs: respiratory system, central nervous system (CNS), peripheral nervous system, cardiovascular system, liver, kidneys, skin

Acute Effects

Inhalation: The vapor is mildly discomforting to the upper respiratory tract.
Inhalation hazard is increased at higher temperatures.
Anesthetics and narcotic effects (with dulling of senses and odor fatigue) are a consequence of exposure to chlorinated solvents.
Individual response varies widely; odor may not be considered objectionable at levels which quickly induce central nervous system effects.
High vapor concentrations may give a feeling of euphoria. This may result in reduced responses, followed by rapid onset of unconsciousness, possible respiratory arrest and death.
Acute effects from inhalation of high concentrations of vapor are pulmonary irritation, including coughing, with nausea; central nervous system depression - characterized by headache and dizziness, increased reaction time, fatigue and loss of coordination.
If exposure to highly concentrated solvent atmosphere is prolonged this may lead to narcosis, unconsciousness, even coma and possible death.
Evidence of acute human toxicity comes mainly from the use of TCE as an anesthetic, Tachypnea and ventricular arrhythmias are experienced at inhaled concentrations exceeding 15000 ppm. Systemic toxicity is low following anesthesia. Occasional hepatotoxicity (liver dysfunction) has been reported; this is probably due to the breakdown of TCE to dichloroacetylene and phosgene by soda-lime present in some anesthetic devices. The effects of TCE appear to be enhanced in some individuals by simultaneous exposure to caffeine, ethanol and other drugs. "Degreasers Flush" describes a reddening of facial, neck, and back skin and is seen after intake of substantial quantities of ethanol by certain individuals after exposures to TCE.

Eye: The liquid is highly discomforting to the eyes and is capable of causing pain and severe conjunctivitis.
Corneal injury may develop, with possible permanent impairment of vision, if not promptly and adequately treated.
The vapor is discomforting to the eyes.
The material may produce moderate eye irritation leading to inflammation.
Repeated or prolonged exposure to irritants may produce conjunctivitis.

Skin: The liquid is discomforting to the skin and may cause drying of the skin, which may lead to dermatitis.
Toxic effects may result from skin absorption.
Bare unprotected skin should not be exposed to this material. The material may accentuate any pre-existing skin condition.
The material may produce severe skin irritation after prolonged or repeated exposure, and may produce a contact dermatitis (nonallergic).
This form of dermatitis is often characterized by skin redness (erythema) and swelling (edema) which may progress to vesiculation, scaling and thickening of the epidermis.
Histologically there may be intercellular edema of the spongy layer (spongiosis) and intracellular edema of the epidermis.
Repeated exposures may produce severe ulceration.
Localized application may produce pustular eruptions, pruritus and erythema. A permeability coefficient of 1.6×10^{-2} cm/hr has been calculated by the US EPA. Percutaneous absorption is unlikely to contribute significantly to total body burdens unless dermatitis is present.

Ingestion: The liquid is highly discomforting and toxic if swallowed.
Ingestion may result in nausea, abdominal irritation, pain and vomiting.
Considered an unlikely route of entry in commercial/industrial environments.

Carcinogenicity: NTP - Not listed; IARC - Group 3, Not classifiable as to carcinogenicity to humans; OSHA - Not listed; NIOSH - Listed as carcinogen; ACGIH - Class A5, Not suspected as a human carcinogen; EPA - Not listed; MAK - Class B, Justifiably suspected of having carcinogenic potential.

Chronic Effects: Sensitive humans may experience anesthetic effects from short exposures.
Chronic effects of exposure include fatigue, headache, irritability, vomiting, skin flush and intolerance to alcohol.
Liver, kidney, heart and neurological damage may also result from chronic overexposure.
Alcohol intake may increase the toxic effects of the material.
A variety of disturbances have been seen among workers exposed at concentrations ranging from 1 to 335 ppm. These disturbances increased with the length of exposure (to 5 years or more) and where more prominent when exposures exceeded 40 ppm. Increased complaints of alcohol intolerance, tremors, giddiness and anxiety were amongst symptoms recorded. Variation in effects in different occupational settings may be due to different physical workloads.

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There appeared to be no increase in the expected rates of congenital defects in children born to women exposed to TCE over a 13 year period.
Epidemiological studies consistently fail to show a link between cancers and TCE exposure. This is significant because of the tens of thousands of exposed workers monitored.

Section 4 - First Aid Measures

Inhalation: Remove to fresh air.
Lay patient down. Keep warm and rested.
If available, administer medical oxygen by trained personnel.
If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor, without delay.
Eye Contact: Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water.
Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.
Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.
Skin Contact: Immediately remove all contaminated clothing, including footwear (after rinsing with water).
Wash affected areas thoroughly with water (and soap if available).
Seek medical attention in event of irritation.
Ingestion: Contact a Poison Control Center.
Do NOT induce vomiting. Give a glass of water.
Avoid giving milk or oils.
Avoid giving alcohol.
After first aid, get appropriate in-plant, paramedic, or community medical support.
Note to Physicians: Treat symptomatically.
Do not administer sympathomimetic drugs as they may cause ventricular arrhythmias.
Following acute or short-term continued exposures to trichloroethylene:
1.Trichloroethylene concentration in expired air correlates with exposure. 8 hours exposure to 100 ppm produces levels of 25 ppm immediately and 1 ppm 16 hours after exposures.
2.Most mild exposure respond to removal from the source and supportive care.
Serious toxicity most often results from hypoxemia or cardiac dysrhythmias so that oxygen, intubation, intravenous lines and cardiac monitoring should be started initially as the clinical situation dictates.
3.Ipecac syrup should be give to alert patients who ingest more than a minor amount and present within 2 hours.
4.The efficacy of activated charcoal and cathartics is unclear.
5.The metabolites, trichloracetic acid, trichlorethanol and to a lesser degree, chloral hydrate, may be detected in the urine up to 16 days postexposure.

BIOLOGICAL EXPOSURE INDEX - BEI
These represent the determinants observed in specimens collected from a healthy worker exposed at the Exposure Standard (ES or TLV):

Determinant	Index	Sampling Time	Comments
Trichloroacetic acid in urine	10 mg/gm creatinine	End of work-week	NS
Trichloroacetic acid AND Trichloroethanol in urine	300 mg/mg creatinine	End of shift at end of work-week	NS
Free Trichloroethanol in blood	4 mg/L	End of shift at end of work-week	NS
Trichloroethylene in end-exhaled air			SQ
Trichloroethylene in blood			SQ

NS: Non-specific determinant; also seen after exposure to other materials
SQ: Semi-quantitative determinant - Interpretation may be ambiguous; should be used as a screening test or confirmatory test.

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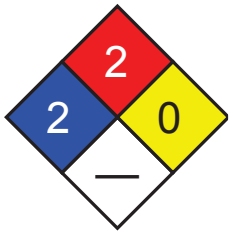
Section 5 - Fire-Fighting Measures

Flash Point: 32.222 °C Closed Cup
Autoignition Temperature: 420 °C
LEL: 8% v/v
UEL: 10.5% v/v
Extinguishing Media: Water spray or fog; foam, dry chemical powder, or BCF (where regulations permit).
Carbon dioxide.
General Fire Hazards/Hazardous Combustion Products: Vapor will burn when in contact with high temperature flame.
May form a flammable/explosive mixture in an oxygen enriched atmosphere. Heating may cause expansion/vaporization with violent rupture of containers. Decomposes on heating and produces corrosive fumes of hydrochloric acid, carbon monoxide and small amounts of toxic phosgene.



Fire Diamond

Fire Incompatibility: Avoid reaction with strong oxidizing agents (particularly oxygen in gas or liquid form and nitrogen dioxide), strong bases, sodium and sodium-potassium alloys. Powdered metals; magnesium, zinc and aluminum.
Contact with water may result in the slow formation of hydrochloric acid.
Attacks natural rubber.
Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.
Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways.
Use water delivered as a fine spray to control fire and cool adjacent area.
Avoid spraying water onto liquid pools.
Do not approach containers suspected to be hot.
Cool fire-exposed containers with water spray from a protected location.
If safe to do so, remove containers from path of fire.

Section 6 - Accidental Release Measures

Small Spills: Remove all ignition sources. Clean up all spills immediately.
Avoid breathing vapors and contact with skin and eyes.
Control personal contact by using protective equipment.
Contain and absorb spill with sand, earth, inert material or vermiculite.
Wipe up. Place in a suitable labeled container for waste disposal.
Large Spills: Clear area of personnel and move upwind.
Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways.
Increase ventilation.
No smoking or bare lights within area.
Stop leak if safe to do so.
Contain and absorb spill with sand, earth, inert material or vermiculite.
Collect and seal in labeled drums for disposal.
If contamination of drains or waterways occurs, advise emergency services.
After clean-up operations, decontaminate and launder all protective clothing and equipment before storing and reusing.
Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Avoid all personal contact, including inhalation.
Wear protective clothing when risk of overexposure occurs.
Use in a well-ventilated area. Prevent concentration in hollows and sumps.
DO NOT enter confined spaces until atmosphere has been checked.
DO NOT allow material to contact humans, exposed food or food utensils.
Avoid smoking, bare lights or ignition sources. When handling, DO NOT eat, drink or smoke. Avoid contact with incompatible materials.
Keep containers securely sealed when not in used. Avoid physical damage to containers. Always wash hands with soap and water after handling. Working clothes should be laundered separately.
Launder contaminated clothing before reuse.
Observe manufacturer's storing/handling recommendations. Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.
Recommended Storage Methods: Inhibited grades may be stored in metal drums.
DO NOT use aluminum or galvanized containers. Check that containers are clearly labeled and free from leaks.
Packaging as recommended by manufacturer.

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Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Local exhaust ventilation usually required.
If risk of overexposure exists, wear NIOSH-approved respirator.
Correct fit is essential to obtain adequate protection. NIOSH-approved self contained breathing apparatus (SCBA) may be required in some situations.
Provide adequate ventilation in warehouse or closed storage area.

Personal Protective Clothing/Equipment

Eyes: Safety glasses with side shields; chemical goggles. Full face shield.
Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

Hands/Feet: PVA gloves. Polyethylene gloves.
Viton gloves.
PVC boots.

Respiratory Protection:
Exposure Range >100 to <1000 ppm: Supplied Air, Constant Flow/Pressure Demand, Half Mask
Exposure Range 1000 to unlimited ppm: Self-contained Breathing Apparatus, Pressure Demand, Full Face
Note: odor threshold unknown

Other: Overalls. Eyewash unit. Barrier cream. Skin cleansing cream.

Glove Selection Index:

PE/EVAL/PE	A
PVA	A
TEFLON	A
VITON	B
VITON/NEOPRENE	C
VITON/NITRILE	C
HYPALON	C
NEOPRENE	C
PVC	C
NITRILE	C

A: Best selection
B: Satisfactory; may degrade after 4 hours continuous immersion
C: Poor to dangerous choice for other than short-term immersion

Section 9 - Physical and Chemical Properties

Appearance/General Info: Colorless liquid with a sweetish, chloroform-like odor, miscible with most organic solvents.

Physical State: Liquid
Vapor Pressure (kPa): 7.87 at 20 °C
Vapor Density (Air=1): 4.54
Formula Weight: 131.38
Specific Gravity (H_2O=1, at 4 °C): 1.47 at 15 °C
Water Solubility: < 1 mg/mL at 21 °C
pH: Not applicable
pH (1% Solution): Not applicable.
Boiling Point Range: 87 °C (189 °F)
Freezing/Melting Point Range: -73 °C (-99.4 °F)
Volatile Component (% Vol): 100

Section 10 - Stability and Reactivity

Stability/Polymerization: Decomposes in the presence of moisture to produce corrosive acid.
Product is considered stable under normal handling conditions. Hazardous polymerization will not occur.

Storage Incompatibilities: Avoid storage with strong oxidizers (particularly oxygen in gas or liquid form and nitrogen dioxide), strong bases, acetone, sodium/sodium-potassium alloys, magnesium, zinc and aluminum.
Avoid contact with water as the slow formation of hydrochloric acid results.
Attacks natural rubber.
Haloalkenes are highly reactive. Some of the more lightly substituted lower members are highly flammable; many members of the group are peroxidizable and polymerizable.

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Section 11 - Toxicological Information

Unless otherwise specified data extracted from RTECS - Registry of Toxic Effects of Chemical Substances

TOXICITY
Oral (human) LD_{Lo}: 7000 mg/kg
Oral (man) TD_{Lo}: 2143 mg/kg
Oral (rat) LD_{50}: 5650 mg/kg
Inhalation (man) LC_{Lo}: 2900 ppm
Inhalation (human) TD_{Lo}: 812 mg/kg
Inhalation (human) TC_{Lo}: 6900 mg/m^3/10 m
Inhalation (man) TC_{Lo}: 2900 ppm
Inhalation (man) TC_{Lo}: 110 ppm/8h
Inhalation (man) TC_{Lo}: 160 ppm/83 m

IRRITATION
Skin (rabbit): 500 mg/24h - SEVERE
Eye (rabbit): 20 mg/24h - SEVERE

See NIOSH, *RTECS* KX 4550000, for additional data.

Section 12 - Ecological Information

Environmental Fate: No data found.

Ecotoxicity: LC_{50} Sheepshead minnow 20 mg/l/96 hr. /Conditions of bioassay not specified; LC_{50} Mexican axolotl (3-4 wk after hatching) 48 mg/l/48 hr /Conditions of bioassay not specified; LC_{50} Clawed toad (3-4 wk after hatching) 45 mg/l/48 hr /Conditions of bioassay not specified; LC_{50} Pimephales promelas (fathead minnow) 40.7 mg/l/96 hr (95% confidence limits 31.4-71.8 mg/l) /Flow-through test; EC_{10} Pimephales promelas (fathead minnow) 15.2 mg/l/24 hr; 16.9 mg/l/48 hr; 15.5 mg/l/72 hr; 13.7 mg/l/96 hr; Toxic effect for all concentrations specified: loss of equilibrium. /Flow-through bioassay; Toxicity Threshold (Cell Multiplication Inhibition Test) Scenedesmus quadricauda(green algae) >1000 mg/l /Time not specified, conditions of bioassay not specified; Toxicity Threshold (Cell Multiplication Inhibition Test) Pseudomonas putida (bacteria) 65 mg/l ; LC_{50} Grass shrimp 2 mg/l/96 hr. /Conditions of bioassay not specified

Henry's Law Constant: 1 x10^{-2}

BCF: bluegill 17 to 39

Biochemical Oxygen Demand (BOD): 0%, 20 days

Octanol/Water Partition Coefficient: log K_{ow} = 2.29

Soil Sorption Partition Coefficient: K_{oc} = 2.0

Section 13 - Disposal Considerations

Disposal: Recycle wherever possible. Consult manufacturer for recycling options.
Follow applicable federal, state, and local regulations.
Reclaim solvent at an approved site.
Evaporate or incinerate residue at an approved site.
Recycle containers if possible, or dispose of in an authorized landfill.

Section 14 - Transport Information

DOT Transportation Data (49 CFR 172.101):

Shipping Name: TRICHLOROETHYLENE **Additional Shipping Information:**
Hazard Class: 6.1(b)
ID No.: 1710
Packing Group: III
Label: Harmful[6]

Section 15 - Regulatory Information

EPA Regulations:
RCRA 40 CFR: Listed U228 Toxic Waste
CERCLA 40 CFR 302.4: Listed per CWA Section 311(b)(4); per RCRA Section 3001; per CWA Section 307(a) 100 lb (45.35 kg)
SARA 40 CFR 372.65: Listed
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

Research Date: .....1999-11 **Review Date:** 2000-07

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Issue Date: 2006-06

Section 1 - Chemical Product and Company Identification 61

Material Name: Toluene
CAS Number: 108-88-3
Chemical Formula: C_7H_8
Structural Chemical Formula: $C_6H_5CH_3$
EINECS Number: 203-625-9
ACX Number: X1001512-0
Synonyms: ANTISAL 1A; BENZENE,METHYL-; CP 25; METHACIDE; METHANE,PHENYL-; METHYL BENZENE; METHYL BENZOL; METHYLBENZENE; METHYLBENZOL; PHENYL METHANE; PHENYLMETHANE; TOLUEEN; TOLUEN; TOLUENE; TOLUENO; TOLUOL; TOLUOLO; TOLU-SOL
General Use: Used as a solvent for paint, resins, lacquers inks & adhesives. Component of solvent blends and thinners; in gasoline and aviation fuel. Used in the manufacture of chemicals, dyes, explosives, benzoic acid.
Some grades of toluene may contain traces of xylene and benzene.
Odor threshold: 2 ppm approx. Odor is not a reliable warning property due to olfactory fatigue.

Section 2 - Composition / Information on Ingredients

Name	CAS	%
toluene	108-88-3	> 99.5

OSHA PEL
TWA: 200 ppm; Ceiling: 300 ppm; 500 ppm, 10-minute maximum peak.

ACGIH TLV
TWA: 50 ppm; skin.

EU OEL
TWA: 192 mg/m^3 (50 ppm); STEL: 384 mg/m^3 (100 ppm).

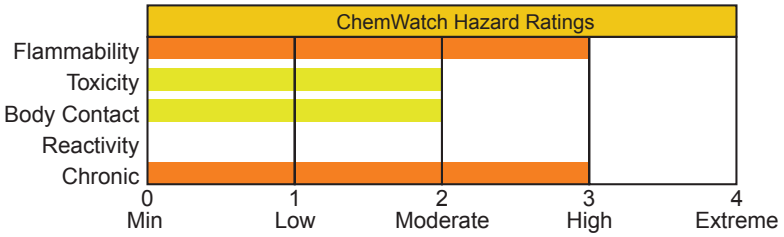
NIOSH REL
TWA: 100 ppm (375 mg/m^3); STEL: 150 ppm (560 mg/m^3).

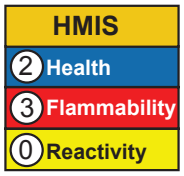
IDLH Level
500 ppm.

DFG (Germany) MAK
TWA: 50 ppm; PEAK: 200 ppm; skin.

Section 3 - Hazards Identification

Fire Diamond





ANSI Signal Word
Danger!

Flammable

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Colorless liquid; sickly, sweet odor. Irritating to eyes/skin/respiratory tract. Other Acute Effects: weakness, headache, dizziness, confusion, insomnia. Chronic Effects: liver/kidney damage, may cause birth defects. Flammable.

Potential Health Effects

Target Organs: Skin, liver, kidneys, central nervous system.
Primary Entry Routes: Inhalation, skin contact/absorbtion.
Acute Effects
Inhalation: The vapor is highly discomforting to the upper respiratory tract. Inhalation hazard is increased at higher temperatures.

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Acute effects from inhalation of high concentrations of vapor are pulmonary irritation, including coughing, with nausea; central nervous system depression - characterized by headache and dizziness, increased reaction time, fatigue and loss of coordination.
If exposure to highly concentrated solvent atmosphere is prolonged this may lead to narcosis, unconsciousness, even coma and possible death.
Central nervous system (CNS) depression may include nonspecific discomfort, symptoms of giddiness, headache, dizziness, nausea, anesthetic effects, slowed reaction time, slurred speech and may progress to unconsciousness.
Serious poisonings may result in respiratory depression and may be fatal.

Eye: The liquid produces a high level of eye discomfort and is capable of causing pain and severe conjunctivitis.
Corneal injury may develop, with possible permanent impairment of vision, if not promptly and adequately treated.
The vapor is discomforting to the eyes if exposure is prolonged.
The material may produce severe irritation to the eye causing pronounced inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.

Skin: The liquid may produce skin discomfort following prolonged contact.
Defatting and/or drying of the skin may lead to dermatitis and it is absorbed by skin.
Toxic effects may result from skin absorption.
Open cuts, abraded or irritated skin should not be exposed to this material.
The material may accentuate any pre-existing skin condition.
The material may cause skin irritation after prolonged or repeated exposure and may produce a contact dermatitis (nonallergic). This form of dermatitis is often characterized by skin redness (erythema) and swelling (edema) which may progress to vesiculation, scaling and thickening of the epidermis. Histologically there may be intercellular edema of the spongy layer (spongiosis) and intracellular edema of the epidermis.

Ingestion: Considered an unlikely route of entry in commercial/industrial environments.
The liquid may produce gastrointestinal discomfort and may be harmful if swallowed. Ingestion may result in nausea, pain and vomiting. Vomit entering the lungs by aspiration may cause potentially lethal chemical pneumonitis.

Carcinogenicity: NTP - Not listed; IARC - Group 3, Not classifiable as to carcinogenicity to humans; OSHA - Not listed; NIOSH - Not listed; ACGIH - Class A4, Not classifiable as a human carcinogen; EPA - Class D, Not classifiable as to human carcinogenicity; MAK - Not listed.

Chronic Effects: Chronic solvent inhalation exposures may result in nervous system impairment and liver and blood changes.
Chronic toluene habituation occurs following intentional abuse (glue-sniffing) or from occupational exposure. Ataxia, incoordination and tremors of the hands and feet (as a consequence of diffuse cerebral atrophy), headache, abnormal speech, transient memory loss, convulsions, coma, drowsiness, reduced color perception, frank blindness, nystagmus (rapid, involuntary eye-movements), decreased hearing leading to deafness and mild dementia have all been associated with chronic abuse.
Peripheral nerve damage, encephalopathy, giant axonopathy, electrolyte disturbances in the cerebrospinal fluid and abnormal computer tomographic (CT) scans are common amongst toluene addicts. Although toluene abuse has been linked with kidney disease, this does not commonly appear in cases of occupational toluene exposures. Cardiac and hematological toxicity are however associated with chronic toluene exposure. Cardiac arrhythmia, multifocal and premature ventricular contractions and supraventricular tachycardia are present in 20% of patients who abused toluene-containing paints.
Previous suggestions that chronic toluene inhalation produced human peripheral neuropathy have largely been discounted. However central nervous system (CNS) depression is well documented where blood toluene levels exceed 2.2 mg%. Toluene abusers can achieve transient circulating concentrations of 6.5 mg%. Amongst workers exposed for a median time of 29 years to toluene no subacute effects on neurasthenic complaints and pyschometric test results could be established.
The prenatal toxicity of very high toluene concentrations has been documented for several animal species and man. Malformations indicative of specific teratogenicity have not generally been found. The toxicity described in the literature takes the form of embryo death or delayed fetal growth and delayed skeletal system development. Permanent damage of children has been seen only when mothers had suffered from chronic intoxication as a result of "sniffing".

Section 4 - First Aid Measures

Inhalation: Remove to fresh air.
Lay patient down. Keep warm and rested.
If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor.

Eye Contact: Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.
Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: Immediately remove all contaminated clothing, including footwear (after rinsing with water).
Wash affected areas thoroughly with water (and soap if available).
Seek medical attention in event of irritation.

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Ingestion: Contact a Poison Control Center.
Do NOT induce vomiting. Give a glass of water.
After first aid, get appropriate in-plant, paramedic, or community medical support.

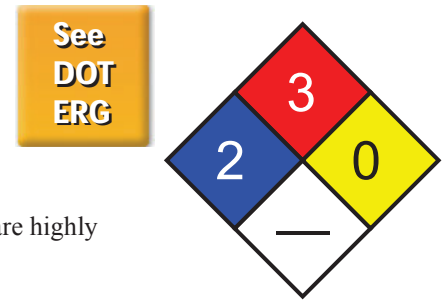
Note to Physicians: Following acute or short-term repeated exposures to toluene:
1. Toluene is absorbed across to alveolar barrier, the blood/air mixture being 11.2/15.6 (at 37 °C) The order of toluene, in expired breath, is of the order of 18 ppm following sustained exposure to 100 ppm.
The tissue/blood proportion is 1/3 except in adipose where the proportion is 8/10.
2.Metabolism by microsomal mono-oxygenation, results in the production of hippuric acid. This may be detected in the urine in amounts between 0.5 and 2.5 g/24hr which represents, on average 0.8 gm/gm of creatinine.
The biological half life of hippuric acid is in the order of 1-2 hours.
3.Primary threat to life from ingestion and/or inhalation is respiratory failure.
4.Patients should be quickly evaluated for signs of respiratory distress (e.g. cyanosis, tachypnea, intercostal retraction, obtundation) and given oxygen. Patients with inadequate tidal volumes or poor arterial blood gases (pO_2 <50 mm Hg or pCO_2 >50 mm Hg) should be intubated.
5.Arrhythmias complicate some hydrocarbon ingestion and/or inhalation and electrocardiographic evidence of myocardial injury has been reported; intravenous lines and cardiac monitors should be established in obviously symptomatic patients. The lungs excrete inhaled solvents, so that hyperventilation improves clearance.
6.A chest x-ray should be taken immediately after stabilization of breathing and circulation to document aspiration and detect the presence of pneumothorax.
7.Epinephrine (adrenalin) is not recommended for treatment of bronchospasm because of potential myocardial sensitization to catecholamines.
Inhaled cardioselective bronchodilators (e.g. Alupent, Salbutamol) are the preferred agents, with aminophylline a second choice.
8.Lavage is indicated in patients who require decontamination; ensure use of cuffed endotracheal tube in adult patients.
BIOLOGICAL EXPOSURE INDEX - BEI
These represent the determinants observed in specimens collected from a healthy worker exposed at the Exposure Standard (ES or TLV):

Determinant	Index	Sampling Time	Comments
Hippuric acid in urine	2.5 gm/gm creatinine	End of shift Last 4 hrs of shift	B,NS
Toluene in venous blood	1 mg/L	End of shift	SQ
Toluene in end-exhaled air		End of shift	SQ

NS: Non-specific determinant; also observed after exposure to other material
SQ: Semi-quantitative determinant - Interpretation may be ambiguous; should be used as a screening test or confirmatory test.
B: Background levels occur in specimens collected from subjects NOT exposed.

Section 5 - Fire-Fighting Measures

Flash Point: 4 °C Closed Cup
Autoignition Temperature: 480 °C
LEL: 1.2% v/v
UEL: 7.1% v/v
Extinguishing Media: Foam, dry chemical powder, BCF (where regulations permit), carbon dioxide.
Water spray or fog - Large fires only.
General Fire Hazards/Hazardous Combustion Products: Liquid and vapor are highly flammable.
Severe fire hazard when exposed to heat, flame and/or oxidizers.
Vapor forms an explosive mixture with air.
Severe explosion hazard, in the form of vapor, when exposed to flame or spark. Vapor may travel a considerable distance to source of ignition.
Heating may cause expansion/decomposition with violent rupture of containers.
On combustion, may emit toxic fumes of carbon monoxide (CO) and carbon dioxide (CO_2).



Fire Diamond

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Fire Incompatibility: Avoid contamination with strong oxidizing agents as ignition may result.
Nitric acid with toluene, produces nitrated compounds which are explosive.

Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.
May be violently or explosively reactive. Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation.
Fight fire from a safe distance, with adequate cover.
If safe, switch off electrical equipment until vapor fire hazard removed.
Use water delivered as a fine spray to control the fire and cool adjacent area. Avoid spraying water onto liquid pools.
Do not approach containers suspected to be hot.
Cool fire-exposed containers with water spray from a protective location.
If safe to do so, remove containers from path of fire.

Section 6 - Accidental Release Measures

See DOT ERG

Small Spills: Remove all ignition sources. Clean up all spills immediately.
Avoid breathing vapors and contact with skin and eyes.
Control personal contact by using protective equipment.
Contain and absorb small quantities with vermiculite or other absorbent material. Wipe up. Collect residues in a flammable waste container.

Large Spills: Clear area of personnel and move upwind.
Contact fire department and tell them location and nature of hazard.
May be violently or explosively reactive. Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation.
No smoking, bare lights or ignition sources. Increase ventilation.
Stop leak if safe to do so. Water spray or fog may be used to disperse/absorb vapor. Contain spill with sand, earth or vermiculite.
Use only spark-free shovels and explosion proof equipment.
Collect recoverable product into labeled containers for recycling.
Absorb remaining product with sand, earth or vermiculite.
Collect solid residues and seal in labeled drums for disposal.
Wash area and prevent runoff into drains.
If contamination of drains or waterways occurs, advise emergency services.

Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Avoid all personal contact, including inhalation.
Wear protective clothing when risk of exposure occurs.
Use in a well-ventilated area. Prevent concentration in hollows and sumps.
DO NOT enter confined spaces until atmosphere has been checked.
Avoid smoking, bare lights, heat or ignition sources.
When handling, DO NOT eat, drink or smoke.
Vapor may ignite on pumping or pouring due to static electricity.
DO NOT use plastic buckets. Ground and secure metal containers when dispensing or pouring product. Use spark-free tools when handling.
Avoid contact with incompatible materials.
Keep containers securely sealed. Avoid physical damage to containers.
Always wash hands with soap and water after handling.
Work clothes should be laundered separately.
Use good occupational work practices. Observe manufacturer's storing and handling recommendations. Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions.

Recommended Storage Methods: Metal can; Metal drum; Metal safety cans. Packing as supplied by manufacturer.
Plastic containers may only be used if approved for flammable liquid.
Check that containers are clearly labeled and free from leaks.

Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Use in a well-ventilated area; local exhaust ventilation may be required for safe working, i. e. , to keep exposures below required standards; otherwise, PPE is required.
General exhaust is adequate under normal operating conditions.
Local exhaust ventilation may be required in special circumstances.
If risk of overexposure exists, wear NIOSH-approved respirator. Correct fit is essential to ensure adequate protection.
Provide adequate ventilation in warehouses and enclosed storage areas.

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In confined spaces where there is inadequate ventilation, wear full-face air supplied breathing apparatus.

Personal Protective Clothing/Equipment:

Eyes: Safety glasses with side shields; chemical goggles. Full face shield.

DO NOT wear contact lenses. Contact lenses pose a special hazard; soft contact lenses may absorb irritants and all lenses concentrate them.

Hands/Feet: Wear chemical protective gloves, eg. PVC. Wear safety footwear.

Respiratory Protection:

Exposure Range >200 to <500 ppm: Air Purifying, Negative Pressure, Half Mask

Exposure Range 500 to unlimited ppm: Self-contained Breathing Apparatus, Pressure Demand, Full Face

Cartridge Color: black

Other: Overalls. Barrier cream. Eyewash unit.

Glove Selection Index:

PE/EVAL/PE ..... Best selection
VITON/CHLOROBUTYL ..... Best selection
VITON ..... Best selection
PVA ..... Best selection
TEFLON ..... Satisfactory; may degrade after 4 hours continuous immersion
SARANEX-23 2-PLY..... Poor to dangerous choice for other than short-term immersion
CPE ..... Poor to dangerous choice for other than short-term immersion
VITON/NEOPRENE ..... Poor to dangerous choice for other than short-term immersion
SARANEX-23 ..... Poor to dangerous choice for other than short-term immersion
NEOPRENE/NATURAL..... Poor to dangerous choice for other than short-term immersion
NITRILE+PVC ..... Poor to dangerous choice for other than short-term immersion
NITRILE ..... Poor to dangerous choice for other than short-term immersion
BUTYL ..... Poor to dangerous choice for other than short-term immersion
PVC..... Poor to dangerous choice for other than short-term immersion
NEOPRENE..... Poor to dangerous choice for other than short-term immersion

Section 9 - Physical and Chemical Properties

Appearance/General Info: Clear highly flammable liquid with a strong aromatic odor; floats on water. Mixes with most organic solvents.

Physical State: Liquid
Odor Threshold: 2.14 ppm
Vapor Pressure (kPa): 2.93 at 20 °C
Vapor Density (Air=1): 3.2
Formula Weight: 92.14
Specific Gravity (H_2O=1, at 4 °C): 0.87 at 20 °C
Evaporation Rate: 2.4 (BuAc=1)
pH: Not applicable
pH (1% Solution): Not applicable.
Boiling Point: 111 °C (232 °F) at 760 mm Hg
Freezing/Melting Point: -95 °C (-139 °F)
Volatile Component (% Vol): 100
Water Solubility: < 1 mg/mL at 18 °C

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Product is considered stable. Hazardous polymerization will not occur.
Storage Incompatibilities: Segregate from strong oxidizers.

Section 11 - Toxicological Information

Toxicity

Oral (human) LD_{Lo}: 50 mg/kg
Oral (rat) LD_{50}: 636 mg/kg
Inhalation (human) TC_{Lo}: 100 ppm
Inhalation (man) TC_{Lo}: 200 ppm
Inhalation (rat) LC_{50}: > 26700 ppm/1h
Dermal (rabbit) LD_{50}: 12124 mg/kg
Reproductive effector in rats

Irritation

Skin (rabbit): 20 mg/24h-moderate
Skin (rabbit): 500 mg - moderate
Eye (rabbit): 0.87 mg - mild
Eye (rabbit): 2 mg/24h - SEVERE
Eye (rabbit): 100 mg/30sec - mild

See *RTECS* XS 5250000, for additional data.

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Section 12 - Ecological Information

Environmental Fate: If released to soil, it will be lost by evaporation from near-surface soil and by leaching to the groundwater. Biodegradation occurs both in soil and groundwater, but it is apt to be slow especially at high concentrations, which may be toxic to microorganisms. The presence of acclimated microbial populations may allow rapid biodegradation. It will not significantly hydrolyze in soil or water under normal environmental conditions. If released into water, its concentration will decrease due to evaporation and biodegradation. This removal can be rapid or take several weeks, depending on temperature, mixing conditions, and acclimation of microorganisms. It will not significantly adsorb to sediment or bioconcentrate in aquatic organisms. If released to the atmosphere, it will degrade by reaction with photochemically produced hydroxyl radicals (half-life 3 hr to slightly over 1 day) or be washed out in rain. It will not be subject to direct photolysis.

Ecotoxicity: LC_{50} Aedes aegypti-4th instar (mosquito larvae) 22 mg/l /Conditions of bioassay not specified; LC_{50} Cyprinodon variegatus (sheepshead minnow) 277-485 mg/l 96 hr /Conditions of bioassay not specified; LC_{50} Calandra granaria (grain weevil) 210 mg/l /in air; LC_{50} Cancer magister (crab larvae stage I) 28 ppm/96 hr /Conditions of bioassay not specified; LC_{50} Crangon franciscorum (shrimp) 4.3 ppm 96 hr /Conditions of bioassay not specified; LC_{50} Artemia salina (brine shrimp) 33 mg/l 24 hr /Conditions of bioassay not specified; LC_{50} Morone saxatilis (striped bass) 7.3 mg/l 96 hr /Conditions of bioassay not specified; LC_{50} Pimephales promelas (fathead minnows) 55-72 mg/l (embryos), 25-36 mg/l (1-day posthatch protolarvae), and 26-31 mg/l (30-day-old minnows)/ 96 hour /Conditions of bioassay not specified

Henry's Law Constant: 0.0067

BCF: eels 13.2

Biochemical Oxygen Demand (BOD): 0%, 5 days

Octanol/Water Partition Coefficient: log K_{ow} = 2.69

Soil Sorption Partition Coefficient: K_{oc} = silty loam 37

Section 13 - Disposal Considerations

Disposal: Consult manufacturer for recycling options and recycle where possible.
Follow applicable federal, state, and local regulations.
Incinerate residue at an approved site.
Recycle containers where possible, or dispose of in an authorized landfill.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Shipping Name and Description: Toluene
ID: UN1294
Hazard Class: 3 - Flammable and combustible liquid
Packing Group: II - Medium Danger
Symbols:
Label Codes: 3 - Flammable Liquid
Special Provisions: IB2, T4, TP1
Packaging: **Exceptions:** 150 **Non-bulk:** 202 **Bulk:** 242
Quantity Limitations: **Passenger aircraft/rail:** 5 L **Cargo aircraft only:** 60 L
Vessel Stowage: **Location:** B **Other:**

Section 15 - Regulatory Information

EPA Regulations:

RCRA 40 CFR: Listed U220 Toxic Waste
CERCLA 40 CFR 302.4: Listed per CWA Section 311(b)(4), per RCRA Section 3001, per CWA Section 307(a) 1000 lb (453.5 kg)
SARA 40 CFR 372.65: Listed
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

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Issue Date: 2006-06

Section 1 - Chemical Product and Company Identification 61

Material Name: Xylene
CAS Number: 1330-20-7
Chemical Formula: C_8H_{10}
Structural Chemical Formula: $C_6H_4(CH_3)_2$
EINECS Number: 215-535-7
ACX Number: X1001166-8
Synonyms: BENZENE,DIMETHYL-; COMPONENT 1 (83%): XYLENES; COMPONENT 2 (17%): ETHYL BENZENE; DIMETHYLBENZENE; DIMETHYLBENZENES; EPA PESTICIDE CHEMICAL CODE 086802; KSYLEN; METHYL TOLUENE; METHYLTOLUENE; VIOLET 3; XILOLI; XYLENE; XYLENEN; XYLOL; XYLOLE
General Use: A strong solvent for general use in the manufacture of paints, varnishes, lacquers, thinners, inks, rubber, pesticides, herbicides and paint strippers.

Section 2 - Composition / Information on Ingredients

Name	CAS	%
xylene	1330-20-7	> 95

OSHA PEL
TWA: 100 ppm; 435 mg/m^3.

NIOSH REL
TWA: 100 ppm, 435 mg/m^3; STEL: 150 ppm, 655 mg/m^3.

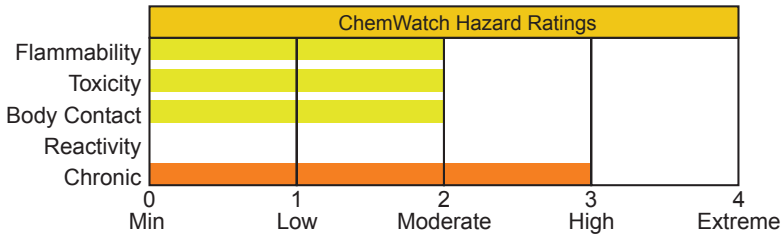
DFG (Germany) MAK
TWA: 100 ppm; PEAK: 200 ppm; skin.

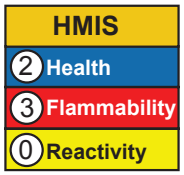
ACGIH TLV
TWA: 100 ppm; STEL: 150 ppm.

EU OEL
TWA: 50 ppm; STEL: 100 ppm.

Section 3 - Hazards Identification

Fire Diamond





ANSI Signal Word
Warning!

Flammable

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Clear, sweet smelling liquid. Irritating to eyes/skin/respiratory tract. Other Acute Effects: dizziness, nausea, drowsiness. Chronic Effects: dermatitis, kidney/liver/peripheral nerve damage. May cause birth defects (animal data). Flammable.

Potential Health Effects

Target Organs: central nervous system (CNS), eyes, gastrointestinal (GI) tract, liver, kidneys, skin
Primary Entry Routes: inhalation, skin absorption (slight), eye contact, ingestion
Acute Effects
Inhalation: Xylene is a central nervous system depressant. The vapor is discomforting to the upper respiratory tract and may be harmful if inhaled.
Inhalation hazard is increased at higher temperatures.
Toxic effects are increased by consumption of alcohol.
Acute effects from inhalation of high concentrations of vapor are pulmonary irritation, including coughing, with nausea; central nervous system depression - characterized by headache and dizziness, increased reaction time, fatigue and loss of coordination.

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If exposure to highly concentrated solvent atmosphere is prolonged this may lead to narcosis, unconsciousness, even coma and possible death.
Headache, fatigue, lassitude, irritability and gastrointestinal disturbances (e.g., nausea, anorexia and flatulence) are the most common symptoms of xylene overexposure. Injury to the heart, liver, kidneys and nervous system has also been noted among workers. Transient memory loss, renal impairment, temporary confusion and some evidence of disturbance of liver function was reported in three workers overcome by gross exposure to xylene (10000 ppm). One worker died and autopsy revealed pulmonary congestion, edema, and focal alveolar hemorrhage.
Volunteers inhaling xylene at 100 ppm for 5 to 6 hours showed changes in manual coordination, reaction time and slight ataxia. Tolerance developed during the workweek but was lost over the weekend. Physical exercise may antagonize this effect. Xylene body burden in humans exposed to 100 or 200 ppm xylene in air depends on the amount of body fat with 4% to 8% of total absorbed xylene accumulating in human adipose tissues.

Eye: The liquid is highly discomforting to the eyes and is capable of causing a mild, temporary redness of the conjunctiva (similar to wind-burn), temporary impairment of vision and/or other transient eye damage/ulceration.
The vapor is highly discomforting to the eyes.
The material may produce severe irritation to the eye causing pronounced inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.
Corneal changes have been reported in furniture polishers exposed to xylene.

Skin: The liquid is highly discomforting to the skin and may cause drying of the skin, which may lead to dermatitis and it is absorbed by the skin.
Toxic effects may result from skin absorption.
Open cuts, abraded or irritated skin should not be exposed to this material.
The material may accentuate any pre-existing skin condition.
The material may cause skin irritation after prolonged or repeated exposure and may produce a contact dermatitis (nonallergic). This form of dermatitis is often characterized by skin redness (erythema) and swelling (edema) which may progress to vesiculation, scaling and thickening of the epidermis. Histologically there may be intercellular edema of the spongy layer (spongiosis) and intracellular edema of the epidermis.

Ingestion: Considered an unlikely route of entry in commercial/industrial environments.
The liquid may produce gastrointestinal discomfort and may be harmful if swallowed. Ingestion may result in nausea, pain and vomiting. Vomit entering the lungs by aspiration may cause potentially lethal chemical pneumonitis.

Carcinogenicity: NTP - Not listed; IARC - Group 3, Not classifiable as to carcinogenicity to humans; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Class D, Not classifiable as to human carcinogenicity; MAK - Not listed.

Chronic Effects: Chronic solvent inhalation exposures may result in nervous system impairment and liver and blood changes.
Prolonged or continuous skin contact with the liquid may cause defatting with drying, cracking, irritation and dermatitis following.
Small excess risks of spontaneous abortion and congenital malformation was reported amongst women exposed to xylene in the first trimester of pregnancy. In all cases however the women had also been exposed to other substances.
Evaluation of workers chronically exposed to xylene has demonstrated a lack of genotoxicity. Exposure to xylene has been associated with increased risks of hemopoietic malignancies but, again simultaneous exposure to other substances (including benzene) complicate the picture. A long-term gavage study of mixed xylenes (containing 17% ethyl benzene) found no evidence of carcinogenic activity in rats and mice of either sex.
Exposure to the material for prolonged periods may cause physical defects in the developing embryo (teratogenesis).

Section 4 - First Aid Measures

Inhalation: Remove to fresh air.
Lay patient down. Keep warm and rested.
If available, administer medical oxygen by trained personnel.
If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor, without delay.

Eye Contact: Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.
Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: Immediately remove all contaminated clothing, including footwear (after rinsing with water).
Wash affected areas thoroughly with water (and soap if available).
Seek medical attention in event of irritation.

Ingestion: Contact a Poison Control Center.
Do NOT induce vomiting. Give a glass of water.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: For acute or short-term repeated exposures to xylene:
1.Gastrointestinal absorption is significant with ingestions.

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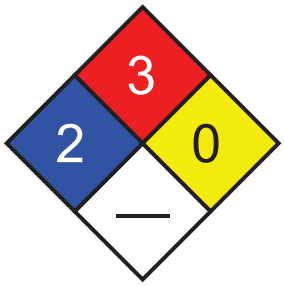
For ingestions exceeding 1-2 mL (xylene)/kg, intubation and lavage with cuffed endotracheal tube is recommended. The use of charcoal and cathartics is equivocal.
2.Pulmonary absorption is rapid with about 60-65% retained at rest.
3.Primary threat to life from ingestion and/or inhalation is respiratory failure.
4.Patients should be quickly evaluated for signs of respiratory distress (e.g. cyanosis, tachypnea, intercostal retraction, obtundation) and given oxygen. Patients with inadequate tidal volumes or poor arterial blood gases (pO_2 <50 mm Hg or pCO_2 >50 mm Hg) should be intubated.
5.Arrhythmias complicate some hydrocarbon ingestion and/or inhalation and electrocardiographic evidence of myocardial injury has been reported; intravenous lines and cardiac monitors should be established in obviously symptomatic patients. The lungs excrete inhaled solvents, so that hyperventilation improves clearance.
6.A chest x-ray should be taken immediately after stabilization of breathing and circulation to document aspiration and detect the presence of pneumothorax.
7.Epinephrine (adrenalin) is not recommended for treatment of bronchospasm because of potential myocardial sensitization to catecholamines.
Inhaled cardioselective bronchodilators (e.g. Alupent, Salbutamol) are the preferred agents, with aminophylline a second choice.
BIOLOGICAL EXPOSURE INDEX - BEI
These represent the determinants observed in specimens collected from a healthy worker exposed at the Exposure Standard (ES or TLV):

Determinant	Index	Sampling Time	Comments
Methylhippuric acids in urine	1.5 gm/gm creatinine	End of shift	
	2 mg/min	Last 4 hrs of shift.	

Section 5 - Fire-Fighting Measures

Flash Point: 25.6 °C
Autoignition Temperature: 241 °C
LEL: 1.0% v/v
UEL: 7.0% v/v
Extinguishing Media: Alcohol stable foam; dry chemical powder; carbon dioxide.
Water spray or fog - Large fires only.
General Fire Hazards/Hazardous Combustion Products: Liquid and vapor are flammable.
Moderate fire hazard when exposed to heat or flame.
Vapor forms an explosive mixture with air.
Moderate explosion hazard when exposed to heat or flame.
Vapor may travel a considerable distance to source of ignition.
Heating may cause expansion or decomposition leading to violent rupture of containers.
On combustion, may emit toxic fumes of carbon monoxide (CO).
Other combustion products include carbon dioxide (CO_2).
Fire Incompatibility: Avoid contamination with strong oxidizing agents as ignition may result.
Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.
May be violently or explosively reactive. Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways.
If safe, switch off electrical equipment until vapor fire hazard removed.
Use water delivered as a fine spray to control fire and cool adjacent area.
Avoid spraying water onto liquid pools.
Do not approach containers suspected to be hot.
Cool fire-exposed containers with water spray from a protected location.
If safe to do so, remove containers from path of fire.

See DOT ERG



Fire Diamond

Section 6 - Accidental Release Measures

Small Spills: Remove all ignition sources. Clean up all spills immediately.
Avoid breathing vapors and contact with skin and eyes.
Control personal contact by using protective equipment.
Contain and absorb small quantities with vermiculite or other absorbent material. Wipe up. Collect residues in a flammable waste container.
Large Spills: Clear area of personnel and move upwind.
Contact fire department and tell them location and nature of hazard.
May be violently or explosively reactive. Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways.
No smoking, bare lights or ignition sources. Increase ventilation.

See DOT ERG

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Stop leak if safe to do so. Water spray or fog may be used to disperse/absorb vapor. Contain spill with sand, earth or vermiculite.
Use only spark-free shovels and explosion proof equipment.
Collect recoverable product into labeled containers for recycling.
Absorb remaining product with sand, earth or vermiculite.
Collect solid residues and seal in labeled drums for disposal.
Wash area and prevent runoff into drains.
If contamination of drains or waterways occurs, advise emergency services.

Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Avoid all personal contact, including inhalation.
Wear protective clothing when risk of overexposure occurs.
Use in a well-ventilated area. Prevent concentration in hollows and sumps.
DO NOT enter confined spaces until atmosphere has been checked.
Avoid smoking, bare lights or ignition sources.
Avoid generation of static electricity. DO NOT use plastic buckets.
Ground all lines and equipment. Use spark-free tools when handling.
Avoid contact with incompatible materials.
When handling, DO NOT eat, drink or smoke.
Keep containers securely sealed when not in use. Avoid physical damage to containers. Always wash hands with soap and water after handling.
Work clothes should be laundered separately.
Observe manufacturer's storing and handling recommendations. Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions.

Recommended Storage Methods: Metal can; metal drum. Packing as recommended by manufacturer.
Check all containers are clearly labeled and free from leaks.
Plastic containers may only be used if approved for flammable liquids.

Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Use in a well-ventilated area. Local exhaust ventilation may be required for safe working, i. e. , to keep exposures below required standards; otherwise, PPE is required.
CARE: Use of a quantity of this material in confined space or poorly ventilated area, where rapid build-up of concentrated atmosphere may occur, could require increased ventilation and/or protective gear.
General exhaust is adequate under normal operating conditions.
Local exhaust ventilation may be required in specific circumstances.
If risk of overexposure exists, wear NIOSH-approved respirator.
Correct fit is essential to obtain adequate protection.
Provide adequate ventilation in warehouse or closed storage areas.
In confined spaces where there is inadequate ventilation, wear full-face air supplied breathing apparatus.

Personal Protective Clothing/Equipment:

Eyes: Safety glasses with side shields; or as required, chemical goggles.
Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

Hands/Feet: Barrier cream with polyethylene gloves; Butyl rubber gloves or Neoprene gloves or PVC gloves.
Safety footwear.
Do NOT use this product to clean the skin.

Other: Overalls. Impervious protective clothing.
Eyewash unit.
Ensure there is ready access to an emergency shower.

Glove Selection Index:

PE/EVAL/PE	Best selection
PVA	Best selection
VITON	Best selection
TEFLON	Best selection
PVDC/PE/PVDC	Poor to dangerous choice for other than short-term immersion
NATURAL+NEOPRENE	Poor to dangerous choice for other than short-term immersion
NEOPRENE/NATURAL	Poor to dangerous choice for other than short-term immersion
NITRILE+PVC	Poor to dangerous choice for other than short-term immersion
HYPALON	Poor to dangerous choice for other than short-term immersion
NAT+NEOPR+NITRILE	Poor to dangerous choice for other than short-term immersion
BUTYL	Poor to dangerous choice for other than short-term immersion
BUTYL/NEOPRENE	Poor to dangerous choice for other than short-term immersion

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NITRILE..... Poor to dangerous choice for other than short-term immersion
NEOPRENE..... Poor to dangerous choice for other than short-term immersion
PVC..... Poor to dangerous choice for other than short-term immersion

Section 9 - Physical and Chemical Properties

Appearance/General Info: Clear colorless flammable liquid with a strong aromatic odor; floats on water. Mixes with most organic solvents.

Physical State: Liquid
Odor Threshold: 5.00 x10^{-5} ppm
Vapor Pressure (kPa): 0.5 at 15 °C
Vapor Density (Air=1): 3.66 at 15 °C
Formula Weight: 106.18
Specific Gravity (H_2O=1, at 4 °C): 0.87 at 15 °C
Evaporation Rate: 0.7 Bu Ac=1

pH: Not applicable
pH (1% Solution): Not applicable.
Boiling Point: 137 °C (279 °F) to 140 °C (284 °F)
Freezing/Melting Point: -47 °C (-53 °F)
Volatile Component (% Vol): 100
Water Solubility: Practically insoluble in water

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Product is considered stable. Hazardous polymerization will not occur.
Storage Incompatibilities: Avoid storage with oxidizers.

Section 11 - Toxicological Information

Toxicity
Oral (human) LD_{Lo}: 50 mg/kg
Oral (rat) LD_{50}: 4300 mg/kg
Inhalation (human) TC_{Lo}: 200 ppm
Inhalation (man) LC_{Lo}: 10000 ppm/6h
Inhalation (rat) LC_{50}: 5000 ppm/4h
Reproductive effector in rats

Irritation
Skin (rabbit):500 mg/24h moderate
Eye (human): 200 ppm irritant
Eye (rabbit): 87 mg mild
Eye (rabbit): 5 mg/24h SEVERE

See *RTECS* ZE 2100000, for additional data.

Section 12 - Ecological Information

Environmental Fate: Most of the xylenes are released into the atmosphere where they may photochemically degrade by reaction with hydroxyl radicals (half-life 1-18 hr). The dominant removal process in water is volatilization. Xylenes are moderately mobile in soil and may leach into groundwater where they are known to persist for several years, despite some evidence that they biodegrade in both soil and groundwater. Bioconcentration is not expected to be significant.
Ecotoxicity: LC_{50} Rainbow trout 13.5 mg/l/96 hr /Conditions of bioassay not specified; LD_{50} Goldfish 13 mg/l/24 hr /Conditions of bioassay not specified
Henry's Law Constant: 0.22
BCF: estimated at 2.14 to 2.20
Octanol/Water Partition Coefficient: log K_{ow} = 3.12 to 3.20
Soil Sorption Partition Coefficient: K_{oc} = 48 to 68

Section 13 - Disposal Considerations

Disposal: Consult manufacturer for recycling options and recycle where possible.
Follow applicable federal, state, and local regulations.
Incinerate residue at an approved site.
Recycle containers where possible, or dispose of in an authorized landfill.

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Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Note: This material has multiple possible HMT entries. Choose the appropriate one based on state and condition of specific material when shipped.

Shipping Name and Description: Xylenes
ID: UN1307
Hazard Class: 3 - Flammable and combustible liquid
Packing Group: II - Medium Danger
Symbols:
Label Codes: 3 - Flammable Liquid
Special Provisions: IB2, T4, TP1
Packaging: **Exceptions:** 150 **Non-bulk:** 202 **Bulk:** 242
Quantity Limitations: **Passenger aircraft/rail:** 5 L **Cargo aircraft only:** 60 L
Vessel Stowage: **Location:** B **Other:**

Shipping Name and Description: Xylenes
ID: UN1307
Hazard Class: 3 - Flammable and combustible liquid
Packing Group: III - Minor Danger
Symbols:
Label Codes: 3 - Flammable Liquid
Special Provisions: B1, IB3, T2, TP1
Packaging: **Exceptions:** 150 **Non-bulk:** 203 **Bulk:** 242
Quantity Limitations: **Passenger aircraft/rail:** 60 L **Cargo aircraft only:** 220 L
Vessel Stowage: **Location:** A **Other:**

Section 15 - Regulatory Information

EPA Regulations:

RCRA 40 CFR: Listed U239 Ignitable Waste
CERCLA 40 CFR 302.4: Listed per CWA Section 311(b)(4), per RCRA Section 3001 100 lb (45.35 kg)
SARA 40 CFR 372.65: Listed
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

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Material Safety Data Sheet Collection
Genium group inc.
1171 RiverFront Center, Amsterdam, NY 12010
(518) 842-4111

Issue Date: 2006-06

Section 1 - Chemical Product and Company Identification 61

Material Name: Arsenic **CAS Number:** 7440-38-2
Chemical Formula: As
Structural Chemical Formula: As_4
EINECS Number: 231-148-6
ACX Number: X1002785-7
Synonyms: ARSEN; ARSENIA; ARSENIC; ARSENIC-75; ARSENIC BLACK; ARSENICALS; COLLOIDAL ARSENIC; GRAY ARSENIC; GREY ARSENIC; METALLIC ARSENIC
General Use: In metallurgy for hardening copper, lead alloys. In the manufacture of certain types of glass.

Section 2 - Composition / Information on Ingredients

Name	CAS	%
Arsenic		>98

OSHA PEL
TWA: 0.01 mg/m^3.

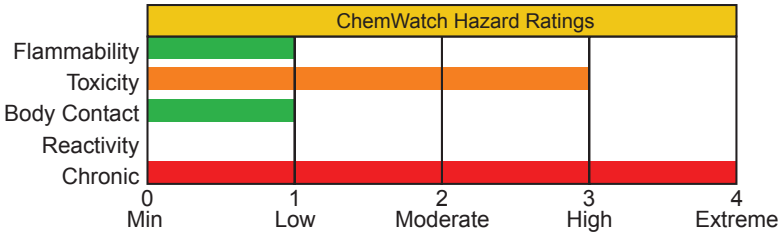
NIOSH REL
Ceiling: 0.002 mg/m^3 (15-minute).

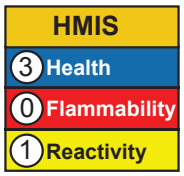
ACGIH TLV
TWA: 0.01 mg/m^3.

IDLH Level
5 mg/m^3 (as As).

Section 3 - Hazards Identification

Fire Diamond





ANSI Signal Word

Warning!

Flammable

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Brittle, crystalline, silvery-black metal. Irritating to eyes/skin/respiratory tract. Chronic Effects: damage to blood-forming organs, nervous/cardiovascular systems effects. Cancer hazard. Powder is flammable.

Potential Health Effects

Target Organs: liver, kidneys, skin, lungs, lymphatic system
Primary Entry Routes: inhalation, ingestion of dust and fumes, skin absorption
Acute Effects

Inhalation: The dust is toxic and discomforting to the upper respiratory tract and lungs.
Acute inhalation exposure can cause cough, chest pain, shortness of breath, dizziness, headache, pulmonary edema and extreme general weakness.
Prolonged or repeated exposure can cause perforation of the nasal septum.
High exposures can cause poor appetite, nausea, vomiting and muscle cramps. Heart effects with abnormal EKG can also occur with very high exposures.

Eye: The dust may produce eye discomfort causing smarting, pain and redness.

Skin: The material is moderately discomforting to the skin and may be harmful.
Exposure may result in abnormal redness (caused by capillary congestion), burning, itching, swelling, skin eruptions and dermatitis.
Toxic effects may result from skin absorption.
Repeated skin contact can cause thickened skin and/or patchy areas of darkening and loss of pigment. Some persons develop white lines on the nails.

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Ingestion: The solid/dust is discomforting to the gastrointestinal tract and is toxic and may be fatal if swallowed.
Symptoms of acute poisoning by ingestion, which develop within 4 hours include epigastric pain, vomiting and watery diarrhea. Blood may appear in vomitus and stools. If amount ingested is sufficiently high, shock may develop, followed by death within 24 hours.
Considered an unlikely route of entry in commercial/industrial environments.

Carcinogenicity: NTP - Class 1, Known to be a carcinogen; IARC - Group 1, Carcinogenic to humans; OSHA - Listed as a carcinogen; NIOSH - Listed as carcinogen; ACGIH - Class A1, Confirmed human carcinogen; EPA - Class A, Human carcinogen; MAK - Class A1, Capable of inducing malignant tumors as shown by experience with humans.

Chronic Effects: Symptoms of chronic poisoning by inhalation include weight loss, nausea and diarrhea alternating with constipation, pigmentation and eruption of the skin, loss of hair, peripheral neuritis, blood disorders (anemia), striations on fingernails and toenails.
Long-term exposure can cause an ulcer or hole in the `bone' dividing the inner nose. Hoarseness and sore eyes also occur.
High or repeated exposure can cause nerve damage with `pins and needles', burning, numbness, and later weakness of arms and legs. Repeated exposure can also damage the liver, causing narrowing of the blood vessels, or interfere with the bone marrow's ability to make red blood cells.
Many cases of skin cancer have been reported among people exposed to arsenic through medical treatment with inorganic trivalent arsenic compounds. In some instances skin cancers have occurred in combination with other cancers, such as liver angiosarcoma, intestinal and urinary bladder carcinomas and meningioma. Epidemiological studies of cancer after medical treatment have shown an excess of skin cancers but no clear association with other cancers has been shown. An association between environmental exposure to arsenic through drinking water and skin cancer has been observed and confirmed. Epidemiological studies in areas where drinking water contained 0.35-1.14 mg/l arsenic elevated risks for cancers of the bladder, kidney, skin, liver, lung and colon in both men and women. Occupational exposure to inorganic arsenic, especially in mining and copper smelting, has consistently been associated with an increased risk of cancer. An almost tenfold increase in the incidence of lung cancer was found in workers most heavily exposed to arsenic and relatively clear dose-response relationships have been obtained with regard to cumulative exposure. Other smelter worker populations have been shown to have consistent increases in lung cancer incidence, as well as increases of about 20% in the incidence of gastrointestinal cancer and of 30% for renal cancer and hematolymphatic malignancies.

Section 4 - First Aid Measures

Inhalation: Remove to fresh air. Lay patient down. Keep warm and rested.
If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor.

Eye Contact: Immediately hold the eyes open and wash continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids. Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: Quickly but gently, wipe material off skin with a dry, clean cloth.
Immediately remove all contaminated clothing, including footwear.
Wash affected areas with water (and soap if available) for at least 15 minutes. Transport to hospital or doctor.

Ingestion: Contact a Poison Control Center.
If swallowed, and if more than 15 minutes from a hospital, induce vomiting, preferably using Ipecac Syrup APF.
Note: DO NOT INDUCE VOMITING in an unconscious person

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: For acute or short term repeated exposures to arsenic, soluble compounds:
Treat as per arsenic poisoning.
1. Acute skin lesions such as contact dermatitis usually do not require other treatment than removal from exposure.
2. If more severe symptoms of the respiratory system, the skin or the gastrointestinal tract occur, British Anti-Lewisite (BAL, dimercaprol) may be given. Prompt administration in such cases is vital; to obtain maximum benefit such treatment should be administered within 4 hours of poisoning.
3. In addition, general treatment such as prevention of further absorption from the gastrointestinal tract are mandatory.
4. General supportive therapy such as maintenance of respiration and circulation, maintenance of water and electrolyte balance and control of nervous system effects, as well as elimination of absorbed poison through dialysis and exchange transfusion, may be used if feasible.
5. Dimercaprol is given by deep intramuscular injection as a 5% solution in peanut oil (or a 10% solution with benzyl-benzoate in vegetable oil). It is usually given in a dose of 3 mg/kg, 4-hourly, for the first two days, or twice daily for up to seven days.
6. BAL Therapy is effective for hematological manifestations of chronic arsenic poisoning but not for neurological symptoms. Watch for side effects (e.g. urticaria, burning sensation in the lips, mouth and throat, fever, conjunctivitis etc).
7. Some relief results from administration of diphenhydramine (Benadryl) (1.5 mg/kg intramuscularly or by mouth every 6 hour).

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BIOLOGICAL EXPOSURE INDEX - BEI

These represent the determinants observed in specimens collected from a healthy worker exposed at the Exposure Standard (ES or TLV):

Determinant	Index	Sampling Time	Comments
Inorganic arsenic metabolites in urine	50 ug/g creatinine	End of workweek	B

B: Background levels occur in specimens collected from subjects NOT exposed

Consult specific documentation.

Section 5 - Fire-Fighting Measures

See DOT ERG

Fire Diamond

Flash Point: Noncombustible solid

Extinguishing Media: Use fire fighting procedures suitable for surrounding area.

General Fire Hazards/Hazardous Combustion Products: Solid which exhibits difficult combustion or is difficult to ignite.

Avoid generating dust, particularly clouds of dust in a confined or unventilated space.

Dust may form an explosive mixture with air, and any source of ignition, i.e. flame or spark, will cause fire or explosion.

Dry dust can be charged electrostatically by turbulence, pneumatic transport, pouring, in exhaust ducts and during transport. Build-up of electrostatic charge may be prevented by bonding and grounding.

Powder handling equipment such as dust collectors, dryers and mills may require additional protection measures such as explosion venting.

Decomposes on heating and produces toxic fumes of arsenic oxides (AsO_x).

Fire Incompatibility: Avoid contact with acids, oxidizing agents, halogens.

Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.

Wear breathing apparatus plus protective gloves for fire only. Prevent, by any means available, spillage from entering drains or waterways.

Use fire fighting procedures suitable for surrounding area.

Do not approach containers suspected to be hot.

Cool fire exposed containers with water spray from a protected location.

If safe to do so, remove containers from path of fire.

Equipment should be thoroughly decontaminated after use.

Section 6 - Accidental Release Measures

See DOT ERG

Small Spills: Clean up all spills immediately. Wear protective clothing, impervious gloves and safety glasses. Increase ventilation.

Use a vacuum or a wet method to reduce dust during clean-up. DO NOT dry sweep.

Place in suitable containers for disposal.

Wash area down with large quantity of water and prevent runoff into drains.

Large Spills: POLLUTANT -contain spillage. Clear area of personnel and move upwind.

Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways.

If contamination of drains or waterways occurs, advise emergency services.

Shut off all possible sources of ignition and increase ventilation.

Stop leak if safe to do so.

Contain spill with sand, earth or vermiculite.

Use dry clean up procedures and avoid generating dust.

Collect recoverable product into labeled containers for recycling. Collect residues and seal in labeled drums for disposal.

Wash area down with large quantity of water and prevent runoff into drains.

Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.

Use good occupational work practice.

Avoid contact with skin and eyes.

Avoid generating and breathing dust.

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Use in a well-ventilated area.
Wear protective clothing when risk of exposure occurs.
Avoid sources of heat. Avoid contact with incompatible materials. Avoid physical damage to containers.
Keep containers securely sealed when not in use.
When handling, DO NOT eat, drink or smoke.
Wash hands with soap and water after handling.
Work clothes should be laundered separately: NOT at home.

Recommended Storage Methods: Glass container. Plastic drum. Polyethylene or polypropylene container. Steel drum. Metal drum.
Check that containers are clearly labeled.

Storage Requirements: Observe manufacturer's storing and handling recommendations.
Store in a cool, dry place. Store in a well-ventilated area. Store away from sources of heat or ignition/bare lights. Avoid storage at temperatures higher than 60 °C. Store away from incompatible materials. Store away from foodstuff containers.
Protect containers against physical damage.
Keep containers securely sealed.
Check regularly for spills and leaks.

Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: General exhaust is adequate under normal operating conditions.
Local exhaust ventilation may be required.
Use ventilated helmet or air-line hood to provide clean air at the breathing zone.
If risk of overexposure exists, wear NIOSH approved respirator. Correct fit is essential to obtain adequate protection.

Personal Protective Clothing/Equipment:

Eyes: Safety glasses. Chemical goggles.
Full face shield.
Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

Hands/Feet: Impervious, gauntlet length gloves; Rubber gloves. Neoprene gloves.
Rubber boots.

Respiratory Protection:
Exposure Range >0.01 to 0.1 mg/m^3: Air Purifying, Negative Pressure, Half Mask
Exposure Range >0.1 to 1 mg/m^3: Air Purifying, Negative Pressure, Full Face
Exposure Range >1 to <5 mg/m^3: Supplied Air, Constant Flow/Pressure Demand, Full Face
Exposure Range 5 to unlimited mg/m^3: Self-contained Breathing Apparatus, Pressure Demand, Full Face
Cartridge Color: magenta (P100)

Other: Overalls. PVC apron. PVC protective suit may be required if exposure severe.
Eyewash unit. Ensure there is ready access to a safety shower.
* Preplacement and periodic medical examinations are essential for workers exposed to arsenic. Preplacement physical examinations should give particular attention to allergic and chronic skin lesions, eye disease, psoriasis, chronic eczematous dermatitis, hyperpigmentation of the skin, keratosis and warts, baseline weight, baseline blood and hemoglobin counts, baseline urinary arsenic determinations.
Annual physical examinations should give attention to general health, weight, skin condition, and any evidence of excessive exposure or absorption of arsenic.

Section 9 - Physical and Chemical Properties

Appearance/General Info: Grey, shiny, brittle, metallic-looking rhombohedral crystals. Can be heated to burn in air with a bluish flame, giving off an odor of garlic and dense white fumes of arsenic trioxide. Loses its luster on exposure to air. Converted by nitric acid or hot sulfuric acid into arsenous or arsenic acid.

Brinell hardness: 147
Mohs' scale: 3.5

Physical State: Divided solid
Vapor Pressure (kPa): Not applicable
Vapor Density (Air=1): Not applicable
Formula Weight: 74.92
Specific Gravity (H_2O=1, at 4 °C): 5.73
Evaporation Rate: Not applicable
pH: Not applicable
pH (1% Solution): Not applicable
Boiling Point: Sublimes
Freezing/Melting Point: 817 °C (1502.6 °F) at 28 atm
Volatile Component (% Vol): Not applicable
Water Solubility: Insoluble

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Contact with acids liberates toxic gases. Presence of heat source and ignition source.
Product is considered stable under normal handling conditions. Hazardous polymerization will not occur.

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Storage Incompatibilities: Segregate from oxidizing agents, halogens.
Contact with acids produces toxic fumes.

Section 11 - Toxicological Information

Toxicity
Oral (man) TD_{Lo}: 7857 mg/kg/55 years
Oral (rat) LD_{50}: 763 mg/kg
Tumorigenic - Carcinogenic by RTECS criteria.

Irritation
Nil reported

See *RTECS* CG 0525000, for additional data.

Section 12 - Ecological Information

Environmental Fate: No data found.
Ecotoxicity: Food chain concentration potential: Bioaccumulated by fresh water and marine aquatic organisms
BCF: bioaccumulated by aquatic organisms
Biochemical Oxygen Demand (BOD): none

Section 13 - Disposal Considerations

Disposal: Follow all federal, state, and local regulations.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Shipping Name and Description: Arsenic
ID: UN1558
Hazard Class: 6.1 - Poisonous materials
Packing Group: II - Medium Danger
Symbols:
Label Codes: 6.1 - Poison *or* Poison Inhalation Hazard *if inhalation hazard, Zone A or B*
Special Provisions: IB8, IP2, IP4
Packaging: **Exceptions:** None **Non-bulk:** 212 **Bulk:** 242
Quantity Limitations: **Passenger aircraft/rail:** 25 kg **Cargo aircraft only:** 100 kg
Vessel Stowage: **Location:** A **Other:**

Section 15 - Regulatory Information

EPA Regulations:
RCRA 40 CFR: Listed
CERCLA 40 CFR 302.4: Listed per CWA Section 307(a), per CAA Section 112 1 lb (0.454 kg)
SARA 40 CFR 372.65: Listed
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

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1171 RiverFront Center, Amsterdam, NY 12010
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Issue Date: 2006-06

Section 1 - Chemical Product and Company Identification 61

Material Name: Benzene
CAS Number: 71-43-2
Chemical Formula: C_6H_6
Structural Chemical Formula: C_6H_6
EINECS Number: 200-753-7
ACX Number: X1001488-9
Synonyms: Benzene; BENZENE; (6)ANNULENE; BENZEEN; BENZEN; BENZIN; BENZINE; BENZOL; BENZOL 90; BENZOLE; BENZOLENE; BENZOLO; BICARBURET OF HYDROGEN; CARBON OIL; COAL NAPHTHA; CYCLOHEXATRIENE; EPA PESTICIDE CHEMICAL CODE 008801; FENZEN; MINERAL NAPHTHA; MOTOR BENZOL; NITRATION BENZENE; PHENE; PHENYL HYDRIDE; POLYSTREAM; PYROBENZOL; PYROBENZOLE
General Use: Manufacture of chemicals including styrene, dyes, and many other organic chemicals. Has been used in artificial leather, linoleum, oil cloth, airplane dopes, lacquers; as solvent for waxes, resins, oils etc.
May also be a minor component of gasoline, petrol.
Exposure should be minimized by use in closed systems.
Handling procedures and control measures should be evaluated for exposure before commencement of use in plant operations.

Section 2 - Composition / Information on Ingredients

Name	CAS	%
benzene	71-43-2	99.9

OSHA PEL
TWA: 1 ppm; STEL: 5 ppm.

NIOSH REL
TWA: 0.1 ppm; STEL: 1 ppm.

DFG (Germany) MAK
Skin.

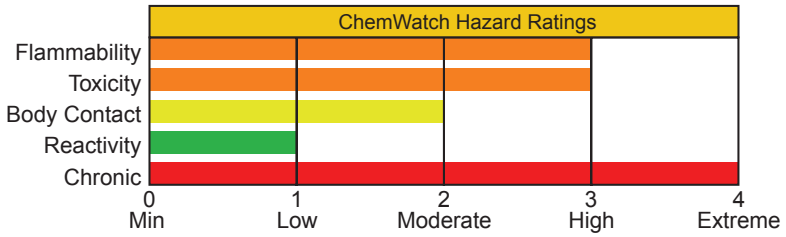
ACGIH TLV
TWA: 0.5 ppm; STEL: 2.5 ppm; skin.

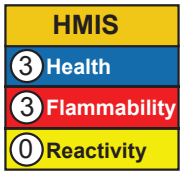
IDLH Level
500 ppm.

EU OEL
TWA: 1 ppm.

Section 3 - Hazards Identification

Fire Diamond





ANSI Signal Word

Danger!

Flammable

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Colorless liquid; sweet odor. Irritating to eyes/skin/respiratory tract. Toxic. Other Acute Effects: headache, dizziness, drowsiness. Absorbed through skin. Chronic Effects: dermatitis, leukemia, bone marrow damage. Carcinogen. Reproductive effects. Flammable.

Potential Health Effects

Target Organs: blood, central nervous system (CNS), bone marrow, eyes, upper respiratory system, skin
Primary Entry Routes: inhalation, skin contact
Acute Effects
Inhalation: The vapor is discomforting to the upper respiratory tract and lungs and may be harmful if inhaled.

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If exposure to highly concentrated solvent atmosphere is prolonged this may lead to narcosis, unconsciousness, even coma and possible death.
Acute effects from inhalation of high concentrations of vapor are pulmonary irritation, including coughing, with nausea; central nervous system depression - characterized by headache and dizziness, increased reaction time, fatigue and loss of coordination.
Inhalation hazard is increased at higher temperatures.
The symptoms of acute exposure to high vapor concentrations include confusion, dizziness, tightening of the leg muscles and pressure over the forehead followed by a period of excitement. If exposure continues the casualty quickly becomes stupefied and lapses into a coma with narcosis.
Effects of inhalation may include nausea, vomiting headache, dizziness, drowsiness, weakness, sometimes preceded by brief periods of exhilaration, or euphoria, irritability, malaise, confusion, ataxia, staggering, weak and rapid pulse, chest pain and tightness with breathlessness, pallor, cyanosis of the lips and fingertips and tinnitus. Severe exposures may produce blurred vision, shallow, rapid breathing, delirium, cardiac arrhythmias, unconsciousness, deep anesthesia, paralysis and coma characterized by motor restlessness, tremors and hyperreflexia (occasionally preceded by convulsions). Polyneuritis and persistent nausea, anorexia, muscular weakness, headache, drowsiness, insomnia and agitation may also occur. Two-three weeks after the exposure, nervous irritability, breathlessness and unsteady gait may still persist; cardiac distress and an unusual dicoloration of the skin may be evident for up to four weeks.
Hemotoxicity is not normally a feature of acute exposures although anemia, thrombocytopenia, petechial hemorrhage, and spontaneous internal bleeding have been reported. Fatal exposures may result from asphyxia, central nervous system depression, cardiac and respiratory failure and circulatory collapse; sudden ventricular fibrillation may also be fatal.
Death may be sudden or may be delayed for 24 hours. Central nervous system, respiratory or hemorrhagic complications may occur up to five days after the exposure and may be lethal; pathological findings include respiratory inflammation with edema, and lung hemorrhage, renal congestion, cerebral edema and extensive petechial hemorrhage in the brain, pleurae, pericardium, urinary tract, mucous membrane and skin.
Exposure to toxic levels has also produced chromosome damage.

Eye: The liquid is highly discomforting to the eyes, may be harmful following absorption and is capable of causing a mild, temporary redness of the conjunctiva (similar to wind-burn), temporary impairment of vision and/or other transient eye damage/ulceration.
The vapor is moderately discomforting to the eyes.
The material may produce severe irritation to the eye causing pronounced inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.

Skin: The liquid may produce skin discomfort following prolonged contact.
Defatting and/or drying of the skin may lead to dermatitis. Open cuts, abraded or irritated skin should not be exposed to this material.
Toxic effects may result from skin absorption.
The material may cause skin irritation after prolonged or repeated exposure and may produce a contact dermatitis (nonallergic). This form of dermatitis is often characterized by skin redness (erythema) and swelling (edema) which may progress to vesiculation, scaling and thickening of the epidermis. Histologically there may be intercellular edema of the spongy layer (spongiosis) and intracellular edema of the epidermis.

Ingestion: The liquid is discomforting to the gastrointestinal tract and may be harmful if swallowed.
Ingestion may result in nausea, pain, vomiting. Vomit entering the lungs by aspiration may cause potentially lethal chemical pneumonitis.

Carcinogenicity: NTP - Class 1, Known to be a carcinogen; IARC - Group 1, Carcinogenic to humans; OSHA - Listed as a carcinogen; NIOSH - Listed as carcinogen; ACGIH - Class A2, Suspected human carcinogen; EPA - Class A, Human carcinogen; MAK - Class A1, Capable of inducing malignant tumors as shown by experience with humans.

Chronic Effects: Liquid is an irritant and may cause burning and blistering of skin on prolonged exposure.
Chronic exposure may cause headache, fatigue, loss of appetite and lassitude with incipient blood effects including anemia and blood changes.
Benzene is a myelotoxicant known to suppress bone-marrow cell proliferation and to induce hematologic disorders in humans and animals.
Signs of benzene-induced aplastic anemia include suppression off leukocytes (leukopenia), red cells (anemia), platelets (thromocytopenia) or all three cell types (pancytopenia). Classic symptoms include weakness, purpura, and hemorrhage. The most significant toxic effect is insidious and often irreversible injury to the blood forming tissue. Leukemia may develop.

Section 4 - First Aid Measures

Inhalation: Remove to fresh air.
Lay patient down. Keep warm and rested.
If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor.

Eye Contact: Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.

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Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: Immediately remove all contaminated clothing, including footwear (after rinsing with water).
Wash affected areas thoroughly with water (and soap if available).
Seek medical attention in event of irritation.

Ingestion: Contact a Poison Control Center.
Do NOT induce vomiting. Give a glass of water.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: For acute or short-term repeated exposures to petroleum distillates or related hydrocarbons:

1.Primary threat to life from pure petroleum distillate ingestion and/or inhalation is respiratory failure.

2.Patients should be quickly evaluated for signs of respiratory distress (e.g. cyanosis, tachypnea, intercostal retraction, obtundation) and given oxygen. Patients with inadequate tidal volumes or poor arterial blood gases (pO_2 <50 mm Hg or pCO_2 >50 mm Hg) should be intubated.

3.Arrhythmias complicate some hydrocarbon ingestion and/or inhalation and electrocardiographic evidence of myocardial injury has been reported; intravenous lines and cardiac monitors should be established in obviously symptomatic patients. The lungs excrete inhaled solvents, so that hyperventilation improves clearance.

4.A chest x-ray should be taken immediately after stabilization of breathing and circulation to document aspiration and detect the presence of pneumothorax.

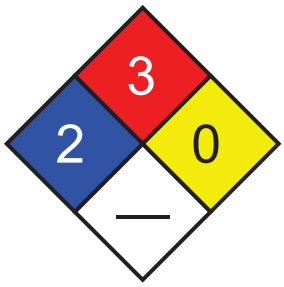
5.Epinephrine (adrenalin) is not recommended for treatment of bronchospasm because of potential myocardial sensitization to catecholamines.
Inhaled cardioselective bronchodilators (e.g. Alupent, Salbutamol) are the preferred agents, with aminophylline a second choice.

6.Lavage is indicated in patients who require decontamination; ensure use of cuffed endotracheal tube in adult patients. Consider complete blood count. Evaluate history of exposure.

Section 5 - Fire-Fighting Measures

Flash Point: -11 °C Closed Cup
Autoignition Temperature: 562 °C
LEL: 1.3% v/v
UEL: 7.1% v/v

See DOT ERG



Fire Diamond

Extinguishing Media: Foam, dry chemical powder, BCF (where regulations permit), carbon dioxide.
Water spray or fog - Large fires only.

General Fire Hazards/Hazardous Combustion Products: Liquid and vapor are highly flammable.
Severe fire hazard when exposed to heat, flame and/or oxidizers.
Vapor forms an explosive mixture with air.
Severe explosion hazard, in the form of vapor, when exposed to flame or spark. Vapor may travel a considerable distance to source of ignition.
Heating may cause expansion/decomposition with violent rupture of containers.
On combustion, may emit toxic fumes of carbon monoxide (CO).

Fire Incompatibility: Avoid contamination with oxidizing agents i.e. nitrates, oxidizing acids, chlorine bleaches, pool chlorine etc. as ignition may result.

Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.
May be violently or explosively reactive. Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation.
Fight fire from a safe distance, with adequate cover.
If safe, switch off electrical equipment until vapor fire hazard removed.
Use water delivered as a fine spray to control fire and cool adjacent area.
Avoid spraying water onto liquid pools.
Do not approach containers suspected to be hot.
Cool fire-exposed containers with water spray from a protected location.
If safe to do so, remove containers from path of fire.
Equipment should be thoroughly decontaminated after use.

Section 6 - Accidental Release Measures

Small Spills: Remove all ignition sources. Clean up all spills immediately.
Avoid breathing vapors and contact with skin and eyes.
Control personal contact by using protective equipment.
Contain and absorb small quantities with vermiculite or other absorbent material. Wipe up. Collect residues in a flammable waste container.

See DOT ERG

Large Spills: Pollutant - contain spillage. Clear area of personnel and move upwind.
Contact fire department and tell them location and nature of hazard.

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May be violently or explosively reactive. Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation.
No smoking, bare lights or ignition sources. Increase ventilation.
Stop leak if safe to do so. Water spray or fog may be used to disperse/absorb vapor. Contain spill with sand, earth or vermiculite.
Use only spark-free shovels and explosion proof equipment.
Collect recoverable product into labeled containers for recycling.
Absorb remaining product with sand, earth or vermiculite.
Collect solid residues and seal in labeled drums for disposal.
Wash area and prevent runoff into drains.
If contamination of drains or waterways occurs, advise emergency services.

Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Avoid all personal contact, including inhalation.
Wear protective clothing when risk of exposure occurs.
Use in a well-ventilated area. Prevent concentration in hollows and sumps.
DO NOT enter confined spaces until atmosphere has been checked.
Avoid smoking, bare lights, heat or ignition sources.
When handling, DO NOT eat, drink or smoke.
Vapor may ignite on pumping or pouring due to static electricity.
DO NOT use plastic buckets. Ground and secure metal containers when dispensing or pouring product. Use spark-free tools when handling.
Avoid contact with incompatible materials.
Keep containers securely sealed. Avoid physical damage to containers.
Always wash hands with soap and water after handling.
Work clothes should be laundered separately.
Use good occupational work practices. Observe manufacturer's storing and handling recommendations. Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions.

Recommended Storage Methods: Metal can; metal drum. Packing as recommended by manufacturer.
Check all containers are clearly labeled and free from leaks.

Storage Requirements: Store in original containers in approved flame-proof area.
No smoking, bare lights, heat or ignition sources.
DO NOT store in pits, depressions, basements or areas where vapors may be trapped. Keep containers securely sealed.
Store away from incompatible materials in a cool, dry well ventilated area.
Protect containers against physical damage and check regularly for leaks.
Observe manufacturer's storing and handling recommendations.

Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Use in a well-ventilated area. Local exhaust ventilation usually required.
If risk of overexposure exists, wear NIOSH-approved respirator.
Correct fit is essential to obtain adequate protection. NIOSH-approved self contained breathing apparatus (SCBA) may be required in some situations.
Provide adequate ventilation in warehouse or closed storage area.

Personal Protective Clothing/Equipment:

Eyes: Chemical goggles. Full face shield.
Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

Hands/Feet: Nitrile gloves; Neoprene gloves.
Safety footwear.
Do NOT use this product to clean the skin.

Respiratory Protection:
Exposure Range >1 to 10 ppm: Air Purifying, Negative Pressure, Half Mask
Exposure Range >10 to 100 ppm: Air Purifying, Negative Pressure, Full Face
Exposure Range >100 to 1000 ppm: Supplied Air, Constant Flow/Pressure Demand, Full Face
Exposure Range >1000 to unlimited ppm: Self-contained Breathing Apparatus, Pressure Demand, Full Face
Cartridge Color: black
Note: must change cartridge at beginning of each shift

Other: Overalls. Eyewash unit. Barrier cream. Skin cleansing cream.

Glove Selection Index:
PE/EVAL/PE ..... Best selection
PVA ..... Best selection
TEFLON ..... Best selection

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VITON	Best selection
VITON/NEOPRENE	Best selection
NITRILE+PVC	Poor to dangerous choice for other than short-term immersion
BUTYL	Poor to dangerous choice for other than short-term immersion
NITRILE	Poor to dangerous choice for other than short-term immersion
NEOPRENE	Poor to dangerous choice for other than short-term immersion
PVC	Poor to dangerous choice for other than short-term immersion
NATURAL RUBBER	Poor to dangerous choice for other than short-term immersion
BUTYL/NEOPRENE	Poor to dangerous choice for other than short-term immersion

Section 9 - Physical and Chemical Properties

Appearance/General Info: Clear, highly flammable liquid; floats on water. Characteristic aromatic odor. Highly volatile. Mixes with alcohol, chloroform, ether, carbon disulfide, carbon tetrachloride, glacial acetic acid, acetone and oils.

Physical State: Liquid
Odor Threshold: 4.68 ppm
Vapor Pressure (kPa): 9.95 at 20 °C
Vapor Density (Air=1): 2.77
Formula Weight: 78.12
Specific Gravity (H_2O=1, at 4 °C): 0.879 at 20 °C
Evaporation Rate: Fast

pH: Not applicable
pH (1% Solution): Not applicable.
Boiling Point: 80.1 °C (176 °F)
Freezing/Melting Point: 5.5 °C (41.9 °F)
Volatile Component (% Vol): 100
Water Solubility: 0.18 g/100 g of water at 25 °C

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Product is considered stable. Hazardous polymerization will not occur.
Storage Incompatibilities: Avoid reaction with oxidizing agents.

Section 11 - Toxicological Information

Toxicity

Oral (man) LD_{Lo}: 50 mg/kg
Oral (rat) LD_{50}: 930 mg/kg
Inhalation (rat) LC_{50}: 10000 ppm/7h
Inhalation (human) LC_{Lo}: 2000 ppm/5m
Inhalation (man) TC_{Lo}: 150 ppm/1y - I
Inhalation (human) TC_{Lo}: 100 ppm
Reproductive effector in rats

Irritation

Skin (rabbit): 20 mg/24 hr - mod
Eye (rabbit): 2 mg/24 hr - SEVERE

See *RTECS* CY 1400000, for additional data.

Section 12 - Ecological Information

Environmental Fate: If released to soil, it will be subject to rapid volatilization near the surface and that which does not evaporate will be highly to very highly mobile in the soil and may leach to groundwater. It may be subject to biodegradation based on reported biodegradation of 24% and 47% of the initial 20 ppm in a base-rich para-brownish soil in 1 and 10 weeks, respectively. It may be subject to biodegradation in shallow, aerobic groundwaters, but probably not under anaerobic conditions. If released to water, it will be subject to rapid volatilization; the half-life for evaporation in a wind-wave tank with a moderate wind speed of 7.09 m/sec was 5.23 hours; the estimated half-life for volatilization from a model river one meter deep flowing 1 m/sec with a wind velocity of 3 m/sec is estimated to be 2.7 hours at 20 °C. It will not be expected to significantly adsorb to sediment, bioconcentrate in aquatic organisms or hydrolyze. It may be subject to biodegradation based on a reported biodegradation half-life of 16 days in an aerobic river die-away test. In a marine ecosystem biodegradation occurred in 2 days after an acclimation period of 2 days and 2 weeks in the summer and spring, respectively, whereas no degradation occurred in winter. According to one experiment, it has a half-life of 17 days due to photodegradation which could contribute to removal in situations of cold water, poor nutrients, or other conditions less conductive to microbial degradation. If released to the atmosphere, it will exist predominantly in the vapor phase. Gas-phase will not be subject to direct photolysis but it will react with photochemically produced hydroxyl radicals with a half-life of 13.4 days calculated using an experimental rate constant for the reaction. The reaction time in polluted atmospheres which contain nitrogen oxides or sulfur dioxide is accelerated with the half-life being reported as 4-6 hours. Products of photooxidation include phenol, nitrophenols, nitrobenzene, formic acid, and peroxyacetyl nitrate. It is fairly soluble in water and is removed from the atmosphere in rain.

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Ecotoxicity: LC_{50} Clawed toad (3-4 wk after hatching) 190 mg/l/48 hr /Conditions of bioassay not specified; LC_{50} Morone saxatilis (bass) 5.8 to 10.9 ppm/96 hr /Conditions of bioassay not specified; LC_{50} Poecilia reticulata (guppy) 63 ppm/14 days /Conditions of bioassay not specified; LC_{50} Salmo trutta (brown trout yearlings) 12 mg/l/1 hr (static bioassay); LD_{50} Lepomis macrochirus (bluegill sunfish) 20 mg/l/24 to 48 hr /Conditions of bioassay not specified; LC_{100} Tetrahymena pyriformis (ciliate) 12.8 mmole/l/24 hr /Conditions of bioassay not specified; LC_{50} Cancer magister (crab larvae) stage 1, 108 ppm/96 hr /Conditions of bioassay not specified; LC_{50} Crangon franciscorum (shrimp) 20 ppm/96 hr /Conditions of bioassay not specified

Henry's Law Constant: 5.3×10^{-3}

BCF: eels 3.5

Biochemical Oxygen Demand (BOD): 1.2 lb/lb, 10 days

Octanol/Water Partition Coefficient: log $K_{ow} = 2.13$

Soil Sorption Partition Coefficient: K_{oc} = woodburn silt loam 31 to 143

Section 13 - Disposal Considerations

Disposal: Consult manufacturer for recycling options and recycle where possible.
Follow applicable federal, state, and local regulations.
Incinerate residue at an approved site.
Recycle containers where possible, or dispose of in an authorized landfill.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Shipping Name and Description: Benzene
ID: UN1114
Hazard Class: 3 - Flammable and combustible liquid
Packing Group: II - Medium Danger
Symbols:
Label Codes: 3 - Flammable Liquid
Special Provisions: IB2, T4, TP1
Packaging: **Exceptions:** 150 **Non-bulk:** 202 **Bulk:** 242
Quantity Limitations: **Passenger aircraft/rail:** 5 L **Cargo aircraft only:** 60 L
Vessel Stowage: **Location:** B **Other:** 40

Section 15 - Regulatory Information

EPA Regulations:

RCRA 40 CFR: Listed U019 Toxic Waste, Ignitable Waste
CERCLA 40 CFR 302.4: Listed per CWA Section 311(b)(4), per RCRA Section 3001, per CWA Section 307(a), per CAA Section 112 10 lb (4.535 kg)
SARA 40 CFR 372.65: Listed
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

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Issue Date: 2006-06

cis-Acetylene Dichloride
DIC4550

Section 1 - Chemical Product and Company Identification 61

Material Name: cis-Acetylene Dichloride
CAS Number: 156-59-2
Chemical Formula: $C_2H_2Cl_2$
Structural Chemical Formula: CHCl=CHCl
EINECS Number: 205-859-7
ACX Number: X1007815-0
Synonyms: ACETALYNE DICHLORIDE; CIS-ACETYLENE DICHLORIDE; CIS-1,2-DICHLORETHYLENE; CIS-1,2-DICHLOROETHENE; (Z)-1,2-DICHLOROETHYLENE; 1,2-CIS-DICHLOROETHYLENE; CIS-1,2-DICHLOROETHYLENE; CIS-DICHLOROETHYLENE; ETHENE,1,2-DICHLORO-,(Z)-; ETHYLENE,1,2-DICHLORO-,(Z)-
General Use: solvent for waxes, resins, fats, phenol, camphor, acetyl cellulose, organic materials and heat-sensitive substances such as caffeine; in rubber manufacture, as a refrigerant, as an additive to dye and lacquer solutions, in retarding fermentation, in organic synthesis, in medicines, in dye extraction, in chlorination reactions and in the manufacture of artificial pearls; a constituent of perfumes and thermoplastics

Section 2 - Composition / Information on Ingredients

Name	CAS	%
cis-acetylene dichloride	156-59-2	>98

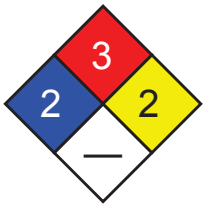
OSHA PEL
TWA: 200 ppm; 790 mg/m^3.

NIOSH REL

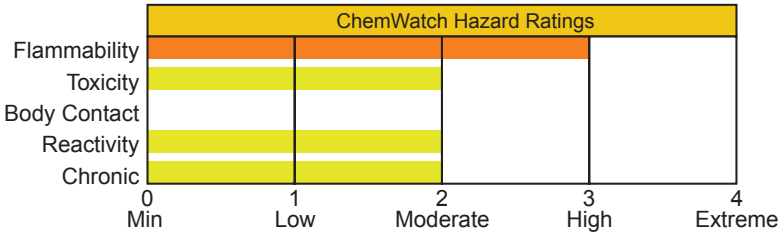
DFG (Germany) MAK
TWA: 200 ppm; PEAK: 400 ppm.

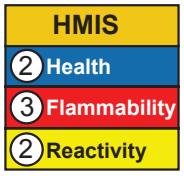
ACGIH TLV
TWA: 200 ppm.

Section 3 - Hazards Identification



Fire Diamond





ANSI Signal Word
Warning!

Flammable

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Colorless liquid; sweetish odor. Irritating to eyes/skin/respiratory tract. Harmful. Other Acute Effects: narcotic effect. Flammable.

Potential Health Effects

Target Organs: eyes, skin, respiratory system, nervous system, liver, kidneys
Primary Entry Routes: inhalation of vapor, skin/eye contact

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Acute Effects

Inhalation: There is a single report of an industrial poisoning, a fatality caused by the inhalation of a vapor in a small enclosure. Acute intoxication by halogenated aliphatic hydrocarbons appears to take place over two stages. Signs of a reversible narcosis are evident in the first stage and in the second stage signs of injury to organs may become evident, a single organ alone is (almost) never involved. Depression of the central nervous system is the most outstanding effect of most halogenated aliphatic hydrocarbons. Inebriation and excitation, passing into narcosis, is a typical reaction. In severe acute exposures there is always a danger of death from respiratory failure or cardiac arrest due to a tendency to make the heart more susceptible to catecholamines (adrenalin). The most important effects of exposure are narcosis and irritation of the central nervous system. Liver responses may occur after repeated narcotic doses and involves fatty liver degeneration. Vapor exposure may produce central nervous system depression or in milder exposures, nausea, vomiting, weakness, tremor and epigastric cramps. Recovery is usually rapid.

Eye: The vapor when concentrated has pronounced eye irritation effect; this gives some warning of high vapor concentrations. If eye irritation occurs seek to reduce exposure with available control measures, or evacuate area. Exposure to the trans isomer at 2200 ppm caused burning of the eyes, vertigo, nausea. Reversible corneal clouding has been described in exposures to acetylene dichloride.

Skin: The liquid may produce skin discomfort following prolonged contact. Defatting and/ or drying of the skin may lead to dermatitis.

Ingestion: The liquid is discomforting to the gastrointestinal tract and toxic if swallowed. Considered an unlikely route of entry in commercial/industrial environments.

Carcinogenicity: NTP - Not listed; IARC - Not listed; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Class D, Not classifiable as to human carcinogenicity; MAK - Not listed.

Chronic Effects: The material may accumulate in the human body and progressively cause tissue damage.

Section 4 - First Aid Measures

See DOT ERG

Inhalation: • If fumes or combustion products are inhaled, remove to fresh air.
• Lay patient down. Keep warm and rested.
• If breathing is shallow or has stopped, ensure clear airway and apply resuscitation, preferably with a demand valve resuscitator, bag-valve mask device, or pocket mask as trained. Perform CPR if necessary.
• Transport to hospital or doctor.

Eye Contact: • Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water.
• Ensure complete irrigation of the eye by keeping eyelids apart and away from eye and moving the eyelids by occasionally lifting the upper and lower lids.
• Transport to hospital or doctor without delay.
• Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: • Immediately remove all contaminated clothing, including footwear (after rinsing with water).
• Wash affected areas thoroughly with water (and soap if available).
• Seek medical attention in event of irritation.

Ingestion: Contact a Poison Control Center. Do NOT induce vomiting. Give a glass of water.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: Treatment should follow that practiced in carbon tetrachloride exposures:
• Acute exposures to carbon tetrachloride present, initially, with CNS depression followed by hepatic and renal dysfunction.
• Respiratory depression and cardiac dysrhythmias are an immediate threat to life.
• Since a major fraction of absorbed carbon tetrachloride is exhaled in first hour, good tidal volumes should be maintained in severely poisoned patients; hyperventilation may be an additional therapeutic modality.
• Ipecac syrup, lavage, activated charcoal or catharsis may all be used in the first 4 hours.
• Since reactive metabolites may cause hepatorenal toxicity, administration of N-acetyl-L-cysteine may reduce complications. Experience with this therapy is limited.

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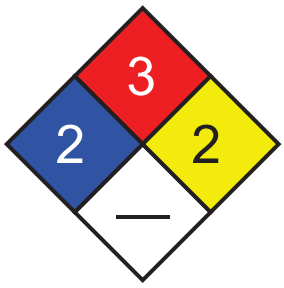
Section 5 - Fire-Fighting Measures

Flash Point: 2.2 to 3.9 °C Closed Cup
Autoignition Temperature: 460 °C
LEL: 9.7% v/v
UEL: 12.8% v/v
Extinguishing Media: Foam. Dry chemical powder. BCF (where regulations permit). Carbon dioxide. Water spray or fog - Large fires only.
General Fire Hazards/Hazardous Combustion Products: • Liquid and vapor are highly flammable.
• Severe fire hazard when exposed to heat, flame and/or oxidizers.
• Vapor forms an explosive mixture with air.
• Severe explosion hazard, in the form of vapor, when exposed to flame or spark.
• Vapor may travel a considerable distance to source of ignition.
• Heating may cause expansion/decomposition with violent rupture of containers.
• On combustion, may emit toxic fumes of carbon monoxide (CO). Other combustion products include hydrogen chloride and phosgene.
Fire Incompatibility: Avoid contamination with oxidizing agents i.e., nitrates, oxidizing acids, chlorine bleaches, pool chlorine etc. as ignition may result.
Fire-Fighting Instructions: • Contact fire department and tell them location and nature of hazard.
• May be violently or explosively reactive.
• Wear breathing apparatus plus protective gloves.
• Prevent, by any means available, spillage from entering drains or waterways.
• Consider evacuation (or protect in place).
• Fight fire from a safe distance, with adequate cover.
• If safe, switch off electrical equipment until vapor fire hazard removed.
• Use water delivered as a fine spray to control the fire and cool adjacent area.
• Avoid spraying water onto liquid pools.
• Do not approach containers suspected to be hot.
• Cool fire-exposed containers with water spray from a protected location.
• If safe to do so, remove containers from path of fire.

See DOT ERG



Fire Diamond

Section 6 - Accidental Release Measures

Small Spills: • Remove all ignition sources.
• Clean up all spills immediately.
• Avoid breathing vapors and contact with skin and eyes.
• Control personal contact by using protective equipment.
• Contain and absorb small quantities with vermiculite or other absorbent material.
• Wipe up.
• Collect residues in a flammable waste container.
Large Spills: • Clear area of personnel and move upwind.
• Contact fire department and tell them location and nature of hazard.
• May be violently or explosively reactive.
• Wear breathing apparatus plus protective gloves.
• Prevent, by any means available, spillage from entering drains or waterways.
• No smoking, bare lights or ignition sources.
• Increase ventilation.
• Stop leak if safe to do so.
• Water spray or fog may be used to disperse/absorb vapor.
• Contain spill with sand, earth or vermiculite.
• Use only spark-free shovels and explosion proof equipment.
• Collect recoverable product into labeled containers for recycling.
• Absorb remaining product with sand, earth or vermiculite.
• Collect solid residues and seal in labeled drums for disposal.
• Wash area and prevent runoff into drains.
• If contamination of drains or waterways occurs, advise emergency services.
Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

See DOT ERG

Section 7 - Handling and Storage

Handling Precautions: • Avoid all personal contact, including inhalation.
• Wear protective clothing when risk of exposure occurs.
• Use in a well-ventilated area.
• Prevent concentration in hollows and sumps.

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• DO NOT enter confined spaces until atmosphere has been checked.
• Avoid smoking, bare lights or ignition sources.
• Avoid contact with incompatible materials.
• When handling, DO NOT eat, drink or smoke.
• Keep containers securely sealed when not in use.
• Avoid physical damage to containers.
• Always wash hands with soap and water after handling.
• Work clothes should be laundered separately.
• Follow good occupational work practices.
• Observe manufacturer's storage and handling recommendations.
• Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions.

Recommended Storage Methods: Check that containers are clearly labeled. Packaging as recommended by manufacturer. DO NOT use aluminum or galvanized containers.

Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Local exhaust ventilation usually required. If risk of overexposure exists, wear NIOSH-approved respirator. Provide adequate ventilation in warehouse or closed storage area.

Personal Protective Clothing/Equipment:

Eyes: Safety glasses with side shields or, as required, chemical goggles. Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

Hands/Feet: Butyl rubber gloves. Neoprene gloves.

Respiratory Protection: Respirator protection may be required. Consult your supervisor.

Other: • Overalls.
• Barrier cream.
• Eyewash unit.

Glove Selection Index:

VITON ..... Poor to dangerous choice for other than short-term immersion

Section 9 - Physical and Chemical Properties

Appearance/General Info: Colorless liquid with pleasant chloroform-like odor.

Physical State: colorless liquid

Odor Threshold: 0.085 ppm

Vapor Pressure (kPa): 200 mm Hg at 25 °C

Vapor Density (Air=1): 3.34

Formula Weight: 96.94

Specific Gravity (H_2O=1, at 4 °C): 1.2837 at 20 °C/4 °C

Boiling Point: 60.3 °C (141 °F) at 760 mm Hg

Freezing/Melting Point: -80.5 °C (-112.9 °F)

Water Solubility: 1 to 5 mg/mL at 16 °C

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Product is considered stable. Hazardous polymerization will not occur.

Storage Incompatibilities: Avoid reaction with oxidizing agents. Acetylene dichloride in contact with solid caustic alkalies or their concentrated solutions will form chloracetylene which ignites in air. Haloalkenes are highly reactive.

Section 11 - Toxicological Information

Toxicity

Inhalation (mouse) LC_{Lo}: 65000 mg/m^3/2 hr

Rat liver cell mutagen in vitro

Irritation

Nil reported

See *RTECS* KV9420000, for additional data.

Section 12 - Ecological Information

Environmental Fate: If released on soil, it should evaporate and/or leach into the groundwater where very slow biodegradation should occur. If released into water, it will be lost mainly through volatilization (half life 3 hr in a model river). Biodegradation, adsorption to sediment, and bioconcentration in aquatic organisms should not be significant. In the atmosphere it will be lost by reaction with photochemically produced hydroxyl radicals (half life 8 days) and scavenged by rain. Because it is relatively long lived in the atmosphere, considerable dispersal from source areas should occur.

Ecotoxicity: LC_{50} Lepomis machrochirus (bluegill) 135,000 ug/l/96 hr in a static unmeasured bioassay

Henry's Law Constant: estimated at 0.00337

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BCF: calculated at 15
Octanol/Water Partition Coefficient: log K_{ow} = 1.86
Soil Sorption Partition Coefficient: K_{oc} = 49

Section 13 - Disposal Considerations

Disposal: • Consult manufacturer for recycling options and recycle where possible.
• Follow applicable local, state, and federal regulations.
• Incinerate residue at an approved site.
• Recycle containers if possible, or dispose of in an authorized landfill.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Shipping Name and Description: 1,2-Dichloroethylene
ID: UN1150
Hazard Class: 3 - Flammable and combustible liquid
Packing Group: II - Medium Danger
Symbols:
Label Codes: 3 - Flammable Liquid
Special Provisions: IB2, T7, TP2
Packaging: **Exceptions:** 150 **Non-bulk:** 202 **Bulk:** 242
Quantity Limitations: **Passenger aircraft/rail:** 5 L **Cargo aircraft only:** 60 L
Vessel Stowage: **Location:** B **Other:**

Section 15 - Regulatory Information

EPA Regulations:
RCRA 40 CFR: Not listed
CERCLA 40 CFR 302.4: Not listed
SARA 40 CFR 372.65: Not listed
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

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Material Safety Data Sheet Collection
Genium group inc.
1171 RiverFront Center, Amsterdam, NY 12010
(518) 842-4111

Issue Date: 2006-06

Section 1 - Chemical Product and Company Identification 61

Material Name: Ethylbenzene **CAS Number:** 100-41-4
Chemical Formula: C_8H_{10}
Structural Chemical Formula: $C_6H_5 \bullet C_2H_5$
EINECS Number: 202-849-4
ACX Number: X1003016-1
Synonyms: AETHYLBENZOL; BENZENE,ETHYL-; EB; ETHYL BENZENE; ETHYLBENZEEN; ETHYLBENZENE; ETHYLBENZOL; ETILBENZENE; ETYLOBENZEN; PHENYLETHANE
General Use: Used in the manufacture of cellulose acetate, styrene and synthetic rubber; solvent or diluent; component of automotive and aviation gasoline.
Component of many petroleum hydrocarbon solvents, thinners.
The use of a quantity of material in an unventilated or confined space may result in increased exposure and an irritating atmosphere developing. Before starting consider control of exposure by mechanical ventilation.

Section 2 - Composition / Information on Ingredients

Name	CAS	%
ethylbenzene	100-41-4	>95

OSHA PEL
TWA: 100 ppm; 435 mg/m^3.

ACGIH TLV
TWA: 100 ppm; STEL: 125 ppm.

EU OEL
TWA: 100 ppm; STEL: 200 ppm.

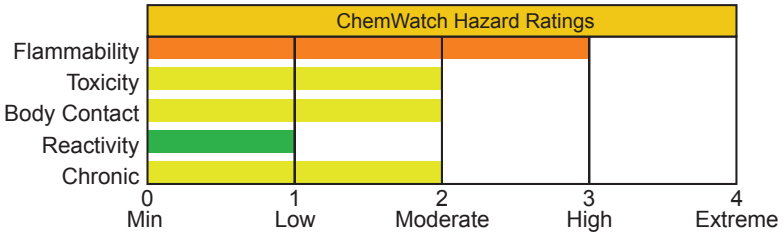
NIOSH REL
TWA: 100 ppm (435 mg/m^3); STEL: 125 ppm (545 mg/m^3).

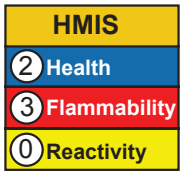
IDLH Level
800 ppm (10% LEL).

DFG (Germany) MAK
Skin.

Section 3 - Hazards Identification

Fire Diamond





ANSI Signal Word
Warning!

Flammable

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Colorless liquid; pungent odor. Irritating to eyes/skin/respiratory tract. Other Acute Effects: chest constriction, vertigo, narcosis, cramps, respiratory paralysis. Chronic Effects: fatigue, sleepiness, headache, blood disorders, lymphocytosis. Flammable.

Potential Health Effects

Target Organs: eyes, respiratory system, skin, central nervous system (CNS), blood
Primary Entry Routes: inhalation, skin contact, eye contact
Acute Effects
Inhalation: The vapor is discomforting to the upper respiratory tract.
Inhalation hazard is increased at higher temperatures.
Acute effects from inhalation of high concentrations of vapor are pulmonary irritation, including coughing, with nausea; central nervous system depression - characterized by headache and dizziness, increased reaction time, fatigue and loss of coordination.

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If exposure to highly concentrated solvent atmosphere is prolonged this may lead to narcosis, unconsciousness, even coma and possible death.
Inhalation of vapor may aggravate a pre-existing respiratory condition such as asthma, bronchitis, emphysema.
When humans were exposed to the 100 and 200 ppm for 8 hours about 45-65% is retained in the body. Only traces of unchanged ethyl benzene are excreted in expired air following termination of inhalation exposure.
Humans exposed to concentrations of 23-85 ppm excreted most of the retained dose in the urine (mainly as metabolites).
Guinea pigs that died from exposure had intense congestion of the lungs and generalized visceral hyperemia. Rats exposed for three days at 8700 mg/m^3 (2000 ppm) showed changes in the levels of dopamine and noradrenaline in various parts of the brain.

Eye: The liquid is highly discomforting to the eyes and is capable of causing a mild, temporary redness of the conjunctiva (similar to wind-burn), temporary impairment of vision and/or other transient eye damage/ulceration.
The vapor is discomforting to the eyes.
The material may produce severe irritation to the eye causing pronounced inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.
Two drops of the material in to the conjunctival sac produced only slight irritation of the conjunctival membrane but no corneal injury.

Skin: The liquid is discomforting to the skin if exposure is prolonged and is capable of causing skin reactions which may lead to dermatitis.
The material may cause skin irritation after prolonged or repeated exposure and may produce a contact dermatitis (nonallergic). This form of dermatitis is often characterized by skin redness (erythema) and swelling (edema) which may progress to vesiculation, scaling and thickening of the epidermis. Histologically there may be intercellular edema of the spongy layer (spongiosis) and intracellular edema of the epidermis.
The mean rate of absorption of liquid ethyl benzene applied to 17.3 cm2 area of the forearm of seven volunteers for 10-15 minutes was determined to be 38 mg/cm2/hr. Immersion of the whole hand in aqueous solutions of ethyl benzene (112-156 mg/l) for 1 hour yielded mean absorption rates of 118 and 215.7 ug/cm2/hr. The rate of absorption is thus greater than that of aniline, benzene, nitrobenzene, carbon disulfide and styrene.
Repeated application of the undiluted product to the abdominal area of rabbits (10-20 applications over 2-4 weeks) resulted in erythema, edema and superficial necrosis. The material did not appear to be absorbed through the skin in sufficient quantity to produce outward signs of toxicity.

Ingestion: Considered an unlikely route of entry in commercial/industrial environments.
The liquid may produce considerable gastrointestinal discomfort and may be harmful or toxic if swallowed. Ingestion may result in nausea, pain and vomiting. Vomit entering the lungs by aspiration may cause potentially lethal chemical pneumonitis.

Carcinogenicity: NTP - Not listed; IARC - Not listed; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Class D, Not classifiable as to human carcinogenicity; MAK - Not listed.

Chronic Effects: Chronic solvent inhalation exposures may result in nervous system impairment and liver and blood changes.
Prolonged or continuous skin contact with the liquid may cause defatting with drying, cracking, irritation and dermatitis following.
Industrial workers exposed to a maximum level of ethyl benzene of 0.06 mg/l (14 ppm) reported headaches and irritability and tired quickly. Functional nervous system disturbances were found in some workers employed for over 7 years whilst other workers had enlarged livers.

Section 4 - First Aid Measures

Inhalation: Remove to fresh air.
Lay patient down. Keep warm and rested.
If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor.

Eye Contact: Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.
Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: Immediately remove all contaminated clothing, including footwear (after rinsing with water).
Wash affected areas thoroughly with water (and soap if available).
Seek medical attention in event of irritation.

Ingestion: Rinse mouth out with plenty of water. DO NOT induce vomiting.
Observe the patient carefully. Never give liquid to a person showing signs of being sleepy or with reduced awareness; i.e. becoming unconscious.
Give water (or milk) to rinse out mouth. Then provide liquid slowly and as much as casualty can comfortably drink.
Transport to hospital or doctor without delay.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: For acute or short-term repeated exposures to petroleum distillates or related hydrocarbons:

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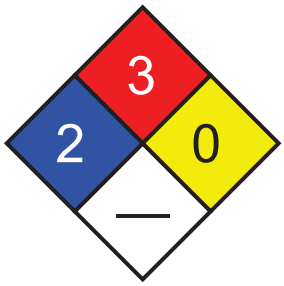
1. Primary threat to life from pure petroleum distillate ingestion and/or inhalation is respiratory failure.
2.Patients should be quickly evaluated for signs of respiratory distress (e.g. cyanosis, tachypnea, intercostal retraction, obtundation) and given oxygen. Patients with inadequate tidal volumes or poor arterial blood gases (pO_2 <50 mm Hg or pCO_2 >50 mm Hg) should be intubated.
3.Arrhythmias complicate some hydrocarbon ingestion and/or inhalation and electrocardiographic evidence of myocardial injury has been reported; intravenous lines and cardiac monitors should be established in obviously symptomatic patients. The lungs excrete inhaled solvents, so that hyperventilation improves clearance
4.A chest x-ray should be taken immediately after stabilization of breathing and circulation to document aspiration and detect the presence of pneumothorax.
5.Epinephrine (adrenalin) is not recommended for treatment of bronchospasm because of potential myocardial sensitization to catecholamines.
Inhaled cardioselective bronchodilators (e.g. Alupent, Salbutamol) are the preferred agents, with aminophylline a second choice.
6.Lavage is indicated in patients who require decontamination; ensure use of cuffed endotracheal tube in adult patients.

Section 5 - Fire-Fighting Measures

Flash Point: 12.8 °C Closed Cup
Autoignition Temperature: 432 °C
LEL: 1.6% v/v
UEL: 7% v/v
Extinguishing Media: Foam, dry chemical powder, BCF (where regulations permit), carbon dioxide.
Water spray or fog - Large fires only.
General Fire Hazards/Hazardous Combustion Products: Liquid and vapor are flammable.
Moderate fire hazard when exposed to heat or flame.
Vapor forms an explosive mixture with air.
Moderate explosion hazard when exposed to heat or flame.
Vapor may travel a considerable distance to source of ignition.
Heating may cause expansion or decomposition leading to violent rupture of containers.
On combustion, may emit toxic fumes of carbon monoxide (CO).
May emit clouds of acrid smoke.
Fire Incompatibility: Avoid contamination with oxidizing agents i.e. nitrates, oxidizing acids, chlorine bleaches, pool chlorine etc. as ignition may result.
Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.
May be violently or explosively reactive. Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways.
If safe, switch off electrical equipment until vapor fire hazard removed.
Use water delivered as a fine spray to control fire and cool adjacent area.
Avoid spraying water onto liquid pools.
Do not approach containers suspected to be hot.
Cool fire-exposed containers with water spray from a protected location.
If safe to do so, remove containers from path of fire.

See DOT ERG



Fire Diamond

Section 6 - Accidental Release Measures

Small Spills: Remove all ignition sources. Clean up all spills immediately.
Avoid breathing vapors and contact with skin and eyes.
Control personal contact by using protective equipment.
Contain and absorb small quantities with vermiculite or other absorbent material. Wipe up. Collect residues in a flammable waste container.
Large Spills: Clear area of personnel and move upwind.
Contact fire department and tell them location and nature of hazard.
May be violently or explosively reactive. Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways.
No smoking, bare lights or ignition sources. Increase ventilation.
Stop leak if safe to do so. Water spray or fog may be used to disperse/absorb vapor. Contain spill with sand, earth or vermiculite.
Use only spark-free shovels and explosion proof equipment.
Collect recoverable product into labeled containers for recycling.
Absorb remaining product with sand, earth or vermiculite.
Collect solid residues and seal in labeled drums for disposal.
Wash area and prevent runoff into drains.
If contamination of drains or waterways occurs, advise emergency services.

See DOT ERG

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Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Avoid generating and breathing mist. Avoid all personal contact, including inhalation.
Wear protective clothing when risk of exposure occurs.
Use in a well-ventilated area. Prevent concentration in hollows and sumps.
DO NOT enter confined spaces until atmosphere has been checked.
Avoid smoking, bare lights, heat or ignition sources.
When handling, DO NOT eat, drink or smoke.
Vapor may ignite on pumping or pouring due to static electricity.
DO NOT use plastic buckets. Ground and secure metal containers when dispensing or pouring product. Use spark-free tools when handling.
Avoid contact with incompatible materials.
Keep containers securely sealed. Avoid physical damage to containers.
Always wash hands with soap and water after handling.
Work clothes should be laundered separately.
Use good occupational work practices. Observe manufacturer's storing and handling recommendations. Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions.
Recommended Storage Methods: Metal can; metal drum. Packing as recommended by manufacturer.
Check all containers are clearly labeled and free from leaks.
Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: CARE: Use of a quantity of this material in confined space or poorly ventilated area, where rapid build-up of concentrated atmosphere may occur, could require increased ventilation and/or protective gear. Use in a well-ventilated area.
General exhaust is adequate under normal operating conditions.
If risk of overexposure exists, wear NIOSH-approved respirator.
Correct fit is essential to obtain adequate protection.
Provide adequate ventilation in warehouse or closed storage areas.
Personal Protective Clothing/Equipment:
Eyes: Safety glasses with side shields; or as required, chemical goggles.
Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.
Hands/Feet: Barrier cream with polyethylene gloves or Nitrile gloves.
Protective footwear.
Respiratory Protection:
Exposure Range >100 to <800 ppm: Air Purifying, Negative Pressure, Half Mask
Exposure Range 800 to unlimited ppm: Self-contained Breathing Apparatus, Pressure Demand, Full Face
Cartridge Color: black
Other: Overalls. Eyewash unit.
Glove Selection Index:
VITON ..... Best selection
TEFLON ..... Best selection

Section 9 - Physical and Chemical Properties

Appearance/General Info: Clear highly flammable liquid; floats on water. Aromatic solvent odor. Soluble in alcohol, benzene, carbon tetrachloride and ether.
Physical State: Liquid
Odor Threshold: 8.7 to 870.0 mg/m^3
Vapor Pressure (kPa): 1.333 at 25.9 °C
Vapor Density (Air=1): 3.66
Formula Weight: 106.17
Specific Gravity (H_2O=1, at 4 °C): 0.8670 at 20 °C
Evaporation Rate: Fast
pH: Not applicable
pH (1% Solution): Not applicable.
Boiling Point: 136.2 °C (277 °F) at 760 mm Hg
Freezing/Melting Point: -95 °C (-139 °F)
Volatile Component (% Vol): 100
Water Solubility: 0.01% by weight

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Hazardous polymerization will not occur.
Storage Incompatibilities: Avoid storage with oxidizers.

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Section 11 - Toxicological Information

Toxicity

Oral (rat) LD_{50}: 3500 mg/kg
Inhalation (human) TC_{Lo}: 100 ppm/8h
Inhalation (rat) LC_{Lo}: 4000 ppm/4h
Intraperitoneal (mouse) LD_{50}: 2642 mg/kg~
Dermal (rabbit) LD_{50}: 17800 mg/kg~
Liver changes, utheral tract, effects on fertility, specific developmental abnormalities (musculoskeletal system) recorded.
NOTE: Substance has been shown to be mutagenic in various assays, or belongs to a family of chemicals producing damage or change to cellular DNA.

Irritation

Skin (rabbit): 15 mg/24h mild
Eye (rabbit): 500 mg - SEVERE

See *RTECS* DA 0700000, for additional data.

Section 12 - Ecological Information

Environmental Fate: If released to the atmosphere, it exist predominantly in the vapor phase based on its vapor pressure where it will photochemically degrade by reaction with hydroxyl radicals (half-life 0.5 to 2 days) and partially return to earth in rain. It will not be subject to direct photolysis. Releases into water will decrease in concentration by evaporation and biodegradation. The time for this decrease and the primary loss processes will depend on the season, and the turbulence and microbial populations in the particular body of water. Representative half-lives are several days to 2 weeks. Some may be adsorbed by sediment but significant bioconcentration in fish is not expected to occur based upon its octanol/water partition coefficient. It is only adsorbed moderately by soil. It will not significantly hydrolyze in water or soil.

Ecotoxicity: LC_{50} Cyprinodon variegatus (sheepshead minnow) 275 mg/l 96 hr in a static unmeasured bioassay; LC_{50} Pimephales promelas (fathead minnow) 12.1 mg/l/96 hr (confidence limit 11.5 - 12.7 mg/l), flow-through bioassay with measured concentrations, 26.1 °C, dissolved oxygen 7.0 mg/l, hardness 45.6 mg/l calcium carbonate, alkalinity 43.0 mg/l; Toxicity threshold (cell multiplication inhibition test): Pseudomonas putida (bacteria) 12 mg/l ; LC_{50} Palaemonetes pugio (grass shrimp, adult) 14,400 ug/l/24 hr in a static unmeasured bioassay; LC_{50} Palaemonetes pugio (grass shrimp, larva) 10,200 ug/l/24 hr in a static unmeasured bioassay; Toxicity threshold (cell multiplication inhibition test): Microcystis aeruginosa (algae) 33 mg/l; Scenedesmus quadricauda (green algae) > 160 mg/l

Henry's Law Constant: 8.44×10^{-3}

BCF: goldfish 1.9

Biochemical Oxygen Demand (BOD): theoretical 2.8%, 5 days

Octanol/Water Partition Coefficient: log $K_{ow} = 3.15$

Soil Sorption Partition Coefficient: $K_{oc} = 164$

Section 13 - Disposal Considerations

Disposal: Consult manufacturer for recycling options and recycle where possible.
Follow applicable federal, state, and local regulations.
Incinerate residue at an approved site.
Recycle containers where possible, or dispose of in an authorized landfill.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Shipping Name and Description: Ethylbenzene
ID: UN1175
Hazard Class: 3 - Flammable and combustible liquid
Packing Group: II - Medium Danger
Symbols:
Label Codes: 3 - Flammable Liquid
Special Provisions: IB2, T4, TP1
Packaging: **Exceptions:** 150 **Non-bulk:** 202 **Bulk:** 242
Quantity Limitations: **Passenger aircraft/rail:** 5 L **Cargo aircraft only:** 60 L
Vessel Stowage: **Location:** B **Other:**

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Section 15 - Regulatory Information

EPA Regulations:

RCRA 40 CFR: Not listed
CERCLA 40 CFR 302.4: Listed per CWA Section 311(b)(4), per CWA Section 307(a) 1000 lb (453.5 kg)
SARA 40 CFR 372.65: Listed
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

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Material Safety Data Sheet Collection
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Issue Date: 2006-06

Unleaded Petrol
AUT5000

Section 1 - Chemical Product and Company Identification 61

Material Name: Unleaded Petrol
CAS Number: 8006-61-9
Chemical Formula: Mixture of hydrocarbons
EINECS Number: 232-349-1
ACX Number: X1003056-5
Synonyms: AUTOMOTIVE GASOLINE, LEAD-FREE; GASOLINE; MOTOR FUEL; MOTOR SPIRITS; NATURAL GASOLINE; PETROL; UNLEADED PETROL
General Use: Lead free motor fuel for internal combustion engines, 2-stroke and 4-stroke.

Section 2 - Composition / Information on Ingredients

Name	CAS	%
gasoline	8006-61-9	>90
benzene	71-43-2	5 max.

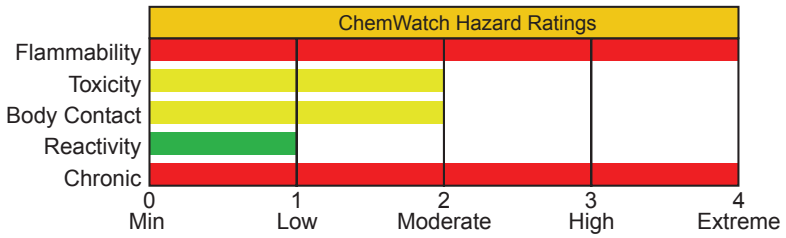
OSHA PEL

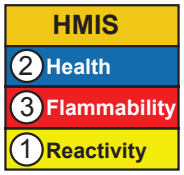
NIOSH REL

ACGIH TLV
TWA: 300 ppm, 890 mg/m^3;
STEL: 500 ppm, 1480 mg/m^3.

Section 3 - Hazards Identification

Fire Diamond





ANSI Signal Word

Danger!

Flammable

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Clear liquid; distinctive odor. Irritating to eyes/skin/respiratory tract. Other Acute Effects: dizziness, drunkenness, unconsciousness. Chronic Effects: dermatitis. Possible cancer hazard. Flammable.

Potential Health Effects

Target Organs: skin, eye, respiratory system, central nervous system (CNS)
Primary Entry Routes: inhalation, ingestion, skin contact

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Acute Effects

Inhalation: The vapor is discomforting to the upper respiratory tract and may be harmful if exposure is prolonged. Inhalation hazard is increased at higher temperatures. Acute effects from inhalation of high concentrations of vapor are pulmonary irritation, including coughing, with nausea; central nervous system depression - characterized by headache and dizziness, increased reaction time, fatigue and loss of coordination. If exposure to highly concentrated solvent atmosphere is prolonged this may lead to narcosis, unconsciousness, even coma and possible death. WARNING: Intentional misuse by concentrating/inhaling contents may be lethal. High inhaled concentrations of mixed hydrocarbons may produce narcosis characterized by nausea, vomiting and lightheadedness. Inhalation of aerosols may produce severe pulmonary edema, pneumonitis and pulmonary hemorrhage. Inhalation of petroleum hydrocarbons consisting substantially of low molecular weight species may produce irritation of mucous membranes, incoordination, giddiness, nausea, vertigo, confusion, headache, appetite loss, drowziness, tremors and anesthetic stupor. Massive exposures may produce central nervous system depression with sudden collapse and deep coma; fatalities have been recorded. Irritation of the brain and/or apneic anoxia may produce convulsions. Although recovery following overexposure is generally complete, cerebral micro- hemorrhage of focal post-inflammatory scarring may produce eleptiform seizures some months after the exposure. Pulmonary episodes may include chemical pneumonitis with edema and hemorrhage. The lighter hydrocarbons may produce kidney and neurotoxic effects. Liquid paraffins may produce anesthesia and depressant actions leading to weakness, dizziness, slow and shallow respiration, unconsciousness, convulsions and death. C_{5-7} paraffins may also produce polyneuropathy. Aromatic hydrocarbons accumulate in lipid-rich tissues (typically the brain, spinal cord and peripheral nerves) and may produce functional impairment manifested by nonspecific symptoms such as nausea, weakness, fatigue, vertigo; severe exposures may produce inebriation or unconsciousness. Many of the petroleum hydrocarbons are cardiac sensitizers and may cause ventricular fibrillations.

Eye: The liquid may produce eye discomfort and is capable of causing temporary impairment of vision and/or transient eye inflammation, ulceration. The vapor is discomforting to the eyes. Petroleum hydrocarbons may produce pain after direct contact with the eyes. Slight, but transient, disturbances of the corneal epithelium may also result. The aromatic fraction may produce irritation and lachrymation. The material may produce moderate eye irritation leading to inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.

Skin: The material is moderately discomforting to the skin if exposure is prolonged. The material contains a component that may be absorbed through the skin and may cause drying of the skin, which may lead to dermatitis from repeated exposures over long periods. Toxic effects may result from skin absorption. Open cuts, abraded or irritated skin should not be exposed to this material. The material may accentuate any pre-existing dermatitis condition.

Ingestion: Considered an unlikely route of entry in commercial/industrial environments. The liquid may produce gastrointestinal discomfort and may be harmful if swallowed. Ingestion may result in nausea, pain and vomiting. Vomit entering the lungs by aspiration may cause potentially lethal chemical pneumonitis. Ingestion of petroleum hydrocarbons may produce irritation of the pharynx, esophagus, stomach and small intestine with edema and mucosal ulceration. Resulting symptoms include a burning sensation in the mouth and throat. Large amounts may produce narcosis with nausea and vomiting, weakness or dizziness, slow and shallow respiration, swelling of the abdomen, unconsciousness and convulsions. Myocardial injury may produce arrhythmias, ventricular fibrillation and electrocardiographic changes. Central nervous system depression may also occur. Light aromatic hydrocarbons produce a warm, sharp, tingling sensation on contact with taste buds and may anesthetize the tongue. Aspiration into the lungs may produce coughing, gagging, and a chemical pneumonitis with pulmonary edema and hemorrhage.

Carcinogenicity: NTP - Not listed; IARC - Group 2B, Possibly carcinogenic to humans; OSHA - Not listed; NIOSH - Listed as carcinogen; ACGIH - Class A3, Animal carcinogen; EPA - Not listed; MAK - Not listed.

Chronic Effects: Chronic solvent inhalation exposures may result in nervous system impairment and liver and blood changes. Prolonged or continuous skin contact with the liquid may cause defatting with drying, cracking, irritation and dermatitis following. Chronic poisoning may occur from vapor inhalation or skin absorption. The most significant toxic effect is insidious and irreversible injury to the blood-forming tissue by benzene. Leukemia may develop. Chronic exposure may cause headache, fatigue, loss of appetite and lassitude with incipient blood effects including anemia and blood changes. Gasoline "sniffing" has caused severe nerve damage. Repeated or prolonged exposure to mixed hydrocarbons may produce narcosis with dizziness, weakness, irritability, concentration and/or memory loss, tremor in the fingers and tongue, vertigo, olfactory disorders, constriction of visual field, paresthesias of the extremities, weight loss and anemia and degenerative changes in the liver and kidney. Chronic exposure by petroleum workers to the lighter hydrocarbons has been associated with visual disturbances, damage to the central nervous system, peripheral neuropathies (including numbness and paresthesias), psychological and neurophysiological deficits, bone marrow toxicities (including hypoplasia, possibly due to benzene) and hepatic and renal involvement. Chronic dermal exposure to petroleum hydrocarbons may result in defatting which produces localized dermatoses. Surface cracking and erosion may also increase susceptibility to infection by microorganisms.

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Section 4 - First Aid Measures

Inhalation: Remove to fresh air. Lay patient down. Keep warm and rested.
If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital, or doctor.

See DOT ERG

Eye Contact: Immediately hold the eyes open and wash continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids. Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: Immediately remove all contaminated clothing, including footwear (after rinsing with water). Wash affected areas thoroughly with water (and soap if available). Seek medical attention in event of irritation.

Ingestion: Contact a Poison Control Center. If swallowed, do NOT induce vomiting. Give a glass of water.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: For acute or short term repeated exposures to petroleum distillates or related hydrocarbons:

1. Primary threat to life from pure petroleum distillate ingestion and/or inhalation is respiratory failure.
2. Patients should be quickly evaluated for signs of respiratory distress (e.g. cyanosis, tachypnea, intercostal retraction, obtundation) and given oxygen. Patients with inadequate tidal volumes or poor arterial blood gases (pO_2 <50 mm Hg or pCO_2 >50 mm Hg) should be intubated.
3. Arrhythmias complicate some hydrocarbon ingestion and/or inhalation and electrocardiographic evidence of myocardial injury has been reported; intravenous lines and cardiac monitors should be established in obviously symptomatic patients. The lungs excrete inhaled solvents, so that hyperventilation improves clearance.
4. A chest x-ray should be taken immediately after stabilization of breathing and circulation to document aspiration and detect the presence of pneumothorax.
5. Epinephrine (adrenalin) is not recommended for treatment of bronchospasm because of potential myocardial sensitization to catecholamines.
Inhaled cardioselective bronchodilators (e.g. Alupent, Salbutamol) are the preferred agents, with aminophylline a second choice.
6. Lavage is indicated in patients who require decontamination; ensure use of cuffed endotracheal tube in adult patients.

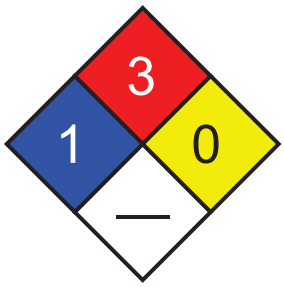
Section 5 - Fire-Fighting Measures

Flash Point: -43 °C
Autoignition Temperature: 280 °C
LEL: 1.4% v/v
UEL: 7.6% v/v

See DOT ERG

Extinguishing Media: Foam. Dry chemical powder.
Bromochlorodifluoromethane (BCF) (where regulations permit). Carbon dioxide.

General Fire Hazards/Hazardous Combustion Products: Liquid and vapor are highly flammable. Severe fire hazard when exposed to heat, flame and/or oxidizers. Vapor forms an explosive mixture with air. Severe explosion hazard, in the form of vapor, when exposed to flame or spark. Vapor may travel a considerable distance to source of ignition. Heating may cause expansion/decomposition with violent rupture of containers. On combustion, may emit toxic fumes of carbon monoxide (CO).



Fire Diamond

Fire Incompatibility: Avoid contamination with oxidizing agents, i.e. nitrates, oxidizing acids, chlorine bleaches, pool chlorine etc., as ignition may result.

Fire-Fighting Instructions: Alert fire department and tell them location and nature of hazard. May be violently or explosively reactive. Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or water ways. If safe, switch off electrical equipment until vapour fire hazard removed. Use water delivered as a fine spray to control fire and cool adjacent area. Avoid spraying water onto liquid pools. Do not approach containers suspected to be hot. Cool fire exposed containers with water spray from a protected location. If safe to do so, remove containers from path of fire.

Section 6 - Accidental Release Measures

Small Spills: Remove all ignition sources. Clean up all spills immediately. Avoid breathing vapors and contact with skin and eyes. Control personal contact by using protective equipment. Contain and absorb small quantities with vermiculite or other absorbent material. Wipe up. Collect residues in a flammable waste container.

See DOT ERG

Large Spills: Clear area of personnel and move upwind. Alert fire department and tell them location and nature of hazard. May be violently or explosively reactive. Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or water ways. No smoking, naked lights or ignition sources. Increase ventilation. Stop leak if safe to do so.
Water spray or fog may be used to disperse/absorb vapor. Contain spill with sand, earth or vermiculite. Use only

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spark-free shovels and explosion proof equipment. Collect recoverable product into labeled containers for recycling. Absorb remaining product with sand, earth or vermiculite. Collect solid residues and seal in labelled drums for disposal. Wash area and prevent runoff into drains.
If contamination of drains or waterways occurs, advise emergency services.

Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Avoid generating and breathing mist. Avoid all personal contact, including inhalation. Wear protective clothing when risk of exposure occurs. Use in a well-ventilated area. Prevent concentration in hollows and sumps. DO NOT enter confined spaces until atmosphere has been checked. Avoid smoking, bare lights, heat or ignition sources. When handling, DO NOT eat, drink or smoke. Vapor may ignite on pumping or pouring due to static electricity. DO NOT use plastic buckets. Ground and secure metal containers when dispensing or pouring product. Use spark-free tools when handling. Avoid contact with incompatible materials. Keep containers securely sealed. Avoid physical damage to containers. Always wash hands with soap and water after handling. Work clothes should be laundered separately. Use good occupational work practices. Observe manufacturer's storing and handling recommendations. Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions.

Recommended Storage Methods: Metal can, metal drum. Packing as recommended by manufacturer. Check all containers are clearly labeled and free from leaks.

Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: CARE: Use of a quantity of this material in confined space or poorly ventilated area, where rapid build-up of concentrated atmosphere may occur, could require increased ventilation and/or protective gear. Use in a well-ventilated area. If inhalation risk of overexposure exists, wear a NIOSH approved organic-vapor respirator. Correct respirator fit is essential to obtain adequate protection. In confined spaces where there is inadequate ventilation, wear full-face air supplied breathing apparatus. Provide adequate ventilation in warehouse or closed storage areas.

Personal Protective Clothing/Equipment:

Eyes: Safety glasses with side shields; or as required, chemical goggles.
Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

Hands/Feet: Barrier cream with polyethylene gloves or PVC gloves. Safety footwear. Do NOT use this product to clean the skin.

Respiratory Protection:

Exposure Range >300 to 1000 ppm: Air Purifying, Negative Pressure, Half Mask
Exposure Range >1000 to 15,000 ppm: Air Purifying, Negative Pressure, Full Face
Exposure Range >15,000 to 300,000 ppm: Supplied Air, Constant Flow/Pressure Demand, Full Face
Exposure Range >300,000 to unlimited ppm: Self-contained Breathing Apparatus, Pressure Demand, Full Face
Cartridge Color: black

Other: Overalls. Ensure that there is ready access to eye wash unit. Ensure there is ready access to an emergency shower.

Section 9 - Physical and Chemical Properties

Appearance/General Info: Purple, highly flammable, volatile liquid with characteristic sharp odor. Floats on water. Consists of a complex mixture of hydrocarbons with small amounts of residual benzene from the refining operations.

Physical State: Liquid
Odor Threshold: 0.005 ppm
Vapor Pressure (kPa): 53.33 at 20 °C
Vapor Density (Air=1): > 2
Formula Weight: Not applicable.
Specific Gravity (H_2O=1, at 4 °C): 0.72-0.735 at 15 °C
Evaporation Rate: Fast
pH: Not applicable
pH (1% Solution): Not applicable.
Boiling Point: 38.89 °C (102 °F)
Freezing/Melting Point: Not available
Volatile Component (% Vol): 100
Decomposition Temperature (°C): Not available.
Water Solubility: Insoluble

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Presence of incompatible materials. Product is considered stable. Hazardous polymerization will not occur.

Storage Incompatibilities: Avoid storage with oxidizers.

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Section 11 - Toxicological Information

Toxicity
Oral (rat) LD_{50}: 18800 mg/kg

Irritation
Skin (rabbit): 500 mg/24h mild

Section 12 - Ecological Information

Environmental Fate: No data found.
Ecotoxicity: No data found.
Biochemical Oxygen Demand (BOD): 8%, 5 days

Section 13 - Disposal Considerations

Disposal: Consult manufacturer for recycling options and recycle where possible. Follow all applicable federal, state, and local laws. Incinerate residue at an approved site. Recycle containers where possible, or dispose of in an authorized landfil.
BEWARE: Empty solvent, paint, lacquer and flammable liquid drums present a severe explosion hazard if cut by flame torch or welded. Even when thoroughly cleaned or reconditioned, the drum seams may retain sufficient solvent to generate an explosive atmosphere in the drum.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Shipping Name and Description: Gasoline
ID: UN1203
Hazard Class: 3 - Flammable and combustible liquid
Packing Group: II - Medium Danger
Symbols:
Label Codes: 3 - Flammable Liquid
Special Provisions: 139, B33, B101, T8
Packaging: **Exceptions:** 150 **Non-bulk:** 202 **Bulk:** 242
Quantity Limitations: **Passenger aircraft/rail:** 5 L **Cargo aircraft only:** 60 L
Vessel Stowage: **Location:** E **Other:**

Section 15 - Regulatory Information

EPA Regulations:
RCRA 40 CFR: Not listed
CERCLA 40 CFR 302.4: Not listed
SARA 40 CFR 372.65: Not listed
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

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Issue Date: 2006-06

Hydrochloric Acid
HYD2200

Section 1 - Chemical Product and Company Identification 61

Material Name: Hydrochloric Acid
CAS Number: 7647-01-0
Chemical Formula: ClH
Structural Chemical Formula: HCl
EINECS Number: 231-595-7
ACX Number: X1002202-3
Synonyms: 4-D BOWL SANITIZER; ACIDE CHLORHYDRIQUE; ACIDO CLORHIDRICO; ACIDO CLORIDRICO; ANHYDROUS HYDROCHLORIC ACID; ANHYDROUS HYDROGEN CHLORIDE; AQUEOUS HYDROGEN CHLORIDE; BOWL CLEANER; CHLOORWATERSTOF; CHLOROHYDRIC ACID; CHLOROWODOR; CHLORURE D'HYDROGENE; CHLORURE D'HYDROGENE ANHYDRE; CHLORURO DE HIDROGENO; CHLORWASSERSTOFF; CLORURO DE HIDROGENO ANHIDRO; EMULSION BOWL CLEANER; EPA PESTICIDE CHEMICAL CODE 045901; HYDROCHLORIC ACID; HYDROCHLORIC ACID GAS; HYDROCHLORIDE; HYDROGEN CHLORIDE; HYDROGEN CHLORIDE (HCL); HYGEIA CREME MAGIC BOWL CLEANER; MURIATIC ACID; MURIATIC ACID); NOW SOUTH SAFTI-SOL BRAND CONCENTRATED BOWL CLEANSE WITHMAGIC ACTIO; PERCLEEN BOWL AND URINAL CLEANER; SPIRITS OF SALT; VARLEY'S OCEAN BLUE SCENTED TOILET BOWL CLEANER; VARLEY POLY-PAK BOWL CREME; WHITE EMULSION BOWL CLEANER; WUEST BOWL CLEANER SUPER CONCENTRATED
General Use: Hydrogen chloride is used to produce pharmaceutical hydrochlorides; vinyl chloride from acetylene; alkyl chlorides from olefins and arsenious chloride from arsenious oxide; electronic grade for etching semiconductor crystals. Used in the chlorination of rubber; in organic reactions involving isomerization, polymerization and alkylation; as a catalyst and condensing agent; for making chlorine where economical; in the separation of cotton from wool and cotton de-linting; as flux in the babbitt type of metal alloy; etching semi-conductor crystals.
Hydrochloric acid is used for pickling and heavy duty cleaning of metal parts; rust and scale removal. The production of chlorides; neutralizing bases; a laboratory reagent. For hydrolyzing starch and proteins in preparations for food. As a catalyst and solvent in organic synthesis. As "spirits of salts" for cleaning of lime and masonry from new brickwork. As flux or flux component for soldering; manufacture of "killed spirits".

Section 2 - Composition / Information on Ingredients

Name	CAS	%
hydrogen chloride	7647-01-0	> 99.0

OSHA PEL
Ceiling: 5 ppm, 7 mg/m^3.

NIOSH REL
Ceiling: 5 ppm (7 mg/m^3).

DFG (Germany) MAK
TWA: 5 ppm; PEAK: 5 ppm.

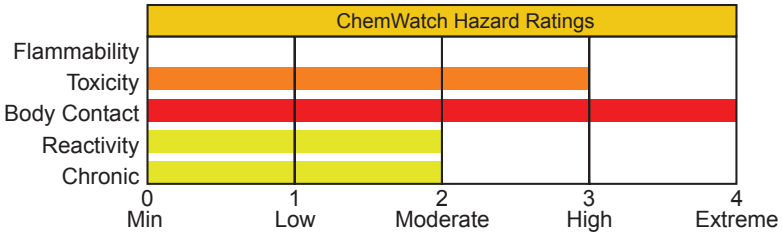
ACGIH TLV
Ceiling: 2 ppm.

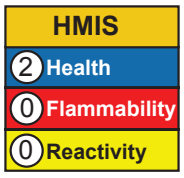
IDLH Level
50 ppm.

EU OEL
TWA: 5 ppm; STEL: 10 ppm.

Section 3 - Hazards Identification

Fire Diamond





ANSI Signal Word

Danger!

Corrosive Compressed Gas

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Colorless gas; characteristic suffocating, pungent odor. Corrosive. Stored as compressed gas which may cause frostbite. Chronic Effects: erosion of teeth.

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Potential Health Effects

Target Organs: eyes, skin, respiratory system, liver (in animals)
Primary Entry Routes: inhalation, skin contact, eye contact
Acute Effects

Inhalation: The vapor is extremely discomforting to the upper respiratory tract, may cause severe mucous membrane damage and may be harmful if inhaled.
Inhalation of quantities of liquid mist may be extremely hazardous, even lethal due to spasm, extreme irritation of larynx and bronchi, chemical pneumonitis and pulmonary edema.
A single severe exposure may cause coughing and choking; bleeding of nose, inflammation and occasionally ulceration of the nose, throat and larynx. Fluid on the lungs followed by generalized lung damage may follow.
Breathing of vapor may aggravate asthma and inflammatory or fibrotic pulmonary disease.
High concentrations cause necrosis of the tracheal and bronchial epithelium, pulmonary edema, atelectasis and emphysema and damage to the pulmonary blood vessels and liver.
Inhalation hazard is increased at higher temperatures.
The vapor from heated material is extremely discomforting to the upper respiratory tract and lungs if inhaled.
Continued severe exposure can result in pulmonary edema and corrosion of tissues in the nose and throat.

Eye: Hydrogen Chloride: The vapor is extremely discomforting to the eyes and is capable of causing pain and severe conjunctivitis. Corneal injury may develop, with possible permanent impairment of vision, if not promptly and adequately treated.
The material may be irritating to the eye, with prolonged contact causing inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.
Hydrochloric Acid: Eye contact is extremely painful and may cause rapid corneal damage. The liquid is extremely corrosive to the eyes and is capable of causing severe damage with loss of sight.
The vapor is highly discomforting and may be corrosive to the eyes. The vapor from heated material is extremely discomforting to the eyes.

Skin: The material is corrosive to the skin and may cause chemical burns.
Toxic effects may result from skin absorption. Bare unprotected skin should not be exposed to this material. The material may accentuate any pre-existing skin condition.
The vapor is discomforting to the skin.

Ingestion: Considered an unlikely route of entry in commercial/industrial environments.
The liquid is extremely corrosive if swallowed and is capable of causing burns to mouth, throat, esophagus, with extreme discomfort, pain and may be fatal if swallowed in quantity. Ingestion may result in nausea, abdominal irritation, pain and vomiting.

Carcinogenicity: NTP - Not listed; IARC - Group 3, Not classifiable as to carcinogenicity to humans; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Not listed; MAK - Not listed.

Chronic Effects: Chronic exposure may cause discoloration or erosion of the teeth, bleeding of the nose and gums; and ulceration of the nasal mucous membranes.
Repeated exposures of animals to concentrations of about 34 ppm produced no immediate toxic effects.
Workers exposed to hydrochloric acid suffered from gastritis and a number of cases of chronic bronchitis have also been reported.
Repeated or prolonged exposure to dilute solutions may cause dermatitis. Repeated exposure to low vapor concentrations can cause skin tenderness, bleeding of the nose and gums, chronic bronchitis, gastritis.

Section 4 - First Aid Measures

Inhalation: Remove to fresh air.
Lay patient down. Keep warm and rested.
If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor.

Eye Contact: Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.
Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: Immediately flush body and clothes with large amounts of water, using safety shower if available.
Quickly remove all contaminated clothing, including footwear.
Wash affected areas with water (and soap if available) for at least 15 minutes. Transport to hospital or doctor.

Ingestion: Contact a Poison Control Center. Rinse mouth out with plenty of water. Do NOT induce vomiting. Give a glass of water.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: For acute or short-term repeated exposures to strong acids:
1.Airway problems may arise from laryngeal edema and inhalation exposure.
Treat with 100% oxygen initially.
2.Respiratory distress may require cricothyroidotomy if endotracheal intubation is contraindicated by excessive swelling.

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3. Intravenous lines should be established immediately in all cases where there is evidence of circulatory compromise.
4.Strong acids produce a coagulation necrosis characterized by formation of a coagulum (eschar) as a result of the desiccating action of the acid on proteins in specific tissues.
INGESTION:
1.Immediate dilution (milk or water) within 30 minutes post-ingestion is recommended.
2.Do not attempt to neutralize the acid since exothermic reaction may extend the corrosive injury.
3.Be careful to avoid further vomiting since re-exposure of the mucosa to the acid is harmful. Limit fluids to one or two glasses in an adult.
4.Charcoal has no place in acid management.
5.Some authors suggest the use of lavage within 1 hour of ingestion.
SKIN:
1.Skin lesions require copious saline irrigation. Treat chemical burns as thermal burns with non-adherent gauze and wrapping.
2.Deep second-degree burns may benefit from topical silver sulfadiazine.
EYE:
1.Eye injuries require retraction of the eyelids to ensure thorough irrigation of the conjunctival cul-de-sacs. Irrigation should last at least 20-30 minutes. Do not use neutralizing agents or any other additives. Several liters of saline are required.
2.Cycloplegic drops (1% cyclopentolate for short-term use or 5% homatropine for longer term use), antibiotic drops, vasoconstrictive agents, or artificial tears may be indicated dependent on the severity of the injury.
3.Steroid eye drops should only be administered with the approval of a consulting ophthalmologist.

Section 5 - Fire-Fighting Measures

Flash Point: Nonflammable
Autoignition Temperature: Not applicable
LEL: Not applicable
UEL: Not applicable
Extinguishing Media: Water spray or fog; foam; Bromochlorodifluoromethane (BCF) (where regulations permit); Dry agent; Carbon dioxide.

See DOT ERG

Fire Diamond

General Fire Hazards/Hazardous Combustion Products: Noncombustible liquid. Will not burn, but heat produces highly toxic fumes/vapors.
Heating may cause expansion or decomposition leading to violent rupture of containers. Decomposes on heating and produces toxic fumes of hydrogen chloride. Decomposition may produce toxic fumes of chlorine.
Reacts with metals producing flammable/explosive hydrogen gas. Contact with moisture or water may generate heat causing ignition. Reacts vigorously with alkalis. Moderate fire hazard when in contact with reducing agents.
Fire Incompatibility: Reacts with metals producing flammable/explosive hydrogen gas.
Avoid reactions with metals, metal oxides, hydroxides, amines, carbonates, alkaline materials, acetic anhydride, cyanides, sulphides, sulphites, phosphides, acetylides, borides, carbides, silicides, vinyl acetate, formaldehyde and potassium permanganate, unsaturated organics, metal acetylides, sulphuric acid.
Note: Compatibility with plastics should be confirmed prior to use.
Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.
Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation. Cool fire-exposed containers with water spray from a protected location. If safe to do so, remove containers from path of fire. Equipment should be thoroughly decontaminated after use. Water spray or fog may be used to disperse vapor. Do not approach cylinders suspected to be hot. If safe to do so, stop flow of gas.

Section 6 - Accidental Release Measures

Small Spills: DO NOT touch the spill material. Clean up all spills immediately. Wear fully protective PVC clothing and breathing apparatus. Contain and absorb spill with sand, earth, inert material or vermiculite. Use soda ash or slaked lime to neutralize. Collect residues and place in labeled plastic containers with vented lids. Clear area of personnel and move upwind. Avoid breathing vapors and contact with skin and eyes. Do not exert excessive pressure on valve; do not attempt to operate damaged valve. Water spray or fog may be used to disperse vapor.

See DOT ERG

Large Spills: Contact fire department and tell them location and nature of hazard. Clear area of personnel and move upwind. Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation. Stop leak if safe to do so. Remove leaking cylinders to a safe place if possible. Release pressure under safe, controlled conditions by opening the valve. Do not exert excessive pressure on valve; do not attempt to operate damaged valve. Shut off all possible sources of ignition and increase ventilation. Water spray or fog may be used to disperse vapor. Use soda ash or slaked lime to neutralize.
Collect and seal in labeled drums for disposal. Wash spill area with large quantities of water. If contamination of

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drains or waterways occurs, advise emergency services. After clean-up operations, decontaminate and launder all protective clothing and equipment before storing and reusing. DO NOT touch the spill material. Contain and absorb spill with sand, earth, inert material or vermiculite.
DO NOT USE WATER OR NEUTRALIZING AGENTS INDISCRIMINATELY ON LARGE SPILLS.

Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Avoid generating and breathing mist and vapor, breathing vapors and contact with skin and eyes.
Avoid physical damage to containers. Use in a well-ventilated area. Wear protective clothing and gloves when handling containers. Handle and open container with care.
WARNING: To avoid violent reaction, ALWAYS add material to water and NEVER water to material. When handling, DO NOT eat, drink or smoke. Always wash hands with soap and water after handling. Work clothes should be laundered separately. Use good occupational work practices. Observe manufacturer's storing and handling recommendations.
Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.
Local exhaust ventilation may be required for safe working, i.e. to keep exposures below required standards; otherwise, PPE is required.
Keep dry. Reacts violently with water.
Transport containers on a trolley. Avoid sources of heat. DO NOT transfer gas from one cylinder to another.

Recommended Storage Methods: Packaging as recommended by manufacturer. Check that containers are clearly labeled.
Cylinder. Ensure the use of equipment rated for cylinder pressure. Ensure the use of compatible materials of construction. Valve protection cap to be in place until cylinder is secured, connected. Cylinder must be properly secured either in use or in storage. Cylinder valve must be closed when not in use or when empty. Segregate full from empty cylinders. WARNING: Suckback into cylinder may result in rupture. Use back-flow preventive device in piping.
Hydrochloric acid: Packs of 2.5 litres or less require a child-resistant closure. Glass container or Plastic carboy or Polylined drum.

Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: If risk of overexposure exists, wear air supplied breathing apparatus. Provide adequate ventilation in warehouse or closed storage areas. Use in a well-ventilated area. Local exhaust ventilation may be required for safe working, i. e. , to keep exposures below required standards; otherwise, PPE is required.
If risk of inhalation or overexposure exists, wear NIOSH-approved respirator or work in fume hood. Hydrogen chloride vapors will not be adequately absorbed by organic vapor respirators.

Personal Protective Clothing/Equipment:

Eyes: Chemical goggles. Full face shield.
DO NOT wear contact lenses. Contact lenses pose a special hazard; soft contact lenses may absorb irritants and all lenses concentrate them.

Hands/Feet: Neoprene gloves; rubber gloves. Nitrile gloves.
Safety footwear. Rubber boots.
Hydrochloric acid: Barrier cream and Neoprene gloves or Elbow length PVC gloves. Nitrile gloves.
PVC boots or PVC safety gumboots.

Respiratory Protection:
Exposure Range >5 to <50 ppm: Air Purifying, Negative Pressure, Half Mask
Exposure Range 50 to unlimited ppm: Self-contained Breathing Apparatus, Pressure Demand, Full Face
Cartridge Color: white

Other: Ensure there is ready access to a safety shower; Eyewash unit.
Acid-resistant overalls. Full protective suit. Operators should be trained in procedures for safe use of this material.

Glove Selection Index:

BUTYL	Best selection
BUTYL/NEOPRENE	Best selection
HYPALON	Best selection
NEOPRENE	Best selection
NEOPRENE/NATURAL	Best selection
NITRILE+PVC	Best selection
PE/EVAL/PE	Best selection
SARANEX-23	Best selection
VITON/NEOPRENE	Best selection
PVC	Best selection

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NITRILE ..... Best selection
NATURAL RUBBER..... Satisfactory; may degrade after 4 hours continuous immersion
NATURAL+NEOPRENE..... Satisfactory; may degrade after 4 hours continuous immersion
NAT+NEOPR+NITRILE ..... Poor to dangerous choice for other than short-term immersion

Section 9 - Physical and Chemical Properties

Appearance/General Info: Hydrogen chloride: Colorless, corrosive gas. Pungent suffocating odor. White fumes in moist air. Soluble in methanol, ethanol, ether and benzene.
Hydrochloric acid: Clear to light yellow (orange tint for inhibited grades) fuming corrosive liquid with sharp, suffocating odor.

Physical State: Hydrogen chloride: Compressed gas; Hydrochloric acid: Liquid
Odor Threshold: 0.26 to 0.3 ppm
Vapor Pressure (kPa): < 24.8 at 25 °C
Vapor Density (Air=1): 1.268 at 20 °C
Formula Weight: 36.461
Specific Gravity (H_2O=1, at 4 °C): < 1.19 at 20 °C
Evaporation Rate: Slow

pH: Hydrochloric acid: < 1
Boiling Point: -85 °C (-121 °F)
Freezing/Melting Point: -114.44 °C (-173.992 °F)
Volatile Component (% Vol): 100
Decomposition Temperature (°C): Not applicable
Water Solubility: 56.1 g/100 cc hot water at 60 °C

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Decomposes in the presence of moisture to produce corrosive acid. May generate sufficient heat to ignite combustible materials. Presence of heat source and direct sunlight (ultra-violet radiation). Product is considered stable under normal handling conditions. Hazardous polymerization will not occur.
Storage Incompatibilities: Hydrogen chloride: Segregate from most common metals and their alloys, alkalis, unsaturated organics, fluorine, metal carbides, metal acetylides, potassium permanganate and sulfuric acid. Compatibility with plastics should be confirmed prior to use.
Hydrochloric acid: Segregate from alkalies, oxidizing agents and chemicals readily decomposed by acids, i.e. cyanides, sulfides, carbonates. Avoid storage with metals, metal oxides, hydroxides, amines, carbonates, alkaline materials, acetic anhydride, cyanides, sulphides, sulphites, phosphides, acetylides, borides, carbides, silicides, vinyl acetate, formaldehyde and potassium permanganate. Reacts with zinc, brass, galvanized iron, aluminum, copper and copper alloys.

Section 11 - Toxicological Information

Toxicity
Inhalation (human) LC_{Lo}: 1300 ppm/30 m
Inhalation (human) LC_{Lo}: 3000 ppm/5 m
Inhalation (rat) LC_{50}: 3124 ppm/60 m
Inhalation (rat) LC_{50}: 4701 ppm/30 m
Oral (rat) LD_{50}: 900 mg/kg

Irritation
Eye (rabbit): 5 mg/30 s - mild

See *RTECS* MW 4025000, for additional data.

Section 12 - Ecological Information

Environmental Fate: No data found.
Ecotoxicity: TL_m Gambusia affinis (mosquito fish) 282 ppm/96 hr (fresh water) /Conditions of bioassay not specified; Lethal Lepomis macrochirus (bluegill sunfish) 3.6 mg/l/48 hr /Conditions of bioassay not specified; LC_{50} Cockle 330 to 1,000 mg/l/48 hr /Conditions of bioassay not specified; LC_{50} Carassius auratus (goldfish) 178 mg/l (1 to 2 hr survival time) /Conditions of bioassay not specified; LC_{50} Shore crab 240 mg/l/48 hr /Conditions of bioassay not specified; LC_{50} Shrimp 100 to 330 ppm/48 hr (salt water) /Conditions of bioassay not specified; LC_{100} Trout 10 mg/l 24 hr /Conditions of bioassay not specified
Biochemical Oxygen Demand (BOD): none

Section 13 - Disposal Considerations

Disposal: Recycle wherever possible. Consult manufacturer for recycling options. Treat and neutralize at an effluent treatment plant. Bury residue in an authorized landfill. Decontaminate empty containers with a lime slurry. Return empty containers to supplier or bury empty containers at an authorized landfill.
Return empty cylinders to supplier.

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Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Note: This material has multiple possible HMT entries. Choose the appropriate one based on state and condition of specific material when shipped.

Shipping Name and Description: Hydrogen chloride, anhydrous
ID: UN1050
Hazard Class: 2.3 - Poisonous gas
Packing Group:
Symbols:
Label Codes: 2.3 - Poison Gas, 8 - Corrosive
Special Provisions: 3
Packaging: **Exceptions:** None **Non-bulk:** 304 **Bulk:** None
Quantity Limitations: **Passenger aircraft/rail:** Forbidden **Cargo aircraft only:** Forbidden
Vessel Stowage: **Location:** D **Other:** 40

Shipping Name and Description: Hydrochloric acid
ID: UN1789
Hazard Class: 8 - Corrosive material
Packing Group: II - Medium Danger
Symbols:
Label Codes: 8 - Corrosive
Special Provisions: A3, A6, B3, B15, IB2, N41, T8, TP2, TP12
Packaging: **Exceptions:** 154 **Non-bulk:** 202 **Bulk:** 242
Quantity Limitations: **Passenger aircraft/rail:** 1 L **Cargo aircraft only:** 30 L
Vessel Stowage: **Location:** C **Other:**

Shipping Name and Description: Hydrochloric acid
ID: UN1789
Hazard Class: 8 - Corrosive material
Packing Group: III - Minor Danger
Symbols:
Label Codes: 8 - Corrosive
Special Provisions: IB3, T4, TP1, TP12
Packaging: **Exceptions:** 154 **Non-bulk:** 203 **Bulk:** 241
Quantity Limitations: **Passenger aircraft/rail:** 5 L **Cargo aircraft only:** 60 L
Vessel Stowage: **Location:** C **Other:**

Section 15 - Regulatory Information

EPA Regulations:
RCRA 40 CFR: Not listed
CERCLA 40 CFR 302.4: Listed per CWA Section 311(b)(4) 5000 lb (2268 kg)
SARA 40 CFR 372.65: Listed
SARA EHS 40 CFR 355: Listed
RQ: 5000 lb
TPQ: 500 lb
TSCA: Listed

Section 16 - Other Information

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Material Safety Data Sheet Collection
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Issue Date: 2006-06

Section 1 - Chemical Product and Company Identification 61

Material Name: Isobutene **CAS Number:** 115-11-7
Chemical Formula: C_4H_8
Structural Chemical Formula: $(CH_3)_2C=CH_2$
EINECS Number: 204-066-3
ACX Number: X1003822-9
Synonyms: Isobutene; ISOBUTYLENE; ASYM-DIMETHYLETHYLENE; GAMMA-BUTYLENE; 1,1-DIMETHYLETHYLENE; ISO-BUTENE; ISOBUTENE; ISOPROPYLIDENEMETHYLENE; LIQUEFIED PETROLEUM GAS; 2-METHYL-1-PROPENE; 2-METHYLPROPENE; 2-METHYLPROPYLENE; 1-PROPENE,2-METHYL-; PROPENE,2-METHYL-; UNSYM. DIMETHYLETHYLENE
General Use: Production of butene polymers used as adhesives, tackifiers, oil additives.
Butyl rubbers, copolymer resins with butadiene, acrylates and methacrylates.
Also to produce anti-oxidants for foods, food supplements, plastics and in production of isooctane and high-octane aviation gasoline.
Used in closed pressurized systems, fitted with safety relief valve.
Vented gas is flammable, denser than air and will spread. Vent path must not contain ignition sources, pilot lights, bare flames.

Section 2 - Composition / Information on Ingredients

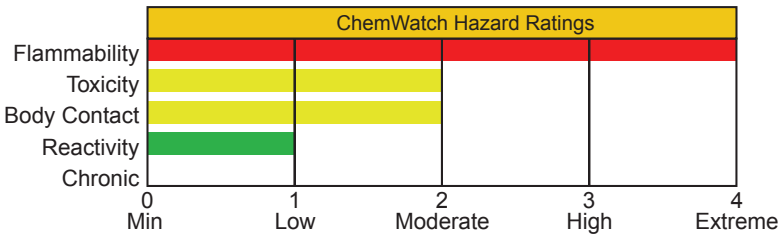
Name	CAS	%
isobutene	115-11-7	>99

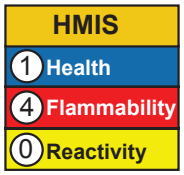
OSHA PEL **NIOSH REL**

ACGIH TLV

Section 3 - Hazards Identification

Fire Diamond





ANSI Signal Word

Danger!

Flammable

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Colorless gas. Acute Effects: Simple asphyxiant which can displace available oxygen; initial symptoms: rapid respiration, air hunger, diminished mental alertness, impaired muscular coordination. Can form explosive mixtures in air. Flammable.

Potential Health Effects

Target Organs: None reported
Primary Entry Routes: inhalation
Acute Effects
Inhalation: The gas is a simple asphyxiant (precludes access to oxygen) and is harmful if exposure is prolonged and inhalation may cause loss of consciousness.

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Acute effects from inhalation of high concentrations of gas / vapor are pulmonary irritation, including coughing, with nausea; central nervous system depression - characterized by headache and dizziness, increased reaction time, fatigue and loss of coordination.
If exposure to highly concentrated atmosphere of gas is prolonged this may lead to narcosis, unconsciousness, even coma, and unless resuscitated, death.
Iso-butene is a simple asphyxiant and may have a narcotic action.
Material is highly volatile and may quickly form concentrated atmosphere in confined or unventilated area. Vapor is heavier than air and may displace and replace air in breathing zone, acting as a simple asphyxiant. This may happen with little warning of overexposure.
Hydrocarbons may sensitize the heart to adrenalin and other circulatory catecholamines; as a result cardiac arrhythmias and ventricular fibrillation may occur. Abrupt collapse may produce traumatic injury.
Central nervous system (CNS) depression may be evident early. Symptoms of moderate poisoning may include giddiness, headache, dizziness and nausea.
Serious poisonings may result in respiratory depression and may be fatal.
The paraffin gases C1-4 are practically non-toxic below their lower flammability limits (18000-50000 ppm). Above this level, incidental effects include CNS depression and irritation but these are reversible upon cessation of the exposure. The C3 and iso-C5 hydrocarbons show increasing narcotic properties; branching of the chain also enhances the effect.
The C4 hydrocarbons appear to be more highly neurotoxic than the C3 and C5 members. Several fatalities due to voluntary inhalation of butane have been reported, possibly due to central, respiratory and circulatory effects resulting from anesthesia, laryngeal edema, chemical pneumonia or the combined effects of cardiac toxicity and increased sympathomimetic effects.
Inhalation of petroleum gases may produce narcosis, due in part to olefinic impurities. Displacement of oxygen in the air may cyanosis.
If present in sufficient quantity these gases may reduce the oxygen level to below 18% producing asphyxiation.
Symptoms include rapid respiration, mental dullness, lack of coordination, poor judgement, nausea and vomiting.
The onset of cyanosis may lead to unconsciousness and death.

Eye: The liquid is highly discomforting and may cause severe cold burns and is capable of causing pain and severe conjunctivitis.
Corneal injury may develop, with possible permanent impairment of vision, if not promptly and adequately treated.
The gas is regarded as non-irritating to the eyes.

Skin: Vaporizing liquid causes rapid cooling and contact may cause cold burns, frostbite.The liquid is discomforting to the skin and may rapidly cause severe cold burns.
Bare unprotected skin should not be exposed to this material.
There is no evidence of skin absorption but contact may cause frostbite,

Ingestion: Overexposure is unlikely in this form.
Considered an unlikely route of entry in commercial/industrial environments.
The liquid is highly discomforting if swallowed and may cause severe cold burns.

Carcinogenicity: NTP - Not listed; IARC - Not listed; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Not listed; MAK - Not listed.

Chronic Effects: Chronic overexposure may produce dermatitis.

Section 4 - First Aid Measures

Inhalation: Avoid becoming a casualty and remove to fresh air.
Lay patient down. If breathing is shallow or has stopped, ensure clear airway and apply resuscitation.
If available, medical oxygen should be administered by trained personnel.
Transport to hospital or doctor, without delay.

Eye Contact: Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.
Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: In case of cold burns (frost-bite): Bathe the affected area immediately in cold water for 10 to 15 minutes, immersing if possible and without rubbing.
Do not apply hot water or radiant heat. Apply a clean, dry dressing.
Transport to hospital or doctor.

Ingestion: Contact a Poison Control Center. DO NOT induce vomiting. Observe the patient carefully. Never give liquid to a person showing signs of being sleepy or with reduced awareness; i.e. becoming unconscious. Give water (or milk) to rinse out mouth. Then provide liquid slowly and as much as casualty can comfortably drink. Transport to hospital or doctor without delay.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: For acute or short-term repeated exposures to petroleum distillates or related hydrocarbons:
1.Primary threat to life from pure petroleum distillate ingestion and/or inhalation is respiratory failure.

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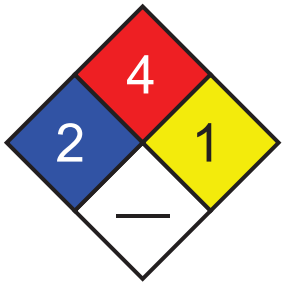
2.Patients should be quickly evaluated for signs of respiratory distress (e.g. cyanosis, tachypnea, intercostal retraction, obtundation) and given oxygen. Patients with inadequate tidal volumes or poor arterial blood gases (pO_2 <50 mm Hg or pCO_2 >50 mm Hg) should be intubated.
3.Arrhythmias complicate some hydrocarbon ingestion and/or inhalation and electrocardiographic evidence of myocardial injury has been reported; intravenous lines and cardiac monitors should be established in obviously symptomatic patients. The lungs excrete inhaled solvents, so that hyperventilation improves clearance.
4.A chest x-ray should be taken immediately after stabilization of breathing and circulation to document aspiration and detect the presence of pneumothorax.
5.Epinephrine (adrenalin) is not recommended for treatment of bronchospasm because of potential myocardial sensitization to catecholamines.
Inhaled cardioselective bronchodilators (e.g. Alupent, Salbutamol) are the preferred agents, with aminophylline a second choice.
6.Lavage is indicated in patients who require decontamination; ensure use of cuffed endotracheal tube in adult patients.

Section 5 - Fire-Fighting Measures

Flash Point: -76.111 °C
Autoignition Temperature: 465 °C
LEL: 1.8% v/v
UEL: 9.6% v/v
Extinguishing Media: Water spray or fog; dry chemical powder.
Carbon dioxide.
Foam.
General Fire Hazards/Hazardous Combustion Products: Flammable gas. Liquid and vapor are highly flammable.
Dangerous hazard when exposed to heat, flame and oxidizers.
Gas may form explosive mixtures with air over a wide area.
Decomposes on heating and produces toxic fumes of carbon monoxide (CO) and carbon dioxide (CO_2).

See DOT ERG



Fire Diamond

Fire Incompatibility: Avoid contamination with oxidizing agents i.e. nitrates, oxidizing acids, chlorine bleaches, pool chlorine etc. as ignition may result.
Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.
May be violently or explosively reactive. Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation.
Do not extinguish burning gas. If safe to do so, stop flow of gas.
If flow of gas cannot be stopped, leave gas to burn.
Cool fire-exposed containers with water spray from a protected location.
Do not approach cylinders suspected to be hot.
If safe to do so, remove containers from path of fire.
Fight fire from a safe distance, with adequate cover.

Section 6 - Accidental Release Measures

Small Spills: Avoid breathing vapor and any contact with liquid or gas. Protective equipment including respirator should be used. Do NOT enter confined spaces where gas may have accumulated. Shut of all sources of possible ignition and increase ventilation. Clear area of personnel. Stop leak only if safe to so do. Remove leaking cylinders to safe place. Release pressure under safe controlled conditions by opening valve. Keep area clear of personnel until gas has dispersed.

See DOT ERG

Large Spills: DO NOT touch the spill material. Shut off all possible sources of ignition and increase ventilation.
Restrict access to area. Clear area of personnel and move upwind.
May be violently or explosively reactive. Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation.
Avoid spraying water onto liquid pools.
Use extreme caution to avoid a violent reaction.
Stop leak if safe to do so.
DO NOT enter confined places where gas may have collected. Remove leaking cylinders to a safe place. Fit vent pipes. Release pressure under safe, controlled conditions by opening valve. Burn issuing gas at vent pipes.
Do not exert excessive pressure on valve; do not attempt to operate damaged valve.
Keep area clear of personnel until gas has dispersed
Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Use good occupational work practices. Use in a well-ventilated area.

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Obtain a work permit before attempting any repairs.
Do not attempt repair work on lines, vessels under pressure.
Atmospheres must be tested and O.K. before work resumes after leakage.
Wear protective clothing and gloves when handling containers.
No smoking, bare lights, heat or ignition sources.
Use spark-free tools when handling. Ground all lines and equipment.
Prevent concentration in hollows and sumps. DO NOT enter confined spaces until atmosphere has been checked.
Gas may travel a considerable distance to source of ignition.
Vapor may ignite on pumping or pouring due to static electricity.
Avoid physical damage to containers.
DO NOT transfer gas from one cylinder to another.
Natural gases contain a contaminant, radon-222, a naturally occurring radioactive gas. During subsequent processing, radon tends to concentrate in liquified petroleum streams and in product streams having similar boiling points.
Industry experience indicates that the commercial product may contain small amounts of radon-222 and its radioactive decay products (radon daughters). The actual concentration of radon-222 and radioactive daughters in process equipment (IE lines, filters, pumps and reactor units) may reach significant levels and produce potentially damaging levels of gamma radiation. A potential external radiation hazard exists at or near any pipe, valve or vessel containing a radon enriched stream or containing internal deposits of radioactive material. Field studies, however, have not shown that conditions exist that expose the worker to cumulative exposures in excess of general population limits. Equipment containing gamma-emitting decay products should be presumed to be internally contaminated with alpha- emitting decay products which may be hazardous if inhaled or ingested.
During maintenance operations that require the opening of contaminated process equipment, the flow of gas should be stopped and a four hour delay enforced to allow gamma-radiation to drop to background levels. Protective equipment (including high efficiency particulate respirators (P3) suitable for radionucleotides or supplied air) should be worn by personnel entering a vessel or working on contaminated process equipment to prevent skin contamination or inhalation of any residue containing alpha-radiation.
Airborne contamination may be minimized by handling scale and/or contaminated materials in a wet state.

Recommended Storage Methods: Packaging as recommended by manufacturer.
Check that containers are clearly labeled.
Cylinder fitted with valve protector cap.
Ensure the use of equipment rated for cylinder pressure.
Ensure the use of compatible materials of construction.
Cylinder valve must be closed when not in use or when empty.
Cylinder must be properly secured either in use or in storage.
WARNING: Suckback into cylinder may result in rupture.
Use back-flow preventive device in piping.

Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Use in a well-ventilated areaIf gas concentrations are high: or If risk of overexposure exists, wear NIOSH-approved respirator.
Correct fit is essential to obtain adequate protection.
Used in closed pressurized systems; fitted with temperature and pressure safety relief valves which are vented to allow safe dispersal.
Provide adequate ventilation in warehouse or closed storage areas.

Personal Protective Clothing/Equipment:

Eyes: Safety glasses with side shields; or as required, chemical goggles.
Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

Hands/Feet: Protective gloves eg. leather gloves or gloves with leather facing. Neoprene rubber gloves.
Safety footwear.

Other: Operators should be trained in correct use & maintenance of respirators Ensure that there is ready access to breathing apparatus.
Protective overalls, closely fitted at neck and wrist. Eye-wash unit.
IN CONFINED SPACES:
1. Non-sparking protective boots.
2. Static-free clothing.
3. Ensure availability of lifeline.
Staff should be trained in all aspects of rescue work.
Ensure there is ready access to an emergency shower.

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Section 9 - Physical and Chemical Properties

Appearance/General Info: Easily liquified flammable gas or colorless highly volatile liquid. Packed as liquid under pressure and remains liquid only under pressure. Sudden release of pressure or leakage may result in rapid vaporization with generation of large volume of highly flammable / explosive gas. Strong gasoline odor. Floats and boils on water giving a flammable / explosive, visible cloud. Soluble in alcohol, ether, benzene and sulphuric acid.

Physical State: Liquefied gas
Odor Threshold: 1.3 to 3.0 mg/m^3
Vapor Pressure (kPa): 182 kPa at 10 °C
Vapor Density (Air=1): 2.01
Formula Weight: 56.11
Specific Gravity (H_2O=1, at 4 °C): 0.59
Evaporation Rate: Very rapid
pH: Not applicable
pH (1% Solution): Not applicable.
Boiling Point: -6.9 °C (20 °F)
Freezing/Melting Point: -140.35 °C (-220.63 °F)
Volatile Component (% Vol): 100
Water Solubility: Practically insoluble in water

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Product is considered stable. Hazardous polymerization will not occur.
Storage Incompatibilities: Avoid contact with oxidizing agents.

The interaction of alkenes and alkynes with nitrogen oxides and oxygen may produce explosive addition products; these may form at very low temperatures and explode on heating to higher temperatures (the addition products from 1,3-butadiene and cyclopentadiene form rapidly at -150 °C and ignite or explode on warming to -35 to -15 C). These derivatives ("pseudo- nitrosites") were formerly used to characterize terpene hydrocarbons.

Exposure to air must be kept to a minimum so as to limit the build-up of peroxides which will concentrate in bottoms if the product is distilled.

The product must not be distilled to dryness if the peroxide concentration is substantially above 10 ppm (as active oxygen) since explosive decomposition may occur. Distillate must be immediately inhibited to prevent peroxide formation. The effectiveness of the antioxidant is limited once the peroxide levels exceed 10 ppm as active oxygen. Addition of more inhibitor at this point is generally ineffective.

Prior to distillation it is recommended that the product should be washed with aqueous ferrous ammonium sulfate to destroy peroxides; the washed product should be immediately re-inhibited.

A range of exothermic decomposition energies for double bonds is given as 40-90 kJ/mol. The relationship between energy of decomposition and processing hazards has been the subject of discussion; it is suggested that values of energy released per unit of mass, rather than on a molar basis (J/g) be used in the assessment. For example, in "open vessel processes" (with man-hole size openings, in an industrial setting), substances with exothermic decomposition energies below 500 J/g are unlikely to present a danger, whilst those in "closed vessel processes" (opening is a safety valve or bursting disk) present some danger where the decomposition energy exceeds 150 J/g.

Avoid reactions with oxidizing agents, organic acids, inorganic acids halogenated compounds, polymerizable esters, oxygen, cyanohydrins and molten sulphur.

Section 11 - Toxicological Information

Toxicity
Inhalation (rat) LC_{50}: 620000 mg/m^3/4h

Irritation
Nil reported

See *RTECS* UD 0890000, for additional data.

Section 12 - Ecological Information

Environmental Fate: No data found.
Ecotoxicity: No data found.
BCF: no food chain concentration potential
Biochemical Oxygen Demand (BOD): none

Section 13 - Disposal Considerations

Disposal: Consult manufacturer for recycling options.
Discharge to burning flare. Return empty cylinders to supplier.

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Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Note: This material has multiple possible HMT entries. Choose the appropriate one based on state and condition of specific material when shipped.

Shipping Name and Description: Isobutylene *see also* Petroleum gases, liquefied
ID: UN1055
Hazard Class: 2.1 - Flammable gas
Packing Group:
Symbols:
Label Codes: 2.1 - Flammable Gas
Special Provisions: 19, T50
Packaging: **Exceptions:** 306 **Non-bulk:** 304 **Bulk:** 314, 315
Quantity Limitations: **Passenger aircraft/rail:** Forbidden **Cargo aircraft only:** 150 kg
Vessel Stowage: **Location:** E **Other:** 40

Shipping Name and Description: Petroleum gases, liquefied *or* Liquefied petroleum gas
ID: UN1075
Hazard Class: 2.1 - Flammable gas
Packing Group:
Symbols:
Label Codes: 2.1 - Flammable Gas
Special Provisions: T50
Packaging: **Exceptions:** 306 **Non-bulk:** 304 **Bulk:** 314, 315
Quantity Limitations: **Passenger aircraft/rail:** Forbidden **Cargo aircraft only:** 150 kg
Vessel Stowage: **Location:** E **Other:**

Section 15 - Regulatory Information

EPA Regulations:
RCRA 40 CFR: Not listed
CERCLA 40 CFR 302.4: Not listed
SARA 40 CFR 372.65: Not listed
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

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Issue Date: 2006-06

Section 1 - Chemical Product and Company Identification 61

Material Name: Isopropyl Alcohol **CAS Number:** 67-63-0
Chemical Formula: C_3H_8O
Structural Chemical Formula: $(CH_3)_2CHOH$
EINECS Number: 200-661-7
ACX Number: X1001458-1
Synonyms: ALCOJEL; ALCOOL ISOPROPILICO; ALCOOL ISOPROPYLIQUE; ALCOSOLVE; ALCOSOLVE 2; AVANTIN; AVANTINE; CHROMAR; COMBI-SCHUTZ; (COMPONENT OF) HIBISTAT; DIMETHYL CARBINOL; DIMETHYLCARBINOL; EPA PESTICIDE CHEMICAL CODE 047501; HARTOSOL; 2-HYDROXYPROPANE; IMSOL A; IPA; ISOHOL; ISOPROPANOL; ISOPROPYL ALCOHOL; ISO-PROPYLALKOHOL; LUTOSOL; 1-METHYLETHANOL; 1-METHYLETHYL ALCOHOL; PETROHOL; PRO; 2-PROPANOL; I-PROPANOL; N-PROPAN-2-OL; PROPAN-2-OL; PROPOL; 2-PROPYL ALCOHOL; I-PROPYL ALCOHOL; SEC-PROPYL ALCOHOL; I-PROPYLALKOHOL; SECONDARY PROPYL ALCOHOL; SPECTRAR; STERISOL HAND DISINFECTANT; TAKINEOCOL; VISCO 1152
Derivation: Treating propylene with sulfuric acid and then hydrolyzing or direct hydration of propylene using superheated steam. Most commonly available as rubbing alcohol (70% IPA).
General Use: As a solvent for gums, shellac, and essential oils, chemical intermediate, dehydrating agent, vehicle for germicidal compounds, de-icing agent for liquid fuels; for denaturing ethyl alcohol, preserving pathological specimens; in extraction of alkaloids, quick-drying inks and oils, and an ingredient of skin lotions, cosmetics, window cleaner, liquid soaps, and pharmaceuticals.

Section 2 - Composition / Information on Ingredients

Name	CAS	%
Isopropyl alcohol	67-63-0	100% vol.

Most commonly sold as 70% isopropyl alcohol (rubbing alcohol).

OSHA PEL
TWA: 400 ppm; 980 mg/m^3.

NIOSH REL
TWA: 400 ppm (980 mg/m^3); STEL: 500 ppm (1225 mg/m^3).

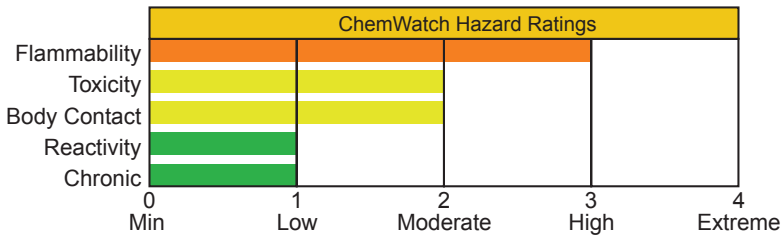
DFG (Germany) MAK
TWA: 200 ppm; PEAK: 400 ppm.

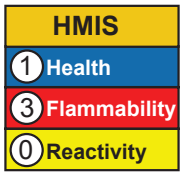
ACGIH TLV
TWA: 200 ppm; STEL: 400 ppm.

IDLH Level
2000 ppm (10% LEL).

Section 3 - Hazards Identification

Fire Diamond





ANSI Signal Word
Warning!

Flammable

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Volatile liquid. Irritating to eyes/respiratory tract. Other Acute Effects: CNS depression, possible dermatitis, systemic toxicity. Flammable

Potential Health Effects

Target Organs: Eyes, skin, respiratory system.
Primary Entry Routes: Inhalation, ingestion, skin contact/absorption.

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Acute Effects

Inhalation: Vapor inhalation is irritating to the respiratory tract and can cause central nervous system depression at high concentrations. Volunteers exposed to 400 ppm for 3 to 5 min experienced mild eye and respiratory irritation. At 800 ppm, irritation was not severe, but most people found the air uncomfortable to breathe.

Eye: Exposure to the vapor or direct contact with the liquid causes irritation and possible corneal burns.

Skin: Some irritation may occur after prolonged exposure.

Ingestion: Accidental ingestions have provided the most information on isopropyl alcohol toxicity. Symptoms include nausea and vomiting, headache, facial flushing, dizziness, lowered blood pressure, mental depression, hallucinations and distorted perceptions, difficulty breathing, respiratory depression, stupor, unconsciousness, and coma. Kidney insufficiency including oliguria (reduced urine excretion), anuria (absent urine excretion), nitrogen retention, and edema (fluid build-up in tissues) may occur. One post-mortem examination in a case of heavy ingestion showed extensive hemorrhagic tracheobronchitis, broncho pneumonia, and hemorrhagic pulmonary edema. Death can occur in 24 to 36 h post-ingestion due to respiratory paralysis.

Carcinogenicity: NTP - Not listed; IARC - Group 3, Not classifiable as to carcinogenicity to humans; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Not listed; MAK - Not listed.

Medical Conditions Aggravated by Long-Term Exposure: Dermatitis or respiratory or kidney disorders.

Chronic Effects: Repeated skin contact can cause drying of skin and delayed hypersensitivity reactions in some individuals.

Section 4 - First Aid Measures

See DOT ERG

Inhalation: Remove exposed person to fresh air and support breathing as needed.

Eye Contact: *Do not* allow victim to rub or keep eyes tightly shut. Gently lift eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. Consult a physician immediately.

Skin Contact: *Quickly* remove contaminated clothing. Rinse with flooding amounts of water for at least 15 min. Wash exposed area with soap and water. For reddened or blistered skin, consult a physician.

Ingestion: Never give anything by mouth to an unconscious or convulsing person. Contact a poison control center. Unless the poison control center advises otherwise, have the *conscious and alert* person drink 1 to 2 glasses of water to dilute. Vomiting may be contraindicated because of the rapid onset of central nervous system depression. Gastric lavage is preferred.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: Diagnostic test: acetone in urine. Isopropyl alcohol is oxidized in the body to acetone where it is excreted by the lungs or kidneys. Some acetone may be further metabolized to acetate, formate, and finally carbon dioxide. Probable oral lethal dose is 240 mL.

Section 5 - Fire-Fighting Measures

See DOT ERG

Flash Point: 53 °F (12 °C), Closed Cup

Burning Rate: 2.3 mm/min.

Autoignition Temperature: 750°F (399°C)

LEL: 2 % v/v

UEL: 12.7 % v/v at 200 °F

Flammability Classification: Class 1B Flammable Liquid

Extinguishing Media: Carbon dioxide, dry chemical, water *spray* (solid streams can spread fire), alcohol- resistant foam, or fog.

General Fire Hazards/Hazardous Combustion Products: Carbon oxides and acrid smoke. Container may explode in heat of fire. Vapors may travel to an ignition source and flash back. Isopropyl alcohol poses an explosion hazard indoors, outdoors, and in sewers.

Fire Diamond

Fire-Fighting Instructions: If possible without risk, move container from fire area. Apply cooling water to container side until well after fire is out. Stay away from ends of tanks. For massive fire in cargo area, use monitor nozzles or unmanned hose holders; if impossible, withdraw and let fire burn. Withdraw immediately if you hear a rising sound from venting safety device or notice any tank discoloration due to fire. *Do not* release runoff from fire control methods to sewers or waterways. Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode. Structural firefighters' protective clothing provides only limited protection.

Section 6 - Accidental Release Measures

See DOT ERG

Spill/Leak Procedures: Notify safety personnel, isolate and ventilate area, deny entry, and stay upwind. Shut off ignition sources. Cleanup personnel should protect against vapor inhalation and skin/eye contact. Water spray may reduce vapor, but may not prevent ignition in closed spaces.

Small Spills: Take up with earth, sand, vermiculite, or other absorbent, noncombustible material and place in suitable containers.

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Large Spills: For large spills, dike far ahead of liquid spill for later disposal. Do not release into sewers or waterways.

Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Use non-sparking tools to open containers.
Never eat, drink, or smoke in work areas. Practice good personal hygiene after using isopropyl alcohol, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Recommended Storage Methods: Store in a cool, dry, well-ventilated area away from heat, ignition sources, and incompatibles (Sec 10). Install electrical equipment of Class 1, Group D.

Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: To prevent static sparks, electrically ground and bond all equipment used with and around IPA. Provide general or local exhaust ventilation systems to maintain airborne levels below OSHA PELs (Sec. 2). Local exhaust ventilation is preferred since it prevents contaminant dispersion into the work area by controlling it at its source.

Administrative Controls: Consider preplacement and periodic medical exams of exposed workers with emphasis on the skin, kidneys, and respiratory system. Be extra cautious when using IPA concurrently with carbon tetrachloride because animal studies have shown it enhances carbon tetrachloride's toxicity.

Personal Protective Clothing/Equipment: Wear chemically protective gloves, boots, aprons, and gauntlets to prevent prolonged or repeated skin contact. Nitrile rubber (breakthrough time > 8 hr), Neoprene and Teflon (breakthrough time > 4 hr) are suitable materials for PPE. Do not use PVA, PVC or natural rubber (breakthrough time < 1 hr). Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Because contact lens use in industry is controversial, establish your own policy.

Respiratory Protection: Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator. For < 1000 ppm, use any powered, air purifying respirator with organic vapor cartridges or any chemical cartridge respirator with a full facepiece and organic vapor cartridge(s). For < 10,000 ppm, use any supplied-air respirator (SAR) operated in continuous-flow mode. For < 12,000 ppm, use any air- purifying, full facepiece respirator (gas mask) with a chin-style, front-or back-mounted organic vapor canister or any SCBA or SAR with a full facepiece. For emergency or entrance into unknown concentrations, use any SCBA or SAR (with auxiliary SCBA) with a full facepiece and operated in pressure-demand or other positive-pressure mode. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.* If respirators are used, OSHA requires a written respiratory protection program that includes at least: medical certification, training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas.

Other: Separate contaminated work clothes from street clothes. Launder before reuse. Remove isopropyl alcohol from your shoes and clean personal protective equipment. Make emergency eyewash stations, safety/quick-drench showers, and washing facilities available in work area.

Section 9 - Physical and Chemical Properties

Appearance/General Info: Colorless with a slight odor and bitter taste.

Physical State: Liquid
Odor Threshold: 7.84 to 490 mg/m^3
Vapor Pressure (kPa): 44 mm Hg at 25 °F (77 °C)
Formula Weight: 60.09
Density: 0.78505 at 68°F (20 °C)
Refractive Index: 1.375 at 68 °F (20 °C)
Boiling Point: 180.5 °F (82.5 °C)
Freezing/Melting Point: -129.1 °F (-89.5 °C)
Viscosity: 2.1 cP at 77 °F (25 °C)
Surface Tension: 20.8 dyne/cm at 77 °F (25 °C)
Ionization Potential (eV): 10.10 eV
Critical Temperature: 455 °F (235 °C)
Critical Pressure: 47 atm
Water Solubility: > 10 %
Other Solubilities: Soluble in alcohol, ether, chloroform, and benzene. Insoluble in salt solutions.

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Isopropyl alcohol is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization does not occur. Exposure to heat, ignition sources, and incompatibles.

Storage Incompatibilities: Include acetaldehyde, chlorine, ethylene oxide, acids and isocyanates, hydrogen + palladium, nitroform, oleum, phosgene, potassium *t*-butoxide, oxygen (forms unstable peroxides), trinitromethane, barium perchlorate, tetrafluoroborate, chromium trioxide, sodium dichromate + sulfuric acid, aluminum, aluminum triisopropoxide, and oxidizers. Will attack some forms of plastic, rubber, and coatings.

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Hazardous Decomposition Products: Thermal oxidative decomposition of isopropyl alcohol can produce carbon oxides and acrid smoke.

Section 11 - Toxicological Information

Acute Oral Effects:

Rat, oral, LD_{50}: 5045 mg/kg caused a change in righting reflex, and somnolence (general depressed activity).

Human, oral, TD_{Lo}: 223 mg/kg caused hallucinations, distorted perceptions, lowered blood pressure, and a change in pulse rate.

Human, oral, LD_{Lo}: 3570 mg/kg caused coma, respiratory depression, nausea, and vomiting.

Irritation Effects:

Rabbit, eye: 100 mg caused severe irritation.

Rabbit, skin: 500 mg caused mild irritation.

Other Effects:

Rat, inhalation: 3500 ppm/7 hr given from 1 to 19 days of pregnancy caused fetotoxicity.

See *RTECS* NT8050000, for additional data.

Section 12 - Ecological Information

Environmental Fate: On soil, IPA will volatilize or leach into groundwater. Biodegradation is possible but rates are not found in available literature. It will volatilize (est. half-life = 5.4 days) or biodegrade in water. It is not expected to bioconcentrate in fish. In the air, it reacts with photochemically produced hydroxyl radicals with a half-life of one to several days. Because it is soluble, removal by rain, snow or other precipitation is possible.

Ecotoxicity: Guppies (*Poecilia reticulata*) LC_{50} = 7,060 ppm/7 days; fathead minnow (*Pimephales promelas*) LC_{50} = 11,830 mg/L/1 hr. BOD = 133 %/5 days.

Octanol/Water Partition Coefficient: log K_{ow} = 0.05

Section 13 - Disposal Considerations

Disposal: Microbial degradation is possible by oxidizing isopropyl alcohol to acetone by members of the genus *Desulfovibrio*. Spray waste into incinerator (permit-approved facilities only) equipped with an afterburner and scrubber. Isopropyl alcohol can be settled out of water spills by salting with sodium chloride. Note: Salt may harm aquatic life, so weigh the benefits against possible harm before application. Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations. Triple rinse containers.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Shipping Name and Description: Isopropanol *or* Isopropyl alcohol
ID: UN1219
Hazard Class: 3 - Flammable and combustible liquid
Packing Group: II - Medium Danger
Symbols:
Label Codes: 3 - Flammable Liquid
Special Provisions: IB2, T4, TP1
Packaging: **Exceptions:** 150 **Non-bulk:** 202 **Bulk:** 242
Quantity Limitations: **Passenger aircraft/rail:** 5 L **Cargo aircraft only:** 60 L
Vessel Stowage: **Location:** B **Other:**

Section 15 - Regulatory Information

EPA Regulations:

RCRA 40 CFR: Not listed
CERCLA 40 CFR 302.4: Not listed
SARA 40 CFR 372.65: Listed
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

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Issue Date: 2006-06

Methyl tert-Butyl Ether
BUT5410

Section 1 - Chemical Product and Company Identification 61

Material Name: Methyl tert-Butyl Ether **CAS Number:** 1634-04-4
Chemical Formula: $C_5H_{12}O$
Structural Chemical Formula: $(CH_3)_3COCH_3(CH_3)_3COCH_3$
EINECS Number: 216-653-1
ACX Number: X1001502-4
Synonyms: T-BUTYL METHYL ETHER; TERT-BUTYL METHYL ETHER; ETHER,TERT-BUTYL METHYL; 2-METHOXY-2-METHYL PROPANE; 2-METHOXY-2-METHYLPROPANE; METHYL TERT-BUTYL ETHER; METHYL 1,1-DIMETHYLETHYL ETHER; METHYL-TERT-BUTYL ETHER; METHYL TERTIARY BUTYL ETHER; 2-METHYL-2-METHOXYPROPANE; MTBE; PROPANE,2-METHOXY-2-METHYL-; PROPANE,2-METHOXY-2-METHYL-(9CI)
General Use: Octane booster for unleaded petrol (up to 7% by volume), manufacture of isobutene; solvent for a number of applications, including pesticide analysis.

Section 2 - Composition / Information on Ingredients

Name	CAS	%
methyl tert-butyl ether	1634-04-4	>95
commercial material may contain C_5 hydrocarbons <5%		

OSHA PEL

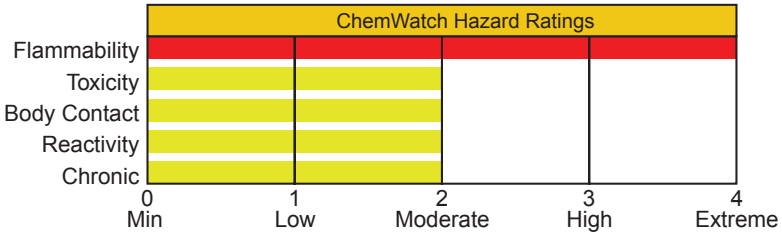
NIOSH REL

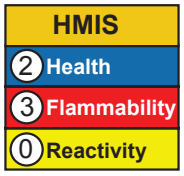
DFG (Germany) MAK
TWA: 50 ppm; PEAK: 75 ppm.

ACGIH TLV
TWA: 50 ppm.

Section 3 - Hazards Identification

Fire Diamond





ANSI Signal Word
Danger!

Flammable

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Clear, colorless liquid; slight hydrocarbon/mint or terpene-like odor. Irritating to eyes/skin/respiratory tract. Other Acute Effects: CNS and respiratory depression, aspiration pneumonitis. Chronic Effects: nasal/tracheal inflammation. Flammable.

Potential Health Effects

Target Organs: upper respiratory system, central nervous system (CNS)
Primary Entry Routes: inhalation, ingestion
Acute Effects
Inhalation: The vapor is harmful and discomforting to the upper respiratory tract. Acute effects from inhalation of high vapor concentrations may be chest and nasal irritation with coughing, sneezing, headache and even nausea. If exposure to highly concentrated vapor atmosphere is prolonged this may lead to narcosis, unconsciousness, even coma, and unless resuscitated, death. Inhalation of the lower alkyl ethers may produce intoxication, blurred vision, headache, dizziness, excitation, pharyngitis, and irritation of the nose and throat. Convulsions, respiratory distress or paralysis, asphyxia, pneumonitis, and unconsciousness are all serious manifestations of poisoning; liver and kidney damage may occur. Fatalities have been reported. Ethers produce narcosis following inhalation.

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Rats exposed to 8000 ppm for 6 hours showed changes in motor activity with the pattern and time course of effects being indicative of transient central nervous system depression. Transient increases in motor activity, on the other hand, were observed in male rats exposed at 800 and 4000 ppm. This finding may reflect an exposure-related stimulant effect or an exaggerated response following recovery from an anesthetic effect. Rats exposed to 1000 ppm, 6 hours/day, 5 days/week for 9 exposures showed lachrymation, conjunctival swelling and corneal changes. A reduced reaction to auditory stimuli was noted at 3000 ppm. There were no other macroscopic pathology findings other than chronic inflammatory changes in the nasal mucosa and trachea.

Eye: The liquid is extremely discomforting to the eyes.
Eye contact with alkyl ethers (vapors or liquid) may produce irritation, redness and lachrymation.

Skin: The liquid is discomforting to the skin and is capable of causing skin reactions which may lead to dermatitis. Bare unprotected skin should not be exposed to this material. Considered to be harmful if it is absorbed by the skin. Alkyl ethers may defat and dehydrate the skin producing dermatoses.
Absorption may produce headache, dizziness, and central nervous system depression.

Ingestion: Considered an unlikely route of entry in commercial/industrial environments. The liquid is extremely discomforting and may be fatal if swallowed. Ingestion may result in nausea, pain, vomiting. Vomit entering the lungs by aspiration may cause potentially lethal chemical pneumonitis. Ingestion of alkyl ethers may produce symptoms to those produced following inhalation.

Carcinogenicity: NTP - Not listed; IARC - Group 2B, Possibly carcinogenic to humans; OSHA - Not listed; NIOSH - Not listed; ACGIH - Class A3, Animal carcinogen; EPA - Not listed; MAK - Not listed.

Chronic Effects: Prolonged or repeated exposure may cause kidney damage.
Rats exposed to 800, 4000 or 8000 ppm, 6 hours/day, 5 days/week, for 13 weeks showed statistically significant increases in the mean absolute and relative weights of liver, kidneys, and adrenal gland in the two higher exposure groups, while mild hematological changes were seen in all animals.
Chronic exposure to alkyl ethers may result in loss of appetite, excessive thirst, fatigue, and weight loss.

Section 4 - First Aid Measures

Inhalation: Remove to fresh air. Lay patient down. Keep warm and rested. If available, administer medical oxygen by trained personnel. If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor without delay.

See DOT ERG

Eye Contact: Immediately hold the eyes open and wash continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids. Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: Immediately flush body and clothes with large amounts of water, using safety shower if available. Quickly remove all contaminated clothing, including footwear. Wash affected areas with water (and soap if available) for at least 15 minutes. Transport to hospital or doctor.

Ingestion: DO NOT induce vomiting.
Observe the patient carefully. Never give liquid to a person showing signs of being sleepy or with reduced awareness; i.e. becoming unconscious. Give water (or milk) to rinse out mouth. Then provide liquid slowly and as much as casualty can comfortably drink. Transport to hospital or doctor without delay.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: Treat symptomatically.

Section 5 - Fire-Fighting Measures

Flash Point: -26 °C Closed Cup
Autoignition Temperature: 435 °C
LEL: 1.5% v/v

See DOT ERG

Extinguishing Media: Foam. Dry chemical powder. BCF (where regulations permit). Carbon dioxide.
Water spray or fog - Large fires only.

Fire Diamond

General Fire Hazards/Hazardous Combustion Products: Liquid and vapor are highly flammable. Severe fire hazard when exposed to heat, flame and/or oxidizers. Vapor forms an explosive mixture with air.
Severe explosion hazard, in the form of vapor, when exposed to flame or spark. Vapor may travel a considerable distance to source of ignition.
Heating may cause expansion/decomposition with violent rupture of containers.
On combustion, may emit toxic fumes of carbon monoxide (CO). May emit poisonous fumes.

Fire Incompatibility: Avoid contact with oxidizing agents and strong acids.

Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.
May be violently or explosively reactive. Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation.
Fight fire from a safe distance, with adequate cover.

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If safe, switch off electrical equipment until vapor fire hazard removed.
Use water delivered as a fine spray to control the fire and cool adjacent area. Avoid spraying water onto liquid pools.
Do not approach containers suspected to be hot. Cool fire exposed containers with water spray from a protective location. If safe to do so, remove containers from path of fire.

Section 6 - Accidental Release Measures

Small Spills: Remove all ignition sources. Clean up all spills immediately.
Avoid breathing vapors and contact with skin and eyes.
Control personal contact by using protective equipment.
Contain and absorb small quantities with vermiculite or other absorbent material. Wipe up. Collect residues in a flammable waste container.

Large Spills: Clear area of personnel and move upwind.
Contact fire department and tell them location and nature of hazard.
May be violently or explosively reactive. Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation.
No smoking, bare lights or ignition sources. Increase ventilation.
Stop leak if safe to do so. Water spray or fog may be used to disperse/absorb vapor. Contain spill with sand, earth or vermiculite.
Use only spark-free shovels and explosion proof equipment.
Collect recoverable product into labeled containers for recycling.
Absorb remaining product with sand, earth or vermiculite.
Collect solid residues and seal in labeled drums for disposal.
Wash area and prevent runoff into drains.
If contamination of drains or waterways occurs, advise emergency services.
Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Do not allow clothing wet with material to stay in contact with skin.
Avoid all personal contact, including inhalation. Wear protective clothing when risk of exposure occurs. Use in a well-ventilated area. Prevent concentration in hollows and sumps.
DO NOT enter confined spaces until atmosphere has been checked.
Avoid smoking, bare lights, heat or ignition sources. When handling, DO NOT eat, drink or smoke.
Vapor may ignite on pumping or pouring due to static electricity.
Ground and secure containers when dispensing or pouring product. Use spark-free tools when handling.
Avoid contact with incompatible materials.
Keep containers securely sealed. Avoid physical damage to containers.
Always wash hands with soap and water after handling. Work clothes should be laundered separately.
Use good occupational work practice. Observe manufacturer's storing and handling recommendations. Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions.
Recommended Storage Methods: Metal can; Metal drum; Metal safety cans. Packing as supplied by manufacturer.
Plastic containers may only be used if approved for flammable liquid.
Check that containers are clearly labeled and free from leaks.
Storage Requirements: Store below 38 deg. C.
Rotate all stock to prevent aging. Use on FIFO (First In-First Out) basis.
Store in original containers in approved flame-proof area.
No smoking, bare lights, heat or ignition sources.
DO NOT store in pits, depressions, basements or areas where vapors may be trapped. Keep containers securely sealed.
Store away from incompatible materials in a cool, dry well ventilated area.
Protect containers against physical damage and check regularly for leaks.
Observe manufacturer's storing and handling recommendations.
Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Use in a well-ventilated area.
General exhaust is adequate under normal operating conditions.
Local exhaust ventilation may be required in specific circumstances.
If risk of overexposure exists, wear NIOSH approved respirator.
Correct fit is essential to obtain adequate protection.
Provide adequate ventilation in warehouse or closed storage areas.
Ground and secure containers when dispensing or pouring.
Avoid generation of static electricity. Ground all lines and equipment.

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Vapor may ignite on pumping or pouring due to static electricity. Ground and secure containers when dispensing or pouring product.

Personal Protective Clothing/Equipment:

Eyes: Safety glasses. Safety glasses with side shields. Chemical goggles.
Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

Hands/Feet: Nitrile gloves Safety footwear.

Respiratory Protection:

Exposure Range >40 to 2000 ppm: Supplied Air, Constant Flow/Pressure Demand, Half Mask
Exposure Range >2000 to 40,000 ppm: Supplied Air, Constant Flow/Pressure Demand, Full Face
Exposure Range >40,000 to unlimited ppm: Self-contained Breathing Apparatus, Pressure Demand, Full Face
Note: odor threshold unknown

Other: Eyewash unit. Ensure there is ready access to a safety shower.
Impervious apron.

Section 9 - Physical and Chemical Properties

Appearance/General Info: Colorless, highly volatile, highly flammable liquid; ethereal odor.

Physical State: Liquid
Vapor Pressure (kPa): 27.5 at 20 °C
Vapor Density (Air=1): 3.1
Formula Weight: 88.15
Specific Gravity (H_2O=1, at 4 °C): 0.74
Evaporation Rate: Fast
pH: Not applicable

pH (1% Solution): Not applicable
Boiling Point: 55.2 °C (131 °F)
Freezing/Melting Point: -109 °C (-164.2 °F)
Volatile Component (% Vol): 100
Water Solubility: Solubility of water in methyl-tbutyl ether 2 g/100 g

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: WARNING: Long standing in contact with air and light may result in the formation of potentially explosive peroxides.
Product is considered stable. Hazardous polymerization will not occur.

Storage Incompatibilities: May form explosive peroxides on standing or following concentration by distillation. Review of stocks and testing for peroxide content by given tested procedures at 3-monthly intervals is recommended, together with safe disposal of peroxidic samples.
[Peroxide containing residues can often be rendered innocuous by pouring into an excess of sodium carbonate solution] Avoid storage with oxidizers and strong acids.

Section 11 - Toxicological Information

Toxicity
Oral (rat) LD_{50}: 4000 mg/kg
Inhalation (rat) LC_{50}: 23576 ppm/4 H

Irritation
Nil reported

See *RTECS* KN5250000, for additional data.

Section 12 - Ecological Information

Environmental Fate: If released to soil, it will be subject to volatilization. It will be expected to exhibit very high mobility in soil and, therefore, it may leach to groundwater. It will not be expected to hydrolyze in soil. If released to water, it will not be expected to significantly adsorb to sediment or suspended particulate matter, bioconcentrate in aquatic organisms, hydrolyze, directly photolyze, or photooxidize via reaction with photochemically produced hydroxyl radicals in the water, based upon estimated physical-chemical properties or analogies to other structurally related aliphatic ethers. In surface water it will be subject to rapid volatilization with estimated half-lives of 4.1 hr and 2.0 days for volatilization from a river one meter deep flowing 1 m/sec with a wind velocity of 3 m/sec and a model pond, respectively. It may be resistant to biodegradation in environmental media based upon screening test data from a study using activated sludge inocula. Many ethers are known to be resistant to biodegradation. If released to the atmosphere, it will be expected to exist almost entirely in the vapor phase based on its vapor pressure. It will be susceptible to photooxidation via vapor phase reaction with photochemically produced hydroxyl radicals with an estimated half-life of 5.6 days for this process. Direct photolysis will not be an important removal process since aliphatic ethers do not adsorb light at wavelengths >290 nm.

Ecotoxicity: No data found.
Henry's Law Constant: 5.87×10^{-4}
BCF: carp 1.5
Soil Sorption Partition Coefficient: K_{oc} = estimated at 11.2

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Section 13 - Disposal Considerations

Disposal: Consult manufacturer for recycling options and recycle where possible. Follow applicable federal, state, and local regulations. Incinerate residue at an approved site. Recycle containers where possible, or dispose of in an authorized landfill.
BEWARE: Empty solvent, paint, lacquer and flammable liquid drums present a severe explosion hazard if cut by flame torch or welded. Even when thoroughly cleaned or reconditioned the drum seams may retain sufficient solvent to generate an explosive atmosphere in the drum.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Shipping Name and Description: Methyl tert-butyl ether
ID: UN2398
Hazard Class: 3 - Flammable and combustible liquid
Packing Group: II - Medium Danger
Symbols:
Label Codes: 3 - Flammable Liquid
Special Provisions: IB2, T7, TP1
Packaging: **Exceptions:** 150 **Non-bulk:** 202 **Bulk:** 242
Quantity Limitations: **Passenger aircraft/rail:** 5 L **Cargo aircraft only:** 60 L
Vessel Stowage: **Location:** E **Other:**

Section 15 - Regulatory Information

EPA Regulations:
RCRA 40 CFR: Not listed
CERCLA 40 CFR 302.4: Listed per CAA Section 112 1000 lb (453.5 kg)
SARA 40 CFR 372.65: Listed
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

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Material Safety Data Sheet Collection
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Issue Date: 2006-06

Section 1 - Chemical Product and Company Identification 61

Material Name: Nitric Acid
CAS Number: 7697-37-2
Chemical Formula: HNO_3
Structural Chemical Formula: HNO_3
EINECS Number: 231-714-2
ACX Number: X1002177-5
Synonyms: ACIDE NITRIQUE; ACIDO NITRICO; AQUA FORTIS; AZOTIC ACID; AZOTOWY KWAS; ENGRAVER'S ACID; ENGRAVERS ACID; HYDROGEN NITRATE; KYSELINA DUSICNE; NITAL; NITRIC ACID; NITRIC ACID OTHER THAN RED FUMING WITH >70% NITRIC ACID; NITRIC ACID OTHER THAN RED FUMING WITH NOT >70% NITRICACID; NITROUS FUMES; NITRYL HYDROXIDE; RED FUMING NITRIC ACID (RFNA); SALPETERSAURE; SALPETERZUUROPLOSSINGEN; WHITE FUMING NITRIC ACID (WFNA)
General Use: Manufacture of organic and inorganic nitrates and nitro compounds for fertilizers, dye intermediates and many organic chemicals.
Used for etching and cleaning metals.
Operators should be trained in procedures for safe use of this material.

Section 2 - Composition / Information on Ingredients

Name	CAS	%
nitric acid	7697-37-2	>95

OSHA PEL
TWA: 2 ppm; 5 mg/m^3.

ACGIH TLV
TWA: 2 ppm; STEL: 4 ppm.

EU OEL
STEL: 2.6 mg/m^3 (1 ppm).

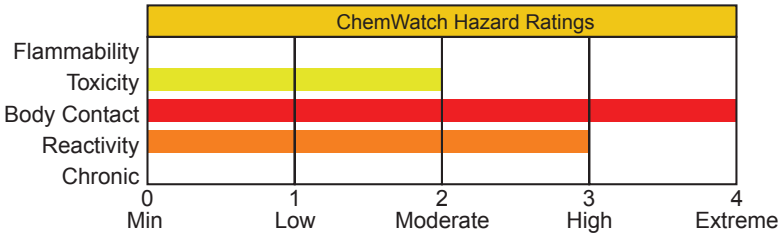
NIOSH REL
TWA: 2 ppm (5 mg/m^3); STEL: 4 ppm (10 mg/m^3).

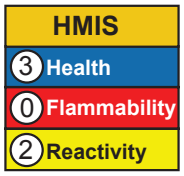
IDLH Level
25 ppm.

DFG (Germany) MAK
TWA: 2 ppm; PEAK: 2 ppm.

Section 3 - Hazards Identification

Fire Diamond





ANSI Signal Word

Danger!

Corrosive

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Clear to yellow fuming liquid; acrid, suffocating odor. Corrosive. Other Acute Effects: lung damage. Chronic Effects: tooth erosion, bronchitis. Strong oxidizer.

Potential Health Effects

Target Organs: eyes, skin, respiratory system, teeth
Primary Entry Routes: inhalation, ingestion, skin contact, eye contact
Acute Effects
Inhalation: The vapor is extremely discomforting and corrosive to the upper respiratory tract and lungs and the material presents a hazard from a single acute exposure or from repeated exposures over long periods.
Inhalation hazard is increased at higher temperatures.
Reactions may occur following a single acute exposure or may only appear after repeated exposures.

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Reactions may not occur on exposure but response may be delayed with symptoms only appearing many hours later.
The material may produce respiratory tract irritation which produces an inflammatory response involving the recruitment and activation of many cell types, mainly derived from the vascular system. Unlike most organs the lung can respond to a chemical insult or agent by first trying to remove or neutralize the irritant and then repairing the damage. The repair process, which initially developed to protect mammalian lungs from foreign matter and antigens, may however, cause further damage the lungs when activated by hazardous chemicals. The result is often the impairment of gas exchange, the primary function of the lungs.
Inhalation of nitric acid mist or fumes at 2 to 25 ppm over an 8 hour period may cause pulmonary irritation and symptoms of lung damage.
Only several minutes of exposure to concentrated atmosphere i.e. 200 ppm may cause severe pulmonary damage and even fatality. Death may be delayed for several days.
Exposure to nitric acid fumes (with concurrent inhalation of nitrogen dioxide and nitric oxide) may elicit prompt irritation of the upper respiratory tract leading to coughing, gagging, chest pain, dyspnea, cyanosis if concentrations are sufficiently high and duration of exposure sufficiently long, pulmonary edema.

Eye: The liquid is extremely corrosive to the eyes and contact may cause rapid tissue destruction and is capable of causing severe damage with loss of sight.
The vapor is extremely discomforting to the eyes and is capable of causing pain and severe conjunctivitis.
Corneal injury may develop, with possible permanent impairment of vision, if not promptly and adequately treated.
The material may produce moderate eye irritation leading to inflammation.
Repeated or prolonged exposure to irritants may produce conjunctivitis.
Eye contact with concentrated acid may give no pain, whilst diluted solution causes intense pain and both can cause permanent eye damage or blindness. Burns may result in shrinkage of the eyeball, symblepharon (adhesions between tarsal and bulbar conjunctivae), permanent corneal opacification, and visual impairment leading to blindness.

Skin: The liquid is extremely corrosive to the skin and contact may cause tissue destruction with severe burns.
Bare unprotected skin should not be exposed to this material.
The vapor is highly discomforting to the skin.
The material may cause skin irritation after prolonged or repeated exposure and may produce a contact dermatitis (nonallergic). This form of dermatitis is often characterized by skin redness (erythema) and swelling (edema) which may progress to vesiculation, scaling and thickening of the epidermis. Histologically there may be intercellular edema of the spongy layer (spongiosis) and intracellular edema of the epidermis.
Skin contact causes yellow discoloration of the skin, blisters and scars that may not heal. The skin may be stained bright-yellow or yellowish brown due to the formation of xanthoproteic acid. Dilute solutions may harden the epithelium without producing overt corrosion.

Ingestion: Considered an unlikely route of entry in commercial/industrial environments.
The material is extremely corrosive if swallowed and is capable of causing burns to mouth, throat, esophagus, with extreme discomfort, pain and may be fatal.
Even a small amount causes severe corrosion of the stomach, burning pain, vomiting and shock, possibly causing non-healing scarring of the gastrointestinal tract and stomach. Death may be delayed 12 hours to 14 days or to several months. Such late fatalities are attributed to a chemical lobular pneumonitis secondary to aspiration. Survivors show stricture of the gastric mucosa and subsequent pernicious anemia.

Carcinogenicity: NTP - Not listed; IARC - Not listed; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Not listed; MAK - Not listed.

Chronic Effects: Prolonged or repeated overexposure to low concentrations of vapor may cause chronic bronchitis, corrosion of teeth, even chemical pneumonitis.

Section 4 - First Aid Measures

Inhalation: Remove to fresh air.
Lay patient down. Keep warm and rested.
If available, administer medical oxygen by trained personnel.
If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor, without delay.

Eye Contact: Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.
Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.
Immediately transport to hospital or doctor. DO NOT delay.

Skin Contact: Immediately flush body and clothes with large amounts of water, using safety shower if available.
Quickly remove all contaminated clothing, including footwear.
Wash affected areas with water (and soap if available) for at least 15 minutes. Transport to hospital or doctor. DO NOT delay.

Ingestion: Contact a Poison Control Center.
Do NOT induce vomiting. Give a glass of water.
Immediately transport to hospital or doctor. DO NOT delay.

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After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: For acute or short-term repeated exposures to strong acids:

1.Airway problems may arise from laryngeal edema and inhalation exposure.
Treat with 100% oxygen initially.
2.Respiratory distress may require cricothyroidotomy if endotracheal intubation is contraindicated by excessive swelling.
3. Intravenous lines should be established immediately in all cases where there is evidence of circulatory compromise.
4.Strong acids produce a coagulation necrosis characterized by formation of a coagulum (eschar) as a result of the desiccating action of the acid on proteins in specific tissues.

INGESTION:

1.Immediate dilution (milk or water) within 30 minutes post-ingestion is recommended.
2.Do not attempt to neutralize the acid since exothermic reaction may extend the corrosive injury.
3.Be careful to avoid further vomiting since re-exposure of the mucosa to the acid is harmful. Limit fluids to one or two glasses in an adult.
4.Charcoal has no place in acid management.
5.Some authors suggest the use of lavage within 1 hour of ingestion.

SKIN:

1.Skin lesions require copious saline irrigation. Treat chemical burns as thermal burns with non-adherent gauze and wrapping.
2.Deep second-degree burns may benefit from topical silver sulfadiazine.

EYE:

1.Eye injuries require retraction of the eyelids to ensure thorough irrigation of the conjunctival cul-de-sacs. Irrigation should last at least 20-30 minutes. Do not use neutralizing agents or any other additives. Several liters of saline are required.
2.Cycloplegic drops (1% cyclopentolate for short-term use or 5% homatropine for longer term use), antibiotic drops, vasoconstrictive agents, or artificial tears may be indicated dependent on the severity of the injury.
3.Steroid eye drops should only be administered with the approval of a consulting ophthalmologist.

Section 5 - Fire-Fighting Measures

Flash Point: Nonflammable
Autoignition Temperature: Not applicable
LEL: Not applicable
UEL: Not applicable
Extinguishing Media: Water spray or fog; foam, dry chemical powder, or BCF (where regulations permit).
Carbon dioxide.

Fire Diamond

General Fire Hazards/Hazardous Combustion Products: Will not burn but increases intensity of fire.
Heating may cause expansion or decomposition leading to violent rupture of containers.
Heat affected containers remain hazardous.
Contact with combustibles such as wood, paper, oil or finely divided metal may cause ignition, combustion or violent decomposition.
May emit irritating, poisonous or corrosive fumes.
Decomposes on heating and produces toxic fumes of nitrogen oxides (NO_x) and nitric acid.

Fire Incompatibility: Oxidizing agents as a class are not necessarily combustible themselves, but can increase the risk and intensity of fire in many other substances.
Reacts vigorously with water and alkali.
Avoid reaction with organic materials/compounds, powdered metals, reducing agents and hydrogen sulfide (H_2S) as ignition may result.
Reacts with metals producing flammable/explosive hydrogen gas.

Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.
May be violently or explosively reactive. Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation.
Fight fire from a safe distance, with adequate cover.
Extinguishers should be used only by trained personnel.
Use water delivered as a fine spray to control fire and cool adjacent area.
Avoid spraying water onto liquid pools.
Do not approach containers suspected to be hot.
Cool fire-exposed containers with water spray from a protected location.
If safe to do so, remove containers from path of fire.
If fire gets out of control withdraw personnel and warn against entry.
Equipment should be thoroughly decontaminated after use.

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Section 6 - Accidental Release Measures

Small Spills: Dangerous levels of nitrogen oxides may form during spills of nitric acid.
Wear fully protective PVC clothing and breathing apparatus.
Clean up all spills immediately. No smoking, bare lights, ignition sources.
Avoid all contact with any organic matter including fuel, solvents, sawdust, paper or cloth and other incompatible materials, as ignition may result.
Avoid breathing dust or vapors and all contact with skin and eyes.
Control personal contact by using protective equipment.
Contain and absorb spill with dry sand, earth, inert material or vermiculite. DO NOT use sawdust as fire may result.
Scoop up solid residues and seal in labeled drums for disposal.
Neutralize/decontaminate area.
Use soda ash or slaked lime to neutralize.

Large Spills: DO NOT touch the spill material. Restrict access to area.
Clear area of personnel and move upwind. Contact fire department and tell them location and nature of hazard.
May be violently or explosively reactive. Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation.
No smoking, flames or ignition sources. Increase ventilation.
Contain spill with sand, earth or other clean, inert materials.
NEVER use organic absorbents such as sawdust, paper, cloth; as fire may result. Avoid any contamination by organic matter.
Use spark-free and explosion-proof equipment.
Collect any recoverable product into labeled containers for possible recycling. DO NOT mix fresh with recovered material.
Collect residues and seal in labeled drums for disposal.
Wash area and prevent runoff into drains. Decontaminate equipment and launder all protective clothing before storage and reuse.
If contamination of drains or waterways occurs advise emergency services.
DO NOT USE WATER OR NEUTRALIZING AGENTS INDISCRIMINATELY ON LARGE SPILLS.

Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Avoid generating and breathing mist. Do not allow clothing wet with material to stay in contact with skin.
Avoid all personal contact, including inhalation.
Wear protective clothing when risk of exposure occurs.
Use in a well-ventilated area.
WARNING: To avoid violent reaction, ALWAYS add material to water and NEVER water to material.
Avoid smoking, bare lights or ignition sources.
Avoid contact with incompatible materials.
When handling, DO NOT eat, drink or smoke.
Keep containers securely sealed when not in use. Avoid physical damage to containers. Always wash hands with soap and water after handling. Work clothes should be laundered separately.
Launder contaminated clothing before reuse.
Use good occupational work practices. Observe manufacturer's storing and handling recommendations. Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.

Recommended Storage Methods: Stainless steel drum. Check that containers are clearly labeled.
Packaging as recommended by manufacturer.

Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Use in a well-ventilated area.
Local exhaust ventilation may be required for safe working, i. e. , to keep exposures below required standards; otherwise, PPE is required.
If risk of overexposure exists, wear NIOSH-approved respirator.
Correct fit is essential to obtain adequate protection.
In confined spaces where there is inadequate ventilation, wear full-face air supplied breathing apparatus.

Personal Protective Clothing/Equipment:

Eyes: Chemical goggles. Full face shield.
DO NOT wear contact lenses. Contact lenses pose a special hazard; soft contact lenses may absorb irritants and all lenses concentrate them.

Hands/Feet: Bare unprotected skin should not be exposed to this material. Impervious, gauntlet length gloves i.e., butyl rubber gloves or Neoprene rubber gloves or wear chemical protective gloves, e.g. PVC.

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Wear safety footwear or safety gumboots, e.g. Rubber.

Respiratory Protection:

Exposure Range >2 to <25 ppm: Supplied Air, Constant Flow/Pressure Demand, Half Mask

Exposure Range 25 to unlimited ppm: Self-contained Breathing Apparatus, Pressure Demand, Full Face

Other: Operators should be trained in procedures for safe use of this material.

Acid-resistant overalls or Rubber apron or PVC apron.

Ensure there is ready access to an emergency shower.

Ensure that there is ready access to eye wash unit.

Ensure that there is ready access to breathing apparatus.

Glove Selection Index:

BUTYL ..... Best selection
HYPALON ..... Best selection
NEOPRENE..... Best selection
NEOPRENE/NATURAL..... Best selection
PE/EVAL/PE ..... Best selection
SARANEX-23 ..... Best selection
NATURAL RUBBER..... Satisfactory; may degrade after 4 hours continuous immersion
NATURAL+NEOPRENE..... Satisfactory; may degrade after 4 hours continuous immersion
PVC..... Poor to dangerous choice for other than short-term immersion
NITRILE+PVC ..... Poor to dangerous choice for other than short-term immersion

Section 9 - Physical and Chemical Properties

Appearance/General Info: Clear, colorless to slightly yellow liquid. Sharp strong odor.
CAUTION: exothermic dilution hazard.
HIGHLY CORROSIVE. Corrosive to most metals. Powerful oxidizing agent.
Darkens to brownish color on aging and exposure to light.

Physical State: Liquid
Odor Threshold: 0.75 to 2.50 mg/m^3
Vapor Pressure (kPa): 8.26
Vapor Density (Air=1): 1.5
Formula Weight: 63.02
Specific Gravity (H_2O=1, at 4 °C): 1.3-1.42
pH: < 1

pH (1% Solution): 1
Boiling Point: 83 °C (181 °F) at 760 mm Hg
Freezing/Melting Point: -42 °C (-43.6 °F)
Volatile Component (% Vol): 100 (nominal)
Decomposition Temperature (°C): Not applicable
Water Solubility: Soluble in all proportions

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Presence of heat source and direct sunlight. Storage in unsealed containers. Hazardous polymerization will not occur.

Storage Incompatibilities: Segregate from reducing agents, finely divided combustible materials, combustible materials, sawdust, metals and powdered metals.

Avoid contamination of water, foodstuffs, feed or seed.

Segregate from alkalies, oxidizing agents and chemicals readily decomposed by acids, i.e. cyanides, sulfides, carbonates.

Section 11 - Toxicological Information

Toxicity

Oral (human) LD_{Lo}: 430 mg/kg
Inhalation (rat) LC_{50}: 2500 ppm/1 hr
Unreported (man) LD_{Lo}: 110 mg/kg

Irritation

Nil reported

See *RTECS* QU 5775000, for additional data.

Section 12 - Ecological Information

Environmental Fate: No data found.

Ecotoxicity: LC_{50} Starfish 100-300 mg/l/48 hr /Aerated water conditions; LC_{50} Shore crab 180 mg/l/48 hr /Static, aerated water conditions; LC_{50} Cockle 330-1000 mg/l/48 hr /Aerated water conditions

BCF: no food chain concentration potential

Biochemical Oxygen Demand (BOD): none

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Section 13 - Disposal Considerations

Disposal: Recycle wherever possible. Special hazards may exist - specialist advice may be required.
Consult manufacturer for recycling options.
Follow applicable federal, state, and local regulations.
Treat and neutralize at an approved treatment plant.
Decontaminate empty containers. Observe all label safeguards until containers are cleaned and destroyed.
Puncture containers to prevent reuse and bury at an authorized landfill.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Note: This material has multiple possible HMT entries. Choose the appropriate one based on state and condition of specific material when shipped.

Shipping Name and Description: Nitric acid *other than red fuming, with more than 70 percent nitric acid*

ID: UN2031
Hazard Class: 8 - Corrosive material
Packing Group: I - Great Danger
Symbols:
Label Codes: 8 - Corrosive, 5.1 - Oxidizer
Special Provisions: B47, B53, T10, TP2, TP12, TP13
Packaging: **Exceptions:** None **Non-bulk:** 158 **Bulk:** 243
Quantity Limitations: **Passenger aircraft/rail:** Forbidden **Cargo aircraft only:** 2.5 L
Vessel Stowage: **Location:** D **Other:** 44, 66, 89, 90, 110, 111

Shipping Name and Description: Nitric acid *other than red fuming, with not more than 70 percent nitric acid*

ID: UN2031
Hazard Class: 8 - Corrosive material
Packing Group: II - Medium Danger
Symbols:
Label Codes: 8 - Corrosive
Special Provisions: B2, B47, B53, IB2, T8, TP2, TP12
Packaging: **Exceptions:** None **Non-bulk:** 158 **Bulk:** 242
Quantity Limitations: **Passenger aircraft/rail:** Forbidden **Cargo aircraft only:** 30 L
Vessel Stowage: **Location:** D **Other:**

Shipping Name and Description: Nitric acid, red fuming

ID: UN2032
Hazard Class: 8 - Corrosive material
Packing Group: I - Great Danger
Symbols: + - Override definitions
Label Codes: 8 - Corrosive, 5.1 - Oxidizer, 6.1 - Poison *or* Poison Inhalation Hazard *if inhalation hazard, Zone A or B*
Special Provisions: 2, B9, B32, B74, T20, TP2, TP12, TP13, TP38, TP45
Packaging: **Exceptions:** None **Non-bulk:** 227 **Bulk:** 244
Quantity Limitations: **Passenger aircraft/rail:** Forbidden **Cargo aircraft only:** Forbidden
Vessel Stowage: **Location:** D **Other:**

Section 15 - Regulatory Information

EPA Regulations:
RCRA 40 CFR: Not listed
CERCLA 40 CFR 302.4: Listed per CWA Section 311(b)(4) 1000 lb (453.5 kg)
SARA 40 CFR 372.65: Listed
SARA EHS 40 CFR 355: Listed
RQ: 1000 lb
TPQ: 1000 lb
TSCA: Listed

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Section 16 - Other Information

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REPORT

Remedy Implementation Completion Report

The Sherwin-Williams Company
1450 Sherwin Avenue
Emeryville, California

Prepared For:

The Sherwin-Williams Company
101 Prospect Avenue NW
Cleveland, OH 44115

Prepared By:

CDM Smith Inc.
100 Pringle Avenue, Suite 300
Walnut Creek, California 94596

July 25, 2012

CDM Smith

Remedy Implementation Completion Report

The Sherwin-Williams Company
1450 Sherwin Avenue
Emeryville, California

July 25, 2012

Prepared For:

The Sherwin-Williams Company
101 Prospect Avenue NW
Cleveland, OH 44115-1075

CERTIFICATION:

This document was prepared under the direction and supervision of qualified, registered professionals.

David K. Cline, P.E.
CDM Smith Inc.

Pawan K. Sharma, P.E.
CDM Smith Inc.

Envirocon

July 25, 2012

Mr. Larry Mencin
Sherwin-Williams
1450 Sherwin Ave.,
Emeryville, CA 94608

RE: Certification Letter for the Remedy Implementation Completion Report
The Sherwin-Williams Company: 1450 Sherwin Avenue,
Emeryville, California

Dear Mr. Mencin:

The intent of this letter is to summarize the design components and remedial activities performed by Envirocon in executing our contract for The Sherwin-Williams Company (S-W) property located at 1450 Sherwin Avenue in Emeryville, California and in doing so, certify that these activities were performed in accordance with the Remedial Design and Implementation Plan.

- Design Assistance with formalizing the Final Remedial Design Implementation Report (RDIP), dated June 29, 2011, included:

    - Heave Management Plan and Earthwork Requirements, prepared by TRC Solutions, dated January 24, 2011: *Geotechnical Recommendations, Remedial Design and Implementation Plan (RDIP), Former Sherwin-Williams Coating Facility, Emeryville, California*;

    - Temporary Shoring Design along Horton Street and Building 31 to support excavation to depths of -11 FT NAVD88, prepared by Condon Johnson, dated February 10, 2011: *Temporary Shoring Plans;*

    - Dust and Vapor Control Plan to mitigate public concerns at the Site perimeter, prepared by KUMA Corporation, dated May 2011: *Dust and Vapor Control Plan V1.6;*

    - Noise and Vibration Monitoring and Mitigation Plan to compare background levels to high energy construction equipment; prepared by Eilar Associates, Inc., dated January 20, 2011, *Noise and Vibration Monitoring Plan*;

- Stability Analysis to support the excavation(s) of each: Slurry Wall Extension, Slurry Wall Breaches, and the Interceptor Trench, prepared by Envirocon, dated October 25, 2011: *Trench Stability Calculation for SWE* (Submittal No. 004.c.1), November 7, 2011: *Trench Stability Calculations for Slurry Wall Breaches* (Submittal No. 011.b), and November 23, 2011: *Interceptor Trench Stability Calculations* (submittal No. 014.f);

- Excavation Design Plan developed to incorporate boring logs from historical and recent data into a 3-dimensional excavation plan that could be utilized to segregate the excavation into 8 separate categories; prepared by Envirocon, dated March 19, 2011: *Excavation Design Plan*(s).

- Pre-mobilization activities including submittal of workplans and acquiring construction related permits;

- Installation and operation of a temporary soil vapor extraction and treatment system to remove volatile organics from excavation area vadose zone soils;

- Relocation of high-pressure natural gas line from adjacent to the excavation, under the western sidewalk along Horton Street, to the other side of the street;

- Removal and offsite disposal of aboveground and underground structures, pipes, and debris containing arsenic, lead, and/or organic contaminants, primarily consisting of the raised cap and former water treatment plant;

- Excavation and offsite disposal of vadose zone soil containing arsenic, lead, and/or organic contaminants to support future potential residential use of the Site;

- Excavation and offsite disposal of saturated zone soil containing arsenic, lead, and/or organic contaminants to support long-term protection of groundwater underlying the Site;

- Excavation dewatering, onsite treatment, and discharge to sanitary sewer;

- Backfill of excavation areas to control groundwater movement within the Site;

- Placement of backfill and gravel cover to re-grade the Site to facilitate storm water drainage;

- Extension of the existing slurry wall along the southwestern portion of the Site;

Envirocon

- Installation of a membrane barrier and interceptor trench to prevent movement of groundwater from the S-W property to the Novartis property;

- Removal of portions of the existing slurry wall to facilitate groundwater movement from the Site to offsite, downgradient (western) areas;

- Abandonment of a former underground storage tank (UST) at the Site.

The remedial activities listed above including those items specifically identified to support the design assistance were, to the best of my knowledge and belief, performed in general accordance with the Final Remedial Design and Implementation Plan (RDIP) and its associated documents including Department of Toxic Substances Control (DTSC) approved variances, as described and documented in the Remedy Implementation Completion Report prepared by CDM Smith, dated July 25, 2012.

Further, my review of the project data and quality control procedures and my assessment of the persons directly responsible for gathering QA/QC information pertaining to construction of the remedy elements associated with the RDIP indicate that these activities were, to the best of my knowledge and belief, conducted in general accordance with applicable industry standards and the Site specific Quality Control/Quality Assurance Project Plan.

Respectfully submitted,

Tino Maestas, P.E.
Senior Engineer
Envirocon, Inc.

Cc Peter Joy, Envirocon Director of Operations
Jeff Rankin, Envirocon Project Director

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Executive Summary

This Remedy Implementation Completion Report (Completion Report) has been prepared for The Sherwin-Williams Company (S-W) property located at 1450 Sherwin Avenue in Emeryville, California and a portion of the adjacent former Rifkin property, located at 4525 – 4563 Horton Street, to which hazardous substances have migrated from the S-W property. Collectively the S-W property and this portion of the former Rifkin property are referred to as the "Site" within this document. The Site consists of approximately 10 acres. Novartis Vaccines and Diagnostics, Inc. (Novartis) is the current owner of the former Rifkin property.

This Completion Report is consistent with the description of report contents presented in Section 14.2.1 of the Remedial Design Implementation Plan (RDIP), dated June 29, 2011 (CDM, 2011), and with the Department of Toxic Substances Control (DTSC) Imminent and Substantial Endangerment Determination and Order and Remedial Action Order No. 05/06-007 (the Order) and the Remedial Action Plan (RAP), dated May 10, 2006 and June 14, 2010, respectively (DTSC, 2006 and CDM, 2010). The RAP and RDIP were approved by DTSC in their letters dated June 14, 2010 and June 30, 2011, respectively (DTSC, 2010 and DTSC, 2011a). DTSC had previously provided conditional approval to proceed with soil excavation after partial review of the RDIP in their letter dated June 8, 2011(DTSC, 2011b). The RAP and RDIP provide summaries of the Site location, background, geology/hydrogeology, and history, and previous project remedial investigation results and actions.

The remedy implementation has achieved the project remedial action objectives (RAOs). The following presents the RAOs that were established for the Site in the RAP and remedy component that fulfills the RAO:

Remedial Action Objective (RAO)	*Remedy Component*
▪ Minimize direct contact/ingestion by humans with Site soil containing chemicals of concern (COCs) at concentrations exceeding the cleanup goals.	▪ Removal of vadose zone soil with COC concentrations above cleanup goals. ▪ Development and recording of the land use covenant (LUC). ▪ Monitor for unknown contamination in areas outside existing removal areas, as identified in the project operation, maintenance and monitoring (OM&M) plan and/or subsequent DTSC-approved modifications. ▪ Monitor soil gas conditions, as identified in the OM&M plan and/or subsequent DTSC-approved modifications.
▪ Minimize migration of and/or inhalation of airborne dust by humans from the Site containing COCs at concentrations exceeding the cleanup goals.	▪ Removal of vadose zone soil with COC concentrations above cleanup goals. ▪ Development and recording of the LUC, controlling intrusive activity at the S-W property.

Remedial Action Objective (RAO)	*Remedy Component*
▪ Minimize exposure to and inhalation by humans of volatile organic COCs at concentrations in indoor air exceeding the cleanup goals.	▪ Removal of vadose zone soil with COC concentrations above cleanup goals. ▪ Development and recording of the LUC. ▪ Monitor for unknown contamination in areas outside existing removal areas, as identified in the OM&M plan and/or subsequent DTSC-approved modifications. ▪ Monitor soil gas conditions, as identified in the OM&M plan and/or subsequent DTSC-approved modifications.
▪ Minimize risk to down-gradient ecological receptors from off-site groundwater migration containing COCs at concentrations exceeding the cleanup goals.	▪ Removal of saturated zone soil with COC concentrations identified as source material. ▪ Backfill to control groundwater movement. ▪ Installation of slurry wall breaches and extension; maintain key portions of existing slurry wall. ▪ Monitor groundwater conditions, as identified in the OM&M plan and/or subsequent DTSC-approved modifications.
▪ Minimize on-site human contact with groundwater containing COCs at concentrations exceeding the cleanup goals.	▪ Removal of saturated zone soil with COC concentrations identified as source material. ▪ Development and recording of the LUC.

Vadose zone soils with chemicals of concern above cleanup goals have been removed. Confirmation samples were collected from the vadose zone excavation sidewalls to demonstrate conformance with the cleanup goals as established in the RAP.

The remedy implementation occurred between March 2011 and April 2012, and consisted of the following key components:

- Installation and operation of an air monitoring system and air sampling program to evaluate the effectiveness of Site controls in maintaining the safety of the surrounding community.
- Installation and operation of a temporary soil vapor extraction and treatment system to remove volatile organics from the most impacted vadose zone excavation area.
- Relocation of a high-pressure natural gas line, from under the western sidewalk of Horton Street (i.e., adjacent to the excavation) to the other side of the street.
- Removal and offsite disposal of aboveground and underground structures, pipes, and debris containing arsenic, lead, and/or organic contaminants, primarily consisting of the raised cap and former water treatment plant.

- Excavation and offsite disposal of vadose zone soil containing arsenic, lead, and/or organic contaminants to support future potential residential use of the Site.
- Excavation and offsite disposal of saturated zone soil containing arsenic, lead, and/or organic contaminants to support long-term protection of groundwater.
- Excavation dewatering, and onsite pre-treatment and discharge to sanitary sewer of extracted water.
- Backfill of excavation areas to control groundwater movement within the Site.
- Placement of backfill and gravel cover to re-grade the Site to facilitate storm water drainage.
- Extension of the existing slurry wall along the southwestern portion of the Site.
- Installation of a membrane barrier and interceptor trench to prevent movement of groundwater from the S-W property to the Novartis property.
- Removal of portions of the existing slurry wall to control groundwater movement from the Site to offsite, downgradient (western) areas.
- Abandonment of a former underground storage tank (UST) at the Site.
- Abandonment of selected existing groundwater wells no longer required for the project.
- Installation of new groundwater wells required for the post-remedy implementation groundwater monitoring program.

The remedy implementation was completed by S-W's contractors, Envirocon Inc., Waste Solutions Group, and CDM Smith Inc., and their subcontractors.

This Completion Report provides summaries of the completed remedy components; documents variances in their implementation from that described in the RDIP; presents actual amounts and dispositions of waste; presents the results of the air monitoring and sampling; presents selected photographic documentation of pre- and post-remedy Site conditions; and, presents locations and plans for protection and monitoring of installed remedy components.

Variances from the RDIP are identified in this Completion Report with reference to the RDIP sections. For reference, the RDIP Table of Contents is included with this Completion Report as Attachment A.

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Section 1

Documentation of Results

1.1 Locations and Quantities of Excavated Soil

The Asbuilt Drawings in Attachment B illustrate the final spatial boundaries of the excavation areas. Based on the actual weigh tickets returned from receiving landfills, 149,708 tons of soil and debris were removed from the Site. Of this amount, approximately 139,600 tons were removed to support the remedy; the preliminary estimate for waste disposal amount during remedy planning was 106,200 tons. The larger final quantity for soil removal to support the remedy is due to (1) the expanded excavation boundary in the main excavation area and (2) higher amounts of debris/concrete encountered resulting in relatively higher density to the excavation volume removed.

The approximately 20,148 tons of additional soil and debris removed from the Site were from activities that developed from the remedy implementation but did not directly support the RAOs, including:

- removal of underground utility pipes and overlying soils encountered during excavation, slurry wall extension, and activities pertaining to slurry wall breaches,
- removal of pavement, vadose zone soil, and buried concrete foundations within the northern portions of the S-W property to support storm water drainage, and
- removal of the water treatment plant (WTP), and underlying vadose zone soils, after completion of dewatering activities.

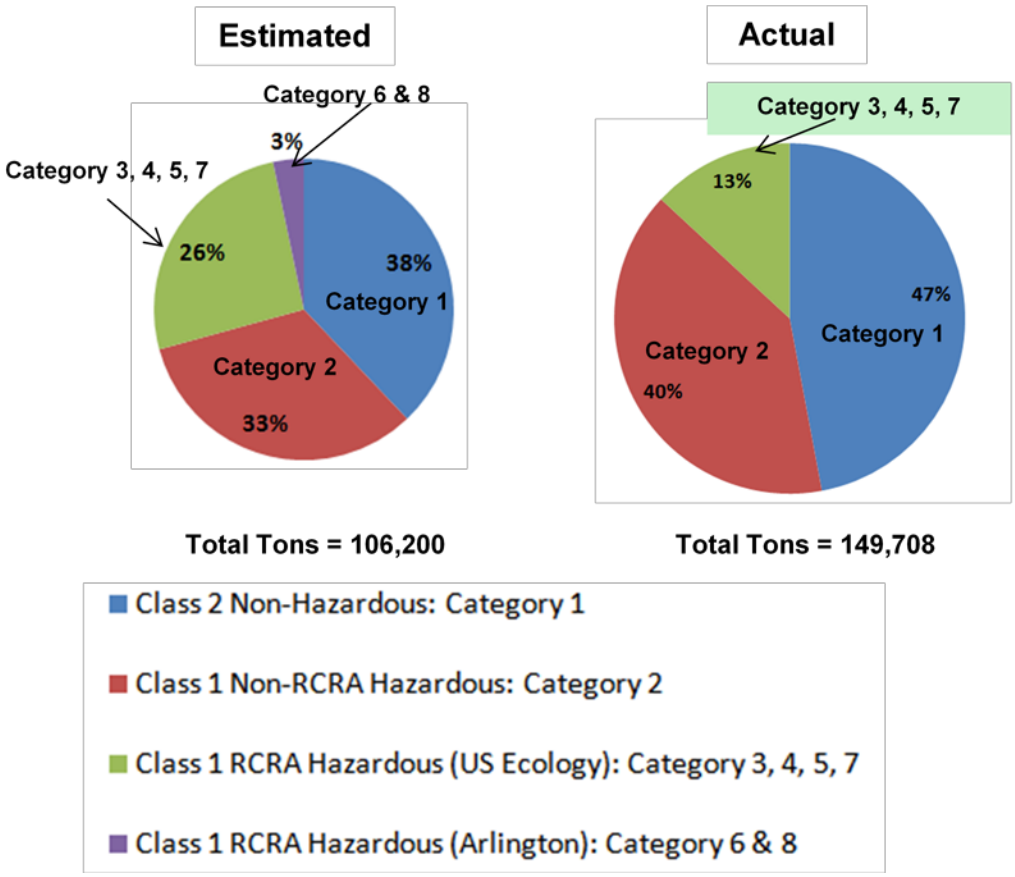
1.2 Amounts Disposed by Waste Characterization Profile

The RDIP identified eight possible project waste categories from the excavation, based on evaluation of in place sample results and state/federal hazardous waste regulations. The U.S. EPA waste classification for each category is described as follows:

- Category 1 - Class 2, non-hazardous waste.
- Category 2 - Class 1, non-RCRA hazardous waste.
- Categories 3 through 8 - Class 1, RCRA hazardous waste of various types.

The RDIP estimated amounts of materials for each of these eight categories. The materials for Categories 1 through 5 and 7 (see below) were transported to their designated facilities listed in the RDIP. Anticipated RCRA hazardous waste containing metal and organic underlying hazardous constituents with total volatile organic compounds at or greater than 500 mg/kg (Category 6 and 8) were not identified during stockpile characterization. No material was transported to the designated disposal facility for these two categories (in Arlington, OR). Hazardous waste was shipped under manifests with S-W EPA generator identification number CAD003934601. Non-RCRA and RCRA waste manifests are presented in Attachment J1 and Attachment J2, respectively.

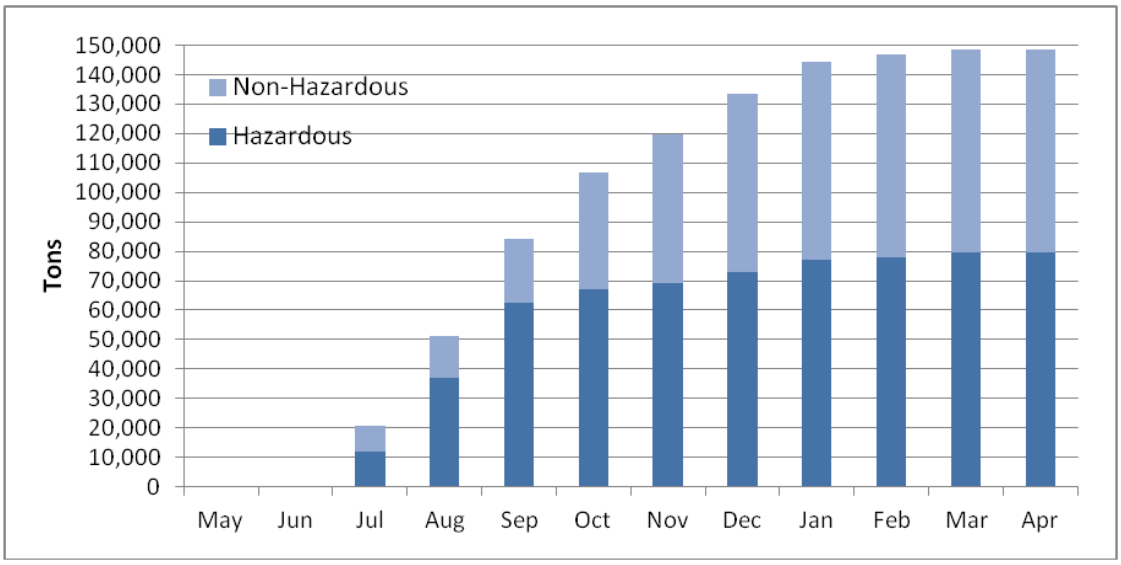
The two pie charts shown below reflect the percentages of waste disposal by category, as estimated in the RDIP and the actual disposition.



Final waste amounts removed from the Site are presented by their waste characterization results below and are based on reported weights received by the disposal facilities.

Waste Characterization	*Project Waste Category*	*Amount (Tons)*
Class 2 Non-Hazardous	1	69,671
Class 1 Non-RCRA Hazardous	2	60,650
Class 1 RCRA Hazardous (US Ecology)	3, 4, 5, 7	19,387
Class 1 RCRA Hazardous (Arlington)	6 & 8	0

The following chart presents excavated materials transported offsite (in accumulated tons by month):



The following summarizes total truck loads and rail cars by waste type:

Total trucks with non-hazardous waste loads out:	2,670
Total trucks with non-RCRA hazardous waste loads out	302
Total trucks with RCRA hazardous waste loads out:	4
Total rail cars with RCRA hazardous waste loads out	180
Total rail cars with non-RCRA hazardous waste loads out:	502

1.3 Soil Vapor Extraction and Treatment

In accordance with the RDIP and the Bay Area Air Quality Management District (BAAQMD) operation permit, the soil vapor extraction and treatment (SVET) system was operated prior to excavation activities. The extraction wells were installed between April 25 and 29, 2011 under an Alameda County Public Works Agency (ACPWA) permit, and the treatment system assembled during that same timeframe. The wells and treatment system were built in accordance with the RDIP. Startup of the system occurred May 2, 2012 and it operated for approximately six weeks until total VOC levels in the soil gas stabilized and DTSC approved the commencement of excavation activities. The wells were abandoned under an ACPWA permit by removal during excavation. Site permits are included in Attachment F.

Attachment D1 presents a summary of the daily total flow rate and total VOC measurements during the SVET operation. Total VOC measurements were one to three orders of magnitude higher than that anticipated in the RDIP. The constructed treatment system was able to handle this additional mass rate. Per the BAAQMD permit, bi-weekly samples were collected from the SVET system effluent stream. No VOCs were detected in any of these samples and reporting limits were below permit requirements. Site permits are included in Attachment F.

1.4 Air Quality Monitoring Results

Throughout the remediation activities, as described in RDIP Section 14, air quality on and surrounding the Site was monitored and the results submitted to DTSC in weekly and monthly reports, and in daily reports for the first several weeks. Air quality monitoring reports submitted were posted to the DTSC website where they are available for review (DTSC Envirostor, 2012) and are provided in Attachment C.

The airborne concentrations of Total Volatile Organic Compounds (TVOC) and Respirable Particulate Matter of 10 microns or less (RPM10) for the air monitoring stations were below the project action levels as presented in the charts in Attachment D2.

RPM10 readings from the air monitoring stations ranged from 0.0 micrograms per cubic meter ($\mu g/m^3$) to 432 $\mu g/m^3$ and averaged less than acute RPM10 action levels for any 4-hour period as established for the phases of the excavation: raised cap removal, vadose zone soil removal, and saturated soil removal. During the monitoring, the running average for RPM10 readings from the start of the project was less than the subchronic RPM10 action level (see charts in Attachment D2).

TVOC readings from the air monitoring stations ranged from 0.0 parts per million volume (ppmv) to 12.8 ppmv and averaged less than 1.80 ppmv for any one 24-hour period, which is less than the acute TVOC action level. During the monitoring, the running average for TVOC readings from the start of the project was less than the subchronic TVOC action level (see charts in Attachment D2).

Shortly after startup it was determined the perimeter misters, being used for odor and vapor control, located adjacent to the air monitoring stations were impacting the RPM10 readings. The very low particle sizes of the mist were being included in the monitor's readings. Through a DTSC-approved protocol for daily calibration of the incremental increase in RPM10 readings due to the effects of the misters, a daily adjustment to the action level for AMS #3 was applied. Near the end of October, as the misters were no longer in use, calibration and daily adjustment of the action level were discontinued. As the RPM10 chart indicates this adjusted action level had no relevance to the running average over the length of the project. The correspondence with DTSC regarding the daily calibration of the AMS#3 action level is provided in Attachment D2.

During the first six weeks of excavation, daily air samples were collected at several of the AMS locations for laboratory analysis of arsenic, lead and volatile organic compounds in conjunction with the real time monitoring of TVOC and RPM10 readings at seven AMS locations. These laboratory results verified that the derivations of the action levels for real-time monitoring were protective of the surrounding community. The daily collection of air samples was discontinued, with DTSC approval, after demonstrating that Site controls were keeping chemical concentrations in perimeter air below established performance standards. In addition, the real-time TVOC and RPM10 monitoring at the seven AMS location was determined to be acceptable for assessing air quality and protection of surrounding community. The DTSC approval letter is provided in Attachment D2.

On March 5, 2012, the perimeter air monitoring system was taken offline and replaced with local air monitoring using handheld units. This modification to the air monitoring program was previously approved by DTSC on March 1, 2012. The perimeter air monitoring system was subsequently decommissioned and demobilized from the Site in March 2012.

Local air monitoring was conducted within the Site during waste handling activities in March 2012, at breathing level heights outside and downwind of the exclusion zone. The local air monitoring during

this period and its results are discussed below; no action levels were exceeded during the activities. No waste handling activities requiring local air monitoring occurred in April 2012. Wastes materials transported offsite in April 2011 were in closed drums or boxes without potential for dust or vapor generation.

RPM10 readings during waste handling activities in March 2012 from handheld units ranged from 0.0 µg/m^3 to 490 µg/m^3 and averaged less than 45 µg/m^3 for any 4-hour period, which is less than the acute RPM10 action levels for activities: vadose zone soil removal and saturated soil removal. The readings maintain the running average for RPM10 since the start of the project to be less than the subchronic RPM10 action level.

TVOC readings during waste handling activities in March 2012 from handheld units ranged from 0.0 ppmv to 11.8 ppmv and averaged less than 0.40 ppmv for any one 24-hour period, which is less than the acute TVOC action level. The readings maintain the running average for TVOCs since the start of the project to be less than the subchronic TVOC action level.

1.5 Vadose Zone Soil Confirmation Sample Results

Vadose zone soil confirmation samples were collected and analyzed for arsenic, and compared to its cleanup goals for two areas of the Site:

- The main excavation area, and
- The four "hot spots" and former UST excavation areas.

The cleanup goal consists of the 95UCL of the arsenic results from the confirmation samples be less than 24 mg/kg, with no arsenic result exceeding 100 mg/kg. The results confirmed that the final excavation extents had removed vadose zone soils with arsenic above the cleanup goal. Confirmation samples collected from the vadose zone excavation sidewalls demonstrate conformance with the cleanup goal. A summary of these two sets of data is presented in Attachment D3.

Samples were collected from the excavation sidewalls in accordance with the RDIP. See Attachment B for Asbuilt Drawings showing the main excavation vadose soil confirmation sample locations. Attachment D3 presents the sidewall location information for each "hot spot" excavation vadose zone soil confirmation sample.

For the main excavation area, one sample was collected approximately every 50 feet along the sidewalls at random depths. Samples were collected during two separate events.

Around mid-September 2011, with DTSC approval, it was attempted to demonstrate attainment of the vadose zone cleanup goal prior to completing the western vadose zone excavation design extent presented in the RDIP; design excavation had been completed along Horton Street and the northern and southern extents. As such, 19 sample locations – spaced approximately every 50 feet – were identified around the perimeter of the excavation extents at this time, with location 1 in the southeast corner, along Horton Street, moving clockwise to location 19 in the northeast corner of the excavation, again along Horton Street. Results from samples 1 to 5 and 15 to 19 were below the cleanup goal, with arsenic results ranging from 3.8 mg/kg to 31 mg/kg. Results from samples 6 to 10 and 13 to 14 are no longer representative because further excavation was conducted in response to the high arsenic results from samples 8, 9, 10, 13, and 14, which ranged from 52 mg/kg to 1,100 mg/kg. Given

these high results, samples from locations 11 and 12 were not collected and additional excavation was conducted at these areas.

After the additional excavation, vadose zone confirmation samples were collected along this new western extent in late November 2011, at locations 20 to 29. Results from samples 21 to 29 were below the cleanup goal, with arsenic results ranging from 4.1 mg/kg to 54 mg/kg. Result from sample 20 is no longer representative because further excavation was conducted in response to its high arsenic result of 115 mg/kg.

Four "hot spots" were located and sampled based on previous soil boring sample results exceeding 100 mg/kg arsenic in the vadose zone outside the main excavation, as presented in the RDIP. "Hot spots" were named based on these previously associated soil borings: SA-BH-04, SA-AH-01, CDM-SB50, and SB-7AB. The locations of these four "hot spot" excavations are presented in Attachment B.

The results for the north, east, and west wall sidewall samples from "hot spot" SA-BH-04 were below the cleanup goal. The arsenic results ranged from 5.4 mg/kg to 29 mg/kg. The south wall sample result of this "hot spot" exaction is no longer representative due to subsequent additional excavation conducted for an underground pipe removal. No additional sample was collected along the south wall as the excavation progressed to the Sherwin-Williams property line with the City of Emeryville Parcel D site, where soils had been removed previously by the City of Emeryville and replaced with imported backfill.

Results for sidewall samples from "hot spot" SA-AH-01 were below the cleanup goal. Arsenic results ranged from 7.7 mg/kg to 9.4 mg/kg.

Initial north, east, and west sidewall samples from "hot spot" CDM-SB50 were above the cleanup goal, with arsenic ranging from 50 to 370 mg/kg. The south sidewall sample was below the cleanup goal, at 21 mg/kg. Additional excavation was conducted towards the north, east, and west, and this "hot spot" was incorporated into the main excavation toward excavation to the east. After the additional excavation, vadose zone confirmation samples were collected along these new extents to the north and west. These results were below the cleanup goal, with arsenic of 21 mg/kg and 9.9 mg/kg, respectively. The eastern extent of the "hot spot" was connected to the main excavation, and there no longer was an eastern sidewall to sample.

Initial results for south sidewall samples from "hot spot" SB-7AB did not meet cleanup goal, with arsenic ranging from 55 to 77 mg/kg. After further excavation of the south sidewall, an arsenic result of 24 mg/kg was obtained. With the north, east, and west sidewall arsenic results of 9.6 mg/kg to 29 mg/kg, the final sidewall sample results were below the cleanup goal.

Due to changes in the extent of the main excavation (discussed further in Section 2), one of the "hot spot" excavation areas was incorporated into the main excavation ("hot spot" excavation for boring CDM-SB50) for comparison to its cleanup goal.

At DTSC's direction, sidewall samples from the former UST excavation for arsenic were incorporated with those from the "hot spot" excavation areas for comparison to its cleanup goal.

1.6 Groundwater Monitoring and Sample Results

In accordance with the RDIP, monthly depth to groundwater measurements and quarterly groundwater samples were collected from specified wells. A summary of these results are presented in Attachment D4.

The monthly water levels demonstrated the affects from the excavation dewatering activities as lowered groundwater elevations were observed in wells away from the excavation extents. These results were part of the rationale used to eliminate the need for the French drain and continue to meet the objectives of excavation and backfill (further discussed in Section 2).

Quarterly sampling consisted of analysis for arsenic and VOCs. The RAP established two triggers during remedy implementation for additional post-remedy action:

1. If arsenic exceeds 500 µg/L in any sample/well during remedy implementation, an additional well on former Rifkin well would need to be installed (as specified in RDIP Figure 13-1).

2. If arsenic exceeds its historical maximum detection during remedy implementation, quarterly sampling of that well would be maintained until stable or decreasing trend is determined.

The first trigger did not occur; therefore, an additional well was not installed on the former Rifkin property.

The second trigger occurred at wells RP-1, RP-4, and MW-3 during the remedy implementation, as presented in Attachment D4. These three wells are identified for quarterly sampling in the project OM&M plan.

1.7 Underground Storage Tank Abandonment

Working with DTSC and Alameda County Department of Environmental Health (ACDEH), a tank closure plan was developed for the former UST. The closure plan was developed during an onsite meeting on February 22, 2012. At that time, it was understood that the former UST had been abandoned in place during the slurry wall installation in 1993, as previously reported. Excavation was conducted around the former UST to determine if it would be feasible to remove the abandoned UST, presumed to have been previously filled with grout. However, it was discovered that the former UST had not been abandoned in place. In addition, it was observed that a portion of the former UST was underneath the Site transformer and therefore could not be removed without providing structural support to the transformer. The top of former tank was measured at El. 13.3 ft North American Vertical Datum of 1988 (NAVD88).

As agreed upon by DTSC and ACDEH, the former UST closure consisted of abandoning it in place. As instructed by ACDEH, the tank interior was rinsed to remove sludge and to clean the interior walls. The former UST was filled with neat cement on February 24, 2012. An ACDEH representative observed the tank cleaning, documented that the tank interior was sufficiently cleaned, and observed the filling with neat cement. Approximately 12 cubic yards of neat cement were poured into the former tank, which is consistent with the dimensions of the former UST. During filling of the former tank, lighter material coming to the surface from the former tank interior was not observed, confirming the former UST had been cleaned sufficiently.

At the direction of DTSC, potential impacted vadose zone soils were excavated around the former UST to approximately El. 10 ft NAVD88: north along the transformer pad, east toward the Site building until underground water lines were encountered, south into the arsenic "hot spot" excavation, and west into the existing excavation for railroad and storm sewer demolition. Excavation surrounding the former UST was conducted to the extent possible with the engineering constraints of the transformer pad, existing waterlines and Site building. See Attachment B for Asbuilt Drawings showing the footprint of the excavation around the former UST.

Vadose zone soil samples were collected along the north, east, northwest and northeast sidewalls of the excavation. Soil samples on the southern portion of the excavation were collected as part of the arsenic "hot spot" excavation. One groundwater sample was collected on western, downgradient side of the former UST by creating a two-foot sump in this area of the excavation bottom (i.e., below the vadose zone soil). Groundwater elevation was approximately El. 9.7 ft NAVD88 at the time of sample collection.

As directed by DTSC, sidewall vadose zone soil and groundwater grab samples were collected for analysis of arsenic, lead, total petroleum as gasoline (TPH-g), diesel (TPH-d), and motor oil (TPH-mo), volatile organic compounds (VOCs), and semi-volatile organic compounds (SVOCs). With DTSC approval, TPH-d and TPH-mo analyses were conducted with silica gel cleanup.

The arsenic results from the sidewall vadose zone soil samples are discussed in Section 1.6 along with the other vadose zone soil confirmation results. These results conform to the Site cleanup goal. Attachment D5 presents a summary of the other results from the sidewall soil samples and the groundwater sample, and provides a comparison to the Site cleanup goals. Of these other results, TPH-d in soil and TPH-g, TPH-d, TPH-mo, and arsenic in groundwater were found above their Site cleanup goals.

After sample collection, the former UST excavation was backfilled consistent with other vadose zone excavation areas at the Site.

1.8 CEQA Mitigation Measures

Two CEQA mitigation measures were identified for the project and were monitored during the remedy implementation as described below.

1.8.1 Cultural Resources Monitoring Results

Archaeological monitoring was undertaken during soil-disturbing activities, when excavating from El. 18 ft NAVD88 to El. 6 ft NAVD88, including removal of asphalt caps and buried concrete and debris and removal of existing slurry walls and groundwater monitoring wells at the Site from July 1-August 8, 2011. Archaeological monitoring during soil-disturbing activities did not identify prehistoric or historic archaeological materials with a potential for significance under CEQA. The Archaeological Monitoring Report, prepared for S-W by the archaeological monitors at URS, is included with this Completion Report as Attachment E.

1.8.2 Park Avenue Street Beautification Project

Due to project-related truck-traffic, the City of Emeryville Park Avenue Street Beautification Project was impacted by the legally loaded truck traffic travelling along the City of Emeryville truck route over the recently finished Park Avenue and Halleck Street intersection. A set of bricks inlaid in the pavement at this intersection were prematurely damaged (chips and cracks) due to the increased

truck-traffic. This assessment was based on comparing the conditions of these bricks after remedy implementation to pre-remedy photographic documentation. The damaged bricks were replaced with new bricks during the week of June 11, 2012. The City of Emeryville provided the new bricks and specifications for installation.

1.9 Permits and Clearances Obtained

1.9.1 RDIP Section 2.2, Permitting

Envirocon or CDM Smith obtained the following permits, which are included in Attachment F, associated with the remedy implementation work:

Permit	*Permit Number*
Alameda County Department of Environmental Health-Underground Tank Closure Permit	SR0020135
Alameda County Public Works Agency-Water Resources Well Permit	W2011-0213 to W2011-0264, W2011-0398, W2011-0399, W2012-0105 to W2012-0107, W2012-0126 to W2012-0139, W2012-0159
BAAQMD Permit to Operate for Soil Vapor Extraction and Abatement System	Application: 23044 Condition: 24917 Plant: 20614
BAAQMD Permit to Operate for Facility-Wide Soil Excavation Project	Application: 23244 Condition: 24986 Plant: 20716
BAAQMD Notification for Water Treatment Plant Demolition and Acknowledgement	Regulation 11, Rule 2
City of Emeryville Grading Permit	G2011-0001
City of Emeryville Shoring Permit	B2011-0031
City of Emeryville Water Treatment Plant Demolition Permit	B2011-0257
City of Emeryville Encroachment Permits	21105121, 21105122, and 21107136
East Bay Municipal Utility District Wastewater Discharge Permit	50372992
OSHA Excavation Notification Permit	2011-904305
Water Quality Control Board, San Francisco Bay Region, Notice of Intent for Coverage under the General Construction Storm Water permit	Application: 415037 WDID: 2 01c361055

Work was conducted in compliance with the requirements and/or conditions established in these permits. City of Emeryville permits were closed with and signed by the City of Emeryville. Other permits were terminated with the respective agency or not renewed at the end of the project.

1.9.2 RDIP Section 2.3.2, Community Safety Plan

The Community Safety Plan, approved as part of the RDIP and included as Appendix B of the RDIP, was successfully implemented during the phases of the remediation activities.

A toll-free, 24-hour community complaint telephone answering service was activated as part of the Community Safety Plan. During the course of the remediation activities, the service logged over 50 calls from 10 individuals within the neighborhood. The project team personally responded to each call by calling the individual the same day. In several cases phone messages were left in lieu of

reaching the caller. In such cases follow up calls with the individual were done within the next day. The responses to the community calls were done in coordination with DTSC as appropriate. The calls were responded to and no open issues are remaining.

The calls and responses were documented in the monthly status reports.

1.9.3 RDIP Section 3.4, Clearance and Relocation of Utilities

Underground Service Alert (USA) was contacted according to the RDIP procedures. The following USA ticket numbers were obtained for the clearances performed:

USA Clearance Area	*Ticket Number*
For asphalt removal and replacement on Halleck Street	080637
For Parcel D excavation	342110
For excavation along Horton Street	047933
For monitoring well installation	0041212, 0073275, 0073316
For BAAQMD construction and operation of SVE system	0111814

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Section 2
Variances from RDIP

The RDIP presented engineering and monitoring details regarding the planned remedy implementation activities as anticipated with the information available at the time. Based on field conditions encountered at the time of implementation, some of the engineering and monitoring details were modified in order to maintain the effectiveness of the remedy. The information presented in this section identifies only those details that varied in some way from RDIP. Section references presented here identify the specific sections of the RDIP, and in some cases refer to additional information in attachments to this Completion Report.

For reference, the RDIP Table of Contents is included with this Completion Report as Attachment A. Only RDIP Sections with variances are presented below.

2.1 RDIP Section 3 – Pre-Excavation Activities

2.1.1 RDIP Section 3.2, Groundwater Monitoring Well Abandonment

Table 3-1 of the RDIP listed the groundwater wells planned for abandonment. These wells were abandoned under permit and reports for the abandonments were submitted to ACPWA, except well LF-6. LF-6 was determined to have been previously abandoned and its status was confirmed with ACPWA. Copies of these reports are included in Attachment G1. Site permits are included in Attachment F. One deviation from the RDIP was that in addition to abandonment of wells by (1) drill out with tremie grout backfill or (2) in-place abandonment via tremie grout and removal of well vault, some wells were removed completely during excavation. This was approved by ACPWA. .

2.1.2 RDIP Section 3.6, Subsurface Vapor Extraction and Treatment

The SVE system was installed and operated in accordance with the RDIP. The original schedule for operation of the SVE system was estimated for no more than 4 weeks. However, the system operated for 6.5 weeks in order to remove additional mass of subsurface organic vapors.

2.2 RDIP Section 4 – Raised Cap Removal and Shoring

2.2.1 RDIP Section 4.1, Removal of Raised Cap

The actual sequencing of Raised Cap removal differed from the RDIP text (see last paragraph of this particular RDIP section) to accommodate scheduling changes for the shoring installation subcontractor and overall excavation logistics on the Site.

2.2.2 RDIP Section 4.3, Shoring along Horton Street and Building 31

Two of the installed soldier beams (beams numbered 2 and 3) for the shoring wall met refusal while being vibrated into place. These two beam installations were reviewed by the project structural engineer and approved as installed.

Timber lagging for the shoring wall was not necessary in the bottom five feet of the deepest excavation areas due to a change in the excavation sequence. Excavations along these areas were originally to be conducted in the middle of the main excavation activities. It was actually conducted at the end and removed in small sections and backfilled immediately, allowing for sufficient support of

the shoring wall at these depths. Sumps at both ends of the deep excavation area were installed and continuous pumping was conducted to lower the hydraulic gradient along the shoring wall.

The RDIP allowed for the installation of tie-backs. It was initially planned, during the RDIP preparation, that tie-backs would not be allowed by the City of Emeryville to be left in place once the excavation was completed. Therefore, the RDIP indicated that "No shoring elements will remain". However, during finalization of the RDIP, the City of Emeryville approved and permitted the use of tie-backs, and for them to be left in place. These tie-backs were cut, during removal of the shoring wall, and the portions under Horton Street were left in place. Locations of the remaining portions are presented in Attachment B. Site permits are included in Attachment F.

2.3 RDIP Section 5 – Excavation and Dewatering

2.3.1 RDIP Section 5.1, Excavation Dewatering

The RDIP text in this section included an estimate that excavation water would be pumped at an average steady state rate up to 10 gallons per minute (gpm) following the initial higher flow rate at the start of excavation. In using a series of sumps with interconnecting ditches, the actual dewatering rate averaged 30 to 35 gpm, with periods of peak flow around 60 gpm. The higher actual dewatering rates encountered during remedy implementation, compared to the RDIP steady-state estimate, are due to the following factors:

- Dewatering operations conducted on an episodic basis with shutdowns during night shift and over other down times. [1]
- RDIP steady-state estimate included only groundwater flow from the A-aquifer and did not estimate process wastewater, water from daily dust control and misting operations, storm water, or surface water component. Significant flow rates of storm water were experienced during the remedy implementation, particularly in October and November 2011.
- RDIP steady-state estimate did not include any vertical groundwater leakage induced from the B-aquifer into the excavation. The dewatering operations maintained significant drawdown of the water levels in the A-aquifer within the excavation and in the surrounding cone of depression, and increased vertical movement from the B-aquifer into A-aquifer.

With inherent uncertainty in all modeled geologic settings, the higher than estimated dewatering rate could indicate hydrogeologic characteristics may need to be reevaluated to understand post-remedy implementation groundwater flow pathways.

The post-remedy implementation groundwater monitoring program (discussed in Section 2.10 of this report) is structured to provide the data necessary for evaluating flow direction and hydraulic gradient. As the A-aquifer reaches equilibrium re-saturation, the groundwater flow conditions will be compared to the projected design groundwater model conditions for the remedy. If the assessment determines that groundwater movement patterns differ significantly from projected design

[1] A total of 4,892,618 gallons were pre-treated and discharged to the sewer between the start of continuous dewatering operations (22 July 2011) and when the maximum depth of the excavation was reached (30 November 2011). Over this 132 day period, an average discharge rate of 25.7 gpm was observed.

conditions, S-W will provide written recommendation to DTSC for either implementation of additional monitoring/investigation steps or a contingency action.

During the remedy implementation, over five million gallons of water in total were pre-treated and discharged to East Bay Municipal Utility District (EBMUD) under permit. Quarterly reports were submitted to EBMUD to document the results from dewatering and pre-treatment system and adherence to their permit, and are included in Attachment H. Site permits are included in Attachment F.

2.3.2 RDIP Section 5.3, Soil Excavation and Handling

Actual soil removal sequencing varied from the plan presented in the RDIP text to accommodate improved Site logistics for rail car transport; high-pressure natural gas transmission line relocation; excavation dewatering; and soil stockpile handling. Due to the spatial variability of the waste categories it became crucial to excavate areas of similar categories to meet rail car transport requirements. Also, the mass excavation of similar waste categories lowered the potential for cross contamination of soils with differing preliminary categories. These objectives required modifying the RDIP method of "strip" excavation spanning the entire length of the excavation across multiple waste categories.

The RDIP described installation of a temporary "French drain" at the bottom of the excavation along the northern S-W property line with the Novartis parking lot (the former Rifkin property). The intent of this drain line was a safety measure to control groundwater seepage in the open excavation and prevent it from migrating northward across the property line into newly placed clean backfill. Subsequent calculations, modified excavation and backfilling methods, and discussions with Novartis and DTSC determined that this temporary drain line was not required to control groundwater migration during the short amount of time the excavation depth was exposed. The groundwater gradient was maintained in a positive direction away from the Novartis property and verified by increased monitoring of the potentiometric water surface in wells, sumps and at the seepage face elevations. Groundwater monitoring data are provided in Attachment D4.

The final soil excavation areal footprint is illustrated on the Asbuilt Drawings provided in Attachment B. The final bottom excavation contours are also provided in the Attachment B Asbuilt Drawings.

2.3.3 RDIP Section 5.3.1, Vadose Zone

As described in this RDIP section, additional vadose zone soil removal was anticipated if data from soil sample analyses indicated continued high arsenic or other constituent concentrations. Actual excavation included extending soil removal beyond RDIP preliminary projected extents to areas containing arsenic concentrations above the cleanup goal. The additional vadose zone soil removal included the areas northwest and west area of the RDIP identified area. The removal of vadose material in these areas was also to facilitate the removal of additional saturated soil as discussed below. Conversely, several "cells" of in-place soil were not excavated according to the RDIP plan because soil sample results confirmed that in-place constituent concentrations already met the cleanup goals.

Vadose zone soils within the four "hot spot" excavations were removed per the RDIP. The lateral extend of a number of the sidewalls in these locations coincided with other soil removal for utility demolition, rail spur demolition and slurry wall extension. In these cases the remaining sidewalls were confirmed below the cleanup goals. As such, the "hot spot" excavation for boring CDM-SB50 was

merged with the main excavation, and included in that soil sample results set. The three other "hot spot" excavations continued to be evaluated independently.

Confirmation soil sample results demonstrating conformance with the cleanup goals are presented in Attachment D3.

2.3.4 RDIP Section 5.3.2, Saturated Zone

The RDIP presented a concern regarding heaving of the excavation floor at the top of the A/B aquitard (El. -11 ft NAVD88), which resulted in the preparation and inclusion of a Heave Management Plan (RDIP Appendix I-2). As discussed above in RDIP Section 5.3.1, mass excavation of similar category waste was utilized for saturated soil excavation rather than the "strip excavation" presented in the RDIP. However, this did not affect the excavation conformance to the RDIP objective of minimizing the exposed areal floor of the excavation above the aquitard to no more than 5,000 square feet at any moment. The bottom five feet of saturated soil above the aquitard was excavated and backfilled concurrently, never leaving more than 5,000 square feet of the top of aquitard exposed.

The exposed lithology during saturated soil excavation was observed to confirm final source area removal extents for permeable materials along the sidewalls of the excavation. Portions of the western extent of the design excavation boundary had greater than 4 feet of sand/gravel (permeable materials) in areas identified with having arsenic concentrations in groundwater above 1 mg/L prior to the remedy implementation. As such, additional saturated soils were removed in these areas until total permeable material amounts were less than 4 feet. At the other extents of the excavation, less than 4 feet of sand/gravel were observed. The final extents of the saturated soil excavation are presented in Attachment B.

2.3.5 Section 5.5, Waste Stockpiles Management

The project simultaneously tracked and managed in excess of over 160 waste stockpiles. The RDIP estimated that approximately 5,000 cubic yards of stockpiled waste material may be on Site at any one time, as inventory staged between placement, characterization, and load out. Due to the segregation of eight different potential waste streams from the excavation and to avoid unwanted delays for rail car transport, the stockpiled volumes maintained onsite increased up to approximatly12,700 cubic yards for short periods of time. On average, stockpiled waste amounts were much smaller, close to the RDIP estimate of 5,000 cubic yards.

Due to the limitations of space and to avoid extending the project schedule any further than necessary, every effort was made to minimize the amount of stockpiled waste present onsite at any given time. Waste characterization turnaround times were accelerated from planned RDIP schedules in an effort to minimize the onsite stockpiling of material. Much of the stockpiled volume was due to the separate stockpiling of multiple categories of waste, while limited to the loading of a single waste category in multiple train cars (unit trains) intended for a single location.

2.3.6 RDIP Section 5.6, Vadose Zone Soil Confirmation Sampling

The only variance to the RDIP sampling procedures described in this section was that some samples were also collected using 8 oz. jars, instead of sample tubes. Sampling materials were sample specific so no equipment blanks were necessary. Confirmation soil sample results demonstrating conformance with the cleanup goals are presented in Attachment D3.

2.4 RDIP Section 6 – Excavation Backfilling

2.4.1 RDIP Section 6.4, Backfill Placement, Compaction and Interceptor Trench

The variance to the RDIP is that the width of the curtain wall for the inceptor trench was reduced from 36 inches to 30 inches. A sensitivity analysis on this modification did not show any significant change to the modeled groundwater flow paths.

2.4.2 RDIP Section 6.5, Membrane Barrier and Trench Installation, RDIP Section 6.5.1, Selection of Material

Busan 1058 was used instead of Busan 1059WS Biostat (Dazomet) for extension of the biopolymer slurry used during installation of the membrane barrier.

As part of the HDPE Membrane Barrier installation, Envirocon also installed a geonet HDPE drain fabric on the HDPE panels to help protect the panels against punctures from the placed drain gravel. The drain gravel selected for the trench had both the required natural filtering requirements for the hydraulic design of the trench and a consistent particle size. This minimized "layering" of the gravel during placement in the bio-polymer slurry. The selected gravel had a slight angular shape; it was anticipated to be well rounded in the RDIP. The geonet was installed to protect the membrane liner from potential damage from the drain gravel. The geonet is expected to have a higher transmissivity than the drain rock and therefore reduce the hydraulic pressure on the membrane, further protecting the membrane.

SDR 17, 6-inch diameter rigid HDPE, pipe was installed at the base of the interceptor trench, instead of the proposed flexible pipe stated in the RDIP. This rigid pipe was required as it had sufficient pipe strength to work with the installation method and selected gravel.

2.4.3 RDIP Section 6.7, Panel Placement

The Curtain Wall panels (fabricated by GSE Lining Technology) that comprise the membrane barrier system were installed as intended, to depths below the top of the aquitard in order to prevent movement of A-zone groundwater from the S-W property toward the Novartis property at this shared property line. The bottom of the panel elevations ranged between El. -12 ft NAVD88 to El. -14.5 ft NAVD88. The top of the aquitard is at approximately El. -11 ft NAVD88 in the project area.

The RDIP Section 6.5 indicates that "[t]he bottom of the membrane barrier will be placed adjacent to the north wall of the excavation as to achieve direct contact with the undisturbed soil or compacted backfill." During field installation activities, the steel frames holding the panels during placement were lowered adjacent to the north wall of the excavation trench and were lowered to depths equal to or greater than the top of the aquitard. Each panel placement, subsequent to the first one, was joined to adjacent panels, in accordance with the specifications. Due to the method of placement and the required use of the biopolymer slurry, however, actual "direct contact" of the panels with the trench bottom could not be confirmed by direct observation.

In lieu of direct observation, the bottom elevations of the placed panels were compared to the target trench bottom elevation using the following measurements: GPS surveys of the tops of installed panels and surrounding ground surface, previously measured panel heights, and depths to the trench bottom (conducted prior to panel placement using a weighted rope). Measurements for 5 of the 11 panels that comprise the membrane barrier system indicated that the panels were lowered to the target trench bottom elevation when released from their frames. For 6 of the 11 panels, measurements

could not confirm that the bottom of the panel frames reached the actual trench bottom. Fine-grained deposits, from the compacted backfill trench sidewalls, settling out from the slurry and accumulating at the trench bottom during panel installation is believed to have affected the assessment for reaching the target trench bottom elevation at these six panels. For all panel placements, however, the panel frame bottoms were determined to reach depths below the top of the aquitard at El. -11 ft NAVD88.

2.4.4 RDIP Section 6.8, Drain Pipe and Gravel Backfill Placement

A pea gravel (3/8 inch minus) material was used for the bedding material beneath the interceptor trench drain pipe. This was a modification from the RDIP specified "drain gravel" gradation specification. Due to the placement of pipe bedding being dropped from the top of the trench in the presence of the bio-polymer slurry, a pea gravel material was used. The pea gravel has a more uniform particle size and can achieve the desired compaction values compared to the more "well graded" drain gravel as specified in the RDIP for permeability and self-filtering design, as installed.

2.5 RDIP Section 7 – Slurry Wall Breach

2.5.1 RDIP Section 7.3, Slurry Wall Breach

The final design of the three slurry wall breaches varied from the design presented in the RDIP, to accommodate improved constructability and to avoid installing the northwestern breach across the western property boundary with Union Pacific Railroad. The breach design revisions maintained the required transmissivity necessary per the groundwater flow modeling. The location of Breach 3 was moved to the east in order for it to be in adjacent with saturated soil excavation. The asbuilt design and locations of the slurry wall breaches are included in Attachment B. This change was reviewed and approved by DTSC.

2.5.2 RDIP Section 7.5, Trench Excavation

Actual trench excavation procedures differed from the RDIP text due to the redesign of the slurry wall breaches, therefore reference to biopolymer slurry in the cross trenches and the up- and down-gradient trenches are no longer applicable. See Attachment B for the asbuilt design and locations of the installed breaches.

2.5.3 RDIP Section 7.6, Backfill Placement

References in the RDIP text to the up and down gradient and cross trench backfilling are no longer applicable due to the breach redesign.

2.6 RDIP Section 8 – Slurry Wall Extension

2.6.1 RDIP Section 8.4, Slurry Wall Extension

The actual slurry wall extension was 675 feet long; the RDIP estimated a length of 494 feet. The extension was brought into the existing slurry wall further north than originally designed to accommodate installation closer to the property line (further west). This change was reviewed and approved by DTSC.

The actual slurry wall thickness, in accordance with approved design modifications, was 30 inches; the RDIP text indicated a minimum wall thickness of 36 inches. A sensitivity analysis on this modification did not show any significant change to the modeled groundwater flow paths.

The slurry wall extension also included design and installation of a slurry wall cap, to protect the bentonite-based slurry wall from damage due to future active surface loads. The slurry wall cap was also of similar low permeable clay soil to allow for a higher impermeable wall height. See Attachment B for the slurry wall extension asbuilt location and installation details.

2.7 RDIP Section 9 – Waste Profiling, Transport and Disposal

Aside from the sample tubes presented in the RDIP for stockpile sample collection, 8 oz. glass jars were also used. In discussions with the lab, En Core® and Terra Core® samplers from the Site could not be composited without losing significant VOCs that may be present. The laboratory recommended that samples for VOCs be taken from the tubes or jars and composited the same day in EnCore® samplers by the laboratory. The sampling materials were designated to each sample and no sampling equipment was re-used, so no QC samples were taken or necessary.

The amount of truck loads/tons and rail car loads/tons exceeded the original estimate. A variance to the RDIP is that truck beds were not lined with plastic or straw when trailers were being loaded with non-hazardous material. Material was placed onto truck beds directly and covered for exporting. The non-hazardous material being placed in the truck trailers passed the wet paint filter test and passed through the decontamination pad where the loads were inspected prior to leaving the Site.

Another variance to the RDIP is that dry decontamination methods were used when trucks exited the Site. Stiff brushes were used to clean tires while stopped on the decontamination pad. The trucks being loaded for export of waste material were limited to hard surface travel and daily removal of spilled soil from the truck route was performed. MEC sprayers were used to spray tires while on the decontamination pad on rainy days or days with an excess of mud on the truck path.

At the final stages of the project it became necessary to begin removal of the Site rail line and spur track at the north end of the property to begin final backfill and grading in these areas. Without the access to the adjacent Union Pacific rail yard, final loads of non-RCRA hazardous waste (California regulated) were loaded on trucks for transport to the San Francisco Bay Railroad (SFBR) for loading onto rail cars for final transport. This transportation variance was approved by DTSC and the community was informed of this activity.

During loading of non-hazardous waste to the local Class 2 non-hazardous waste landfill, approximately 20 loads of non-RCRA hazardous waste were mistakenly transported by truck to the Class 2 landfill. The transport of this material was identified within hours of leaving the Site, and arrangements with the landfill were made to isolate and contain the waste for removal and transport to the SFBR for transport by train to the appropriate landfill facility. A total of 334.26 tons of waste were initially delivered to the Class 2 landfill. In order to assure complete removal of this waste, approximately 12 tons of additional material around and beneath it were excavated; totaling 342.41 tons. This waste was taken to the SFBR for transport by train to the appropriate landfill.

Final waste amounts removed from the Site were based on stockpile sample results and are presented by their waste characterization results below, based on reported weights received by the disposal facilities.

Waste Characterization	*Project Waste Category*	*Amount (Tons)*
Class 2 Non-Hazardous	1	69,671
Class 1 Non-RCRA Hazardous	2	60,650
Class 1 RCRA Hazardous (US Ecology)	3, 4, 5, 7	19,387
Class 1 RCRA Hazardous (Arlington)	6 & 8	0

Attachment D6 provides a summary of the stockpile sample results and their determined waste characterizations. Section 1 provides a chart presenting excavated materials transported offsite (in accumulated tons by month).

2.8 RDIP Section 10 – Non-Remedial Activities

In addition to the spur track removal and storm sewer removal activities anticipated and presented in the RDIP, Envirocon also encountered and removed other inactive subsurface utility pipes and buried concrete foundations associated with former railroad activities, former S-W operations, or other historic operations. See Attachment B for Asbuilt Drawings showing areas where piping was encountered and removed.

2.9 RDIP Section 11 – Soil Gas Evaluation

The RDIP text indicates the anticipated schedules for post-remediation activity installation and sampling of soil gas occurring in February/March, and August/September 2012, assuming a completion of remediation activities in November 2011. These dates for soil gas evaluation are now anticipated to occur in June 2012 and November 2012. Soil gas evaluation strategy is further discussed in the project OM&M plan. The soil gas evaluation strategy is consistent with Section 11 of the RDIP, with the following modifications:

- Additional investigation location near the former UST area.
- Additional investigation location downgradient of the former UST area and within the former water treatment plant area.
- Re-location of one sampling location from near slurry wall Breach 3 to upgradient of the breach.

2.10 RDIP Section 13 – Groundwater Monitoring Program

2.10.1 RDIP Section 13.1, Groundwater Monitoring Well Locations

The project OM&M plan includes the groundwater monitoring program for the project after remedy implementation. This groundwater monitoring program is consistent with Section 13 of the RDIP, with the following modifications:

- Slight movement of actual new well installations based on field conditions.

- Installation of additional well, CDM-113, upgradient of current location of slurry wall breach #3 (breach moved east to connect with saturated soil excavation).
- Installation of additional well CDM-114 at RDIP-identified piezometer location, downgradient of the former UST area and upgradient to the existing slurry wall.
- Re-numbering of piezometers based on above change.
- Contingent well not needed on former Rifkin property.
- Modification to sampling frequency of wells RP-1, RP-4, and MW-3 based on groundwater monitoring results during the remedy implementation.
- Addition of existing monitoring well MD-5 at downgradient offsite property for periodic depth to groundwater measurements.
- Change frequency of depth to groundwater measurements to annually for downgradient wells LF-24 and LF-25 on Union Pacific Railroad property.

Wells installed during remedy implementation were installed under permit and reports for the completions were submitted to ACPWA. Copies of these reports are included in Attachment G2. A summary of their construction and surveyed coordinates are also included in Attachment G2. The locations for these newly installed wells and other remaining wells are presented in Attachment B. Site permits are included in Attachment F.

The first post-remedy implementation groundwater monitoring report will be submitted by July 31, 2012 to DTSC and Novartis. It will include data from March 2012, April 2012, May 2012, and June 2012, monthly water levels and sample results from April 2012. April 2012 sampling/analysis conforms to the annual sampling requirements for the project.

2.10.2 RDIP Section 13.2.1, Groundwater Quality Sampling and Analysis during Remedy Implementation

Groundwater sampling and analysis were conducted in accordance with the RDIP. The results were used to assess potential impacts to the former Rifkin property from the potential spreading of upgradient, offsite plumes and, to evaluate any arsenic concentration changes during remedy implementation. The results from the activities are presented in Attachment D4.

2.10.3 RDIP Section 13.2.2, Depth to Groundwater Measurements during Remedy Implementation

Depth to groundwater measurements were conducted in accordance with the RDIP. The results were used to assess potential impacts to the former Rifkin property from the potential spreading of upgradient, offsite plumes and, to evaluate any arsenic concentration changes during remedy implementation. The results from the activities are presented in Attachment D4.

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Section 3

Photographs of Site Conditions

Representative photographs of the Site before, during, and after remediation activities are presented in Attachment I.

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Section 4
References

CDM, 2011. Final Remedial Design Implementation Plan, Sherwin-Williams Company, Emeryville, California. Camp Dresser & McKee Inc. June 29, 2011.

CDM, 2010. Final Remedial Action Plan, Sherwin-Williams Company, Emeryville, California. Camp Dresser & McKee Inc. June 14, 2010.

DTSC Envirostor. 2012. Sherwin Williams Site Activities and Reports. Available on-line at: http://www.envirostor.dtsc.ca.gov/public/profile_report.asp?global_id=60000189

DTSC, 2011a. Letter providing approval of the June 29, 2011 Final Remedial Design and Implementation Plan. California Environmental Protection Agency, Department of Toxic Substances Control. June 30, 2011.

DTSC, 2011b. Letter providing conditional approval to proceed with soil excavation after partial review of the Remedial Design and Implementation Report. California Environmental Protection Agency, Department of Toxic Substances Control. June 8, 2011.

DTSC, 2010. Letter providing approval of the June 14, 2010 Final Remedial Action Plan. California Environmental Protection Agency, Department of Toxic Substances Control. June 14, 2010.

DTSC, 2006. Imminent and Substantial Endangerment Determination and Order and Remedial Action Order. Docket No. IS/E 05/06-007. California Environmental Protection Agency, Department of Toxic Substances Control. May 10, 2006.

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CDM Smith

cdmsmith.com

Appendix A
Selected Remedial Investigation Figures and Tables

Appendix A1

Selected Figures from Remedial Investigation, Sherwin-Williams Site, Emeryville, California. March 8, 2002.

Legend

- MONITORING WELL OR PIEZOMETER
- EXTRACTION WELL
- SOIL BORING OR CONE PENTROMETER TEST BORING
- SURFACE SOIL SAMPLE LOCATION
- COMPOSITE SOIL SAMPLE LOCATION
- EXCAVATION SOIL SAMPLE LOCATION
- CREEK SAMPLE LOCATION
- INVESTIGATION BOUNDARY
- SHERWIN-WILLIAMS CURRENT PROPERTY BOUNDARY
- RAISED CAP AREA
- SLURRY WALL
- RAILROAD TRACK
- 28 EXISTING BUILDING & BUILDING NUMBER
- ABOVEGROUND STORAGE TANK
- CROSS-SECTION LINE

NOTES:
(1) REMEDIAL INVESTIGATION SAMPLE LOCATIONS ARE SHOWN IN BLUE. SAMPLE LOCATIONS FROM OTHER PREVIOUS OR ONGOING INVESTIGATIONS ARE SHOWN IN BLACK.

(2) GEOLOGIC CROSS SECTIONS ARE PRESENTED IN FIGURES 5-1 THROUGH 5-4.

City of Emeryville

1:600

100 50 0 100 Feet

NAD83 California Stateplane Zone 3

Sherwin-Williams Company, Emeryville, California

Figure 2-5
Sample Location Map

ENTRIX

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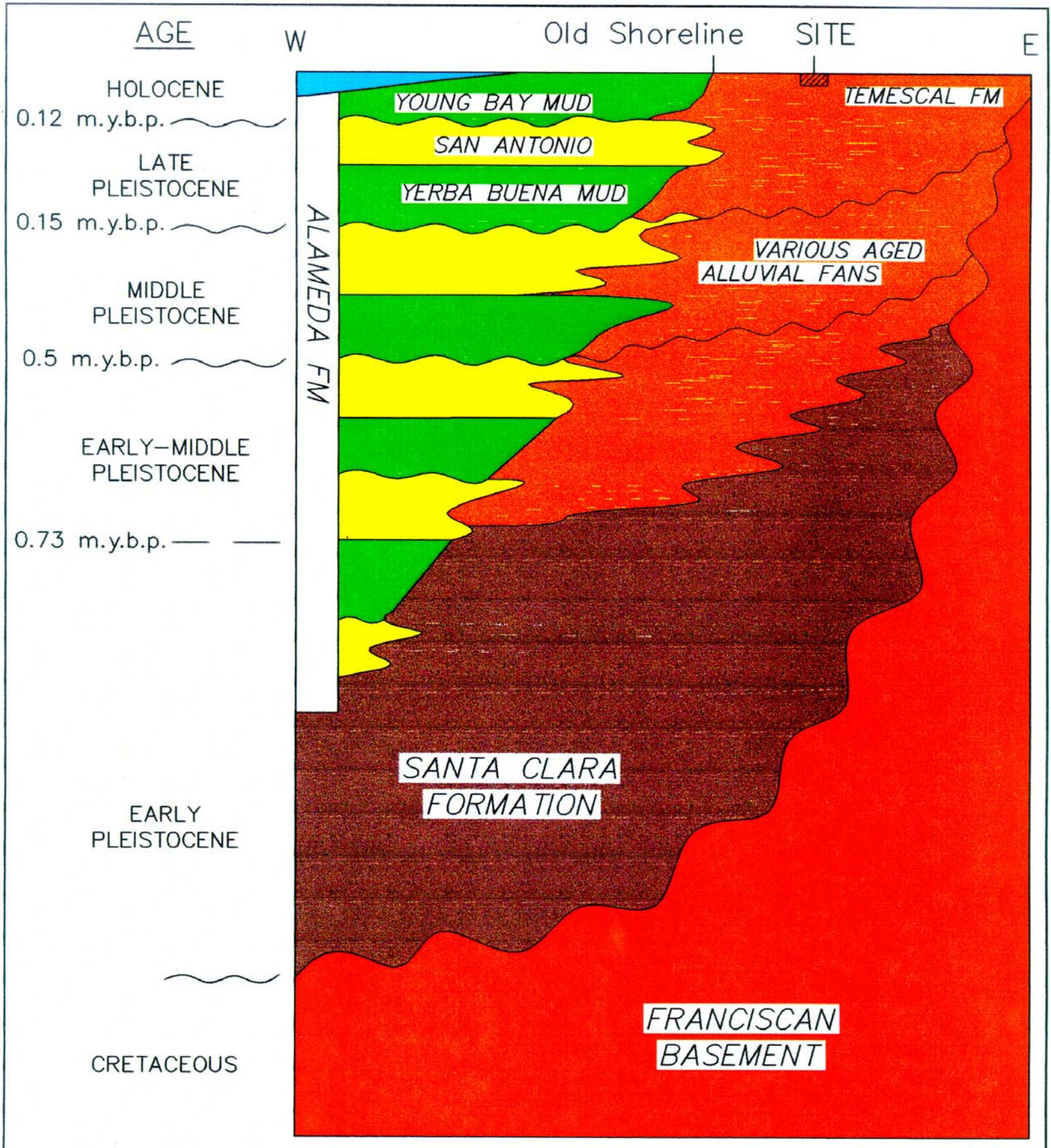


STRATIGRAPHIC SECTION
ADAPTED FROM NORFLEET CONSULTANTS, 1998

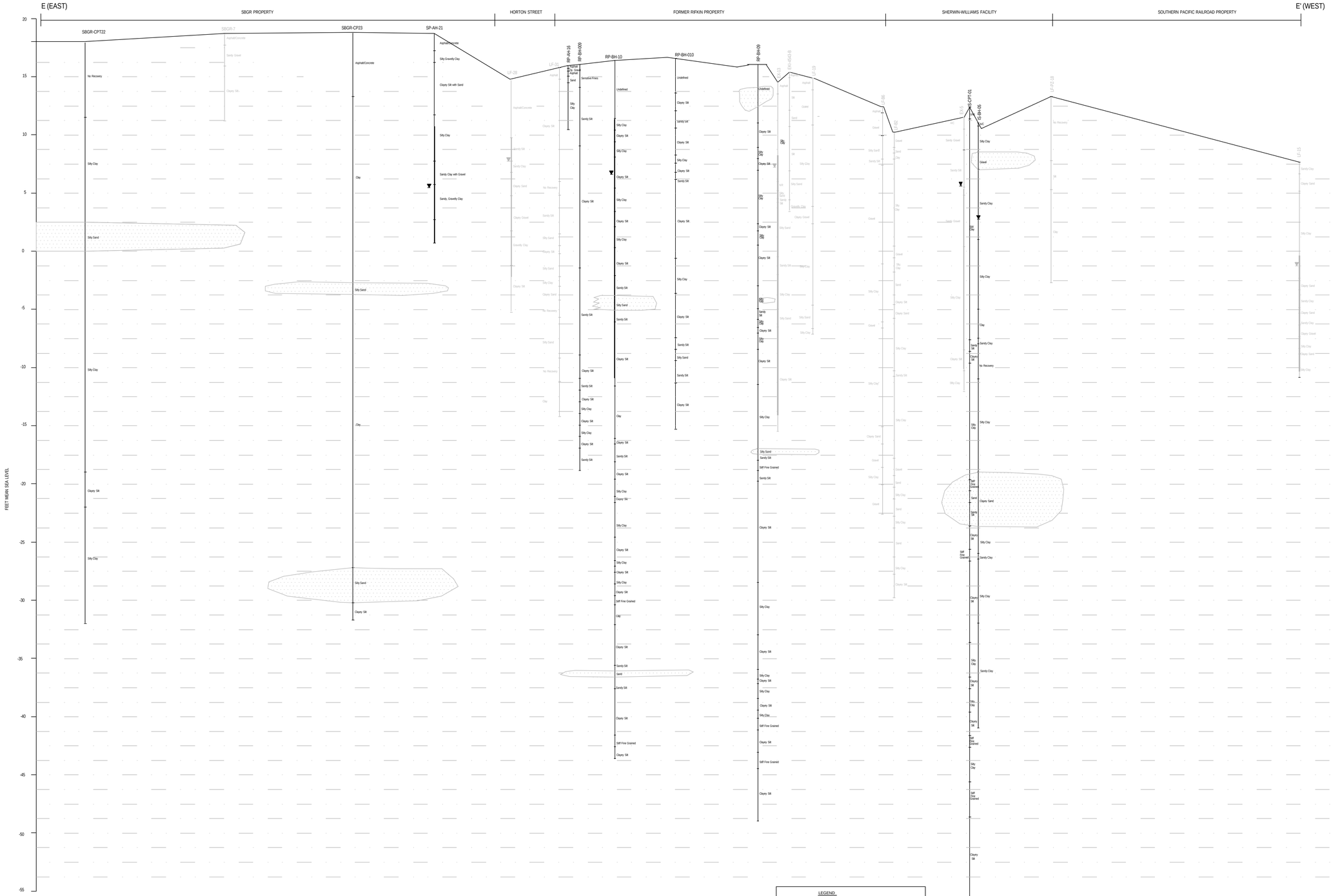
Sherwin-Williams Company, Emeryville, California

Figure 2-6

Stratigraphic Section

ENTRIX

Sw-strat.dwg


E (EAST)
E' (WEST)
SBGR PROPERTY
HORTON STREET
FORMER RIFKIN PROPERTY
SHERWIN-WILLIAMS FACILITY
SOUTHERN PACIFIC RAILROAD PROPERTY
FEET MEAN SEA LEVEL
20
15
10
5
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
-50
-55
SBGR-CPT22
SBGR-7
SBGR-CP23
SP-AH-21
RP-AH-15
RP-BH-09
RP-BH-10
RP-BH-010
RP-BH-09
LF-28
LF-33
LF-34
LF-35
LF-36
LF-37
LF-38
LF-39
LF-40
LF-41
LF-42
LF-43
LF-44
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LF-70
LF-71
LF-72

G (NORTH)

FORMER RIFKIN PROPERTY

SHERWIN-WILLIAMS FACILITY

G' (SOUTH)

FEET MEAN SEA LEVEL

20 15 10 5 0 -5 -10 -15 -20 -25 -30 -35 -40 -45

RP-BH-017 RP-BH-013 LF-34 RP-2 RP-BH-10 LF-32 RP-BH-005 LF-31 RP-BH-002 EKI-4526-3 LF-PZ5 LS-BH-07 LF-PZ6 SB-39 LF-PZ20 SB-40 AA0101 SA-AH-01 SA-AH-04 SA-AH-20

RP-BH-017: Undefined; Clayey Silt; Silty Clay; Clayey Silt; Silty Clay; Clayey Silt; Sandy Silt; Clayey Silt; Silty Sand; Sandy Silt; Silty Sand; Clayey Silt

RP-BH-013: Undefined; Sandy Silt; Clayey Silt; Sandy Silt; Silty Sand; Sandy Silt; Clayey Silt

LF-34: Asphalt; Silty Clay; No Recover; Clayey Silt; Sand; Clayey Silt; Sandy Gravel; Silty Clay; Silty Gravel; Clayey Sand; Silty Gravel; Clayey Silt; Silty Clay

RP-2: Asphalt; Sandy Silt; Clayey Gravel; Sandy Clay; Silty Clay

RP-BH-10: Undefined; Silty Clay; Clayey Silt; Silty Clay; Clayey Silt; Silty Clay; Clayey Silt; Sandy Silt; Silty Sand; Sandy Silt; Clayey Silt; Sandy Silt; Clayey Silt; Silty Clay; Clayey Silt; Silty Clay; Clayey Silt; Silty Clay; Clayey Silt; Silty Clay; Clayey Silt; Sandy Silt; Clayey Silt; Sandy Silt; Sand; Sandy Silt; Clayey Silt

LF-32: Asphalt; Silty Sand; Sand; Silty Clay; Sand; Silty Clay; Sand; Silty Clay; Sand; Silty Gravel; Clayey Silt

RP-BH-005: Sens. Fines; Sandy Silt; Clayey Silt; Sandy Silt; Sand

LF-31: Asphalt/Concrete; Silty Clay; Clayey Silt; Silty Clay; Silty Sand; Silty Clay; Silty Sand; Silty Clay; Silty Sand; Sand; Clayey Silt; Sandy Silt; Silty Sand; Sand; Silty Sand; Clayey Silt; Silty Clay; Clayey Silt; Silty Clay; Clayey Silt; Silty Clay; Clayey Silt; Sandy Silt; Sand; Clayey Silt

RP-BH-002: Sensitive Fines; Sandy Silt; Silty Sand; Sandy Silt; Sand; Silty Clay; Sand; Clayey Silt; Sandy Silt; Silty Sand; Sand; Silty Sand; Clayey Silt; Silty Clay; Clayey Silt; Silty Clay; Clayey Silt; Silty Clay; Clayey Silt

EKI-4526-3: Asphalt; Gravel; Silty Clay; Sandy Silt; Clayey Gravel; Sandy Silt; Silty Sand; Clayey Silt; Silty Clay; Sand; Clayey Silt; Silty Clay; Gravelly Clay; Sand; Clayey Gravel; Silty Clay

LF-PZ5: Concrete; Fill; Sandy Silt; Silty Clay; Clayey Gravel; Silty Sand; Cly. Silt; Silty Clay; Silt/Clay; Silty Sand; Silt/Clay; Sandy Silt; Silty Sand; Silt/Clay; Sandy Silt; Silt/Clay; Sand; Silt/Clay

LS-BH-07: Drilled Out

LF-PZ6: Asphalt; Silty Clay; Sand; Clayey Silt; Silty Clay

SB-39: Asphalt; Sandy Gravel; Silty Clay; Sand

LF-PZ20: Asphalt; No Recover; Sandy Gravel; Silty Clay; Sandy Gravel; Silty Clay; Sandy Gravel; Silt; Sandy Silt; Clay

SB-40: Asphalt; Gravel; Silty Clay

AA0101: Asphalt; Railroad Tie; Sandy Gravel; Silty Clay; Sandy Gravel; Sand; Silty Clay; Sandy Gravel; Silty Clay; Sand; Clayey Silt

SA-AH-01: Concrete; Silty Clay; Silty Sand (fill?)

SA-AH-04: Asphalt/Concrete; Fill; Asphalt/Concrete; Sandy Silt; Silty Clay; Sandy Clay; Clayey Silt

SA-AH-20: Asphalt/Concrete; Silty Gravel; Silty Clay; Clayey Silt; Sand; Sandy Silt; Clayey Sand; Silty Clay

NOTES:

1. STRATIGRAPHIC CONTACTS ARE APPROXIMATE AND MAY ACTUALLY BE GRADATIONAL.
2. SEE FIGURE 2-5 FOR ORIENTATION OF CROSS SECTIONS.
3. SOILS ARE CLASSIFIED IN ACCORDANCE WITH THE UNITED SOIL CLASSIFICATION SYSTEM (USCS).
4. THE SOIL BORINGS PRESENTED IN BLACK REPRESENT CPT BORINGS INSTALLED AT THE SITE AND IN THE SITE VICINITY AND THE SOIL BORINGS INSTALLED AS PART OF THE SCOPE OF WORK OUTLINED IN THE WORKPLAN ADDENDUM (ENTRIX, Inc. (ENTRIX) 1999a). THE SOIL BORINGS PRESENTED IN GREY REPRESENT SOIL BORINGS INSTALLED PRIOR TO THE SCOPE OF WORK CONDUCTED AS PART OF THE WORKPLAN ADDENDUM. THE CPT BORINGS AND THE SOIL BORINGS INSTALLED AS PART OF THE SCOPE OF WORK SPECIFIED IN THE WORKPLAN ADDENDUM WERE PRIMARILY USED TO CHARACTERIZE THE SUBSURFACE GEOLOGY AS DISCUSSED IN SECTION 5.1.2 OF THE REPORT.

LEGEND

- SILT AND CLAY (FINE-GRAINED MATERIAL)
- SAND AND GRAVEL (COARSE-GRAINED MATERIAL)
- SOIL BORING WITH USCS SOIL TYPE
- FIRST ENCOUNTERED GROUNDWATER (where noted)
- WELL SCREEN INTERVAL

VERT. SCALE FEET: 5.0, 2.5, 0

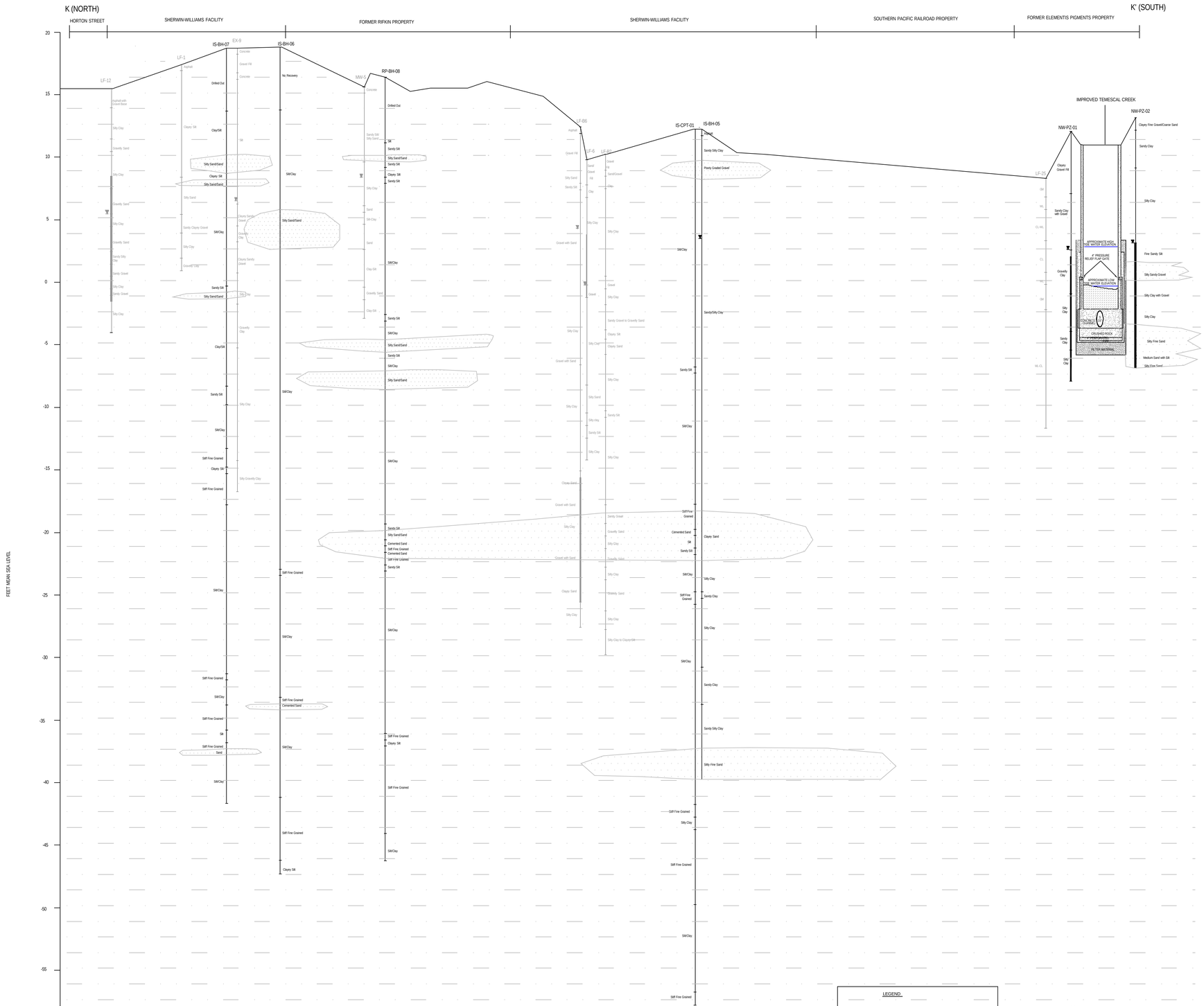
HORIZ. SCALE FEET: 0, 25, 50

SHERWIN-WILLIAMS COMPANY, EMERYVILLE, CALIFORNIA

FIGURE 5-2

GEOLOGIC CROSS SECTION G - G'

ENTRIX



NOTES:

1. STRATAGRAPHIC CONTACTS ARE APPROXIMATE AND MAY ACTUALLY BE GRADATIONAL.
2. SEE FIGURE 2-5 FOR ORIENTATION OF CROSS SECTIONS.
3. SOILS ARE CLASSIFIED IN ACCORDANCE WITH THE UNITED SOIL CLASSIFICATION SYSTEM (USCS).
4. THE SOIL BORINGS PRESENTED IN BLACK REPRESENT CPT BORINGS INSTALLED AT THE SITE AND IN THE SITE VICINITY AND THE SOIL BORINGS INSTALLED AS PART OF THE SCOPE OF WORK OUTLINED IN THE WORKPLAN ADDENDUM (ENTRIX, Inc. [ENTRIX] 1999a). THE SOIL BORINGS PRESENTED IN GREY REPRESENT SOIL BORINGS INSTALLED PRIOR TO THE SCOPE OF WORK CONDUCTED AS PART OF THE WORKPLAN ADDENDUM. THE CPT BORINGS AND THE SOIL BORINGS INSTALLED AS PART OF THE SCOPE OF WORK SPECIFIED IN THE WORKPLAN ADDENDUM WERE PRIMARILY USED TO CHARACTERIZE THE SUBSURFACE GEOLOGY AS DISCUSSED IN SECTION 5.1.2 OF THE REPORT.

SHERWIN-WILLIAMS COMPANY, EMERYVILLE, CALIFORNIA

FIGURE 5-3
GEOLOGIC CROSS SECTION K - K'

ENTRIX

L (EAST)

L' (WEST)

45TH AVENUE | HORTON STREET | SHERWIN-WILLIAMS FACILITY

FEET MEAN SEA LEVEL

20 15 10 5 0 -5 -10 -15 -20 -25 -30 -35 -40 -45 -50 -55

LF-13
Gravel
Silty Clay
Clayey Sand
Sandy Clay
Silty Clay
Clayey Sand
Silty Clay
Clayey Sand
Silty Clay
Clayey Sand
Silty Clay

HT-CPT-02
Silt/Clay
Sandy Silt
Silt/Clay
Stiff Fine Grained
Silt/Clay
Stiff Fine Grained
Silt/Clay

SA-AH-01
Concrete
Silty Clay
Silty Sand (fill?)

LF-PZ11
No Recovery
Gravel
Sand
Silty Clay
Clay
Sand
Clay
Sand
Clay

LF-PZ0
No Recovery
Gravel

SA-AH-09
Concrete
Clayey Sand
Clayey Sand
Sandy Clay

SA-AH-12
Concrete
Clayey Sand
Clayey Gravel
Asphalt
Silty Sand
Clayey Sand

SA-BH-04
SA-AH-16
Asphalt and Gravel fill
Gravelly Sand (fill)
Drilled Out
Silty Clay
Clayey Gravel
Sandy Silt
Sandy Clay
Clayey Silt
Clayey Fine Sand
Silty Clay
Silt/Clay
Silty Sand/Sand
Silt/Clay
Stiff Fine Grained
Silt/Clay

NOTES:

1. STRATAGRAPHIC CONTACTS ARE APPROXIMATE AND MAY ACTUALLY BE GRADATIONAL.
2. SEE FIGURE 2-5 FOR ORIENTATION OF CROSS SECTIONS.
3. SOILS ARE CLASSIFIED IN ACCORDANCE WITH THE UNITED SOIL CLASSIFICATION SYSTEM (USCS).
4. THE SOIL BORINGS PRESENTED IN BLACK REPRESENT CPT BORINGS INSTALLED AT THE SITE AND IN THE SITE VICINITY AND THE SOIL BORINGS INSTALLED AS PART OF THE SCOPE OF WORK OUTLINED IN THE WORKPLAN ADDENDUM (ENTRIX, Inc. [ENTRIX] 1999a). THE SOIL BORINGS PRESENTED IN GREY REPRESENT SOIL BORINGS INSTALLED PRIOR TO THE SCOPE OF WORK CONDUCTED AS PART OF THE WORKPLAN ADDENDUM. THE CPT BORINGS AND THE SOIL BORINGS INSTALLED AS PART OF THE SCOPE OF WORK SPECIFIED IN THE WORKPLAN ADDENDUM WERE PRIMARILY USED TO CHARACTERIZE THE SUBSURFACE GEOLOGY AS DISCUSSED IN SECTION 5.1.2 OF THE REPORT.

LEGEND

- SILT AND CLAY (FINE-GRAINED MATERIAL)
- SAND AND GRAVEL (COARSE-GRAINED MATERIAL)
- SOIL BORING WITH USCS SOIL TYPE
- FIRST ENCOUNTERED GROUNDWATER (where noted)
- WELL SCREEN INTERVAL

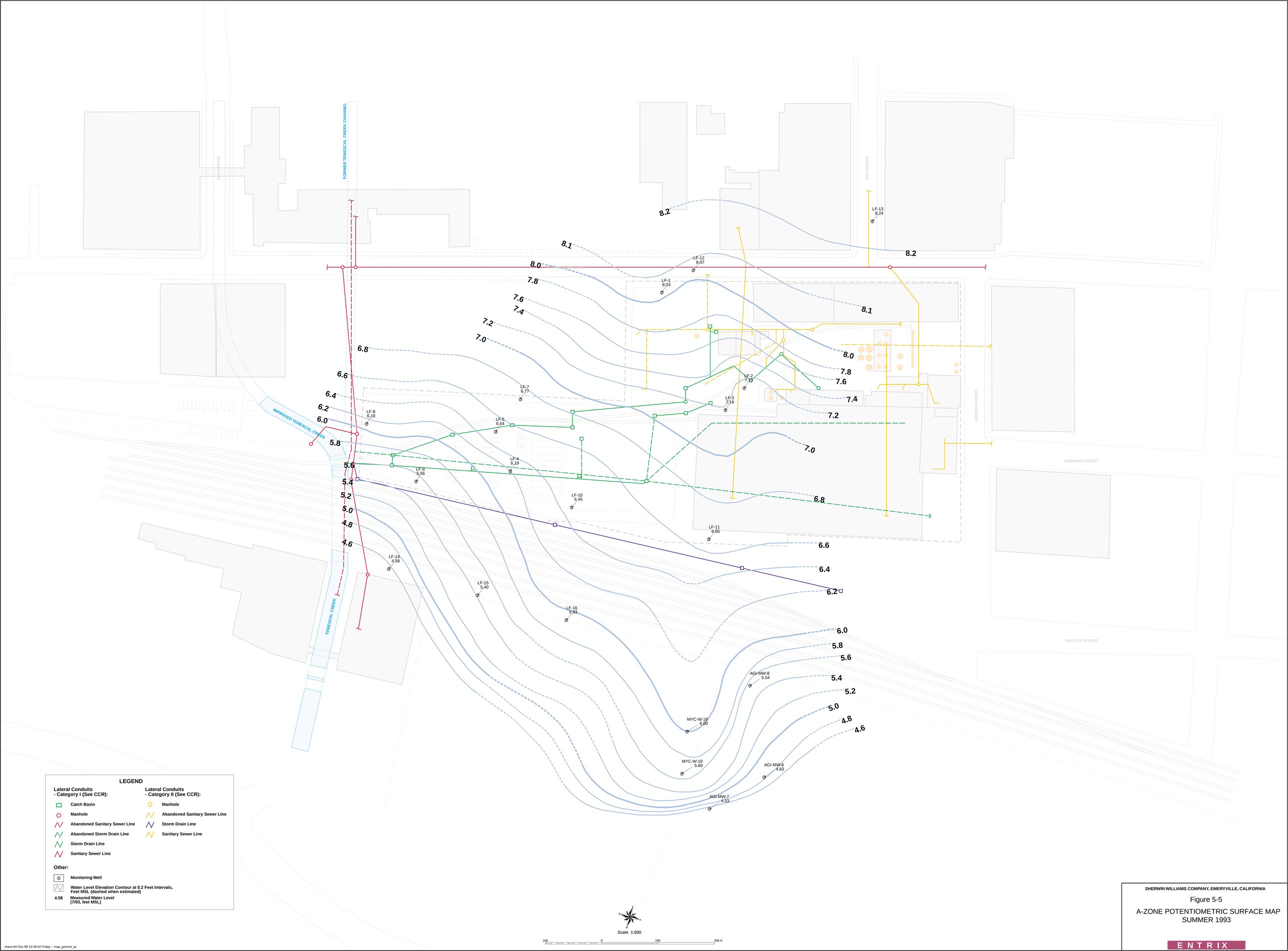
VERT. SCALE FEET: 5.0, 2.5, 0

HORIZ. SCALE FEET: 0, 25, 50

SHERWIN-WILLIAMS COMPANY, EMERYVILLE, CALIFORNIA

FIGURE 5-4
GEOLOGIC CROSS SECTION
L - L'

ENTRIX



LEGEND

Lateral Conduits - Category I (See CCR):

- Catch Basin
- Manhole
- Abandoned Sanitary Sewer LIne
- Abandoned Storm Drain LIne
- Storm Drain LIne
- Sanitary Sewer Line

Lateral Conduits - Category II (See CCR):

- Manhole
- Abandoned Sanitary Sewer LIne
- Storm Drain LIne
- Sanitary Sewer Line

Other:

- Monitoring Well
- Water Level Elevation Contour at 0.2 Feet Intervals, Feet MSL (dashed when estimated)
- 4.58 Measured Water Level (7/93, feet MSL)

Scale 1:600

100 0 100 200 ft

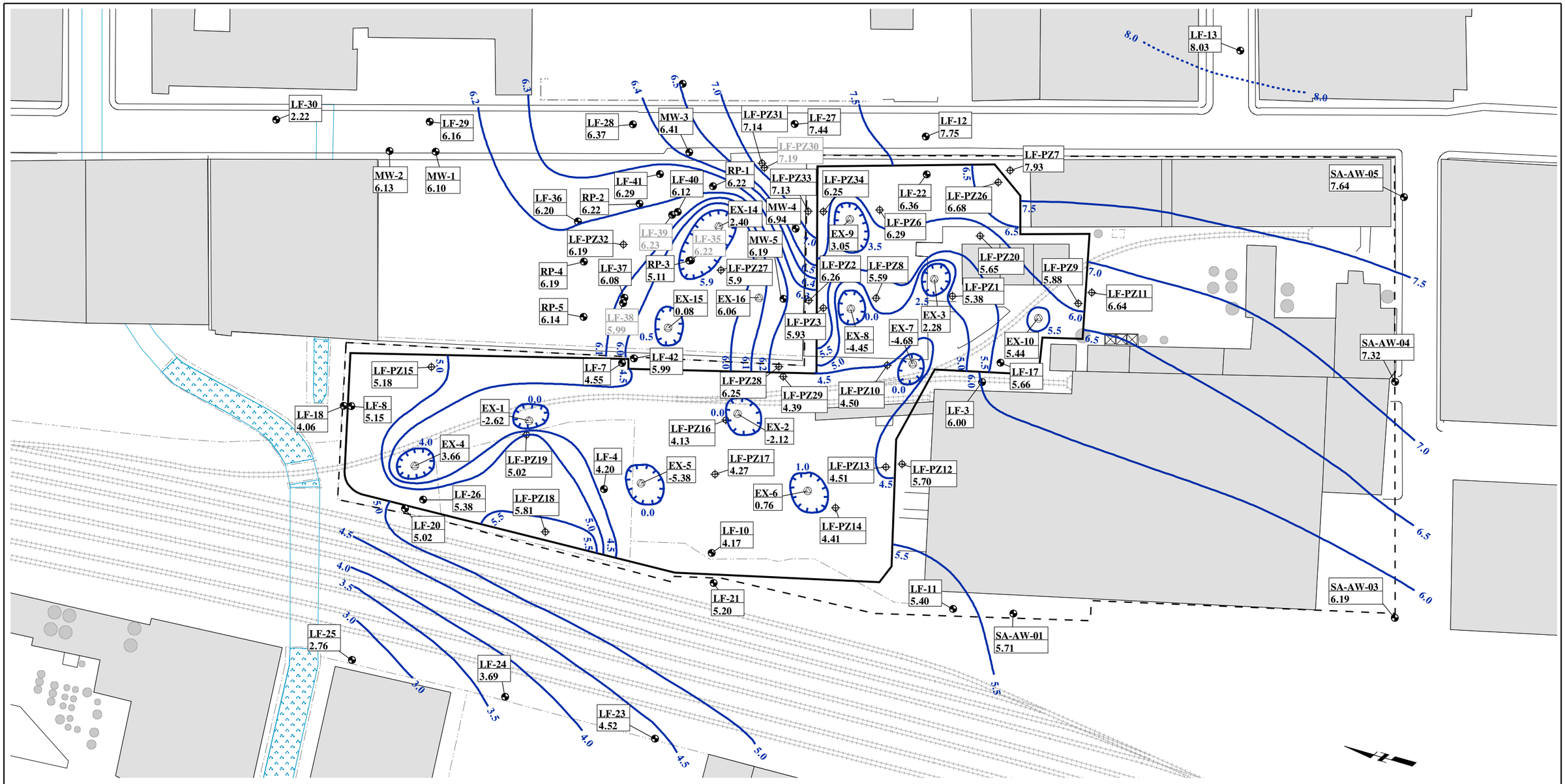
SHERWIN WILLIAMS COMPANY, EMERYVILLE, CALIFORNIA

Figure 5-5

A-ZONE POTENTIOMETRIC SURFACE MAP SUMMER 1993

ENTRIX

shana 04 Dec 98 13:39:42 Friday -- map_gwcont_az



LEGEND

- LF-10 — A-zone monitoring well
- LF-PZ1 — A-zone piezometer
- EX-8 — Extraction well
- 6.5 — Groundwater elevation contour
- Depression in groundwater surface
- Property boundary
- Slurry wall
- Fence
- Railroad tracks
- Aboveground water channel
- Underground water channel
- Building
- Storage tank

NOTES

NM Not measured

Groundwater elevation contours drawn every 0.1 feet on the former Rifkin property and every 0.5 feet on the remainder of the site.

LF-11 / 5.40 — Location ID; Groundwater elevation (feet relative to mean sea level)

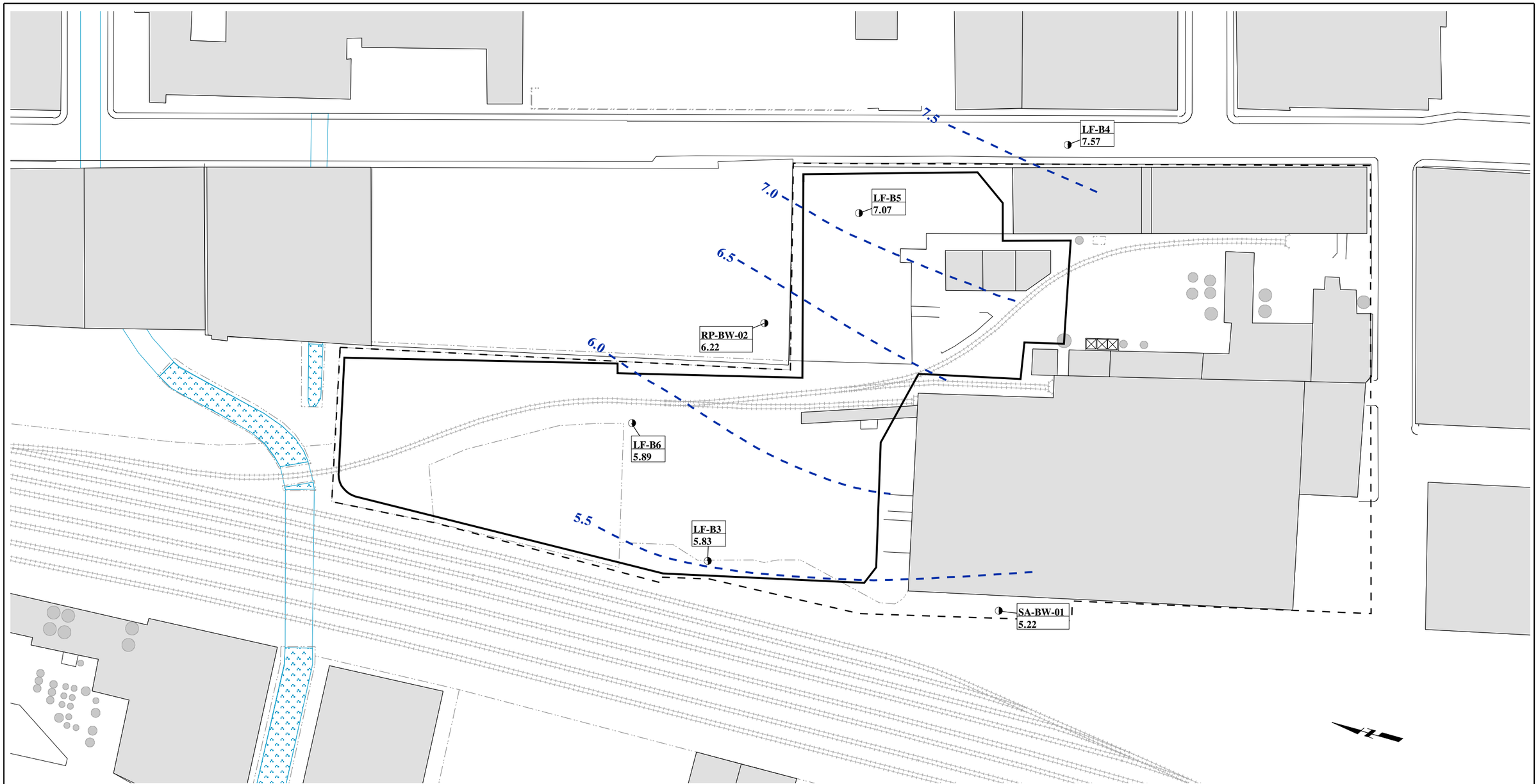
LF-39 / 6.23 — A-zone wells/piezometers screened in the lower portion of the A-zone. Data not used in contouring.

Sherwin-Williams Company, Emeryville, California

Figure 5-6
A-ZONE POTENTIOMETRIC SURFACE MAP
August 10, 2000

ENTRIX

Source: Levine-Fricke Quarterly Groundwater Monitoring Report, October 1 to December 21, 2000. Site Cleanup Requirements Order No. 98-009. January 31.



LEGEND

- LF-B3 — B-zone monitoring well
- 6.5 — Groundwater elevation contour
- Aboveground water channel
- Underground water channel
- Building
- Storage tank

NOTE

See Figure 2 for location of abandoned wells.

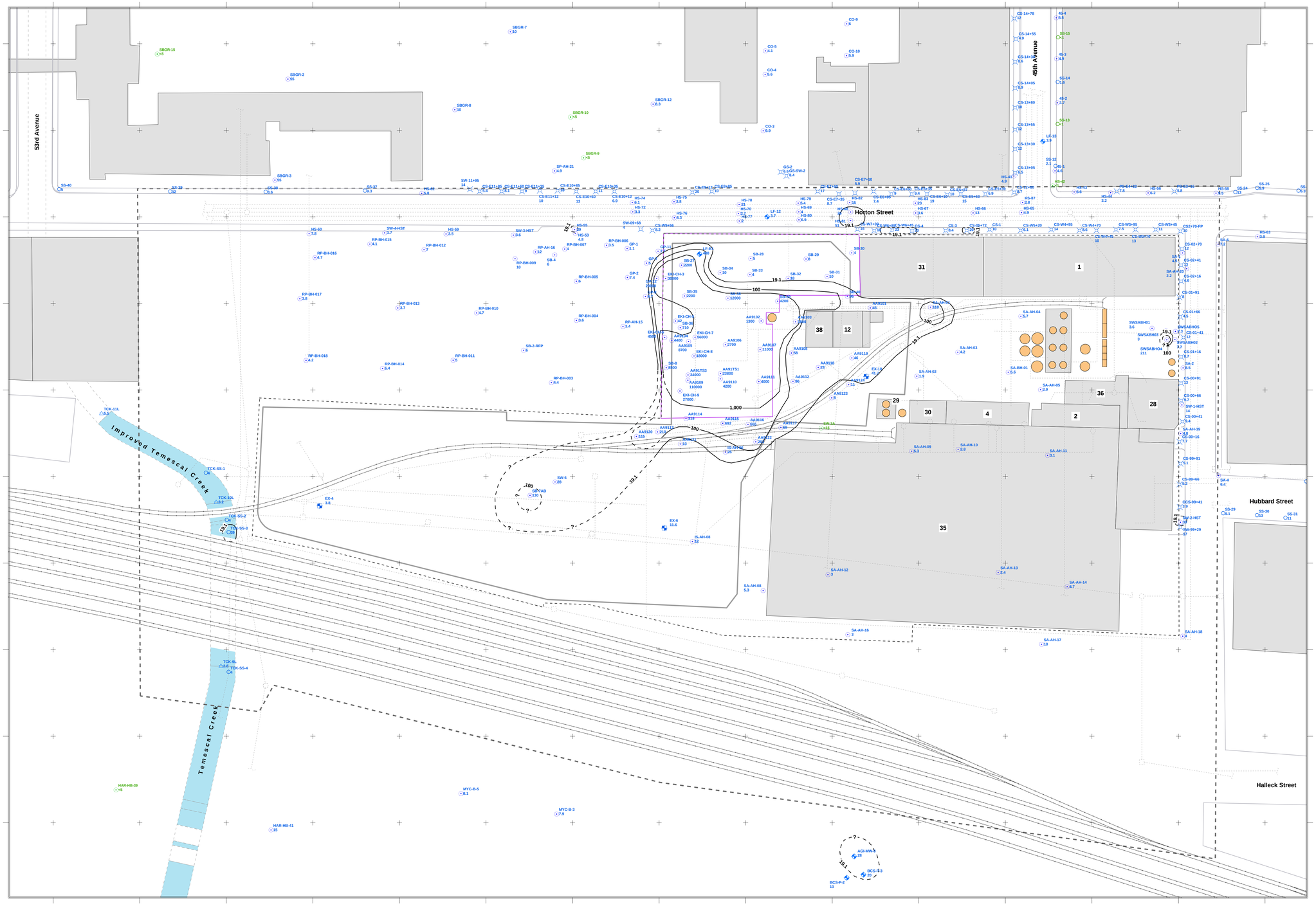
SA-BW-01 — Location ID
5.22 — Groundwater elevation (feet relative to mean sea level)

Sherwin-Williams Company, Emeryville, California

Figure 5-7
B-ZONE POTENTIOMETRIC SURFACE MAP
August 10, 2000

ENTRIX

Source: Levine-Fricke Quarterly Groundwater Monitoring Report, October 1 to December 21, 2000. Site Cleanup Requirements Order No. 98-009. January 31.


53rd Avenue
45th Avenue
Hotton Street
Hubbard Street
Halleck Street
Improved Temescal Creek
Temescal Creek
1
2
4
28
29
30
31
35
36
38
12
100
1,000
19.1
SBGR-7 10
SBGR-15 <5
SBGR-2 55
SBGR-8 10
SBGR-10 <5
SBGR-12 8.3
SBGR-9 <5
SBGR-3 6.6
CO-9 6
CO-5 4.1
CO-10 5.9
CO-4 5.6
CO-3 9.9
CS-14+78 12
CS-14+55 6.9
CS-14+30 6.6
CS-14+05 6.9
CS-13+80 10
CS-13+55 12
CS-13+30 12
CS-13+05 6.5
4S-4 5.5
SS-15
4S-3 4.9
SS-14 5.6
4S-2 3.7
SS-13
LF-13 3.9
SS-12 2.1
HS-1 4.6
HS-2
SS-40 <5
SS-39 12
SS-38 6.6
SS-37 8.3
SS-36 5.8
SS-24 13
SS-25 <5.9
SS-26 <5.9
SW-1+95 14
SP-AH-21 4.9
GS-2 & GS-SW-2 8.4
CS-E7+10 4.9
CS-E10+88 11
CS-E10+60 13
CS-E10+12 6.9
CS-E10+25 11
CS-E11+12 10
CS-E11+25 8.4
CS-E11+38 9
CS-E11+50 8.4
CS-E11+88 11
CS-E12+25 10
CS-E12+50 20
CS-E13+00 10
CS-E7+35 8.7
CS-E6+90 7.4
CS-E6+63 15
CS-E6+40 19
CS-E6+16 10
CS-E5+93 9.4
CS-E5+47 10
CS-E5+20 6.9
CS-E4+97 6.7
CS-E4+62 7.8
CS-E4+45 5.8
HS-1 5.6
HS-2 3.2
HS-3 8.2
HS-4 8.5
HS-5 13
HS-6 <5.9
HS-7 <5.9
HS-8 <5.9
HS-9 <5.9
HS-10 <5.9
HS-11 <5.9
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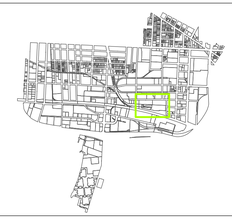
HS-84 <5.9
HS-85 <5.9
HS-86 <5.9
HS-87 <5.9
CS-W1+70 <5.9
CS-W2+45 <5.9
CS-W3+20 <5.9
CS-W3+95 <5.9
CS-W4+70 <5.9
CS-W4+95 <5.9
CS-W5+20 <5.9
CS-W6+45 <5.9
CS-W7+70 <5.9
CS-W8+95 <5.9
CS-W9+56 <5.9
CS-1 <5.9
CS-2 <5.9
CS-3 <5.9
CS-4 <5.9
CS-5 <5.9
CS-6 <5.9
CS-7 <5.9
CS-8 <5.9
CS-9 <5.9
CS-10 <5.9
CS-11 <5.9
CS-12 <5.9
CS-13 <5.9
CS-14 <5.9
CS-15 <5.9
CS-16 <5.9
CS-17 <5.9
CS-18 <5.9
CS-19 <5.9
CS-20 <5.9

Legend

- MONITORING WELL OR PIEZOMETER
- EXTRACTION WELL
- SOIL BORING OR CONE PENTROMETER TEST BORING
- SURFACE SOIL SAMPLE LOCATION
- COMPOSITE SOIL SAMPLE LOCATION
- EXCAVATION SOIL SAMPLE LOCATION
- CREEK SAMPLE LOCATION
- INVESTIGATION BOUNDARY
- SHERWIN-WILLIAMS CURRENT PROPERTY BOUNDARY
- RAISED CAP AREA
- SLURRY WALL
- RAILROAD TRACK
- 28 — EXISTING BUILDING & BUILDING NUMBER
- ABOVEGROUND STORAGE TANK

LF-24	SAMPLING POINT IDENTIFICATION
0.34	CONCENTRATION OF CHEMICAL IN MG/KG
<5	CHEMICAL NOT DETECTED ABOVE DETECTION LIMIT OF 5 MG/KG
MG/KG	MILLIGRAMS PER KILOGRAM
—— ?——	ARSENIC CONCENTRATION CONTOUR (DASHED WHERE INFERRED AND QUERIED WHERE UNCERTAIN)

NOTES:
(1) CONCENTRATIONS PRESENTED IN MG/KG.
(2) DATA PRESENTED IN BLUE IF ARSENIC WAS DETECTED. DATA PRESENTED IN GREEN IF ARSENIC WAS NOT DETECTED.
(3) THE HIGHEST CONCENTRATION DETECTED IN SOIL SAMPLES COLLECTED WITHIN THE DEPTH INTERVAL IS PRESENTED.
(4) DATA PRESENTED ON THIS FIGURE ARE REPRESENTATIVE OF CONDITIONS ON APRIL 1, 2001; SOIL SAMPLES REMOVED DURING PREVIOUS EXCAVATION ACTIVITIES ARE NOT PRESENTED ON THIS FIGURE.
(5) THE RAISED CAP AREA IS UNDERLAIN BY APPROXIMATELY 1 TO 3 FEET OF ARSENIC-BEARING SOIL PREVIOUSLY EXCAVATED DURING SLURRY WALL CONSTRUCTION. SAMPLE DEPTHS PRESENTED IN THIS AREA ARE BASED ON THE ORIGINAL GROUND SURFACE ELEVATION; ANALYTICAL DATA FROM THE EXCAVATED ARSENIC-BEARING SOIL ARE SUMMARIZED IN SECTION 2.3 AND WILL BE EVALUATED IN THE RISK ASSESSMENT.
(6) CONCENTRATION CONTOUR INTERVALS WERE SELECTED BASED ON AVAILABLE CRITERIA AND DATA. THE VALUE OF 19.1 MG/KG REPRESENTS THE BACKGROUND SOIL CONCENTRATION DEVELOPED FOR SOIL AT LAWRENCE BERKELY NATIONAL LABORATORY IN BERKELEY, CALIFORNIA. CONCENTRATION CONTOUR INTERVALS OF 100 AND 1,000 MG/KG WERE SELECTED BASED ON THE RANGE OF CONCENTRATIONS DETECTED IN THE SOIL AT THE SITE.
(7) CONCENTRATION CONTOUR LINES REPRESENT ONE INTERPRETATION BASED ON AVAILABLE DATA. OTHER INTERPRETATIONS ARE POSSIBLE.
(8) SOIL SAMPLES COLLECTED AT THE FOLLOWING SETS OF SAMPLE LOCATIONS WERE COMPOSITED: SBGR-2 AND SBGR-3; SBGR-7 AND SBGR-8; SBGR-9 AND SBGR-10; AND SBGR-12 AND SBGR-13. ARSENIC CONCENTRATIONS FOR THESE COMPOSITE SAMPLES WERE EXCLUDED FROM CONCENTRATION CONTOURING.



City of Emeryville

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NAD83 California Stateplane Zone 3

Sherwin-Williams Company, Emeryville, California

Figure 5-12
Arsenic Concentrations in Deep Soil
(3-10 Feet bgs)

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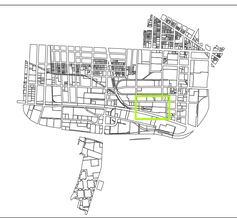
Legend

- MONITORING WELL OR PIEZOMETER
- EXTRACTION WELL
- SOIL BORING OR CONE PENTROMETER TEST BORING
- SURFACE SOIL SAMPLE LOCATION
- COMPOSITE SOIL SAMPLE LOCATION
- EXCAVATION SOIL SAMPLE LOCATION
- CREEK SAMPLE LOCATION
- INVESTIGATION BOUNDARY
- SHERWIN-WILLIAMS CURRENT PROPERTY BOUNDARY
- RAISED CAP AREA
- SLURRY WALL
- RAILROAD TRACK
- 28 — EXISTING BUILDING & BUILDING NUMBER
- ABOVEGROUND STORAGE TANK
- LF-24 — SAMPLING POINT IDENTIFICATION
- 0.34 — CONCENTRATION OF CHEMICAL IN MG/KG
- <5 — CHEMICAL NOT DETECTED ABOVE DETECTION LIMIT OF 5 MG/KG
- MG/KG — MILLIGRAMS PER KILOGRAM

NOTES:
(1) CONCENTRATIONS PRESENTED IN MG/KG.
(2) DATA PRESENTED IN BLUE IF LEAD WAS DETECTED. DATA PRESENTED IN GREEN IF LEAD WAS NOT DETECTED.
(3) THE HIGHEST CONCENTRATION DETECTED IN SOIL SAMPLES COLLECTED WITHIN THE DEPTH INTERVAL ARE PRESENTED.
(4) DATA PRESENTED ON THIS FIGURE ARE REPRESENTATIVE OF CONDITIONS ON APRIL 1, 2001; SOIL SAMPLES REMOVED DURING PREVIOUS EXCAVATION ACTIVITIES ARE NOT PRESENTED ON THIS FIGURE.
(5) THE RAISED CAP AREA IS UNDERLAIN BY APPROXIMATELY 1 TO 3 FEET OF ARSENIC-BEARING SOIL PREVIOUSLY EXCAVATED DURING SLURRY WALL CONSTRUCTION. SAMPLE DEPTHS PRESENTED IN THIS AREA ARE BASED ON THE ORIGINAL GROUND SURFACE ELEVATION; ANALYTICAL DATA FROM THE EXCAVATED ARSENIC-BEARING SOIL ARE SUMMARIZED IN SECTION 2.3 AND WILL BE EVALUATED IN THE RISK ASSESSMENT.
(6) SOIL SAMPLES COLLECTED AT THE FOLLOWING SETS OF SAMPLE LOCATIONS WERE COMPOSITED: SBGR-2 AND SBGR-3; SBGR-7 AND SBGR-8; SBGR-9 AND SBGR-10; AND SBGR-12 AND SBGR-14.



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NAD83 California Stateplane Zone 3

Sherwin-Williams Company, Emeryville, California

Figure 5-13
Lead Concentrations in Shallow Soil
(0-3 Feet bgs)

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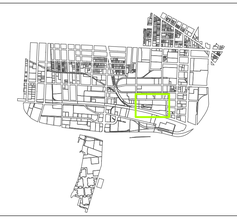
Legend

- MONITORING WELL OR PIEZOMETER
- EXTRACTION WELL
- SOIL BORING OR CONE PENTROMETER TEST BORING
- SURFACE SOIL SAMPLE LOCATION
- COMPOSITE SOIL SAMPLE LOCATION
- EXCAVATION SOIL SAMPLE LOCATION
- CREEK SAMPLE LOCATION
- INVESTIGATION BOUNDARY
- SHERWIN-WILLIAMS CURRENT PROPERTY BOUNDARY
- RAISED CAP AREA
- SLURRY WALL
- RAILROAD TRACK
- 28 — EXISTING BUILDING & BUILDING NUMBER
- ABOVEGROUND STORAGE TANK

LF-24	SAMPLING POINT IDENTIFICATION
0.34	CONCENTRATION OF CHEMICAL IN MG/KG
<5	CHEMICAL NOT DETECTED ABOVE DETECTION LIMIT OF 5 MG/KG
MG/KG	MILLIGRAMS PER KILOGRAM

NOTES:
(1) CONCENTRATIONS PRESENTED IN MG/KG.
(2) DATA PRESENTED IN BLUE IF LEAD WAS DETECTED. DATA PRESENTED IN GREEN IF LEAD WAS NOT DETECTED.
(3) THE HIGHEST CONCENTRATION DETECTED IN SOIL SAMPLES COLLECTED WITHIN THE DEPTH INTERVAL ARE PRESENTED.
(4) DATA PRESENTED ON THIS FIGURE ARE REPRESENTATIVE OF CONDITIONS ON APRIL 1, 2001; SOIL SAMPLES REMOVED DURING PREVIOUS EXCAVATION ACTIVITIES ARE NOT PRESENTED ON THIS FIGURE.
(5) THE RAISED CAP AREA IS UNDERLAIN BY APPROXIMATELY 1 TO 3 FEET OF ARSENIC-BEARING SOIL PREVIOUSLY EXCAVATED DURING SLURRY WALL CONSTRUCTION. SAMPLE DEPTHS PRESENTED IN THIS AREA ARE BASED ON THE ORIGINAL GROUND SURFACE ELEVATION; ANALYTICAL DATA FROM THE EXCAVATED ARSENIC-BEARING SOIL ARE SUMMARIZED IN SECTION 2.3 AND WILL BE EVALUATED IN THE RISK ASSESSMENT.
(6) SOIL SAMPLES COLLECTED AT THE FOLLOWING SETS OF SAMPLE LOCATIONS WERE COMPOSITED: SBGR-2 AND SBGR-3; SBGR-7 AND SBGR-8; SBGR-9 AND SBGR-10; AND SBGR-12 AND SBGR-13.



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NAD83 California Stateplane Zone 3

Sherwin-Williams Company, Emeryville, California

Figure 5-14
Lead Concentrations in Deep Soil
(3-10 Feet bgs)

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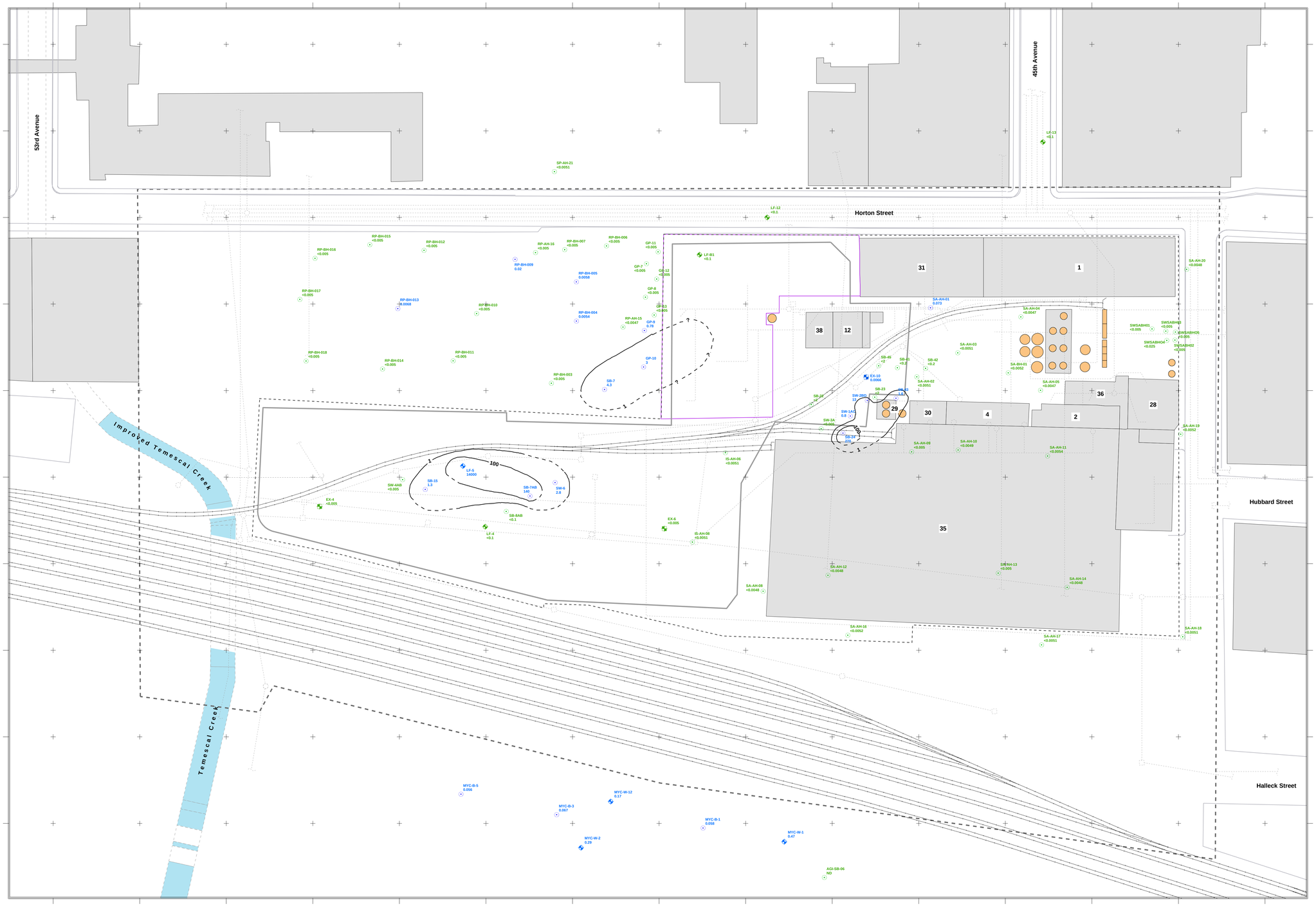


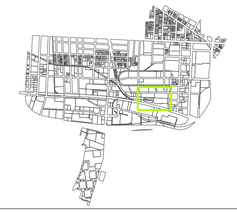
Legend

- MONITORING WELL OR PIEZOMETER
- EXTRACTION WELL
- SOIL BORING OR CONE PENTROMETER TEST BORING
- SURFACE SOIL SAMPLE LOCATION
- COMPOSITE SOIL SAMPLE LOCATION
- EXCAVATION SOIL SAMPLE LOCATION
- CREEK SAMPLE LOCATION
- INVESTIGATION BOUNDARY
- SHERWIN-WILLIAMS CURRENT PROPERTY BOUNDARY
- RAISED CAP AREA
- SLURRY WALL
- RAILROAD TRACK
- 28 — EXISTING BUILDING & BUILDING NUMBER
- ABOVEGROUND STORAGE TANK

LF-24	SAMPLING POINT IDENTIFICATION
13	CONCENTRATION OF CHEMICAL IN MG/KG
<0.005	CHEMICAL NOT DETECTED ABOVE DETECTION LIMIT OF 0.005 MG/KG
MG/KG	MILLIGRAMS PER KILOGRAM
— ? —	TOLUENE CONCENTRATION CONTOUR (DASHED WHERE INFERRED AND QUERIED WHERE UNCERTAIN)

NOTES:

(1) CONCENTRATIONS PRESENTED IN MG/KG.
(2) DATA PRESENTED IN BLUE IF TOLUENE WAS DETECTED. DATA PRESENTED IN GREEN IF TOLUENE WAS NOT DETECTED.
(3) THE HIGHEST CONCENTRATION DETECTED IN SOIL SAMPLES COLLECTED WITHIN THE DEPTH INTERVAL IS PRESENTED.
(4) DATA PRESENTED ON THIS FIGURE ARE REPRESENTATIVE OF CONDITIONS ON APRIL 1, 2001; SOIL SAMPLES REMOVED DURING PREVIOUS EXCAVATION ACTIVITIES ARE NOT PRESENTED ON THIS FIGURE.
(5) THE RAISED CAP AREA IS UNDERLAIN BY APPROXIMATELY 1 TO 3 FEET OF ARSENIC-BEARING SOIL PREVIOUSLY EXCAVATED DURING SLURRY WALL CONSTRUCTION. SAMPLE DEPTHS PRESENTED IN THIS AREA ARE BASED ON THE ORIGINAL GROUND SURFACE ELEVATION; ANALYTICAL DATA FROM THE EXCAVATED ARSENIC-BEARING SOIL ARE SUMMARIZED IN SECTION 2.3 AND WILL BE EVALUATED IN THE RISK ASSESSMENT.
(6) CONCENTRATION CONTOUR INTERVALS OF 1 AND 100 MG/KG WERE SELECTED BASED ON THE RANGE OF CONCENTRATIONS DETECTED IN SOIL AT THE SITE.
(7) CONCENTRATION CONTOUR LINES REPRESENT ONE INTERPRETATION BASED ON AVAILABLE DATA. OTHER INTERPRETATIONS ARE POSSIBLE.



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NAD83 California Stateplane Zone 3

Sherwin-Williams Company, Emeryville, California

Figure 5-19
Toluene Concentrations in Shallow Soil (0-3 Feet bgs)

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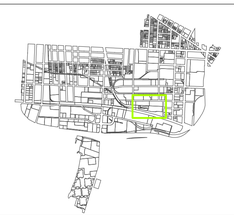
Legend

- MONITORING WELL OR PIEZOMETER
- EXTRACTION WELL
- SOIL BORING OR CONE PENTROMETER TEST BORING
- SURFACE SOIL SAMPLE LOCATION
- COMPOSITE SOIL SAMPLE LOCATION
- EXCAVATION SOIL SAMPLE LOCATION
- CREEK SAMPLE LOCATION
- INVESTIGATION BOUNDARY
- SHERWIN-WILLIAMS CURRENT PROPERTY BOUNDARY
- RAISED CAP AREA
- SLURRY WALL
- RAILROAD TRACK
- 28 — EXISTING BUILDING & BUILDING NUMBER
- ABOVEGROUND STORAGE TANK

LF-24	SAMPLING POINT IDENTIFICATION
0.34	CONCENTRATION OF CHEMICAL IN MG/KG
<0.005	CHEMICAL NOT DETECTED ABOVE DETECTION LIMIT OF 0.005 MG/KG
MG/KG	MILLIGRAMS PER KILOGRAM
—— ? ——	TOLUENE CONCENTRATION CONTOUR (DASHED WHERE INFERRED AND QUERIED WHERE UNCERTAIN)

NOTES:

(1) CONCENTRATIONS PRESENTED IN MG/KG.
(2) DATA PRESENTED IN BLUE IF TOLUENE WAS DETECTED. DATA PRESENTED IN GREEN IF TOLUENE WAS NOT DETECTED.
(3) THE HIGHEST CONCENTRATION DETECTED IN SOIL SAMPLES COLLECTED WITHIN THE DEPTH INTERVAL IS PRESENTED.
(4) DATA PRESENTED ON THIS FIGURE ARE REPRESENTATIVE OF CONDITIONS ON APRIL 1, 2001; SOIL SAMPLES REMOVED DURING PREVIOUS EXCAVATION ACTIVITIES ARE NOT PRESENTED ON THIS FIGURE.
(5) THE RAISED CAP AREA IS UNDERLAIN BY APPROXIMATELY 1 TO 3 FEET OF ARSENIC-BEARING SOIL PREVIOUSLY EXCAVATED DURING SLURRY WALL CONSTRUCTION. SAMPLE DEPTHS PRESENTED IN THIS AREA ARE BASED ON THE ORIGINAL GROUND SURFACE ELEVATION; ANALYTICAL DATA FROM THE EXCAVATED ARSENIC-BEARING SOIL ARE SUMMARIZED IN SECTION 2.3 AND WILL BE EVALUATED IN THE RISK ASSESSMENT.
(6) CONCENTRATION CONTOUR INTERVALS OF 1 AND 100 MG/KG WERE SELECTED BASED ON THE RANGE OF CONCENTRATIONS DETECTED IN SOIL AT THE SITE.
(7) CONCENTRATION CONTOUR LINES REPRESENT ONE INTERPRETATION BASED ON AVAILABLE DATA. OTHER INTERPRETATIONS ARE POSSIBLE.



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NAD83 California Stateplane Zone 3

Sherwin-Williams Company, Emeryville, California

Figure 5-20
Toluene Concentrations in Deep Soil
(3-10 Feet bgs)

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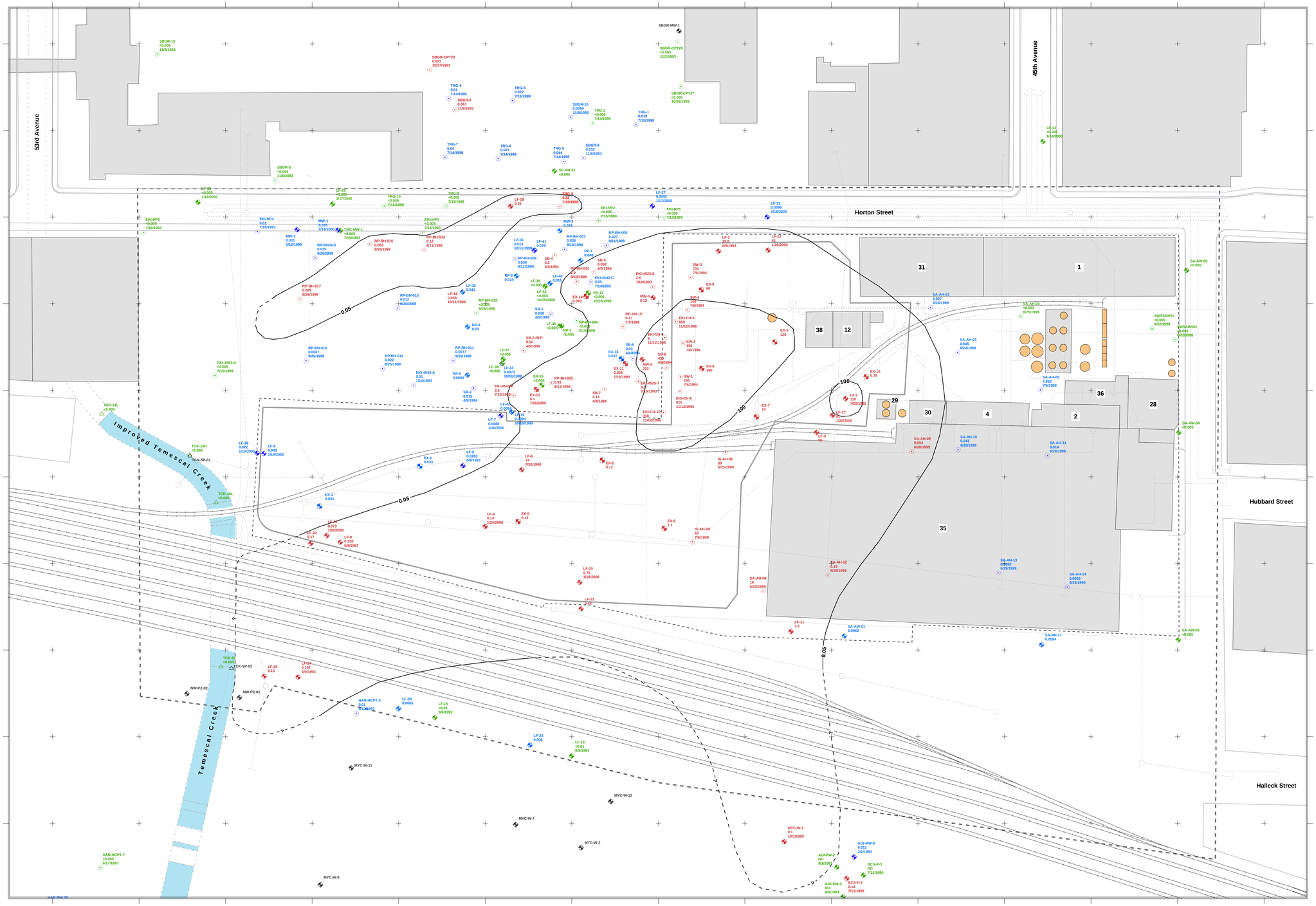


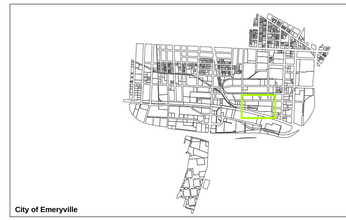
Legend

- MONITORING WELL OR PIEZOMETER
- EXTRACTION WELL
- SOIL BORING OR CONE PENTROMETER TEST BORING
- SURFACE SOIL SAMPLE LOCATION
- COMPOSITE SOIL SAMPLE LOCATION
- EXCAVATION SOIL SAMPLE LOCATION
- CREEK SAMPLE LOCATION
- INVESTIGATION BOUNDARY
- SHERWIN-WILLIAMS CURRENT PROPERTY BOUNDARY
- SLURRY WALL
- RAILDROAD TRACK
- 28 — EXISTING BUILDING & BUILDING NUMBER
- ABOVEGROUND STORAGE TANK

LF-24	SAMPLING POINT IDENTIFICATION
0.34	CONCENTRATION OF CHEMICAL IN MG/L
<0.005	CHEMICAL NOT DETECTED ABOVE DETECTION LIMIT OF 0.005 MG/L
8/25/1998	SAMPLE DATE
MG/L	MILLIGRAMS PER LITER
— ? —	ARSENIC CONCENTRATION CONTOUR (DASHED WHERE INFERRED AND QUERIED WHERE UNCERTAIN)

NOTES:

(1) CONCENTRATIONS PRESENTED IN MG/L.
(2) SAMPLE COLLECTION DATE SHOWN WITH SAMPLE RESULT FOR (1) WELLS NOT SAMPLED DURING 4TH QUARTER EVENT (MOST RECENT DATE PRESENTED) AND (2) GRAB GROUNDWATER SAMPLES
(3) DATA PRESENTED IN RED IF ARSENIC MAXIMUM CONTAMINANT LEVEL (MCL) OF 0.05 MG/L IS EXCEEDED. DATA PRESENTED IN BLUE IF DETECTED CONCENTRATION IS BELOW ARSENIC MCL. DATA PRESENTED IN GREEN IF ARSENIC WAS NOT DETECTED.
(4) WELL LOCATION PRESENTED IN BLACK IF NO ARSENIC DATA ARE AVAILABLE.
(5) CONCENTRATION CONTOUR INTERVALS WERE SELECTED BASED ON AVAILABLE CRITERIA AND DATA. THE VALUE OF 0.05 MG/L IS THE CALIFORNIA MCL. THE CONCENTRATION CONTOUR INTERVAL OF 100 MG/L WAS SELECTED BASED ON THE RANGE OF CONCENTRATIONS DETECTED IN GROUNDWATER AT THE SITE.
(6) CONCENTRATION CONTOUR LINES REPRESENT ONE INTERPRETATION BASED ON AVAILABLE DATA. OTHER INTERPRETATIONS ARE POSSIBLE.



N E S W

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NAD83 California Stateplane Zone 3

Sherwin-Williams Company, Emeryville, California

Figure 5-21
Arsenic Concentrations in Groundwater, A Zone, 4th Quarter 2000

ENTRIX

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Appendix A2

Selected Figures from Report of Findings, Soil Characterization Study Addendum, Sherwin-Williams Site, 1450 Sherwin Avenue, Emeryville, California. February 22, 2008.

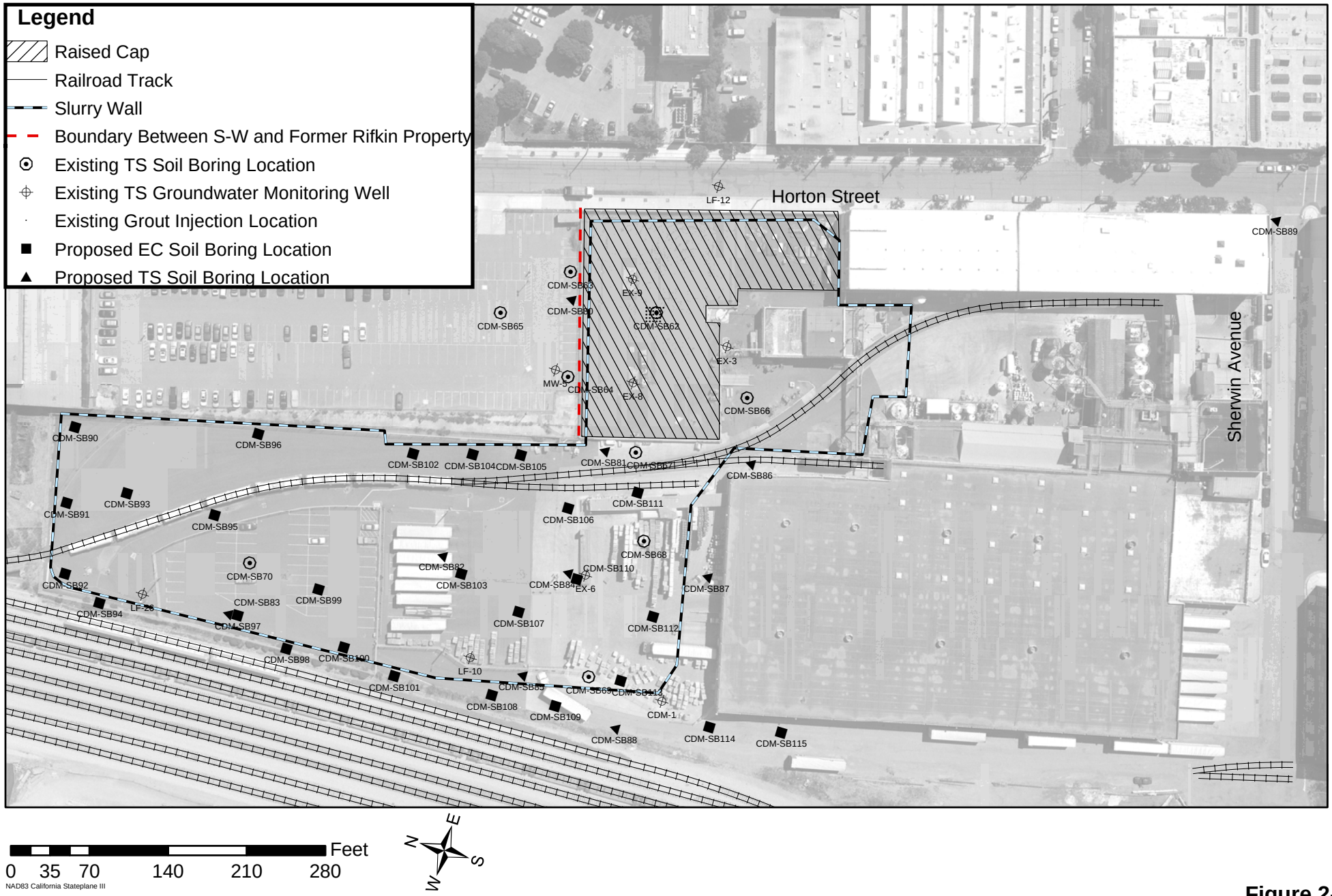

Figure 2-1
Sample Location Map
Geophysical Investigation and Treatability Study
Emeryville, CA

Appendix A3

Selected Figures from Report of Findings, Phase III Groundwater Treatability Study, Groundwater Column Studies, Sherwin-Williams Site, 1450 Sherwin Avenue, Emeryville, California. February 6, 2008.

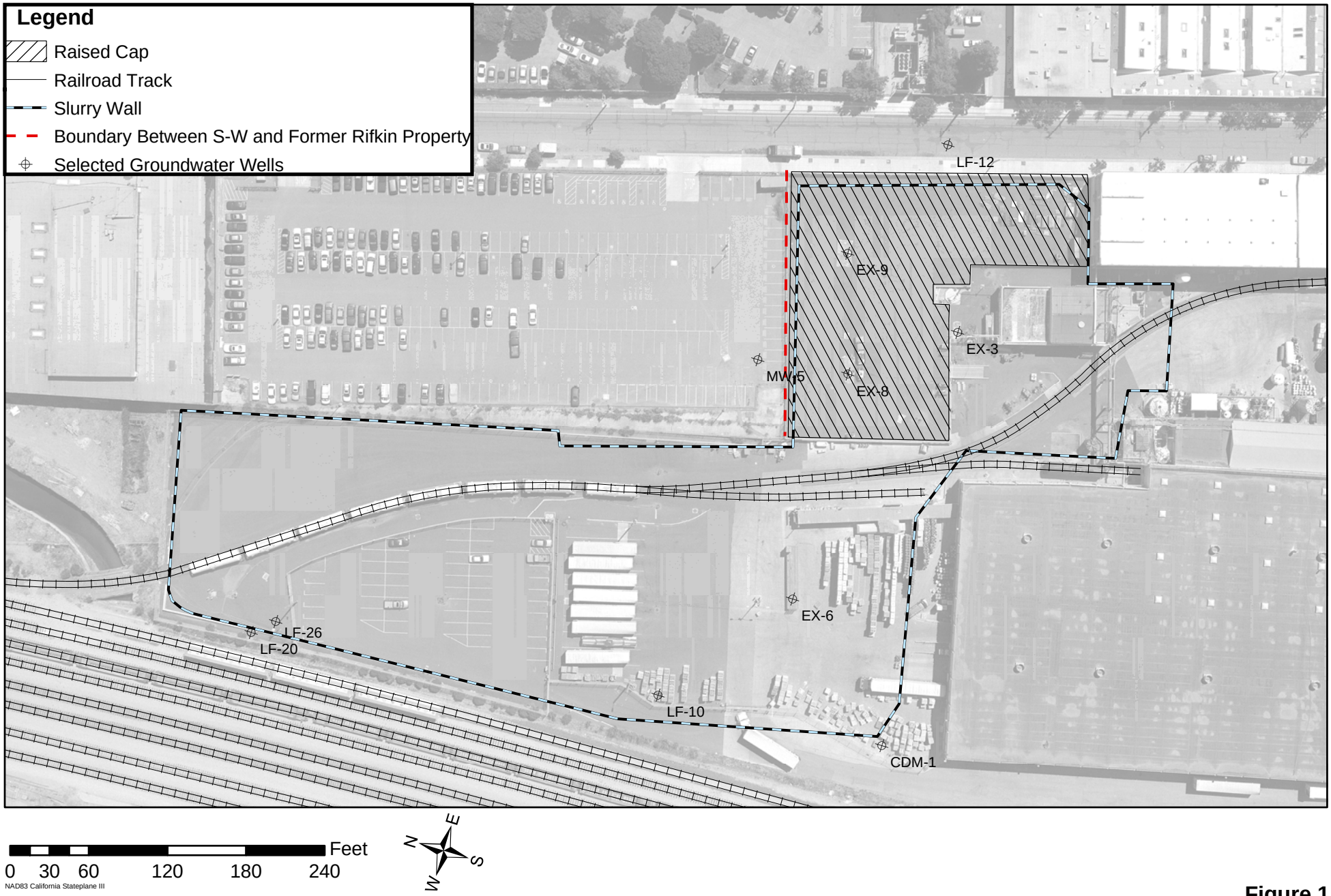

Figure 1
Location of Selected Groundwater Wells
Emeryville, CA

Figure 2
A. Completed Columns
B. Close-up of Inlet / Outlet and Sampling Apparatus
Phase II Groundwater Treatability Study
Emeryville, CA

CDM

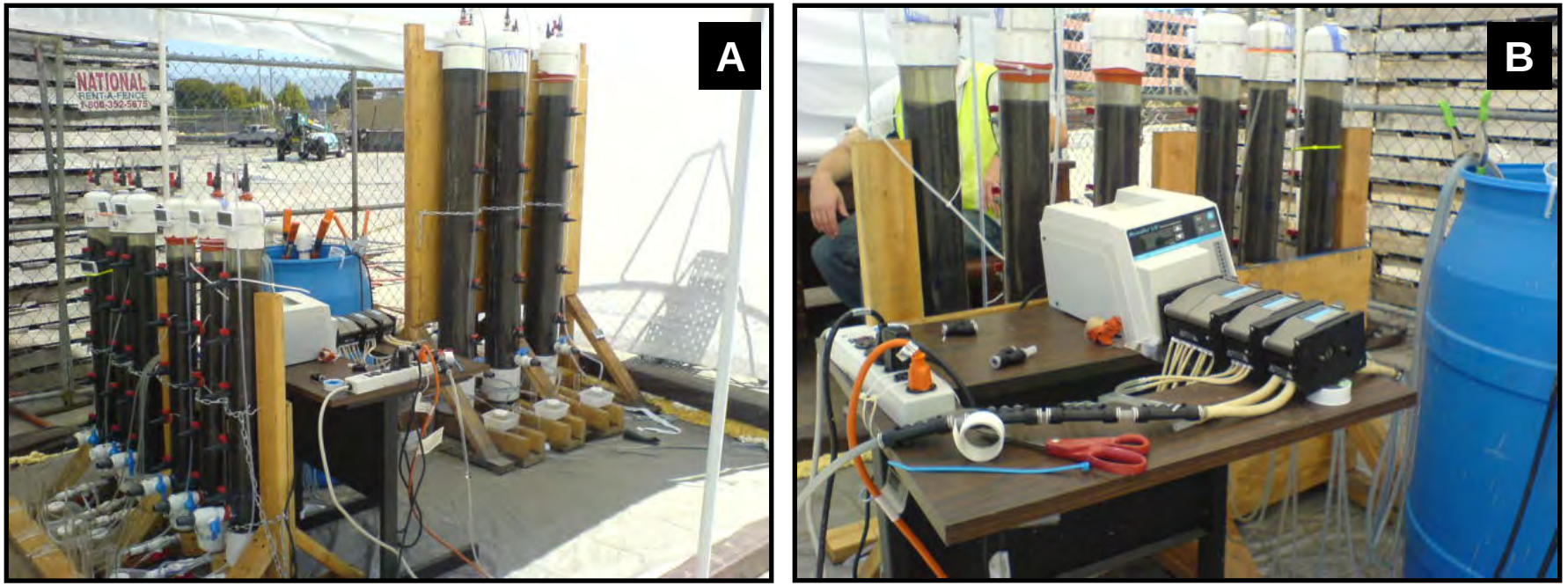

Figure 3
A. Overview of Column Setup at CDM-1
B. Peristaltic Pump Setup
Phase II Groundwater Treatability Study
Emeryville, CA

CDM

Notes:
System flow will vary according to desired residence time.
Effluent port in sparging basin can also be selected for desired residence time.
One transfer tank (300 gal) for each well
Sludge columns are clear PVC
$FeCl_3$ - Ferric Chloride (coagulant)
MnO_4 - Permanganate (oxidant)

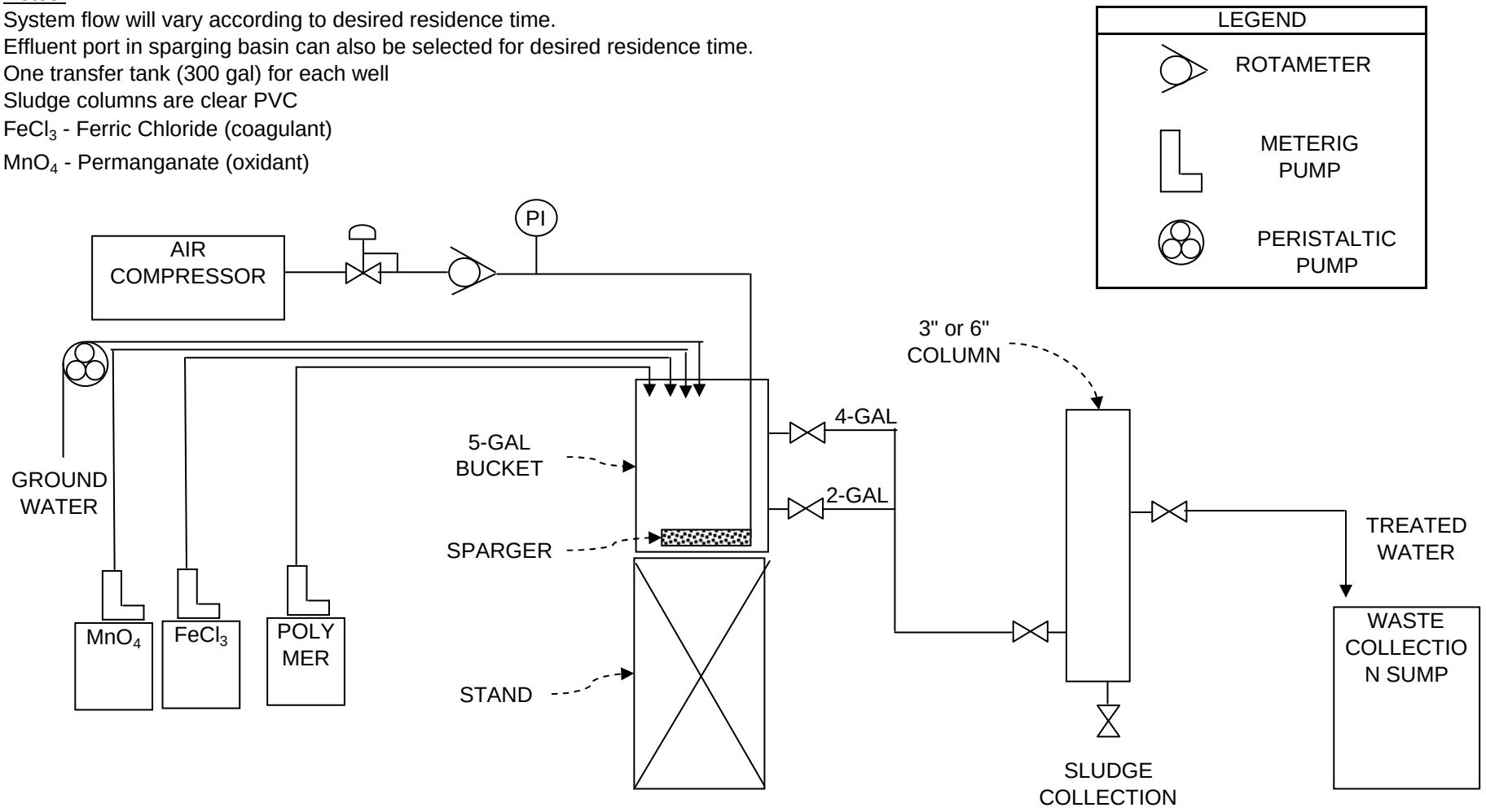

Figure 4
Process Flow Diagram
Active Precipitation Process
Phase III Groundwater Treatability Study
Emeryville, CA

CDM

Figure 5
Active Process Testing Setup
Phase III Groundwater Treatability Study
Emeryville, CA

CDM

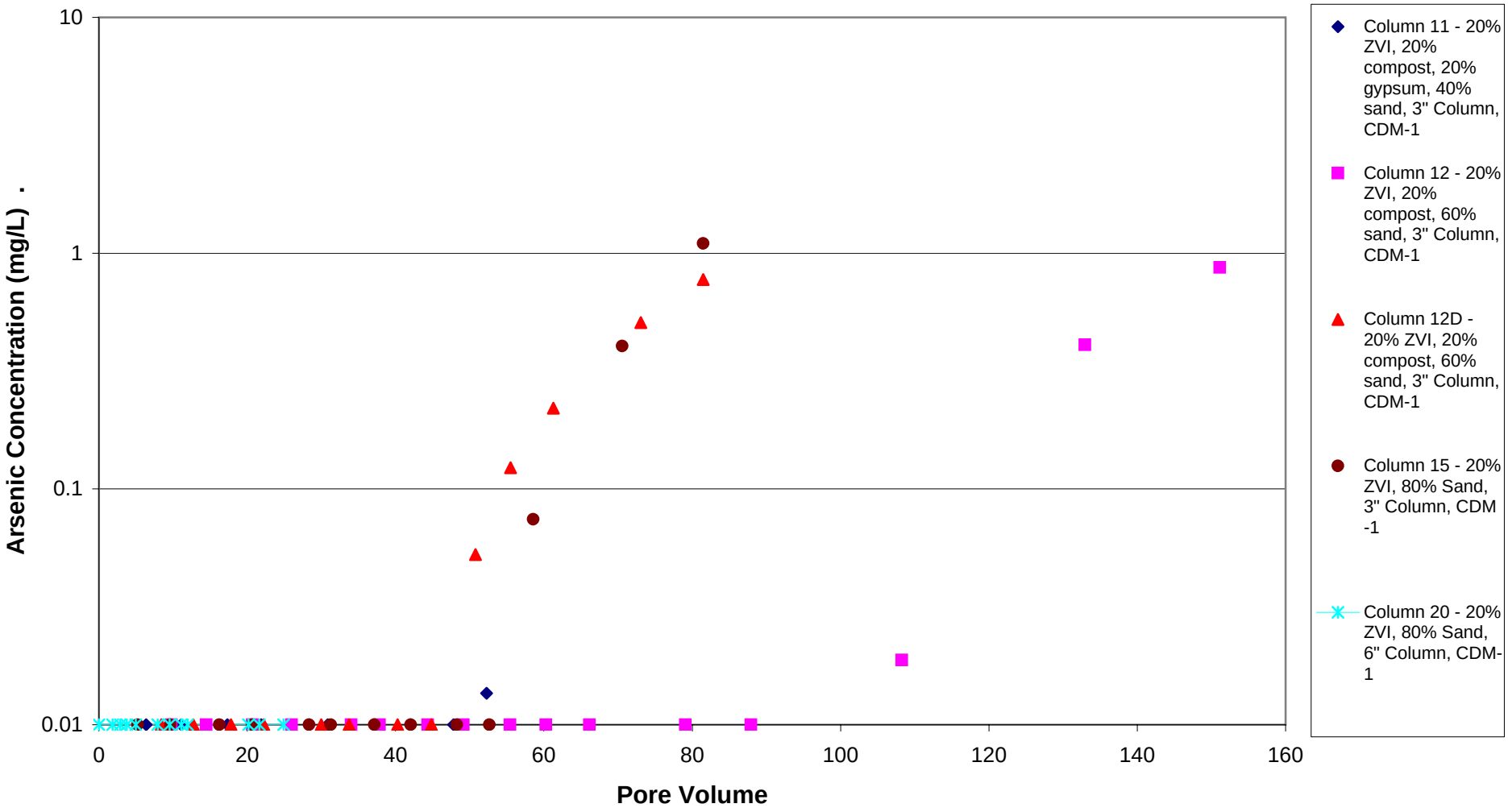

Figure 6
Arsenic Breakthrough at Well CDM-1
Phase II Groundwater Treatability Study
Emeryville, CA

CDM

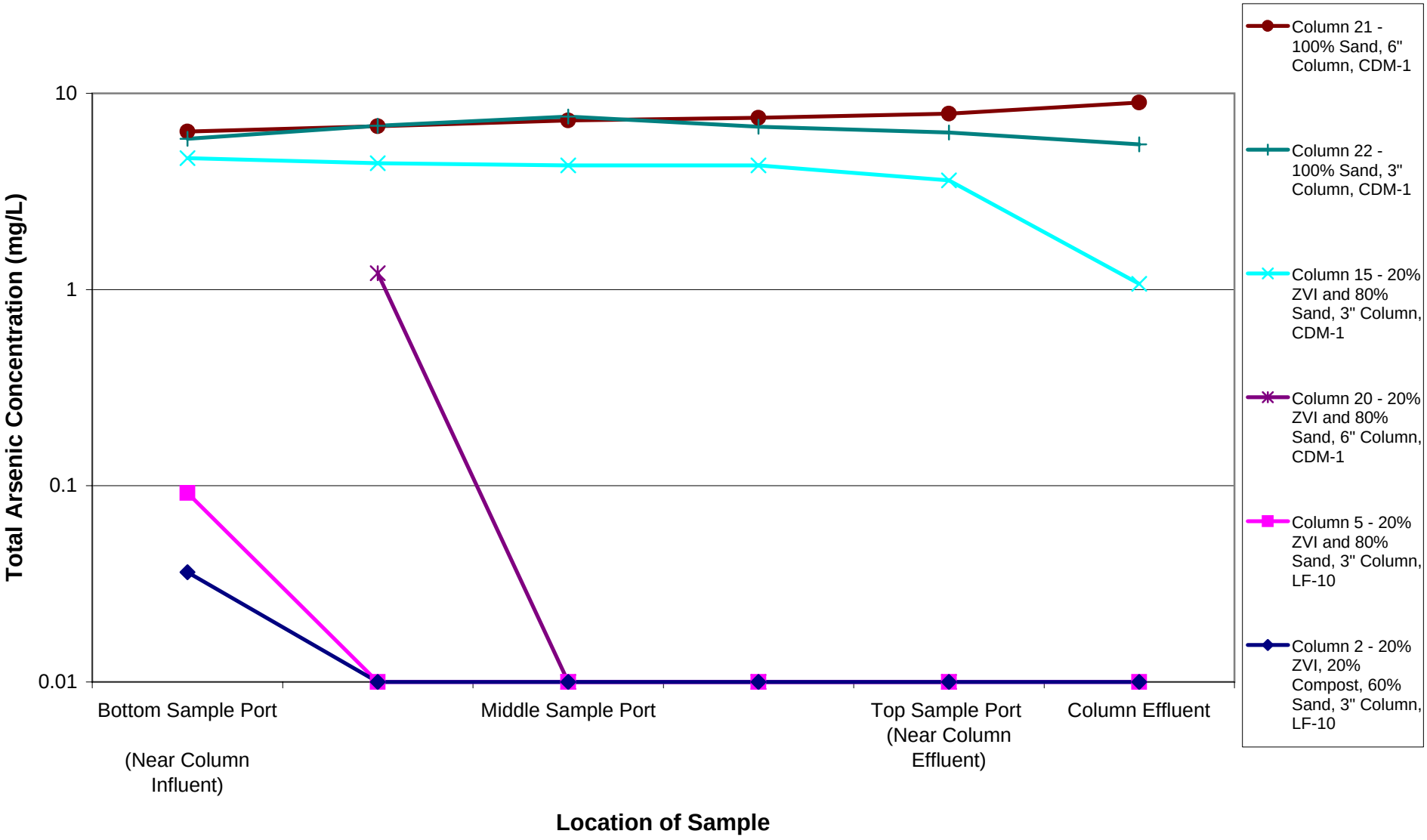

Figure 7
Arsenic Profiles Along Selected Test Columns at End of Phase III
Phase II Groundwater Treatability Study
Emeryville, CA

CDM

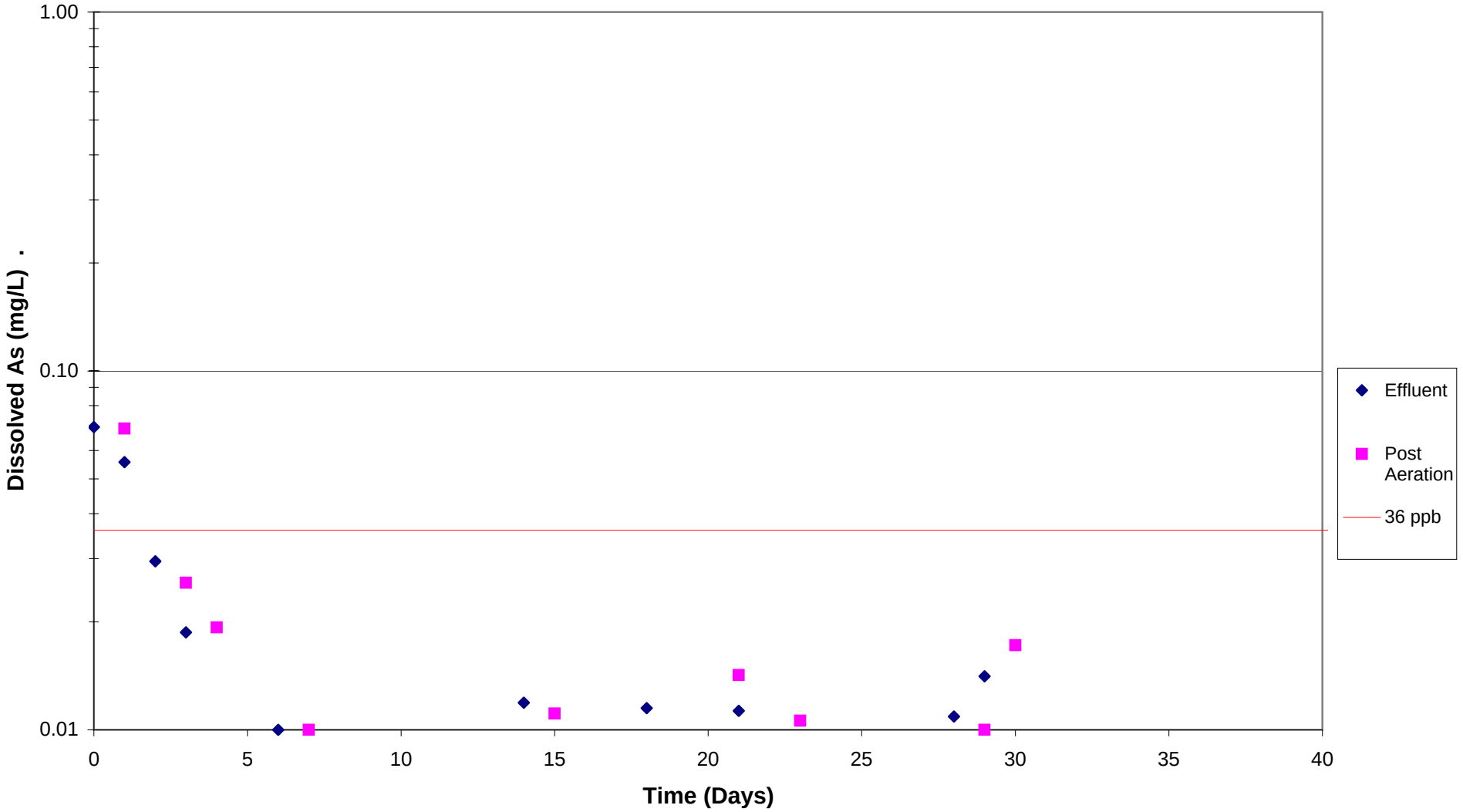

Figure 8
Dissolved Arsenic Concentrations vs. Time at Well LF-10
Active Process - Phase III Groundwater Treatability Study
Emeryville, CA

CDM

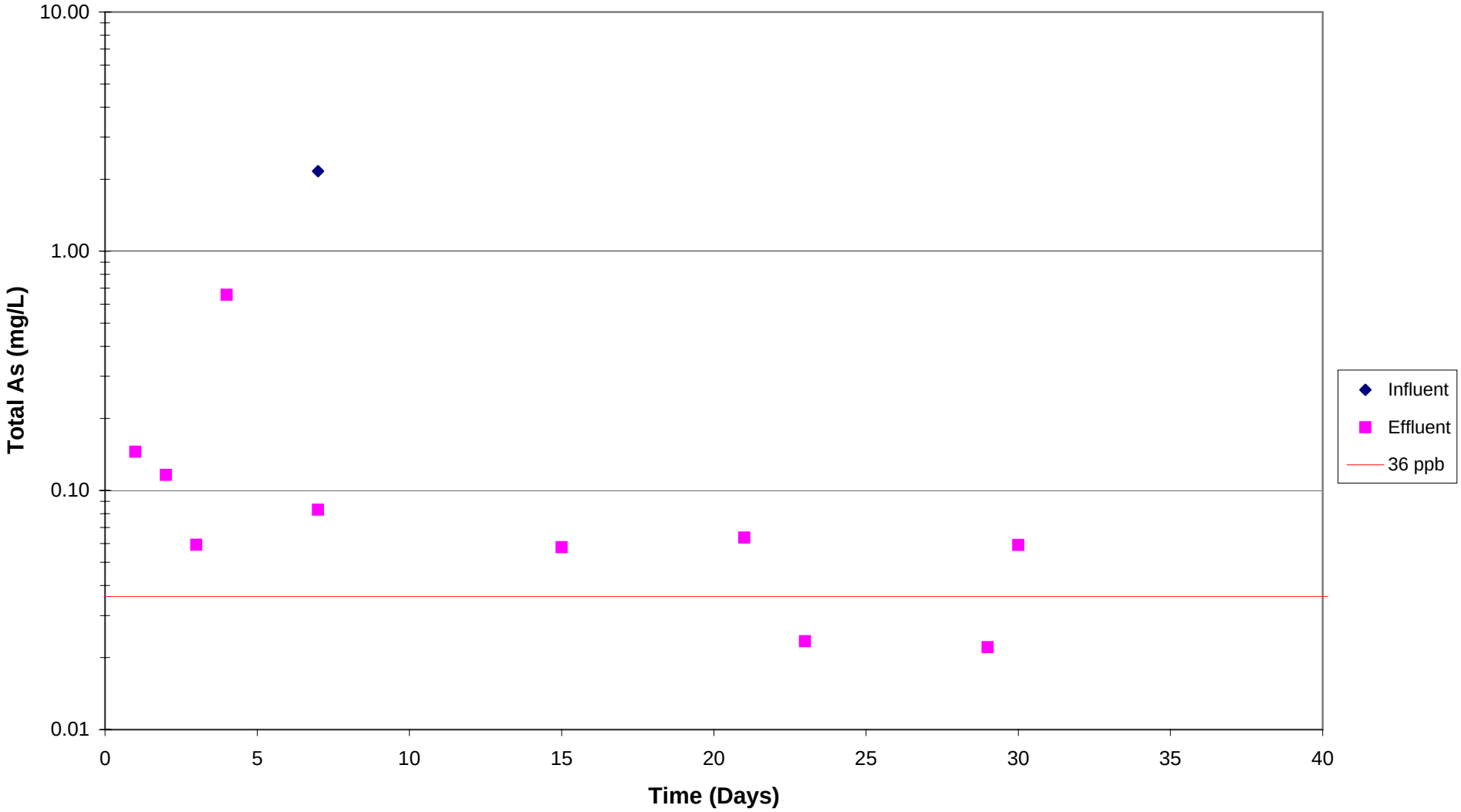

Figure 9
Total Arsenic Concentrations Vs. Time at Well LF-10
Active Process - Phase III Groundwater Treatability Study
Emeryville, CA

CDM

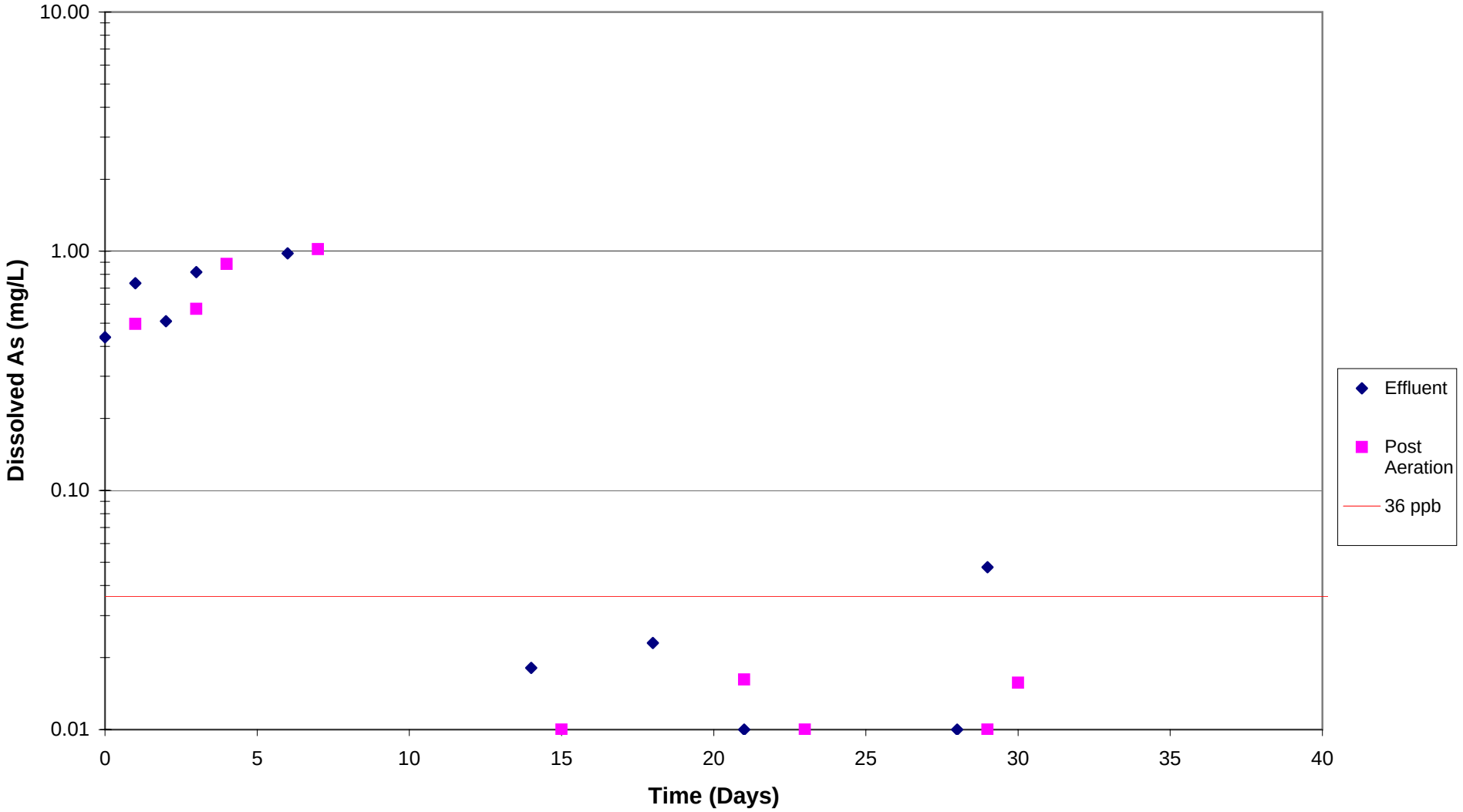

Figure 10
Dissolved Arsenic Concentrations Vs. Time at Well CDM-1
Active Process - Phase III Groundwater Treatability Study
Emeryville, CA

CDM

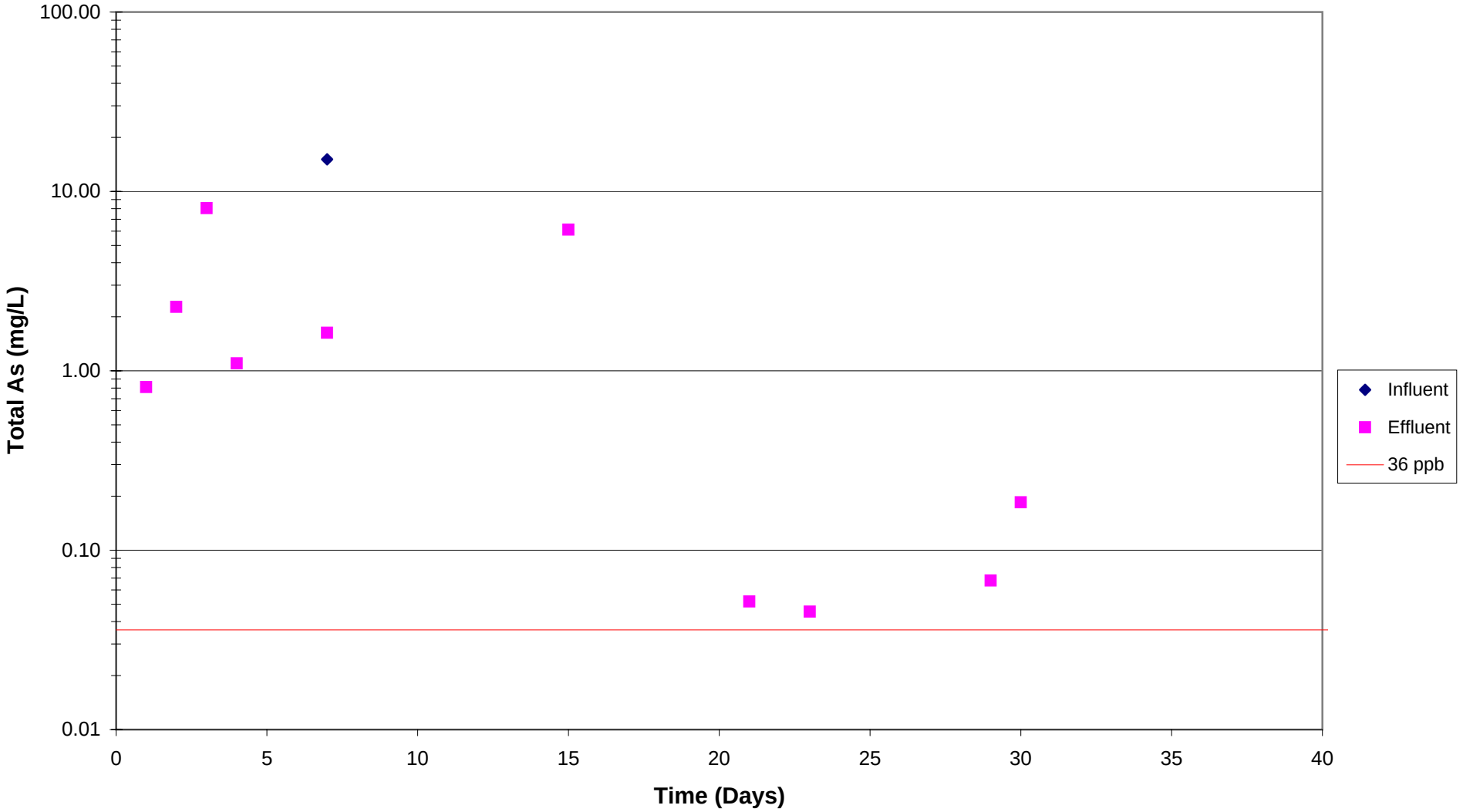

Figure 11
Total Arsenic Concentrations Vs. Time at Well CDM-1
Active Process - Phase III Groundwater Treatability Study
Emeryville, CA

CDM

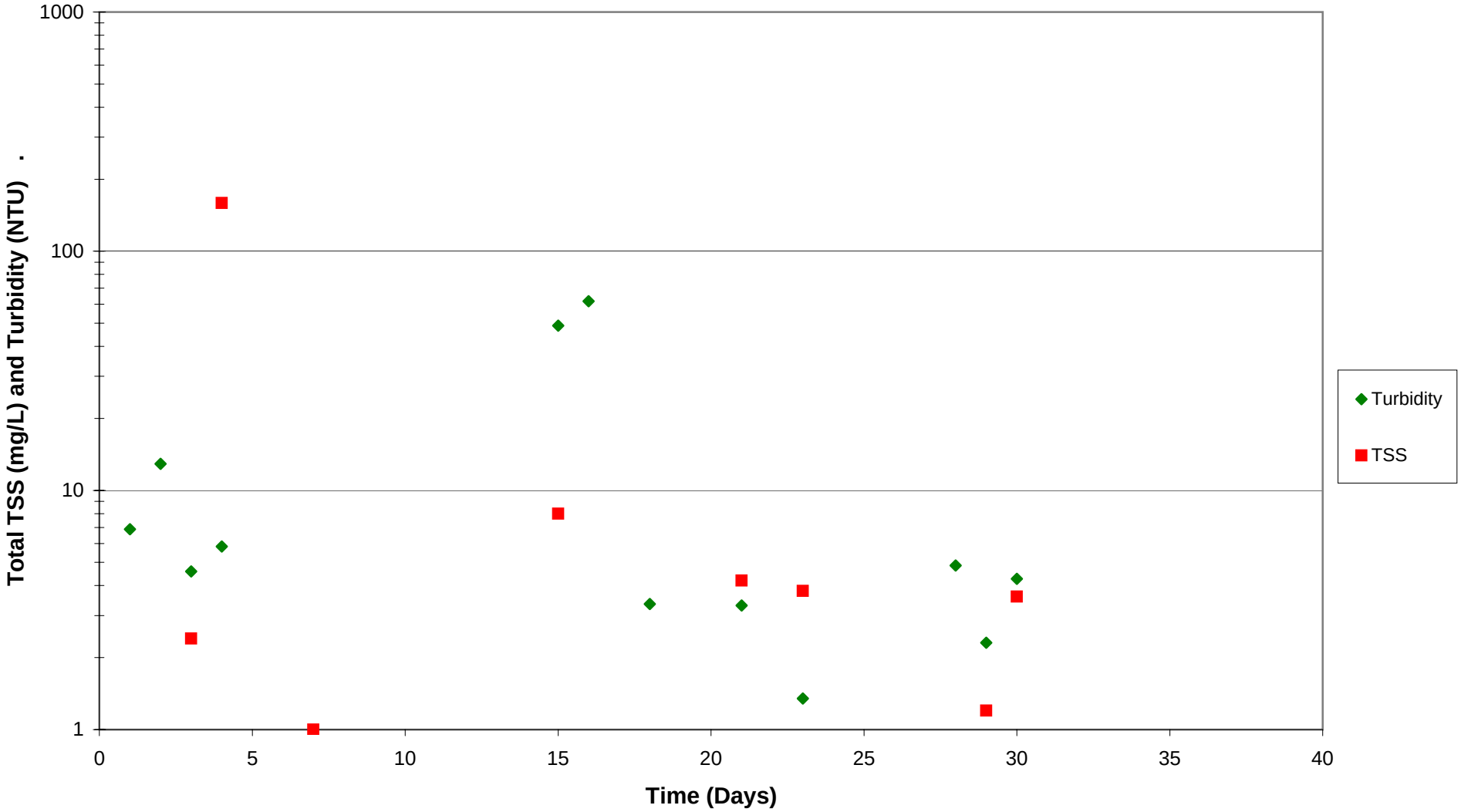

Figure 12
Effluent Turbidity and Total Suspended Solids vs. Time at Well LF-10
Active Process - Phase III Groundwater Treatability Study
Emeryville, CA

CDM

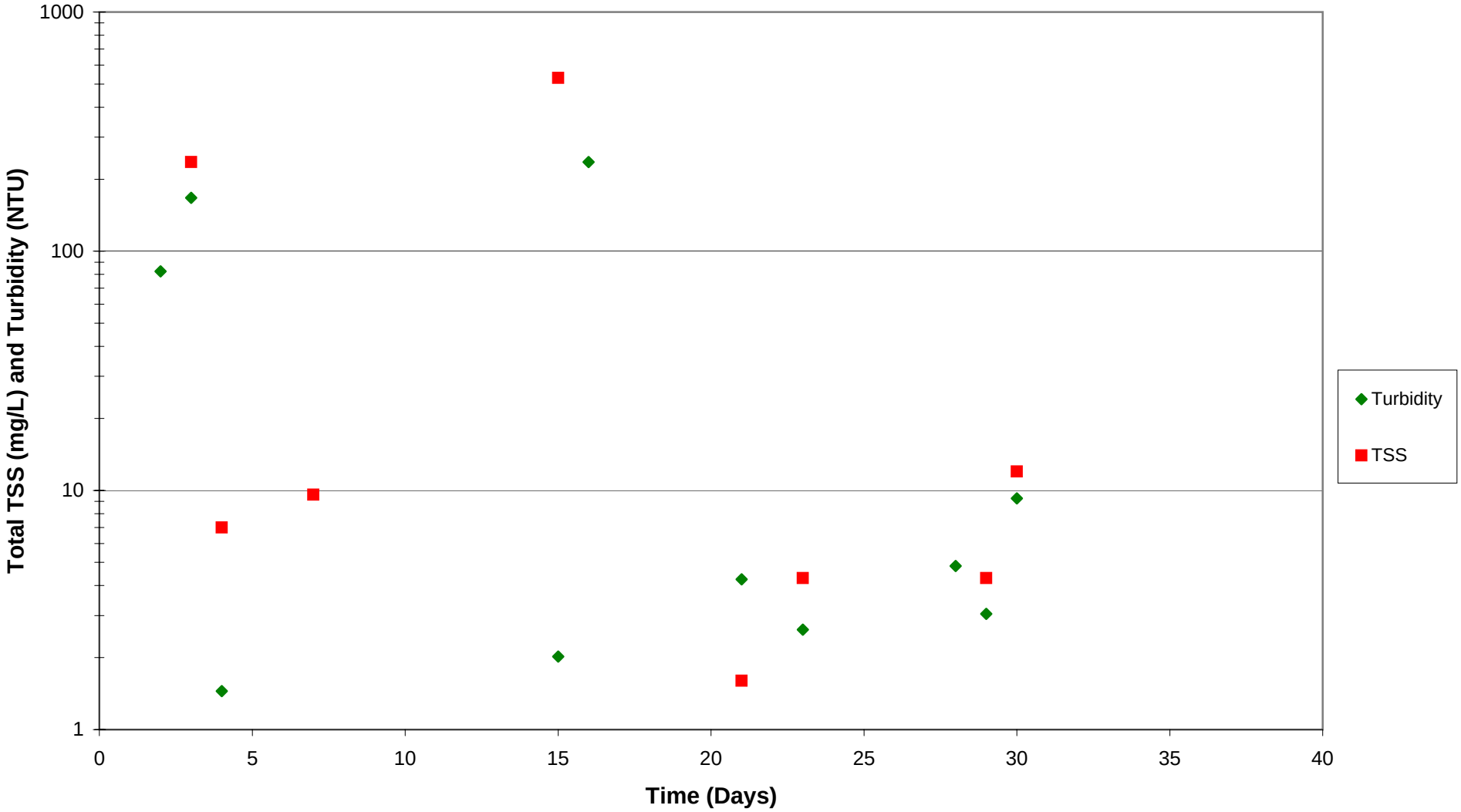

Figure 13
Total Arsenic Concentrations vs. Time at Well CDM-1
Active Process - Phase III Groundwater Treatability Study
Emeryville, CA

CDM

Appendix A4

Selected Figures from Report of Findings, Phase II Groundwater Treatability Study, Groundwater Column Studies, Sherwin-Williams Site, 1450 Sherwin Avenue, Emeryville, California. October 15, 2007.

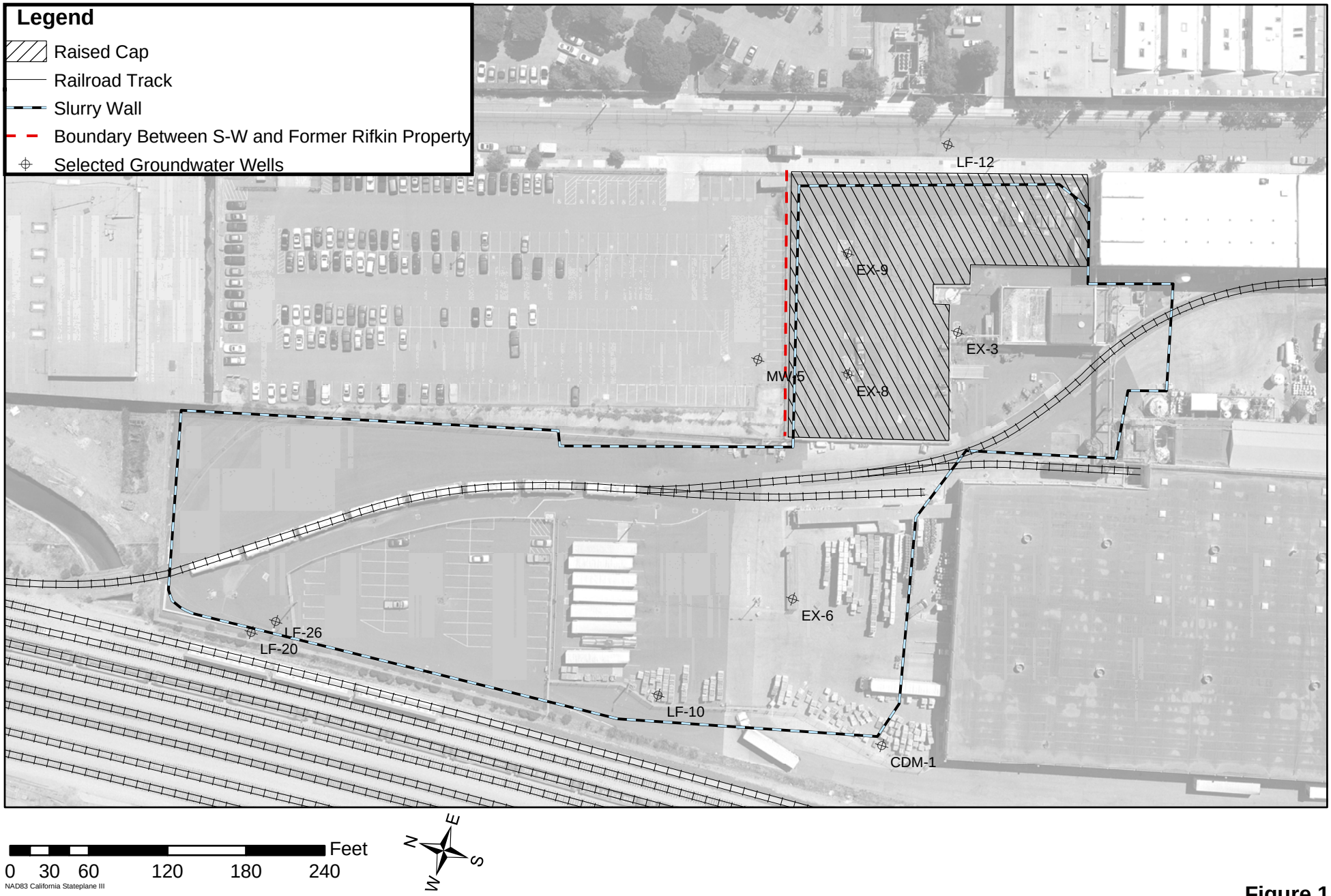

Figure 1
Location of Selected Groundwater Wells
Emeryville, CA

Figure 2
A. Completed Columns
B. Close-up of Inlet / Outlet and Sampling Apparatus
Phase II Groundwater Treatability Study
Emeryville, CA

CDM

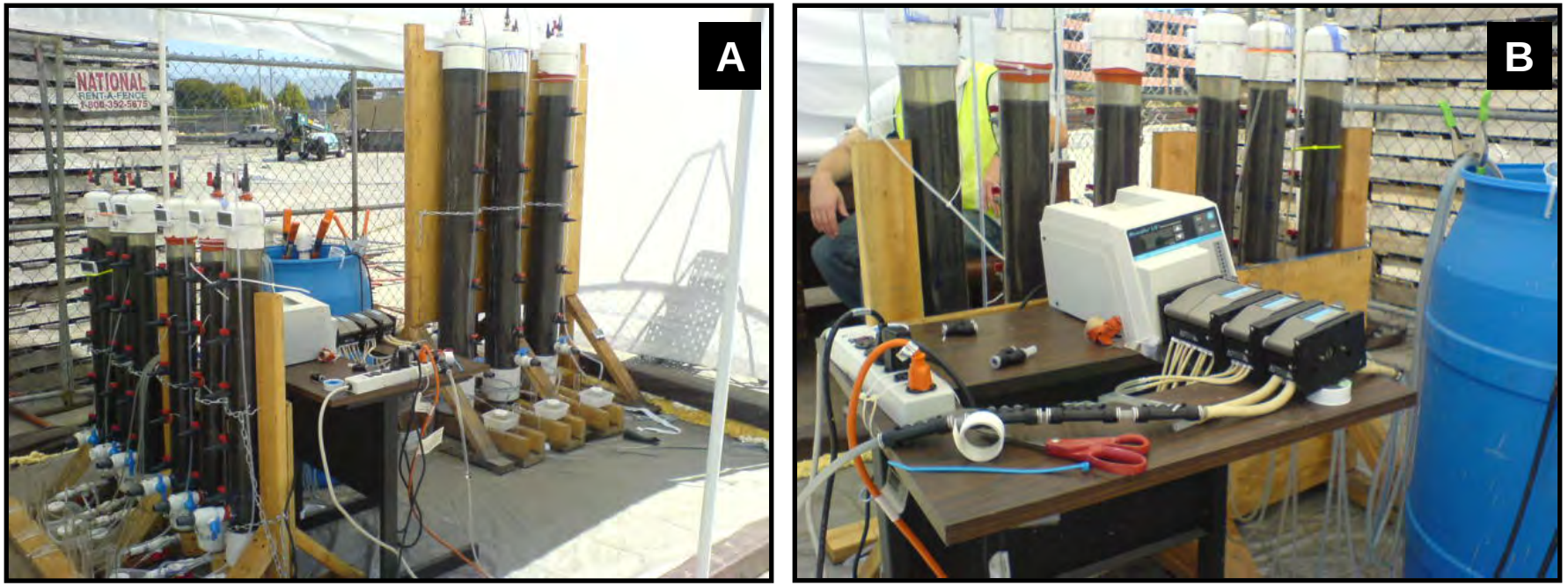

Figure 3
A. Overview of Column Setup at CDM-1
B. Peristaltic Pump Setup
Phase II Groundwater Treatability Study
Emeryville, CA

CDM

Figure 4
A. Sieving of Taconite
B. Tamping the Column
Phase II Groundwater Treatability Study
Emeryville, CA

CDM

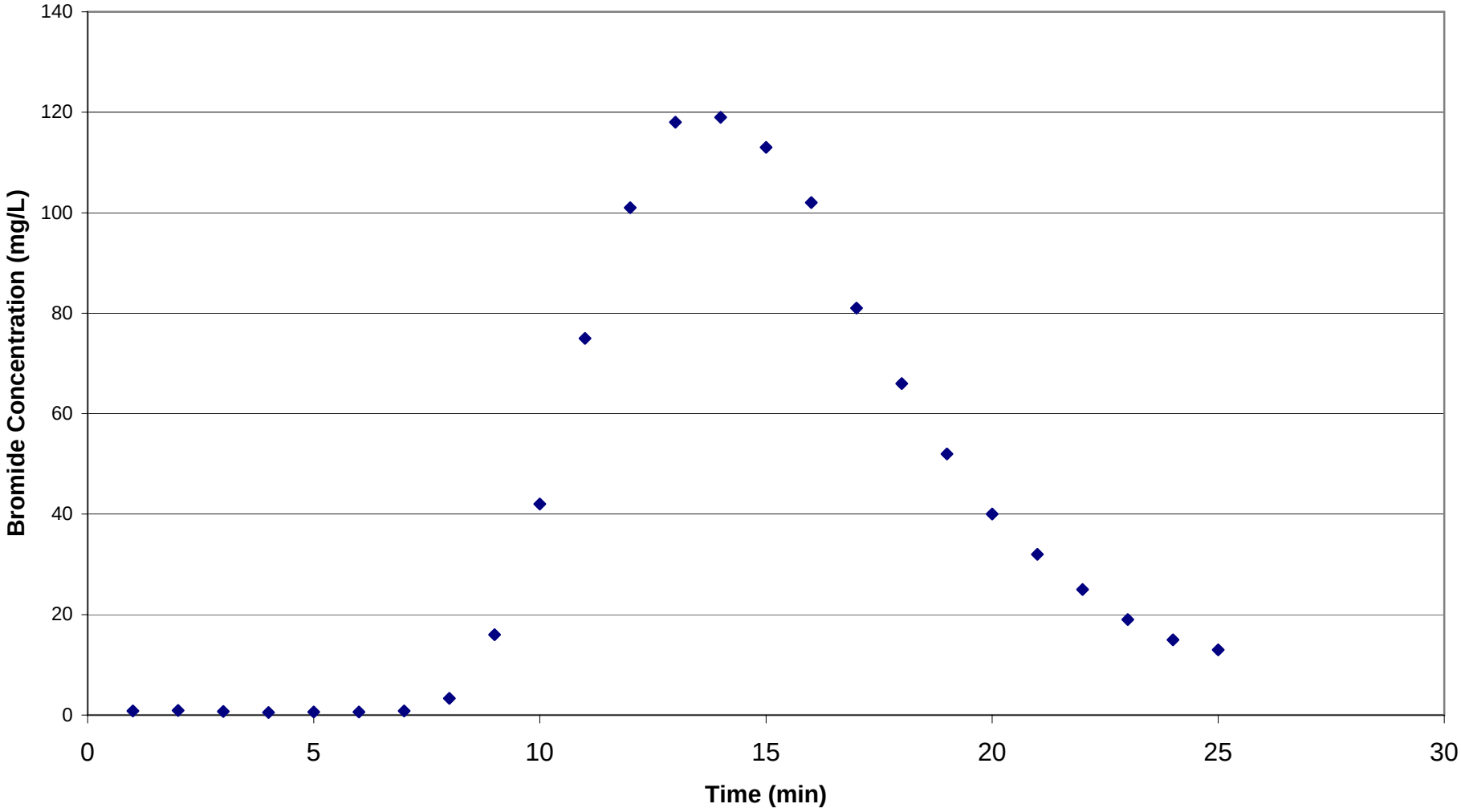

Figure 5: Example Residence Time Distribution
Column 8 (6-inch column, 20% ZVI, 80% Taconite, LF-10)
Phase II Groundwater Treatability Study
Emeryville, CA

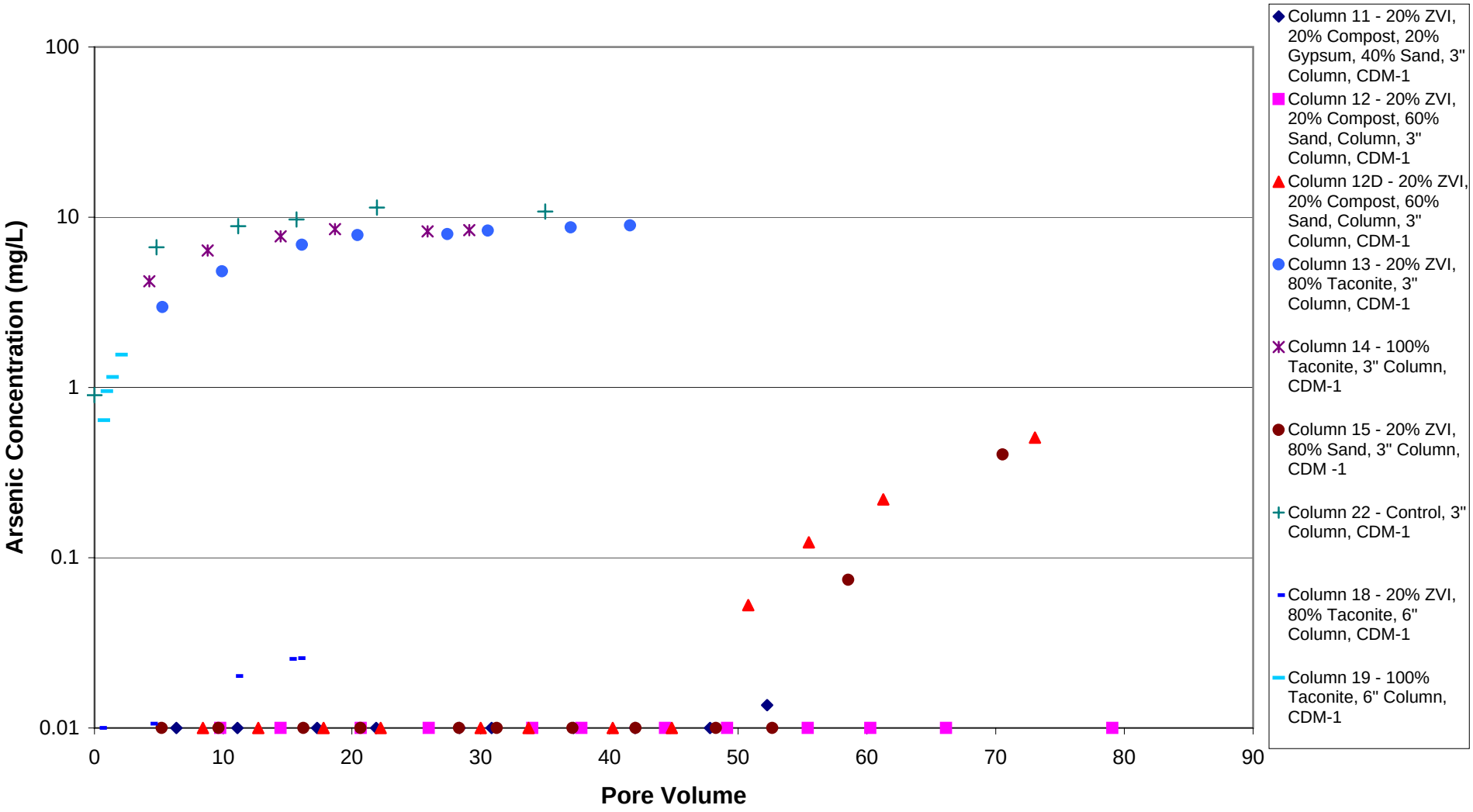

Figure 6: Arsenic Concentrations Vs. Pore Volume at Well CDM-1
Phase II Groundwater Treatability Study
Emeryville, CA

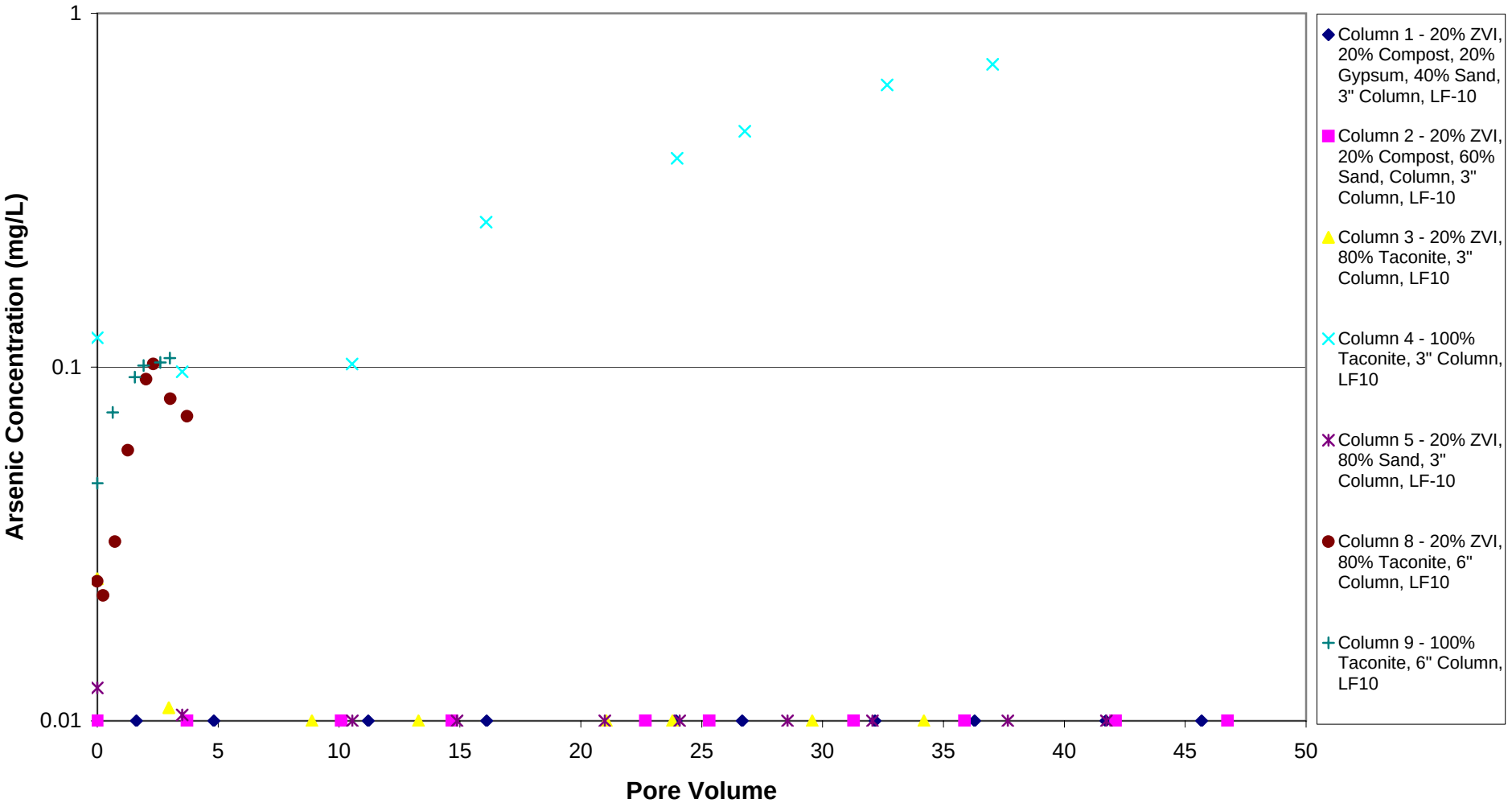

Figure 7 - Arsenic Concentrations Vs. Pore Volume at Well LF-10
Phase II Groundwater Treatability Study
Emeryville, CA

CDM

Appendix A5

Selected Figures from Report of Findings, Soil Characterization Study, The Sherwin-Williams Company, Emeryville, CA. June 28, 2007.

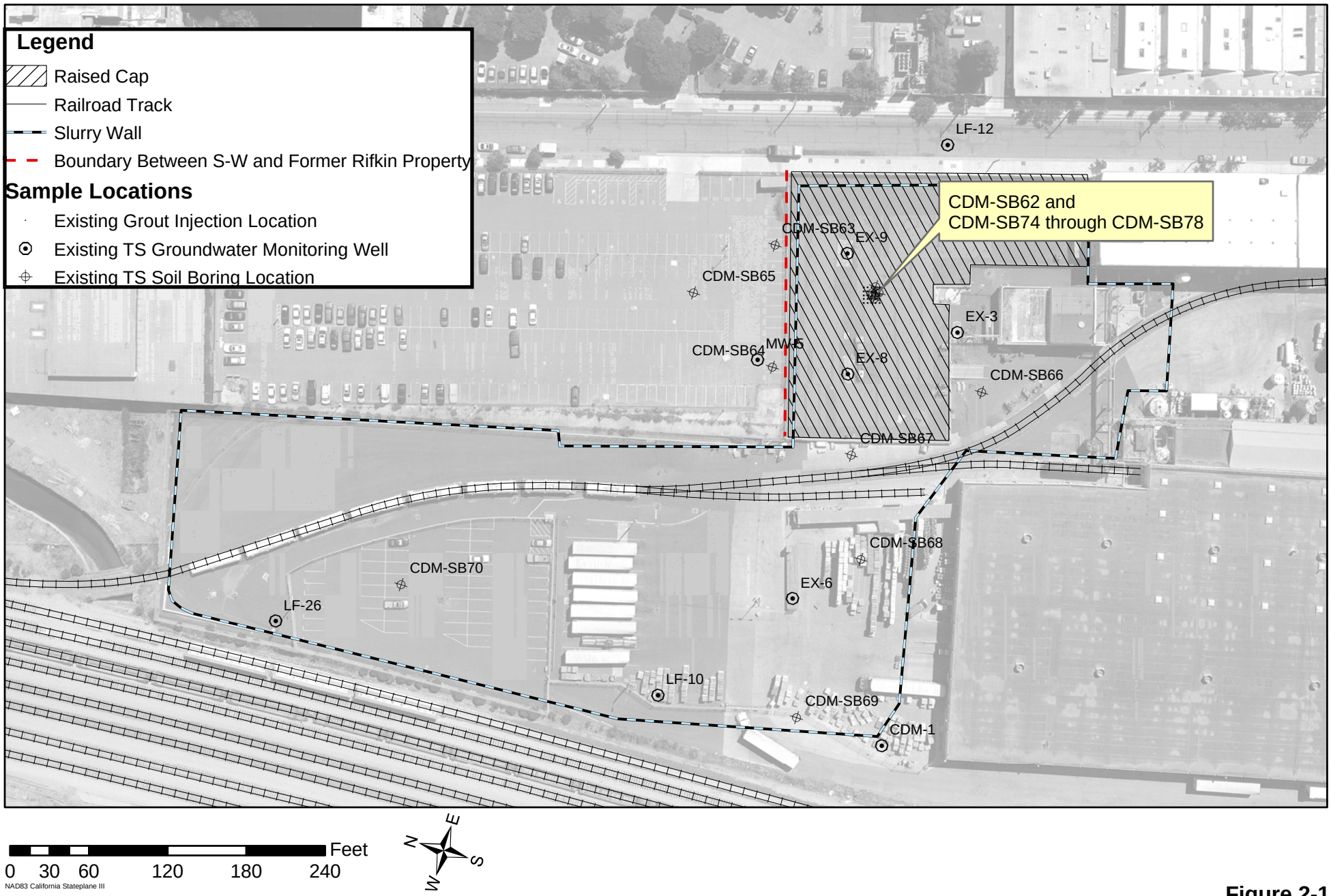

Figure 2-1
Site Plan
Emeryville, CA

Appendix A6

Selected Tables and Figures from Data Summary Report for Soil Gas Investigation Activities, Sherwin-Williams Site, 1450 Sherwin Avenue, Emeryville, California.
January 30, 2007.

Table 1
Summary of Soil Gas Analytical Results
Samples without Significant Helium Detections

	Screening Levels		Method Reporting Limit	Sample Location									
	ESL Residential	CHHSL Residential		CDM-SB54	CDM-SB54 Duplicate	CDM-SB56	CDM-SB58	CDM-SB60	CDM-SB65	CDM-SB67	CDM-SB72	CDM-SB73	CDM-SB74
Sample Date				11/29/2006	11/29/2006	11/30/2006	11/30/2006	11/30/2006	12/21/2006	12/20/2006	12/19/2006	12/19/2006	12/19/2006
Sample Depth (feet bgs)				4	4	4	4	4	3	3	4	4	6.5
Initial Pressure (inches Hg)				-29.0	-29.0	-29.0	-29.0	-29.0	-29.0	-29.0	-29.0	-29.0	-29.0
Final Pressure (inches Hg)				-3.0	-6.0	-6.0	-3.0	-5.5	-1.0	-20.0	-2.5	-4.0	-1.0
Reporting Limit Multiplier			1.00	596	672	33.6	372	65.6	27.9	6.06	5870	2.33	104
Target Analyte			**Concentrations by ASTM D-1945 (percent volume)**										
				Result	**RL**	**Result**	**RL**	**Result**	**RL**	**Result**	**RL**	**Result**	**RL**	**Result**	**RL**	**Result**	**RL**	**Result**	**RL**	**Result**	**RL**	**Result**	**RL**
Methane			1.0E-04	**2.6E+01**	1.5E-04	**2.7E+01**	1.7E-04	**2.2E-01**	1.7E-04	**2.1E+01**	1.5E-04	**8.4E+00**	1.6E-04	**1.2E-02**	2.1E-04	**4.6E-02**	6.1E-03	**3.9E+01**	2.2E-03	ND	2.3E-03	**1.0E-01**	2.1E-03
Helium			5.0E-02	**7.8E-02**	7.4E-02	**8.8E-02**	8.4E-02	ND	8.4E-02	ND	7.4E-02	**9.5E-01**	8.2E-02	**1.4E-01**	1.0E-01	ND	3.0E-01	ND	1.1E-01	ND	1.2E-01	ND	1.0E-01
Target Analyte			**Concentration by USEPA Method TO-15 (micrograms per cubic meter)**										
				Result	**RL**	**Result**	**RL**	**Result**	**RL**	**Result**	**RL**	**Result**	**RL**	**Result**	**RL**	**Result**	**RL**	**Result**	**RL**	**Result**	**RL**	**Result**	**RL**
Freon 12	NE	NE	2.5	ND	1.5E+03	ND	1.7E+03	ND	8.4E+01	ND	9.3E+02	ND	1.6E+02	ND	7.0E+01	ND	1.5E+01	ND	1.5E+04	ND	5.8E+00	ND	2.6E+02
Freon 114	NE	NE	3.5	ND	2.1E+03	ND	2.4E+03	ND	1.2E+02	ND	1.3E+03	ND	2.3E+02	ND	9.8E+01	ND	2.1E+01	ND	2.1E+04	ND	8.2E+00	ND	3.6E+02
Chloromethane	3.3E+02	NE	4.1	ND	2.4E+03	ND	2.8E+03	ND	1.4E+02	ND	1.5E+03	ND	2.7E+02	ND	1.1E+02	ND	2.5E+01	ND	2.4E+04	ND	9.6E+00	ND	4.3E+02
Vinyl Chloride	3.2E+01	1.33E+01	1.3	ND	7.7E+02	ND	8.7E+02	ND	4.4E+01	ND	4.8E+02	ND	8.5E+01	ND	3.6E+01	ND	7.9E+00	ND	7.6E+03	ND	3.0E+00	ND	1.4E+02
1,3-Butadiene	NE	NE	1.1	ND	6.6E+02	ND	7.4E+02	ND	3.7E+01	ND	4.1E+02	ND	7.2E+01	ND	3.1E+01	**1.1E+03**	6.7E+00	ND	6.5E+03	**3.1E+00**	2.6E+00	ND	1.1E+02
Bromomethane	1.0E+03	NE	1.9	ND	1.1E+03	ND	1.3E+03	ND	6.4E+01	ND	7.1E+02	ND	1.2E+02	ND	5.3E+01	ND	1.2E+01	ND	1.1E+04	ND	4.4E+00	ND	2.0E+02
Chloroethane	2.9E+03	NE	1.3	ND	7.7E+02	ND	8.7E+02	ND	4.4E+01	ND	4.8E+02	ND	8.5E+01	ND	3.6E+01	ND	7.9E+00	ND	7.6E+03	ND	3.0E+00	ND	1.4E+02
Freon 11	NE	NE	2.8	ND	1.7E+03	ND	1.9E+03	ND	9.4E+01	ND	1.0E+03	ND	1.8E+02	ND	7.8E+01	ND	1.7E+01	ND	1.6E+04	ND	6.5E+00	ND	2.9E+02
Ethanol	1.9E+07	NE	3.8	ND	2.3E+03	ND	2.6E+03	ND	1.3E+02	ND	1.4E+03	ND	2.5E+02	ND	1.1E+02	**2.8E+01**	2.3E+01	ND	2.2E+04	ND	8.9E+00	ND	4.0E+02
Freon 113	NE	NE	3.8	ND	2.3E+03	ND	2.6E+03	ND	1.3E+02	ND	1.4E+03	ND	2.5E+02	ND	1.1E+02	**3.4E+01**	2.3E+01	ND	2.2E+04	ND	8.9E+00	ND	4.0E+02
1,1-Dichloroethene	4.2E+04	NE	2.0	ND	1.2E+03	ND	1.3E+03	ND	6.7E+01	ND	7.4E+02	ND	1.3E+02	ND	5.6E+01	ND	1.2E+01	ND	1.2E+04	ND	4.7E+00	ND	2.1E+02
Acetone	6.6E+05	NE	4.8	ND	2.9E+03	ND	3.2E+03	ND	1.6E+02	ND	1.8E+03	ND	3.1E+02	**1.6E+04**	1.3E+02	**3.2E+02**	2.9E+01	ND	2.8E+04	**6.6E+01**	1.1E+01	ND	5.0E+02
2-Propanol	NE	NE	4.9	ND	2.9E+03	ND	3.3E+03	ND	1.6E+02	ND	1.8E+03	ND	3.2E+02	ND	1.4E+02	**3.4E+01**	3.0E+01	ND	2.9E+04	ND	1.1E+01	ND	5.1E+02
Carbon Disulfide	NE	NE	1.6	ND	9.5E+02	ND	1.1E+03	ND	5.4E+01	ND	6.0E+02	**1.3E+02**	1.0E+02	ND	4.5E+01	**5.9E+01**	9.7E+00	**1.0E+04**	9.4E+03	ND	3.7E+00	ND	1.7E+02
Methylene Chloride	2.4E+03	NE	1.7	ND	1.0E+03	ND	1.1E+03	ND	5.7E+01	ND	6.3E+02	ND	1.1E+02	ND	4.7E+01	**2.9E+01**	1.0E+01	ND	1.0E+04	ND	4.0E+00	ND	1.8E+02
Methyl tert-butyl ether	9.4E+03	4.00E+03	1.8	ND	1.1E+03	ND	1.2E+03	ND	6.0E+01	ND	6.7E+02	ND	1.2E+02	ND	5.0E+01	ND	1.1E+01	ND	1.1E+04	ND	4.2E+00	ND	1.9E+02
trans-1,2-Dichloroethene	1.5E+04	3.19E+04	2.0	ND	1.2E+03	ND	1.3E+03	ND	6.7E+01	ND	7.4E+02	ND	1.3E+02	ND	5.6E+01	ND	1.2E+01	ND	1.2E+04	ND	4.7E+00	ND	2.1E+02
Hexane	NE	NE	1.8	ND	1.1E+03	ND	1.2E+03	**6.1E+02**	6.0E+01	ND	6.7E+02	**4.8E+02**	1.2E+02	**4.8E+02**	5.0E+01	**4.2E+03**	1.1E+01	ND	1.1E+04	ND	4.2E+00	ND	1.9E+02
1,1-Dichloroethane	1.5E+03	NE	2.0	ND	1.2E+03	ND	1.3E+03	ND	6.7E+01	ND	7.4E+02	ND	1.3E+02	ND	5.6E+01	ND	1.2E+01	ND	1.2E+04	ND	4.7E+00	ND	2.1E+02
2-Butanone (Methyl Ethyl Ketone)	2.1E+05	NE	1.5	ND	8.9E+02	ND	1.0E+03	ND	5.0E+01	ND	5.6E+02	ND	9.8E+01	**6.4E+02**	4.2E+01	**4.6E+01**	9.1E+00	ND	8.8E+03	**1.8E+01**	3.5E+00	ND	1.6E+02
cis-1,2-Dichloroethene	7.3E+03	1.59E+04	2.0	ND	1.2E+03	ND	1.3E+03	ND	6.7E+01	ND	7.4E+02	ND	1.3E+02	ND	5.6E+01	ND	1.2E+01	ND	1.2E+04	ND	4.7E+00	ND	2.1E+02
Tetrahydrofuran	NE	NE	1.5	ND	8.9E+02	ND	1.0E+03	ND	5.0E+01	ND	5.6E+02	ND	9.8E+01	ND	4.2E+01	ND	9.1E+00	ND	8.8E+03	ND	3.5E+00	ND	1.6E+02
Chloroform	4.5E+02	NE	2.4	ND	1.4E+03	ND	1.6E+03	ND	8.1E+01	ND	8.9E+02	ND	1.6E+02	ND	6.7E+01	ND	1.5E+01	ND	1.4E+04	ND	5.6E+00	ND	2.5E+02
1,1,1-Trichloroethane	4.6E+05	9.91E+05	2.7	ND	1.6E+03	ND	1.8E+03	ND	9.1E+01	ND	1.0E+03	ND	1.8E+02	ND	7.5E+01	ND	1.6E+01	ND	1.6E+04	ND	6.3E+00	ND	2.8E+02
Cyclohexane	NE	NE	1.7	ND	1.0E+03	ND	1.1E+03	**2.1E+04**	5.7E+01	**3.1E+04**	6.3E+02	**4.0E+04**	1.1E+02	**5.1E+03**	4.7E+01	**1.2E+02**	1.0E+01	**7.9E+05**	1.0E+04	**6.9E+00**	4.0E+00	ND	1.8E+02
Carbon Tetrachloride	5.7E+01	2.51E+01	3.1	ND	1.8E+03	ND	2.1E+03	ND	1.0E+02	ND	1.2E+03	ND	2.0E+02	ND	8.6E+01	ND	1.9E+01	ND	1.8E+04	ND	7.2E+00	ND	3.2E+02
Benzene	8.5E+01	3.62E+01	1.6	ND	9.5E+02	ND	1.1E+03	**7.2E+01**	5.4E+01	**1.6E+04**	6.0E+02	**9.0E+02**	1.0E+02	**4.6E+02**	4.5E+01	**3.4E+02**	9.7E+00	ND	9.4E+03	**5.0E+00**	3.7E+00	**2.1E+02**	1.7E+02
1,2-Dichloroethane	1.2E+02	4.96E+01	2.0	ND	1.2E+03	ND	1.3E+03	**1.0E+03**	6.7E+01	ND	7.4E+02	ND	1.3E+02	ND	5.6E+01	ND	1.2E+01	ND	1.2E+04	ND	4.7E+00	ND	2.1E+02
Heptane	NE	NE	2.0	ND	1.2E+03	ND	1.3E+03	**3.2E+03**	6.7E+01	ND	7.4E+02	**4.7E+03**	1.3E+02	**1.9E+04**	5.6E+01	**4.2E+02**	1.2E+01	ND	1.2E+04	ND	4.7E+00	ND	2.1E+02
Trichloroethene	1.2E+03	5.28E+02	2.7	ND	1.6E+03	ND	1.8E+03	**3.6E+02**	9.1E+01	ND	1.0E+03	ND	1.8E+02	ND	7.5E+01	**1.7E+01**	1.6E+01	ND	1.6E+04	ND	6.3E+00	ND	2.8E+02
1,2-Dichloropropane	2.4E+02	NE	2.3	ND	1.4E+03	ND	1.5E+03	ND	7.7E+01	ND	8.6E+02	ND	1.5E+02	ND	6.4E+01	ND	1.4E+01	ND	1.4E+04	ND	5.4E+00	ND	2.4E+02
1,4-Dioxane	NE	NE	7.2	ND	4.3E+03	ND	4.8E+03	ND	2.4E+02	ND	2.7E+03	ND	4.7E+02	ND	2.0E+02	ND	4.4E+01	ND	4.2E+04	ND	1.7E+01	ND	7.5E+02
Bromodichloromethane	6.6E+01	NE	3.4	ND	2.0E+03	ND	2.3E+03	ND	1.1E+02	ND	1.3E+03	ND	2.2E+02	ND	9.5E+01	ND	2.1E+01	ND	2.0E+04	ND	7.9E+00	ND	3.5E+02
cis-1,3-Dichloropropene	NE	NE	2.3	ND	1.4E+03	ND	1.5E+03	ND	7.7E+01	ND	8.6E+02	ND	1.5E+02	ND	6.4E+01	ND	1.4E+01	ND	1.4E+04	ND	5.4E+00	ND	2.4E+02
4-Methyl-2-pentanone	NE	NE	2.0	ND	1.2E+03	ND	1.3E+03	ND	6.7E+01	ND	7.4E+02	ND	1.3E+02	**1.2E+04**	5.6E+01	ND	1.2E+01	ND	1.2E+04	ND	4.7E+00	ND	2.1E+02
Toluene	6.3E+04	1.35E+05	1.3	ND	7.7E+02	ND	8.7E+02	**3.2E+02**	4.4E+01	**1.9E+03**	4.8E+02	**1.3E+02**	8.5E+01	**1.0E+04**	3.6E+01	**3.2E+02**	7.9E+00	ND	7.6E+03	**7.4E+00**	3.0E+00	ND	1.4E+02
trans-1,3-Dichloropropene	NE	NE	2.3	ND	1.4E+03	ND	1.5E+03	ND	7.7E+01	ND	8.6E+02	ND	1.5E+02	ND	6.4E+01	ND	1.4E+01	ND	1.4E+04	ND	5.4E+00	ND	2.4E+02
1,1,2-Trichloroethane	1.5E+02	NE	2.7	ND	1.6E+03	ND	1.8E+03	ND	9.1E+01	ND	1.0E+03	ND	1.8E+02	ND	7.5E+01	ND	1.6E+01	ND	1.6E+04	ND	6.3E+00	ND	2.8E+02
Tetrachloroethene	4.1E+02	1.80E+02	3.4	ND	2.0E+03	ND	2.3E+03	**1.6E+02**	1.1E+02	ND	1.3E+03	ND	2.2E+02	ND	9.5E+01	ND	2.1E+01	ND	2.0E+04	ND	7.9E+00	ND	3.5E+02
2-Hexanone	NE	NE	8.2	ND	4.9E+03	ND	5.5E+03	ND	2.8E+02	ND	3.1E+03	ND	5.4E+02	ND	2.3E+02	ND	5.0E+01	ND	4.8E+04	ND	1.9E+01	ND	8.5E+02
Dibromochloromethane	9.1E+01	NE	4.2	ND	2.5E+03	ND	2.8E+03	ND	1.4E+02	ND	1.6E+03	ND	2.8E+02	ND	1.2E+02	ND	2.5E+01	ND	2.5E+04	ND	9.8E+00	ND	4.4E+02
1,2-Dibromoethane (EDB)	3.4E+01	NE	3.8	ND	2.3E+03	ND	2.6E+03	ND	1.3E+02	ND	1.4E+03	ND	2.5E+02	ND	1.1E+02	ND	2.3E+01	ND	2.2E+04	ND	8.9E+00	ND	4.0E+02
Chlorobenzene	1.2E+04	NE	2.3	ND	1.4E+03	ND	1.5E+03	ND	7.7E+01	ND	8.6E+02	ND	1.5E+02	ND	6.4E+01	ND	1.4E+01	ND	1.4E+04	ND	5.4E+00	ND	2.4E+02
Ethyl Benzene	4.2E+05	NE	2.2	ND	1.3E+03	ND	1.5E+03	ND	7.4E+01	**4.2E+04**	8.2E+02	**1.3E+03**	1.4E+02	**6.0E+01**	6.1E+01	**4.4E+01**	1.3E+01	ND	1.3E+04	ND	5.1E+00	**3.8E+02**	2.3E+02
m,p-Xylene	1.5E+05	3.17E+05	2.2	ND	1.3E+03	ND	1.5E+03	ND	7.4E+01	**2.0E+04**	8.2E+02	**1.3E+04**	1.4E+02	**1.7E+02**	6.1E+01	**8.9E+01**	1.3E+01	ND	1.3E+04	**7.2E+00**	5.1E+00	ND	2.3E+02

Table 1
Summary of Soil Gas Analytical Results
Samples without Significant Helium Detections

	Screening Levels		Method Reporting Limit	Sample Location											
	ESL Residential	CHHSL Residential		CDM-SB54	CDM-SB54 Duplicate	CDM-SB56	CDM-SB58	CDM-SB60	CDM-SB65	CDM-SB67	CDM-SB72	CDM-SB73	CDM-SB74		
Sample Date				11/29/2006	11/29/2006	11/30/2006	11/30/2006	11/30/2006	12/21/2006	12/20/2006	12/19/2006	12/19/2006	12/19/2006		
Sample Depth (feet bgs)				4	4	4	4	4	3	3	4	4	6.5		
Initial Pressure (inches Hg)				-29.0	-29.0	-29.0	-29.0	-29.0	-29.0	-29.0	-29.0	-29.0	-29.0		
Final Pressure (inches Hg)				-3.0	-6.0	-6.0	-3.0	-5.5	-1.0	-20.0	-2.5	-4.0	-1.0		
Reporting Limit Multiplier			1.00	596	672	33.6	372	65.6	27.9	6.06	5870	2.33	104		
Target Analyte			**Concentrations by ASTM D-1945 (percent volume)**												
				Result	**RL**	**Result**	**RL**	**Result**	**RL**	**Result**	**RL**	**Result**	**RL**	**Result**	**RL**	**Result**	**RL**	**Result**	**RL**	**Result**	**RL**	**Result**	**RL**
Methane			1.0E-04	**2.6E+01**	1.5E-04	**2.7E+01**	1.7E-04	**2.2E-01**	1.7E-04	**2.1E+01**	1.5E-04	**8.4E+00**	1.6E-04	**1.2E-02**	2.1E-04	**4.6E-02**	6.1E-03	**3.9E+01**	2.2E-03	ND	2.3E-03	**1.0E-01**	2.1E-03
Helium			5.0E-02	**7.8E-02**	7.4E-02	**8.8E-02**	8.4E-02	ND	8.4E-02	ND	7.4E-02	**9.5E-01**	8.2E-02	**1.4E-01**	1.0E-01	ND	3.0E-01	ND	1.1E-01	ND	1.2E-01	ND	1.0E-01
Target Analyte			**Concentration by USEPA Method TO-15 (micrograms per cubic meter)**												
				Result	**RL**	**Result**	**RL**	**Result**	**RL**	**Result**	**RL**	**Result**	**RL**	**Result**	**RL**	**Result**	**RL**	**Result**	**RL**	**Result**	**RL**	**Result**	**RL**
o-Xylene	1.5E+05	3.15E+05	2.2	ND	1.3E+03	ND	1.5E+03	ND	7.4E+01	**2.4E+03**	8.2E+02	**1.7E+02**	1.4E+02	ND	6.1E+01	**3.1E+01**	1.3E+01	ND	1.3E+04	ND	5.1E+00	ND	2.3E+02
Styrene	2.1E+05	NE	2.1	ND	1.3E+03	ND	1.4E+03	ND	7.1E+01	ND	7.8E+02	ND	1.4E+02	ND	5.9E+01	**1.8E+01**	1.3E+01	ND	1.2E+04	ND	4.9E+00	ND	2.2E+02
Bromoform	NE	NE	5.2	ND	3.1E+03	ND	3.5E+03	ND	1.7E+02	ND	1.9E+03	ND	3.4E+02	ND	1.5E+02	ND	3.2E+01	ND	3.1E+04	ND	1.2E+01	ND	5.4E+02
Cumene	NE	NE	2.4	ND	1.4E+03	ND	1.6E+03	ND	8.1E+01	**2.5E+04**	8.9E+02	**5.7E+02**	1.6E+02	**ND**	6.7E+01	ND	1.5E+01	**2.4E+04**	1.4E+04	ND	5.6E+00	ND	2.5E+02
1,1,2,2-Tetrachloroethane	4.3E+01	NE	3.4	ND	2.0E+03	ND	2.3E+03	ND	1.1E+02	ND	1.3E+03	ND	2.2E+02	ND	9.5E+01	ND	2.1E+01	ND	2.0E+04	ND	7.9E+00	ND	3.5E+02
Propylbenzene	NE	NE	2.4	ND	1.4E+03	ND	1.6E+03	ND	8.1E+01	**7.2E+04**	8.9E+02	**7.7E+02**	1.6E+02	**ND**	6.7E+01	**1.8E+01**	1.5E+01	**3.1E+04**	1.4E+04	ND	5.6E+00	ND	2.5E+02
4-Ethyltoluene	NE	NE	2.4	ND	1.4E+03	ND	1.6E+03	ND	8.1E+01	**1.3E+04**	8.9E+02	**2.1E+02**	1.6E+02	ND	6.7E+01	**3.3E+01**	1.5E+01	ND	1.4E+04	ND	5.6E+00	ND	2.5E+02
1,3,5-Trimethylbenzene	NE	NE	2.4	ND	1.4E+03	ND	1.6E+03	ND	8.1E+01	**7.4E+03**	8.9E+02	**1.7E+02**	1.6E+02	ND	6.7E+01	ND	1.5E+01	ND	1.4E+04	ND	5.6E+00	ND	2.5E+02
1,2,4-Trimethylbenzene	NE	NE	2.4	ND	1.4E+03	ND	1.6E+03	ND	8.1E+01	**4.0E+04**	8.9E+02	**2.6E+02**	1.6E+02	ND	6.7E+01	**3.0E+01**	1.5E+01	ND	1.4E+04	ND	5.6E+00	ND	2.5E+02
1,3-Dichlorobenzene	2.2E+04	NE	3.0	ND	1.8E+03	ND	2.0E+03	ND	1.0E+02	ND	1.1E+03	ND	2.0E+02	ND	8.4E+01	ND	1.8E+01	ND	1.8E+04	ND	7.0E+00	ND	3.1E+02
1,4-Dichlorobenzene	2.1E+02	NE	3.0	ND	1.8E+03	ND	2.0E+03	ND	1.0E+02	ND	1.1E+03	ND	2.0E+02	ND	8.4E+01	ND	1.8E+01	ND	1.8E+04	ND	7.0E+00	ND	3.1E+02
alpha-Chlorotoluene	NE	NE	2.6	ND	1.5E+03	ND	1.7E+03	ND	8.7E+01	ND	9.7E+02	ND	1.7E+02	ND	7.3E+01	ND	1.6E+01	ND	1.5E+04	ND	6.1E+00	ND	2.7E+02
1,2-Dichlorobenzene	4.2E+04	NE	3.0	ND	1.8E+03	ND	2.0E+03	ND	1.0E+02	ND	1.1E+03	ND	2.0E+02	ND	8.4E+01	ND	1.8E+01	ND	1.8E+04	ND	7.0E+00	ND	3.1E+02
1,2,4-Trichlorobenzene	7.3E+02	NE	15	ND	8.9E+03	ND	1.0E+04	ND	5.0E+02	ND	5.6E+03	ND	9.8E+02	ND	4.2E+02	ND	9.1E+01	ND	8.8E+04	ND	3.5E+01	ND	1.6E+03
Hexachlorobutadiene	NE	NE	21	ND	1.3E+04	ND	1.4E+04	ND	7.1E+02	ND	7.8E+03	ND	1.4E+03	ND	5.9E+02	ND	1.3E+02	ND	1.2E+05	ND	4.9E+01	ND	2.2E+03
Naphthalene	7.1E+01	3.19E+01	10	ND	6.0E+03	ND	6.7E+03	ND	3.4E+02	ND	3.7E+03	ND	6.6E+02	ND	2.8E+02	ND	6.1E+01	ND	5.9E+04	ND	2.3E+01	ND	1.0E+03
p-Cymene	NE	NE	11	ND	6.6E+03	ND	7.4E+03	ND	3.7E+02	ND	4.1E+03	ND	7.2E+02	ND	3.1E+02	ND	6.7E+01	ND	6.5E+04	ND	2.6E+01	ND	1.1E+03

Notes:
feet bgs - feet below ground surface
CHHSL - California Human Health Screening Level for residential use (Cal/EPA, 2005)
ESL - Regional Water Quality Control Board Environmental Screening Level for residential use (Water Board, 2005)
ND - not detected at or above stated reporting limit (RL)
NE - not established
bold concentration result indicates a detection

26	- stated concentration equal to or greater than screening level
ND	- stated detection limit equal to or greater than screening level

Table 2
Summary of In Situ Intrinsic Soil Permeability Testing Results

Test Date	Location	Test #	Measured Test Data							Constants		Intrinsic Permeability (K(v))
			Flow Rate (Q)		Vacuum		Probe Internal Radius (r)		Probe Pressure (P)	Air Viscosity (u)	pi	
			(cc/min)	(m^3/s)	(in-H2O)	(Pa)	(in)	(m)	(Pa)	(kg/m-s)		(cm^2)
11/30/2006	CDM-SB56	1	156	2.600E-06	1	249.1	0.425	0.011	249.1	1.83E-05	3.14159	1.3E-06
		2	295	4.917E-06	2	498.2	0.425	0.011	498.2	1.83E-05	3.14159	1.2E-06
		3	443	7.383E-06	3	747.3	0.425	0.011	747.3	1.83E-05	3.14159	1.2E-06
		4	726	1.210E-05	5	1245.5	0.425	0.011	1245.5	1.83E-05	3.14159	1.2E-06
		Average										**1.2E-06**
11/30/2006	CDM-SB60	1	172	2.867E-06	1	249.1	0.425	0.011	249.1	1.83E-05	3.14159	1.4E-06
		2	252	4.200E-06	2	498.2	0.425	0.011	498.2	1.83E-05	3.14159	1.1E-06
		3	386	6.433E-06	3	747.3	0.425	0.011	747.3	1.83E-05	3.14159	1.1E-06
		4	668	1.113E-05	5	1245.5	0.425	0.011	1245.5	1.83E-05	3.14159	1.1E-06
		Average										**1.2E-06**
12/19/2006	CDM-SB72	1	434	7.233E-06	0.5	124.6	0.425	0.011	124.55	1.83E-05	3.14159	7.3E-06
		2	606	1.010E-05	0.75	186.8	0.425	0.011	186.825	1.83E-05	3.14159	6.8E-06
		3	806	1.343E-05	1	249.1	0.425	0.011	249.1	1.83E-05	3.14159	6.7E-06
		Average										**6.9E-06**
12/19/2006	CDM-SB73	1	790	1.317E-05	0.4	99.6	0.425	0.011	99.64	1.83E-05	3.14159	1.7E-05
		Average										**1.7E-05**
12/19/2006	CDM-SB74	1	215.3	3.588E-06	3	747.3	0.425	0.011	747.3	1.83E-05	3.14159	6.0E-07
		2	294	4.900E-06	4	996.4	0.425	0.011	996.4	1.83E-05	3.14159	6.1E-07
		3	371	6.183E-06	5.4	1345.1	0.425	0.011	1345.14	1.83E-05	3.14159	5.7E-07
		4	443	7.383E-06	6.8	1693.9	0.425	0.011	1693.88	1.83E-05	3.14159	5.4E-07
		Average										**5.8E-07**

Notes:
Equation for the calculation of Intrinsic Permeability: K(v) = (Q*u)/(4*pi*r^2*P); (USEPA, 1992)

Table 3 *Summary of Soil Core Results*							
Sample Date	**Location**	**Sample Depth (feet bgs)**	**Moisture Content (% wieght)**	**Bulk Denisty (g/cc)**	**Grain Density (g/cc)**	**Total Porosity (%Vb)**	**Fraction Organic Carbon (g/g)**
11/30/2006	CDM-SB56	1	4.8	1.60	2.60	44.3	0.0172
11/30/2006	CDM-SB56	2	6.6	1.89	2.77	31.7	0.00660
11/30/2006	CDM-SB60	1	5.9	1.70	2.66	34.6	0.00125
11/30/2006	CDM-SB60	2	23.3	1.27	2.46	50.8	0.148

Notes:
feet bgs - feet below ground surface
g/cc - grams per cubic centimeter
%Vb - percent bulk volume
g/g - gram per gram

Attachment 2
Summary of Soil Gas Analytical Results
Samples with Significant Helium Detections

	Screening Levels		Method Reporting Limit	Sample Location											
	ESL	CHHSL		CDM-SB55		CDM-SB57		CDM-SB59		CDM-SB61		CDM-SB71		CDM-SB71 Duplicate	
	Residential	Residential													
Sample Date				11/29/2006		11/29/2006		11/30/2006		12/1/2006		12/19/2006		12/19/2006	
Sample Depth (feet bgs)				4		4		4		4		4		4	
Initial Pressure (inches Hg)				-29.0		-29.0		-29.0		-29.0		-29.0		-29.0	
Final Pressure (inches Hg)				-4.0		-3.5		-5.5		-3.0		-4.5		-4.0	
Reporting Limit Multiplier			1.00	7.75		1.52		1.64		298		79.3		93.2	
Target Analyte			**Concentrations by ASTM D-1945 (percent volume)**												
				Result	**RL**	**Result**	**RL**	**Result**	**RL**	**Result**	**RL**	**Result**	**RL**	**Result**	**RL**
Methane			1.0E-04	**1.9E-02**	1.6E-04	**4.7E+00**	1.5E-04	**3.8E-04**	1.6E-04	**4.9E+01**	1.5E-04	**5.3E-02**	2.4E-03	**5.8E-02**	2.3E-03
Helium			5.0E-02	**8.7E+01**	7.8E-02	**3.6E+01**	7.6E-02	**8.2E+01**	8.2E-02	**1.5E+01**	7.4E-02	**4.4E+01**	1.2E-01	**4.7E+01**	1.2E-01
Target Analyte			**Concentration by USEPA Method TO-15 (micrograms per cubic meter)**												
				Result	**RL**	**Result**	**RL**	**Result**	**RL**	**Result**	**RL**	**Result**	**RL**	**Result**	**RL**
Freon 12	NE	NE	2.5	ND	1.9E+01	ND	3.8E+00	ND	4.1E+00	ND	7.5E+02	ND	2.0E+02	ND	2.3E+02
Freon 114	NE	NE	3.5	ND	2.7E+01	ND	5.3E+00	ND	5.7E+00	ND	1.0E+03	ND	2.8E+02	ND	3.3E+02
Chloromethane	3.3E+02	NE	4.1	ND	3.2E+01	ND	6.2E+00	ND	6.7E+00	ND	1.2E+03	ND	3.3E+02	ND	3.8E+02
Vinyl Chloride	3.2E+01	1.33E+01	1.3	ND	1.0E+01	ND	2.0E+00	ND	2.1E+00	ND	3.9E+02	ND	1.0E+02	ND	1.2E+02
1,3-Butadiene	NE	NE	1.1	ND	8.5E+00	**2.2E+01**	1.7E+00	ND	1.8E+00	ND	3.3E+02	ND	8.7E+01	ND	1.0E+02
Bromomethane	1.0E+03	NE	1.9	ND	1.5E+01	ND	2.9E+00	ND	3.1E+00	ND	5.7E+02	ND	1.5E+02	ND	1.8E+02
Chloroethane	2.9E+03	NE	1.3	ND	1.0E+01	**9.7E+00**	2.0E+00	ND	2.1E+00	ND	3.9E+02	ND	1.0E+02	ND	1.2E+02
Freon 11	NE	NE	2.8	ND	2.2E+01	ND	4.3E+00	ND	4.6E+00	ND	8.3E+02	ND	2.2E+02	ND	2.6E+02
Ethanol	1.9E+07	NE	3.8	ND	2.9E+01	ND	5.8E+00	ND	6.2E+00	ND	1.1E+03	ND	3.0E+02	ND	3.5E+02
Freon 113	NE	NE	3.8	ND	2.9E+01	ND	5.8E+00	ND	6.2E+00	ND	1.1E+03	ND	3.0E+02	ND	3.5E+02
1,1-Dichloroethene	4.2E+04	NE	2.0	ND	1.6E+01	ND	3.0E+00	ND	3.3E+00	ND	6.0E+02	ND	1.6E+02	ND	1.9E+02
Acetone	6.6E+05	NE	4.8	**1.1E+02**	3.7E+01	**5.2E+01**	7.3E+00	**2.1E+01**	7.9E+00	ND	1.4E+03	ND	3.8E+02	ND	4.5E+02
2-Propanol	NE	NE	4.9	ND	3.8E+01	**7.5E+00**	7.4E+00	ND	8.0E+00	ND	1.5E+03	ND	3.9E+02	ND	4.6E+02
Carbon Disulfide	NE	NE	1.6	ND	1.2E+01	**1.0E+02**	2.4E+00	ND	2.6E+00	ND	4.8E+02	ND	1.3E+02	ND	1.5E+02
Methylene Chloride	2.4E+03	NE	1.7	ND	1.3E+01	**1.2E+01**	2.6E+00	ND	2.8E+00	ND	5.1E+02	ND	1.3E+02	ND	1.6E+02
Methyl tert-butyl ether	9.4E+03	4.00E+03	1.8	ND	1.4E+01	ND	2.7E+00	ND	3.0E+00	ND	5.4E+02	ND	1.4E+02	ND	1.7E+02
trans-1,2-Dichloroethene	1.5E+04	3.19E+04	2.0	ND	1.6E+01	ND	3.0E+00	ND	3.3E+00	ND	6.0E+02	ND	1.6E+02	ND	1.9E+02
Hexane	NE	NE	1.8	ND	1.4E+01	**3.8E+01**	2.7E+00	**8.8E+00**	3.0E+00	ND	5.4E+02	**7.9E+02**	1.4E+02	ND	1.7E+02
1,1-Dichloroethane	1.5E+03	NE	2.0	ND	1.6E+01	ND	3.0E+00	ND	3.3E+00	ND	6.0E+02	ND	1.6E+02	ND	1.9E+02
2-Butanone (Methyl Ethyl Ketone)	2.1E+05	NE	1.5	**2.1E+01**	1.2E+01	**2.1E+01**	2.3E+00	**7.1E+00**	2.5E+00	ND	4.5E+02	ND	1.2E+02	ND	1.4E+02
cis-1,2-Dichloroethene	7.3E+03	1.59E+04	2.0	ND	1.6E+01	**8.4E+00**	3.0E+00	ND	3.3E+00	ND	6.0E+02	ND	1.6E+02	ND	1.9E+02
Tetrahydrofuran	NE	NE	1.5	**1.6E+01**	1.2E+01	ND	2.3E+00	ND	2.5E+00	ND	4.5E+02	ND	1.2E+02	ND	1.4E+02
Chloroform	4.5E+02	NE	2.4	ND	1.9E+01	ND	3.6E+00	ND	3.9E+00	ND	7.2E+02	ND	1.9E+02	ND	2.2E+02
1,1,1-Trichloroethane	4.6E+05	9.91E+05	2.7	ND	2.1E+01	ND	4.1E+00	ND	4.4E+00	ND	8.0E+02	ND	2.1E+02	ND	2.5E+02
Cyclohexane	NE	NE	1.7	**3.3E+01**	1.3E+01	**8.9E+01**	2.6E+00	**1.2E+01**	2.8E+00	**5.1E+02**	5.1E+02	**1.0E+03**	1.3E+02	**1.3E+03**	1.6E+02
Carbon Tetrachloride	5.7E+01	2.51E+01	3.1	ND	2.4E+01	ND	4.7E+00	ND	5.1E+00	ND	9.2E+02	ND	2.5E+02	ND	2.9E+02
Benzene	8.5E+01	3.62E+01	1.6	ND	1.2E+01	**2.2E+01**	2.4E+00	**2.7E+00**	2.6E+00	ND	4.8E+02	**1.6E+02**	1.3E+02	ND	1.5E+02
1,2-Dichloroethane	1.2E+02	4.96E+01	2.0	ND	1.6E+01	ND	3.0E+00	ND	3.3E+00	ND	6.0E+02	ND	1.6E+02	ND	1.9E+02
Heptane	NE	NE	2.0	**1.5E+02**	1.6E+01	**3.6E+01**	3.0E+00	**7.8E+00**	3.3E+00	ND	6.0E+02	**2.6E+03**	1.6E+02	**2.8E+03**	1.9E+02
Trichloroethene	1.2E+03	5.28E+02	2.7	ND	2.1E+01	**1.2E+01**	4.1E+00	ND	4.4E+00	ND	8.0E+02	ND	2.1E+02	ND	2.5E+02
1,2-Dichloropropane	2.4E+02	NE	2.3	ND	1.8E+01	ND	3.5E+00	ND	3.8E+00	ND	6.9E+02	ND	1.8E+02	ND	2.1E+02
1,4-Dioxane	NE	NE	7.2	ND	5.6E+01	ND	1.1E+01	ND	1.2E+01	ND	2.1E+03	ND	5.7E+02	ND	6.7E+02
Bromodichloromethane	6.6E+01	NE	3.4	ND	2.6E+01	ND	5.2E+00	ND	5.6E+00	ND	1.0E+03	ND	2.7E+02	ND	3.2E+02
cis-1,3-Dichloropropene	NE	NE	2.3	ND	1.8E+01	ND	3.5E+00	ND	3.8E+00	ND	6.9E+02	ND	1.8E+02	ND	2.1E+02
4-Methyl-2-pentanone	NE	NE	2.0	ND	1.6E+01	**6.2E+00**	3.0E+00	ND	3.3E+00	ND	6.0E+02	ND	1.6E+02	ND	1.9E+02
Toluene	6.3E+04	1.35E+05	1.3	**8.5E+01**	1.0E+01	**3.0E+01**	2.0E+00	**1.6E+02**	2.1E+00	ND	3.9E+02	**5.4E+02**	1.0E+02	**5.0E+02**	1.2E+02
trans-1,3-Dichloropropene	NE	NE	2.3	ND	1.8E+01	ND	3.5E+00	ND	3.8E+00	ND	6.9E+02	ND	1.8E+02	ND	2.1E+02

Attachment 2
Summary of Soil Gas Analytical Results
Samples with Significant Helium Detections

	Screening Levels		Method Reporting Limit	Sample Location					
	ESL	CHHSL		CDM-SB55	CDM-SB57	CDM-SB59	CDM-SB61	CDM-SB71	CDM-SB71 Duplicate
	Residential	Residential							
Sample Date				11/29/2006	11/29/2006	11/30/2006	12/1/2006	12/19/2006	12/19/2006
Sample Depth (feet bgs)				4	4	4	4	4	4
Initial Pressure (inches Hg)				-29.0	-29.0	-29.0	-29.0	-29.0	-29.0
Final Pressure (inches Hg)				-4.0	-3.5	-5.5	-3.0	-4.5	-4.0
Reporting Limit Multiplier			1.00	7.75	1.52	1.64	298	79.3	93.2
Target Analyte			**Concentrations by ASTM D-1945 (percent volume)**						
				Result	**RL**	**Result**	**RL**	**Result**	**RL**	**Result**	**RL**	**Result**	**RL**	**Result**	**RL**
Methane			1.0E-04	**1.9E-02**	1.6E-04	**4.7E+00**	1.5E-04	**3.8E-04**	1.6E-04	**4.9E+01**	1.5E-04	**5.3E-02**	2.4E-03	**5.8E-02**	2.3E-03
Helium			5.0E-02	**8.7E+01**	7.8E-02	**3.6E+01**	7.6E-02	**8.2E+01**	8.2E-02	**1.5E+01**	7.4E-02	**4.4E+01**	1.2E-01	**4.7E+01**	1.2E-01
Target Analyte			**Concentration by USEPA Method TO-15 (micrograms per cubic meter)**						
				Result	**RL**	**Result**	**RL**	**Result**	**RL**	**Result**	**RL**	**Result**	**RL**	**Result**	**RL**
1,1,2-Trichloroethane	1.5E+02	NE	2.7	ND	2.1E+01	ND	4.1E+00	ND	4.4E+00	ND	8.0E+02	ND	2.1E+02	ND	2.5E+02
Tetrachloroethene	4.1E+02	1.80E+02	3.4	ND	2.6E+01	ND	5.2E+00	ND	5.6E+00	ND	1.0E+03	ND	2.7E+02	ND	3.2E+02
2-Hexanone	NE	NE	8.2	ND	6.4E+01	ND	1.2E+01	ND	1.3E+01	ND	2.4E+03	ND	6.5E+02	ND	7.6E+02
Dibromochloromethane	9.1E+01	NE	4.2	ND	3.3E+01	ND	6.4E+00	ND	6.9E+00	ND	1.3E+03	ND	3.3E+02	ND	3.9E+02
1,2-Dibromoethane (EDB)	3.4E+01	NE	3.8	ND	2.9E+01	ND	5.8E+00	ND	6.2E+00	ND	1.1E+03	ND	3.0E+02	ND	3.5E+02
Chlorobenzene	1.2E+04	NE	2.3	**4.9E+01**	1.8E+01	ND	3.5E+00	ND	3.8E+00	ND	6.9E+02	**2.3E+02**	1.8E+02	**3.2E+02**	2.1E+02
Ethyl Benzene	4.2E+05	NE	2.2	**1.1E+03**	1.7E+01	**4.4E+00**	3.3E+00	**7.0E+00**	3.6E+00	ND	6.6E+02	**3.1E+04**	1.7E+02	**4.8E+04**	2.1E+02
m,p-Xylene	1.5E+05	3.17E+05	2.2	**4.2E+03**	1.7E+01	**1.4E+01**	3.3E+00	**5.5E+01**	3.6E+00	ND	6.6E+02	**5.1E+04**	1.7E+02	**7.9E+04**	2.1E+02
o-Xylene	1.5E+05	3.15E+05	2.2	**8.3E+02**	1.7E+01	**5.2E+00**	3.3E+00	ND	3.6E+00	ND	6.6E+02	**5.5E+03**	1.7E+02	**8.3E+03**	2.1E+02
Styrene	2.1E+05	NE	2.1	ND	1.6E+01	**4.3E+00**	3.2E+00	ND	3.4E+00	ND	6.3E+02	ND	1.7E+02	ND	2.0E+02
Bromoform	NE	NE	5.2	ND	4.0E+01	ND	7.9E+00	ND	8.5E+00	ND	1.5E+03	ND	4.1E+02	ND	4.8E+02
Cumene	NE	NE	2.4	**1.4E+02**	1.9E+01	ND	3.6E+00	ND	3.9E+00	**7.3E+02**	7.2E+02	**8.9E+02**	1.9E+02	**1.4E+03**	2.2E+02
1,1,2,2-Tetrachloroethane	4.3E+01	NE	3.4	ND	2.6E+01	ND	5.2E+00	ND	5.6E+00	ND	1.0E+03	ND	2.7E+02	ND	3.2E+02
Propylbenzene	NE	NE	2.4	**3.1E+02**	1.9E+01	ND	3.6E+00	**8.3E+00**	3.9E+00	**7.3E+02**	7.2E+02	**1.2E+03**	1.9E+02	**2.0E+03**	2.2E+02
4-Ethyltoluene	NE	NE	2.4	**6.5E+02**	1.9E+01	ND	3.6E+00	ND	3.9E+00	ND	7.2E+02	**3.3E+03**	1.9E+02	**5.5E+03**	2.2E+02
1,3,5-Trimethylbenzene	NE	NE	2.4	**3.0E+02**	1.9E+01	ND	3.6E+00	ND	3.9E+00	ND	7.2E+02	**1.5E+03**	1.9E+02	**2.4E+03**	2.2E+02
1,2,4-Trimethylbenzene	NE	NE	2.4	**1.1E+03**	1.9E+01	**4.6E+00**	3.6E+00	**9.6E+00**	3.9E+00	ND	7.2E+02	**4.5E+03**	1.9E+02	**7.5E+03**	2.2E+02
1,3-Dichlorobenzene	2.2E+04	NE	3.0	ND	2.3E+01	ND	4.6E+00	ND	4.9E+00	ND	8.9E+02	ND	2.4E+02	ND	2.8E+02
1,4-Dichlorobenzene	2.1E+02	NE	3.0	ND	2.3E+01	ND	4.6E+00	ND	4.9E+00	ND	8.9E+02	ND	2.4E+02	ND	2.8E+02
alpha-Chlorotoluene	NE	NE	2.6	ND	2.0E+01	ND	4.0E+00	ND	4.3E+00	ND	7.7E+02	ND	2.1E+02	ND	2.4E+02
1,2-Dichlorobenzene	4.2E+04	NE	3.0	ND	2.3E+01	ND	4.6E+00	ND	4.9E+00	ND	8.9E+02	ND	2.4E+02	ND	2.8E+02
1,2,4-Trichlorobenzene	7.3E+02	NE	15	ND	1.2E+02	ND	2.3E+01	ND	2.5E+01	ND	4.5E+03	ND	1.2E+03	ND	1.4E+03
Hexachlorobutadiene	NE	NE	21	ND	1.6E+02	ND	3.2E+01	ND	3.4E+01	ND	6.3E+03	ND	1.7E+03	ND	2.0E+03
Naphthalene	7.1E+01	3.19E+01	10	ND	7.8E+01	ND	1.5E+01	ND	1.6E+01	ND	3.0E+03	ND	7.9E+02	ND	9.3E+02
p-Cymene	NE	NE	11	ND	8.5E+01	ND	1.7E+01	ND	1.8E+01	ND	3.3E+03	ND	8.7E+02	ND	1.0E+03

Notes:
CHHSL - California Human Health Screening Level for residential use (Cal/EPA, 2005)
ESL - Regional Water Quality Control Board Environmental Screening Level for residential use (Water Board, 2005)
ND - not detected at or above stated reporting limit (RL)
NE - not established
bold concentration result indicates a detection

45 - result is not valid due to significant presence of leak gas (helium) in canister
26 - stated concentration equal to or greater than screening level
ND - stated detection limit equal to or greater than screening level

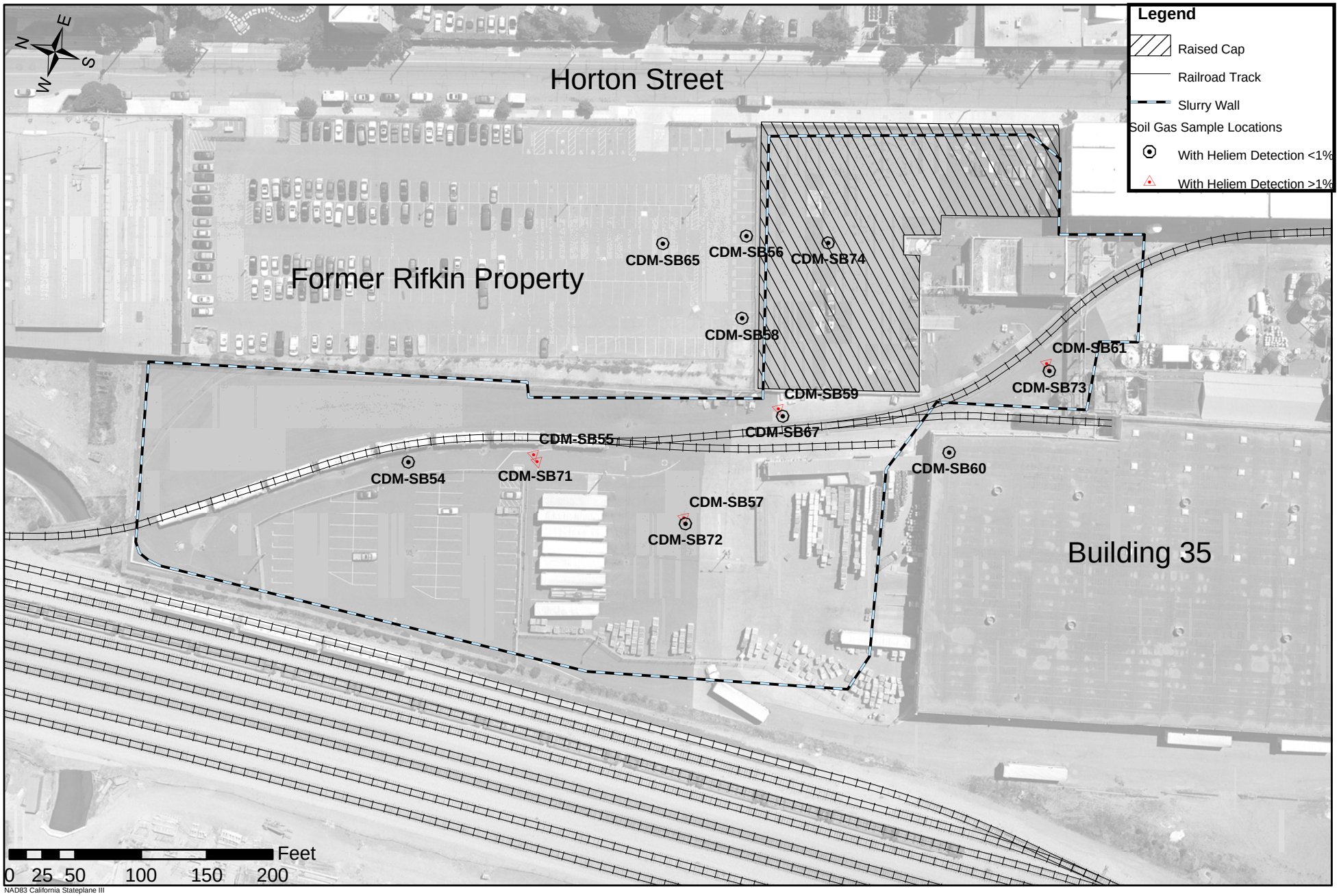

Figure 1
Soil Gas Sample Locations
Sherwin-Williams, Emeryville, California

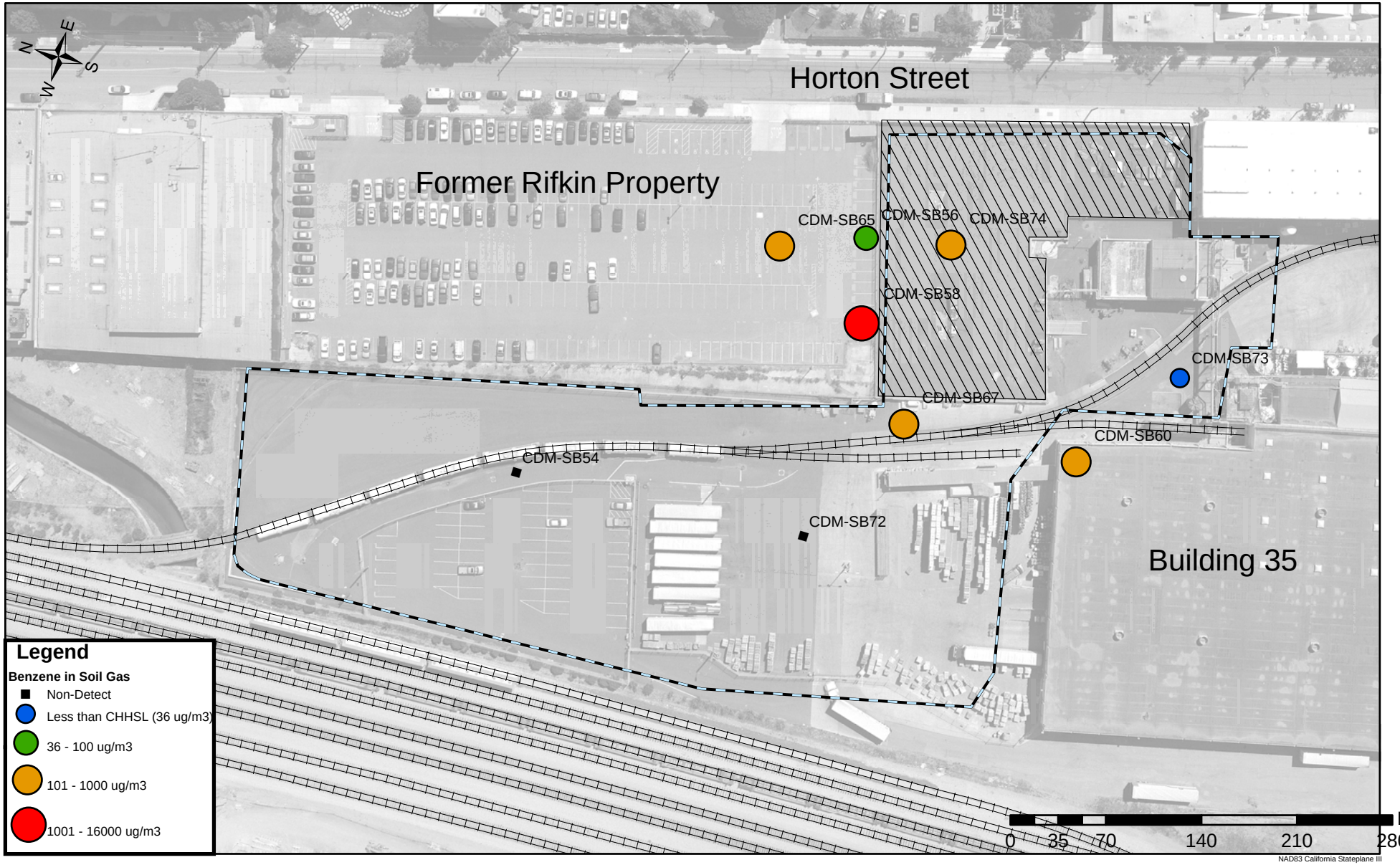

Figure 2
Soil Gas Sample Results - Benzene
Sherwin-Williams, Emeryville, California

Appendix A7

Selected Tables and Figures from Report of Findings, December 2004 Subsurface Investigation, 1450 Sherwin Avenue, Emeryville, California. March 2005.

Table 1-1
December 2004 Investigation Locations

Boring ID	Easting	Northing	Approximate Surface Elevation (feet MSL)
CDM-SB13	6045004.71	2130907.2	21.8
CDM-SB14	6044982.77	2130894.97	21.7
CDM-SB15	6044955.73	2130887.83	21.3
CDM-SB16	6044924.76	2130875.41	20.8
CDM-SB17	6044891.66	2130872.77	20.5
CDM-SB18	6044856.53	2130860.18	20.5
CDM-SB19	6045015.24	2130873.32	22
CDM-SB20	6044990.84	2130863.51	21.7
CDM-SB21	6044962.88	2130854.66	21.1
CDM-SB22	6044929.41	2130841.08	20.5
CDM-SB23	6044892.98	2130834.57	20
CDM-SB24	6044854.53	2130826.64	20
CDM-SB25	6045026.42	2130833.61	22
CDM-SB26	6045003.95	2130822.13	21.7
CDM-SB27	6044972.72	2130826.79	21
CDM-SB28	6044941.11	2130813.16	20.5
CDM-SB29	6044913.04	2130803.36	19.8
CDM-SB30	6044882.88	2130786.19	19.5
CDM-SB31	6044991.04	2130792.5	21
CDM-SB32	6045040.33	2130770.62	22
CDM-SB33	6045027.3	2130756.28	21.5
CDM-SB34	6044997.34	2130764.18	21
CDM-SB35	6045011.13	2130740.16	21
CDM-SB36	6044985.93	2130931.86	18.5
CDM-SB37	6044942.86	2130918.25	19
CDM-SB38	6044908.78	2130907.67	19
CDM-SB39	6044872.49	2130897	19
CDM-SB42	6044900.53	2130927.93	19
CDM-SB43	6044857.97	2130914.67	18.8
CDM-SB44	6044960.61	2130972.42	18.8
CDM-SB45	6044896.63	2130953.71	19
CDM-SB46	6044832.56	2130934.57	18.5
CDM-SB47	6044779.58	2130842.2	14.5
CDM-SB48	6044794.99	2130799.27	14.5
CDM-SB49	6044812.3	2130755.49	14.8
CDM-SB50	6044729.79	2130822.47	13.8
CDM-SB51	6044728.88	2130777.47	13.5
CDM-SB52	6044758.28	2130732.85	14.2
CDM-SB53	6045027.92	2130827.94	22

Notes:

Coordinates and Elevations based on 1983 North American Vertical Datum for California Stateplane III.

Surface Elevations are approximate values based on interpolation of elevation contours from 2001 aerial survey of the Site.

Table 3-1
Soil Analytical Results - Inorganics
Concentrations for Analytes Detected

Boring ID	Depth (feet bgs)[1]			Sample Date	Matrix	Total Metals (mg/kg)																	Soluble Metals (mg/L)				
	Depth 1	Depth 2	Depth 3			Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc	TCLP Arsenic	TCLP Lead	TCLP Mercury	WET Arsenic	SPLP Arsenic
Concentration of Concern[2]						150	50	1000	7.5	10	50	800	250	50	2	3500	200	10	50	70	240	2500	5	5	0.2	5	0.01
CDM-SB13	10			08-Dec-04	SV	ND<3	5.7	100	0.52	ND<0.25	32	8	17	19	0.054	ND<1	39	ND<0.25	ND<0.25	ND<0.25	31	45					
	14			13-Dec-04	SS	ND<2.5	**370**	86	0.39	0.67	32	5.7	13	5.5	0.31	0.87	32	ND<0.21	ND<0.21	ND<0.21	28	220					
	19.5			13-Dec-04	SS		**120**			1.2				**12000**			55					690					
	20.5			13-Dec-04	SS		**1200**																1.7				
	20.5	24		13-Dec-04	SS	ND<2.9	**790**	110	0.24	0.62	**86**	3.9	18	**350**	0.4	1.1	29	ND<0.24	ND<0.24	ND<0.24	32	150					
	24			13-Dec-04	SS		5.9				28			**81**													ND<0.05
CDM-SB14	4			07-Dec-04	RCM	ND<2.9	6.2	150	0.44	0.39	30	8.7	19	16	0.056	1.2	41	ND<0.24	ND<0.24	ND<0.24	28	56					
	9			07-Dec-04	SV		**86**																				
	11			07-Dec-04	SV		9.7																				
	11	13		07-Dec-04	SV	ND<2.2	9	180	0.5	0.51	36	9.8	18	9.7	0.025	1.7	45	ND<0.18	ND<0.18	ND<0.18	36	48					
	13			07-Dec-04	SS		19																				
	15			07-Dec-04	SS		5																				
	15	18.5		07-Dec-04	SS					0.66				19			40					55					
	18.5			07-Dec-04	SS		**150**																			3.7	
	24.5			07-Dec-04	SS	ND<2	**95**	240	0.32	ND<0.16	29	8	14	4.9	0.055	2.2	34	ND<0.16	ND<0.16	ND<0.16	21	44					
	26.5			07-Dec-04	SS		**78**																				
	26.5	29		07-Dec-04	SS					0.6				17			48					53					
	29			07-Dec-04	SS		44																				
CDM-SB15	4			07-Dec-04	RCM	**1200**	**110000**	520	0.13	**19**	25	5.6	**980**	**35000**	**76**	1.5	19	**36**	4.6	6	15	950	**370**	0.048	ND<0.001		
	10			15-Dec-04	SV		**15000**																				
	15			15-Dec-04	SS	23	**18000**	110	0.55	0.61	34	7.6	22	5.1	0.53	1.6	36	1.3	ND<0.23	ND<0.23	33	140					
	20			15-Dec-04	SS		**1800**			0.53				5.4			34					590	2.4				
	27.5			15-Dec-04	SS		**4000**																				
	29			15-Dec-04	SS		**960**																				
CDM-SB16	6			07-Dec-04	SV	ND<2	**470**	130	0.5	0.47	34	9.5	18	23	0.38	0.99	44	ND<0.17	ND<0.17	ND<0.17	34	42					
	10			15-Dec-04	SV		**880**																				
	15			15-Dec-04	SS	ND<3.3	**2600**	130	ND<0.11	ND<0.28	2.4	ND<1.1	4.8	**130**	0.14	ND<1.1	2.3	0.32	ND<0.28	ND<0.28	2.3	79					
	20			15-Dec-04	SS		**71**			0.67				5			52					490					
	22.5			15-Dec-04	SS		**1000**																				
	22.5	25		15-Dec-04	SS	ND<2.9	**1700**	120	0.32	0.35	22	5.3	13	**59**	0.078	1.6	26	ND<24	ND<0.24	ND<0.24	22	140					**10**
	25			15-Dec-04	SS		**2400**							6													
	28			15-Dec-04	SS		**750**							37													
CDM-SB17	4			06-Dec-04	RCM	11	**30000**	**2100**	0.16	**47**	41	4.2	**270**	**6100**	0.16	2.2	27	ND<0.27	0.57	ND<0.27	24	1400	**150**	0.32			
	8			06-Dec-04	SV		**1500**																				
	12			06-Dec-04	SS		**8300**																**48**				
	12	14		06-Dec-04	SS	ND<2.7	**6300**	470	0.36	1.1	**71**	6.4	66	**1100**	0.13	3.5	36	ND<0.22	0.56	ND<0.22	29	340		0.081			
	14			06-Dec-04	SS		**540**																				
	16			06-Dec-04	SS		**3600**																**14**				
	16	21		06-Dec-04	SS					7.1				**58**			9.7					74					
	21			06-Dec-04	SS		**3500**																				
	21	24		06-Dec-04	SS	ND<2.3	**2800**	93	0.23	0.31	26	2.5	11	36	0.039	1.5	17	ND<0.19	ND<0.19	ND<0.19	20	100					
	24			06-Dec-04	SS		**430**																			**18**	**2.1**
	26			06-Dec-04	SS		30																				**1.7**
	26	28.5		06-Dec-04	SS					0.62				6.3			40					190					
	28.5			06-Dec-04	SS		12																				

Abbreviations:

RCM - raised cap material
SV - vadose zone soil
SS - saturated soil
ND<0.005 - not detected at specified detection limit
mg/kg - milligrams per kilogram
mg/L - milligrams per liter
TCLP - Toxic Characteristic Leaching Procedure
STLC - Soluble Threshold Limit Concentrations by water extraction test (WET)
SPLP - Synthetic Precipitation Leaching Procedure
bgs - below ground surface

Notes:

[1] Depths 1, 2, and 3 reflect depth of sample collected. Multiple depths refer to sample collection depths for laboratory composited samples.
[2] Concentration of Concern: 10 times California STLC values for total metals; federal TCLP values for TCLP metals; STLC value for WET metals; and MCL values for SPLP metals.
69 = At or above concentration of concern.
20 = Sample depth within 5 feet of the top of aquitard.
25 = Sample depths within aquitard.

Table 3-1
Soil Analytical Results - Inorganics
Concentrations for Analytes Detected

Boring ID	Depth (feet bgs)[1]			Sample Date	Matrix	Total Metals (mg/kg)																Soluble Metals (mg/L)				
	Depth 1	Depth 2	Depth 3			Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc	TCLP Arsenic	TCLP Lead	TCLP Mercury	WET Arsenic	SPLP Arsenic
Concentration of Concern[2]						150	50	1000	7.5	10	50	800	250	50	2	3500	200	10	50	70	240	2500	5	5	0.2	5	0.01
CDM-SB18	2.5			06-Dec-04	RCM	ND<2.9	5.7	95	0.38	0.32	**71**	19	30	6.2	0.053	3.1	130	0.69	ND<0.25	ND<0.25	51	55					
	6			06-Dec-04	SV		**1600**																				
	11	15		06-Dec-04	SS	16	**16000**	390	0.34	1.8	34	6.3	**810**	**26000**	0.39	5.8	33	ND<0.23	1.2	ND<0.23	22	600	**49**	0.57			
	11			06-Dec-04	SV		**30000**																				
	15			06-Dec-04	SS		**3100**																				
	16			06-Dec-04	SS		**1900**																				
	16	19		06-Dec-04	SS					3.6				**1200**			33					160					
	19			06-Dec-04	SS		**1400**																2.6				
	21			06-Dec-04	SS		**60**																			3.8	**0.01**
	21	24		06-Dec-04	SS	ND<2.1	44	150	0.38	0.41	28	15	15	17	0.044	1.2	46	ND<0.18	ND<0.18	ND<0.18	27	76					
	24			06-Dec-04	SS		18																				
	27			06-Dec-04	SS		42																				
	27	30		06-Dec-04	SS					0.54				36			56					300					
	30			06-Dec-04	SS		**54**																				**0.35**
CDM-SB19	4			08-Dec-04	RCM	ND<2.9	5.7	100	0.51	ND<0.25	29	9	15	5.6	0.056	ND<0.98	40	ND<0.25	ND<0.25	ND<0.25	32	42					
	10			15-Dec-04	SV		7.1																				
	15			15-Dec-04	SS		**2100**							5.8													
	20			15-Dec-04	SS		**77**							4.3												**5.9**	
	22.5			15-Dec-04	SS		36							5.2													
	25			15-Dec-04	SS		2.3							4.4													
CDM-SB20	4			07-Dec-04	RCM	2.8	**310**	140	0.43	0.41	29	8.2	18	7	0.072	0.89	35	ND<0.15	ND<0.15	ND<0.15	30	46					
	10			13-Dec-04	SV		**74**																				
	15			13-Dec-04	SS		**980**							6.4													
	17			13-Dec-04	SS		**840**							14													
	22			13-Dec-04	SS		**740**							5.1													
	24			13-Dec-04	SS		**270**							5.5													
	26			13-Dec-04	SS		**590**																				
	30			13-Dec-04	SS		3.1																				
CDM-SB21	4			07-Dec-04	RCM	ND<2.8	**110**	130	0.28	0.43	30	7	29	**100**	0.12	ND<0.92	41	ND<0.23	ND<0.23	ND<0.23	32	73					
	6			13-Dec-04	SV		**4300**																				
	13.5			13-Dec-04	SS		**4800**							7.5													
	16.5			13-Dec-04	SS		**480**							13													
	23			13-Dec-04	SS		27							4													
	25			13-Dec-04	SS		3.4							7.2													ND<0.05
CDM-SB22	4			07-Dec-04	RCM	**640**	**50000**	150	0.16	**21**	20	4	170	**420**	0.41	0.67	17	1.5	ND<0.17	0.74	27	110					
	9			13-Dec-04	SV		**36000**																				
	13			13-Dec-04	SS		**26000**							9.1													
	15			13-Dec-04	SS		**31000**							16													
	20			13-Dec-04	SS		**150**							5.9													
	22.5			13-Dec-04	SS		**1400**							3.6													
	25			13-Dec-04	SS		**330**							4.9													
	27			13-Dec-04	SS		**21000**																				
	30			13-Dec-04	SS		**190**																				
CDM-SB23	2			07-Dec-04	RCM	**150**	**64000**	**1300**	0.15	5.5	34	4.8	**6000**	**58000**	1.4	1.1	27	4.2	1.3	1.4	15	1300	**260**	0.03			
	10			14-Dec-04	SV		**2300**							5.1													
	12.5			14-Dec-04	SS		**40000**							4.6													
	20			14-Dec-04	SS		10							6.2													
	22			14-Dec-04	SS		**1100**							7.2													
	25			14-Dec-04	SS		7.1							5.6													

Abbreviations:
RCM - raised cap material
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SS - saturated soil
ND<0.005 - not detected at specified detection limit
mg/kg - milligrams per kilogram
mg/L - milligrams per liter
TCLP - Toxic Characteristic Leaching Procedure
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SPLP - Synthetic Precipitation Leaching Procedure
bgs - below ground surface

Notes:
[1] Depths 1, 2, and 3 reflect depth of sample collected. Multiple depths refer to sample collection depths for laboratory composited samples.
[2] Concentration of Concern: 10 times California STLC values for total metals; federal TCLP values for TCLP metals; STLC value for WET metals; and MCL values for SPLP metals.
69 = At or above concentration of concern.
20 = Sample depth within 5 feet of the top of aquitard.
25 = Sample depths within aquitard.

Table 3-1
Soil Analytical Results - Inorganics
Concentrations for Analytes Detected

Boring ID	Depth (feet bgs)[1]			Sample Date	Matrix	Total Metals (mg/kg)																Soluble Metals (mg/L)				
	Depth 1	Depth 2	Depth 3			Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc	TCLP Arsenic	TCLP Lead	TCLP Mercury	WET Arsenic	SPLP Arsenic
Concentration of Concern[2]						150	50	1000	7.5	10	50	800	250	50	2	3500	200	10	50	70	240	2500	5	5	0.2	5	0.01
CDM-SB24	2			07-Dec-04	RCM	50	**13000**	**1300**	0.28	7.5	44	7.8	**4100**	**12000**	**13**	ND<1.1	44	**40**	0.85	0.88	26	2200	**71**	0.62	ND<0.001		
	10			14-Dec-04	SV		**420**																				
	15			14-Dec-04	SS		**850**							5.1													
	18			14-Dec-04	SS		**410**							4.6													
	25			14-Dec-04	SS		16							5.3													
CDM-SB25	2			08-Dec-04	RCM	ND<2.6	27	230	0.64	ND<0.21	22	30	28	**140**	0.95	ND<0.85	36	ND<0.21	ND<0.21	ND<0.21	27	120					
	10			14-Dec-04	SV		5.4																				
	15			14-Dec-04	SS		5.3							5.1													
	20			14-Dec-04	SS		**340**							5.4												**11**	
	25			14-Dec-04	SS		2.8							5.4													
CDM-SB26	4			08-Dec-04	RCM	ND<2.3	**390**	140	0.52	ND<0.19	36	11	22	**110**	0.13	0.85	54	ND<0.19	ND<0.19	ND<0.19	30	66					
	10			14-Dec-04	SV		8.5																				
	15			14-Dec-04	SS		**78**							4.5													
	20			14-Dec-04	SS		**1100**							5.1									3.5				
	22.5			14-Dec-04	SS		26							5													
	25			14-Dec-04	SS		**630**							4.5													
	27.5			14-Dec-04	SS		**550**																				
	30			14-Dec-04	SS		5.0																				
CDM-SB27	3			08-Dec-04	RCM	ND<3.3	**570**	160	0.51	0.48	32	10	30	**9100**	0.21	ND<1.1	43	ND<0.27	ND<0.27	ND<0.27	32	320					
	7.5			19-Dec-04	SV		**450**																				
	12.5			19-Dec-04	SS		**240**							5.4													
	17.5			19-Dec-04	SS		**620**							7.5													
	22.5			19-Dec-04	SS		**780**							6													
	25			19-Dec-04	SS		42							3.3													
CDM-SB28	3			08-Dec-04	RCM	64	**3100**	150	0.12	**17**	15	3.6	78	**2400**	**13**	ND<0.74	27	1.6	0.26	1.3	12	150					
	10			15-Dec-04	SV		**790**																				
	15			15-Dec-04	SS		**1100**							3													
	20			15-Dec-04	SS		3.7							6.3													
	22.5			15-Dec-04	SS		**3200**							**200**													**41**
	25			15-Dec-04	SS		7.0							5.2													ND<0.05
CDM-SB29	2			08-Dec-04	RCM	ND<3.3	**7000**	160	0.48	ND<0.28	29	8.4	80	**260**	0.28	ND<1.1	38	0.39	ND<0.28	ND<0.28	29	74					
	10			20-Dec-04	SV		**320**																				
	15			20-Dec-04	SS		**710**							**52**													
	17.5			20-Dec-04	SS		**710**							13													
	22			20-Dec-04	SS		**600**							22													
	24			20-Dec-04	SS		16							4.1													
CDM-SB30	4			08-Dec-04	RCM	ND<2.4	**240**	140	0.47	ND<0.2	28	8.5	18	7.5	0.045	0.88	37	ND<0.2	ND<0.2	ND<0.2	29	49					
	10			20-Dec-04	SV		**250**																				
	15			20-Dec-04	SS		**330**							5.1													
	18.5			20-Dec-04	SS		35							14													
	22.5			20-Dec-04	SS		**190**							20													
	25			20-Dec-04	SS		1.4							5.8													

Abbreviations:

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TCLP - Toxic Characteristic Leaching Procedure
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bgs - below ground surface

Notes:

[1] Depths 1, 2, and 3 reflect depth of sample collected. Multiple depths refer to sample collection depths for laboratory composited samples.
[2] Concentration of Concern: 10 times California STLC values for total metals; federal TCLP values for TCLP metals; STLC value for WET metals; and MCL values for SPLP metals.

69 = At or above concentration of concern.
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Table 3-1
Soil Analytical Results - Inorganics
Concentrations for Analytes Detected

Boring ID	Depth (feet bgs)[1]			Sample Date	Matrix	Total Metals (mg/kg)																Soluble Metals (mg/L)				
	Depth 1	Depth 2	Depth 3			Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc	TCLP Arsenic	TCLP Lead	TCLP Mercury	WET Arsenic	SPLP Arsenic
Concentration of Concern[2]						150	50	1000	7.5	10	50	800	250	50	2	3500	200	10	50	70	240	2500	5	5	0.2	5	0.01
CDM-SB31	3			09-Dec-04	RCM	ND<2.6	15	150	0.46	0.42	40	9	19	30	0.1	0.98	59	ND<0.22	ND<0.22	ND<0.22	32	59					
	10			16-Dec-04	SV		**61**																				
	15			16-Dec-04	SS		**390**							7.1													
	20			16-Dec-04	SS		**330**							4.7													
	23			16-Dec-04	SS		**370**							5.2													
	25			16-Dec-04	SS		27							3.9													
CDM-SB32	4			08-Dec-04	RCM	ND<2.8	7.0	350	0.9	ND<0.23	12	19	22	19	1.6	ND<0.92	32	ND<0.23	ND<0.23	ND<0.23	23	55					
	10			14-Dec-04	SV		5.1																				
	15			14-Dec-04	SS		4.8							5.5													
	20			14-Dec-04	SS		**120**							6.6												**5**	
	22.5			14-Dec-04	SS		**150**							5.9													
	25			14-Dec-04	SS		2.7							5.2													
CDM-SB33	3			08-Dec-04	RCM	ND<3.2	**720**	150	0.59	0.3	40	10	47	**3700**	0.35	1.2	50	ND<0.26	ND<0.26	ND<0.26	34	170					
	10			14-Dec-04	SV		7.2																				
	15			14-Dec-04	SS		12							4.7													
	20			14-Dec-04	SS		**62**							4.1													
	22.5			14-Dec-04	SS		**110**							20													
	25			14-Dec-04	SS		1.9							4.6													
CDM-SB34	2			09-Dec-04	RCM	ND<2.8	**200**	130	0.32	0.44	35	8.5	27	**300**	0.14	ND<0.93	48	ND<0.23	ND<0.23	ND<0.23	37	84					
	10			16-Dec-04	SV		7.0																				
	15			16-Dec-04	SS		**70**							4.5												2	
	20			16-Dec-04	SS		**91**							4.1													
	22.5			16-Dec-04	SS		6.4							5.7													
	25			16-Dec-04	SS		36							4.6													
CDM-SB35	2			09-Dec-04	RCM	ND<2.6	5.0	160	0.56	ND<0.22	**54**	29	19	7.1	0.063	ND<0.86	78	ND<0.22	ND<0.22	ND<0.22	53	31					
	10			16-Dec-04	SV		5.9																				
	15			16-Dec-04	SS		**61**							4.6													
	20			16-Dec-04	SS		**180**							5.6													
	23.5			16-Dec-04	SS		13							3.9													
	25			16-Dec-04	SS		1.3							4.3													
CDM-SB36	5			20-Dec-04	SV		5.1																				
	10			20-Dec-04	SS		**900**																0.78				
	15			20-Dec-04	SS		**63**																				
	17.5			20-Dec-04	SS		26																				
	20			20-Dec-04	SS		6.7																				
CDM-SB37	4.5			17-Dec-04	SV		6.5																				
	9.5			17-Dec-04	SS	ND<2.5	**3600**	85	0.13	0.5	18	ND<0.83	10	4.8	0.13	2.3	8.5	1.1	ND<0.21	ND<0.21	20	210					
	11	13	14.5	17-Dec-04	SS					8.9				6.4			33					970					
	11			17-Dec-04	SV		**4700**																				
	13			17-Dec-04	SS		**2700**																1.6				
	14.5			17-Dec-04	SS		21																				**0.073**

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bgs - below ground surface

Notes:
[1] Depths 1, 2, and 3 reflect depth of sample collected. Multiple depths refer to sample collection depths for laboratory composited samples.
[2] Concentration of Concern: 10 times California STLC values for total metals; federal TCLP values for TCLP metals; STLC value for WET metals; and MCL values for SPLP metals.
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Table 3-1
Soil Analytical Results - Inorganics
Concentrations for Analytes Detected

Boring ID	Depth (feet bgs)[1] Depth 1	Depth 2	Depth 3	Sample Date	Matrix	Total Metals (mg/kg) Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc	Soluble Metals (mg/L) TCLP Arsenic	TCLP Lead	TCLP Mercury	WET Arsenic	SPLP Arsenic
Concentration of Concern[2]						150	50	1000	7.5	10	50	800	250	50	2	3500	200	10	50	70	240	2500	5	5	0.2	5	0.01
CDM-SB38	3.5			17-Dec-04	SV		16																				
	5.5			17-Dec-04	SV		15																				
	8.5			17-Dec-04	SS	ND<3.1	**490**	240	ND<0.1	1.6	1.7	ND<1	3.6	**170**	0.063	ND<1	3.6	ND<0.26	ND<0.26	ND<0.26	1.6	750					
	8.5			17-Dec-04	SS																						
	12.5			17-Dec-04	SS		**84**			1.3				**470**			3.9					460					
	15			17-Dec-04	SS		**51**			0.41				**180**			2.2					170					
	15.5			17-Dec-04	SS		**150**																				
	15.5	18		17-Dec-04	SS	ND<2.3	**130**	130	0.49	2.8	39	6.1	21	42	0.052	1.3	37	0.45	ND<0.19	ND<0.19	34	670					
	18			17-Dec-04	SS		8.2																				
CDM-SB39	3.5			17-Dec-04	SV		5.1																				
	7.5			17-Dec-04	SS	ND<2.3	8.1	130	0.48	0.29	33	11	16	5.5	0.058	1.4	43	0.5	ND<0.19	ND<0.19	31	64					
	13			17-Dec-04	SS		**3400**																				
	13	14		17-Dec-04	SS					**17**				30			8					210					
	14			17-Dec-04	SS		**1500**																0.87				
	17			17-Dec-04	SS		**52**																				
	17	19		17-Dec-04	SS	ND<2.2	**180**	100	0.6	1.6	36	9.6	22	6.6	0.051	1.6	43	0.46	ND<0.18	ND<0.18	36	460					
	19			17-Dec-04	SS		20																				**0.23**
CDM-SB42	5			21-Dec-04	SV		7.6																				
	7.5			21-Dec-04	SS	ND<2.6	6.5	110	ND<0.086	3.6	16	1.5	32	9.4	0.14	1.2	9.2	ND<0.22	ND<0.22	ND<0.22	8.9	1500					
	10			21-Dec-04	SS		2.5							**90**													
	10	11.5	12	21-Dec-04	SS					3.3				**340**			4.9					1300					
	11.5			21-Dec-04	SV		5.5							**240**													
	12.5			21-Dec-04	SS		13							25													
CDM-SB43	5			21-Dec-04	SV		5.0																				
	7.5			21-Dec-04	SS		10																				
	10			21-Dec-04	SS		**210**																				
	12.5			21-Dec-04	SS		**3900**																3.8				
	14			21-Dec-04	SS		**940**																				
	16.5			21-Dec-04	SS		37																				
	19.5			21-Dec-04	SS		18																				
CDM-SB44	4			21-Dec-04	SV		5.6																				
	7.5			21-Dec-04	SS		4.7																				
	10			21-Dec-04	SS		42																				
	12.5			21-Dec-04	SS		**480**																0.53			**11**	
	15			21-Dec-04	SS		21																				
	17.5			21-Dec-04	SS		**110**																				
	20			21-Dec-04	SS		11																				
CDM-SB45	5			21-Dec-04	SV		24																				
	10			21-Dec-04	SS		5.1																				
	10	12.5		21-Dec-04	SS					0.37				4.3			26					390					
	12.5			21-Dec-04	SS		5.7																				
CDM-SB46	5			21-Dec-04	SV		5.9																				
	10			21-Dec-04	SS		**150**																			**6.5**	
	10	12.5		21-Dec-04	SS					ND<0.17				5.1			32					110					
	12.5			21-Dec-04	SS		**660**																				
	15			21-Dec-04	SS		10																				
	17.5			21-Dec-04	SS		6.3																				
	20			21-Dec-04	SS		4.3																				

Abbreviations:

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Notes:

[1] Depths 1, 2, and 3 reflect depth of sample collected. Multiple depths refer to sample collection depths for laboratory composited samples.
[2] Concentration of Concern: 10 times California STLC values for total metals; federal TCLP values for TCLP metals; STLC value for WET metals; and MCL values for SPLP metals.

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Table 3-1
Soil Analytical Results - Inorganics
Concentrations for Analytes Detected

Boring ID	Depth (feet bgs)[1]			Sample Date	Matrix	Total Metals (mg/kg)																	Soluble Metals (mg/L)				
	Depth 1	Depth 2	Depth 3			Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc	TCLP Arsenic	TCLP Lead	TCLP Mercury	WET Arsenic	SPLP Arsenic
Concentration of Concern[2]						150	50	1000	7.5	10	50	800	250	50	2	3500	200	10	50	70	240	2500	5	5	0.2	5	0.01
CDM-SB47	2.5			19-Dec-04	SV		18																				
	8			19-Dec-04	SS		**2300**																				
	12.5			19-Dec-04	SS		**6800**																				
	15			19-Dec-04	SS		**1100**																0.24				
	17.5			19-Dec-04	SS		**2100**																				
	19			19-Dec-04	SS		7.0																				
CDM-SB48	4.5			19-Dec-04	SV		**75**																				
	9.5			19-Dec-04	SS		**3300**																				
	12.5			19-Dec-04	SS		**96**																				
	16			19-Dec-04	SS		**960**																				
	18.5			19-Dec-04	SS		2.6																				
CDM-SB49	4			19-Dec-04	SV		**210**																				
	8.5			19-Dec-04	SS		**180**																ND<0.05			1	
	13			19-Dec-04	SS		**110**																				
	17			19-Dec-04	SS		45																				**0.22**
	19			19-Dec-04	SS		12																				ND<0.05
CDM-SB50	5			16-Dec-04	SV		**200**																				
	10			16-Dec-04	SS		**240**																0.33				
	15			16-Dec-04	SS		4.8																				
	20			16-Dec-04	SS		2.4																				
CDM-SB51	5			17-Dec-04	SV		**380**																				
	10			17-Dec-04	SS		**470**																			**11**	
	12			17-Dec-04	SS		**400**																				
	16			17-Dec-04	SS		**320**																				
	19.5			17-Dec-04	SS		2.1																				
CDM-SB52	5			16-Dec-04	SV		19																				
	10			16-Dec-04	SS		**69**																				
	15			16-Dec-04	SS		30																				
	20			16-Dec-04	SS		9.7																				

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Notes:

[1] Depths 1, 2, and 3 reflect depth of sample collected. Multiple depths refer to sample collection depths for laboratory composited samples.
[2] Concentration of Concern: 10 times California STLC values for total metals; federal TCLP values for TCLP metals; STLC value for WET metals; and MCL values for SPLP metals.

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25 = Sample depths within aquitard.

Table 3-2
Soil Analytical Results - Volatile Organic Compounds
Concentrations for Analytes Detected

Boring ID	Depth (feet bgs)	Sample Date	Matrix	Volatile Organic Compounds (mg/kg)																				
				1,2,4-Trimethylbenzene	1,2-Dichloroethane	1,3,5-Trimethylbenzene	2-Butanone	4-Methyl-2-Pentanone	Acetone	Benzene	Ethylbenzene	Isopropylbenzene	m,p-Xylenes	Methylene Chloride	Naphthalene	n-Butylbenzene	o-Xylene	para-Isopropyl Toluene	Propylbenzene	sec-Butylbenzene	Toluene	Trichloroethene	Total Volatile Organic Compounds
CDM-SB13	10	08-Dec-04	SV	ND<0.0046	ND<0.0046	ND<0.0046	ND<0.0093	ND<0.0093	ND<0.019	ND<0.0046	ND<0.0046	ND<0.0046	ND<0.0046	ND<0.019	ND<0.0046	ND<0.0046	ND<0.0046	ND<0.0046	ND<0.0046	ND<0.0046	ND<0.0046	ND<0.0046	ND<0.0046	ND
CDM-SB14	4	07-Dec-04	RCM	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0096	ND<0.0096	ND<0.019	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	0.036	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	0.036
	9	07-Dec-04	SV	ND<0.0046	ND<0.0046	ND<0.0046	ND<0.0093	ND<0.0093	0.021	ND<0.0046	ND<0.0046	ND<0.0046	ND<0.0046	ND<0.0046	0.034	ND<0.0046	ND<0.0046	ND<0.0046	ND<0.0046	ND<0.0046	ND<0.0046	ND<0.0046	ND<0.0046	0.055
	11	07-Dec-04	SV	ND<0.0046	ND<0.0046	ND<0.0046	ND<0.0093	ND<0.0093	ND<0.019	ND<0.0046	ND<0.0046	ND<0.0046	ND<0.0046	ND<0.0046	0.019	ND<0.0046	ND<0.0046	ND<0.0046	ND<0.0046	ND<0.0046	ND<0.0046	ND<0.0046	ND<0.0046	0.019
	13	07-Dec-04	SS	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0098	ND<0.0098	ND<0.02	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0049	0.026	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0049	0.026
	15	07-Dec-04	SS	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0098	ND<0.0098	ND<0.02	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0049	0.023	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0049	0.023
	18.5	07-Dec-04	SS	ND<0.0045	ND<0.0045	ND<0.0045	ND<0.0091	ND<0.0091	ND<0.018	ND<0.0045	ND<0.0045	ND<0.0045	ND<0.0045	ND<0.0045	0.037	ND<0.0045	ND<0.0045	ND<0.0045	ND<0.0045	ND<0.0045	ND<0.0045	ND<0.0045	ND<0.0045	0.037
	24.5	07-Dec-04	SS	ND<0.0045	ND<0.0045	ND<0.0045	ND<0.0091	ND<0.0091	ND<0.018	ND<0.0045	ND<0.0045	ND<0.0045	ND<0.0045	ND<0.0045	0.026	ND<0.0045	ND<0.0045	ND<0.0045	ND<0.0045	ND<0.0045	ND<0.0045	ND<0.0045	ND<0.0045	0.026
	26.5	07-Dec-04	SS	ND<0.0043	ND<0.0043	ND<0.0043	ND<0.0086	ND<0.0086	0.027	ND<0.0043	ND<0.0043	ND<0.0043	ND<0.0043	ND<0.0043	0.019	ND<0.0043	ND<0.0043	ND<0.0043	ND<0.0043	ND<0.0043	ND<0.0043	ND<0.0043	ND<0.0043	0.046
	29	07-Dec-04	SS	ND<0.0046	0.0049	ND<0.0046	ND<0.0093	ND<0.0093	ND<0.019	ND<0.0046	ND<0.0046	ND<0.0046	ND<0.0046	ND<0.0046	0.068	ND<0.0046	ND<0.0046	ND<0.0046	ND<0.0046	ND<0.0046	ND<0.0046	ND<0.0046	ND<0.0046	0.0729
CDM-SB15	4	07-Dec-04	RCM	ND<0.005	ND<0.005	ND<0.005	ND<0.01	ND<0.01	ND<0.02	ND<0.005	ND<0.005	ND<0.005	ND<0.005	ND<0.005	0.027	ND<0.005	ND<0.005	ND<0.005	ND<0.005	ND<0.005	ND<0.005	ND<0.005	ND<0.005	0.027
CDM-SB16	6	07-Dec-04	SV	0.16	ND<0.025	0.046	1.3	0.66	3.3	ND<0.025	0.17	ND<0.025	0.76	ND<0.1	ND<0.025	ND<0.025	0.24	ND<0.025	ND<0.025	ND<0.025	1.3	ND<0.025	7.936
	10	15-Dec-04	SV	ND<1	ND<1	ND<1	5.1	2.2	13	ND<1	ND<1	ND<1	ND<1	ND<4	ND<1	ND<1	ND<1	ND<1	ND<1	ND<1	2.1	ND<1	22.4
	15	15-Dec-04	SS	0.095	ND<0.025	ND<0.025	0.084	0.08	0.22	ND<0.025	0.12	ND<0.025	0.54	0.16	ND<0.025	ND<0.025	0.13	ND<0.025	ND<0.025	ND<0.025	1.6	ND<0.025	3.029
	20	15-Dec-04	SS	ND<0.025	ND<0.0045	ND<0.0045	ND<0.0091	ND<0.0091	ND<0.018	ND<0.0045	0.031	ND<0.0045	0.11	0.11	ND<0.0045	ND<0.0045	0.026	ND<0.0045	ND<0.0045	ND<0.0045	0.31	ND<0.0045	0.587
CDM-SB17	4	06-Dec-04	RCM	210	ND<100	ND<100	240	250	ND<400	ND<100	220	ND<100	940	ND<400	ND<100	ND<100	240	ND<100	ND<100	ND<100	2600	ND<100	4700
	8	06-Dec-04	SV	ND<170	ND<170	ND<170	ND<330	ND<330	ND<670	ND<170	ND<170	ND<170	390	ND<670	ND<170	ND<170	ND<170	ND<170	ND<170	ND<170	1800	ND<170	2190
	12	06-Dec-04	SS	98	ND<50	ND<50	140	140	ND<200	ND<50	120	ND<50	480	ND<200	ND<50	ND<50	120	ND<50	ND<50	ND<50	1300	ND<50	2398
	14	06-Dec-04	SS	120	ND<100	ND<100	270	350	ND<400	ND<100	170	ND<100	650	ND<400	ND<100	ND<100	150	ND<100	ND<100	ND<100	2600	ND<100	4310
	16	06-Dec-04	SS	11	ND<2.5	3.7	54	37	120	ND<2.5	17	ND<2.5	63	ND<10	ND<2.5	ND<2.5	14	ND<2.5	ND<2.5	ND<2.5	310	ND<2.5	629.7
	21	06-Dec-04	SS	11	ND<2.5	3.6	44	28	100	ND<2.5	16	ND<2.5	61	ND<10	ND<2.5	ND<2.5	14	ND<2.5	ND<2.5	ND<2.5	300	ND<2.5	577.6
	24	06-Dec-04	SS	12	ND<5	ND<5	48	30	86	ND<5	17	ND<5	68	ND<20	ND<5	ND<5	16	ND<5	ND<5	ND<5	260	ND<5	537
	26	06-Dec-04	SS	ND<10	ND<10	ND<10	21	ND<20	ND<40	ND<10	11	ND<10	42	ND<40	ND<10	ND<10	ND<10	ND<10	ND<10	ND<10	170	ND<10	244
	28.5	06-Dec-04	SS	ND<1.3	ND<1.3	ND<1.3	2.8	ND<2.5	ND<5	ND<1.3	ND<1.3	ND<1.3	4.3	ND<5	ND<1.3	ND<1.3	ND<1.3	ND<1.3	ND<1.3	ND<1.3	20	ND<1.3	27.1
CDM-SB18	2.5	06-Dec-04	RCM	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0096	ND<0.0096	ND<0.019	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	0.048	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	0.048
	6	06-Dec-04	SV	29	ND<17	ND<17	ND<33	ND<33	ND<67	ND<17	50	ND<17	250	ND<67	ND<17	ND<17	71	ND<17	ND<17	ND<17	390	ND<17	790
	11	06-Dec-04	SV	ND<8.3	ND<8.3	ND<8.3	ND<17	ND<17	ND<33	ND<8.3	36	ND<8.3	260	ND<33	ND<8.3	ND<8.3	90	ND<8.3	ND<8.3	ND<8.3	180	ND<8.3	566
	15	06-Dec-04	SS	14	ND<8.3	ND<8.3	ND<17	ND<17	ND<33	ND<8.3	20	ND<8.3	110	ND<33	ND<8.3	ND<8.3	33	ND<8.3	ND<8.3	ND<8.3	120	ND<8.3	297
	16	06-Dec-04	SS	15	ND<10	ND<10	ND<20	ND<20	ND<40	ND<10	22	ND<10	100	ND<40	ND<10	ND<10	28	ND<10	ND<10	ND<10	160	ND<10	325
	19	06-Dec-04	SS	11	ND<6.3	ND<6.3	ND<13	ND<13	ND<25	ND<6.3	15	ND<6.3	(2)	ND<25	ND<6.3	ND<6.3	20	ND<6.3	ND<6.3	ND<6.3	110	ND<6.3	229
	21	06-Dec-04	SS	0.19	ND<0.13	ND<0.13	0.26	ND<0.25	ND<0.5	ND<0.13	0.22	ND<0.13	1.2	ND<0.5	ND<0.13	ND<0.13	0.36	ND<0.13	ND<0.13	ND<0.13	1.2	ND<0.13	3.43
	24	06-Dec-04	SS	0.005	ND<0.0048	ND<0.0048	0.013	ND<0.0096	0.081	ND<0.0048	0.0079	ND<0.0048	0.041	0.047	ND<0.0048	ND<0.0048	0.013	ND<0.0048	ND<0.0048	ND<0.0048	0.043	ND<0.0048	0.2509
	27	06-Dec-04	SS	0.55	ND<0.31	ND<0.31	ND<0.63	ND<0.63	ND<1.3	ND<0.31	0.71	ND<0.31	3.4	ND<1.3	ND<0.31	ND<0.31	0.97	ND<0.31	ND<0.31	ND<0.31	4.6	ND<0.31	10.23
	30	06-Dec-04	SS	ND<0.25	ND<0.25	ND<0.25	ND<0.5	ND<0.5	ND<1	ND<0.25	0.42	ND<0.25	2.3	ND<1	ND<0.25	ND<0.25	0.72	ND<0.25	ND<0.25	ND<0.25	3.1	ND<0.25	6.54
CDM-SB19	4	08-Dec-04	RCM	ND<0.0046	ND<0.0046	ND<0.0046	ND<0.0093	ND<0.0093	ND<0.019	ND<0.0046	ND<0.0046	ND<0.0046	ND<0.0046	0.02	ND<0.0046	ND<0.0046	ND<0.0046	ND<0.0046	ND<0.0046	ND<0.0046	ND<0.0046	ND<0.0046	ND<0.0046	0.02
CDM-SB20	4	07-Dec-04	RCM	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0096	ND<0.0096	ND<0.019	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	0.035	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	0.035
CDM-SB21	4	07-Dec-04	RCM	ND<0.0047	ND<0.0047	ND<0.0047	ND<0.0094	ND<0.0094	ND<0.019	ND<0.0047	ND<0.0047	ND<0.0047	ND<0.0047	0.049	ND<0.0047	ND<0.0047	ND<0.0047	ND<0.0047	ND<0.0047	ND<0.0047	ND<0.0047	ND<0.0047	ND<0.0047	0.049
	6	13-Dec-04	SV	ND<0.005	ND<0.005	ND<0.005	ND<0.01	ND<0.01	ND<0.02	ND<0.005	ND<0.005	ND<0.005	ND<0.005	ND<0.1	ND<0.005	ND<0.005	ND<0.005	ND<0.005	ND<0.005	ND<0.005	ND<0.005	ND<0.005	ND<0.005	ND
	13.5	13-Dec-04	SS	ND<0.0045	ND<0.0045	ND<0.0045	ND<0.0089	ND<0.0089	ND<0.018	ND<0.0045	ND<0.0045	ND<0.0045	ND<0.0045	ND<0.1	ND<0.0045	ND<0.0045	ND<0.0045	ND<0.0045	ND<0.0045	ND<0.0045	ND<0.0045	ND<0.0045	ND<0.0045	ND
	16.5	13-Dec-04	SS	ND<0.0045	ND<0.0045	ND<0.0045	ND<0.0089	ND<0.0089	ND<0.018	ND<0.0045	ND<0.0045	ND<0.0045	ND<0.0045	ND<0.018	ND<0.0045	ND<0.0045	ND<0.0045	ND<0.0045	ND<0.0045	ND<0.0045	ND<0.0045	ND<0.0045	ND<0.0045	ND
	23	13-Dec-04	SS	ND<0.0048	0.0052	ND<0.0048	ND<0.0096	ND<0.0096	ND<0.019	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	0.1	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	0.0091	0.1143
	25	13-Dec-04	SS	ND<0.0047	0.039	ND<0.0047	ND<0.0094	ND<0.0094	0.034	ND<0.0047	ND<0.0047	ND<0.0047	ND<0.0047	0.068	ND<0.0047	ND<0.0047	ND<0.0047	ND<0.0047	ND<0.0047	ND<0.0047	ND<0.0047	ND<0.0047	ND<0.0047	0.141
CDM-SB22	4	07-Dec-04	RCM	ND<0.0049	ND<0.0049	ND<0.0049	0.028	0.02	0.075	ND<0.0049	0.015	ND<0.0049	0.053	0.064	ND<0.0049	ND<0.0049	0.015	ND<0.0049	ND<0.0049	ND<0.0049	0.0081	ND<0.0049	0.2781

Abbreviations:
RCM - raised cap material
SV - vadose zone soil
SS - saturated soil
ND<0.005 - not detected at specified detection limit
mg/kg - milligrams per kilogram
bgs - below ground surface

Table 3-2
Soil Analytical Results - Volatile Organic Compounds
Concentrations for Analytes Detected

Boring ID	Depth (feet bgs)	Sample Date	Matrix	Volatile Organic Compounds (mg/kg)																			
				1,2,4-Trimethylbenzene	1,2-Dichloroethane	1,3,5-Trimethylbenzene	2-Butanone	4-Methyl-2-Pentanone	Acetone	Benzene	Ethylbenzene	Isopropylbenzene	m,p-Xylenes	Methylene Chloride	Naphthalene	n-Butylbenzene	o-Xylene	para-Isopropyl Toluene	Propylbenzene	sec-Butylbenzene	Toluene	Trichloroethene	Total Volatile Organic Compounds
CDM-SB23	2	07-Dec-04	RCM	11	ND<6.3	ND<6.3	ND<13	ND<13	ND<25	ND<6.3	25	ND<6.3	92	ND<25	ND<6.3	ND<6.3	21	ND<6.3	ND<6.3	ND<6.3	430	ND<6.3	579
	10	14-Dec-04	SV	87	ND<7.1	28	ND<14	ND<14	ND<29	ND<7.1	30	ND<7.1	130	ND<29	ND<7.1	ND<7.1	32	ND<7.1	11	ND<7.1	110	ND<7.1	428
	12.5	14-Dec-04	SS	2.5	ND<0.025	0.26	0.078	0.21	ND<0.1	ND<0.025	0.41	0.043	3.9	ND<0.1	ND<0.025	ND<0.025	0.3	ND<0.025	0.09	ND<0.025	0.35	ND<0.025	8.141
	20	14-Dec-04	SS	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0098	ND<0.0098	ND<0.02	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.01	0.088	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.01	ND<0.0049	0.088
	22	14-Dec-04	SS	2.4	ND<0.42	0.71	ND<0.83	ND<0.83	ND<1.7	ND<0.42	1.2	ND<0.42	4.9	ND<1.7	ND<0.42	ND<0.42	1.1	ND<0.42	ND<0.42	ND<0.42	5.7	ND<0.42	16.01
	25	14-Dec-04	SS	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0098	ND<0.0098	ND<0.02	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.02	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0049	ND
CDM-SB24	2	07-Dec-04	RCM	11	ND<5	ND<5	ND<10	21	ND<20	ND<5	22	ND<5	81	ND<20	ND<5	ND<5	13	ND<5	ND<5	ND<5	340	ND<5	488
	15	14-Dec-04	SS	ND<1.7	ND<1.7	ND<1.7	14	ND<3.3	22	ND<1.7	ND<1.7	ND<1.7	ND<1.7	ND<6.7	ND<1.7	ND<1.7	ND<1.7	ND<1.7	ND<1.7	ND<1.7	2.3	ND<1.7	38.3
	18	14-Dec-04	SS	ND<1	ND<1	ND<1	8.8	3	15	ND<1	ND<1	ND<1	2.6	ND<4	ND<1	ND<1	ND<1	ND<1	ND<1	ND<1	7.5	ND<1	36.9
	25	14-Dec-04	SS	ND<0.005	ND<0.005	ND<0.005	ND<0.01	ND<0.01	ND<0.02	ND<0.005	ND<0.005	ND<0.005	0.011	0.055	ND<0.005	ND<0.005	ND<0.005	ND<0.005	ND<0.005	ND<0.005	0.018	ND<0.005	0.084
CDM-SB25	2	08-Dec-04	RCM	ND<0.0045	ND<0.0045	ND<0.0045	ND<0.0091	ND<0.0091	ND<0.018	ND<0.0045	ND<0.0045	ND<0.0045	ND<0.0045	ND<0.0045	ND<0.018	ND<0.0045	ND<0.0045	ND<0.0045	ND<0.0045	ND<0.0045	ND<0.0045	ND<0.0045	ND<0.0045	ND
CDM-SB26	4	08-Dec-04	RCM	ND<0.0045	ND<0.0045	ND<0.0045	ND<0.0089	ND<0.0089	ND<0.018	ND<0.0045	ND<0.0045	ND<0.0045	ND<0.0045	ND<0.0045	ND<0.018	ND<0.0045	ND<0.0045	ND<0.0045	ND<0.0045	ND<0.0045	ND<0.0045	ND<0.0045	ND<0.0045	ND
CDM-SB27	3	08-Dec-04	RCM	ND<0.005	ND<0.005	ND<0.005	ND<0.01	ND<0.01	ND<0.02	ND<0.005	ND<0.005	ND<0.005	ND<0.005	ND<0.02	ND<0.005	ND<0.005	ND<0.005	ND<0.005	ND<0.005	ND<0.005	ND<0.005	ND<0.005	ND<0.005	ND
CDM-SB28	3	08-Dec-04	RCM	0.2	ND<0.016	0.056	0.22	ND<0.031	0.23	ND<0.016	ND<0.016	ND<0.016	0.061	ND<0.063	ND<0.016	ND<0.016	ND<0.016	ND<0.016	ND<0.016	ND<0.016	ND<0.016	ND<0.016	ND<0.016	0.767
CDM-SB29	2	08-Dec-04	RCM	0.24	ND<0.023	0.073	ND<0.045	0.075	0.16	ND<0.023	0.22	0.027	0.51	ND<0.091	ND<0.023	ND<0.023	0.094	ND<0.023	0.037	ND<0.023	0.42	ND<0.023	1.856
CDM-SB30	4	08-Dec-04	RCM	0.035	ND<0.016	ND<0.016	0.05	ND<0.031	0.25	ND<0.016	ND<0.016	ND<0.016	0.033	ND<0.063	ND<0.016	ND<0.016	ND<0.016	ND<0.016	0.025	ND<0.016	0.028	ND<0.016	0.421
	10	20-Dec-04	SV	0.025	ND<0.0049	0.012	ND<0.0098	ND<0.0098	ND<0.02	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.02	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0049	0.037
	13	20-Dec-04	SS	0.87	ND<0.13	0.4	ND<0.25	ND<0.25	ND<0.5	ND<0.13	ND<0.13	ND<0.13	ND<0.13	ND<0.5	ND<0.13	ND<0.13	ND<0.13	ND<0.13	ND<0.13	ND<0.13	ND<0.13	ND<0.13	1.27
	20	20-Dec-04	SS	ND<0.005	ND<0.005	ND<0.005	ND<0.01	ND<0.01	ND<0.02	ND<0.005	ND<0.005	ND<0.005	ND<0.005	ND<0.02	ND<0.005	ND<0.005	ND<0.005	ND<0.005	ND<0.005	ND<0.005	ND<0.005	ND<0.005	ND<0.005	ND
	22.5	20-Dec-04	SS	0.044	ND<0.0049	0.021	ND<0.0098	ND<0.0098	ND<0.02	ND<0.0049	ND<0.0049	ND<0.0049	0.0099	0.031	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0049	0.1059
	25	20-Dec-04	SS	ND<0.0046	ND<0.0046	ND<0.0046	ND<0.0093	ND<0.0093	ND<0.019	ND<0.0046	ND<0.0046	ND<0.0046	ND<0.0046	0.048	ND<0.0046	ND<0.0046	ND<0.0046	ND<0.0046	ND<0.0046	ND<0.0046	ND<0.0046	ND<0.0046	ND<0.0046	0.048
CDM-SB31	3	09-Dec-04	RCM	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0096	ND<0.0096	ND<0.019	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.019	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	ND
CDM-SB32	4	08-Dec-04	RCM	ND<0.0045	ND<0.0045	ND<0.0045	ND<0.0089	ND<0.0089	ND<0.018	ND<0.0045	ND<0.0045	ND<0.0045	ND<0.0045	ND<0.018	ND<0.0045	ND<0.0045	ND<0.0045	ND<0.0045	ND<0.0045	ND<0.0045	ND<0.0045	ND<0.0045	ND<0.0045	ND
CDM-SB33	3	08-Dec-04	RCM	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0098	ND<0.0098	ND<0.02	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.02	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0049	ND
CDM-SB34	2	09-Dec-04	RCM	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0096	ND<0.0096	ND<0.019	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.019	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	ND
CDM-SB35	2	09-Dec-04	RCM	ND<0.0046	ND<0.0046	ND<0.0046	ND<0.0093	ND<0.0093	ND<0.019	ND<0.0046	ND<0.0046	ND<0.0046	ND<0.0046	0.024	ND<0.0046	ND<0.0046	ND<0.0046	ND<0.0046	ND<0.0046	ND<0.0046	ND<0.0046	ND<0.0046	ND<0.0046	0.024
CDM-SB36	5	20-Dec-04	SV	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0096	ND<0.0096	ND<0.019	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	0.083	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	0.083
	10	20-Dec-04	SS	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0096	ND<0.0096	ND<0.019	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	0.023	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	0.023
	15	20-Dec-04	SS	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0098	ND<0.0098	ND<0.02	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0049	0.028	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0049	0.028
CDM-SB37	4.5	17-Dec-04	SV	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0098	ND<0.0098	ND<0.02	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0049	0.15	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0049	0.15
	9.5	17-Dec-04	SS	ND<0.0046	ND<0.0046	ND<0.0046	ND<0.0093	ND<0.0093	ND<0.019	ND<0.0046	ND<0.0046	ND<0.0046	ND<0.0046	0.026	ND<0.0046	ND<0.0046	ND<0.0046	ND<0.0046	ND<0.0046	ND<0.0046	ND<0.0046	ND<0.0046	ND<0.0046	0.026
	14.5	17-Dec-04	SS	0.013	ND<0.0048	0.0078	ND<0.0096	ND<0.0096	ND<0.019	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	0.21	0.084	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	0.3148
CDM-SB38	3.5	17-Dec-04	SV	ND<0.0049	ND<0.0049	ND<0.0049	0.011	ND<0.0098	0.061	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0049	0.22	ND<0.066	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0049	0.032	ND<0.0049	0.324
	5.5	17-Dec-04	SV												ND<0.066								
	8.5	17-Dec-04	SS	ND<2.5	ND<2.5	ND<2.5	ND<5	ND<5	ND<10	ND<2.5	ND<2.5	ND<2.5	ND<2.5	ND<10	ND<3.3	ND<2.5	ND<2.5	ND<2.5	ND<2.5	ND<2.5	59	ND<2.5	59
	15	17-Dec-04	SS	2.1	ND<0.5	0.71	ND<1	ND<1	ND<2	ND<0.5	ND<0.5	ND<0.5	0.77	ND<2	6.7	ND<0.5	ND<0.5	0.52	ND<0.5	ND<0.5	ND<0.5	ND<0.5	10.8
	15.5	17-Dec-04	SS	0.032	ND<0.0049	0.011	0.02	0.054	0.059	0.016	0.0054	ND<0.0049	(2)	ND<0.02	2.9	0.0059	0.012	0.0053	ND<0.0049	ND<0.0049	0.37	ND<0.0049	3.5126
	18	17-Dec-04	SS	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0096	ND<0.0096	ND<0.019	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	0.072	ND<0.066	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	0.0051	ND<0.0048	0.0771
CDM-SB39	3.5	17-Dec-04	SV	0.052	ND<0.0046	0.025	0.0098	0.12	0.055	0.0076	0.3	0.0074	0.86	0.22	ND<0.0046	ND<0.0046	0.071	ND<0.0046	0.015	ND<0.0046	0.044	ND<0.0046	1.7868
	7.5	17-Dec-04	SS	0.039	ND<0.0048	0.013	ND<0.0096	0.042	0.02	ND<0.0048	0.027	ND<0.0048	0.074	ND<0.019	ND<0.0048	ND<0.0048	0.0058	ND<0.0048	0.0069	ND<0.0048	ND<0.0048	ND<0.0048	0.2277
	12	17-Dec-04	SS	12	ND<2.5	3.7	ND<5	ND<5	ND<10	ND<2.5	8.7	ND<2.5	26	ND<10	ND<2.5	ND<2.5	3.3	ND<2.5	ND<2.5	ND<2.5	3.9	ND<2.5	57.6
	17	17-Dec-04	SS	0.68	ND<0.025	0.19	0.087	ND<0.05	0.19	ND<0.025	0.58	0.036	1.1	0.26	0.032	ND<0.025	0.1	ND<0.025	0.085	ND<0.025	0.057	ND<0.025	3.397
	19	17-Dec-04	SS	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0098	ND<0.0098	ND<0.02	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0049	0.21	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0049	0.013	ND<0.0049	0.223

Abbreviations:
RCM - raised cap material
SV - vadose zone soil
SS - saturated soil
ND<0.005 - not detected at specified detection limit
mg/kg - milligrams per kilogram
bgs - below ground surface

Table 3-2
Soil Analytical Results - Volatile Organic Compounds
Concentrations for Analytes Detected

Boring ID	Depth (feet bgs)	Sample Date	Matrix	Volatile Organic Compounds (mg/kg)																				
				1,2,4-Trimethylbenzene	1,2-Dichloroethane	1,3,5-Trimethylbenzene	2-Butanone	4-Methyl-2-Pentanone	Acetone	Benzene	Ethylbenzene	Isopropylbenzene	m,p-Xylenes	Methylene Chloride	Naphthalene	n-Butylbenzene	o-Xylene	para-Isopropyl Toluene	Propylbenzene	sec-Butylbenzene	Toluene	Trichloroethene	Total Volatile Organic Compounds
CDM-SB42	5	21-Dec-04	SV	ND<1.7	ND<1.7	ND<1.7	ND<3.3	6	ND<6.7	ND<1.7	ND<1.7	ND<1.7	ND<1.7	ND<6.7	ND<1.7	ND<1.7	ND<1.7	ND<1.7	ND<1.7	ND<1.7	26	ND<1.7	32
	10	21-Dec-04	SS	ND<1.7	ND<1.7	ND<1.7	ND<3.3	7.7	15	ND<1.7	ND<1.7	ND<1.7	ND<1.7	ND<6.7	ND<1.7	ND<1.7	ND<1.7	ND<1.7	ND<1.7	ND<1.7	21	ND<1.7	43.7
	11.5	21-Dec-04	SV	ND<3.6	ND<3.6	ND<3.6	ND<7.1	7.7	ND<14	ND<3.6	ND<3.6	ND<3.6	ND<3.6	ND<14	ND<3.6	ND<3.6	ND<3.6	ND<3.6	ND<3.6	ND<3.6	52	ND<3.6	59.7
	12.5	21-Dec-04	SS	ND<1	ND<1	ND<1	ND<2	4.3	4.2	ND<1	ND<1	ND<1	ND<1	ND<4	ND<1	ND<1	ND<1	ND<1	ND<1	ND<1	13	ND<1	21.5
CDM-SB45	5	21-Dec-04	SV	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0096	ND<0.0096	0.048	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	0.43	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	0.478
	10	21-Dec-04	SS	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0098	ND<0.0098	0.023	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0049	0.026	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0049	0.049
	12.5	21-Dec-04	SS	ND<10	ND<10	ND<10	ND<20	21	ND<40	ND<10	ND<10	ND<10	ND<10	ND<40	ND<10	ND<10	ND<10	ND<10	ND<10	ND<10	100	ND<10	121
CDM-SB46	5	21-Dec-04	SV	ND<0.0047	ND<0.0047	ND<0.0047	ND<0.0094	ND<0.0094	0.046	ND<0.0047	ND<0.0047	ND<0.0047	ND<0.0047	0.12	ND<0.0047	ND<0.0047	ND<0.0047	ND<0.0047	ND<0.0047	ND<0.0047	ND<0.0047	ND<0.0047	0.166
	10	21-Dec-04	SS	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0098	ND<0.0098	0.038	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0049	0.083	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0049	0.121
	12.5	21-Dec-04	SS	3.5	ND<0.25	1.2	ND<0.5	ND<0.5	ND<1	ND<0.25	1.5	ND<0.25	5.3	ND<1	ND<0.25	ND<0.25	0.93	ND<0.25	0.51	ND<0.25	ND<0.25	ND<0.25	12.94
CDM-SB47	15	19-Dec-04	SS	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0096	ND<0.0096	ND<0.019	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.019	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	ND
	19	19-Dec-04	SS	ND<0.0045	ND<0.0045	ND<0.0045	ND<0.0091	ND<0.0091	0.04	ND<0.0045	ND<0.0045	ND<0.0045	ND<0.0045	ND<0.018	ND<0.0045	ND<0.0045	ND<0.0045	ND<0.0045	ND<0.0045	ND<0.0045	ND<0.0045	ND<0.0045	0.04
CDM-SB49	4	19-Dec-04	SV	0.0051	ND<0.0045	ND<0.0045	ND<0.0089	ND<0.0089	ND<0.048	ND<0.0045	ND<0.0045	ND<0.0045	ND<0.0045	0.16	0.016	0.019	ND<0.0045	ND<0.0045	0.0094	0.0046	ND<0.0045	ND<0.0045	0.2141
	8.5	19-Dec-04	SS	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0096	ND<0.0096	ND<0.067	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	0.19	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	0.19
	13	19-Dec-04	SS	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0098	ND<0.0098	ND<0.02	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0049	0.022	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0049	ND<0.0049	0.022
	17	19-Dec-04	SS	ND<0.025	ND<0.025	ND<0.025	ND<0.05	ND<0.05	ND<0.1	ND<0.025	ND<0.025	ND<0.025	ND<0.025	0.2	ND<0.025	ND<0.025	ND<0.025	ND<0.025	ND<0.025	ND<0.025	ND<0.025	ND<0.025	0.2
	19	19-Dec-04	SS	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0096	ND<0.0096	0.024	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	0.021	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	ND<0.0048	0.045

Abbreviations:
RCM - raised cap material
SV - vadose zone soil
SS - saturated soil
ND<0.005 - not detected at specified detection limit
mg/kg - milligrams per kilogram
bgs - below ground surface

Table 3-3
Soil Analytical Results - Semi-Volatile Organic Compounds and Total Extractable Petroleum Hydrocarbons Concentrations for Analytes Detected

Boring ID	Depth (feet bgs)	Sample Date	Matrix	Semi-Volatile Organic Compounds (mg/kg)				Total Extractable Petroleum Hydrocarbons (mg/kg)		
				2-Methylnaphthalene	Fluorene	N-Nitrosodiphenylamine	Phenanthrene	Diesel (C10-C24)	Kerosene (C10-C16)	Motor Oil (C24-C36)
CDM-SB38	3.5	17-Dec-04	SV	ND<0.066	ND<0.066	ND<0.33	ND<0.066	20	12	20
	5.5	17-Dec-04	SV	ND<0.066	ND<0.066	ND<0.33	ND<0.066	130	26	340
	8.5	17-Dec-04	SS	5	ND<3.3	ND<17	ND<3.3	5600	2500	5700
	15	17-Dec-04	SS	21	ND<3.3	ND<17	4.4	8100	3900	6500
	15.5	17-Dec-04	SS	11	0.82	1.9	2.3	1700	770	890
	18	17-Dec-04	SS	ND<0.066	ND<0.066	ND<0.33	ND<0.066	28	14	20

Abbreviations:
RCM - raised cap material
SV - vadose zone soil
SS - saturated soil
ND<0.005 - not detected at specified detection limit
mg/kg - milligrams per kilogram
bgs - below ground surface

Table 3-4
Grab Groundwater Analytical Results - Inorganics
Dissolved Metals (mg/L)

Boring ID	Depth (feet bgs)	Sample Date	Arsenic [1]	Arsenic [2]	Arsenic III [2]	Arsenic V [2]	Ferrous Iron [1]
CDM-SB14	35	7-Dec-04	0.039				0.26
CDM-SB16	20	15-Dec-04	130	82.336	57.057	25.279	40
CDM-SB16	30	15-Dec-04	38	22.115	20.916	1.199	34
CDM-SB18	25	6-Dec-04	8.2				53
CDM-SB19	30	15-Dec-04	0.34	0.1499	0.107	0.0433	9.1
CDM-SB28	30	15-Dec-04	79				9.6
CDM-SB30	20	20-Dec-04	100				11
CDM-SB36	15	20-Dec-04	2.6				
CDM-SB38	18	17-Dec-04	85				
CDM-SB44	15	21-Dec-04	1.0				97
CDM-SB46	15	21-Dec-04	4.2				120
CDM-SB47	15	19-Dec-04	18	15.655	16.058	0.000007	28
CDM-SB49	15	19-Dec-04	6.1	5.883	5.101	0.782	5
CDM-SB51	25	17-Dec-04	0.25	0.209	0.216	0.000007	28

Abbreviations:
mg/L - milligrams per liter
ND<0.005 - not detected at specified detection limit
bgs - below ground surface
1. Samples analyzed by Curtis and Tompkins, Ltd.
2. Samples analyzed by Brooks Rand

Table 3-5
Grab Groundwater Analytical Results - Volatile Organic Compounds
Concentrations for Analytes Detected (mg/L)

Boring ID	Depth (feet bgs)	Sample Date	1,1-Dichloroethene	1,2,3-Trichloropropane	1,2,4-Trimethylbenzene	1,2-Dichloroethane	1,3,5-Trimethylbenzene	2-Butanone	4-Methyl-2-Pentanone	Acetone	Benzene	Carbon Disulfide	cis-1,2-Dichloroethene	Ethylbenzene	Isopropylbenzene	
CDM-SB14	25	7-Dec-04	ND<0.0005	ND<0.0005	ND<0.0005	0.032	ND<0.0005	ND<0.01	ND<0.01	ND<0.01	ND<0.0005	ND<0.0005	0.025	ND<0.0005	ND<0.0005	
CDM-SB14	35	7-Dec-04	0.0003	0.0021	ND<0.0005	0.089	ND<0.0005	ND<0.01	ND<0.01	ND<0.01	ND<0.0005	ND<0.0005	0.051	ND<0.0005	ND<0.0005	
CDM-SB16	20	15-Dec-04	ND<0.042	ND<0.042	0.059	ND<0.042	ND<0.042	8.9	5.2	21	0.028	ND<0.042	ND<0.042	0.3	ND<0.042	
CDM-SB16	30	15-Dec-04	ND<0.1	ND<0.1	0.71	ND<0.1	0.2	9.5	5	15	ND<0.1	ND<0.1	ND<0.1	1.8	ND<0.1	
CDM-SB18	25	6-Dec-04	ND<0.1	ND<0.1	0.31	ND<0.1	0.11	ND<2	ND<2	1.7	ND<0.1	ND<0.1	ND<0.1	0.92	ND<0.1	
CDM-SB19	30	15-Dec-04	ND<0.0013	ND<0.0013	ND<0.0013	0.18	ND<0.0013	ND<0.025	ND<0.025	ND<0.025	ND<0.0013	ND<0.0013	0.0095	ND<0.0013	ND<0.0013	
CDM-SB28	30	15-Dec-04	ND<0.0013	ND<0.0013	0.0028	0.001	0.0007	ND<0.025	ND<0.025	ND<0.025	ND<0.0013	ND<0.0013	0.017	0.011	ND<0.0013	
CDM-SB30	20	20-Dec-04	ND<0.0013	ND<0.0013	0.29	ND<0.0013	0.13	ND<0.025	ND<0.025	ND<0.025	0.01	ND<0.0013	0.0023	0.037	0.014	
CDM-SB31	25	16-Dec-04	ND<0.0005	ND<0.0005	0.0013	0.0003	0.0004	0.02	0.009	0.056	ND<0.0005	0.0005	0.0019	0.0026	ND<0.0005	
CDM-SB36	15	20-Dec-04	ND<0.0005	ND<0.0005	ND<0.0005	ND<0.0005	ND<0.0005	ND<0.01	ND<0.01	ND<0.01	ND<0.0005	0.0022	0.0018	ND<0.0005	ND<0.0005	
CDM-SB38	18	17-Dec-04	ND<0.0025	ND<0.0025	0.0061	ND<0.0025	0.0025	0.11	0.32	0.16	0.025	0.0019	ND<0.0025	0.0055	ND<0.0025	
CDM-SB44	15	21-Dec-04	ND<0.0005	ND<0.0005	ND<0.0005	ND<0.0005	ND<0.0005	ND<0.01	ND<0.01	0.038	ND<0.0005	0.0034	0.0008	ND<0.0005	ND<0.0005	
CDM-SB46	15	21-Dec-04	ND<0.0036	ND<0.0036	0.19	ND<0.0036	0.053	ND<0.071	ND<0.071	ND<0.071	ND<0.0036	ND<0.0036	ND<0.0036	0.28	0.011	
CDM-SB47	15	19-Dec-04	ND<0.0005	ND<0.0005	ND<0.0005	ND<0.0005	ND<0.0005	ND<0.01	ND<0.01	ND<0.01	0.0009	0.0003	0.0079	ND<0.0005	ND<0.0005	
CDM-SB49	15	19-Dec-04	ND<0.0005	ND<0.0005	ND<0.0005	ND<0.0005	ND<0.0005	ND<0.01	ND<0.01	ND<0.01	ND<0.0005	ND<0.0005	ND<0.0005	0.0003	0.0005	
CDM-SB51	25	17-Dec-04	ND<0.0017	ND<0.0017	0.015	ND<0.0017	0.0061	ND<0.033	ND<0.033	ND<0.033	ND<0.0017	ND<0.0017	ND<0.0017	0.36	0.0051	

Boring ID	Depth (feet bgs)	Sample Date	m,p-Xylenes	MTBE	Naphthalene	n-Butylbenzene	o-Xylene	para-Isopropyl Toluene	Propylbenzene	sec-Butylbenzene	tert-Butylbenzene	Tetrachloroethene	Toluene	trans-1,2-Dichloroethene	Trichloroethene	Total Volatile Organic Compounds
CDM-SB14	25	7-Dec-04	ND<0.0005	0.0023	ND<0.002	ND<0.0005	ND<0.0005	ND<0.0005	ND<0.0005	ND<0.0005	ND<0.0005	ND<0.0005	ND<0.0005	0.0065	0.0033	0.012
CDM-SB14	35	7-Dec-04	ND<0.0005	0.0056	ND<0.002	ND<0.0005	ND<0.0005	ND<0.0005	ND<0.0005	ND<0.0005	ND<0.0005	ND<0.0005	ND<0.0005	0.0073	0.02	0.18
CDM-SB16	20	15-Dec-04	1.1	ND<0.042	ND<0.17	ND<0.042	0.29	ND<0.042	ND<0.042	ND<0.042	ND<0.042	ND<0.042	9.5	ND<0.042	ND<0.042	46
CDM-SB16	30	15-Dec-04	6.9	ND<0.1	ND<0.4	ND<0.1	1.6	ND<0.1	0.079	ND<0.1	ND<0.1	ND<0.1	26	ND<0.1	ND<0.1	67
CDM-SB18	25	6-Dec-04	4.6	ND<0.1	ND<0.4	ND<0.1	1.4	ND<0.1	ND<0.1	ND<0.1	ND<0.1	ND<0.1	13	ND<0.1	0.051	22
CDM-SB19	30	15-Dec-04	ND<0.0013	0.0097	ND<0.005	ND<0.0013	ND<0.0013	ND<0.0013	ND<0.0013	ND<0.0013	ND<0.0013	ND<0.0013	ND<0.0013	0.0054	0.0016	0.21
CDM-SB28	30	15-Dec-04	0.041	0.001	ND<0.005	ND<0.0013	0.0095	ND<0.0013	ND<0.0013	ND<0.0013	ND<0.0013	ND<0.0013	0.16	0.025	0.012	0.28
CDM-SB30	20	20-Dec-04	0.083	ND<0.0013	0.0094	0.021	0.0053	0.013	0.032	0.0061	ND<0.0013	ND<0.0013	0.0023	0.001	ND<0.0013	0.66
CDM-SB31	25	16-Dec-04	0.01	ND<0.0005	ND<0.002	ND<0.0005	0.0028	ND<0.0005	ND<0.0005	ND<0.0005	ND<0.0005	ND<0.0005	0.037	0.0007	ND<0.0005	0.14
CDM-SB36	15	20-Dec-04	ND<0.0005	ND<0.0005	ND<0.002	ND<0.0005	ND<0.0005	ND<0.0005	ND<0.0005	0.0005	ND<0.0005	0.0078	0.0004	0.001	0.01	0.024
CDM-SB38	18	17-Dec-04	0.02	ND<0.0025	0.018	ND<0.0025	0.006	ND<0.0025	ND<0.0025	ND<0.0025	ND<0.0025	ND<0.0025	0.19	ND<0.0025	ND<0.0025	0.87
CDM-SB44	15	21-Dec-04	0.0007	ND<0.0005	ND<0.002	ND<0.0005	ND<0.0005	ND<0.0005	ND<0.0005	0.0005	ND<0.0005	0.0009	0.003	ND<0.0005	0.0037	0.051
CDM-SB46	15	21-Dec-04	0.96	ND<0.0036	ND<0.014	ND<0.0036	0.17	ND<0.0036	0.019	ND<0.0036	ND<0.0036	ND<0.0036	ND<0.0036	ND<0.0036	0.002	1.7
CDM-SB47	15	19-Dec-04	0.0005	ND<0.0005	ND<0.002	ND<0.0005	ND<0.0005	ND<0.0005	ND<0.0005	ND<0.0005	ND<0.0005	ND<0.0005	0.0003	0.0026	0.0004	0.013
CDM-SB49	15	19-Dec-04	0.0005	ND<0.0005	ND<0.002	ND<0.0005	ND<0.0005	ND<0.0005	ND<0.0005	0.0059	0.0017	ND<0.0005	ND<0.0005	ND<0.0005	ND<0.0005	0.009
CDM-SB51	25	17-Dec-04	1.5	ND<0.0017	0.005	0.0025	0.09	0.011	0.0039	0.0018	ND<0.0017	ND<0.0017	0.0091	ND<0.0017	ND<0.0017	2.0

Abbreviations:
mg/L - milligrams per liter
ND<0.005 - not detected at specified detection limit
bgs - below ground surface

Table 4-1
Grab Groundwater Analytical Results - Comparison of Duplicate Samples
Concentrations for Analytes Detected (mg/L)

Boring ID	Depth (feet bgs)	Sample ID	Sample Date	1,2,4-Trimethylbenzene	1,3,5-Trimethylbenzene	2-Butanone	4-Methyl-2-Pentanone	Acetone	Arsenic	Benzene	Carbon Disulfide	cis-1,2-Dichloroethene	Ethylbenzene
CDM-SB36	15	CDM-SB36-GW-15B	20-Dec-04	ND<0.0005	ND<0.0005	ND<0.01	ND<0.01	ND<0.01	2.5	ND<0.0005	0.0028	0.0018	ND<0.0005
	15	CDM-SB36-GW-15A	20-Dec-04	ND<0.0005	ND<0.0005	ND<0.01	ND<0.01	ND<0.01	2.6	ND<0.0005	0.0022	0.0018	ND<0.0005
CDM-SB38	18	CDM-SB-38-GW-18-DUP	17-Dec-04	--	--	--	--	--	83	--	--	--	--
	18	CDM-SB-38-GW-18	17-Dec-04	0.0061	0.0025	0.11	0.32	0.16	85	0.025	0.0019	ND<0.025	0.0055
CDM-SB47	15	CDM-SB47-GW-15-DUP	19-Dec-04	ND<0.0005	ND<0.5	ND<0.01	ND<0.01	ND<0.01	17	0.001	0.0008	0.0089	0.0004
	15	CDM-SB47-GW-15	19-Dec-04	ND<0.0005	ND<0.5	ND<0.01	ND<0.01	ND<0.01	18	0.0009	0.0003	0.0079	ND<0.0005

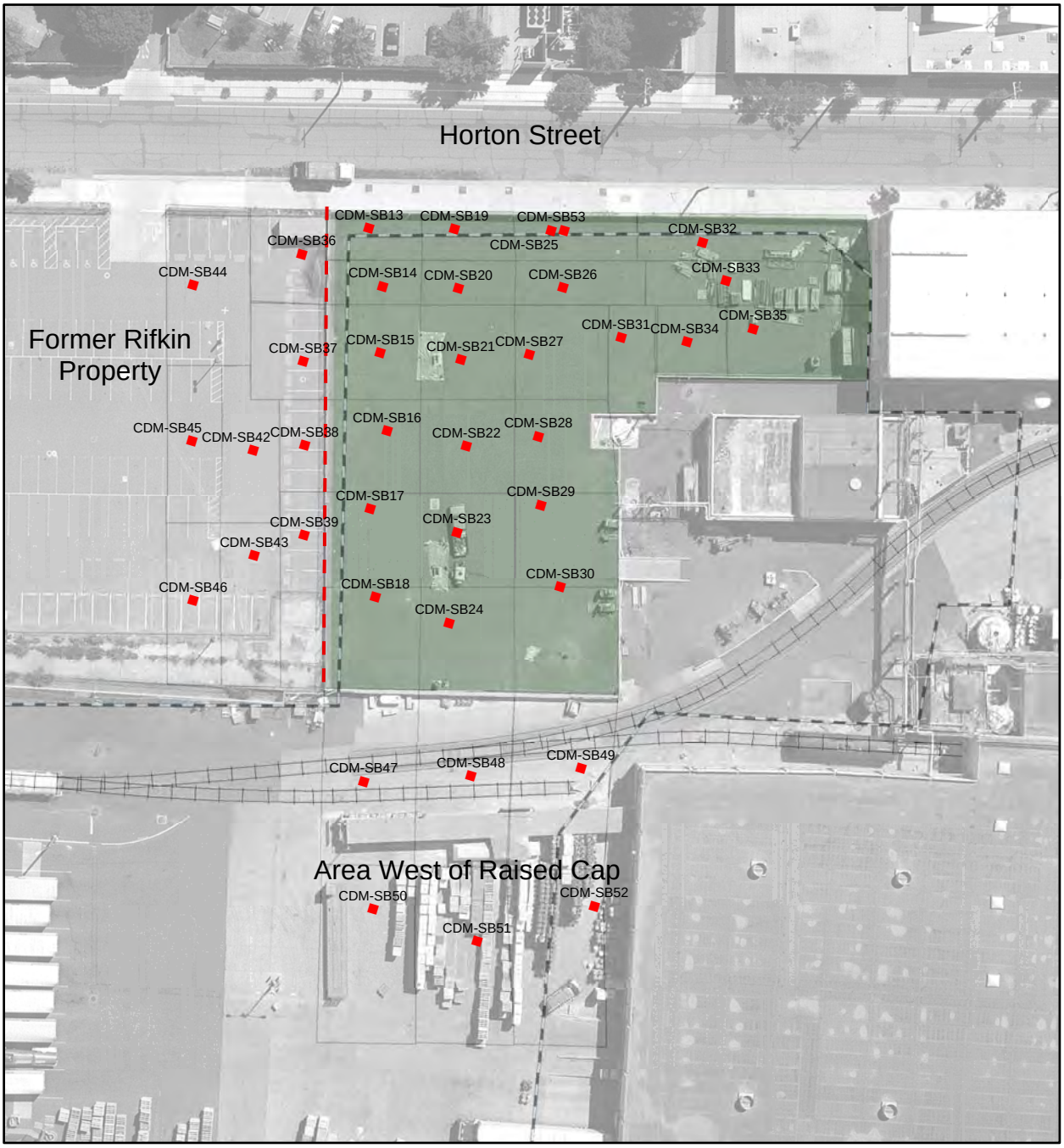
Boring ID	Sample Depth (feet bgs)	Sample ID	Sample Date	Ferrous Iron	m,p-Xylenes	Naphthalene	o-Xylene	sec-Butylbenzene	Styrene	Tetrachloroethene	Toluene	trans-1,2-Dichloroethene	Trichloroethene
CDM-SB36	15	CDM-SB36-GW-15B	20-Dec-04	--	ND<0.0005	ND<0.02	ND<0.0005	0.0004	ND<0.0005	0.0074	0.0003	0.0009	0.0089
	15	CDM-SB36-GW-15A	20-Dec-04	11	ND<0.0005	ND<0.02	ND<0.0005	0.0005	ND<0.0005	0.0078	0.0004	0.01	0.01
CDM-SB38	18	CDM-SB-38-GW-18-DUP	17-Dec-04	--	--	--	--	--	--	--	--	--	--
	18	CDM-SB-38-GW-18	17-Dec-04	8.9	0.02	0.018	0.006	ND<0.025	ND<0.025	ND<0.025	0.19	ND<0.025	ND<0.025
CDM-SB47	15	CDM-SB47-GW-15-DUP	19-Dec-04	26	0.0008	ND<0.02	ND<0.0005	ND<0.0005	ND<0.0005	ND<0.0005	0.0006	0.0029	0.0004
	15	CDM-SB47-GW-15	19-Dec-04	28	0.0005	ND<0.02	ND<0.0005	ND<0.0005	ND<0.0005	ND<0.0005	0.0003	0.0026	0.0004

Abbreviations:
mg/L - milligrams per liter
ND<0.005 - not detected at specified detection limit
bgs - below ground surface

Table 4-2
Equipment Blank Analytical Results
Concentrations for Analytes Detected (mg/L)

Sample Date	Sample ID	Acetone	Arsenic	Bromodichloromethane	Bromoform	Chloroform	Dibromochloromethane
7-Dec-04	CDM-EB-120704A	ND<0.010	ND<0.050	ND<0.0005	ND<0.0001	ND<0.0005	ND<0.0005
8-Dec-04	EB-2	ND<0.010	ND<0.050	ND<0.0005	ND<0.0001	ND<0.0005	ND<0.0005
14-Dec-04	CDM-EB-121404A	0.0053	0.026	0.0004	ND<0.0001	ND<0.0005	0.0003
14-Dec-04	CDM-EB-121404B	0.0051	0.0051	0.0003	ND<0.0001	ND<0.0005	0.0003
16-Dec-04	CDM-EB-121604A	0.008	0.013	0.0007	ND<0.0001	0.0003	0.0008
16-Dec-04	CDM-EB-121604B	0.011	0.0063	0.0007	0.0005	0.0003	0.0006
17-Dec-04	CDM-EB-01	0.012	0.015	0.0007	ND<0.0001	0.0003	0.0007
19-Dec-04	CDM-EB-121904	ND<0.010	0.017	ND<0.0005	ND<0.0001	ND<0.0005	ND<0.0005
20-Dec-04	CDM-EB-122004	0.015	0.021	0.0012	0.0007	0.0006	0.0012

Abbreviations:
mg/L - micrograms per liter
ND<0.005 - not detected at specified detection limit



Legend

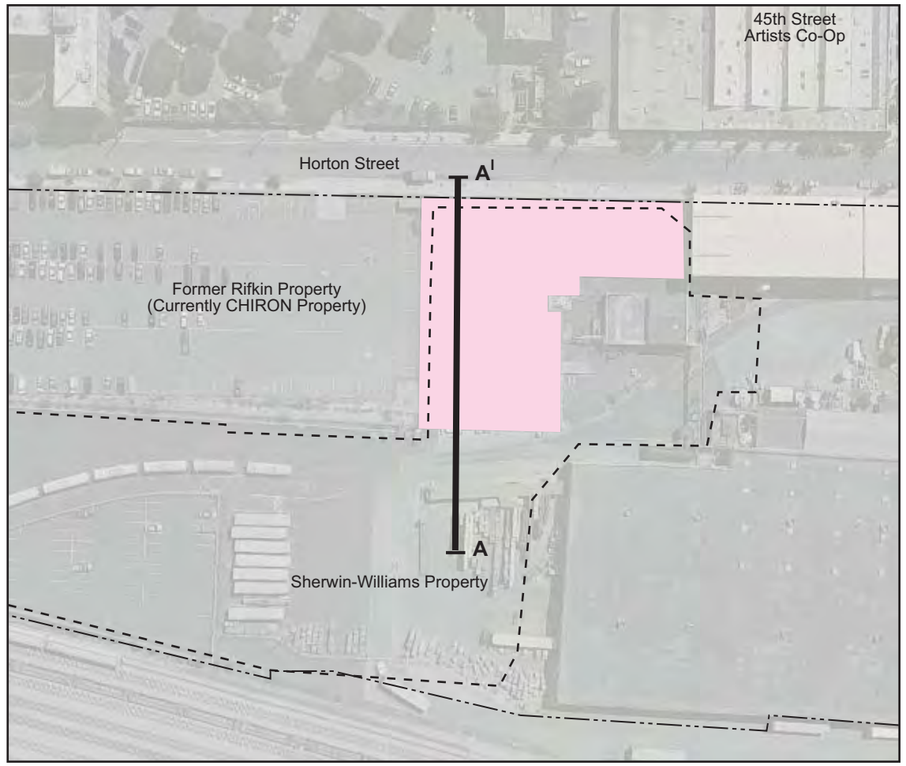
- Boundary Between S-W and Former Rifkin Property
- Slurry Wall
- Railroad Track
- Raised Cap Area
- December 2004 CDM Boring Locations
- December 2004 CDM Boring Cells

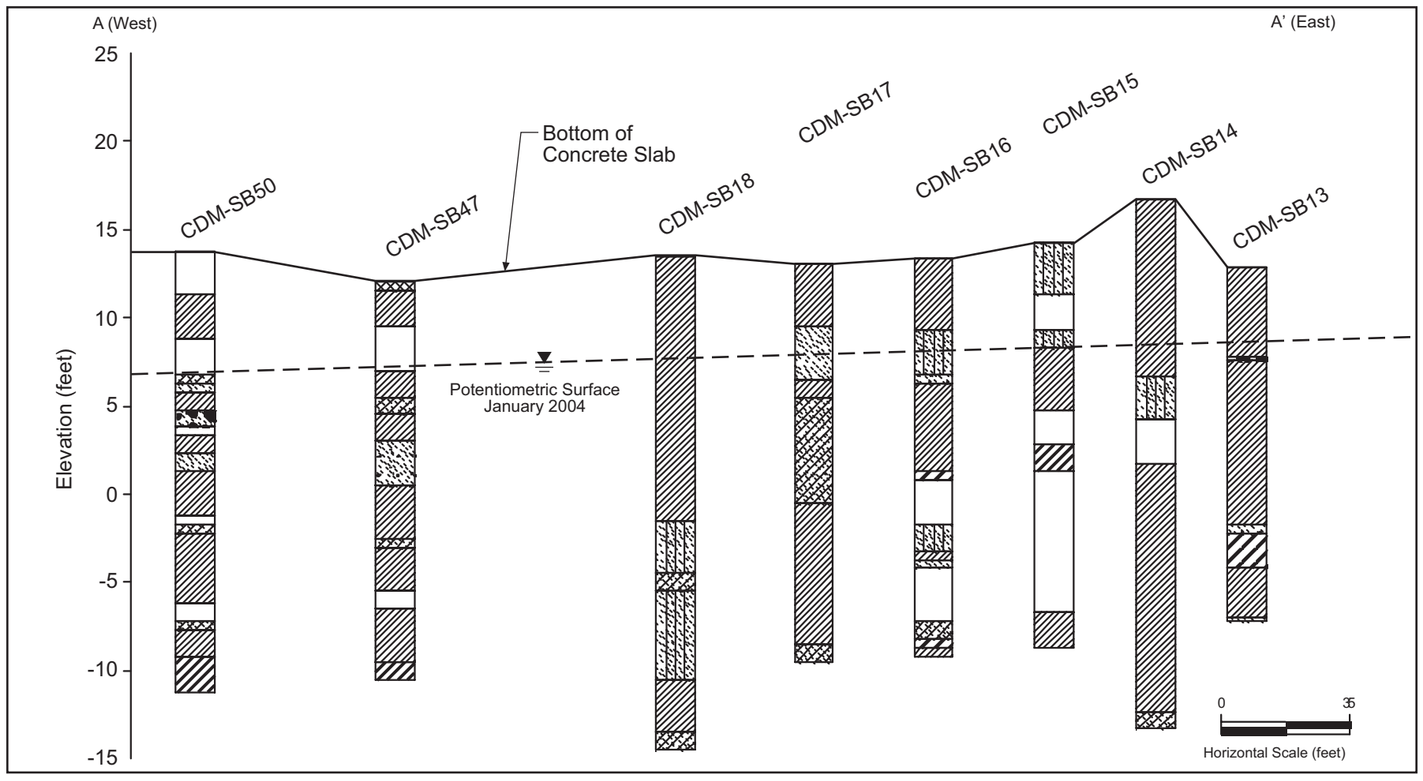
N E S W

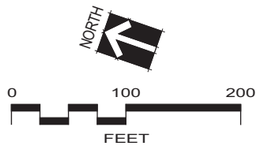
Feet
0 15 30 60 90 120
NAD83 California Stateplane III

Figure 1-2
December 2004 Investigation Locations
Sherwin-Williams Emeryville, CA

CDM







Legend

- Site Boundary
- Slurry Wall
- A' / A — Trace of Geologic Cross Section
- Raised Cap

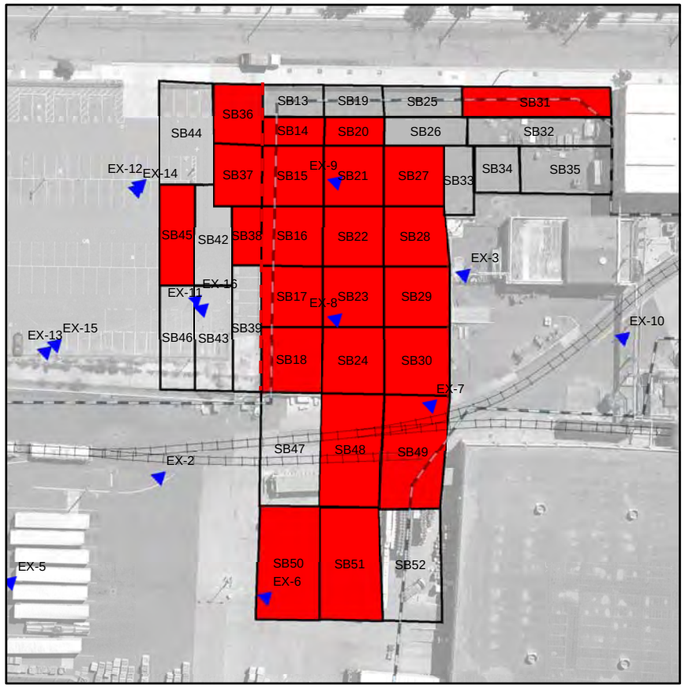
Cross Section Legend

- USCS Low Plasticity Clay
- USCS Poorly-graded Gravel
- USCS Well-graded Sand
- USCS High Plasticity Clay
- USCS Silty Sand
- USCS Clayey Sand
- USCS Poorly-graded Sand
- Fill (made ground)
- USCS Well-graded Gravel
- No Recovery
- Water Level

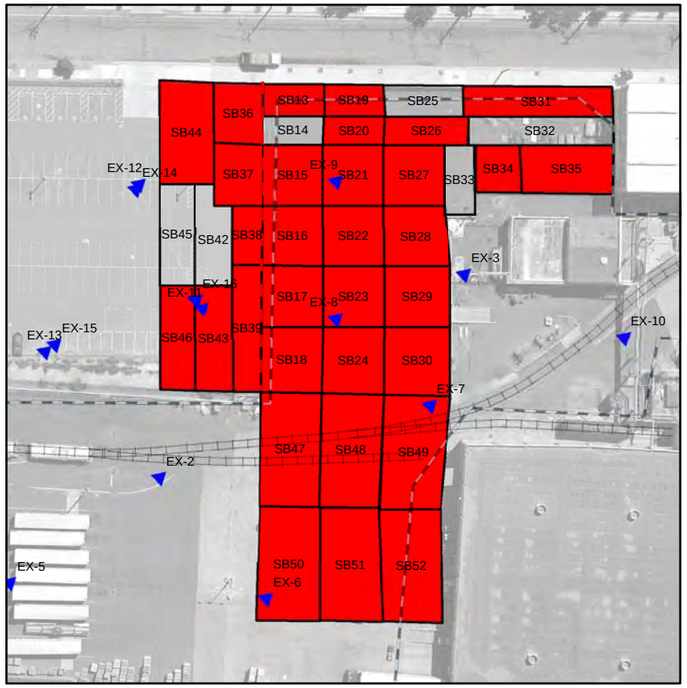
Figure 2-1
Geologic Cross Section A-A'
Sherwin-Williams Company
Emeryville, California

CDM

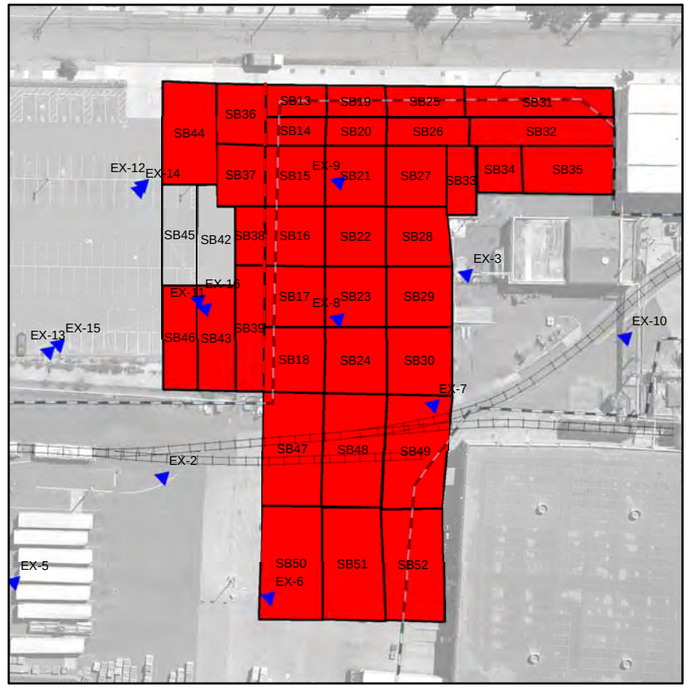
Surface to 8.5 Feet MSL



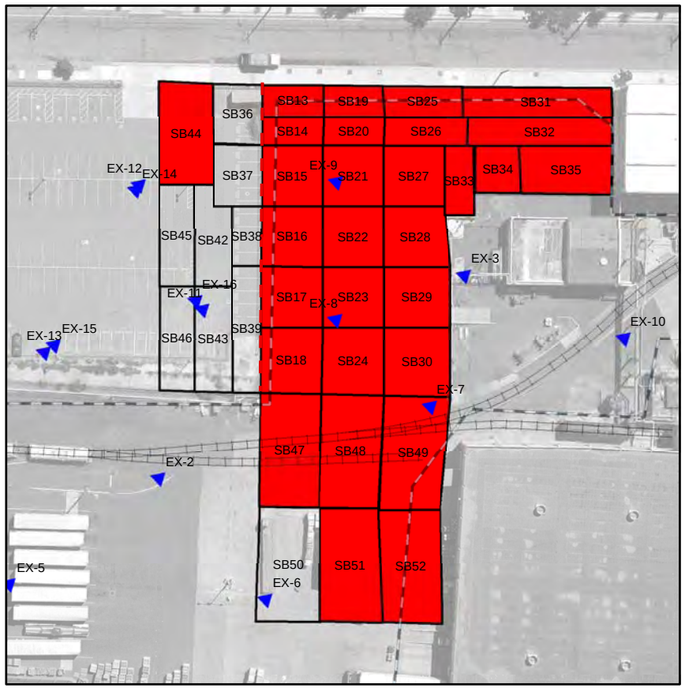
8.5 to 3.5 Feet MSL



3.5 to -1.5 Feet MSL



-1.5 to -6.5 Feet MSL



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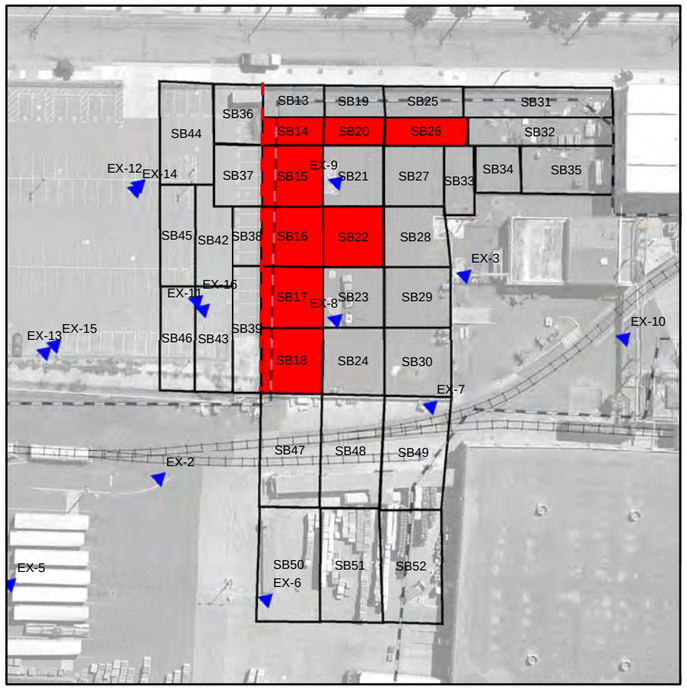
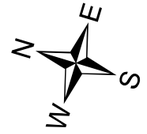




Feet
0 20 40 80 120 160
NAD83 California Stateplane III

Legend

- Boundary Between S-W and Former Rifkin Property
- Slurry Wall
- Railroad Track
- ▲ Extraction Well

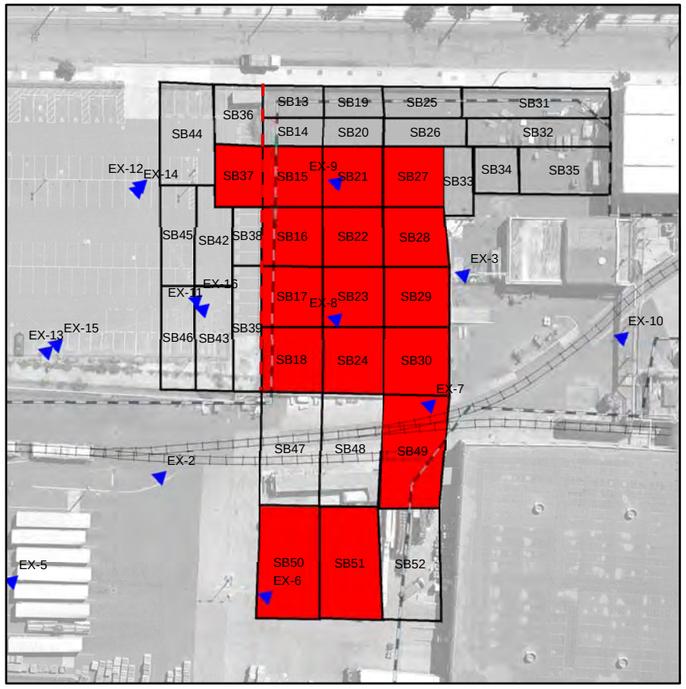
Above/Below 20 ppm Arsenic

- BELOW
- ABOVE

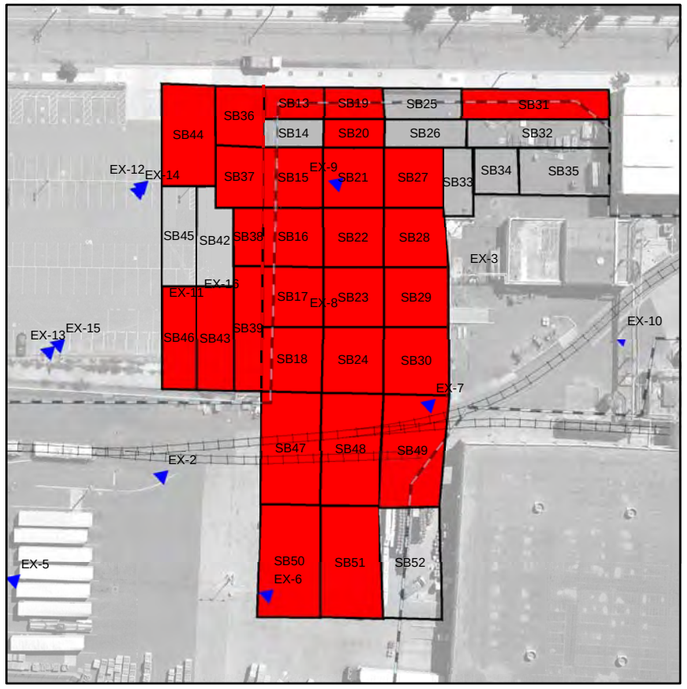
CDM

Figure 3-1
Arsenic Above 20 ppm in Soil
December 2004 Investigation Cells
Sherwin-Williams Emeryville, CA

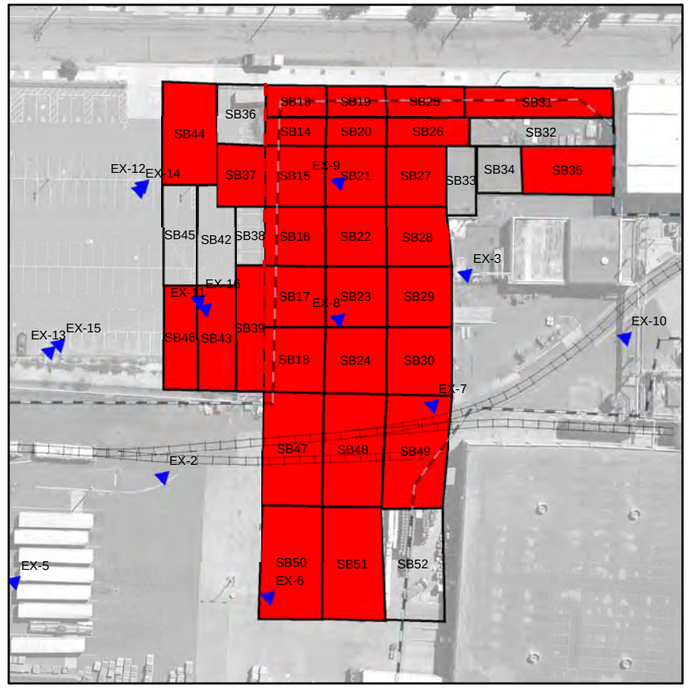
Surface to 8.5 Feet MSL



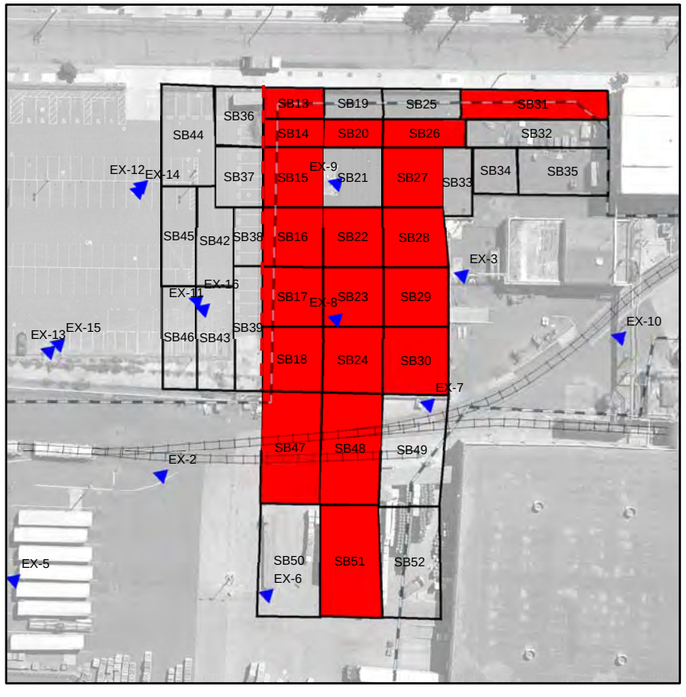
8.5 to 3.5 Feet MSL



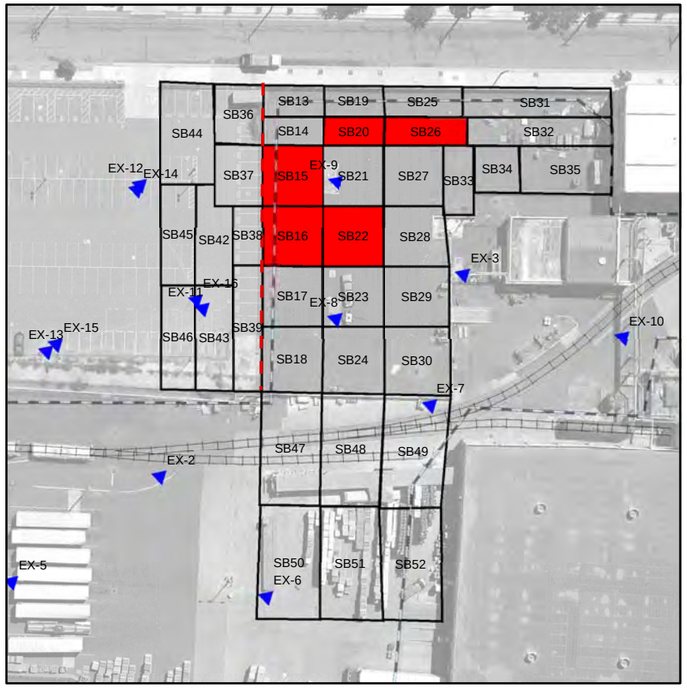
3.5 to -1.5 Feet MSL



-1.5 to -6.5 Feet MSL



-6.5 to -11.5 Feet MSL



Feet
0 20 40 80 120 160
NAD83 California Stateplane III

Legend

- Boundary Between S-W and Former Rifkin Property
- Slurry Wall
- Railroad Track
- ▲ Extraction Well

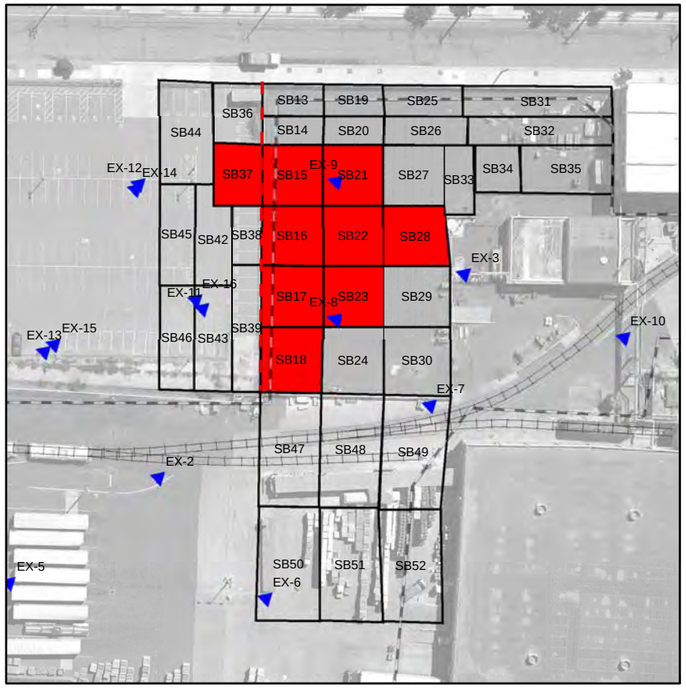
Above/Below 100 ppm Arsenic

- BELOW
- ABOVE

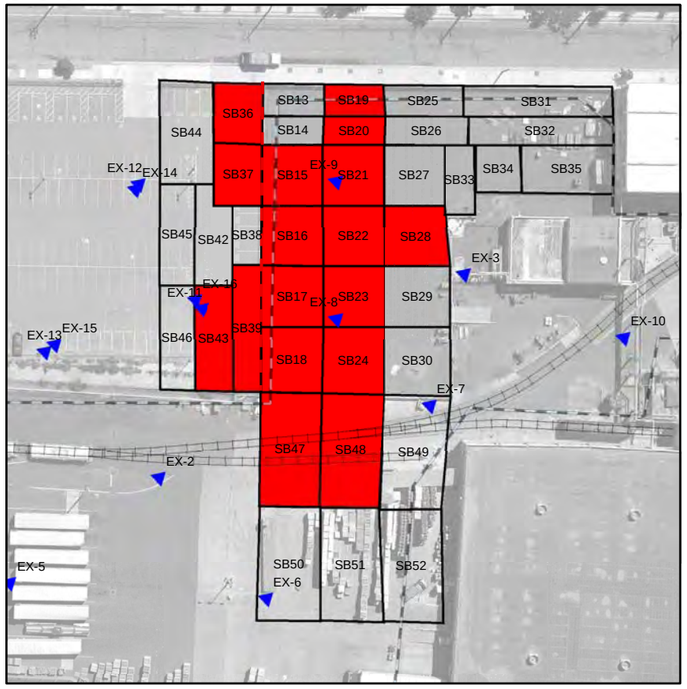
CDM

Figure 3-2
Arsenic Above 100 ppm in Soil
December 2004 Investigation Cells
Sherwin-Williams Emeryville, CA

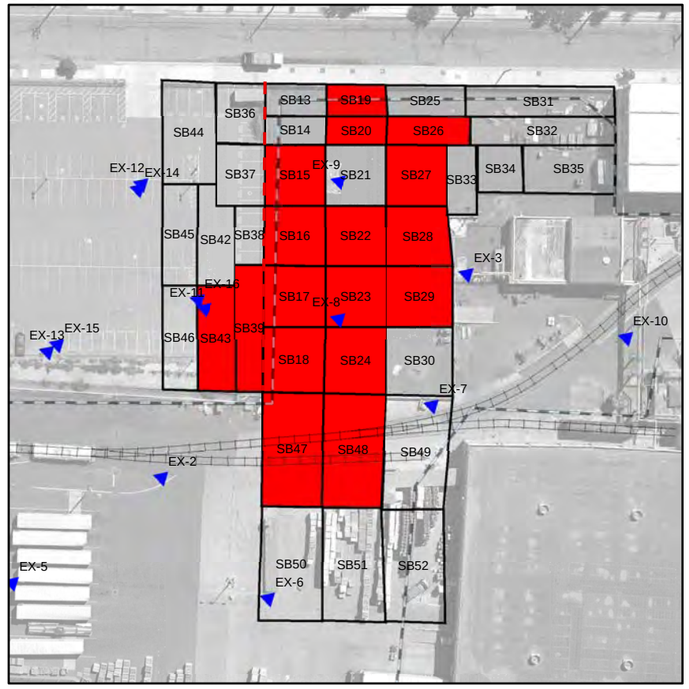
Surface to 8.5 Feet MSL



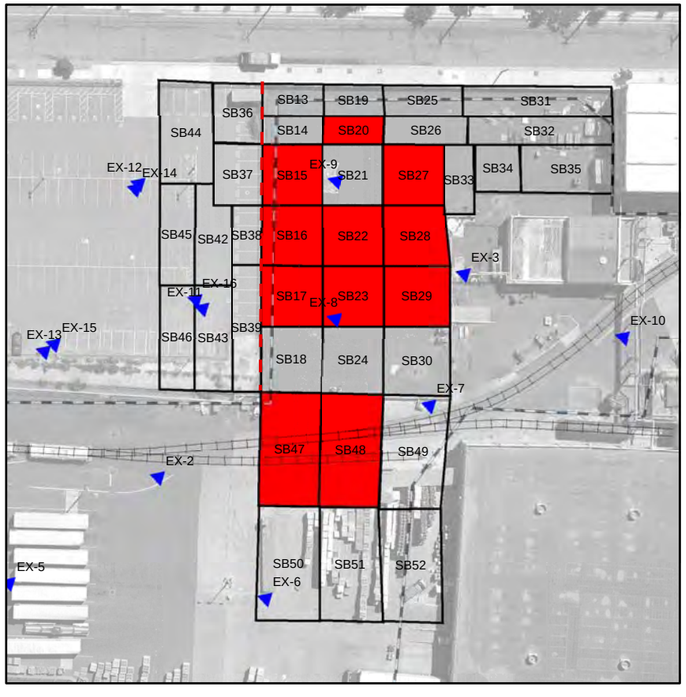
8.5 to 3.5 Feet MSL



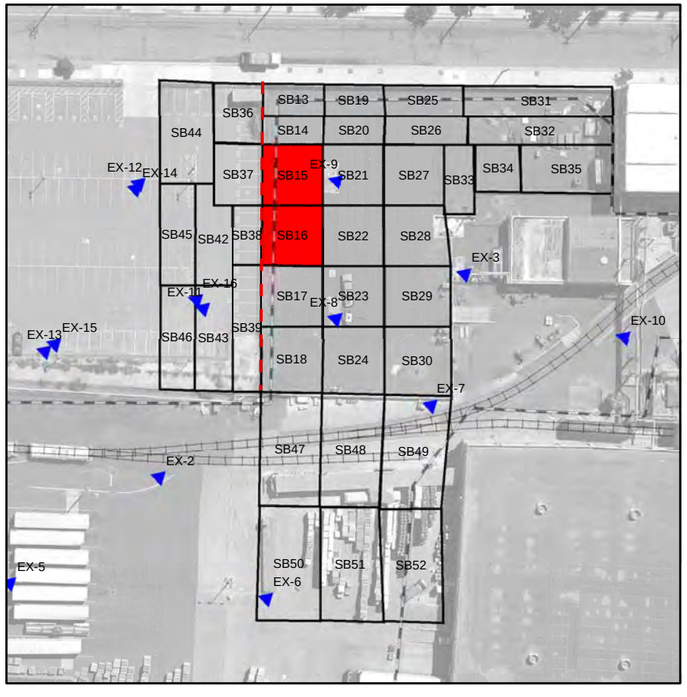
3.5 to -1.5 Feet MSL



-1.5 to -6.5 Feet MSL



-6.5 to -11.5 Feet MSL



Feet
0 20 40 80 120 160
NAD83 California Stateplane III

Legend

- Boundary Between S-W and Former Rifkin Property
- Slurry Wall
- Railroad Track
- Extraction Well

Above/Below 500 ppm Arsenic

- BELOW
- ABOVE

CDM

Figure 3-3
Arsenic Above 500 ppm in Soil
December 2004 Investigation Cells
Sherwin-Williams Emeryville, CA

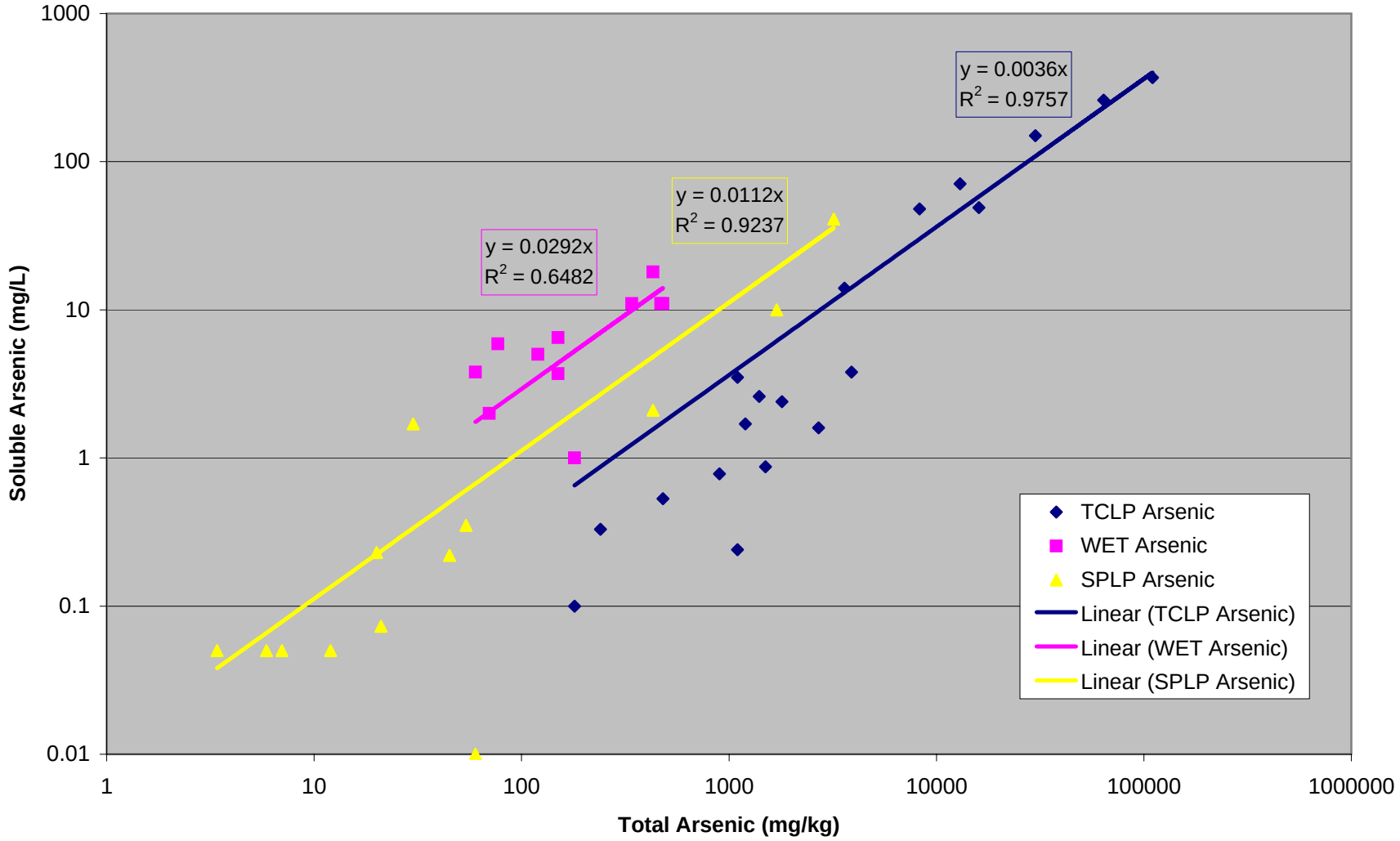


Figure 3-4
Soluble Arsenic vs. Total Arsenic Concentrations in Soil
December 2004 Investigation
Sherwin-Williams Emeryville, CA

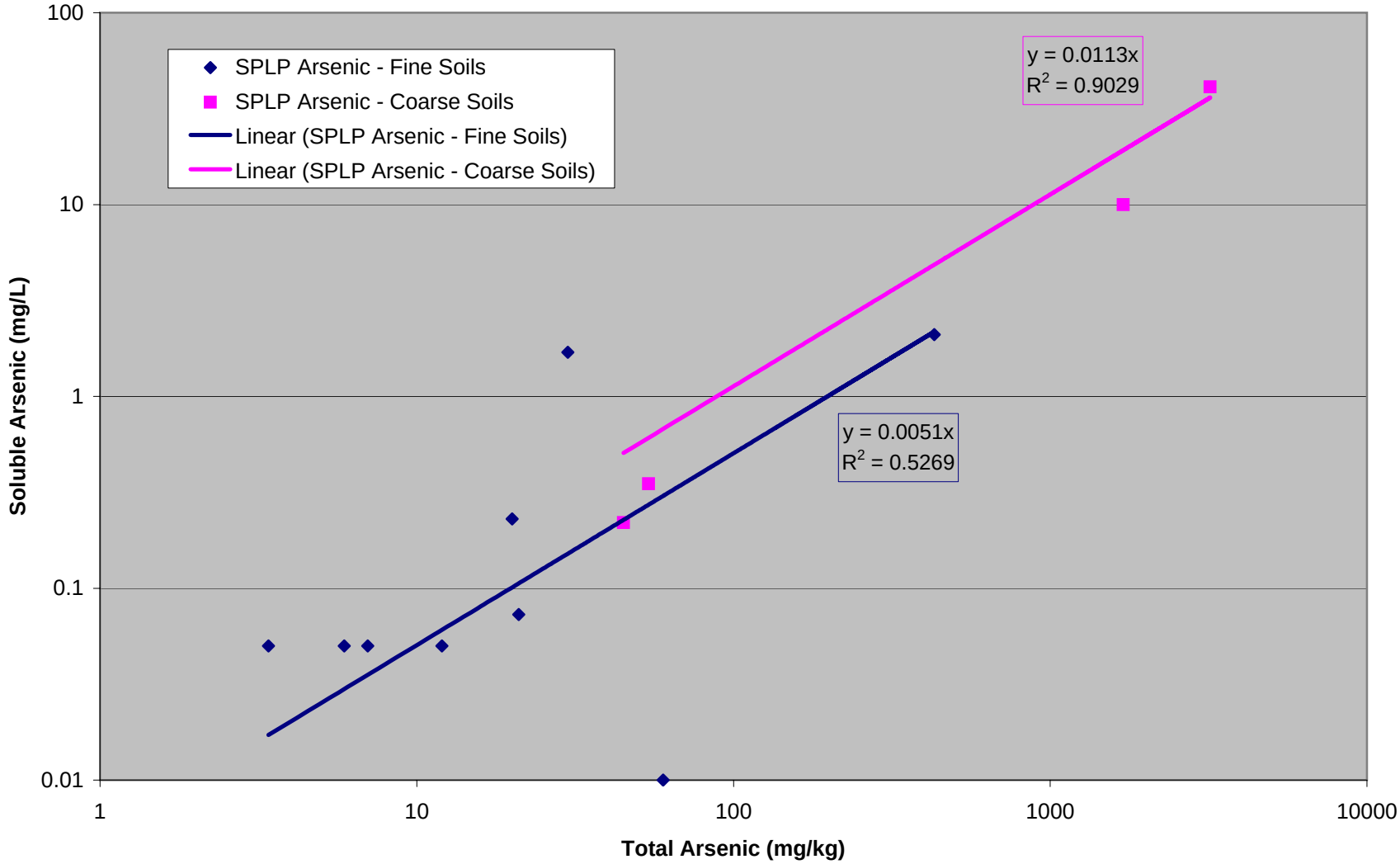


Figure 3-5
SPLP Arsenic vs. Total Arsenic Concentrations in Soil
December 2004 Investigation
Sherwin-Williams Emeryville, CA

Appendix A8

Selected Tables and Figures from Report of Findings, Subsurface Investigation, Former Rifkin Property, Emeryville, California. December 2002.

Table 2-3
Photoionization Detector (PID) Measurements of Soil Cores

Area	*Boring*	*Depth (ft bgs)*	*PID (ppm)*	*Area*	*Boring*	*Depth (ft bgs)*	*PID (ppm)*
Rifkin Plume		2	0.3	Southern Rifkin Area	CDM-SB6	3	4
		4	0.9			4	3.3
		5	0.9			5	3.3
		7	0.3			6	2.1
		11	1.5			8	3.3
		12.5	0.9			10	7.7
		15	0.9			11	12.6
	CDM-SB2	2	0.3			12.5	7
		3.5	0.3			13.5	1.5
		5.5	0.3			15	4
		8	0.3			16	2.7
		10	0.3		CDM-SB7	4	5.8
		12	0.3			5	2.1
		13	0.9			6	2.7
		14	0.9			11	3.3
		14.5	2.1			11.5	8.9
		16	0.3			13.5	49.9
	CDM-SB3	2	0.9			14	74.2
		3.5	0.9			16	4
		4	0.3		CDM-SB8	2.5	0.9
		9	0.9			4	1.5
		10.5	0.9			5	1.5
		14	0.9			7.5	0.3
		15.5	0.3			8	0.9
		20	0.3			12	0.9
	CDM-SB4	3	0.3			13	4.6
		10	0.3			16	7.7
		13	6.4		CDM-SB9	2.5	0.9
		17	0.3			5	0.9
		20	0.9			7	0.9
Southern Rifkin Area	CDM-SB5	2	0.9			9	0.3
		4	0.3			9.5	2.1
		6	1.5			10.5	1.5
		8	0.9			11	0.9
		10	0.3			13	0.9
		11	0.5			15	0.9
		12	2.1				
		13.5	13.8				
		15	0.9				

silty sand with angular gravel clasts and brick fragments. Brick and concrete were encountered in CDM-SB7 between 5 and 8 ft bgs. Between 8 and 14 ft bgs, soils comprised of gray-brown to olive clay interbedded with permeable horizons (water bearing units) that consisted of clayey sand and clayey gravel. The water bearing units varied in thickness and depth between boreholes, ranging from a single 6-inch clayey gravel layer at 13.5 ft bgs in CDM-SB6 to a 3-foot clayey sand/clayey gravel layer at 11.5 ft bgs in CDM-SB7. The water bearing units were generally located between 8 and 14 ft bgs. Between 14 and 16 ft bgs (the total depth explored), soils comprise gray-brown to olive clay.

In CDM-SB5, a light yellow-gray colored soil was observed between 8 and 11 ft bgs. This light colored soil was not observed in adjacent borings (CDM-SB6 and CDM-SB7).

Sharp, solvent odors were observed in saturated soils of CDM-SB6 and CDM-SB7. The odors correlate with high PID readings obtained on soil specimens (Table 2-3). The highest readings were obtained on soil collected from CDM-SB7 between 11.5 and 14 ft bgs (8.9, 49.9, and 74.2 ppm). Slightly elevated PID readings were noted in saturated soil from CDM-SB6 and CDM-SB8. However, odors were not observed during sample collection.

3.2 Groundwater Parameters

Observed depths to water in each borehole are summarized in Table 2-1. The following is a discussion of groundwater parameters measured during purging of groundwater impacted by the Rifkin plume and Southern Rifkin Area. Groundwater parameter results are summarized in Table 3-1.

Table 3-1
Groundwater Parameters, Former Rifkin Property
The Sherwin-Williams Company, Emeryville, CA

Sample ID	*Sample Date*	*Temperature (^{o}C)*	*pH*	*Conductivity (mS/cm)*	*Turbidity (NTUs)*	*ORP (mV)*	*DO (mg/L)*
CDM-SB1-GW	9/4/2002	22.1	5.46	0.590	213	-97	0.0
CDM-SB2-GW	9/4/2002	22.7	6.43	0.699	858	-111	0.0
CDM-SB3-GW	9/5/2002	20.5	6.51	0.759	230	-122	0.13
CDM-SB4-GW	9/4/2002	22.1	5.12	0.791	999	-75	0.97
CDM-SB5-GW	9/5/2002	22.7	3.96	4.81	383	188	0.65
CDM-SB6-GW	9/5/2002	22.7	5.81	2.61	4	-62	2.05
CDM-SB7-GW	9/5/2002	24.8	4.05	16.8	884	180	1.26
CDM-SB8-GW	9/5/2002	23.6	5.40	0.98	106	-79	0.14
CDM-SB9-GW	9/4/2002	23.6	5.96	2.02	271	-80	0.52

Notes:
1) ORP - oxidation reduction potential
2) DO - dissolved oxygen
3) C - degrees Celsius
4) mS/cm - milliSiemen per centimeter
5) NTUs - Nephelometric Turbidity Units
6) mV - millivolts
7) mg/L - milligrams per liter
8) CDM-SB6-GW and CDM-SB7-GW had poor recharge. There was insufficient groundwater flow and time to continue collecting groundwater parameters after sampling. The parameters reflect groundwater conditions while using the filters.

Table 4-1
Inorganic Analytical Results for Soil Samples, Former Rifkin Property
The Sherwin-Williams Company, Emeryville, CA

Area	Sample ID	Matrix	Sample Date	Depth	Arsenic	Lead	Nickel	Zinc	Total Iron	Total Phosphorus	Nitrite	Nitrate	Sulfate	COD	Alkalinity				CEC
															Bicarbonate	Carbonate	Hydroxide	Total	
				(ft bgs)	(mg/kg)														(meq/kg)
Rifkin Plume	CDM-SB1-A	Soil	9/4/2002	11.5-12.0	6.9	7.6	--	--	17,000	--	--	--	--	--	290	ND<2.0	ND<2.0	290	98
	CDM-SB1-B	Soil	9/4/2002	14.5-15.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	CDM-SB2-A	Soil	9/4/2002	11.5-12.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	CDM-SB2-B	Soil	9/4/2002	18.5-19.0	2.1	5.5	--	--	11,000	22	ND<0.5	ND<0.5	22	--	390	ND<2.0	ND<2.0	390	100
	CDM-SB2-C	Soil	9/4/2002	19.0-19.5	2.5	7.9	--	--	17,000	--	--	--	--	--	--	--	--	--	--
	CDM-SB3-A	Soil	9/5/2002	10.5-11.0	2.2	4.6	--	--	13,000	--	--	--	--	--	250	ND<2.0	ND<2.0	250	130
	CDM-SB3-B	Soil	9/5/2002	12.5-13.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	CDM-SB3-C	Soil	9/5/2002	15.5-16.0	2.0	3.3	--	--	9,400	--	--	--	--	--	**	**	**	**	**
	CDM-SB4-A	Soil	9/4/2002	15.5-16.0	1.2	5.6	--	--	12,000	ND<1.0	ND<0.5	ND<0.5	9.0	--	210	ND<2.0	ND<2.0	210	150
	CDM-SB4-B	Soil	9/4/2002	17.5-18.0	3.4	5.6	--	--	15,000	**	**	**	**	--	**	**	**	**	**
Southern Rifkin Area	CDM-SB5-A	Soil	9/5/2002	3.5-4.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	CDM-SB5-B	Soil	9/5/2002	7.0-7.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	CDM-SB5-C	Soil	9/5/2002	10.5-11.0	5.1	3.5	19	250	18,000	ND<1.0	ND<0.5	1.7	3,700	--	ND<2.0	ND<2.0	ND<2.0	ND<2.0	170
	CDM-SB5-D	Soil	9/5/2002	12.0-12.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	CDM-SB5-E	Soil	9/5/2002	13.0-13.5	38	8.5	--		13,000	--	--	--	--	--	--	--	--	--	--
	CDM-SB6-A	Soil	9/5/2002	13.5-14.0	190	5.3	22	150	21,000	ND<1.0	ND<0.5	ND<0.5	150	--	350	ND<2.0	ND<2.0	350	130
	CDM-SB6-B	Soil	9/5/2002	14.5-15.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	CDM-SB6-C	Soil	9/5/2002	15.5-16.0	4.9	7.8	--	--	19,000	--	--	--	--	--	--	--	--	--	--
	CDM-SB7-A	Soil	9/5/2002	12.0-12.5	1.9	4.5	16	570	9,800	ND<1.0	ND<0.5	6.4	8,600	--	ND<2.0	ND<2.0	ND<2.0	ND<2.0	130
	CDM-SB7-B	Soil	9/5/2002	14.0-14.5	1.7	3.5	17	740	11,000	**	**	**	**	--	**	**	**	**	**
	CDM-SB7-C	Soil	9/5/2002	15.0-15.5	3.9	5.4	--	--	16,000	--	--	--	--	--	--	--	--	--	--
	CDM-SB8-A	Soil	9/5/2002	11.5-12.0	31	5.3	--	--	21,000	--	--	--	--	--	530	ND<2.0	ND<2.0	530	79
	CDM-SB8-B	Soil	9/5/2002	14.5-15.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	CDM-SB8-C	Soil	9/5/2002	15.5-16.0	5.0	9.2	51	560	22,000	--	--	--	--	--	--	--	--	--	--
	CDM-SB9-A	Soil	9/4/2002	3.5-4.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	CDM-SB9-B	Soil	9/4/2002	9.5-10.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	CDM-SB9-C	Soil	9/4/2002	13.5-14.0	22	4.3	10	30	16,000	--	--	--	--	--	110	ND<2.0	ND<2.0	110	110
	CDM-SB9-D	Soil	9/4/2002	14.5-15.0	25	5.4	--	--	15,000	--	--	--	--	--	--	--	--	--	--

Notes:
1) -- - not analyzed
2) ND - not detected
3) ** - Samples from SB3-A and SB3-C; SB4-A and SB4-B; and, SB7-A and SB7-B were composited prior to alkalinity and CEC analysis.
Samples from SB4-A and SB4-B; and, SB7-A and SB7-B were composited prior to nitrate, sulfate, and phosphorus analysis.
4) COD - chemical oxygen demand
5) CEC - cation exchange capacity
6) mg/kg - milligrams per kilogram
7) meq/kg - milliequivalents per kilogram
8) ft bgs - feet below ground surface

Table 4-2
Organic Analytical Results for Soil Samples, Former Rifkin Property
The Sherwin-Williams Company, Emeryville, CA

Area	Sample ID	Matrix	Sample Date	Depth	Napthalene	2-Methylnaphthalene	Fluorene	Phenanthrene	PCBs	Benzene	Toluene	Ethylbenzene	m,p-Xylenes	o-Xylene	TOC
				(ft bgs)	(ug/kg)										(%)
Rifkin Plume	CDM-SB1-A	Soil	9/4/2002	11.5-12.0	--	--	--	--	--	--	--	--	--	--	0.13
	CDM-SB1-B	Soil	9/4/2002	14.5-15.0	--	--	--	--	--	--	--	--	--	--	--
	CDM-SB2-A	Soil	9/4/2002	11.5-12.0	--	--	--	--	--	--	--	--	--	--	--
	CDM-SB2-B	Soil	9/4/2002	18.5-19.0	--	--	--	--	--	--	--	--	--	--	0.19
	CDM-SB2-C	Soil	9/4/2002	19.0-19.5	--	--	--	--	--	--	--	--	--	--	--
	CDM-SB3-A	Soil	9/5/2002	10.5-11.0	--	--	--	--	--	--	--	--	--	--	0.12
	CDM-SB3-B	Soil	9/5/2002	12.5-13.0	--	--	--	--	--	--	--	--	--	--	--
	CDM-SB3-C	Soil	9/5/2002	15.5-16.0	--	--	--	--	--	--	--	--	--	--	**
	CDM-SB4-A	Soil	9/4/2002	15.5-16.0	--	--	--	--	--	--	--	--	--	--	0.09
	CDM-SB4-B	Soil	9/4/2002	17.5-18.0	--	--	--	--	--	--	--	--	--	--	**
Southern Rifkin Area	CDM-SB5-A	Soil	9/5/2002	3.5-4.0	--	--	--	--	--	--	--	--	--	--	--
	CDM-SB5-B	Soil	9/5/2002	7.0-7.5	--	--	--	--	--	--	--	--	--	--	--
	CDM-SB5-C	Soil	9/5/2002	10.5-11.0	--	--	--	--	--	ND<5.0	ND<5.0	ND<5.0	ND<5.0	ND<5.0	0.06
	CDM-SB5-D	Soil	9/5/2002	12.0-12.5	--	--	--	--	--	--	--	--	--	--	--
	CDM-SB5-E	Soil	9/5/2002	13.0-13.5	--	--	--	--	--	ND<9.6	ND<9.6	ND<9.6	ND<9.6	ND<9.6	--
	CDM-SB6-A	Soil	9/5/2002	13.5-14.0	--	--	--	--	--	ND<5.2	ND<5.2	ND<5.2	ND<5.2	ND<5.2	0.55
	CDM-SB6-B	Soil	9/5/2002	14.5-15.0	--	--	--	--	--	--	--	--	--	--	--
	CDM-SB6-C	Soil	9/5/2002	15.5-16.0	--	--	--	--	--	5.1	ND<5.0	7.8	36	5.1	--
	CDM-SB7-A	Soil	9/5/2002	12.0-12.5	490	1,500	310	510	ND	ND<5,000	100,000	ND<5,000	ND<5,000	ND<5,000	0.32
	CDM-SB7-B	Soil	9/5/2002	14.0-14.5	450	<1,700	530	980	ND	54	3,100	21	ND<130	60	**
	CDM-SB7-C	Soil	9/5/2002	15.0-15.5	--	--	--	--	--	10	77	ND<5.1	ND<5.1	ND<5.1	--
	CDM-SB8-A	Soil	9/5/2002	11.5-12.0	--	--	--	--	--	ND<4.6	7.1	ND<4.6	ND<4.6	ND<4.6	0.19
	CDM-SB8-B	Soil	9/5/2002	14.5-15.0	--	--	--	--	--	--	--	--	--	--	--
	CDM-SB8-C	Soil	9/5/2002	15.5-16.0	--	--	--	--	--	ND<4.7	10	ND<4.7	ND<4.7	ND<4.7	--
	CDM-SB9-A	Soil	9/4/2002	3.5-4.0	--	--	--	--	--	--	--	--	--	--	--
	CDM-SB9-B	Soil	9/4/2002	9.5-10.0	--	--	--	--	--	--	--	--	--	--	--
	CDM-SB9-C	Soil	9/4/2002	13.5-14.0	--	--	--	--	--	ND<5.1	ND<5.1	ND<5.1	ND<5.1	ND<5.1	0.07
	CDM-SB9-D	Soil	9/4/2002	14.5-15.0	--	--	--	--	--	ND<5.3	ND<5.3	ND<5.3	ND<5.3	ND<5.3	--

Notes:
1) -- - not analyzed
2) ND - not detected
3) ** - Samples from SB3-A and SB3-C; SB4-A and SB4-B; and, SB7-A and SB7-B were composited prior to TOC analysis.
4) PCBs - polychlorinated byphenols
5) PCB analysis included Aroclor 1016, 1221, 1232, 1242, 1248, 1254, and 1260. The non-detection limits were 12 mg/kg for all compounds except Aroclor 1221, which was 24 mg/kg.
6) TOC - total organic carbon
7) ug/kg - micrograms per kilogram
8) % - percent of sample by mass
9) ft bgs - feet below ground surface

Table 4-3
Inorganic Analytical Results for Groundwater Samples, Former Rifkin Property
The Sherwin-Williams Company, Emeryville, CA

Area	Sample ID	Matrix	Sample Date	Arsenic	Lead	Nickel	Zinc	Total iron	Ferrous Iron	Total Phosphorus	Nitrite	Nitrate	Sulfate	Sulfide	COD	Hardness as CaCO3	TDS	TSS	Alkalinity			
																			Bicarbonate	Carbonate	Hydroxide	Total
				(ug/L)						(mg/L)												
Rifkin Plume	CDM-SB1-GW	GW	9/4/2002	95	ND<3.0	--	--	--	9,500	--	--	--	--	--	44	--	--	--	--	--	--	--
	CDM-SB2-GW	GW	9/4/2002	35	ND<3.0	--	--	10,000	16,000	0.14	ND<0.05	ND<0.05	66	ND<0.04	430	--	--	--	--	--	--	--
	CDM-SB3-GW	GW	9/5/2002	34	4.1	--	--	21,000	12,000	--	--	--	--	--	77	290	--	--	--	--	--	--
	CDM-SB4-GW	GW	9/4/2002	40	ND<3.0	--	--	6,600	8,600	4.0	ND<0.05	0.53	52	ND<0.04	670	--	--	--	--	--	--	--
Southern Rifkin Area	CDM-SB5-GW	GW	9/5/2002	63,000	24	1,600	200,000	57,000	74,000	0.15	ND<0.05	6.3	3,300	ND<0.04	620	2,300	--	--	--	--	--	--
	CDM-SB6-GW	GW	9/5/2002	6,800	ND<3.0	180	690	350,000	400,000	0.58	ND<0.25	ND<0.25	1,400	ND<0.04	280	680	--	--	--	--	--	--
	CDM-SB6-DUP	GW	9/5/2002	7,000	ND<3.0	--	--	290,000	410,000	--	--	--	--	--	--	--	--	--	--	--	--	--
	CDM-SB7-GW	GW	9/5/2002	ND<5.0	340	6,800	1,800,000	1,300,000	1,800,000	0.15	ND<1.3	32	15,000	ND<0.04	5,300	5,400	21,600	2,500	ND<1.0	ND<1.0	ND<1.0	ND<1.0
	CDM-SB8-GW	GW	9/4/2002	3,100	ND<3.0	43	170	--	76,000	--	--	--	--	--	310	--	--	--	--	--	--	--
	CDM-SB9-GW	GW	9/5/2002	610	4.6	130	1,000	150,000	170,000	--	--	--	--	--	510	650	--	--	--	--	--	--
	Trip Blank	Water	9/4/2002	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Equipment Blank	Water	9/4/2002	ND<5.0	ND<3.0	--	--	ND<100	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes:
1) -- - not analyzed
2) ND - not detected
3) COD - chemical oxygen demand
4) TDS - total dissolved solids
5) TSS - total suspended solids
6) ug/L - micrograms per liter
7) mg/L - milligrams per liter

Table 4-4
Organic Analytical Results for Groundwater Samples, Former Rifkin Property
The Sherwin-Williams Company, Emeryville, CA

Area	Sample ID	Matrix	Sample Date	Napthalene	Toluene	Ethylbenzene	m,p-Xylenes	o-Xylene	1,3,5-Trimethylbenzene	1,2,4-Trimethylbenzene	Acetone	4-Methyl-2-Pentanone (MIBK)	TOC
				(ug/L)									(mg/L)
Rifkin Plume	CDM-SB1-GW	GW	9/4/2002	--	--	--	--	--	--	--	--	--	3.7
	CDM-SB2-GW	GW	9/4/2002	--	--	--	--	--	--	--	--	--	7.4
	CDM-SB3-GW	GW	9/5/2002	--	--	--	--	--	--	--	--	--	3.6
	CDM-SB4-GW	GW	9/4/2002	--	--	--	--	--	--	--	--	--	6.6
Southern Rifkin Area	CDM-SB5-GW	GW	9/5/2002	190	ND<5.0	ND<5.0	ND<5.0	ND<5.0	ND<5.0	ND<5.0	ND<20	ND<10	15
	CDM-SB6-GW	GW	9/5/2002	ND<50	1,500	480	1,300	380	98	300	ND<200	ND<100	54
	CDM-SB6-DUP	GW	9/5/2002	ND<50	1,600	470	1,300	370	85	230	ND<200	ND<100	--
	CDM-SB7-GW	GW	9/5/2002	ND<13,000	ND<13,000	ND<13,000	ND<13,000	ND<13,000	ND<13,000	ND<13,000	330,000	74,000	670
	CDM-SB8-GW	GW	9/4/2002	ND<5.0	ND<5.0	ND<5.0	ND<5.0	ND<5.0	ND<5.0	ND<5.0	ND<20	ND<10	4.4
	CDM-SB9-GW	GW	9/5/2002	ND<5.0	ND<5.0	ND<5.0	ND<5.0	ND<5.0	ND<5.0	ND<5.0	ND<20	ND<10	16
	Trip Blank	Water	9/4/2002	ND<5.0	ND<5.0	ND<5.0	ND<5.0	ND<5.0	ND<5.0	ND<5.0	ND<20	ND<10	--
	Equipment Blank	Water	9/4/2002	ND<5.0	ND<5.0	ND<5.0	ND<5.0	ND<5.0	ND<5.0	ND<5.0	ND<20	ND<10	--

Notes:
1) -- - not analyzed
2) ND - not detected
3) TOC - total organic carbon
4) ug/L - micrograms per liter
5) mg/L - milligrams per liter

4.2.1 Rifkin Plume Area

Arsenic concentrations in the four groundwater samples ranged from 34 to 95 micrograms per liter (µg/L). Lead concentrations in groundwater samples ranged from less than 3.0 to 4.1 µg/L.

The highest concentration of arsenic in groundwater, 95 µg/L, was measured in sample CDM-SB1-GW, the nearest location to Horton Street. Concentrations of arsenic in groundwater samples from locations CDM-SB2 through CDM-SB4 ranged from 34 to 40 µg/L. The previous groundwater investigation of the Rifkin Plume was in August 1998 by Entrix. Entrix reported concentrations of arsenic in groundwater between 63 and 120 µg/L along the length of the Rifkin Plume, in the general vicinity of locations CDM-SB1 through CDM-SB-4.

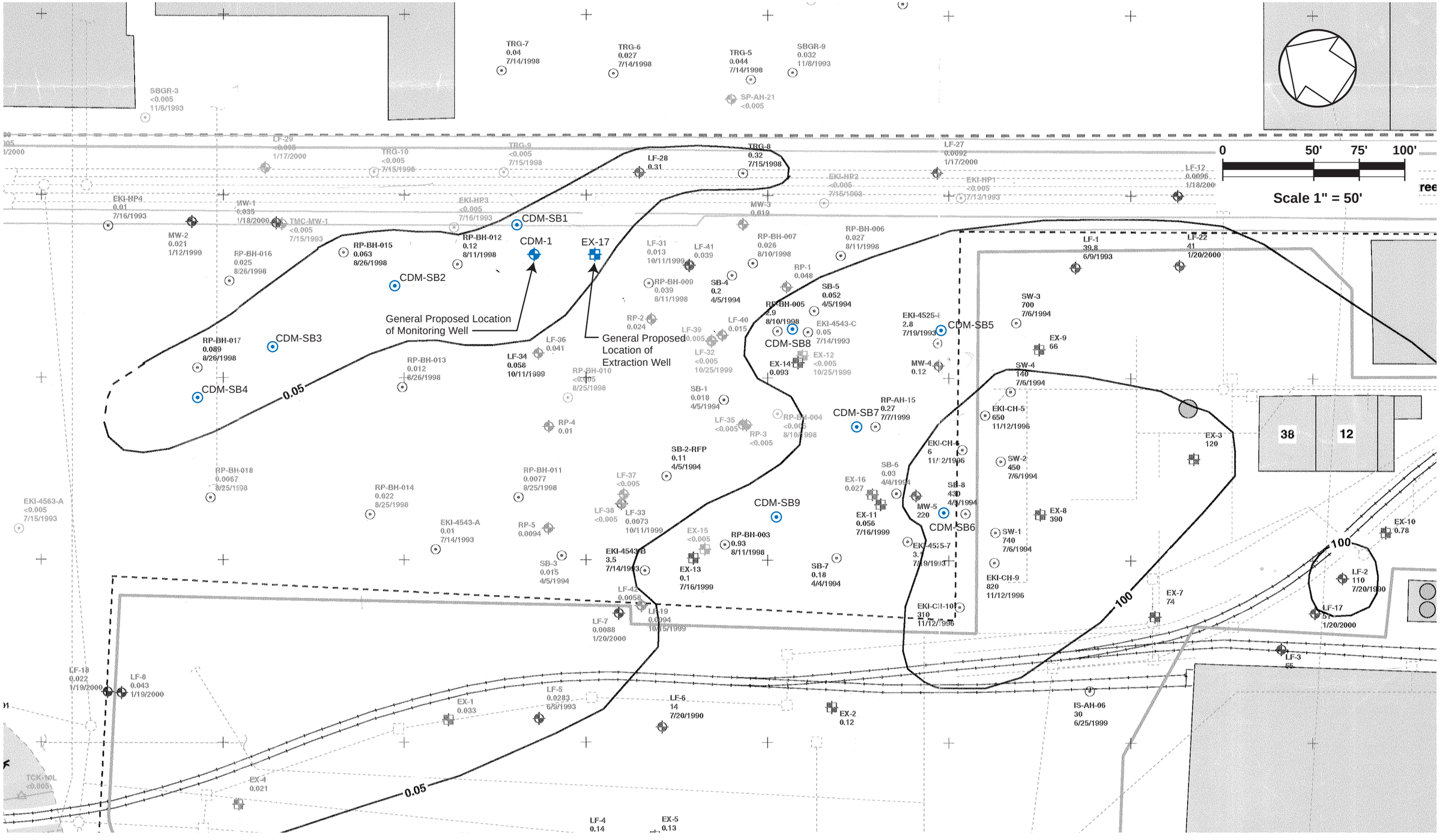


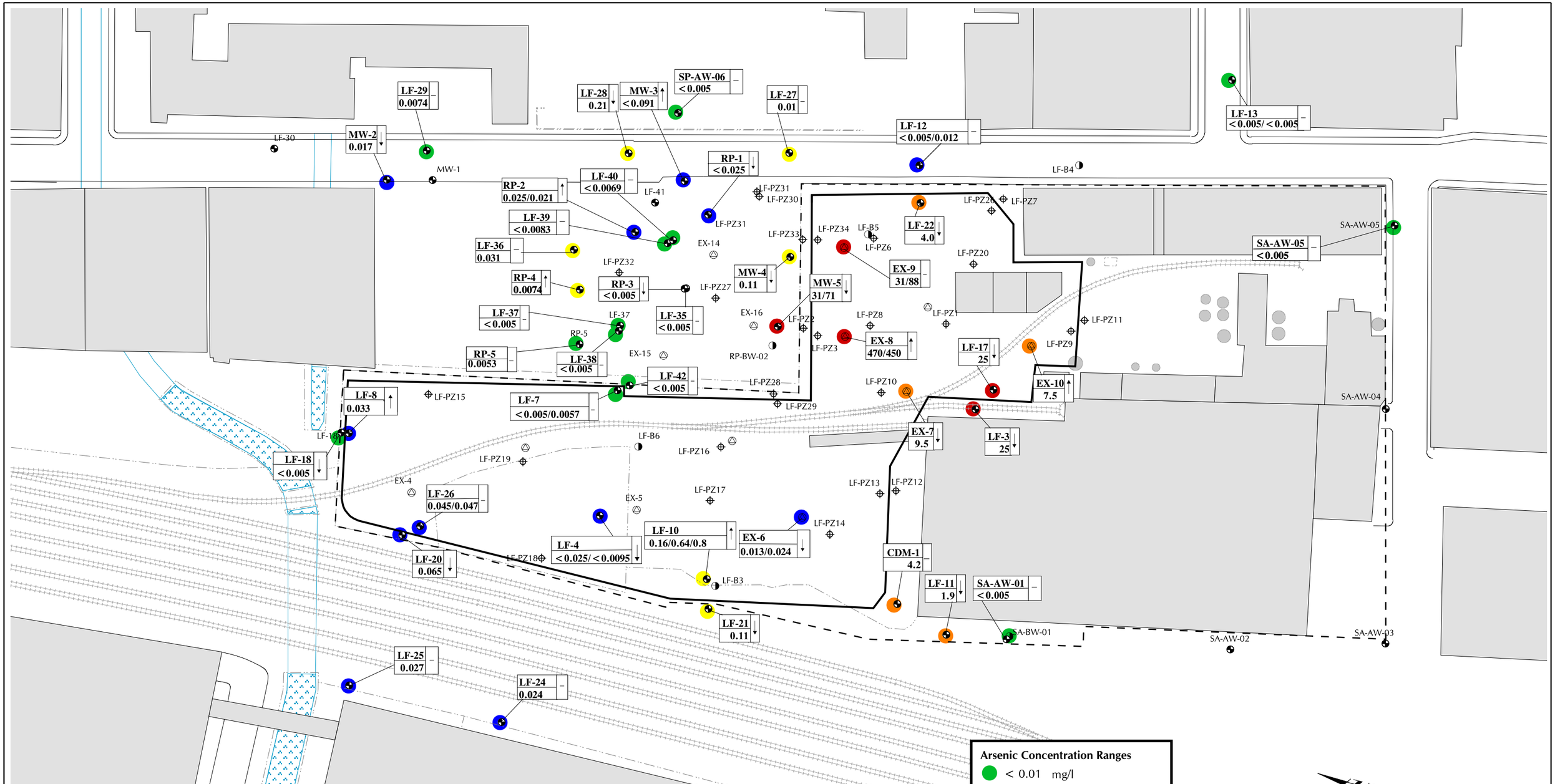
Figure 1
Soil Boring Locations
Sherwin-Williams Company, Emeryville, CA

CDM

Source: Image provided by ENTRIX, Remedial Investigation, March 2002

Appendix A9

Selected Figures from Groundwater Monitoring Report. January 30, 2008.



LEGEND

LF-10	A-zone monitoring well	Property boundary	Aboveground water channel
LF-B3	B-zone monitoring well	Slurry wall	Underground water channel
LF-PZ1	A-zone piezometer	Fence	Building
EX-8	Extraction well	Railroad tracks	Storage tank

RP-3 — Location ID
<0.005/<0.005 — Duplicate sample
Concentration in milligrams per liter (mg/l)

NOTES:

See Figure 2 for location of abandoned wells.

Arsenic Concentration Ranges

- < 0.01 mg/l
- < 0.1 mg/l
- < 1 mg/l
- < 10 mg/l
- >10 mg/l
- Statistically increasing trend
- Statistically decreasing trend
- No Statistically significant trend

100 0 100 Feet

Concentrations of Arsenic A-Zone Groundwater April 2007

Sherwin-Williams Company, Emeryville, CA

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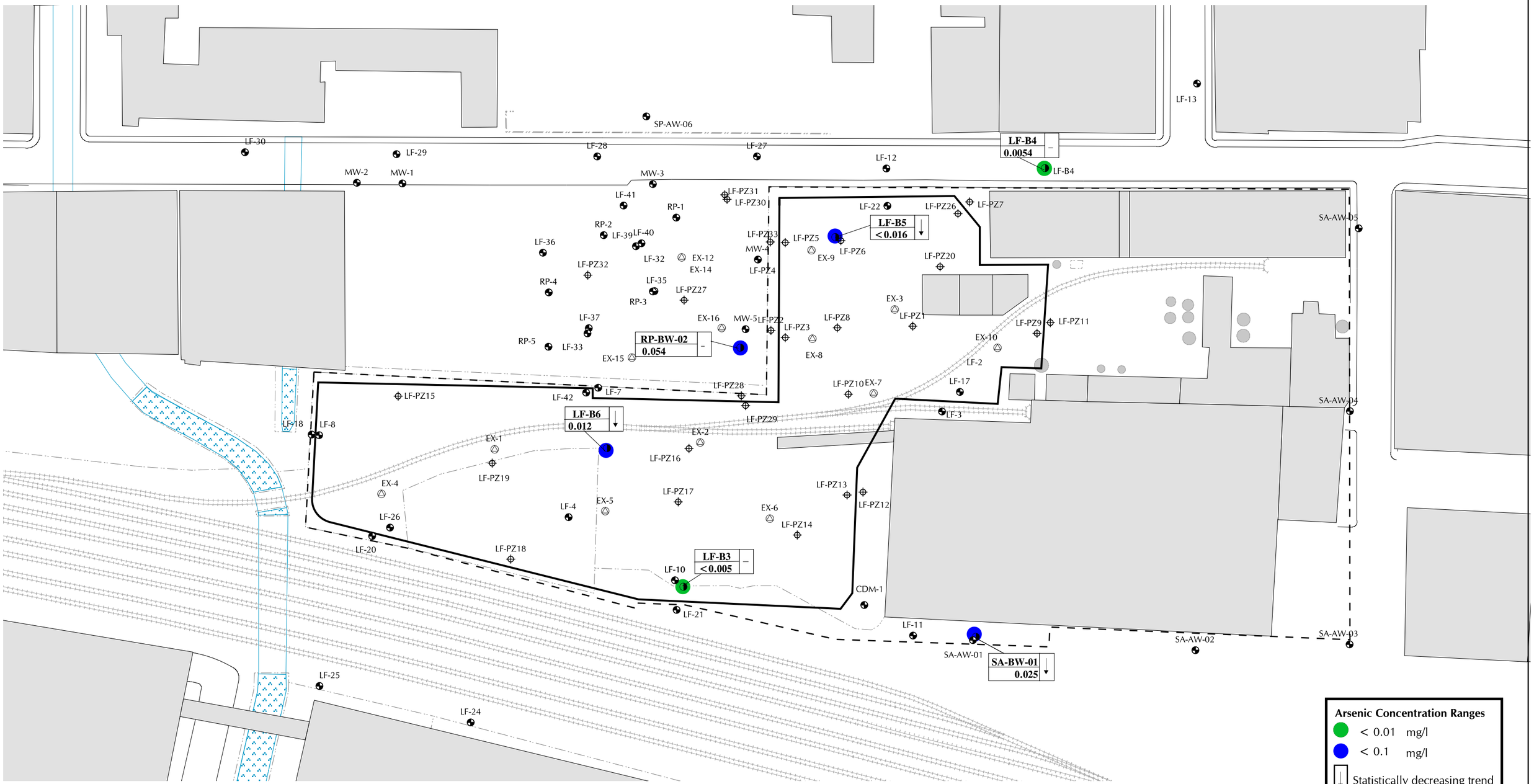
Figure 18

U:\Sherwin\GIS_9911\Qmr_APR\qmr06q3use.apr 10/11/2006



Arsenic Concentration Ranges

- < 0.01 mg/l
- < 0.1 mg/l
- Statistically decreasing trend

LEGEND

- LF-10 — A-zone monitoring well
- LF-B3 — B-zone monitoring well
- LF-PZ1 — A-zone piezometer
- EX-8 — Extraction well
- Property boundary
- Slurry wall
- Fence
- Railroad tracks
- Aboveground water channel
- Underground water channel
- Building
- Storage tank

LF-B5 — Location ID
<0.005/0.005 — Concentration in milligrams per liter (mg/l); Duplicate sample

NOTES:
See Figure 2 for location of abandoned wells.

100 0 100 Feet

Concentrations of Arsenic B-Zone Groundwater April 2007

Sherwin-Williams Company, Emeryville, CA

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Figure 19

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LF-28 0.3
SP-AW-06
LF-12 0.0059/0.0051
LF-13
LF-30
LF-29
LF-27
LF-B4
MW-2
MW-1
MW-3
RP-2 0.028
LF-41
LF-PZ31
LF-PZ30
RP-1
LF-40
LF-PZ26
LF-PZ7
LF-22 4.5
LF-PZ34
LF-B5
LF-PZ6
LF-PZ33
SA-AW-05
LF-36 0.042/0.044
LF-39
EX-14
EX-9
LF-PZ20
LF-PZ32
RP-4 0.013
LF-35
RP-3
LF-PZ27
MW-4 0.16
MW-5 48
EX-3
LF-PZ1
LF-PZ11
LF-37
EX-16
LF-PZ2
LF-PZ8
RP-5
LF-38
LF-PZ3
EX-8 460
EX-10
LF-PZ9
LF-17 38/35
EX-15
RP-BW-02
LF-42
LF-PZ28
LF-PZ10
EX-7
LF-7
LF-PZ15
LF-PZ29
SA-AW-04
LF-8 0.036
LF-3 24
LF-B6
EX-1
LF-PZ16
EX-2
LF-18 < 0.005
LF-PZ19
LF-PZ13
LF-PZ12
EX-4
LF-26 0.12
EX-5
LF-PZ17
LF-10 0.74
LF-PZ14
LF-4 0.065
EX-6 5.6
CDM-1 5.1
LF-20 0.13
LF-PZ18
LF-B3
LF-11 1.7
LF-21 0.037
SA-BW-01
SA-AW-01
SA-AW-02
SA-AW-03
LF-25 0.033
LF-24

LEGEND

- LF-10 — A-zone monitoring well
- LF-B3 — B-zone monitoring well
- LF-PZ1 — A-zone piezometer
- EX-8 — Extraction well
- Property boundary
- Slurry wall
- Fence
- Railroad tracks
- Aboveground water channel
- Underground water channel
- Building

LF-36 — Location ID
0.042/0.044
Duplicate sample
Concentration in milligrams per liter (mg/l)

NOTES:

See Figure 2 for location of abandoned wells.

Arsenic Concentration Ranges

- < 0.01 mg/l
- < 0.1 mg/l
- < 1 mg/l
- < 10 mg/l
- >10 mg/l
- Statistically increasing trend
- Statistically decreasing trend
- No statistically significant trend

100 0 100 Feet

Concentrations of Dissolved Arsenic A-Zone Groundwater October 2007

Sherwin-Williams Company, Emeryville, CA

LFR

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Figure 8

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LEGEND

LF-10	A-zone monitoring well	Property boundary	Aboveground water channel
LF-B3	B-zone monitoring well	Slurry wall	Underground water channel
LF-PZ1	A-zone piezometer	Fence	Building
EX-8	Extraction well	Railroad tracks	

LF-B5 / 0.0064 — Location ID; Concentration in milligrams per liter (mg/l)

NOTES:
See Figure 2 for location of abandoned wells.

Arsenic Concentration Ranges

- < 0.01 mg/l
- < 0.1 mg/l
- Statistically decreasing trend
- No statistically significant trend

Concentrations of Dissolved Arsenic B-Zone Groundwater October 2007

Sherwin-Williams Company, Emeryville, CA

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Figure 9

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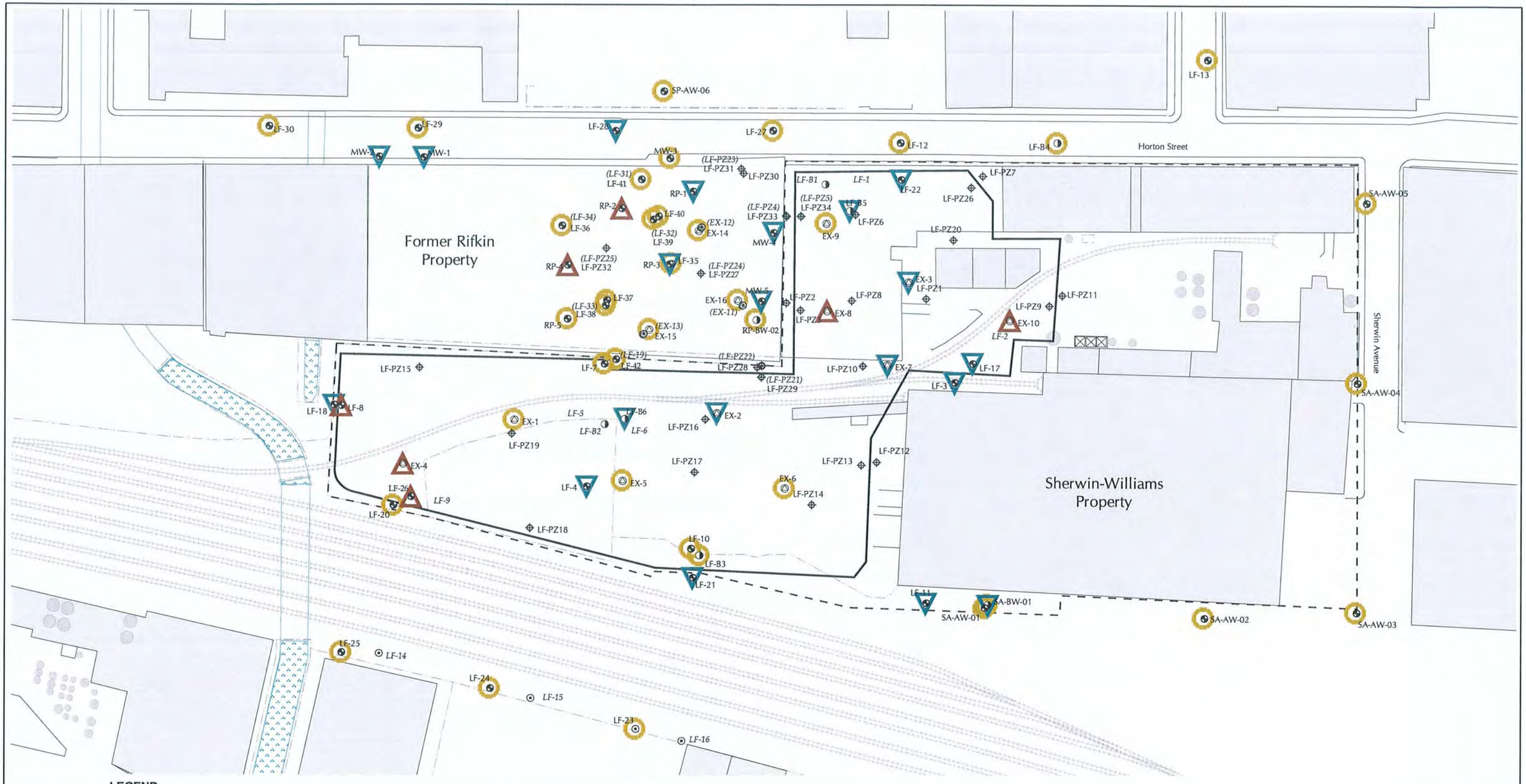
Appendix A10

Selected Figures from Groundwater Monitoring Plan Assessment. June 28, 2006.



LEGEND

LF-10	A-zone monitoring well		Property boundary
LF-B3	B-zone monitoring well		Slurry wall
LF-PZ1	A-zone piezometer		Fence
EX-8	Extraction well		Railroad tracks
LF-14	Abandoned monitoring well		Aboveground water channel
(LF-32) LF-39	Abandoned monitoring well/piezometer co-located with existing monitoring well/piezometer		Underground water channel
(EX-13)	Abandoned extraction well		Building
			Storage tank
			Increasing Trend
			No Trend
			Decreasing Trend

100 0 100 Feet

Site Plan Showing Mann-Kendall Trends for Arsenic

Sherwin-Williams Company, Emeryville, CA

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Figure 3

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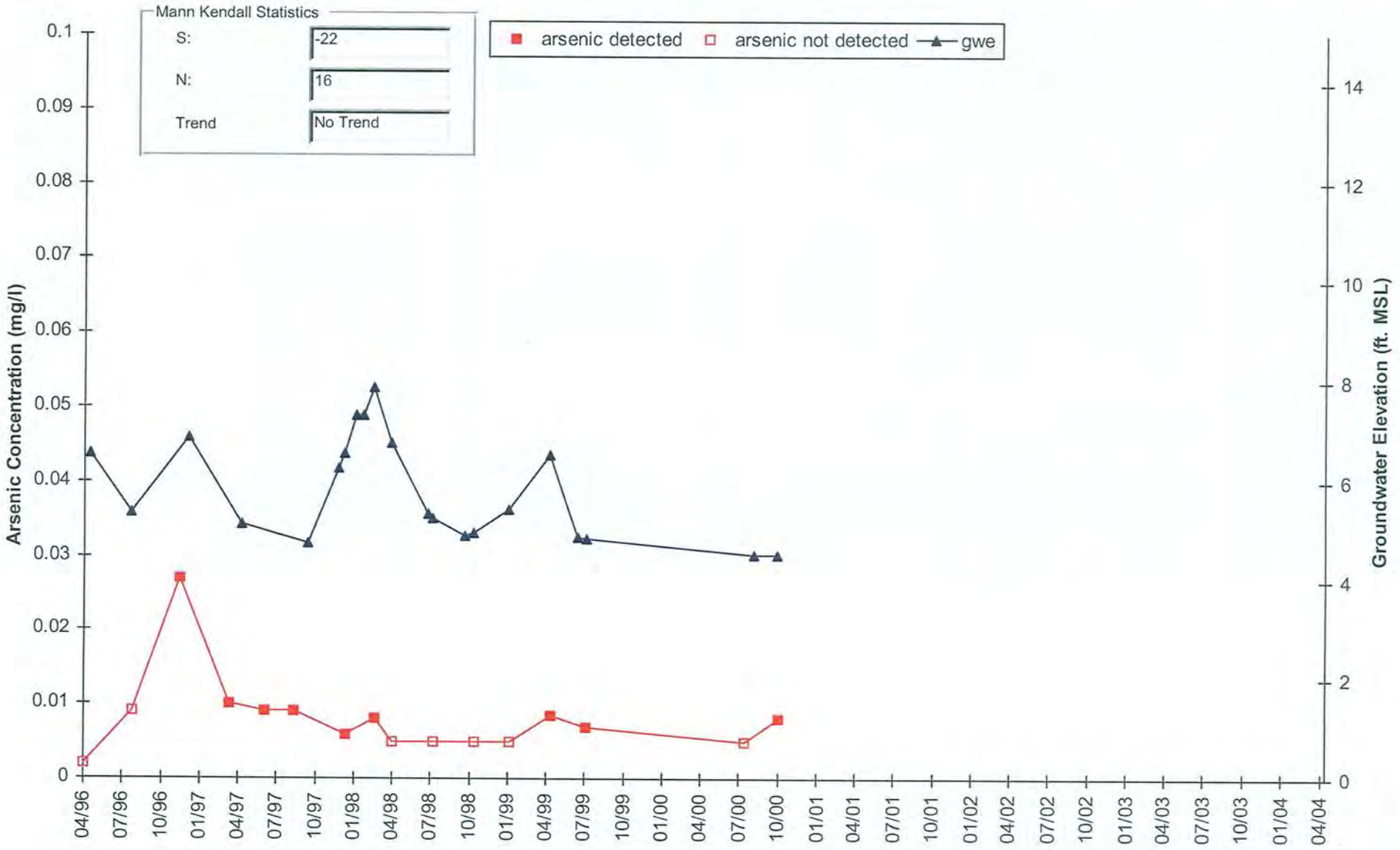
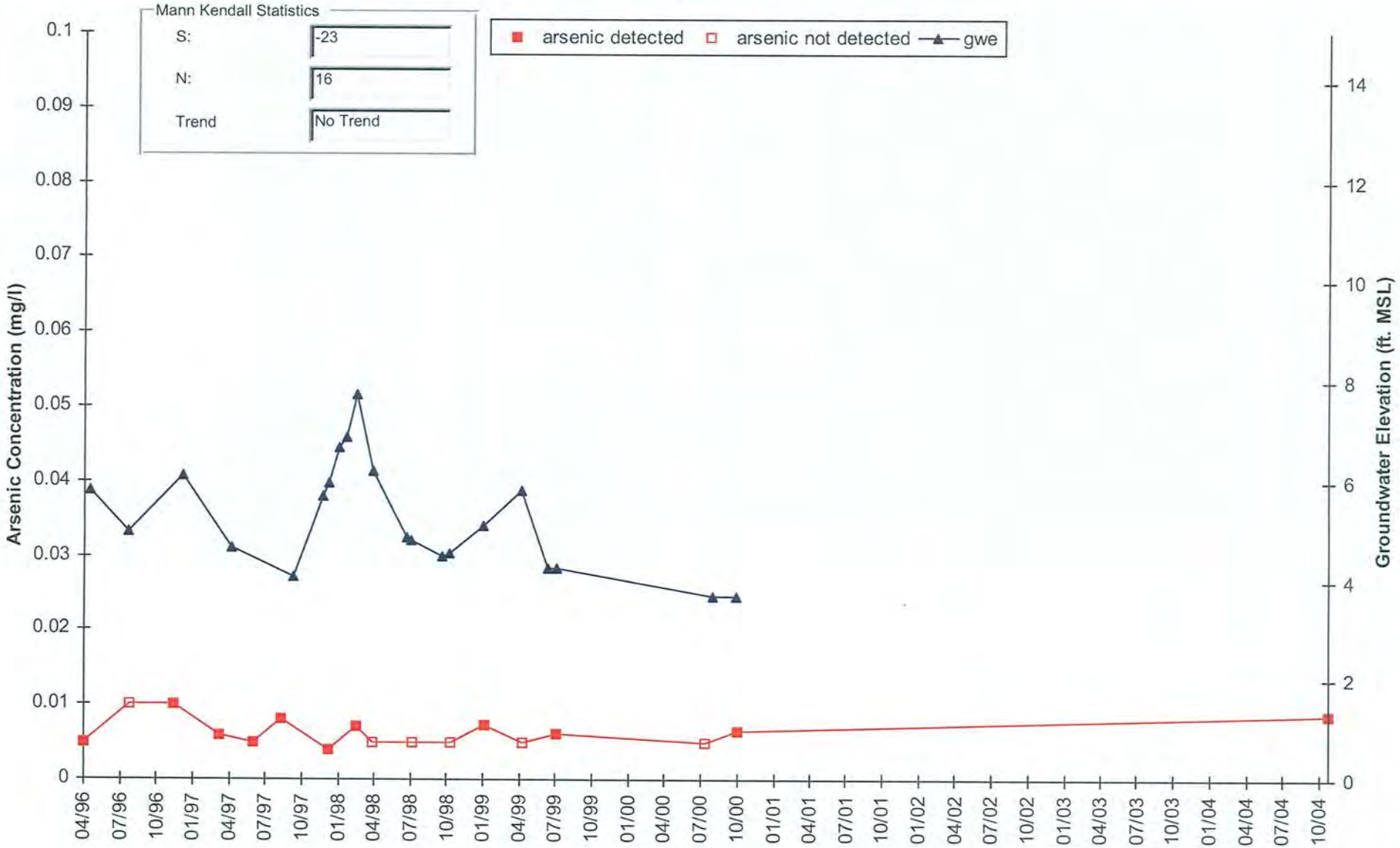
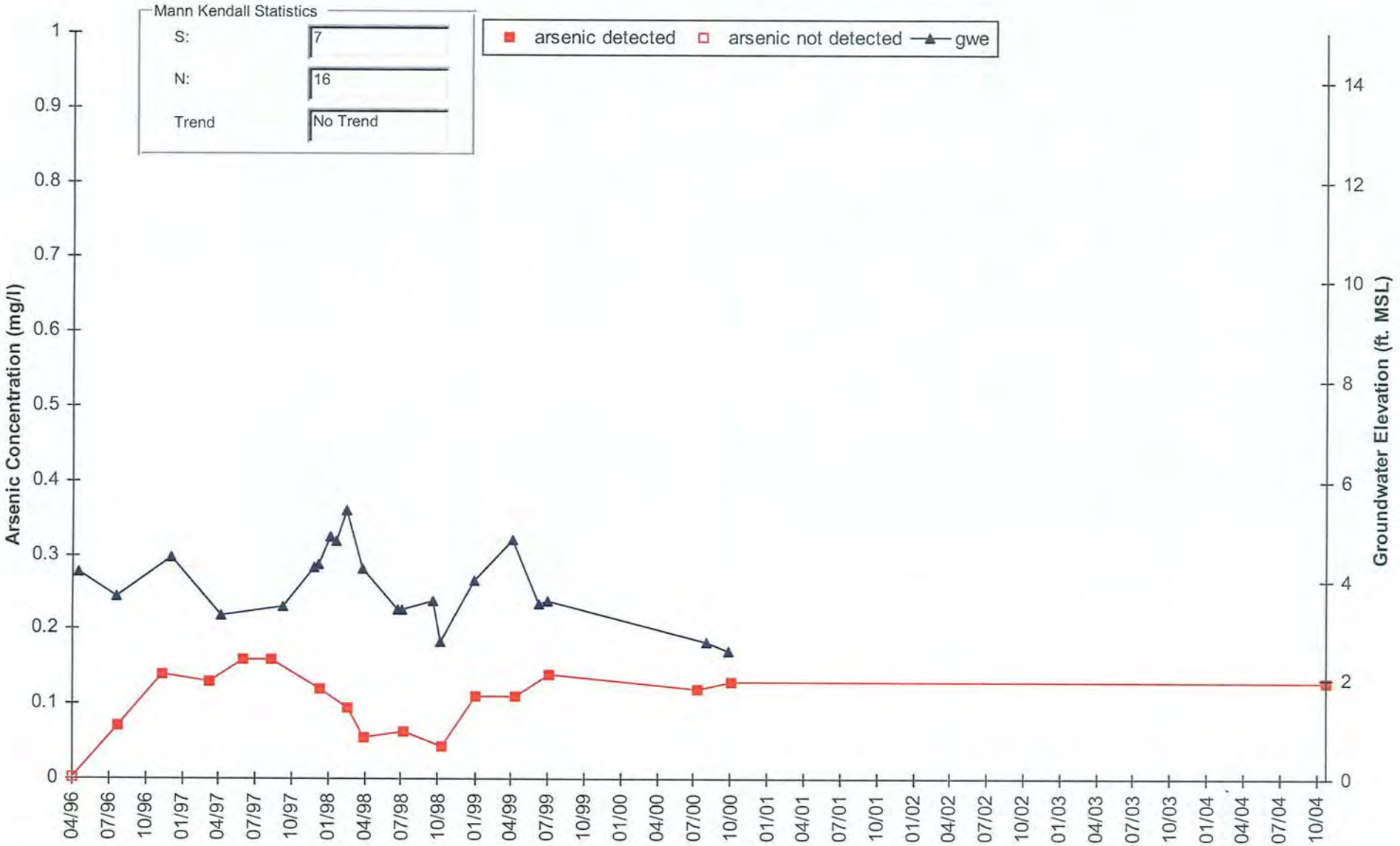
Time Plot of Arsenic Concentrations
Well LF-23
The Sherwin Williams Facility
Emeryville, CA



Time Plot of Arsenic Concentrations
Well LF-24
The Sherwin Williams Facility
Emeryville, CA



Time Plot of Arsenic Concentrations
Well LF-25
The Sherwin Williams Facility
Emeryville, CA



Appendix B
Selected Feasibility Study Figures and Tables

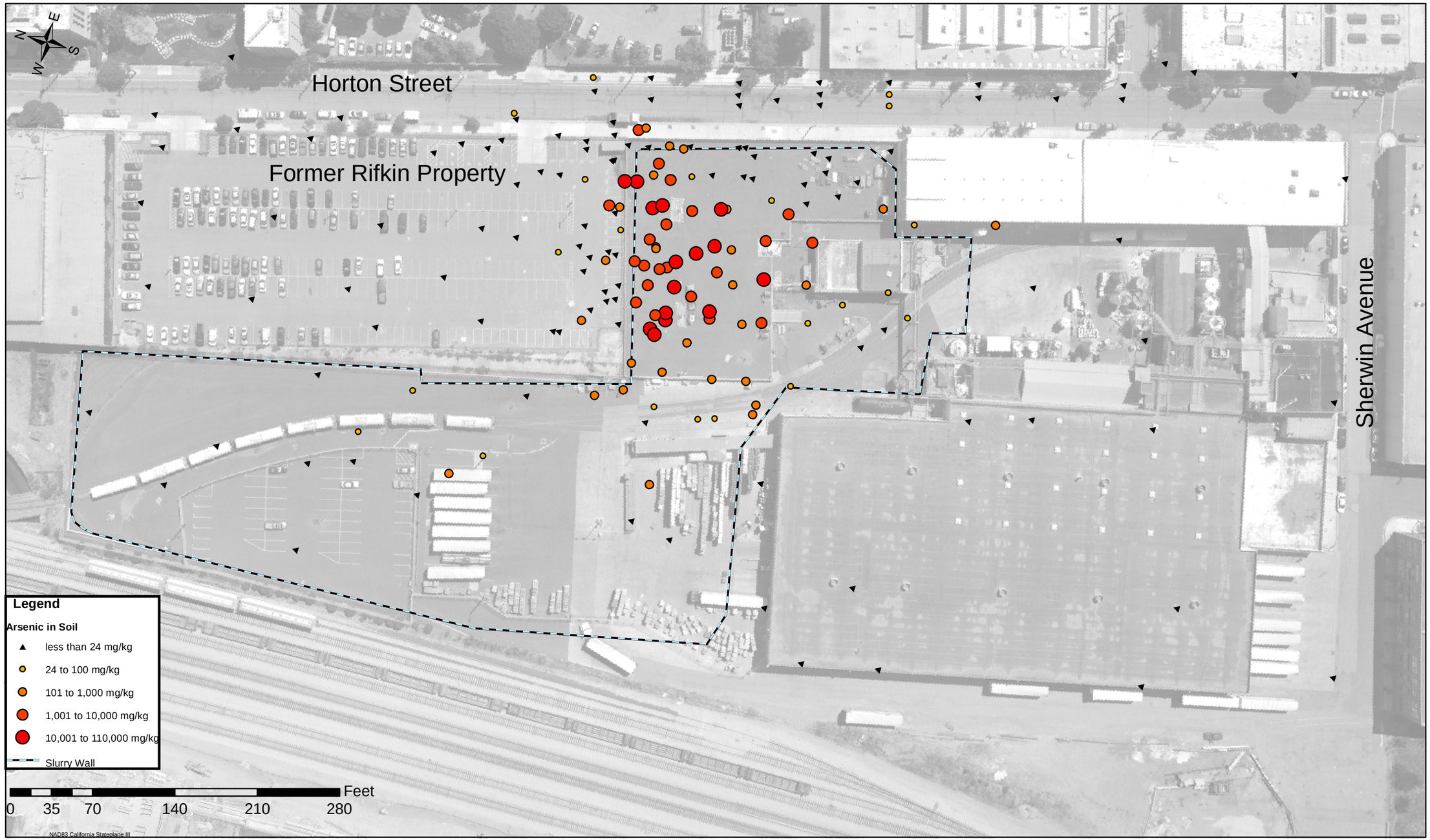


Figure 2-6a
Arsenic in Vadose Zone Soil
Sherwin-Williams Company - Emeryville, California

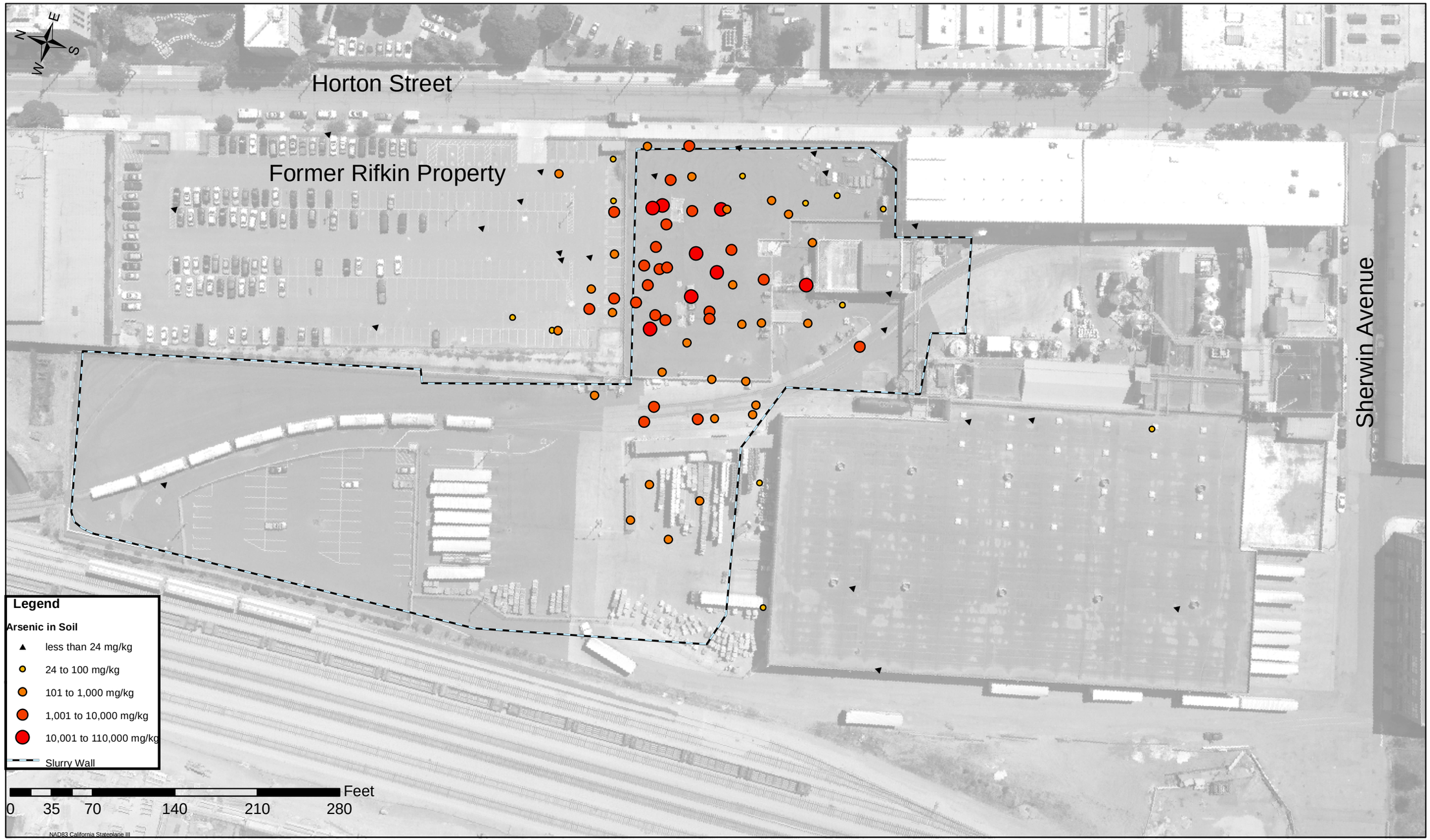


Figure 2-6b
Arsenic in Saturated Soil, 8.5 to 3.5 Feet MSL
Sherwin-Williams Company - Emeryville, California

Figure 2-6c
Arsenic in Saturated Soil, 3.5 to -1.5 Feet MSL
Sherwin-Williams Company - Emeryville, California

CDM

Figure 2-6d
Arsenic in Saturated Soil, -1.5 to -6.5 Feet MSL
Sherwin-Williams Company - Emeryville, California

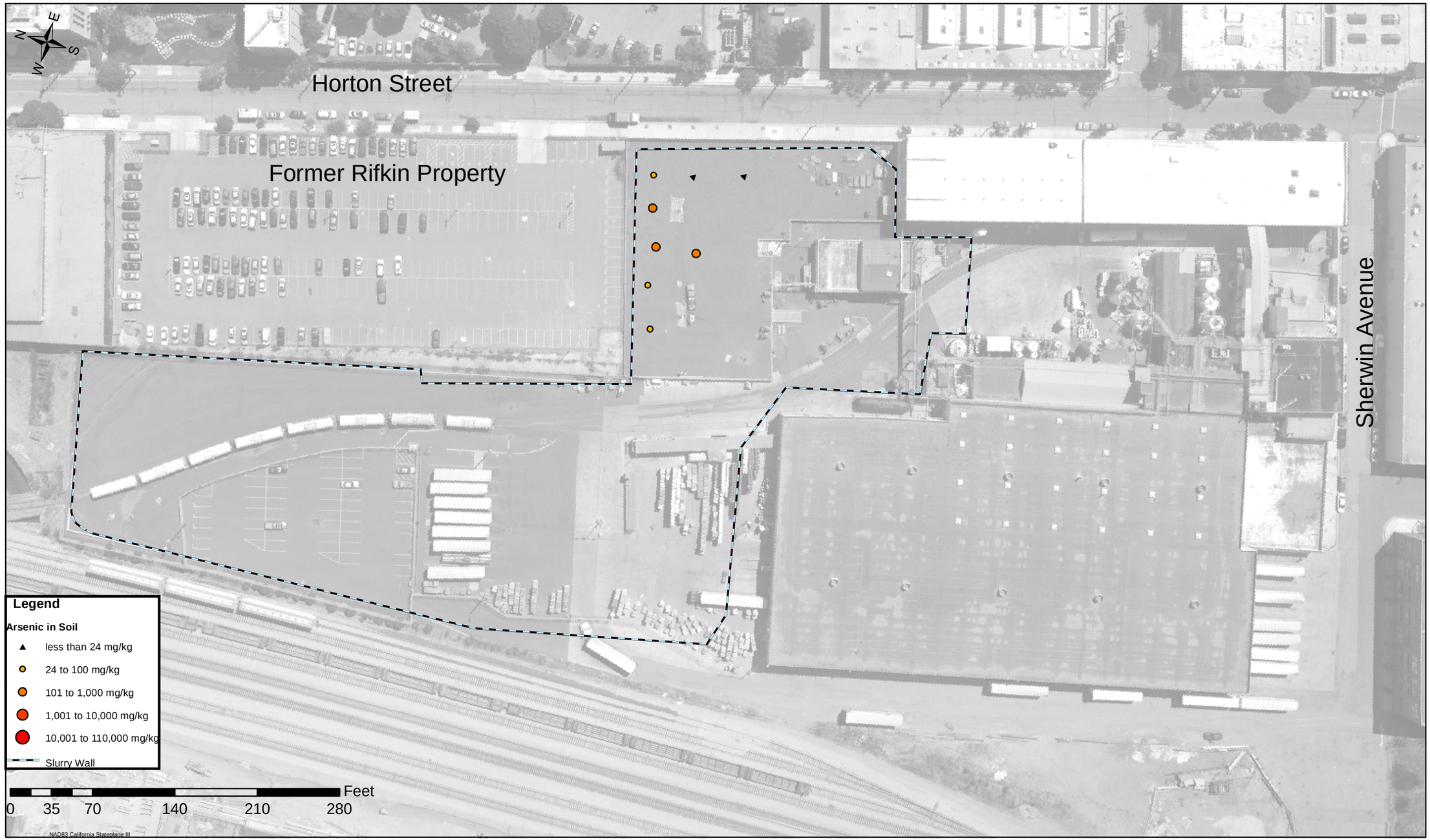


Figure 2-6e
Arsenic in Saturated Soil, -6.5 to -11.5 Feet MSL
Sherwin-Williams Company - Emeryville, California

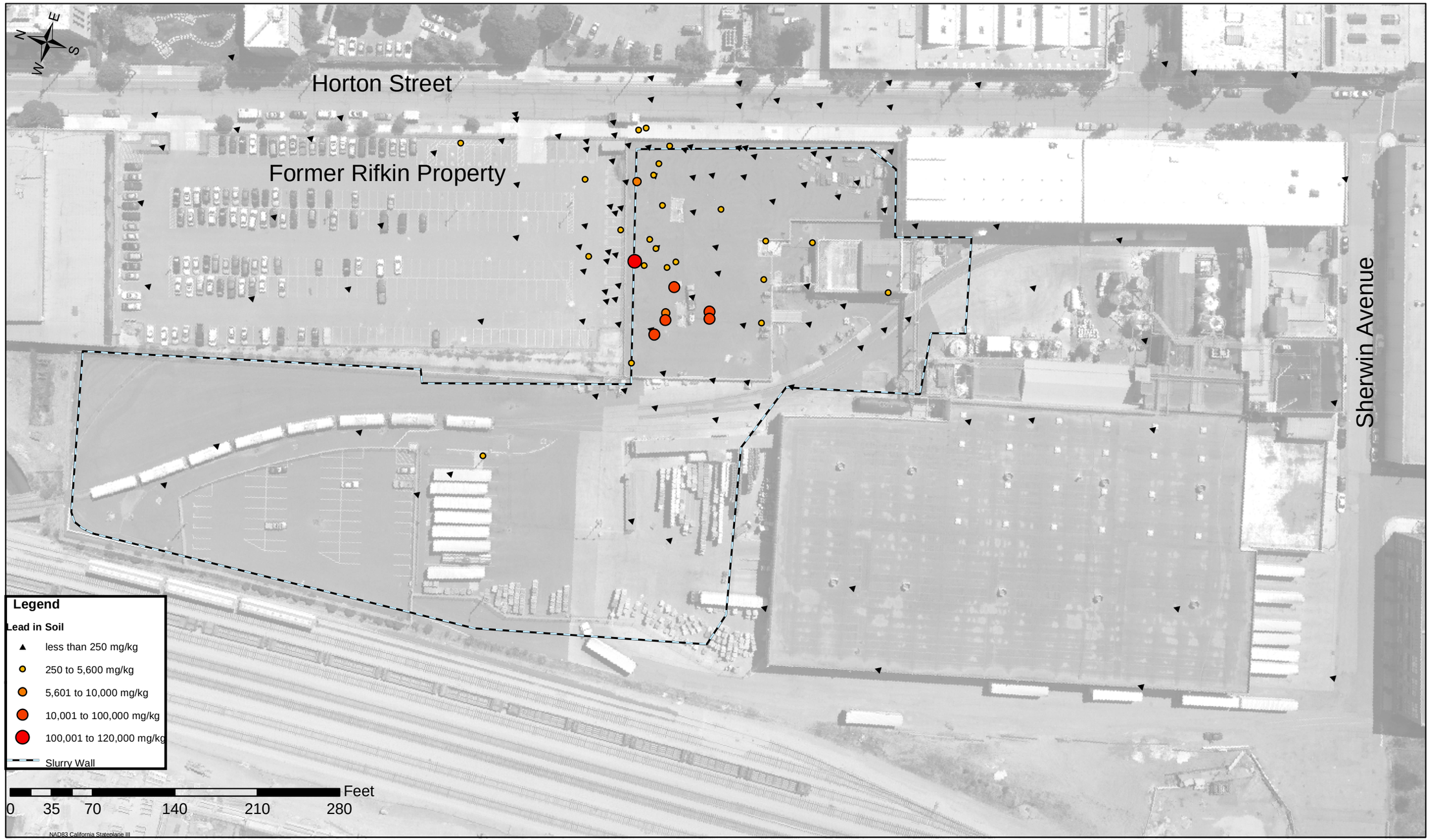
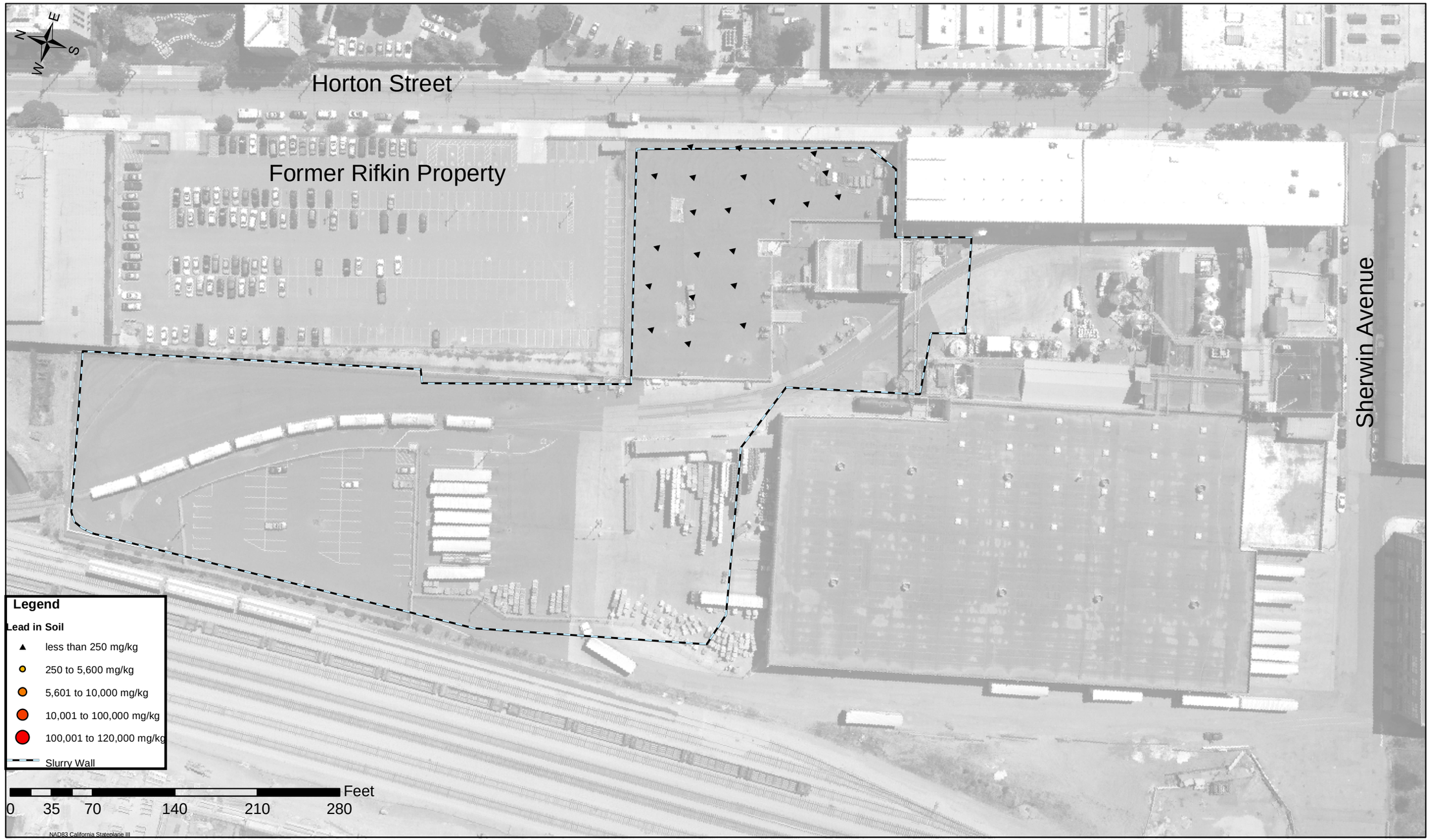


Figure 2-7a
Lead in Vadose Zone Soil
Sherwin-Williams Company - Emeryville, California

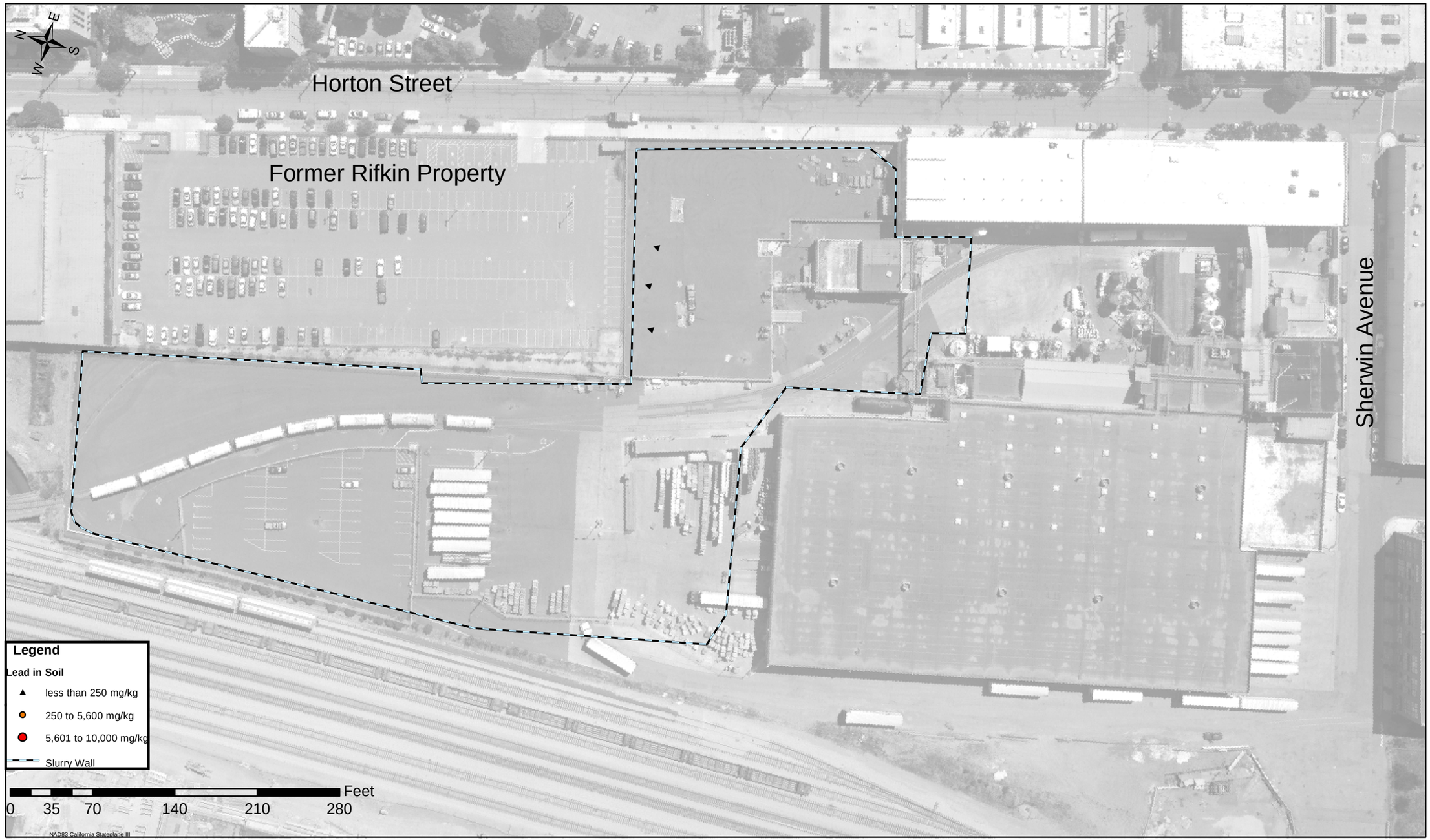
Figure 2-7b
Lead in Saturated Soil, 8.5 to 3.5 feet MSL
Sherwin-Williams Company - Emeryville, California

Figure 2-7c
Lead in Saturated Soil, 3.5 to -1.5 feet MSL
Sherwin-Williams Company - Emeryville, California



CDM

Figure 2-7d
Lead in Saturated Soil, -1.5 to -6.5 feet MSL
Sherwin-Williams Company - Emeryville, California



CDM

Figure 2-7e
Lead in Saturated Soil, -6.5 to -11.5 feet MSL
Sherwin-Williams Company - Emeryville, California

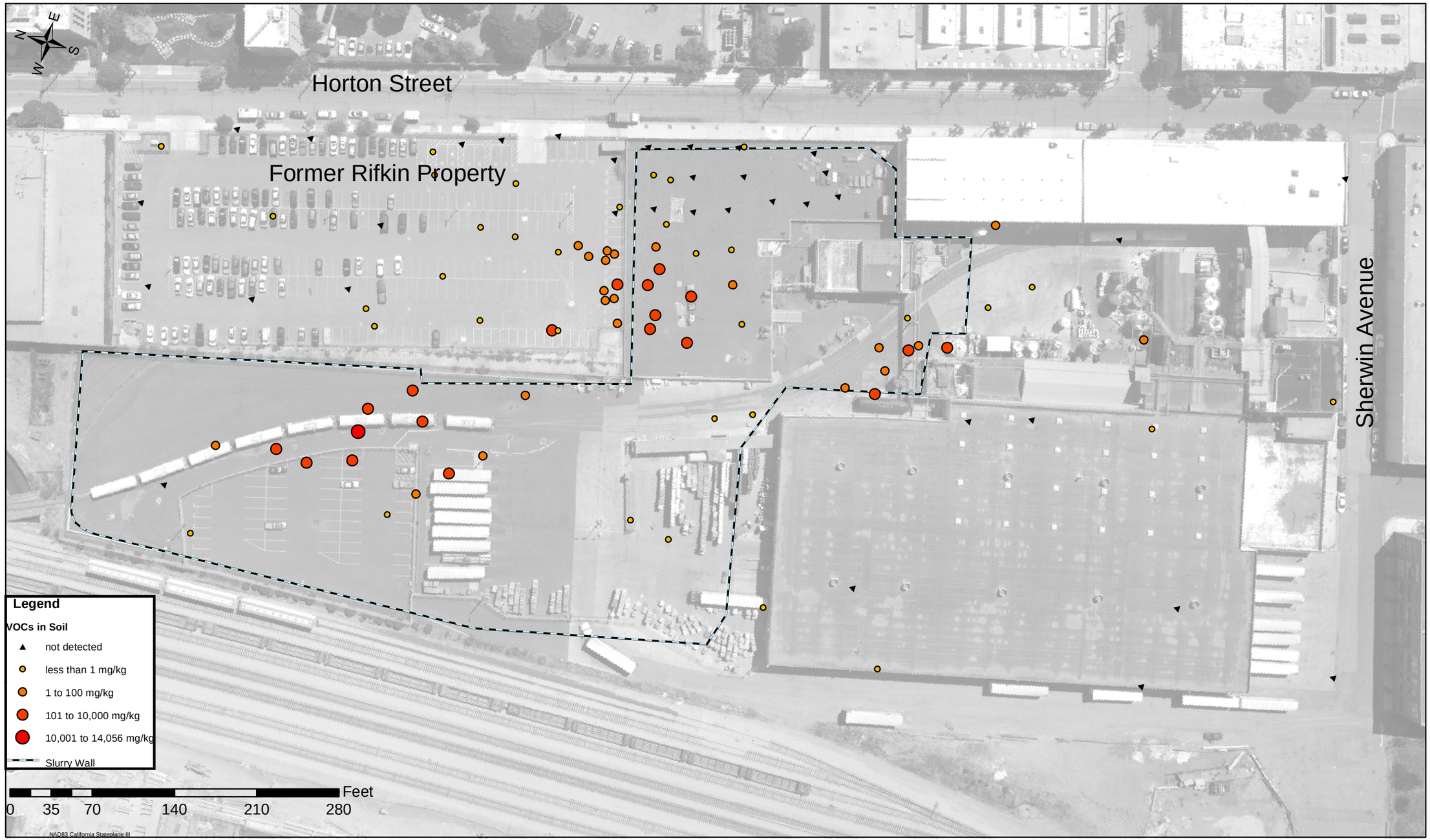


Figure 2-8a
Total Non-Halogenated VOCs in Vadose Zone Soil
Sherwin-Williams Company - Emeryville, California

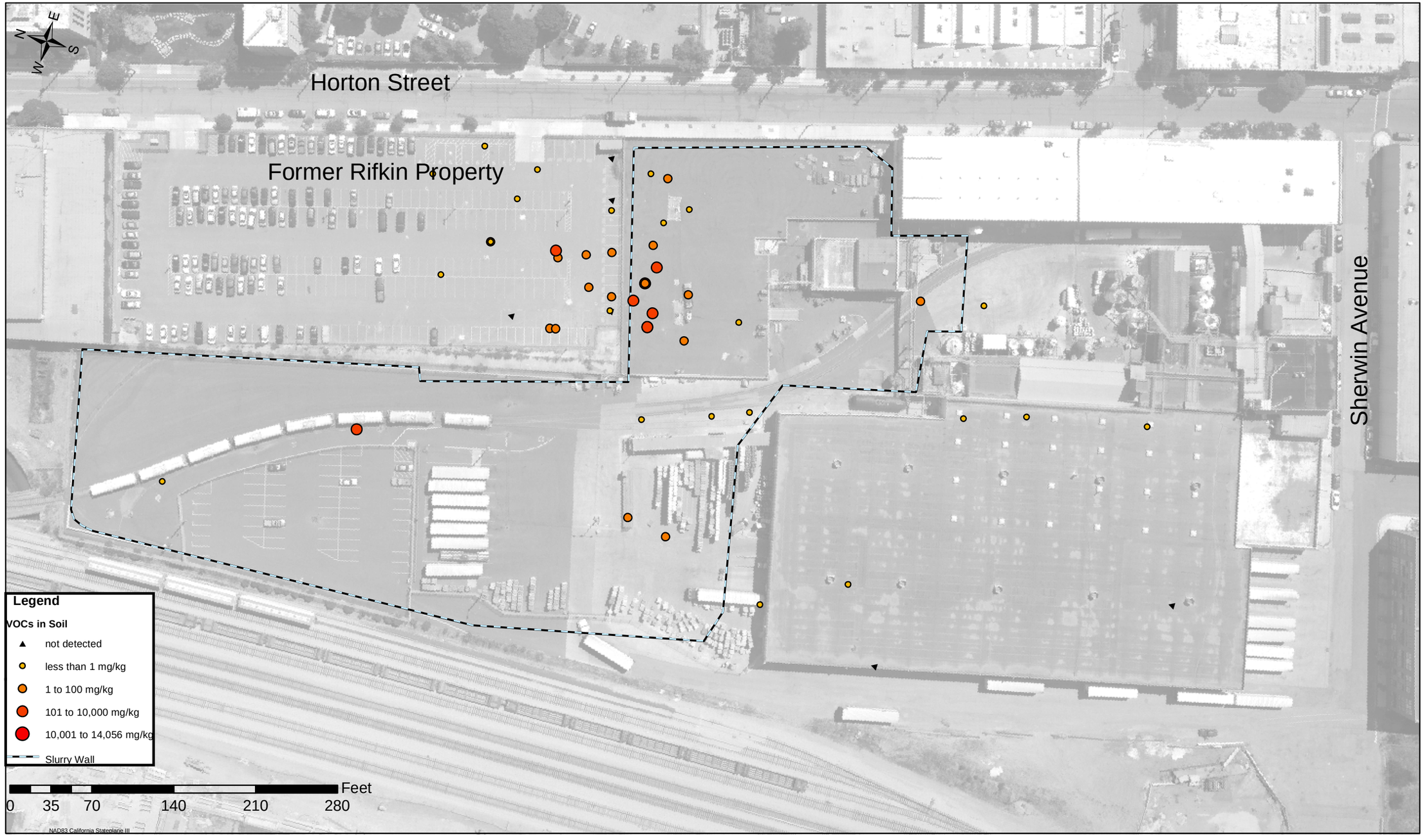


Figure 2-8b
Total Non-Halogenated VOCs in Saturated Soil
Sherwin-Williams Company - Emeryville, California

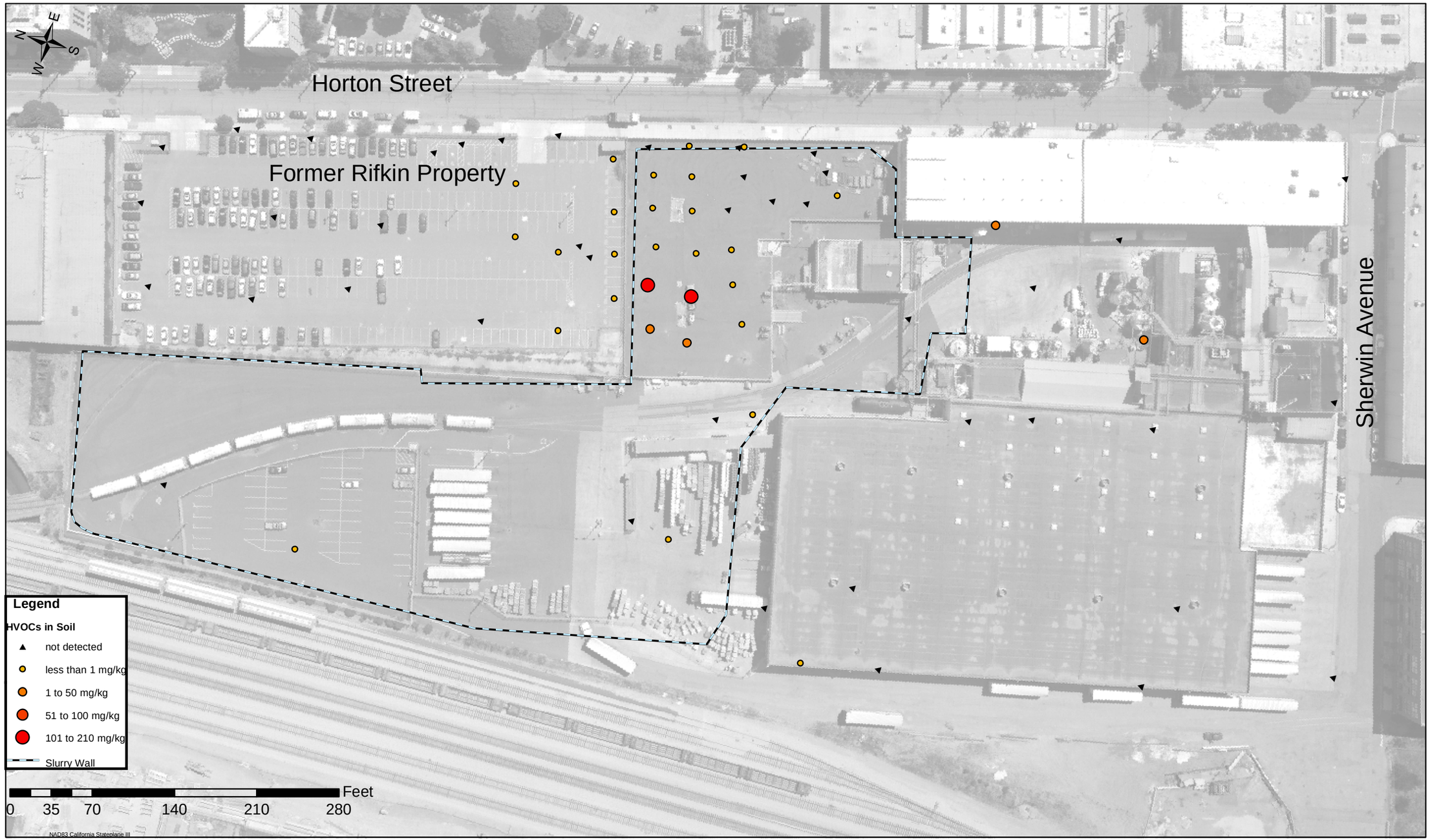
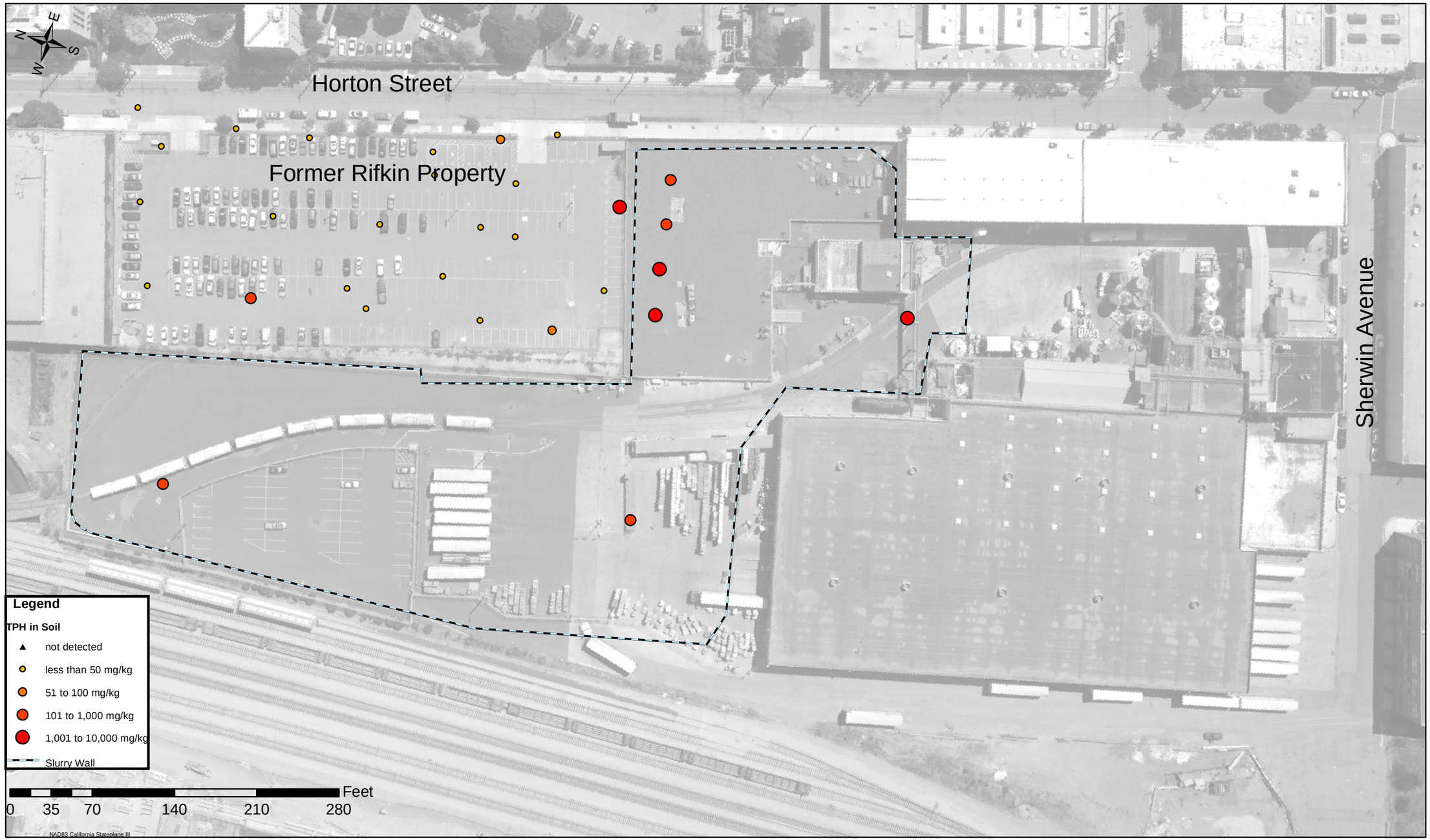


Figure 2-8c
Total Halogenated VOCs in Vadose Zone Soil
Sherwin-Williams Company - Emeryville, California

Figure 2-8d
Total Halogenated VOCs in Saturated Soil
Sherwin-Williams Company - Emeryville, California



CDM

Figure 2-9a
Total TPH in Vadose Zone Soil
Sherwin-Williams Company - Emeryville, California

Figure 2-9b
Total TPH in Saturated Soil
Sherwin-Williams Company - Emeryville, California

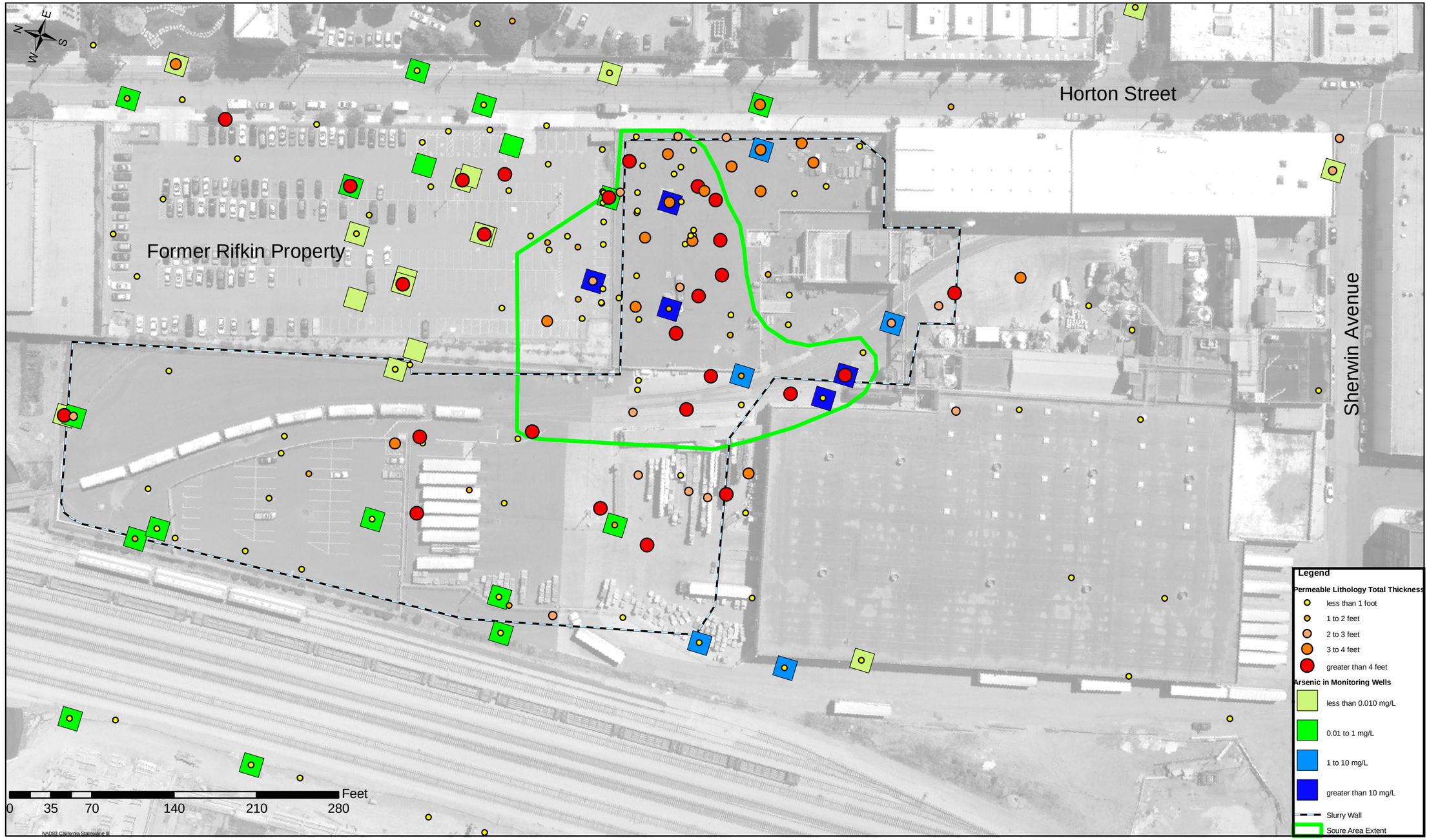


Figure 4-1
Source Area Extent
Sherwin-Williams Company - Emeryville, California

Table 5-1
Summary of Remedial Alternative Elements
Sherwin-Williams Emeryville Feasibility Study

Retained Technology Elements	*Remedial Alternatives*										
	1	*2*	*3A*	*3B*	*3C*	*4A*	*4B*	*5A*	*5B*	*6*	*7*
Land Use Controls - soil, soil gas, groundwater			❍	❍	❍	❍	❍	❍	❍	❍	❍
Soil Technologies											
No Action	❍										
Remove Raised Cap			❍	❍	❍	❍	❍	❍	❍	❍	❍
Install New Cap/Surface			❍	❍	❍	❍	❍	❍	❍	❍	❍
Storm water controls		❍	❍	❍	❍	❍	❍	❍	❍	❍	
Vadose zone excavation - As > 24 mg/kg			❍	❍	❍	❍	❍	❍	❍	❍	❍
Source Area Groundwater Technologies											
No Action	❍	❍									
Groundwater extraction and aboveground treatment/discharge (current system)		❍									
Permeability Reduction - Source Area Saturated Soil				❍							
Interceptor Trench/Drain - Replace sections of existing slurry wall upgradient of source area						❍	❍				
Interceptor Trench/Drain - install downgradient of source area								❍	❍		
Saturated soil excavation - all areas with As > 0.036 mg/L upgradient of interceptor trench/drain						❍	❍	❍	❍		
Saturated soil excavation - source area					❍					❍	❍
Saturated soil excavation - area with As > 0.036 mg/L											❍
Downgradient Groundwater Technologies											
No Action	❍										
Groundwater extraction and aboveground treatment/discharge (current system)		❍									
Extend Slurry Wall			❍	❍	❍	❍	❍	❍	❍	❍	
Passive Treatment - PRB						❍		❍			
Active Treatment - In Place			❍	❍			❍		❍		
Monitored Natural Attenuation for organics	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	
Monitored Natural Attenuation for arsenic					❍					❍	
Long-term Performance Monitoring	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Rifkin Property Soil/Groundwater Technologies											
No Action	❍										
Vadose zone excavation - As > 24 mg/kg			❍	❍	❍	❍	❍	❍	❍	❍	❍
Groundwater extraction and aboveground treatment/discharge (current system)		❍			❍						
Saturated soil excavation - source area			❍	❍		❍	❍	❍	❍	❍	❍
Saturated soil excavation - all areas with As > 0.036 mg/L upgradient of interceptor trench/drain						❍	❍	❍	❍		
Contingency Plan			❍	❍	❍					❍	
Breach Slurry Wall			❍	❍	❍					❍	
Trench installation - slurry wall breach			❍	❍	❍						
Trench installation - B line capture			❍	❍							
Vapor Barrier Contingency			❍	❍	❍					❍	

Figure 5-1
Remedial Alternative 3A: Vadose Zone Excavation/Active In-Situ Groundwater Treatment/Rifkin Excavation/Groundwater Monitoring/LUCs

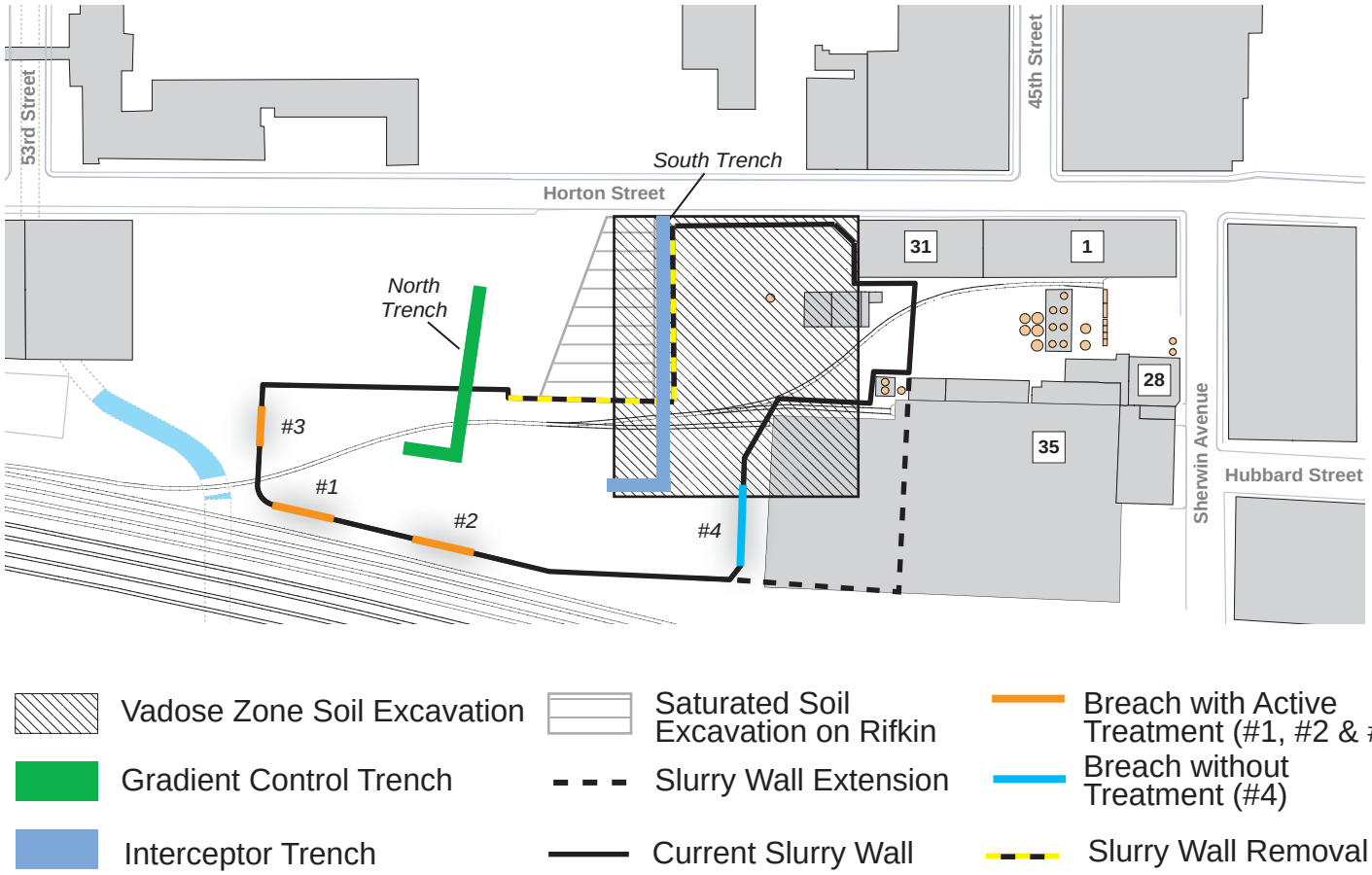
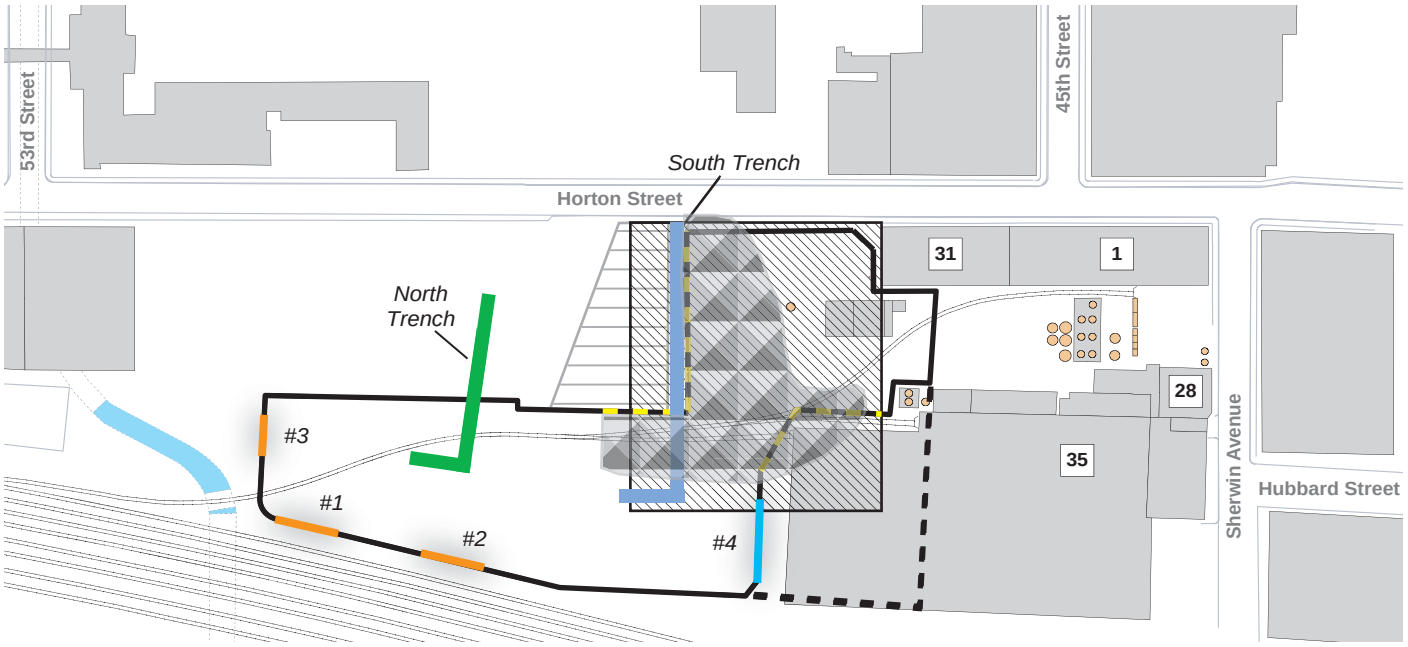
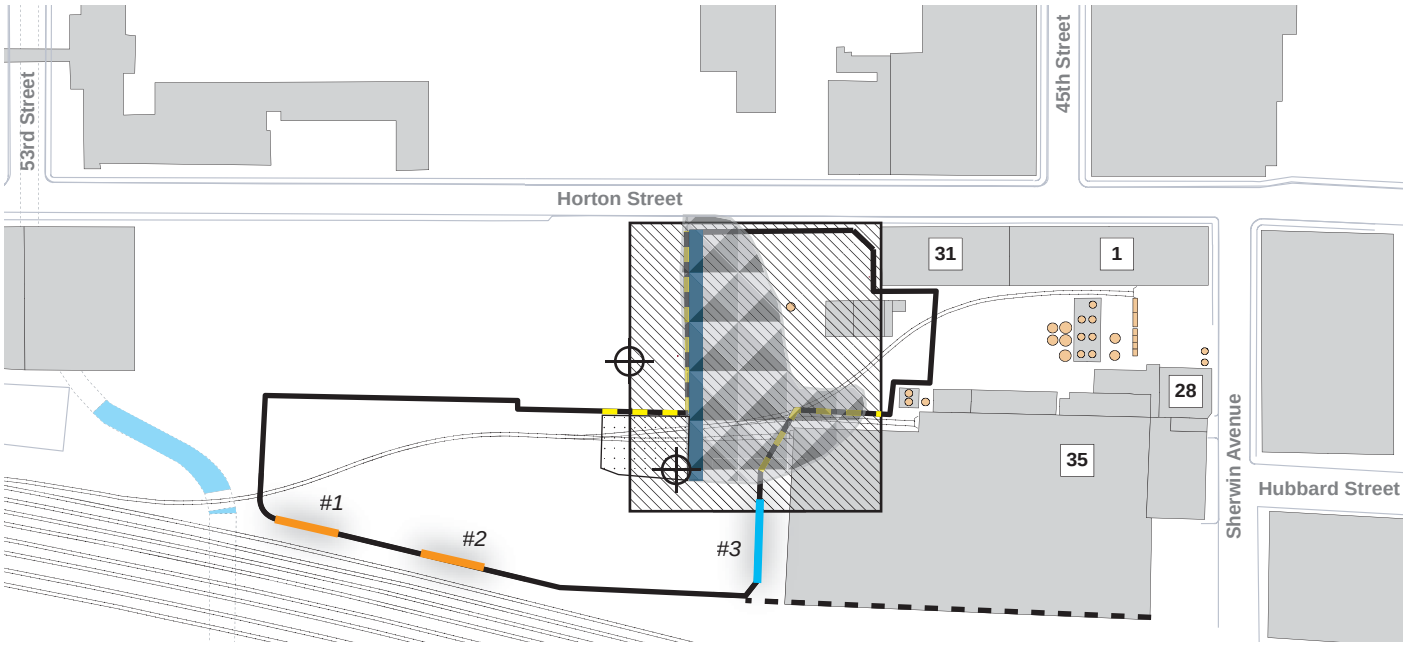


Figure 5-2
Remedial Alternative 3B: Vadose Zone Excavation/S-W Source Area Soil Mixing/ Active In-Situ Groundwater Treatment/Rifkin Excavation/Groundwater Monitoring/LUCs



Saturated Soil Mixing on S-W
Gradient Control Trench
Interceptor Trench
Vadose Zone Soil Excavation
Saturated Soil Excavation on Rifkin
Slurry Wall Extension
Current Slurry Wall
Breach with Active Treatment (#1, #2 & #3)
Breach without Treatment (#4)
Slurry Wall Removal

Figure 5-3
Remedial Alternative 3C: Vadose Zone Excavation/S-W Source Area Excavation/Rifkin Groundwater Extraction and Aboveground Treatment/MNA/Groundwater Monitoring/LUCs



Saturated Soil Excavation on S-W and Low Permeability Backfill

Saturated Soil Excavation on S-W and High Permeability Backfill

Vadose Zone Soil Excavation

Interceptor Trench with Membrane Barrier Along Rifkin Property Boundary

Extraction Well

Slurry Wall Extension

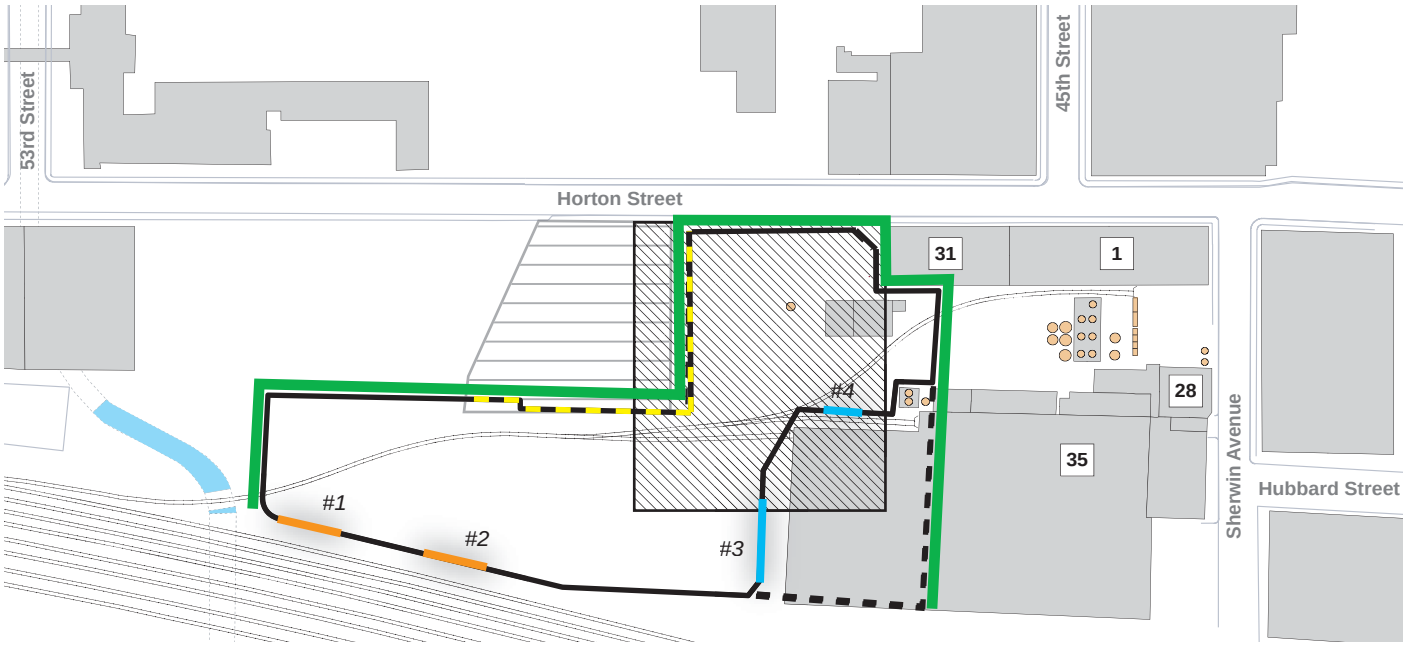
Current Slurry Wall

Breach without Treatment (#1 & #2)

Breach without Treatment (#3)

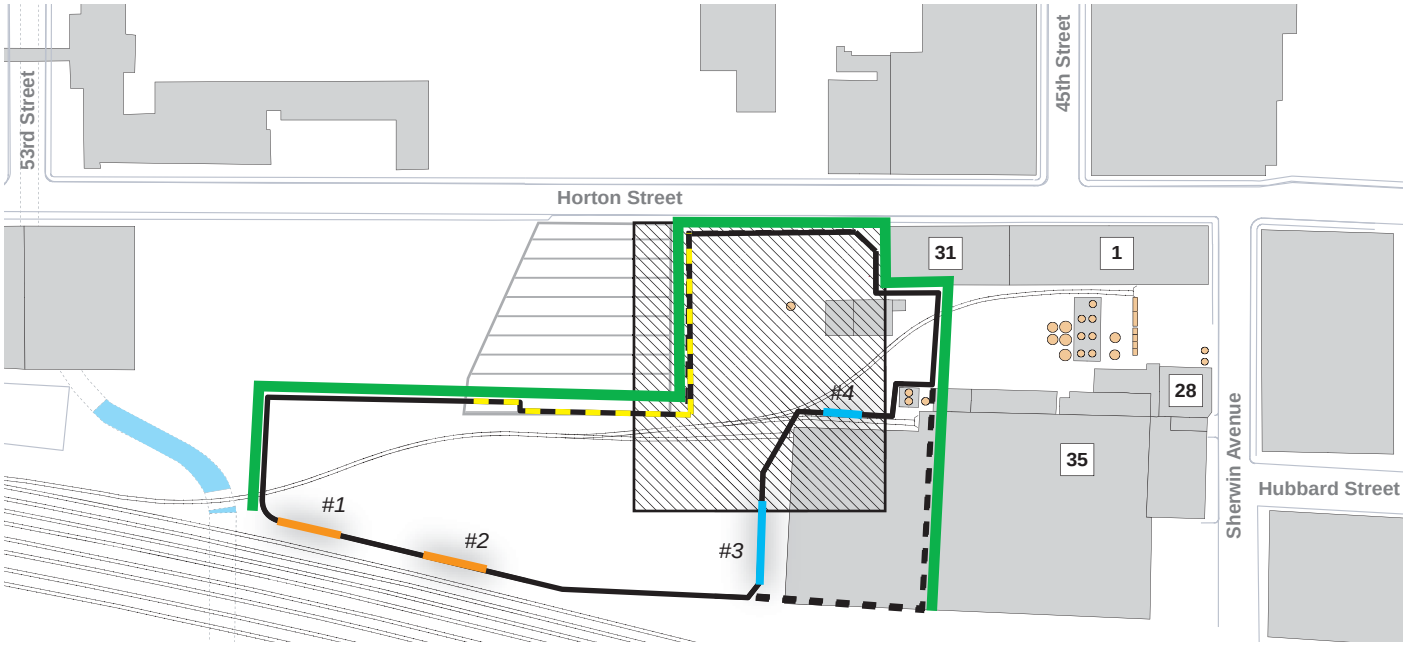
Slurry Wall Removal

Figure 5-4
Remedial Alternative 4A: Vadose Zone Excavation/Upgradient Interceptor Drain Installation/Passive In-Situ Groundwater Treatment/Rifkin Excavation/Groundwater Monitoring/LUCs



Current Slurry Wall
Slurry Wall Extension
Slurry Wall Removal
Saturated Soil Excavation on Rifkin
Interceptor Drain
Vadose Zone Soil Excavation
Breach with Passive Treatment (#1 & #2)
Breach without Treatment (#3 & #4)

Figure 5-5
Remedial Alternative 4B: Vadose Zone Excavation/Upgradient Interceptor Drain Installation/Active In-Situ Groundwater Treatment/Rifkin Excavation/Groundwater Monitoring/LUCs



Current Slurry Wall

Slurry Wall Extension

Slurry Wall Removal

Saturated Soil Excavation on Rifkin

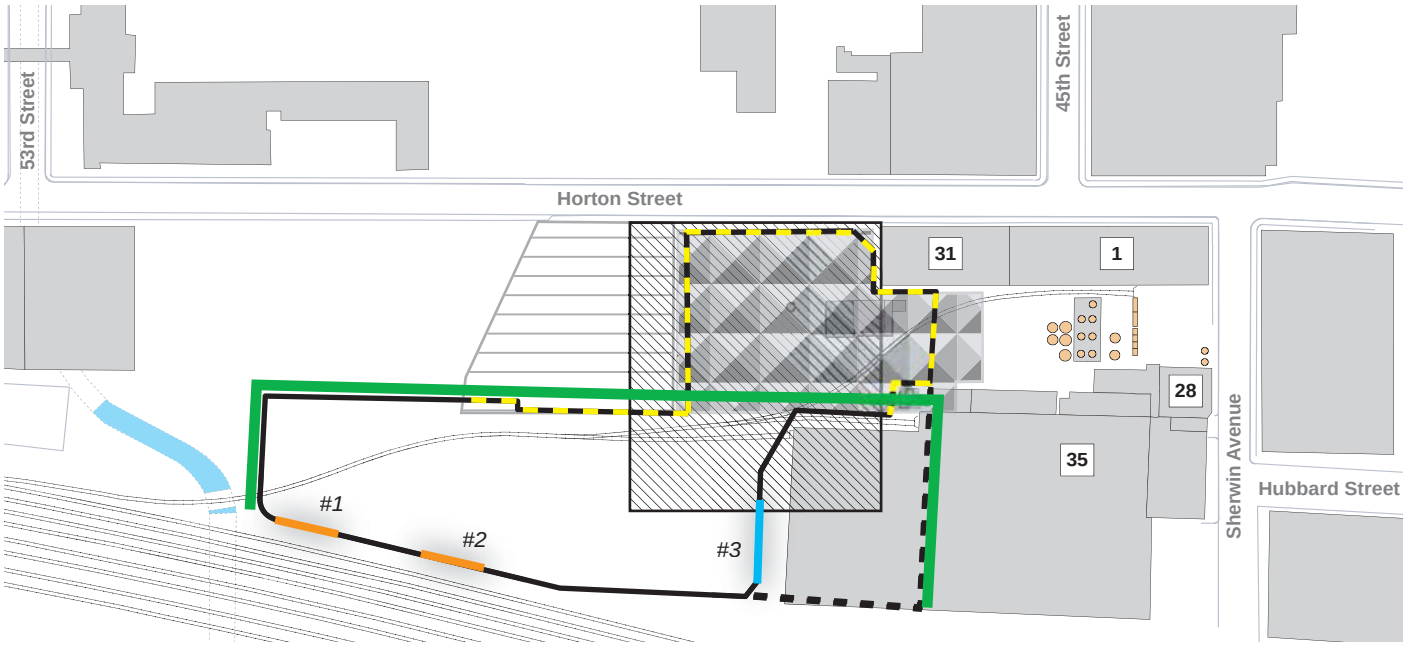
Interceptor Drain

Vadose Zone Soil Excavation

Breach with Active Treatment (#1 & #2)

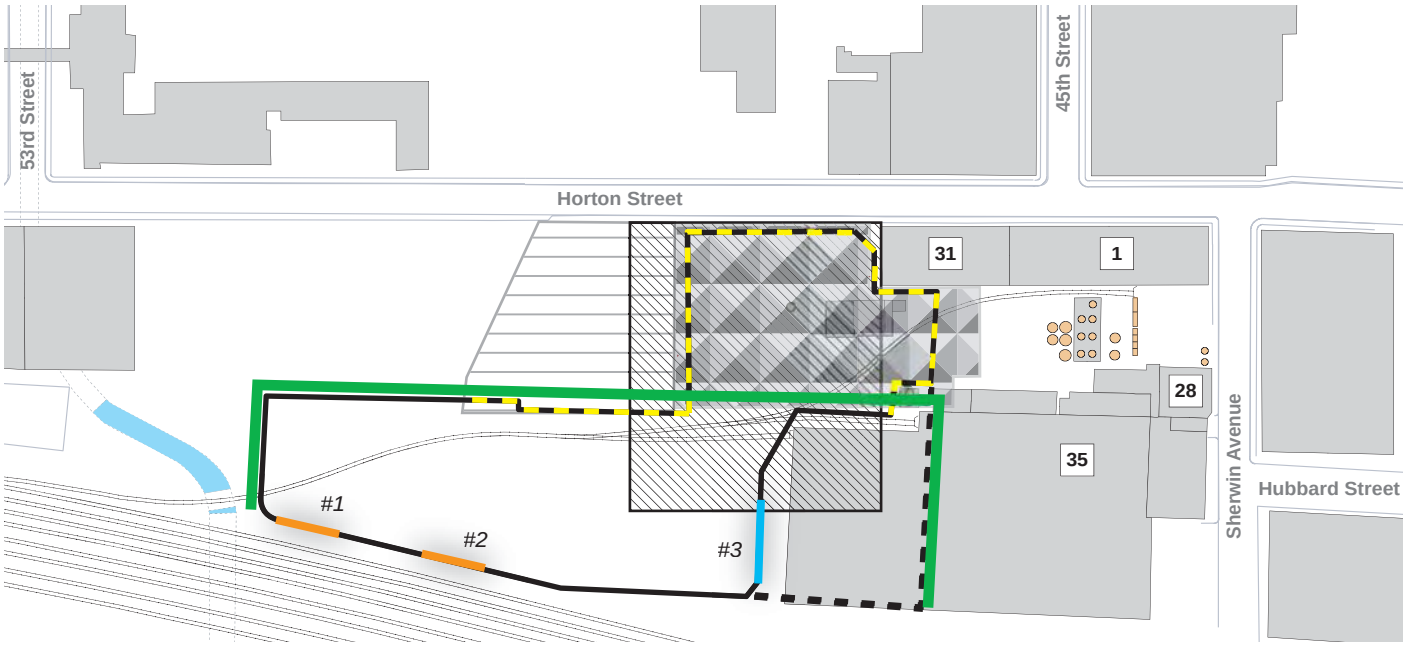
Breach without Treatment (#3 & #4)

Figure 5-6
Remedial Alternative 5A: Vadose Zone Excavation/Excavation Upgradient of Interceptor Drain/Downgradient Interceptor Drain Installation/Passive In-Situ Groundwater Treatment/Rifkin Excavation/Groundwater Monitoring/LUCs



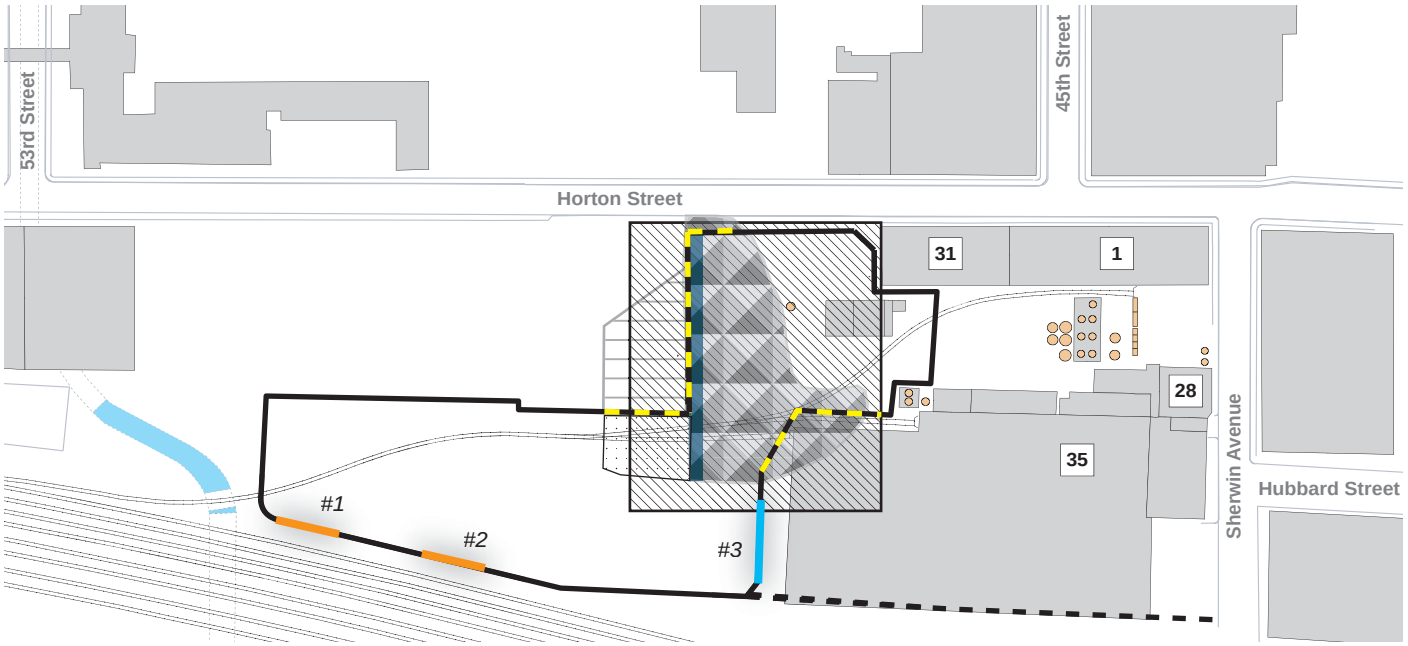
Current Slurry Wall
Slurry Wall Extension
Slurry Wall Removal
Saturated Soil Excavation on Rifkin
Interceptor Drain
Saturated Soil Excavation on S-W
Breach with Passive Treatment (#1 & #2)
Breach without Treatment (#3)
Vadose Zone Soil Excavation

Figure 5-7
Remedial Alternative 5B: Vadose Zone Excavation/Excavation Upgradient of Interceptor Drain/Downgradient Interceptor Drain Installation/Active In-Situ Groundwater Treatment/Rifkin Excavation/Groundwater Monitoring/LUCs



Current Slurry Wall
Slurry Wall Extension
Slurry Wall Removal
Saturated Soil Excavation on Rifkin
Interceptor Drain
Saturated Soil Excavation on S-W
Breach with Active Treatment (#1 & #2)
Breach without Treatment (#3)
Vadose Zone Soil Excavation

Figure 5-8
Remedial Alternative 6: Vadose Zone Excavation/Source Area Excavation/MNA/Groundwater Monitoring/LUCs



Saturated Soil Excavation on S-W and Low Permeability Backfill

Saturated Soil Excavation on S-W and High Permeability Backfill

Saturated Soil Excavation on Rifkin and Low Permeability Backfill

Interceptor Trench with Membrane Barrier Along Rifkin Property Boundary

Slurry Wall Extension

Vadose Zone Soil Excavation

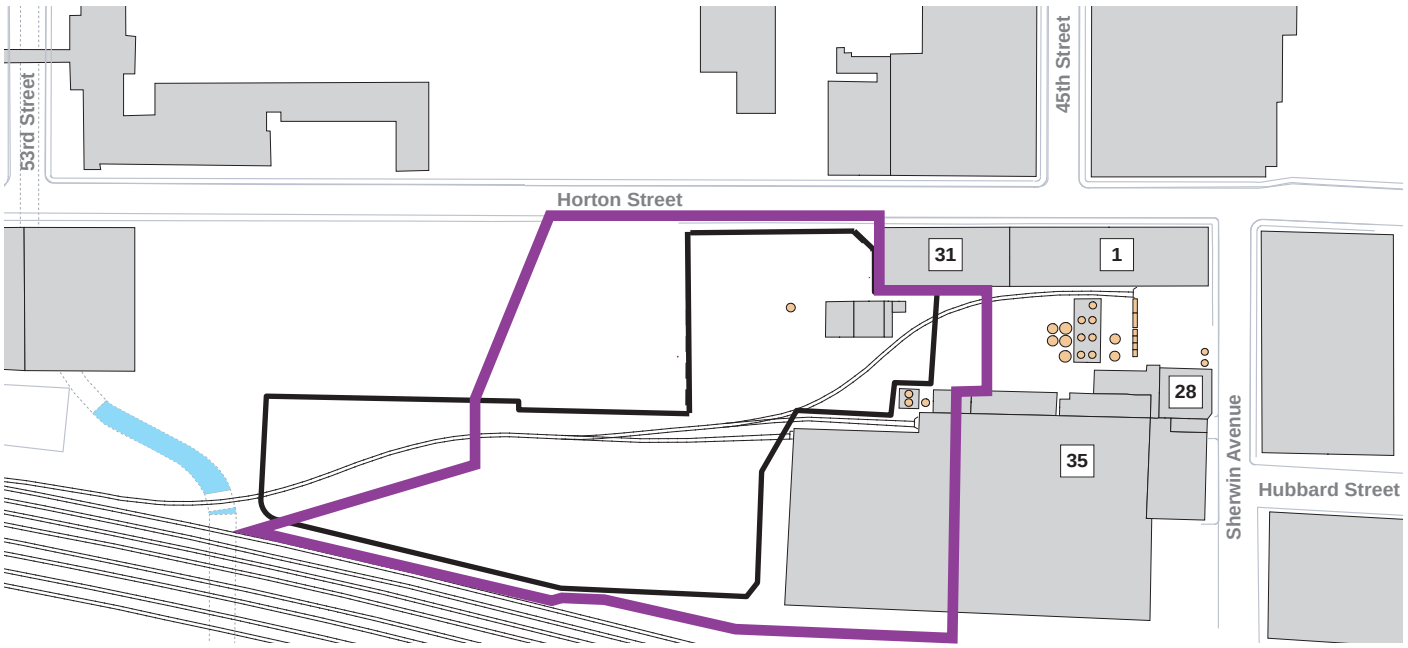
Current Slurry Wall

Breach without Treatment (#1 & #2)

Breach without Treatment (#3)

Slurry Wall Removal With Excavation

Figure 5-9
Remedial Alternative 7: A-Zone Aquifer Excavation/LUCs



A-Zone Aquifer Excavation (vadose and saturated)

Table 7-1
Comparative Analysis of Combined Design Options
Sherwin-Williams Emeryville Feasibility Study

NCP Evaluation Criteria	*Alternative 1 – No Action*	*Alternative 2 – Limited Action*	*Alternative 3A – Vadose Zone Excavation/Active In-Situ Groundwater Treatment/Rifkin Excavation/Groundwater Monitoring/LUCs*	*Alternative 3B – Vadose Zone Excavation/Source Area Soil Mixing/Active In-Situ Groundwater Treatment/Rifkin Excavation/ Groundwater Monitoring/LUCs*
Overall Protection of Human Health and the Environment	No protection of human health and the environment.	Existing asphalt cap eliminates human health exposure pathway and reduces storm water infiltration minimizing potential impacts to downgradient surface waters.	Vadose zone excavation and new surface cover controls human health exposure pathway and reduces storm water infiltration minimizing potential impacts to downgradient surface waters.	Vadose zone excavation and new surface cover controls human health exposure pathway and reduces storm water infiltration minimizing potential impacts to downgradient surface waters.
Compliance with ARARs	Compliant with ARARs.	Compliant with ARARs.	Compliant with ARARs.	Compliant with ARARs.
Long-Term Effectiveness and Permanence	Not effective for achieving RAOs; groundwater PRGs would not be met as plume near CDM-1 would not be contained under this alternative.	Not effective for achieving RAOs; groundwater PRGs would not be met as plume near CDM-1 would not be contained under this alternative.	Requires ongoing OMM to maintain effectiveness of groundwater treatment system. Relies on LUCs for maintaining effectiveness of surface cover and slurry wall containment system.	Requires ongoing OMM to maintain effectiveness of groundwater treatment system. Relies on LUCs for maintaining effectiveness of surface cover and slurry wall containment system.
Reduction of Toxicity, Mobility, and Volume through Treatment	Provides no reduction of toxicity, mobility, or volume through treatment.	Provides limited reduction of mobility through containment. Provides limited reduction in volume through extraction and treatment of groundwater. Provides no change to toxicity of impacted soils and groundwater.	Provides reduction of mobility through containment. Provides limited reduction in volume through treatment of groundwater. Decreases toxicity to human health though removal of impacted vadose zone soils. This alternative leaves more impacted saturated soil in place on S-W and former Rifkin properties than Alternatives 6 and 7.	Provides reduction of mobility through containment and soil mixing. Provides limited reduction in volume through treatment of groundwater. Decreases toxicity to human health though removal of impacted vadose zone soils. Provides larger excavation of impacted soil than 3A. This alternative leaves more impacted saturated soil in place on S-W and former Rifkin properties than Alternatives 6 and 7.
Short-Term Effectiveness	No impacts on community due to lack of additional implementation.	No impacts on community due to lack of additional implementation.	Implementation of Alternative 3A has lower duration and lower excavation volumes than Alternatives 4B, 5B, 6, and 7.	Implementation of Alternative 3B has higher duration and higher excavation volumes than Alternatives 3A.
Implementability	No action to implement.	No additional action to implement.	Implementable, uses standard construction techniques and equipment.	Implementable, uses standard construction techniques and equipment.
Cost: Capital 30 Year NPV at 3%	 $0 $0	 $0 $16,400,00	 $27,700,000 $35,400,000	 $40,300,000 $48,000,000

Table 7-1

Comparative Analysis of Combined Design Options

Sherwin-Williams Emeryville Feasibility Study

NCP Evaluation Criteria	*Alternative 3C – Vadose Zone Excavation/S-W Source Area Excavation/Rifkin Groundwater Extraction and Aboveground Treatment/MNA/Groundwater Monitoring/LUCs*	*Alternative 6 – Vadose Zone Excavation/Source Area Excavation MNA/ Groundwater Monitoring/ LUCs*	*Alternative 7 – A-Zone Aquifer Excavation/ LUCs*
Overall Protection of Human Health and the Environment	Vadose zone and S-W source area excavation and new S-W surface cover and existing Rifkin asphalt cover controls human health exposure pathway and reduces storm water infiltration minimizing potential impacts to downgradient surface waters.	Vadose zone and source area excavation and new surface cover controls human health exposure pathway and reduces storm water infiltration minimizing potential impacts to downgradient surface waters.	Vadose zone and source area excavation and new surface cover controls human health exposure pathway and reduces storm water infiltration minimizing potential impacts to downgradient surface waters.
Compliance with ARARs	Compliant with ARARs.	Compliant with ARARs, except S-W and Novartis settlement agreement.	Compliant with ARARs, except S-W and Novartis settlement agreement.
Long-Term Effectiveness and Permanence	Requires ongoing OMM to maintain effectiveness of groundwater extraction and treatment system for former Rifkin property.	No elements requiring OMM. Relies on LUCs for maintaining effectiveness of surface cover and slurry wall containment system.	No elements requiring OMM. Removes all impacted soil from the Site.
Reduction of Toxicity, Mobility, and Volume through Treatment	Provides reduction of mobility through containment and S-W source area removal. Decreases toxicity to human health though removal of impacted vadose zone soils. This alternative leaves less impacted saturated soil in place on S-W and former Rifkin properties than Alternatives 3A and 3B.	Provides reduction of mobility through containment and source area removal. Decreases toxicity to human health though removal of impacted vadose zone soils. This alternative leaves less impacted saturated soil in place on S-W and former Rifkin properties than Alternatives 3A, 3B, and 3C.	Provides reduction of mobility through containment and source area removal. Decreases toxicity to human health though removal of impacted vadose zone soils. This alternative provides for maximum removal of impacted saturated soil; removes all impacted soil from the Site.
Short-Term Effectiveness	Implementation of Alternative 3C has lower duration and lower excavation volumes than Alternatives 6 and 7.	Implementation of Alternative 6 has lower duration and lower excavation volumes than Alternative 7.	This alternative has the highest duration and excavation volumes and would cause the highest impacts on community during construction.
Implementability	Implementable, uses standard construction techniques and equipment.	Implementable, uses standard construction techniques and equipment.	Implementable, uses standard construction techniques and equipment.
Cost: Capital 30 Year NPV at 3%	 $34,500,000 $41,100,000	 $37,900,000 $42,400,000	 $103,000,000 $107,000,000

Appendix C
Determination of Chemicals of Potential Concern

Appendix C. Maximum Detected Chemical Levels in Site Soils and COPC Selection Criteria[a]

Distinct Chemical Analyte Detected	Maximum Concentration (mg/kg)	COPC Selection Criterion	COPC	
1,2,4-Trimethylbenzene	210	2004 sampling maximum concentration exceeded USEPA Region 9 PRG[b]	Y (new)	
1,2-Dichloroethane	0.039	2004 sampling maximum concentration exceeded USEPA Region 9 PRG	Y (new)	
1,2-Dichloropropane	2.5	Max. concentration yielded hazard quotient > 1 in Johnson & Ettinger model	Y (new)	*
1,3,5-Trimethylbenzene (Mesitylene)	28	2004 sampling maximum concentration exceeded USEPA Region 9 PRG	Y (new)	
2,4-Dimethylphenol	5.2	Did not exceed USEPA Region 9 PRGs	--	
2-Butanone	270	Did not exceed USEPA Region 9 PRGs	--	*
2-Hexanone	0.12	No USEPA Region 9 PRGs; Did not exceed USEPA Region 3 RBCs[c]	--	
2-Methylnaphthalene	21	No USEPA Region 9 PRGs; Did not exceed USEPA Region 3 RBCs	--	*
4-Chloroaniline	0.2	Exceeded USEPA Region 9 PRG	Y	
4-Methyl-2-Pentanone (MIBK)	350	Max. concentration yielded hazard quotient > 1 in Johnson & Ettinger model	Y (new)	*
4-Methylphenol	2	Did not exceed USEPA Region 9 PRGs	--	
Acenaphthene	0.27	Did not exceed USEPA Region 9 PRGs	--	*
Acetone	2200	Exceeded USEPA Region 9 PRG	Y	
Anthracene	0.36	Did not exceed USEPA Region 9 PRGs	--	
Antimony	1200	Exceeded USEPA Region 9 PRG	Y	
Arsenic	110,000	Selected in concentration/toxicity screen	Y	
Barium	6700	Exceeded USEPA Region 9 PRG	Y	
Benzene	0.054	Exceeded USEPA Region 9 PRG	Y	
Benzo(a)anthracene	0.45	Exceeded USEPA Region 9 PRG	Y	
Benzo(b)fluoranthene	0.38	Exceeded USEPA Region 9 PRG	Y	
Benzo(b,k)fluoranthene	0.51	Exceeded USEPA Region 9 PRG	Y	
Beryllium	0.9	Did not exceed USEPA Region 9 PRGs	--	
Bis(2-ethylhexyl) phthalate	8.1	Did not exceed USEPA Region 9 PRGs	--	
Cadmium	47	Exceeded USEPA Region 9 PRG	Y	
Chromium	71	Exceeded USEPA Region 9 PRG	Y	
Chrysene	0.63	Did not exceed USEPA Region 9 PRGs	--	*
Cobalt	72	Did not exceed USEPA Region 9 PRGs	--	
Copper	6000	2004 sampling maximum concentration exceeded USEPA Region 9 PRG	Y (new)	
Cresol (ortho)	2	Did not exceed USEPA Region 9 PRGs	--	
Dibenzofuran	0.33	Did not exceed USEPA Region 9 PRGs	--	*
Di-n-butyl phthalate	0.7	Did not exceed USEPA Region 9 PRGs	--	
Ethylbenzene	520	Exceeded USEPA Region 9 PRG	Y	
Fluoranthene	2.6	Did not exceed USEPA Region 9 PRGs	--	
Fluorene	0.82	Did not exceed USEPA Region 9 PRGs	--	*
Iron	22,000	Did not exceed USEPA Region 9 PRGs	--	
Isopropylbenzene	1.2	Did not exceed USEPA Region 9 PRGs	--	*
Lead	58,000	Selected in concentration/toxicity screen	Y	
Mercury	76	2004 sampling maximum concentration exceeded USEPA Region 9 PRG	Y (new)	
Methylene chloride	0.43	Did not exceed USEPA Region 9 PRGs	--	*
Molybdenum	3.1	Did not exceed USEPA Region 9 PRGs	--	
Naphthalene	11	Exceeded USEPA Region 9 PRG	Y	
n-Butylbenzene	2.2	Did not exceed USEPA Region 9 PRGs	--	*
Nickel	130	Upper bound regional background level in soil (270 mg/kg) not exceeded	--	
n-Nitrosodiphenylamine	1.9	2004 sampling maximum concentration exceeded USEPA Region 9 PRG	Y (new)	
n-Propylbenzene	11	Did not exceed USEPA Region 9 PRGs	--	
PCBs (total)	2.1	Detected once; No history of PCB contamination; professional judgment	--	
p-Cymene	1.6	No appropriate screening levels available; food additive; professional judgment	--	
Phenanthrene	4.4	No appropriate screening levels available; included as professional judgment	Y	
Phenol	4.6	Did not exceed USEPA Region 9 PRGs	--	
Pyrene	2	Did not exceed USEPA Region 9 PRGs	--	*
sec-Butylbenzene	1.4	Did not exceed USEPA Region 9 PRGs	--	*
Selenium	40	Exceeded USEPA Region 9 PRG	Y	
Silver	4.6	Exceeded USEPA Region 9 PRG	Y	
tert-Butylbenzene	0.018	Did not exceed USEPA Region 9 PRGs	--	*
Tetrachloroethene	0.2	Exceeded USEPA Region 9 PRG	Y	
Thallium	6	2004 sampling maximum concentration exceeded USEPA Region 9 PRG	Y (new)	
Toluene	14,000	Exceeded USEPA Region 9 PRG	Y	
Trichloroethene	0.0091	2004 sampling maximum concentration exceeded USEPA Region 9 PRG	Y (new)	

Appendix C. Maximum Detected Chemical Levels in Groundwater Underlying the Site and COPC Selection Criteria[a]

Distinct Chemical Analyte Detected	Maximum Concentration (µg/L)	COPC Selection Criterion	COPC	
1,1,1-Trichloroethane	2.9	Did not exceed USEPA Region 9 PRGs	--	*
1,1-Dichloroethane	1.1	Did not exceed USEPA Region 9 PRGs	--	*
1,1-Dichloroethene	1.9	Did not exceed USEPA Region 9 PRGs	--	*
1,2,3-Trichloropropane	17	Exceeded USEPA Region 9 PRG	Y	
1,2,4-Trimethylbenzene	630	Exceeded USEPA Region 9 PRG	Y	
1,2-Dichlorobenzene	1.5	Did not exceed USEPA Region 9 PRGs	--	*
1,2-Dichloroethane	240	Exceeded USEPA Region 9 PRG	Y	
1,2-Dichloropropane	200	Exceeded USEPA Region 9 PRG	Y	
1,3,5-Trimethylbenzene (Mesitylene)	210	Exceeded USEPA Region 9 PRG	Y	
2-Butanone	85,000	Exceeded USEPA Region 9 PRG	Y	
2-Chlorotoluene	0.5	Did not exceed USEPA Region 9 PRGs	--	
2-Hexanone	67	No USEPA Region 9 PRG; Did not exceed USEPA Region 3 RBC[c]	--	
4-Methyl-2-Pentanone (MIBK)	46,000	Exceeded USEPA Region 9 PRG	Y	
Acetone	190,000	Exceeded USEPA Region 9 PRG	Y	
Arsenic	964,000	Selected in concentration/toxicity screen	Y	
Barium	83	Did not exceed USEPA Region 9 PRGs	--	
Benzene	640	Exceeded USEPA Region 9 PRG	Y	
Bromobenzene	5.9	Did not exceed USEPA Region 9 PRGs	--	
Carbon disulfide	530	Did not exceed USEPA Region 9 PRGs	--	
Chlorobenzene	7.9	Did not exceed USEPA Region 9 PRGs	--	*
Chloroethane	1	Did not exceed USEPA Region 9 PRGs	--	*
Chloroform	4.3	Exceeds 2004 Region 9 PRG; Did not exceed former PRG	Y (new)	
cis-1,2-Dichloroethene	48	Did not exceed USEPA Region 9 PRGs	--	*
Cobalt	110	Did not exceed USEPA Region 9 PRGs	--	
Copper	12	Did not exceed USEPA Region 9 PRGs	--	
Ethylbenzene	4500	Exceeded USEPA Region 9 PRG	Y	
Iron	130,000	Exceeded USEPA Region 9 PRG	Y	
Isopropylbenzene	51	Did not exceed USEPA Region 9 PRGs	--	*
Manganese	14,000	Exceeded USEPA Region 9 PRG	Y	
Methyl tert butyl ether	15	Exceeded USEPA Region 9 PRG	Y	
Naphthalene	390	Exceeded USEPA Region 9 PRG	Y	
n-Butylbenzene	28	Did not exceed USEPA Region 9 PRGs	--	*
Nickel	210	Did not exceed USEPA Region 9 PRGs	--	
n-Propylbenzene	61	Did not exceed USEPA Region 9 PRGs	--	*
p-Cymene	15	No appropriate screening levels available; food additive; professional judgment	--	
sec-Butylbenzene	9.5	Did not exceed USEPA Region 9 PRGs	--	*
Selenium	8.5	Did not exceed USEPA Region 9 PRGs	--	
Styrene	1.7	Did not exceed USEPA Region 9 PRGs	--	*
tert-Butylbenzene	25	Did not exceed USEPA Region 9 PRGs	--	*
Tetrachloroethene	5.1	Exceeded USEPA Region 9 PRG	Y	
Toluene	95,000	Exceeded USEPA Region 9 PRG	Y	
trans-1,2-Dichloroethene	26	Did not exceed USEPA Region 9 PRGs	--	*
Trichloroethene	18	Exceeded USEPA Region 9 PRG	Y	
Vinyl acetate	65	Did not exceed USEPA Region 9 PRGs	--	*
Vinyl chloride	17	Exceeded USEPA Region 9 PRG	Y	
Xylenes (total)	13,400	Exceeded USEPA Region 9 PRG	Y	
Zinc	13,000	Exceeded USEPA Region 9 PRG	Y	

Appendix D
Statement of Reasons

Appendix D
Statement of Reasons

Pursuant to California Health and Safety Code (HSC) section 25356.1(e), the California Environmental Protection Agency, Department of Toxic Substances Control (DTSC) has prepared this Statement of Reasons as part of the Remedial Action Plan (RAP) for the S-W property located at 1450 Sherwin Avenue in Emeryville, California and a portion of the adjacent former Rifkin property, located at 4525 – 4563 Horton Street, to which hazardous substances have migrated from the S-W property. Collectively the S-W property and this portion of the former Rifkin property are referred to as the "Site" within this document.

California Health and Safety Code Section 25356.1(d) outlines six additional criteria that need to be addressed for the recommended remedial alternative. As these criteria are addressed within the nine U.S. EPA criteria, a separate analysis has not been conducted.

Appendix E
Non-Binding Allocation of Responsibility

Appendix E
Preliminary Non-Binding Allocation of Responsibility

Health and Safety Code (HSC) section 25356.1(e) requires the Department of Toxic Substances Control (DTSC) to prepare a preliminary nonbonding allocation of responsibility (the "NBAR") among all identifiable potentially responsible parties (PRPs). HSC section 25356.3(a) allows PRPs with an aggregate allocation in excess of 50% to convene an arbitration proceeding by submitting to binding arbitration before an arbitration panel. If PRPs with over 50% of the allocation convene arbitration, then any other PRP wishing to do so may also submit to binding arbitration.

The sole purpose of the NBAR is to establish which PRPs will have an aggregate allocation in excess of 50% and can therefore convene arbitration if they so choose. The NBAR, which is based on the evidence available to DTSC, is not binding on anyone, including PRPs, DTSC, or the arbitration panel. If a panel is convened, its proceedings are de novo and do not constitute a review of the provisional allocation. The arbitration panel's allocation will be based on the panel's application of the criteria spelled out in HSC section 25356.3(c) to the evidence produced at the arbitration hearing. Once arbitration is convened, or waived, the NBAR has no further effect, in arbitration, litigation or any other proceeding, except that both the NBAR and the arbitration panel's allocation are admissible in a court of law, pursuant to HSC section 25356.7 for the sole purpose of showing the good faith of the parties who have discharged the arbitration panel's decision.

DTSC sets forth the following preliminary nonbinding allocation of responsibility for the Sherwin-Williams site located at 1450 Sherwin Avenue in Emeryville, Alameda County, California:

Sherwin-Williams operated at the Site since the early 1900s, manufacturing various types of coating products until the facility closed in December 2006. Lead-arsenate pesticides were also manufactured at the Site from the 1920s until the late 1940s. Site sampling data indicate that releases occurred on the Site during the manufacturing process, releasing chemicals into the soil at certain locations on the Site. Therefore, this NBAR allocates 100% of the responsibility for addressing contamination at the Site to The Sherwin-Williams Company.

Appendix F

California Environmental Quality Act Documentation

CALIFORNIA ENVIRONMENTAL QUALITY ACT
INITIAL STUDY

The Department of Toxic Substances Control (DTSC) has completed the following document for this project in accordance with the California Environmental Quality Act (CEQA) [Pub. Resources Code, div. 13, § 21000 et seq.] and accompanying Guidelines [Cal. Code Regs., tit. 14, § 15000 et seq.].

PROJECT TITLE: **Approval of Sherwin-Williams Site Draft Remedial Action Plan**		**CALSTARS CODING:** **200956-00**
PROJECT ADDRESS: 1450 Sherwin Avenue, and 4525 – 4563 Horton Street	**CITY:** Emeryville	**COUNTY:** Alameda County
PROJECT SPONSOR: The Sherwin-Williams Company	**CONTACT:** Larry Mencin	**PHONE:** 216 566-1768

APPROVAL ACTION UNDER CONSIDERATION BY DTSC:

☒ **Remedial Action Plan**

STATUTORY AUTHORITY:

☐ California H&SC, Chap. 6.5 ☒ California H&SC, Chap. 6.8 ☐ Other (specify):

DTSC PROGRAM/ ADDRESS: 700 Heinz Avenue, Berkeley, CA 94710-2721	**CONTACT:** Janet Naito	**PHONE:** 510 540-3833

PROJECT DESCRIPTION:

The California Department of Toxic Substances Control (DTSC) proposes to approve the Draft Remedial Action Plan (RAP) for the former Sherwin-Williams Company (S-W) Site located at 1450 Sherwin Avenue in Emeryville, California. **Figure 1** shows the location of the S-W site. The Draft RAP proposes a cleanup plan for soil and groundwater containing chemicals in concentrations above Preliminary Remediation Goals (PRGs). The proposed cleanup activities include a combination of: excavation of unsaturated-zone soil; excavation of source area soil within the shallow groundwater; monitored natural attenuation of arsenic and volatile organic compounds (VOCs) within the shallow groundwater; groundwater monitoring; and Land Use Controls (LUCs).

The recommended remedial alternative in the Draft RAP consists of:

- Excavation and offsite disposal of approximately 60,000 cubic yards of soil and debris containing arsenic; lead; and/or VOCs above site screening levels:. The planned limits of soil excavation extend approximately 285 feet along Horton Street (60 feet on the former Rifkin property and 225 feet on the S-W property) and approximately 330 feet west of Horton Street to a depth of up to 30 feet below the ground surface;

- Stockpiling of excavated soil and debris in prepared onsite areas;
- Loading of excavated soil and debris into containers (e.g., trucks, bins, rail cars) for offsite disposal;
- Importing backfill soil. Soil would be tested to ensure that it does not contain chemicals of concern above Site cleanup goals prior to bringing the material onsite;
- Extending the existing slurry wall along the southwestern Sherwin-Williams property boundary;
- Removing portions of the existing slurry wall to facilitate groundwater movement;
- Removing up to 50 groundwater monitoring wells that are no longer needed or are located within the proposed excavation area and installing a minimum of 12 permanent groundwater monitoring wells following the completion of backfilling activities;
- Conducting periodic groundwater monitoring and submitting reports documenting the results to the DTSC; and
- Recording land use restrictions that run with the land to ensure that future development of the Site incorporates physical protections against exposure to or release of remaining environmental hazards, and to require non-interference with and ongoing operation and maintenance of any remediation systems.

The project has to be implemented in accordance with all applicable federal, State and local requirements. Project elements necessary to implement these actions are discussed throughout this document and include:

- Obtaining City of Emeryville grading permits to conduct the soil excavation and backfilling activities;
- Complying with the City of Emeryville Noise Ordinance with respect to work hours;
- Complying with the Emeryville Urban Forestry Ordinance (Title 7, Chapter 10 of the Emeryville City Code) if tree removal is required;
- Removing pavement to expose the underlying soil;
- Installing shoring to stabilize excavations. The procedures to be used for shoring installation, and the locations where shoring is required, are discussed in Section 6, Geology and Soils, and in Section 11, Noise and Vibration;
- Dewatering of excavations to facilitate soil excavation below groundwater table. Procedures for removing, treating, and discharging water from the excavation are discussed in Section 8, Hydrology and Water Quality;
- Treating water generated during dewatering activities using the existing groundwater treatment system or a new groundwater treatment system and discharging the treated water to the storm drain under an existing Water Board permit;

- Extracting soil vapor containing VOCs from soil, prior to and during excavation activities and treating the soil vapor under a permit from the Bay Area Air Quality Management District. The procedures for installing and operating the vapor capture and treatment system are discussed in Section 3, Air Quality, and in Attachment D;
- Installing a roadway along the western site boundary;
- Abandoning and installing groundwater wells under permit from the Alameda County Department of Environmental Health. Shallow wells would be removed by overdrilling, deeper wells may be abandoned by pressure grouting in accordance with Alameda County requirements;
- Controlling dust, VOCs and odor utilizing dust, soil vapor extraction and odor control measures while excavation activities are occurring, pursuant to a Dust and Vapor Control Plan (DVCP), to control levels of dust and VOCs released during remedial activities. These controls would be implemented in accordance with the procedures outlined in the *Public Health Evaluation of the Remedial Alternative* (PHERA) (CDM, 2009b) and in the Bay Area Air Quality Management District's CEQA Guidelines (BAAQMD, 1999). The PHERA is included as Attachment D to this document;
- Monitoring compliance with the DVCP by establishing air monitoring stations around the Site and collecting and analyzing air samples in accordance with the Dust and Vapor Control Plan. The proposed locations for the air monitoring stations are illustrated on Figure 3;
- Implementing storm water pollution control procedures in accordance with Best Management Practices (BMPs) as outlined in the Storm Water Pollution Prevention Plan (SWPPP) approved by the San Francisco Bay Regional Water Quality Control Board (Water Board). Storm water control procedures to be implemented during construction activities are discussed in Section 8, Hydrology and Water Quality;
- Conducting work pursuant to a site-specific health and safety plan (HASP) prepared to meet the California Division of Occupational Safety and Health **(**Cal/OSHA) requirements by the contractor performing the work. Section 7, Hazards and Hazardous Materials, includes discussion of the exposure risks and an evaluation of accidental releases;
- Using workers who meet the Cal/OSHA training requirements to implement the remedial plan; and
- Utilizing licensed hazardous waste haulers and hazardous waste manifests to transport any soil classified as hazardous waste to a Class 1 Waste Management Unit (WMU).

It is anticipated that these actions would be implemented during a six-month period beginning in the Spring of 2010.

The Project includes contingency actions that would be implemented if future groundwater monitoring results indicate increasing chemical concentrations or groundwater flow directions other than anticipated. While specific contingent actions are not fully designed at this time, implementation of such contingent actions could include: additional soil excavation; installation of subsurface barriers; additional monitoring or groundwater extraction and treatment of the extracted groundwater.

Project Background

The Sherwin-Williams site consists of S-W property located at 1450 Sherwin Avenue and a portion of the adjacent former Rifkin property, located at 4525-4563 Horton Street in Emeryville, California. Manufacturing operations at the S-W property were conducted from the 1920s until

December 2006. The plant manufactured a wide variety of paints/coatings including oil-based paints until 1987, and water-based paints until 2006. In addition, pesticides containing lead and arsenic were also manufactured at the plant from around the 1920s until the late 1940s. In December 2006, S-W discontinued its operations and decommissioned the manufacturing plant. In the fall 2007, S-W demolished former structures on the S-W property to the ground level, with the exception of two historic buildings and the groundwater treatment system facilities.

S-W continues to own the property. The Site is paved and fenced. Two buildings (Buildings 1 and 31) are classified as "Tier 1 Architecturally Significant Building" by the City of Emeryville. **Figure 2** shows the location of these two buildings. The groundwater treatment system facilities also remain on the property.

The Water Board provided oversight for the site investigation and remediation activities until early 2006, when DTSC assumed responsibility for oversight. DTSC is overseeing the remediation activities at this Site pursuant to Imminent or Substantial Endangerment Determination and Order and Remedial Action Order, Docket No. 05/06-007.

Beginning in the late 1980s, remedial investigations were initiated to delineate chemically-affected soils and groundwater that resulted from historic releases during manufacturing operations. The investigations determined that chemically-affected soils and groundwater at the S-W property extended onto a portion of the adjacent former Rifkin property, located at 4525 – 4563 Horton Street. **Figure 2** shows the location of the former Rifkin property. The former Rifkin property is currently owned by Novartis Vaccines and Diagnostics, Inc. (Novartis). As noted, the S-W property and this portion of the former Rifkin property are referred to collectively as the "Site" in this document.

Between 1993 and 1995, the Water Board required installation of interim remedial measures (IRMs) to control off-site migration of chemically-affected groundwater until a final remedy could be implemented for the Site. The IRMs are still operating at the Site and they include a surface cap, storm water collection system, subsurface slurry wall, and groundwater extraction and treatment (GWET) system.

The slurry wall was constructed around chemically-affected soils within the S-W property and minimizes the migration of chemically-affected groundwater to off-site areas. The slurry wall extends from approximately five feet below ground surface to a minimum of three feet into the underlying bay mud. The surface cap and storm water collection system reduce infiltration of storm water runoff into chemically-affected soils. The surface cap also prevents physical contact with the chemically-affected subsurface soil and groundwater. The GWET system pumps groundwater from inside the slurry wall and from a portion of the adjacent former Rifkin property to contain it within these areas and to minimize its potential migration to off-site areas. This groundwater is then treated before it is discharged to the Temescal Creek Channel under a permit from the Water Board.

On May 7, 2009, the Department of Toxic Substances Control (DTSC) approved the *Feasibility Study* (FS) for the Site (CDM, 2009a). The Feasibility Study evaluates different feasible alternatives for addressing the chemicals found in soil and groundwater underlying the site and recommends a preferred alternative. The Feasibility Study evaluated a number of different alternatives including:

- **Alternative 1** – No Action. This alternative serves as a baseline for comparison to other alternatives and was not selected as it was not protective of public health or the environment;
- **Alternative 2** – Limited Action. This alternative would continue the operation of the interim remedial measures. It was not being recommended as it would allow contaminated groundwater outside of the slurry wall to continue to migrate and would significantly impact future uses of the property;
- **Alternative 3A** – Vadose Zone Excavation/Active *In-Situ* Groundwater Treatment/Rifkin Excavation/Groundwater Monitoring/ Land Use Controls. This alternative required ongoing operations and maintenance of a groundwater treatment system, and left more impacted saturated soil in place than Alternatives 6 and 7;
- **Alternative 3B** – Vadose Zone Excavation/S-W Source Area Soil Mixing/Active *In-Situ* Groundwater Treatment/Rifkin Excavation /Groundwater Monitoring/ Land Use Controls. This alternative was more costly than 3A and still left more impacted saturated soil in place than Alternatives 6 and 7;
- **Alternative 3C** – Vadose Zone Excavation/S-W Source Area Excavation/Rifkin Groundwater Extraction and Aboveground Treatment/ Monitored Natural Attenuation of Arsenic in Groundwater/ Groundwater Monitoring/ Land Use Controls. This alternative removed impacted saturated soil from the S-W property but left impacted soil in-place on the former Rifkin property and required long-term operation and maintenance of a groundwater extraction and treatment system.
- **Alternative 6** – Vadose Zone Excavation/Source Area Excavation/Monitored Natural Attenuation of Arsenic in Groundwater/Groundwater Monitoring/Land Use Controls. Alternative 6, described above in the Project Description, is the preferred alternative because it calls for more removal of impacted saturated soil than prior numbered alternatives, and does not require a long-term operation and maintenance of groundwater extraction and treatment.
- **Alternative 7** – A-Zone Aquifer Excavation/LUCs. This alternative was not selected because it has the highest duration of construction disruption to the community due to the excavation of the entire impacted vadose and saturated zone soils. The significant incremental cost and disruption would not provide a commensurate improvement in human health and environmental protection.

Alternative 6 is the recommended alternative as it provides the best combination of overall protection to both human health and the environment, and long-term effectiveness and permanence. It removes the source of arsenic to groundwater, providing assurance for long-term protection of ecological receptors and for groundwater downgradient of the Site.

The *Draft Remedial Action Plan* (RAP) summarizes the FS, recommends a final remedy and discusses its proposed implementation activities, hereafter referred to as the “proposed project” or “project” in this document.

ENVIRONMENTAL IMPACT ANALYSIS:

1. Aesthetics

Project Activities Likely to Create an Impact:

- Soil excavation and backfilling activities may be visible for a six month period from the surrounding commercial and residential properties.
- Removal of the Raised Cap area.
- Truck and vehicle traffic across Park Avenue and Halleck Street.

Description of Baseline Environmental Conditions:

The Site is paved and fenced, with two buildings (Buildings 1 and 31) and the groundwater treatment system facilities remaining on the property. The two buildings are classified as "Tier 1 Architecturally Significant Buildings" by the City of Emeryville. A portion of the site adjacent to Horton Street (Raised Cap Area) is elevated approximately three feet above the surface elevation of the adjacent areas. This area is shown on Figure 2. Groundwater monitoring wells are installed flush with the ground surface. Groundwater extraction wells are installed below grade within traffic rated Christie boxes.

The Site is located in a mixed land use area with commercial, industrial, and residential properties on nearby and adjacent parcels (see Figure 2). The surroundings are characterized as follows:

- **To the west:** Union Pacific Railroad main line tracks; vacant former Union Pacific Railroad (UPRR) Parcel D currently owned by the City of Emeryville and currently used for construction staging for the City's Park Avenue improvement project.

- **To the north:** Former Chiron Corporation headquarters and research/manufacturing facilities, currently owned by Novartis and leased by Bayer Pharmaceuticals, beyond a surface-level parking lot immediately north of the S-W property (i.e., the former Rifkin property).

- **To the east:** Horton Street, across which are 45th Street Artists' Co-op live-work studios, as well as the former Shell development property (currently South BGR property leased by Novartis). Bayer Pharmaceuticals occupies one building between the parking area and the Artist Co-op building for manufacturing operations.

- **To the south:** Sherwin Avenue, across which is a warehouse (leased by Bayer), multi-story residential lofts (Emeryville Lofts, Blue Star Corner Condominiums).

The City of Emeryville is implementing the Park Street Beautification project, which includes Park Street between Halleck Street and Hollis Street, and Horton Street, between 40th Street and 45th Street.

Analysis as to whether or not project activities would:

a. Have a substantial adverse effect on a scenic vista.

Impact Analysis:

No scenic resources exist in proximity to the Site; therefore the project activities would not create a significant impact to scenic resources.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☐ Less Than Significant Impact
☒ **No Impact**

b. Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings and historic buildings within a state scenic highway.

Impact Analysis:
The nearest scenic highway is a 10.6 mile stretch of Highway 580 from the San Leandro city limit to State Route 24 in Oakland between Posts R34.545 and 45.151 (Caltrans, 2009). The Site is located over a mile from this feature.

No scenic resources exist in proximity to the Site; therefore the project activities would not create a significant impact to scenic resources.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☐ Less Than Significant Impact
☒ **No Impact**

c. Substantially degrade the existing visual character or quality of the site and its surroundings.

Impact Analysis:

The existing visual character is defined by industrial, commercial and residential structures one to three stories high and open views of paved parking and industrial storage areas, active rail tracks, and a multi-story parking garage and cinema complex. Construction equipment and project activities would be temporary and would not result in permanent changes to the existing visual character of the Site surroundings. Removal of the Raised Cap would lower the ground surface elevation in that area, restoring it back to its original grade. The elevation change would be permanent, but less than significant as the final elevation would be closer to surrounding properties.

The City of Emeryville is implementing the Park Street Beautification project, which includes Park Street between Halleck Street and Hollis Street, and Horton Street, between 40th Street and 45th Street. This street project will terminate at the western extension of Park Avenue at the confluence with the preferred truck route. Impacts may arise from legally loaded truck traffic travelling along the preferred route over the newly finished street.

Mitigation of these potential impacts may be necessary (e.g., via placement of cushioning materials over the top of the intersection surfacing).

Conclusion:

☐ Potentially Significant Impact
☒ Potentially Significant Unless Mitigated
☐ Less Than Significant Impact
☐ No Impact

d. Create a new source of substantial light or glare that would adversely affect day or nighttime views in the area.

Impact Analysis:

Project activities would be conducted during weekday daylight hours. There would not be any new sources of substantial light or glare that would adversely affect day or nighttime views in the area. The project is limited to the remediation of soil and groundwater. No permanent structures, including light sources would be introduced to the project area as a result of the remediation. Vehicle or hand-held lighting used by on-site security staff during implementation of the project activities would not constitute a new source of substantial light or glare. Therefore, the project would not change existing day or nighttime views with respect to light or glare either temporarily or permanently.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☐ Less Than Significant Impact
☒ **No Impact**

2. Agricultural Resources

Project Activities Likely to Create an Impact:

None.

Description of Baseline Environmental Conditions:

The Site is situated entirely within an area defined as “urban and built-up land” in the California Department of Conservation (DOC) Alameda County Important Farmland 2008 map (DOC, 2008a). Nearby and adjacent properties are also classified with this designation. There are no Williamson Act Lands depicted within the City of Emeryville on the DOC Williamson Act Lands Map for Alameda County that shows lands enrolled in the Williamson Act and Farmland Security Zone Contracts as of January 1, 2008 (DOC, 2008b). The nearest Williamson Act land is a non-prime agricultural land located over 12 miles away from the Site. The Site area is an urban environment that includes industrial and residential land uses. The Site has been used for over 80 years for manufacturing purposes.

Analysis as to whether or not project activities would:

a. Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland) as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use.

Impact Analysis:

The project involves remediation of contaminated soils from an industrial facility in an urbanized area. No farmland of any type exists on or within nine miles of the Site (DOC, 2008a), and the activities associated with the project would not have the potential to affect any farmland or other agricultural resources. The proposed project would not remove any farmland from active production or otherwise adversely affect or contribute to cumulative impacts on farmland.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☐ Less Than Significant Impact
☒ **No Impact**

b. Conflict with existing zoning or agriculture use, or Williamson Act contract.

Impact Analysis:

The California Land Conservation Act, commonly referred to as the Williamson Act, enables local governments to enter into contracts with private landowners for the purpose of restricting specific parcels of land to agriculture or related open space use. Landowners benefit by receiving lower property tax assessments on their Williamson Act lands over set periods of time – typically ten years. No Williamson Act Lands are identified in the area on the California Department of Conservation website (DOC, 2008b). As no Williamson Act contract lands or other agricultural lands are present in the project vicinity, the project would not affect such resources. The proposed project would not contribute to cumulative impacts on Williamson Act contract lands or other agricultural properties and all project activities would be consistent with existing zoning.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☐ Less Than Significant Impact
☒ **No Impact**

c. Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural uses.

Impact Analysis:

The Site is not a Farmland and has not been operated by S-W for agricultural use; it has been used for manufacturing since the 1920s. The activities associated with the project would result in limited, temporary excavations at an industrial site. After completion of the project, the Site would be restored to pre-project conditions and would not change the land uses on-site in any way. Therefore, there would be no potential to cause, directly or

indirectly, conversion of farmland to non-agricultural use. As a result, no direct or cumulative impacts to farmland would occur as a result of this project.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☐ Less Than Significant Impact
☒ **No Impact**

3. Air Quality

Project Activities Likely to Create an Impact:

The Project has the potential to generate dust and organic vapors.

- Removal of paving and the Raised Cap area;
- The excavation, stockpiling, loading and transport of contaminated soils and debris;
- Reducing the size of concrete rubble within the "concrete processing area;"
- Backfilling and grading the soil excavation;
- Extracting and treating soil vapors;
- Addition of a maximum of approximately 228 vehicles/truck trips per day, including personnel, construction vehicles, vehicles and trucks delivering supplies, trucks used to transport excavated soil to an appropriately permitted offsite disposal facility, and trucks used to transport backfill material to the site.
- Adding rail cars to trains to transport contaminated soil to an appropriately permitted offsite disposal facility and to transport backfill material to the site.
- Use of diesel-powered equipment during the project activities. The diesel equipment includes excavators, front end loaders, backhoes, trucks, and possibly diesel-electric locomotives. Such emissions would include oxides of nitrogen (NOx), volatile organic compounds (VOCs), particulate matter up to 10 microns in diameter (PM_{10}), particulate matter up to 2.5 microns in diameter ($PM_{2.5}$), and carbon dioxide (CO_2).

Description of Baseline Environmental Conditions:

The project is located within the San Francisco Bay Area Air Basin, which encompasses a nine-county region including all of Alameda, Contra Costa, Santa Clara, San Francisco, San Mateo, Marin and Napa Counties and the southern portion of Solano and Sonoma Counties.

The Site lies on the eastern shore of San Francisco Bay and normally is exposed to marine air from the west. Wind measurements taken at the National Weather Service (NWS) San Francisco Surface Monitoring Station (San Francisco Airport) indicate that the wind originates out of the west, west-northwest, and northwest approximately 55 percent of the time. In the Emeryville area, late-summer winds are predominantly from the west. Light winds are frequent

in the area with approximately one-third of the readings recording wind speed less than 3 miles per hour (mph). Average yearly temperature is approximately 60 degrees Fahrenheit.

The on-site meteorological station data collected between August 2002 and July 2007 confirmed a predominantly on-shore wind direction from the west northwest, with average wind speeds of 3 mph and recorded gusts up to 9 mph. Existing Site wind data indicate maximum winds from the south southeast at 18 mph. The existing meteorological station, or a replacement unit, would remain operational to monitor wind conditions during the project.

The Bay Area Air Quality Management District (BAAQMD) is the regulatory agency responsible for regulating stationary sources of air pollution in the project vicinity. The BAAQMD provides guidance and recommendations regarding acceptable vapor and dust threshold concentrations. The site area is out of attainment (i.e., exceeds acceptable levels) for ozone (O_3) and for particulate matter in excess of 10 microns and 2.5 microns in diameter (PM_{10} and $PM_{2.5}$, respectively), sometimes termed “fugitive dust.”

Strategies to achieve ozone emissions reductions are developed in the 2005 Ozone Strategy. The BAAQMD has also started the process of preparing the 2009 Bay Area Clean Air Plan, which would update the 2005 Ozone Strategy. These plans outline regional programs and control measures to reduce future emissions based on population projections. These plans are based on Association of Bay Area Governments (ABAG) projections as well as the requirements and projections included in the General Plans for those communities located within the Bay Area Air Basin.

In order to make progress towards attainment of state and national PM_{10} and $PM_{2.5}$ standards, the California Legislature enacted Senate Bill (SB 656) in 2003. This bill requires the California Air Resources Board (CARB) to work with local air districts to adopt an implementation schedule for appropriate CARB and air district measures. CARB adopted a Particulate Matter Implementation Schedule in 2005.

Analysis as to whether or not project activities would:

a. Conflict with or obstruct implementation of the applicable air quality plan.

Impact Analysis:

Air emissions in the Bay Area are regulated by the BAAQMD. The BAAQMD is required, pursuant to the Clean Air Act, to reduce emissions of criteria pollutants for which the BAAQMD is in non-attainment. The site area is out of attainment for ozone, PM_{10} and $PM_{2.5}$.

The project would not involve or induce population growth or cause an exceedance of established population or growth projections. Furthermore, the project would not produce long-term significant quantities of any criteria pollutant or violate ambient air quality standard. Therefore, the project is consistent with the 2005 Ozone Strategy (BAAQMD, 2006), the 2009 Bay Area Clean Air Plan (BAAQMD, 2009), and the Particulate Matter Implementation Schedule (BAAQMD, 2005) and would not conflict with or obstruct their implementation.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☒ **Less Than Significant Impact**
☐ No Impact

b. Violate any air quality standard or contribute substantially to an existing or projected air quality violation.

Impact Analysis:

The operation of the soil vapor extraction and treatment system would require a permit from the BAAQMD and one shall be obtained from the BAAQMD before proceeding with the installation of the equipment.

The Project soil handling and loading activities will be conducted in accordance with the Remedial Design and Implementation Plan (RDIP), which would include a Dust and Vapor Control Plan (DVCP). The DVCP would specify the techniques, materials, and equipment to be used to control emissions during implementation activities. The DVCP would include the following elements for dust control: water sprays/mist, surfactants, wetting agents, dust suppressants, covers, and windscreens. The DVCP would also include the following elements for vapor control: water spray/mist; vapor suppressant foam; and impervious tarps/covers. A network of vapor extraction wells would also be installed prior to the removal of the raised cap. These vapor extraction wells would be used to remove stagnant VOCs present in the raised cap material and vadose zone soils prior to excavation. The vapor stream would be treated through a combination of adsorption media.

The DVCP would be implemented consistent with the findings presented in the PHERA (See Attachment D) regarding appropriate use of dust and vapor controls (CDM, 2009b). The RDIP will be submitted to DTSC for review and approval prior to implementation of the project. The DVCP will include mitigation requirements set forth in this Initial Study as applicable. If control measures are not adequate, the contractor will be required to stop activities causing the exceedance of action levels until conditions improve or the contractor employs satisfactory mitigation methods.

The first 8 to 10 feet of excavation into Site soil would encounter unsaturated silty clay and clays that may generate fine dust as soil is removed and handled on-Site. The dust from excavated soil could contain arsenic and lead at concentrations that have the potential to exceed acceptable health standards if inhaled by on-site workers or down-wind, off-site receptors. The subject excavation activities do not require a permit from the Bay Area Air Quality Management District (BAAQMD). The BAAQMD does not currently have quantitative thresholds of significance for construction impacts, citing the short-term duration of construction operations. Although construction activities can potentially cause localized impacts of PM_{10}, the BAAQMD has found that control measures can be effectively implemented to avoid generating significant levels of emissions. The following control measures will be implemented at the construction site to minimize emissions of fugitive dust in accordance with BAAQMD requirements for sites of this size and located near sensitive receptors:

- Water all active construction areas at least twice daily.
- Cover all vehicles hauling soil, sand, and other loose materials or require at least two feet of freeboard.
- Pave, apply water three times daily, or apply (non-toxic) soil stabilizers on all unpaved access roads, parking areas and staging areas.
- Sweep daily (with water sweepers) all paved access roads, parking areas, and staging areas.
- Sweep streets daily (with water sweepers) if visible soil material is carried onto adjacent public streets.
- Hydroseed or apply (non-toxic) soil stabilizers to inactive construction areas (previously graded areas inactive for ten days or more).
- Enclose, cover, water twice daily or apply (non-toxic) soil binders to exposed stockpiles (dirt, sand, etc.).
- Limit traffic speeds on unpaved roads to 15 mph.
- Install sandbags or other erosion control measures to prevent silt runoff to public roadways.
- Replant vegetation in disturbed areas as quickly as possible.
- Install wheel washers for all exiting trucks, or wash off the tires or tracks of all trucks and equipment leaving the site.
- Suspend excavation and grading activity when winds (instantaneous gusts) exceed 25 mph.
- Limit the area subject to excavation, grading, and other construction activity at any one time.

Project Construction Activities

Although the BAAQMD does not require the quantification of construction activities, emissions were estimated using the URBEMIS2007 model to meet disclosure requirements (see **Table 1**). This model includes emissions from construction equipment, vehicles used to transport workers to and from the Site, vehicles used to transport supplies to and from the Site, and trucks used to transport contaminated soil from the Site and backfill material to the Site. Since existing rail routes would be used to transport rail cars to and from the Site, a separate analysis was not conducted for the use of rail cars.

Table 1
2010 Summary of Emissions from Construction Activities

	ROG	NOx	CO	SO_2	PM_{10}	$PM_{2.5}$
2010 Daily Emissions (lbs/day unmitigated)	11.15	122.15	48.86	0.08	5.49	4.88
2010 Annual Emissions (tons/year unmitigated)	0.50	5.48	2.17	0.00	0.25	0.22

Temporary Project Operation Activities

The project will include the temporary operation of a soil vapor extraction and treatment (SVE) system, which will be subject to the stationary source permitting requirements at the BAAQMD. The SVE system will be the only source of project operations emissions.

The BAAQMD has published quantitative thresholds of significance for project operations. The current thresholds for project operation emissions as set by BAAQMD can be found below in **Table 2**.

Table 2
BAAQMD Operations Emission Thresholds
(BAAQMD 1999)

BAAQMD Thresholds	***ROG***	***NOx***	***PM_{10}***
Daily Emissions (lbs/day)	80	80	80
Annual Emissions (tons/yr)	15	15	15

Emissions of volatile organic compounds from the SVE system will be treated and emissions from this system will not exceed the operations emissions threshold. Therefore, the impacts to air quality would be less than significant from this temporary project operation.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☒ **Less Than Significant Impact**
☐ No Impact

c. Conflict with the State goal of reducing GHG emissions in California to 1990 levels by 2020, as set forth by the timetable established in AB 32, California Global Warming Solutions Act of 2006.

Impact Analysis:

Although the BAAQMD presently has no guidance concerning CEQA evaluation of greenhouse gas (GHG) and no regulatory requirements, the emission of GHG is a rising concern in California and around the world. The primary sources of GHG for this project are the on-road trucks used for transportation of soil and off-road construction equipment.

Global climate change is caused by combined worldwide greenhouse gas (GHG) emissions, and mitigating global climate change will require worldwide solutions. GHGs play a critical role in the Earth's radiation budget by trapping infrared radiation emitted from the Earth's surface, which could have otherwise escaped into space. Prominent GHGs contributing to this process include water vapor, carbon dioxide (CO2), nitrous oxide (N2O), methane (CH4), ozone (O3), and certain hydro- and fluorocarbons. This phenomenon, known as the "greenhouse effect", keeps the Earth's atmosphere near the surface warmer than it would be otherwise and allows for successful habitation by humans and other forms of life. Increases in these gases lead to more absorption of radiation and warm the lower atmosphere further, thereby increasing evaporation rates and temperatures near the surface. Climate change is a global problem, and GHGs are global pollutants, unlike criteria air pollutants (such as ozone precursors) and toxic air contaminants (TACs), which are pollutants of regional and local concern.

Senate Bill 97 (SB 97) mandated that the Governor's Office of Planning and Research (OPR) amend the state's CEQA Guidelines to address impacts from GHG. In compliance with this requirement, OPR released Preliminary Draft CEQA Guideline Amendments in January 2009; the draft Guideline Amendments were forwarded to the Natural Resources

Agency in April 2009 and made available for public review and comment through August 27, 2009.

In the draft CEQA Guideline Amendments, OPR recommended the following criteria for significance related to GHG emissions:

- The extent to which the project could help or hinder attainment of the state's goals of reducing GHG emissions to 1990 levels by the year 2020 as stated in the Global Warming Solutions Act of 2006 (AB 32). A project may be considered to help attainment of the state's goals by being consistent with an adopted statewide 2020 GHG emissions limit, or the plans, programs, and regulations adopted to implement AB 32;

- The extent to which the project may increase the consumption of fuels or other energy resources, especially fossil fuels, that contribute to GHG emissions when consumed; and

- The extent to which the project impacts or emissions exceed any threshold of significance that applies to the project.

CARB released a Preliminary Draft Staff Proposal for Recommended Approaches for Setting Interim Significance Thresholds for Greenhouse Gases under the California Environmental Quality Act (CEQA) in October 2008 (CARB 2008). CARB's guidelines provide recommendations for assessing significance from operational and construction emissions from industrial and commercial/residential projects.

Although CARB's preliminary draft staff proposal suggests a quantitative threshold for assessing impacts from the operation of industrial projects, it prescribes the use of performance standards for construction-related emissions from all types of projects. CARB does not provide specific performance standards that should be used to address construction-related impacts. CARB is taking no further action at this time regarding the interim thresholds of significance, based largely on the fact that OPR is proceeding with amendments to the CEQA Guidelines that will better define the analytical requirements for climate change and GHG emissions in environmental documents (Ito 2009).

The GHG emissions of interest for this project were from carbon dioxide (CO_2), nitrous oxide (N_2O), and methane (CH_4). CO_2 emissions levels were calculated using URBEMIS 2007 and the default parameters for the relevant construction equipment. N_2O and CH_4 emissions for off-road construction equipment were calculated using the default horsepower from URBEMIS 2007 along with emissions factors from the CARB OFFROAD 2007 model. N_2O and CH_4 emissions for on-road trucks used for soil hauling were calculated using emission factors and calculation methods from the California Regulation for the Mandatory Reporting of GHG Emissions (CARB 2007). The estimated GHG emissions from this project are shown below in **Table 3**.

Table 3 *Greenhouse Gas Emissions Estimates from Construction Activities*			
Greenhouse Gas	***Emission (MT/yr)***	***Global Warming Potential (GWP)***	***CO_2 Equivalent Emissions (MT/yr)***
CO_2	631	1	631
N_2O	0.0009	310	0.3
CH_4	0.0014	21	0.03
		Total CO_2 Equivalent	631

Based on the proposed project and equipment uses, the project could generate approximately 630 metric tons of carbon dioxide equivalents (CO_2e). CARB has proposed a preliminary threshold of significance of 7,000 metric tons CO_2e for industrial projects (CARB, 2008b). The amount of GHG emitted from this project is less than 10 percent of this preliminary threshold; therefore this Project would not contribute significantly to GHG emissions and would not conflict with State goals to reduce GHG emissions in California.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☒ **Less Than Significant Impact**
☐ No Impact

d. Result in cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors).

Impact Analysis:

The BAAQMD CEQA Guidelines (BAAQMD, 1999) require that a project be evaluated with respect to its contribution to cumulative impacts. This contribution with respect to air emissions would include both construction and operational emissions. Cumulative projects include local development as well as general growth within the project area. However, as with most development, the greatest source of emissions is from mobile sources, which travel well out of the local area. Therefore, from an air quality standpoint, the cumulative analysis extends beyond any local projects and when wind patterns are considered would cover an even larger area.

As noted above, the project area is out of attainment for O_3, PM_{10}, and $PM_{2.5}$. Cumulative construction and operation of projects will further degrade the local air quality. Air quality will be temporarily degraded during construction activities that occur separately or simultaneously. However, the greatest cumulative impact on the quality of the regional air "cell" will be the incremental addition of pollutants mainly from increased traffic from residential, commercial and industrial development and the use of heavy equipment and trucks associated with the construction of these projects.

The proposed project, would not, however, result in a net increase in operational air emissions, as temporary construction emissions would stop once project activities are complete. Project-related emissions would result from on-Site excavation and transport of

soil and other materials, as well as from Site restoration, which would be temporary activities.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☒ **Less Than Significant Impact**
☐ No Impact

e. Expose sensitive receptors to substantial pollutant concentrations.

Impact Analysis:

As mentioned, the potential level of exposure of identified chemicals of concern (COCs) to the people in the community was examined in the PHERA (CDM, 2009b), Attachment D. The health risk to receptors was evaluated for two scenarios. The first scenario involved no use of emission controls and the second scenario was the use of emission controls resulting in a 60% reduction in PM_{10} and 90% reduction in organic vapors.

The PHERA concluded that that the implementation of the Project without emission controls could pose an unacceptable risk to the community. Thus, emission control measures are included as part of the Project. To address Site areas with the highest concentrations of COCs in the soil/material, minimum dust and vapor control measure efficiencies required to reduce risks to target levels were determined to be up to 96 percent for dust and 90 percent for organic vapors. The higher concentration material, however, is limited in volume (i.e., approximately 10 percent of the soil to be excavated). For the remaining approximately 90 percent of soil/material with lower COC concentration, minimum dust and vapor control measure efficiencies to reduce risks to target levels were determined to be 60 percent for dust and 90 percent for organic vapors.

The proposed dust and vapor control measures can reduce dust and organic vapor emissions by 99.9 percent. Therefore, the use of emission control measures can and will be used to reduce risk to the community to acceptable levels.

Diesel particulate matter (DPM) is listed as a toxic air contaminant (TAC) by the California Air Resources Board (CARB). BAAQMD's CEQA Guidelines (BAAQMD 1999) do not contain a methodology for quantifying impacts from diesel exhaust emissions; however, the CEQA Guidelines state that the lead agency should address potential impacts based on the best information available at the time of the analysis.

The BAAQMD is currently in the process of updating its CEQA Guidelines and released a White Paper to discuss various thresholds of significance for CEQA (BAAQMD 2009). Although the district acknowledges that DPM is designated as a TAC, it does not recommend establishing a specific threshold of significance to evaluate TAC impacts from construction activities. The following points are used in its rationale:

1. Construction activities are temporary and would only be within an influential distance to a sensitive receptor for a short period;
2. Most models and methods to evaluate impacts are associated with long-term exposures of 9, 40, and 70 years; and
3. The primary health concern with DPM is long-term impacts.

BAAQMD staff is in the process of developing a screening level method (based on the size of the project) for assessment of a construction project's health risks; this screening level will be provided in the methodologies section of the updated CEQA Guidelines.

Based on the temporary and variable nature of DPM emissions from construction activities, emissions of DPM from this proposed construction project would result in a less than significant impact.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☒ **Less Than Significant Impact**
☐ No Impact

f. Create objectionable odors affecting a substantial number of people.

Impact Analysis:

To assess the possibility of odors affecting nearby sensitive receptors, SCREEN3 modeling analysis was used to estimate the maximum concentration at the nearest sensitive receptor and this concentration was compared to an odor threshold concentration provided in the American Industrial Hygiene Association's Odor Thresholds for Chemicals with Established Occupational Health Standards (1993).

The concentrations of the various COCs can be controlled below their respective odor threshold level with the methods identified in the PHERA (Attachment D) The Project includes the necessary emission controls to reduce the emissions to acceptable levels; therefore the air quality impacts from objectionable odors would be less than significant.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☒ **Less Than Significant Impact**
☐ No Impact

g. Result in human exposure to Naturally Occurring Asbestos (see also Geology and Soils, f.).

Impact Analysis:

Based upon information in the California Department of Conservation (DOC) maps showing the general location of areas more likely to contain naturally-occurring asbestos (DOC, 2000) and lithologic information collected during the site investigation (CDM, 2009c), no naturally-occurring asbestos is likely to be encountered on the Site. Therefore, the project would not expose people to naturally-occurring asbestos and the there would be no related air quality impact.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☐ Less Than Significant Impact
☒ **No Impact**

4. Biological Resources

Project Activities Likely to Create an Impact:

- Noise and vibration during the excavation and transportation of soil/debris and during the installation of shoring.
- Discharge of treated water generated during dewatering activities.

Description of Baseline Environmental Conditions:

The Site is located within the Oakland West U.S. Geological Survey 7.5 Minute Quadrangle. The list of federal and state special status species with potential habitat or known occurrences within this quadrangle is maintained by the California Natural Diversity Database (CNDDB). Several federal and state listed species are included in the Oakland West quad, although many species occurrences are now believed to be extirpated based on the high level of development that has occurred in the region, and the absence of suitable habitat. The CNDDB list of special status species and the U.S. Fish and Wildlife Service (USFWS) Sacramento Office list are included in Attachment B. There are no known occurrences of these species and no potential habitat for them within the Site or immediate vicinity.

The Site is located in a highly urbanized area with little, if any native plant communities. The Site is paved and there are no known biological resources in the area other than fennel and other opportunistic species along the Temescal Creek channel to the north of the Site and trees planted in the sidewalk on the western side of Horton Street adjacent to the Site. The project area does not contain any candidate, sensitive, special status species, or their habitats. Additionally, the Site and its surroundings do not contain any wetlands, and there is no habitat conservation plan for land within the City of Emeryville (City of Emeryville 2009c). The Temescal Creek Channel is located north of the Site and, as a concrete-lined storm drain channel, does not contain any potential riparian habitat, sensitive natural communities, or associated species.

The City of Emeryville General Plan Environmental Impact Report (City of Emeryville, 2009d) acknowledges that the majority of Emeryville is developed with few open spaces and very little of the native habitat remains with exception of the Emeryville Crescent.

Analysis as to whether or not project activities would:

a. Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service.

Impact Analysis:

As noted above, no special status plant species have been identified. The activities associated with the project would not have the potential to affect any sensitive or protected species, as all activities would occur on-site and the Site does not contain habitats that are occupied by, or are suitable for, such species. No habitat will be modified, and the land use

currently on-site will continue to exist. Therefore, the project would not impact sensitive species or their habitats.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☐ Less Than Significant Impact
☒ **No Impact**

b. Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service.

Impact Analysis:

As noted above, the Site does not contain any riparian habitat, sensitive natural communities, or sensitive species. The Site and its surroundings are highly urbanized with industrial, commercial, and residential uses. The activities associated with the project would occur entirely on-site and will therefore not have the potential to affect any riparian habitat or sensitive natural community.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☐ Less Than Significant Impact
☒ **No Impact**

c. Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means.

Impact Analysis:

No wetlands, federally protected or otherwise, exist on or adjacent to the Site (USFWS, 2009). The nearest wetlands are the coastal wetlands along the shoreline of the Bay, approximately 0.4 miles to the west of the Site, UPRR mainline tracks, the Bay Street commercial/residential development, and U.S. Interstate Highway 80. The proposed project would involve the excavation and backfilling of soils within an existing urbanized area. Therefore, the project would not impact any wetlands.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☐ Less Than Significant Impact
☒ **No Impact**

d. Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites.

Impact Analysis:

The proposed project would not interfere in any way with the migration, movement, or use of wildlife nursery sites by native fish or wildlife species. No wildlife corridors or nursery sites are located on, or in proximity to, the Site. Furthermore, the project would not have any effect on any wildlife corridors or nursery sites. As such, no impacts to wildlife migration corridors or nursery sites would occur.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☐ Less Than Significant Impact
☒ **No Impact**

e. Conflict with local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance.

Impact Analysis:

No protected or special status species or plant communities exist on the Site. Trees within Emeryville are protected by the Emeryville Urban Forestry Ordinance (Title 7, Chapter 10 of the Emeryville City Code). There are "street trees" as defined by this ordinance, along the western side of Horton Street. Protection measures during construction, as identified in the ordinance, would be implemented. It is not anticipated that the project activities would require removal of any of these trees. However, if the contractor later determines a need to remove a tree, removal activities would follow the requirements identified in the ordinance and any removed trees would be replanted after the project activities have been completed. Upon completion of the project, the Site will either be covered by concrete or seeded soil. Therefore, the proposed project would not conflict with this ordinance, or any others protecting biological resources.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☒ **Less Than Significant Impact**
☐ No Impact

f. Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan.

Impact Analysis:

The Site is not subject to any adopted Habitat Conservation Plans or other conservation plans (City of Emeryville 2009c). Therefore, the on-site activities will not conflict with the provisions of any such plans. No impacts are anticipated.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☐ Less Than Significant Impact
☒ **No Impact**

5. Cultural Resources

Project Activities Likely to Create an Impact:

- Soil excavation to a maximum depth of 30 feet below ground surface.
- Vibration impacts associated with removal of former building foundations.
- Drilling and potential vibration during installation of the shoring.
- Installation of the slurry wall.

Description of Baseline Environmental Conditions:

A cultural resources assessment was prepared for the Project Site by William Self Associates, Inc. (WSA) in 2003 and updated in 2009. With the exception of confidential site-specific archaeological content, the original report and the update are included with this document as Attachment C. A total of 27 cultural resource surveys have been conducted within a one-quarter mile radius of the project area since 1977, none of which identified cultural resources on the Project Site. Six cultural resources that have been identified within one-quarter mile of the property in a records search conducted by the Northwest Information Center of the California Historical Resources Inventory System (CHRIS). These include:

- An historic industrial building, the Nabisco Bakery;
- Five prehistoric archaeological sites (shellmounds).

Nels C. Nelson conducted the first intensive archaeological survey of the San Francisco Bay Area in the early 20th century. Nelson documented more than 100 shellmounds along the bay shore in Alameda and Contra Costa counties, when the area was still ringed by salt marshes three to five miles wide. The Emeryville shellmound was the largest of several located near or at the mouth of Temescal Creek, and was one of the largest shell mounds in the bay region. The Emeryville shellmound covered an area approximately 300 by 900 feet, and was nearly 30 feet in height. In 1926, W. E. Schenk recorded the precise locations of the Emeryville shellmound and four other separate mounds in the area along Temescal Creek. None of these archaeological sites documented in the CHRIS records is located on S-W property or on the former Rifkin property.

The project area lies within the region occupied by the Ohlone or Costanoan group of Native Americans at the time of historic contact with Europeans (Kroeber 1925: 462-473). Chochenyo or East Bay Costanoan was the language spoken by the estimated 2,000 people who occupied the ". . . east shore of San Francisco Bay between Richmond and Mission San Jose, and probably also in the Livermore Valley" (Levy 1978: 485).

The Oakland Trotting Park, completed in 1871, was located west of San Pablo Avenue and east of and adjacent to the Project Site. In 1896, the Oakland Trotting Park was replaced by the California Jockey Club which operated until 1911. The California Jockey Club rebuilt the track complex on an area roughly bounded by today's Union Pacific Railroad tracks to the west, Stanford Avenue to the north, Watts Street to the east, and Park Avenue to the south.

The extant buildings on the Project Site (Buildings 1 and 31) are identified as Tier 1 - Architecturally Significant Buildings (City of Emeryville, 2009d, Table 3.8-1) Building 1 was constructed sometime between 1919 and 1924. Building 31 was added to Building 1 in 1936. These buildings are outside of, yet adjacent to, project activities that could potentially damage the structures due to excessive ground-borne vibration and/or undermining of the building foundation.

Analysis as to whether or not project activities would:

a. Cause a substantial adverse change in the significance of a historical resource as defined in 15064.5.

Impact Analysis:

Section 15126.4 of CEQA directs public agencies to "avoid damaging effects" on an archaeological resource whenever feasible. If avoidance is not feasible, the importance of the site shall be evaluated as a means of determining impact and developing mitigation measures. As defined by Section 15064.5(a)(3)(A-D) of the State CEQA Guidelines, a resource shall be considered by the lead agency historically significant if the resource meets the criteria for listing on the California Register of Historical Resources, that is, if the resource meets the following criteria:

A. Is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage; or
B. Is associated with the lives of persons important in our past;
C. Embodies the distinctive characteristics of a type, period, region or method of construction, or represents the work of an important creative individual, or possesses high artistic values; or
D. Has yielded, or may be likely to yield, information important in prehistory or history.

The California Register of Historical Resources (CRHR) and many local preservation ordinances have employed the criteria for eligibility to the National Register of Historic Places (NRHP) as a model, since the National Historic Preservation Act of 1966 (NHPA) provides the highest standard for evaluating the significance of historical resources. A resource that meets the NHRP criteria is clearly an historical resource. In addition, a resource that does not meet the NHRP standards may still be considered historically significant at a local or state level. CEQA specifically states that a resource need not be listed on any register to be found historically significant (Public Resources Code Section 21084.1).

Ground-disturbing construction activities have the potential to impact cultural resources by disturbing both surface and subsurface soils. These resources could be prehistoric (Native American artifacts, features or burials) or historic (features or artifacts associated with ca. post-1840 land use in the area, including the Oakland Trotting Park, early industry, residences, etc.). Such disturbance could result in the loss of integrity of cultural deposits,

or loss of information through the alteration of site setting, both of which would be considered significant impacts under CEQA if not mitigated. There is also the potential for unanticipated discoveries during construction.

In terms of potential damage to Building 31 from removal of the raised cap and foundations, vibration levels are estimated to be less than 0.5 in/sec, which is below the threshold at which there is a risk of architectural damage to buildings with plastered ceilings and walls. (See the Vibration discussion in Section 11.)

DTSC concurs in recommendations presented by WSA in the updated 2009 cultural resources assessment, including:

- an Archaeological Monitoring and Data Recovery Plan (AMDRP) will be developed and implemented by a qualified archaeologist;
- a qualified archaeologist should monitor construction-related excavations to determine the presence or absence of buried resources. Such archaeological monitoring should occur to the maximum depth of construction excavation or to when the archaeological monitor determines that soils with little or no potential for cultural material have been encountered;
- the archaeological monitor shall have 40 hour Hazardous Waste Operations and Emergency Response (HAZWOPER) training and use appropriate personal protective equipment (PPE) to eliminate exposure to contaminated soils;
- should unanticipated finds be uncovered during construction, work within 30 ft. of the find shall cease until the archaeological monitor can conduct an assessment of the resource and develop treatment measures as appropriate;
- should significant cultural resources be discovered during construction, a data recovery plan shall be developed by a qualified archaeologist and implemented; and
- should human remains or funerary objects be located, the provisions of the California Health and Safety Code shall be followed.

Therefore, with the implementation of these measures there would be no significant impacts to cultural resources.

Conclusion:
☐ Potentially Significant Impact
☒ **Potentially Significant Unless Mitigated**
☐ Less Than Significant Impact
☐ No Impact

b. Cause a substantial adverse change in the significance of an archeological resource pursuant to 15064.5.

Impact Analysis:

Section 15064.5(c) of CEQA applies to the analysis of effects on archaeological sites. When a project will affect an archaeological site, a lead agency must determine whether the archaeological site is an historic resource, and therefore subject to the NRHP criteria listed above (particularly Criterion D), or whether the archaeological site is a unique

archaeological resource, as defined in Section 21083.2 of CEQA, and whether the provisions of that section for mitigation apply. Section 21083.2(g) of CEQA defines a unique archaeological resource as an archaeological artifact, object, or site about which it can be clearly demonstrated that, without merely adding to the current body of knowledge, there is a high probability that it meets any of the following criteria:

(1) Contains information needed to answer important scientific research questions and that there is a demonstrable public interest in that information.
(2) Has a special and particular quality such as being the oldest of its type or the best available example of its type.
(3) Is directly associated with a scientifically recognized important prehistoric or historic event or person.

If a lead agency determines that an archaeological site is neither historic nor unique, Section 21083.2(h) of CEQA states that the resource requires no further consideration, other than recordation.

No archaeological resources have been documented on the Project Site. In addition, excavations and borings advanced on the property have not revealed indications of cultural resources. Should any resources be discovered, their significance would be determined in relation to the criteria for eligibility to the CRHR.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☒ **Less Than Significant Impact**
☐ No Impact

c. Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature.

Impact Analysis:

The types of geological deposits present in an area determine the area's potential for paleontological resources. The project corridor lies upon alluvial soils and bay mud of recent origin (see the detailed discussion of the area's geological stratigraphy in Section 6 Geology and Soils). Since mud and alluvium are not fossil-bearing, no significant paleontological resources are expected to occur with the Project area.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☐ Less Than Significant Impact
☒ **No Impact**

d. Disturb any human remains, including those interred outside of formal cemeteries.

Impact Analysis:

Should unanticipated finds be uncovered during construction, work in the immediate vicinity (within 30 feet) will cease until an archaeologist conducts an assessment of the historic or

prehistoric resources. Section 7050.5(b) of the California Health and Safety Code will be implemented in the event that human remains or possible human remains are located. This section of the Code states that if human remains are discovered, all excavation work in the area must stop until the County Coroner has evaluated the discovery. The County Coroner, upon recognizing the remains as being of Native American origin, is responsible for contacting the Native American Heritage Commission within 24 hours. The Commission has various powers and duties to provide for the ultimate disposition of any Native American remains, as does the assigned Most Likely Descendant. Section 5097.98 and 5097.99 of the Public Resources Code also call for "protection to Native American human burials and skeletal remains from vandalism and inadvertent destruction". Worker training typically instructs workers as to the potential for discovery of cultural or human remains, and both the need for proper and timely reporting of such finds, and the consequences of failure to properly report such finds. The aforementioned requirements provide adequate protection, such that no mitigation measures are required.

Conclusion:
☐ Potentially Significant Impact
☒ **Potentially Significant Unless Mitigated**
☐ Less Than Significant Impact
☐ No Impact

6. Geology and Soils

Project Activities Likely to Create an Impact:

The project will include several specific activities that could impact geology and soils. These are described below:

- Excavating approximately 60,000 cubic yards of soil to a depth of up to 30 feet below ground surface.
- Installing shoring, as necessary, in compliance with California Division of Occupational Safety and Health requirements (California Code of Regulations, title 8, subchapter 4, Construction Safety Orders, Article 6, Excavations). Shoring will be used along Horton Street to protect the street. The design for the shoring system(s) will be provided to DTSC as part of the RDIP. It is anticipated that two different systems will be utilized.
- Installing and operating a dewatering system.

Description of Baseline Environmental Conditions:

The soil underlying the Site consists of Holocene through Early Pleistocene alluvial sediments of the Temescal Formation (ENTRIX, 2002). The Temescal Formation is primarily an alluvial fan deposit, comprised of interfingering lenses of clayey gravel, sandy silty clay, and sand-clay-silt mixtures. The sediments are approximately 200 to 300 feet thick, based on deep coring drilled near the Site. In addition, north-south trending shoreline deposits (i.e., Aeolian sand deposits) were likely placed at the Site, given the proximity of the historical shoreline to the Site location, concurrently with the alluvial fan deposits. Soil borings drilled to characterize the nature and extent of contamination at the Site have characterized the Temescal Formation to a depth of

approximately 60 feet below ground surface (bgs). Four general units were encountered: fill material, Unit A, aquitard, and Unit B (ENTRIX, 2002).

Engineered fill is the shallowest unit beneath the Site, consisting of sands, silts, and gravels with concrete fragments. This fill extends from ground surface and ranges from 0 to 4 feet in thickness. The fill material unconformably overlies Unit A (which includes the A-zone groundwater). Unit A consists predominately of silt and clay with discontinuous lenses of sand from approximately 4 feet to 20 feet bgs. The sand lenses have been observed to range in thickness from approximately 1 to 10 feet below the Site and rapidly change in thickness between nearby boreholes. There is evidence of several discontinuous sand zones occurring in Unit A that vary in thickness from 1 to 5 feet between nearby boreholes.

Unit A is underlain by approximately 30 feet of silty clay that acts as a local aquitard separating Unit A from Unit B. The top of the aquitard begins at approximately 25 feet bgs (corresponding to an elevation of approximately -11.5 feet NAVD88). Unit B (which includes the B-zone groundwater) consists of primarily silty clay and clayey silt beginning at approximately 50 feet bgs. The top of Unit B ranges from approximately 45 to 55 feet bgs. Similar to Unit A, Unit B includes discontinuous lenses of silty sand ranging between 1 and 3 feet thick situated between 50 and 60 feet bgs. The A/B aquitard is distinguished from Unit B by the characteristics of the more permeable lenses within the Unit B formation. The lenses in the aquitard consist of clayey sand with some silt, while the Unit B lenses consist of silty sand.

FAULTING AND SEISMICITY

The Site is not within a currently designated State of California “Special Studies Zone” for active faults (Hart, 1992). No known active or inactive faults or segments occur at the Site.

The Site is located on the eastern flank of the San Francisco Basin, which roughly corresponds to present day San Francisco Bay. The San Francisco Bay Region is considered by geologists and seismologists to be a seismically very active region. The bay is formed by a major asymmetrical basement synform within the Coast Range Province. It is bounded on the east by the Hayward Fault and on the west by the San Andreas Fault. The trace of the Hayward Fault occurs in the Berkeley Hills, approximately 3.5 miles to the east of the Site. Basement rock underlying the bay consists of the Franciscan Complex. Earthquakes along major active faults create very strong ground motion that can cause severe damage to structures and destabilize ground.

The Site is located on the East Bay Plain, approximately 0.3 miles east of the current bay shoreline and 3.5 miles west of the Hayward Fault. The closest seismic fault, the Hayward Fault is located three miles east of the Site. The Hayward Fault is estimated to generate a maximum credible earthquake of 7.5 (Richter Scale).

According to the Association of Bay Area Governments (ABAG), the Site is in a zone at risk for violent shaking (IX on the Modified Mercalli Intensity scale) during an earthquake of magnitude 7.1 on the Hayward Fault, and at risk for strong shaking (VII) during earthquakes on the Northern Calaveras Fault and the Peninsula segment of the San Andreas Fault (ABAG, 1999). The Site is in a high liquefaction hazard level for earthquakes on the Hayward Fault and a moderate level for earthquakes on the Peninsula segment of San Andreas Fault and Northern Calaveras Fault (ABAG, 2001).

Analysis as to whether or not project activities would:

a. Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:

❖ **Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault.**

The project is not located on or adjacent to a known active or potential active earthquake fault mapped on the Alquist-Priolo Earthquake Fault Zoning Map (Hart, 1997). No impacts are expected.

❖ **Strong seismic ground shaking.**

The project is located in a seismically active region and could potentially be subject to strong ground shaking if an earthquake were to occur in the region. The project includes excavation of soils to up to 30 feet bgs next to existing occupied structures, sidewalks, streets, and rail spur tracks. As a part of the planned excavation, a shoring wall (utilizing a soldier pile with lagging system) will be designed to support the excavation sidewalls and adjacent structures along Horton Street. Specific shoring methodology will differ based on the soil zone (either vadose or saturated). The shoring wall design will incorporate the 2007 California Building Code (2007 CBC, based on the 2006 International Building Code) requirements that account for seismic loads, as part of the local requirements with the City of Emeryville. Although the 2007 CBC does not require temporary structures to be designed for seismic forces, the wall design analysis will consider seismic forces. Therefore, any impacts would be less than significant.

❖ **Seismic-related ground failure, including liquefaction.**

The project is located in an area that may be susceptible to liquefaction due to the presence of shallow, saturated, loose granular sediments. The project includes excavation of soil next to existing occupied structures, sidewalks, streets, and rail spur tracks. The excavation will penetrate into liquefiable soils only when excavated into the saturated soil zone. The shoring wall will be designed to support the planned excavation sidewalls and adjacent structures in accordance with 2007 California Building Code requirements. The counterforts design will account for the loss of soil bearing that could be experienced in saturated, loose sand layers. In the area where excavated (and liquefiable) native soil has been removed, the backfill soil will be engineered and no longer liquefiable, thus reducing the risk of future liquefaction hazard. Therefore, any impacts are expected to be less than significant.

❖ **Landslides.**

Impact Analysis:

The project is not located in an area subject to landslides due to its flat topography. The proposed excavation activities would not increase the risk to people or structures from landslides.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☒ **Less Than Significant Impact**
☐ No Impact

b. Result in substantial soil erosion or the loss of topsoil.

Impact Analysis:

The project is in a flat area with no significant exposed areas of bare soil. Project activities will not expose bare soil on slopes where storm water runoff would generate sufficient velocity to erode soil. Storm water runoff in non-excavated areas is by sheet flow where runoff velocities would not be sufficient to erode soil. The project is planned in a fully-developed, urbanized area currently covered with several feet of artificial fill and pavement. Therefore, no topsoil is present. A majority of the area planned for excavation has previously been excavated or disturbed. Therefore, the proposed project activities would not result in substantial soil erosion or loss of topsoil.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☒ **Less Than Significant Impact**
☐ No Impact

c. Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on or off-site landslide, lateral spreading, subsidence, liquefaction or collapse.

Impact Analysis:

The Site is located in an area with potentially liquefiable soil (ABAG, 2001); however, the proposed activities will not increase the risks to people or structures on-site from on- or off-site landslides, lateral spreading, subsidence, liquefaction or collapse. The engineered fill that will replace excavated soil will equal or enhance the stability of the subsurface in and nearby the planned excavation. Other than liquefiable soil, no other unique, unstable geologic unit or soil exists in the Site or area. Because no excavation would take place under buildings or other structures, there is limited potential for project activities to affect, or be affected by, unstable soil. As such, impacts related to unstable geologic units or soils will be less than significant.

Conclusion:

☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☒ **Less Than Significant Impact**
☐ No Impact

d. Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property.

Impact Analysis:

The Site is potentially located on expansive soil, which has the potential to exhibit shrink-swell characteristics when exposed to wetting and drying. However, the proposed project will remove soil and replace it with engineered fill to a depth not prone to wetting and drying conditions that cause expansive soil to shrink and swell. Therefore, project activities will not increase the risks to life or property from expansive soil.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☒ **Less Than Significant Impact**
☐ No Impact

e. Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of water.

Impact Analysis:

The Site is located in an area where sewers are available. Therefore, the project will not result in impacts to alternative waste water disposal systems.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☐ Less Than Significant Impact
☒ **No Impact**

f. Be located in an area containing naturally occurring asbestos (see also Air Quality, f.).

Impact Analysis:

The Site is not located in any area depicted on the California Department of Conservation's General Location Guide for Ultramafic Rocks in California (DOC, 2000) as containing naturally-occurring asbestos. Therefore, there would be no impact.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☐ Less Than Significant Impact
☒ **No Impact**

7. Hazards and Hazardous Materials

Project Activities Likely to Create an Impact:

- Removal of the Raised Cap;
- Excavation of soil;
- Transport of excavated soil to the on-site soil management stockpiles;
- Loading of soil into trucks and/or railroad gondola cars;
- Pumping of excavation water;
- Refueling of heavy equipment.

Description of Baseline Environmental Conditions:

Soil, soil gas, and groundwater investigations have been conducted at the Site since 1988. The primary Site-related contaminants present in soil and groundwater beneath the Site are metals (primarily arsenic and lead), VOCs (primarily aromatic constituents and ketones), and petroleum hydrocarbons (CDM, 2009c). Several of these contaminants migrated from the S-W property onto a portion of the former Rifkin property. (CDM, 2009c). Chlorinated volatile organic compounds were also detected in groundwater samples collected from the Site, but in most instances appear to be related to past releases on adjacent properties.

A high pressure natural gas line owned by Pacific Gas and Electric Company (PG&E) is located parallel to Horton Street under the west sidewalk along the Site.

Analysis as to whether or not project activities would:

a. Create a significant hazard to the public or the environment throughout the routine transport, use or disposal of hazardous materials.

Impact Analysis:

The proposed project involves the transport of hazardous materials (contaminated soil) from the project Site to an off-site disposal facility via a mixture of rail and/or gondola cars as well as trucks. The RDIP will present the techniques, materials, and equipment to be used for the loading activities. The RDIP will be submitted to DTSC for review and approval prior to implementation of the project.

Soil will be loaded into truck trailers, which will be covered and secured prior to leaving the Site to prevent dust or odor from escaping. The truck trailer will be covered and secured prior to leaving the Site. Truck and trailer wheels will be cleaned at a wheel wash station prior to departing the Site. In addition, equipment and vehicles may require decontamination prior to leaving the Site. A station will be setup for decontamination and the methods for decontamination will be established by the contractor.

All excavation, handling, transport, and disposal of such materials will be carried out according to applicable policies and regulations of the California Department of Transportation (Caltrans) in accordance with a DTSC-approved RDIP, which will include a transportation and traffic plan and the techniques, materials, and equipment needed to execute the removal of the Raised Cap, excavation, and soil/debris handling activities. The RDIP will be submitted to DTSC for

review and approval prior to implementation of the project. Because all handling and transport of hazardous materials would be carried out in accordance with applicable regulations of Title 49 of the Federal Code Regulations and applicable regulations of Title 22 California Code of Regulations and applicable policies of affected agencies, impacts related to risks to the public or environment from hazardous materials would be less than significant.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☒ **Less Than Significant Impact**
☐ No Impact

b. Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident involving the release of hazardous materials into the environment.

Impact Analysis:

The proposed project would expose, excavate, transport, and dispose of the soil containing concentrations of arsenic, lead, toluene, and other chemicals of concern above health-based preliminary remediation goals. The excavated soil will be identified, characterized for waste disposal, and handled as a non-hazardous, California-only hazardous waste, or RCRA hazardous waste (depending on the characterization results). Groundwater pumped from the open excavation will contain concentrations of arsenic and other COCs that will require on-site treatment prior to its discharge to the Temescal Creek Channel.

The proposed project will require excavation, transport, and off-site disposal of lead, arsenic, and VOC-contaminated soils, as well as treatment and discharge of groundwater. All project operations occur at ambient temperature and pressure, and a release of soil from a container, gondola, truck, or excavator bucket would not result in an uncontrolled chemical reaction, explosion, fire, pressure wave, or other significant hazard to the public or environment. Any accident scenario involving such materials in a soil medium would not have the potential to significantly affect individuals, groups, or the environment. The potential health risks have been fully assessed in the PHERA (CDM, 2009b). Any accident condition (e.g., rail gondola car with contaminated soil overturns) would be addressed with immediate emergency procedures, and possible halting of work, and would not pose an immediate danger to the public or environment. As such, impacts related to the release of hazardous materials from accident conditions would be less than significant.

PG&E owns a high pressure natural gas line located parallel to Horton Street under the west sidewalk along the Site which, if damaged during excavation activities, could release flammable gas. PG&E will be contacted to mark the specific location of the line. In coordination with PG&E, S-W will (or will have PG&E) physically locate the gas line prior to installation of the shoring by hand digging at selected intervals and “daylighting” the line. The shoring system and gas line will be monitored by survey during the excavation to confirm that excessive deflection is not occurring.

The proposed project incorporates the following major design components that address potential releases of hazardous materials:

- Dust and vapor controls;

- Air Monitoring;
- Transportation Plan;
- Groundwater control and treatment;
- Site-specific Health and Safety Plan; with an Emergency Response Plan.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☒ **Less Than Significant Impact**
☐ No Impact

c. Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances or waste within one-quarter mile of an existing or proposed school.

Impact Analysis:

No existing or proposed school is located within one-quarter mile of the Site. Project activities, however, will take place across Horton Street from existing residences and commercial buildings. Measures to control fugitive dust (from contaminated soils) will be implemented during excavation to minimize the potential for any impacts to nearby sensitive receptors will be included with the RDIP. The RDIP will be submitted to DTSC for review and approval prior to implementation of the project. DTSC staff will also be present during the project to oversee the activities. In addition, the PAMP during project activities will provide indication to the contractor if perimeter air monitoring action levels are exceeded. Such an occurrence would require halting of operations to restore perimeter air quality conditions to acceptable levels of any hazardous vapors or dust particles. These perimeter air monitoring action levels were developed in the PHERA (CDM, 2009b). Based on the evaluation in the PHERA, and the control measures that have been incorporated into the design of the Project, potential impacts to the community would be less than significant.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☒ **Less Than Significant Impact**
☐ No Impact

d. Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would create a significant hazard to public or the environment.

Impact Analysis:

The Site is listed by the California Environmental Protection Agency (and more specifically, DTSC), as a contaminated Site (Cal/EPA, 2009), as characterized in the environmental setting, above. However, the purpose of the proposed project is to remediate the Site. As such, the proposed project will improve the environmental quality of the Site by removing the contamination for which the Site is listed by DTSC. Therefore, impacts related to hazardous materials sites, including the Site itself, would not be significant.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☒ **Less Than Significant Impact**
☐ No Impact

e. Impair implementation of, or physically interfere with, an adopted emergency response plan or emergency evacuation plan.

Impact Analysis:

The project activities associated with the proposed project will occur in limited areas, and within a scheduled, temporary timeframe. As such, these activities would not be widespread on the Site, and would therefore not interfere with emergency response or evacuation plans, since emergency crews or groups of people evacuating the Site would not be significantly impeded by construction equipment or other project-related obstructions.

In inquiries to the City of Emeryville (EPD 2009, EBD 2009), [cite each of these in the references as "personal communication with Randall Smith 10/21/09"] no adopted emergency response or evacuation plan was identified; however, all on-site activities affecting traffic lanes or access will be conducted in accordance with City police and fire department requirements and with the DTSC-approved transportation and traffic plan, which will be included with the RDIP. Emergency access will not be compromised by on-site activities, since no roadways would be closed as part of the proposed project and no walkways or internal corridors between occupied buildings would be significantly obstructed during excavation.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☐ Less Than Significant Impact
☒ **No Impact**

8. Hydrology and Water Quality

Project Activities Likely to Create an Impact:

As identified in the project description, and described in the geology and soils section, the project requires excavation and other activities that will impact groundwater. These activities include:

- removal of the Raised Cap material,
- dewatering of the excavation,
- soil excavation and backfilling, and
- breeching/removal of the slurry walls to facilitate groundwater movement.
- shutdown of the groundwater extraction system.

Description of Baseline Environmental Conditions:

The Site is located over alluvial sediments as described in Section 6, Geology and Soils. Industrial, commercial, and domestic water supplies are provided by the East Bay Municipal Utility District (EBMUD); shallow or deep groundwater resources under the Site or under nearby properties are not extracted for water supply use. In addition, the Site is not located within a groundwater recharge area (Norfleet, 1998). Shallow groundwater (groundwater contained in Unit A in the range of four feet to 20 feet below ground surface) under the Site has been impacted by historical releases of chemicals to the subsurface; the purpose of the proposed project is to remediate these subsurface soils and restore groundwater quality impacted by the historical releases.

The Site resides within the Temescal Creek watershed. The northwest extent of the Site borders with Temescal Creek. In the vicinity of the Site, the surface channel of old Temescal Creek between Horton Street and the on-site railroad spur has been replaced by a relocated, underground culvert north of the Site and an open, engineered flood channel extending downstream (west) to Interstate 880.

Analysis as to whether or not project activities would:

a. Violate any water quality standards or waste discharge requirements.

Impact Analysis:

Current groundwater extraction and treatment activities operate within the terms of a National Pollutant Discharge Elimination System (NPDES) permit that allows treated groundwater to be discharged to Temescal Creek. Excavation water will be removed from sumps on the S-W property and pumped to the Dewatering Equipment Storage and Pretreatment Unit, and subsequently to the existing and/or a new groundwater treatment system prior to discharge to Temescal Creek or to the sanitary sewer under permit, or transported offsite for treatment and disposal/reuse. If treated water is discharged to Temescal Creek, it will be discharged in accordance with the current NPDES permit terms and conditions.

The dewatering activities, therefore, will not create an incremental impact to water flows or water quality into Temescal Creek or violate any water quality standards or waste discharge requirements. Once groundwater extraction and treatment operations are terminated, associated discharges of treated water to Temescal Creek will cease. By pumping water from sumps installed on the S-W property, the water table on the S-W property will be lower compared to the former Rifkin property, inducing groundwater flow towards the S-W property. As a result, contaminated groundwater from the S-W property will not migrate towards the former Rifkin property.

The project would require dewatering at the excavation that would initially occur at a maximum rate estimated at 30 gallons per minute, and reduce to an estimated maximum of 10 gallons per minute. Groundwater extracted from the sump(s) will be conveyed into a dewatering settling tank system (the Dewatering Equipment Storage and Pretreatment Unit) and subsequently pumped to the groundwater treatment system prior to discharge under permit.

Runoff from the Site could potentially lead to impacts on surface water quality during the construction. Runoff from the Site is currently directed to Temescal Creek. During the project activities, Site runoff that comes into contact with contaminated soils or water will be treated in the existing on-site treatment system, and other runoff will continue to be directed to Temescal Creek. The completion of the project would not have any potential impact on surface water.

The existing slurry wall will be breached to provide an outlet for groundwater that accumulates within the formerly closed slurry wall system, or to provide a pathway for groundwater flow from areas outside the formerly closed slurry wall system into these areas, specifically the arsenic-impacted groundwater. The locations for the slurry wall breaches have been selected to be placed in areas where permeable soils are present to provide a hydraulic connection with the existing groundwater flow. **Figure 3** presents the locations of the breaches.

Removal of the accessible subsurface vadose and saturated zone soil will reduce the source of contaminants migrating to groundwater. Groundwater concentrations of arsenic are expected to decline. This is considered a beneficial impact.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☒ **Less Than Significant Impact**
☐ No Impact

b. Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficient in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted).

Impact Analysis:

Shallow or deep groundwater resources under the Site or under nearby properties are not extracted for water supply use. In addition, the Site is not located within a groundwater recharge area (Norfleet, 1998). The currently operating groundwater extraction and treatment system extracts one to eight gallons of shallow A-zone groundwater per minute. At the initiation of excavation, up to approximately 30 gallons per minute of groundwater may be drawn from the A-zone, with the rate reducing to an estimated maximum of 10 gallons per minute. Following backfilling of the excavation, the groundwater extraction system will be turned off and the Site re-paved, or hydro-seeded. The Project will create no permanent change in groundwater recharge, and the Project will have no impact on the depletion of currently used groundwater supplies.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☒ **Less Than Significant Impact**
☐ No Impact

c. Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on or off-site.

Impact Analysis:

The existing Site is paved and sloped for collection and diversion of storm water to pumps connected to hoses discharging directly to the Temescal Creek channel. Treated groundwater currently extracted from within the existing slurry wall also discharges to the channel. Implementation of excavation activities will alter the drainage pattern in the immediate area of the excavation, although the required contractor-prepared storm water management plan, and the scheduling of excavation during the seasonally dry summer, will result in no change to existing storm water volumes entering the Temescal Creek channel. Discharge of treated groundwater will continue throughout the excavation activities, at discharge rates at or above current discharge levels. Even if treated groundwater discharge rates double from current rates, up to 20 gallons per minute, such water will continue to discharge into the concrete-lined Temescal Creek channel and therefore will not alter the existing drainage pattern and will not impact erosion or siltation within the channel.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☐ Less Than Significant Impact
☒ **No Impact**

d. Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on or off-site.

Impact Analysis:

No impact. See the discussion under item c. above.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☐ Less Than Significant Impact
☒ **No Impact**

e. Create or contribute runoff water which would exceed the capacity of existing or planned storm water drainage systems or provide substantial additional sources of polluted runoff.

Impact Analysis:

No impact. As described under the items above, all anticipated excavation dewatering will be treated and discharged in accordance with the existing NPDES permit; therefore project water will not impact storm sewer facilities. Currently, Site storm water is directed to existing City storm drains along Horton Street and Sherwin Avenue. As rain water flows towards the western S-W property boundary and within the northern half of the S-W property, it is collected in surface sumps and pumped directly to the Temescal Creek Channel. The Project will not increase runoff water to existing or planned storm water drainage systems.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☐ Less Than Significant Impact
☒ **No Impact**

f. Otherwise substantially degrade water quality.

Impact Analysis:

The project is designed to physically remove subsurface contaminants that have historically degraded the quality of groundwater under the Site. Implementation of the project, including all related storm water and groundwater control activities, will not degrade current surface or groundwater quality. One of the project's remedial action objectives is to improve water quality.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☐ Less Than Significant Impact
☒ **No Impact**

g. Place within a 100-flood hazard area structures which would impede or redirect flood flows.

Impact Analysis:

No permanent structures will be constructed as part of the project. All project activities are scheduled to occur during the seasonally dry summer months. Therefore, there would be no impact.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☐ Less Than Significant Impact
☒ **No Impact**

h. Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam.

Impact Analysis:

The only dam or levee in the area is at Temescal Reservoir, approximately 3.5 miles upstream at the headwaters of Temescal Creek. No project activities will alter the potential flow of floodwater from an upstream failure of the Temescal Reservoir dam. Although there is the potential for flooding in the event of an upstream dam failure, the risk to the on-site people and structures would not be affected by activities associated with the proposed project. The proposed project would not expose people or structures to any more risk of flooding than is currently experienced on-site; as such, impacts would be less than significant.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☒ **Less Than Significant Impact**
☐ No Impact

i. Inundation by seiche, tsunami or mudflow.

Impact Analysis:

While the Site may be subject to inundation due to its proximity to the Bay, project activities will have no impact on the potential inundation.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☐ Less Than Significant Impact
☒ **No Impact**

9. Land Use and Planning

Project Activities Likely to Create an Impact:

None

Description of Baseline Environmental Conditions:

The Site is located in an urbanized area that is undergoing redevelopment. The General Plan land use designation for the Site is Industrial (City of Emeryville, General Plan Land Use Map, 2009b). It is surrounded by transportation (railroad), retail, commercial, open space, and live-work uses.

The City of Emeryville General Plan also identifies the zoning designations for the area, which indicates the types of properties that can be built in the area (City of Emeryville, Zoning District Map, 2009a). The zoning designation for the Site is primarily light industrial, and it is within the boundary of the Park Avenue District Plan. This plan establishes policies and guidelines to enhance Emeryville's historic center into a pedestrian scaled urban environment (City of Emeryville, 2006). Additionally, the northeastern portion of the Site that is the former Rifkin Property and currently owned by Novartis, is included in the Planned Unit Development (PUD) Industrial Ordinance [ORD] 95-6. This designation indicates that it is part of a Master Plan Area that is likely to change over the next 20 years, and has already been approved by the City Council.

Analysis as to whether or not project activities would:

a. Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect.

Impact Analysis:

The proposed on-site project activities will not change land uses or conflict with applicable land use plans, policies, or regulations. Remediation of the Site supports the restoration and enhancement objectives of the Emeryville General Plan and the Park Avenue District Plan. For example, General Plan Policy CSN-P-36 states: "Prior to reuse, development sites will be remediated, according to relevant State and federal regulations." The proposed project would result in temporary excavations; such activities would have no potential to affect plans, policies, or regulations related to land use. No impact would occur.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☐ Less Than Significant Impact
☒ **No Impact**

b. Conflict with any applicable habitat conservation plan or natural community conservation plan.

Impact Analysis:

As discussed in Section 4, Biological Resources, the Site has no biological resources and only unimpacted storm water and treated groundwater are discharged to the Temescal Creek Channel. The Site is not subject to any adopted Habitat Conservation Plans or other conservation plans. Therefore, no impacts would occur with respect to a habitat conservation plan or natural community conservation plan.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☐ Less Than Significant Impact
☒ **No Impact**

10. Mineral Resources

Project Activities Likely to Create an Impact:

None.

Description of Baseline Environmental Conditions:

The Site consists of a former coatings manufacturing facility, surrounded by light industrial, commercial, transportation, and live-work uses. No on-site mineral resources are known to exist and no current petroleum production activities occur on the Site.

Analysis as to whether or not project activities would:

a. Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state.

Impact Analysis:

The Site is underlain with alluvial soils and bay mud of recent origin (see the detailed discussion of the area's geological stratigraphy in Section 6 Geology and Soils). Since mud and alluvium are not mineral-bearing, no significant mineral resources are expected to be present within the Project Site. Therefore, the proposed project would not affect the availability of a known mineral resource.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☐ Less Than Significant Impact
☒ **No Impact**

b. Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan.

Impact Analysis:

There are no locally important mineral resource recovery sites located on or near the Site (City of Emeryville, 2009d). Therefore, on-site project activities would not have the potential to affect the availability of any locally-important mineral resource recovery site.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☐ Less Than Significant Impact
☒ **No Impact**

11. Noise

Activities Likely to Create an Impact:

- Removal of former concrete building foundations and pavement under the Raised Cap Area and immediately above the target soil excavation area, including use of jackhammers.
- Soil excavation
- Shoring installation
- Soil vapor extraction and treatment
- Use of construction and trucking equipment

Description of Baseline Environmental Conditions:

The S-W project Site is located in a mixed land use area with commercial, industrial, and residential properties on the adjacent and nearby parcels. The surroundings are characterized as follows:

- **To the west:** Union Pacific Railroad main line tracks (which operate at all hours of the day and night)—both freight trains and AMTRAK passenger trains use these tracks; vacant Union Pacific railroad Parcel D, currently owned by the City of Emeryville and currently used for construction staging for the City's Park Avenue Beautification project. Interstate 80 is about 0.3 miles west of the Site.

- **To the north:** Former Chiron Corporation headquarters and research/manufacturing facilities, currently owned by Novartis and leased to Bayer, beyond a surface-level parking lot immediately north of the S-W property.

- **To the east:** Horton Street, across which are the Artists Co-op live-work studios, as well as the former Shell development property (currently South BGR property leased by Novartis). Bayer occupies one building between the parking area and the Artists Co-op building.

- **To the south:** Sherwin Avenue, across which is a warehouse (leased by Bayer) and multi-story residential lofts (Emeryville Lofts, Blue Star Corner Condominiums).

The Emeryville Challenges and Opportunities report indicates a day-time noise level from rail operations alone of 60 dBA on Horton Street north of 45th Street. This indicates that freight and passenger train activity on the nearby railroad tracks is a major source of noise in the Site vicinity. Based on the mix of urban residential and industrial land uses in the project vicinity and the presence of the Union Pacific main line railroad tracks and major highways nearby, the most appropriate land use descriptor for the project vicinity would be "Noisy Urban Residential," i.e., an average daytime noise level in the project vicinity would be 65 dBA.

NOISE DESCRIPTORS

Noise is defined as unwanted sound. Airborne sound is a rapid fluctuation of air pressure above and below atmospheric pressure. The human ear perceives sound, which is mechanical energy, as pressure on the ear. Sound levels are usually measured and expressed in decibels (dB), a measurement of pressure, with zero decibels roughly corresponding to the threshold of human hearing. Most sounds heard in the environment do not consist of a single frequency but, rather, a broad band of frequencies with each frequency differing in sound level. The intensities of each frequency combine to generate a sound. The method commonly used to quantify environmental sounds consists of evaluating all the frequencies of a sound using the "A-weighted scale" that reflects the fact that human hearing is less sensitive at low frequencies and extreme high frequencies than in the mid-range frequencies. Thus, the A scale simulates the frequency response of the human ear. A-weighted sound levels are designated as dBA.

Although the A-weighted noise level may adequately indicate the level of environmental noise at any instant in time, community noise levels vary continuously. Two methods are used to describe time variable sounds. These are exceedance levels and equivalent levels, both of which are derived from a large number of moment-to-moment A-weighted noise level

measurements. Most environmental noise includes a conglomeration of noise from distant sources, which creates a relatively steady background noise in which no particular source is identifiable. To describe the time-varying character of environmental noise, the statistical noise descriptors $L_{10,}$ $L_{50,}$ and L_{90} are commonly used. They are the A-weighted noise levels equaled or exceeded during ten, 50, and 90 per cent of a stated time period. A single number descriptor called the L_{eq} is also widely used. The L_{eq} is the average A-weighted noise level during a stated period of time. The L_{eq} provides a methodology for combining noise from individual events and steady background sources into a measure of cumulative noise exposure. It is used by local jurisdictions and the Federal Highway Administration to evaluate noise impacts.

The day-night noise level (L_{dn}) is the energy average sound level for a 24-hour day determined after the addition of a 10-dBA penalty to all noise events occurring at night between 10:00 p.m. and 7:00 a.m. The L_{dn} is a useful metric of community noise impact because people in their homes are much more sensitive to noise at night, when they are relaxing or sleeping, than they are to noise in the daytime. The L_{dn} is used by local jurisdictions to rate community noise impacts from transportation noise sources.

In the State of California, the community noise equivalent level (CNEL) is widely used. It is similar to the L_{dn} noise level, except that evening noise events (occurring between the evening hours of 7:00 p.m. and 10:00 p.m.) are weighted 5 dB higher than daytime events and 5 dB lower than nighttime (10:00 p.m. to 7:00 a.m.).

HEALTH EFFECTS OF NOISE

Excessive noise is undesirable and may cause physical and/or psychological harm. Health effects of noise can be characterized as auditory or non-auditory. Auditory effects include interference with communication and, in extreme circumstances, hearing loss. Non-auditory effects include physiological reactions such as change in blood pressure or breathing rate, interference with sleep, adverse effects in human performance, and annoyance.

The amount of annoyance or harm cause by noise is dependant primarily upon three factors: the amount and nature of the noise; the level of ambient noise before the intruding noise; and the activity of persons (“receptors”) working or living in the area of the noise source. Noise ranges from constant background noise to more individualized noise events. The amount of ambient noise present before the introduction of project-generated noise is an important factor in noise analysis under CEQA. A relatively low level of noise will have a much greater impact in a quiet, rural environment than an urban environment.

TYPICAL A-WEIGHTED SOUND LEVELS OF COMMON NOISE SOURCES

Decibels	Description
130	Threshold of pain
120	Jet aircraft take-off at 100 feet
110	Riveting machine at operators position
100	Shotgun at 200 feet
90	Bulldozer at 50 feet
80	Diesel locomotive at 300 feet
70	Commercial jet aircraft interior during flight
60	Normal conversation speech at 5 - 10 feet
50	Open office background level
40	Background level within a residence
30	Soft whisper at 2 feet
20	Interior of recording studio

Source: Bollard Acoustical Consultants, Inc. & Egan, Architectural Acoustics, McGraw Hill 1988.

REGULATORY JURISDICTION

Noise

The City of Emeryville General Plan Noise Element establishes a noise level of 60 dBA L_{dn} as "normally acceptable" and 60-70 dBA L_{dn} as "conditionally acceptable" for residential uses. The City of Emeryville Noise Ordinance (Emeryville Municipal Code – Title 5, Chapter 13) does not set quantitative noise level criteria. The ordinance provides guidance on minimizing noise-related impacts during implementation activities. Specifically, general construction noise (Section 5-13.05 of the Noise Ordinance) shall be limited to weekdays from 7:00 am to 6:00 pm. Pile driving and similarly loud activities are limited to weekdays from 8:00 am to 5:00 pm. More restrictive hours for allowable construction noise may be established as appropriate, given the surrounding neighborhood, type of noise, or other unique factors.

Weekend work, and/or work outside the established weekday time limits, may be allowed at the discretion of the City Manager, the Planning and Building Director, or the Public Works Director. Weekend construction work, if allowed, would be limited to the period between 9:00 am to 6:00 pm.

Proposed project activities are anticipated to be conducted during the allowable weekday construction noise time limits. Certain activities, such as truck loading, stockpile/ maintenance and off-site transport of hazardous waste (debris and soil), may be conducted during nighttime hours to avoid daytime truck traffic impacts. If activities are proposed outside of the weekday allowable construction noise time limits, the contractor will apply to the City for a waiver, as described in Section 5-13.06 of the Ordinance. The procedures for waiver application require submittal of a description of the type of work to be performed, the type of equipment to be used, notifications to neighbors, and, among other requirements, a description of the types of construction practices to be used to minimize noise.

The City of Emeryville zoning ordinance at Section 9.4.59.7 limits noise at lot lines to the sound levels stated in the Noise Standards table adopted by the City Council. However, these performance standards apply to land use operations, not to temporary construction activities.

Vibration

The City of Emeryville zoning ordinance at Section 9.4.59.8 limits vibration at any lot line as stated in the Vibration Standards table adopted by the City Council. However, these performance standards do not apply to operations involved in the construction or demolition of structures or caused by motor vehicle or trains.

Analysis as to whether or not project activities would result in:

a. Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies.

Impact Analysis:

In terms of compliance with applicable standards, the Emeryville noise ordinance, the proposed project would have a less than significant impact because the project activities are anticipated to be scheduled between 7:00 am and 6:00 pm, with heavy equipment-based

activities limited to 8:00 am to 5:00 pm. If activities are proposed outside of the weekday allowable construction noise time limits, the contractor will apply to the City for a waiver, as described in Section 5-13.06 of the Ordinance. The procedures for waiver application require submittal of a description of the type of work to be performed, the type of equipment to be used, notifications to neighbors, and, among other requirements, a description of the types of construction practices to be used to minimize noise.

Conclusion:

☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☒ **Less Than Significant Impact**
☐ No Impact

b. Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels.

Impact Analysis:

Installation of the excavation shoring would generate groundborne vibration. Based on the geotechnical investigation and the preliminary shoring design, the preferred installation procedure is a soldier pile with lagging retaining wall. Since the shoring installation would be near to and parallel to Horton Street, any groundborne vibration from this area would be initiated within 55 feet of potential receptors in the 45th Street Artists Co-op building, within 125 feet of the Bayer Pharmaceuticals lab building and adjacent to Building 31. Because pile driving could generate substantial vibration at adjacent structures the geotechnical design for shoring evaluated lower-vibration installation methods in lieu of pile driving, such as: cast-in-drilled-hole (CIDH) piles, pre-drilled piles, soil-mix wall technology, shielded pile drivers, or vibratory pile drivers.

The preferred method, i.e., pre-drilled piles, would eliminate the need to drive piles and limit potential exposure to excessive vibration levels. This would result in a lower-vibration method of installing piles than the pile-driving method recently used for the Pixar Studios project. The estimated peak particle velocity from drilling of the boreholes (based on vibration data for caisson drilling (FTA, 2006)) at the 45th Street Artists Co-op is 0.027 in/sec. The threshold of human perception is approximately 0.005 in/sec PPV, and the threshold amplitude at which annoyance can occur is approximately 0.02 to 0.05 in/sec PPV. The lower threshold of 0.005 in/sec PPV is considered appropriate to evaluate annoyance caused by vibration in residential buildings, and 0.05 in/sec PPV is considered appropriate to evaluate vibration in commercial or office buildings. Therefore, this vibration level is in the range of levels at which continuous vibrations begin to annoy people in buildings, but is a level tolerable by most people if short term in length, i.e., not excessive. The drilling for the shoring system is expected to take less than a month. The estimated vibration level would have no effect on the buildings.

At the Bayer Labs building, the estimated peak particle velocity is 0.008 in/sec, which would be barely perceptible to people and have no effect on the building.

Another potential source of excessive vibrations is the removal of the concrete building foundations below the raised cap. The estimated peak particle velocity from jack-hammering of the concrete (FTA, 2006) at the Artists Loft is 0.011 in/sec. At the Bayer Labs,

the peak particle velocity from jack-hammering is estimated as 0.003 in/sec. These levels fall into the imperceptible to barely perceptible to humans range with no effects on buildings.

In terms of potential damage to Building 31 from removal of the raised cap and foundations, vibration levels are estimated to be less than 0.5 in/sec, which is below the threshold at which there is a risk of architectural damage to buildings with plastered ceilings and walls.

The preliminary construction schedule indicates the installation of the shoring system would overlap the removal of the raised cap (jack-hammering). Since these are the first few days of mobilizing for the shoring system installation, the combined vibrations from the two activities occurring simultaneously are not expected to be substantially higher than the individual activities.

Construction vibrations from excavation, trucks, and other activities would on average occur at greater distances from the buildings on Horton Street and Sherwin Avenue than the activities analyzed above and would not be expected to expose the Horton Street and Sherwin Avenue buildings to vibration levels as high as the above-calculated activity levels. Note that the nearby railroad tracks and area truck traffic are two existing sources of ambient groundborne vibration in the study area.

No permanent sources of vibration that would expose persons to excessive groundborne vibration or noise levels would be created by the project.

The Emeryville City Ordinance does not establish a vibration limit for construction activities. Therefore, an evaluation of potential vibration impacts cannot be conducted. However, measures (described above) have been incorporated within the project to minimize the potential for vibration effects to a less than significant level.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☒ **Less Than Significant Impact**
☐ No Impact

c. A substantial permanent increase in ambient noise levels in the vicinity above levels existing without the project.

Impact Analysis:

The remediation activities proposed at the Site would be temporary in nature and would therefore generate no permanent increase in ambient noise levels.

Conclusion:

☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☐ Less Than Significant Impact
☒ **No Impact**

d. A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project.

Impact Analysis:

Given the nature of the required construction activities and the types of equipment required, temporary increases in noise level would be unavoidable. As a result, a construction noise impact analysis was conducted to identify the ambient noise levels prior to implementation of project activities. Ambient noise levels provide a baseline for measuring project-generated construction noise levels at the receptors closest to the anticipated noisiest temporary activities, namely the 45th Street Artists Co-op and Bayer lab property boundaries across Horton Street.

CONSTRUCTION NOISE IMPACT ANALYSIS

The construction noise analysis evaluated noise based on the anticipated use of construction equipment, both quantity and type, and for specified distances from construction activities. Because there are no specific construction noise limits defined under CEQA, the following general guidelines were used to assess construction (e.g. temporary) noise impacts:

- A less than 3-dBA increase in existing noise level is considered no impact (0 to 3 dBA increase is barely perceptible);
- A 3- to 5-dBA increase in existing noise level is considered a slight temporary impact (3 to 5 dBA increase is readily perceptible);
- A 6- to 10-dBA increase in existing noise level is considered a moderate temporary impact (6 to 10 dBA increase is perceptible to twice as loud); and
- A greater than 10-dBA increase in existing noise level is considered a substantial temporary impact (greater than 10 dBA increase is more than twice as loud).

Source: FHWA, Highway Traffic Noise Analysis and Abatement Policy and Guidance, June 1995.

Noise levels in this analysis are presented in A-weighted decibels (dBA) and are one-hour equivalent sound levels (L_{eq}) unless otherwise noted. The L_{eq} represents an energy average for the daytime construction period and includes the effects of intermittent loud events. Maximum sound levels (L_{max}) are also presented as additional information for this impact assessment.

CONSTRUCTION ACTIVITIES AND EQUIPMENT

Table 4 presents the anticipated construction equipment that will operate during each project activity.

Removal of former building foundations, currently under the raised cap area and immediately above the target Source Area soil, may require the use of large, excavator-mounted hydraulic jackhammers to break out the concrete.

Typical construction equipment such as excavators, trucks, dozers, and backhoes, will generate lower one hour noise levels than the jack-hammer equipment, although the typical equipment will be in use for a longer duration than the jack hammer equipment. Excavators and other typical construction equipment will be on-site for an estimated six months.

Table 4 also presents the L_{max} sound level and percent of time the equipment is expected to be operated at full power (usage factor) for each piece of construction equipment used. The L_{max} sound levels represent typical maximum noise that normally occurs during full power operation of the equipment. These levels typically only occur for a short duration, since the equipment is not operated at full power for an entire workday. The effects of both the L_{max} sound level and duration are included in the L_{eq} impact assessment.

The construction noise predictions are based on the following parameters:

- Type of equipment expected to be utilized;
- Quantity of equipment expected to be utilized;
- L_{max} sound level for full power operation of each type of equipment;
- Percentage of time equipment typically operates at full power;
- Noise attenuation from energy dissipation with distance;
- Noise attenuation from portable and stationary barriers adjacent to soil excavation operation.

Table 4 Construction Equipment Noise Levels					
Implementation Activity	***Equipment***	***Number of Units***	***Lmax @ 50 feet (dBA)***	***Usage Factor (%)***	***Leq @ 50 feet (dBA)***
Removal of Raised Cap	Excavator	1	81	40%	77
	Excavator/Jack Hammer	1	90	20%	83
	Front End Loader	1	79.1	40%	75
	Dump Truck	2	76.5	40%	76
				Total	**85**
Shoring/Soldier Pile Installation	Auger Drill Rig	1	85	20%	78
	Excavator	1	81	40%	77
	Cement Truck	1	79	40%	75
				Total	**82**
Dewatering	Drill rig	1	79	20%	72
	Pumps	2	81	50%	81
				Total	**82**
Excavation	Water Truck	1	74.3	40%	70
	Excavator	1	81	40%	77
	Dump Truck	1	76.5	40%	73
	Front End Loader	1	79.1	40%	75
	Foam Application Truck	1	74.3	40%	70
				Total	**81**
Waste Pile Staging	Front End Loader	1	79.1	40%	75
				Total	**75**
Backfilling	Front End loader	1	79.1	40%	75
	Dozer	1	82	40%	78
				Total	**80**
Truck loading[(1)]	Front End Loader	1	79.1	40%	75
	Haul Trucks	3	76.5	40%	78
				Total	**79**
Slurry Wall Breach	Excavator	1	81	40%	77
				Total	**77**
Final Grading	Dozer	1	82	40%	78
	Front End Loader	1	79.1	40%	75
				Total	**80**

(1) Assumes that haul trucks exporting material are also importing backfill and borrow material on return trips.

The L_{eq} noise level was calculated using the following equations:

$$L_{eq}\,(\text{equipment}) = EL - 20\log_{10}(d/50) + 10\log_{10}(UF)$$

Where:

EL is the estimated noise level at 50 feet (dBA)

d is the distance from the equipment to nearest receptor (feet)

UF is the daily usage fraction of time that equipment is used at full power

This formula results in a 6-dBA loss for each doubling of distance. This formula includes the effect of geometrical spreading of noise with distance.

The individual contributions of each piece of equipment were combined to obtain an approximation of overall combined noise level at each location using:

$$L_{eq}\ (\text{overall}) = 10 \log_{10} \sum 10^{(Leq(equipment) / 10)}$$

Based on this general equation, the estimated daytime L_{eq} noise level at the exterior of the 45th Street Artists Co-op building (midpoint of building wall fronting Horton Street) from these overlapping construction activities would be 77 dBA. Inside the building, the estimated uncontrolled noise level would be approximately 62 dBA (15 dBA of sound attenuation is typically provided by a building with open windows). This level is comparable to the typical level of normal conversational speech at 5-10 feet (See earlier table of typical A-weighted sound levels of common noise sources). Although this would be considered a substantial and potentially annoying short-term noise increase (greater than 10 dBA increase or more above existing noise levels) at the 45th Street Artists Co-op this worst-case substantial increase would occur only for a few days based on the preliminary construction schedule when removal of the raised cap would be occurring simultaneously with initiation of the shoring installation. Furthermore, the 62 dBA noise level would be below the level where health effects could occur.

The estimated daytime L_{eq} noise level at the exterior of the Bayer facility would be approximately 78 dBA. Inside the building, the estimated uncontrolled noise level would be approximately 58 dBA (20-25 dBA of sound attenuation is typically provided by a building without openable windows). Inside the building, the estimated uncontrolled noise level would be approximately 58 dBA (20-25 dBA of sound attenuation is typically provided by a building without openable windows). The typical noise level inside a business office is 55 dBA. Based on this typical indoor noise level, the construction L_{eq} level would be 3 dBA over the typical existing interior L_{eq} level of 55 dBA. This level would be considered a slight noise impact (3 to 5 dBA increase above existing noise levels) at the Bayer facility.

Material used to cover stockpiles can also potentially generate noise when not adequately secured against winds. However, the cover material would be held down with weights, the stockpiles will be inspected daily, and any loose covering would be addressed. Therefore, this would not have a significant impact.

It is anticipated that the daytime construction noise impacts will last up to seven months. Based on the estimated potential increase in noise, and the relatively short duration of the activity, the impacts would be less than significant.

TRAFFIC-RELATED NOISE

Transportation-related noise sources would include construction worker vehicles, haul trucks, visitors and equipment deliveries. According to the traffic analysis, the volume of construction traffic generated by these sources would be low in relation to existing traffic volumes. Because a doubling of traffic in passenger-cars increases noise levels by 3 dBA, the noise generated by this short-term traffic would increase area noise levels by less than 3 dBA and therefore would have a barely perceptible to imperceptible impact.

The traffic analysis estimates that 228 truck trips per day would occur on Halleck Street south of Sherwin Avenue. While no traffic count data are available for Halleck Street, the traffic analysis provides a rough estimate of ADT on Halleck Street of 450 vehicles per day (vpd) with a majority of this traffic occurring during the daytime hours of 7:00 am to 6:00 pm. The estimated average increase in noise due to haul truck traffic on Halleck Street is less than 3 dBA, which would represent a barely perceptible daytime impact.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☒ **Less Than Significant Impact**
☐ No Impact

12. Population and Housing

Project Activities Likely to Create an Impact:

None.

Description of Baseline Environmental Conditions:

The Site is located in an industrial area surrounded by transportation (railroad), retail, commercial, and live-work uses. Residences are located east of the Site at the intersection of 45th Street and Horton Street, and south of the Site at the intersection of Hubbard Street and Sherwin Avenue, as well as Halleck and Sherwin Avenue.

Analysis as to whether or not project activities would:

a. Induce substantial population growth in area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure).

Impact Analysis:

The proposed project does not involve construction of new homes or buildings or installation of permanent infrastructure. Therefore, the project activities would not induce population growth directly or indirectly. .

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☐ Less Than Significant Impact
☒ **No Impact**

b. Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere.

Impact Analysis:

Although the proposed activities involve work within a mixed land use area, project activities will have no affect on existing housing. Therefore, the project activities would not displace

substantial numbers of existing housing or require the construction of replacement housing elsewhere.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☐ Less Than Significant Impact
☒ **No Impact**

c. Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere.

Impact Analysis:

See b. above.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☐ Less Than Significant Impact
☒ **No Impact**

13. Public Services

Project Activities Likely to Create an Impact:

- On-site excavation and other project activities.

Description of Baseline Environmental Conditions:

The Site is a former industrial facility in a highly urbanized area of Emeryville. As such, the community is served by the City of Emeryville Police Department (EPD), Fire Department (EFD), Community Services Department (Parks), and the Emeryville Unified School District.

Analysis as to whether or not project activities would:

a. Result in substantial adverse physical impacts associated with the provision of new or physically altered government facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the following public services:

Impact Analysis:

❖ **Fire protection**
The on-site project activities would not require new or expanded fire protection services from EFD, as the nature and intensity of on-site land use would not change as a result of the excavation and restoration activities. As such, no impacts to fire protection services would result.

- **Police protection**
  The on-site project activities would not require new or expanded police protection services from EPD, as the nature and intensity of on-site land use would not change as a result of the excavation and restoration activities. As such, no impacts to police protection services would result.

- **Schools**
  The on-site project activities would not require new or expanded school facilities, since no net population growth would results from the project. No neighborhood schools will be affected by the project. No impacts to school services would result.

- **Parks**
  No parkland or other recreational facilities would be affected by the project, nor will any new or expanded parks or other recreational facilities be necessitated by project implementation. The land to the west of the Site is owned by the City of Emeryville and the City plans to construct a public park on its property after the proposed project is completed. Therefore, no impacts to existing or proposed park facilities would occur.

- **Other public facilities**
  The project entails temporary activities at the Site; no permanent or net change to the nature or intensity of current on-site land uses would result from the project. No impacts to other public facilities would result.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☐ Less Than Significant Impact
☒ **No Impact**

14. Recreation

Project Activities Likely to Create an Impact:

None.

Description of Baseline Environmental Conditions:

The Site is an industrial facility in a highly urbanized area of Emeryville. Land to the west and north of the Site was formerly owned by Union Pacific Railroad and is currently owned by the City and is designated as for use as open space. However a portion of this parcel is currently (Fall 2009) being used as a staging area for the City's Park Avenue beautification project. At the completion of the proposed project and the Park Avenue project, this area is to be restored to a public park.

Analysis as to whether or not project activities would:

a. Increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated.

Impact Analysis:

The proposed project involves remediation activities that will neither require use of, nor access through any parks or other recreational facilities. Therefore, the proposed project will not result in the physical deterioration of any recreational facilities.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☐ Less Than Significant Impact
☒ **No Impact**

b. Include recreational facilities or require construction or expansion of recreational facilities which might have an adverse physical effect on the environment.

Impact Analysis:

The proposed project is limited to remediation activities with no construction or expansion of public recreational facilities. Therefore, the project will not have an adverse physical effect on the environment due to construction of recreational facilities.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☐ Less Than Significant Impact
☒ **No Impact**

15. Transportation and Traffic

Project Activities Likely to Create an Impact:

- Mobilization of equipment, trucks and personnel to the Site.
- Transportation of excavated materials off the site.
- Transportation of backfill material to the site.

Description of Baseline Environmental Conditions:

The Site is located in an urbanized area of the City. The Site is bounded by the Novartis (former Rifkin) parking area to the north, Horton Street to the east, Sherwin Avenue to the south, and the Union Pacific Railroad (UPRR) tracks to the west. 45th Street connects to Horton Street just north of the intersection of Horton Street and Sherwin Avenue. Hubbard Street and Halleck Street are parallel (Halleck is west of Hubbard) and connect to Sherwin Avenue at the central and western, respectively, parts of the facility. No intersections in the immediately

vicinity are signalized. The closest routes to the Site of Emeryville's bus service, Emery Go-Round, and the Alameda-Contra Costa Transit District (AC Transit) follow Hollis Street (east of the Site) and 40th Street (south of the Site). There is no bus service along roads adjacent to the Site.

The following narratives summarize the key features of the City's transportation system as presented in the City's General Plan Draft Environmental Impact Report (City of Emeryville, May 2009).

The City has classified its streets as arterials, collectors, and local streets. The City's streets carry thousands of vehicle and transit trips daily and are primarily based on a grid, with several major north-south and east-west roadways interlaced with a system of intersecting minor streets.

Street Classifications

Streets in Emeryville are classified as follows:

- **Arterial** - City arterial streets are intended to provide most of the City's required internal traffic capacity, carry the heaviest traffic volumes and provide the most direct routes between internal and external places.

- **Collector** - This type of street provides arterial access to residential neighborhoods and other development areas, but protects those areas from heavier through traffic.

- **Local** - Local streets are intended to provide access only for the areas immediately adjacent to them and are planned to be free from use by through traffic. The local streets are integral with the development areas they serve. Local streets generally connect to other local streets or to collectors.

Key roadways are described below:

- **Shellmound Street** is a two- to four-lane north/south arterial with on-street parking at select locations. Shellmound Street becomes 40th Street to the south of a railroad overcrossing.

- **Hollis Street** is a two-lane, north/south arterial, with on-street parking that begins in Oakland at Peralta Street and ends in Berkeley at Folger Avenue. North of Folger Avenue, Hollis Street becomes 7th Street extending northwards through Berkeley.

- **San Pablo Avenue,** designated as State Route 123 (SR 123), is a four-lane, north/south arterial. San Pablo Avenue extends north from downtown Oakland to Crockett. In Emeryville, San Pablo Avenue generally has four lanes with left-turn lanes, raised medians, and on-street parking (in some locations).

- **40th Street** is an east/west four-lane arterial with left-turn pockets and on-street parking in some locations. 40th Street turns into Shellmound Street to the west of the railroad overcrossing. Eastward, 40th Street passes on the north side of the MacArthur BART Station and terminates at Piedmont Avenue in Oakland.

- **Powell Street** is an east/west arterial, generally with four lanes, with an interchange at I-80. It extends westward from I-80 to the Emeryville Marina, and east from I-80 to west of San Pablo Avenue, where it becomes Stanford Avenue and continues to Adeline Street in Berkeley.

- **Adeline Street** is a two to four-lane north/south arterial with on-street parking that begins at the Port of Oakland and extends northward to Shattuck Avenue in Berkeley. It is the principal vehicular route to the Ashby BART Station from Emeryville.

- **65th Street** is a two-lane, east/west street that extends eastward from Lacoste Street. Land uses along 65th Street include residential, commercial, and office and on-street parking is available. An at-grade railroad crossing is located just east of Shellmound Street.

- **Frontage Road** is a two-lane, north/south street that parallels I-80 on the west. Left-turn pockets are provided at major intersections, including I-80 access points. This roadway extends northward from Powell Street in Emeryville to Gilman Street in Berkeley.

- **Shellmound Way** is a short four-lane east/west roadway that connects Christie Avenue and Shellmound Street. On-street parking is prohibited on Shellmound Way.

- **Christie Avenue** is generally a two-lane, north/south Street extending from Shellmound Street, south of Powell Street, north to 65th Street. On-street parking is permitted at select locations on Christie Avenue.

- **45th Street** is a two-lane, east/west street that extends eastward from Horton Street. On-street parking is permitted. An AC Transit yard is located near the intersection of 45th Street and San Pablo Avenue.

- **Park Avenue** is a wide two-lane street running east/west between Halleck Street and San Pablo Avenue. Between San Pablo Avenue and Hollis Street, angled on-street parking is generally provided on the north side of the street and parallel on-street parking is on the south side. West of Hollis Street portions of Park Avenue are unimproved and have a mix of perpendicular and parallel parking.

- **Horton Street** is a north/south two-lane street with on-street parking provided at select locations. Class II bike lanes are provided north of 53rd Street.

- **Emery Street** is a two-lane north/south street extending southward from Park Avenue. On-street parking is available. Emery Street becomes Peralta Street south of MacArthur Boulevard.

- **MacArthur Boulevard** is an arterial stretching from Hollis Street in the west, through Oakland and continuing east. MacArthur Boulevard has one lane in each direction. It forms a one-way couplet (each direction is separated by a wide median) between Linden Street and Hollis Street although it is discontinuous at the San Pablo Avenue / Adeline Street intersection. MacArthur Boulevard also goes under the San Pablo Avenue / Adeline Street intersection and connects to eastbound 1-580 via left-hand ramps.

- **36th Street** is the westbound portion of a one-way couplet formed with 35th Street. This two-lane street is a major access point for vehicles inbound to Emeryville due to the I-580 and SR 24 ramps. 36th Street terminates in the west where it meets Peralta Street and West MacArthur Boulevard.

- **35th Street** is the eastbound portion of a one-way couplet formed with 36th Street. This two-lane street provides access to the I-580 and SR 24 freeway on-ramps.

The City is in the process of changing their street classification system to reflect the trend towards multi-modal travel and less reliance on the automobile. The proposed new classification system is defined in the Emeryville General Plan (January 2009). It carries forward concepts of a complete street system and proposes to categorize City transportation facilities as follows according to newly defined "typologies". The following typology definitions apply to the streets and other facilities that make up the City's transportation system plan:

- **Transit Street** – These are primary routes for AC Transit, Emery Go-Round, and other public transit providers. Signal preemption for transit vehicles, bus stops, and, where appropriate, bus lanes, are provided. Other travel modes, including automobiles, bicycles, and trucks, are accommodated in the roadway, but if there are conflicts, transit has priority. These streets accommodate moderate to high volumes of through-traffic within and beyond the City. Pedestrians are accommodated with ample sidewalks on both sides of the street, and amenities around bus stops (e.g. shelters, benches, lighting, etc).

- **Bicycle Boulevard** – These are through-routes for bicycles providing continuous access and connections to the local and regional bicycle route network. Through-motor vehicle traffic is discouraged. High volumes of motor vehicle traffic are also discouraged, but may be allowed in localized areas where necessary to accommodate adjacent land uses. Local automobile, truck, and transit traffic are accommodated in the roadway, but if there are conflicts, bicycles have priority. Traffic calming techniques to slow and discourage through-automobile and truck traffic may be appropriate. Pedestrians are accommodated with ample sidewalks on both sides of the road.

- **Connector Street** – Automobiles, bicycles, and trucks are accommodated equally in the roadway. Transit use, if any, is incidental. These streets accommodate moderate to high volumes of through-traffic within and beyond the City. Pedestrians are accommodated with ample sidewalks on both sides of the street.

- **Local Street** – Automobiles, bicycles, and trucks are accommodated equally in the roadway. Transit use, if any, is incidental. These streets accommodate low volumes of local traffic and primarily provide access to property. Through-traffic is discouraged. Traffic calming techniques to slow and discourage through-automobile and truck traffic may be appropriate. Pedestrians are accommodated with ample sidewalks on both sides of the street.

- **Auto Dominant Highway** – These are freeways and approach roads (e.g. Ashby Avenue and West MacArthur Boulevard underpass) that serve high volumes of high speed regional motor vehicle traffic including automobiles and trucks. Transbay and express transit buses are also accommodated. Bicycles and pedestrians are prohibited.

- **Intercity Rail** – This is the mainline Union Pacific/Amtrak railroad line serving long distance and local freight and passenger traffic. The Capitol Corridor line is the third busiest route in the U.S. Other passenger routes include cross country trains (California Zephyr and Coast Starlight), San Joaquin, and future "East Bay Express".

- **Major Transit Hub** – These are transfer points where high volume transit lines intersect. These are located in the Amtrak station with access from both sides of the rail line, and at 40th Street and San Pablo Avenue.

- **Bicycle Path** – Class I Bicycle path as defined by Caltrans standards accommodates both bicycles and pedestrians. Motor vehicle traffic is prohibited.

- **Bike Route** – Class II (bike lanes) or Class III (signed route) bike facilities as defined by Caltrans standards, are overlaid on transit, connector, and local streets. While bicycle use is always accommodated on these streets, it is encouraged along designated bike routes, which provide continuous access and connections to the local and regional bicycle route network.

- **Pedestrian Path** – These are exclusive walkways for pedestrians. Bicycles and motor vehicles are prohibited.

- **Pedestrian Priority Zones** – These are zones on which high volumes of pedestrian traffic are encouraged along the sidewalk. This includes zones around neighborhood centers, regional retail areas, and around school and other public facilities.

INTERSECTION LEVELS OF SERVICE

In order to evaluate the Level of Service (LOS), a number of intersections were selected for this transportation technical analysis based on the availability of traffic count data from previous traffic studies. To that end, adjacent to and in the immediate vicinity of the Site, 12 specific intersections were identified within the limits of Emeryville along the various truck route alternatives. These intersections are as presented in **Table 5**.

Based upon the available information from other studies, the operational characteristics of each intersection were obtained. Note that for each intersection, data are primarily presented for the peak hour period between 4:00 p.m. to 6:00 p.m. (e.g. PM peak hour), to ensure that the intersection's peak volumes were represented.

Table 5 ***Existing Intersection Level of Service – Locations within Emeryville (2007 Data)***				
Intersection	***AM Peak Hour***		***PM Peak Hour***	
	Delay (seconds)	***LOS***	***Delay (seconds)***	***LOS***
Powell Street / I-80 EB Ramps Note 3	SEE NOTE 2	SEE NOTE 2	73 sec.	E
Powell Street/Christie Avenue Note 3	SEE NOTE 2	SEE NOTE 2	38 sec.	D
Powell Street/Peladeau Street (U) Note 4	0 (14) sec.	A (B)	2 (17) sec.	A (C)
Powell Street / Hollis Street Note 3	SEE NOTE 2	SEE NOTE 2	51 sec.	D
Stanford Avenue/Hollis Street Note 4	4 sec.	A	6 sec.	A
Stanford Avenue/Peladeau Street (U) Note 4	8 (11) sec.	A (B)	5 (10) sec.	A (A)
Stanford Avenue/Horton Street Note 4	8 sec.	A	9 sec.	A
Horton Street/ 53rd Street Note 4	8 sec.	A	8 sec.	A
Horton Street/45th Street Note 4	8 sec.	A	8 sec.	A
Horton Street/Park Avenue Note 4	8 sec.	A	9 sec.	A
Horton Street/40th Street Note 3	SEE NOTE 2	SEE NOTE 2	37 sec.	D
Horton Street/Mandela Parkway/Yerba Buena Avenue Note 3	SEE NOTE 2	SEE NOTE 2	42 sec.	E

Note 1: Two delay values are reported for each side-street stop-controlled unsignalized intersection: (1) the intersection average delay and (2) the highest controlled movement delay.
Note 2: AM peak hour analysis was not completed for these locations in the existing data gathered for this analysis.
Note 3: Fehr and Peers Transportation Consultants. June 20, 2007. City of Emeryville Supplemental Cumulative Traffic Analysis – Appendix B: Intersection LOS Summary, Emeryville, California.
Note 4: City of Emeryville. May 2009. Emeryville General Plan Draft Environmental Impact Report, Emeryville, California.

To identify the order-of-magnitude increases associated with the project activities, estimates for (Average Daily Traffic) ADT's along selected streets in the area were made by taking the PM peak hour traffic volume from an adjacent nearby intersection and multiplying the value by 10. The logic behind this method is the rule-of-thumb that on any given roadway system the PM peak hour is approximately 10 percent of the total ADT on the road. In reality, this adjustment can be anywhere between 8 percent and 15 percent, but in absence of clear data, the 10 percent rule has been used. **Table 6** contains estimated ADT's for some of the roadways in the vicinity of the Site.

Table 6 ***Estimated ADT Volumes on Various Area Roadways***			
Location of Estimated ADT	***Adjacent Intersection Count Used***	***Total PM Peak Hour Count from Adjacent Intersection***	***Estimated ADT***
Horton Street (immediately north of 53rd Street) Note 2	Horton Street & 53rd Street	338 vehicles	3,380 vehicles
Horton Street (immediately north of 45th Street) Note 2	Horton Street & 45th Street	351 vehicles	3,510 vehicles
Powell Street (immediately west of Hollis Street) Note 1	Powell Street & Hollis Street	2,191 vehicles	21,900 vehicles
Park Avenue (immediately west of Horton Street) Note 2	Horton Street & Park Avenue	138 vehicles	1,380 vehicles
Halleck Street (immediately north of 40th Street) Note 3	Harlan Street & Park Avenue	45 vehicles	450 vehicles

Note 1: Fehr and Peers Transportation Consultants. June 20, 2007. City of Emeryville Supplemental Cumulative Traffic Analysis – Appendix B: Intersection LOS Summary, Emeryville, California.

Note 2: City of Emeryville. May 2009. Emeryville General Plan Draft Environmental Impact Report, Emeryville, California.

Note 3: No traffic data are available for Halleck Street and/or its intersections. Harlan Street, between Park Avenue and 40th Street, was used as a similar roadway facility for purposes of estimating existing ADT volumes.

Based on the types of roadways found within the vicinity of the Site, the following level of service volume thresholds were estimated as shown in **Table 7**. Note that the values contained within **Table 7** do not incorporate any possible adjustments to the gross planning level volumes, which may be allowed for the presence of left-turn bays on the roadway facility.

Table 7 ***Theoretical Planning Level ADTs for City Roads in an Urbanized Area***						
Lanes	***Separation Features***	***LOS A***	***LOS B***	***LOS C***	***LOS D***	***LOS E***
2	Undivided	**	**	9,100	14,600	15,600
4	Undivided / Divided	**	**	21,400	31,100	32,900
6	Divided	**	**	33,400	46,800	49,300

Source: Transportation Research Board - National Research Council. 2000. *Highway Capacity Manual (HCM2000)* - Chapter 9 Analytical Procedures Overview, Section VI Service Volume Tables, Page 9-9, Washington D.C.

Source: Florida Department of Transportation, Systems Planning Office. 2002. *Quality/Level of Service Handbook* - Chapter 4 General Planning Analysis, Table 4-1 Generalized Annual Average Daily Volumes for Florida's Urbanized Areas (page 85), Tallahassee, Florida.

** As per HCM2000, levels of service A and B planning level volumes cannot be calculated in urbanized areas using default values.

PUBLIC TRANSIT (CITY OF EMERYVILLE, MAY 2009)

Several public transit options serve the City, including the Emery Go-Round shuttle to the MacArthur BART station, the 72 Rapid Bus on San Pablo Avenue, several other AC Transit bus routes, and commuter trains at the Amtrak station. Amtrak also operates buses between Emeryville and San Francisco, but non-train passengers are not allowed to ride those buses. There are two transit hubs in Emeryville including the Amtrak station and the San Pablo Avenue/40th Street intersection.

PEDESTRIAN CIRCULATION (CITY OF EMERYVILLE, MAY 2009)

The City's pedestrian network consists of sidewalks, multi-use paths, and street crossings. Emeryville has many areas that are conducive to walking for recreation and transportation, particularly in the neighborhoods east of the railroad tracks and north of 40th Street, such as Park Avenue District, the Hollis Street corridor, the San Pablo Avenue corridor, and the Doyle Street Greenway.

BICYCLE CIRCULATION (CITY OF EMERYVILLE, MAY 2009)

The City of Emeryville has endorsed policies to encourage bicycling as a form of transportation and has implemented changes to roadways for bicyclists. Given that 28 percent of Emeryville's working population is employed within Emeryville, a comprehensive citywide bikeway network and associated support facilities planning, such as bicycle parking at employment locations and other destinations, has greatly increased the mode share of bicycling as a form of transportation in Emeryville.

PARKING (CITY OF EMERYVILLE, MAY 2009)

Emeryville currently has an abundance of free parking for residents, visitors, and workers, making driving an attractive alternative to taking public transit, walking or bicycling. In the past, zoning requirements have prescribed parking requirements by land use type, but have not allowed for appropriate off-sets to account for shared parking, transit availability, or to promote bicycling and walking.

Analyses of Project Impacts

This section presents the impacts of the proposed project on the surrounding transportation system. The transportation system impacts are categorized for each transport alternative defined for transport of materials and arrival and departure of Site personnel. There are five (5) alternatives that have been defined for transportation routes. These alternatives are described later in this section and are shown on **Figure 4**.

Project Activities

TRIP GENERATION

Table 8, Estimated Vehicle Trips presents a summary of estimated total and maximum daily vehicle trips (one trip represents one vehicle movement to the Site or away from the Site).

Table 8 ***Estimated Vehicle Trips***		
Project Activity	***Total Truck Trips***	***Maximum Daily Vehicle Trips***
Mobilization of Construction Workers (associated with Shoring along Horton Street)	3 (pieces of equipment)	7
Off-Site Transport of Excavated Material [Note 1] (assumes 64,000 yd^3 max. w/1.4 expansion factor; 20 yd^3/truck)	4,480	114 (57 leaving & 57 returning)
Delivery of Clean Backfill [Note 2] (assumes 68,274 yd^3 ; 20 yd^3/truck)	3,414	106 (53 leaving & 53 returning)
Demobilization	12	--
TOTAL		228 trips (114 leaving & 114 returning)

Note 1: Because of volume expansion factors associated with removal and loading of excavated materials, volumes of excavation and import of clean backfill are not identical.

Anticipated additional daily vehicle volumes include 114 vehicle trips associated with excavation activities to haul material off-site, 106 vehicle trips associated with the delivery of clean backfill to the Site, and 8 additional vehicle trips for worker travel associated with the shoring activities along Horton Street. This represent a total of approximately 228 additional trips per day on the transportation system, distributed between the hours of 7 am and 6 pm. Based on a one hour lunch break, the new vehicle trips equate to 22.7 (i.e., 23) new vehicle trips per hour on the roadway system. These trips are both entering (11.5 per hour) and leaving (11.5 per hour) the Site. This volume of additional trips, which amounts to one vehicle trip every 2.6 minutes, would result in a negligible change in roadway and intersection operations and capacities. Note that the three project activities described above in Table 8 are expected to be concurrent activities, and as such reflect the maximum daily vehicle trips expected to occur during the project at any given time.

CURRENT AND/OR PLANNED PROJECTS FOR CUMULATIVE IMPACT ASSESSMENT

There are several current and/or planned projects within the vicinity of the Site that may attribute to potential cumulative impacts. These are described in **Table 9**.

Potential cumulative impacts on transportation would only occur during construction, as there would be no permanent new traffic trips at the completion of the S-W proposed project. Of the seven other current and/or planned projects listed in **Table 9**, the potential does exist that one or more planned project may undertake construction activities during the same timeframe that the S-W proposed project activities occur - with associated hauling of material off-site and delivery of clean backfill on-site. In this circumstance, there may be a less than significant cumulative impact on the transportation system resulting from the occurrence of more than one project in the area. However, none of the transportation route alternatives described below will realize these impacts to be “cumulatively considerable”, primarily due to the short-term nature of the S-W proposed project and the presence and function of the urban street system in

Emeryville and Oakland. This is further discussed in the analysis of the five transportation alternatives.

Table 9
Current and/or Planned Local Projects

Project Name, Location	***Description***	***Project Construction Schedule***
Park Street Beautification; Park St between Halleck St. and Hollis St, And Horton St between 40th St and 45th St.	Sidewalk widening; additional street tree plantings; limit truck turning on to Park Avenue west of Hollis St. to Hollis and Halleck Streets; place corner bulbouts at the intersection of Park Avenue with Holden, Horton, and Hubbard Streets; bike racks on every block face of Park avenue; create a park north of Sherwin Avenue and west of Horton St.; create a public space on Park Avenue and west of Halleck St.; a park potentially on the north side of perk avenue midway between Hollis St. and the railroad.	Present through August 2010.
Pixar Project, 1200 park Avenue Between Hollis and Watt.	New production building of about 155,000 square feet at northeast corner of Park Avenue and Hollis Street. Phase II includes expansion of surface parking lot and construction of new City park and bike path at east end of campus. (Not anticipated to affect S-W traffic).	Present through 2011
Horton Landing Park/South Bayfront Pedestrian-Bicycle Bridge, over Union Pacific Railroad.	A pedestrian-bicycle overpass over the Union Pacific Railroad to the north of the Sherwin Williams Property and the Former Rifkin Property	October 2009-Summer 2010
Transit Center, Horton and 59th	Mixed use transit-oriented development and public parking structure with about 248,000 square feet of office/lab/retail space, and 300 parking spaces in a 135- foot tall tower on the "Mound" site; and a 600-space, 7 level parking garage with 3,620 square feet of retail/office space on the Heritage Square site.	November 2009-Spring 2010
Emery Station Greenway, Hollis and 59th	New 91,000 square foot laboratory building on southern portion; existing 39,000 square foot industrial building on northern portion to remain for now. Project includes Greenway improvements on northern portion of block and expansion of plaza at Powell and Hollis Streets.	August 2009- Spring 2010
Public Market Redevelopment; Christie and 64th	Approximately 210 residential rental units and 7 ground floor "shopkeeper" units in a six-story building.	Start in Spring 2010
Bay Street Site B Development, Christie/Shellmound/Powell/ railroad	Northern expansion of Bay Street mixed use project, with 150-room hotel in 240-foot tower, 140 to 240 residential units, 80,000 to 130,000 s.f. of retail, possibly including a Nordstrom's department store, and 800- 900 parking spaces.	Start in November 2010

IMPACTS ANALYSIS

Alternative Truck Route Number 1

Description

This route utilizes Horton Street as the main travel route to and from the Site. Access is provided through the Former Rifkin Property to the north via Horton Street, then to Hollis Street, and then onto Powell Street to freeway connections. It is not anticipated that any rail car usage would occur with this proposed transportation alternative, although that would be a potential beneficial "add-on" subject to contractor operations.

Potential Transportation System Impacts

The intersection of Powell Street & Hollis Street presently operates at a level of service of D during the PM peak hour. Powell Street & Christie Avenue operates at a level of service of D during the PM peak hour. Powell Street and the I-80 EB Ramps operate at a level of service of E during the PM peak hour. Level of service of D is acceptable according to City of Emeryville standards. The usage of this route may require the need for construction flaggers and/or lane closures at the intersection of Powell Street and Hollis Street.

Impacts of this alternative include potential intersection operational delays along Hollis Street and Powell Street. Additionally, there is a queuing concern due to the short merge required for access onto I-80 from Powell Street.

This route would avoid primary residential areas within the community and traverses the industrial areas in northern Emeryville.

This route potentially impacts businesses in the area, directly adjacent to the alternative haul route, including Novartis and Bayer. Coordination would need to occur with both businesses for this route to be viable.

The addition of 228 additional trips per day, superimposed on an estimated existing ADT of 3,380 vehicles, would result in a total estimated existing ADT of 3,608 vehicle trips for Horton Street just north of the Site. This is well below the planning level threshold for this type of facility of 14,600 vehicles per day as defined in **Table 7**.

Cumulative Potential Transportation System Impacts

For potential cumulative impacts, there are two projects identified in **Table 9** that are planned along the general route of Alternative 1. The first project is the Horton Landing Park/South Bayfront Pedestrian-Bicycle Bridge (over UPRR). Construction activities are expected to occur between October, 2009 and Summer, 2010. Due to the proximity of this project near the Site, the potential does exist for additional construction traffic over and above that solely generated with the S-W proposed project along Horton Street, Stanford Avenue, and Powell Street.

The second project is the Bay Street Site B Development, and construction is expected to begin in November of 2010. It is expected that the S-W proposed project activities at the Site will be completed prior to the beginning of this project.

The cumulative impacts associated with the addition of these two projects on the area's transportation system, in concert with the transportation impacts of the S-W proposed project, are not cumulatively considerable.

Alternative Truck Route Number 2

Description

This alternative utilizes a combination of truck traffic and rail car loading and transport. For truck traffic, the route would enter and exit through the Horton Landing Park site north of Hollis Street and traverse onto Powell Street to freeway connections. The existing rail spur would also be utilized for rail car loading and transport.

Potential Transportation System Impacts

The intersection of Powell Street & Hollis Street presently operates at a level of service of D during the PM peak hour. Powell Street & Christie Avenue operates at a level of service of D during the PM peak hour. Powell Street and the I-80 EB Ramps operate at a level of service of E during the PM peak hour. Level of service of D is acceptable according to City of Emeryville standards. The usage of this route may require the need for construction flaggers and/or lane closures at the intersection of Powell Street and Hollis Street.

Impacts associated with this alternative include potential intersection incremental operational delays along Hollis Street and Powell Street. Additionally, there is a queuing concern due to the short merge required for access onto I-80 from Powell Street.

This route would avoid primary residential areas within the community and traverses the industrial areas in northern Emeryville. This route would potentially impact businesses in the area, including Novartis and Bayer.

The potential usage of the rail spur for material transport is considered beneficial. At the present time, it is expected that only hauling of excavated material could occur (i.e., clean backfill will not likely be brought to the Site by rail). The usage of gondola cars would need to be coordinated with the selected contractor, S-W, and the UPRR. It is estimated that each gondola rail car could accommodate the equivalent of five 20-ton truckloads. It is further expected that the Site could accommodate up to 8 gondola rail cars, the equivalent of 40 trucks.

For rail to be viable, an additional rail spur may need to be constructed on the Site. The addition of a revised 188 additional trips per day (228 minus 40 trips removed), superimposed on an estimated existing ADT of 3,380 vehicles, would result in a total estimated ADT of 3,568 vehicle trips for Horton Street just north of the Site. This is well below the planning level threshold for this type of facility of 14,600 vehicles per day as defined in **Table 7.**

Cumulative Potential Transportation System Impacts

For potential cumulative impacts, there are two projects identified in **Table 9** that are planned along the general route of Alternative 2. The first project is the Horton Landing Park/South Bayfront Pedestrian-Bicycle Bridge (over UPRR tracks). Construction activities are expected to occur between October 2009 and Summer, 2010. Due to the proximity of the bicycle bridge project near the Site, the potential does exist for additional construction traffic over and above

that solely generated with the S-W proposed project along Horton Street, Stanford Avenue, and Powell Street.

The second project is the Bay Street Site B Development, and construction is expected to begin in November of 2010. It is expected that S-W proposed project activities at the Site will be completed prior to the beginning of the Site B Development project.

The cumulative impacts associated with the addition of these two projects on the area's transportation system, in concert with the transportation impacts of the S-W proposed project, are not cumulatively considerable.

Alternative Truck Route Number 3

Description

This route utilizes Horton Street as the main travel route to and from the Site, however access is provided to the south rather than the north, as was the case with Alternative 1. Access is provided through the Former Rifkin Property to the south via Mandela Parkway to and from freeway connections. It is not anticipated that any rail car usage would occur with this alternative, although that would be a potential beneficial "add-on" subject to contractor operations.

Potential Transportation System Impacts

The intersection of Horton Street and Mandela Parkway/Yerba Buena Avenue presently operates at a level of service of E during the PM peak hour below the City's standard. The intersection of Horton Street and 40th Street operates at a level of service of D during the PM peak hour. Both Horton Street and Park Avenue and Horton Street and 45th Street function at a level of service of A. Because of high pedestrian usage and the presence of loading/unloading trucks, the usage of this route may require the need for construction flaggers and/or brief lane closures along Horton Street south of the Site.

This alternative includes potential surface impacts to the newly constructed intersection of Park Avenue and Horton Street. By the time hauling operations begin, it is likely this intersection will have been constructed as part of the Park Avenue Beautification project. This particular intersection is a highlight of that project and will receive aesthetic and operational enhancements. Given the aesthetic design and construction component of the intersection surfacing, coupled with pedestrian features such as bollards and curb bulb-outs, care must be exercised to avoid impacts to this particular intersection.

Impacts of this alternative include potential intersection operational delays along Horton Street between the Site and 40th Street.

This route generally traverses a primarily residential area of both Emeryville and North Oakland.

This route would directly impact several key businesses in the area, directly adjacent to the alternative haul route, including Novartis and Bayer. Coordination would need to occur with both businesses for this route to be viable. This impact is considered to be an adverse impact.

The addition of 228 additional trips per day, superimposed on an estimated existing ADT of 3,510 vehicles, would result in a total estimated ADT of 3,738 vehicle trips for Horton Street just south of the Site. This is well below the planning level threshold for this type of facility of 14,600 vehicles per day as defined in **Table 7**.

Cumulative Potential Transportation System Impacts

For potential cumulative impacts, there is one project identified in **Table 9** that is planned along the general route of Alternative 3. This project is the Park Street Beautification project, which includes Park Street between Halleck Street and Hollis Street, and Horton Street, between 40th Street and 45th Street. Construction activities are currently underway and will be completed by August 2010. Due to the proximity of this project near the Site, especially the intersection of Horton Street and Park Avenue, minor cumulative impacts could occur. These include the combination of construction activities from both projects and the need to protect the aesthetic features of the intersection of Horton Street and Park Avenue during S-W proposed project hauling activities.

The cumulative impacts associated with the addition of this project on the area's transportation system, in concert with the transportation impacts of the S-W proposed project, are not cumulatively considerable.

Alternative Truck Route Number 4

Description

This route utilizes a combination of Hubbard Street to enter the Site northbound, and Halleck Street to leave the Site southbound. Vehicles leaving the Site southbound on Halleck Street would follow the same route as defined in the preferred truck route Alternative 5 and as shown on **Figure 5**, (i.e. across Park Avenue, under 40th Street, south to 32nd Street, then Mandela Parkway to Grand Avenue and freeway connections). It is not anticipated that any rail car usage would occur with this proposed alternative, although that would be a potential beneficial "add-on" subject to contractor operations.

Potential Transportation System Impacts

It is not anticipated that any rail car usage would occur with this proposed alternative, although that would be a potential beneficial "add-on" subject to contractor operations. This route follows Emeryville and North Oakland roadways south to Grand Avenue and then onto freeway connections.

Impacts of this alternative include potential surface impacts to the newly constructed intersection of Park Avenue and Halleck Street, and also Park Avenue and Hubbard Street. By the time hauling operations begin, it is likely both of these intersections will have been constructed as part of the Park Avenue Beautification project. Given the aesthetic design and construction component of the intersection surfacing, coupled with pedestrian features such as bollards and curb bulb-outs, care must be exercised to avoid impacts to these particular intersections.

This route includes the avoidance of several key intersections north of the Site that have operational issues along Horton Street and Powell.

This route allows the avoidance of trucks maneuvering directly adjacent to several key businesses in the area, including Novartis and Bayer. The route does, however, traverse through a primarily residential area, which is considered undesirable.

The usage of Hubbard Street may be problematic, as it is not a designated truck route within the City, and travels through the heart of the Park Avenue Beautification project. Additionally, this route would be slightly longer than the "preferred truck route" due to the usage of one-way traffic flows on Hubbard Street and Halleck Street.

There are no existing or planned transit facilities along this route.

Cumulative Potential Transportation System Impacts

For potential cumulative impacts, there is one project identified in **Table 9** that is planned along the general route of Alternative 4. This project is the Park Street Beautification project, which includes Park Street between Halleck Street and Hollis Street, and Horton Street, between 40th Street and 45th Street. Construction activities are currently underway and will be completed by August 2010. Due to the proximity of this project near the Site, especially the intersection of Halleck Street and Park Avenue, and also Hubbard Street and Park Avenue, minor cumulative impacts could occur. These include the combination of construction activities from both projects, as well as the need to protect the aesthetic features of the intersections of Halleck Street and Hubbard Street with Park Avenue during S-W proposed project hauling activities.

The cumulative impacts associated with the addition of this project on the area's transportation system, in concert with the transportation impacts of the S-W proposed project, are not cumulatively considerable.

Alternative Truck Route Number 5

Description

This route utilizes roadways south of the Site, and is the truck route for the former Sherwin-Williams plant. Traffic would enter the Site northbound on Halleck Street, through Sherwin Avenue. Traffic would exit the Site southbound on Halleck Street, across Park Avenue, under 40th Street, and south to 32nd Street. From 32nd Street, trucks would access Mandela Parkway to Grand Avenue and freeway connections.

Potential Transportation System Impacts

It is not anticipated that any rail car usage would occur with this proposed alternative, although that would be a potential beneficial "add-on" subject to contractor operations. This route follows Emeryville and North Oakland roadways south to Grand Avenue and then onto freeway connections.

Impacts of this alternative include potential surface impacts to the newly constructed intersection of Park Avenue and Halleck Street. By the time hauling operations begin, it is likely this intersection will have been constructed as part of the Park Avenue Beautification project. Given the aesthetic design and construction component of the intersection surfacing, coupled with pedestrian features such as bollards and curb bulb-outs, care must be exercised to avoid impacts to this particular intersection.

This route includes the avoidance of several key intersections north of the Site that have operational issues along Horton Street and Powell Street.

This route allows the avoidance of trucks maneuvering directly adjacent to several key businesses in the area, including Novartis and Bayer.

The southern portion of Halleck Street, and subsequently Beach Street, are proposed collector routes for vehicular traffic in the Emeryville General Plan, thereby encouraging the movement of vehicles along these facilities.

As described earlier, trip generation estimates anticipated 114 truck trips for excavation related activities, 106 truck trips delivery of clean backfill to the Site, and 7 additional vehicle trips for worker travel associated with the shoring activities along Horton Street. This amounts to a total of approximately 228 additional trips on the transportation system, per day, spread out between the hours of 7 am and 6 pm. Assuming a one hour lunch break, the new vehicle trips equate to 22.7 (23) new vehicle trips per hour on the roadway system. These trips are both entering (11.5 per hour) and leaving (11.5 per hour) the Site. This low volume of additional trips will have a negligible impact on roadway and intersection operations.

The addition of 228 additional trips per day, superimposed on an estimated existing ADT of 450 vehicles, will result in a total estimated ADT of 668 vehicle trips for Halleck Street just south of the Site. This is well below the planning level threshold for this type of facility of 14,600 vehicles per day as defined in **Table 7**.

There are no existing or planned transit facilities along this route.

Cumulative Potential Transportation System Impacts

For potential cumulative impacts, there is one project identified in **Table 9** that is planned along the general route of Alternative 5. This project is the Park Street Beautification project, which includes Park Street between Halleck Street and Hollis Street, and Horton Street, between 40th Street and 45th Street. Construction activities are currently underway and will be completed by August 2010. Due to the proximity of this project near the Site, especially the intersection of Halleck Street and Park Avenue, less than significant cumulative impacts could occur. These include the combination of construction activities from both projects, as well as the need to protect the aesthetic features of the intersection of Halleck Street and Park Avenue during S-W proposed project hauling activities.

The cumulative impacts associated with the addition of this project on the area's transportation system, in concert with the transportation impacts of the S-W proposed project, are not cumulatively considerable.

SELECTION OF PREFERRED TRUCK ROUTE

The preferred truck route is Alternative Number 5, as shown on **Figure 5**. This alternative is selected as the preferred truck route because it exhibits the least overall impacts to the surrounding transportation system and community of Emeryville, as compared to the other alternatives. Alternative 5 is preferred for the following reasons:

- The preferred truck route avoids the high volume and congested corridor of Powell Street. As a major link to the Interstate system, several intersections along Powell Street

exhibit a poor level of service and possibly may require flaggers and/or lane closures to accommodate truck movements on a periodic basis.

- The preferred truck route avoids impacts to both the Novartis and Bayer facilities - from a noise, aesthetics and possible traffic congestion perspective.

- The preferred truck route utilizes Halleck Street as the primary haul route within Emeryville's city limits. This route has an estimated average daily traffic (ADT) volume of 450 vehicles per day, which is the lowest volume route of any routes considered within Emeryville.

- The roadway network for the preferred truck route, outside of Emeryville and within North Oakland, is better able to accommodate the potential truck traffic via the more extensive network of commuter streets and connections to the freeway system.

- The preferred truck route impacts only one intersection of the Park Avenue Beautification project, Halleck Street and Park Avenue, and will provide for only "thru movements" at the intersection in a north-south direction, thereby eliminating potential street damage from turning trucks at the recently modified intersections.

- The preferred truck route avoids many of the problem areas associated with existing bicycle travel within Emeryville. The route keeps truck traffic moving in a north-south direction on the western side of the Site, eliminating east-west conflict points that bicyclists currently encounter along Horton Street

- The preferred truck route utilizes two proposed "connector" streets as identified in the current draft Emeryville General Plan. These two routes are Halleck Street and Beach Street. The preferred truck route accordingly directs project truck movements on these two Emeryville streets.

In accordance with the Department of Toxic Substances Control (DTSC) California Environmental Quality Act (CEQA) Initial Study guidelines, the following impact analysis is prepared for the preferred truck route (e.g. alternative truck route number 5).

Analysis as to whether or not project activities would:

a. Cause an increase in traffic which is substantial in relation to the existing traffic load and capacity of the street system (i.e., result in a substantial increase in either the number of vehicle trips, the volume to capacity ratio on roads, or congestion at intersections).

Impact Analysis:

The proposed project includes hauling and disposal of material off-site and the importing of suitable materials back to the Site. This will result in an increase in truck traffic adjacent to and throughout the immediate project vicinity. Construction workers will also drive to and from the Site and supplies (e.g. equipment) will be delivered to the Site. Taken together, the proposed project activities would increase truck traffic and, to some extent, passenger vehicle traffic, above that which is currently observed in the Site vicinity. This traffic is

expected to be of short duration, as these project activities would occur over a six-month period.

The following general types of heavy equipment and supplies would be transported to the Site: excavators, dump trucks, water tanks/clarifier, lights, and hoses. During Site mobilization, stationary materials would be delivered to the Site by truck. These materials would remain on-site throughout their use during project activities.

During the various project activities, construction workers would be on Site. Most if not all of these workers are expected to drive their own vehicle to the Site each workday. Project workers would use the west side access road into the facility and park in the northwest corner of the site, in the proposed parking area shown on **Figure 3**.

Excavated soil would be loaded and transported off-Site to one or more licensed landfills. Asphalt and concrete debris, to the extent such materials are analyzed and found suitable, may be loaded into trucks for regional recycling or disposal. A maximum of 57 trucks, or an estimated 114 truck trips per day, would be scheduled to transport all excavated soil, debris and pavement, assuming trucks are used with capacities of 20 cubic yards. The 114 truck trips would be comprised of 57 vehicle trips leaving the Site, and 57 vehicle trips returning to the Site. A conservative estimate of 3,414 truck trips, based on 20 cubic yards per truck, would be required to deliver clean import material. If the selected contractor utilizes trucks with larger capacities or rail cars are used, fewer trips would be required.

Project-related truck traffic would use the truck route for the former S-W plant. Truck traffic would enter the Site northbound on Halleck Street through Sherwin Avenue and would exit the Site southbound on Halleck Street, across Park Avenue, under 40th Street, and south to 32nd Street. From 32nd Street, trucks would access Mandela Parkway to Grand Avenue and freeway connections.

The material transport analysis assumed a maximum of 114 truck trips per day during excavation and backfilling operations. Such traffic increases, given the temporary nature of S-W proposed project operations and the volume of existing traffic in the Emeryville area, are not expected to result in significant traffic load/system capacity impacts. This volume of truck traffic would potentially create temporary congestion south of the Site on the one block of Halleck Street between Park Avenue and Sherwin Avenue. The entrance to the E-loft parking structure is located on Halleck Street immediately north of Park Avenue. Cars exiting the parking structure could experience minor delays as empty trucks wait at the southbound stop sign to cross Park Avenue. Cross traffic on Park Avenue at this intersection, however, is limited since Park Avenue terminates one block west of Halleck. Deliveries of supplies and clean backfill would be scheduled as much as possible to avoid peak travel hours on Halleck Street.

If an encroachment permit is required by the City of Emeryville, and if required as part of that permit, traffic control personnel would be utilized during designated time periods to direct vehicular traffic through this area of Halleck Street. Such traffic control practices would maintain temporary traffic impacts to a less than significant level.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☒ **Less Than Significant Impact**
☐ No Impact

b. Exceed, either individually or cumulatively, a level of service standard established by the country congestion management agency for designated roads or highway.

Impact Analysis:

The temporary increase in truck traffic on Halleck Street would be of a short duration (varying levels of traffic over approximately four months), resulting in no significant long-term impact on Level of Service. No other construction projects or long-term modifications to land use have been identified that would contribute to a cumulative change in the level of service along the proposed vehicle transportation corridor. Alternative 5 is preferred based upon the following factors:

- The preferred truck route avoids the high volume and congested corridor of Powell Street. As a major link to the Interstate system, several intersections along Powell Street exhibit a poor level of service and possibly may require flaggers and/or lane closures to accommodate truck movements on a periodic basis.

- The preferred truck route avoids impacts to both the Novartis and Bayer facilities - from a noise, aesthetics and possible traffic congestion perspective.

- The preferred truck route utilizes Halleck Street as the primary haul route within Emeryville's city limits. This route has an estimated average daily traffic (ADT) volume of 450 vehicles per day, which is the lowest volume route of any routes considered within Emeryville.

- The roadway network for the preferred truck route, outside of Emeryville and within North Oakland, is better able to accommodate the potential truck traffic via the more extensive network of commuter streets and connections to the freeway system.

- The preferred truck route impacts only one intersection of the Park Avenue Beautification project, Halleck Street and Park Avenue, and will provide for only "thru movements" at the intersection in a north-south direction, thereby minimizing potential street damage from turning trucks at the recently modified intersections.

- The preferred truck route avoids many of the problem areas associated with existing bicycle travel within Emeryville. The route keeps truck traffic moving in a north-south direction on the western side of the Site, eliminating east-west conflict points that bicyclists currently encounter along Horton Street

- The preferred truck route utilizes two proposed "connector" streets as identified in the current draft Emeryville General Plan. These two routes are Halleck Street and Beach Street. The preferred truck route accordingly directs project truck movements on these two Emeryville streets.

From a quantitative perspective, the temporary project activities are of short duration with no anticipated long-term impacts to the transportation system. The City of Emeryville does not specify when full level of service impact analyses are required for potential traffic increases associated with temporary, short duration construction activities. However, the anticipated addition of 23 new vehicle trips per hour (11.5 entering and 11.5 leaving the Project Site)

amounts to one vehicle trip every 2.6 minutes. This increase is less than significant as it would not have a significant effect on intersection levels of service.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☒ **Less Than Significant Impact**
☐ No Impact

c. Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment).

Impact Analysis:

The project does not propose any changes to the existing street system, or any structures that could affect such roadways. See also impact analysis in section b. Therefore, the project would not have a significant traffic impact related to design feature hazards.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☒ **Less Than Significant Impact**
☐ No Impact

d. Result in inadequate emergency access.

Impact Analysis:

The Sherwin-Williams Company will notify the first responders with schedules and the type of response that might be required and the potential hazards that may be encountered during a response. The Emeryville Fire Department is the primary first responder for onsite emergencies and would be assisted by Alameda County Hazardous Materials Response Team as required. Offsite responders are contacted by dialing 911 or in the case of a fire automatically or manually by various alarms.

Any onsite emergencies will be handled as outlined in the Health and Safety Plan prepared for the site. Offsite responders would access the site from either Sherwin Avenue or Halleck Avenue. Project activities will be arranged (see Figure 3) so that they will not affect existing access routes for offsite entities responding to an onsite emergency; emergency ingress and egress shall be maintained at all times.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☐ Less Than Significant Impact
☒ **No Impact**

e. Result in inadequate parking capacity.

Impact Analysis:

The proposed on-site project activities would be temporary in nature and would only affect portions of the Site at any given time. A City of Emeryville encroachment permit will be

obtained to use of the east side of Halleck Street to queue trucks, if required, arriving with backfill material. Remediation workers will be directed to park their vehicles on the northwestern portion of the S-W property during project implementation. Therefore, the project would not have a significant impact to on-street parking.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☒ Less Than Significant Impact
☐ **No Impact**

f. Conflict with adopted policies, plans, or programs supporting alternative transportation (e.g., bus turnouts, bicycle racks).

Impact Analysis:

Project-related project activities would be temporary in nature and would not affect alternative transportation. The local bus and bicycle routes will not be affected by on-site project activities as noted in b. above. Therefore, no impacts to alternative transportation would result from project implementation.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☐ Less Than Significant Impact
☒ **No Impact**

16. Utilities and Service Systems

Project Activities Likely to Create an Impact:

- Soil excavation
- Disposal of treated excavation dewatering fluids.
- Disposal of decontamination fluids
- Applying water to soil for dust and vapor control during excavation, stockpiling and loading activities

Description of Baseline Environmental Conditions:

Pacific Gas and Electric (PG&E) provides electrical service to the Site; natural gas service remains connected but was shut off by PG&E prior to decommissioning and demolition activities in late 2007. P&GE owns a high pressure natural gas line located under the sidewalk adjacent to the eastern edge of the Site.

EBMUD provides water and wastewater services. Underground utility cables/pipelines exist within the Site but are not present in the excavation areas. Prior to the start of construction, the contractor will consult with utility providers, to identify underground utilities.

The existing storm water management system on the S-W property includes an array of isolated sumps, pumps, and hoses. Storm water runoff, and other discharged surface water, is collected in the sumps and pumped directly to the Temescal Creek channel. In addition, there is currently a groundwater treatment system on-site treating the contaminated groundwater and discharging it to the Temescal Creek channel in accordance with an existing NPDES permit.

Analysis as to whether or not project activities would:

a. Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board.

Impact Analysis:

Excavation dewatering would collect water in sumps installed in the excavation. Based on groundwater pump tests conducted at the Site, approximately10 gallons per minute of groundwater would be generated from the dewatering system to keep the excavation free of groundwater, although initial rates may reach a maximum of 30 gallons per minute. The collected water would be pumped to the Dewatering Equipment Storage and Pretreatment Unit, and then through the existing groundwater treatment system on-site before being discharged to Temescal Creek or to the sanitary sewer under permit.

A storm water pollution prevention plan (SWPPP) would be developed to address storm water runoff impacts that could arise during rainfall events. Although water would be used for dust control, the work is proposed for the dry season and erosion controls would be in place in accordance with the SWPPP. The existing storm water collection system will continue to operate as needed during implementation activities. Storm water from the Site that does not contact areas impacted by project activities, will be directed (and pumped as needed) to the Temescal Creek channel.

In Site areas where implementation activities and/or construction laydown are planned, berms would be constructed as needed to isolate water runoff and Site water. Collected water runoff would be discharged to the Temescal Creek channel following on-site treatment, discharged to the sanitary sewer (if permitted), or transported off-site for treatment and discharge.

Treatment and discharge of groundwater to Temescal Creek is currently authorized by existing permits, and the proposed project would not significantly increase the volume of treated water to be discharged or exceed the limits of the permit. In addition, this minimal increase would be temporary, as it would primarily occur during the dewatering process.

Wastewater generated by the decontamination of field equipment would be collected and conveyed to the Dewatering pretreatment unit where solids would settle for removal and water would be pumped to the groundwater dewater treatment system and the treated water discharged to the Temescal Creek channel or to the sanitary sewer under permit]

With the implementation of these measures, the proposed project would comply with wastewater treatment requirements.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☒ **Less Than Significant Impact**
☐ No Impact

b. Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects.

Impact Analysis:

The proposed project would not permanently change the existing on-site land use type or intensity; hence, construction of new or expanded water or wastewater facilities is not required. Water from on-site fire hydrants will be used for dust and vapor suppression and decontamination. Dust and vapor suppression activities will be conducted in a manner that avoids creating runoff.

Any increase in wastewater discharge to the sanitary sewer (if permitted) associated with the dewatering or decontamination activities would be minimal and temporary and would not result in a need for expanded treatment capacity at the EBMUD sanitary sewer treatment plant.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☒ **Less Than Significant Impact**
☐ No Impact

c. Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects.

Impact Analysis:

The existing storm water management system on the Site that collects storm water and discharges it to Temescal Creek will continue to operate as needed during implementation activities. Collected water runoff from areas impacted by project activities will be discharged to: 1) Temescal Creek following on-site treatment; 2) discharged to the sanitary sewer (if permitted); or 3) transported off-site for treatment and discharge. Any such discharges would be conducted in accordance with all applicable requirements and policies of the DTSC. No new impervious surface area will be added to the Site as a result of the proposed project, and therefore no additional flow of storm water will be generated from additional pavement. As such, no new storm water facilities will be constructed and the project will not have a significant impact on storm water drainage facilities.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☒ **Less Than Significant Impact**
☐ No Impact

d. Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed.

Impact Analysis:

The proposed project activities would require water from on-site fire hydrants for equipment decontamination, dust control, and vapor control measures during excavation, shoring, stockpiling and handling, loading, and backfilling. This use of this water would be minimal and temporary. The proposed project activities would therefore not have a significant impact on water supplies in the area.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☒ **Less Than Significant Impact**
☐ No Impact

e. Result in determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the providers existing commitments.

Impact Analysis:

The proposed project activities on-site would be temporary and would require minimal sanitary wastewater disposal to EBMUD. Therefore, it would not have a significant impact on wastewater service capacity.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☐ Less Than Significant Impact
☒ **No Impact**

f. Be served by a landfill with sufficient permitted capacity to accommodate the projects solid waste disposal needs.

Impact Analysis:

The project will excavate impacted soil/debris that will be loaded into trucks and/or railroad gondola cars for off-site disposal at an approved disposal facilities. The estimated 64,000 cubic yards of material transported off-site for disposal, represents a one-time disposal volume that, based upon preliminary communications with potential transport and disposal contractors, can be accommodated within planned receiving facility capacity with no significant change to the planned facility life expectancy. Therefore, the project will not have a significant impact on landfill capacity.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☒ **Less Than Significant Impact**
☐ No Impact

g. Comply with federal, state, and local statutes and regulations related to solid waste.

Impact Analysis:

All excavation, transport, and disposal of the contaminated soils from the Site would be carried out in accordance with applicable statutes and regulations, as described in the FS (CDM, 2009a). This would include development of and compliance with the DTSC-approved RDIP.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☐ Less Than Significant Impact
☒ **No Impact**

Mandatory Findings of Significance

Based on evidence provided in this Initial Study, DTSC makes the following findings:

a. The project ☐ has ☒ does not have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal, or eliminate important examples of the major periods of California history or prehistory.

b. The project ☐ has ☒ does not have impacts that are individually limited but cumulatively considerable. "Cumulatively considerable" means that the incremental effects of an individual project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects.

The proposed project is to remove impacted soil and to replace it with clean, imported soil. The project will take approximately six months to complete. Following completion of the project, no long-term effects will remain that could impact the issues defined in this section. However, concurrent projects must be considered for potential cumulative results that could arise, even if temporary. The concurrent projects considered for cumulative effects are indicated in **Figure 6**. These projects are summarized in **Table 10**.

This CEQA analysis demonstrates that several resources with the potential to be impacted by the proposed project would not be significantly affected. Therefore, the project would not contribute to any cumulatively considerable impacts on these resources when added to the impacts from concurrent projects. The resources that would not be affected by the proposed project include: agricultural resources, biological resources, land use and planning, mineral resources, population and housing, and recreation.

The project would have less than significant impacts on other resources, and it must be determined if these impacts could become cumulatively considerable when added to potential impacts identified in **Table 10**.

Table 10 ***Concurrent Projects Considered for Cumulative Effects***		
Project Name, Location	***Description***	***Project Construction Schedule***
Park Street Beautification; Park St between Halleck St. and Hollis St, And Horton St between 40th St and 45th St.	Sidewalk widening; additional street tree plantings; limit truck turning on to Park Avenue west of Hollis St. to Hollis and Halleck Streets; place corner bulbouts at the intersection of Park Avenue with Holden, Horton, and Hubbard Streets; bike racks on every block face of Park avenue; create a park north of Sherwin Avenue and west of Horton St.; create a public space on Park Avenue and west of Halleck St.; a park potentially on the north side of perk avenue midway between Hollis St. and the railroad.	Present through August 2010.
Pixar Project, 1200 park Avenue Between Hollis and Watt.	New production building of about 155,000 square feet at northeast corner of Park Avenue and Hollis Street. Phase II includes expansion of surface parking lot and construction of new City park and bike path at east end of campus. (Not anticipated to affect S-W traffic).	Present through 2011
Horton Landing Park/South Bayfront Pedestrian-Bicycle Bridge, over Union Pacific Railroad.	A pedestrian-bicycle overpass over the Union Pacific Railroad to the north of the S-W Property and the former Rifkin Property	October 2009-Summer 2010
Transit Center, Horton and 59th	Mixed use transit-oriented development and public parking structure with about 248,000 square feet of office/lab/retail space, and 300 parking spaces in a 135- foot tall tower on the “Mound” site; and a 600-space, 7 level parking garage with 3,620 square feet of retail/office space on the Heritage Square site.	November 2009-Spring 2010
Emery Station Greenway, Hollis and 59th	New 91,000 square foot laboratory building on southern portion; existing 39,000 square foot industrial building on northern portion to remain for now. Project includes Greenway improvements on northern portion of block and expansion of plaza at Powell and Hollis Streets.	August 2009- Spring 2010
Public Market Redevelopment; Christie and 64th	Approximately 210 residential rental units and 7 ground floor “shopkeeper” units in a six-story building.	Start in Spring 2010
Bay Street Site B Development, Christie/Shellmound/Powell/railroad	Northern expansion of Bay Street mixed use project, with 150-room hotel in 240-foot tower, 140 to 240 residential units, 80,000 to 130,000 s.f. of retail, possibly including a Nordstrom’s department store, and 800- 900 parking spaces.	Start in November 2010

AESTHETICS

The proposed project could have an impact on aesthetics due to the visibility of the Site from the surrounding residences. However, any impacts would be temporary, as the Site would be restored to existing conditions (and potentially improved with the addition of hydro-seed, pending determinations of the City of Emeryville). Therefore, the aesthetic impacts would be less than significant.

The proposed project may impact improvements made to the Park Avenue and Halleck Street intersection by the City of Emeryville’s Park Street Beautification project. Impacts may arise from legally loaded truck traffic travelling along the preferred route over the newly finished

street. Mitigation of these potential impacts may be necessary (e.g., via placement of cushioning materials over the top of the intersection surfacing).

Based on the temporary nature of the visual impact and the implementation of mitigation measures for potential physical impacts at Park Avenue and Halleck Street, the proposed project would not contribute to cumulatively considerable impacts on aesthetics.

AIR QUALITY

The proposed project would not have cumulative impacts with the concurrent projects. All projects in the area are required to follow the BAAQMD's requirements for fugitive dust control and thus, impacts would be less than significant. The proposed project would not result in any net increase in operational air emissions, as temporary construction emissions would stop once project activities are complete. As a result, there would be no cumulatively significant impacts from project operations.

CULTURAL

The proposed project is not anticipated to have any significant impacts on cultural resources. However, unknown cultural resources could potentially be impacted during construction activities, and mitigation measures have been outlined to ensure that these potential impacts would be less than significant if cultural resources were unexpectedly encountered. Based on the absence of known cultural resources that could be impacted by the proposed project, and the guidelines that will also be adhered to by concurrent projects, there would not be cumulatively considerable impacts from the proposed project.

GEOLOGY AND SOILS

The proposed project would have less than significant impacts on geology and soils, and the design of the project includes measures to maintain the integrity of the surrounding surfaces. None of the concurrent projects considered would involve deep excavation within the area and therefore, would not be expected to have significant impacts on geology and soils. Therefore, the project would not result in cumulatively considerable impacts on geology and soils.

HAZARDOUS MATERIALS

The proposed project would remove contaminated soil and debris, some of which would be classified as a hazardous waste. None of the projects considered for cumulative impacts would generate hazardous materials, or involve the use of such materials in any significant amount. In addition, the technologies applied to manage the excavated soil are feasible and are standard to the waste treatment industry, and the proposed project actions would not require development of new technologies in order to be completed. Furthermore, the amount of waste material from the proposed excavations would be finite, and their treatment and/or disposal would be a temporary activity that would cease at the completion of the project. No significant impacts associated with hazardous materials would occur, and the project would not contribute to cumulatively considerable impacts.

HYDROLOGY AND WATER QUALITY

The proposed project would have less than significant impacts on water quality. The project is designed to improve the quality of groundwater and to prevent further spread of contamination,

while protecting surrounding groundwater and surface water. Concurrent projects are not anticipated to have a significant effect on groundwater or surface water, as they occur within developed areas and do not directly involve hydrology components. In addition, concurrent projects would also be required to implement construction best management practices (BMPs) to avoid impacts from Site runoff during construction. Therefore, the proposed project would not contribute to cumulatively considerable impacts on hydrology and water quality.

NOISE

The proposed project would not result in significant cumulative noise impacts when considered with the concurrent projects. Except for the Horton Landing Park pedestrian-bicycle bridge, the concurrent projects are located at a distance from the Site so that the noise generated by these projects when combined with the noise generated by the proposed project would not produce perceptibly higher noise levels at the project Site. The noise generated by the Horton Landing Park bridge project may overlap the proposed project activities but the combined noise level would be expected to be less than 3 dBA higher than the proposed project alone, which is an insignificant change (impact).

TRANSPORTATION AND TRAFFIC

The proposed project would have less than significant impacts on cumulative transportation and traffic impacts with the concurrent projects. The less than significant transportation and traffic impacts of the project would occur in close proximity to the Site, to the south along the preferred truck route. Except for the Park Street Beautification project, which includes Park Street between Halleck Street and Hollis Street, and Horton Street, between 40th Street and 45th Street, all of the concurrent projects are located far enough away that transportation impacts for those projects will be focused on the transportation system north of the project Site. By mandating truck traffic to the south of the Site, to be specified in the Transportation and Traffic Control Plan created for the project, the mixing of project traffic with current and/or future concurrent project traffic will be minimized. Depending on construction timing, there may be some observed overlap between this project's hauling activities and construction activities associated with the Park Street Beautification project, however these will be temporary in nature and are not considered to be cumulatively considerable. Employee traffic is estimated at 30 vehicle trips per day, which would temporarily add imperceptible volume to area roadways and intersections.

UTILITIES AND SERVICES

The proposed project would have less than significant impacts on utilities and services. It would not increase demand on local utilities or services, or create a new need for these. Concurrent projects may require additional utility services, such as water or electricity for new facilities; however the proposed project would be temporary, and would not be contribute to these new demands. Therefore, the proposed project would not contribute to cumulatively considerable impacts on utilities and services.

c. The project ☐ has ☒ does not have environmental effects that will cause substantial adverse effects on human beings, either directly or indirectly.

Determination of Appropriate Environmental Document:

Based on evidence provided in this Initial Study, DTSC makes the following determination:

☐ The proposed project COULD NOT HAVE a significant effect on the environment. A **Negative Declaration** will be prepared.

☒ The proposed project COULD HAVE a significant effect on the environment. However, there will not be a significant effect in this case because revisions in the project have been made by or agreed to by the project proponent. A **Mitigated Negative Declaration** will be prepared.

☐ The proposed project MAY HAVE a significant effect on the environment. An **Environmental Impact Report** is required.

☐ The proposed project MAY HAVE a "potentially significant impact" or "potentially significant unless mitigated" impact on the environment, but at least one effect 1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and 2) has been addressed by mitigation measures based on the earlier analysis as described on attached sheets. An **Environmental Impact Report** is required, but it must analyze only the effects that remain to be addressed.

☐ The proposed project COULD HAVE a significant effect on the environment. However, all potentially significant effects (a) have been analyzed adequately in an earlier Environmental Impact Report or Negative Declaration pursuant to applicable standards, and (b) have been avoided or mitigated pursuant to that earlier Environmental Impact Report or Negative Declaration, including revisions or mitigation measures that are imposed upon the proposed project. Therefore, nothing further is required.

Certification:

I hereby certify that the statements furnished above and in the attached exhibits, present the data and information required for this initial study evaluation to the best of my ability and that the facts, statements and information presented are true and correct to the best of my knowledge and belief.

Preparer's Signature		Date
Preparer's Name	Preparer's Title	Phone #
Branch or Unit Chief Signature		Date
Branch or Unit Chief Name	Branch or Unit Chief Title	Phone #

ACRONYMS AND ABBREVIATIONS

AB	Assembly Bill
ABAG	Association of Bay Area Governments
AC Transit	Alameda-Contra Costa Transit District
ADT	Average Daily Traffic
AMDRP	Archaeological Monitoring and Data Recovery Plan
BAAQMD	Bay Area Air Quality Management District
bgs	below ground surface
BMPs	Best Management Practices
Cal/OSHA	California Division of Occupational Safety and Health
Caltrans	California Department of Transportation
CARB	California Air Resources Board
CDM	Camp Dresser & McKee Inc.
CEQA	California Environmental Quality Act
CH_4	methane
CHRIS	California Historical Resources Inventory System
CIDH	cast-in-drilled-hole
CNDDB	California Natural Diversity Database
CNEL	community noise equivalent level
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
COCs	Chemicals of concern
CRHR	California Register of Historical Resources
dB	decibels
dBA	A-weighted decibels
DOC	California Department of Conservation
DPM	diesel particulate matter
DTSC	California Department of Toxic Substances Control
DVCP	Dust and Vapor Control Plan
EBMUD	East Bay Municipal Utility District
EFD	City of Emeryville Fire Department
EPD	City of Emeryville Police Department
FS	Feasibility Study
GHG	greenhouse gas
GWET	groundwater extraction and treatment
GWP	Global Warming Potential
HAZWOPER	Hazardous Waste Operations and Emergency Response
HASP	health and safety plan
in	inch
IRMs	interim remedial measures
L_{dn}	day-night noise level
L_{eq}	one-hour equivalent sound levels

L_{max}	Maximum sound levels
lbs	pounds
LOS	Level of Service
LUCs	Land Use Controls
mph	miles per hour
MT	metric tons
Novartis	Novartis Vaccines and Diagnostics, Inc.
N_2O	nitrous oxide
NHPA	National Historic Preservation Act of 1966
NOx	oxides of nitrogen
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
NWS	National Weather Service
O_3	ozone
Parks	Emeryville Community Services Department
PG&E	Pacific Gas and Electric Company
PHERA	Public Health Evaluation of the Remedial Alternative
$PM_{2.5}$	particulate matter up to 2.5 microns in diameter
PM_{10}	particulate matter up to 10 microns in diameter
PPE	personal protective equipment
PRG	Preliminary Remediation Goal
PUD	Planned Unit Development
RAP	Draft Remedial Action Plan
RDIP	Remedial Design and Implementation Plan
S-W	The Sherwin-Williams Company
SB	Senate Bill
sec	second
SVE	soil vapor extraction
SWPPP	Storm Water Pollution Prevention Plan
TAC	toxic air contaminant
UPRR	Union Pacific Railroad
USFWS	U.S. Fish and Wildlife Service
VOCs	volatile organic compounds
vpd	vehicles per day
Water Board	San Francisco Bay Regional Water Quality Control Board
Williamson Act	California Land Conservation Act
WMU	Waste Management Unit
WSA	William Self Associates, Inc.
yr	year

FIGURES

Figure 1 Site Location
Figure 2 Site Plan
Figure 3 Preliminary Site Layout and Controls
Figure 4 Truck Transportation Route Alternatives
Figure 5 Preferred Truck Transportation Route Map
Figure 6 Concurrent Emeryville Projects

ATTACHMENTS

Attachment A References
Attachment B CNNDB List
Attachment C Cultural Resource Assessment
Attachment D Public Health Evaluation of the Remedial Alternative

Figure 1
Site Location Map
Sherwin-Williams Company
Emeryville, California

CDM

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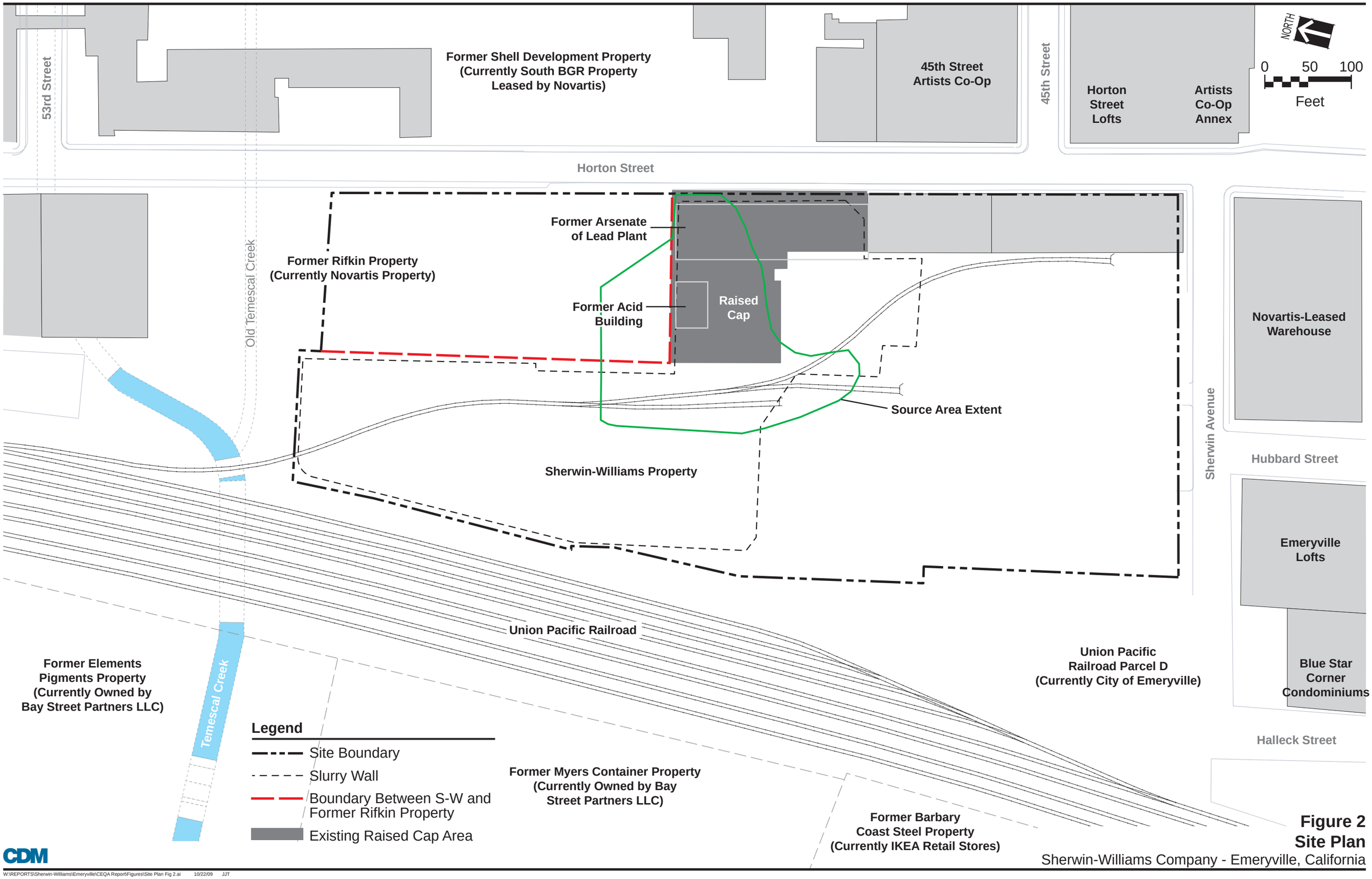

Figure 2
Site Plan
Sherwin-Williams Company - Emeryville, California

CDM

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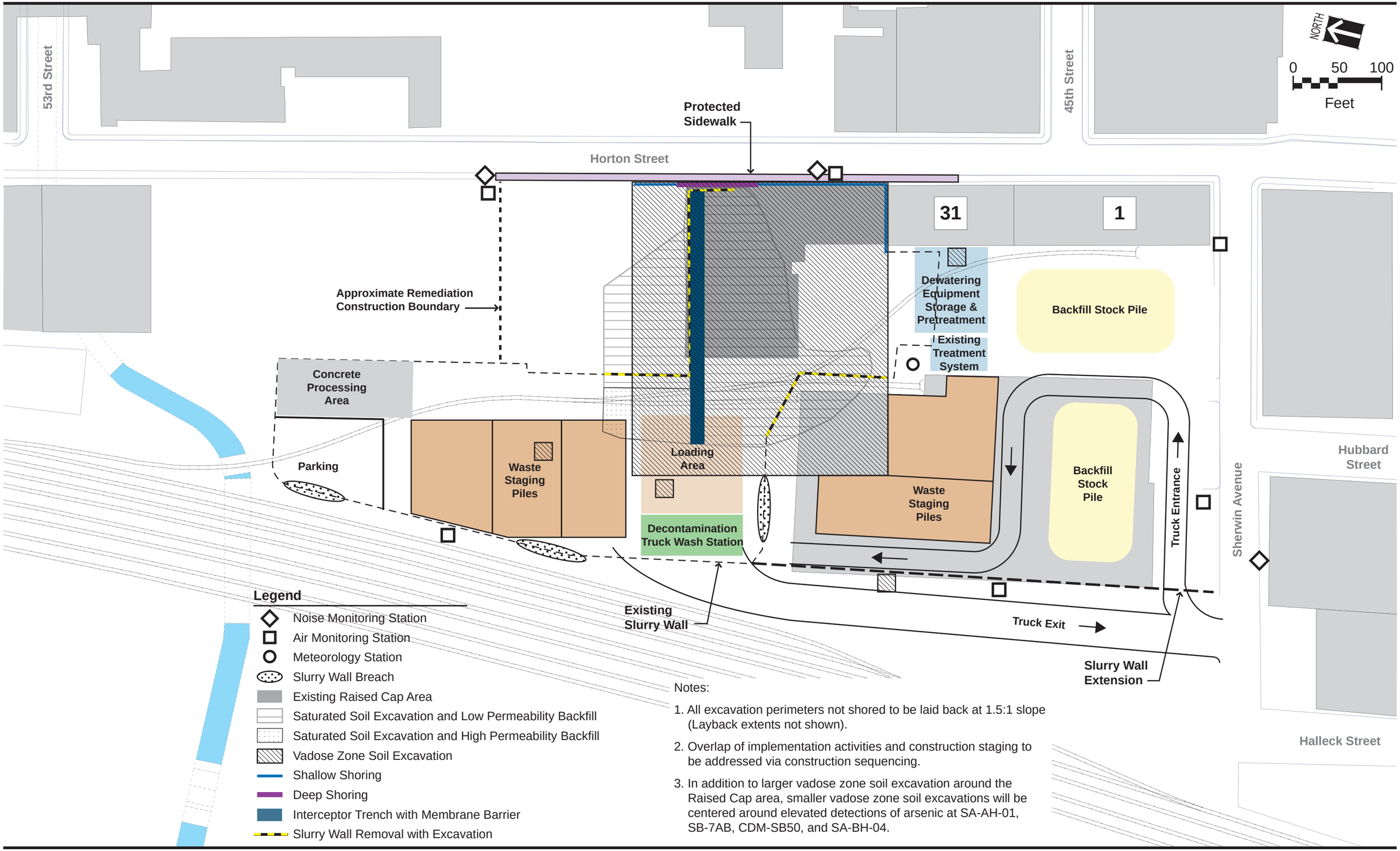

Notes:

1. All excavation perimeters not shored to be laid back at 1.5:1 slope (Layback extents not shown).
2. Overlap of implementation activities and construction staging to be addressed via construction sequencing.
3. In addition to larger vadose zone soil excavation around the Raised Cap area, smaller vadose zone soil excavations will be centered around elevated detections of arsenic at SA-AH-01, SB-7AB, CDM-SB50, and SA-BH-04.

W:\REPORTS\Sherwin-Williams\Emeryville\CEQA Report\Figures\Preliminary Site Layout and Controls Fig 2.ai 10/22/09 JJT

CDM

Figure 3
Preliminary Site Layout and Controls
Sherwin-Williams Company - Emeryville, California

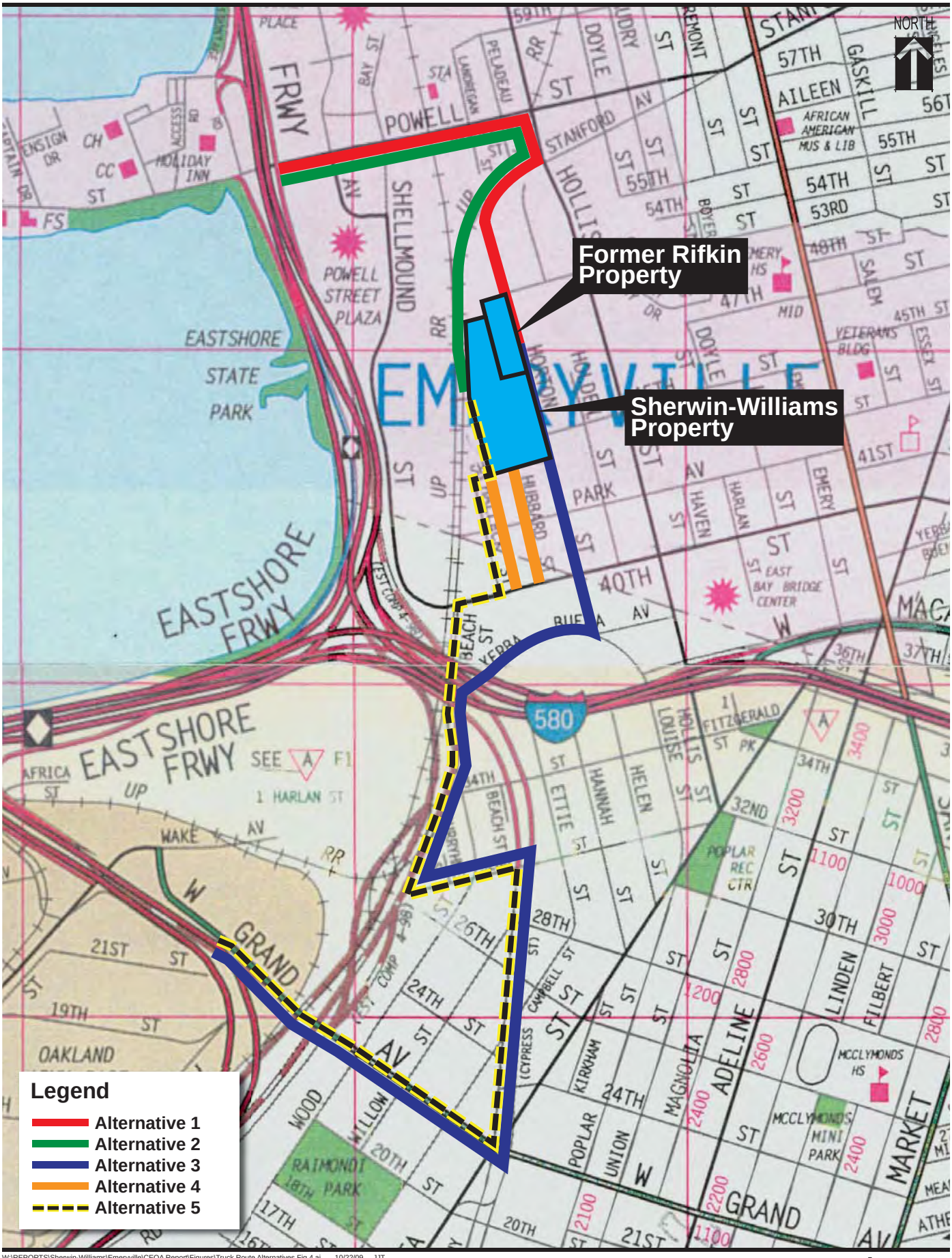

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Figure 4

Truck Transportation Route Alternatives

Sherwin-Williams Company - Emeryville, California

CDM

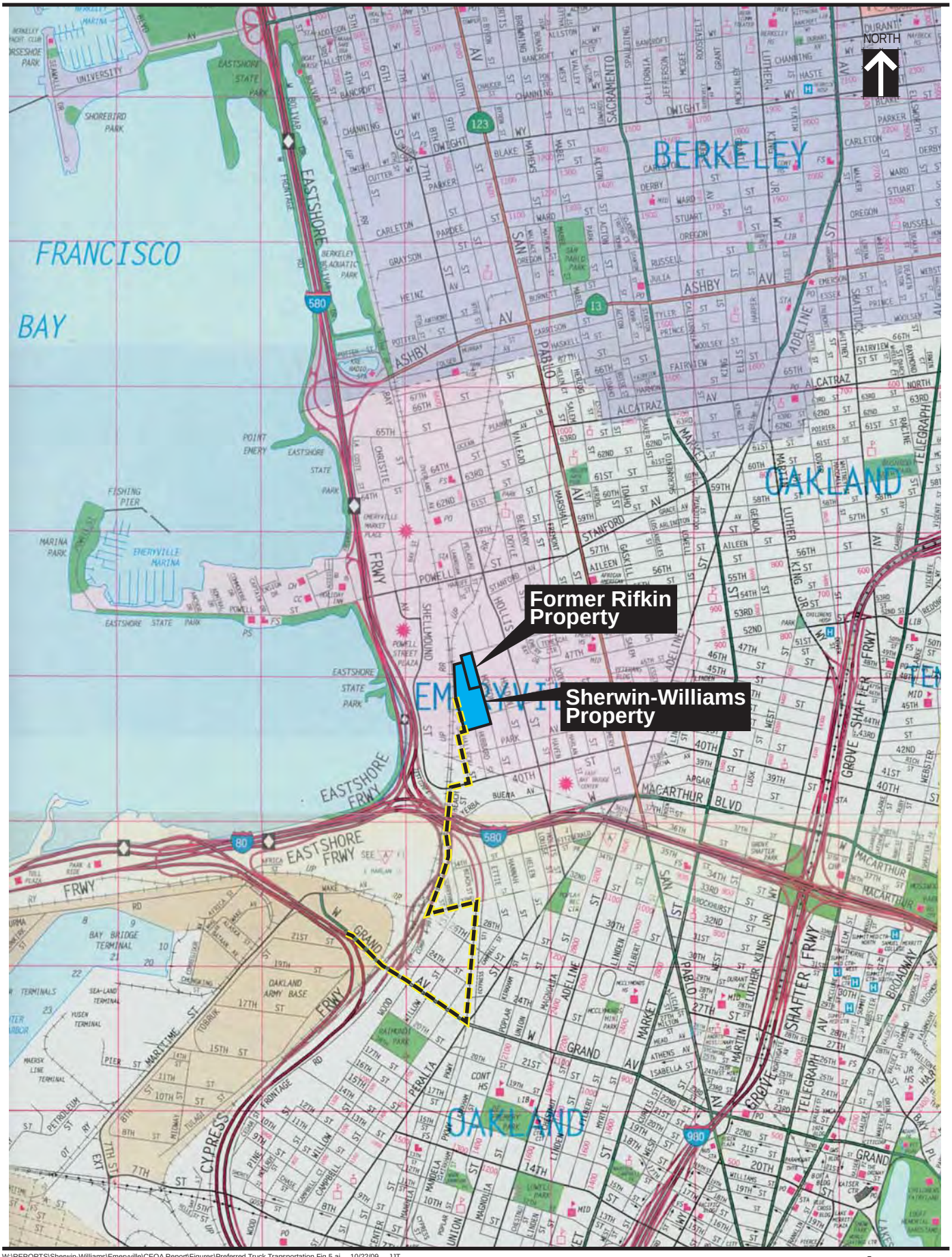

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Figure 5

Preferred Truck Transportation Route Map

Sherwin-Williams Company - Emeryville, California

CDM

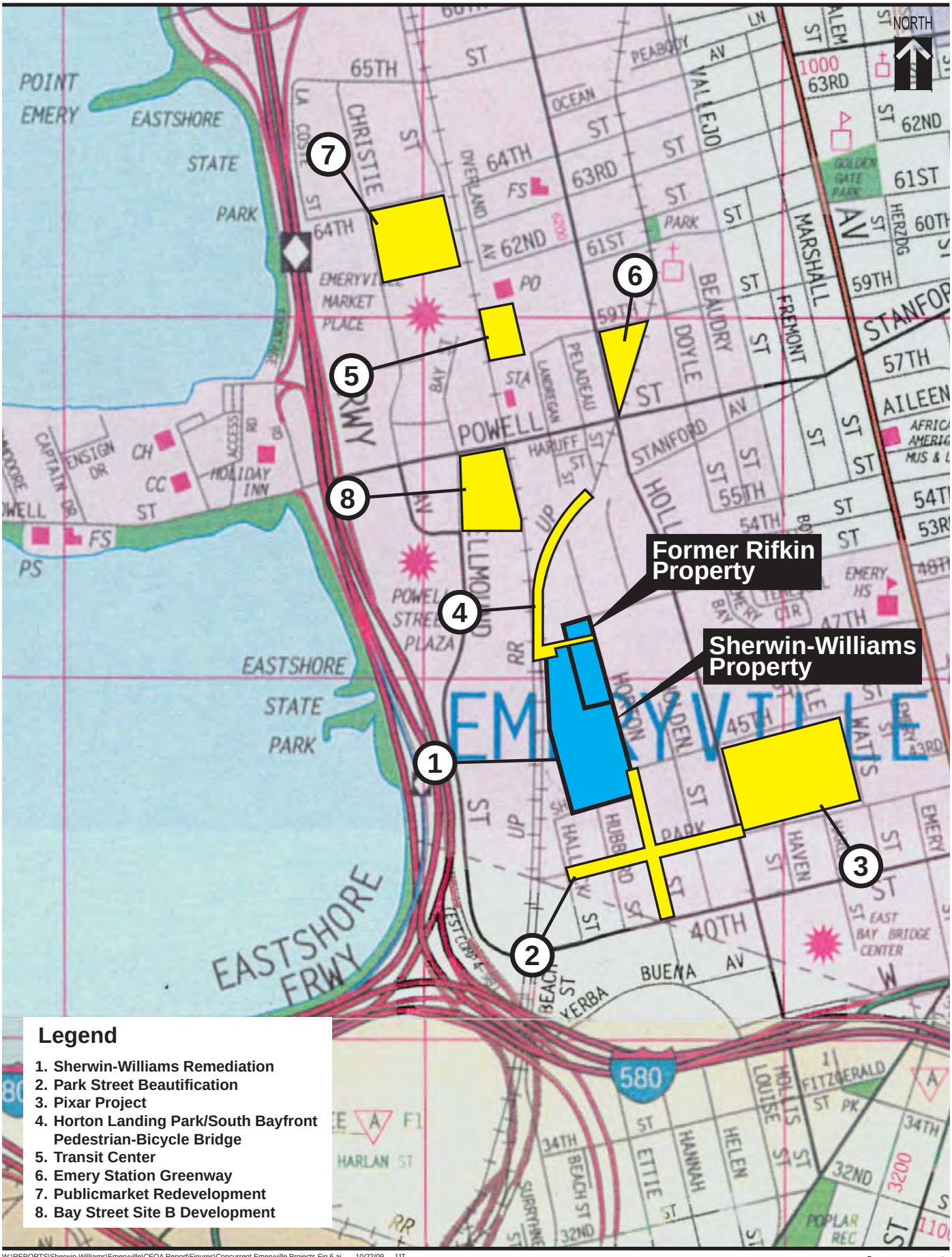

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Figure 6

Concurrent Emeryville Projects

Sherwin-Williams Company - Emeryville, California

CDM

Attachment A
References

ATTACHMENT A

REFERENCES

ABAG, Bay Area Shaking Hazard Maps, http://quake.abag.ca.gov/mapsba.html, 1999.

ABAG, The REAL Dirt on Liquefaction, http://quake.abag.ca.gov/liquefac/liquefac.html, 2001.

American Industrial Hygiene Association (AIHA). 1993. *Odor Thresholds for Chemicals with Established Occupational Health Standards*. 1993.

Bay Area Air Quality Management District (BAAQMD). 1999. *BAAQMD CEQA Guidelines: Assessing the Air Quality Impacts of Projects and Plans*. December 1999. Available online at: http://www.baaqmd.gov/Divisions/Planning-and-Research/Planning-Programs-and-Initiatives/CEQA-GUIDELINES.aspx

Bay Area Air Quality Management District (BAAQMD). 2005. Particulate Matter Implementation Schedule. November 2005

Bay Area Air Quality Management District (BAAQMD). 2009. *California Environmental Quality Act Thresholds of Significance*. Workshop Draft Options Report. April. Available online at: http://www.baaqmd.gov/pln/ceqa/index.htm [Accessed June 5, 2009]

Bolt, Beranek and Newman, Inc., Fundamentals and Abatement of Highway Traffic Noise, Report PB222-703. Prepared for the Federal Highway Administration, June 1973.

California Air Resources Board (CARB). 2007 Regulation for the Mandatory Reporting of Greenhouse Gas Emissions. December 2007. Available online at: http://www.arb.ca.gov/regact/2007/ghg2007/frofinoal.pdf

California Air Resources Board (CARB). 2008a *Ambient Air Quality Standards Chart*. November 17 2008. Available online at: http://www.arb.ca.gov/research/aaqs/aaqs2.pdf.

California Air Resources Board (CARB). 2008b *Recommended Approaches for Setting Interim Significance Thresholds for Greenhouse Gases under the California Environmental Quality Act. Preliminary Draft Staff Report.* October 24 2008. Available online at: http://www.arb.ca.gov/cc/localgov/ceqa/meetings/102708/prelimdraftproposal102408.pdf.

California Department of Conservation (DOC), Division of Land Resource Protection, Farmland Mapping and Monitoring Program, Alameda County Important Farmland 2008 Map, 2008 (DOC, 2008a). Available online at: http://www.consrv.ca.gov/dlrp/fmmp/Pages/index.aspx (Accessed September 16, 2009)

California Department of Conservation (DOC), Division of Land Resource Protection, Farmland Mapping and Monitoring Program, Alameda County Williamson Act Lands 2008, (DOC, 2008b). Available online at: ftp://ftp.consrv.ca.gov/pub/dlrp/wa/Map%20and%20PDF/Alameda/AlamedaWA_08_09.pdf.

California Department of Conservation (DOC), A General Location Guide for Ultramafic Rocks in California - Areas More Likely to Contain Naturally-Occurring Asbestos, 2000, Compiled by Ronald K. Churchill and Robert L. Hill, August 2000. Available online at: ftp://ftp.consrv.ca.gov/pub/dmg/pubs/ofr/ofr_2000-019.pdf (Accessed on September 16, 2009)

California Department of Conservation (DOC), Division of Mines and Geology, Special Publication 42, Fault-Rupture Hazard Zones in California, 1997 edition. Available online at: ftp://ftp.consrv.ca.gov/pub/dmg/pubs/sp/Sp42.pdf (Accessed on September 16, 2009)

California Department of Fish and Game (DFG), 2009, California Natural Diversity Database. http://www.dfg.ca.gov/biogeodata/cnddb/, (Accessed on August 5, 2009).

California Department of Transportation (Caltrans), Officially Designated Scenic Highways. Available online at: http://itvendors.dot.ca.gov/hq/LandArch/scenic/schwy.htm Accessed September 16, 2009.

California Environmental Protection Agency, Cortese List Data Resources, 2009. Available online at: http://www.calepa.ca.gov/SiteCleanup/CorteseList/ (Accessed on September 16, 2009)

Camp Dresser & McKee Inc., May 26 2009. *The Sherwin-Williams Company Remedial Action Plan Draft Report – DTSC Review Version, Chapter 6 Remediation and Restoration*, Emeryville, California.

CDM, 2009a. Feasibility Study, Sherwin-Williams Company, Emeryville, California. April 1, 2009.

CDM, 2009b. Report for Public Health Evaluation of the Remedial Alternative. The Sherwin-Williams Company Emeryville, California. April 10, 2009.

City of Emeryville, 2009a. *Draft General Plan, General Plan Land Use Map*. http://ca-emeryville.civicplus.com/index.aspx?NID=518

City of Emeryville, 2009b. *Zoning Districts Map, 2009*. http://ca-emeryville.civicplus.com/DocumentView.aspx?DID=377

City of Emeryville. January 2009. *Emeryville Draft General Plan – Chapter 3 Transportation*, Emeryville, California.

City of Emeryville General Plan, Noise Element. http://ca-emeryville.civicplus.com/index.aspx?NID=518 , Chapter 6: Conservation, Safety and Noise.

City of Emeryville Noise Ordinance. http://ca-emeryville.civicplus.com/DocumentView.aspx?DID=325

City of Emeryville Zoning Ordinance. http://ca-emeryville.civicplus.com/DocumentView.aspx?DID=369

City of Emeryville, 2006. *Park Avenue District Plan*, *City of Emeryville*. August 2006. http://ca-emeryville.civicplus.com/DocumentView.asp?DID=143

City of Emeryville, 2009c, Planning Commission Staff Report, Housing Element of the General Plan (GPA 09-01), April 15, 2009.

City of Emeryville, 2009d, Emeryville General Plan Draft Environmental Impact Report, May 2009. http://www.ci.emeryville.ca.us/DocumentView.aspx?DID=665

City of Emeryville. May 2009. *Emeryville General Plan Draft Environmental Impact Report*, Emeryville, California. Available online at: http://ca-emeryville.civicplus.com/DocumentView.aspx?DID=665

City of Emeryville (EPD, 2009), personal communication with Emeryville Police Department by Randall Smith, 21 October 2009.

City of Emeryville (EBD, 2009), personal communication with Emeryville Building Department by Randall Smith, 21 October 2009.

ENTRIX, 2002. Remedial Investigation, Sherwin-Williams Site, Emeryville, California, March 8.

Fehr and Peers Transportation Consultants. June 20, 2007. *City of Emeryville Supplemental Cumulative Traffic Analysis – Appendix B: Intersection LOS Summary*, Emeryville, California.

FHWA, *Highway Traffic Noise Analysis and Abatement Policy and Guidance*, June 1995.

FHWA, *Noise Fundamentals Training Document, "Highway Noise Fundamentals",* September, 1980

Florida Department of Transportation, Systems Planning Office. 2002. *Quality/Level of Service Handbook - Chapter 4 General Planning Analysis, Table 4-1 Generalized Annual Average Daily Volumes for Florida's Urbanized Areas (page 85)*, Tallahassee, Florida.

FTA, *Noise and Vibration Impact Assessment,* 2006

Gradient, 2005. Human Health Risk Assessment for 1450 Sherwin Avenue, Emeryville, California. Gradient Corporation. February 11, 2005.

Harris, Cyril M., *Handbook of Acoustical Measurements and Noise Control, Third Edition,* http://ca-emeryville.civicplus.com/DocumentView.aspx?DID=143 Last modified February 19, 2009.

Hart, E.W., (Hart,1997) Fault-Rupture Hazard Zones in California: Alquist-Priolo Special Studies Zones Act of 1972 with Index to Special Studies Zones Maps, California Division of Mines and Geology, Special Publication 42, 1990 (revised and updated 1997),

Michael Minor & Associates, Vibration Primer http://www.drnoise.com/ PDF_files/Vibration%20Primer.pdf.

Noise Control Engineering Journal, Construction Noise Control Program and Mitigation Strategy at the Central Artery/Tunnel Project, Sep-Oct, 2000.

Norfleet Consultants, 1998. Groundwater Study and Water Supply History of the East Bay Plain, Alameda & Contra Costa Counties, CA prepared for: The Friends of the San Francisco Estuary.

Transportation Research Board - National Research Council. 2000. *Highway Capacity Manual (HCM2000) - Chapter 9 Analytical Procedures Overview, Section VI Service Volume Tables, Page 9-9*, Washington D.C.

U.S. EPA, Information on Levels of Environmental Noise Requisite to Protect Public Health and USGS, 2008. The Uniform California Earthquake Rupture Forecast, Version 2 (UCERF 2), by 2007 Working Group on California Earthquake Probabilities, USGS Open File Report 2007-1437 / CGS Special Report 203 / SCEC Contribution #1138. 2008. Welfare with an Adequate Margin of Safety, March 1974.

US Fish and Wildlife Service, National Wetlands Inventory Mapper, 2009. http://www.fws.gov/wetlands/data/GoogleEarth.html

Attachment B
CNNDB List

California Department of Fish and Game
Natural Diversity Database
Selected Elements by Common Name - Portrait

	Common Name/Scientific Name	Element Code	Federal Status	State Status	GRank	SRank	CDFG or CNPS
1	A leaf-cutter bee *Trachusa gummifera*	IIHYM80010			G1	S1	
2	Alameda Island mole *Scapanus latimanus parvus*	AMABB02031			G5T1Q	S1	SC
3	Alameda song sparrow *Melospiza melodia pusillula*	ABPBXA301S			G5T2?	S2?	SC
4	California black rail *Laterallus jamaicensis coturniculus*	ABNME03041		Threatened	G4T1	S1	
5	California clapper rail *Rallus longirostris obsoletus*	ABNME05016	Endangered	Endangered	G5T1	S1	
6	California least tern *Sternula antillarum browni*	ABNNM08103	Endangered	Endangered	G4T2T3Q	S2S3	
7	California tiger salamander *Ambystoma californiense*	AAAAA01180	Threatened	unknown code...	G2G3	S2S3	SC
8	Choris' popcorn-flower *Plagiobothrys chorisianus var. chorisianus*	PDBOR0V061			G3T2Q	S2.2	1B.2
9	Cooper's hawk *Accipiter cooperii*	ABNKC12040			G5	S3	
10	Kellogg's horkelia *Horkelia cuneata ssp. sericea*	PDROS0W043			G4T1	S1.1	1B.1
11	Northern Coastal Salt Marsh	CTT52110CA			G3	S3.2	
12	Point Reyes bird's-beak *Cordylanthus maritimus ssp. palustris*	PDSCR0J0C3			G4?T2	S2.2	1B.2
13	San Francisco Bay spineflower *Chorizanthe cuspidata var. cuspidata*	PDPGN04081			G2T2	S2.2	1B.2
14	San Joaquin spearscale *Atriplex joaquiniana*	PDCHE041F3			G2	S2	1B.2
15	Santa Cruz tarplant *Holocarpha macradenia*	PDAST4X020	Threatened	Endangered	G1	S1.1	1B.1
16	adobe sanicle *Sanicula maritima*	PDAPI1Z0D0		Rare	G2	S2.2	1B.1
17	alkali milk-vetch *Astragalus tener var. tener*	PDFAB0F8R1			G1T1	S1.1	1B.2
18	beach layia *Layia carnosa*	PDAST5N010	Endangered	Endangered	G2	S2.1	1B.1
19	bent-flowered fiddleneck *Amsinckia lunaris*	PDBOR01070			G2	S2.2	1B.2
20	big free-tailed bat *Nyctinomops macrotis*	AMACD04020			G5	S2	SC
21	blue coast gilia *Gilia capitata ssp. chamissonis*	PDPLM040B3			G5T2	S2.1	1B.1
22	bristly sedge *Carex comosa*	PMCYP032Y0			G5	S2?	2.1
23	double-crested cormorant *Phalacrocorax auritus*	ABNFD01020			G5	S3	
24	hoary bat *Lasiurus cinereus*	AMACC05030			G5	S4?	

	Common Name/Scientific Name	Element Code	Federal Status	State Status	GRank	SRank	CDFG or CNPS
25	mimic tryonia (=California brackishwater snail) *Tryonia imitator*	IMGASJ7040			G2G3	S2S3	
26	northern harrier *Circus cyaneus*	ABNKC11010			G5	S3	SC
27	pallid bat *Antrozous pallidus*	AMACC10010			G5	S3	SC
28	robust spineflower *Chorizanthe robusta var. robusta*	PDPGN040Q2	Endangered		G2T1	S1.1	1B.1
29	rose leptosiphon *Leptosiphon rosaceus*	PDPLM09180			G1	S1.1	1B.1
30	round-leaved filaree *California macrophylla*	PDGER01070			G3	S3.1	1B.1
31	saline clover *Trifolium depauperatum var. hydrophilum*	PDFAB400R5			G5T2?	S2.2?	1B.2
32	salt-marsh harvest mouse *Reithrodontomys raviventris*	AMAFF02040	Endangered	Endangered	G1G2	S1S2	
33	saltmarsh common yellowthroat *Geothlypis trichas sinuosa*	ABPBX1201A			G5T2	S2	SC
34	sandy beach tiger beetle *Cicindela hirticollis gravida*	IICOL02101			G5T2	S1	
35	seaside tarplant *Hemizonia congesta ssp. congesta*	PDAST4R065			G5T2T3	S2S3	1B.2
36	tidewater goby *Eucyclogobius newberryi*	AFCQN04010	Endangered		G3	S2S3	SC
37	white-tailed kite *Elanus leucurus*	ABNKC06010			G5	S3	

United States Department of the Interior

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FISH AND WILDLIFE SERVICE

Fish & Wildlife Service logo

Sacramento Fish and Wildlife Office
2800 Cottage Way, Room W-2605
Sacramento, California 95825

August 5, 2009

Document Number: 090805113529

Ilana Cohen
CDM
2295 Gateway Oaks Drive
Suite 240
Sacramento, CA 95833

Subject: Species List for Sherwin-Williams Remedial Action Plan

Dear: Ms. Cohen

We are sending this official species list in response to your August 5, 2009 request for information about endangered and threatened species. The list covers the California counties and/or U.S. Geological Survey 7½ minute quad or quads you requested.

Our database was developed primarily to assist Federal agencies that are consulting with us. Therefore, our lists include all of the sensitive species that have been found in a certain area *and also ones that may be affected by projects in the area*. For example, a fish may be on the list for a quad if it lives somewhere downstream from that quad. Birds are included even if they only migrate through an area. In other words, we include all of the species we want people to consider when they do something that affects the environment.

Please read Important Information About Your Species List (below). It explains how we made the list and describes your responsibilities under the Endangered Species Act.

Our database is constantly updated as species are proposed, listed and delisted. If you address proposed

and candidate species in your planning, this should not be a problem. However, we recommend that you get an updated list every 90 days. That would be November 03, 2009.

Please contact us if your project may affect endangered or threatened species or if you have any questions about the attached list or your responsibilities under the Endangered Species Act. A list of Endangered Species Program contacts can be found at www.fws.gov/sacramento/es/branches.htm.

Endangered Species Division

Take Pride in America

U.S. Fish & Wildlife Service

Sacramento Fish & Wildlife Office

Federal Endangered and Threatened Species that Occur in

or may be Affected by Projects in the

OAKLAND WEST (466D)

U.S.G.S. 7 1/2 Minute Quad

Database last updated: January 29, 2009

Report Date: August 5, 2009

Listed Species

Fish

Acipenser medirostris

green sturgeon (T) (NMFS)

Eucyclogobius newberryi

tidewater goby (E)

Hypomesus transpacificus

delta smelt (T)

Oncorhynchus kisutch

coho salmon - central CA coast (E) (NMFS)

Oncorhynchus mykiss

Central California Coastal steelhead (T) (NMFS)

Central Valley steelhead (T) (NMFS)

Critical habitat, Central California coastal steelhead (X) (NMFS)

Oncorhynchus tshawytscha

Central Valley spring-run chinook salmon (T) (NMFS)

Critical habitat, winter-run chinook salmon (X) (NMFS)

winter-run chinook salmon, Sacramento River (E) (NMFS)

Amphibians

Rana aurora draytonii

California red-legged frog (T)

Reptiles

Masticophis lateralis euryxanthus

Alameda whipsnake [=striped racer] (T)

Birds

Charadrius alexandrinus nivosus

western snowy plover (T)

Pelecanus occidentalis californicus

California brown pelican (E)

Rallus longirostris obsoletus

California clapper rail (E)

Sternula antillarum (=Sterna, =albifrons) browni

California least tern (E)

Mammals

Reithrodontomys raviventris

salt marsh harvest mouse (E)

Key:

- (E) *Endangered* - Listed as being in danger of extinction.

- (T) *Threatened* - Listed as likely to become endangered within the foreseeable future.
- (P) *Proposed* - Officially proposed in the Federal Register for listing as endangered or threatened.
- (NMFS) Species under the Jurisdiction of the National Oceanic & Atmospheric Administration Fisheries Service. Consult with them directly about these species.
- *Critical Habitat* - Area essential to the conservation of a species.
- (PX) *Proposed Critical Habitat* - The species is already listed. Critical habitat is being proposed for it.
- (C) *Candidate* - Candidate to become a proposed species.
- (V) Vacated by a court order. Not currently in effect. Being reviewed by the Service.
- (X) *Critical Habitat* designated for this species

CNPS Inventory of Rare and Endangered Plants

Status: Plant Press Manager window with 3 items - Fri, Sep. 11, 2009 16:00 c

Reformat list as: Standard List - with Plant Press controls

ECOLOGICAL REPORT

scientific	family	life form	blooming	communities	elevation	CNPS
Amsinckia lunaris	Boraginaceae	annual herb	Mar-Jun	•Coastal bluff scrub (CBScr) •Cismontane woodland (CmWld) •Valley and foothill grassland (VFGrs)	3 - 500 meters	List 1B.2
Gilia capitata ssp. chamissonis	Polemoniaceae	annual herb	Apr-Jul	•Coastal dunes (CoDns) •Coastal scrub (CoScr)	2 - 200 meters	List 1B.1
Trifolium depauperatum var. hydrophilum	Fabaceae	annual herb	Apr-Jun	•Marshes and swamps (MshSw) •Valley and foothill grassland (VFGrs)(mesic, alkaline) •Vernal pools (VnPls)	0 - 300 meters	List 1B.2

Attachment C
Cultural Resource Assessment

ARCHAEOLOGY AND HISTORIC PRESERVATION

MEMORANDUM

TO: **Randy Smith**
CDM

DATE: September 24, 2009

FROM: **James M. Allan, Ph.D., RPA**
Vice-President

SUBJECT: **Sherwin-Williams Remediation Project, Emeryville, California**

In accordance with our agreement, William Self Associates, Inc. (WSA) has implemented an updated records search and assessment of the Sherwin-Williams Remediation Project in Emeryville, California. This memo is to supplement the Cultural Resources Assessment Report prepared by WSA for the project in 2003.

Records Search Results

On behalf of WSA, staff at the California Historical Resources Information System, Northwest Information Center (NWIC) at Sonoma State University conducted an updated records search of the project area and a surrounding ¼-mile radius on July 30, 2009 (File No. 09-0129). The records search was undertaken to determine whether additional cultural resources studies have been undertaken since 2002, if there are any newly recorded cultural resources within the project vicinity that were unknown during the 2002 records search, or if there have been any recently prepared updates to previously recorded sites.

The Cultural Resources Assessment Report prepared by WSA in 2003 for the Sherwin-Williams Remediation Project is the only report on file at the NWIC that encompasses the proposed project area. A total of 27 cultural resources studies have been undertaken within ¼-mile of the project area (Table 1).

Table 1. Cultural Resources Studies Undertaken Within ¼-Mile of the Project Area

Study No.	Author(s)	Year	Title
S-000779	Chavez	1977	Preliminary Cultural Resources Assessment of the East Bay Municipal Utility District (EBMUD) Wet Weather Facilities/Overflow Project Facilities Sites, Alameda and Contra Costa Counties, California.
S-004950	Buss	1982	Archaeological Survey Report for Proposed High Occupancy Vehicle Lanes from the Bay Bridge to Carquinez Bridge, 04-ALNCC-80 2.0/8.0,0.0/14.1 04209-400211.
S-007571	Cope	1985	The Mammalian Fauna of the Emeryville Shellmound, CA-ALA-309.
S-011406	Roop	1989	An Evaluation of the Potential for Archaeological Deposits within the Chiron Development Parcel, City of Emeryville, California.
S-012125	Garaventa, Fong, Jarvis, Banet, Melandry and Pape	1990	Archaeological Survey Report, I-880/Cypress Replacement Project, 04-ALA-880 32.12/34.31, 04-ALA-580 45.99/46.95, 04-ALA-80 1.99/3.39, E.A.#04195-190271 MEQ 85001, Cities of Oakland and Emeryville, Alameda County, California.
S-012221	Garaventa, Jarvis and Busby	1990	First Addendum Archaeological Survey Report, I-880/Cypress Replacement Project, 04-ALA-880 32.12/34.31, 04-ALA-580 45.99/46.95, 04-ALA-80 1.99/3.39, E.A. 04195-190271 MEQ 85001, Cities of Oakland and Emeryville, Alameda County, California.
S-012289	Garaventa, Fong, Jarvis, Banet and Busby	1990	Archaeological Survey Report, I-880/Cypress Replacement Project, 04-ALA-880 P.M. 32.4/34.3 E.A.# 04195-190271 MEQ 85001, Cities of Oakland and Emeryville, Alameda County, California.
S-013824	Ambro	1992a	Report on Archival Research and a Preliminary Inventory of Potential Prehistoric and Historic Archaeological Resources in the Del Monte Project.
S-015610	Holman & Associates	1993	Report on Archival Research and a Preliminary Inventory of Potential Prehistoric and Historic Archaeological Resources in the Kaiser Hospital Project Area, Emeryville, Alameda County, California.
S-016217	Praetzellis, Olmsted, Olmsted, Johnson, McIlroy, Medin, Praetzellis, Spires, Woods, Guedon, Tannam and Pape	1994	West Oakland--A Place to Start From, Research Design and Treatment Plan, Cypress I-880 Replacement Project, Volume 1: Historical Archaeology, ALA-880 P.M. 31.9/35.8; ALA-80 P.M. 2.3/4.0, in the Cities of Oakland and Emeryville, Alameda County, California.
S-016800	Ambro	1992b	Archaeological Cultural Resource Study for the Bay/Shellmound Street Project.
S-017835	Myers Suchey	1975	Biological Distance of Prehistoric Central California Populations Derived from Non-Metric Traits of the Cranium.

Study No.	Author(s)	Year	Title
S-017895	Rhode, Hudson, Blackburn, Beardsley, Heizer, Ragir, Lillard, Schenk, Latta, Gerow, Bickel, Coberly, Davis, Elsasser and Moorehead	1989	A Charmstone Compendium for Central California.
S-018248	Garaventa, Jarvis, Knecht, Chiappetta, Corbett, Liskin, Lombardi, Marvin, Minor, Polito, Winans and Woods	1990	First Addendum Historic Property Survey Report for the Proposed I-880 Reconstruction Project in the Cities of Oakland and Emeryville, Alameda County, California.
S-018249	Knecht, Liskin, Lombardi, Marvin and Winans	1991	Second Addendum Historic Property Survey Report for the Proposed Reconstruction of Interstate 880 within the City Limits of Oakland and Emeryville, Alameda County, 04-ALA-880 32.12/34.31, 04-ALA-580 45.99/46.95, 04-ALA-80 1.99/3.79,4195-190270.
S-019176	Allan, Wills and Self	1997	Archaeological Testing and Monitoring Report: Chiron Life Sciences Center.
S-019466	Pape and White	1995	Archaeological Research Design and Treatment Plan, Volume II: Prehistoric Archaeology, I-880 Cypress Replacement Project in the Cities of Oakland and Emeryville, Alameda County, ALA-880 31.6/35.8, ALA-80 2.3/4.0.
S-021880	Nelson and Broughton	1996	Excavation of the Emeryville, Shellmound, 1906: Nels C. Nelson's Final Report.
S-022820	Nelson, Norton, Chiea and Mitsanis	2000	Cultural Resources Survey for the Level (3) Communications Long Haul Fiber Optics Project, Segment WS07: Oakland to San Jose.
S-023012	URS Greiner Woodward Clyde	1999	Archaeological Mitigation and Data Recovery Plan for the South Bayfront Project: Archaeological Sites CA-ALA-309 and CA-ALA-310, The Emeryville Shellmound.
S-023367	Busby and Guedon	1999	Archaeological Monitoring Closure Report -IKEA Project, 4400 Shellmound Street, Cities of Emeryville and Oakland, Alameda County (letter report).
S-024028	Self	2001	Chiron Campus Expansion Program, Report on Pre-construction Archaeological Test Borings for Building 12a Parking Structure.
S-025127	Popetz, Brown, Strother, Summerlin and Self	2002	Report on the Archaeological Monitoring at the Chiron Campus Expansion: Building 12A Parking Structure, Emeryville, CA.
S-026291	Mason and Lander	1999	Cultural Resources and Paleontological Resources Literature Review Report for Level 3 Long Haul Fiber Optic Project: Emeryville ILA D-Node, in the City of Emeryville, Alameda County.
S-026419	Chavez and Hupman	2002	Archaeological Resources Investigations for the EBMUD East Bayshore Recycled Water Project, Alameda County, California, Additional Pipeline Alignments.

Study No.	Author(s)	Year	Title
S-027814	Self	2003	Archaeological Monitoring of the Demolition of the Rifkin Building Foundation, Located along Horton Street, Emeryville, Alameda County, California (letter report).
S-027893	Munns and Mason	2000	Cultural Resources Survey Report, Level (3) Long Haul Fiber Optic Project: Segment WS02 in Emeryville and Oakland, Alameda County, California.
S-028124	Montero, Marvin and McKale	2004	A Cultural and Paleontological Resources Study and Historical Evaluation for the Pixar Animation Studios Headquarters Expansion Project.

There are no newly recorded cultural resources within the project area. Six cultural resources are within ¼-mile of the project area (Table 2). Four of these are shellmounds that are discussed in WSA (2003). There have been no updates to these site records since the 2002 records search was completed. However in 2004, Richard Schwartz submitted a copy of an 1875 newspaper article that refers to a shellmound located behind the racetrack (presumably the Oakland Trotting Park), which has been appended to the site record for P-01-000086/CA-ALA-309 (Schwartze 2004). The information contained in the newspaper article does not affect the significance of the site. Two cultural resources have been recorded within ¼ -mile of the project area since 2002, P-01-010873 and P-01-010657. P-01-010873 is a concentration of shell with dark soil found alongside a city sidewalk (Schwartz 2007), [redacted]. It was not recorded by a qualified archaeologist and does not address the integrity of the materials (e.g. if it is in its primary context or if it is disturbed shellmidden material from surrounding sites). P-01-010657 is a historic industrial building located to the east of the project area. The building will not be impacted by the proposed project.

Table 2. Recorded Sites Within ¼-Mile of the Project Area

Site No.	Description	Newly Recorded (2002-2009)	Updated Since 2002	Reference
P-01-000086/ CA-ALA-309	prehistoric shellmound (Emeryville Mound)	no	no site update but in 2004, Richard Schwartz provided a copy of an 1875 newspaper article that discusses a shellmound "to the rear of the racetrack"	Schwartz 2004; Nelson 1998; Pilling 1952; Pilling n.d. a
P-01-000088/ CA-ALA-311	prehistoric shellmound	no	no	Pilling n.d. b
P-01-000089/ CA-ALA-312	prehistoric shellmound	no	no	Pilling n.d. c
P-01-000090/ CA-ALA-313	prehistoric shellmound	no	no	Pilling n.d. d
P-01-010657	Nabisco Bakery, 4240 Hollis St	yes	n/a	Marvin 2003

Site No.	Description	Newly Recorded (2002-2009)	Updated Since 2002	Reference
P-01-010873	concentration of shell, dark soil	yes, however the site was not recorded by a qualified archaeologist	n/a	Schwartz 2007

Recommendations

In the 2003 cultural resources assessment of the Sherwin-Williams Remediation Project, WSA determined that, although none of the previously recorded historic or prehistoric resources in the immediate area are believed to be located within the boundaries of the project area, there exists the potential to encounter significant cultural deposits during project excavations. In summary, WSA recommends that:

- an Archaeological Monitoring and Data Recovery Plan (AMDRP) should be developed and implemented by a qualified archaeologist;
- a qualified archaeologist should monitor all construction-related excavations to determine the presence or absence of buried resources;
- archaeological monitoring should occur to the maximum depth of construction excavation or when the archaeological monitor determines that soils with little or no potential for cultural material have been encountered;
- the archaeological monitor should have 40 hour Hazardous Waste Operations and Emergency Response (HAZWOPER) training and use appropriate personal protective equipment (PPE) to eliminate exposure to contaminated soils;
- should unanticipated finds be uncovered during construction, work within 30 ft. of the find should cease until the archaeological monitor can conduct an assessment of the resource and develop treatment measures as appropriate;
- should significant cultural resources be discovered during construction, a data recovery plan should be developed by a qualified archaeologist and implemented; and
- should human remains or funerary objects be located, the provisions of the California Health and Safety Code should be followed.

The results of the updated records search and reassessment of the proposed project impacts will not have an effect on the findings and recommendations prepared by WSA in 2003 and reiterated here. The recommendations provided in WSA (2003) on pages 23 to 25 and summarized on page 26 should be adhered to for the Sherwin-Williams Remediation Project.

References

Allan, James M., Carrie D. Wills and William Self

1997 Archaeological Testing and Monitoring Report: Chiron Life Sciences Center (S-019176). Prepared by William Self Associates, Inc. On file at the Northwest Information Center, Sonoma State University, Rohnert Park, CA.

Ambro, Richard D

1992a Report on Archival Research and a Preliminary Inventory of Potential Prehistoric and Historic Archaeological Resources in the Del Monte Project (S-013824). Prepared by Holman & Associates. On file at the Northwest Information Center, Sonoma State University, Rohnert Park, CA.

1992b Archaeological Cultural Resource Study for the Bay/Shellmound Street Project (S-016800). Prepared by Holman & Associates . On file at the Northwest Information Center, Sonoma State University, Rohnert Park, CA.

Busby, Colin I. and Stuart A. Guedon

1999 Archaeological Monitoring Closure Report -IKEA Project, 4400 Shellmound Street, Cities of Emeryville and Oakland, Alameda County (letter report) (S-023367). Prepared by Basin Research Associates, Inc. On file at the Northwest Information Center, Sonoma State University, Rohnert Park, CA.

Buss, Margaret

1982 Archaeological Survey Report for Proposed High Occupancy Vehicle Lanes from the Bay Bridge to Carquinez Bridge, 04-ALNCC-80 2.0/8.0,0.0/14.1 04209-400211 (S-004950).Prepared by the California Department of Transportation. On file at the Northwest Information Center, Sonoma State University, Rohnert Park, CA.

Chavez, David

1977 Preliminary Cultural Resources Assessment of the East Bay Municipal Utility District (EBMUD) Wet Weather Facilities/Overflow Project Facilities Sites, Alameda and Contra Costa Counties, California (S-000779). On file at the Northwest Information Center, Sonoma State University, Rohnert Park, CA.

Chavez, David and Jan M. Hupman

2002 Archaeological Resources Investigations for the EBMUD East Bayshore Recycled Water Project, Alameda County, California, Additional Pipeline Alignments (S-026419). Prepared by David Chavez and Associates. On file at the Northwest Information Center, Sonoma State University, Rohnert Park, CA.

Cope, Carol Robin
1985 The Mammalian Fauna of the Emeryville Shellmound, CA-ALA-309 (S-007571). Masters thesis, Sonoma State University, California. On file at the Northwest Information Center, Sonoma State University, Rohnert Park, CA.

Garaventa, Donna M., Michael R. Fong, Sondra A. Jarvis, Angela M. Banet and Colin I. Busby
1990 Archaeological Survey Report, I-880/Cypress Replacement Project, 04-ALA-880 P.M. 32.4/34.3 E.A.# 04195-190271 MEQ 85001, Cities of Oakland and Emeryville, Alameda County, California (S-012289). Prepared by Basin Research Associates, Inc. On file at the Northwest Information Center, Sonoma State University, Rohnert Park, CA.

Garaventa, Donna M., Michael R. Fong, Sondra A. Jarvis, Angela M. Banet, Mara Melandry and Janet Pape
1990 Archaeological Survey Report, I-880/Cypress Replacement Project, 04-ALA-880 32.12/34.31, 04-ALA-580 45.99/46.95, 04-ALA-80 1.99/3.39, E.A.#04195-190271 MEQ 85001, Cities of Oakland and Emeryville, Alameda County, California (S-012125). Prepared by Basin Research Associates, Inc. and the California Department of Transportation. On file at the Northwest Information Center, Sonoma State University, Rohnert Park, CA.

Garaventa, Donna M., Sondra A. Jarvis and Colin I. Busby
1990 First Addendum Archaeological Survey Report, I-880/Cypress Replacement Project, 04-ALA-880 32.12/34.31, 04-ALA-580 45.99/46.95, 04-ALA-80 1.99/3.39, E.A. 04195-190271 MEQ 85001, Cities of Oakland and Emeryville, Alameda County, California (S-012221). Prepared by Basin Research Associates, Inc. On file at the Northwest Information Center, Sonoma State University, Rohnert Park, CA.

Garaventa, Donna M., Sondra A. Jarvis, Gary Knecht, Alex G. Chiappetta, Michael R. Corbett, Miriam Liskin, Gail G. Lombardi, Betty Marvin, Woodruff C. Minor, Donnalynn Polito, Christine Winans and Aicha S. Woods
1990 First Addendum Historic Property Survey Report for the Proposed I-880 Reconstruction Project in the Cities of Oakland and Emeryville, Alameda County, California (S-018248). Prepared by the California Department of Transportation, Basin Research Associates, Inc., and Oakland Cultural Heritage Survey. On file at the Northwest Information Center, Sonoma State University, Rohnert Park, CA.

Holman & Associates
1993 Report on Archival Research and a Preliminary Inventory of Potential Prehistoric and Historic Archaeological Resources in the Kaiser Hospital Project Area, Emeryville,

Alameda County, California (S-015610). Prepared by Holman & Associates. On file at the Northwest Information Center, Sonoma State University, Rohnert Park, CA.

Knecht, Gary, Miriam Liskin, Gail G. Lombardi, Betty Marvin and Christine Winans
1991 Second Addendum Historic Property Survey Report for the Proposed Reconstruction of Interstate 880 within the City Limits of Oakland and Emeryville, Alameda County, 04-ALA-880 32.12/34.31, 04-ALA-580 45.99/46.95, 04-ALA-80 1.99/3.79,4195-190270 (S-018249). Prepared by the California Department of Transportation. On file at the Northwest Information Center, Sonoma State University, Rohnert Park, CA.

Marvin, Judith
2003 Department of Parks and Recreation 523 Recording Forms for P-01-010657. On file at the Northwest Information Center, Sonoma State University, Rohnert Park, CA.

Mason, Roger D. and E. Bruce Lander
1999 Cultural Resources and Paleontological Resources Literature Review Report for Level 3 Long Haul Fiber Optic Project: Emeryville ILA D-Node, in the City of Emeryville, Alameda County (S-026291). Prepared by Chambers Group, Inc. and Paleo Environmental Associates. On file at the Northwest Information Center, Sonoma State University, Rohnert Park, CA.

Montero, Carie S., Judith Marvin and George McKale
2004 A Cultural and Paleontological Resources Study and Historical Evaluation for the Pixar Animation Studios Headquarters Expansion Project (S-028124). Prepared by LSA Associates, Inc. On file at the Northwest Information Center, Sonoma State University, Rohnert Park, CA.

Munns, Ann M. and Roger D. Mason
2000 Cultural Resources Survey Report, Level (3) Long Haul Fiber Optic Project: Segment WS02 in Emeryville and Oakland, Alameda County, California (S-027893). Prepared by Chambers Group, Inc. On file at the Northwest Information Center, Sonoma State University, Rohnert Park, CA.

Myers Suchey, Judy
1975 Biological Distance of Prehistoric Central California Populations Derived from Non-Metric Traits of the Cranium (S-017835). PhD dissertation, University of California, Riverside. On file at the Northwest Information Center, Sonoma State University, Rohnert Park, CA.

Nelson, Jim
1998 Department of Parks and Recreation 523 Recording Form for P-01-000086/CA-ALA-309 (Update). On file at the Northwest Information Center, Sonoma State University, Rohnert Park, CA.

Nelson, Nels C. and Jack M. Broughton
1996 Excavation of the Emeryville, Shellmound, 1906: Nels C. Nelson's Final Report (S-021880). On file at the Northwest Information Center, Sonoma State University, Rohnert Park, CA.

Nelson, Wendy J., Tammara Norton, Larry Chiea and Eugenia Mitsanis
2000 Cultural Resources Survey for the Level (3) Communications Long Haul Fiber Optics Project, Segment WS07: Oakland to San Jose (S-022820). Prepared by Far Western Anthropological Research Group, Inc. On file at the Northwest Information Center, Sonoma State University, Rohnert Park, CA.

Pape, Janet L. and Greg White
1995 Archaeological Research Design and Treatment Plan, Volume II: Prehistoric Archaeology, I-880 Cypress Replacement Project in the Cities of Oakland and Emeryville, Alameda County, ALA-880 31.6/35.8, ALA-80 2.3/4.0 (S-019466). Prepared by the California Department of Transportation and Anthropological Studies Center, Sonoma State University. On file at the Northwest Information Center, Sonoma State University, Rohnert Park, CA.

Pilling, Arnold R.
n.d. a Archaeological Site Survey Record for P-01-000086/CA-ALA-309. On file at the Northwest Information Center, Sonoma State University, Rohnert Park, CA.
n.d. b Archaeological Site Survey Record for P-01-000088/CA-ALA-311. On file at the Northwest Information Center, Sonoma State University, Rohnert Park, CA.
n.d. c Archaeological Site Survey Record for P-01-000089/CA-ALA-312. On file at the Northwest Information Center, Sonoma State University, Rohnert Park, CA.
n.d. d Archaeological Site Survey Record for P-01-000090/CA-ALA-313. On file at the Northwest Information Center, Sonoma State University, Rohnert Park, CA.
1952 Archaeological Site Survey Record for P-01-000086/CA-ALA-309. On file at the Northwest Information Center, Sonoma State University, Rohnert Park, CA.

Popetz, Kimberley, Kyle Brown, Eric Strother, Nacy Summerlin and William Self
2002 Report on the Archaeological Monitoring at the Chiron Campus Expansion: Building 12A Parking Structure, Emeryville, CA (S-025127). Prepared by William Self Associates, Inc. On file at the Northwest Information Center, Sonoma State University, Rohnert Park, CA.

Praetzellis, Mary, Nancy Leigh Olmsted, Roger Wolcott Olmsted, Katherine Johnson, Jack McIlroy, Anmarie Medin, Adrian Praetzellis, Will Spires, Aicha Woods, Stuart Guedon, Melody Tannam and Janet Pape

1994 West Oakland--A Place to Start From, Research Design and Treatment Plan, Cypress I-880 Replacement Project, Volume 1: Historical Archaeology, ALA-880 P.M. 31.9/35.8; ALA-80 P.M. 2.3/4.0, in the Cities of Oakland and Emeryville, Alameda County, California (S-016217). Prepared by Anthropological Studies Center, Sonoma State University, Basin Research Associates, Inc., and the California Department of Transportation. On file at the Northwest Information Center, Sonoma State University, Rohnert Park, CA.

Rhode, Pete, T. Hudson, T. C. Blackburn, R. K. Beardsley, R. Heizer, S. Ragir, J. B. Lillard, W. E. Schenk, Frank Latta, B. A. Gerow, Polly Bickel, Mary Coberly, James Davis, Albert Elsasser and Warren K. Moorehead

1989 A Charmstone Compendium for Central California (S-017895). On file at the Northwest Information Center, Sonoma State University, Rohnert Park, CA.

Roop, William

1989 An Evaluation of the Potential for Archaeological Deposits within the Chiron Development Parcel, City of Emeryville, California (S-011406). Prepared by Archaeological Resource Service. On file at the Northwest Information Center, Sonoma State University, Rohnert Park, CA.

Schwartz, Richard

2004 Letter to Leigh Jordan and Annette Schachter. Attached to P-01-000086/CA-ALA-309. On file at the Northwest Information Center, Sonoma State University, Rohnert Park, CA.

2007 Archaeological Site Record for P-01-010873. On file at the Northwest Information Center, Sonoma State University, Rohnert Park, CA.

Self, William

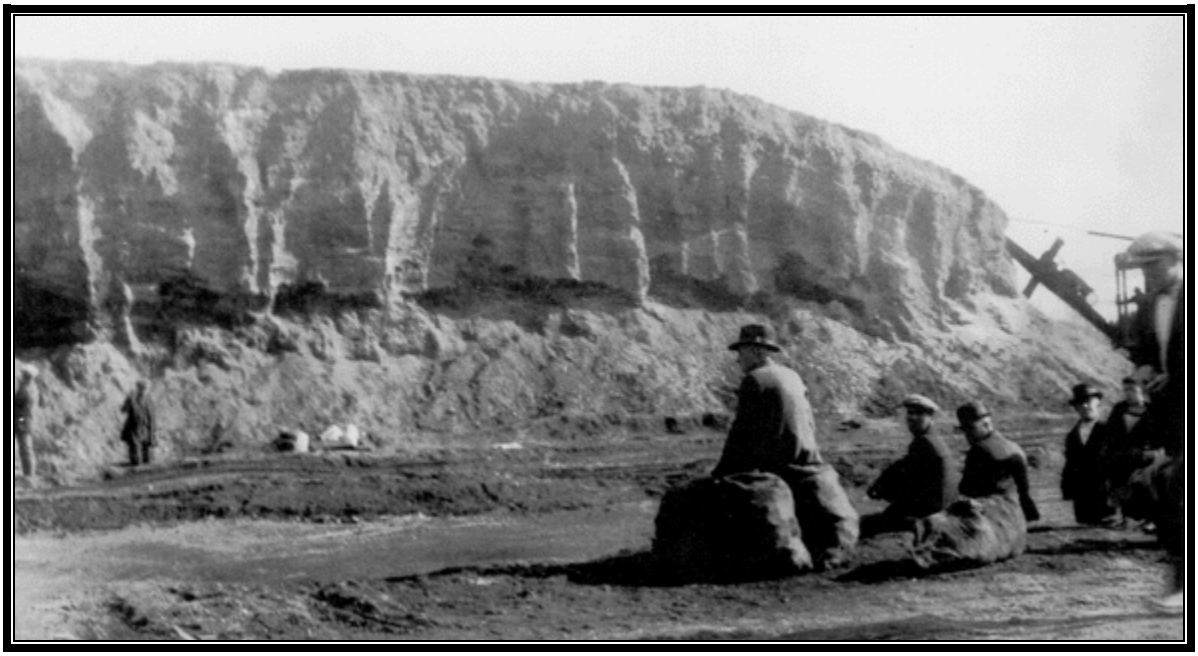
2001 Chiron Campus Expansion Program, Report on Pre-construction Archaeological Test Borings for Building 12a Parking Structure (S-024028). Prepared by William Self Associates, Inc. On file at the Northwest Information Center, Sonoma State University, Rohnert Park, CA.

2003 Archaeological Monitoring of the Demolition of the Rifkin Building Foundation, Located along Horton Street, Emeryville, Alameda County, California (letter report) (S-027814). Prepared by William Self Associates, Inc. On file at the Northwest Information Center, Sonoma State University, Rohnert Park, CA.

URS Greiner Woodward Clyde

1999 Archaeological Mitigation and Data Recovery Plan for the South Bayfront Project: Archaeological Sites CA-ALA-309 and CA-ALA-310, The Emeryville Shellmound (S-023012). Prepared by URS Greiner Woodward Clyde. On file at the Northwest Information Center, Sonoma State University, Rohnert Park, CA.

CULTURAL RESOURCES ASSESSMENT REPORT
SHERWIN-WILLIAMS REMEDIATION PROJECT
EMERYVILLE, CALIFORNIA



Excavation of the Emeryville Shellmound, 1924

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EXECUTIVE SUMMARY

The Sherwin-Williams Company (Sherwin-Williams) will be conducting a soils remediation project to remove potentially hazardous soils that exist on the company property in Emeryville. Soils will be excavated in a prescribed area up to about 19 feet in depth, stockpiled on site, and hauled off site to an acceptable hazardous waste disposal facility. This report examines the potential for encountering significant cultural resources during the work (prehistoric human burials and cultural deposits have been found and removed by the hundreds in the immediate vicinity of the property), and presents measures that can be followed to address potential impact to these resources should they exist on the parcel.

PROJECT LOCATION AND DESCRIPTION

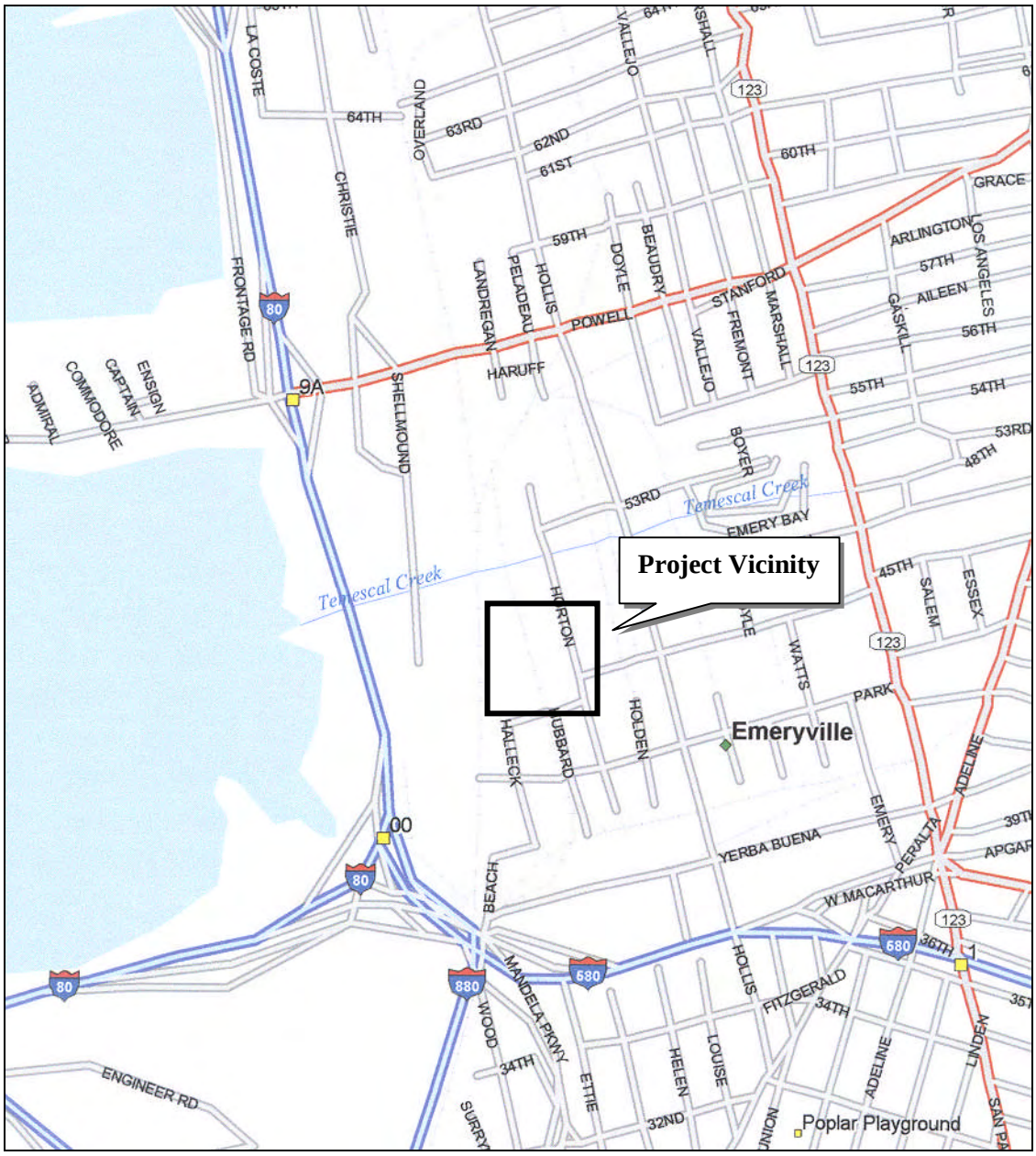
Sherwin-Williams will be conducting a remediation project to remove potentially hazardous soils from a portion of the Sherwin-Williams property in Emeryville, California. The project area is located in a former industrial neighborhood approximately ¾-mile east of the San Francisco Bay along Temescal Creek (Figure 1). The boundaries of the project area are the Union Pacific Railroad tracks on the west, Chiron Corporation on the north, Horton Ave. on the east and Sherwin Ave. on the south. The general location of the project is shown on the Oakland West, California USGS 7.5' topographic map and is located in Township 1 South, Range 4 West, MDBM (Figure 2).

NATURAL AND CULTURAL SETTING

Existing Environment

The Sherwin-Williams property is situated near the eastern shore of San Francisco Bay, the largest estuarine system in California. The project area, located near the southern city limits of Emeryville, comprises a flat, developed industrial area. Temescal Creek, which drains the Berkeley Hills to the east, has been channelized and flows in a subterranean conduit south of 53rd Street.

Annual precipitation in the Bay region varies from 20 to 40 inches with precipitation concentrated in the fall, winter, and spring months. This climate is much like that found in the Mediterranean: mild, rainy winters, and dry, warm summers. After the first rain at the end of October or early November, the vegetation becomes green and remains green, but not growing, until late February, when the grasses that cover the surrounding Berkeley Hills begin to grow rapidly. By early May, these have usually changed to dry golden-colored grasses that remain that way until fall (Brown 1985). Due to the cooling effects of the local bay environment, temperatures in the project area are mild in the summer, usually averaging 55-



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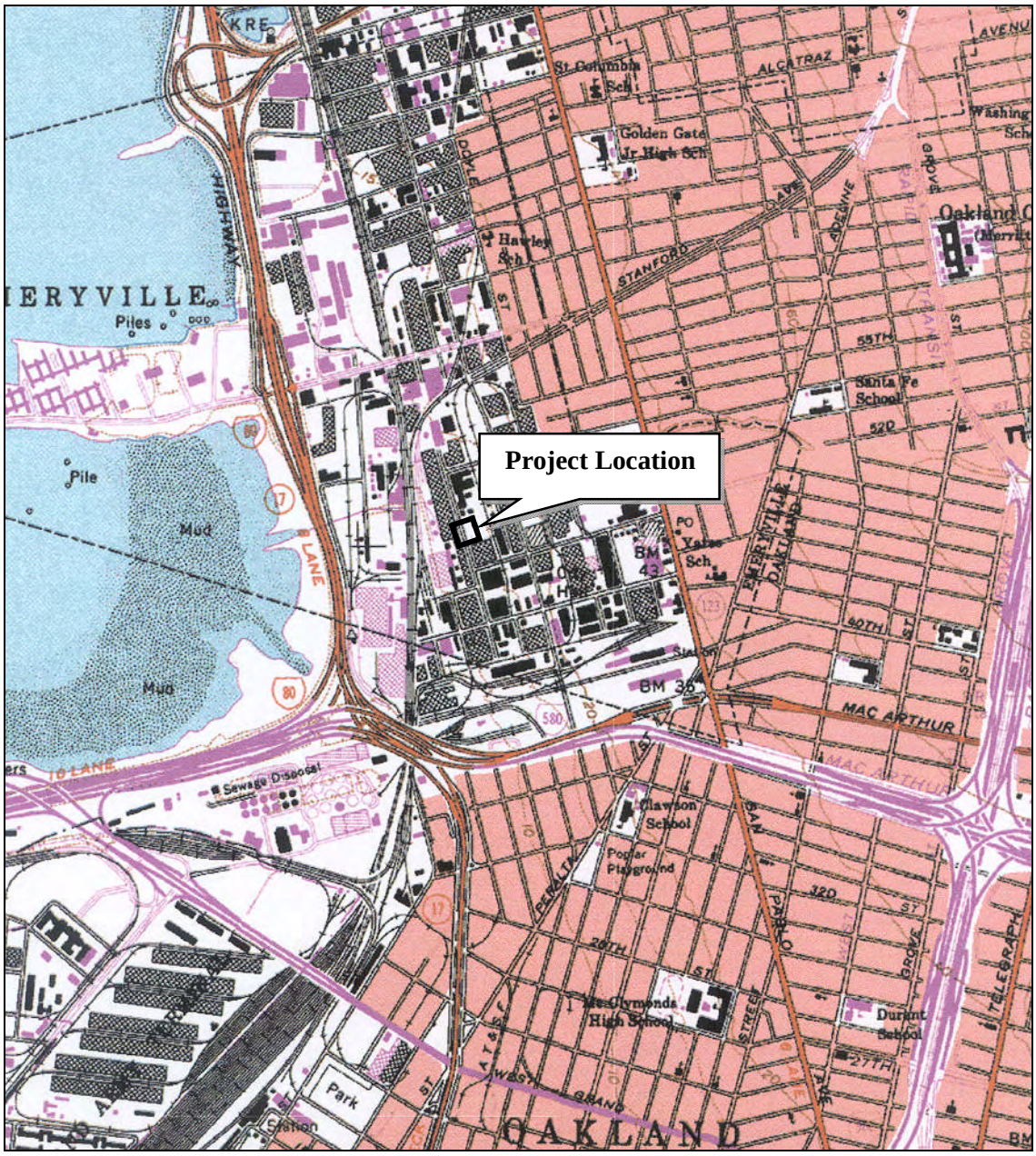
Project Vicinity Map

Scale: 1inch equals approximately ¼-mile

Figure 1
Sherwin-Williams Remediation Project
Emeryville, California



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Project Location Map
USGS 7.5' Oakland West (1959, PR 1980)
Scale 1:2000

Figure 2
Sherwin-Williams Remediation Project
Emeryville, California

65° (Moratto 1984:223). The cold water of the bay also creates frequent fog, and relative humidity remains high most of the time (Schoenherr 1992:627).

Prehistory

In 1902, under the auspices of the University of California, Max Uhle excavated a portion of a large shellmound located in Emeryville, near the shoreline of San Francisco Bay. The Emeryville Shellmound (CA-ALA-309) was one of the largest in the bay region, covering an area approximately 100 x 300 meters, and was nearly 10 meters in height (Moratto 1984:228-229). It was used to define the Emeryville facies of the Augustine Pattern, 500 - 1500 A.D. (see below).

N. C. Nelson of the University of California at Berkeley conducted the first intensive archaeological survey of the San Francisco Bay region from 1906 to 1908. He was the first person to recognize that the Bay Area was a discrete archaeological entity. He maintained that the intensive use of shellfish, a subsistence strategy reflected in both coastal and bay shore middens, was an indication of a general economic unity in the prehistoric region (Moratto 1984). Nelson documented more than 100 shellmounds along the bay shore in Alameda and Contra Costa Counties, when the area was still ringed by salt marshes three to five miles wide (Nelson 1909: 316).

In 1911, Nelson supervised excavations at CA-SFR-7 (the Crocker mound) near Hunter's Point, a site later dated to 3000-1500 BP[1]. L.L. Loud identified archaeological components from this same period in Santa Clara County in 1911 while excavating at CA-SCL-1 (the Ponce, Mayfield, or Castro Mound site). R.J. Drake recognized them in San Mateo County in 1941-42 at CA-SMA-23 (Mills Estate) in San Bruno (Moratto 1984).

The work of Nelson and Loud in the Bay Area provided the impetus for investigation into the prehistory of Central California, which began in earnest in the 1920s. Stockton-area amateur archaeologists J.A. Barr and E.J. Dawson excavated a number of sites and made substantial collections in the area from 1893 to the 1930s. On the basis of artifact comparisons, Barr identified what he felt were two distinct cultural traditions. Dawson later refined his work into a series of "Early," "Middle," and "Late" sites (Ragir 1972; Schenck and Dawson 1929).

Professional or academic-sponsored archaeological investigations began in the 1930s when J. Lillard and W. Purves of Sacramento Junior College formed a field school, which conducted excavations throughout the Sacramento Delta area. By means of artifact and burial data they identified a three-phase sequence similar to Barr's and Dawson's, which

[1] All BP (before present) dates are calculated from 1950 AD.

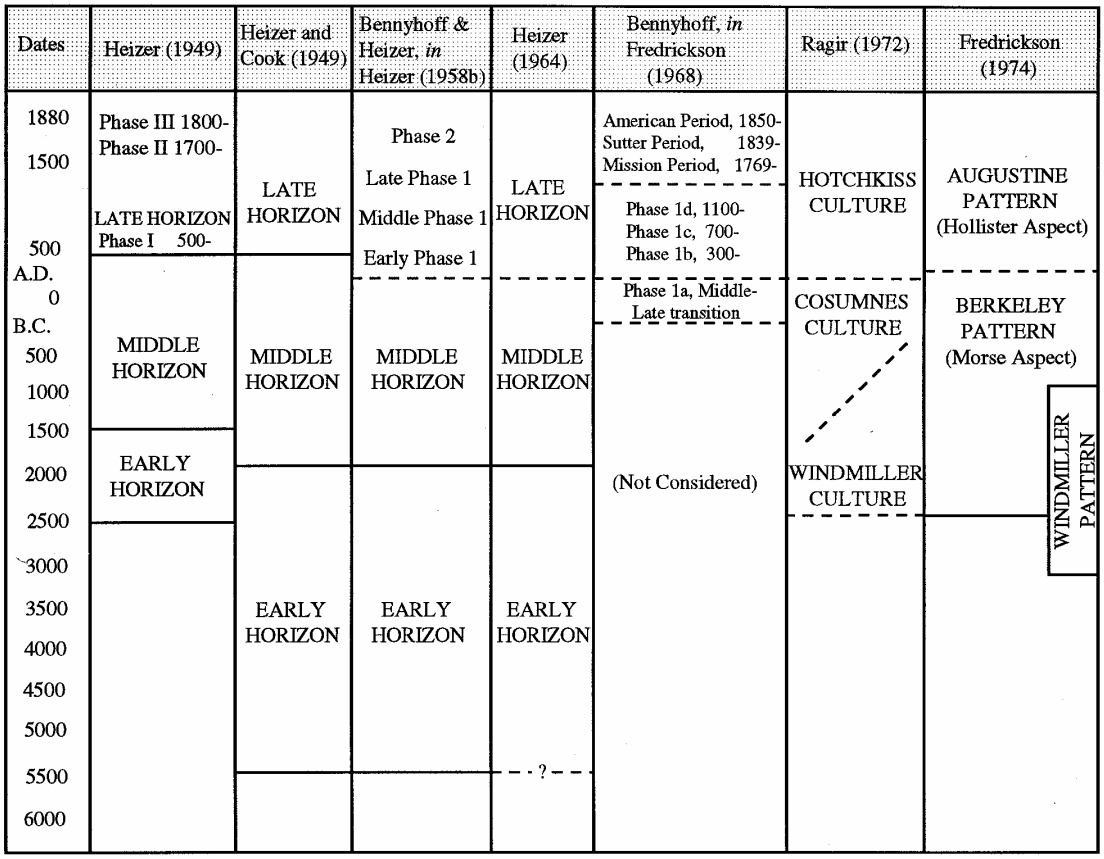
they called "Early," "Intermediate," and "Recent" cultures (Lillard and Purves 1936). In 1954, Richard Beasley refined this system and extended it to include the region of San Francisco Bay. The result was referred to as the Central California Taxonomic System (CCTS) (Lillard, Heizer and Fenenga 1939; Moratto1984). Subsequently the CCTS system was applied widely to site dating and taxonomy throughout Central California (Figure 3).

Much of the subsequent archaeological investigation in the Central Valley focused on a refinement of the CCTS through an analysis of environmental change, settlement and subsistence strategy, exchange, population movement, and related topics. These studies established sub-sequences for many regions of Central California. The best received of these studies has been Fredrickson's (1973) concept of cultural "patterns" (Moratto 1984:201-214). His idea was that, in spite of local variations, widespread cultural patterns are identifiable. He characterized patterns as:

> …adaptive mode[s] extending across one or more regions, characterized by particular technological skills and devices, particular economic modes, including participation in trade networks and practices surrounding wealth, and by particular mortuary and ceremonial practices (Fredrickson 1973:7-8).

The chronological sequence for the Central California region begins with the Windmiller Pattern, which possesses cultural elements belonging to both the Early and Middle Horizons. Sites from this period date from about 6950 to 3950 BP. Although earlier occupations no doubt existed, sites from the Paleo-Indian Period, dating from about 11950 to 7950 BP, are thought to be buried beneath Holocene alluvial deposits and are not well documented in this part of California (Ragir 1972). Some scholars have suggested that Windmiller Pattern sites are associated with an influx of people from outside of California, who introduced survival skills for life in river-wetlands (Moratto 1984:207).

Windmiller Pattern sites are often situated in riverine, marshland, or valley floor settings, as well as atop small knolls above prehistoric seasonal floodplains. Such an area provided a wide variety of plant and animal resources. Most Windmiller Pattern sites have contained burials with remains that are extended ventrally, oriented to the west, and that contain copious amounts of mortuary artifacts. These artifacts often include large projectile points and a variety of fishing paraphernalia – net weights, bone hooks, and spear points. The faunal remains indicate that the inhabitants hunted a range of large and small mammals. Stone mortars and grindstones for seed and nut processing are common finds. Other artifacts – such as charmstones, ochre, quartz crystals, *Olivella* and *Haliotis* shell beads – suggest a practice of ceremonialism and trade.



Source: Moratto 1984

San Francisco Bay Area
Cultural Chronology

Figure 3
Sherwin-Williams Remediation Project
Emeryville, California

The subsequent Berkeley Pattern (previously included in the Middle Horizon culture) covers a period from about 3500 to 1500 BP in the San Francisco Bay region. At the beginning of the sequence this pattern shares some attributes with the Windmiller Pattern and with the Late Horizon period at the end. Berkeley Pattern sites are much more common and well documented, and therefore better understood, than Windmiller Pattern sites. These sites are scattered in more diverse environmental settings, but riverine settings are prevalent.

Deeply stratified midden deposits, which develop over generations of occupation, are common to Berkeley Pattern sites. These middens contain numerous milling and grinding stones for food preparation. Projectile points become progressively smaller and lighter over time, culminating in the introduction of the bow-and-arrow during the Late Horizon period. Slate pendants, steatite beads, stone tubes, ear ornaments, and burial techniques that utilize variable directional orientation, flexed body positioning, and a general reduction of mortuary goods are unique to Berkeley Pattern sites (Fredrickson 1973; Moratto 1984).

The Late Prehistoric Period (formerly the Late Horizon) ranges from about 950 to 150 BP. This period coincides with Fredrickson's Augustine Pattern, which is typified by intensive fishing, hunting, and gathering (especially acorns), a large population increase, expanded trade and exchange networks, increased ceremonial and social attributes, and the practice of cremation in addition to flexed burials. Certain artifacts are also distinctive of this pattern: bone awls used in basketry, small notched and serrated projectile points indicative of bow-and-arrow usage, occasional pottery, clay effigies, bone whistles, and stone pipes. The Augustine Pattern and the Late Prehistoric period are recognized as the apex of Native American cultural development in this part of California.

In 1951, prehistoric burials and artifacts were exposed by heavy equipment operators on the southwestern bank of San Francisquito Creek in Santa Clara County. Dubbed the University Village Site (CA-SMA-77), it was excavated in 1951 and 1952 by G.A. Gerow of Stanford University. The cultural pattern identified was a mixture of Windmiller Pattern traits with materials markedly dissimilar to other Early Horizon period sites. To explain this, Gerow argued for a cultural expression different from that found in the Central Valley, which had been used to define the Windmiller Pattern. Gerow suggested that an Early Bay Culture inhabited the area from 3400 to 2900 BP. It eventually merged with the culture of the Central Valley.

Evidence of even earlier occupation in the Bay Area came to light in 1970 during construction of the Bay Area Rapid Transit system (BART) when workers unearthed a skeleton in San Francisco's Civic Center. W.G. Henn and R.E. Schenk of San Francisco State University examined the skeleton and confirmed, through radiocarbon dating, that the skeletal remains dated to approximately 5660 BP (Henn and Schenk 1970). Further confirmation for early

occupation came from Sunnyvale when Bada and Helfman provided radiocarbon dates of about 4410 ±95 BP for charcoal found in association with a skeleton unearthed there.

In 1922, B. Seymour, a student at Stanford University, found a skull eroding out of the bank of San Francisquito Creek. It was located about six meters below the surface and was in primary context. Labeled Stanford Man I, it was dated in 1974 to 5080 ±70 BP (Berger 1974). B. Gerow discovered Stanford Man II, a flexed human skeleton, 1150 meters downstream from Stanford Man I in 1963. Radiocarbon dates for Stanford Man II were 4350 ±70 BP (Berger 1974).

Data recovered from these and other Bay Area sites indicate a widespread but sparsely populated culture of hunters and gatherers in the region as early as 5660 BP (Henn and Schenk 1970; Henn et al 1972). This culture was replaced around 3950 BP by one adapted to bayshore and marshland habitation. The Berkeley Pattern specifies this culture although there is considerable regional variation (Moratto 1984). Moratto suggests that this replacement culture corresponds to the spread of Utian (Miwok-Costanoan) people from eastern Contra Costa County. By 3400 BP, this group had settled the southern Bay Area. From here they spread northward to the peninsula, westward to the coast, and southward to the Santa Clara Valley. They would remain in these areas until historic times.

By 1920 BP, the Berkeley Pattern was developing into the Augustine Pattern, with its characteristic bow-and-arrow, tubular tobacco pipe, cremation, intensive acorn utilization, and complicated exchange systems. It was this emerging pattern that was destroyed by the Spanish mission system and subsequent historical developments (Moratto 1984; 283).

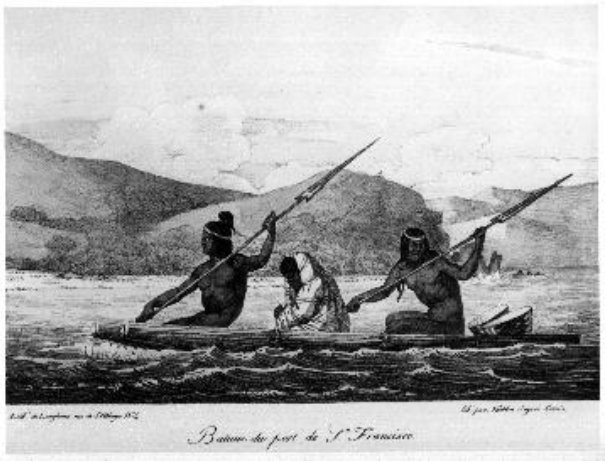
Ethnography

There is a considerable body of ethnographic literature on the Native American inhabitants of the project region. This section provides a brief summary of the ethnography of the area and is intended to provide a general background only. For a more extensive review of Ohlone ethnography, see Bocek (1986), Cambra (et al. 1996), Kroeber (1925), Levy (1978), Milliken (1983), and Shoup with Milliken and Brown (1995).

The project area lies within the region occupied by the Ohlone or Costanoan group of Native Americans at the time of historic contact with Europeans (Kroeber 1925: 462-473). Although the term Costanoan is derived from the Spanish word Costaños, or "coast people," its application as a means of identifying this population is based in linguistics. The Costanoans spoke a language now considered one of the major subdivisions of the Miwok- Costanoan, which belonged to the Utian family within the Penutian language stock (Shipley 1978: 82-84). Costanoan actually designates a family of eight languages. Of these, Chochenyo or East Bay

Costanoan was the language spoken by the estimated 2,000 people who occupied the ". . . east shore of San Francisco Bay between Richmond and Mission San Jose, and probably also in the Livermore Valley" (Levy 1978: 485).

Tribal groups occupying the area from the Pacific Coast to the Diablo Range, and from San Francisco to Point Sur spoke the other seven languages of the Costanoan family. Modern descendants of the Costanoan prefer to be known as Ohlone. The name Ohlone is derived from the Oljon group, which occupied the San Gregorio watershed in San Mateo County (Bocek 1986: 8). The two terms (Costanoan and Ohlone) are used interchangeably in much of the ethnographic literature.



Indians of the San Francisco Bay Area (Lithographic plate by Louis Choris [1822])

On the basis of linguistic evidence, it has been suggested that the ancestors of the Ohlone arrived in the San Francisco Bay area about 500 A.D., having moved south and west from the Sacramento-San Joaquin Delta region. The ancestral Ohlone displaced speakers of a Hokan language and were probably the producers of the artifact assemblages that constitute the Augustine Pattern described above (Levy 1978:486).

Although linguistically linked as a family, the eight Costanoan languages actually comprised a continuum in which neighboring groups could probably understand each other. However, beyond neighborhood boundaries, each group's language was unrecognizable to the other. Each of the eight language groups was subdivided into smaller village complexes or tribal groups. The groups were independent political entities, each occupying specific territories defined by physiographic features. Each group controlled access to the natural resources of their territories, which also included one or more permanent villages and numerous smaller campsites used as needed during a seasonal round of resource exploitation.

Leadership was provided by a chief, who inherited the position patrilineally and who could be either a man or woman. The chief and a council of elders served mainly as community advisers. Specific responsibility for feeding visitors, providing for the impoverished and directing ceremonies, hunting, fishing, and gathering activities fell to the chief. Only in times of warfare was the chief's role as absolute leader recognized by group members (Levy 1978:487).

Extended families lived in domed structures thatched with tule, grass, wild alfalfa, or ferns (Levy 1978: 492). Semi-subterranean sweathouses were built into pits excavated in stream banks and covered with a structure against the bank. The tule raft, propelled by double-bladed paddles similar to those that were used in the Santa Barbara Island region, were used to navigate across San Francisco Bay (Kroeber 1925: 468).

Mussels were an important staple in the Ohlone diet as were acorns of the coast live oak, valley oak, tanbark oak and California black oak. Seeds and berries, roots and grasses, as well as the meat of deer, elk, grizzly, rabbit, and squirrel formed the Ohlone diet. Careful management of the land through controlled burning served to insure a plentiful and reliable source of all these foods (Levy 1978: 491).

The Chochenyo usually cremated a corpse immediately upon death but, if there were no relatives to gather wood for the funeral pyre, interment occurred. Mortuary goods comprised most of the personal belongings of the deceased (Levy 1978: 490).

The arrival of the Spanish in the San Francisco Bay Area in 1775 led to a rapid and major reduction in native California populations. Diseases, declining birth rates, and the effects of the mission system served to largely eradicate the aboriginal life ways (which are currently experiencing resurgence among Ohlone descendants). Brought into the missions, the surviving Ohlone, along with former neighboring groups of Esselen, Yokuts, and Miwok were transformed from hunters and gatherers into agricultural laborers (Levy 1978; Shoup with Milliken and Brown 1995). With abandonment of the mission system and the Mexican takeover in the 1840s, numerous ranchos were established. Generally, the few Indians who remained were then forced, by necessity, to work on the ranchos.

Today, descendents of the Ohlone live throughout the Bay Area. Several Ohlone groups (Muwekma, Amah) have banded together to seek Federal recognition. Many Ohlone, both as individuals and as groups, are active in preserving and reviving elements of their traditional culture, such as dance, basketry, and song, and are active participants in the monitoring and excavation of archaeological sites.

Regional History

The historic period in the eastern San Francisco Bay region begins with the Fages-Crespi expedition of 1770. The Fages party explored the eastern shore of San Francisco Bay, eventually reaching the location of modern Fremont, where they traded with the local Costanoans. Members of the expedition eventually sighted the entrance to San Francisco Bay from the Oakland Hills. In 1772, a second Fages expedition traveled from Monterey through what is now Milpitas, San Lorenzo, Oakland, and Berkeley, finally reaching Pinole on March

28, 1772 (Cook 1957:131). From there they traveled through Rodeo and Crockett to Martinez, made a brief foray into the delta region of the Central Valley, and then camped somewhere near Pittsburg or Antioch. On 31 March, the Fages party began the return journey to Monterey. They traveled to Walnut Creek, turned south, and then made their way to Danville, where they spent the night. On 1 April they passed through San Ramon, Dublin, and Pleasanton, finally arriving back in the area of Milpitas on the following day.

In 1776, the Anza-Font expedition traveled through the same area and also traded with residents of native villages encountered along the way. The significant impact of the European presence on the local California natives, however, was not felt until the Spanish missions were established in the region.

In 1775, Captain Juan Manuel Ayala's expedition studied the San Francisco Bay and ventured up the Sacramento and San Joaquin Rivers in search of a suitable mission site. The first mission in the region was established the following year with the completion of Mission San Francisco de Asis (Mission Dolores) in San Francisco. Mission Santa Clara de Asis followed in 1777, and Mission San Jose in 1797. The ensuing Mission era lasted for the next 46 years and proved to be the downfall of the native inhabitants of the region, who were brought to the missions as conscripts for labor under the pretense of "Christianization." The missions became the loci of native "missionization," which brought disease, subjugation, and ultimately decimation, to the native Californian groups. It is reported that by 1810, the traditional Costanoan lifestyle ceased to exist (Levy 1978:486). Diseases introduced by the early expeditions and missionaries, and the contagions associated with the forced communal life at the missions, killed a large number of local peoples, exemplified by a mass burial of 18 individuals adjacent to the Hotchkiss Mound site near Oakley (Heizer 1954). On an expedition through the Central Valley in 1832-1833, Ewing Young observed:

> *In the Fall of 1832...the banks of the Sacramento River, in its whole course through the valley, were studded with Indian villages.... On our return, late in the summer of 1833, we found the valleys depopulated. From the head of the Sacramento to the great bend and slough of the San Joaquin, we did not see more than six or eight Indians; while large numbers of their skulls and dead bodies were to be seen under almost every shade-tree near water, where the uninhabited and deserted villages had been converted into graveyards....* (Cook 1957:318).

Cook (1943) estimates that by 1832, the Costanoan population had been reduced from a high of over 10,000 in 1770 to less than 2000.

In 1820, Sergeant Luis Maria Peralta received a grant of 10 square leagues of land in the East Bay in recognition of his long, faithful military service in California. Peralta named his grant Rancho San Antonio. It comprised the land that lay from the water's edge to the crest of the Oakland hills between San Leandro Creek in the south and El Cerrito Creek in the north (Hendry and Bowman 1940:585). The entire Emeryville area was encompassed in Peralta's holdings.

In 1842, Peralta formally divided his holdings among his four sons. Vicente Peralta received the area between Lake Merritt and the southern border of Berkeley. On the north bank of Temescal Creek, in the vicinity of the intersection of Telegraph Avenue, 55th Street, and Highway 24, he built his home, a chapel, corrals, storerooms, and other buildings (Bowman 1951: 225-226; Hendry and Bowman 1940: 589-591; Judd 1984:2). Corrals were also situated along the lower course of Temescal Creek and two structures stood at its mouth. Hides and tallow from the Peralta cattle herds were processed at the mouth of the creek and then shipped to San Francisco.

Following the U.S. takeover of Alta California from Mexico in 1846, Rancho lands began to be divided up and generally overrun by the Anglo immigration to the area coincident with the land boom following the Gold Rush of 1849. By the beginning of 1850, Vicente Peralta had lost nearly $100,000 in rustled cattle, and squatters were usurping his land (Davis 1967:252). Rancho San Antonio suffered the fate of most Mexican land grants in northern California, with squatters taking quasi-legal title to lands, and the courts denying title to the original grantees. By 1870, most of the Peralta grant was divided; what remained in title to the Peralta family was but a fraction of the original grant (Hendry and Bowman 1940:585) (Figure 4).

Although early maps show scattered residences and structures in the Emeryville area as early as the 1850s, significant development didn't occur in the area until Edward Wiard purchased a 115 acre tract of land from Joseph Emery (after whom Emeryville is named) for $7000 in 1859. Wiard's property was located west of San Pablo Avenue, north of Park Avenue, and south of Stanford Avenue. In the late 1860s, Wiard built the Oakland Trotting Park on the eastern portion of his tract. The one-mile track, 2000 feet long and 900 feet wide, was completed in 1871 (Hausler 1994: 5). Temescal Creek flowed through the center of the track and the racetrack itself crossed the creek on bridges (Figure 5).

The track complex included a two-story hotel, stables, and grandstand. The tack rooms and Jockey Club were located between what are now 45th and 53rd Streets. The track housed a number of commercial establishments to the area, including saloons, hotels, restaurants, and bordellos.

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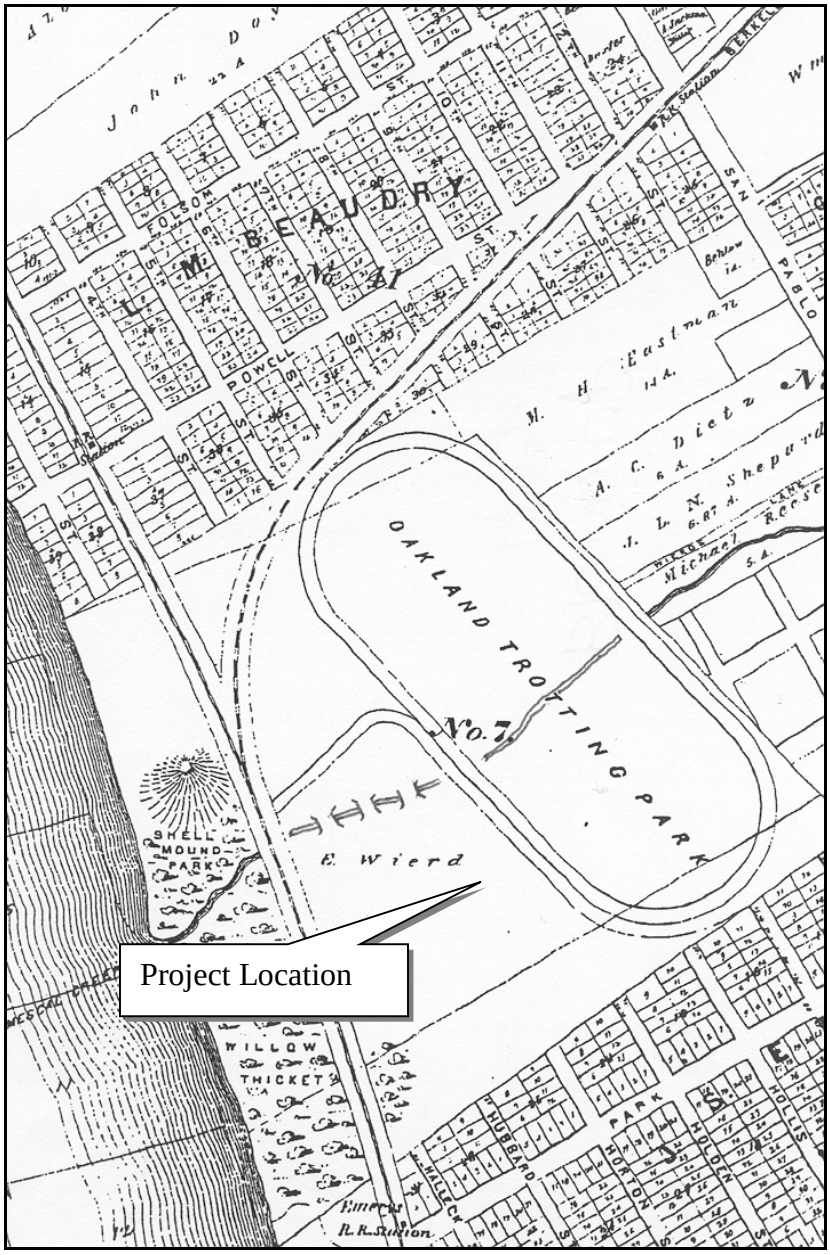
1878 Map of Project Vicinity

Source: Historical Atlas of Alameda County, by Thompson and West *In* Hausler 1994

Figure 4
Sherwin-Williams Remediation Project
Emeryville, California



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Oakland Trotting Park

Source: Historical Atlas of Alameda County, by Thompson and West *In* Hausler 1994

Figure 5
Sherwin-Williams Remediation Project
Emeryville, California

Harness racing was the track's primary feature for its first twenty-five years. In 1873, the first California Derby was held at the Trotting Park, featuring thoroughbred races between the harness racing heats (Hausler 1994:6).

In 1874, Wiard's property was bisected by the tracks of the Northern Railway that connected Oakland with Martinez. Two years later, Wiard leased the land west of the tracks to Captain L. Seibe, who developed Shell Mound Park, the famous resort and picnic area on top of the largest Emeryville shellmound.

In the 1880s, Wiard fell on hard times, eventually lost the track, and died a broken man in 1885. San Francisco judge James Mee assumed ownership of the track in 1886, maintaining its operation until his death in 1894. In May of that year, Thomas H. Williams, president of the California Jockey Club, leased the property from Mee's estate. Williams rebuilt the track and its infrastructure, replacing the stables, paddocks, barns, jockey club, and other buildings. He replaced the grandstand with one resembling a large Japanese pagoda, insuring that it was connected to the nearby train depot with a covered walkway. The track itself was redesigned and relayed:

> Underlying the track is nine inches of rock, which acts as a subdrain. Above this is a dressing of twelve inches of soil. In making the base of the course, some twenty thousand yards of broken rock were required. . .(*Oakland Enquirer*: 10/23/1896 in Hausler 1994).

Renamed the New California Jockey Club, the track flourished for another fifteen years. To protect their investment in the track, which was situated on unincorporated land, Williams and his investors promoted the incorporation of Emeryville into a town. In December 1896, local voters approved incorporation and the town of Emeryville was established (Hausler 1994:11).

The track flourished into the twentieth century, serving as a magnet for commercial development in the surrounding neighborhoods. In 1906 it also provided a haven for thousands of people displaced by the 1906 San Francisco earthquake and fire. By 1910, the political climate embodied in the Progressive movement was such that the state legislature passed the Walker-Young anti-gambling law, which made racetrack betting illegal. The bill took effect in February 1911 and the last race on the track was held on February 15th (Hausler 1994:13).

Barnstorming pilots subsequently used the track facilities and in 1912 the California Jockey Club was the site of the Third International Aviation Meet. Two years later, the track was the site of the famed race between Lincoln Beachey, piloting a Curtiss Biplane, and renowned

racecar driver Barney Oldfield, behind the wheel of a Simplex racer. Oldfield won the race by a scant twenty feet (Hausler 1994:14).

In 1915, the Mee's estate announced the property was to be subdivided into factory sites and demolition of the track and its infrastructure began in the fall of that year. On December 15, 1915, the portion of the grandstand not yet dismantled and the remaining outbuildings of the track caught fire and burned to the ground (San Francisco Chronicle, Dec. 16, 1915).

Development of the property proceeded and in the 1920s PG& E built two plants on the west side of Hollis Street, the Watkins Company established a brick factory at what was once the south end of the track, and Western Electric built a factory on the former north end of the track, a structure that now houses a portion of the Chiron Life Sciences Center (Hausler 1994:14). Over the next two decades, several other industrial enterprises established operations on the former grounds of the racetrack. Pacific Telephone and Telegraph, and the Shell Development Company both built offices and warehouses on the northern end of former track grounds. The Thorsen Tools Company, an electrical contractor, and an asbestos products company also had commercial enterprises in that immediate area.

RESULTS OF THE RECORD AND LITERATURE SEARCH

WSA has conducted numerous record searches on the Emeryville area at the California Archeological Inventory, Northwest Information Center at Sonoma State University, UC Berkeley and elsewhere as part of recent work conducted there. All known archeological sites and previous cultural resource surveys within one-half mile of the Sherwin-Williams project boundary were identified on topographic maps of the area. The National Register of Historic Places, the California Inventory of Historic Resources, and California Historical Landmarks were examined to determine if any county, state, or federal historic landmarks or National Register of Historic Places properties were located in the project area.

Previous Cultural Resource Surveys

Nine cultural resource surveys have been conducted within a one-half mile radius of the project area, none of which encompassed the immediate project boundary. Surveys which have taken place within a one-half mile radius of the project boundary include those conducted by Basin Research (1990), Buss (1982), Chavez (1977, 1992), Holman (1992a, 1992b, 1993), Montizambert and Bingham (1982), and Roop (1989). William Self Associates, Inc. has conducted recent work at Chiron, including removal of human remains during construction monitoring (WSA 2002). Archaeological sites identified during the record search are discussed below.

Known Cultural Resources

In addition to potential remains from the Oakland Trotting park and associated facilities, as well as 19th century residences, five prehistoric archaeological sites (CA-ALA-309, -310, -311, -312, -313) lie within a one-half mile radius of the project area (Figure 6).

[redacted]

[redacted]

. . .there were two large mounds just east of the tracks. . . An old history of

[redacted]

APPLICABLE LAWS, ORDINANCES, REGULATIONS AND STATURES (LORS)

The following LORS could apply to the project depending on land jurisdiction:

a. Federal Regulations (applicable if federal permits, funding, or approvals are required on any aspect of the work).

National Historic Preservation Act (NHPA), Title 16, United States Code, Section 470, establishes a national policy to preserve for public use historic sites, buildings, and objects of national significance for the inspiration and benefit of the people of the United States.

National Environmental Policy Act (NEPA): Title 42 United States Code, Sections 4321-4327; requires federal agencies to consider potential environmental impacts of projects with federal involvement and requires application of appropriate mitigation measures.

American Indian Religious Freedom Act; Title 42 United States Code, Section 1996: protects Native American religious practices, ethnic heritage sites, and land uses.

Native American Graves Protection and Repatriation Act (1990); Title 25, United States Code Section 3001, *et seq*: defines "cultural items", "sacred objects", and "objects of cultural patrimony"; establishes an ownership hierarchy; provides for review; allows excavation of human remains, but stipulates return of the remains according to ownership; sets penalties; calls for inventories; and provides for return of specified cultural items. The Act applies only on Federal or Indian lands.

b. State Policies

Title 14, Public Resources Code, Section 5020.1 defines several terms, including the following:

> (f) "DPR Form 523" means the Department of Parks and Recreation Historic Resources Inventory Form.
>
> (i) "Historical resource" includes, but is not limited to, any object, building, structure, site, area, place, record, or manuscript which is historically or archaeologically significant in the architectural, engineering, scientific, economic, agricultural, educational, social, political, military, or cultural annals of California.
>
> (j) "Local register of historical resources" means a list of properties officially designated or recognized as historically significant by a local government pursuant to a local ordinance or resolution.
>
> (l) "National Register of Historic Places" means the official federal list of districts, sites, buildings, structures, and objects significant in

American history, architecture, archaeology, engineering, and culture as authorized by the National Historic Preservation Act of 1966 (Title 16 United States Code Section 470 et seq.).

(q) "Substantial adverse change" means demolition, destruction, relocation, or alteration such that the significance of an historical resource would be impaired.

Title 14, Public Resources Code, Section 5024.1 establishes a California Register of Historic Places; sets forth criteria to determine significance; defines eligible properties; lists nomination procedures.

Title 14, Public Resources Code, Section 5097.5 – any unauthorized removal or destruction of archaeological, paleontological resources on sites located on public lands is a misdemeanor.

Title 14, Public Resources Code 5097.98 prohibits obtaining or possessing Native American artifacts or human remains taken from a grave or cairn; sets penalties.

Title 14, Public Resources Code, Section 21083.2. – the lead agency determines whether a project may have a significant effect on unique archaeological resources; if so, an Environmental Impact Report (EIR) shall address these resources. If a potential for damage to unique archaeological resources can be demonstrated, such resources must be avoided; if they can't be avoided, mitigation measures shall be required; discusses excavation as mitigation; discusses cost of mitigation for several types of projects; sets time frame for excavation; defines "unique and non-unique archaeological resources"; provides for mitigation of unexpected resources; sets limitation for this section.

Title 14, Public Resources Code, Section 21084.1 – indicates that a project may have a significant effect on the environment if it causes a substantial change in the significance of a historic resource; the section further describes what constitutes a historic resource and a significant historic resource.

Guidelines for the Implementation of the California Environmental Quality Act (CEQA) – Section 15064.5 specifically addresses effects on historic and prehistoric archaeological resources, in response to problems that have arisen in the application of CEQA to these resources.

Title 14, Penal Code, Section 622.5 – anyone who damages an item of archaeological or historic interest is guilty of a misdemeanor.

California Environmental Quality Act (CEQA): Public Resources Code Sections 5020.1, 5024.1, 21083.2, 21084.1, *et seq*; requires analysis of potential environmental impacts of proposed projects application of feasible mitigation measures.

California Environmental Quality Act (CEQA) Guidelines: California Code of Regulations, Sections 15000, *et seq*, Appendix G (j), specifically defines a potentially significant environment effect as occurring when the proposed project will "…disrupt or adversely affect…an archeological site, except as part of a scientific study."

Public Resources Code, Section 5097.5. Any unauthorized removal of archaeological resources on sites located on public lands is a misdemeanor. As used in this section, "public lands" means lands owned by, or under the jurisdiction of, the state, or any city, county, district, authority or public corporation, or any agency thereof.

POTENTIAL IMPACTS AND MITIGATION

Impact Evaluation Criteria

The California Environmental Quality Act (CEQA) contains provisions relative to preservation of historic and prehistoric cultural sites. Section 15126.4 of CEQA directs public agencies (i.e., City of Antioch) to "avoid damaging effects" on an archeological resource whenever feasible. If avoidance is not feasible, the importance of the site shall be evaluated as a means of determining impact and developing mitigation measures. CEQA Section 15064.5 states:

> "Generally, a resource shall be considered by the lead agency to be "historically significant" if the resource meets the criteria for listing on the California Register of Historical Resources (Pub. Res. Code SS5024.1, Title 14 CCR, Section 4852) including the following:
>
> (A) Is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage;
>
> (B) Is associated with the lives of persons important in our past;

(C) Embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possesses high artistic values; or

(D) Has yielded, or may be likely to yield, information important in prehistory or history."

To evaluate cultural resource sites against these CEQA criteria requires consideration of, among other things, the overall integrity of the site, the regional culture history (the types, ages, and distribution of other sites in the region), and the nature of questions that researchers are attempting to address regarding the history or prehistory of the region.

Potential Project Impacts

Ground-disturbing construction activities have the potential to directly impact cultural resources in the project area by disturbing both surface and subsurface soils (refer to Figure 6). These resources could be prehistoric (Native American artifacts, features or burials) or historic (features or artifacts associated with ca. post-1840 land use in the area, including the Oakland Trotting Park, early industry, residences, etc). Such disturbance could result in the loss of integrity of cultural deposits, or loss of information through the alteration of site setting, both of which would be considered significant impacts under CEQA if not mitigated. There is also the potential for inadvertent discoveries during construction.

Although none of the known historic or prehistoric resources in the immediate area are believed to be located within the boundaries of the project area (refer to Figure 6), there is nonetheless the potential to encounter significant cultural deposits during project excavations. The exact location of the known resources has not been pinpointed (except those within the Bay Street development), and both historic and prehistoric deposits are likely in the area given the previous land uses there over the past 5,000 years. Should any resources be discovered, their significance would have to be determined in relation to the criteria for eligibility to the California Register of Historic Resources (CRHR). Simply because a shellmound has been leveled, or historic structures removed does not necessarily reduce the significance insofar as CRHR eligibility is concerned. Buried features of many kinds can remain undetected until being discovered during construction; at that time they must be evaluated and a determination made as to their significance.

The preferred mitigation under CEQA is always avoidance of the resource. In this case, given the prescribed area of excavation and the nature of the work – toxic soil remediation – it is unlikely that avoidance will be possible. Should significant resources be discovered during construction, data recovery would be required to gather sufficient information from

the site to consider its loss a less-then-significant impact under CEQA. Should preconstruction excavation or borings be conducted within the project area, it would be advantageous for a qualified archaeologist to monitor the work to define the presence or absence of buried resources to promote advance planning for mitigation purposes.

Preparation of an Archaeological Monitoring and Data Recovery Plan

It has been established that potentially significant cultural resources are known to exist within the immediate project vicinity. Failure to address impacts to these resources during project implementation would be a significant impact under CEQA. City of Emeryville mitigation measures established for the Chiron campus expansion (abutting the northern project boundary) include the formulation of a "...general archaeological monitoring program..." to be implemented "...during excavation, grading, and other earthmoving activities below grade on the project site..." Should the City require Sherwin-Williams to implement similar measures, then an Archaeological Monitoring and Data Recovery Plan (AMDRP) would need to be prepared.

The AMDRP would be prepared as required to meet CEQA mitigation measures, and to reduce impacts to a less-than-significant level. All aspects of cultural resource mitigation would comply with the general requirements of the CEQA Guidelines and CEQA section 15064.5. No additional historic preservation regulations (e.g. Section 106 of the [federal] National Historic Preservation Act) would be applicable, except for those pertaining to the discovery of human remains during construction. Such an occurrence would require compliance with Section 7050.5(b) of the California Health and Safety Code as it pertains to human remains (see below).

The purpose of the AMDRP, therefore, would be to establish construction protocols focused on implementation of specific mitigation measures, monitoring procedures and data recovery methods intended to protect subsurface cultural resources from project-related impacts. Construction monitoring during remediation excavations by a qualified archaeologist(s) would be required to assess whether or not buried deposits are encountered, and to evaluate resources if they area found. The AMDRP would describe monitoring methods, excavation methods, research questions, lab analysis methods, and cataloging and curation requirements for artifacts recovered as part of the work.

Health and Safety issues associated with monitoring and excavating in hazardous soils would have to be addressed in the AMDRP. Archaeological monitors and excavators should not be working in conditions that require OSHA 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPE) or other training if at all possible. A protocol will have to

be established to address how resources will be recovered under hazardous soil conditions and under what conditions resources may be unrecoverable.

Discoveries During Construction

Typically, should unanticipated finds be uncovered during construction, work in the immediate vicinity (within 30 feet) would cease until an archaeologist conducts an assessment of the historic or prehistoric resources. Treatment measures following AMDRP protocol would be implemented on significant finds. In the event that Native American human remains or funerary objects are discovered, the provisions of the California Health and Safety Code should be followed. Section 7050.5(b) of the California Health and Safety Code should be implemented in the event that human remains or possible human remains are located. It states:

> *In the event of discovery or recognition of any human remains in any location other than a dedicated cemetery, there shall be no further excavation or disturbance of the site or any nearby area reasonably suspected to overlie adjacent remains until the coroner of the county in which the human remains are discovered has determined, in accordance with Chapter 10 (commencing with Section 27460) of Part 3 of Division 2 of Title 3 of the Government Code, that the remains are not subject to the provisions of Section 27492 of the Government Code or any other related provisions of law concerning investigation of the circumstances, manner and cause of death, and the recommendations concerning treatment and disposition of the human remains have been made to the person responsible for the excavation, or to his or her authorized representative, in the manner provided in Section 5097.98 of the Public Resources Code.*

The County Coroner, upon recognizing the remains as being of Native American origin, is responsible to contact the Native American Heritage Commission within 24 hours. The Commission has various powers and duties to provide for the ultimate disposition of any Native American remains, as does the assigned Most Likely Descendant. Sections 5097.98 and 5097.99 of the Public Resources Code also call for "protection to Native American human burials and skeletal remains from vandalism and inadvertent destruction". A combination of preconstruction worker training and construction monitoring by a qualified archaeologist (and the likely presence of an onsite Native American monitor) would serve to achieve compliance with this requirement for protection of human remains. Worker training typically instructs workers as to the potential for discovery of cultural or human remains, and both the need for proper and timely reporting of such finds, and the consequences of failure thereof.

SUMMARY

It has been determined on the basis of a record and literature search that there is a potential for significant historic and prehistoric deposits, including whole or partial human remains, to be located in the Sherwin-Williams remediation project area. It is likely that such remains, particularly human remains, would qualify for listing on the CRHR, and would therefore be considered important under CEQA, requiring mitigation. The preferred mitigation is always avoidance, however given the nature of the project, it may not be feasible to avoid resources within the project area should they occur. In anticipation of the need to monitor construction to address the presence or absence of cultural resources, and the need for data recovery should such resources be discovered, an Archaeological Monitoring and Data Recovery Plan should be prepared which describes the protocol under which monitoring will be conducted, and the research questions to be addressed should significant resources be found which require data recovery. Data recovery methods, lab analysis, and cataloging and curation requirements will also be specified in the AMDRP. The need for a Health and Safety Plan should be specified as well, to address monitoring and excavation in hazardous soil conditions.

REFERENCES

Basin Research Associates, Inc.

1990 Archaeological Survey Report. I-880/Cypress Replacement Project. Cities of Oakland and Emeryville, Alameda County, California for DeLeuw, Cather, & Co., San Francisco, California.

Berger, Rainer

1974 Letters of Bert Gerow, January 24, 1974; November 4, 1974. On file in Stanford University Planning Office.

Bocek, Barbara Rose

1986 Hunter-Gatherer Ecology and Settlement Mobility Along San Francisquito Creek. Ph.D. dissertation: Stanford University.

Bolton, Herbert E., ed.

1930 *Anza's California Expeditions*. 5 vols. Berkeley: University of California Press.

Bowman, J.N.

1951 The Peraltas and their Houses. *California Historical Society Quarterly*. 30(3). San Francisco.

Brown, Lauren, ed.

1985 The Audubon Society Nature Guides. *Grasslands*. Alfred A. Knopf, Inc. New York.

Buss, Margaret

1982 *Archaeological Survey Report for Proposed High Occupancy Vehicle Lanes from Bay Bridge to Carquinez Bridge*. Caltrans District 4, Environmental Planning Branch.

Cambra, R., A. Leventhal, L. Jones, L. Field, and N. Sanchez

1996 Archaeological Investigations at *Kaphan Umux* (Three Wolves) site, CA-SCL-732: A Middle Period Prehistoric Cemetery on Coyote Creek in Southern San Jose, Santa Clara County, California. Report on file at Caltrans District 4 Offices, Oakland, California.

Chavez, David

1977 Preliminary Cultural Resources Assessment of the East Bay Municipal Utility District (EBMUD) Wet Weather Facilities/Overflow Project Facilities Sites, Alameda and Contra Costa Counties, California. Prepared for Earth Metrics, Inc.

Chavez, David

1992 Archaeological Resources Investigations for the Hollis Street Sewer Rehabilitation Project, City of Emeryville, Alameda County, California. Submitted to East Bay Municipal Utility District.

Cook, Sherburne F.

1943 The Conflict Between the California Mission Indians and White Civilization. *Ibero-Americana,* Vol. 22. Berkeley.

1957 The Aboriginal Populations of Alameda and Contra Costa Counties, California, *Anthropological Records of the University of California Anthropological Survey,* Berkeley, CA.

Davis, William Heath

1967 *Seventy-five Years in California.* John Howell Books. San Francisco.

Fredrickson, David

1973 Early Cultures of the North Coast Ranges, California. Ph.D. Dissertation, University of California Davis.

Hausler, Donald

1994 The Emeryville Horse Race Track: 1871-1915. *Journal of the Emeryville Historical Society*. Vol. V, No. 1. Spring, 1994.

Heizer, Robert F.

1954 The Archeology of Central California I: The Early Horizon. *University of California Anthropology Records,* Volume 12, No.1:1-84. Berkeley.

Hendry, G.W. and J.N. Bowman

1940 The Spanish and Mexican adobe and other buildings in the nine San Francisco Bay Counties, 1776 About 1850. Ms. on file at the Bancroft Library, University of California, Berkeley.

Henn, W.G., and R.E. Schenk

1970 An Archaeological analysis of Skeletal Material Excavated from the Civic Center of BART. San Francisco: *Society for California Archaeology, R.E. Schenk Memorial Archives of California Archaeology 11*.

Henn, W.G., T.L. Jackson, and J. Schlocker

1972 Buried human bones at the "BART" site, San Francisco, California. Sacramento: *California Geology* 25(9):208-209.

Holman and Associates

1993 Report on Archival Research and a Preliminary Inventory of Potential Prehistoric and Historic Archaeological Resources in the Kaiser Hospital Project Area, Emeryville, Alameda County, California. Submitted to David Powers Associates.

1992a Archaeological Culture Resource Study for the Bay/Shellmound Street Project. Prepared for the City of Emeryville, City of Oakland, Caltrans. Prepared by Richard D. Ambro, Ph.D.

1992b Report on Archival Research and a Preliminary Inventory of Potential Prehistoric and Historic Archaeological Resources in the Del Monte Project Area, Emeryville, Alameda County, California. Submitted to David Powers Associates. Prepared by Richard Ambro, Ph.D.

Jones, Olive and Catherine Sullivan

1989 *The Parks Canada Glass Glossary for the Description of Containers, Tableware, Flat Glass, and Closures*. Revised edition Canada Parks Service, Ottawa.

Judd, D.R.

1984 Early Days in Temescal. *Oakland Heritage Alliance Newsletter.* 4(1):1-6.

Kroeber, Alfred

1970 *Handbook of the Indians of California*. Third Edition. California Book Company, Berkeley.

1925 Handbook of the Indians of California. *Bureau of American Ethnology Bulletin* 78. Washington.

Levy, Richard

1978 Costanoan. In *Handbook of North American Indians*, Volume 8, California, Robert F. Heizer, Ed., pp. 485-495. Smithsonian Institution, Washington.

Lillard, J.B and W.K. Purves

1936 The Archeology of the Deer Creek - Cosumnes Area, Sacramento County, California. *Sacramento Junior College, Department of Anthropology Bulletin* 1. Sacramento.

Lillard J.B., R.F. Heizer and F. Fenenga

1939 An Introduction to the Archeology of Central California. *Sacramento Junior College, Department of Anthropology Bulletin* 2. Sacramento.

Milliken, R.T.

1983 The Spatial Organization of Human Population on Central California's San Francisco Peninsula at the Spanish Arrival. M.A. thesis on file at Sonoma State University, Rohnert Park, CA.

Montizambert, Eric and Jefferey Bingham

1982 Negative Archaeological Survey Report: Proposed HOV Lanes from the Oakland Bay Bridge Toll Plaza on Route 80 to the Route 580/24 interchange in the City of Oakland.. Report on file at the Northwest Information Center, Sonoma State University.

Moratto, M. J., T. F. King, and W. B. Woolfenden

1978 Archaeology and California's climate. *The Journal of California Anthropology* 5(2): 147-161.

Moratto, M. J.

1984 *California Archeology*. Academic Press, Orlando.

Nelson, Nels C.

1909 Shellmounds of the San Francisco Bay Region. *American Archaeology and Ethnology.* University of California Publications. Volume 7, No. 4. Berkeley.

Pilling, Arnold

n.d. Archaeological Site Survey Records for CA-ALA-309, 310, 311, 312, 313. Compiled from Nelson Maps. Records on file at the Northwest Information Center, Sonoma State University.

Schenck, W.E. and E.J. Dawson

1926 The Emeryville Shellmound: Final Report. *University of California Publications in American Archaeology and Ethnology* 23(3):147-282.

Schoenherr, Allan A.

1992 *A Natural History of California*. Berkeley: University of California Press.

Shoup, L.H. with Randall T. Milliken and Alan K. Brown

1995 Ingio of Rancho Posolmi: The Life and Times of A Mission Indian and His Land. Submitted to Woodward-Clyde Consultants, Oakland.

Ragir, S.R.

1972 The Early Horizon in Central California Prehistory. *Contributions of the University of California Archeological Research Facility* 15. Berkeley.

Roop, William

1989 An Evaluation of the Potential for Archaeological Deposits within the Chiron Development Parcel, City of Emeryville, California.. Submitted to EIP Associates.

Schenck, W. E. and E.J. Dawson

1929 Archeology of the Northern San Joaquin Valley. *University of California Publications in American Archeology and Ethnology* 25(4):289-413. Berkeley.

Schoenherr, Allan

1992 *A Natural History of California.* Berkeley: University of California Press.

Shipley, William

1978 Native Languages of California. In *Handbook of North American Indians*, Volume 8, California, Robert F. Heizer, Ed., pp. 80-90. Smithsonian Institution, Washington.

Thompson and West

1878 *Official and Historical Atlas Map of Alameda County, California.* Thompson & West Publishers, Oakland. Bicentennial Reprint in 1976 by Valley Publishers, Fresno.

Uhle, Max

1907 The Emeryville Shellmound. *University of California Publications. American Archaeology and Ethnology, Vol. 7, No.1.* Berkeley: The University Press.

Wallace, W. J.

1978 Post-Pleistocene Archaeology, 9000 to 2000 B.C. In *Handbook of North American Indians Volume 8 California* (W.C. Sturtevant ed.). Smithsonian Institute, Washington. p. 25-36.

William Self Associates, Inc. (WSA)

2002 Report on the Archaeological Monitoring at the Chiron Campus Expansion: Building 12A Parking Structure, Emeryville, CA. Report on file at the Northwest Information Center, Sonoma State University, Rohnert Park.Ca.

Attachment D
Public Health Evaluation of the Remedial Alternative

CDM

The Sherwin-Williams Company

Report for Public Health Evaluation of the Remedial Alternative Emeryville, California

April 10, 2009

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Acronyms

1,2-DCA	1,2-dichloroethane
95%UCL	95 percent upper confidence limit
10^{-6}	one-in-one million
AIHA	American Industrial Hygiene Association
ARARs	Applicable or Relevant and Appropriate Requirements
ATc	averaging time - carcinogens
ATn	averaging time – non-carcinogens
ATSDR	Agency for Toxic Substances and Disease Registry
BAAQMD	Bay Area Air Quality Management District
BWa	body weight - adult
BWc	body weight - child
CAAQS	California Ambient Air Quality Standards
Cal/EPA	California Environmental Protection Agency
CDM	Camp, Dresser & McKee Inc.
COC	chemical of concern
COPC	chemical of potential concern
DTSC	Department of Toxic Substances Control
DVCP	Dust and Vapor Control Plan
ECF	emission control factor
ED	exposure duration
EF	exposure frequency
ET	exposure time
HAZWOPER	Hazardous Waste Operations and Emergency Response Standard
HEAST	USEPA Health Effects Assessment Summary Tables
HHRA	Human Health Risk Assessment
HI	hazard index
IRa	inhalation rate - adult
IRc	inhalation rate – child
kg	kilogram
m^3	cubic meter
mg	milligrams
MNA	monitored natural attenuation
mph	miles per hour
MRLs	Minimal Risk Levels
NAAQS	National Ambient Air Quality Standard
OEHHA	Office of Environmental Health Hazard Assessment
OSHA	Occupational Safety and Health Administration
PAMP	Perimeter Air Monitoring Plan
PCE	tetrachloroethylene
PHERA	Public Health Evaluation of the Remedial Alternative
PM_{10}	particulate matter of 10 microns or less
PPE	personal protection equipment

PPRTV	Provisional Peer Reviewed Toxicity Value
RfC	reference concentration
REL	reference exposure level
RME	reasonable maximum exposure
SCREEN3	Screening Air Dispersion Model
S-W	Sherwin-Williams Company
SVOC	semi-volatile organic compound
TCE	trichloroethylene
TPH	total petroleum hydrocarbons
µg	microgram
USEPA	U.S. Environmental Protection Agency
VOC	volatile organic compound

Executive Summary

The purpose of this Public Health Evaluation of the Remedial Alternative (PHERA) is to provide results from evaluations of potential health effects to people in the surrounding community during implementation of the preferred remedial action associated with the Sherwin-Williams Company (S-W) Emeryville, California site ("Site"). The implementation activities will include excavation and offsite transport of approximately 64,000 cubic yards of soil/material, and take place over a 6-month duration. Chemicals of concern (COCs) for the remedial action include: arsenic, lead, and volatile organic compounds (VOCs). Based on the use of appropriate emission control technologies, e.g., dust and vapor controls, evaluations presented herein show that people in the community will not be put at risk from implementation of the preferred remedial action.

The primary objective of the PHERA is to estimate possible risk to people in the community for adverse health effects during implementation of the preferred remedial action. Two types of potential health effects are typically evaluated: cancer and noncancer. Federal and California governmental agencies have developed thresholds for these two types of risks, and consider estimated risks that fall below these thresholds to be acceptable. For cancer effects, a one-in-one million (10^{-6}) risk level is at the conservative lower range of the health effects commonly used by Federal and California regulatory agencies to determine whether health-protective measures are needed for a community. For noncancer effects, a hazard index (HI) of 1 is generally used by Federal and California regulatory agencies as a risk level above which more detailed toxicology evaluations should be conducted. Neither of these risk levels for cancer or noncancer are direct indicators that health effects will or are likely to occur. They are, however, useful for helping to ensure protection of people in the community from unacceptable exposure to COCs.

During implementation activities, potential exposure to COCs could occur from inhalation of dust and organic vapors from the implementation activities. Dust could be generated during excavation, loading/unloading of excavated soil/material, and offsite transport of excavated soil/material. Organic vapors could be generated from off-gassing of VOCs found in the soil and groundwater.

Based on concentrations of COCs in soil and groundwater samples collected within the planned excavation footprint, an air dispersion computer model was used to estimate unmitigated respirable concentrations of COCs that might be present in the air at the nearest downwind Site fence line location. In this case, unmitigated means without consideration of implementing dust and vapor control measures. Possible exposure to people in the community was then evaluated at the nearest downwind Site fence line location rather than at their offsite property locations. The evaluations of potential health effects to people in the community (i.e., this PHERA) included adult and young children (0 to 6 years old) residents. Young children are the most

sensitive population. Exposure levels that are acceptable for young children residents would also be acceptable for other people in the community, including older children and adult residents, adult workers at nearby commercial and industrial buildings, as well as incidental exposure to neighborhood visitors and pedestrians. Potential exposures were evaluated for the expected total duration of 6 months for implementation activities. Dust at the Site was assumed to be generated 8 hours per day, 5 days per week during excavation and loading activities, and organic vapor generated 24 hours per day, 7 days per week while excavated soils are exposed. The evaluations considered long-term exposure over the total duration of implementation activities as well as short-term exposure to address possible acute health effects. The evaluations considered possible cumulative effects from both inhalation of respirable dust containing arsenic and lead, and air containing VOCs.

The PHERA concludes that that theoretical excess lifetime cancer risk and noncancer hazard index to people in the community without implementation of emission control measures could exceed the target levels (i.e., acceptable cancer risk level of 10^{-6} and noncancer HI of 1). Thus, emission control measures are necessary during implementation activities. Minimum dust and vapor control measure efficiencies required to reduce cancer and noncancer risks to target levels were determined to be 96 percent for dust and 90 percent for organic vapors for soil/material at the Site with the highest concentrations of COCs. This material comprises approximately 7,000 cubic yards of the 64,000 cubic yards of soil/material proposed for excavation. For the remaining approximately 57,000 cubic yards of soil/material with lower COC concentration, minimum dust and vapor control measure efficiencies to reduce risks to target levels were determined to be 60 percent for dust and 90 percent for organic vapors.

Proposed dust and vapor control measures can reduce dust and organic vapor emissions by 99.9 percent. Therefore, the use of emission control measures can and will be used to reduce health risk to people in the community to acceptable levels. Dust and vapor control measures will include: water sprays, surfactants, wetting agents, dust suppressants, plastic covers, and windscreens for dust control; and water sprays, wetting agents, foam covers, and plastic covers for vapor control.

The second objective in the PHERA is to develop performance standards. Performance standards are respirable concentrations for COCs in air that should not be exceeded. Adherence to performance standards helps to ensure protection of people in the community from unacceptable exposure to COCs. A performance standard was calculated for each COC based on Federal and California regulatory enforcement and guidance standards. During implementation activities, samples will be collected on a periodic basis to measure actual respirable COC concentrations in air for comparison to these performance standards. These comparisons will be used to demonstrate that people in the community are not being exposed to unacceptable concentrations of COCs during proposed implementation activities. That is, concentrations of COCs in air monitoring samples are below conservative risk-based performance standards. Ongoing monitoring of respirable COC concentrations in air

will allow implementation activities to be adjusted if and as required to ensure that performance standards are met. Performance standards for the COCs are presented in Table 4-3.

COC concentrations in air cannot be evaluated in "real-time"; that is, concentrations of individual COCs in collected samples will not be available until some hours or days after samples are taken and submitted for analytical testing. Some alternative means is thus needed to assess short-term emissions. Action levels were therefore developed by which COCs can be evaluated immediately, as implementation activities proceed. For this purpose, chemical-specific performance standards were converted into action levels based on real-time measurements of respirable dust and total organic vapors using hand-held and stationary monitors. Comparison of real-time dust and total organic vapor concentrations with these action levels will facilitate real-time decision making regarding the adequacy of emission control measures. As needed, control measures would be modified to maintain emissions below respirable dust and total organic vapor risk-based action levels.

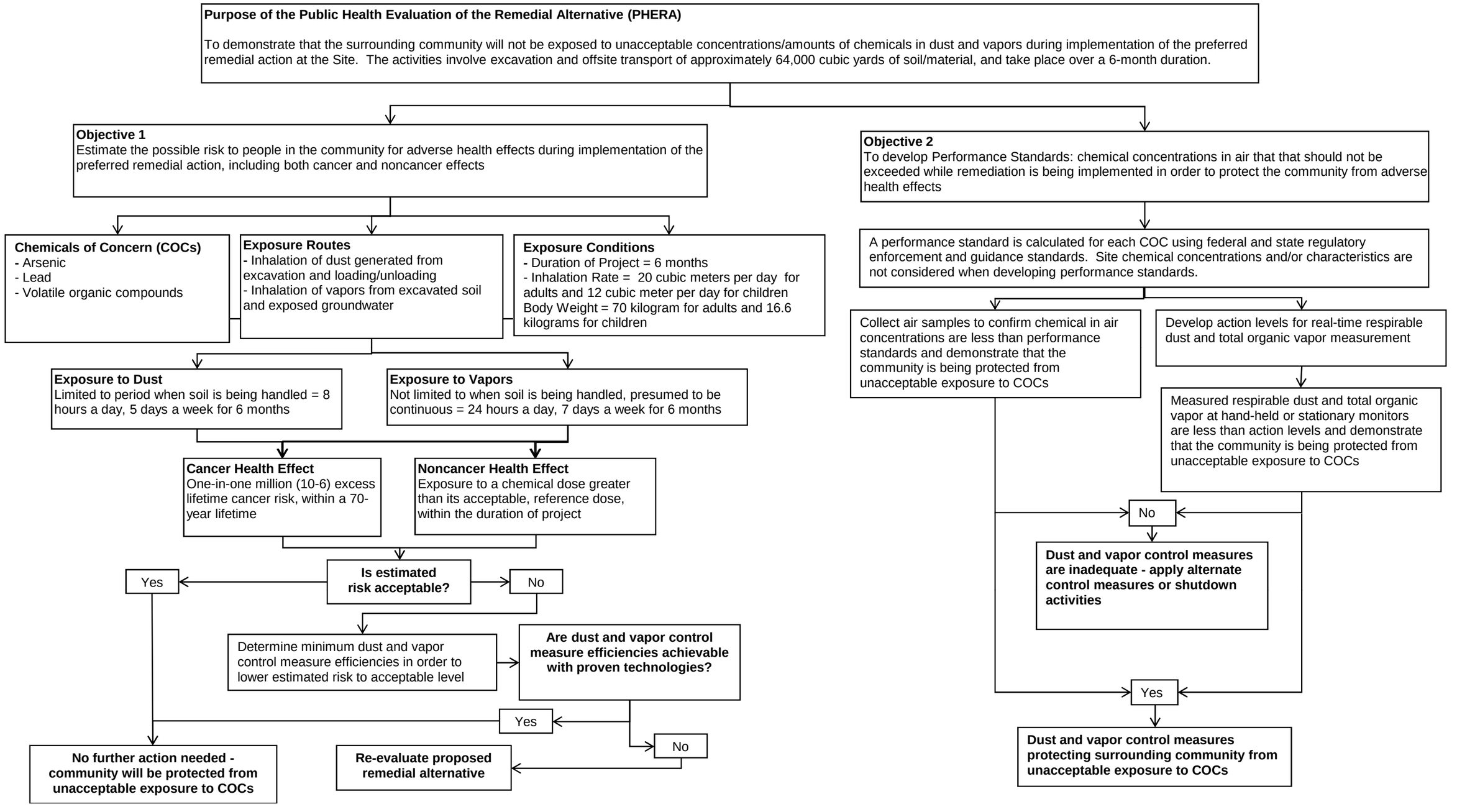
The respirable dust action level to be utilized will vary depending on the concentrations of arsenic and lead for the soil being handled from different parts of the excavation. The calculated action level for respirable dust thus varies from 0.6 micrograms per cubic meter ($\mu g/m^3$) for those excavation areas with the highest concentrations to 50 $\mu g/m^3$ for those excavation areas with lower concentrations.

The calculated action level for total organic vapors is 1,505 $\mu g/m^3$ and does not vary with the excavation activities because off-gassing of organic vapors is not solely a function of soil handling.

Based on these evaluations presented in this report, the preferred remedial action can be implemented in a manner which protects people in the community from unacceptable exposure to COCs.

S-W will ensure protection of public health from unacceptable exposure to COCs during implementation activities with a combination of actions including: (1) implementing a variety of control technologies designed to reduce the generation of dust and organic vapors during implementation activities; (2) continuous monitoring of COC concentrations in air and comparison of these concentrations with chemical-specific performance standards that address long-term exposure; and, (3) real-time measurement of respirable dust and organic vapor concentrations and comparison of these concentrations with action levels that address short-term exposure.

FIGURE ES-1: OVERVIEW OF THE PUBLIC HEALTH EVALUATION OF THE REMEDIAL ALTERNATIVE



Section 1
Introduction

On behalf of the Sherwin-Williams Company (S-W), Camp Dresser & McKee Inc. (CDM) has prepared this Public Health Evaluation of the Remedial Alternative (PHERA) report for the S-W property located at 1450 Sherwin Avenue in Emeryville, California and a portion of the adjacent former Rifkin property, located at 4525-4563 Horton Street. Collectively, these two properties are referred to as the "Site" within this document. Figure 1-1 shows the location of the Site, and Figure 1-2 presents a plan view of the Site.

Several phases of soil and groundwater investigation have been conducted at the Site since 1998. The investigations have revealed that soil and shallow groundwater at the Site contain elevated concentrations of arsenic and lead, from historic lead arsenate manufacturing at the Site and elevated concentrations of volatile organic compounds (VOC) from other historical Site uses. These constituents are chemicals of concern (COCs) for the Site and are the focus of this PHERA. The investigations concluded that COCs have migrated from the S-W property onto a portion of the adjacent former Rifkin property.

Other chemicals detected at the Site include other metals, semi-volatile organic compounds (SVOCs), and total petroleum hydrocarbons (TPHs). However, concentrations of these other chemicals reported in Site soils are not expected to be of concern for public health and are not further addressed.

In the Feasibility Study report for the Site, dated April 1, 2009 (CDM, 2009), S-W identified its preferred remedial action that includes the following implementation activities:

- Raised cap removal;
- Vadose zone soil excavation;
- Source area saturated soil excavation;
- Modification of the existing the slurry wall system;
- Monitored natural attenuation (MNA);
- Groundwater monitoring; and
- Update land use controls.

The implementation activities will include excavation and offsite transport of approximately 64,000 cubic yards of soil/material, and are scheduled to take place over a 6-month duration. The approximate locations of the raised cap removal area,

vadose zone soil excavation, source area saturated soil excavation, and extension of slurry wall are shown on Figure 1-2.

Properties located adjacent to or within close proximity to the Site support residential, commercial, and industrial land uses. Multi-family residential buildings, including Emeryville Lofts, Horton Street Lofts, and 45th Street Artists Co-op (and Annex), are located directly to the east and southwest of the Site. S-W installed a meteorological station at the Site in August 2002, and began recording wind speed, direction, temperature, and rainfall at 30-minute intervals through mid 2007. The station, was located in the approximate center of the S-W property at the end of the existing railcar loading dock extending north from the northeast corner of former Building 35, and was positioned approximately 20 feet above ground. The station confirms a predominantly on-shore wind direction from the west northwest, with average wind speeds of 3 miles per hour (mph) and recorded gusts as high as 9 mph from this direction. Existing Site wind data indicate maximum recorded winds from the south southeast at 18 mph.

Prevailing winds at the Site could thus carry any COCs released to air during implementation activities toward people in the community. To assess this possibility, the Department of Toxic Substances Control (DTSC) requested the completion of a PHERA to characterize potential human health cancer risk and noncancer risks (i.e., hazards) posed by implementation of the preferred remedial action. This report provides a detailed description of the findings of these evaluations. This PHERA was developed following preparation and approval of the PHERA Work Plan (CDM, 2008)[1].

The purpose of the PHERA is to quantitatively evaluate possible risks to people in the surrounding community associated with fugitive dust and organic vapor emissions during implementation activities. Conservative logic indicates that the Site workers, surrounding offsite workers, and transient population will also be protected from unacceptable exposure to COCs by the standards established for the residential population who are in proximity for more hours per day and more days per week.

Further, during implementation activities, Site workers will be required to have 40 hours of Occupational Safety and Health Administration (OSHA) Hazardous Waste Operations and Emergency Response Standard (HAZWOPER) training and use appropriate personal protection equipment (PPE) to control exposure to COCs. This training and PPE can be anticipated to protect workers implementing the preferred remedial action from unacceptable exposure to COCs. Therefore, the PHERA does

[1] Prior to conducting this evaluation, a PHERA Work Plan, dated September 30, 2008 (CDM, 2008), was developed in accordance with the guidelines from U.S. Environmental Protection Agency (USEPA), California EPA (Cal/EPA) and DTSC, and other pertinent risk assessment documents. DTSC approved the PHERA Work Plan in a letter dated October 6, 2008 (DTSC, 2008).

not address exposure assessments for construction workers during implementation of the preferred remedial action.

1.1 Purpose and Objectives

This PHERA provides the results of quantitative evaluations of possible risks to people in the surrounding community from potential exposure to COCs as fugitive dust and organic vapor could be released to ambient air during implementation activities.

The specific objectives of PHERA include:

1. Evaluate possible risks to residents living near the Site from potential exposures to fugitive dust and organic vapor emissions that could be generated during implementation of the preferred remedial action.

2. Develop Site-specific performance standards for COCs in air to limit long-term exposure to fugitive dust and organic vapors that could result from implementation of the preferred remedial action. These performance standards would be used to evaluate respirable COC concentrations in air, which would be continuously monitored through collection and laboratory analysis of air monitoring samples. Comparison of detected COC concentrations in air monitoring samples with performance standards would be used to confirm the effectiveness of dust and vapor control measures.

3. Develop action levels for fugitive dust and total organic vapor concentrations in air that would be used to limit short-term exposure to COCs during implementation of the preferred remedial action. These action levels would be used to evaluate real-time dust and total organic vapor concentrations measured by hand-held or stationary monitors. Comparison of measured dust and total organic vapor concentrations with the action levels would facilitate real-time evaluation of the adequacy of dust and vapor control measures; and, as appropriate, would be used to modify these control measures.

Implementation activities will be managed under the specifications of a Site-specific dust and vapor control plan (DVCP) and monitored for effectiveness under a Site-specific perimeter air-monitoring plan (PAMP). The PAMP will specify that background and ambient air quality will be monitored so that airborne dust and organic vapor generated by implementation activities are maintained below the risk-based performance standards.

1.2 Organization of Report

This PHERA report is organized in the following sections:

- Section 1 Introduction: Background and objectives of the report, and the report organization are presented.

- Section 2 Chemicals of Concern: Chemicals of concern (COCs) are chemicals that drive the need for remediation. Selection of these chemicals as COCs is based on findings from previous remedial investigations and risk assessment studies.

- Section 3 Public Health Evaluation: Results from estimating risk from potential exposure to COCs during implementation activities to nearby residents through inhalation is presented. Potential exposure assessment parameters and toxicity criteria are identified. Values used for estimating appropriate soil, groundwater, and/or air concentrations are also provided.

- Section 4 Development of Performance Standards: Development of Site-specific, risk-based performance standards is provided.

- Section 5 Development of Action Levels: Development of action levels is provided.

- Section 6 References: References cited in the report are provided.

Figure 1-1
Site Location Map
Sherwin-Williams Company
Emeryville, California

CDM

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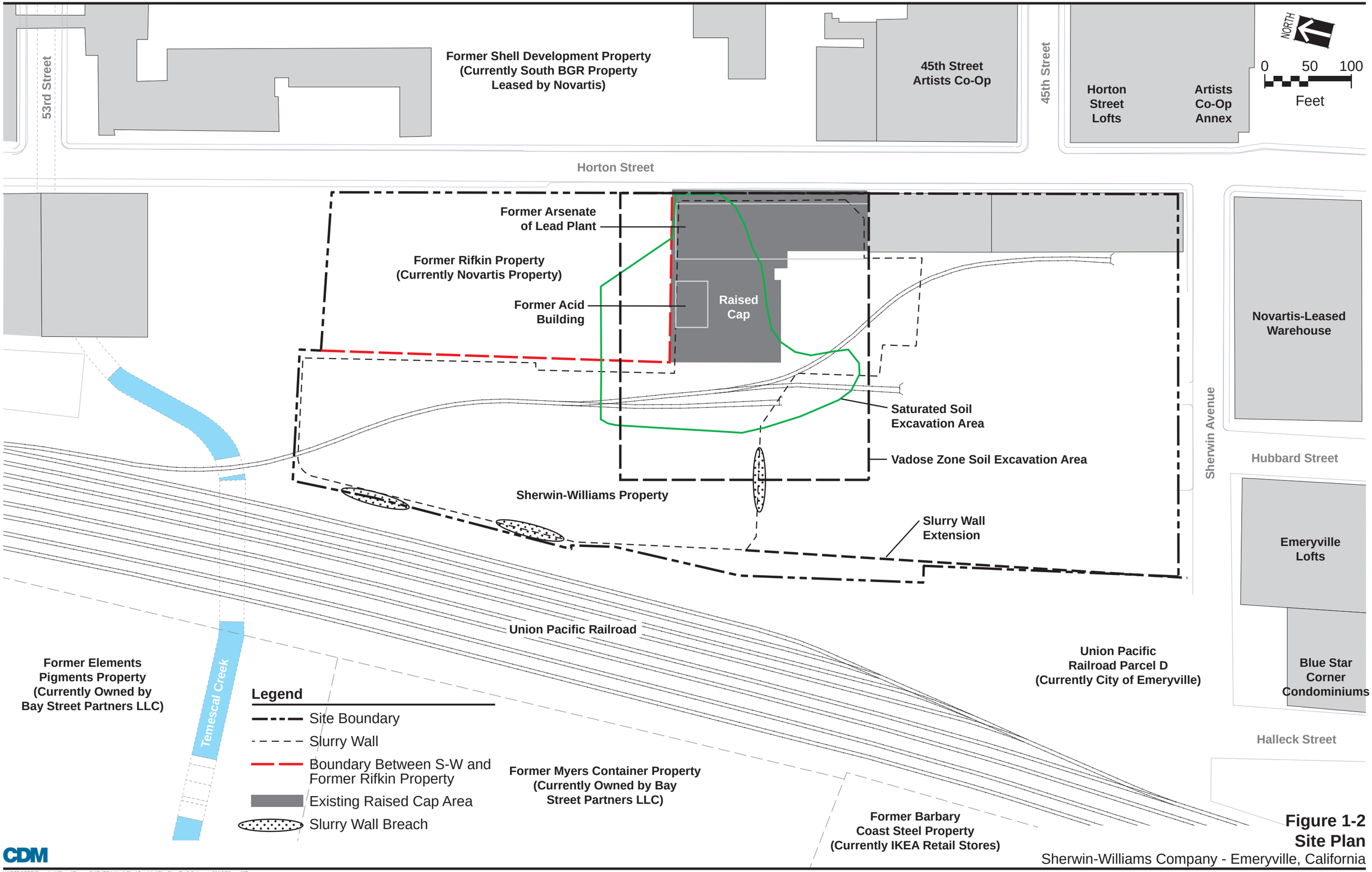

Figure 1-2
Site Plan
Sherwin-Williams Company - Emeryville, California

CDM

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Section 2
Chemicals of Concern

Fugitive dust containing arsenic and lead may be generated and organic vapors may be released to ambient air during the following soil handling activities at the Site:

- Excavation of vadose and saturated zone soils
- Dewatering of excavated material
- Excavation and installation of the slurry wall
- Transferring of soil into trucks/stockpiles
- Transport of the excavated material to offsite facilities

Excavation of soils, transferring of soil into trucks and stockpiles, and removal and installation of the slurry wall are anticipated to be the primary origins for dust emissions. Organic vapors are anticipated to be emitted as a result of excavation of soil, dewatering of soil, and excavation during the installation of the slurry wall, all of which may expose subsurface soil containing VOCs to ambient air. Based on these activities, chemicals of concern (COCs) for the PHERA were identified for soil, groundwater, and soil gas within the excavation.

To the extent appropriate, VOCs selected for the air exposure assessment portion of the Site Human Health Risk Assessment (HHRA) (Gradient, 2005) are evaluated as COCs in the PHERA. Potential exposure of offsite residents associated exposures of several months to COC in dust and as organic vapors can reasonably be evaluated as a subchronic exposure. Chronic exposure scenarios were evaluated in the HHRA and are based on the assumption of continuous lifetime exposure. The approach of using VOCs selected for chronic exposure scenarios in the HHRA as COCs in the PHERA is conservative.

During a 2004 subsurface investigation conducted by CDM at the Site (CDM, 2009), benzene, ethylbenzene, methyl isobutyl ketone, toluene, trichloroethylene (TCE), and xylenes were identified as chemicals comprising total VOCs. Benzene and xylenes were already identified as chemicals of potential concern (COPCs)[2] in the HHRA air assessment (Gradient, 2005). For the purpose of air monitoring, ethylbenzene, methyl isobutyl ketone, toluene, and TCE are selected as COCs for the PHERA. Including all of these chemicals helps ensure that exposure to multiple VOC is adequately addressed.

[2] Chemicals of potential concern are chemicals, among all chemicals detected, that are selected for additional assessment for human health risks. COC are a subset of COPCs that are used to help define the scope and limits of remedial actions.

During a 2006 soil gas investigation conducted by CDM at the Site (CDM, 2009), benzene and 1,2-dichloroethane (1,2-DCA) were detected above their respective soil gas screening levels (Cal/EPA, 2005a). The HHRA air assessment already identified benzene as a COPC for groundwater (Gradient, 2005); however, 1,2-DCA was not identified in the HHRA and was added as a COC for the PHERA.

1,2-Dichloropropane was identified as a COPC in the PHERA Work Plan (CDM, 2008). However, it was not detected in the soil and groundwater samples collected within the planned excavation footprint. Thus it is not evaluated in the PHERA.

COCs evaluated for the PHERA are summarized in Table 2-1. These COCs include:

- Two (2) metals: arsenic and lead.
- Eleven (11) VOCs: benzene, 1,2-DCA, ethylbenzene, methyl ethyl ketone, tetrachloroethylene (PCE), toluene, TCE, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, vinyl chloride, and xylenes.

TABLE 2-1
CHEMICALS OF CONCERN FOR PUBLIC HEALTH EVALUATION

Volatile Organic Compounds[1]	Metals[2]
Benzene	Arsenic
1,2-Dichloroethane	Lead
Ethylbenzene	
Methyl ethyl ketone	
Tetrachloroethylene	
Toluene	
Trichloroethylene	
1,2,4-Trimethylbenzene	
1,3,5-Trimethylbenzene	
Vinyl chloride	
Xylenes	

1. Volatile organic compounds (VOCs) present in air as organic vapors.
2. Metals present in air as respirable dust.

Section 3
Public Health Evaluation

This section presents the public health evaluations based on potential exposures to COCs by people in the community near the Site that could be released during implementation of the preferred remedial action. The steps in these evaluations include: exposure assessment; toxicity assessment; and, risk characterization.

3.1 Exposure Assessment

Exposure assessment identifies and discusses the exposure scenarios, receptor populations, pathways of exposure, and exposure parameters that are used to perform the public health evaluations.

3.1.1 Exposure Scenario and Potential Receptors

During implementation activities, fugitive dust and organic vapors could be released during excavation of vadose and saturated zone soils, dewatering of excavated material, transferring of soil into trucks and stockpiles, removal and installation of the slurry wall, implementation of the slurry wall modifications, and other implementation activities. Arsenic and lead containing particles could be entrained in air as fugitive dust. Particulate matter with an effective diameter of less than or equal to 10 microns (µm) (PM_{10}) is considered respirable (National Ambient Air Quality Standards). Arsenic and lead in these respirable particles that deposit in the deep lung are the basis for toxic effects following inhalation exposure.

VOCs present in soil and groundwater at the excavation could volatilize into ambient air as organic vapors during many of the same activities that might release arsenic and lead. Receptors (i.e., residents in the community) could be exposed to these emitted dusts and organic vapors through inhalation. Potential exposures to COCs in air as respirable dust and organic vapors are evaluated in the PHERA.

The PHERA focuses on evaluating possible risks to residents in the community, specifically adults and young children (0 to 6 years old exposure. Exposure levels that are acceptable for residents in the community would also be acceptable for other possible receptors, including older children, adult workers at nearby commercial and industrial buildings, as well as incidental exposure to neighborhood visitor and pedestrians. In addition, the evaluations have been conservatively based on receptors being continuously present at the nearest downwind Site fence line location rather than at their offsite property locations.

3.1.2 Exposure Concentrations and Parameter Values

Exposure concentrations of COCs for soil and groundwater used in the PHERA are either maximum concentrations or 95 percent upper confidence limits (95%UCLs) of mean concentrations from samples collected within the planned excavation footprint,

whichever is lower. Computation of a 95%UCL of the mean concentration for soil and groundwater was performed using ProUCL Version 4.0, which was developed by USEPA (2007) to recommend an appropriate exposure concentration based on the statistical data distribution, numbers of non-detect data points, and other factors. Table 3-1 presents summary statistics, the distribution type, the 95%UCLs of the mean concentrations, and representative values for exposure concentrations.

Exposure parameters for the PHERA are selected based on USEPA and Cal/EPA guidance for a reasonable maximum exposure (RME) scenario. The intent of RME is to estimate a conservative case that is among the highest exposures possible, but still within the range of possible exposures. For some parameters, either Site-specific values or best professional judgment are used in selecting appropriate exposure parameters. Exposure parameters and the basis for each parameter used for the PHERA are summarized in Table 3-2 and described below.

Exposure Time, Exposure Frequency, and Exposure Duration – The total duration for the implementation activities is expected to be six months. This duration is estimated based on a daily excavation rate of 800 cubic yards for 80 work days (approximately 16 weeks or 3.5 months). Additional time is allowed for contingency and other unforeseeable activities or delays. In order to provide incentive for the selected remediation contractor to complete the work within six months, S-W will impose financial requirements (e.g., liquidated damages) in its agreement with the contractor to complete the work within this time period.

Excavation activities (digging and soil handling) will be performed at the Site for 8 hours per day or 40 hours per week for an estimated total duration of 6 months. Dust generation is expected to only occur during these times. Soil stockpiles and excavations will be covered and no dust-generating activities will occur after work hours. Workers will be present at the Site to monitor the effectiveness of dust mitigation controls. Therefore, the evaluations are based on offsite residents being exposed to dust for approximately 8 hours per workweek day, for the total duration of excavation of half year (i.e., six months)[3].

Organic vapor emissions are anticipated to continue at all times when an excavation is open and are therefore not limited to periods of implementation activities. The PHERA is based on offsite residents being exposed to organic vapors for 24 hours per day, for the total duration of excavation (i.e., six months).

Averaging Time - As recommended by USEPA, an averaging time of a 70-year lifetime of 25,550 days is used for evaluating possible cancer risk. Averaging time for noncancer hazards is equal to the exposure duration of 0.5 year multiplied by 365 days per year (i.e., 183 days). Shorter averaging times are used to estimate possible

[3] Actual exposure to dust is estimated to be 130 days, equivalent to 260 workweek days per year times 0.5 year. Exposure to volatiles is similarly estimated as 183 days, equivalent to 365 total days per year times 0.5 year. Exposure to volatiles could be possible on weekend days as well as weekdays, while exposure to dust could be possible only on weekdays.

subchronic noncancer risk associated with specific "excavation events" of shorter duration. Excavation events represent the planned stages of excavation activities and are further discussed below.

Inhalation Rate – In accordance with regulatory guidance, an inhalation rate of 20 cubic meters per day (m^3/day, 0.83 m^3/hour) for adults and 12 m^3/day (0.5 m^3/hour) for children (birth to 11 years old) are used in the PHERA (USEPA, 2006).

Body Weight - A body weight of 70 kg is used for adults and 16.6 kg for children (0 to 6 years old) (USEPA, 1991 and USEPA, 1997a).

Since arsenic concentrations for soil vary by orders of magnitudes within the excavation, possible concentrations for arsenic in air will vary as the implementation proceeds. Therefore, risk calculations for subchronic exposure to dust containing arsenic are performed separately for the entire excavation and for each excavation event. Exposure parameters for potentially exposed populations are presented in Table 3-2.

3.1.3 Modeling Air Concentrations

Concentrations of COC in soil and groundwater samples collected within the planned excavation event footprints are used to estimate chemical emissions to air. Particulate and volatile emission rates are calculated using USEPA methodologies (USEPA, 1989a and 1993).

3.1.3.1 Particulate Emissions

Particulate emission rates during excavation are estimated using empirically-based equations developed by USEPA (1989a and 1993). Emission rates for arsenic and lead in PM_{10} are estimated based on their corresponding fraction of the total PM_{10} emission rate from soil during excavation activities.

Hourly and long-term (i.e., over the total duration) emission rates are estimated with the appropriate emission factors presented in the PHERA Work Plan (CDM, 2008). The following operations are analyzed for emissions:

- Fugitive dust from excavation activities; and,
- Loading/unloading of excavated material for onsite and offsite transport (materials to be covered during transport).

The emission of fugitive dust from soil movement, including excavation (as discussed above), loading or unloading onto trucks or rail cars and adding or removing from stockpiles, is estimated with Equation 3-1(USEPA, 1993):

$$EF_U = \frac{k(0.0016)(M)\left(\frac{U}{2.2}\right)^{1.3}}{\left(\frac{X_{H2O}}{2}\right)^{1.4}} \qquad (3-1)$$

where:

EF_U	=	PM_{10} emission rate from unloading (g/day)
k	=	particle size multiplier, 0.35 for PM_{10}
M	=	Mass of soil handled (kg/day)
U	=	Mean wind speed (m/sec)
X_{H2O}	=	Soil moisture content (%)
2.2	=	Empirical constant (m/sec)
0.0016	=	Empirical constant (g/kg)

The total emissions from soil excavation and loading and unloading process (i.e., the soil will be excavated and transferred once into the trucks for onsite handling, transferred a second time into stockpiles, and transferred a third time for offsite transport) are estimated by Equation 3-2:

$$ER_{PM10}\left(\frac{kg}{hr}\right) = EF_U\left(\frac{g}{day}\right)(3)\left(\frac{kg}{1000g}\right)\left(\frac{day}{8hr}\right)(1-ECF) \qquad (3-2)$$

where:

ER_{PM10}	=	Total PM_{10} emission rate (kg/hr)
EF_U	=	Emission rate for single transfer processes (g/day) from Equation 3-1
ECF	=	Emission control factor (unitless) (Table 3-11)

Several particle emission control technologies will be used to minimize fugitive dust generation during implementation. Emission control measures that will be used during implementation activities are discussed in Section 3.3 of the report.

Table 3-3 presents the input parameters and estimated particulate emission rates for PM_{10}. Particulate emission rates for arsenic and lead are calculated using 95%UCLs of mean concentrations from soil samples collected within the planned excavation footprint. Results are then incorporated into the air dispersion model discussed in Section 3.1.3.3.

3.1.3.2 Volatile Emissions

During implementation activities, volatile emissions could occur from:

- Exposed soil surfaces within the excavation pit and stockpiles;
- Exposed groundwater within the excavation pit; and,
- Loading /unloading of excavated material for onsite and offsite transport.

Emissions of volatiles from exposed excavation stockpiles will be minimized through several emission control technologies (Table 3-11) and is not be considered in the PHERA. Exposed soils will be sprayed with water and/or foams to inhibit volatilization by filling available pore spaces and thereby decreasing volatilization rate. Plastic sheeting will be used to control vapor emissions from soil stockpiles and transport trucks.

In addition, prior to raised cap materials excavation, soil vapor extraction will be used to remove vapors from soil above the water table. Extracted soil vapor will be treated using granular activated carbon or other treatment technology in compliance with the Bay Area Air Quality Management District requirements. Soil vapor extraction surrounding the excavation pit would continue during excavation and dewatering activities to control release of vapors from exposed excavation walls. The excavation will be dewatered via the installation of a sump pump and conveyance piping.

Possible total volatile emissions from soil are estimated using empirically-based equations developed by USEPA (1993).

$$ER_{vs} = \frac{(S_V)(C)(\beta)(1.0)(1 - ECF)}{t} \qquad (3-3)$$

where:

ER_{vs}	=	Emission rate of chemical i (g/sec)
S_V	=	Total volume of excavated soil (m^3)
C	=	Concentration of chemical i in soil (µg/g)
β	=	Soil bulk density (g/cm^3)
1.0	=	Constant ($g/ 10^6 \mu g \times 10^6 cm^3/m^3$)
ECF	=	Emission control factor (unitless) (Table 3-11)
t	=	Duration of activity (sec)

This equation estimates that, in absence of any emission control technologies and offsite transport, all of the VOC present in the soil will eventually volatize. Thus the estimated possible total emission is conservative.

The chemical flux from soil volatilization is given by Equation 3-4 (USEPA, 1995 and Lakes Environmental, 2007):

$$F_s = \frac{ER_{vs}}{A} \qquad (3-4)$$

where:

F_S	=	Chemical emission rate from soil volatilization (g/m^2-s)
ER_{vs}	=	Emission rate of chemical i (g/sec)
A	=	Surface area of bottom of excavation pit (m^2)

Table 3-4 presents the input parameters and modeling results for the estimation of VOC emissions from the excavation of soil. The evaluation is based on the excavation pit being 76 meters long, 30 meters long and 9 meters deep. This is the longest anticipated length and width of the excavation where VOCs were detected above their associated California Human Health Screening Level (CHHSL) (Cal/EPA, 2005a).

The excavation will be dewatered via the installation of a sump pump and conveyance piping. However, it is unlikely that the pit will be completely free of water at all times. Therefore, potential exposures to organic vapors from groundwater that could be present within the pit are evaluated by using the Virginia Department of Environmental Quality Trench Model (Trench Model) (Virginia Department of Environmental Quality, 2008). The Trench Model is based on a combination of a vadose zone model to estimate volatilization of organic vapors from groundwater into a trench and a box model to estimate dispersion of the VOCs from the air inside the trench into the aboveground atmosphere in order to estimate the air concentration in a construction trench.

VOC concentration in a trench is estimated using Equation 3-5:

$$C_{pit} = (C_{GW})(VF) \qquad (3-5)$$

where:

C_{pit} = Concentration of VOC in the pit (µg/m^3)
C_{GW} = Concentration of VOC in groundwater (µg/L)
VF = Volatilization factor (L/m^3) derived from Equation 3-6

Since a dewater system will be used in the excavation, it is expected that the excavation pit will only intercept the groundwater for a few inches. Volatilization factor, VF, is estimated using Equation 3-6:

$$VF = \frac{(K_i)(A)(F)(10^{-3})(10^4)(3600)}{(ACH)(V)} \qquad (3-6)$$

where:

K_i = Overall mass transfer coefficient of VOC (cm/sec) derived from Equation 3-7
A = Area of excavation pit (m^2)
F = Fraction of floor through which VOC can enter
ACH = Air exchange per hour (/hr)
V = Volume of excavation pit (m^3)
10^{-3} = Conversion factor (L/cm^3)
10^4 = Conversion factor (cm^2/m^2)
3600 = Conversion factor (s/hr)

$$K_i = \frac{1}{\frac{1}{k_{iL}} + \frac{RT}{H_i k_{iG}}} \qquad (3\text{-}7)$$

where:

k_{iL}	=	Liquid-phase mass transfer coefficient of i (cm/sec) derived from Equation 3-8
R	=	Ideal gas constant (atm-m^3/mole- ^{0}K)
T	=	Average system absolute temperature (^{0}K)
H	=	Henry's Law constant of i (atm-m^3/mol)
k_{iG}	=	Gas-phase mass transfer coefficient of i (cm/sec) derived from Equation 3-9

$$k_{iL} = \left(\frac{MW_{O2}}{MW_i}\right)^{0.5} + \frac{T}{298} \times k_{L,O2} \qquad (3\text{-}8)$$

where:

k_{iL}	=	Liquid-phase mass transfer coefficient of i (cm/sec)
MW_{O2}	=	Molecular weight of oxygen (g/mol)
MW_i	=	Molecular weight of i (g/mol)
$K_{L,O2}$	=	Liquid-phase mass transfer coefficient of oxygen at 25 ^{0}C (cm/sec)

$$k_{iG} = \left(\frac{MW_{H2O}}{MW_i}\right)^{0.335} + \left(\frac{T}{298}\right)^{1.005} \times k_{G,H2O} \qquad (3\text{-}9)$$

where:

k_{iG}	=	gas-phase mass transfer coefficient of i (cm/sec)
MW_{O2}	=	Molecular weight of water (g/mol)
MW_i	=	Molecular weight of i (g/mol)
$K_{G,H2O}$	=	gas-phase mass transfer coefficient of water vapor at 25 ^{0}C (cm/sec)

The chemical flux from groundwater volatilization is given by Equation 3-10:

$$F = \left(\frac{C_{pit} \times ACH \times V}{A}\right) \times \left(\frac{g}{1000\,mg}\right) \times \left(\frac{hr}{3600\,s}\right) \qquad (3\text{-}10)$$

where:

F	=	Chemical emission rate from groundwater (g/m^2-s)

C_{pit}	=	Chemical concentration in excavation pit air (mg/m^3)
ACH	=	Air exchange per hour (/hr)
V	=	Volume of excavation pit (m^3)
A	=	Surface area of bottom of excavation pit (m^2)

Table 3-5 presents the input parameters and modeling assumptions for the Trench Model. Estimated VOC emissions from groundwater are presented in Table 3-6. For each COC, volatilization fluxes are calculated using the 95%UCLs of the mean concentrations from soil and groundwater samples collected within the planned excavation footprint. Combined volatilization fluxes are the sum of the calculated soil and groundwater fluxes.

The estimated VOC emissions calculated using the Trench Model are not similar to those detected in soil gas sampling conducted at the Site. This difference is likely due to the detection of organic vapors trapped under the existing cap being detected in the soil gas sampling conducted at the Site.

3.1.3.3 Air Dispersion Model

Once released into the air, organic vapors from soil or groundwater and dust particles from soil could be transported and dispersed by winds to downwind areas. The SCREEN3 (USEPA, 1995) air dispersion model is used to predict downwind air concentrations at the nearest downwind Site fence line location using the above estimated emission rates. The SCREEN3 model is run under "full meteorology" mode, in which all meteorological combinations between stability classes and their associated wind speeds are considered in identifying the "worst case" meteorological condition. The "worst case" condition is the combination that results in the maximum ground level concentrations of COCs. Consequently, estimated fence line air concentrations are conservative (i.e., overestimations of exposure concentrations).

SCREEN3 Model

The SCREEN3 air dispersion model is recommended by USEPA for predicting maximum short-term (1-hour) air concentrations resulting from a point, area, or volume source. It is also one of the preferred models by Cal/EPA Office of Environmental Health Hazard Assessment (OEHHA) for human health risk assessment (OEHHA, 2003).

The SCREEN3 model uses a Gaussian plume model that incorporates source-related factors and meteorological factors to estimate pollutant concentration from contiguous sources. It is assumed that COCs do not go through any chemical reactions and that wet or dry deposition is inconsequential during transport of COCs from source to receptors.

Depending on the location of the source and surrounding land use, the SCREEN3 model uses a set of standard rural and urban dispersion coefficients. Urban atmospheric dispersion coefficients are used for the Site.

SCREEN3 Modeling Parameters

SCREEN3 modeling parameters for the excavation air modeling are presented in Tables 3-7 and 3-8. The exposure area is modeled as a ground level area source. Since the predicted air concentrations vary linearly with the emission rate, a "unit" emission rate per unit area of 1 gram per square meter per second (g/m^2–sec) is used for the model run. This emission rate was selected to determine the maximum ground level concentration at $1g/m^2$-sec, and not to represent the actual emission rate of any specific chemical. The air concentration based on the emission rate of $1g/m^2$-sec is calculated, and the ratio of the true mass flux for each chemical to its ground level concentration is derived.

$$C_{air} = \frac{(C)(PM_{10})(1000)}{10^9} \qquad (3-11)$$

where:

C_{air}	=	Chemical-specific maximum receptor concentration (µg COC/m^3 air)
C	=	Concentration of metal in soil (mg/kg)
PM_{10}	=	Particulate matter (< 10 µm) concentration (µg/m^3)
1000	=	Conversion factor (1000 µg/mg)
10^9	=	Conversion factor (10^9 µg/kg)

The receptors were modeled to be present at the nearest downwind Site fence line location with a breathing height of 1.5 meters.

The excavation is modeled as one area source corresponding to a 76 by 30 meter excavation pit. As shown in Tables 3-7 and 3-8, the plume is assumed to have an initial release height of 0 meters. The distance from the source to the receptors was modeled to be 42 meters, which is the approximate distance from the center of the excavation (Figure 1-2) to the nearest downwind Site fence line location, that along Horton Street based on a predominantly on-shore wind direction from the west northwest.

The SCREEN3 model provides the maximum 1-hour averaging concentration estimations. In order to determine the maximum 8-hour, 24-hour, 30-day and annual ground level concentrations, the maximum 1-hour concentration averages are converted to other averaging periods by using the conversion factors provided by USEPA (1995) and OEHHA (2003). The predicted maximum 1-hour, 8-hour, 24-hour, 30-day and annual ground concentrations for each COC are presented in Table 3-7 for the entire excavation and in Table 3-8 for each excavation event.

The maximum 8-hour concentrations and the maximum 24-hour concentrations in air at the nearest downwind Site fence line location are used for PM_{10} and organic vapor as exposure point concentrations (EPCs), respectively.

3.2 Toxicity Assessment

3.2.1 Cancer and Noncancer

In general, the PHERA utilizes the Cal/EPA OEHHA Toxicity Criteria Database for unit risk factors for inhalation exposure.

Reference exposure levels (RELs) developed by OEHHA are indicators of concentrations at which potential chronic and acute adverse health effects may occur. Acute and chronic RELs are concentrations at which no adverse health effects are anticipated for given short-term (i.e., 1 to 7 hours)[4] and long-term (i.e., greater than 8 years) exposure periods, respectively. Similar to RELs are reference concentrations (RfCs) developed by USEPA. RfCs are derived for short-term (up to 30 days), subchronic (up to 10% of average life span, or 7 years), and chronic exposures (7 years and longer). The anticipated period of excavation when emissions of COCs could occur at the Site is approximately 6 months, which corresponds to the subchronic exposure duration. Subchronic RfCs are thus obtained from the following hierarchy of references and are used preferentially for the risk assessment and development of performance standards:

- Agency for Toxic Substances and Disease Registry 's Minimal Risk Levels (MRLs) (ATSDR, 2007b; http://www.atsdr.cdc.gov/mrls/)
- Provisional Peer Reviewed Toxicity Value (PPRTV) by the Superfund Health Risk Technical Support Center
- USEPA Health Effects Assessment Summary Tables (HEAST) (USEPA, 1997b)

Cal/EPA OEHHA recently published an updated chronic and a new subchronic (8-hour) inhalation REL for arsenic of 0.015 µg/m^3 (Cal/EPA, 2008). The chronic arsenic REL is protective of the general public continuously exposed (i.e., 24 hours per day for 7 days per week) for their total lifetime. The subchronic (8-hour) arsenic REL is designed to address repeated 8-hour exposures occurring as often as daily. Typically, subchronic refers to exposures of not more than a few years, while chronic often means many years to decades of exposure. For example, workers may be exposed in the workplace or children/students may be exposed in schools for 8 hours per day over a total duration of a few years. Subchronic RELs are appropriate to address such exposure situations. Therefore, OEHHA developed an 8-hour arsenic REL for repeated exposure. This 8-hour REL represents a concentration at or below which adverse noncancer health effects are not likely to occur.

Exposures to arsenic in the key study relied upon by OEHHA to derive the REL were long-term rather than intermittent (e.g. 8-hour) exposures and these exposures were daily doses that on average were 30 times higher than the adopted 8-hour arsenic REL

[4] Acute RELs are typically developed for one-hour exposure duration. Because of the uncertainty of extrapolating from repeated dose studies to a one-hour concentration, the arsenic acute REL is for a four-hour exposure (OEHHA 1999).

based on direct ingestion-to-inhalation extrapolation. The subchronic (8-hour) arsenic REL, however, is being established for shorter (8-hour) exposures. OEHHA acknowledges that some arsenic will be metabolized and excreted during the 16 hours of non-exposure but does not believe that excretion is sufficiently well understood to account for it in the development of the subchronic value (Cal/EPA, 2008). Consequently, OEHHA has adopted the chronic arsenic REL as the subchronic value. This approach is likely to be conservative as several studies in humans indicate that 45 to 85% of ingested arsenic is excreted in urine within 1 to 3 days (ATSDR, 2007).

For other COCs where subchronic RELs or RfCs are not available, the more conservative chronic REL or RfC values are used. Chronic criteria are developed based on longer periods of exposure and hence risks for subchronic exposure using the chronic toxicity criteria will overestimate anticipated risks posed by the evaluated exposure. Chronic RELs are obtained from OEHHA (Cal/EPA, 2005b).

Tables 3-9 and 3-10 provide cancer and noncancer toxicity values utilized for the PHERA.

3.2.2 Lead

Risk from inhalation of lead cannot be evaluated in the same manner as arsenic and VOCs because USEPA and Cal/EPA do not have a reference concentration for lead. Instead, the National Ambient Air Quality Standard (NAAQS) for lead of 0.15 µg lead/m^3 will be used as the acceptable respirable lead concentration in air (i.e., its subchronic performance standard). The lead NAAQS was revised in the fall of 2008 by a factor of 10 from 1.5 µg/m^3 to 0.15 µg/m^3 (USEPA, 2008). The California Ambient Air Quality Standards (CAAQS) for lead is 1.5 µg/m^3, averaged over 1 month.

As presented in Table 3-7, the highest modeled exposure concentration for respirable lead of 0.024 µg/m^3 (1-hour without emission control measures) is less than its NAAQS. As such emission control measures are not needed to mitigate possible exposure to respirable lead.

3.3 Emission Control Measures

Measures to control fugitive particulates will be used during implementation activities. Conventional emission control measures to be employed during the implementation include: water sprays, surfactants, wetting agents, dust suppressants, covers, and windscreens. Emission control factors for these technologies have been derived from USEPA references (1989b, 1997c, and 2001).

PM_{10} control efficiencies (i.e., reduction in uncontrolled emissions during soil movement using water spraying) range from 100% at time of application to 75% at up to 2 hours after wetting (USEPA, 2001). Application of water twice daily was reported to result in an average dust emission reduction of 66% to 69% during soil transfer (USEPA, 1989b). Application of water has the potential to cause surface water runoff or ponding, and thus potential migration of COCs. In order to mitigate this concern,

stockpile management areas will have water collection and treatment systems and care will be taken that other areas will not be over-watered, thus, preventing runoff/ponding and potential migration of COCs.

Studies have shown control efficiencies for reduction of dust using windscreens at approximately 60% (USEPA, 1989b).

Emissions of volatiles from exposed soils will be controlled through spraying with water and/or foams to inhibit volatilization by filling available soil pore spaces and thereby decreasing volatilization rate. Temporary foam cover applied during excavation has been shown to have emission control factors of 75 to 95% for up to 1 hour after application, while long-term foam materials have emission control factors of near 100% for up to 24 hours after application. Plastic sheeting will be used to control vapor emissions from soil stockpiles and soil loading onto transport trucks. Plastic sheeting has been reported to also have emission control factors of near 100%.

In addition, prior to material excavation, soil vapor extraction will be used in the raised cap area to remove vapors in soil pores. Soil vapor extraction surrounding the excavation pit will continue during excavation and dewatering activities to minimize volatilization of organic vapors from exposed excavation walls prior to application of foam cover.

Emission control factors for various technologies for dust and organic vapors are summarized in Table 3-11. The emission reductions that these technologies can achieve are sufficient to meet the reductions of 60 to 96% for PM_{10} and 90% for organic vapor, as derived below.

3.4 Risk Characterizations

This section summarizes estimated cancer and noncancer risks to receptors (i.e., residents in the community) due to inhalation of fugitive dust and organic vapors. These estimates are based on a number of conservative assumptions and do not represent estimates of anticipated cancer risks and noncancer hazards for the community. Actual risks and hazards to people in the community are anticipated to be less than those estimated below. Actual respirable concentrations of COCs in air are anticipated to be lower than those estimated for this PHERA, and will be monitored according to the PAMP. Implementation activities will be performed and managed in accordance with the specifications of the DVCP so that airborne dust and organic vapors generated by implementation activities are maintained below risk-based performance standards that are protective of the general public. Risk estimates presented below inform risk managers about the potential impacts to people in the community during implementation activities with the appropriate emission control technologies.

Cancer risk and noncancer hazards to receptors due to inhalation of fugitive dust and organic vapors are estimated for the entire excavation and for each excavation event. Excavation activities will be staged so that only a portion of the excavation footprint is

"open" at any time. Since arsenic soil concentrations vary by orders of magnitudes in samples collected within the planned excavation footprint, possible exposure concentrations in air will vary as the implementation activities proceed. Therefore, risks for exposure to arsenic, based on dust concentrations of PM_{10}, are estimated for the entire excavation and for each excavation event. These two methods for estimating risk are not additive, but represent two different methods to evaluate possible risks during implementation activities.

In addition, risks are estimated by these two methods under two situations: without and with emission control. The first situation characterizes the possible risks to receptors associated with implementation of the preferred remedial action at the Site in the absence of emission control measures. This initial risk evaluation was performed to examine the need for and extent of emissions controls. Since emission controls are necessary for implementation activities, the second situation provides a more representative characterization of possible risks associated with implementation of the preferred remedial action at the Site.

3.4.1 Cancer and Noncancer Risk Estimates for Entire Excavation

As previously mentioned, possible cancer and noncancer risks to receptors are evaluated under two different situations. The first situation assumes that no emission control measures will be used during the excavation. The second situation is based on the assumption that an average emission reduction efficiency of 60% for PM_{10} and 90% for organic vapor will be achieved during the excavation. Risk and hazard calculations are summarized in Table 3-12.

With no emission controls, excess lifetime cancer risk for adult and child residents is 3.3×10^{-6} and 8.4×10^{-6}, respectively. These risk estimates exceed the *de minimis* or lower bound, USEPA and Cal/EPA acceptable risk level of one-in-one million (10^{-6}). For both adult and child residents, organic vapors are the dominant chemical contributors to the cancer risk. Noncancer hazards for adult and child residents is 1.4 and 3.6, respectively, which exceeds the USEPA and Cal/EPA hazard index (HI) risk level of 1. The majority of the calculated noncarcinogenic hazard is attributable to inhalation of organic vapors.

With the above mentioned emission controls, excess lifetime cancer risk for adult and child residents are reduced to 3.7×10^{-7} and 9.3×10^{-7}, respectively. These risk estimates are below the target level of 10^{-6} for acceptable cancer risk. Noncancer HIs for adult and child residents are 0.24 and 0.62 respectively, below the risk level of 1 for an acceptable HI.

3.4.2 Cancer and Noncancer Risk Estimates for Excavation Events

Risk and hazards to receptors from potential inhalation of fugitive dust and organic vapors for the excavation events are calculated under two situations: without emission control and with emission control. The first situation is based on no emission control measures being used during the proposed implementation activities. The second situation is based on an average emission reduction efficiency of 96% of PM_{10}

and a 90% reduction of organic vapor during the raised cap materials excavation event, and 60% for PM_{10} with the 90% reduction of organic vapor during the other excavation events (vadose zone soils, soils for shoring installation, and saturated soils) will be achieved. Risk and hazard calculations are summarized in Table 3-13.

With no emission controls, the sums of excess lifetime cancer risks for adults and children during the excavation events are above the target risk level of 10^{-6}. For both adults and children, organic vapors are the primary contributors to the cancer risk. Unacceptable noncancer hazards exceeding a risk level of 1 are estimated for both adults and children for all excavation events in the absence of emission control measures. For all events except the raised cap materials, the majority of the noncancer hazards are attributable to organic vapors. For the raised cap materials excavation event, they are attributable to arsenic.

With an emission reduction efficiency of 96% of PM_{10} and 90% reduction of organic vapor during the raised cap materials excavation event, and 60% for PM_{10} with the 90% reduction of organic vapor during the other excavation events (vadose zone soils, soils for shoring installation, and saturated soils), the sums of the excess lifetime cancer risks and the noncancer hazards for all excavation events are less than target levels for acceptable risk (i.e., 10^{-6} for cancer and a HI estimates of 1). The higher PM_{10} emission reduction efficiency of 96% is only required for the raised cap materials excavation event, where the highest concentrations of arsenic have been found in soil samples.

3.4.3 Acute Arsenic Risk Evaluation for Excavation Events

Since arsenic soil concentrations vary by orders of magnitudes in samples collected within the planned excavation footprint, acute exposures for excavation is in places where arsenic concentrations are highest was evaluated. The OEHHA provides an acute (4-hour) REL for arsenic of 0.2 micrograms per cubic meter ($\mu g/m^3$), averaged over 4 hours. Table 3-14 presents modeled maximum 4-hour concentrations in air of respirable arsenic at the nearest downwind Site fence line location. Based on an average emission reduction efficiency of 96% for PM_{10} for the raised cap materials excavation event and 60% for other excavation events (vadose zone soils, soils for shoring installation, and saturated soils), estimated respirable arsenic concentrations in air for each excavation event meet the acute (4-hour) REL for arsenic. That is, with the above mentioned emission controls, particulate emissions will not be sufficient to cause respirable arsenic concentrations in air to exceed for 0.2 ug/m^3 for any 4-hour period.

TABLE 3-1
EXPOSURE CONCENTRATIONS

Medium	Chemical of Concern	Unit	Maximum Concentration	Exposure Concentration	Rationale	Statistics
Groundwater	Benzene	µg/L	250	77	95%UCL	KM(BCA)
	1,2-Dichloroethane	µg/L	6.5	4.0	95%UCL	KM(Percentile Bootstrap)
	Ethylbenzene	µg/L	1,000	457	95%UCL	KM(BCA)
	Methyl ethyl ketone	µg/L	30,000	16,335	95%UCL	KM(Chebyshev)
	Tetrachloroethylene	µg/L	1.5	1.5	maximum	
	Toluene	µg/L	62,000	13,974	95%UCL	KM(t)
	Trichloroethylene	µg/L	5.1	4.0	95%UCL	KM(Percentile Bootstrap)
	1,2,4-Trimethylbenzene	µg/L	270	80	95%UCL	KM(BCA)
	1,3,5-Trimethylbenzene	µg/L	60	17	95%UCL	KM(BCA)
	Vinyl chloride	µg/L	0.70	0.70	maximum	
	Xylenes	µg/L	6,340	2,055	95%UCL	KM(BCA)
Soil - Entire Excavation	Arsenic	mg/kg	110,000	5,948	97.5%UCL	KM(Chebyshev)
	Lead	mg/kg	120,000	4,687	97.5%UCL	KM(Chebyshev)
	1,2,4-Trimethylbenzene	mg/kg	210	0.92	95%UCL	KM(t)
	1,3,5-Trimethylbenzene	mg/kg	28	2.0	97.5%UCL	KM(Chebyshev)
	Benzene	mg/kg	0.065	0.007	95%UCL	KM(t)
	Ethylbenzene	mg/kg	220	14	95%UCL	KM(Chebyshev)
	Toluene	mg/kg	2,600	203	95%UCL	KM(Chebyshev)
	Xylenes	mg/kg	670	91	95%UCL	KM(Chebyshev)
Soil - Excavation Event						
Raised Cap Materials	Arsenic	mg/kg	110,000	110,000	maximum	
Vadose Zone Soils	Arsenic	mg/kg	110,000	3,898	95%UCL	Chebyshev(Mean, Sd)
Soils for Shoring Installation	Arsenic	mg/kg	2,100	1,237	95%UCL	Adjusted gamma
Saturated Soils	Arsenic	mg/kg	51,000	3,782	95%UCL	Chebyshev(Mean, Sd)

95%UCL - 95 percentile of upper confidence limit of the mean.

97.5%UCL - 97.5 percentile of upper confidence limit of the mean.

Statistics:

KM(t) - UCL based upon Kaplan-Meier estimates using the Student's t-distribution cutoff value.

KM(BCA) - UCL based upon biased-corrected accelerated bootstrap method.

KM(Percentile Bootstrap) - UCL based upon Kaplan-Meier estimates using the bootstrap method.

KM(Chebyshev) - UCL based upon Kaplan-Meier estimates using the Chebyshev inequality

Chebyshev (Mean, Sd) - UCL based upon Chebyshev Theorem using samples mean and standard deviation.

Adjusted gamma - UCL based upon gamma method.

TABLE 3-2
EXPOSURE PARAMETER VALUES

Parameter	Symbol	Value	Unit	Reference
Inhalation rate - Adult	IR_a	20	m^3/day	USEPA, 1991
inhalation rate - Child	IR_c	12	m^3/day	USEPA, 2006
Body weight - Adult	BW_a	70	kg	USEPA, 1991
Body weight - Child	BW_c	16.6	kg	USEPA, 1997
Exposure Parameters for Entire Project				
Exposure time - PM_{10}	ET	8	hours/day	Professional Judgment[1]
Exposure time - Vapor	ET	24	hours/day	Professional Judgment[1]
Exposure frequency - PM_{10}	EF	260	days/year	Professional Judgment[1]
Exposure frequency - Vapor	EF	365	days/year	Professional Judgment[1]
Exposure duration	ED	0.5	years	Professional Judgment[1]
Averaging Time				
Carcinogens	AT_c	25,550	days	USEPA, 1989
Noncarcinogens	AT_n	183	days	USEPA, 1991
Exposure Parameters for Each Excavation Event				
Exposure time - PM_{10}	ET	8	hours/day	Professional Judgment[1]
Exposure time - Vapor	ET	24	hours/day	Professional Judgment[1]
Exposure days - PM_{10}				
Raised Cap Materials	EF	18	days	Professional Judgment[2]
Vadose Zone Soils	EF	47	days	Professional Judgment[2]
Soils for Shoring Installation	EF	18	days	Professional Judgment[2]
Saturated Soils	EF	47	days	Professional Judgment[2]
Averaging Time				
Carcinogens	AT_c	25,550	days	USEPA, 1989
Noncarcinogens - Vapor	AT_n	183	days	USEPA, 1991
Noncarcinogens - PM_{10}				
Raised Cap Materials	AT_n	25	days	Professional Judgment[3]
Vadose Zone Soils	AT_n	66	days	Professional Judgment[3]
Soils for Shoring Installation	AT_n	25	days	Professional Judgment[3]
Saturated Soils	AT_n	66	days	Professional Judgment[3]

1. Dust assumed to be generated 8 hours per day, 5 days per week during excavation and loading activities and organic vapors assumed to be generated 24 hours per day, 7 days per week while excavated soils are exposed. Total duration for the implementation activities is expected to be 6 months (0.5 year; 130 work days).
2. Work days for each excavation event for PM_{10} exposure, totaling 130 days (260 days/year for 0.5 year).
3. Averaging time is equal to exposure duration, adjusted for 7 days per week.

USEPA, 1989. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual, Part A
USEPA, 1991. Human Health Evaluation Manual, Supplemental Guidance: Standard Default Exposure Factors.
USEPA, 1997. Exposure Factors Handbook Volume I General Factors.
USEPA, 2006. Child-Specific Exposure Factors Handbook (External Review Draft).

TABLE 3-3
PARTICULATE EMISSION RATES FROM SOIL

Parameter	Unit	Calculation	Value	Reference
Emission rate for single transfer processes ($EF_{U)}$	g/day	$EF_U = \frac{k\,(0.0016)(M)\left(\frac{U}{2.2}\right)^{1.3}}{\left(\frac{X_{H2O}}{2}\right)^{1.4}}$	7.29	USEPA, 1993
	g/day	$ERPM_{10} = (EF_u)(3)(1\text{-ECF})$	21.87	Assumes ECF=0
	g/hour	$ERPM_{10} = (EF_u)(3)(1\text{-ECF})$(1 day/8 hours)	2.73	Assumes ECF=0, 8 work hours per day
Total PM_{10} emission rate ($ER_{PM10)}$ (for excavation, loading, and unloading)	g/sec	$ERPM_{10} = (EF_u)(3)(1\text{-ECF})$(1 day/28800 sec)	7.59E-04	Assumes ECF=0, 28,800 work seconds per day (Input for SCREEN3 Model (see Table 3-7))

Parameter	Unit	Description	Value	Reference
EF_U[1]	g/day	Emission rate for single transfer process	see above	site-specific
ER_{PM10}	g/day	Total PM10 emission rate	see above	site-specific
X_{H2O}	percentage	Moisture content	23	site-specific
U	m/s	Wind speed	1.73	site-specific; Gradient, 2005
TM	kg	Total mass to be excavated	70,640,100	site-specific
T	day	Duration of excavation (work days)	130	from Table 3-2
M	kg/day	Mass of soil/material handled per day	543,385	calculated
k	unitless	PM_{10} particle size multiplier	0.35	USEPA, 1993
0.0016	g/kg	Empirical constant	0.0016	USEPA, 1993
2.2	m/sec	Empirical constant	2.2	USEPA, 1993
ECF[2]	unitless	Emission control factor	Table 3-11	site-specific

Gradient, 2005. Human Health Risk Assessment for 1450 Sherwin Avenue, Emeryville, California. February 11.

USEPA, 1993. Models for Estimating Air Emission Rates from Superfund Remedial Actions.

1. EF_U is an input parameter to the SCREEN3 air dispersion model (Table 3-7).

2. ECF values obtained from Table 3-11.

Particulate matter with an effective diameter of less than or equal to 10 microns (µm) (PM_{10}) is considered respirable (National Ambient Air Quality Standards). Arsenic and lead in these respirable particles that deposit in deep lung are the basis for toxic effects following inhalation exposure.

TABLE 3-4
VOLATILE EMISSION RATES FROM SOIL

Chemical of Concern	Exposure Concentration (µg/g) (from Table 3-1)	Possible Emission Rate[1] (g/sec)
Benzene	0.007	1.38E-05
Ethylbenzene	14	2.85E-02
Toluene	203	4.02E-01
1,2,4-Trimethylbenzene	0.92	1.82E-03
1,3,5-Trimethylbenzene	2.0	3.96E-03
Xylenes	91	1.80E-01

1. Possible emission rate for each chemical (ER_{vs}) is estimated based on the following equation (USEPA, 1993):

$$ER_{vs} = \frac{(S_V)(C)(\beta)(1.0)(1-ECF)}{t}$$

Parameter	Unit	Description	Value	Reference
C	µg/g (ppm, mg/kg)	Chemical concentration	see above	from Table 3-1
β	g/cm^3	dry bulk density	1.52	site-specific
t	sec	Duration of excavation	15,768,000	assumed, 183 days
S_v	m^3	total volume of soil to be excavated	20,520	site-specific; excavation pit size
1.0	$g/10^6$ µg × 10^6 cm^3/m^3	constant	-	-
ECF	unitless	Emission control factor	0	no emission control

USEPA, 1993. Models for Estimating Air Emission Rates from Superfund Remedial Actions.

TABLE 3-5
INPUT PARAMETERS FOR GROUNDWATER TRENCH MODEL

Chemical of Concern	Molecular Weight (VDEP, 2008) MW_i (g/mol)	Henry's Law Constant (VDEP, 2008) H_i (atm-m^3/mol)	Exposure Concentration (from Table 3-1) C_{GW} (µg/L)
Benzene	78.11	5.55E-03	77
Methyl ethyl ketone	72.11	1.38E-04	16,335
1,2-Dichloroethane	98.96	9.79E-04	4.0
Ethylbenzene	106.17	7.88E-03	457
Tetrachloroethylene	165.83	1.84E-02	1.5
Toluene	92.14	6.64E-03	13,974
Trichloroethylene	131.39	1.03E-02	4.0
1,2,4-Trimethylbenzene	120.00	5.70E-03	80
1,3,5-Trimethylbenzene	120.00	7.70E-03	17
Vinyl chloride	62.50	2.70E-02	0.70
Xylenes	106.16	5.18E-03	2,055

Parameter	Value	Unit	Reference
For Emission Flux and Concentration in Trench			
CF1	1E-03	L/cm^3	-
CF2	1E+04	cm^2/m^2	-
CF3	3,600	s/hr	-
F	1	unitless	VDEP, 2008
ACH	360	hr-1	VDEP, 2008
Trench dimensions			
Length	249	ft	site-specific; excavation pit size
	76	m	site-specific; excavation pit size
Width	98	ft	site-specific; excavation pit size
	30	m	site-specific; excavation pit size
Depth	30	ft	site-specific; excavation pit size
	9	m	site-specific; excavation pit size
Width/Depth	3.27	unitless	calculated

CF - Conversion factor.

F - Fraction of floor through which VOC can enter

ACH - Air exchange per hour

Virginia Department of Environmental Quality (VDEP), 2008. Voluntary Remediation Program Risk Assessment Guidance.

TABLE 3-6
VOLATILE EMISSION RATES FROM GROUNDWATER

Chemical of Concern	Molecular Weight (VDEP, 2008) (g/mole)	Henry's Law Constant (VDEP, 2008) (atm-m^3/mole)	Gas-Phase Mass Transfer Coefficient[1] (cm/s)	Liquid-Phase Mass Transfer Coefficient[1] (cm/s)	Overall Mass Transfer Coefficient[1] (cm/s)	Exposure Concentration (from Table 3-5) (µg/L)	Trench Model Volatilization Factor[2] (L/m^3)	Concentration of Chemical in Trench[3]		Chemical Emission Rate[4] (g/m^2-s)
								(µg/m^3)	(mg/m^3)	
	MW_i	H_i	k_{iG}	k_{iL}	K_i	C_{GW}	VF	C_{pit}		F
Benzene	78.11	5.55E-03	5.09E-01	1.28E-03	1.27E-03	7.70E+01	1.38E-02	1.07E+00	1.07E-03	9.75E-07
1,2-Dichloroethane	98.96	9.79E-04	4.71E-01	1.14E-03	1.07E-03	4.00E+00	1.17E-02	4.69E-02	4.69E-05	4.29E-08
Ethylbenzene	106.17	7.88E-03	4.60E-01	1.10E-03	1.09E-03	4.57E+02	1.19E-02	5.45E+00	5.45E-03	4.98E-06
Methyl ethyl ketone	72.11	1.38E-04	5.23E-01	1.33E-03	9.18E-04	1.63E+04	6.90E-03	1.13E+02	1.13E-01	1.03E-04
Tetrachloroethylene	165.83	1.84E-02	3.96E-01	8.79E-04	8.76E-04	1.50E+00	9.58E-03	1.44E-02	1.44E-05	1.31E-08
Toluene	92.14	6.64E-03	4.82E-01	1.18E-03	1.17E-03	1.40E+04	1.28E-02	1.79E+02	1.79E-01	1.63E-04
Trichloroethylene	131.39	1.03E-02	4.28E-01	9.87E-04	9.82E-04	4.00E+00	1.07E-02	4.29E-02	4.29E-05	3.93E-08
1,2,4-Trimethylbenzene	120.00	5.70E-03	4.41E-01	1.03E-03	1.02E-03	8.00E+01	1.12E-02	8.95E-01	8.95E-04	8.18E-07
1,3,5-Trimethylbenzene	120.00	7.70E-03	4.41E-01	1.03E-03	1.03E-03	1.70E+01	1.12E-02	1.91E-01	1.91E-04	1.74E-07
Vinyl chloride	62.50	2.70E-02	5.49E-01	1.43E-03	1.43E-03	7.00E-01	1.56E-02	1.09E-02	1.09E-05	9.99E-09
Xylenes	106.16	5.18E-03	4.60E-01	1.10E-03	1.09E-03	2.06E+03	1.19E-02	2.44E+01	2.44E-02	2.23E-05

1. For Mass-Transfer Coefficients:

Gas-Phase Mass-Transfer Coefficient

$$k_{iG} = \left(\frac{MW_{H2O}}{MW_i}\right)^{0.335} + \left(\frac{T}{298}\right)^{1.005} \times k_{G,H2O} \quad \text{(Eq. 3-9)}$$

Liquid-Phase Mass-Transfer Coefficient

$$k_{iL} = \left(\frac{MW_{O2}}{MW_i}\right)^{0.5} + \frac{T}{298} \times k_{L,O2} \quad \text{(Eq. 3-8)}$$

Overall Mass Transfer Coefficient

$$K_i = \frac{1}{\frac{1}{k_{iL}} + \frac{RT}{H_i k_{iG}}} \quad \text{(Eq. 3-7)}$$

Parameter	Value	Unit
$K_{G,H2O}$	0.833	cm/s
MW_{H2O}	18	g/mole
$K_{G,O2}$	0.002	cm/s
MW_{O2}	32	g/mole
T	77	F
T	298	K
R	8.20E-05	atm-m^3/mol-K

2. For Emission Flux:

Volatilization Factor

$$VF = \frac{(K_i)(A)(F_{floor})(10^{-3})(10^4)(3600)}{(ACH)(V)} \quad \text{(Eq. 3-6)}$$

3. For Concentration in Trench:

$$C_{pit} = (C_{GW})(VF) \quad \text{(Eq. 3-5)}$$

4. For Chemical Emission Rate:

$$F = \left(\frac{C_{pit} \times ACH \times V}{A}\right) \times \left(\frac{g}{1000\ mg}\right) \times \frac{hr}{3600\ s} \quad \text{(Eq. 3-10)}$$

Parameter	Value	Unit
F_{floor}	1	
ACH	360	hr^{-1}
Trench Dimensions (from Table 3-5)		
Length	76	m (249 ft)
Width	30	m (98 ft)
Depth	9	m (30 ft)
Volume	20730	m^3
Area	2267	m^2
Width/Depth	3.27	m^2

$K_{G,H2O}$ - gas-phase mass transfer coefficient of water vapor at 25 C (VDEP, 2008)

MW_{H2O} - molecular weight of water vapor (VDEP, 2008)

$K_{G,O2}$ - gas-phase mass transfer coefficient of oxygen gas at 25 C (VDEP, 2008)

MW_{O2} - molecular weight of oxygen gas (VDEP, 2008)

V - volume of excavation pit; site-specific

A - area of excavation pit; site-specific

F_{floor} - fraction of floor through which VOC can enter (VDEP, 2008)

ACH - air exchange per hour (VDEP, 2008)

T - average system absolute temperature; site-specific

R - ideal gas constant (VDEP, 2008)

Virginia Department of Environmental Quality (VDEP), 2008. Voluntary Remediation Program Risk Assessment Guidance.

TABLE 3-7
SCREEN3 AIR DISPERSION MODELING FOR ENTIRE EXCAVATION

SCREEN3 Model Input Parameters:

Source Type:	Area
Emission Rate Modeled:	1.0 g/m^2-s
Release Height:	0.0 m
Receptor Height:	1.5 m
Distance From Source to Fence Line:	42 m
Receptor Distance:	42 m

Chemical of Concern	Exposure Concentration (µg/g) (from Table 3-1)
Arsenic	5,948
Lead	4,687

SCREEN3 Model Input Excavation Dimensions:

Length of Larger Side:	76 m
Length of Smaller Side:	30 m
Area:	2,280 m^2

SCREEN3 Model Input Site Characteristics:

Urban/Rural:	Urban

SCREEN3 Model Results for PM_{10} and VOC Emission Rates and Flux from Soil, and Calculated Respirable Metal Values:

Chemical	Emission Rate (g/s)	Flux (g/m^2-s)
Particulates		
PM_{10}	7.59E-04	3.33E-07
Respirable Arsenic	4.52E-06	1.98E-09
Respirable Lead	3.56E-06	1.56E-09
Organic Vapors		
Benzene	1.38E-05	6.06E-09
Ethylbenzene	2.84E-02	1.25E-05
Toluene	4.00E-01	1.76E-04
1,2,4-Trimethylbenzene	1.81E-03	7.96E-07
1,3,5-Trimethylbenzene	3.95E-03	1.73E-06
Xylene	1.80E-01	7.87E-05

Respirable arsenic and lead values for emission rate and flux calculated by multiplying PM_{10} values with respective exposure concentration.

Only those VOCs detected in soil samples collected from within the excavation footprint were modeled.

Trench Model Results for VOC Emission Rates from Groundwater (from Table 3-6):

Chemical	Trench Concentration (from Table 3-6) ($\mu g/m^3$)	Flux (from Table 3-6) (g/m^2-s)
Benzene	1.07E+00	9.75E-07
1,2-Dichloroethane	4.69E-02	4.29E-08
Ethylbenzene	5.45E+00	4.98E-06
Methyl ethyl ketone	1.13E+02	1.03E-04
Tetrachloroethylene	1.44E-02	1.31E-08
Toluene	1.79E+02	1.63E-04
Trichloroethylene	4.29E-02	3.93E-08
1,2,4-Trimethylbenzene	8.95E-01	8.18E-07
1,3,5-Trimethylbenzene	1.91E-01	1.74E-07
Vinyl Chloride	1.09E-02	9.99E-09
Xylene	2.44E+01	2.23E-05

SCREEN3 Model Results for Ground Level Concentrations at Fence Line with Assumed Flux:

Modeled Chemical Ground Level Concentration at Fence Line with assumed flux of 1 g/m^2-s:	1.53E+07 µg/m3

Chemical Ground Level Concentrations at Fence Line with SCREEN3 and Trench Model Result Flux Values:

Chemical	1-Hour ($\mu g/m^3$)	4-Hour ($\mu g/m^3$)	8-Hour ($\mu g/m^3$)	24-Hour ($\mu g/m^3$)	30-Day ($\mu g/m^3$)	Annual ($\mu g/m^3$)
Particulates (using SCREEN3 model flux results)						
PM_{10}	5.09E+00	4.33E+00	3.57E+00	2.04E+00	1.53E+00	4.08E-01
Respirable Arsenic	3.03E-02	2.58E-02	2.12E-02	1.21E-02	9.09E-03	2.42E-03
Respirable Lead	2.39E-02	2.03E-02	1.67E-02	9.55E-03	7.16E-03	1.91E-03
Organic Vapors (using sum of Trench Model and SCREEN3 Model flux results, as appropriate)						
Benzene	1.50E+01	1.28E+01	1.05E+01	6.00E+00	4.50E+00	1.20E+00
Ethylbenzene	2.67E+02	2.27E+02	1.87E+02	1.07E+02	8.00E+01	2.13E+01
Toluene	5.18E+03	4.41E+03	3.63E+03	2.07E+03	1.56E+03	4.15E+02
1,2,4-Trimethylbenzene	2.47E+01	2.10E+01	1.73E+01	9.88E+00	7.41E+00	1.98E+00
1,3,5-Trimethylbenzene	2.91E+01	2.48E+01	2.04E+01	1.17E+01	8.74E+00	2.33E+00
Xylenes	1.55E+03	1.31E+03	1.08E+03	6.18E+02	4.64E+02	1.24E+02
1,2-Dichloroethane	6.56E-01	5.58E-01	4.60E-01	2.63E-01	1.97E-01	5.25E-02
Methyl ethyl ketone	1.58E+03	1.34E+03	1.10E+03	6.30E+02	4.73E+02	1.26E+02
Tetrachloroethylene	2.01E-01	1.71E-01	1.41E-01	8.04E-02	6.03E-02	1.61E-02
Trichloroethylene	6.01E-01	5.11E-01	4.21E-01	2.40E-01	1.80E-01	4.81E-02
Vinyl chloride	1.53E-01	1.30E-01	1.07E-01	6.12E-02	4.59E-02	1.22E-02

8-Hour, 24-Hour, 30-Day and Annual concentrations were determined by multiplying the 1-Hour concentration by the typical recommended factor that is in Table 4.3 of OEHHA's Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments. The factors are shown in the table below. A 4-hour adjustment factor was developed according to the regression relationship of averaging time and the recommended factor.

Averaging Time	Range	Recommended Factor
3 hours	0.8-1.0	0.9
4 hours	NE	0.85
8 hours	0.5-0.9	0.7
24 hours	0.2-0.6	0.4
30 days	0.2-0.3	0.3
Annual	0.06-0.1	0.08

Particulate matter with an effective diameter of less than or equal to 10 microns (µm) (PM_{10}) is considered respirable (National Ambient Air Quality Standards). Arsenic and lead in these respirable particles that deposit in the deep lung are the basis for toxic effects following inhalation exposure.

TABLE 3-8
SCREEN3 AIR DISPERSION MODELING FOR EXCAVATION EVENTS

SCREEN3 Model Input Parameters:

Source Type:	Area
Emission Rate Modeled:	1.0 g/m^2-s
Release Height:	0.0 m
Receptor Height:	1.5 m
Distance From Source to Fence Line:	42 m
Receptor Distance:	42 m

SCREEN3 Model Input Excavation Dimensions:

Length of Larger Side:	76 m
Length of Smaller Side:	30 m
Area:	2,267 m^2

SCREEN3 Model Input Site Characteristics:

Urban/Rural:	Urban

Excavation Event	Exposure Concentration for Arsenic (µg/g) (from Table 3-1)	Maximum Concentration for Arsenic (µg/g) (from Table 3-1)
Raised Cap Materials	110,000	110,000
Vadose Zone Soils	3,898	110,000
Soils for Shoring Installation	1,237	2,100
Saturated Soils	3,782	51,000

SCREEN3 Model Result for PM_{10} Emission Rate and Flux, and Calculated Respirable Arsenic Values for Excavation Event and Exposure/Maximum Concentrations:

Chemical	Emission Rate (g/s)		Flux (g/m^2-s)	
PM_{10}	7.59E-04		3.35E-07	
Respirable Arsenic	Exposure	Maximum	Exposure	Maximum
Raised Cap Materials	8.35E-05	8.35E-05	3.68E-08	3.68E-08
Vadose Zone Soils	2.96E-06	8.35E-05	1.31E-09	3.68E-08
Soils for Shoring Installation	9.39E-07	1.59E-06	4.14E-10	7.03E-10
Saturated Soils	2.87E-06	3.87E-05	1.27E-09	1.71E-08

Respirable arsenic values for emission rate and flux calculated by multiplying PM_{10} values with respective concentration.

SCREEN3 Model Results for Ground Level Concentrations at Fence Line with Assumed Flux:

Modeled Chemical Ground Level Concentration at Fence Line with Assumed Flux of 1 g/m^2-s:	1.53E+07 µg/m3

Chemical Ground Level Concentrations at Fence Line with Model Result Flux Values for Exposure Concentration:

Chemical	1-Hour (µg/m^3)	4-Hour (µg/m^3)	8-Hour (µg/m^3)	24-Hour (µg/m^3)	30-Day (µg/m^3)	Annual (µg/m^3)
PM_{10}	5.12E+00	4.36E+00	3.59E+00	2.05E+00	1.54E+00	4.10E-01
Respirable Arsenic						
Raised Cap Materials	5.64E-01	4.79E-01	3.95E-01	2.25E-01	1.69E-01	4.51E-02
Vadose Zone Soils	2.00E-02	1.70E-02	1.40E-02	7.99E-03	5.99E-03	1.60E-03
Soils for Shoring Installation	6.34E-03	5.39E-03	4.44E-03	2.54E-03	1.90E-03	5.07E-04
Saturated Soils	1.94E-02	1.65E-02	1.36E-02	7.75E-03	5.81E-03	1.55E-03

Chemical Ground Level Concentrations at Fence Line with Model Result Flux Values for Maximum Concentration:

Chemical	1-Hour (µg/m^3)	4-Hour (µg/m^3)	8-Hour (µg/m^3)	24-Hour (µg/m^3)	30-Day (µg/m^3)	Annual (µg/m^3)
PM_{10}	5.12E+00	4.36E+00	3.59E+00	2.05E+00	1.54E+00	4.10E-01
Respirable Arsenic						
Raised Cap Materials	5.64E-01	4.79E-01	3.95E-01	2.25E-01	1.69E-01	4.51E-02
Vadose Zone Soils	5.64E-01	4.79E-01	3.95E-01	2.25E-01	1.69E-01	4.51E-02
Soils for Shoring Installation	1.08E-02	9.15E-03	7.53E-03	4.30E-03	3.23E-03	8.61E-04
Saturated Soils	2.61E-01	2.22E-01	1.83E-01	1.05E-01	7.84E-02	2.09E-02

8-Hour, 24-Hour, 30-Day and Annual concentrations were determined by multiplying the 1-Hour concentration by the typical recommended factor that is in Table 4.3 of OEHHA's Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments. The factors are shown in the table below. A 4-hour adjustment factor was developed according to the regression relationship of averaging time and the recommended factor.

Averaging Time	Range	Recommended Factor
3 hours	0.8-1.0	0.9
4 hours	NE	0.85
8 hours	0.5-0.9	0.7
24 hours	0.2-0.6	0.4
30 days	0.2-0.3	0.3
Annual	0.06-0.1	0.08

Particulate matter with an effective diameter of less than or equal to 10 microns (µm) (PM_{10}) is considered respirable (National Ambient Air Quality Standards). Arsenic and lead in these respirable particles that deposit in the deep lung are the basis for toxic effects following inhalation exposure.

TABLE 3-9
CANCER TOXICITY VALUES

Chemical of Concern	Unit Risk ($\mu g/m^3)^{-1}$	Unit Risk Reference	Inhalation Slope Factor $(mg/kg/day)^{-1}$	Weight of Evidence/Cancer Guideline Description
Volatile Organic Compounds				
Benzene	2.9E-5	Cal/EPA	1.0E-1	A
1,2-Dichloroethane	2.1E-5	Cal/EPA	7.2E-2	B2, 2B
1,2-Dichloropropane	1.0E-5	Cal/EPA	3.6E-2	3
Ethylbenzene	2.5E-6	Cal/EPA	8.7E-3	D, B2
Methyl ethyl ketone	NE	NE	NE	NE
Tetrachloroethylene	5.9E-6	Cal/EPA	2.1E-2	2B
Toluene	NE	NE	NE	NE
Trichloroethylene	2.0E-6	Cal/EPA	7.0E-3	2A
1,2,4-Trimethylbenzene	NE	NE	NE	D
1,3,5-Trimethylbenzene	NE	NE	NE	D
Vinyl chloride	7.8E-5	Cal/EPA	2.7E-1	A, 1
Xylenes	NE	NE	NE	NE
Metals				
Lead	NE	NE	NE	NE
Arsenic	3.3E-3	Cal/EPA	1.2E+1	A, 1

Cal/EPA – California EPA Office of Environmental Health Hazard Assessment Toxicity Criteria Database.

EPA Weight of Evidence (EPA 1986, EPA 1996):

A,1 - Human Carcinogen.

B1, 2A - Probable human carcinogen - indicates limited evidence in humans.

B2, 2B - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans.

C - Possible human carcinogen.

D - Not classifiable as human carcinogen.

NE - Not established.

Group 3: Carcinogenic properties not classifiable.

Group 4: Probable human non-carcinogen.

TABLE 3-10
NONCANCER TOXICITY VALUES

Chemical of Concern	Chronic RfC/REL ($\mu g/m^3$)	Inhalation RfD (mg/kg/day)	Chronic RfC/REL Reference	Subchronic RfC/REL ($\mu g/m^3$)	Subchronic Inhalation RfD (mg/kg/day)	Subchronic RfC/REL Reference	Acute RfC/REL ($\mu g/m^3$)	Chronic RfC/REL Reference	Primary Target Organ(s)
Volatile Organic Compounds									
Benzene	60	1.7E-2	Cal/EPA	NA	NA	NA	1,300	Cal/EPA	blood, developmental, nerve
1,2-Dichloroethane	2,429	6.9E-1	ADSTR	NA	NA	NA	NA		liver
1,2-Dichloropropane	4	1.1E-3	IRIS	32	9.1E-3	ATSDR 2007b			nasal mucosa
Ethylbenzene	2,000	5.7E-1	Cal/EPA	3,040	8.7E-1	ATSDR 2007b	NA		development, liver, kidney,
Methyl ethyl ketone	5,000	1.4E+00	IRIS	NA	NA	NA	13,000	Cal/EPA	developmental
Tetrachloroethylene	272	7.8E-2	ATSDR	350	1.0E-1	HEAST[1]	20,000	Cal/EPA	liver, kidney
Toluene	300	8.6E-2	Cal/EPA	7000	2.0E+0	HEAST[1]	37,000	Cal/EPA	nerve, development, respiratory
Trichloroethylene	600	1.7E-1	Cal/EPA	537	1.5E-1	ATSDR 2007b	NA		nerve, eye
1,2,4-Trimethylbenzene	7	2.0E-3	PPRTV	70	2.0E-2	PPRTV	NA		central nerve system
1,3,5-Trimethylbenzene [2]	7	2.0E-3	PPRTV	70	2.0E-2	PPRTV	NA		central nerve system
Vinyl chloride	100	2.9E-2	IRIS	77	2.2E-2	ATSDR 2007b	180,000	Cal/EPA	liver
Xylenes	700	2.0E-1	Cal/EPA	2606	7.4E-1	ATSDR 2007b	22,000	Cal/EPA	nerve, respiratory
Metals									
Lead	NE	NE	NE	NE	NE	NE	NE	NE	NE
Arsenic	0.015	8.6E-6	Cal/EPA	0.015	4.3E-6	Cal/EPA[3]	0.20	Cal/EPA	development

1. Converted from subchronic oral reference dose (RfD).

2. 1,2,4-Trimethylbenzene is used as a surrogate.

3. Subchronic REL from OEHHA December 2008.

NE - Not established.

NA – Subchronic RfC is not available or subchronic RfC or subchronic RfC is more stringent than chronic RfC.

Cal/EPA - California EPA, Chronic Reference Exposure Levels (RELs).

ATSDR – Agency for Toxic Substances and Disease Control. Chronic RfCs are based on chronic inhalation Minimal Risk Levels (MRLs). Subchronic RfCs are based on intermediate inhalation MRL (November 2007).

HEAST - EPA's Health Effects Assessment Summary Tables.

PPRTV - Provisional Peer Reviewed Toxicity Value (PPRTV) by the EPA Superfund Health Risk Technical Support Center.

RfC = Reference concentration; RfD = Reference dose

TABLE 3-11
SUMMARY OF EMISSION CONTROL TECHNOLOGIES

Control Technology		Emission Control Factor (ECF)		Comments
		Particulates[1]	Volatile Organic Compounds[2]	
Cover	Clean Soil	NA	>95%	
	Synthetic Cover		NA	
	Mulch		NA	
Foam	Temporary foam cover	NA	75% to 95%	up to an hour
	Long-term foam cover		99% to 100%	24 hours
Water Sprays	Spray of active excavation	42 to 63%	NA	
	spray of dumping area	46 to 77%		
Dust suppressant	unpaved road	40 to 99%	NA	
	soil pile	50 to 70%		
Operational controls	rate of excavation		NA	
	amount of soil exposed			
	duration of soil pile left uncovered			
	timing of excavation			
Wind Barrier			NA	
Other factors on soil pile	placement		NA	shield from prevailing wind
	surface area			minimize surface area
	orientation	60%		length perpendicular to the prevailing wind direction

1. From USEPA, 1989. Air/Superfund national technical guidance study series: Volume III - Estimation of air emissions from cleanup activities at Superfund Sites. Interim Final.

2. From USEPA 1997. Air emissions from the treatment of soils contaminated with petroleum fuels and other substances.

NA - Not available.

TABLE 3-12
CANCER AND NONCANCER RISK ESTIMATES FOR ENTIRE EXCAVATION

				Exposure Frequency	Receptor	Adult		Child	
					PM_{10}	130 days		130 days	
					Vapor	183 days		183 days	
	Chemical of Concern	Inhalation Cancer Slope Factor (from Table 3-9) $(mg/kg/day)^{-1}$	Inhalation Reference Dose (from Table 3-10) (mg/kg/day)	Concentration in Air (from Table 3-7) ($\mu g/m^3$)	Cancer Risk	Hazard Index	Cancer Risk	Hazard Index
No Emission Control								
PM_{10}	Arsenic	1.20E+01	4.29E-06	2.12E-02	1.2E-07	3.4E-01	3.1E-07	8.5E-01
Vapor	Benzene	1.00E-01	1.70E-02	6.00E+00	1.2E-06	1.0E-01	3.1E-06	2.6E-01
	Ethylbenzene	8.70E-03	8.69E-01	1.07E+02	1.9E-06	3.5E-02	4.8E-06	8.9E-02
	Toluene	NE	2.00E+00	2.07E+03	NE	3.0E-01	NE	7.5E-01
	1,2,4-Trimethylbenzene	NE	2.00E-02	9.88E+00	NE	1.4E-01	NE	3.6E-01
	1,3,5-Trimethylbenzene[1]	NE	2.00E-02	1.17E+01	NE	1.7E-01	NE	4.2E-01
	Xylenes	NE	7.45E-01	6.18E+02	NE	2.4E-01	NE	6.0E-01
	1,2-Dichloroethane	7.20E-02	6.94E-01	2.63E-01	3.9E-08	1.1E-04	9.8E-08	2.7E-04
	Methyl ethyl ketone	NE	1.43E+00	6.30E+02	NE	1.3E-01	NE	3.2E-01
	Tetrachloroethylene	2.10E-02	1.00E-01	8.04E-02	3.4E-09	2.3E-04	8.7E-09	5.8E-04
	Trichloroethylene	7.00E-03	1.53E-01	2.40E-01	3.4E-09	4.5E-04	8.7E-09	1.1E-03
	Vinyl chloride	2.70E-01	2.20E-02	6.12E-02	3.4E-08	7.9E-04	8.5E-08	2.0E-03
			TOTAL		**3.3E-06**	**1.4E+00**	**8.4E-06**	**3.6E+00**
With Emission Control (60% reduction of PM_{10} and 90% reduction of vapor)				Reduction of PM_{10}=	60%	Reduction of vapor=	90%	
PM_{10}	Arsenic	1.20E+01	4.29E-06	8.48E-03	4.9E-08	1.3E-01	1.2E-07	3.4E-01
Vapor	Benzene	1.00E-01	1.70E-02	6.00E-01	1.2E-07	1.0E-02	3.1E-07	2.6E-02
	Ethylbenzene	8.70E-03	8.69E-01	1.07E+01	1.9E-07	3.5E-03	4.8E-07	8.9E-03
	Toluene	NE	2.00E+00	2.07E+02	NE	3.0E-02	NE	7.5E-02
	1,2,4-Trimethylbenzene	NE	2.00E-02	9.88E-01	NE	1.4E-02	NE	3.6E-02
	1,3,5-Trimethylbenzene[1]	NE	2.00E-02	1.17E+00	NE	1.7E-02	NE	4.2E-02
	Xylenes	NE	7.45E-01	6.18E+01	NE	2.4E-02	NE	6.0E-02
	1,2-Dichloroethane	7.20E-02	6.94E-01	2.63E-02	3.9E-09	1.1E-05	9.8E-09	2.7E-05
	Methyl ethyl ketone	NE	1.43E+00	6.30E+01	NE	1.3E-02	NE	3.2E-02
	Tetrachloroethylene	2.10E-02	1.00E-01	8.04E-03	3.4E-10	2.3E-05	8.7E-10	5.8E-05
	Trichloroethylene	7.00E-03	1.53E-01	2.40E-02	3.4E-10	4.5E-05	8.7E-10	1.1E-04
	Vinyl chloride	2.70E-01	2.20E-02	6.12E-03	3.4E-09	7.9E-05	8.5E-09	2.0E-04
			TOTAL		**3.7E-07**	**2.4E-01**	**9.3E-07**	**6.2E-01**

Equation Definition:

Cancer Risk = (CSF x ET x EF x ED x IR x C_A x CF1) / (BW x AT_C x CF2)

Hazard Quotient = (ET x EF x ED x IR x C_A x CF1) / (RfD x BW x AT_{NC} x CF2)

Parameter	Definition	Value - Adult	Value - Child	Reference
C_A	chemical-specific concentration in air ($\mu g/m^3$)	chemical-specific, ground level concentrations (see Table 3-7 for vapor for 24-hr, and arsenic for 8-hr)		SCREEN3 Model
BW	body weight (kg)	70	16.6	Table 3-2
AT_C	cancer -averaging time (days)	25550	25550	Table 3-2
AT_{NC}	Noncancer average time (days)	183	183	Table 3-2
ET_{AS}	Exposure time (hours/day) - arsenic	8	8	Table 3-2
EF_{AS}	exposure frequency (d/yr) - arsenic	260	260	Table 3-2
ET_{Vapor}	Exposure time (hours/day) - vapor	24	24	Table 3-2
EF_{Vapor}	exposure frequency (d/yr) - vapor	365	365	Table 3-2
ED	exposure duration (yrs)	0.5	0.5	Table 3-2
CSF	inhalation cancer slope factor $(mg/kg/day)^{-1}$	chemical-specific		Table 3-9
RfD	inhalation reference dose (mg/kg/day)	chemical-specific		Table 3-10
IR	inhalation rate, m^3/day	20	12	Table 3-2
CF1	conversion factor (mg/µg)	1E-03	1E-03	-
CF2	conversion factor (hours/day)	24	24	-

1. 1,2,4-Trimethylbenzene is used as a surrogate.

TABLE 3-13
CANCER AND NONCANCER RISK ESTIMATES FOR EXCAVATION EVENTS

					Excavation Event	Raised Cap Materials			Vadose Zone Soils			Soils for Shoring Installation			Saturated Soils			Entire Excavation	
					Exposure Frequency	PM10 Vapor	18 days 25 days		PM10 Vapor	47 days 66 days		PM10 Vapor	18 days 25 days		PM10 Vapor	47 days 66 days			
Receptor	**Chemical of Concern**		**Inhalation Cancer Slope Factor (from Table 3-9) (mg/kg/day)$^{-1}$**	**Inhalation Reference Dose (from Table 3-10) (mg/kg/day)**	**Concentration in Air (from Tables 3-7 and 3-8) (µg/m^3)**	**Cancer Risk**	**Hazard Index**	**Concentration in Air (from Tables 3-7 and 3-8) (µg/m^3)**	**Cancer Risk**	**Hazard Index**	**Concentration in Air (from Tables 3-7 and 3-8) (µg/m^3)**	**Cancer Risk**	**Hazard Index**	**Concentration in Air (from Tables 3-7 and 3-8) (µg/m^3)**	**Cancer Risk**	**Hazard Index**	**Total Cancer Risk**	**Maximum Hazard Index**
No Emission Control																			
Adult	PM_{10}	Arsenic	1.20E+01	4.29E-06	3.95E-01	3.2E-07	6.3E+00	1.40E-02	2.9E-08	2.2E-01	4.44E-03	3.6E-09	7.0E-02	1.36E-02	2.9E-08	2.2E-01		
	Vapor	Benzene	1.00E-01	1.70E-02	6.00E+00	1.7E-07	1.0E-01	6.00E+00	4.4E-07	1.0E-01	6.00E+00	1.7E-07	1.0E-01	6.00E+00	4.4E-07	1.0E-01		
		Ethylbenzene	8.70E-03	8.69E-01	1.07E+02	2.6E-07	3.5E-02	1.07E+02	6.8E-07	3.5E-02	1.07E+02	2.6E-07	3.5E-02	1.07E+02	6.8E-07	3.5E-02		
		Toluene	NE	2.00E+00	2.07E+03	NE	3.0E-01	2.07E+03	NE	3.0E-01	2.07E+03	NE	3.0E-01	2.07E+03	NE	3.0E-01		
		1,2,4-Trimethylbenzene	NE	2.00E-02	9.88E+00	NE	1.4E-01	9.88E+00	NE	1.4E-01	9.88E+00	NE	1.4E-01	9.88E+00	NE	1.4E-01		
		1,3,5-Trimethylbenzene [1]	NE	2.00E-02	1.17E+01	NE	1.7E-01	1.17E+01	NE	1.7E-01	1.17E+01	NE	1.7E-01	1.17E+01	NE	1.7E-01		
		Xylenes	NE	7.45E-01	6.18E+02	NE	2.4E-01	6.18E+02	NE	2.4E-01	6.18E+02	NE	2.4E-01	6.18E+02	NE	2.4E-01		
		1,2-Dichloroethane	7.20E-02	6.94E-01	2.63E-01	5.3E-09	1.1E-04	2.63E-01	1.4E-08	1.1E-04	2.63E-01	5.3E-09	1.1E-04	2.63E-01	1.4E-08	1.1E-04		
		Methyl ethyl ketone	NE	1.43E+00	6.30E+02	NE	1.3E-01	6.30E+02	NE	1.3E-01	6.30E+02	NE	1.3E-01	6.30E+02	NE	1.3E-01		
		Tetrachloroethylene	2.10E-02	1.00E-01	8.04E-02	4.8E-10	2.3E-04	8.04E-02	1.2E-09	2.3E-04	8.04E-02	4.8E-10	2.3E-04	8.04E-02	1.2E-09	2.3E-04		
		Trichloroethylene	7.00E-03	1.53E-01	2.40E-01	4.7E-10	4.5E-04	2.40E-01	1.2E-09	4.5E-04	2.40E-01	4.7E-10	4.5E-04	2.40E-01	1.2E-09	4.5E-04		
		Vinyl chloride	2.70E-01	2.20E-02	6.12E-02	4.7E-09	7.9E-04	6.12E-02	1.2E-08	7.9E-04	6.12E-02	4.7E-09	7.9E-04	6.12E-02	1.2E-08	7.9E-04		
				Total		**7.6E-07**	**7.4E+00**		**1.2E-06**	**1.3E+00**		**4.5E-07**	**1.2E+00**		**1.2E-06**	**1.3E+00**	**3.6E-06**	**7.4E+00**
Child	PM_{10}	Arsenic	1.20E+01	4.29E-06	3.95E-01	8.0E-07	1.6E+01	1.40E-02	7.4E-08	5.6E-01	4.44E-03	9.0E-09	1.8E-01	1.36E-02	7.2E-08	5.4E-01		
	Vapor	Benzene	1.00E-01	1.70E-02	6.00E+00	4.3E-07	2.6E-01	6.00E+00	1.1E-06	2.6E-01	6.00E+00	4.3E-07	2.6E-01	6.00E+00	1.1E-06	2.6E-01		
		Ethylbenzene	8.70E-03	8.69E-01	1.07E+02	6.6E-07	8.9E-02	1.07E+02	1.7E-06	8.9E-02	1.07E+02	6.6E-07	8.9E-02	1.07E+02	1.7E-06	8.9E-02		
		Toluene	NE	2.00E+00	2.07E+03	NE	7.5E-01	2.07E+03	NE	7.5E-01	2.07E+03	NE	7.5E-01	2.07E+03	NE	7.5E-01		
		1,2,4-Trimethylbenzene	NE	2.00E-02	9.88E+00	NE	3.6E-01	9.88E+00	NE	3.6E-01	9.88E+00	NE	3.6E-01	9.88E+00	NE	3.6E-01		
		1,3,5-Trimethylbenzene [1]	NE	2.00E-02	1.17E+01	NE	4.2E-01	1.17E+01	NE	4.2E-01	1.17E+01	NE	4.2E-01	1.17E+01	NE	4.2E-01		
		Xylenes	NE	7.45E-01	6.18E+02	NE	6.0E-01	6.18E+02	NE	6.0E-01	6.18E+02	NE	6.0E-01	6.18E+02	NE	6.0E-01		
		1,2-Dichloroethane	7.20E-02	6.94E-01	2.63E-01	1.3E-08	2.7E-04	2.63E-01	3.5E-08	2.7E-04	2.63E-01	1.3E-08	2.7E-04	2.63E-01	3.5E-08	2.7E-04		
		Methyl ethyl ketone	NE	1.43E+00	6.30E+02	NE	3.2E-01	6.30E+02	NE	3.2E-01	6.30E+02	NE	3.2E-01	6.30E+02	NE	3.2E-01		
		Tetrachloroethylene	2.10E-02	1.00E-01	8.04E-02	1.2E-09	5.8E-04	8.04E-02	3.1E-09	5.8E-04	8.04E-02	1.2E-09	5.8E-04	8.04E-02	3.1E-09	5.8E-04		
		Trichloroethylene	7.00E-03	1.53E-01	2.40E-01	1.2E-09	1.1E-03	2.40E-01	3.1E-09	1.1E-03	2.40E-01	1.2E-09	1.1E-03	2.40E-01	3.1E-09	1.1E-03		
		Vinyl chloride	2.70E-01	2.20E-02	6.12E-02	1.2E-08	2.0E-03	6.12E-02	3.1E-08	2.0E-03	6.12E-02	1.2E-08	2.0E-03	6.12E-02	3.1E-08	2.0E-03		
				Total		**1.9E-06**	**1.9E+01**		**3.0E-06**	**3.4E+00**		**1.1E-06**	**3.0E+00**		**3.0E-06**	**3.3E+00**	**9.0E-06**	**1.9E+01**
With Emission Control (60 to 96% reduction of PM10 and 90% reduction of vapor)					Reduction of PM10 in Raised Cap Materials Event= 96% , PM10 Reduction in Other Events= 60% ; Reduction of Vapor= 90%													
Adult	PM_{10}	Arsenic	1.20E+01	4.29E-06	1.58E-02	1.3E-08	2.5E-01	5.59E-03	1.2E-08	8.9E-02	1.77E-03	1.4E-09	2.8E-02	5.43E-03	1.1E-08	8.6E-02		
	Vapor	Benzene	1.00E-01	1.70E-02	6.00E-01	1.7E-08	1.0E-02	6.00E-01	4.4E-08	1.0E-02	6.00E-01	1.7E-08	1.0E-02	6.00E-01	4.4E-08	1.0E-02		
		Ethylbenzene	8.70E-03	8.69E-01	1.07E+01	2.6E-08	3.5E-03	1.07E+01	6.8E-08	3.5E-03	1.07E+01	2.6E-08	3.5E-03	1.07E+01	6.8E-08	3.5E-03		
		Toluene	NE	2.00E+00	2.07E+02	NE	3.0E-02	2.07E+02	NE	3.0E-02	2.07E+02	NE	3.0E-02	2.07E+02	NE	3.0E-02		
		1,2,4-Trimethylbenzene	NE	2.00E-02	9.88E-01	NE	1.4E-02	9.88E-01	NE	1.4E-02	9.88E-01	NE	1.4E-02	9.88E-01	NE	1.4E-02		
		1,3,5-Trimethylbenzene [1]	NE	2.00E-02	1.17E+00	NE	1.7E-02	1.17E+00	NE	1.7E-02	1.17E+00	NE	1.7E-02	1.17E+00	NE	1.7E-02		
		Xylenes	NE	7.45E-01	6.18E+01	NE	2.4E-02	6.18E+01	NE	2.4E-02	6.18E+01	NE	2.4E-02	6.18E+01	NE	2.4E-02		
		1,2-Dichloroethane	7.20E-02	6.94E-01	2.63E-02	5.3E-10	1.1E-05	2.63E-02	1.4E-09	1.1E-05	2.63E-02	5.3E-10	1.1E-05	2.63E-02	1.4E-09	1.1E-05		
		Methyl ethyl ketone	NE	1.43E+00	6.30E+01	NE	1.3E-02	6.30E+01	NE	1.3E-02	6.30E+01	NE	1.3E-02	6.30E+01	NE	1.3E-02		
		Tetrachloroethylene	2.10E-02	1.00E-01	8.04E-03	4.8E-11	2.3E-05	8.04E-03	1.2E-10	2.3E-05	8.04E-03	4.8E-11	2.3E-05	8.04E-03	1.2E-10	2.3E-05		
		Trichloroethylene	7.00E-03	1.53E-01	2.40E-02	4.7E-11	4.5E-05	2.40E-02	1.2E-10	4.5E-05	2.40E-02	4.7E-11	4.5E-05	2.40E-02	1.2E-10	4.5E-05		
		Vinyl chloride	2.70E-01	2.20E-02	6.12E-03	4.7E-10	7.9E-05	6.12E-03	1.2E-09	7.9E-05	6.12E-03	4.7E-10	7.9E-05	6.12E-03	1.2E-09	7.9E-05		
				Total		**5.7E-08**	**3.6E-01**		**1.3E-07**	**2.0E-01**		**4.6E-08**	**1.4E-01**		**1.3E-07**	**2.0E-01**	**3.6E-07**	**3.6E-01**
Child	PM_{10}	Arsenic	1.20E+01	4.29E-06	1.58E-02	3.2E-08	6.3E-01	5.59E-03	3.0E-08	2.2E-01	1.77E-03	3.6E-09	7.1E-02	5.43E-03	2.9E-08	2.2E-01		
	Vapor	Benzene	1.00E-01	1.70E-02	6.00E-01	4.3E-08	2.6E-02	6.00E-01	1.1E-07	2.6E-02	6.00E-01	4.3E-08	2.6E-02	6.00E-01	1.1E-07	2.6E-02		
		Ethylbenzene	8.70E-03	8.69E-01	1.07E+01	6.6E-08	8.9E-03	1.07E+01	1.7E-07	8.9E-03	1.07E+01	6.6E-08	8.9E-03	1.07E+01	1.7E-07	8.9E-03		
		Toluene	NE	2.00E+00	2.07E+02	NE	7.5E-02	2.07E+02	NE	7.5E-02	2.07E+02	NE	7.5E-02	2.07E+02	NE	7.5E-02		
		1,2,4-Trimethylbenzene	NE	2.00E-02	9.88E-01	NE	3.6E-02	9.88E-01	NE	3.6E-02	9.88E-01	NE	3.6E-02	9.88E-01	NE	3.6E-02		
		1,3,5-Trimethylbenzene [1]	NE	2.00E-02	1.17E+00	NE	4.2E-02	1.17E+00	NE	4.2E-02	1.17E+00	NE	4.2E-02	1.17E+00	NE	4.2E-02		
		Xylenes	NE	7.45E-01	6.18E+01	NE	6.0E-02	6.18E+01	NE	6.0E-02	6.18E+01	NE	6.0E-02	6.18E+01	NE	6.0E-02		
		1,2-Dichloroethane	7.20E-02	6.94E-01	2.63E-02	1.3E-09	2.7E-05	2.63E-02	3.5E-09	2.7E-05	2.63E-02	1.3E-09	2.7E-05	2.63E-02	3.5E-09	2.7E-05		
		Methyl ethyl ketone	NE	1.43E+00	6.30E+01	NE	3.2E-02	6.30E+01	NE	3.2E-02	6.30E+01	NE	3.2E-02	6.30E+01	NE	3.2E-02		
		Tetrachloroethylene	2.10E-02	1.00E-01	8.04E-03	1.2E-10	5.8E-05	8.04E-03	3.1E-10	5.8E-05	8.04E-03	1.2E-10	5.8E-05	8.04E-03	3.1E-10	5.8E-05		
		Trichloroethylene	7.00E-03	1.53E-01	2.40E-02	1.2E-10	1.1E-04	2.40E-02	3.1E-10	1.1E-04	2.40E-02	1.2E-10	1.1E-04	2.40E-02	3.1E-10	1.1E-04		
		Vinyl chloride	2.70E-01	2.20E-02	6.12E-03	1.2E-09	2.0E-04	6.12E-03	3.1E-09	2.0E-04	6.12E-03	1.2E-09	2.0E-04	6.12E-03	3.1E-09	2.0E-04		
				Total		**1.4E-07**	**9.1E-01**		**3.2E-07**	**5.0E-01**		**1.2E-07**	**3.5E-01**		**3.2E-07**	**5.0E-01**	**9.0E-07**	**9.1E-01**

Equation Definition:
Cancer Risk = (CSF x ET x EF x ED x IR x C_A x CF1) / (BW x AT_C x CF2)
Hazard Quotient = (ET x EF x ED x IR x C_A x CF1) / (RfD x BW x AT_{NC} x CF2)

Parameter	Definition	Value - Adult	Value - Child	Reference
C_A	chemical-specific concentration in air (µg/m^3)	chemical-specific, ground level concentrations (see Table 3-8 - Vapor use 24-hr, As use 8-hr)		SCREEN3 Model
BW	body weight (kg)	70	16.6	Table 3-2
AT_C	cancer -averaging time (days)	25550	25550	Table 3-2
AT_{NC}	Noncancer average time (days)	specific by event and chemical[2]		Table 3-2
ET_{AS}	Exposure time (hours/day) - arsenic	8	8	Table 3-2
EF_{AS}	exposure frequency (d/yr) - arsenic	as noted above per event		Table 3-2
ET_{Vapor}	Exposure time (hours/day) - vapor	24	24	Table 3-2
EF_{Vapor}	exposure frequency (d/yr) - vapor	as noted above per event		Table 3-2
ED	exposure duration (yrs)	included in EF above		Table 3-2
CSF	inhalation cancer slope factor (mg/kg/day^{-1})	chemical-specific		Table 3-9
RfD	inhalation reference dose (mg/kg/day)	chemical-specific		Table 3-10
IR	inhalation rate, m^3/day	20.0	12.0	Table 3-2
CF1	conversion factor (mg/µg)	1E-03	1E-03	-
CF2	conversion factor (hours/day)	24	24	-

1. 1,2,4-Trimethylbenzene is used as a surrogate.
2. The non-cancer averaging time is specific by event and chemical. For vapor, it is the same as the exposure frequency, however, for PM the averaging time is adjusted to account for the fact that PM10 is only released on the weekdays. The exposure frequency for the event is converted into the average time by estimating the number of weeks for the event by dividing the exposure frequency by 5 days/wk (assuming a 5-day work week) to determine the number of weeks of exposure. This value is then multiplied by 7 days/week to determine the total number of days lapsed during the exposure including weekends.

TABLE 3-14
ACUTE ARSENIC RISK EVALUATION FOR EXCAVATION EVENTS

Excavation Event	Maximum Arsenic Air Concentration at Fence Line without Emission Control (4-Hour Conc, µg/m^3) (from Table 3-8)	Selected PM_{10} Emission Reduction Efficiency for Emission Control (Percent) (from Table 3-13)	Arsenic Air Concentration at Fence Line with Selected PM_{10} Emission Reduction Efficiency (4-Hour Conc, µg/m^3)	Acute (4-Hour) REL for Arsenic (µg/m^3) (from Table 3-10)	Additional Mitigation Needed to Address Acute Exposure
Raised Cap Materials	0.48	96%	0.02	0.20	no
Vadose Zone Soils	0.48	60%	0.19		no
Soils for Shoring Installation	0.0091	60%	0.0037		no
Saturated Soils	0.22	60%	0.089		no

Section 4
Development of Performance Standards

Risk-based performance standards were developed to set chemical concentrations in air that limit cancer and noncancer risks posed by COCs to offsite residents, during implementation of the preferred remedial action. Performance standards are developed based on an acceptable cancer risk of 10^{-6} and HI of 1. As discussed previously, performance standards based on residential exposure will also protect people in the community, such as commercial workers.

Arsenic and lead, and some or all VOCs addressed in this PHERA, are anticipated to be present in ambient air in small amounts in the absence of implementation activities. This urban/suburban background is considered in development of performance standards. Chemicals in background dust and organic vapors at the Site's perimeter will be measured at upwind locations. Concentrations measured at the Site during implementation will then be evaluated against the sum of background plus performance standard concentrations derived herein.

The Site is currently paved or covered by building foundations or existing buildings. Therefore, release of arsenic and lead from soil via fugitive dust is unlikely to occur unless the soil is exposed and actively handled at the Site. Thus, emissions should only occur when hardscape is removed and excavation and other soil handling is taking place. Excavation activities will be staged so that only a portion of the excavation footprint is "open" at any time.

Potential for organic vapor emissions will also vary across the excavation footprint but organic vapor emissions could continue outside of normal work hours. Therefore, performance standards for volatile COCs are developed based on the assumption that implementation activities for the entire footprint of the excavation will occur during the total duration of excavation. Because significant differences in concentration and makeup of VOCs calculated using the Trench Model and those detected during soil gas sampling at the Site were seen, soil gas sampling will be conducted during soil vapor extraction activities. The sampling results will be compared to those concentrations predicted by the Trench Model. If these concentrations vary significantly, the performance standard for volatile COCs must be recalculated prior to breaching the cap.

Performance standards are developed by back-calculating an acceptable air concentration based on an acceptable cancer risk or noncancer hazard. For cancer effects, the performance standard is a chemical concentration in air that corresponds to an acceptable cancer risk of 10^{-6}. For noncancer effects, the performance standard is a chemical concentration that corresponds to a noncancer hazard quotient of 1. A cumulative evaluation is then performed to adjust the performance standards in order to meet a total excess cancer risk of 10^{-6} and a total HI of 1. This correction accounts

for possible exposure to more than one COC. Calculations for the development of performance standards are summarized below.

4.1 Performance Standards for Carcinogenic COCs

The chemical-specific risk-based performance standards of carcinogenic COCs (Table 4-1) are calculated using the methodology provided in the PHERA Work Plan (CDM, 2008) and described below.

$$PS_{COC} = \frac{TR \times AT_c \times CF}{UR \times ET \times EF \times ED} \qquad (4\text{-}1)$$

where:

PS_{COC}	=	Chemical-specific performance standard, µg/m^3
TR	=	Target Risk, 10^{-6}
AT_c	=	Averaging time – carcinogens, days
CF	=	conversion factor (24 hours/day)
UR	=	Unit risk, (µg/m^3)$^{-1}$
ET	=	Exposure time, hours/day
EF	=	Exposure frequency, days/year
ED	=	Exposure duration, years

Initially, the risk-based performance standard for each carcinogenic COC is calculated based on an acceptable cancer risk of 10^{-6}. In order to meet a total excess lifetime cancer risk of 10^{-6} from simultaneous exposures to all the carcinogenic COCs, the performance standard for each carcinogen is adjusted by distributing the total risk of 10^{-6} among the carcinogenic COCs. The allocation of target risk is based on modeled air concentration and toxicity of the COCs. The monitoring requirements for measuring respirable COC concentrations in air will be discussed in the Remedial Action Plan. Specific methods and approaches to be implemented will be provided in the Perimeter Air Monitoring Plan submitted with the Remedial Design.

4.2 Performance Standards for Noncarcinogenic COCs

The chemical-specific risk-based performance standards of noncarcinogenic COCs (Table 4-2) are calculated using the methodology provided in the PHERA Work Plan (CDM, 2008) and described below.

$$PS_{COC} = \frac{AT_n \times CF \times RfC}{ET \times EF \times ED} \qquad (4\text{-}2)$$

where:

PS_{COC}	=	Chemical-specific performance standard, µg/m^3

AT_n	=	Averaging time – noncarcinogens, days
CF	=	conversion factor (24 hours/day)
RfC	=	Reference concentration (or REL), µg/m^3
ET	=	Exposure time, hours/day
EF	=	Exposure frequency, days/year
ED	=	Exposure duration, years

Initially, the risk-based performance standard for each noncarcinogenic COC is calculated based on a hazard quotient of 1. Since the total HI is more than one, the performance standard for each noncarcinogen is adjusted based on similar target organs. As an example, if there are 4 noncarcinogens that affect the liver, then the risk-based performance standard for each of these noncarcinogens is divided by 4. Where a COC affects more than one target organ, the lowest target HI associated with the target organ shared by the most COCs is chosen. Primary target organ information and target HI allocation are presented in Table 4-2.

In December 2008, Cal/EPA OEHHA established a subchronic (8-hour) inhalation reference exposure level (REL) for arsenic at the same concentration as the updated chronic arsenic REL (0.015 µg/m^3) (Cal/EPA, 2008). A REL is an airborne concentration of a chemical that is not anticipated to present a significant risk of an adverse noncancer health effect. An important factor to consider in the application of the new subchronic (8-hour) arsenic REL for the Site is the duration of the exposure, e.g., the duration of the implementation activities, and how this relates to the averaging period used for compliance with the REL. OEHHA has adopted the chronic arsenic REL as the subchronic (8-hour) arsenic REL based on frequency and duration as discussed in Section 3.2, assuming multiple 8-hour exposures on a daily basis. OEHHA considers the 8-hour arsenic REL appropriate for repeated, 8-hour exposures that may occur on a daily basis. Therefore, the subchronic (8-hour) arsenic REL should be implemented in a similar manner as the chronic arsenic REL and the total duration of the implementation activities is an appropriate time frame for averaging repeated 8-hour exposures.

S-W plans to implement the new subchronic (8-hour) arsenic REL at the Site as follows[5]:

[5] This approach is consistent with the method of exposure in the key study, the Wasserman study, on which the value is based. First, arsenic in drinking water was likely not ingested by the study subjects on a uniform 24 hour basis; rather the majority of the exposure took place in an 8 to 16 hour period, and possibly within shorter time frames within that 8 to 16 hour period. Second, for the preferred remedy, the potential exposure to arsenic would be limited to 8 work hours per day. Therefore, there should be at minimum 16 hours of "recovery" between work days. Third, it is expected that the potential exposure during the implementation of the preferred remedy will be limited to at most 5 work days per week.

Respirable arsenic will be measured from PM_{10} air monitoring samples collected over the total duration of the implementation activities for comparison to the subchronic (8-hour) arsenic REL. The dust mitigation measures are expected to ensure that this comparison will demonstrate that people in the community were not subjected to an unacceptable noncancer health effect from subchronic exposure to arsenic. These data will be collected as a continuous series of 8-hour samples starting prior to implementation activities and ending when implementation is complete. A running average respirable arsenic concentration will be maintained to confirm that dust control measures are effective and to make any adjustments to these measures that are deemed appropriate.

4.3 Selected Performance Standards

Since some VOCs can cause both carcinogenic and noncarcinogenic effects, the more stringent of the noncarcinogenic and carcinogenic risk-based performance standards is selected as the performance standard (Table 4-3). For arsenic, its subchronic (8-hour) arsenic REL is selected as the performance standard. The resulting performance standards are health-protective because these concentrations of all COCs would have to be observed at the location of the exposed receptors for the total 6-month duration to yield an excess lifetime cancer risk of $4x10^{-7}$ or a total HI of 1 (Table 4-3). Such an occurrence is unlikely as actual exposure concentrations are anticipated to be less.

As discussed in Section 3.2.2, lead cannot be evaluated in the same manner as arsenic and VOCs because USEPA and Cal/EPA do not have a reference concentration for lead. Therefore, the National Ambient Air Quality Standard (NAAQS) for lead of 0.15 $\mu g/m^3$ is used as its acceptable subchronic performance standard, evaluated as a rolling 3-month average. The lead NAAQS was revised in the fall of 2008 by a factor of 10 from 1.5 $\mu g/m^3$ to 0.15 $\mu g/m^3$ (USEPA, 2008). The California Ambient Air Quality Standards (CAAQS) for lead is 1.5 $\mu g/m^3$, averaged over 1 month.

Performance standards will be compared to analytical data from air and organic vapor samples collected at the perimeters of the Site to determine whether measures to mitigate offsite migration of COCs have been successful in adequately protecting people in the community, and to make any adjustments to these measures that are deemed appropriate.

The methods and approaches to be used to measure respirable COC concentrations in air will be discussed in the Remedial Action Plan and specific details will be provided in a perimeter air monitoring plan submitted as part of the Remedial Design.

TABLE 4-1
EVALUATION OF CANCER RISK

Chemical of Concern	Unit Risk[1] ($\mu g/m^3)^{-1}$	Cancer Risk-Based Performance Standard[2] ($\mu g/m^3$)	Estimated Chemical Air Concentration[3] (C_A) (from Table 3-7) ($\mu g/m^3$)	Percentage of VOC in Total Vapor[4]	Adjustment Factor[5]	Adjusted Cancer Risk-Based Performance Standard[6] ($\mu g/m^3$)	Excess Cancer Risk[7]
Metals							
Arsenic	3.3E-3	0.18	0.021	NA	0.74	0.13	7.4E-7
Lead	NE	NE	0.017	NE	NA	NA	NA
Volatile Organic Compounds (VOCs)							
Benzene	2.9E-5	5	6.00	0.2%	0.12	0.6	1.2E-7
1,2-Dichloroethane	2.1E-5	7	0.26	0.0%	0.005	0.03	5.0E-9
Ethylbenzene	2.5E-6	56	107	3.1%	0.159	8.9	1.6E-7
Methyl ethyl ketone	NE	NE	630	18.2%	NA	NA	NA
Tetrachloroethylene	5.9E-6	24	0.08	0.0%	0.01	0.2	1.0E-8
Toluene	NE	NE	2,074	60.0%	NA	NA	NA
Trichloroethylene	2.0E-6	70	0.24	0.0%	0.01	0.7	1.0E-8
1,2,4-Trimethylbenzene	NE	NE	9.88	0.3%	NA	NA	NA
1,3,5-Trimethylbenzene	NE	NE	11.66	0.3%	NA	NA	NA
Vinyl chloride	7.8E-5	2	0.06	0.0%	0.005	0.01	5.0E-9
Xylenes	NE	NE	618.41	17.9%	NA	NA	NA
				Adjustment Factor Total	1.0		

NE - Not established; performance standard for lead is based on National Ambient Air Quality Standard of 0.15 $\mu g/m^3$.

NA - Not applicable.

Total Excess Cancer Risk from all COCs **1.0E-6**

1. From Table 3-9.
2. Cancer Risk-Based Performance Standard is calculated by the following:

$$PS_{COC} = \frac{TR \times AT_c \times CF_1}{UR \times ET \times EF \times ED}$$

Definition	Parameter	Value
Target Risk	TR	1.0E-06
Average time – carcinogens, days	AT_c	25550
Unit risk, $(\mu g/m^3)^{-1}$	UR	chemical-specific
Exposure time, hours/day	ET-metal	8
Exposure time, hours/day	ET-VOC	24
Exposure frequency, days/year	EF-metal	260
Exposure frequency, days/year	EF-VOC	365
Exposure duration, years	ED	0.5
conversion factor (hours/day)	CF_1	24

3. Based on modeled air concentrations from Table 3-7. The maximum 8-hour concentrations in air are used for metals and the maximum 24-hour concentrations in air are used for VOCs.
4. Predicted percentage of each volatile COC present in total vapor.
5. Performance standard for each carcinogen is adjusted by distributing the total risk of 10^{-6} among the carcinogenic COCs. The allocation of target risk is based on modeled air concentrations and toxicity of each chemical.
6. Adjusted cancer risk-based performance standard is derived by multiplying the cancer risk-based performance standard by the adjustment factor.
7. Excess cancer risk after cumulative adjustment is calculated by dividing the adjusted cancer risk-based

TABLE 4-2
EVALUATION OF NONCANCER RISK

Chemical of Concern[2]	Subchronic RfC/REL[1] ($\mu g/m^3$)	Subchronic RfC/REL Refernece[1]	Noncancer Risk-Based Performance Standard[2] ($\mu g/m^3$)	Primary Target Organ[1]	Adjusted Noncancer Risk-Based Performance Standard[2] ($\mu g/m^3$)	Hazard Quotient[3]
Metals						
Arsenic	0.015	Cal/EPA	0.06	development	0.015	2.4E-1
Lead	NE	NE	NE	NE	NA	NA
Volatile Organic Compounds (VOCs)						
Benzene	60	Cal/EPA[4]	60	blood, developmental, nerve	10	1.7E-1
1,2-Dichloroethane	2,429	ATSDR[4]	2,429	liver	607	2.5E-1
Ethylbenzene	3,040	ATSDR	3,040	development, liver, kidney, endocrine system	608	2.0E-1
Methyl ethyl ketone	5,000	IRIS[4]	5,000	development	1,000	2.0E-1
Tetrachloroethylene	350	HEAST[5]	350	liver, kidney	88	2.5E-1
Toluene	7,000	HEAST[5]	7,000	nerve, development, respiratory	1,167	1.7E-1
Trichloroethylene	537	ATSDR	537	nerve, eye	90	1.7E-1
1,2,4-Trimethylbenzene	70	PPRTV	70	central nerve system	12	1.7E-1
1,3,5-Trimethylbenzene	70	PPRTV[6]	70	central nerve system	12	1.7E-1
Vinyl chloride	77	ATSDR	77	liver	19	2.5E-1
Xylenes	2,606	ATSDR	2,606	nerve, respiratory	434	1.7E-1

Cal/EPA - Chronic Reference Exposure Levels (RELs) by California EPA,

ATSDR – Intermediate inhalation Minimal Risk Levels (MRLs) by Agency for Toxic Substances and Disease Control (November 2007).

HEAST - EPA's Health Effects Assessment Summary Tables.

PPRTV - Provisional Peer Reviewed Toxicity Value (PPRTV) by the EPA Superfund Health Risk Technical Support Center.

NE - Not established; performance standard for lead is based on National Ambient Air Quality Standard of 0.15 $\mu g/m^3$.

NA - Not applicable.

Total Hazard Index	**2.4E+0**
Total Nerve Hazard Index	1.0E+0
Total Liver Hazard Index	9.5E-1
Total Developmental Hazard Index	9.7E-1
Total Blood Hazard Index	1.7E-1
Total Kidney Hazard Index	4.5E-1
Total Respiratory Hazard Index	3.7E-1

1. From Table 3-10.

2. Noncancer Risk-Based Performance Standard is calculated by the following:

$$PS_{COPC} = \frac{AT_n \times CF_1 \times RfC}{ET \times EF \times ED}$$

Definition	Parameter	Value
Target Hazard	TH	1.0E+00
Average time – noncinogens, days	AT_n	183
Reference concentrations, ($\mu g/m^3$)	RfC	chemical-specific
Exposure time, hours/day	ET-metal	8
Exposure time, hours/day	ET-VOC	24
Exposure frequency, days/year	EF-metal	260
Exposure frequency, days/year	EF-VOC	365
Exposure duration, years	ED	0.5
conversion factor (hours/day)	CF_1	24

2. The risk-based performance standard for a VOC is adjusted by dividing the number of chemicals affecting the same primary target organ. Where the chemical has more than one target organ, the highest number of chemicals associated with the target organ shared by the most chemicals was chosen. For arsenic, its subchronic REL is selected as the performance standard.

3. Hazard quotient (HQ) after cumulative adjustment.
HQ = Adjusted noncancer risk-based performance standard / Noncancer risk-based performance standard.

4. Based on chronic REL, chronic RfC, or chronic inhalation MRL.

5. Converted from subchronic oral reference dose (RfD).

6. 1,2,4-Trimethylbenzene is used as a surrogate.

TABLE 4-3
SELECTED RISK-BASED PERFORMANCE STANDARDS

Chemical of Concern	Subchronic RfC[1] ($\mu g/m^3$)	Subchronic RfC Reference[1]	Noncancer Risk-Based Performance Standard[2] ($\mu g/m^3$)	Primary Target Organ[1]	Adjusted Noncancer Risk-Based Performance Standard[2] ($\mu g/m^3$)	Adjusted Cancer Risk-Based Performance Standard[3] ($\mu g/m^3$)	Selected Risk-Based Performance Standard[4] ($\mu g/m^3$)	Hazard Quotient for Selected Risk-Based Performance Standard[5]	Excess Cancer Risk for Selected Risk-Based Performance Standard[6]
Metals									
Arsenic	0.015	Cal/EPA	0.06	development	0.015	0.13	0.015	2.4E-1	8.4E-8
Lead	NE	NE	NE	NE	NE	NE	NA	NA	NA
Volatile Organic Compounds (VOCs)									
Benzene	60	Cal/EPA[7]	60	blood, developmental, nerve	10	0.6	0.6	9.7E-3	1.2E-7
1,2-Dichloroethane	2,429	ATSDR[7]	2,429	liver	607	0.03	0.03	1.4E-5	5.0E-9
Ethylbenzene	3,040	ATSDR	3,040	development, liver, kidney, endocrine system	608	8.9	8.90	2.9E-3	1.6E-7
Methyl ethyl ketone	5,000	IRIS[7]	5,000	development	1,000	NA	1,000	2.0E-1	NA
Tetrachloroethylene	350	HEAST[8]	350	liver, kidney	88	0.2	0.2	6.8E-4	1.0E-8
Toluene	7,000	HEAST[8]	7,000	nerve, development, respiratory	1,167	NA	1,167	1.7E-1	NA
Trichloroethylene	537	ATSDR	537	nerve, eye	90	0.7	0.7	1.3E-3	1.0E-8
1,2,4-Trimethylbenzene	70	PPRTV	70	central nervous system	12	NA	12	1.7E-1	NA
1,3,5-Trimethylbenzene	70	PPRTV[9]	70	central nervous system	12	NA	12	1.7E-1	NA
Vinyl chloride	77	ATSDR	77	liver	19	0.01	0.01	1.2E-4	5.0E-9
Xylenes	2,606	ATSDR	2,606	nerve, respiratory	434	NA	434	1.7E-1	NA

Total Hazard Index	**1.1E+0**	**Total**	**3.9E-7**
Total Nerve Hazard Index	6.8E-1		
Total Liver Hazard Index	3.7E-3		
Total Developmental Hazard Index	6.2E-1		
Total Blood Hazard Index	9.7E-3		
Total Kidney Hazard Index	3.6E-3		
Total Respiratory Hazard Index	1.7E-1		

NE - Not established; performance standard for lead is based on National Ambient Air Quality Standard of 0.15 $\mu g/m^3$.

NA - Not applicable.

1. From Table 3-10.
2. From Table 4-2.
3. From Table 4-1.
4. The more stringent between the carcinogenic and noncarcinogenic risk-based performance standard is selected as the risk-based performance standard for VOCs.
5. Hazard quotient (HQ) for the selected performance standards. HQ = Selected action level / Noncancer risk-based performance standard.
6. Excess cancer risk for the selected performance standards from Table 4-1.
7. Based on chronic REL, chronic RfC, or chronic inhalation MRL.
8. Converted from subchronic oral reference dose (RfD).
9. 1,2,4-Trimethylbenzene is used as a surrogate.

Section 5
Development of Action Levels

Action levels were developed to provide real-time air monitoring goals during implementation of the preferred remedial action and evaluate the effectives of the controls implemented to limit fugitive emissions.

In addition to the Site-specific, cancer and subchronic noncancer, risk-based performance standards developed per Section 4, Applicable Relevant and Appropriate Requirements (ARARs) are also considered in developing subchronic action levels. These ARARs include standards published by the Bay Area Air Quality Management District (BAAQMD), Minimal Risk Levels (MRLs) published by the Agency for Toxic Substances and Disease Registry (ATSDR), NAAQS, and American Industrial Hygiene Association (AIHA) odor thresholds.

5.1 Bay Area Air Quality Management District Standards

The BAAQMD Regulation 2, Rule 5 (BAAQMD, 2005) provides emission levels of toxic air contaminants that would be protective of adverse health effects to exposed individuals. These regulatory limits are shown in Table 5-1 and are similar to the acute and chronic RELs developed by Cal/EPA OEHHA. In addition, BAAQMD provides an acceptable emission level for total PM_{10}.

5.2 Minimal Risk Levels

MRLs for toxic substances are screening levels developed by ATSDR. The MRL is an estimated concentration of a hazardous substance that is unlikely to result in adverse health effects based on a daily human exposure over a specified duration. MRLs are derived for

- Acute exposures (1 to 14 days),
- Intermediate exposures (more than 14 to 364 days of exposure), and
- Chronic exposures (365 days and longer).

Table 5-1 presents the acute, intermediate, and chronic MRLs for the COCs at the Site. There are inherent uncertainties associated with these MRLs; therefore to be conservative these concentrations are generally based on the most sensitive endpoint considered relevant to humans. Since the duration of implementation activities are not expected to extend beyond six months, intermediate MRLs are considered the appropriate criteria for the Site. If an intermediate MRL is not available, then the chronic MRL is selected.

5.3 National Ambient Air Quality Standards

The USEPA Office of Air Quality Planning and Standards has set National Ambient Air Quality Standards (NAAQS) for six principal pollutants including lead. The NAAQS for lead is 0.15 $\mu g/m^3$, evaluated as a rolling 3-month average. The lead NAAQS was revised in the fall of 2008 by a factor of 10 from 1.5 $\mu g/m^3$ to 0.15 $\mu g/m^3$ (USEPA, 2008). The California Ambient Air Quality Standards (CAAQS) for lead is 1.5 $\mu g/m^3$, averaged over 1 month.

5.4 American Industrial Hygiene Association Odor Thresholds

The American Industrial Hygiene Association (AIHA) provides odor threshold values for chemicals with established health standards. Reported odor thresholds vary several orders of magnitude since the method of defining and determining odor thresholds varies widely. Individuals could also respond differently to the same odor. To be conservative, the minimum value is used as odor threshold value. The selected odor thresholds are provided in Table 5-1.

5.5 Chemical-Specific Action Levels

The selected action levels for acute and subchronic exposure for the COCs are the lowest, or more stringent, among the following regulatory criteria or calculated performance standard. These include the following:

- BAAQMD regulatory limits
- MRLs from the ATSDR
- Odor threshold values from AIHA
- NAAQS for lead
- The calculated Site-specific risk-based performance standards based on the lower of cancer and noncancer risks (Table 4-3)

5.5.1 Total Volatile Organic Compound Action Levels

The selected subchronic action levels for the VOCs are presented in Table 5-2. The resulting action levels are health-protective because these sustained concentrations yield an excess lifetime cancer risk of $3x10^{-7}$ or a total HI of 0.7, which are below USEPA's acceptable criteria of 10^{-6} and 1, respectively. As shown in Table 5-2, exposures to these concentrations could result in a total HI up to 0.6 for individual primary target organ, which is well below the USEPA risk level of 1.

The real-time air monitoring data for VOCs will be compared with the subchronic VOC action levels and, as appropriate, implementation activities and/or actions levels will be modified to maintain fugitive emissions below acceptable risk levels.

Based on these subchronic VOC action levels, an action level for total VOCs is calculated. Total VOCs in air can be measured in real-time, through use of a high-sensitivity continuous VOC monitor, an organic vapor meter (OVM). As such, the subchronic action level for total VOCs is the sum of each VOC action level, and as presented in Table 5-2 is 1,505 $\mu g/m^3$.

Because VOC concentrations are not uniform across the excavation, the potential for acute exposures exists for those times when excavation is occurring where concentrations are the highest. The selected acute action levels for each of the VOCs are presented in Table 5-2.

5.5.2 Airborne Dust Action Levels

Concentrations of arsenic and lead in air cannot be readily measured in real-time. As such, a high-sensitivity monitor will be used to measure airborne dust and provide respirable PM_{10} correlated measurements. This PM_{10} monitor will be utilized to determine the estimated respirable arsenic and lead concentrations in air. Arsenic and lead concentrations in the dust measured as PM_{10}, are anticipated to be generally equal to those for the soil within the excavation. Thus, the PM_{10} action level is calculated by dividing the chemical-specific performance standard by the concentration for that COC in soil (CDM, 2008).

Arsenic concentrations for soil vary by orders of magnitude within the excavation; the potential for acute exposures will vary as the implementation proceeds. Therefore, PM_{10} action levels for acute exposures to arsenic are developed for each excavation event. Acute action levels for PM_{10} are based on OEHHA's acute (4-hour) REL for arsenic of 0.20 $\mu g/m^3$.

For the acute evaluation, the exposure arsenic concentrations are based on either the maximum concentration or the 95%UCL of the mean concentration, whichever is lower, from samples collected within each planned excavation event footprint. These exposure concentrations are appropriate estimates for the average 4-hour exposure for the acute evaluation. Table 5-3 presents acute REL-based PM_{10} action levels for arsenic for each excavation event. The acute REL-based PM_{10} action levels for arsenic for the excavation events range from 1.8 to 162 $\mu g/m^3$.

The expected total duration of excavation is approximately six months, which corresponds to the exposure duration used in the risk calculation. It is thus also important to develop PM_{10} action levels based on a subchronic inhalation REL or RfC. A subchronic REL-based action level is developed based on the following equation:

$$\text{Subchronic REL or RfC } (mg/m^3) = (mg\ PM_{10}/m^3)(mg\ As/kg\ soil)(1\ kg/1x10^6\ mg)$$

Rearrange the equation and adjust for dust exposures that occur for 40 hours per week (8 hours per day for 5 days per week) during excavation, a subchronic REL-based action level is calculated as follows:

$$PM_{10}\ Action\ Level\ (mg/m^3) = \frac{Subchronic\ REL(mg/m^3)}{Arsenic\ Concentration\ (mg/kg) \times 10^{-6}\ kg/mg} \times \frac{24\ hours}{8\ hours} \times \frac{7\ days}{5\ days}$$

For the subchronic evaluation, the exposure arsenic concentrations are based on either the maximum concentration or the 95%UCL of the mean concentration, whichever is lower, from samples collected within each planned excavation event footprint. Table 5-3 presents subchronic based PM_{10} action levels for arsenic for each excavation event using the selected risk-based performance standard developed for this PHERA (Table 4-2) of 0.015 µg/m³. The subchronic risk-based PM_{10} action levels for arsenic for the excavation events range from 0.6 to 51 µg/m³.

For the subchronic lead evaluation, the exposure lead concentration is based on the 95%UCL of the mean concentration from samples collected within the planned entire excavation footprint. Lead concentrations also vary across the Site. However, USEPA and Cal/EPA do not have an acute REL for lead. Thus, a PM_{10} action level for lead for the entire excavation was estimated. The subchronic PM_{10} action level for lead for the excavation is 134 µg/m³ (Table 5-3).

In addition, Table 5-3 presents BAAQMD's acceptable emission level for PM_{10} of 50 µg/m³.

The minimum subchronic PM_{10} action levels during the excavation events from these evaluations and BAAQMD's acceptable level are:

- Raised Cap Materials: 0.6 µg/m³;
- Vadose Zone Soils: 16 µg/m³;
- Soils for Shoring Installation: 50 µg/m³; and,
- Saturated Soils: 17 µg/m³.

TABLE 5-1
PUBLISHED AIR QUALITY STANDARDS

Chemical of Concern	BAAQMD or NAAQS Regulatory Limit ($\mu g/m^3$)		ATSDR Minimal Risk Level (MRL) ($\mu g/m^3$)				AIHA Odor Threshold ($\mu g/m^3$)
	Acute	Chronic	Acute (1-14 days)	Intermediate (>14-364 days)	Chronic (≥365 days)	Selected MRL	
Metals							
Arsenic	NE	NE	NE	NE	NE	NE	NE
Lead[1]	NE	0.15	NE	NE	NE	NE	NE
Volatile Organic Compounds							
Benzene	1,300	60	29	19	10	19	4792
1,2-Dichloroethane	NE	NE	NE	NE	2,429	2,429	45,331
Ethylbenzene	NE	2,000	43,354	3,035	1,301	3,035	9,986
Methyl ethyl ketone	NE	NE	NE	NE	NE	NE	737
Tetrachloroethylene	20,000	35	1,358	NE	272	NE	41,852
Toluene	37,000	300	3,763	NE	301	NE	603
Trichloroethylene	NE	600	10,716	536	NE	536	7,309
1,2,4-Trimethylbenzene	NE	NE	NE	NE	NE	NE	11,798
1,3,5-Trimethylbenzene	NE	NE	NE	NE	NE	NE	11,798
Vinyl chloride	180,000	26	1,278	77	NE	77	647
Xylenes	22,000	700	8,671	2,601	217	2,601	1,302
PM_{10} (24 hours)	NE	50	NE	NE	NE	NE	NE

NE - Not established.

NA - Not applicable.

BAAQMD - Bay Area Air Quality Management District.

NAAQS - National Ambient Air Quality Standard.

ATSDR – Agency for Toxic Substances and Disease Control (November 2007) inhalation Minimal Risk Levels (MRLs). MRLs are converted from units in ppmv to $\mu g/m^3$ using the following equation:

MRL ($\mu g/m^3$) = (ppmv)(12.187)(Molecular weight)(1000 µg/mg)/(273.15+ ^{0}C)

where ^{0}C = ambient air temperature in degrees Centigrade (assumed to be 25 ^{0}C)

AIHA - American Association of Industrial Hygienists, 1989, Odor thresholds for Chemicals with established occupational health standards.

1. Lead is based on NAAQS for chronic exposure. Total PM_{10} based on chronic exposure, per BAAQMD rules and regulations.

TABLE 5-2
ACTION LEVELS FOR VOLATILE ORGANIC COMPOUNDS

Volatile Organic Compounds	BAAQMD Regulatory Limit[1] (µg/m^3)	Selected MRL[1] (µg/m^3)	AIHA Odor Threshold[1] (µg/m^3)	Selected Noncancer Performance Standards[2] (µg/m^3)	Selected Cancer Risk-Based Performance Standards[2] (µg/m^3)	Selected Subchronic Action Level in Air[3] (µg/m^3)	Hazard Quotient[4]	Excess Cancer Risk[5]	Selected Acute Action Level in Air[6] (µg/m^3)
Volatile Organic Compounds (VOCs)									
Benzene	60	19	4,792	10	0.6	0.6	9.7E-3	1.2E-7	29
1,2-Dichloroethane	NE	2,429	45,331	607	0.03	0.03	1.4E-5	5.0E-9	45,331
Ethylbenzene	2,000	3,035	9,986	608	8.9	8.9	2.9E-3	1.6E-7	9,986
Methyl ethyl ketone	NE	NE	737	1,000	NA	737	1.5E-1	NA	737
Tetrachloroethylene	35	NE	41,852	88	0.2	0.2	6.8E-4	1.0E-8	1,358
Toluene	300	NE	603	1,167	NA	300	4.3E-2	NA	603
Trichloroethylene	600	536	7,309	90	0.7	0.7	1.3E-3	1.0E-8	7,309
1,2,4-Trimethylbenzene	NE	NE	11,798	12	NA	12	1.7E-1	NA	11,798
1,3,5-Trimethylbenzene	NE	NE	11,798	12	NA	12	1.7E-1	NA	11,798
Vinyl chloride	26	77	647	19	0.01	0.01	1.2E-4	5.0E-9	647
Xylenes	700	2,601	1,302	434	NA	434	1.7E-1	NA	1,302
Total VOCs[7]						1,505			
						Total Hazard Index	**7.0E-1**	**Total** **3.1E-7**	
						Total Nerve Hazard Index	5.5E-1		
						Total Liver Hazard Index	3.7E-3		
						ıpmental Hazard Index	2.0E-1		
						Total Blood Hazard Index	9.7E-3		
						Total Kidney Hazard Index	3.6E-3		
						Total Respiratory Hazard Index	4.6E-2		

NE - Not established.

NA - Not applicable.

BAAQMD - Bay Area Air Quality Management District Rules and Regulations.

ATSDR – Agency for Toxic Substances and Disease Control (November 2007) intermediate inhalation Minimal Risk Levels (MRLs) .

AIHA - American Association of Industrial Hygienists, 1989, Odor thresholds for Chemicals with established occupational health standards.

1. From Table 5-1.
2. From Table 4-3. Adjusted Noncancer Risk-Based Performance Standard for final Noncancer action levels. Adjusted Cancer Risk-Based Performance Standard for final cancer action levels.
3. Selected Subchronic Action Level in Air is based on the more stringent of the BAAQMD regulatory limit, MRL, AIHA odor threshold, and the cancer and noncancer performance standards.
4. Hazard quotient for final action levels. HQ = Selected action level / Noncancer risk-based performance standard from Table 4-2.
5. Excess cancer risk for final action level. Excess cancer risk = Selected action level / Cancer risk-based performance standard from Table 4-1.
6. Selected Acute Action Level in Air is based on the more stringent of the BAAQMD regulatory limit, MRL, AIHA odor threshold, and Cal/EPA RELs.
7. Total VOCs Action Level is based on the total sum of each VOC Action Level.

TABLE 5-3
ACTION LEVELS FOR PM_{10}

Chemical	Exposure Concentration (from Table 3-1) (mg/kg)	BAAQMD or NAAQS Regulatory Limit ($\mu g/m^3$)	Performance Standard ($\mu g/m^3$)	Action Level as PM_{10} in Air ($\mu g/m^3$)
Arsenic Acute REL-Based Performance Standard [1]				
Raised Cap Materials	110,000	NA	0.2	1.8
Vadose Zone Soils	3,898	NA	0.2	51
Soils for Shoring Installation	1,237	NA	0.2	162
Saturated Soils	3,782	NA	0.2	53
Arsenic Subchronic Risk-Based Performance Standard [2]				
Raised Cap Materials	110,000	NA	0.015	0.6
Vadose Zone Soils	3,898	NA	0.015	16
Soils for Shoring Installation	1,237	NA	0.015	51
Saturated Soils	3,782	NA	0.015	17
Other Subchronic Performance Standards [3]				
Lead Subchronic Performance Standard	4,687	0.15	NA	134
Total PM_{10} Subchronic Performance Standard	NA	50	NA	50

BAAQMD - Bay Area Air Quality Management District Rules and Regulations.

NAAQS - National Ambient Air Quality Standard.

NA - Not applicable.

1. Based on arsenic acute inhalation REL (see Table 3-14) and arsenic concentration for each excavation event.

2. Based on arsenic risk-based performance standard (see Table 4-3) and arsenic concentration for each excavation event.

3. Lead is based on NAAQS for chronic exposure. Total PM_{10} based on chronic exposure, per BAAQMD rules and regulations.

Section 6
References

Agency for Toxic Substances and Disease Registry, 2007a. Toxicological Profile for Arsenic.

Agency for Toxic Substances and Disease Registry, 2007b. Minimal Risk Levels (MRLs) (http://www.atsdr.cdc.gov/mrls/).

American Industrial Hygiene Association (AIHA), 1989. Odor thresholds for Chemicals with established occupational health standards.

Bay Area Air Quality Management District (BAAQMD), 2005. Bay Area Air Quality Management District Rules and Regulations, Regulation 2, Rule 5, New Source Review of Toxic Air Contaminants.

CDM, 2008. Work Plan for Public Health Evaluation of the Remedial Alternative, The Sherwin-Williams Company, Emeryville, California.

CDM, 2009. Feasibility Study, The Sherwin-Williams Company, Emeryville, California. April 1.

Cal/EPA, 2005a. Use of California Human Health Screening Levels (CHHSLs) in Evaluation of Contaminated properties.

Cal/EPA, 2005b. All Chronic Reference Exposure Levels Adopted by OEHHA.

Cal/EPA, 2008. Technical Support Document for the Derivation of Noncancer Reference Exposure Levels and RELs for Six Chemicals. Office of Environmental Health Hazard Assessment. December 17.

Gradient, 2005. Human Health Risk Assessment for 1450 Sherwin Avenue, Emeryville, California. February 11.

Lakes Environmental, 2007. User's Guide for Screen View: Screening Air Dispersion Model (SCREEN3), Version 2.5.0.

OEHHA 1999. Determination of Acute Reference Exposure Levels for Airborne Toxicants: Arsenic and Inorganic Arsenic Compounds.

OEHHA 2000. Air Toxics Hot Spots Program Risk Assessment Guidelines, Part III, Technical Support Document for the Determination of Noncancer Chronic Reference Exposure Levels.

OEHHA, 2003. The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments.

USEPA, 1974. Development of Emission Factors for Fugitive Dust Sources.

USEPA, 1989a. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual Part A.

USEPA, 1989b. Estimation of Air Emission from Cleanup Activities at Superfund Sites. Interim Final.

USEPA, 1991a. Risk Assessment Guidance for Superfund: Human Health Evaluation Manual, Part C, Risk Evaluation of Remedial Alternatives.

USEPA, 1991b. Human Health Evaluation Manual, Supplemental Guidance: Standard Default Exposure Factors.

USEPA, 1992. Air/Superfund National Technical Guidance Study Series, Estimation of Air Impacts from the Excavation of Contaminated Soil.

USEPA, 1993. Models for Estimating Air Emission Rates from Superfund Remedial Actions.

EPA, 1995. Screening Procedures for Estimating the Air Quality Impact of Stationary Sources, Revised. EPA-450/R-92-019. U.S. Environmental Protection Agency, Research Triangle Park, NC.

USEPA, 1996. Soil Screening Guidance, Technical Background Document.

USEPA, 1997a. Exposure Factors Handbook Volume I General Factors.

USEPA, 1997b. Health Effects Assessment Summary Tables.

USEPA, 1997c. Air Emissions from the Treatment of Soils Contaminated with Petroleum Fuels and Other Substances (October 1997). Final Report,

USEPA, 2001. Particulate Emission Measurements from Controlled Construction Activities.

USEPA, 2002. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites.

USEPA, 2006. Child-Specific Exposure Factors Handbook (External Review Draft). EPA/600/R/06/096A.

USEPA, 2007a. ProUCL Version 4.0 Technical Guide.

USEPA, 2007b. ProUCL Version 4.00.02 User Guide.

USEPA, 2008. National Ambient Air Quality Standards for Lead; Final Rule. Fed. Reg. 73:66964-67062. 40 CFR Parts 50, 51, 53, and 58.

Virginia Department of Environmental Quality, 2008. Voluntary Remediation Program Risk Assessment Guidance. http://www.deq.virginia.gov/vrprisk/raguide.html

Appendix G

Selected Public Health Evaluation Figures and Tables

FIGURE ES-1: OVERVIEW OF THE PUBLIC HEALTH EVALUATION OF THE REMEDIAL ALTERNATIVE

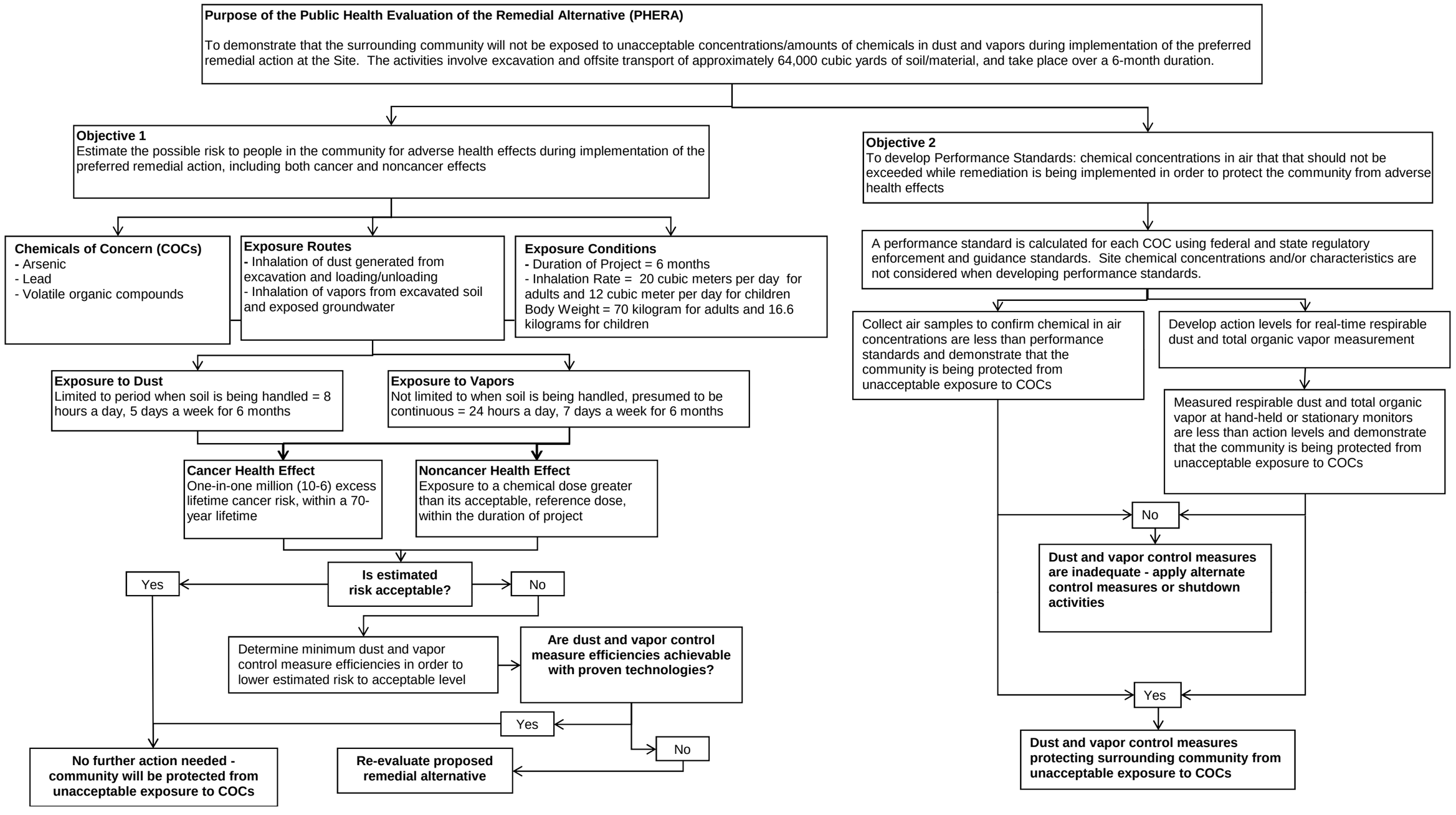

TABLE 2-1
CHEMICALS OF CONCERN FOR PUBLIC HEALTH EVALUATION

Volatile Organic Compounds[1]	Metals[2]
Benzene	Arsenic
1,2-Dichloroethane	Lead
Ethylbenzene	
Methyl ethyl ketone	
Tetrachloroethylene	
Toluene	
Trichloroethylene	
1,2,4-Trimethylbenzene	
1,3,5-Trimethylbenzene	
Vinyl chloride	
Xylenes	

1. Volatile organic compounds (VOCs) present in air as organic vapors.
2. Metals present in air as respirable dust.

TABLE 3-1
EXPOSURE CONCENTRATIONS

Medium	Chemical of Concern	Unit	Maximum Concentration	Exposure Concentration	Rationale	Statistics
Groundwater	Benzene	µg/L	250	77	95%UCL	KM(BCA)
	1,2-Dichloroethane	µg/L	6.5	4.0	95%UCL	KM(Percentile Bootstrap)
	Ethylbenzene	µg/L	1,000	457	95%UCL	KM(BCA)
	Methyl ethyl ketone	µg/L	30,000	16,335	95%UCL	KM(Chebyshev)
	Tetrachloroethylene	µg/L	1.5	1.5	maximum	
	Toluene	µg/L	62,000	13,974	95%UCL	KM(t)
	Trichloroethylene	µg/L	5.1	4.0	95%UCL	KM(Percentile Bootstrap)
	1,2,4-Trimethylbenzene	µg/L	270	80	95%UCL	KM(BCA)
	1,3,5-Trimethylbenzene	µg/L	60	17	95%UCL	KM(BCA)
	Vinyl chloride	µg/L	0.70	0.70	maximum	
	Xylenes	µg/L	6,340	2,055	95%UCL	KM(BCA)
Soil - Entire Excavation	Arsenic	mg/kg	110,000	5,948	97.5%UCL	KM(Chebyshev)
	Lead	mg/kg	120,000	4,687	97.5%UCL	KM(Chebyshev)
	1,2,4-Trimethylbenzene	mg/kg	210	0.92	95%UCL	KM(t)
	1,3,5-Trimethylbenzene	mg/kg	28	2.0	97.5%UCL	KM(Chebyshev)
	Benzene	mg/kg	0.065	0.007	95%UCL	KM(t)
	Ethylbenzene	mg/kg	220	14	95%UCL	KM(Chebyshev)
	Toluene	mg/kg	2,600	203	95%UCL	KM(Chebyshev)
	Xylenes	mg/kg	670	91	95%UCL	KM(Chebyshev)
Soil - Excavation Event						
Raised Cap Materials	Arsenic	mg/kg	110,000	110,000	maximum	
Vadose Zone Soils	Arsenic	mg/kg	110,000	3,898	95%UCL	Chebyshev(Mean, Sd)
Soils for Shoring Installation	Arsenic	mg/kg	2,100	1,237	95%UCL	Adjusted gamma
Saturated Soils	Arsenic	mg/kg	51,000	3,782	95%UCL	Chebyshev(Mean, Sd)

95%UCL - 95 percentile of upper confidence limit of the mean.

97.5%UCL - 97.5 percentile of upper confidence limit of the mean.

Statistics:

KM(t) - UCL based upon Kaplan-Meier estimates using the Student's t-distribution cutoff value.

KM(BCA) - UCL based upon biased-corrected accelerated bootstrap method.

KM(Percentile Bootstrap) - UCL based upon Kaplan-Meier estimates using the bootstrap method.

KM(Chebyshev) - UCL based upon Kaplan-Meier estimates using the Chebyshev inequality

Chebyshev (Mean, Sd) - UCL based upon Chebyshev Theorem using samples mean and standard deviation.

Adjusted gamma - UCL based upon gamma method.

TABLE 3-2
EXPOSURE PARAMETER VALUES

Parameter	Symbol	Value	Unit	Reference
Inhalation rate - Adult	IR_a	20	m^3/day	USEPA, 1991
inhalation rate - Child	IR_c	12	m^3/day	USEPA, 2006
Body weight - Adult	BW_a	70	kg	USEPA, 1991
Body weight - Child	BW_c	16.6	kg	USEPA, 1997
Exposure Parameters for Entire Project				
Exposure time - PM_{10}	ET	8	hours/day	Professional Judgment[1]
Exposure time - Vapor	ET	24	hours/day	Professional Judgment[1]
Exposure frequency - PM_{10}	EF	260	days/year	Professional Judgment[1]
Exposure frequency - Vapor	EF	365	days/year	Professional Judgment[1]
Exposure duration	ED	0.5	years	Professional Judgment[1]
Averaging Time				
Carcinogens	AT_c	25,550	days	USEPA, 1989
Noncarcinogens	AT_n	183	days	USEPA, 1991
Exposure Parameters for Each Excavation Event				
Exposure time - PM_{10}	ET	8	hours/day	Professional Judgment[1]
Exposure time - Vapor	ET	24	hours/day	Professional Judgment[1]
Exposure days - PM_{10}				
Raised Cap Materials	EF	18	days	Professional Judgment[2]
Vadose Zone Soils	EF	47	days	Professional Judgment[2]
Soils for Shoring Installation	EF	18	days	Professional Judgment[2]
Saturated Soils	EF	47	days	Professional Judgment[2]
Averaging Time				
Carcinogens	AT_c	25,550	days	USEPA, 1989
Noncarcinogens - Vapor	AT_n	183	days	USEPA, 1991
Noncarcinogens - PM_{10}				
Raised Cap Materials	AT_n	25	days	Professional Judgment[3]
Vadose Zone Soils	AT_n	66	days	Professional Judgment[3]
Soils for Shoring Installation	AT_n	25	days	Professional Judgment[3]
Saturated Soils	AT_n	66	days	Professional Judgment[3]

1. Dust assumed to be generated 8 hours per day, 5 days per week during excavation and loading activities and organic vapors assumed to be generated 24 hours per day, 7 days per week while excavated soils are exposed. Total duration for the implementation activities is expected to be 6 months (0.5 year; 130 work days).
2. Work days for each excavation event for PM_{10} exposure, totaling 130 days (260 days/year for 0.5 year).
3. Averaging time is equal to exposure duration, adjusted for 7 days per week.

USEPA, 1989. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual, Part A
USEPA, 1991. Human Health Evaluation Manual, Supplemental Guidance: Standard Default Exposure Factors.
USEPA, 1997. Exposure Factors Handbook Volume I General Factors.
USEPA, 2006. Child-Specific Exposure Factors Handbook (External Review Draft).

TABLE 3-3
PARTICULATE EMISSION RATES FROM SOIL

Parameter	Unit	Calculation	Value	Reference
Emission rate for single transfer processes ($EF_{U)}$	g/day	$EF_U = \frac{k\,(0.0016)(M)\left(\frac{U}{2.2}\right)^{1.3}}{\left(\frac{X_{H2O}}{2}\right)^{1.4}}$	7.29	USEPA, 1993
	g/day	$ERPM_{10} = (EF_u)(3)(1\text{-ECF})$	21.87	Assumes ECF=0
	g/hour	$ERPM_{10} = (EF_u)(3)(1\text{-ECF})$(1 day/8 hours)	2.73	Assumes ECF=0, 8 work hours per day
Total PM_{10} emission rate ($ER_{PM10)}$ (for excavation, loading, and unloading)	g/sec	$ERPM_{10} = (EF_u)(3)(1\text{-ECF})$(1 day/28800 sec)	7.59E-04	Assumes ECF=0, 28,800 work seconds per day (Input for SCREEN3 Model (see Table 3-7))

Parameter	Unit	Description	Value	Reference
EF_U[1]	g/day	Emission rate for single transfer process	see above	site-specific
ER_{PM10}	g/day	Total PM10 emission rate	see above	site-specific
X_{H2O}	percentage	Moisture content	23	site-specific
U	m/s	Wind speed	1.73	site-specific; Gradient, 2005
TM	kg	Total mass to be excavated	70,640,100	site-specific
T	day	Duration of excavation (work days)	130	from Table 3-2
M	kg/day	Mass of soil/material handled per day	543,385	calculated
k	unitless	PM_{10} particle size multiplier	0.35	USEPA, 1993
0.0016	g/kg	Empirical constant	0.0016	USEPA, 1993
2.2	m/sec	Empirical constant	2.2	USEPA, 1993
ECF[2]	unitless	Emission control factor	Table 3-11	site-specific

Gradient, 2005. Human Health Risk Assessment for 1450 Sherwin Avenue, Emeryville, California. February 11.

USEPA, 1993. Models for Estimating Air Emission Rates from Superfund Remedial Actions.

1. EF_U is an input parameter to the SCREEN3 air dispersion model (Table 3-7).

2. ECF values obtained from Table 3-11.

Particulate matter with an effective diameter of less than or equal to 10 microns (µm) (PM_{10}) is considered respirable (National Ambient Air Quality Standards). Arsenic and lead in these respirable particles that deposit in deep lung are the basis for toxic effects following inhalation exposure.

TABLE 3-4
VOLATILE EMISSION RATES FROM SOIL

Chemical of Concern	Exposure Concentration (µg/g) (from Table 3-1)	Possible Emission Rate[1] (g/sec)
Benzene	0.007	1.38E-05
Ethylbenzene	14	2.85E-02
Toluene	203	4.02E-01
1,2,4-Trimethylbenzene	0.92	1.82E-03
1,3,5-Trimethylbenzene	2.0	3.96E-03
Xylenes	91	1.80E-01

1. Possible emission rate for each chemical (ER_{vs}) is estimated based on the following equation (USEPA, 1993):

$$ER_{vs} = \frac{(S_V)(C)(\beta)(1.0)(1-ECF)}{t}$$

Parameter	Unit	Description	Value	Reference
C	µg/g (ppm, mg/kg)	Chemical concentration	see above	from Table 3-1
β	g/cm^3	dry bulk density	1.52	site-specific
t	sec	Duration of excavation	15,768,000	assumed, 183 days
S_v	m^3	total volume of soil to be excavated	20,520	site-specific; excavation pit size
1.0	$g/10^6$ µg × 10^6 cm^3/m^3	constant	-	-
ECF	unitless	Emission control factor	0	no emission control

USEPA, 1993. Models for Estimating Air Emission Rates from Superfund Remedial Actions.

TABLE 3-5
INPUT PARAMETERS FOR GROUNDWATER TRENCH MODEL

Chemical of Concern	Molecular Weight (VDEP, 2008) MW_i (g/mol)	Henry's Law Constant (VDEP, 2008) H_i (atm-m^3/mol)	Exposure Concentration (from Table 3-1) C_{GW} (µg/L)
Benzene	78.11	5.55E-03	77
Methyl ethyl ketone	72.11	1.38E-04	16,335
1,2-Dichloroethane	98.96	9.79E-04	4.0
Ethylbenzene	106.17	7.88E-03	457
Tetrachloroethylene	165.83	1.84E-02	1.5
Toluene	92.14	6.64E-03	13,974
Trichloroethylene	131.39	1.03E-02	4.0
1,2,4-Trimethylbenzene	120.00	5.70E-03	80
1,3,5-Trimethylbenzene	120.00	7.70E-03	17
Vinyl chloride	62.50	2.70E-02	0.70
Xylenes	106.16	5.18E-03	2,055

Parameter	Value	Unit	Reference
For Emission Flux and Concentration in Trench			
CF1	1E-03	L/cm^3	-
CF2	1E+04	cm^2/m^2	-
CF3	3,600	s/hr	-
F	1	unitless	VDEP, 2008
ACH	360	hr-1	VDEP, 2008
Trench dimensions			
Length	249	ft	site-specific; excavation pit size
	76	m	site-specific; excavation pit size
Width	98	ft	site-specific; excavation pit size
	30	m	site-specific; excavation pit size
Depth	30	ft	site-specific; excavation pit size
	9	m	site-specific; excavation pit size
Width/Depth	3.27	unitless	calculated

CF - Conversion factor.

F - Fraction of floor through which VOC can enter

ACH - Air exchange per hour

Virginia Department of Environmental Quality (VDEP), 2008. Voluntary Remediation Program Risk Assessment Guidance.

TABLE 3-6
VOLATILE EMISSION RATES FROM GROUNDWATER

Chemical of Concern	Molecular Weight (VDEP, 2008) (g/mole)	Henry's Law Constant (VDEP, 2008) (atm-m^3/mole)	Gas-Phase Mass Transfer Coefficient[1] (cm/s)	Liquid-Phase Mass Transfer Coefficient[1] (cm/s)	Overall Mass Transfer Coefficient[1] (cm/s)	Exposure Concentration (from Table 3-5) (µg/L)	Trench Model Volatilization Factor[2] (L/m^3)	Concentration of Chemical in Trench[3]		Chemical Emission Rate[4] (g/m^2-s)
								(µg/m^3)	(mg/m^3)	
	MW_i	H_i	k_{iG}	k_{iL}	K_i	C_{GW}	VF	C_{pit}		F
Benzene	78.11	5.55E-03	5.09E-01	1.28E-03	1.27E-03	7.70E+01	1.38E-02	1.07E+00	1.07E-03	9.75E-07
1,2-Dichloroethane	98.96	9.79E-04	4.71E-01	1.14E-03	1.07E-03	4.00E+00	1.17E-02	4.69E-02	4.69E-05	4.29E-08
Ethylbenzene	106.17	7.88E-03	4.60E-01	1.10E-03	1.09E-03	4.57E+02	1.19E-02	5.45E+00	5.45E-03	4.98E-06
Methyl ethyl ketone	72.11	1.38E-04	5.23E-01	1.33E-03	9.18E-04	1.63E+04	6.90E-03	1.13E+02	1.13E-01	1.03E-04
Tetrachloroethylene	165.83	1.84E-02	3.96E-01	8.79E-04	8.76E-04	1.50E+00	9.58E-03	1.44E-02	1.44E-05	1.31E-08
Toluene	92.14	6.64E-03	4.82E-01	1.18E-03	1.17E-03	1.40E+04	1.28E-02	1.79E+02	1.79E-01	1.63E-04
Trichloroethylene	131.39	1.03E-02	4.28E-01	9.87E-04	9.82E-04	4.00E+00	1.07E-02	4.29E-02	4.29E-05	3.93E-08
1,2,4-Trimethylbenzene	120.00	5.70E-03	4.41E-01	1.03E-03	1.02E-03	8.00E+01	1.12E-02	8.95E-01	8.95E-04	8.18E-07
1,3,5-Trimethylbenzene	120.00	7.70E-03	4.41E-01	1.03E-03	1.03E-03	1.70E+01	1.12E-02	1.91E-01	1.91E-04	1.74E-07
Vinyl chloride	62.50	2.70E-02	5.49E-01	1.43E-03	1.43E-03	7.00E-01	1.56E-02	1.09E-02	1.09E-05	9.99E-09
Xylenes	106.16	5.18E-03	4.60E-01	1.10E-03	1.09E-03	2.06E+03	1.19E-02	2.44E+01	2.44E-02	2.23E-05

1. For Mass-Transfer Coefficients:

Gas-Phase Mass-Transfer Coefficient

$$k_{iG} = \left(\frac{MW_{H2O}}{MW_i}\right)^{0.335} + \left(\frac{T}{298}\right)^{1.005} \times k_{G,H2O} \quad \text{(Eq. 3-9)}$$

Liquid-Phase Mass-Transfer Coefficient

$$k_{iL} = \left(\frac{MW_{O2}}{MW_i}\right)^{0.5} + \frac{T}{298} \times k_{L,O2} \quad \text{(Eq. 3-8)}$$

Overall Mass Transfer Coefficient

$$K_i = \frac{1}{\frac{1}{k_{iL}} + \frac{RT}{H_i k_{iG}}} \quad \text{(Eq. 3-7)}$$

Parameter	Value	Unit
$K_{G,H2O}$	0.833	cm/s
MW_{H2O}	18	g/mole
$K_{G,O2}$	0.002	cm/s
MW_{O2}	32	g/mole
T	77	F
T	298	K
R	8.20E-05	atm-m^3/mol-K

2. For Emission Flux:

Volatilization Factor

$$VF = \frac{(K_i)(A)(F_{floor})(10^{-3})(10^4)(3600)}{(ACH)(V)} \quad \text{(Eq. 3-6)}$$

3. For Concentration in Trench:

$$C_{pit} = (C_{GW})(VF) \quad \text{(Eq. 3-5)}$$

4. For Chemical Emission Rate:

$$F = \left(\frac{C_{pit} \times ACH \times V}{A}\right) \times \left(\frac{g}{1000\ mg}\right) \times \frac{hr}{3600\ s} \quad \text{(Eq. 3-10)}$$

Parameter	Value	Unit
F_{floor}	1	
ACH	360	hr^{-1}
Trench Dimensions (from Table 3-5)		
Length	76	m (249 ft)
Width	30	m (98 ft)
Depth	9	m (30 ft)
Volume	20730	m^3
Area	2267	m^2
Width/Depth	3.27	m^2

$K_{G,H2O}$ - gas-phase mass transfer coefficient of water vapor at 25 C (VDEP, 2008)
MW_{H2O} - molecular weight of water vapor (VDEP, 2008)
$K_{G,O2}$ - gas-phase mass transfer coefficient of oxygen gas at 25 C (VDEP, 2008)
MW_{O2} - molecular weight of oxygen gas (VDEP, 2008)
V - volume of excavation pit; site-specific
A - area of excavation pit; site-specific
F_{floor} - fraction of floor through which VOC can enter (VDEP, 2008)
ACH - air exchange per hour (VDEP, 2008)
T - average system absolute temperature; site-specific
R - ideal gas constant (VDEP, 2008)

Virginia Department of Environmental Quality (VDEP), 2008. Voluntary Remediation Program Risk Assessment Guidance.

TABLE 3-7
SCREEN3 AIR DISPERSION MODELING FOR ENTIRE EXCAVATION

SCREEN3 Model Input Parameters:

Source Type:	Area
Emission Rate Modeled:	1.0 g/m^2-s
Release Height:	0.0 m
Receptor Height:	1.5 m
Distance From Source to Fence Line:	42 m
Receptor Distance:	42 m

Chemical of Concern	Exposure Concentration (µg/g) (from Table 3-1)
Arsenic	5,948
Lead	4,687

SCREEN3 Model Input Excavation Dimensions:

Length of Larger Side:	76 m
Length of Smaller Side:	30 m
Area:	2,280 m^2

SCREEN3 Model Input Site Characteristics:

Urban/Rural:	Urban

SCREEN3 Model Results for PM_{10} and VOC Emission Rates and Flux from Soil, and Calculated Respirable Metal Values:

Chemical	Emission Rate (g/s)	Flux (g/m^2-s)
Particulates		
PM_{10}	7.59E-04	3.33E-07
Respirable Arsenic	4.52E-06	1.98E-09
Respirable Lead	3.56E-06	1.56E-09
Organic Vapors		
Benzene	1.38E-05	6.06E-09
Ethylbenzene	2.84E-02	1.25E-05
Toluene	4.00E-01	1.76E-04
1,2,4-Trimethylbenzene	1.81E-03	7.96E-07
1,3,5-Trimethylbenzene	3.95E-03	1.73E-06
Xylene	1.80E-01	7.87E-05

Respirable arsenic and lead values for emission rate and flux calculated by multiplying PM_{10} values with respective exposure concentration.

Only those VOCs detected in soil samples collected from within the excavation footprint were modeled.

Trench Model Results for VOC Emission Rates from Groundwater (from Table 3-6):

Chemical	Trench Concentration (from Table 3-6) ($µg/m^3$)	Flux (from Table 3-6) (g/m^2-s)
Benzene	1.07E+00	9.75E-07
1,2-Dichloroethane	4.69E-02	4.29E-08
Ethylbenzene	5.45E+00	4.98E-06
Methyl ethyl ketone	1.13E+02	1.03E-04
Tetrachloroethylene	1.44E-02	1.31E-08
Toluene	1.79E+02	1.63E-04
Trichloroethylene	4.29E-02	3.93E-08
1,2,4-Trimethylbenzene	8.95E-01	8.18E-07
1,3,5-Trimethylbenzene	1.91E-01	1.74E-07
Vinyl Chloride	1.09E-02	9.99E-09
Xylene	2.44E+01	2.23E-05

SCREEN3 Model Results for Ground Level Concentrations at Fence Line with Assumed Flux:

Modeled Chemical Ground Level Concentration at Fence Line with assumed flux of 1 g/m^2-s:	1.53E+07 µg/m3

Chemical Ground Level Concentrations at Fence Line with SCREEN3 and Trench Model Result Flux Values:

Chemical	1-Hour ($µg/m^3$)	4-Hour ($µg/m^3$)	8-Hour ($µg/m^3$)	24-Hour ($µg/m^3$)	30-Day ($µg/m^3$)	Annual ($µg/m^3$)
Particulates (using SCREEN3 model flux results)						
PM_{10}	5.09E+00	4.33E+00	3.57E+00	2.04E+00	1.53E+00	4.08E-01
Respirable Arsenic	3.03E-02	2.58E-02	2.12E-02	1.21E-02	9.09E-03	2.42E-03
Respirable Lead	2.39E-02	2.03E-02	1.67E-02	9.55E-03	7.16E-03	1.91E-03
Organic Vapors (using sum of Trench Model and SCREEN3 Model flux results, as appropriate)						
Benzene	1.50E+01	1.28E+01	1.05E+01	6.00E+00	4.50E+00	1.20E+00
Ethylbenzene	2.67E+02	2.27E+02	1.87E+02	1.07E+02	8.00E+01	2.13E+01
Toluene	5.18E+03	4.41E+03	3.63E+03	2.07E+03	1.56E+03	4.15E+02
1,2,4-Trimethylbenzene	2.47E+01	2.10E+01	1.73E+01	9.88E+00	7.41E+00	1.98E+00
1,3,5-Trimethylbenzene	2.91E+01	2.48E+01	2.04E+01	1.17E+01	8.74E+00	2.33E+00
Xylenes	1.55E+03	1.31E+03	1.08E+03	6.18E+02	4.64E+02	1.24E+02
1,2-Dichloroethane	6.56E-01	5.58E-01	4.60E-01	2.63E-01	1.97E-01	5.25E-02
Methyl ethyl ketone	1.58E+03	1.34E+03	1.10E+03	6.30E+02	4.73E+02	1.26E+02
Tetrachloroethylene	2.01E-01	1.71E-01	1.41E-01	8.04E-02	6.03E-02	1.61E-02
Trichloroethylene	6.01E-01	5.11E-01	4.21E-01	2.40E-01	1.80E-01	4.81E-02
Vinyl chloride	1.53E-01	1.30E-01	1.07E-01	6.12E-02	4.59E-02	1.22E-02

8-Hour, 24-Hour, 30-Day and Annual concentrations were determined by multiplying the 1-Hour concentration by the typical recommended factor that is in Table 4.3 of OEHHA's Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments. The factors are shown in the table below. A 4-hour adjustment factor was developed according to the regression relationship of averaging time and the recommended factor.

Averaging Time	Range	Recommended Factor
3 hours	0.8-1.0	0.9
4 hours	NE	0.85
8 hours	0.5-0.9	0.7
24 hours	0.2-0.6	0.4
30 days	0.2-0.3	0.3
Annual	0.06-0.1	0.08

Particulate matter with an effective diameter of less than or equal to 10 microns (µm) (PM_{10}) is considered respirable (National Ambient Air Quality Standards). Arsenic and lead in these respirable particles that deposit in the deep lung are the basis for toxic effects following inhalation exposure.

TABLE 3-8
SCREEN3 AIR DISPERSION MODELING FOR EXCAVATION EVENTS

SCREEN3 Model Input Parameters:

Source Type:	Area
Emission Rate Modeled:	1.0 g/m^2-s
Release Height:	0.0 m
Receptor Height:	1.5 m
Distance From Source to Fence Line:	42 m
Receptor Distance:	42 m

Excavation Event	Exposure Concentration for Arsenic (µg/g) (from Table 3-1)	Maximum Concentration for Arsenic (µg/g) (from Table 3-1)
Raised Cap Materials	110,000	110,000
Vadose Zone Soils	3,898	110,000
Soils for Shoring Installation	1,237	2,100
Saturated Soils	3,782	51,000

SCREEN3 Model Input Excavation Dimensions:

Length of Larger Side:	76 m
Length of Smaller Side:	30 m
Area:	2,267 m^2

SCREEN3 Model Input Site Characteristics:

Urban/Rural:	Urban

SCREEN3 Model Result for PM_{10} Emission Rate and Flux, and Calculated Respirable Arsenic Values for Excavation Event and Exposure/Maximum Concentrations:

Chemical	Emission Rate (g/s)		Flux (g/m^2-s)	
PM_{10}	7.59E-04		3.35E-07	
Respirable Arsenic	Exposure	Maximum	Exposure	Maximum
Raised Cap Materials	8.35E-05	8.35E-05	3.68E-08	3.68E-08
Vadose Zone Soils	2.96E-06	8.35E-05	1.31E-09	3.68E-08
Soils for Shoring Installation	9.39E-07	1.59E-06	4.14E-10	7.03E-10
Saturated Soils	2.87E-06	3.87E-05	1.27E-09	1.71E-08

Respirable arsenic values for emission rate and flux calculated by multiplying PM_{10} values with respective concentration.

SCREEN3 Model Results for Ground Level Concentrations at Fence Line with Assumed Flux:

Modeled Chemical Ground Level Concentration at Fence Line with Assumed Flux of 1 g/m^2-s:	1.53E+07 µg/m3

Chemical Ground Level Concentrations at Fence Line with Model Result Flux Values for Exposure Concentration:

Chemical	1-Hour (µg/m^3)	4-Hour (µg/m^3)	8-Hour (µg/m^3)	24-Hour (µg/m^3)	30-Day (µg/m^3)	Annual (µg/m^3)
PM_{10}	5.12E+00	4.36E+00	3.59E+00	2.05E+00	1.54E+00	4.10E-01
Respirable Arsenic						
Raised Cap Materials	5.64E-01	4.79E-01	3.95E-01	2.25E-01	1.69E-01	4.51E-02
Vadose Zone Soils	2.00E-02	1.70E-02	1.40E-02	7.99E-03	5.99E-03	1.60E-03
Soils for Shoring Installation	6.34E-03	5.39E-03	4.44E-03	2.54E-03	1.90E-03	5.07E-04
Saturated Soils	1.94E-02	1.65E-02	1.36E-02	7.75E-03	5.81E-03	1.55E-03

Chemical Ground Level Concentrations at Fence Line with Model Result Flux Values for Maximum Concentration:

Chemical	1-Hour (µg/m^3)	4-Hour (µg/m^3)	8-Hour (µg/m^3)	24-Hour (µg/m^3)	30-Day (µg/m^3)	Annual (µg/m^3)
PM_{10}	5.12E+00	4.36E+00	3.59E+00	2.05E+00	1.54E+00	4.10E-01
Respirable Arsenic						
Raised Cap Materials	5.64E-01	4.79E-01	3.95E-01	2.25E-01	1.69E-01	4.51E-02
Vadose Zone Soils	5.64E-01	4.79E-01	3.95E-01	2.25E-01	1.69E-01	4.51E-02
Soils for Shoring Installation	1.08E-02	9.15E-03	7.53E-03	4.30E-03	3.23E-03	8.61E-04
Saturated Soils	2.61E-01	2.22E-01	1.83E-01	1.05E-01	7.84E-02	2.09E-02

8-Hour, 24-Hour, 30-Day and Annual concentrations were determined by multiplying the 1-Hour concentration by the typical recommended factor that is in Table 4.3 of OEHHA's Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments. The factors are shown in the table below. A 4-hour adjustment factor was developed according to the regression relationship of averaging time and the recommended factor.

Averaging Time	Range	Recommended Factor
3 hours	0.8-1.0	0.9
4 hours	NE	0.85
8 hours	0.5-0.9	0.7
24 hours	0.2-0.6	0.4
30 days	0.2-0.3	0.3
Annual	0.06-0.1	0.08

Particulate matter with an effective diameter of less than or equal to 10 microns (µm) (PM_{10}) is considered respirable (National Ambient Air Quality Standards). Arsenic and lead in these respirable particles that deposit in the deep lung are the basis for toxic effects following inhalation exposure.

TABLE 3-9
CANCER TOXICITY VALUES

Chemical of Concern	Unit Risk $(\mu g/m^3)^{-1}$	Unit Risk Reference	Inhalation Slope Factor $(mg/kg/day)^{-1}$	Weight of Evidence/Cancer Guideline Description
Volatile Organic Compounds				
Benzene	2.9E-5	Cal/EPA	1.0E-1	A
1,2-Dichloroethane	2.1E-5	Cal/EPA	7.2E-2	B2, 2B
1,2-Dichloropropane	1.0E-5	Cal/EPA	3.6E-2	3
Ethylbenzene	2.5E-6	Cal/EPA	8.7E-3	D, B2
Methyl ethyl ketone	NE	NE	NE	NE
Tetrachloroethylene	5.9E-6	Cal/EPA	2.1E-2	2B
Toluene	NE	NE	NE	NE
Trichloroethylene	2.0E-6	Cal/EPA	7.0E-3	2A
1,2,4-Trimethylbenzene	NE	NE	NE	D
1,3,5-Trimethylbenzene	NE	NE	NE	D
Vinyl chloride	7.8E-5	Cal/EPA	2.7E-1	A, 1
Xylenes	NE	NE	NE	NE
Metals				
Lead	NE	NE	NE	NE
Arsenic	3.3E-3	Cal/EPA	1.2E+1	A, 1

Cal/EPA – California EPA Office of Environmental Health Hazard Assessment Toxicity Criteria Database.

EPA Weight of Evidence (EPA 1986, EPA 1996):

A,1 - Human Carcinogen.

B1, 2A - Probable human carcinogen - indicates limited evidence in humans.

B2, 2B - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans.

C - Possible human carcinogen.

D - Not classifiable as human carcinogen.

NE - Not established.

Group 3: Carcinogenic properties not classifiable.

Group 4: Probable human non-carcinogen.

TABLE 3-10
NONCANCER TOXICITY VALUES

Chemical of Concern	Chronic RfC/REL ($\mu g/m^3$)	Inhalation RfD (mg/kg/day)	Chronic RfC/REL Reference	Subchronic RfC/REL ($\mu g/m^3$)	Subchronic Inhalation RfD (mg/kg/day)	Subchronic RfC/REL Reference	Acute RfC/REL ($\mu g/m^3$)	Chronic RfC/REL Reference	Primary Target Organ(s)
Volatile Organic Compounds									
Benzene	60	1.7E-2	Cal/EPA	NA	NA	NA	1,300	Cal/EPA	blood, developmental, nerve
1,2-Dichloroethane	2,429	6.9E-1	ADSTR	NA	NA	NA	NA		liver
1,2-Dichloropropane	4	1.1E-3	IRIS	32	9.1E-3	ATSDR 2007b			nasal mucosa
Ethylbenzene	2,000	5.7E-1	Cal/EPA	3,040	8.7E-1	ATSDR 2007b	NA		development, liver, kidney,
Methyl ethyl ketone	5,000	1.4E+00	IRIS	NA	NA	NA	13,000	Cal/EPA	developmental
Tetrachloroethylene	272	7.8E-2	ATSDR	350	1.0E-1	HEAST[1]	20,000	Cal/EPA	liver, kidney
Toluene	300	8.6E-2	Cal/EPA	7000	2.0E+0	HEAST[1]	37,000	Cal/EPA	nerve, development, respiratory
Trichloroethylene	600	1.7E-1	Cal/EPA	537	1.5E-1	ATSDR 2007b	NA		nerve, eye
1,2,4-Trimethylbenzene	7	2.0E-3	PPRTV	70	2.0E-2	PPRTV	NA		central nerve system
1,3,5-Trimethylbenzene [2]	7	2.0E-3	PPRTV	70	2.0E-2	PPRTV	NA		central nerve system
Vinyl chloride	100	2.9E-2	IRIS	77	2.2E-2	ATSDR 2007b	180,000	Cal/EPA	liver
Xylenes	700	2.0E-1	Cal/EPA	2606	7.4E-1	ATSDR 2007b	22,000	Cal/EPA	nerve, respiratory
Metals									
Lead	NE	NE	NE	NE	NE	NE	NE	NE	NE
Arsenic	0.015	8.6E-6	Cal/EPA	0.015	4.3E-6	Cal/EPA[3]	0.20	Cal/EPA	development

1. Converted from subchronic oral reference dose (RfD).

2. 1,2,4-Trimethylbenzene is used as a surrogate.

3. Subchronic REL from OEHHA December 2008.

NE - Not established.

NA – Subchronic RfC is not available or subchronic RfC or subchronic RfC is more stringent than chronic RfC.

Cal/EPA - California EPA, Chronic Reference Exposure Levels (RELs).

ATSDR – Agency for Toxic Substances and Disease Control. Chronic RfCs are based on chronic inhalation Minimal Risk Levels (MRLs). Subchronic RfCs are based on intermediate inhalation MRL (November 2007).

HEAST - EPA's Health Effects Assessment Summary Tables.

PPRTV - Provisional Peer Reviewed Toxicity Value (PPRTV) by the EPA Superfund Health Risk Technical Support Center.

RfC = Reference concentration; RfD = Reference dose

TABLE 3-11
SUMMARY OF EMISSION CONTROL TECHNOLOGIES

Control Technology		Emission Control Factor (ECF)		Comments
		Particulates[1]	Volatile Organic Compounds[2]	
Cover	Clean Soil	NA	>95%	
	Synthetic Cover		NA	
	Mulch		NA	
Foam	Temporary foam cover	NA	75% to 95%	up to an hour
	Long-term foam cover		99% to 100%	24 hours
Water Sprays	Spray of active excavation	42 to 63%	NA	
	spray of dumping area	46 to 77%		
Dust suppressant	unpaved road	40 to 99%	NA	
	soil pile	50 to 70%		
Operational controls	rate of excavation		NA	
	amount of soil exposed			
	duration of soil pile left uncovered			
	timing of excavation			
Wind Barrier			NA	
Other factors on soil pile	placement		NA	shield from prevailing wind
	surface area			minimize surface area
	orientation	60%		length perpendicular to the prevailing wind direction

1. From USEPA, 1989. Air/Superfund national technical guidance study series: Volume III - Estimation of air emissions from cleanup activities at Superfund Sites. Interim Final.

2. From USEPA 1997. Air emissions from the treatment of soils contaminated with petroleum fuels and other substances.

NA - Not available.

TABLE 3-12
CANCER AND NONCANCER RISK ESTIMATES FOR ENTIRE EXCAVATION

				Exposure Frequency	Receptor	Adult		Child	
					PM_{10}	130 days		130 days	
					Vapor	183 days		183 days	
	Chemical of Concern	Inhalation Cancer Slope Factor (from Table 3-9) $(mg/kg/day)^{-1}$	Inhalation Reference Dose (from Table 3-10) (mg/kg/day)	Concentration in Air (from Table 3-7) $(\mu g/m^3)$	Cancer Risk	Hazard Index	Cancer Risk	Hazard Index
No Emission Control								
PM_{10}	Arsenic	1.20E+01	4.29E-06	2.12E-02	1.2E-07	3.4E-01	3.1E-07	8.5E-01
Vapor	Benzene	1.00E-01	1.70E-02	6.00E+00	1.2E-06	1.0E-01	3.1E-06	2.6E-01
	Ethylbenzene	8.70E-03	8.69E-01	1.07E+02	1.9E-06	3.5E-02	4.8E-06	8.9E-02
	Toluene	NE	2.00E+00	2.07E+03	NE	3.0E-01	NE	7.5E-01
	1,2,4-Trimethylbenzene	NE	2.00E-02	9.88E+00	NE	1.4E-01	NE	3.6E-01
	1,3,5-Trimethylbenzene [1]	NE	2.00E-02	1.17E+01	NE	1.7E-01	NE	4.2E-01
	Xylenes	NE	7.45E-01	6.18E+02	NE	2.4E-01	NE	6.0E-01
	1,2-Dichloroethane	7.20E-02	6.94E-01	2.63E-01	3.9E-08	1.1E-04	9.8E-08	2.7E-04
	Methyl ethyl ketone	NE	1.43E+00	6.30E+02	NE	1.3E-01	NE	3.2E-01
	Tetrachloroethylene	2.10E-02	1.00E-01	8.04E-02	3.4E-09	2.3E-04	8.7E-09	5.8E-04
	Trichloroethylene	7.00E-03	1.53E-01	2.40E-01	3.4E-09	4.5E-04	8.7E-09	1.1E-03
	Vinyl chloride	2.70E-01	2.20E-02	6.12E-02	3.4E-08	7.9E-04	8.5E-08	2.0E-03
			TOTAL		**3.3E-06**	**1.4E+00**	**8.4E-06**	**3.6E+00**
With Emission Control (60% reduction of PM_{10} and 90% reduction of vapor)				Reduction of PM_{10}=	60%	Reduction of vapor=	90%	
PM_{10}	Arsenic	1.20E+01	4.29E-06	8.48E-03	4.9E-08	1.3E-01	1.2E-07	3.4E-01
Vapor	Benzene	1.00E-01	1.70E-02	6.00E-01	1.2E-07	1.0E-02	3.1E-07	2.6E-02
	Ethylbenzene	8.70E-03	8.69E-01	1.07E+01	1.9E-07	3.5E-03	4.8E-07	8.9E-03
	Toluene	NE	2.00E+00	2.07E+02	NE	3.0E-02	NE	7.5E-02
	1,2,4-Trimethylbenzene	NE	2.00E-02	9.88E-01	NE	1.4E-02	NE	3.6E-02
	1,3,5-Trimethylbenzene [1]	NE	2.00E-02	1.17E+00	NE	1.7E-02	NE	4.2E-02
	Xylenes	NE	7.45E-01	6.18E+01	NE	2.4E-02	NE	6.0E-02
	1,2-Dichloroethane	7.20E-02	6.94E-01	2.63E-02	3.9E-09	1.1E-05	9.8E-09	2.7E-05
	Methyl ethyl ketone	NE	1.43E+00	6.30E+01	NE	1.3E-02	NE	3.2E-02
	Tetrachloroethylene	2.10E-02	1.00E-01	8.04E-03	3.4E-10	2.3E-05	8.7E-10	5.8E-05
	Trichloroethylene	7.00E-03	1.53E-01	2.40E-02	3.4E-10	4.5E-05	8.7E-10	1.1E-04
	Vinyl chloride	2.70E-01	2.20E-02	6.12E-03	3.4E-09	7.9E-05	8.5E-09	2.0E-04
			TOTAL		**3.7E-07**	**2.4E-01**	**9.3E-07**	**6.2E-01**

Equation Definition:

Cancer Risk = (CSF x ET x EF x ED x IR x C_A x CF1) / (BW x AT_C x CF2)

Hazard Quotient = (ET x EF x ED x IR x C_A x CF1) / (RfD x BW x AT_{NC} x CF2)

Parameter	Definition	Value - Adult	Value - Child	Reference
C_A	chemical-specific concentration in air ($\mu g/m^3$)	chemical-specific, ground level concentrations (see Table 3-7 for vapor for 24-hr, and arsenic for 8-hr)		SCREEN3 Model
BW	body weight (kg)	70	16.6	Table 3-2
AT_C	cancer -averaging time (days)	25550	25550	Table 3-2
AT_{NC}	Noncancer average time (days)	183	183	Table 3-2
ET_{AS}	Exposure time (hours/day) - arsenic	8	8	Table 3-2
EF_{AS}	exposure frequency (d/yr) - arsenic	260	260	Table 3-2
ET_{Vapor}	Exposure time (hours/day) - vapor	24	24	Table 3-2
EF_{Vapor}	exposure frequency (d/yr) - vapor	365	365	Table 3-2
ED	exposure duration (yrs)	0.5	0.5	Table 3-2
CSF	inhalation cancer slope factor $(mg/kg/day)^{-1}$	chemical-specific		Table 3-9
RfD	inhalation reference dose (mg/kg/day)	chemical-specific		Table 3-10
IR	inhalation rate, m^3/day	20	12	Table 3-2
CF1	conversion factor (mg/µg)	1E-03	1E-03	-
CF2	conversion factor (hours/day)	24	24	-

1. 1,2,4-Trimethylbenzene is used as a surrogate.

TABLE 3-13
CANCER AND NONCANCER RISK ESTIMATES FOR EXCAVATION EVENTS

					Excavation Event	Raised Cap Materials		Vadose Zone Soils			Soils for Shoring Installation			Saturated Soils			Entire Excavation	
					Exposure Frequency	PM10 18 days Vapor 25 days			PM10 47 days Vapor 66 days			PM10 18 days Vapor 25 days			PM10 47 days Vapor 66 days			
Receptor	**Chemical of Concern**		**Inhalation Cancer Slope Factor (from Table 3-9) $(mg/kg/day)^{-1}$**	**Inhalation Reference Dose (from Table 3-10) (mg/kg/day)**	**Concentration in Air (from Tables 3-7 and 3-8) $(\mu g/m^3)$**	**Cancer Risk**	**Hazard Index**	**Concentration in Air (from Tables 3-7 and 3-8) $(\mu g/m^3)$**	**Cancer Risk**	**Hazard Index**	**Concentration in Air (from Tables 3-7 and 3-8) $(\mu g/m^3)$**	**Cancer Risk**	**Hazard Index**	**Concentration in Air (from Tables 3-7 and 3-8) $(\mu g/m^3)$**	**Cancer Risk**	**Hazard Index**	**Total Cancer Risk**	**Maximum Hazard Index**
No Emission Control																		
Adult	PM_{10}	Arsenic	1.20E+01	4.29E-06	3.95E-01	3.2E-07	6.3E+00	1.40E-02	2.9E-08	2.2E-01	4.44E-03	3.6E-09	7.0E-02	1.36E-02	2.9E-08	2.2E-01		
	Vapor	Benzene	1.00E-01	1.70E-02	6.00E+00	1.7E-07	1.0E-01	6.00E+00	4.4E-07	1.0E-01	6.00E+00	1.7E-07	1.0E-01	6.00E+00	4.4E-07	1.0E-01		
		Ethylbenzene	8.70E-03	8.69E-01	1.07E+02	2.6E-07	3.5E-02	1.07E+02	6.8E-07	3.5E-02	1.07E+02	2.6E-07	3.5E-02	1.07E+02	6.8E-07	3.5E-02		
		Toluene	NE	2.00E+00	2.07E+03	NE	3.0E-01	2.07E+03	NE	3.0E-01	2.07E+03	NE	3.0E-01	2.07E+03	NE	3.0E-01		
		1,2,4-Trimethylbenzene	NE	2.00E-02	9.88E+00	NE	1.4E-01	9.88E+00	NE	1.4E-01	9.88E+00	NE	1.4E-01	9.88E+00	NE	1.4E-01		
		1,3,5-Trimethylbenzene [1]	NE	2.00E-02	1.17E+01	NE	1.7E-01	1.17E+01	NE	1.7E-01	1.17E+01	NE	1.7E-01	1.17E+01	NE	1.7E-01		
		Xylenes	NE	7.45E-01	6.18E+02	NE	2.4E-01	6.18E+02	NE	2.4E-01	6.18E+02	NE	2.4E-01	6.18E+02	NE	2.4E-01		
		1,2-Dichloroethane	7.20E-02	6.94E-01	2.63E-01	5.3E-09	1.1E-04	2.63E-01	1.4E-08	1.1E-04	2.63E-01	5.3E-09	1.1E-04	2.63E-01	1.4E-08	1.1E-04		
		Methyl ethyl ketone	NE	1.43E+00	6.30E+02	NE	1.3E-01	6.30E+02	NE	1.3E-01	6.30E+02	NE	1.3E-01	6.30E+02	NE	1.3E-01		
		Tetrachloroethylene	2.10E-02	1.00E-01	8.04E-02	4.8E-10	2.3E-04	8.04E-02	1.2E-09	2.3E-04	8.04E-02	4.8E-10	2.3E-04	8.04E-02	1.2E-09	2.3E-04		
		Trichloroethylene	7.00E-03	1.53E-01	2.40E-01	4.7E-10	4.5E-04	2.40E-01	1.2E-09	4.5E-04	2.40E-01	4.7E-10	4.5E-04	2.40E-01	1.2E-09	4.5E-04		
		Vinyl chloride	2.70E-01	2.20E-02	6.12E-02	4.7E-09	7.9E-04	6.12E-02	1.2E-08	7.9E-04	6.12E-02	4.7E-09	7.9E-04	6.12E-02	1.2E-08	7.9E-04		
				Total		**7.6E-07**	**7.4E+00**		**1.2E-06**	**1.3E+00**		**4.5E-07**	**1.2E+00**		**1.2E-06**	**1.3E+00**	**3.6E-06**	**7.4E+00**
Child	PM_{10}	Arsenic	1.20E+01	4.29E-06	3.95E-01	8.0E-07	1.6E+01	1.40E-02	7.4E-08	5.6E-01	4.44E-03	9.0E-09	1.8E-01	1.36E-02	7.2E-08	5.4E-01		
	Vapor	Benzene	1.00E-01	1.70E-02	6.00E+00	4.3E-07	2.6E-01	6.00E+00	1.1E-06	2.6E-01	6.00E+00	4.3E-07	2.6E-01	6.00E+00	1.1E-06	2.6E-01		
		Ethylbenzene	8.70E-03	8.69E-01	1.07E+02	6.6E-07	8.9E-02	1.07E+02	1.7E-06	8.9E-02	1.07E+02	6.6E-07	8.9E-02	1.07E+02	1.7E-06	8.9E-02		
		Toluene	NE	2.00E+00	2.07E+03	NE	7.5E-01	2.07E+03	NE	7.5E-01	2.07E+03	NE	7.5E-01	2.07E+03	NE	7.5E-01		
		1,2,4-Trimethylbenzene	NE	2.00E-02	9.88E+00	NE	3.6E-01	9.88E+00	NE	3.6E-01	9.88E+00	NE	3.6E-01	9.88E+00	NE	3.6E-01		
		1,3,5-Trimethylbenzene [1]	NE	2.00E-02	1.17E+01	NE	4.2E-01	1.17E+01	NE	4.2E-01	1.17E+01	NE	4.2E-01	1.17E+01	NE	4.2E-01		
		Xylenes	NE	7.45E-01	6.18E+02	NE	6.0E-01	6.18E+02	NE	6.0E-01	6.18E+02	NE	6.0E-01	6.18E+02	NE	6.0E-01		
		1,2-Dichloroethane	7.20E-02	6.94E-01	2.63E-01	1.3E-08	2.7E-04	2.63E-01	3.5E-08	2.7E-04	2.63E-01	1.3E-08	2.7E-04	2.63E-01	3.5E-08	2.7E-04		
		Methyl ethyl ketone	NE	1.43E+00	6.30E+02	NE	3.2E-01	6.30E+02	NE	3.2E-01	6.30E+02	NE	3.2E-01	6.30E+02	NE	3.2E-01		
		Tetrachloroethylene	2.10E-02	1.00E-01	8.04E-02	1.2E-09	5.8E-04	8.04E-02	3.1E-09	5.8E-04	8.04E-02	1.2E-09	5.8E-04	8.04E-02	3.1E-09	5.8E-04		
		Trichloroethylene	7.00E-03	1.53E-01	2.40E-01	1.2E-09	1.1E-03	2.40E-01	3.1E-09	1.1E-03	2.40E-01	1.2E-09	1.1E-03	2.40E-01	3.1E-09	1.1E-03		
		Vinyl chloride	2.70E-01	2.20E-02	6.12E-02	1.2E-08	2.0E-03	6.12E-02	3.1E-08	2.0E-03	6.12E-02	1.2E-08	2.0E-03	6.12E-02	3.1E-08	2.0E-03		
				Total		**1.9E-06**	**1.9E+01**		**3.0E-06**	**3.4E+00**		**1.1E-06**	**3.0E+00**		**3.0E-06**	**3.3E+00**	**9.0E-06**	**1.9E+01**
With Emission Control (60 to 96% reduction of PM10 and 90% reduction of vapor)					Reduction of PM10 in Raised Cap Materials Event= 96% , PM10 Reduction in Other Events= 60% ; Reduction of Vapor= 90%													
Adult	PM_{10}	Arsenic	1.20E+01	4.29E-06	1.58E-02	1.3E-08	2.5E-01	5.59E-03	1.2E-08	8.9E-02	1.77E-03	1.4E-09	2.8E-02	5.43E-03	1.1E-08	8.6E-02		
	Vapor	Benzene	1.00E-01	1.70E-02	6.00E-01	1.7E-08	1.0E-02	6.00E-01	4.4E-08	1.0E-02	6.00E-01	1.7E-08	1.0E-02	6.00E-01	4.4E-08	1.0E-02		
		Ethylbenzene	8.70E-03	8.69E-01	1.07E+01	2.6E-08	3.5E-03	1.07E+01	6.8E-08	3.5E-03	1.07E+01	2.6E-08	3.5E-03	1.07E+01	6.8E-08	3.5E-03		
		Toluene	NE	2.00E+00	2.07E+02	NE	3.0E-02	2.07E+02	NE	3.0E-02	2.07E+02	NE	3.0E-02	2.07E+02	NE	3.0E-02		
		1,2,4-Trimethylbenzene	NE	2.00E-02	9.88E-01	NE	1.4E-02	9.88E-01	NE	1.4E-02	9.88E-01	NE	1.4E-02	9.88E-01	NE	1.4E-02		
		1,3,5-Trimethylbenzene [1]	NE	2.00E-02	1.17E+00	NE	1.7E-02	1.17E+00	NE	1.7E-02	1.17E+00	NE	1.7E-02	1.17E+00	NE	1.7E-02		
		Xylenes	NE	7.45E-01	6.18E+01	NE	2.4E-02	6.18E+01	NE	2.4E-02	6.18E+01	NE	2.4E-02	6.18E+01	NE	2.4E-02		
		1,2-Dichloroethane	7.20E-02	6.94E-01	2.63E-02	5.3E-10	1.1E-05	2.63E-02	1.4E-09	1.1E-05	2.63E-02	5.3E-10	1.1E-05	2.63E-02	1.4E-09	1.1E-05		
		Methyl ethyl ketone	NE	1.43E+00	6.30E+01	NE	1.3E-02	6.30E+01	NE	1.3E-02	6.30E+01	NE	1.3E-02	6.30E+01	NE	1.3E-02		
		Tetrachloroethylene	2.10E-02	1.00E-01	8.04E-03	4.8E-11	2.3E-05	8.04E-03	1.2E-10	2.3E-05	8.04E-03	4.8E-11	2.3E-05	8.04E-03	1.2E-10	2.3E-05		
		Trichloroethylene	7.00E-03	1.53E-01	2.40E-02	4.7E-11	4.5E-05	2.40E-02	1.2E-10	4.5E-05	2.40E-02	4.7E-11	4.5E-05	2.40E-02	1.2E-10	4.5E-05		
		Vinyl chloride	2.70E-01	2.20E-02	6.12E-03	4.7E-10	7.9E-05	6.12E-03	1.2E-09	7.9E-05	6.12E-03	4.7E-10	7.9E-05	6.12E-03	1.2E-09	7.9E-05		
				Total		**5.7E-08**	**3.6E-01**		**1.3E-07**	**2.0E-01**		**4.6E-08**	**1.4E-01**		**1.3E-07**	**2.0E-01**	**3.6E-07**	**3.6E-01**
Child	PM_{10}	Arsenic	1.20E+01	4.29E-06	1.58E-02	3.2E-08	6.3E-01	5.59E-03	3.0E-08	2.2E-01	1.77E-03	3.6E-09	7.1E-02	5.43E-03	2.9E-08	2.2E-01		
	Vapor	Benzene	1.00E-01	1.70E-02	6.00E-01	4.3E-08	2.6E-02	6.00E-01	1.1E-07	2.6E-02	6.00E-01	4.3E-08	2.6E-02	6.00E-01	1.1E-07	2.6E-02		
		Ethylbenzene	8.70E-03	8.69E-01	1.07E+01	6.6E-08	8.9E-03	1.07E+01	1.7E-07	8.9E-03	1.07E+01	6.6E-08	8.9E-03	1.07E+01	1.7E-07	8.9E-03		
		Toluene	NE	2.00E+00	2.07E+02	NE	7.5E-02	2.07E+02	NE	7.5E-02	2.07E+02	NE	7.5E-02	2.07E+02	NE	7.5E-02		
		1,2,4-Trimethylbenzene	NE	2.00E-02	9.88E-01	NE	3.6E-02	9.88E-01	NE	3.6E-02	9.88E-01	NE	3.6E-02	9.88E-01	NE	3.6E-02		
		1,3,5-Trimethylbenzene [1]	NE	2.00E-02	1.17E+00	NE	4.2E-02	1.17E+00	NE	4.2E-02	1.17E+00	NE	4.2E-02	1.17E+00	NE	4.2E-02		
		Xylenes	NE	7.45E-01	6.18E+01	NE	6.0E-02	6.18E+01	NE	6.0E-02	6.18E+01	NE	6.0E-02	6.18E+01	NE	6.0E-02		
		1,2-Dichloroethane	7.20E-02	6.94E-01	2.63E-02	1.3E-09	2.7E-05	2.63E-02	3.5E-09	2.7E-05	2.63E-02	1.3E-09	2.7E-05	2.63E-02	3.5E-09	2.7E-05		
		Methyl ethyl ketone	NE	1.43E+00	6.30E+01	NE	3.2E-02	6.30E+01	NE	3.2E-02	6.30E+01	NE	3.2E-02	6.30E+01	NE	3.2E-02		
		Tetrachloroethylene	2.10E-02	1.00E-01	8.04E-03	1.2E-10	5.8E-05	8.04E-03	3.1E-10	5.8E-05	8.04E-03	1.2E-10	5.8E-05	8.04E-03	3.1E-10	5.8E-05		
		Trichloroethylene	7.00E-03	1.53E-01	2.40E-02	1.2E-10	1.1E-04	2.40E-02	3.1E-10	1.1E-04	2.40E-02	1.2E-10	1.1E-04	2.40E-02	3.1E-10	1.1E-04		
		Vinyl chloride	2.70E-01	2.20E-02	6.12E-03	1.2E-09	2.0E-04	6.12E-03	3.1E-09	2.0E-04	6.12E-03	1.2E-09	2.0E-04	6.12E-03	3.1E-09	2.0E-04		
				Total		**1.4E-07**	**9.1E-01**		**3.2E-07**	**5.0E-01**		**1.2E-07**	**3.5E-01**		**3.2E-07**	**5.0E-01**	**9.0E-07**	**9.1E-01**

Equation Definition:
Cancer Risk = (CSF x ET x EF x ED x IR x C_A x CF1) / (BW x AT_C x CF2)
Hazard Quotient = (ET x EF x ED x IR x C_A x CF1) / (RfD x BW x AT_{NC} x CF2)

Parameter	Definition	Value - Adult	Value - Child	Reference
C_A	chemical-specific concentration in air ($\mu g/m^3$)	chemical-specific, ground level concentrations (see Table 3-8 - Vapor use 24-hr, As use 8-hr)		SCREEN3 Model
BW	body weight (kg)	70	16.6	Table 3-2
AT_C	cancer -averaging time (days)	25550	25550	Table 3-2
AT_{NC}	Noncancer average time (days)	specific by event and chemical[2]		Table 3-2
ET_{AS}	Exposure time (hours/day) - arsenic	8	8	Table 3-2
EF_{AS}	exposure frequency (d/yr) - arsenic	as noted above per event		Table 3-2
ET_{Vapor}	Exposure time (hours/day) - vapor	24	24	Table 3-2
EF_{Vapor}	exposure frequency (d/yr) - vapor	as noted above per event		Table 3-2
ED	exposure duration (yrs)	included in EF above		Table 3-2
CSF	inhalation cancer slope factor $(mg/kg/day)^{-1}$	chemical-specific		Table 3-9
RfD	inhalation reference dose (mg/kg/day)	chemical-specific		Table 3-10
IR	inhalation rate, m^3/day	20.0	12.0	Table 3-2
CF1	conversion factor (mg/µg)	1E-03	1E-03	-
CF2	conversion factor (hours/day)	24	24	-

1. 1,2,4-Trimethylbenzene is used as a surrogate.
2. The non-cancer averaging time is specific by event and chemical. For vapor, it is the same as the exposure frequency, however, for PM_{10} the averaging time is adjusted to account for the fact that PM10 is only released on the weekdays. The exposure frequency for the event is converted into the average time by estimating the number of weeks for the event by dividing the exposure frequency by 5 days/wk (assuming a 5-day work week) to determine the number of weeks of exposure. This value is then multiplied by 7 days/week to determine the total number of days lapsed during the exposure including weekends.

TABLE 3-14
ACUTE ARSENIC RISK EVALUATION FOR EXCAVATION EVENTS

Excavation Event	Maximum Arsenic Air Concentration at Fence Line without Emission Control (4-Hour Conc, µg/m^3) (from Table 3-8)	Selected PM_{10} Emission Reduction Efficiency for Emission Control (Percent) (from Table 3-13)	Arsenic Air Concentration at Fence Line with Selected PM_{10} Emission Reduction Efficiency (4-Hour Conc, µg/m^3)	Acute (4-Hour) REL for Arsenic (µg/m^3) (from Table 3-10)	Additional Mitigation Needed to Address Acute Exposure
Raised Cap Materials	0.48	96%	0.02	0.20	no
Vadose Zone Soils	0.48	60%	0.19		no
Soils for Shoring Installation	0.0091	60%	0.0037		no
Saturated Soils	0.22	60%	0.089		no

TABLE 4-1
EVALUATION OF CANCER RISK

Chemical of Concern	Unit Risk[1] ($\mu g/m^3)^{-1}$	Cancer Risk-Based Performance Standard[2] ($\mu g/m^3$)	Estimated Chemical Air Concentration[3] (C_A) (from Table 3-7) ($\mu g/m^3$)	Percentage of VOC in Total Vapor[4]	Adjustment Factor[5]	Adjusted Cancer Risk-Based Performance Standard[6] ($\mu g/m^3$)	Excess Cancer Risk[7]
Metals							
Arsenic	3.3E-3	0.18	0.021	NA	0.74	0.13	7.4E-7
Lead	NE	NE	0.017	NE	NA	NA	NA
Volatile Organic Compounds (VOCs)							
Benzene	2.9E-5	5	6.00	0.2%	0.12	0.6	1.2E-7
1,2-Dichloroethane	2.1E-5	7	0.26	0.0%	0.005	0.03	5.0E-9
Ethylbenzene	2.5E-6	56	107	3.1%	0.159	8.9	1.6E-7
Methyl ethyl ketone	NE	NE	630	18.2%	NA	NA	NA
Tetrachloroethylene	5.9E-6	24	0.08	0.0%	0.01	0.2	1.0E-8
Toluene	NE	NE	2,074	60.0%	NA	NA	NA
Trichloroethylene	2.0E-6	70	0.24	0.0%	0.01	0.7	1.0E-8
1,2,4-Trimethylbenzene	NE	NE	9.88	0.3%	NA	NA	NA
1,3,5-Trimethylbenzene	NE	NE	11.66	0.3%	NA	NA	NA
Vinyl chloride	7.8E-5	2	0.06	0.0%	0.005	0.01	5.0E-9
Xylenes	NE	NE	618.41	17.9%	NA	NA	NA
				Adjustment Factor Total	1.0		

NE - Not established; performance standard for lead is based on National Ambient Air Quality Standard of 0.15 $\mu g/m^3$.

NA - Not applicable.

Total Excess Cancer Risk from all COCs **1.0E-6**

1. From Table 3-9.
2. Cancer Risk-Based Performance Standard is calculated by the following:

$$PS_{COC} = \frac{TR \times AT_c \times CF_1}{UR \times ET \times EF \times ED}$$

Definition	Parameter	Value
Target Risk	TR	1.0E-06
Average time – carcinogens, days	AT_c	25550
Unit risk, $(\mu g/m^3)^{-1}$	UR	chemical-specific
Exposure time, hours/day	ET-metal	8
Exposure time, hours/day	ET-VOC	24
Exposure frequency, days/year	EF-metal	260
Exposure frequency, days/year	EF-VOC	365
Exposure duration, years	ED	0.5
conversion factor (hours/day)	CF_1	24

3. Based on modeled air concentrations from Table 3-7. The maximum 8-hour concentrations in air are used for metals and the maximum 24-hour concentrations in air are used for VOCs.
4. Predicted percentage of each volatile COC present in total vapor.
5. Performance standard for each carcinogen is adjusted by distributing the total risk of 10^{-6} among the carcinogenic COCs. The allocation of target risk is based on modeled air concentrations and toxicity of each chemical.
6. Adjusted cancer risk-based performance standard is derived by multiplying the cancer risk-based performance standard by the adjustment factor.
7. Excess cancer risk after cumulative adjustment is calculated by dividing the adjusted cancer risk-based

TABLE 4-2
EVALUATION OF NONCANCER RISK

Chemical of Concern[2]	Subchronic RfC/REL[1] ($\mu g/m^3$)	Subchronic RfC/REL Refernece[1]	Noncancer Risk-Based Performance Standard[2] ($\mu g/m^3$)	Primary Target Organ[1]	Adjusted Noncancer Risk-Based Performance Standard[2] ($\mu g/m^3$)	Hazard Quotient[3]
Metals						
Arsenic	0.015	Cal/EPA	0.06	development	0.015	2.4E-1
Lead	NE	NE	NE	NE	NA	NA
Volatile Organic Compounds (VOCs)						
Benzene	60	Cal/EPA[4]	60	blood, developmental, nerve	10	1.7E-1
1,2-Dichloroethane	2,429	ATSDR[4]	2,429	liver	607	2.5E-1
Ethylbenzene	3,040	ATSDR	3,040	development, liver, kidney, endocrine system	608	2.0E-1
Methyl ethyl ketone	5,000	IRIS[4]	5,000	development	1,000	2.0E-1
Tetrachloroethylene	350	HEAST[5]	350	liver, kidney	88	2.5E-1
Toluene	7,000	HEAST[5]	7,000	nerve, development, respiratory	1,167	1.7E-1
Trichloroethylene	537	ATSDR	537	nerve, eye	90	1.7E-1
1,2,4-Trimethylbenzene	70	PPRTV	70	central nerve system	12	1.7E-1
1,3,5-Trimethylbenzene	70	PPRTV[6]	70	central nerve system	12	1.7E-1
Vinyl chloride	77	ATSDR	77	liver	19	2.5E-1
Xylenes	2,606	ATSDR	2,606	nerve, respiratory	434	1.7E-1

Cal/EPA - Chronic Reference Exposure Levels (RELs) by California EPA,

ATSDR – Intermediate inhalation Minimal Risk Levels (MRLs) by Agency for Toxic Substances and Disease Control (November 2007).

HEAST - EPA's Health Effects Assessment Summary Tables.

PPRTV - Provisional Peer Reviewed Toxicity Value (PPRTV) by the EPA Superfund Health Risk Technical Support Center.

NE - Not established; performance standard for lead is based on National Ambient Air Quality Standard of 0.15 $\mu g/m^3$.

NA - Not applicable.

Total Hazard Index	**2.4E+0**
Total Nerve Hazard Index	1.0E+0
Total Liver Hazard Index	9.5E-1
Total Developmental Hazard Index	9.7E-1
Total Blood Hazard Index	1.7E-1
Total Kidney Hazard Index	4.5E-1
Total Respiratory Hazard Index	3.7E-1

1. From Table 3-10.

2. Noncancer Risk-Based Performance Standard is calculated by the following:

$$PS_{COPC} = \frac{AT_n \times CF_1 \times RfC}{ET \times EF \times ED}$$

Definition	Parameter	Value
Target Hazard	TH	1.0E+00
Average time – noncinogens, days	AT_n	183
Reference concentrations, ($\mu g/m^3$)	RfC	chemical-specific
Exposure time, hours/day	ET-metal	8
Exposure time, hours/day	ET-VOC	24
Exposure frequency, days/year	EF-metal	260
Exposure frequency, days/year	EF-VOC	365
Exposure duration, years	ED	0.5
conversion factor (hours/day)	CF_1	24

2. The risk-based performance standard for a VOC is adjusted by dividing the number of chemicals affecting the same primary target organ. Where the chemical has more than one target organ, the highest number of chemicals associated with the target organ shared by the most chemicals was chosen. For arsenic, its subchronic REL is selected as the performance standard.

3. Hazard quotient (HQ) after cumulative adjustment.
HQ = Adjusted noncancer risk-based performance standard / Noncancer risk-based performance standard.

4. Based on chronic REL, chronic RfC, or chronic inhalation MRL.

5. Converted from subchronic oral reference dose (RfD).

6. 1,2,4-Trimethylbenzene is used as a surrogate.

TABLE 4-3
SELECTED RISK-BASED PERFORMANCE STANDARDS

Chemical of Concern	Subchronic RfC[1] ($\mu g/m^3$)	Subchronic RfC Reference[1]	Noncancer Risk-Based Performance Standard[2] ($\mu g/m^3$)	Primary Target Organ[1]	Adjusted Noncancer Risk-Based Performance Standard[2] ($\mu g/m^3$)	Adjusted Cancer Risk-Based Performance Standard[3] ($\mu g/m^3$)	Selected Risk-Based Performance Standard[4] ($\mu g/m^3$)	Hazard Quotient for Selected Risk-Based Performance Standard[5]	Excess Cancer Risk for Selected Risk-Based Performance Standard[6]
Metals									
Arsenic	0.015	Cal/EPA	0.06	development	0.015	0.13	0.015	2.4E-1	8.4E-8
Lead	NE	NE	NE	NE	NE	NE	NA	NA	NA
Volatile Organic Compounds (VOCs)									
Benzene	60	Cal/EPA[7]	60	blood, developmental, nerve	10	0.6	0.6	9.7E-3	1.2E-7
1,2-Dichloroethane	2,429	ATSDR[7]	2,429	liver	607	0.03	0.03	1.4E-5	5.0E-9
Ethylbenzene	3,040	ATSDR	3,040	development, liver, kidney, endocrine system	608	8.9	8.90	2.9E-3	1.6E-7
Methyl ethyl ketone	5,000	IRIS[7]	5,000	development	1,000	NA	1,000	2.0E-1	NA
Tetrachloroethylene	350	HEAST[8]	350	liver, kidney	88	0.2	0.2	6.8E-4	1.0E-8
Toluene	7,000	HEAST[8]	7,000	nerve, development, respiratory	1,167	NA	1,167	1.7E-1	NA
Trichloroethylene	537	ATSDR	537	nerve, eye	90	0.7	0.7	1.3E-3	1.0E-8
1,2,4-Trimethylbenzene	70	PPRTV	70	central nervous system	12	NA	12	1.7E-1	NA
1,3,5-Trimethylbenzene	70	PPRTV[9]	70	central nervous system	12	NA	12	1.7E-1	NA
Vinyl chloride	77	ATSDR	77	liver	19	0.01	0.01	1.2E-4	5.0E-9
Xylenes	2,606	ATSDR	2,606	nerve, respiratory	434	NA	434	1.7E-1	NA

Total Hazard Index	**1.1E+0**	**Total**	**3.9E-7**
Total Nerve Hazard Index	6.8E-1		
Total Liver Hazard Index	3.7E-3		
Total Developmental Hazard Index	6.2E-1		
Total Blood Hazard Index	9.7E-3		
Total Kidney Hazard Index	3.6E-3		
Total Respiratory Hazard Index	1.7E-1		

NE - Not established; performance standard for lead is based on National Ambient Air Quality Standard of 0.15 $\mu g/m^3$.

NA - Not applicable.

1. From Table 3-10.
2. From Table 4-2.
3. From Table 4-1.
4. The more stringent between the carcinogenic and noncarcinogenic risk-based performance standard is selected as the risk-based performance standard for VOCs.
5. Hazard quotient (HQ) for the selected performance standards. HQ = Selected action level / Noncancer risk-based performance standard.
6. Excess cancer risk for the selected performance standards from Table 4-1.
7. Based on chronic REL, chronic RfC, or chronic inhalation MRL.
8. Converted from subchronic oral reference dose (RfD).
9. 1,2,4-Trimethylbenzene is used as a surrogate.

TABLE 5-1
PUBLISHED AIR QUALITY STANDARDS

Chemical of Concern	BAAQMD or NAAQS Regulatory Limit ($\mu g/m^3$)		ATSDR Minimal Risk Level (MRL) ($\mu g/m^3$)				AIHA Odor Threshold ($\mu g/m^3$)
	Acute	Chronic	Acute (1-14 days)	Intermediate (>14-364 days)	Chronic (≥365 days)	Selected MRL	
Metals							
Arsenic	NE	NE	NE	NE	NE	NE	NE
Lead[1]	NE	0.15	NE	NE	NE	NE	NE
Volatile Organic Compounds							
Benzene	1,300	60	29	19	10	19	4792
1,2-Dichloroethane	NE	NE	NE	NE	2,429	2,429	45,331
Ethylbenzene	NE	2,000	43,354	3,035	1,301	3,035	9,986
Methyl ethyl ketone	NE	NE	NE	NE	NE	NE	737
Tetrachloroethylene	20,000	35	1,358	NE	272	NE	41,852
Toluene	37,000	300	3,763	NE	301	NE	603
Trichloroethylene	NE	600	10,716	536	NE	536	7,309
1,2,4-Trimethylbenzene	NE	NE	NE	NE	NE	NE	11,798
1,3,5-Trimethylbenzene	NE	NE	NE	NE	NE	NE	11,798
Vinyl chloride	180,000	26	1,278	77	NE	77	647
Xylenes	22,000	700	8,671	2,601	217	2,601	1,302
PM_{10} (24 hours)	NE	50	NE	NE	NE	NE	NE

NE - Not established.

NA - Not applicable.

BAAQMD - Bay Area Air Quality Management District.

NAAQS - National Ambient Air Quality Standard.

ATSDR – Agency for Toxic Substances and Disease Control (November 2007) inhalation Minimal Risk Levels (MRLs). MRLs are converted from units in ppmv to $\mu g/m^3$ using the following equation:

MRL ($\mu g/m^3$) = (ppmv)(12.187)(Molecular weight)(1000 µg/mg)/(273.15+ ^{0}C)

where ^{0}C = ambient air temperature in degrees Centigrade (assumed to be 25 ^{0}C)

AIHA - American Association of Industrial Hygienists, 1989, Odor thresholds for Chemicals with established occupational health standards.

1. Lead is based on NAAQS for chronic exposure. Total PM_{10} based on chronic exposure, per BAAQMD rules and regulations.

TABLE 5-2
ACTION LEVELS FOR VOLATILE ORGANIC COMPOUNDS

Volatile Organic Compounds	BAAQMD Regulatory Limit[1] (µg/m^3)	Selected MRL[1] (µg/m^3)	AIHA Odor Threshold[1] (µg/m^3)	Selected Noncancer Performance Standards[2] (µg/m^3)	Selected Cancer Risk-Based Performance Standards[2] (µg/m^3)	Selected Subchronic Action Level in Air[3] (µg/m^3)	Hazard Quotient[4]	Excess Cancer Risk[5]	Selected Acute Action Level in Air[6] (µg/m^3)
Volatile Organic Compounds (VOCs)									
Benzene	60	19	4,792	10	0.6	0.6	9.7E-3	1.2E-7	29
1,2-Dichloroethane	NE	2,429	45,331	607	0.03	0.03	1.4E-5	5.0E-9	45,331
Ethylbenzene	2,000	3,035	9,986	608	8.9	8.9	2.9E-3	1.6E-7	9,986
Methyl ethyl ketone	NE	NE	737	1,000	NA	737	1.5E-1	NA	737
Tetrachloroethylene	35	NE	41,852	88	0.2	0.2	6.8E-4	1.0E-8	1,358
Toluene	300	NE	603	1,167	NA	300	4.3E-2	NA	603
Trichloroethylene	600	536	7,309	90	0.7	0.7	1.3E-3	1.0E-8	7,309
1,2,4-Trimethylbenzene	NE	NE	11,798	12	NA	12	1.7E-1	NA	11,798
1,3,5-Trimethylbenzene	NE	NE	11,798	12	NA	12	1.7E-1	NA	11,798
Vinyl chloride	26	77	647	19	0.01	0.01	1.2E-4	5.0E-9	647
Xylenes	700	2,601	1,302	434	NA	434	1.7E-1	NA	1,302
Total VOCs[7]						1,505			
						Total Hazard Index	**7.0E-1**	**Total** **3.1E-7**	
						Total Nerve Hazard Index	5.5E-1		
						Total Liver Hazard Index	3.7E-3		
						ıpmental Hazard Index	2.0E-1		
						Total Blood Hazard Index	9.7E-3		
						Total Kidney Hazard Index	3.6E-3		
						Total Respiratory Hazard Index	4.6E-2		

NE - Not established.

NA - Not applicable.

BAAQMD - Bay Area Air Quality Management District Rules and Regulations.

ATSDR – Agency for Toxic Substances and Disease Control (November 2007) intermediate inhalation Minimal Risk Levels (MRLs) .

AIHA - American Association of Industrial Hygienists, 1989, Odor thresholds for Chemicals with established occupational health standards.

1. From Table 5-1.
2. From Table 4-3. Adjusted Noncancer Risk-Based Performance Standard for final Noncancer action levels. Adjusted Cancer Risk-Based Performance Standard for final cancer action levels.
3. Selected Subchronic Action Level in Air is based on the more stringent of the BAAQMD regulatory limit, MRL, AIHA odor threshold, and the cancer and noncancer performance standards.
4. Hazard quotient for final action levels. HQ = Selected action level / Noncancer risk-based performance standard from Table 4-2.
5. Excess cancer risk for final action level. Excess cancer risk = Selected action level / Cancer risk-based performance standard from Table 4-1.
6. Selected Acute Action Level in Air is based on the more stringent of the BAAQMD regulatory limit, MRL, AIHA odor threshold, and Cal/EPA RELs.
7. Total VOCs Action Level is based on the total sum of each VOC Action Level.

TABLE 5-3
ACTION LEVELS FOR PM_{10}

Chemical	Exposure Concentration (from Table 3-1) (mg/kg)	BAAQMD or NAAQS Regulatory Limit ($\mu g/m^3$)	Performance Standard ($\mu g/m^3$)	Action Level as PM_{10} in Air ($\mu g/m^3$)
Arsenic Acute REL-Based Performance Standard [1]				
Raised Cap Materials	110,000	NA	0.2	1.8
Vadose Zone Soils	3,898	NA	0.2	51
Soils for Shoring Installation	1,237	NA	0.2	162
Saturated Soils	3,782	NA	0.2	53
Arsenic Subchronic Risk-Based Performance Standard [2]				
Raised Cap Materials	110,000	NA	0.015	0.6
Vadose Zone Soils	3,898	NA	0.015	16
Soils for Shoring Installation	1,237	NA	0.015	51
Saturated Soils	3,782	NA	0.015	17
Other Subchronic Performance Standards [3]				
Lead Subchronic Performance Standard	4,687	0.15	NA	134
Total PM_{10} Subchronic Performance Standard	NA	50	NA	50

BAAQMD - Bay Area Air Quality Management District Rules and Regulations.

NAAQS - National Ambient Air Quality Standard.

NA - Not applicable.

1. Based on arsenic acute inhalation REL (see Table 3-14) and arsenic concentration for each excavation event.

2. Based on arsenic risk-based performance standard (see Table 4-3) and arsenic concentration for each excavation event.

3. Lead is based on NAAQS for chronic exposure. Total PM_{10} based on chronic exposure, per BAAQMD rules and regulations.

Appendix H
Confirmation Vadose Zone Soil Sampling and Analysis Plan

Appendix H
Confirmation Vadose Zone Soil Sampling and Analysis Plan

This Confirmation Vadose Zone Sampling and Analysis Plan (SAP) is part of the Remedial Action Plan (RAP) for the S-W property located at 1450 Sherwin Avenue in Emeryville, California and a portion of the adjacent former Rifkin property, located at 4525 – 4563 Horton Street, to which hazardous substances have migrated from the S-W property. Collectively the S-W property and this portion of the former Rifkin property are referred to as the "Site" within this document. This SAP describes sampling and analysis of vadose zone soil for arsenic from the area surrounding planned soil removal.

Soil Sampling Strategy

During and/or after excavation of soils at the Site, confirmation vadose zone soil samples will be collected from the side walls of the exaction area. A confirmation sample will be collected every 50 feet along the side walls. The confirmation sampling and analysis will be conducted to confirm that the vadose zone soil cleanup for arsenic is met.

If arsenic concentrations after collection and analysis of confirmation samples indicate that the arsenic soil cleanup goal is not met, one or more duplicate samples will be collected to confirm the arsenic concentrations. If the duplicate samples also indicate that the cleanup goal is not met, soil excavation will continue, and another set of confirmation samples will be collected to determine if the cleanup goal has been met.

Sampling Methods and QA/QC Procedures

Sampling methods and laboratory analyses are presented below.

Sample Collection

Relatively undisturbed confirmation soil samples will be collected. Confirmation soil samples will be collected using one of the following methods:

- A core-barrel, which accepts two-inch diameter, six-inch long stainless steel sleeve inserts, will be driven six inches into the soil (or stockpile) using a slide hammer attachment.

- A six-inch long stainless steel sleeve will be driven six inches into the soil using a hand-held hammer. The sleeve will be protected from damage by placing a piece of wood between the hammer and the sleeve. The sleeve will be removed from the ground using a shovel.

Upon collection, sleeves will be capped with Teflon sheets and plastic end caps, labeled, and immediately placed on ice pending transport to a California state-certified laboratory, following USEPA chain-of-custody protocol. Each sample will be labeled with a unique sample number, sample date and time, and the sampler's initials.

To minimize the risk of cross contamination, all sampling equipment will be decontaminated between sampling locations. Decontamination will consist of an initial wash of the sampling equipment with tap water and Alconox, trisodium phosphate, or equivalent detergent, followed by a rinse with tap water, and a final rinse with deionized water.

Waste generated from this investigation is expected to consist of personal protective equipment (PPE), and equipment decontaminant rinsate. The PPE will be transported off-site and disposed. Equipment rinsate will be passed through the on-site treatment system.

Laboratory Analysis

Confirmation soil samples will be analyzed for arsenic using EPA Method 6010B. Following completion of the sample analyses, the analytical laboratory will dispose of the samples in compliance with applicable laws and regulations.

Appendix I
Stockpile Soil Sampling and Analysis Plan

Appendix I
Stockpile Soil Sampling and Analysis Plan

This Stockpile Soil Sampling and Analysis Plan (SAP) is part of the Remedial Action Plan (RAP) for the S-W property located at 1450 Sherwin Avenue in Emeryville, California and a portion of the adjacent former Rifkin property, located at 4525 – 4563 Horton Street, to which hazardous substances have migrated from the S-W property. Collectively the S-W property and this portion of the former Rifkin property are referred to as the "Site" within this document. This SAP describes sampling and analysis of waste stockpiles following material excavation activities.

Soil Sampling Strategy

Stockpile samples will be collected in accordance with disposal facility waste profiling and acceptance criteria, and is anticipated to be no more than of one set of samples per 500 cubic yards of waste material.

The actual locations of stockpile samples will be presented in the completion report. All sampling activities will be conducted in accordance with a site-specific health and safety plan.

Sampling Methods and QA/QC Procedures

Sampling methods and laboratory analyses are presented below.

Sample Collection

Soil stockpile samples will be collected using one of the following methods:

- A core-barrel, which accepts two-inch diameter, six-inch long stainless steel sleeve inserts, will be driven six inches into the soil (or stockpile) using a slide hammer attachment.

- A six-inch long stainless steel sleeve will be driven six inches into the soil using a hand-held hammer. The sleeve will be protected from damage by placing a piece of wood between the hammer and the sleeve. The sleeve will be removed from the ground using a shovel.

- Immediately after a sleeve sample is taken under either method above, a sub-sample will be taken for VOC analysis using En Core® sampling methodology and preservation, or equivalent.

Upon collection of sub-sample for VOC analysis, sleeves will be capped with Teflon sheets and plastic end caps, and labeled. The sleeve samples and VOC sub-samples will be immediately placed on ice pending transport to a California state-certified laboratory, following USEPA chain-of-custody protocol. Each sample will be labeled

with a unique sample number, sample date and time, and the sampler's initials. The discrete samples will be composited for analysis at the laboratory.

To minimize the risk of cross contamination, all sampling equipment will be decontaminated between sampling locations. Decontamination will consist of an initial wash of the sampling equipment with tap water and Alconox, trisodium phosphate, or equivalent detergent, followed by a rinse with tap water, and a final rinse with deionized water.

Waste generated from this investigation is expected to consist of personal protective equipment (PPE), and equipment decontaminant rinsate. The PPE will be transported off-site and disposed. Equipment rinsate will be passed through the on-site treatment system.

Laboratory Analysis

Stockpile samples will be analyzed for metals using EPA Methods 6010/7000, volatile organic compounds (VOCs) using EPA Method 8260B, semi-volatile organic compounds (SVOCs) using EPA Method 8270C, and/or possibly other constituents required for disposal.

To assess disposal requirements, the stockpile samples may be composited and analyzed for constituents in accordance with disposal facility acceptance criteria. Following completion of the sample analyses, the analytical laboratory will dispose of the samples in compliance with applicable laws and regulations.

Appendix J

Criteria for Implementing Active Groundwater Extraction

Appendix J
Criteria for Implementing Active Groundwater Extraction

This appendix presents the evaluation for determining the appropriate groundwater extraction contingency action criteria for arsenic at the slurry wall breaches along the Union Pacific Railroad property after implementation of the preferred remedy at the S-W property located at 1450 Sherwin Avenue in Emeryville, California and a portion of the adjacent former Rifkin property, located at 4525 – 4563 Horton Street, to which hazardous substances have migrated from the S-W property. Collectively the S-W property and this portion of the former Rifkin property are referred to as the "Site" within this document.

The preferred remedy is identified as Alternative 6 in the final Feasibility Study (FS), dated April 1, 2009 (CDM, 2009b) and presented in this Remedial Action Plan (RAP). The preferred remedy includes the following remediation activities: removal of the raised cap, excavation of vadose zone soil with arsenic above background, excavation of saturated zone soil identified as source to groundwater (i.e., source area soil), backfill of the excavation, installation of a surface cover, and installation of selected slurry wall breaches/extension; and, then to be followed by a groundwater monitoring program which would be designed to demonstrate long-term monitored natural attenuation of residual chemicals of concern (COCs) in groundwater.

As part of the preferred remedy, water from inside the slurry wall will be allowed to flow through two breach areas adjacent to the Union Pacific Railroad property, where it will blend with regional groundwater. Each of these breach areas will consist of a collection trench and a distribution trench on the upgradient and downgradient sides of the slurry wall. These trenches will be installed to the top of the A/B aquitard to allow effective connection with the lenticular sands that are present. Connector trenches installed to below the water table will interconnect these collection and distribution trenches to allow groundwater to move from inside to outside the slurry wall. A performance monitoring well will be installed in the distribution trench at each of two breaches, as a point north of the northernmost interconnection breach trench to allow a determination of concentrations that are exiting from the slurry wall area. Monitoring results from these points will be used to assess the performance of the remedy and to determine if additional actions to protect downgradient groundwater may be necessary. Water that discharges through the breach interconnect trenches will flow to the distributary trench, where it will move into the regional groundwater flow system, principally by moving through sand lenses that are intersected by the trench.

The objective of this evaluation is to assess conditions at these two performance monitoring points that would trigger actions necessary to prevent concentrations in groundwater entering the Temescal Creek channel underdrain from exceeding the

cleanup goal of 36 micrograms per liter (µg/L) for arsenic in groundwater. The 2002 ENTRIX Site Remedial Investigation (RI) report used results from a tidal study that demonstrated tidal fluctuations occur in the A zone and the Temescal Creek channel (ENTRIX, 2002). A water budget approach was used in the 2002 ENTRIX Site RI report to develop a mixing based attenuation ratio between groundwater in the A zone and water in the underdrain system. This report concluded that an attenuation ratio of 0.0003 between the A zone groundwater and the underdrain gravels would occur.

Additional processes that will lead to attenuation of arsenic concentrations within the Temescal Creek channel underdrain material will also be active, such as co-precipitation with iron oxides that are anticipated to be common in this material. The tidal flushing that occurs brings oxygenated water into the underdrain during each rising tidal cycle. This oxygenated water will interact with dissolved iron present in the urban runoff that is also present in the underdrain, leading to precipitation of iron oxides and subsequent immobilization of dissolved arsenic. This tidal influx also results in mixing of the large quantities of San Francisco Bay water with inflowing groundwater and urban runoff in the underdrain, which will also result in major attenuation of arsenic concentrations. However, these mixing and geochemical attenuation processes are not considered in this evaluation, rendering the approach presented in following paragraphs very conservative.

As part of the FS and RAP, groundwater modeling was used to assess the water quantities moving through the slurry wall breaches and to assess the fate and transport of arsenic as it enters the regional groundwater flow system. The north breach presents the worst case for transport to the vicinity of the Temescal Creek channel underdrain material, since at its closest point the distance separating the two features is about 45 feet. The flow distance over which dissolved arsenic would move would be somewhat greater than this, since most of the water exiting the north breach area flows to the northwest. Groundwater from the south breach moves to the west and northwest, and has a much longer flow path that must be traversed prior to reaching the Temescal Creek area, or San Francisco Bay.

For comparison with the approach presented in the 2002 ENTRIX Site RI report, the water budget in the breach area was assessed using the FS/RAP groundwater model. The quantity of groundwater exiting the slurry wall through the north breach area is approximately 110 cubic feet per day (ft^3/day), which will eventually enter the Temescal Creek channel underdrain over an approximately 90 foot length. This water that enters the underdrain will mix with urban runoff that is moving through the underdrain and the flushing tidal waters, resulting in massive attenuation, even before the impact of geochemical immobilization is considered. The flow in the Temescal Creek channel at a gauging station in the headwaters upgradient of the Site indicates a monthly low flow of 0.09 cubic feet per second (cfs) (ENTRIX, 2002). The anticipated flow at the Site would be considerably larger, since additional urban contributing area is present between this gage and the Site. In addition to this

component of upgradient flow, the entire pore volume of the segment of the Temescal Creek channel underdrain that would potentially receive groundwater originating at the north breach is displaced approximately every 14 hours with the tidal fluctuations (ENTRIX, 2002). The volume of this pore space within this potential discharge zone is about 2,800 cubic feet. These volumes that would mix with the inflowing groundwater would result in an attenuation ratio of approximately 0.009, if dilution were considered.

In order to develop a conservative estimate of north breach arsenic in groundwater concentrations that would not result in an exceedance of the 36 µg/L cleanup goal for arsenic in groundwater adjacent to the Temescal Creek channel underdrain, the existing FS/RAP numerical model describing groundwater flow and fate and transport was used to simulate transport of arsenic through the breach and into the regional groundwater flow system. For the purposes of this estimate, the model was configured with a constant dissolved arsenic concentration in the breach interconnect trenches of 1,000 µg/L at time 0. This dissolved arsenic was allowed to move with groundwater and sorb onto the subsurface materials at the rates appropriate for each of the lithologies that are present, as utilized in the FS (see Appendix B of CDM, 2009b).[1] This has the effect of retarding the movement of dissolved arsenic as this equilibrium sorption occurs. The concentration of dissolved arsenic over time simulated in the model was examined to assess the worst case location and the layer with the highest concentration and earliest arrival of arsenic at the creek. This worst case occurs in model layer 6 at a distance of about 85 feet north of well LF-25.

The arsenic in groundwater concentrations over time at this worst case location is summarized on Figure J1 for the 50 year simulation period. These simulation results indicate that if a concentration of 1,000 µg/L arsenic were to discharge through the north breach, at the end of 30 years the highest concentration simulated adjacent to Temescal Creek channel would be 138 µg/L arsenic. Therefore, the attenuation ratio for arsenic in groundwater from the north breach to the area adjacent to the Temescal Creek channel over this time period is approximately 0.138. Using this attenuation ratio, a concentration of 261 µg/L arsenic at the north breach is projected to result in a concentration of 36 µg/L arsenic adjacent to Temescal Creek channel after 30 years.

Based on this conservative evaluation, a threshold level of 250 µg/L (rounded down from 261 µg/L) for arsenic in groundwater at the north breach, combined with an increasing arsenic concentration trend, is recommended as the appropriate groundwater extraction contingency action criteria for arsenic at the north breach.

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[1] A Kd of 8 was used for sand/gravel units and a Kd of 40 was used for silt/clay units, where Kd is the soil-water portioning coefficient for arsenic (soil concentration/water concentration).

The flow path from the south breach is much longer, and arsenic is not projected to arrive at Temescal Creek channel over the modeled evaluation period. An alternate location at the western side of the Union Pacific Railroad property was considered as a potential receptor for arsenic in groundwater migrating from the south breach. Even though this location is not connected with San Francisco Bay, a threshold concentration of 36 µg/L was considered in the evaluation. The same approach described above for the north breach was implemented for the south breach. For the purposes of this estimate, the model was configured with a constant dissolved arsenic concentration in the breach interconnect trenches of 1,000 µg/L at time 0. The concentration of dissolved arsenic over time simulated in the model was examined to assess the worst case location and the layer with the highest concentration and earliest arrival of arsenic at western side of the Union Pacific Railroad property. This worst case occurs in model layer 6 at a distance of about 130 feet south of well LF-24.

The arsenic in groundwater concentrations over time at this worst case location is summarized on Figure J2 for the 50 year simulation period. These simulation results indicate that if a concentration of 1,000 µg/L arsenic were to discharge through the south breach, at the end of 30 years the highest concentration simulated adjacent to western side of the Union Pacific Railroad property would be 2.46 µg/L arsenic. Therefore, the attenuation ratio for arsenic in groundwater from the south breach to the area adjacent to the western side of the Union Pacific Railroad property over this time period is approximately 0.0025. Using this attenuation ratio, a concentration of 14,600 µg/L arsenic at the south breach is projected to result in a concentration of 36 µg/L arsenic adjacent to western side of the Union Pacific Railroad property after 30 years. This value of 14,600 µg/L arsenic at the south breach is almost 56 times the value estimated for the north breach for this same evaluation.

A conservative threshold level of 500 µg/L for arsenic in groundwater at the south breach (i.e., 2 times the value recommended for the north breach), combined with an increasing arsenic concentration trend, is recommended as the groundwater extraction contingency action criteria for arsenic at the south breach.

The performance monitoring program for the Site will provide an early warning of increasing concentrations approaching the breaches, in addition to the monitoring within the breaches themselves.

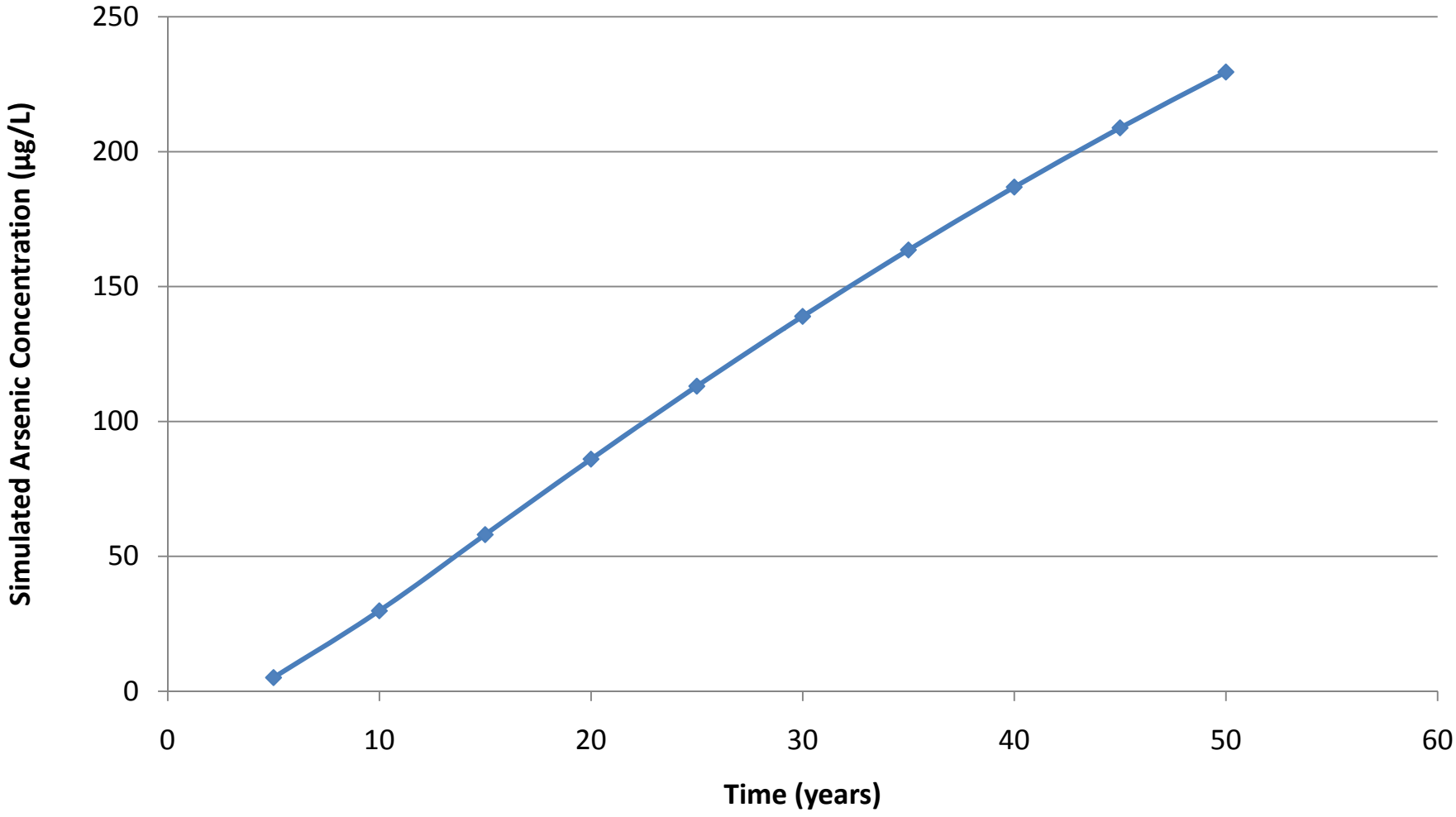

Figure J1
Simulated Arsenic Concentration in Groundwater Adjacent to Temescal Creek Channel with 1,000 µg/L Source Concentration
Sherwin-Williams Company – Emeryville, California

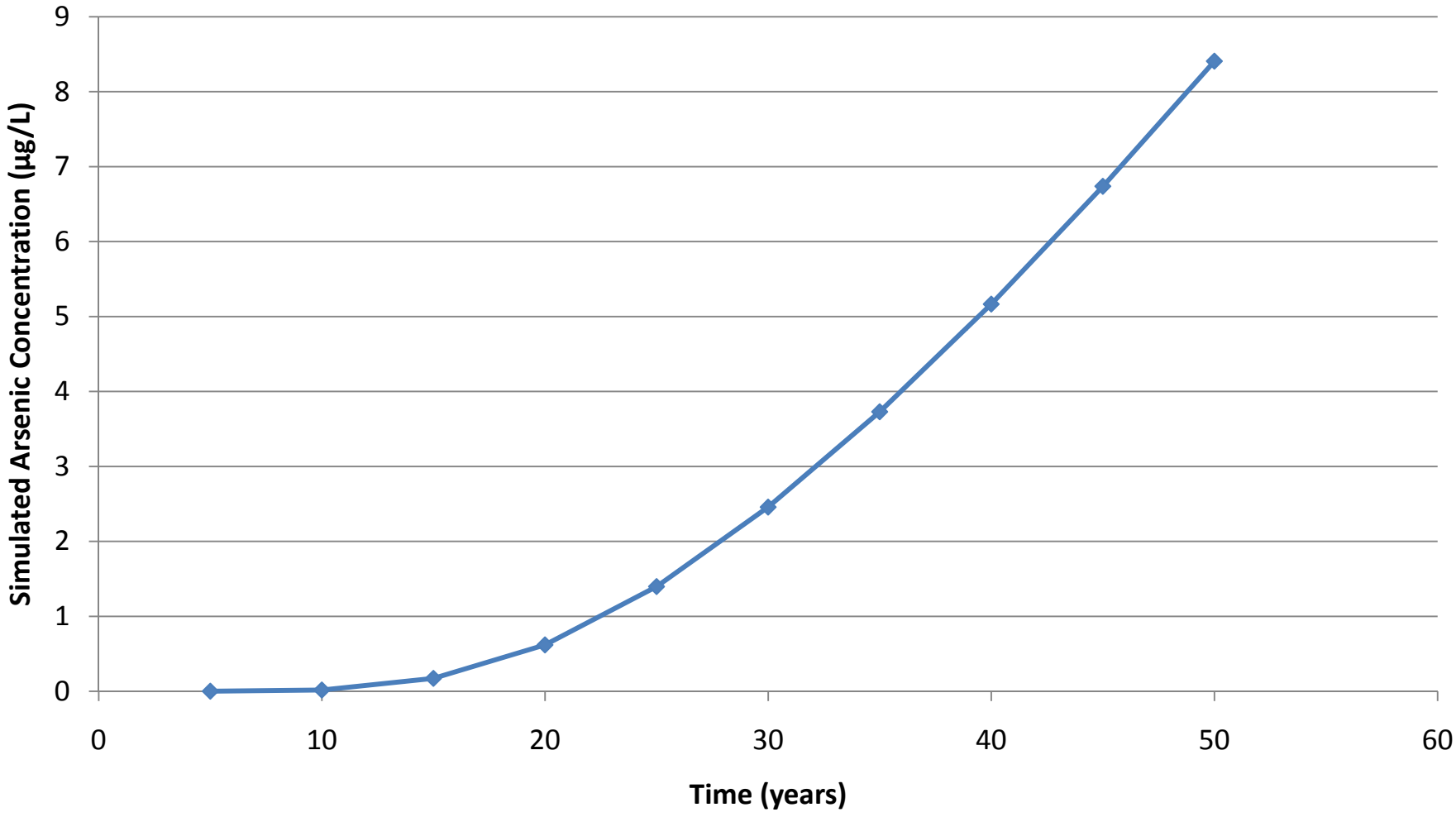

Figure J2
Simulated Arsenic Concentration in Groundwater Adjacent to Western Track Boundary with 1,000 µg/L Source Concentration
Sherwin-Williams Company – Emeryville, California

Appendix K

Contingency Groundwater Extraction Action Evaluation

Appendix K
Contingency Groundwater Extraction Action Evaluation

This appendix presents results from an evaluation of groundwater extraction as a possible contingency action after implementation of the preferred remedy at the S-W property located at 1450 Sherwin Avenue in Emeryville, California and a portion of the adjacent former Rifkin property, located at 4525 – 4563 Horton Street, to which hazardous substances have migrated from the S-W property. Collectively the S-W property and this portion of the former Rifkin property are referred to as the "Site" within this document.

The preferred remedy is identified as Alternative 6 in the final Feasibility Study (FS), dated April 1, 2009 (CDM, 2009b) and presented in this Remedial Action Plan (RAP). The preferred remedy includes the following remediation activities: removal of the raised cap, excavation of vadose zone soil with arsenic above background, excavation of saturated zone soil identified as source to groundwater (i.e., source area soil), backfill of the excavation, installation of a surface cover, and installation of selected slurry wall breaches/extension; and, then to be followed by a groundwater monitoring program which would be designed to demonstrate long-term monitored natural attenuation of residual chemicals of concern (COCs) in groundwater.

Section 7.2 of this RAP presents criteria for when a contingency action that includes groundwater extraction would be needed after implementation of the preferred remedy. The objective of this groundwater extraction would be to prevent further migration of arsenic contaminated groundwater on the former Rifkin property or through the slurry wall breaches along the Union Pacific Railroad (UPRR) property. For this evaluation, further arsenic migration was defined as northerly groundwater movement across Line B (Line B is located on the former Rifkin property and is defined in the Settlement Agreement between Novartis and S-W as a line connecting the Rifkin Guard Wells) or groundwater movement through the slurry wall breaches from the S-W property to the UPRR property. The purpose of this memorandum is to demonstrate the feasibility of a groundwater extraction scenario to meet this objective.

Therefore, the intent of the evaluation was to determine an appropriate location and pumping rate for a groundwater extraction scenario to develop a capture zone extending to Line B on the former Rifkin property and the slurry wall breaches along the UPRR property.

Groundwater Model Approach

A groundwater model for the Unit A aquifer (A-zone) was used for the FS to develop the preferred remedy. The model basis and results were presented in Appendix B of the FS (CDM, 2009b). This same groundwater model was used for this evaluation for developing an appropriate groundwater extraction scenario after implementation of

the preferred remedy. No alterations were made to the preferred remedy or groundwater model basis for this evaluation.

A contingency action that includes groundwater extraction would take advantage of the high permeability backfill planned on the S-W property, as part of the preferred remedy. This area would have uniform backfill material with a permeability as high as the sand lenses that are present within the A-zone, approximately 28.3 feet/day. Aside from modeling results for this evaluation, Figures K1 and K2 of this memorandum present the location of this backfill area and other remedy components, including the adjacent low permeability backfill areas, membrane barrier, interceptor trench, and slurry wall system; and, also present the location of Line B.

The uniform nature of this high permeability backfill would allow for enhanced hydraulic communication with surrounding native materials, backfill at the remainder of the Site, and interceptor trench. Therefore, groundwater extraction after implementation of the remedy would entail incorporation of this high permeability backfill on the S-W property as part of the contingency action.

A series of iterative model simulations assessing different well locations within the high permeability backfill area and different pumping rates was conducted to select a scenario that would meet the objective of this contingency action. Each scenario was evaluated by assessing direction and magnitude of the hydraulic gradient at Line B and the downgradient slurry wall breach nearest to the source area. The model indicates that of the two downgradient slurry wall breaches along the UPRR property, the one near well CDM-108 is the more likely to first have potential increases in COC concentrations that would trigger a need for contingency action. Figure 7-1 of this RAP presents the location of CDM-108.

Groundwater Model Results

Based on these groundwater model simulation results, a single groundwater extraction well within the high permeability backfill on the S-W property would be sufficient to meet the objective of this contingency action. Under this selected groundwater extraction scenario, a pumping rate of approximately 3.1 gallons per minute (gpm) from this well would be sufficient to maintain a hydraulic capture zone that extends to Line B and the slurry wall breach near well CDM-108.

Figure K1 shows this selected well location within the high permeability backfill on the S-W property, along with the simulated steady-state potentiometric surface after implementation of this selected groundwater extraction scenario. The steady-state potentiometric surface depicts the radial flow pattern that would develop due to pumping from this well. The pumping rate of 3.1 gpm would be achievable due to the enhanced hydraulic communication between this well and surrounding uniform high permeability backfill that would be interconnected with the native materials, uniform low permeability backfill on the former Rifkin property and S-W property, and interceptor trench.

Figure K2 shows a particle tracking simulation, where tracer particles were placed in the model at Line B, along the slurry wall system, and other strategic locations and the particle traces were tracked after implementation of this selected groundwater extraction scenario, showing their movement in the A-zone. These particle traces demonstrate that under this selected groundwater extraction scenario, this contingency groundwater extraction action would adequately provide control of migration of COCs in groundwater.

A sensitivity analysis of this simulation was conducted to assess the ability of this selected groundwater extraction scenario to maintain its objective of hydraulic capture under higher recharge conditions than those presented in the FS. As such, an additional simulation using a uniform 50 percent increase in recharge for the S-W property was run; the former Rifkin property was maintained at near zero recharge given future use as a paved parking lot. Results from this additional simulation also met the objective of the contingency action, yielding similar results to those presented in Figures K1 and K2. With this higher recharge rate for the S-W property, hydraulic capture would be achieved through increasing the pumping rate from this well to 4.5 gpm. This higher pumping rate is also considered achievable for this well due the enhanced hydraulic communication after implementation of the remedy

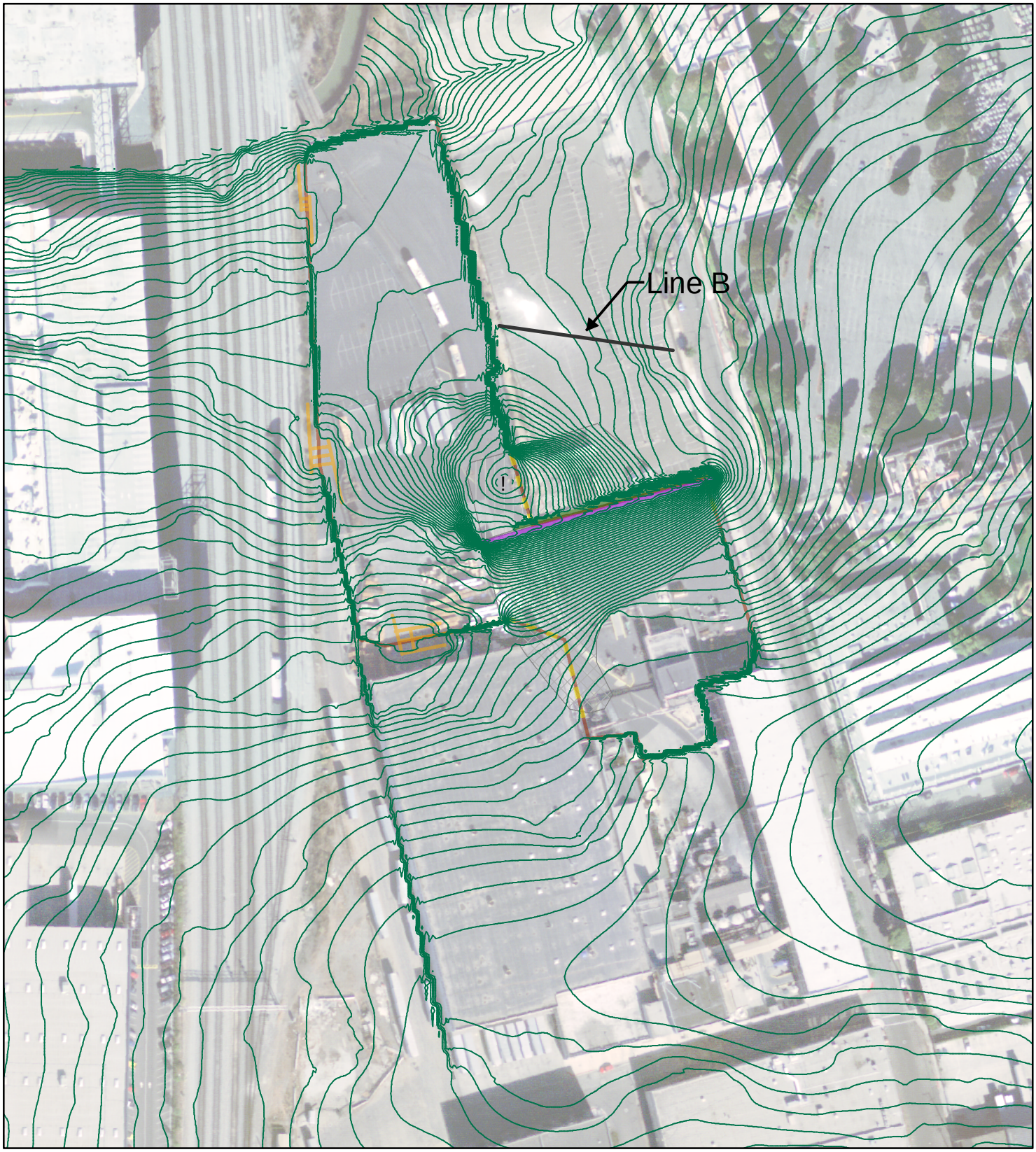

Figure K1 Simulated Potentiometric Surface for Active Groundwater Extraction

- Potentiometric Surface Contour (0.1 ft)
- ! Groundwater Extraction Well
- Membrane Barrier
- Interceptor Trench
- Breach Without Treatment
- Slurry Wall Removal With Excavation
- Current Slurry Wall
- Slurry Wall Extention
- SW Excavation and Backfill (0.283 ft/day)
- SW Excavation and Backfill (28.3 ft day)
- Rifkin Excavation and Backfill (0.283 ft/day)

0 50 100 200 Feet

CDM

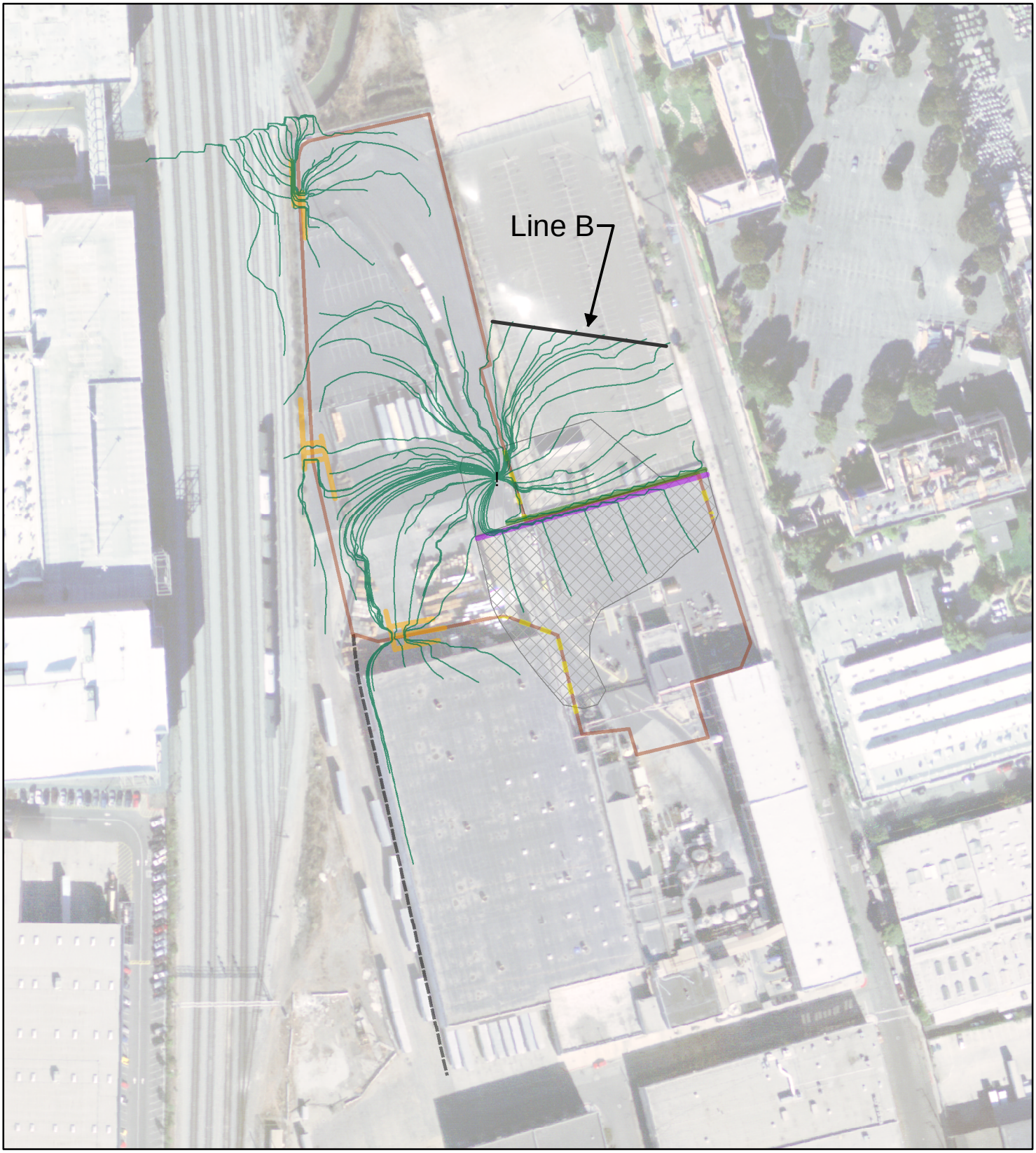

Figure K2 Particle Tracking for Active Groundwater Extraction

- Particle Tracks
- ! Groundwater Extraction Well
- Membrane Barrier
- Interceptor Trench
- Breach Without Treatment
- Slurry Wall Removal With Excavation
- Current Slurry Wall
- Slurry Wall Extention
- SW Excavation and Backfill (0.283 ft/day)
- SW Excavation and Backfill (28.3 ft day)
- Rifkin Excavation and Backfill (0.283 ft/day)

CDM

0 50 100 200 Feet

Appendix L
Responsiveness Summary

RESPONSIVENESS SUMMARY
for the
Sherwin-Williams Site
1450 Sherwin Avenue, Emeryville, California
on the
Draft Remedial Action Plan and California Environmental Quality Act (CEQA) Mitigated Negative Declaration

June 2010

I. Introduction.

This Responsiveness Summary is DTSC's response to comments submitted during the public comment period for the draft Remedial Action Plan (draft RAP) and the California Environmental Quality Act (CEQA) Mitigated Negative Declaration prepared for the Sherwin-Williams Site located at 1450 Sherwin Avenue in Emeryville, Alameda County, California and a portion of the adjacent Novartis property. Collectively, the Sherwin-Williams Site consists of the Sherwin-Williams property and this portion of the Novartis property, and are referred to as the "Site", more specifically identified as Assessor's Parcel Numbers 049-1041-006-00, 049-1041-026-02, 049-1041-026-06, 049-1041-026-07, 049-1041-026-04 and 049-1041-005-00 (see Figure 1).

Public participation is an integral part of the Department of Toxic Substances Control's (DTSC's) remedy selection process. To solicit public input on the proposed remedy for the Sherwin-Williams Site, the draft RAP and CEQA Mitigated Negative Declaration underwent a 52-day public comment period which ran from October 28, 2009 through December 18, 2009. A public meeting was held on November 5, 2009 to provide information regarding the Site and the proposed remedy outlined in the draft RAP and the evaluation of potential environmental impacts in the CEQA Mitigated Negative Declaration and to solicit public comments as to the adequacy of these documents.

A public notice announcing the November 5, 2009 meeting and the original public comment period running from October 28, 2009 through December 1, 2009 was published in the Oakland Tribune on October 28, 2009. A fact sheet discussing the draft RAP and the proposed Site cleanup methods was mailed to the Site mailing list between October 18 through 21, 2009. An extension of the public comment period was sent out via post card to the Site mailing list on November 20, 2009 and placed in the Oakland Tribune on December 2, 2009. Copies of the fact sheet, post card and the public notices are included in Attachment A.

On December 9, 2009, The Project Manager, Janet Naito, and the Public Participation Specialist, Nathan Schumacher met with 45th Street Artists' Cooperative residents at the

Cooperative meeting room in their building at 1420 45th Street in Emeryville. 24 residents participated and DTSC has included their comments in this document.

The draft RAP, CEQA Mitigated Negative Declaration and other site-related documents were made available for public review at DTSC's offices and at the local information repository located at the Oakland Public Library, 5606 San Pablo Avenue in Oakland, CA 94608. Copies were also made available for the 45th Street Artists' Cooperative residents at their building located at 1420 45th Street in Emeryville, CA 94608. These documents are also available at DTSC's web site: http://www.envirostor.dtsc.ca.gov/public.

The verbal and written comments received during the public meeting and comment period are compiled and included in this Responsiveness Summary. The purpose of this document is to present a written response by the DTSC to these comments.

This Responsiveness Summary is organized as follows:

- Section I is the Introduction.
- Section II lists the comments received and provides responses to these comments.
    - Section II.A provides responses to general comments received during the public comment period.
    - Section II.B. provides responses to verbal and written comments received at the public meeting.
    - Section II.C provides responses to comments received at a meeting during the public comment period at the 45th Street Artist's Coop.
    - Section II.D. provides responses to written comments received during the public comment period.
- Attachment A provides a copy of the fact sheet, post card and public notices.
- Attachment B provides a copy of the transcript from the community meeting held on November 5, 2009.
- Attachment C provides copies of the written comments received.

A copy of the RAP and other site-related documents are available for review at:

Department of Toxic Substances Control (510) 540-3800
700 Heinz Avenue, Second Floor, File Room (appointment required)
Berkeley, California 94710

Oakland Public Library (510) 622-2493
5606 San Pablo Avenue
Oakland, CA 94608

45th Street Artists' Cooperative (Co-op Residents Only)
1420 45th Street
Emeryville, CA 94608

DTSC's EnviroStor Database. You can view Site documents on DTSC's website at www.dtsc.ca.gov. "Click" on Find A Site Near You, at the top of the page, then type in "Emeryville" next to the yellow box labeled City, then go to the bottom of the page and "click" on Get Report. You will find Sherwin-Williams listed in alphabetical order. "Click" on Report next to the Site name.

SECTION II. COMMENTS AND RESPONSES

Section II.A General Comments and Concerns

Common issues and concerns were raised by several commenters. The following are responses by DTSC to these general issues and concerns. A detailed response, including any cross-reference to these general issues and concerns, to all comments received during the public comment period is provided later in this document.

General Comment #1: Why does the cleanup need to occur?

Response: The investigations conducted at the Site determined that arsenic is present within the groundwater. Past releases of arsenic and acids at the Site from the former lead arsenate production plant resulted in arsenic being bound up in an amorphous silica coating around the sand particles that the groundwater moves through. As groundwater moves through this material, it causes some of the silica coating to dissolve, releasing arsenic in the groundwater. This will continue until all of the coating is dissolved. Thus, this presents a continuing source of arsenic to the groundwater.

The Water Board has classified groundwater underlying the Site as a potential drinking water source. Cleanup actions approved by DTSC must meet all State and Federal requirements, including the San Francisco Bay Region Basin Plan (Basin Plan). The Basin Plan requires cleanup of pollutant sources that impact potential drinking water sources. Therefore, the cleanup is legally required to protect water resources. The cleanup is also necessary to prevent migration to surface water (in this case, Temescal Creek and the San Francisco Bay) and associated ecological receptors.

General Comment #2: Rail Transport Considerations.

Response: DTSC is requiring Sherwin-Williams to address vadose zone soil (soil above the water table) containing chemicals of concern above site cleanup goals, with arsenic being the primary chemical of concern. The cleanup goals take into consideration both protection of human health and the environment.

Based upon the feasibility study, vadose and saturated zone soil excavation and off-site disposal provides the best level of protection for human health and the environment. Approximately two-thirds of the soil is anticipated to be classified as

hazardous waste and one-third of the soil is anticipated to be non-hazardous waste for disposal purposes.

DTSC and the contractors for Sherwin-Williams have identified solid waste landfills that are permitted and suitable to receive the excavated soil and debris. There are three California landfills permitted to receive both hazardous waste and non-hazardous waste, although they are configured to receive waste by truck transport only. One non-hazardous waste landfill, near Marysville, California, could accept waste loaded into rail cars at the Emeryville site, but only after making special arrangements at the landfill end of the transport where they would unload the waste from the rail car into trucks for final transport to the landfill. Certain landfills in Utah, Idaho, and Oregon can receive waste transported by rail, and Sherwin-Williams continues to evaluate the advantages and disadvantages of the truck and rail transport options in terms of effects on the:

- Local traffic in the Park Avenue District;
- On-site logistics and safety;
- On-site unloading of materials from railcars;
- Cleaning of railcars after waste transport to then be used for transport of backfill;
- Noise and dust control;
- Overall remediation duration; and,
- The transport and logistics of backfill.

Given these issues, it may be possible that a portion of the backfill could be brought onto the Site via rail. However, truck transport cannot be entirely eliminated from the project. For example, certain specialized backfill materials needed to control the long-term, post-excavation flow of groundwater through the remediated Site, likely will not be available near landfills. As such, Sherwin-Williams expects that these specialized backfill materials must be delivered to the Site by trucks. Therefore, traffic controls into and out of the project Site are incorporated into the project, particularly along the preferred truck route that includes Halleck Street.

General Comment #3: Purpose of Remedial Action Plan.

Response: Each contaminated site goes through a cleanup process. The first step is to determine whether chemicals present at the site are present at levels that could pose a significant risk to human health or the environment. If present, additional investigation is conducted to determine the nature and extent of chemicals in environmental media at the site (e.g., soil, soil gas, groundwater, surface water). Based upon an evaluation of the potential risk the contamination found poses to human health and the environment, the areas that need to be addressed as part of a cleanup plan are identified in a Remedial Investigation Report. A range of cleanup technologies is then screened to identify those that could address the chemicals found at the site, with the results presented in a Feasibility Study. Additional laboratory and field testing may be required at this stage to determine whether specific technologies will work on the chemicals and conditions found at the site and

to determine how much it would cost to implement each technology. In the next step, a cleanup plan is prepared that proposes an appropriate remedy for public review.

At this Site, based upon input from the community and members of the Consultative Work Group, DTSC required Sherwin-Williams to complete a Public Health Evaluation of the Remedial Alternative or PHERA, in addition to the documents discussed above. The PHERA analyzed potential risks associated with chemicals in soil, soil vapors, and groundwater at the Site during implementation of the proposed cleanup plan. This evaluation determined that controls were needed to reduce the amounts of dust generated and volatile organic compounds that could be released.

At the Sherwin-Williams Site, DTSC calls the cleanup plan a Remedial Action Plan. As required by state and federal law, DTSC submitted the Remedial Action Plan for public review and comment, along with a CEQA evaluation (see General Comment #4 regarding CEQA).

The Remedial Action Plan proposes a conceptual cleanup plan for the Site. It established goals, describes the proposed cleanup technology, and outlines legal requirements that must be met. The details describing how the remedy will be implemented are not put together until the proposed remedy is approved.

Once DTSC approves a remedy, a Remedial Design is prepared describing how the remedy will be implemented. The Remedial Design contains the engineering details describing specifically how the remedy will be implemented. It also describes the actions required to ensure that the goals and requirements established in the Remedial Action Plan are achieved during implementation. For example, the Remedial Action Plan sets air monitoring goals for allowable levels of dust and contaminants in air during implementation. The Remedial Design will include specific dust controls to be implemented, the air monitoring equipment that will be used, the length of the monitoring periods, and how air monitoring data will be communicated to the surrounding community during implementation.

General Comment #4: CEQA Evaluation Considerations, Significance Standards and Consideration of Rail Transportation.

Response: CEQA, or the California Environmental Quality Act, is a state statute that requires state and local agencies to identify the significant environmental impacts of their decisions and identify how to avoid or mitigate those impacts, if feasible. A public agency like DTSC must comply with CEQA when it undertakes an activity defined by CEQA as a "project." A project is an activity undertaken by a public agency or a private activity which must receive some discretionary approval (meaning that the agency has the authority to deny or approve the requested permit or action) from a government agency which may cause either a direct physical change in the environment or a reasonably foreseeable indirect change in the environment. DTSC has determined that its approval of a Remedial Action Plan is

an action subject to CEQA.

When examining a project subject to CEQA, DTSC prepares an Initial Study to determine whether the project may have a significant adverse effect on the environment. If no potential significant effects are identified, a negative declaration is prepared (Section 21080(c) of the California Public Resources Code). A mitigated negative declaration is called for if there are potential effects, but these can be mitigated to a level of insignificance (Public Resources Code Section 21064.5). An EIR is required if there are significant environmental effects which cannot be avoided or mitigated (Public Resources Code Sections 21100 and 21151).

The *CEQA Guidelines* defines "significant effect on the environment" as: "a substantial, or potentially substantial, adverse change in any of the physical conditions within the area affected by the project including land, air, water, minerals, flora, fauna, ambient noise, and objects of historic or aesthetic significance" (*Guidelines* Public Resources Code Section 15382).

Thresholds are generally established by the agency or local entity with jurisdiction over the resource. Thresholds may be either qualitative or quantitative, incorporating applicable legal standards and requirements and are analytic tools to assist in significance determinations. They should be based on legal standards, studies, surveys, reports, or other data which can identify that point at which a given environmental effect becomes significant.

The CEQA Initial Study looks at the recommended remedial alternative as the project. Project activities that would likely create some form of physical *impact* or *effect* are identified for each of the environmental resource categories. As the Remedial Action Plan contains a conceptual cleanup plan, there may be several ways to conduct a specific activity that meet the established goals and legal requirements. For instance, at the Sherwin-Williams Site, transportation of excavated soil to an off-site disposal facility is described in the project description as potentially being conducted using trucks or rail cars. DTSC looked at both options and determined that the use of trucks had the potential for more significant impacts on the environment. Therefore, DTSC carried that through the analysis. DTSC should have done a better job of communicating this within the Initial Study. In no way did DTSC intend to imply that only trucks would be used to transport excavated soil off-site and/or fill material back to the Site. Please see the response to General Comment #2 above for discussion of rail transport considerations.

The Initial Study lists the following environmental resources that could potentially be impacted by the use of trucks: Aesthetics, Air Quality, Noise, Transportation and Traffic.

Aesthetics- Use of rail cars would lessen the number of trucks crossing the Park Street where the City of Emeryville is currently completing the installation of a new roadway. Additionally, rail cars would use established tracks. Therefore, no change

to the conclusions is required.

Air Quality- As part of the CEQA process, DTSC evaluated an all-truck transport alternative and a transport alternative that incorporates rail, and determined that both are within threshold criteria and result in a less than significant air quality impact. In Section 15 of the CEQA Initial Study, Transportation and Traffic, these two transportation alternatives were described as Alternative Truck Route Number 5 and Number 2, respectively. In Section 3 of the CEQA Initial Study, Air Quality, the all-truck transport alternative (Number 5) was presented since it has the higher potential impact to air quality in the Site vicinity. The following paragraphs compare these two transportation alternatives in terms of air quality impacts. The comparison considers diesel fuel consumption as a surrogate for air quality impacts from diesel engine emissions.

For the all-truck transport alternative (Number 5), the average daily truck trip estimate is 220 truck trips per day, consisting of 114 truck trips for excavated material transported off-site and 106 truck trips for import backfill material transported on-site. For the alternative that incorporates rail transport (Number 2), the excavated material would be transported off-site by rail gondola cars, eliminating the need for 114 truck trips, thus reducing the average daily truck trip estimate from 220 to the 106 needed for backfill material. The rail option then adds two types of rail-based equipment: (1) diesel-electric locomotive used to move gondola cars between the UPRR Emeryville Yard adjacent to the Site and the UPRR Oakland Yard, and; (2) an on-site railcar mover used to move gondola cars within and between the Emeryville Yard and Site spur track. The railcar mover would be utilized approximately 8 hours each work day when excavation occurs. The locomotive would be in the Site vicinity only when moving gondola cars, anticipated to be twice a week between the Emeryville Yard and Oakland Yard.

On average, freight transport by rail can move a ton of material 457 miles on a gallon of diesel (AAR 2009), over long distances, similar to those anticipated from the Site to off-site disposal facilities. On average, freight transport by truck for similar distances requires four times the energy compared to rail (AAR 2009). A heavy single-unit truck is expected to have an average fuel efficiency of 8.2 miles per gallon diesel (ORNL 2009).

Under the all-truck transport alternative, approximately 134 gallons of diesel would be consumed on average per day by the 220 truck trips through the Site vicinity, defined to a distance of 5 miles from the Site. Under the transport alternative that incorporates rail, approximately 123 gallons of diesel would be consumed on average per day. This average rate of 123 gallons of diesel per day is based on the following:

- 65 gallons of diesel per day for 106 truck trips through the Site vicinity, defined to a distance of 5 miles from the Site;
- 25 gallons of diesel per day for the on-site railcar mover; and,

- 33 gallons of diesel per day for the diesel-electric locomotive.

As compared to the all-truck transport alternative, the transport alternative that incorporates rail could reduce diesel consumption by approximately 11 gallons per day, which is equivalent to reducing diesel engine emissions by approximately 18 truck trips through the Site vicinity. DTSC has determined that both alternatives are within threshold criteria and result in a less than significant air quality impact.

References:
Association of American Railroads (AAR). 2009. Railroads: Green From the Start. July. Available at: http://www.aar.org/~/media/AAR/BackgroundPapers/Green%20from%20the%20Start%20%20July%202009.ashx [May 3, 2010].

Oak Ridge National Laboratory (ORNL). 2009. Transportation Energy Data Book: Edition 28. Table 5.1. Prepared for the U.S. Department of Energy. ORNL-6984. Available at: http://cta.ornl.gov/data/download28.shtml [May 3, 2010].

Noise- Use of rail cars has the potential to generate noise as rail cars are filled and moved. However, the levels of noise are not expected to exceed those analyzed as part of the Initial Study analysis. Therefore, no change to the conclusions is required.

Transportation and Traffic- Use of rail cars would lessen the number of trucks used to transport excavated soil off-site and/or backfill material to the Site. Therefore, no change to the conclusions is required.

General Comment #5: Community Safety Concerns from Dust and Vapor Emission and Communication of Air Monitoring Results During Remedy Implementation.

Response: The Site is currently paved or covered by building foundations. Releases of arsenic and lead-containing dust and organic vapor emissions are unlikely to occur until the soil is exposed and actively handled at the Site.

Based upon input from the community and members of the Consultative Work Group, DTSC required Sherwin-Williams to complete a Public Health Evaluation of the Remedial Alternative or PHERA. The PHERA analyzed potential risks associated with chemicals in soil, soil vapors and groundwater at the Site during implementation of the proposed cleanup plan. This evaluation determined that controls were needed to reduce the amounts of dust generated and volatile organic compounds that could be released.

By using controls, such as water sprays and foams during excavation and covering soil stockpiles, the amount of dust and vapor emissions generated can be reduced by 99 percent. In addition, vapors will be controlled by extracting soil vapors prior to and during soil excavation and pumping groundwater to minimize the amount of

water that accumulates at the bottom of the excavation area. The PHERA determined that together, these controls would reduce the potential health risks to the adults and children in the community to below the state's acceptable risk thresholds.

To monitor the effectiveness of the dust and vapor controls, performance standards and action levels were calculated. Performance standards identify how much arsenic, lead or VOCs can be present in the air before posing an unacceptable health risk. This information is then used to calculate dust and vapor action levels that should not be exceeded during cleanup. Action levels are compared to real-time measurements that take place during implementation of the cleanup activities. This ensures that the community is protected from any adverse health effects. These action levels are discussed in Section 6.2 of the Remedial Action Plan.

Stationary air monitors will collect air samples for laboratory analysis of arsenic, lead, and VOCs. These results (which will not be available in real-time) will be compared to the performance standards to verify that the dust and vapor controls and the action levels are appropriate to ensure that community is protected.

Because samples collected at the perimeter of the Site need to be analyzed in the laboratory, they are not useful for "real-time" decision-making. Instead the real-time measurements for dust and vapor, using hand-held instruments, will be compared to the action levels and used by on-site supervisors for decision-making. If needed, the supervisors will stop work and/or modify the dust/vapor controls, as needed, so that dust/vapor actions levels are met.

Arsenic is the compound found most frequently and at the highest concentrations at the Site. DTSC used the average arsenic concentration across an excavation area to calculate dust action levels. Dust action levels ranged from 0.6 micrograms per cubic meter of air (ug/m3) during removal of the Raised Cap materials to 50 ug/m3 during shoring installation. For comparison purposes, the dust action level based upon lead concentrations in the soil would be 134 ug/m3.

As discussed in the Remedial Action Plan, Section 6.2.1, fixed-location direct-reading monitors will be used at perimeter air monitoring stations to measure dust levels at the Site boundaries. The dust monitors will consist of ThermoMIE brand DataRam units or equivalent that reliably respond to respirable dust concentrations as low as 0.1 microgram per cubic meter (µg/m3). Respirable dust is particulate matter 10 microns or smaller. The dust monitors will be used to automatically record dust concentrations, and provide an alert if the dust action level is exceeded.

Additionally, during construction operations, portable dust monitors will be utilized near on-site activities so that real-time feedback can be provided to adjust construction operations and/or dust controls to limit potential exceedance of the dust action level at the perimeter air monitoring stations.

During the initial weeks of remedy implementation, perimeter air samples will be collected 24-hours a day for arsenic, lead, and VOC analysis. Collection will be performed using high-volume size selective inlet (SSI) samplers located in a predominantly downwind position. This high-volume air sampling will be performed each work day during removal of the Raised Cap. Data collected from these sampling events will be compared to performance standards for arsenic, lead, and VOCs and evaluate how they correlate with real-time respirable dust and VOC action levels. Daily sampling will continue from the start of the soil excavation activities. Once a reliable correlation is established, Sherwin-Williams may propose a reduced sampling frequency to DTSC. Any reduction would have to be approved by DTSC before it could be implemented. DTSC will require daily sampling when soil excavation activities are occurring in areas with the high arsenic and VOC levels.

Section II.B.1 <u>Public Meeting - Verbal Comments</u>

On November 5, 2009, comments/questions on the draft RAP and CEQA Mitigated Negative Declaration were solicited at a public meeting held at the City Council Chambers at City Hall, 1333 Park Avenue, Emeryville, California. The following comments/questions were taken from the transcript of the meeting; some of the comments/questions are rephrased for clarity.

Comments were received from

1. Unidentified Audience Member
2. Greg Harper
3. Archana Horsting
4. Louise Stanley
5. Edythe Bresnahan
6. Diane Troy
7. Tim Curran
8. Jody Sparks
9. Sylvie Hessini
10. Scott Donahue
11. Teresa Kalnoskas
12. Michael Hammond
13. Seth Headson
14. Sridhar Aaraharam

Comment 1-1: When is the work scheduled to start?

Response: Per the revised schedule in the Final RAP, work will begin in the first quarter of 2011.

Comment 2-1: …what life forms does the contaminated groundwater impact?

Response: Please see the response to General Comment #1.

Comment 2-2: Paraphrase: I want to know what the practical reason is that this action has to be undertaken. A lot of people will be impacted and some entities like Sherwin-Williams and DTSC will make money over time from the development and monitoring of this site. We have to know what is really behind the project and what all this sacrifice is going to be about.

Response: Please see the response to General Comment #1. As a clarification, DTSC does not make money if the property is redeveloped. DTSC requires responsible parties, such as Sherwin-Williams, to pay for the time DTSC staff spend overseeing their investigation and cleanup activities and reviewing associated documents. Additionally, DTSC collect fees from generators of hazardous waste and uses these fees to regulate and inspect waste disposal.

Comment 2-3: Well one I didn't raise was the whole notion of using particulate traps. You've got heavy equipment whether you use rail or otherwise, and that heavy equipment is far dirtier than the trucks are going to be, that excavation equipment. And there's no reason that that should be putting out much at all. It's not PM10, it's PM1. It goes really deep into the lungs and it can't come out. And it's carcinogenic. It is the most hazardous air pollutant we know is diesel. So it is -- I sort of had the feeling that you almost trivialized it a little bit. It's not trivial. When a truck goes by and they've got an open window, it is really impacting on their health. And that needs to be at least recognized and considered, and I think the rail is the only mitigation that makes sense.

Response: Diesel exhaust and diesel particulate matter (DPM) from the trucks is regulated by the Air Resources Board and the local air districts. DTSC does not trivialize health impacts from either diesel exhaust or DPM. DTSC evaluated potential air quality impacts from the use of only truck transport (i.e., no rail transport) as part of the CEQA evaluation for this project. DTSC conducted the evaluation in accordance with the Air Resources Board and Bay Area Air Quality Management District requirements. Currently, these agencies have required measures to begin controlling the potential air quality impacts from diesel exhaust and DPM. This project has incorporated these controls.

Rail may be utilized to minimize truck usage. However, it may not be and as such, DTSC's CEQA evaluation without rail transport was utilized to determine need for mitigation. Air quality impacts from diesel exhaust and DPM from locomotives is regulated by the USEPA and CARB; such regulations are not applicable to this project and apply solely to the permitted rail operator.

Comment 3-1: I was wondering why we haven't heard anything about the rail option.

Response: Please see the response to General Comment #2.

Comment 3-2: Then why don't you talk more about it?

Response: DTSC requires that a cleanup be conducted. The Remedial Action Plan outlines the alternatives considered and a recommended cleanup alternative for the Site. DTSC agrees that DTSC could have done a better job of discussing the potential rail option at the community meeting. Please see the response to General Comments #2 and #4 for further discussion.

Comment 3-3: Paraphrased: I understood that rail was originally preferred. Rail cars were hard to find for a while but that is not the case during the recession. I don't know whether there is a disposal site. I just don't understand the criteria, why this big switch to trucks?

Response: Please see response to General Comments #2 and #4, above.

Comment 3-4: We're a united neighborhood. We admire each other, and we are a cultural resource. So if you're looking for artifacts here that happened hundreds of thousands of years ago, those were great artists, the artists that I work with, many of them have that quality. And the work that's being done in these studios is also a cultural resource. So if you'll design mitigation to save an artifact, it deserves to be saved, I'm all for it. Why not design the mitigation so that the artists who are working here and doing great work that's going to last hundreds of years, thousands in some cases, but hundreds of years for our culture and be why not create a possibility to live and work in place and health and safety. Especially when the rail solves so many problems?

Response: DTSC evaluates cultural resources as defined under the California Environmental Quality Act (CEQA). CEQA has a specific definition for cultural resources. Unfortunately, it generally does not include living artists or their work products. Please see the response to General Comment #5 regarding the Public Health Evaluation conducted to evaluate potential impacts to the surrounding community during implementation of the proposed remedy. Please see the response to General Comment #2 regarding truck versus rail considerations.

Comment 3-5: Paraphrase: A railroad manager said that railroad cars are available. So, Sherwin-Williams should talk to Union Pacific Railroad. The lines go right by the Site and that would avoid so much noise, traffic, diesel.

Response: Please see the response to General Comment #2.

Comment 3-6: Why did the whole idea of rail not show up in this? It should be carefully discussed, at least as discussed as those five alternatives, with the criteria clearly pronunciated. Why this versus that, these are our problems, why we can't do rail and are those surmountable?

Response: During a previous meeting with the community, community members asked DTSC and Sherwin-Williams to evaluate alternative truck transportation

routes. DTSC presented the results of that survey on December 9, 2009. As discussed during the public meeting, transportation via rail cars is still an option, as outlined in the Remedial Action Plan.

Please see the response to General Comments #2 and 4 for further discussion.

Comment 3-7: I appreciate you looking out for the worst case scenario, but shouldn't we be advising about the best case scenario?

Response: Please see the response to General Comment #4.

Comment 3-8: And certainly no criteria about why would people -- I mean, if you're accepting five different alternatives, why isn't that in comparison or in the context of rail? Do you understand? Because we're just completely confused how did it go from everyone talking about trucks when this project just started a decade ago or two decades ago it was represented to the council and the community at that time as a rail?

Response: DTSC was not the lead agency when the discussions the commenter referenced took place and cannot speak to discussions held between the City of Emeryville representatives and Sherwin-Williams. Rail transportation is a still an option for off-site disposal of excavated soil and for bringing clean fill material back to the Site. Please see the response to General Comment #2 for further discussion.

Comment 3-9: There is also lead in the soil and I would like to have that addressed in the report, as well as any other elements in the soil that weren't mentioned and the mitigations for those.

Response: The focus tends to be on arsenic since it is the contaminant found most frequently and at the highest concentrations relative to its cleanup goal. The Remedial Action Plan discusses the other contaminants that were found in soil, soil gas and groundwater. Lead and other contaminants found above site cleanup goals in soil were found in areas that contained arsenic above its site cleanup goal. Therefore, soil excavation targeting arsenic-impacted soil will also remove soil impacted by lead and/or other contaminants above the site cleanup goals. Lead was detected at concentrations up to 58,000 mg/kg (or 5800,000 parts per million) in soil.

Comment 4-1: I get diesel coming in my studio when I'm just sitting there now. During the day I smell diesel. And I have cracks in my windows from trucks that used to idle right here… So I'm just saying, I lived through this and I will die if trucks go by my place. I will just die. We're going to lie in the road unless you do this railroad thing. You haven't even talked about this and that's not fair…

Response: Please see the response to General Comments #2 and #4 and Comment 2-3, above.

Comment 5-1: In what I've read, that this project will go on for 6 months and for 7 days a week we will have a truck go by every 15 minutes for 10 to 8 hours a day. Now that's not a livable situation. If they go by us, we have it. If they go through the Halleck Street areas, the other living community has it…When a diesel truck goes by I cannot hear any other sounds…There is no way that you will be able to keep that dust from being picked up and carried over…That's why the alternate route is just so important.

Response: Please see the response to General Comment #2 and #4. As a clarification, work is anticipated to occur Monday through Friday from 8 a.m. to 6 p.m. in compliance with the City of Emeryville's noise requirements. As discussed in the CEQA Initial Study, the City of Emeryville must permit work outside of these hours.

Comment 5-2: The standard to have trucks idle no longer than 5 minutes seems impractical considering the number and frequency of trucks that will be coming and going from the site.

Response: This is a requirement of the Air Resources Board and local Bay Area Air Quality Management District. Therefore, the project must comply with this as a legally Applicable, or Relevant and Appropriate Requirement.

Comment 6-1: How is the material being removed from the ground?

Response: The material will be excavated out and stockpiled in the staging area while it is being tested and characterized to make sure that it goes to the right disposal facility. Equipment such as excavators and front-end loaders would be used to remove the soil. Please see the response to General Comment #5 regarding dust and vapor controls that are part of the project.

Comment 6-2: Paraphrased: How will the material and water from it be managed in the staging areas? Will soil be enclosed, or just on a slab?

Response: As discussed in the Draft RAP, section 6.8, excavated soil will be stockpiled within bermed staging areas on paved surfaces. Stockpiles will be covered with nylon-reinforced polyethylene or sprayed with stabilizing foam each night, on weekends, and all other non-work days, or when the pile is not being actively worked. If polyethylene covers are used, they will be secured with ties or a sufficient number of sandbags or other weighted objects designed to keep the cover in place.

While the stockpiles are in operation, the berms and cover will be inspected several times daily, including non-work days, to detect evidence of tears, loose seams, punctures, and the presence of water and proper functioning of water collection and removal systems.

Soil excavated from within the groundwater table will contain some water. Water that has been in contact with impacted materials, and water extracted from the excavation, will be isolated from non-impacted storm water by construction and maintenance of berms. This contact water will be: 1) treated on-site and discharged to Temescal Creek under the requirements of an NPDES construction permit, 2) discharged to the sanitary sewer (if permitted), or 3) transported off-site for treatment and discharge. The exact method of treatment, if necessary, and disposal will be discussed in the Remedial Design. The remediation contractor will select the appropriate option based upon the amount of water that has been collected, the contaminant concentrations within the water, and permitting requirements.

Comment 6-3: And then how long is that material going to sit there before it goes on the truck to be taken out?

Response: About a week. As indicated in the Draft RAP, section 6.8, it is anticipated that the volume of stockpiled material will be equivalent to 5 days of excavation, i.e., up to an estimated 5,000 cubic yards. If the rate of accumulation exceeds this amount, excavation activities will be slowed down and/or, if possible, loading and transport activities will be accelerated until material handling flow rates are approximately equal.

Comment 6-4: And what happens if somehow it [arsenic, lead or VOCs in air monitoring samples] isn't in compliance with the acceptable amount of toxins for us to be breathing?

Response: Please see the response to General Comment #5.

Comment 6-5: And as far as the removal of the material from the ground, water and the source material, there are going to be heavy equipment there that's going to be removing that?

Response: Yes, heavy equipment will be used to excavate soil, move the excavated soil to the staging area, stockpile and load it into trucks. The Draft RAP, section 6.4 states that this equipment will include excavators, excavators with hydraulic attachments like jackhammers, front-end loaders, and off-road dump trucks.

Comment 7-1: Describe the [soil stockpile] enclosure.

Response: Please see the response to comment 6-2.

Comment 7-2: Paraphrased: First, has the local population been given a detailed characterization, for instance how many children there are within the local environment? How many people have asthma? How many are elderly and have respiratory problems? I have a two-year old child and I'm concerned that engineering requirements are not effective to keep down the dust. The air

monitoring is only done during the work days, and the trucks are still spreading dust even though they may be brushed and/or hosed off. The plastic sheeting over the soil blows off or rips and becomes compromised.

Response: A health study of this community has not been performed as part of the preparation of the cleanup plan. However, a Public Health Evaluation of the Remedial Alternative (PHERA) was completed for this project. Please see the response to General Comment #5 for further discussion regarding this.

Also, the recommended remedy for this Site proposes to collect air samples continuously from perimeter air monitoring stations during the initial weeks of remedy implementation (see RAP Section 6.2.1, Perimeter Air Monitoring and Sampling). Data collected will be compared to performance standards and correlated with real-time measurements. Once a reliable correlation is established, DTSC may approve a modified reduced sampling frequency. However, daily air sampling will be continued during work in areas with the highest concentrations of arsenic in soil. As discussed on page 6-14 of the RAP, while stockpiles are in operation, the berms and cover will be inspected several times daily, including non-work days, to detect evidence of tears, loose seams and punctures. Any problems noted will be promptly repaired.

Comment 7-3: Paraphrased: People do their best, but decontamination procedures for trucks are often not adequate and cause dirty roads and dust generation. Containment systems often break down or rip open. Wants specific details for real solutions so that we are not relying upon a guy with a hose and a guy with a broom

Response: DTSC is requiring Sherwin-Williams to implement best management practices outlined by the Bay Area Quality Management District to minimize the potential for dust generation. If needed, DTSC will stop work. The project will be re-started only when it is demonstrated to DTSC's satisfaction that the project can be re-started without posing an unacceptable risk to the community. Please see the response to comment 6-2 for additional information.

Comment 8-1: Would the berm be constructed of soil?

Response: The design of the staging area berm is not specified in the Remedial Action Plan. Berms are typically constructed of soil or other material and covered with plastic sheeting.

Comment 8-2: How high would the waste piles be? (p. 40)

Response: The height of the soil piles within the staging area is not specified in the Remedial Action Plan, but would be part of the final design submitted. The stockpile will be limited to appropriate heights to maintain Site controls, including those for dust generation in order to meet air monitoring action levels.

Comment 8-3: Paraphrase: Please help us imagine what 64,000 cubic yards of material would look like.

Response: A standard football field is about 360 feet by 160 feet or 6,400 square yards. 64,000 cubic yards of material can be visualized as being piled on a standard football field approximately 30 feet high.

Comment 8-4: What sort of guarantees does the community have that clean fill is actually being brought in [to backfill excavations], because it's going to be stacked outside of other residential areas. So that is different than the hazardous waste piles that are the orange. So that is a concern. How high are those? How are they going to be protected so that dust doesn't blow and all of that? ... And how are you going to determine it's clean? What does clean mean?

Response: The height of the soil stockpiles is not specified in the Remedial Action Plan, but would be part of the final design submitted. Fill soil must tested and meet the Site cleanup goals in order to be considered clean and appropriate for use as backfill at the Site. The contractor will need to manage backfill material stockpiles to minimize the potential for dust generation so that dust monitoring action levels are not exceeded.

Comment 8-5: I felt that it would be good if up front in the introduction and purpose they gave more of an overview of the proposed project, that they plan on removing 64,000 cubic yards. You don't get that until you go back into the document. And also that they plan on shipping out a certain amount. I think that needs to be up front. I don't believe the community should have to dig for that within the document.

Response: The DTSC October 2009 fact sheet distributed to the community summarizing the Remedial Action Plan provides this information. On page five of this fact sheet, DTSC said “DTSC recommends the removal of approximately 64,000 cubic yards of contaminated soil including the Raised Cap Area, the soil overlying the source area, and the soil with the shallow groundwater source area. These actions provide the best overall protection of human health and the environment.”

Comment 8-6: I have concerns regarding the transportation component of this. The community has voiced strong concern over all the years that I have known these people about what will happen when they try to ship this stuff out.

Response: Please see the response to General Comment #2.

Comment 8-7: I believe that there is real problem with the regulatory definition of what is significant. It is certainly significant to this community. Why isn't a transportation plan in the appendices now to the RAP? I know sometimes it's done after the fact, but it seems like a transportation plan should be a component that the community has an opportunity to review.

Response: Please see the response to General Comment #3 for information regarding the purposes of the RAP and the response to General Comment #4 for information about the CEQA evaluation conducted. A Transportation Plan is one part of the Remedial Design. The Remedial Design is the engineering plan for implementing the final remedy. It is prepared once a final remedy for the Site is approved.

Comment 8-8: I know that I had asked for a community health and safety plan to be developed. Within the text of this remedial action plan it says it's going to be given to the community. Well doesn't the community have any input as to what their health and safety plan should be? In the text it says it's going to be prepared and then given to the community. Well I think the community needs to be a part of developing a health and safety plan so that all of the issues that they have will be covered in the health and safety plan as it relates to if there are any accidents or anything like that that might occur during the remediation.

Response: Comment noted. DTSC has held several meetings with the community to understand their concerns regarding the Site. The community has been very helpful in articulating their concerns. The Community Safety Plan would be developed to address the concerns expressed to date. Once prepared, DTSC would meet with the community to present the plan. The plan could then be amended, as appropriate, to incorporate additional suggestions and concerns.

Comment 8-9: This project has been going on forever. And I have been involved in reviewing remedial action plans for a very, very long time. And if I had difficulty getting through the document, trying to make comments, trying to get my ideas in order, and reviewing the initial study, I certainly think community members would.

Response: Comment noted.

Comment 8-10: And I do not believe that people had the document long enough before you had the hearing. I believe that the hearing I'm sorry, I call it a hearing, the meeting, the formal meeting should have been later in the time period. You had it so early, the document really just came out. And on behalf of the artist co-op we have asked for an extension of time to get our comments in and I believe that has been granted?

Response: The public comment period was extended from December 1 through December 18, 2009. An additional meeting was held with the 45th Street Artists' Coop residents on December 9, 2009.

Comment 8-11: …there are some errors with figures matching your text I found one or two errors. I know one is in chapter 6. I had a question regarding appendix

1, it's called stock pile soil sampling and analysis. On your chart stock pile is the clean. Do you mean waste pile?

Response: Titles can be confusing. Appendix I outlines the process for sampling the excavated soil to determine the appropriate disposal requirements and facility. The RAP Figure 6-1 was shown at the public meeting. On the Figure, the terms "Waste Staging Piles" and ""Backfill Stock Piles" is used. The RAP Section 6.8, Waste Stockpiles, correctly references Appendix I, Stockpile Soil Sampling and Analysis Plan.

Comment 8-12: As far as the CEQA document, I believe that you need to revisit the project description. In consultation with the CEQA attorney, I've concluded that because under normal circumstances in a CEQA document that is for site mitigation it would be the norm to say that the excavated soils would be loaded and taken off site. However, this is different because this is a huge excavation. And so your project description has to include the amount of excavation and should also include the number of trucks because it is truly significant and it is not sufficient to just have it in the back part of the study.

Response: The project description within both the Mitigated Negative Declaration and the Initial Study will be revised to note that approximately 64,000 cubic yards (changed from 60,000 cubic yards) of soil and debris would be excavated. This will make the description consistent with the analysis within the Initial Study and with the RAP description. As the mode(s) for off-site transportation of excavated materials has not been determined, DTSC cannot specify the number of trucks or rail cars that would be used. Please see the response to General Comment #2 and #4 for further discussion.

Comment 8-13: I'm going to submit written comments, but I really hope that the department listens to the community. The community is working as a whole. The 45th Street artist co-op don't want it to go by their place, but it isn't okay to go by some other residence place. So I really hope that you're hearing what they're telling you.

Response: Comment noted.

Comment 8-14: Paraphrased: One of the problems in the CEQA document is that you only discuss impacts from trucking and don't discuss rail. You're supposed to look at the alternatives.

Response: The CEQA Initial Study looks at the recommended remedial alternative in its entirety and analyzes potential impacts associated with the option that poses the potential for the greatest impact. Please see the response to General Comment #4.

Comment 8-15: You're talking about the trucks as if they are a given. I did look back at the CEQA document and you only look at truck, you do not look at rail.

Response: Please see response to General Comment #4.

Comment 9-1: I live at 1500 Park Avenue. Our building has 141 units in it. We are between Hubbard and Halleck, which are the two long streets on that diagram. And we would be heavily impacted by truck traffic, we are right now. It's very noisy, and again, this noise level is a huge problem. If I have one window of my three windows open and there's a truck rumbling by, I can't carry on a conversation and I would be a huge proponent of the rail method to get soils out of there, that would really be optimal.

Response: Please see the response to General Comment #2.

Comment 10-1: I live here in an artist co-op at 1420 45th Street, and I work every day in this building because I work in my studio and I do public art and I have workers. And often we work outdoors….what I'm concerned about is the continuous exposure that I and my workers may be exposed to for the particulate matter coming down this driveway and why I'm especially concerned is that the predominant west wind focus the air right down this driveway from the worst part of the site. And when this project was first begun, a long time ago when my daughter was being taken to school on the back of my bicycle in her little seat, we came down this driveway the first day that Sherwin-Williams was bulldozing this site and the workers here were not controlled by the Water Board or the Department Of Toxic Substances and they were wearing masks on their bulldozer, and Kate and I were getting particulate in our face right from the worst part of this site. And later my daughter Kate had her lead count measured and it was twice the American average. And I don't have to tell you that that has an effect on a kid. So there is a credibility of problems in our community about this site and clean up.

Response: DTSC understands that this community is particularly sensitive to dust issues based upon its past experience. DTSC required Sherwin-Williams to conduct a Public Health Evaluation of the Remedial Action (PHERA) to evaluate potential risks to the surrounding community during implementation of the proposed remedial action. The PHERA assumed that people would be living and working in this area during the entire implementation period. Based upon the results of the PHERA, the project incorporated dust and vapor controls. Please see the response to General Comment #5 for further discussion.

Comment 10-2: I would like to know if these [air] monitors in effect put on an alarm system that could broadcast to our community if they go over so we could have some real time monitored. We hear that alarm, we quickly go inside, put on face masks, get particulate masks, something that would increase the credibility of the protections to know that we had a failsafe in our own ability to take action

and put a particulate mask on. Because that's something we would have the possibility of doing. And given the long term exposure to have real time notice of what our exposure is would be a significant asset to us that maybe this easily done.

Response: Please see the response to General Comment #5.

Comment 10-3: And also I would like to know what the real exposure would be for all this particulate if I am working outdoors the entire time this project is going on. It wouldn't be significant maybe by a measure that our government would say would be the average exposure if someone were around this, but for our community and us what wouldn't necessarily be significant by a certain government measurement may become significant to us given the focus of the particulate. So I would like to know what significant means in relationship to the government's standards and how that significant might be more than significant if it were focused and continuous?

Response: There are many sources of particulate matter in the environment. The Public Health Evaluation of the Remedial Alternative looked at the potential effects of contaminants in soil, soil gas and groundwater that could be released during implementation of the proposed cleanup actions. The real-time dust and vapor action levels and chemical-specific performance standards were developed to protect the adjacent community during implementation. Please see the response to General Comment #5 for further discussion.

Comment 10-4: Earlier on one of the ideas for cleaning up the Site was to take the soil and in effect turn it into concrete by mixing it and not removing it from the Site but thereby preserving it so it wouldn't go into the groundwater using that method. But that was not preferred by Sherwin-Williams from my understanding because it limited their development potential of the site.

Response: As presented in the work notices discussing these activities, as distributed to the community, Sherwin-Williams conducted laboratory tests to evaluate the effectiveness of both soil mixing and grout injection to reduce the permeability of soils within the groundwater so that groundwater would not move through it. Based upon laboratory testing, soil mixing was retained as a potential option and is incorporated into Alternative-3B in the Draft RAP. Based upon the laboratory testing, grout injection was pilot tested at the Site. Unfortunately, it was not able to achieve the permeability reduction required. Additionally, adding grout or cement to bind up the arsenic caused a change in the pH within the groundwater that unfortunately resulted in an increase in the concentrations of arsenic.

Comment 11-1: My primary concerns are the potential toxins and pollutants in the air that we breathe that are settled on edible gardens and settled on high human traffic surfaces. I have a young child and several pets. How will you be testing for residential areas near the cleanup site, soil, air and surfaces and how

will we be informed and be assured that we are not slowly poisoned on a day-to-day basis?

Response: Please see the response to comment 10-3.

Comment 12-1: I don't know how these pollutants have moved in the groundwater, how far it's moved, if it's only under the cement or does it -- I would imagine it keeps moving. Is there any monitors on what's going on right now with the dust that's all over everything?

Response: There are many sources of dust in the environment. The Sherwin-Williams Site is paved, so contaminants in the underlying soil cannot become air borne. Additionally, there are no aboveground cleanup activities currently ongoing at the Site that would generate dust. Groundwater continues to be removed and treated by the groundwater extraction and treatment system.

Comment 12-2: The second part of the question would be if you are using trucks to take all of this stuff away isn't, when a truck hits a pothole stuff spills out, all our cars are covered with it. How are you going to safeguard that process from once it leaves the site and is that being addressed?

Response: Trucks leaving the Site will be covered so the material will stay inside. Truck tires and body will be brushed or washed to ensure that material is not being tracked off the Site.

Comment 12-3: Is the soil tested on Park now?

Response: The Sherwin-Williams Site has conducted testing to show that their contamination does not extend to Park Avenue. Additionally, groundwater flows away from Park Avenue. The City of Emeryville has stated that the soil under Park Avenue has been tested. Please contact the City of Emeryville Public Works Department for further information. Their telephone number is (510) 596-4330.

Comment 13-1: Are these single trucks or double-haul trucks or longer?

Response: Please see the response to General Comment #2. Sherwin-Williams and its contractor are responsible for deciding the transportation method.

Comment 14-1: Have you evaluated any abatement that can reduce diesel exhaust from trucks?

Response: DTSC can only require abatement if the CEQA analysis for the project demonstrates that the project will have a significant impact on the environment. DTSC is requiring that the project comply with all Air Resources Board and Bay Area Air Quality Management District requirements.

Comment 14-2: How are you going to keep dust and vapor down after work hours, like after 5:00 until the next morning, how are you going to protect excavations from having vapors out or gassing out or dust blowing off?

Response: Please see the response to comment 6-2. Open excavations areas will be sprayed with water and/or foam and the amount of excavation open at any one time will be limited to minimize the potential for dust and vapor generation. The Remedial Design will include a Dust and Vapor Control Plan and a Community Safety Plan that discusses the procedures for minimizing the potential for dust and vapor generation from excavations, both during and after work hours.

Comment 14-3: Paraphrased: Will groundwater extraction and treatment cause any vapor emissions on site?

Response: The groundwater extraction and treatment will generate vapor emission. However, the amount emitted will be insignificant according to BAAQMD regulations and does not require control and/or permit. This vapor emission exists currently, through the existing groundwater extraction and treatment system on-site. During the project, the extraction rates and treatment methods of groundwater will be similar to the way it exists currently.

Currently, groundwater is treated to remove metals and generate sludge which is taken off-site for disposal. Potential volatile organics are treated though activated carbon and other media that remove the organic material so that it meets the Water Board's requirements for discharge under an existing NPDES construction permit to the storm drain. When nearing capacity, the activated carbon is replaced with fresh material and the spent materials are transported off-site for recycling.

Comment 14-4: Will there be an impact on potable water?

Response: The project will not impact potable water. This area does not use groundwater for drinking water. Residents receive their drinking water from the East Bay Municipal Utility District.

Section II.B.2 <u>Public Meeting - Written Comments</u>

The following comments were provided on comment cards from:

15. Edythe Bresnahan
16. Michael Hammond
17. M. Louise Stanley
18. Greg Harper
19. Diane Troy
20. Teresa Kalnoskas
21. Sridhar Agraharam (Bayer)
22. Sylvie Hessini
23. Tim Curran
24. Archana Horsting

Comment 15-1: Number of Trucks to be used?

Response: DTSC currently don't know the number of trucks that will be used. The Draft RAP indicates that soil can be removed via trucks or rail. If all of the soil were to be removed using trucks, this would involve approximately 4,480 truck trips to remove the soil and 3,414 truck trips to bring clean fill material on-site to backfill the excavations over a six-month period.

Comment 16-1: Are there any tests done now?

Response: Air quality is currently not monitored at the Site. The Site has a meteorological station that monitors weather conditions. Prior to the start of work, baseline air quality samples will be collected.

Comment 17-1: Diesel exhaust is the greatest worry for me. Also weight of trucks moving the ground beneath us.

Response: Comment noted. The project will comply with the Bay Area Air Quality Management District requirements to control the levels of diesel exhaust. The proposed truck route utilizes a route designated by the City for truck traffic.

Comment 18-1: Why don't you actually test the decibels of a truck pulling away from a stop.

Response: The noise evaluation was conducted using data from actual trucks. This study considered both maximum decibel levels such as when a truck is accelerating from a stop and average decibel levels based on a usage factor over the course of a work day in order to evaluate the project to comparable published standards for impact to a human receptor.

Comment 18-2: What life forms does the groundwater impact?

Response: The impacted groundwater has the potential to affect ecological receptors, including naturally-occurring microbial and aquatic life forms. Please also see the response to General Comment #1.

Comment 18-3: Who are the people being protected by the soil removal?

Response: Please see the response to General Comment #1.

Comment 18-4: Why aren't you studying the rail costs, etc?

Response: Please see the response to General Comment #2 and comment 3-2.

Comment 18-5: Why can't you require the trucks to be CARB compliant or have particulate traps?

Response: DTSC is requiring Sherwin-Williams to meet all Air Resources Board and Bay Area Air Quality Management District requirements.

Comment 19-1: How are the "source materials" going to be removed … jackhammers?

Response: The materials will be removed and handled with common soil excavation tools, equipment and vehicles, including jackhammers, backhoes, excavators, and dump trucks.

Comment 19-2: What are the waste staging areas made of? How are the materials and water contained?

Response: The waste staging pile berms will be composed of site soil, import material, concrete, and/or plastic sheeting.

Comment 19-3: Are the materials going to be removed daily?

Response: Yes, it is anticipated that materials will be removed daily, during approved workdays and work hours.

Comment 20-1: My primary concerns are the potential toxins and pollutants in the air that we breathe that are settled on edible gardens and settled on high human traffic surfaces. I have a young child and several pets?

Response: Please see the response to General Comment #5, above.

Comment 20-2: How will you be testing the residential areas near the cleanup site? (Soil/air/surfaces)

Response: Please see the response to comment 10-3, above.

Comment 20-3: How will we be informed and be assured that we are not being slowly poisoned on a day-to-day basis?

Response: Please see the response to General Comment #5, above. The Community Safety Plan will specify how air monitoring data will be made available to the community.

Comment 21-1: Soil management to prevent off-gassing (e.g., under plastic, berms)?

Response: Please see the response to General Comment #5, above.

Comment 21-2: Practices to be adopted to prevent off-gassing and dust generation during non-work hours?

Response: Please see the response to General Comment #5 and Comments 6-3, 7-2 and 14-2, above.

Comment 21-3: Elaborate on emissions from water remediation?

Response: Please see the response to comment #6-3, above.

Comment 21-4: Security?

Response: The site is currently fenced and will remain secured with fencing through the project. Security guards will patrol and monitor the fence and the Site during the project.

Comment 21-5: Impact on POTW water?

Response: The project will not impact Publicly Owned Treatment Works, or POTW, water. Please also see the response to comment 14-4, above. Any discharge to the POTW will need to meet permit requirements.

Comment 21-6: Have abatement devices on trucks to reduce diesel particulate

matter (exhaust) been evaluated?

Response: The CEQA evaluation did not find a significant impact associated with truck use for this project. The project will comply with Air District specified measures to reduce truck air emissions. However, these measures do not include a specific requirement for diesel particulate matter abatement devices.

Comment 21-7: Dust monitoring for respirable fractions? What criteria?

Response: As presented in the RAP, the air monitors will include measurement of respirable dust, particulate matter 10 microns in size or smaller.

Comment 22-1: Truck noise, diesel fumes and dust kicked up by the trucks heavily impact our 141 unit building at 1500 Park. Transport of toxic soil by rail would be optimal! The second choice would be that the trucks head north with their cargo, rather than using Halleck and Hubbard.

Response: Comment noted.

Comment 23-1: Detailed population characterization?

Response: Please see the response to comment 7-2, above.

Comment 23-2: Engineering recommendations result in guys with brooms and hoses?

Response: Please see the response to comment 7-3, above.

Comment 24-1: I want to know why rail options for removal of the soil have not been discussed. What are the criteria for choosing trucks over rail? Rail is the obvious solution from the entire neighborhood's point of view. Railcars are available on the market now – what are the problems with rail delivery to an approved disposal site? Cost for Sherwin-Williams site owners should be less than trucks. Who is benefiting from the truck contracts?

Response: Please see the response to General Comment 2 and comment 3-2, above.

Comment 24-2: What about the lead in the site and in the environment?

Response: Please see the response to comment 3-5, above.

Comment 24-3: The artists living in the neighborhood are a cultural resource as well as human beings. (The artwork being made at the coop (and other sites) is contemporary but is as important as the ancient artifacts potentially discovered at the site.) So deserves mitigations.

Response: Please see the response to General Comment 4, above.

Section II.C.1 Artists Coop Meeting – Verbal Comments

Comment 25-1: Are you going to tell the group what DTSC is proposing?

Response: DTSC provided an overview of the proposed cleanup activities at the meeting.

Comment 25-2: Is this meeting different than the previous meeting?

Response: This meeting is different than the public meeting. DTSC held this meeting at the request of Artist Coop representatives who felt that disruption caused by a recent building fire would prevent Artist Coop representatives from having meaningful participation in the public meeting held on November 5, 2009. The meeting was not transcribed, although comments and questions were written down on newsprint.

Comment 25-3: Where on the Site will concrete processing take place? How tall will the processing plant be? What volume of noise is expected from these operations? What sound barriers would be used?

Response: Concrete processing is anticipated to take place in the northern corner of the western half of the Site as shown on Figure 6-1 of the Remedial Action Plan. This will not be a processing plant. Oversized pieces of concrete will be broken up into pieces that can be transported off-site for disposal. The concrete processing area activities will be limited to crushing concrete to appropriate size for off-site transport. This activity was included in the analysis of the implementation activity entitled “waste pile staging”, along the western and northwestern boundaries of the Site. Please see the table under “waste pile staging”. The concrete processing area is the farthest from the noise-sensitive receptors on Horton Street of all the implementation activity areas. Because of this, the predicted noise level from this activity area is considerably lower than the other activity areas that are closer to the noise-sensitive receptors and no noise barrier was determined to be needed for this area.

Comment 25-4: Could you give me a visual measurement of 1 cubic yard of material? 64,000 cubic yards of material?

Response: One cubic yard is a cube measuring 3 feet on all sides. A football field is approximately 160 feet by 360 feet, so approximately 53.3 yards by 120 yards. So 64,000 cubic yards of soil would occupy three football fields to a height of 10 feet.

Comment 25-5: Not all the material will be taken away, based on RAP, 99% of the contamination will be removed so 1% will be left behind. Remember that not everything will be removed?

Response: The RAP does not present percentage of contamination removed. However, the commenter is correct that the remedy will not remove all contaminated soils. The feasibility study, as summarized in the RAP did evaluate an alternative that would attempt to remove all on-site contamination.

Comment 25-6: Whatever options you discuss in the remedial action plan you must discuss in your CEQA document. There is a problem in the CEQA because the rail was not done. Was there a formal traffic study done ever? In your document the impact of truck traffic is relative to the local roads. Have you ever taken into account the impact of the truck traffic on the freeways?

Response: Please see the response to General Comment #4. A traffic study performed by the City of Emeryville was reviewed and utilized to complete the CEQA document for this project. The results of the CEQA analysis indicate that the maximum number of trips that would occur during the proposed project would be 228 trips per day. Of these trips, 200 would be from haul trucks, while the remaining 28 trips would be from construction workers commuting to and from the project site. Data from Caltrans indicates that the average annual daily trips (AADT) along I-580 are 512,000 trips near the 80/880/580 interchange. An estimated 4% of these vehicles are diesel-fueled trucks (20,480 diesel truck trips per day). The addition of the construction truck traffic would be less than one percent of the existing diesel truck traffic in the project vicinity.

Comment 25-7: Did you ever consult an audiologist for the noise and vibration limits?

Response: An audiologist was not consulted during the evaluation. The noise analysis and the vibration analysis were based upon standard audiological assumptions and practices.

Comment 25-8: The hours of work are 7a.m. – 6 p.m. on weekdays. If the activities go outside these hours, the city would need to issue a waiver. The hours of work are important for this community. There are some questions on changing the rules of the game.

Response: Comment noted.

Comment 25-9: Have you done some test holes, drillings on the west side of the freeway to determine whether or not the contamination is going to the bay? Did you get any bad water from the plant going to the bay?

Response: Borings to test soil and groundwater on the west side of the freeway were not conducted as part of this project. Groundwater flow directions are determined based upon groundwater monitoring results at the Site. These results indicate that groundwater flows toward Temescal Creek and the San Francisco Bay.

Comment 25-10: Can the underflow of the creek be tested?

Response: This has been evaluated and unfortunately it cannot be tested. Temescal Creek from Horton Street to the San Francisco Bay was constructed as a concrete-lined flood control channel between 1964 and 1968. Testing the underflow would involve breaking through the concrete channel. The Army Corps of Engineers has jurisdiction over this activity and has indicated that they would not permit such an activity.

Comment 25-11: What controls you are going to include in terms of action regarding dust. What alternatives do we have as we see lots of dust on a typical day?

Response: Please see the response to General Comment #5.

Comment 25-12: We get wind here a lot. Any given day due to wind direction we might get bad air. What controls do you have? What are the dust control measures?

Response: Please see the response to General Comment #5.

Comment 25-13: Truck idling: How many trucks will be waiting on any given day. Any new pattern is being considered? The trucks idle anyway.

Response: The Air Resources Board and the Bay Area Air Quality Management District regulate the amount of time trucks can idle. The number of transportation vehicles bringing clean fill material to the Site and transporting excavated soil off-site will vary day-to-day. Therefore, the CEQA Initial Study evaluated the impacts associated with the maximum number of trucks per day projected for use on this project. Please see the response to General Comment #2 for a discussion regarding transportation of materials using trucks versus rail cars.

Truck drivers will be monitored to make sure that they honor the Bay Area Air Quality Management District regulations regarding idling times. If drivers do not comply, they will be removed from the project.

Comment 25-14: The option needs to be rail. According to what you are proposing, it means a different diesel truck for every 15 minutes, 8 hrs/day, and 5 days/week for 6 months. Imagine how much diesel particulate matter (DPM) will be exhausted in our community. This will be in addition to the toxic material that you a re taking out.

Response: Please see the response to General Comment #2.

Comment 25-15: I can't imagine what this stuff is? Here is what I think; there was a bunch of crap leftover and covered over by concrete. Is this concrete itself toxic? What does this thing look like?

Response: To the naked eye, the impacted soil looks like regular soil and impacted concrete looks like regular concrete. However, when viewed through laboratory tools, the impacted soil and concrete is very different than regular soil and concrete as it contains elevated arsenic, lead, and organic contaminants. Please also see response to General Comment #1.

Comment 25-16: Is this all soil? Is the groundwater below this? The contamination made its way through the soil?

Response: Please see response to General Comment #1.

Comment 25-17: The current concrete, soil below that and all the dirt will be taken out. Correct?

Response: Please see response to General Comment #1.

Comment 25-18: Just curious about several sites that can take substances through rail. What is the problem with rail to be used for this Site? Rail vs. Truck

Response: Please see response to General Comment #2.

Comment 25-19: Confused about who makes the decision on the transport? If the responsible party (RP) looks at it then it is going to be based on Cost. How can we impress you to use rail transport? Who decides?

Response: Please see response to General Comment #2 and comment 3-2.

Comment 25-20: When Randy explained the landfills there was one which can accept both hazardous and non-hazardous wastes. What is the issue when the landfill is there? This landfill can provide backfill material and will take both types of waste, then what is the issue?

Response: Yes, there may be landfills that can accept both hazardous and non-hazardous wastes, are accessible by rail, and potentially have backfill material suitable for this project. Use of such landfills however is not necessarily the most efficient for this project. Construction contractors are best suited to recommend to Sherwin-Williams the most efficient manner to transport and dispose of the waste. Based on discussions with the selected contractor, Sherwin-Williams will then decide

how to transport and dispose the waste based on their evaluation of the disposal facilities and transportation methods.

Comment 25-21: I think the transportation discussion was important for the community and in the last meeting nothing was discussed. I think that it was rude. The community does not need trucks and you have not discussed rail as an option. Why so? Why doesn't the CEQA analysis talk about the Rail?

Response: Please see the response to General Comment #4.

Comment 25-22: All the information that was given in today's presentation was missing in the documents. DTSC has the authority to put teeth in the documents.
Comment 25-25: Does DTSC have authority to require Sherwin to choose Rail over Trucks?

Response: Please see the response to comment 3-2.

Comment 25-23: I don't understand how there is no significant impact from the trucks in CEQA? What is significant if this isn't?

Response: Please see the response to General Comment #4.

Comment 25-24: In the CEQA analysis and the risk assessment, did they take into consideration that this is live/work community? We live and work here all day and all night long. 7 a.m.-6 p.m. is when a lot of people are here in the community.

Response: Yes, live/work condition was taken into consideration and the exposure evaluated for the community was for continuous exposure for the entire duration of the project.

Comment 25-25: How significant is this short term impact? Do we eat what is grown here in this time frame? Do we need to take bath 3 times a day etc.?

Response: Please see the response to General Comment #5 and 25-24 above.

Comment 25-26: What are the thresholds for significant airborne contamination?

Response: Please see the response to General Comments #4 and #5. In addition, based upon the chemicals of concern at the Site, the RAP specified performance standards for airborne arsenic and VOCs that must be achieved.

Comment 25-27: Air monitors, do these measure a range of particulate matter (PM)? Do these measure DPM and others as well? What height are the monitors deployed?

Response: As presented in the RAP, the air monitors will include measurement of respirable dust, particulate matter 10 microns in size or smaller. This will include DPM and other dust in this range. The monitors collected air at an adult breathing height between 5 and 6 feet above the ground.

Comment 25-28: Can we put monitors on the roof?

Response: Placing monitoring locations on the roofs of adjacent buildings is not the best method for evaluating the emissions from project activities and determining the effectiveness of the action being implemented to maintain acceptable air quality levels. It is best to evaluate emissions from the Site within the Site boundary, close to project activity.

Comment 25-29: There are second story buildings and the stuff will come into our units through the skylights?

Response: Comment noted. See response to comment 25-28.

Comment 25-30: Why are you saying that the dust is monitored for 8 hours when the work is for going to be from 7 a.m. – 6 p.m.?

Response: See response to General Comment #5. As presented in the RAP, dust will be monitored continuously from the start of work to the beginning of the next work day continuously throughout the duration of the project.

Comment 25-31: About dust: Air monitors are for peak occurrences? Do we have any way to monitor the accumulated dust on items from this project? Such as the dust on the rooftop of my car. Is there any way we can figure out the cumulative impact from the accumulated dust and DPM?

Response: Dust is generated from many sources. For example, rail traffic generates dust, as does the motor vehicle traffic along Emeryville streets. DTSC relied upon the Bay Area Air Quality Management District's procedures for evaluating potential air quality impacts associated with project.

Comment 25-32: How long will it take to find out the air monitoring results after samples are taken to be analyzed by the laboratory?

Response: It will take 3 to 5 days. But also, there will be real time air monitoring done on-site each and every day.

Comment 25-33: Trucks are higher that the air monitors. How is the air monitor going to catch the dust generated from putting the soil into the dump trucks?

Response: The on-site activities will occur at some distance from the perimeter air monitoring locations and will disperse in all radial directions downwind of the activity,

as such, potential dust from activities will be captured by air monitors and be representative of the air moving off the Site.

Comment 25-34: Loading zones: Explain dust levels in loading zones. Do they not need tent? We have high wind area and even if the soil is wetted it will travel. How are we protected from the vapors and dust?

Response: See response to General Comment #5.

Comment 25-35: Are the trucks going to be covered by a tarp?

Response: Yes, material being sent off-site for disposal by truck will be covered by secured tarps.

Comment 25-36: If you get a red light on a sample and have 4 hour gap who will make the decision about stopping the work? On extremely windy days will the project be shutdown?

Response: Please see the response to General Comment #5 regarding dust and vapor monitoring. Real-time dust and vapor monitoring will be conducted continuously during this project. The results are compared to action levels in real-time. Therefore, there should not be a four-hour gap in decision-making. Dust action levels are based upon the expected concentrations of arsenic and lead in respirable dust potentially generated from the material or soil being removed. Respirable dust is particulate matter 10 microns in size or smaller. If during a consecutive 4-hour period in a single work day the average respirable dust measurements exceeds the acute respirable dust action level or if the rolling-average respirable dust and/or total VOC measurement exceeds the respective subchronic action level, operations will be reviewed, the cause for the exceedance determined, and appropriate actions taken. As necessary, remedy implementation activities will be suspended until the cause is identified and additional control measures are implemented. DTSC, Sherwin-Williams, and/or contractor are responsible for making decisions regarding stopping work.

Comment 25-37: If all the trucks are waiting in a line, will you stop the work?

Response: If required, work will be shutdown in order to maintain health and safety objectives. DTSC, Sherwin-Williams, and/or contractor are responsible for making decisions regarding stopping work.

Comment 25-38: Is there a method to measure specific DPM? Here, we have wind tunnels with people living on both sides and with our windows shut, we still smell diesel. Diesel particulate matter is as poisonous as lead and arsenic. This is the reason why we need Rail. Although diesel is used in rail, as well in trucks, the rail car goes by much faster in a puff.

Response: As presented in the RAP, air monitoring program will sample DPM present in respirable dust, particulate matter 10 microns in size or smaller.

Comment 25-40: Will DTSC be involved in day- to-day things? I think the contractors will be making those decisions. How does DTSC oversee all these such as a problem with the monitors, or project specifics? I think that these will be decided by Sherwin- Williams.

Response: DTSC's role is a regulatory one. DTSC is not involved in specific day-to-day decisions made regarding the work being conducted. DTSC is responsible for ensuring that the work is being conducted in accordance with the approved work plan. The approved work plan would include, among other things, the perimeter air monitoring plan and community safety plan. Also, if necessary, DTSC staff will oversee activities on-site every day. Please also see the response to comment 25-36.

Comment 25-41: If you [DTSC] find a problem or negligence during a spot check what will happen? What type of fine are we looking at?

Response: DTSC's response to a problem discovered during a spot check inspection depends upon the severity of the problem. It could range from notifying the contractor and Sherwin-Williams to resolve the problem to shutting down the project. DTSC has the ability to pursue fines and penalties for hazardous waste violations and for violations of the Site Order of up to $25,000 per day per violation.

Comment 25-42: Will CDM be involved in deciding whether to hire a contractor?

Response: CDM will be assisting Sherwin-Williams with contractor selection.

Comment 25-43: Solid waste disposal options: Have you done analysis on the cost of using these landfills and Rail vs. Trucks? It's very obvious that Rail is the community preferred option.

Response: See response to General Comment #2.

Comment 25-44: If we get really really sick then how can we be moved out to a better terrain? You are talking to us even though we are not living down that street. What about other people who live directly on that street.

Response: As presented in PHERA and RAP, the project can be completed in a manner that will not pose an unacceptable risk to the community. Air monitoring will be performed continuously at the start of the project to evaluate actual risk posed to the community. If the performance standards are exceeded at any point during the project, the work will be stopped. The project will be re-started only when it is demonstrated to DTSC satisfaction that the project can be re-started without posing an unacceptable risk to the community.

Comment 25-45: In the CEQA process the department cannot make you do Rail. So Rail option should be a gesture of goodwill for Sherwin. We all know that is you look at Randy's chart and make as much possible waste (both types) transported by Rail, it will go long ways with the community and the city.

Response: Comment noted.

Section II.C. <u>Written Comments Received During the Public Comment Period</u>

Written comments were received during the public comment period from the following:

26. Margaret Fisher (via email dated 11/4/2009 and 11/22/2009)
27. Brian Donahue (via emails dated 11/8/2009)
28. Eryka Milligan (via email dated 11/19/2009)
29. Martha Boersch (via email dated 11/22/2009)
30. Isabelle Eyman (via email dated 11/22/2009)
31. Tim Curran (via letter dated 12/3/2009)
32. Ann Holsberry and Gary Grimm (via letter dated 12/11/2009 attached to an email dated 12/10/2009)
33. M. Louise Stanley (via email dated 12/14.2009)
34. Collin Jones (via email dated 12/14/2009)
35. Jan Zvaifler (via email dated 12/16/2009)
36. Jody Sparks (via email dated 12/18/2009)
37. Michael Biddle (via letter dated 12/18/2009 attached to email sent 12/18/2009)
38. Scott Donahue (via email dated 12/18/2009)

Comment 26-1: I understand the current plan favors trucks and that the choice of routing, according to your mailing, is Halleck Street. This choice will be very difficult for our neighbors. If they challenge it, we will be in a situation where neighbor must fight neighbor to avoid the hardship of the cleanup. I noticed in your recent mailing that noise and vibration and nonstop truck traffic, including fumes from trucks, were not part of your criteria for hardship. This surprised me. No matter which traffic route is chosen, Halleck or Horton, it will be unacceptable. I believe eight hours are proposed, and they are repeated, day after day, week after week, month after month. Having been through the previous cleanup, we know that even two hours of such traffic is very difficult. To increase that to a whole day amounts to a lost day or enforced vacancy of the live work unit during truck hours.

If a truck route on Horton Street is used, we will argue vigorously that it would be unjustly cruel to subject the Artists Cooperative yet again to a six-month period of noise, diesel fuel, vibration, dirt, and traffic on Horton Street. Once was enough. I think we used the term "the walking wounded" to describe the aftermath of the first Horton St. cleanup. Unfortunately, it still applies. We remember the first cleanup as if it were yesterday. We also don't wish this on our

neighbors. Rail is a solution that would favor both neighborhoods. Rail would be the right way to do this project. Thank you very much for your community outreach.

Response: Comment noted.

Comment 26-2: How does DTSC characterize the population of the neighborhood involved?

Response: As presented in the PHERA and RAP, DTSC considers the community included in the evaluations to be children and adults who are continuously present in the vicinity of the project.

Comment 26-3: What will the impact of the proposed cleanup be on special populations such as infants, children, persons with asthma, the elderly, etc? It seems there are a lot more families, children, etc. in the neighborhood than there were in 1996-1997.

Response: Impacts to sensitive subpopulations were considered in the development of the air monitoring action levels and performance standards. Reference exposure levels (RELs) were used to determine safe levels and to calculate action levels and performance standards in the Public Health Evaluation of the Remedial Alternative (PHERA). RELs are airborne levels of a chemical at or below which no adverse health effects are anticipated in individuals indefinitely exposed to that level. In developing RELs, the California Office of Environmental Health Hazards Assessment (OEHHA) reviewed the available data to identify the most sensitive endpoint and population (i.e., the effects that occur at the lowest concentration). These available data include effects on children and other sensitive subpopulations. To account for variations in populations, RELs incorporate a safety factor. This is done because no analysis can account for all of the potential variations between individuals.

Comment 26-4: The 10/23/09 Negative Declaration reports a negative impact of the cleanup on the environment. Where are the studies that show the projected impact on human beings? If there are no such studies, is there a study that reports on the need for such a study? If these studies exist, do they address noise and vibration levels as well as dust?

Response: The CEQA Initial Study evaluates potential impacts from implementation of the proposed remedy on sixteen different environmental resources. Within the evaluation of significant impacts, potential impacts to people are considered. For example, DTSC had Sherwin-Williams prepare the Public Health Evaluation of the Remedial Alternative to evaluate potential impacts of the proposed remedy from contaminants in the soil. This was used to help respond to potential significant air quality impacts and hazards and hazardous materials impacts. The Initial Study includes an evaluation of potential noise and vibration impacts associated with

implementation of the proposed remedy. Acceptable noise levels are based on potential impacts to human receptors.

Comment 26-5: Are the human (rather than environmental) tolerance levels or limits calculated for a cumulative effect over hours, days, weeks, and months; or does one measurement for one instant of time apply to every instant over the duration of the 6 months? (In other words, what thresholds do human beings have regarding coping with noise, dust, vibration for time durations?)

Response: Some criteria are established as not to exceed values, some criteria are based upon average values over time, and sometimes controls are specified instead of setting quantitative criteria. For example, particulate matter criteria set by the Air Resources Board is based upon a concentration averaged over a period of time (e.g., 24-hour, annual) and assumes exposure to this level every day. An example of setting controls rather than specific criteria is the City of Emeryville Noise Ordinance (Emeryville Municipal Code – Title 5, Chapter 13). The ordinance provides guidance on minimizing noise-related impacts during implementation activities. Specifically, general construction noise (Section 5-13.05 of the Noise Ordinance) is limited to weekdays from 7:00 am to 6:00 pm. Pile driving and similarly loud activities are limited to weekdays from 8:00 am to 5:00 pm. City approval is required for work outside of these times.

Comment 26-6: What is the environmental impact on the Bay of the current runoff from the site soil? What is the date of the most recent environmental impact report concerning this site and its impact on the bay?

Response: The Site is paved and surface water controls have been installed. Therefore, rain water does not come into contact with contaminated soil. There is no environmental impact report for this Site. However, the quarterly groundwater monitoring reports for the Site are available for review at DTSC's DTSC's web site: http://www.envirostor.dtsc.ca.gov/public or at the local repositories.

Comment 26-7: Why is rail not presented as a viable and likely option?

Response: Please response to General Comment #2 and comment 3-2.

Comment 26-8: Why does the soil removal have to happen at all?

Response: Please response to General Comment #1.

Comment 26-9: Are there funds available for the re-location of individuals/families/ businesses who might not be able to inhabit their home/business during the cleanup because of the cleanup?

Response: The PHERA indicated that we should be able to implement the proposed cleanup without posing a significant risk to the surrounding community. The PHERA

determined that standard dust and vapor controls would reduce the potential health risk to the community residents to below the State's acceptable risk thresholds. Therefore, DTSC cannot require Sherwin-Williams to relocate nearby residents. Residents can choose to leave their units while work was being conducted, but there is not a mechanism to pay for alternative housing or work space.

Comment 26-10: Regarding the monitoring reports '08 and '09, why does the amount of arsenic removed in a three month time period (e.g., for the 2 quarters reported July 2009 for 78 days and that removed for 84 days in July-Sept. 2008) vary dramatically and with no proportional relationship (given the difference in the # of gallons treated)? Does the amount of arsenic extracted pose a danger to the bay?

Response: Although the amounts removed did vary between these two periods, the amount removed during each period is within the range of amounts removed during other periods since the operations began. The amounts removed are based on the amounts of arsenic present in the groundwater during each period. The extracted arsenic is disposed off-site, and does not pose a danger to the bay.

Comment 27-1: Sherwin Williams Corporation, the City of Emeryville and the State/Federal government thus far has no credibility as to cleaning up the Sherwin Williams site. Years ago, during the first action [the Horton Street excavation] here, graders and other heavy machinery kicked up massive clouds of toxic dust that were released into our neighborhood. After Artist's Co-op members complained, Sherwin Williams admitted there was a problem and assured us this would not happen again. They [Water Board] blamed a "bad contractor". Where was the government during this time? Why were the residents interests not adequately addressed?

Response: The project discussed was overseen by the Water Board. Therefore, DTSC cannot comment directly about what happened during that removal action. The Sherwin-Williams Site was transferred to DTSC in 2006. DTSC is committed to ensuring that the Site is cleaned up and that the cleanup is conducted safely in a manner that is protective of human health and the environment. Please call or contact Janet Naito at (510) 540-3833 or JNaito@dtsc.ca.gov., or Nathan Schumacher at toll free (866) 495-5651 or NSchumac@dtsc.ca.gov., if you have any concerns during the actual cleanup.

Comment 27-2: At a meeting during the run-up to the current clean-up effort, residents asked for rail cars to be used to remove toxic soil. We were told none were available due to the over-heated economy, presumably not a problem any longer. Why is it that this changed railcar scenario was not volunteered by SW/Government to the residents? Why is it that the residents at the Thursday meeting had to bring this up themselves? The fact that the Government did not see fit to address the rail car solution after the initial argument became erroneous, and volunteer this information to the residents, makes me feel as if

the resident's interests are not being taken seriously. We initially were told, ostensibly and as an aside, the rail car solution is more expensive than the trucking method, and were assured that cost saving was not the deciding factor in the decision to opt for trucks. With the revelation that the rail option is now possible, yet not acted on, I believe that SW money saving is why rail cars are not being taken seriously. The Government seems to have SW's interest at heart, not the resident's. This rail car controversy is evidence of that.

Response: Please see the response to General Comment #2 and comment 3-2.

Comment 27-3: What I'm not interested in is years after this clean up, we come to find out the neighbors have been doused with lead and arsenic and we are offered up an apology and perhaps some money. I need to make sure my daughter is not doused in the first place. Owing to the lack of credibility demonstrated by SW/Government, we need some other entity performing field verification, performed in real time to assure the neighbors will not be exposed. Private corporate testers are obviously not in any position to provide assurance to the neighbors due in no small part to the corrupting influence of money. Also, after 30 years of Republican rule in the nation, evisorating government function, the government doesn't seem capable to this task. Perhaps some other EPA type agency from say, Canada could be paid to provide assurances to the residents they will be protected. Worth entertaining since we can't seem to get satisfaction from the private sector or indeed our own government.

Response: Per California law, DTSC will provide oversight. DTSC has the stated mission of "preventing environmental damage from hazardous waste and restoring contaminated sites for all Californians".

If you have concerns about how the clean up effort proceeds, please share them with either Nathan Schumacher, toll free (866) 495-5651 or e-mail at Nschumac@dtsc.ca.gov or Janet Naito, (510) 540-3833 or e-mail at JNaito@dtsc.ca.gov. Also, please feel free to share these same concerns with your elected representatives on the local, state and/or federal levels.

Comment 27-4: Why is this clean up even necessary at all? We have been told that the toxins are migrating towards Temescal Creek and therefore it is necessary to do this now. Frankly, I doubt it. After 80 years, with no mitigation at all, then after the concrete injection mitigation method employed a few years ago, it stretches the imagination that now…now this is a problem. What seems so much more likely is that great development pressure in the wake of the Sherwin Williams abandonment of the site is what's driving this massive clean up. Especially since the Emeryville Redevelopment Agency, if history is any indicator, will likely pick up a lot of the tab and a future developer will receive massive taxpayer subsidies. I find it highly objectionable that those who invocate simple human nature are to be put on the defensive. In the absence of trust, old-fashioned greed is the most likely driving force here. It is we, the neighbors that

live next to the Sherwin Williams site, that ultimately must take this gamble; Will the decision makers be able to resist the force brought by tens of millions in potential profits and give an honest appraisal? Or is it more likely that Emeryville historic precedent will prevail and the loud chorus of development at any cost be assuaged? I say it is the latter, more reasonable assumption that is most likely to hold sway.

Response: See response to General Comment #1.

Comment 28-1: We have an office in the 1500 Park building with windows on Sherwin St. directly across from the site. Do you know if there are any funds available for noise reduction in our office? We'd like to see if we can install something to insulate the windows against some of the noise when the project really gets going.

Response: The noise evaluation conducted indicated that there would be a less than significant impact. As such, no alteration to building windows or other mitigation measures are required for potential noise impacts from the project.

Comment 29-1: I am writing to comment on the draft plan for the clean-up of the Sherwin Williams site and to express my view that the ONLY way to remove the dirt safely and with the least amount of inconvenience and danger to the surrounding neighbors and businesses is by loading and removing the soil by rail car and NOT by 50-100 trucks per day on Halleck Street. I live at 1500 Park Avenue and the only exit for the several hundred residents of my building is out of our garage and onto Halleck.

The City of Emeryville has been using Halleck to stage the trucks and equipment now being used for the Park Avenue beautification project. This relatively small amount of traffic on Halleck is already creating a significant amount of traffic, dirt and dust, and air pollution. In my view Halleck simply cannot handle 50 to 100 semi-tractors per day without significantly and drastically impairing the use, enjoyment and safety of 1500 Park Avenue. The use of rail cars will obviate most of the problems that will be created by 50-100 trucks per day entering and exiting the Sherwin Williams property along Halleck. To accommodate that many trucks the street will be all but unusable for the residents of 1500 Park Ave. and the street is our ONLY means of entering and exiting our property. If 50-100 trucks per day are used for the clean-up, that will be 100 - 200 trips per day by large semi-tractors. That is 25 loads every hour or a truck every two minutes for eight hours a day!

Rail cars, on the other hand, can carry more soil, can be moved onto the site once or twice a day en masse -- maybe 10 or more cars at a time -- and can be filled and removed without affecting our ability to enter and exit our building, without the noise and air pollution caused by the trucks, and without other disturbance

other residents and business in the area besides the dirt and dust, but even that should have a lesser impact.

I do not believe that the use of rail cars would be prohibitively expensive or impractical, and in any event I do not believe that a decision to use trucks should be made without a thorough analysis of a cost and logistical comparison between the use of rail cars versus the use of trucks.

Response: Comment noted. Please see the response to General Comment #2 for additional information

Comment 30-1: Will pedestrian access to the public thoroughfare (sidewalks and roadways adjacent to the Horton Street work areas) be impinged during the remediation work?

a. **Will the sidewalk(s) be blocked at any time?**
b. **Will there be changes to the street parking surrounding the site during the work period?**
c. **Will the roadway be blocked at any time?**
d. **Will there be any barrier erected between the work and the public sidewalk (ie: windscreen, plywood wall.)**
e. **Will the trench, all construction equipment and any disturbed soil be covered during every weekend and holiday to prevent the migration of dust from the site to the public right of way while construction crews are not present**
f. **Will there be public notification before significant events which might expose the adjacent public right of way to vapor contaminents (the removal of the concrete cap)? If so how will the notification be distributed? How much advance warning?**
g. **Will the street trees adjacent to the work area be disturbed?**
h. **If 99.9% of the 64,000 cubic yards of soil will be contained and efficiently removed from the site that still leaves 1% of the soil that can migrate from the site into the surrounding area. At 1%, 64 cubic yards of lead and arsenic contaminated soil may be distributed into the surrounding area. A 1/8th inch layer of contaminated soil could cover a 3.5 acre area (somewhere between 1 and 2 metropolitan blocks).**

Response: During some portions of the project activities, including the installation of shoring and excavation along Horton Street, access to the adjacent sidewalk, parking area, and the western (southbound) lane of Horton Street would be restricted. The restrictions would be temporary and traffic control personnel would be in place to direct traffic. It is not anticipated that Horton Street would be restricted in its entirety for public thoroughfare. The work notice distributed to the community will describe street or sidewalk closures in more detail. A City of Emeryville encroachment permit will be obtained to use of the east side of Halleck Street to queue trucks, if required, arriving with backfill material. Remediation workers will be directed to park their vehicles on the northwestern portion of the S-W property during

project implementation. The project does not propose to block roadways.

Fencing will be maintained between the work areas and the public sidewalk to maintain community safety and Site security. A windscreen is not required as part of the project, but the contractor may elect to install one.

Please see the response to General Comment #5 regarding dust and vapor controls and Specific Comments #6-2 (soil stockpile covers), #14-2 (non-work hour dust control measures), and #12-2 and #25-35 (truck covers). The project does not require construction equipment to be covered.

A work notice will be distributed to nearby residents prior to the start of work. Because appropriate control measures will be implemented to control the generation of dust, vapor and odor from the Site, no events that would require advance warning or notification to the community are anticipated once the work has been initiated. Please see the response to General Comment #5 regarding dust and vapor controls.

The project does not propose to disturb the trees within the sidewalk adjacent to the Site.

The reference to controlling 99.9% refers to the effectiveness of dust control measures to reduce the amount of dust generated during removal of the Raised Cap materials, vadose zone soil and source area soil; it does not refer to the volume of soil proposed for removal (64,000 cubic yards). Based upon the dust action levels set for this project, it is not possible for this project to generate 64 cubic yards of lead and arsenic contaminated dust. Please see the response to General Comment #5 for further discussion regarding dust control measures and dust action levels.

Comment 30-2. Street Sweeping/Cleaning

a. **Will there be street cleaning by a contractor's street sweeper?**
b. **Will there be an increase in sweeping by city street sweeper?**
c. **Is the street sweeping frequency determined by the contractor/ city/ DTSC?**
d. **Is there a requirement for the street sweeping vehicle(s) to be inspected for maintenance problems?**
e. **What happens to the dirt from the sweeper?**
f. **Will there be any change in street parking to insure that street sweepers get access to ALL of the street? If so will this be a contractor responsibility or a city responsibility?**
g. **Is there a plan to keep sidewalks clean? What is it? Who is responsible for S.W. sidewalks and neighborhood sidewalks?**
h. **Is there a monitoring plan for the accumulated lead and arsenic levels due to the work in the surrounding area? Trees, ground foliage, untouched horizontal surfaces all accumulate particulates. Real time air monitoring will notice spikes in the migration of vapors and particulates off site. Is there a testing/monitoring protocol to identify the amount of accumulated contaminants in the surrounding area (ie: collection plates)?**

i. **If there is no testing/monitoring protocol for accumulated contaminants in the surrounding area, why not?**
j. **Can I request and receive: before work begins, during work and after work is completed, wipe tests of my residence entry floors to insure that contaminants are not being tracked into my home?**

Response: In compliance with Bay Area Air Quality Management District's Best Management Practices and the Water Board's Storm Water Pollution Prevention requirements, the project includes requirements to sweep daily (with water sweepers) all paved access roads, parking areas, and staging areas and to sweep streets daily (with water sweepers) if visible soil material is carried onto adjacent public streets. This sweeping would be the responsibility of Sherwin-Williams' contractor. The City is not required to increase its sweeping of city streets as part of this project. The contractor conducting the street sweeping is responsible for maintaining his equipment, ensuring that it is operating properly and for managing wastes generated by street sweeping.

As trucks and equipment will be decontaminated prior to leaving the Site, no long-term changes in street parking are anticipated for street sweeping. If changes in street parking are necessary to sweep the entire street, the contractor will apply to the City for the required permits. However, any changes in street parking would be temporary. The dirt and debris from the sweeping will be containerized and taken to an offsite solid waste landfill.

Please see the response to General Comment #5 and comments #10-3 and 25-31, above, regarding dust monitoring and dust sampling.

Comment 30-3. Trucks

a. **Who will inspect and hold the necessary permits for the trucks and operators hired for the transport of the contaminated soil?**
b. **Will the trucks remain only on concrete or also travel on disturbed soil while on the S.W. property?**
c. **Will the decontamination station for the transport trucks be enclosed and sheilded from wind?**
d. **Will the truck tires remain on concrete or other cleanable driving surface, after leaving the decontamination station until they are on the public roadway?**
e. **Will there be an inspector/worker insuring that all trucks are covered when departing from the decontamination station?**
f. **Is there any requirement that the trucks be cleaned at the disposal location, after the soil is off loaded?**
g. **Will the same trucks be used to transport the contaminated soil be used to transport the clean fill soil?**
h. **Will the clean fill truckloads be covered?**
i. **Will the clean fill be tested before it is delivered to S.W.?**

j. Will the clean fill be tested periodically? If so, who determines the frequency of the testing?
k. Will the clean fill be sprayed with water during off loading to reduce the migration of particulates?
l. Who will determine when trucks should idle or shut off their engines? Each driver is given guidelines? Are large signs posted? Is there someone insuring that drivers remember/comply?
m. Is there an alternate truck route in place?
n. If an alternate truck route is needed for any reason, how will that route be communicated to the truck drivers to insure that they follow the alternate route?
o. How will the public be notified if an alternate truck route needs to be used?

Response: The contractor(s) hired to transport soil are responsible for maintaining the appropriate license and registration to transport contaminated soil. Sherwin-Williams is responsible for verifying that they hold the required license and registration.

Specific information regarding truck routes within the Site during remediation activities will be contained within the Remedial Design. On-site truck routes for import material entering the Site and waste material leaving the Site may include both paved and unpaved surfaces, but would not include unpaved areas planned for excavation.

All trucks and equipment will be decontaminated prior to leaving the Site. Decontamination activities do not generally generate a significant amount of dust. Therefore, the Remedial Action Plan does not require that the decontamination area be enclosed or shielded from the wind. The contractor is responsible for ensuring that truck beds containing contaminated soil are covered prior to leaving the Site and that the trucks are appropriately decontaminated prior to leaving the Site. DTSC will be conducting periodic inspections to ensure that this is occurring.

Trucks leaving the Site may utilize the currently unpaved adjacent right-of-way (aka: Union Pacific Railroad (UPRR) Parcel D). The UPRR Parcel D site was remediated by the City of Emeryville. If trucks inadvertently carried some soil from the UPRR Parcel D site onto the roadway, it would not be contaminated soil and the contractor would need to remove it.

It may be possible to use the same trucks to carry contaminated soil from the Site to the landfill and then pick up clean fill material for transport back to the Site. In this case, the Remedial Design would describe the steps that would be implemented to ensure that the trucks did not contain residual contaminated soil prior to picking up the clean fill material.

Clean fill material will be tested prior to bringing it on-site. The amount of testing is dependent upon the source of the material. DTSC provides guidance for the testing

frequency, but Sherwin-Williams is responsible for ensuring that the material brought on-site does not contain chemicals of concern above the Site's cleanup goals. Water sprays will be used, if necessary, to minimize dust generation during off-loading of the clean fill material.

Sherwin-Williams and the contractor are responsible for communicating truck routes and idling requirements to the trucking contractor(s). They are also responsible for ensuring compliance with these requirements. DTSC will be conducting inspections to monitor compliance with these requirements. Additionally, the Bay Area Air Quality Management District has additionally authority to enforce the idling requirement.

Any alternative truck routes using City streets would need to be approved by the City of Emeryville. Any changes in the truck route would be communicated to the community prior to implementation. Depending upon the conditions encountered requiring an alternative truck route, the best alternative from those presented in the CEQA analysis would be chosen. The specific communication method will be included in the Community Safety Plan. Please see the response to comment #8-8 regarding development of the Community Safety Plan.

Comment 30-4: Communication. Over the 6 month period of remediation work how many communications from DTSC should we expect to inform us about progress, problems, results of monitoring data, extensions to the schedule etc.?

Response: This information will be described in the Community Safety Plan. Please see the response to comment #8-8 regarding development of the Community Safety Plan.

Comment 31-1: The comment I would like to add here is that a significant amount of dust, dirt, and mud has been tracked into the building from the current project...bringing it directly into our living space. I would love to see something taken into consideration to reduce or avoid the scenario of tracking in toxic dirt.

Response: There currently are no soil disturbing activities at the Site. Therefore, the Site should not be impacting the commenter's building. The only current project DTSC is aware of in this community is the City of Emeryville's Park Avenue Street Beautification Project.

Comment 32-1: After reviewing the draft RAP, the CEQA Initial Study and the proposed CEQA Mitigated Negative Declaration, it is our conclusion that these documents fail to adequately addresses the proposed remediation and environmental impacts on the Site and the surrounding community, and is therefore legally defective unless revised to address the concerns of the community and as addressed below. Randy Smith's presentation (CDM) at the meeting regarding further analysis of rail and truck transportation methods and possible off-site disposal locations, material that was not presented in the RAP or

the CEQA documents, further demonstrated the inadequacies and incompleteness of the RAP and CEQA documents.

RESPONSE: Comment noted. Please see the response to General Comment #4.

Comment 32-2: Draft Remedial Action Plan (RAP), Remedial Action Objectives in section 3.2 (p.3-3) – among the objectives identified are 1) minimization of migration and inhalation of airborne dust; 2) minimize exposure to and inhalation of constituents of concern (COCs); and 3) minimization of inhalation of organic compounds (VOCs). The assurance of achievement of these objectives is essential to the Coop community. However some of these concerns are not adequately addressed as described below.

a) **Preliminary Implementation Schedule, even the RAP details that are somewhat vague may change based on the remedial design implementation plan (RDIP), (not yet prepared), contractor plans and local permits. This will include a Community Safety Plan as well as a Dust and Vapor Control Plan described in section 6.1.1.1, p.6.2 – the Coop is generally downwind of the remediation activities. It seems essential that community input be sought and encouraged on the RDIP including the Community Safety Plan and the Dust and Vapor Control Plan, as it will contain a lot of the details that will directly affect us.**

Response: Comment noted.

b) **Project Schedule - Figure 5-1 shows the planned 12-month schedule for this project and lists the planned tasks, dates and duration. It shows that the bulk of actual on-site activities will occur between May 1 – December 1, 2010. While this time period may in some respects be considered temporary, it is a long period of time for residents living in this area.**

Response: Comment noted.

c) **Work Hours on the site will be 7am-6pm on weekdays and weekend workdays, if necessary, from 9am-6pm. (section 5.1, p.5-1). As this work will be very noisy and disruptive to the adjacent community, are these reasonable hours? This also means that if truck transportation is used to haul contaminated soil away from the Site, they probably will be lining up well prior to 7am with their engines idling. This will cause additional noise and diesel fumes prior to the permitted work hours. Conditions should be imposed by Sherwin-Williams that clearly limit this practice.**

Response: Comment noted. The work hours comply with the City's noise requirements. Truck idling will be limited as required by the Bay Area Air Quality Management District.

d) Noise Monitoring – section 6.2.2, p.6-7 describes noise monitoring and refers to the Emeryville noise ordinance – again 7am-6pm weekdays and 9am-6pm on weekends, if necessary. It notes that more restrictive hours may be established when residential use is very close and the work will involve a lot of heavy equipment – section 6.7 p.6-12 identifies the equipment that will be used for soil excavation. Stringent noise monitoring is essential for this project given the surrounding residential/work areas.

Response: Comment noted. The project includes requirements for noise monitoring.

e) Loading and off-site Transport – these sections are critical. Section 6.9, 6.9.1 and 6.9.2 (pp.6-14&15). Excavated soil will be removed from the site by rail and/or truck (very vague) and transported to yet undisclosed disposal sites. Rail cars will be used "to the extent possible" depending on availability and location of rail cars. Removal of soil from the site (estimated 9-18 weeks involving 50-100 trucks per day) and bringing clean fill back to the site will probably be done mostly by truck. This should be made more definite and specific with emphasize on requiring Sherwin-Williams to do as much removal as possible by rail car. If DTSC has concerns with mandating rail transport, a more through analysis of the truck related community disruption should be undertaken in revised CEQA documents. This should not be deferred to the RDIP process or any other future report.

Response: DTSC believes that the CEQA document adequately addresses the transportation issues. Please see the response to General Comment #2 and comment 3-2. The RAP provides a sufficient amount of detail for the public to understand the options being considered and to comment upon them.

f) Truck Transport Route – It is anticipated that the large trucks will approach the site from the south along Hallack St. and Sherwin Ave. and leave by that same route. This appears to be the historic truck route for this facility. Noise and Encroachment permits will have to be obtained from the cities of Emeryville and Oakland. We understand that there may be some complications with the City's Park Ave. Improvement Project, thus, Sherwin-Williams should negotiate with the City as necessary to secure this preferred truck route to the extent that rail transport is not possible. Any other truck route is not acceptable and has not been sufficiently analyzed in the RAP and CEQA documents.

Response: Comment noted. The truck route discussed in the comment is the truck route recommended in the Draft Remedial Action Plan and in the CEQA Initial Study. Therefore, DTSC concludes that no change to either document is required.

g) **Reporting – During remediation activities, the results of air monitoring and sampling activities will be submitted to DTSC. We think that it is important that Coop members have easy and prompt access to the results. Table 6-1 is a summary of controls for exposure risks relating to dust and vapor control. In addition, a process should be set up so that Coop members can immediately contact an appropriate DTSC staff person when and if the need arises.**

Response: Comment noted and will be incorporated in the remedial design.

h) **Location of Noise and Air Monitoring Stations – The preliminary locations of these monitoring stations are shown on Figure 6-1. While they propose monitoring stations across Horton from the Coop Horton Street parking lot entrance and another around the corner on Sherwin Ave, another monitoring station should be added somewhere between these two stations around the intersection of 45th St & Horton. This would provide more complete air and noise monitoring around areas sensitive to the Coop.**

Response: DTSC believes that the preliminary locations are sufficient. A building is present between the work area and the commenter's proposed noise and air monitoring location.

i) **Diesel Exhaust Air Pollution Issues – this is a critical issue that is not addressed in the RAP – it should be addressed and monitored – this area is already a BAAQMD non attainment area for ozone and particulate matter, and any additional discharge of diesel pollutants will raise pollutant levels well beyond the non attainment thresholds. There will be a lot of diesel air emissions from all the heavy equipment, the truck transport and idling engines as the trucks line up and await their loads and use of rail transport. This should be further addressed in more detail in the RAP.**

Response: Please see the response to General Comments #3 and #4.

Comment 32-3: CEQA Initial Study and Proposed Mitigated Negative Declaration. It is our view that the CEQA Initial Study and proposed Mitigation Negative Declaration is inadequate in the follow respects:

a) **Project Description – Initial Study pp.1-3. The project description is inadequate in that the transportation methods and routes are not determined (left for later reports), the amount of clean soil backfill is not described, the off-site disposal sites are not identified and many of the environmental control protective measures for the community (monitoring, dust, VOC and odor control), are left for analysis in later reports. Without these details, the environmental impacts of the project cannot be effectively determined. The Initial Study now only considers certain segments of the environmental impacts.**

Response: Please see the response to General Comment #4.

b) Aesthetics – Initial Study pp.5-8, pp.79-80. The description of the aesthetic impacts fails to adequately consider the impacts on the surrounding community. The noise, dust, changed traffic patterns and operation of heavy equipment and trucks will cause substantial aesthetic disruption to the residents in this area. While it is described as "temporary," this impact will continue for anywhere from 8-12 months in 2010-2011 – not so temporary if you live and/or work in the vicinity of the proposed project. This simply cannot be disregarded as "temporary" or mitigated – the only mitigation measure mentioned is "replacement of cushioning materials over the top of the intersection surfacing." This does little to address the aesthetic impacts on the surrounding residential community. This needs further environmental analysis and submission of mitigation measures.

Response: The CEQA Initial Study Aesthetics section referenced evaluates the potential for significant impacts to aesthetic resources. As such, the analysis conducted was appropriate.

c) Air Quality – Initial Study pp.10-18, p.80. It is acknowledged that the project has the potential to generate dust and organic vapors. This is a certainty. The BAAQMD states that this area is already out of attainment and exceeds acceptable levels for ozone and particulate matter. The predominant winds are from the west/northwest that will carry dust and vapors from the remediation site directly over the Coop buildings. Thus, the fact that air quality in this neighborhood is already significantly compromised, would seem to call for extraordinary measures to prevent further deterioration of air quality. Diesel emissions from the trucks and heavy equipment are not considered. While a DVCP will eventually be developed, the cumulative impacts of this and surrounding projects cannot be accurately determined prior to its development. To state that the impacts will be "less than significant" relies on incomplete information and fails to meet the analysis threshold necessary to protect this community without further environmental review.

Response: Please see the response to General Comment #5 for dust and vapor. With respect to ozone and particulate matter, DTSC completed the CEQA analysis in accordance with BAAQMD guidelines.

d) Hazardous Materials – Initial Study pp.31-34. The significance of the hazards and hazardous materials cannot be determined without more a definite determination of the transportation methods that will be used to transport the materials away from the site, without the off-site disposal facility being determined or without the details from the RDIP that will be critical in assessing the environmental impacts of the project. The analysis

seems to rely heavily on a report that is not yet in existence – the RDIP. Thus, this section seems to be based on incomplete information and requires further environmental analysis.

Response: The CEQA Initial Study Hazards and Hazardous Materials Section appropriately evaluates potential impacts associated with implementation of the project. Potential emissions associated with transportation are addressed in the air quality section of the CEQA Initial Study. Please see the response to General Comment #4 for further discussion.

e) Noise – Initial Study pp.41-51. The Initial study describes the project vicinity as "noisy urban residential," or about 65dBA. The Emeryville General Plan describes the 60 to 70 dBA range as "conditionally acceptable" for residential use. Thus, it would appear that not much more noise can be added and still allow the residents to enjoy reasonable residential use. Unfortunately, the Initial Study states that City vibration standards do not apply to construction or demolition or to vibrations caused by motor vehicles, i.e. trucks. Table 4 demonstrates that there will be significant temporary increases (lasting up to 7 months) in the noise levels in the immediately surrounding community. Despite this data, the Initial Study concludes that this is "less than significant" impacts and provides no mitigation. This conclusion without mitigation does not follow from the data generated.

Response: The noise analysis as outlined in Table 4 does not indicate that there will be significant temporary increases (lasting up to 7 months) in the noise levels in the immediately surrounding community. The analysis concludes that for one week only when the removal of the Raised Cap is occurring simultaneously with initiation of shoring there could be a substantial temporary increase (greater than 10dBA) in the average noise level at the exterior of the Artists Co-op building. At all other times and at other noise-sensitive receptors, the temporary construction noise-level increase will be slight to moderate.

f) Transportation & Traffic – Initial Study, pp 54- Table 8 estimates the maximum daily vehicle trips to be about 228 trips – mostly large trucks hauling soil off-site and delivering clean backfill. Cumulative construction in the project area is shown in Table 9 – they are significant. Alternative 5 is the preferred transport alternative as it exhibits the least overall impacts to the surrounding transportation system and community of Emeryville, as compared to the other alternatives. While we agree that this is the only viable truck transport route, for some reason truck and rail was not evaluated in a public setting. This is a serious shortcoming of the Initial Study and proposed Mitigated Negative Declaration. At the December 9 community meeting, Randy Smith of CDM described in more detail potential disposal sites for the contaminated soil and discussed rail transport. However, this information is not in the Initial Study as it should

be, thus, demonstrating a serious shortcoming in the Initial Study and proposed Mitigated Negative Declaration. Many of the commentors at the December 9 meeting were focused on the rail alternative, but this consideration has not been evaluated. The documents should be revised to consider this option.

Response: Please see the response to General Comment #4.

g) The "Findings of Significance" in the Initial Study concludes that the project does not have the potential to degrade the quality of the environment. DTSC then concludes that while the proposed project could have a significant effect on the environment, revisions have been made to the project or agreed to that would allow the issuance of a Mitigated Negative Declaration. However, the only mitigation measures identified in the proposed Mitigated Negative Declaration relate to truck impacts to street surfaces and archaeological monitoring. There are no mitigation measures proposed, or project revisions identified, that would directly relate to the noise, aesthetic, air quality, or truck and traffic significant impacts to the adjacent residential community. What are the revisions made to the project or that have been agreed to? We have not seen them in a public setting.

Response: Controls were incorporated into the project as it was being developed to address potential impacts. Therefore, they are not mitigation measures or identified project revisions.

Comment 33-1: I wish to express my concern that the remediation plan has not fully addressed the impacts to the adjoining neighborhood relating to noise, air quality and traffic. Having experienced one remediation that was terribly invasive, I do not have much faith that this will be any better as it is far more extensive. The horrific number of trucks spouting diesel in the neighborhood is a major issue for my neighbors and myself. Both prospective neighborhoods have narrow wind tunnels that capture exhaust which comes into our windows. As I have a stop sign out my window (45th and Horton Streets), I get diesel and gas fumes in my studio every time someone shifts gears. I smell diesel from trucks a block away and I cannot imagine the invasion these numerous trips will cause. It is not the dust I worry about, it is the diesel that will run <u>all</u> the equipment that will be needed for this project. Using rail to and from the site will reduce the diesel. Please seriously consider this option.

Response: Comment noted.

Comment 33-2: Is it possible to test dust, particulate and diesel fumes that come into our windows and skylights?

Response: Please see response to comment 25-28; this response also applies to diesel fumes. Please see response to comment 25-27 for diesel fumes.

Comment 34-1: I am writing because even though I have reviewed the October 2009 Fact Sheet, I am still unclear on the effect of the cleanup and the existing toxic chemicals on myself and fellow residents. I understand that arsenic compounds are present in the groundwater, and in solid forms, but does this mean they are present in our building? Are they able to migrate through joints in pipes, and therefore are in our domestic water? Are the solid compounds present in the air?

Response: Please see the response to General Comment #5 concerning potential exposure to arsenic in soil and dust. Although arsenic is present in the groundwater, the City of Emeryville does not use groundwater as drinking water. There are no drinking water lines crossing through the Sherwin-Williams Site plume. Additionally, drinking water is generally conveyed through pressurized pipes. Therefore, nearby residents will not be exposed to arsenic within the groundwater at the Sherwin-Williams Site through their drinking water.

Comment 35-1: I am a member & resident of the 45th Street Artists Coop. I am writing to voice my support for the railway option for removing toxic soil from the Sherwin Williams site. I am very concerned that the use of diesel trucks for this purpose would be extremely disruptive and destructive to the residents, workers, roads, traffic and general environment and well-being of the Emeryville community. The work and construction are already going to cause considerable disruption, and the suggestion of adding to it with thousands of truck trips in and out of the site can not possibly be taking the community into consideration. As I understand it, using railway cars and the available tracks is a reasonable and viable solution.

Response: Comment noted. Please see response to General Comment #2.

Comment 36-1: First, let me state that as a member of the Consultative Work Group (CWG), I am extremely disappointed in the DTSC for not giving members of the CWG the opportunity to review the "pre" Draft Initial Study(Draft IS) and allow the participants the opportunity to review and provide comments. The norm for this CWG, is that we have reviewed and had the opportunity to comment on all documents prior to general release to the public. Apparently in the name of expediency, the DTSC chose to ignore the normal procedure for the CWG membership.

Response: Comment noted.

Comment 36-2: When comparing the two documents relative to transportation options, it appears that the various transportation options, specifically rail transportation, discussed in the Draft RAP are not discussed the Draft IS. Case

law is clear that all alternatives that are analyzed in the Draft RAP must be analyzed in the Draft IS. Rail transportation is not analyzed in the Draft IS at all. Rail transportation is only eluded to Project description ["Loading of excavated soil and debris into containers (e.g., trucks, bins, rail cars) for off-site disposal;"], yet there is no analysis of the alternative/option for transportation of the wastes from the site by rail.

Response: Comment noted. Please see the response to General Comment #2.

Comment 36-3: The Project description in the Draft IS does not include detail about the size of this project relative to what is being proposed. This is a very large removal action and the transportation of the materials from and to the site is significant. The Project Description does not elude this, but rather treats the amount of wastes to be removed and soils replaced, and the traffic associated with that activity, as if it were simply a "scoop and dump" operation associated with the remediation of a neighborhood corner gas station. The Project description, needs to be revisited and revised to reflect the true nature of the proposed remediation and the associated mitigation measures.

Response: The Project Description, bullet 1, discusses the dimensions of the proposed excavation and the amount of soil proposed for excavation. Additionally, the proposed excavation area is shown on Figure 3 in the Initial Study. Although the number of transportation vehicles is not specified in the Project Description, the Project Description does describe that the material would be excavated and loaded into containers (e.g., trucks, bins, rail cars) for off-site disposal. Therefore, no change is required to the Initial Study or Mitigated Negative Declaration.

Comment 36-4: The Figure in Section 6.3 of the Draft RAP does not match the text in Section 6.9.2. Please ensure that all Figures, Tables and the like that are referenced in the text of the documents correlate.

Response: The Draft RAP, Section 6.3 discusses the Vapor Extraction and Treatment and references Figure 6-2, Preliminary Soil Vapor Extraction Layout. Section 6.9.2 discusses Loading and Off-Site Transport by Truck and references Figure 6-1, Preliminary Site Layout and Controls. The two figures are referenced correctly.

Comment 36-5: Though the Draft RAP and Draft IS are intended to compliment one another, they are individual documents that must stand on their own. The Draft RAP does not include an Executive Summary outlining the proposed remediation. One can not determine what the proposed remediation is without going into the document itself and gleaning the information. The Draft RAP needs to have an Executive Summary.

Response: The Draft Remedial Action Plan describes the cleanup plan for the Site. A fact sheet was distributed to the Site mailing list summarizing the proposed cleanup plan. An Executive Summary is not required by statute or regulations.

Comment 36-6: Draft IS/MND, Noise. page 44: Statement that a permit request may be made to the City to allow noise-generating activities outside of normally permitted hours. No description is given of what time periods might be involved. No analysis is provided of the possible associated effects. There is no indication of whether this City permit would be subject to CEQA analysis.

Response: As discussed in the Initial Study, a permit from the City would be required to allow noise-generating activities outside of normally permitted hours (8 a.m. to 5 p.m.). The City sets the process for obtaining these permits. Therefore, this permit would be obtained in accordance with the City's process and no revision is required to the Initial Study or Mitigated Negative Declaration.

Comment 36-7: Draft IS/MND, Vibration analysis. page 45: I have concerns about this section and it seems suspect. I believe that expert opinion is needed on this issue.

Response: Comment noted. Licensed engineers conducted the appropriate engineering analysis. Therefore, no revision is required.

Comment 36-8: Draft IS/MND, Construction noise. page 47: This section contains questionable noise attenuation assumptions related to windows. This section contains unsubstantiated conclusions. Given the proximity to sensitive receptors (live/work space), mitigations should be offered in order to reduce construction noise, including but not limited to, "quiet" construction equipment standards; limited hours of operation; and the requirement for installation of new double or triple pane windows.

Response: Please see the response to Comment #18-1 and #32-3e. DTSC believes the noise evaluation is adequate and appropriately demonstrates that no mitigation measures are needed to reduce potential noise generation from the proposed project.

Comment 36-9: Draft IS/MND, Transportation and Traffic. Page 54: This section includes an incomplete intersection analysis. It seems as if this section used incomplete existing data and no real traffic analysis was prepared. There is no discussion of the potential conflict between trucks and cars/pedestrians in an urban residential setting. There is no discussion of cumulative impacts, particularly with trucks on freeways. There is no discussion of haul routes or destinations for ultimate disposal. The Draft IS/ND fails to support conclusion of LTS conclusion re 50% increase in traffic on neighborhood. There is no discussion of traffic safety impacts of 1 truck every few minutes carrying hazardous wastes in a residential neighborhood. The Draft IS/MND fails to

analyze the rail transport alternative and its potential for reducing traffic and safety impacts.

Response: Please see the response to General Comments #2 and 4. The Initial Study, Transportation and Traffic, #15a analyzes potential impacts of this project associated with transportation and traffic. The project proposes to use a truck route designated by the City of Emeryville to minimize potential impacts through the residential area.

As noted in the Initial Study, the project could potentially create temporary congestion south of the Site on the one block of Halleck Street between Park Avenue and Sherwin Avenue. The entrance to the E-loft parking structure is located on Halleck Street immediately north of Park Avenue. Cars exiting the parking structure could experience minor delays as empty trucks wait at the southbound stop sign to cross Park Avenue. Cross traffic on Park Avenue at this intersection, however, is limited since Park Avenue terminates one block west of Halleck. Deliveries of supplies and clean backfill would be scheduled as much as possible to avoid peak travel hours on Halleck Street.

If an encroachment permit is required by the City of Emeryville, and if required as part of that permit, traffic control personnel would be utilized during designated time periods to direct vehicular traffic through this area of Halleck Street.

Comment 36-10: I am concerned that information (both verbally and in writing) was made available to the members of the Artists' Coop at the recent meeting at the Coop, that was not made available at the formal meeting for the community at large that took place some weeks ago. It is unfortunate that the other members of the community were not privy to such important and relevant information about the transportation options that are available associated with the remediation of the S/W site.

Response: Comment noted. The information presented at this meeting is summarized in the response to General Comment #2.

Comment 37-1: In Section 1 of the RAP, the "site" is defined as property owned by Sherwin-Williams as well as property owned by Novartis (i.e., the former Rifkin property). Given the separate ownership, is it appropriate to define both properties as one site or should separate RAPs corresponding to the distinct ownership areas be prepared?

Response: DTSC, under Federal law, defines “site” to mean any area “where a hazardous substance has been deposited, stored, disposed of, or placed, or otherwise come to be located.” Because the extent of the contamination from the Sherwin-Williams property ends on a portion of the Novartis property that portion of the Novartis property is part of the “site” under applicable state and federal laws. Therefore, the proposed remedy for the Site covers portions of both parcels, and has been addressed in one RAP.

Comment 37-2: By defining the "site" in this fashion, is DTSC saying that contamination from Sherwin-Williams' operations never impacted any properties other than the Sherwin-Williams site and the former Rifkin property, or is it simply saying that only those two properties are the specific focus of this RAP document? If DTSC is saying that the pesticide operations conducted at the site never affected any property other than Sherwin-Williams property and the Rifkin property, what is the basis for that conclusion? Specifically, has DTSC considered the bridge that, according to Sherwin-Williams documents attached, once connected the 1450 Sherwin site to property west of the UPRR tracks?

Response: The focus of the RAP document is the scope and extent of contamination at Sherwin-Williams' former manufacturing site at 1450 Sherwin Avenue. Sherwin-Williams conducted an extensive investigation to determine the extent of contamination at the Site, and it extends to a portion of the Novartis property (see answer to Question 1 above). The data from the investigation indicate that the source of the arsenic contamination is an area beneath the former lead arsenate pesticide manufacturing operations, where wastes from those operations accumulated. None of the data from the investigation and none of the Site-related documents indicate that releases of site-related wastes occurred on any property other than the Sherwin-Williams property and a portion of the Novartis property.

The bridge referenced in the question was a bridge constructed to provide access over the railroad tracks to the New California Jockey Club Racetrack, which was west of the railroad tracks. A 1911 Sanborn Insurance Map notes the bridge and "covered walk to grand stand." Site-related documents depicting the vicinity in 1920, 1939, and 1950 show a bridge present over the railroad tracks near the Site. The bridge is not present on site-related documents depicting the vicinity in 1903 and 1952, and subsequently. The bridge provided a way for the public to travel between areas east and west of the tracks without having to cross the tracks. The documents showing the bridge do not depict the bridge (or its attached inclines on either side) as being present on Sherwin-Williams property. None of the historical maps and documents indicate that Sherwin-Williams used the bridge for any Sherwin-Williams' operations.

Comment 37-3: The Site History section of the RAP notes that pesticides were manufactured at the S-W facility, but it does not explain how or where wastes from the pesticide operation were disposed of (other than on-site such as through spillage). Has Sherwin-Williams submitted documentation comprehensively documenting the location or locations where wastes associated with its pesticide operation were disposed (no discussion of that topic is included in the RAP)? Has someone determined that no off-site disposal of wastes from Sherwin-Williams' pesticide operation occurred, or is that simply a topic beyond the scope of the RAP document?

Response: Wastes from the former lead arsenate pesticide manufacturing operation accumulated in an area originating beneath those operations. Other than the wastes in that area, none of the data from the Site investigation and none of the Site-related documents indicate that wastes from the pesticide operation were disposed anywhere, on-site or off-site (except at disposal facilities).

Comment 37-4: In Section 2.4.2.1 of the RAP there are references to a "release beneath Horton Street." How could there be a release beneath Horton Street if the plant operations were conducted west of Horton Street and Horton Street is generally up gradient from the facility?

Response: The reference to the “release beneath Horton Street” is not intended to mean that the release came from the Site. In fact, just the opposite is true. As the question correctly notes, a release would have been up-gradient from the Sherwin-Williams facility. Information about the release was obtained from communications with City of Emeryville personnel, who indicated that in the 1980’s the City’s sewer line broke in the same general location as ground water monitoring well LF-28 in the middle of Horton Street. The sewer served a number of historic industries in the area. Several investigations on and adjacent to Horton Street indicate that this historic sewer break may have been the cause of shallow ground water contamination in that area.

Comment 37-5: In connection with Horton Street, has there been any investigation of the "6-inch [pipe] to lime sulphur plant" indicated on the map attached? Has Sherwin-Williams previously brought this pipe to DTSC's attention? Has Sherwin-Williams previously brought this pipe to the Regional Board's attention? The pipe does not seem to appear in the Entrix study in which other pipes and conduits associated with the plant are documented. In addition, when asked at a recent deposition (November 12, 2009) whether he had "any understanding of what that line was?" Larry Mencin of SherwinWilliams responded "Not at all." Beyond the boundaries of that portion of Horton Street adjacent to the Artists Co-op previously remediated in the early 1990s, has any effort been undertaken to investigate potential releases further north on Horton Street?

Response: The pipe referenced present on the map attached with the comment letter is a “Water Pipe (Underground)” as described in the map’s Key to Plan Notations. The map attached is a portion of a “fire-insurance”-type map from March 1921 of Sherwin-Williams’ “Paint & Varnish Works” (1450 Sherwin Avenue) and “Lime Sulphur Plant” (northern portion of Site A at the Baystreet Redevelopment). On this map, this pipe is shown to provide water to the Site and off-site, to the public fire hydrant. The notation ("6-inch [pipe] to lime sulphur plant") for this pipe indicates that this pipe is part of a system of pipes that also provide water to the Lime Sulphur Plant. This pipe has been presented in other site-related documents, including the 1998 Current Conditions Report (see document Figures 3-5, 3-6, and 3-7). Please

see the response to Question 37-2 above regarding the extent of releases associated with the Site.

Comment 37-6: Section 2.4.3.1 (numbered paragraph 5) of the RAP refers to drying ovens, crushing and packaging operations. Are those operations further described in historic records that have been shared with the DTSC?

Response: The process described in numbered paragraph 5 in Section 2.4.3.1 of the draft RAP is the best estimate of likely operations based on available documents and site diagrams.

Comment 37-7: The *ARAR/TBC* discussion in Section 3.1.3.1 of the RAP identifies a settlement agreement involving Sherwin-Williams and Novartis. What does that document specify in relation to remediation at the site and what is its role as an ARAR or TBC?

Response: The Settlement Agreement addresses Sherwin-Williams' agreement to remediate the contamination that extends from the Sherwin-Williams property to a portion of the Novartis property. Under the Agreement, Sherwin-Williams agreed to implement the remedial action plan, as approved by the DTSC. Therefore, it is listed as a to-be-considered requirement.

Comment 37-8: The ARAR Table (3-1) identifies the Park Avenue District Plan, the Chiron Planned Unit Development (PUD) and Preliminary Development Plan (PDP), and the City of Emeryville General Plan. How have those documents impacted the process of remedy design and evaluation? Are local land use documents such as those customarily and properly considered in preparing and evaluating a RAP?

Response: The proposed remedy was developed in coordination with the Park Avenue District Plan, the Chiron Planned Unit Development (PUD) and the City of Emeryville General Plan. The ARARs identifying these plans were considered in identifying future site uses of a property undergoing remediation. The plans are evaluated in determining the clean-up goals applicable to the Site so that current and likely future uses are addressed by the Site remediation.

Comment 37-9: Section 4.1.3.7 (former Rifkin Property Remedial Action) of the RAP includes some discussion about excavating VOCs from the saturated zone, apparently based on locations where VOCs in soil gas exceeds cleanup goals. Is that aspect of the site (VOCs in soil gas) an appropriate basis on which to remediate VOCs in saturated material?

Response: The excavation is defined by arsenic concentrations at the Site. Saturated soils containing VOCs are only being excavated to the extent they are contained in the arsenic source excavation area. Any VOCs remaining in the saturated zone across the Site are being addressed through Monitored Natural

Attenuation (MNA), an approach common throughout Emeryville, the state, and the country.

Comment 37-10: Section 4.1.3.7 of the RAP makes reference to the Rifkin site being "returned to current use as a parking lot" and the same point is made in Section 6.11. Elsewhere, however, there is discussion about the Rifkin site being developed into a high rise tower. Which is it? If the Rifkin site is to become a high-rise tower, when will the tower development happen? Is it reasonable/appropriate to clean the site up in the near term before the tower development is ready to proceed? The development into a tower does not show up in the project schedule (Figure 5-1). Is it possible/appropriate to clean up the site before the final decisions have been made about the eventual redevelopment? Is that a reasonable approach?

Response: The site's draft RAP describes those activities that will take place during the short period during which the remedial action is completed. The site will be returned to its pre-remediation use as an open area and a surface parking lot after completion of the remedial action. Future redevelopment of both properties may occur at the discretion of the Site owners. It is DTSC's understanding that there are no plans for near-term development, and that there are several options under the Chiron Preliminary Development Plan for the Rifkin property (one of which is a "high rise" tower).

Comment 37-11: Section 4.2.2.5 of the RAP on cost doesn't say what the cost is, but Table 7 -1 in Appendix B indicates costs of either $37.9 or $42.4 million, or perhaps the total of those. Is the total cost the sum of those two numbers (approximately $80.3 million) or is the total $42.4 million? Does either of those figures account for what has been spent since the Regional Board issued its order in 1989 on the IRMs, the site investigation, feasibility study and the RAP? What is the approximate total cost when all of the interim cleanup actions, site characterization, treatability study tests, past and future investigation, feasibility evaluation, cleanup and post excavation treatment and monitoring work are considered?

Response: Table 7.1 of the Feasibility Study states that the short term capital costs are expected to be $37.9 M with the future O & M (ground water monitoring, etc.) to be an additional net present value of $4.5 M, representing a total of $42.4 M. The remedy will be conducted by S-W. The historic costs of investigation, plans and reports, Interim Remedial Actions and State oversight costs are not presented in the FS or RAP. DTSC typically does not compile those costs and has not done so here. Sherwin-Williams has been paying DTSC's oversight costs.

Comment 37-12: How will Sherwin-Williams/DTSC decide whether a vapor intrusion contingency mechanism is required? What happens if all the testing on that issue is not yet completed when the planned redevelopment begins? What happens then to assure protection of future occupants of a building on the Rifkin

site? Is there some principle that if in doubt S-W /DTSC will err on the side of caution and require the vapor barrier?

Response: DTSC expects that the removal of organics from the excavation of the arsenic source area will remove the significant mass of site-wide ground water and soil contaminated with VOCs, thereby minimizing the likelihood that a vapor barrier will be warranted. However, as a precaution, vapor testing will be conducted after completion of excavation of the arsenic source area, and again before the properties are developed. If testing indicates that vapor concentrations remain elevated, a contingency for a vapor barrier is included in the RAP. Moreover, even if a vapor barrier is not required, a developer may decide to install one; developers often design vapor barriers into their initial projects as preventive measures (i.e., an extra safety measure) for the existing conditions in Emeryville and around the Bay Area.

Comment 37-13: Near the end of Section 6.7 of the RAP there is a discussion about excavating around certain sampling locations that are outside the so-called source area, and the statement is made that "excavation beyond the limits presented above may be needed." Is it acceptable practice to excavate and rely on confirmation sampling rather than have the excavation area fully delineated and known before excavation begins? How does the public know what it is getting if the excavation area is not fully defined before the work starts?

Response: A significant number of samples have been collected across the Site to delineate site contamination. The deep excavation beneath the water table is based upon site investigations, which have identified the extent of the arsenic source area; no additional sampling is contemplated in this area. The references to confirmation samples in Section 6.7 are for shallow “Vadose Zone” (above the water table) soils across the Site where there is evidence of elevated arsenic concentrations. The soil confirmation sampling is a common practice for these situations, and any additional soil removed is not anticipated to add much to the volume or the schedule of this project.

Comment 38-1: We need a way to measure cumulative toxic loads that we will be receiving from the site. I understand the measuring devices measure to limits for a given. But this kind of measurement would calculate for our toxic exposure 24 hours a day for the duration of the project.

Response: Please see response to General Comment #5.

ATTACHMENT A

NOTICE OF A PUBLIC MEETING AND COMMENT PERIOD ON THE DRAFT REMEDIAL ACTION PLAN

DEPARTMENT OF TOXIC SUBSTANCES CONTROL

SHERWIN-WILLIAMS SITE
1450 Sherwin Avenue
Emeryville, California
PUBLIC COMMENT PERIOD: 10/28/2009 – 12/1/2009

WHAT'S BEING PROPOSED?

The California State Department of Toxic Substances Control (DTSC) invites public comment on the draft Remedial Action Plan (RAP) for the Sherwin-Williams Site at 1450 Sherwin Avenue in Emeryville, California. You may attend a public meeting on this project:

November 5, 2009
City Council Chambers, City Hall,
1333 Park Avenue, Emeryville, California,
From 7:00 to 9:00 p.m.

Sherwin-Williams operated a manufacturing plant at the Site between 1919 and 2006, producing paints and coatings. From 1919 to the 1940s, lead-arsenate pesticide was also produced. These former operations caused soil and groundwater contamination. Arsenic is the main chemical of concern in soil and groundwater. Other metal and organic chemicals of concern have also been found in the soil and groundwater. There is no immediate health risk because the Site is paved and the groundwater is not used for drinking water. The draft RAP proposes to remove 64,000 cubic yards of impacted soil from the Site.

DTSC has prepared a draft Mitigated Negative Declaration for this cleanup activity under the California Environmental Quality Act (CEQA). With the implementation of project controls, this project should not have a significant negative impact on the human health or the environment.

HOW DO I PARTICIPATE?

This notice provides you with the opportunity to learn more about the project and provide comments to DTSC about the proposed cleanup during the public comment period. Your participation is encouraged. Comments concerning the draft RAP may be submitted in writing to Janet Naito, Project Manager, DTSC, 700 Heinz Avenue, Berkeley, California 94710, e-mail address: JNaito@dtsc.ca.gov, and must be postmarked or e-mailed by December 1, 2009.

WHERE DO I GET MORE INFORMATION?

A copy of the draft RAP and other project documents are available at the Oakland Public Library, 5606 San Pablo Avenue, Oakland, CA and the DTSC fileroom at the address listed above. You can also view documents online at DTSC's web site, www.envirostor.dtsc.ca.gov/public/profile_report.asp?global_id=60000189. Click on "Community Involvement" to look at documents available for public review.

CONTACTS:

You may contact Nathan Schumacher, DTSC Public Participation Specialist (866) 495-5651, press prompt #1, then press prompt #5 or e-mail at NSchumac@dtsc.ca.gov. You may also contact Janet Naito, DTSC Project Manager, (510) 540-3833 or e-mail at JNaito@dtsc.ca.gov. Members of the Media please contact Carol Northrup, DTSC Public Information, (510) 407-4817 or CNorthru@dtsc.ca.gov.

OT #3297904
Oct. 28, 2009

Department of Toxic Substances Control

Preventing environmental damage from hazardous waste, and restoring contaminated sites for all Californians.

State of California

California Environmental Protection Agency

Fact Sheet, October 2009

SHERWIN-WILLIAMS SITE
DRAFT REMEDIAL ACTION PLAN
AVAILABLE FOR PUBLIC REVIEW

The Department of Toxic Substances Control (DTSC) invites you to comment on the draft Remedial Action Plan (RAP) for the Sherwin-Williams Company property located at 1450 Sherwin Avenue in Emeryville, California and a portion of the adjacent former Rifkin property, located at 4525 – 4563 Horton Street (collectively called the Sherwin-Williams Site, please see Figure 1 on Page 9). The draft RAP proposes soil and groundwater cleanup actions for the Sherwin-Williams Site.

This fact sheet provides information concerning the public comment period, Site background, the draft RAP, the proposed California Environmental Quality Act (CEQA) draft Mitigated Negative Declaration, information repositories, information contacts and mailing list information.

A RAP is a document that identifies goals and objectives for a cleanup action, summarizes the assessment of cleanup alternatives to address the contamination found at a site, and presents the implementation activities for the selected final cleanup. DTSC is responsible for overseeing the investigation and cleanup activities at the Sherwin-Williams Site.

Public Comment Period

We encourage you to review and comment on the draft RAP and the draft CEQA Mitigated Negative Declaration for the Sherwin-Williams Site. These documents are available for review as listed on Page 8. DTSC begins a 30-day public comment period on October 28, 2009 that ends on December 1, 2009. All written comments must be postmarked by or sent by December 1, 2009 to the following:

Ms. Janet Naito, DTSC Project Manager
700 Heinz Avenue, Suite 200
Berkeley, California 94710
Or via e-mail to **JNaito@dtsc.ca.gov**

Public Meeting

Thursday, November 5, 2009, 7:00 p.m. to 9:00 p.m.

DTSC will hold a public meeting regarding the draft RAP and the draft CEQA Mitigated Negative Declaration on **Thursday, November 5, 2009** at **the City Council Chambers at City Hall, 1333 Park Avenue, Emeryville, California from 7:00 p.m. to 9:00 p.m.** DTSC will respond to written and oral comments submitted at the public meeting as well as written comments received by mail or e-mail by December 1, 2009. For more information about the accessibility of the public meeting site or community involvement, please call Mr. Nathan Schumacher, DTSC Public Participation Specialist at toll free (866) 495-5651 or e-mail him at NSchumac@dtsc.ca.gov.

Site Background

The Sherwin-Williams Company operated a manufacturing plant that produced a wide variety of paints and coatings between 1919 and 2006. Pesticides containing lead and arsenic were also manufactured at the plant from the 1920s until the late 1940s. Sherwin-Williams closed its operations at the Site in December 2006. These former operations caused soil and groundwater contamination.

Arsenic is the main chemical of concern in soil and groundwater. Volatile organic compounds (VOCs), polycyclic aromatic hydrocarbons (PAHs) and other metals have also been found in the soil. VOCs, other metals, and naphthalene have been found in the groundwater. There is no immediate health risk because the Sherwin-Williams Site is paved and the groundwater is not used for drinking water.

Site Regulatory History

Prior to February 2006, the San Francisco Bay Regional Water Quality Control Board (Water Board) provided oversight for the cleanup activities at the Sherwin-Williams Site. During its oversight, the Water Board approved several Site documents, including a 2004 Remedial Investigation Report and a 2005 Human Health Risk Assessment.

In February 2006, regulatory oversight was transferred to DTSC to evaluate the cleanup alternatives and to implement the final cleanup action. On May 10, 2006, DTSC issued an Order to Sherwin-Williams defining the cleanup process for the Site. These documents can be found in the information repositories and on DTSC's EnviroStor Database listed on Page 8 of this fact sheet.

Site Characterization

Arsenic is the primary chemical of concern on-site in both soil and groundwater. The highest concentration of arsenic in soil is in the east-central portion of the Sherwin-Williams property and in the adjacent portion of the former Rifkin property. These areas are covered with pavement.

Arsenic is detected in shallow groundwater (between 10 and 25 feet below the ground surface) below an area referred as the Raised Cap and also on the adjacent portions of the former Rifkin property extending west toward the Union Pacific Railroad tracks (see Figure 1 on Page 9).

After becoming the lead agency, DTSC required additional investigations and studies to assist in the evaluation of cleanup alternatives. Additional soil and groundwater samples were collected for a series of tests. A team of professional and academic experts helped to identify and evaluate potential cleanup options for the Site.

Conceptual Site Model

Based upon the results of the Site characterization, a conceptual site model was developed. This model describes how chemicals may have been released into the environment, how these chemicals moved in the environment, and how people and the environment could be exposed to these chemicals.

Sherwin-Williams produced lead arsenate pesticides for about 25 years at the Site. During this time, spills of acids, raw materials, liquids, and/or the finished product occurred onto the building floor and ground surface. Some of these materials contained arsenic. Over time, the spilled material moved into the subsurface. Acids that moved into the subsurface dissolved the natural minerals in the soil and released silica (the most common element in earth's crust), which then dissolved in groundwater.

As arsenic-containing spills moved through the subsurface soil and into shallow groundwater, the arsenic reacted with the dissolved silica and formed a mineral coating around soil particles. This is called solid phase arsenic silica or the source material (see Figure 2 on Page 10). The source material is found in the sandy (east-central) portion of the Site also referred to as the source area.

Groundwater flowing through sandy soils in the source area dissolves some of the coating and releases arsenic into the groundwater. This is an on-going, slow process and represents a continuous source of arsenic to groundwater.

The dissolved arsenic primarily moves within sandier soils in the direction of groundwater flow, west/northwest toward the railroad tracks. Arsenic concentrations in groundwater decrease rapidly as groundwater moves away from the source area and toward the western property boundary. Some of the dissolved arsenic moves into the clay surrounding the sandier soils. In these clays, the arsenic reacts with sulfides (naturally occurring within the groundwater) to form an arsenic sulfide precipitate, a mineral that does not readily dissolve in groundwater. This process contributes to the decrease in arsenic concentrations in groundwater away from the source area.

Interim Cleanup Actions

Several cleanup actions have already been implemented at the Site. Interim cleanup actions are actions taken to protect public health and the environment while long-term solutions are being developed.

Between 1973 and 1994, Sherwin-Williams removed the manufacturing plant that produced lacquer. Solvent and oil tanks were also removed during this time. Soil in the area of the solvent tanks containing VOCs, such as toluene, was removed and disposed off-site prior to 1990.

In the early 1990s, the Water Board approved the implementation of several interim cleanup actions that included the installation of:

- A slurry wall, a subsurface vertical wall primarily composed of clay, to contain the more highly contaminated groundwater at the Sherwin-Williams Site.
- An asphalt cap over the surface of the Site to prevent contact with contaminated soil.
- A groundwater extraction and treatment system inside the slurry wall to help contain groundwater within the slurry wall.

In 1997, the Water Board oversaw the removal of arsenic impacted soil along the portion of Horton Street adjacent to the Sherwin-Williams Site (see Figure 1 on Page 9). In 1999 and 2000, the groundwater extraction and treatment system was expanded to add additional groundwater extraction wells.

DTSC is currently overseeing the operation and maintenance of the capped area, the storm water collection system, and the groundwater extraction and treatment system.

Cleanup Action Objectives

Based upon data gathered during the Remedial Investigation, a Human Health Risk Assessment was performed to look at the various ways people could be exposed to chemicals present in soil and groundwater. This assessment determined that cleanup actions are necessary to address the future risks posed by arsenic and other chemicals of concern in soil and groundwater.

The cleanup action objectives are to:

- Minimize the potential for people to come into direct contact with soil containing chemicals of concern at concentrations exceeding their cleanup goals.
- Minimize the potential for the generation of airborne dust from soil containing chemicals of concern at concentrations exceeding Site cleanup goals.
- Minimize the potential for people to be exposed to volatile organic chemicals of concern in indoor air exceeding Site cleanup goals;
- Minimize the risk to fish or other water organisms from groundwater containing chemicals of concern at concentrations exceeding Site cleanup goals; and
- Minimize the potential for on-site human contact with groundwater containing chemicals of potential concern at concentrations exceeding Site cleanup goals.

Cleanup goals are based upon concentrations calculated as part of the risk assessment to protect public health and the environment. Cleanup goals for chemicals in groundwater were set at the more protective of the federal or state drinking water standards. For those chemicals

without drinking water standards, DTSC used the Water Board's Environmental Screening Level.

Treatability Study Tests

Under DTSC oversight, Sherwin-Williams evaluated numerous technologies to identify those that could potentially address chemicals of concern at the Site. Sherwin-Williams then conducted tests to determine whether these cleanup technologies could effectively clean up the arsenic and other chemicals found in soil and groundwater at the Site. Based upon concerns about potential disruptions to the community, Sherwin-Williams focused on technologies that would treat the arsenic in place, and minimize the amounts of soil excavated from the Sherwin-Williams Site.

The following cleanup technologies were studied:

In-Place Groundwater Treatment: Groundwater treatment such as adding iron to bind the arsenic that would be done in-place within the shallow groundwater. This technology would require the addition of too much material to be effective at addressing the arsenic in the source area, but could treat groundwater containing less arsenic away from the source area.

Active Groundwater Treatment: Groundwater would be cleaned in a treatment system (one or more containers) installed above or below ground level. Materials such as iron and oxygen would be used to cause the arsenic in the shallow groundwater to become insoluble. Treatability tests were conducted to determine the best materials to use.

On-site Soil Treatment: Soil treatment technologies that would be done in-place.

- Grout Injection. Injection of a cement-like material into the shallow groundwater so that groundwater could not move easily through the source area. The pilot test was not successful at distributing the grout material evenly through the soil in the shallow groundwater.
- Soil Mixing. Using a drilling rig to mix the cement-like material with soil within the shallow groundwater. Laboratory tests indicated that this could significantly slow down the movement of groundwater through the source area and thus keep the arsenic from moving further. However, the addition of the cement-like material could also cause some arsenic currently binding to soil to be released into the groundwater.

Cleanup Options for the Site

Sherwin-Williams evaluated the following general cleanup options for soil and groundwater:

- No Action
- Land Use Controls
- Excavation (Soils) and Extraction (Groundwater)
- Disposal to an approved off-site disposal facility
- Treatment of soil and/or groundwater

These options are further discussed below.

No Action: This option includes discontinuing operation of the existing interim cleanup actions as discussed on Page 3.

No Additional Action: This option includes continuing to operate the existing interim cleanup actions described on Page 3.

Land Use Controls: These are restrictions on the future use of the property to ensure that people and the environment are not exposed to the chemicals in soil or groundwater at unsafe levels.

Typical restrictions include 1) prohibiting excavation or drilling into soil or the groundwater containing arsenic and other chemicals without prior DTSC approval and risk management planning; and 2) prohibiting the use of the groundwater from the Sherwin-Williams Site.

Excavation (Soils): The following are potential options for soil excavation. Excavated soil would be disposed of at an appropriate off-site disposal facility.

- Removal of approximately 33,500 cubic yards of soil, including approximately 7,000 cubic yards of soil and debris from the Raised Cap area and approximately 26,500 cubic yards of soil above the groundwater either containing arsenic above the Site cleanup goal of 24 parts per million (ppm) or overlying the source area.
- Removal of approximately 59,000 cubic yards of soil, including removal of the soil discussed in the previous bullet and approximately 25,300 cubic yards of soil from the source area on the Sherwin-Williams property.
- Removal of approximately 64,000 cubic yards of soil, including removal of soil discussed in the previous bullet and approximately 4,600 cubic yards of soil within the source area on the former Rifkin property.
- Removal of approximately 194,000 cubic yard of contaminated soil to remove all soil exceeding both of the soil cleanup goals. This would include the removal of soil above the shallow groundwater containing arsenic above the Site cleanup goal and soil within the shallow groundwater in areas where arsenic levels in groundwater exceed levels protective of aquatic resources.

Extraction (Groundwater): Groundwater containing chemicals of concern would be pumped out of the ground and cleaned up in a treatment system. The treated water would be disposed of to the sanitary sewer or storm drain under appropriate permits.

Treatment (Soil): Soil within the shallow groundwater in the central portion of the Sherwin-Williams Site would be mixed with cement-like material so that groundwater cannot move easily through this material. This would reduce the levels of arsenic in the shallow groundwater flowing away from the source area.

Treatment (Groundwater): Groundwater would be cleaned up by using oxygen and iron to cause the arsenic to become insoluble and able to be removed from the groundwater.

Assessment of Alternatives

The above cleanup options were combined into different cleanup alternatives in the Feasibility Study (FS) report for further assessment. DTSC and Sherwin-Williams evaluated the cleanup alternatives based upon their ability to meet the following federal criteria:

- Overall Protection of Human Health and the Environment
- Compliance with Applicable or Relevant and Appropriate Requirements
- Long-Term Effectiveness and Permanence
- Reduction of Toxicity, Mobility and Volume through Treatment
- Short-Term Effectiveness
- Implementability
- Cost
- Regulatory Acceptance
- Community Acceptance

Draft RAP Recommended Alternative

Based upon the technologies tested and the alternatives evaluated, DTSC recommends the removal of approximately 64,000 cubic yards of contaminated soil including the Raised Cap Area, the soil overlying the source area and the soil within the shallow groundwater source area. These actions provide the best overall protection of human health and the environment. The soil removed would be transported to an appropriate permitted off-site disposal facility. Removing this soil also provides long-term cleanup effectiveness and permanence. Long-term groundwater monitoring will be conducted to evaluate the effectiveness of the soil removal.

California Environmental Quality Act

As required by the California Environmental Quality Act (CEQA), an Initial Study was prepared to evaluate potential environmental impacts that may result from the implementation of the draft RAP. DTSC has determined that because the focus of the draft RAP is to clean up impacted soil and groundwater and the draft RAP has controls to protect the community and environment during cleanup, there will be no

significant negative impacts. DTSC has proposed a CEQA Mitigated Negative Declaration for the draft RAP. Items requiring mitigation during cleanup are offsite aesthetics at the intersection of Park Avenue and Halleck Street and documentation for potential archeological findings.

Cleanup Plan and Implementation

Details of the recommended final cleanup are provided in the draft RAP. This plan describes the proposed cleanup measures, transportation routes and the proposed actions to ensure the safety and protection of the surrounding community while the cleanup is implemented. Figure 3 on Page 11 presents a preliminary layout of the Sherwin-Williams Site during cleanup implementation.

If approved, the cleanup activities would include excavation and off-site transport of about 64,000 cubic yards of soil over a 6-month period beginning in spring 2010. Based on the results of the Public Health Evaluation of the Remedial Alternative (Public Health Evaluation), DTSC will require the use of a variety of control measures to reduce dust and vapors during the cleanup.

The Public Health Evaluation analyzed the potential risks from the cleanup activities. Based on the use of appropriate emission control technologies, e.g., dust and vapor controls, the Public Health Evaluation concluded that people in the community will not be put at risk from cleanup implementation.

Prior to the start of the cleanup, a Community Safety Plan will be distributed to the community. The plan will provide information for the community regarding the measures to control exposures to chemicals that could be present during the implementation. The substance of the Community Safety Plan will be presented to the community during a meeting prior to cleanup.

The Public Health Evaluation calculated dust and vapor action levels that should not be exceeded at the perimeter during cleanup, thus ensuring protection of the community from any adverse health effects. The Public Health Evaluation calculates these action levels using state and federal guidance and standards. Perimeter air monitoring will be used to confirm the effectiveness of vapor and odor control methods (see Figure 3 on Page 11 for preliminary monitoring locations). Control methods will be modified as appropriate to maintain levels below action levels. Results from the perimeter air monitoring will be sent to DTSC on a constant basis.

As part of vapor controls, prior to excavation, soil vapor extraction wells will be used to remove stagnant VOCs present in the subsurface. The soil vapor extraction and treatment system will be operated pursuant to a BAAQMD permit. The system will be phased out as excavation proceeds.

As excavation proceeds, a shoring system and a dewatering system will be installed. For excavation along Horton Street, the shoring system will consist of a retaining wall utilizing an anticipated nine piles drilled into place with boards/plates in between the piles. The piles will be drilled to a depth of approximately 50 feet. The wall will be approximately 60 feet in length. Perimeter noise monitoring will be conducted to ensure compliance with local noise ordinance throughout the cleanup activity. The remaining portions of the excavation will be shored through sloping.

The excavation depth will be approximately 25 feet. The shallow groundwater extends from approximately 7 to 25 feet below ground surface. The excavation will be dewatered using one or more sump pumps installed at the bottom of the excavation on the S-W property. Water collected will be pumped to the existing groundwater treatment system prior to discharge to Temescal Creek or to the local wastewater treatment plant under permit, or transported off-site for treatment and disposal/reuse.

During excavation, the soils will be monitored for cultural resources and as appropriate the work will be modified to preserve any discovered resources.

The excavated soil/material will be stockpiled on-site for characterization, and then loaded onto trucks and/or railcars for transport to off-site disposal. If all materials removed from the Site were to be trucked, the duration for truck loading and off-site transport is estimated at 9 to 18 weeks. This duration is based on 50 to 100 truck trips per day.

Trucks will approach the Sherwin-Williams Site northbound from Mandela Parkway through Halleck Street to Sherwin Avenue, and then enter into the property. Trucks will leave through the same route. A decontamination station will be set up on-site to dry brush and/or wet rinse trucks when leaving. All soil/material will be covered during on-site storage or transport.

After completion of the excavation and backfill activities, a long-term groundwater monitoring program will be implemented to evaluate the effectiveness of the cleanup. The program will involve the proper abandonment of over 50 wells and installation of 15 wells. The program will involve periodic gauging of groundwater water level and collection of groundwater samples for analysis from approximately 40 wells.

Information Repositories

Documents for the Sherwin-Williams Site can be viewed at the following Information Repositories:

Oakland Public Library
5606 San Pablo Avenue
Oakland, CA 94608
(510) 622-2493

45th Street Artists' Cooperative (Co-op Residents Only)
1420 45th Street
Emeryville, CA 94608

Department of Toxic Substances Control
700 Heinz Avenue
Berkeley, CA 94710
File Room: Monday-Friday: 8:00 a.m. to 5:00 p.m.; please call (510) 540-3800 to make the necessary arrangements.

You can also view Site documents on our website at www.dtsc.ca.gov. "Click" on Find A Site Near You, at the top of the page, then type in "Emeryville" next to the yellow box labeled City, then go to the bottom of the page and "click" on Get Report. You will find Sherwin-Williams listed in alphabetical order. "Click" on Report next to the site name.

DTSC Contact Information

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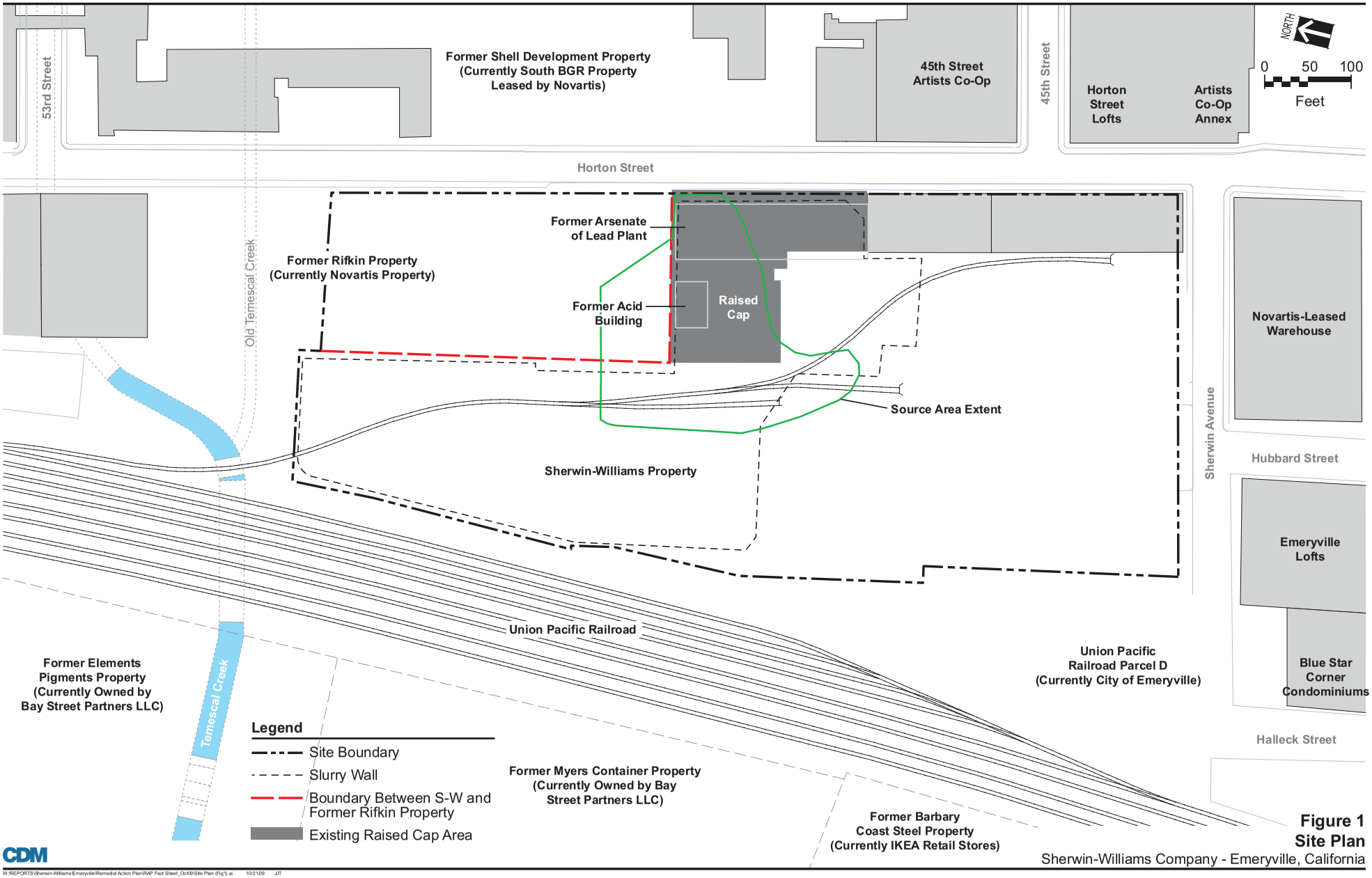
Sacramento CA 95826
Toll free (866) 495-5651, press prompt # 1, then press prompt # 5 or (916) 255-3650
NSchumac@dtsc.ca.gov

If you are a member of the Media, please contact Carol Northrup, Public Information Officer, (510) 407-4817 or CNorthru@dtsc.ca.gov.

Nathan Schumacher
Department of Toxic Substances Control
8800 Cal Center Drive
Sacramento CA 95826

Notice to Hearing Impaired Individuals

TDD users can use the California Relay Service at 1-888-877-5378. Please ask them to send your message to Nathan Schumacher at (916) 255-3650 about the Sherwin-Williams project.



CDM

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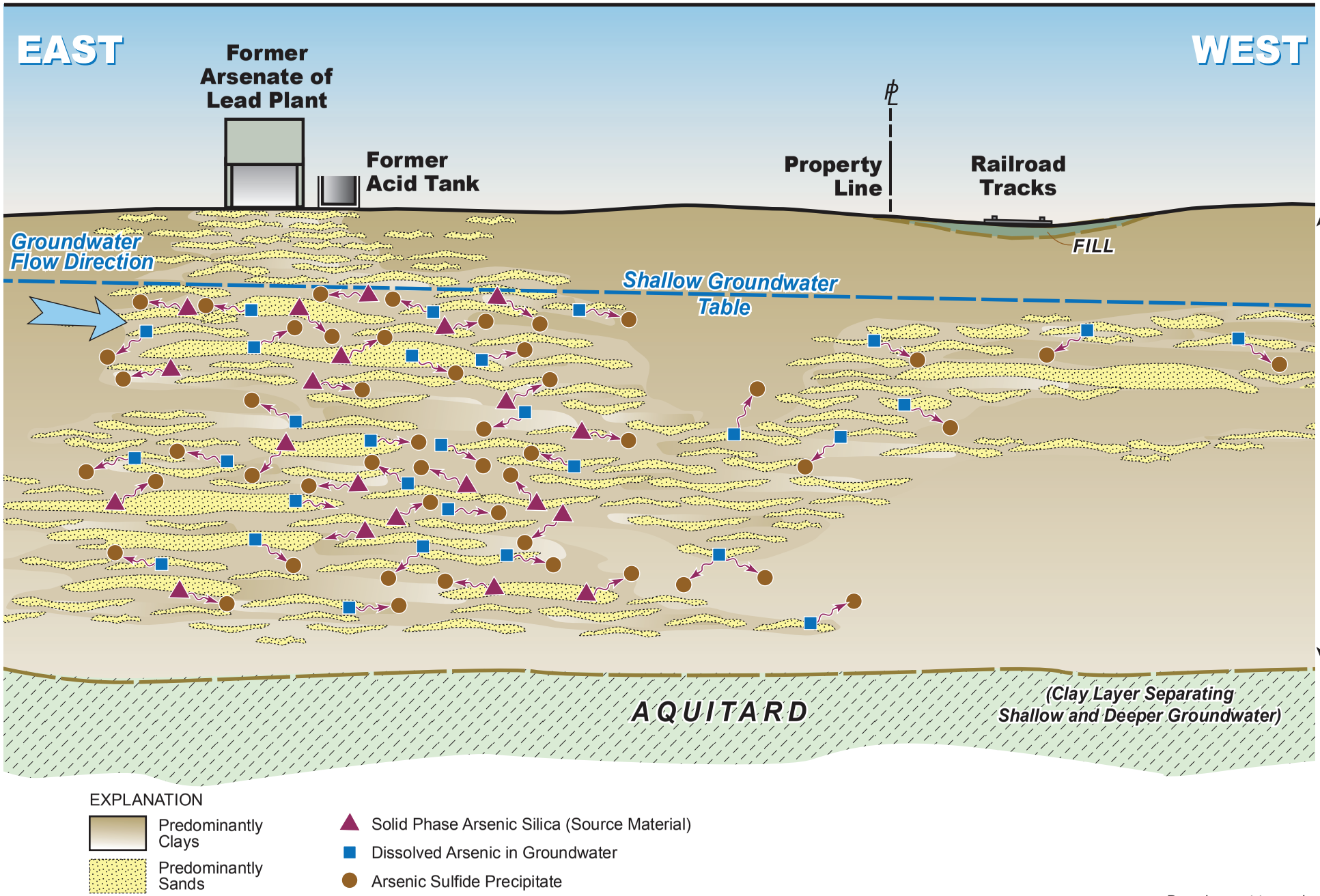
Figure 1
Site Plan
Sherwin-Williams Company - Emeryville, California



Drawing not to scale

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Figure 2
Conceptual Site Model
Sherwin-Williams Company - Emeryville, California

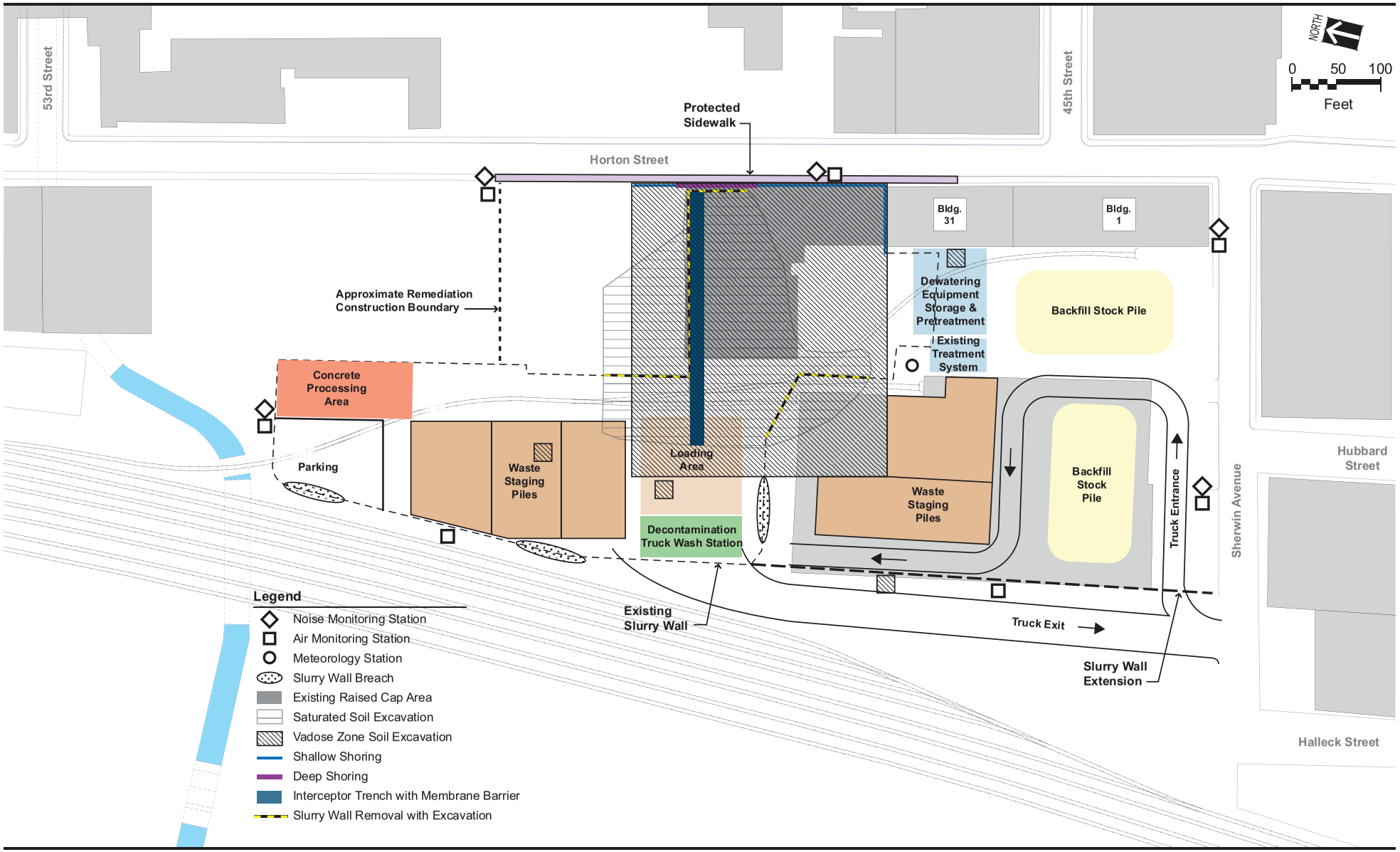

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Figure 3
Site Layout and Controls
Sherwin-Williams Company - Emeryville, California

Nathan Schumacher
Department of Toxic Substances Control
8800 Cal Center Drive
Sacramento CA 95826

Sherwin-Williams Site
Public Meeting
November 5, 2009

DEPARTMENT OF TOXIC SUBSTANCES CONTROL

Public Comment Period Extended

On Draft Cleanup Plan Documents

For The Sherwin-Williams Site

Emeryville, California

In response to public requests, DTSC has extended the public comment period on the draft Remedial Action Plan and a draft Mitigated Negative Declaration for an additional seventeen days until December 18, 2009. The public comment period began October 28, 2009. Please send comments in writing to Janet Naito, Project Manager, DTSC, 700 Heinz Ave., Suite 200, Berkeley, CA 94710 or by e-mail to JNaito@dtsc.ca.gov. Comments must be postmarked or delivered by December 18, 2009.

For questions, please contact Janet Naito, DTSC Project Manager, at (510) 540-3833 or JNaito@dtsc.ca.gov. You may also contact Nathan Schumacher, DTSC Public Participation Specialist, at toll free (866) 495-5651 or NSchumac@dtsc.ca.gov. If you are from the media, please contact Carol Northrup, DTSC Public Information, at (510) 407-4817 or CNorthru@dtsc.ca.gov. The documents and additional information are available at DTSC's web site: http://www.envirostor.dtsc.ca.gov/public. Please type in "Emeryville" under City and proceed from there to the Sherwin-Williams section.

ATTACHMENT B

NOVEMBER 5, 2009

COMMUNITY AGENDA MEETING

City Council Chambers at City Hall

1333 Park Avenue

Emeryville, California

Reported by:

CHERIE L. LUBASH

JAN BROWN & ASSOCIATES

NATIONWIDE DEPOSITION & VIDEOGRAPHY SERVICES

701 Battery Street, 3rd Floor

San Francisco, CA 94111

(415) 981-3948

MR. WOODSON: We're going to go ahead and get started here in just a minute. Couple of people still signing in, but if I could ask you to take your seats and I'll kick this off. We'll wait on the folks. Can everyone here see okay? This is a nice, intimate setting, and I think the acoustics are good, but can you hear me out in the back? Okay, good.

Good evening and welcome. My name is Larry Woodson, I'm with the Department of Toxic Substance Controls Public Participation Program, and I'm going to serve as your facilitator this evening. Nathan Schumacher, the public participation specialist, who has worked on this project and you may be familiar with, is home ill. So I'm pinch hitting for Nathan.

Some house keeping issues first, and you guys probably know this building better than I do, but I discovered that the restroom is out this door and across the walkway, and there's two restrooms there that are probably the closest. The fire exits are the way you came in, this exit come probably the quickest or back down the stairs.

The agenda for to tonight's meeting is on the table over here to my right along with some other documents and handouts which you might find helpful. There's also a sign-in sheet. We ask you to sign in.

It's optional, but it helps us make sure that we have an accurate mailing address for you. And we're also trying to do something different and go green and save paper, so we're asking for people's email addresses, and whether you prefer to receive fact sheets and future notices by email and we'll oblige you of that and save trees. So if you didn't write your email down and you want to receive things electronically, jot that down for us on your way out.

The purpose of tonight's meeting is for DTSC to overview with you the proposed clean-up plan which we call a draft Remedial Action Plan or draft RAP, and the accompanying CEQA, California Environmental Quality Act document in this case a proposed mitigated negative decoration. And to receive your comments and questions on the draft RAP and CEQA document.

Now I know many of you have been involved in this project for a long time going back when the Water Board was the lead. We consider your review and comments on this important document as very important input.

At this point I'm going to just briefly go over the agenda which was at the back or the side and I've already kind of given the introduction. We're going to have Janet Naito, the DTSC project manager, give a

brief overview of the clean-up process and then Pawan Sharma will be talking about the proposed cleanup plan or draft RAP, Janet will come back and talk about the CEQA document and then we will open it up for questions and comments.

If you've got a really pressing question that's more for clarification we'll, Janet or Pawan may take it, but hold your main comments and questions until the presentation is complete. Just take a note to yourself and then bring that forward during the question and comment period.

We also have a court reporter here tonight. This is an official meeting. We're required by law to produce an official transcript of the meeting and your comments will be recorded, and we will respond in writing to your comments. To help facilitate the speakers, we have speaker cards. If you haven't gotten one and you would like to speak, I'd like you to fill one out. This is for two purposes. You can write your comments on the card, you can write a brief statement, you don't have to write a whole lot, or you can if you're shy, and you want to submit written comments, certainly put your comments on here and give them to us. And Radhika Majhail with our public participation program, she'll walk around and hand you a card if you

want one and if you didn't get one. And the other purpose of this card is to make sure we spell your name right for the record so that the court reporter has is correctly. Also note any organization you may represent will be helpful as well.

The draft RAP and CEQA documents are available electronically at the DTSC website on our enviro-store database. The fact sheet, which you hopefully all got in the mail, and if you have lost, you can pick it up at the table, tells you exactly how the access the documents electronically and also gives you public repositories where we have hard copies those documents; the Oakland public library, the Artist Co-op, and the DTSC Berkeley office. The comment period is October 28th through December 1st, and comments can be mailed or emailed to Janet at the address and email that the listed in the fact sheet.

At this time I would like to turn it over to Janet. Let me ask before I go any further: are there any questions or did I leave anything uncovered about the process tonight you need to ask? Okay. I'm going to turn things over to Janet at this time and Janet Naito is your DTSC project manager.

MS. NAITO: Can everybody see this? It's also up there. It's just I can't reach.

Thank you everybody for coming out tonight. I'm going to provide a quick overview of our site cleanup process. As you know, we're here tonight to talk about the Sherwin-Williams site. The site is located 1450 Sherwin Avenue at the intersection of Sherwin Avenue and Horton Street.

Sherwin-Williams manufactured a wide variety of paints and coatings between 1919 to 2006 when the facility shut down. Pesticides containing lead and arsenic were also manufactured there between the late, I'm sorry, from the 1920s until the late 1940s.

This is our general cleanup process, it's laid out on the game board. Prior to 2006, as Larry mentioned, the Water Board oversaw the cleanup act, the investigation and cleanup activities at this site. They approved a remedial investigation report that characterized the chemicals of concern at the site and also the Human Health Risk Assessment that looked at the ways people could be exposed to chemicals that were found at the site. They also provided oversight for the implementation of several early cleanup measurers. I'm going to walk around to that figure over here on this side.

There is a slurry wall around the area that has the highest concentrations of arsenic and groundwater.

This was to contain this material, it extends to about 25 feet below the ground surface in a vertical wall. They also installed paving across their site to prevent the opportunity to come in contact with chemicals in the soil and prevent rainwater from moving into the soil. They installed a groundwater extraction and treatment system that is located both on site and on the former Rifkin property over here. And as a lot of folks in this community might remember, in 1997 they also oversaw the removal of arsenic containing soil along Horton Street.

In February of 2006 regulatory oversight was switched and DTSC began to oversee the evaluation of cleanup alternatives and to oversee the implementation of the final cleanup itself. So this was in the feasibility studies here. We held community meetings in April and May of 2008 and '09 to discuss the results.

So currently the Sherwin-Williams site in this next face as Larry was describing. During this phase a proposed cleanup plan was prepared, in this case it's called the draft Remedial Action Plan, it summarized the results of the investigation and evaluation of cleanup alternatives that were done in the previous step.

We also look at the potential impacts our cleanup activities have on the environment. This is done as part of our compliance activities for the California Environmental Quality Act. In this case, DTSC is proposing to issue a Mitigated Negative Declaration which I'll talk a little more about later.

At the end of the public comment period, DTSC reviews and responds to all the comments received during the public comment period in a response to comments document. And this will be sent to everybody that made comments so that you can see how we respond to your comments. The document then resides in response to comments we received and then approved.

Once the RAP is a approved, the site moves into the remedial design phase. In this phase, engineering design documents are prepared that guide implementation. Following approval of the design, the remedy is implemented. Following, once the remedy is completely implemented, a report documenting what was done is submitted. Once that is approved it is then certified. What that means is that we certify that the remedy has been implemented. For sites like the Sherwin-Williams site where future operation and maintenance activities are required, the site then moves into operation and maintenance phase.

So that's my quick overview of the site cleanup process. I'm going to turn it over to Pawan to describe the cleanup activities.

MR. SHARMA: Thank you Janet. Let me give a brief overview of the document that is on the review. It's a document that summarizes previous work including investigation and feasibility studies that have been done that have lead us to the proposed plan that you have in front of us. The basis for the work that we've done has been numerous investigations that have totaled over 700 investigation points at the site and surrounding areas. The data from those points in regard to evaluate the site, evaluate alternatives that best could remediate the site and proposed plan that we have here. As part of the feasibility study we took a look at different technologies that could clean up the site. We knew enough from the data at that time that we could evaluate certain technologies like containment, pump and treat, excavation, attenuation, which is naturally recurring reaction that clean up the contamination of groundwater.

There are other sites where we didn't have sufficient data at the time. We evaluated those technologies through different feasibility studies, conducted those testings, reviewed the data providing

the results to DTSC, and worked with them to develop the adequacy of those.

So we have evaluated those technologies for both soil and groundwater. For soil some of the technologies included surface cap at the site, excavation of the contaminated soil, soil mixing, ground injections to increase credibility so that the contaminants and the compounds in the surface are less leachable, that they don't move as readily. And also looking at treatment technologies for if we excavated, how would we treat the material prior to disposal like exigent chemical stabilization.

We looked at soil groundwater use controls using some sort of control of those contaminants to the human population as well as the environment.

So we took all of those technologies, the ones that were applicable to the site based on studies and knowledge of the site and data, we compiled them into different alternatives. Those are summarized in the fact sheet. They ranged from a no action alternative to limited action alternative, which is continuing with the remedial measures that Janet talked about to different mixes of different technologies including soil excavation, and ultimately a final alternative would have been execration and removal of all of the

impacted soil and associated groundwater.

Taking all of that information that we collected from our investigations and studies, we developed a conceptual site model. This is a methodology for us to explain how the contaminants got to where they are, how they got to be in what phase they're in, what media they're in, how they're present in the subsurface, and how they move in the subsurface, in the groundwater below the site.

And what we learned from all of our work is that as we know based on the history of the site, there was a former lead/arsenic plant there, and also as part of the operations for acid. And through the course of operations they had releases of these compounds including the acid, the lead and the arsenic. The acid, as they moved into the subsurface into the soil and groundwater, they were strong enough to dissolve some of the silica that's in the soil. So you add a crystalline structured silica, that because of the type of acid used, dissolved and became aqueous into the groundwater.

Now over time that silica as the acid dispersed and is no longer as acidic, that dissolved silica dissolved sand, wanted to come back into the solid phase. And as it came back into the solid phase, it

coprecipitated the arsenic that also had been used at the site.

So what was once just silica, now that it's turned back to the solid phase now has a mixture of silica and arsenic in it. And that's very critical to our process to how we understand how the arsenic is moved at the site. Over time the ph returned back to normal in the groundwater and now you have this precipitate, this solid material, and as groundwater moved through, it would dissolve the silica and the arsenic and form what we call the source material. This is a material that's constantly present at the site leading to further groundwater impacts as water moves through the site from the hills down to the Bay and causes this plume of arsenic originating from the site. As that arsenic moves down gradient towards the Bay it reacts with the soils that are present there.

And in the cleaning material that arsenic will react with naturally occurring sulfides that the present and return back to the solid phase. Go from the dissolved phase back to a solid phase and precipitate those sulfides into naturally occurring sulfite. In the sandy material in the subsurface, that arsenic will absorb on to the sand type material and also come out of groundwater. So those two mechanisms

are the primary reasons why we don't have a lot of arsenic moving across the site right into the Bay. There's reactions that are preventing the amount of arsenic actually moving off the property. There is arsenic moving, but not at the levels that no reactions were occurring.

So based on all of that information, we selected what's calls alternative 6 in the FS as our proposed cleanup. And what it involves, Janet had this up here earlier, we delineated, evaluated the data from the sight and determined where that source material is, that silica arsenic material that is a source to the contamination of groundwater. And we were able to delineate, draw a line around where that material exists at the site. And alternative 6 involves removing that material, that soil both above the water table and below the water table. So that we take away that source material. And by taking away that source material, that no longer feeds into this plume of arsenic contamination that we have in the groundwater. And over a time period the remaining arsenic that's present outside of this area will, like I said, precipitate or absorb onto the soils and clean up the remaining portions of the groundwater that are impacted at the site and down gradient.

That's the key component of the proposed plan is to remove this material to serve as a mechanism to clean up the remaining parts of the site and groundwater. This material, soil, plus a baosump (phonetic) excavation tried to just cleaning up groundwater we have a protection of human population as well, and so we are also removing soil that has primarily arsenic above concentrations.

That delineation is this larger rectangular piece of the property as well as a couple other, four other areas with high concentrations of arsenic.

Within those areas there are other contaminants. There are other lead and organics also present, but by removing the impacted soils, we also remove all of the other impacted soils as well from the contaminants. We have this removal of soil above the water table, we have a removal below the water table combined, that's about 64,000 cubic yards of unplaced material. Aside from that there is also one other removal, as Janet mentioned, the raised cap material, that's also going to be removed as part of the excavation.

So those three items, the raised cap, the soil above the water table, and the soil below the water table equate to about 64,000 cubic yards of material

that would be dug up and taken off site. The material would not be treated on site, they would be removed for disposal to identify which appropriate landfills to go to and transport it to those appropriate facilities. In order for them to eliminate the need to pump from the site, which we're currently doing today, we'd have to restore the groundwater movement at the site, which is currently impeded by slurry wall that surrounds part of the site.

So there were several locations where the slurry walls to be removed to allow water to move once again move through the site. In addition to the removal of the slurry wall in order to maintain water impacted with arsenic and contaminants on the site, the slurry wall would need to be extended in this segment over here along the UP railroad tracks to Sherwin Avenue so that the removal at the site is through the site and through these two, three the beaches and also around the site.

As part of this operation, there is a potential for dust and vapors to be generated. So the remedy also includes controls to prevent, minimize the amount of dust and vapor that's generated. Prior to removal of this material there would be a component to run vapor extraction so that we remove vapors that are

present underneath the raised cap material underneath the former building foundations out there so that when we begin excavations we don't have the vapors coming off, that we've removed a good portion of it. And as we excavate and move material we can apply controls like misting or wetting of the soil or foaming agents et cetera to minimize the amount of dust and vapor generation.

That will be monitored at several points around the perimeter of the work area so that we're evaluating in real time the dust and vapor measurements and also collecting samples to actually know what chemicals in the air are moving away from the work area. The material as it's being excavated would be stockpiled in different stage areas for its characterization.

And then trucks would come, or trucks would potentially come into the site and pick up that material and take it to a disposal facility. Also trucks would come in to bring in backfill material to bring this site back to its original elevations, the street level elevation. Potentially we're still evaluating the option for rail as an option for bringing material in and out of the site as well. Those discussions are ongoing.

The other components as part of the remedy as

we excavate the material, we're going to dig below the water table and we're going to have a need to de-water so that we're not digging in water potentially. That water as it comes up would have to be treated on site or stored and taken off site. Currently there is a treatment out there that's functioning to the groundwater extraction system. And potentially that system may still be utilized.

Another component of the remedy would be, like I said, the raised cap material has concrete debris that will be removed as part of this. We'll have a concrete processing area to break that into sizeable segments that can be transported off site. Once again, there will be no treatment of material on site other than potentially groundwater and the vapors that come off. The vapors would be treated on site and discharged to the atmosphere with a Bay Area district permit.

The last component I like to talk about is that there are a lot of groundwater monitoring wells at the site. Those will be removed, a good portion of those will be removed and new monitoring wells and some existing monitoring wells would remain at the site. In addition some additional monitoring wells would be installed at the site.

Figure 7.1 identifies those wells. Those wells would be monitored on a periodic basis to assess the effectiveness of the excavation. Did the excavation sufficiently remove our source material to allow the groundwater to clean up over time now? And that would be an ongoing process to gauge the effectiveness of our remedy.

MS. SPARKS: Ongoing?

MR. SHARMA: Ongoing for a period of time that we'd evaluate every five years. But yes, it would be ongoing for our lifetimes more than likely. So with that I turn it back to Larry.

MR. WOODSON: Okay, thank you. And we'll bring Janet back up to talk about the CEQA document.

MS. NAITO: Thank you Larry.

As I mentioned before, our goal is improve the environment through our cleanups. Therefore we are going to evaluate the potential effects of our cleanup on the environment. CEQA requires state and local agencies such as DTSC to identify the significant environmental impacts to their actions and to avoid or mitigate those if possible. Approval of a remedial action plan is being one of these actions subject to CEQA.

So how does the process work? We start by looking at the proposed project. If it's a small project, it may qualify for exceptions under CEQA. Projects of this size, obviously are not. So what we have done is we start the process by preparing an initial study. This is really an evaluation that describes the existing conditions at the site; identifies sensitive natural and cultural resources at the site; describes the activities that could impact these resources; and evaluates whether or not these activities would have a significant impact on these resources.

Guidelines and guidance documents developed by state agencies are used to determine whether or not the impact would be significant. This is a different standard than you and I talking, we might think something is significant, but it may meet this threshold. Because up on the results of the study you can have three outcomes.

If your project activity is not going to have a significant effect on the environment, you could prepare a negative declaration. If your project activity, if you've incorporated some measures to ensure will not have a significant effect on the environment, you could prepare a mitigated negative

declaration, which is what we did. If you can't mitigate the potential impacts and the project may have a significance on the environment, then you would prepare an environmental impact report.

Public involvement is an essential part of the CEQA process. We have been out here in the community, you guys have done a great job of telling us about some of your concerns, which we have tried to address and incorporate to the extent possible. And hopefully that's made it a much better document.

So we went through and evaluated potential impacts to 16 different resources; 14 were determined less than significant. We had two resources that the project could potentially have a significant impact on if we didn't have measures to mitigate them. And those ended up being esthetics and cultural resources.

The project activities could have a significant impact on the intersection of Park Avenue and Halleck right over here. The city has a project called the Park Street Beautification Project. Park Avenue Street Beautification Project. We're going to be redoing the road along Park Avenue. So as our trucks come across Park Avenue, that could potentially impact this brand new street. So as a mitigation measure to address this, they're requiring Sherwin-Williams to work with

the city to address the damage that might be caused to that road. Because that would have an esthetic impact.

And for cultural resources, as you may be aware, there were some cultural resources in this area before it was developed. There were show mounds, which are obviously evidence of indigenous peoples that were here before we were. So because we're digging out a lot of soil we want to make sure that we can handle cultural resources, we know what they are, and we handle them appropriately. So another mitigation measure the preparation of an archaeological monitoring and data recovery plan.

Now I'd like to take a few minutes to go over some of the issues that were raised in previous meetings. Most of the issues were related to truck transportation, they concerned diesel particulate matter, noise, transportation routes, and cumulative impacts.

An issue was raised regarding diesel particulate matter. This is the stuff that comes out of the back end of a truck, comes out of the tailpipe. It's a complex mixture. It was identified as a toxic air contaminant by the State of California in 1998. And although there is no standard for diesel particulate matter, the California Air Resources Board

and the local air district are developing or looking at ways to reduce diesel particulate matter and have identified measures that everybody needs to incorporate. The project will comply with these measures. An example might be they now require that trucks not idle for longer than five minutes. Because of the uncertainly of the human exposure response data to diesel particulate matter, any risk assessment wouldn't be reliable.

There's not a set risk factor or reference concentration that tells us how toxic these are. But there are ambient air quality standards for particulate matter. As Pawan mentioned, the project does include air monitoring stations that will measure particulate matter. Diesel particulate matter will be included in these and measured in these stations. And we have set action levels that are consistent with our project. Attainment of those will ensure that we meet the ambient air quality standards. Truck noise.

THE WITNESS: Janet, I'm just going to interrupt you. Not previous projects at the Sherwin-Williams plants but other DTSC projects in the Bay Area.

MS. NAITO: Thank you Jody. I sometimes assume everybody knows exactly what I'm thinking, and

that's not a good thing.

Truck noise. We are going to have quite a few trucks. The project has a total of about (inaudible) truck trips I believe. And so we calculated or we estimated a maximum number of truck trips per day 220. These are one-way trips. This would result, and we calculated how much noise would be generated, and this would result in a noise increase of about 3 decibels or less than 3 decibels, which would be barely perceptible during the daytime.

MS. BRESNAHAN: That's simply not true.

MS. NAITO: I understand. This is using standard calculations that are available for us. If you're standing out on the street it might sound a little louder. Again, this is level of significance. There is a legal standard versus you and I standing out on the street corner having a conversation. Essentially what that means is at the point of reference a 3 decibel increase would result in, 3 decibels would be about the same level of noise you would see if you and I were having a conversation right here.

MS. BRESNAHAN: It's simply not true. I live on that street, it's simply not true.

MS. NAITO: You guys did ask us to

consider different transportation routes. So we considered five, or four, sorry, we considered three different routes, Sherwin-Williams looked at another one, and then we also looked at the route that the trucks have used when Sherwin-Williams was in operation.

The first one goes north and goes out the back end of the property: It's the green line. So it would proceed along the railroad tracks, connect up to Halleck Street, and then go down Powell connecting onto the Freeway. That's the second alternative.

First one would go out, trucks would leave the site, go along Horton Street, connect up with Halleck, then go down Powell Street, take the loop and then on to the freeway. That one, we did take a look at that. That would probably require the use of flag people at the intersection to direct traffic to make sure it's safe for the trucks to make that turn. And it may require lane closures. That intersection is pretty jammed most of the time already when I travel it, so that wouldn't be a preferable route.

AUDIENCE MEMBER: Which intersection?

MS. NAITO: Powell and Halleck. It's not my favorite intersection.

Although 2 was out the back side making that

same turn going making the loop and then going on to the freeway. There is another project in this area, and that would be -- I think there's a pedestrian overcrossing route that's supposed to be implemented right around the same time as our project. So they wouldn't -- we would significantly impact that project or they wouldn't give us access to implement. Another difficultly with this route once you make the loop onto the freeway, trucks would have to switch over three or four lanes to make it to 880 to go south.

Coming down, Alternative 3 was to come out, exit the site, go down Horton Street, connect up to the regular truck route. We did take a look at that, it is also not our recommended route at this time. It would be difficult for the trucks to make the turn to get onto Horton Street from our site. As you can see from the diagram, things are pretty tight in there. It would also potentially impact going along this route in the morning.

Then we have Alternative 4, which looked at potentially using Hubbard Street to come to the site and Halleck Street to leave the site. So it would be one-way traffic in each direction. This unfortunately would require us to impact two intersections along Park Avenue and impact more residential areas.

Coming down, and then we get to our recommended truck route, which leaves Halleck and then takes, this is a route that trucks used while Sherwin-Williams was in operation. It's our preferred truck route mainly because, and I'm sorry for the people who live on Halleck, it impacts the least number of residential areas, and businesses, but mostly the residential areas. So that's why it's currently our recommended route.

Flipping over to cumulative, we identify eight different projects including ours that have the potential to be going on at the same time. As you know, construction projects are sometimes delayed, but this is our best estimate for the projects that might be occurring at the same time. We have Number 1 our project, Number 2 is the Park Avenue Street Beautification Project, 3 as I'm sure everybody here knows is the Pixar, 4 is the Horton Landing Pedestrian Bicycle Bridge, 5 is up here and that's the Transit Center we also call that internally the Mound Site. Six was the Greenway project, 7 is the Public Market Redevelopment and right over here is the Bay Street Site B, we also call that South Bay B. We anticipate that these projects all have different time frames, I wrote them all down.

The South Bay Front B is not going to start until November of 2010; hopefully by then our project is done, almost done. The Horton Street Landing Site Project is scheduled to begin last month. Construction projects are sometimes fluid. It is also scheduled to be completed in the summer of 2010, so there would be some overlap with our project. The Park Street Beautification Project is already under way and it's currently scheduled to be completed August 2010. The Pixar is on going through 2011. The Transit Center Project is over here, it's scheduled to start this month and should be completed by the spring of 2010. That one may be a little delayed. The Emery Station Project the Emery Station Greenway, which is over here, is on the city's web page as being started in August 2009 and completed by spring of 2010. I'm not sure if that started yet. And the Public Market Redevelopment over here is scheduled to start in spring of 2010.

We don't anticipate impacts to the projects over here because they will be using Powell Street as their trucking route, and south of us these two projects; the Park Avenue project shouldn't have a lot of soil removal going on, and the Pixar project is mostly is above ground construction at this point. Okay. That ends my presentation.

MR. WOODSON: Thank you Janet. This is your opportunity to comment. If you need a comment card and haven't filled one out yet, Radhika will give you one, and do we have any that you have collected?

AUDIENCE MEMBER: How about pens?

MR. WOODSON: You need a card too?

AUDIENCE MEMBER: Yes.

MR. WOODSON: Anybody ready with a card?

AUDIENCE MEMBER: When is the work scheduled to start?

MS. NAITO: We're hoping to start spring of 2010.

MR. WOODSON: Just as a reminder, you don't have to write out your whole comment, you can just give a brief statement of what you want to say or leave it blank and we'll capture it with the court reporter.

MR. HARPER: One of the things that I didn't hear that I was curious about is the groundwater is contaminated. But it was explained how the contaminants react, but what life forms does the contaminated groundwater impact?

MR. WOODSON: Okay. Why don't you make a note of that and we'll give you time to talk about it and we'll try it answer it. One of the thinks we're

going to do is if we can answer questions easily tonight or difficultly, we'll do that, but we may say we'll get back to you in writing and do that in the response to comments. So you may not get answers to all your questions or your comments tonight, but ultimately you will in the response to comments.

MS. HORSTING: I was wondering why we haven't heard anything about the rail option. You have gotten five different options on the trucks, but I think the whole neighborhood, whether you're on Halleck or 45th Street or Horton we're --

MR. WOODSON: Very interested in the rail option. Please bring that up.

MS. HORSTING: I will. And what I want to make clear is that I was told there was a problem with cars at one time which is not a problem anymore, there's plenty of railroad cars. And the second objection I heard to it was that there was not a site. So I'd like to understand what sort of site is needed for these materials and where they might be on the railroad or how we look that up to actually check that there isn't a site available because railroad is even cheaper.

MR. WOODSON: Jot it down and bring it up, give me your card and make sure you got your name

on it we're going to address that. Okay, I'm going to ask is there any more clarification kinds of questions?

MS. BRESNAHAN: I'd like to ask, it's my understanding that if trucks are used there will be a truck moving every 15 minutes 7 days a week for 6 months; is that correct?

MS. NAITO: I'm happy to answer the question, I just don't know if we need you to state your name for the record first.

MR. WOODSON: Yeah. I'm going to ask you, I don't mean to be predictory up here, but I'm going to ask you to hold that question because it's an important question and I know a lot of you had that same concern. And I'd like you to come up and ask that and I'm going to kind of follow the order of the cards here. It's a very good question and Janet appreciates your concern about it.

So let's go ahead and get started. We've got eight or ten cards here. Do you want to go first Jody? You're my first card.

MS SPARKS: Well, I have a lot of comments about the document and I'll leave it up to you. I'm more than willing to wait. However you want or I can ask some of mine and you can take some other ones and then we can go back and do more.

MR. WOODSON: Okay.

MS SPARKS: However you want to handle it.

MR. WOODSON: I tell you what, I'm going to move the truck card up to front, and I'm going to take yours too. So let's, is it Louise?

MS. STANLEY: Yeah.

MR. WOODSON: Louise, why don't you go ahead and start and we'll have you go first and we'll follow it with Edythe.

Please give your name, if you are associated with any organization, tell us that too. But if you're a resident or a business person, just tell us that. And also be sure that you speak loud enough so that the court reporter can hear and she'll tell you if she can't.

MS. STANLEY: Can I just talk from here?

MR. WOODSON: If you stand up you'll probably be heard better.

THE WITNESS: My name is Louise Stanley, and I live right where is it? Right there on this right here. I defiled your sign which some artists got paid probably not enough for. Anyway, that's where I am. And I get diesel coming in my studio when I'm just sitting there now. During the day I smell diesel. And

I have cracks in my windows from trucks that they used to idle right here. I had an agreement with them, I'd go out every time a truck would be out there and ask them to climb up to the cab and ask them to turn their trucks off. So I lived through that, the loading dock and I have pictures here of the remediation right out my window from the last one. One day I woke up in the morning and there is a fence all around our perimeter that said do not enter if you are pregnant or nursing and here we are living in the space coming and going. We're not pregnant or nursing but. So one morning there was black smoke in my studio and because of the fence around here, it was hot in the summer I opened my windows all night because usually it's not safe. So in the morning I wake up, I'm in bed, and there's a tractor in front of my window with the smoke stack coming right into my studio, didn't bother to ask me to close it or warn me beforehand.

And before that when I came back from a European trip, the porta potty was venting into my studio and I came into my studio and smelled like shit and then -- literally. And then my water, one day I went to take a drink of water and it tasted like old rubber and my water system came through the site into a hole in my wall, and the crew had taken undone my water

source and stuck a garden hose to it. And that's what I was tasting, it was off gassing and it was very hot. So I'm just saying, I lived through this and I will die if trucks go by my place. I will just die. You're going to have to -- we're going to lie in the road unless you do this railroad thing. You haven't even talked about this and that's not fair. Because none of the options are good for us and you're just shoving it down our throats.

MR. WOODSON: Janet, do you want to say anything more about the railroad at this point?

MS. NAITO: I think Pawan mentioned it during his discussion. We are still considering rail, we have not ruled that out.

MS. HORSTING: Then why don't you talk more about it?

MS. NAITO: Because I don't know more about it frankly. Other than to say we're considering it. If they do use rail, we have a rail spur on the site. Rail cars come on the site, they get loaded, they will go off the site. So there's not much more that I can say about that. I'm sorry I'm going to have to.

MR. WOODSON: Why don't you go ahead, Edythe?

MS. BRESNAHAN: My name is Edythe Bresnahan, and I live right next door to Lulu. And I also went through a horrific time when the last remediation was done. But my concern right now is that I've been told, and I don't know if this is false or true. It's what I've read, that this project will go on for 6 months and for 7 days a week we will have a truck go by every 15 minutes for 10 to 8 hours a day. Now that's not a livable situation. If they go by us, we have it. If they go through the Halleck Street areas, the other living community has it. It's not livable. Six months of 7 days a week?

And when you talk about the noise, I don't mean to be disrespectful, but I live in that studio. When a diesel truck goes by, I cannot hear any other sounds; if I have the radio on, if I have music on, if I have a conversation going, or if I have a t.v. on.

The trucks, or I don't know what that number is that you have, but and your numbers may be accurate, but the noise level is loud enough to block out everything. Now can you imagine living in that for 6 months every 15 minutes for 10 to 8 hours a day? It's not a livable situation for people. That doesn't even begin to speak of the fact that for our community we live at the wind down wind from this. There is no way

that you are going to be able to keep that dust from being picked up and carried over. You may be able to reduce it, you may be able to reduce what's happening here, but you cannot reduce that in that kind of truck load. I mean, I am truthfully if I sound a bit tense, I'm shocked you would even think of putting this on people who live here. That's why the alternate route is just so very important.

And again, I don't mean to be excited or disrespectful, but I can't believe you're even thinking of going here.

MS. NAITO: As a clarification in a similar vein, we only anticipate working Monday through Friday, five days of the week and we anticipate in compliance with the noise ordinance we anticipate working from 8:00 to 5:00, or is it 6:00? 8:00 to 6:00 that's it.

MR. WOODSON: And further clarity, is the truck route is not by her, preferred --

MS. NAITO: Our preferred truck route is not to use Horton Street, but it does use Halleck.

MR. WOODSON: It is down here Halleck. There are residents. Is it Diane Troy?

MS. TROY: So my question, I'm late coming into this I haven't been to a meeting before. I

understand the concerns about the truck route going. I'm concerned what happens prior to the trucks. How is the material being removed from the ground? It's not being shoveled out, it's got to have jackhammers backhoes, right? Heavy equipment? So before we even get to the trucks this stuff all has to be removed. Also those brown areas that are the staging areas, so all this toxic material to be taken out of the ground and put into these places that are concrete or they're just piles that are going to have plastic bags over them or what's going to happen with that and the water? And then how long is that material going to sit there before it goes on to the truck to be taken out?

MR. WOODSON: Are those three things that we can address?

MR. SHARMA: So yes, material will be execrated out and staged in locations while the material is being tested and characterized to make sure it goes to the right disposal facility. Material sit out there for maybe, a particular amount of soil would stay onsite for up to five days before it's transferred out in a truck. More than likely it would be a lot faster than that. But there will be soil coming continuously. So there would be some sort of soil

present on site during this operation.

So the material will be situated within bermed areas, so any water coming out of that material will be contained and captured as part of the construction storm water pollution prevention plan. That water, liquids would be pumped and treated just like the groundwater that we would pump out would be treated or containerized and shipped out. There would be sheeting covering the material, could be foam covering the material depending on what type of soil it is or what type of vapor or contaminants are present in that soil. And those controls; the sheeting, the foaming, the watering would be monitored continuously to ensure that we are meeting our action levels at the perimeter that we don't have airborne contaminates leaving the property in excess of what is considered perfected of the community.

So yes engineering controls and monitoring would be ongoing to prevent that type of scenario.

MS. TROY: And what happens if somehow it isn't in compliance with what is considered to be an acceptable amount of toxins for us to be breathing?

MR. PAWAN: Well ultimately if we have a situation where release has occurred and airborne contaminants are leaving the site, hopefully we would

see that process occurring and be able to change our work habits and methodologies to bring the numbers back down before we have an exceedance. But if there is an exceedance, work would stop until the situation is resolved.

MS. TROY: And as far as the removal of the material from the ground, water and the source material, there are going to be heavy equipment there that's going to be removing that?

MR. PAWAN: Yes.

MS. TROY: So there's going to be jackhammering or backhoeing or whatever the thing is that's going to be going on for x amount of months daily in addition to the trucks?

MR. PAWAN: Yes. There will be heavy equipment on site to remove the different components of the remedy of the excavation. And that would involve large --

MS. TROY: And the piles of whatever, the brown square stuff, that is just a slab of cement of something on which this stuff is going to be dumped over which you're going to put sheeting, or it's not an enclosed --

MR. PAWAN: It would be an enclosed environment so that any liquids would not permeate down

into the subsurface, into the soils.

MR. CURRAN: Describe th enclosure.

MR. PAWAN: What was that?

MR. CURRAN: Describe that enclosure.

MR. PAWAN: It would involve like a berm around --

MR. CURRAN: Describe that berm?

MR. PAWAN: That berm --

MR. CURRAN: Is it the hay berm?

MS. NAITO: I'm sorry, can we have, for our court reporter and for our record, we're going to need an identification.

MR. CURRAN: Just for clarification, my name is Tim Curran, and if you would just describe the enclosure.

MR. PAWAN: I can provide more detail later, but it would be an enclosure such that would prevent any liquids or contaminants away from that enclosed area.

MR. WOODSON: Is that documented, do we have a design on that?

MR. PAWAN: There's a general description of that process in the RAP.

MR. WOODSON: He can point that out maybe after the meeting and go over that with you.

MR. CURRAN: My point is the people that hear enclosure have a very different idea of what an enclosure actually is.

MR. WOODSON: I understand.

MR. CURRAN: So when you say enclosure, he doesn't know if that means a building, she doesn't know if that means a two-foot hay perimeter, to enclose the soil. She has no idea what that term enclosure means. That's what I was hoping to get at.

THE WITNESS: Jody Sparks. I want to add to Tim's. Would the berm be constructed of soil?

MR. PAWAN: It may be constructed of soil and augmented with sheeting or other components to prevent the movement of any liquids or contaminants away from that area.

MS. SPARKS: How high would those waste piles be?

MR. PAWAN: I don't --

MS. SPARKS: That's not in the RAP.

MR. PAWAN: That's not in the RAP, but it would be part of the eventual design that we would submit.

MS. SPARKS: I have one more question. In the document, Sherwin-Williams states that 64,000 cubic yards of material will by excavated. My math

isn't very good, but if I tried to imagine it, it seems like it's about 120 feet by 120 feet by 120 feet if you were to look at it as a cube. Is that about right?

MR. PAWAN: Okay.

MS. SPARKS: Is that about right? I'm trying to get people to understand the amount that, cubic yards, but if you make 126 feet high a cube, I just wanted to know that. So people understood what you were talking about. Thank you.

MS. BRESNAHAN: Is that a 12-story building?

MR. WOODSON: Okay, have you finished?

MS. SPARKS: Yeah I guess so.

MR. WOODSON: Let's go on. This question has to do back to truck noise. It's from Sylvie --

MS. HESSINI: Sylvie Hessini.

MR. WOODSON: -- Hessini.

MS. HESSINI: I live at 1500 Park Avenue. Our building has 141 units in it. We are between Hubbard and Halleck, which are the two long streets on that diagram. And we would be heavily impacted by truck traffic, we are right now. It's very noisy, and again, this noise level is a huge problem. If I have one window of my three windows open and there's a truck rumbling by, I can't carry on a conversation and I

would be a huge component of the rail method to get the soils out of there, that would really be optimal. And I'm sure that 100 percent of my building -- 141 units and then all the other people who are in the immediate vicinity also. So I would just hope very strongly that you really look at that rail method and go for it.

MR. WOODSON: Thank you. Jody, your card has come up next. If you'd like to go into some detail.

MS. SPARKS: I'll go into some detail. I would like to like to talk about -- Jody Sparks, pro bono consultant for the 45th Street artist co op. I'd like to talk about the waste piles, I have a number of comments to make that I'll be submitting in writing. A lot of them are comments that require clarification. But if we look at the map in front of us here, and I'm going to get up and show what time talking about, these are the waste piles, they haven't talked they haven't talked the back fill stock piles.

Now, the waste, the reason I'm asking is on the back fill stock piles which are different than the waste piles, that's where soil is going to come up and be stored to fill in the hole. And so one of the things that -- I am trying to think of things that would be of concern to community members, and that is

what sort of guarantees does the community have that clean fill is actually being brought in because it's going to be stacked outside of other residential areas. So that is different than the hazardous waste piles that are the orange. So that is a concern. How high are those? How are they going to be protected so that dust doesn't blow and all of that?

MR. WOODSON: And did you -- were concerned about whether the clean fill is actually clean and how we determine it's clean?

MS. SPARKS: And how are you going to determine it's clean? What does clean mean? Clean usually means that it actually can have hazardous waste that are not naturally occurring. I just don't know what that is.

As far as the remedial action plan goes, I felt that it would be good if up front in the introduction and purpose they gave more of an overview of the proposed project, that they plan on removing 64,000 cubic yards. You don't get that until you go back into the document. And also that they plan on shipping out a certain amount. I think that needs to be up front. I don't believe the community should have to dig for that within the document.

I have concerns regarding the transportation

component of this. The community has voiced strong concern over all the years that I have known these people about what will happen when they try to ship this stuff out.

And I believe that there is real problem with the regulatory definition of what is significant. It is certainly significant to this community. Why isn't a transportation plan in the appendices now to the RAP? I know sometimes it's done after the fact, but it seems like a transportation plan should be a component that the community has an opportunity to review.

I know that I had asked for a community health and safety plan to be developed. Within the text of this remedial action plan it says it's going to be given to the community. Well doesn't the community have any input as to what their health and safety plan should be? In the text it says it's going to be prepared and then given to the community. Well I think the community needs to be a part of developing a health and safety plan so that all of the issues that they have will be covered in the health and safety plan as it relates to if there are any accidents or anything like that that might occur during the remediation.

This project has been going on forever. And I have been involved in reviewing remedial action plans

for a very, very long time. And if I had difficulty getting through the document, trying to make comments, trying to get my ideas in order, and reviewing the initial study, I certainly think community members would.

And I do not believe that people had the document long enough before you had the hearing. I believe that the hearing I'm sorry, I call it a hearing, the meeting, the formal meeting should have been later in the time period. You had it so early, the document really just came out. And on behalf of the artist co-op we have asked for an extension of time to get our comments in and I believe that has been granted? Yes.

I have in a minor thing, there are some errors with figures matching your text I found one or two errors. I know one is in chapter 6. I had a question regarding appendix 1, it's called stock pile soil sampling and analysis. On your chart stock pile is the clean. Do you mean waste pile?

MR. PAWAN: Yes.

MS. SPARKS: You need to change that then. As far as a CEQA document, I have so many comments, I'm sorry. As far as the CEQA document, I believe that you need to revisit the project

description. In consultation with the CEQA attorney, I've concluded that because under normal circumstances in a CEQA document that is for site mitigation it would be the norm to say that the excavated soils would be loaded and taken off site. However, this is different because this is a huge excavation. And so your project description has to include the amount of excavation and should also include the number of trucks because it is truly significant and it is not sufficient to just have it in the back part of the study.

I'm going to submit written comments, but I really hope that the department listens to the community. The community is working as a whole. The 45th Street artist co-op don't want it to go by their place, but it isn't okay to go by some other residence place. So I really hope that you're hearing what they're telling you. Thank you

MR. WOODSON: Thank you Jody. Help me with your name, is it Archana?

MS. HORSTING: Archana.

MR. WOODSON: Horsting.

THE WITNESS: Well, I live in this building and I have a work space in that building, and my husband and I have a daughter that we're raising. I wasn't as impacted as Edith and Lulu at the last

mitigation and the last work that was done, but this is on another scale. And it was bad enough the first time. And what I really don't understand is I believe when my husband, who was on city council at the time, if I understand, that the rail was the preferred; that's what the city counsel was told by the whoever was it owners of the site at that time. So this preference for rail goes way back and the counsel was assured that this was the plan.

I understand that rail cars got a little hard to find for a while, now but that's not the case during the recession. Railroad cars are available. What I don't know is whether there is a disposal site. I've heard that might be an issue. I just don't understand what the criteria, for the difference why this big switch to trucks? Is there some company that's going to benefit from the trucking contract that we don't know about or something or is there a real logical reason? Because it's more expensive, it's more destructive to all the neighborhoods, and we don't want to get in a fight. We like our neighbors at 1500 Park for example, we don't want to say just dump on those guys. We're a united neighborhood. We admire each other, and we are a cultural resource. So if you're looking for art effects here that happened hundreds of

thousands of years ago, those were great artists, the artists that I work with, many of them have that quality. And the work that's being done in these studios is also a cultural resource.

So if you'll design mitigation to save a art effects, it deserves to be saved, I'm all for it. Why not design the mitigation so that the artists who are working here and doing great work that's going to last hundreds of years, thousands in some cases, but hundreds of years for our culture and be why not create a possibility to live and work in place and health and safety. Especially when the rail solves so many problems? It should even be cheaper from the site owners point of view.

Because we have a railroad manager on my board, I run a non-profit in Berkeley, and I had a chat with them can you find cars he said absolutely. He knows the guys and he's willing to call them up and say is there a dumping site that these people can use. I'm not an expert by any means, but I'm willing to do that if it would help.

But I think the people who own this site could get on the phone and talk to Union Pacific too because it is so logical. The lines go right by there and that would avoid so much noise, traffic, diesel.

The same husband, I've only had one, was also the director of the air quality San Francisco Bay Area Air Quality Board. Now if you ask him about the effects of diesel, he seems to know a lot about it. It's not quite as mysterious. It's one of the worst things. So we don't, I don't think we have to say we don't really if it's good for you or not.

MS. NAITO: Oh we're not saying it's good for you, we're saying we don't know how bad it is.

MS. HORSTING: But just the fact that we already know it's bad for us, you can get more information from the Air Quality people if you need that to really make your decision.

MS. NAITO: Well they were the source of my information.

MS. HORSTING: I understand that it's not very controversial, that it's really bad for you.

So my question is this. Why did the whole idea of the rail not show up in this? It should be carefully discussed, at least as discussed as those five alternatives with the criteria clearly pronunciated, why this versus that, these are our problems, why we can't do rail and are those surmountable? Because I think I'm speaking, and if I'm out of place from any of the people in the audience who

live in the area, please raise our hand right now. Am I out of place asking for rail?

AUDIENCE: No.

MS. HORSTING: All right. So did that message get clear?

MR. WOODSON: And I'm going to ask Janet, can we give a little more background on criteria?

MS. NAITO: I think there's two problems. The first one is that when we do our CEQA analysis, we're really focused on the worst case analysis. So as you say, rail would have less impact, and that's why we focused on truck transport. It's not to say that we're not going to do rail, it's just that we were looking at the worst case scenario.

MS. SPARKS: Sorry, that's not right under CEQA.

MS. HORSTING: Because even if you were doing that, and I appreciate you looking out for us the worst case scenario, but shouldn't we be advising what the best case scenario is?

MS. NAITO: And we do discuss in the remedial action plan.

MS. HORSTING: But I didn't see the in what you handed out tonight.

MS. NAITO: Okay.

MS. HORSTING: And certainly no criteria about why would people -- I mean, if you're accepting five different alternatives, why isn't that in comparison or in the context of rail? Do you understand? Because we're just copletely confused how did it go from everyone talking about trucks when this project just started a decade ago or two decades ago it was represented to the council and the community at that time as a rail?

MS. NAITO: Okay.

MS. HORSTING: Okay so I think I've beat that one.

MR. WOODSON: We appreciate the importance of this to many or most of you.

MS. SPARKS: Jody Sparks. In fact in the CEQA document you are supposed to look at all of the alternatives. It's one of the problems in the CEQA document that you have. You're supposed to look at the alternatives and it doesn't really discuss the other.

MS. NAITO: Okay.

MR. WOODSON: Okay, thank you Jody. Scott Donahue?

MR. DONAHUE: I'm Scott Donahue, and I live at --

MR. WOODSON: Turn around and make sure

they can hear you please.

MR. DONAHUE: I live here in an artist co-op at 1420 45th Street, and I work every day in this building because I work in my studio and I do public art and I have workers. And often we work outdoors. We get permission from the artist co-op sometimes to work on projects outdoors. And what I'm concerned about is the continuous exposure that I and my workers may be exposed to for the particulate matter coming down this driveway and why I'm especially concerned is that the predominant west wind focus the air right down this driveway from the worst part of the site.

And when this project was first begun, a long time ago when my daughter was being taken to school on the back of my bicycle in her little seat, we came down this driveway the first day that Sherwin-Williams was bulldozing this site and the workers here were not controlled by the Water Board or the Department Of Toxic Substances and they were wearing masks on their bulldozer, and Kate and I were getting particulate in our face right from the worst part of this site. And later my daughter Kate had her lead count measured and it was twice the American average. And I don't have to tell you that that has an effect on a kid. So there is a credibility of problems in our community about this

site and clean up. And I would like to know if these monitors in effect put on an alarm system that could broadcast to our community if they go over so we could have some real time monitored. We hear that alarm, we quickly go inside, put on face masks, get particulate masks, something that would increase the credibility of the protections to know that we had a failsafe in our own ability to take action and put a particulate mask on.

Because that's something we would have the possibility of doing. And given the long term exposure to have real time notice of what our exposure is would be a significant asset to us that maybe this easily done.

And also I would like to know what the real exposure would be for all this particulate if I am working outdoors the entire time this project is going on. It wouldn't be significant maybe by a measure that our government would say would be the average exposure if someone were around this, but for our community and us what wouldn't necessarily be significant by a certain government measurement may become significant to us given the focus of the particulate. So I would like to know what significant means in relationship to the government's standards and how that significant

might be more than significant if it were focused and continuous.

MR. WOODSON: Thank you. Teresa Kalnoskas?

AUDIENCE MEMBER: She had to leave.

MR. WOODSON: Okay. And I can make sure this questions gets part of the public record.

AUDIENCE MEMBER: Could you read it?

MR. WOODSON: Oh, sure. My primary concerns are the potential toxins and pollutants in the air that we breathe that are settled on edible gardens and settled on high human traffic surfaces. I have a young child and several pets. How will you be testing for residential areas near the cleanup site, soil, air and surfaces and how will we be informed and be assured that we are not slowly poisoned on a day-to-day basis? Thank you Teresa. Michael Hammond?

MR. HAMMOND: I had a quick question. As we watch Park Avenue get unified and we're already covered in some dust, is that dust tested, I don't know how these pollutants have moved in the groundwater, how far it's moved, if it's only under the cement or does it -- I would imagine it keeps moving. Is there any monitors on what's going on right now with the dust that's all over everything?

The second part of the question would be if you are using trucks to take all of this stuff away isn't, when a truck hits a pothole stuff spills out, all our cars are covered with it. How are you going to safeguard that process from once it leaves the site and is that being addressed?

MS. NAITO: That's one that I can answer. You remember that picture that Pawan showed with all the little dots on it showing the over 700 locations that we've tested? Our contamination is pretty much within these boundaries of our site. And groundwater flows in soil because we've already the Horton Street clean up. Groundwater flows in this direction, predominantly in this direction, so away from Park Avenue.

WITNESS: West?

MS. NAITO: I'm incredibly directionally challenged.

WITNESS: Towards the bay?

MS. NAITO: Towards the bay. Trucks when they are leaving the site will all be covered so that if they do hit a pot hole, the material will stay inside. They will also be brushed or washed to ensure that we're not tracking material off the site. You might have seen something similar on the South Bay

Front B site?

MR. HAMMOND: And is the soil tested on Park now?

MS. NAITO: I honestly can't answer that because that's not our project. You'd have to check with it city?

MR. SHARMA: They say that it is tested.

MS. SPARKS: Jody Sparks. I have a problem with the way you're presenting the transportation --

MS. NAITO: I'm sorry.

MS. SPARKS: -- and you are stating it as if the truck is the given.

MS. NAITO: Okay.

THE WITNESS: And I did go back and look in the CEQA document, you only look at truck you do not look at rail though rail is mentioned in the project description. So I really think it's inappropriate given your CEQA document and action plan for you to speak that it is going to be truck leaving. I find that sort of insulting to the community when you're telling you that your documents may not be complete.

MS. NAITO: Okay.

MR. HEADSON: Just a clarification question. On the trucks, Seth Headson, I live nearby

here. Are these on all the truck numbers are they single trucks or double haul trucks or longer?

MS. NAITO: I can't answer that because that's something that is dependant upon the contractor you hire.

MR. HEADSON: So could be?

MS. NAITO: It could be.

MR. WOODSON: Greg Harper.

MR. HARPER: I'm Greg Harper, 1420 45th Street, I'm Archana's husband. My question is actually the most basic one. I know the aggravation that all the people around here are going to undertake. I just don't know why we're doing it. I don't know what it is about whatever it is that lives underneath Ikea that is going to be impacted by this groundwater. I know that we don't drink it. I know that it eventually gets to the Bay in some form, but what do we know about its impacts at that point? I mean, for all of us, yeah if we got to hall it out of there, and it is three different grades of material, I don't hear anything about the possibility of leaving the stuff that's least contaminated in place.

But for all of us the best thing would be, I mean, can we cap it and what kind of construction would go? Because there's a secondary effect to all of this.

The secondary effect is after Sherwin-Williams spends 10 or 15 million dollars in this cleanup that they're going to have to do a development that's that much denser to pay for it. So we get it double. We get the impact of all this clean up that they have to do. And then when Sherwin-Williams does their pro forma and they bring it to the city, the pro forma says oh my gosh, we've got to have 287 units here because or whatever 500 some, because we've got to get our clean up money out.

So I want to know the basic thing. What's the sacrifice here? Is it some soil bacteria that's commonly -- is it at least a mollusk that we're giving it up for? Is it endangered at all? We have to be doing this for something. Pawan said over here we're going to clean up the middle dirty stuff in order to protect people. Well, what people? If it's just people on site there who are going to live there, they're the people that have to pay for it over time because they're the only ones benefitting from the fact it has to be taken out.

So I really think this it why this has to be done because truth be told, if DTSC were to be full disclosure about it, full disclosure would include all of the monitoring and permitting fees that

Sherwin-Williams is going to pay DTSC if this project goes forward like this. That's hundreds of thousands of dollars. So we've got to be realistic about it. I don't like the idea of a project going forward like this on a high scale just because it sounds good on paper. We really have to know what's behind it and what all this sacrifice is going to be about.

MR. WOODSON: Okay. Thank you.

MS. NAITO: I can take part of that.

I'm not sure I can completely answer your question, but I'm going to try to answer parts of it. The reason we're doing this cleanup is because the contamination, we do have arsenic contamination in the groundwater.

As you heard Pawan described, the form of arsenic in the groundwater, I think of it as rock candy. You make those wonderful crystals by superheating sugar and water so that the sugar dissolves in the water. When the solution comes back to room temperature, sugar crystalizes forming bigger rocks. As you put clean water in there, or if you use it to flavor your coffee like my mom does, some of that sugar is going to dissolve. So similarly over here as clean water moves through it's always going to pick up come of this arsenic and the arsenic is going to move down gradient and it will eventually reach Temescal

Creek and move to the Bay. So that we are required under the water code we have to remove source areas to protect under lying groundwater. See that's why we're doing the majority of the work here.

MR. HARPER: So there's no particular real environment -- it's a code, it's statutory?

AUDIENCE MEMBER: It's your fish.

MS. NAITO: No, it's we are doing this also like I mentioned we want to protect the Bay. We don't want this contamination to move out into the Bay. So that answers part of your question.

Another part was DTSC doesn't have any -- Sherwin-Williams pays for my time working on this project, you're right. We also get fees associated with hazardous waste disposal if it's disposed of then there's generator fees. But that's not what's driving this project in an effort for full disclosure. You had a couple of other points that I'm sorry that are escaping me right now.

MR. HARPER: Well one I didn't raise was the whole notion of using particulate traps. You've got heavy equipment whether you use it rail or otherwise, and that heavy equipment is far dirtier than the trucks are going to be, that excavation equipment. And there's no reason that that should be putting out

much at all it's not PM10, it's PM1. It goes really deep into the lungs and it can't come out. And it's carcinogenic. It is the most hazardous air pollutant we know is diesel. So it is -- I sort of had the feeling that you almost trivialized it a little bit. It's not trivial.

MS. NAITO: I'm sorry.

MR. HARPER: When a truck goes by and they've got an open window, it is really impacting on their health. And that needs to be at least recognized and considered, and I think the rail is the only mitigation that makes sense.

MR. DONAHUE: I just have a point that I'd like to clarify.

MR. WOODSON: Say your name again please.

MR. DONAHUE: My name is Scott Donahue. Greg seemed to have a point of levels of cleanup potentially being influenced by the owner of the sites desire to develop the site if I can interpret what I understood Greg to say. Earlier on one of the ideas for cleaning up the site was to take the soil and in effect turn it into concrete by mixing it and not removing it from the site but thereby preserving it so it wouldn't go into the groundwater using that method. But that was not preferred by Sherwin-Williams from my

understanding because it limited their development potential of the site.

MS. NAITO: I can answer that part.

MR. DONAHUE: Okay.

MS. NAITO: They did propose to do soil mixing as part of the remedy, essentially bind it up with something similar to concrete. Unfortunately when we went and did some laboratory testing and we did some pilot testing if you have seen some of the work notices that have gone out, it didn't work. We tried it.

MS. SPARKS: It didn't bind.

MS. NAITO: It didn't bind up. So arsenic continued to move out of this. So Sherwin-Williams tried, they really didn't want to impact the community to this extent, but unfortunately it didn't work.

MR. WOODSON: Okay I'm going to ask Tim Curran?

MR. CURRAN: Tim Curran, 4250 Horton Street. Two things; first of all has the local population been given a detailed characterization? So for instance how many children there are within the local environment?

MS. NAITO: No.

MR. CURRAN: Do you know how many people

have asthma?

MS. NAITO: No.

MR. CURRAN: Do you know how many people there are over the age of 70 who might have respiratory problems?

MS. NAITO: No.

MR. CURRAN: So there's just kind of the general idea that there are people in the environment?

MS. NAITO: Right.

MR. CURRAN: Just the general population, okay. I won't go into detail, but that matters. It matters to me and my 2-year-old and other children whose lungs are developing. So I'll get up to the mat.

Recently there was contamination under Sherwin Avenue. In the last few months I think that was removed and repaved. So moving dirt is a dirty business. I was down there often talking to the very good project manager on the site trying to keep the dirt down. I talked to the air monitors that were working their monitors during working hours. Still got dirty. Still increased the particulate in the environment. The monitors never showed an increase. The project manager, we talked at length how she was fulfilling all the engineering requirements, doing a great job getting that dirt off the wheels, doing

whatever she could to stop the dispersement of the dirt. Didn't work. Continued to accumulate, continued to blow down the street, accumulate on the cars, continued to accumulate on the road signs and things like that, it didn't work. It may have satisfied the engineering requirements, it may have satisfied the criteria for the air monitors. But living through it and talking to the project manager, who was going a top notch job, this small test project down here, this little triangle that was just excavated, it was very small compared to what's going to be done, increased the dirt in my world. And the dirt is not good for little lungs and big lungs and whatnot.

So I don't trust when engineer requirements say that there's a decontamination statement to brush and/or hose off the trucks. I don't trust when containment means plastic sheeting that's left over the weekend to blow off. I don't trust basically that the engineering recommendations are a guy with a hose and a guy with a broom. It comes down to that. And I've met those guys.

And one more thing, the air quality, the monitoring goes on for about 30 percent of the time maybe less if you do the math. It's there when the guy is there from 9:00 to 5:00, it's not there at night,

it's not there on a weekend, things happen. Weather happens, things happen. The air monitoring is good, it's good people doing the best job they can. But ultimately it accumulates. And over six months it's going to be dirt in here. And it's going to be dirt in the 2-year-old's lungs. I know it. I've just been through it. And that's all I want to say.

So I'll write those comments down, and I'd like to have these addressed specifically. Because I've been through many of them where I've had to talk to the project managers again and again, and they're top notch jobs and they have to explain to me that they're doing everything they can. And I explain to them I'm the test subject I'm the one out there. I'm the one just a few hundred feet away from all that giant dirt movement, big heavy machinery, trucks moving, guys with the broom, guys with the hose, guys with the Visqueen.

MS. NAITO: Tim? Your referencing the project that occurred down here?

MR. CURRAN: Yes.

MS. NAITO: Unlike that project our air monitors are supposed to run 24 hours a day. So we will have additional data for you.

MR. CURRAN: That's nice for one vector for the dirt to move throughout the environment, but

the efforts spent on looking at the other way that dirt travels and whatnot and particulate moves throughout the environment, they're just left up to the construction guys to do their best. That's what happens.

MS. NAITO: Okay.

MR. WOODSON: Tim, I'm wondering what your preference is to leave in place or do you have --

MR. CURRAN: Well if I saw, from my experience if I saw operations which had thorough solutions, which when I observed one and notice the effects I would say, Wow, that is a great decontamination site for your truck. These trucks that come down here are clean and that road is nice and clean. If I were able to say that I might be able to be satisfied with such a proposal.

But when I hear proposals on paper, that's why I want berm clarified and containment clarified, because looking at these things on paper, you think, well great, it's going to be contained. And then it ends up being sand bags and six mill plastic, and some guy who's got to get home to his wife and doesn't have time to check on the back side of it, and a long 3-day weekend, and a windy one that. And you come back and there are rips in the plastic. That's the reality of

the stuff that actually happens. I've been observing it in this brown field environment for many years.

So to answer your question, I would like thorough solutions to these very real details of this project, or I would like it solved in another way with thorough solutions that don't just give me large scale descriptions of what we're going to do and leave the details up to the guy with the hose and the guy with the broom. Thank you.

MR. WOODSON: Okay I don't have anymore cards. I do have a hand, two hands. We have about five minutes to wrap up. So why don't we just take -- state your name again.

MS. BRESNAHAN: My name is Edythe Bresnahan. And my question goes back to the when you first gave your talk you mentioned that there were new standards coming out where a truck could not idle more than five minutes.

MS. NAITO: Um-hmm?

MS. BRESNAHAN: Because of the contamination I believe. And thinking about that and thinking about -- I mean that's almost comical. If you think about the number of trucks you're talking about. A truck every 15 minutes eight to ten hours a day for five day of the week for six months. That standard

that you talked about is laughable when you think of the scope of this project. I really believe we're in danger here, all of us.

MR. WOODSON: Thank you.

MS. HORSTING: And I appreciate your attempt to answer all of our questions.

MR. WOODSON: State your name again please?

MS. HORSTING: Archana Horsting, spelled like an arch. One thing that wasn't discussed tonight it was mentioned that lead was also in the soil and we talked quite a bit about the arsenic and some other elements, but nobody has discussed how the lead what would have happened the lead that's in the soil and of course that's something you have to deal a lot in our site. And so I'd like to have that covered also in the report. And what other things like that that weren't all the elements in the material have not been discussed thoroughly and what the mitigations are for those.

MR. WOODSON: Okay, thank you. One last question.

THE WITNESS: The question I had was --

MR. WOODSON: Could you please state your name please?

MR. AARAHARAM: My name Sridhar Aaraharam, I'm from Bayar, and I basically gave my card here because I guess we're out of time. But there are a couple of questions I had. Have you evaluated any abatement that can reduce diesel exhaust from trucks?

MS. NAITO: That's a good question. I don't have an answer yet.

MR. AARAHARAM: And the other question I had was how are you going to keep dust and vapor down after work hours, like after 5:00 until the next morning, how are you going to protect excavations from having vapors out or gassing out or dust blowing off?

MS. NAITO: For the excavations and dust and vapor control, we're going to have sprayed the excavation area, we're going to try to limit the amount of excavation open at any time so we can minimize the amount of chemicals that come out of the hole essentially. I think those were the two main ones.

MR. AARAHARAM: Yes. The final one I have here, I had seven, but some of them are redundant, so I don't want to go over redundant questions I had. But like site management I guess people already asked you to elaborate on that, so basically I have the same question. And the non-work hours I basically brought about. And then you were talking about emissions from

water remediation. So when you're doing the water remediation, are you going to be emitting it out there because there's an air permit or is it a charcoal filter that you're going through?

MS. NAITO: Are you talking about when we do the soil vapor extraction or groundwater extraction?

MR. AARAHARAM: Groundwater extraction.

MS. NAITO: Groundwater extraction? Most of the -- we will need to have a phased treatment system similar to the one we have now so it can address both the volatile organics and the arsenic.

MR. AARAHARAM: So volatiles are not going to be emitted there, you're going to have some charcoal filters or --

MS. NAITO: I'm going to have to defer to Pawan on this one.

MR. PAWAN: You're asking about groundwater treatment? The groundwater is going to be treated through a system on site to deal with the vapors and the minerals, arsenic and lead. Or it may be, depending on the volume we generate, containerized onsite and transported off site for treatment and disposal. And the treatment if we were to treat on site it would be similar to what's happening today out here. That's been ongoing. We have a system to settle

out the metals and generate sludge which is then taken off site for disposal. And potential volatile organics are in the groundwater are treated through different activated carbon and other media that remove the organic material from the water and leaving the water sufficient to discharge. And that media are periodically changed out so that they continue organics can be removed from groundwater.

MR. AARAHARAM: So you won't have any other emissions other than fugitive emissions?

MR. PAWAN: Yes.

THE WITNESS: That's what I was trying to be clear about. And then there is a question about impact on PODW water, because we use PODW water in the manufacturing process.

MR. PAWAN: I'm not sure I understand.

MR. AARAHARAM: I'm talking about the potable water, basically the lady was saying the water was tasting in a different way, and we use a lot of city water for our process.

MR. PAWAN: I don't anticipate this project affects city water quality.

MR. AARAHARAM: Okay, thank you.

MR. WOODSON: Thank you. We are at 9:00 and I think we have finished. I really appreciate your

comments, your questions. You have given us a lot to consider and we will seriously do that. We will be responding in writing, as I said, and we will make that available. This is not the last opportunity for any discussion or dialogue. We will come back to community with response to comments and thank you very much for coming tonight.

(Off the record at 9:02 p.m.)

I do hereby certify that the foregoing meeting was taken at the time and place therein stated; that the testimony of said parties was reported by me, a shorthand reporter and a disinterested person, and was under my supervision thereafter transcribed into typewriting.

CHERIE L. LUBASH

ATTACHMENT C

Department of Toxic Substances Control
Sherwin-Williams Site
- Speaker Card -

Thank you for your interest in the **Sherwin-Williams site** draft Remedial Action Plan (RAP) public meeting. Please provide your comments and questions below. Your participation and comments are appreciated.

PLEASE PRINT

Name: Scott Donahue

Address: 1420 45th st. #49

Provide your comments and questions below:

(Please print legibly and use the other side for extended comments)

Department of Toxic Substances Control
Sherwin-Williams Site
- Speaker Card -

Thank you for your interest in the **Sherwin-Williams site** draft Remedial Action Plan (RAP) public meeting. Please provide your comments and questions below. Your participation and comments are appreciated.

PLEASE PRINT

Name: Jody Sparks

Address: PO Box 186 Stewarts Point, CA 95480

Provide your comments and questions below:

(Please print legibly and use the other side for extended comments)

Department of Toxic Substances Control
Sherwin-Williams Site
- Speaker Card -

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PLEASE PRINT

Name: EDYTHE BRENNAHAN

Address:

Provide your comments and questions below:

(Please print legibly and use the other side for extended comments)

1) number of trucks to be used

Department of Toxic Substances Control
Sherwin-Williams Site
- Speaker Card -

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PLEASE PRINT

Name: MICHAEL HAMMOND

Address: 1500 PARK AVE

Provide your comments and questions below:

(Please print legibly and use the other side for extended comments)

ARE THERE ANY TESTS DONE KNOWN!

Department of Toxic Substances Control
Sherwin-Williams Site
- Speaker Card -

Thank you for your interest in the **Sherwin-Williams site** draft Remedial Action Plan (RAP) public meeting Please provide your comments and questions below. Your participation and comments are appreciated

PLEASE PRINT

Name: M. LOUISE STANLEY

Address: 1420 45th St. #29, EMERYVILLE

Provide your comments and questions below:

(Please print legibly and use the other side for extended comments)

Diesel exhaust is the greatest worry for me. Also weight of trucks moving the ground beneath us.

Speaker # _____

(DTSC Use Only)

Department of Toxic Substances Control
Sherwin-Williams Site
- Speaker Card -

Thank you for your interest in the **Sherwin-Williams site** draft Remedial Action Plan (RAP) public meeting Please provide your comments and questions below Your participation and comments are appreciated

PLEASE PRINT

Name: Greg HARPER

Address: 1420 45th St #27

Provide your comments and questions below:

(Please print legibly and use the other side for extended comments)

1. Why don't you actually test the dust of a truck pulling away from a stop
2. What life forms does the groundwater support
3. Who are the people being protected by the soil removal
4. Why aren't you studying the rail costs etc.
5. Why can't you require the trucks to be CARB compliant or have particulate traps

Department of Toxic Substances Control
Sherwin-Williams Site
- Speaker Card -

Thank you for your interest in the **Sherwin-Williams site** draft Remedial Action Plan (RAP) public meeting. Please provide your comments and questions below. Your participation and comments are appreciated.

PLEASE PRINT

Name: DIANE TROY

Address: 1420 45th St

Provide your comments and questions below:
(Please print legibly and use the other side for extended comments)

(1) How are the source materials going to be removed ... jake hammers

(2) WHAT ARE THE staging (waste) areas made of. How are the Materials also contained

(3) Are the materials going to be removed daily

Department of Toxic Substances Control
Sherwin-Williams Site
- Speaker Card -

Thank you for your interest in the **Sherwin-Williams site** draft Remedial Action Plan (RAP) public meeting. Please provide your comments and questions below. Your participation and comments are appreciated

PLEASE PRINT

Name: Teresa Kalnoskas

Address: 4333 Holden St #520 Emeryville CA 94608

Provide your comments and questions below:
(Please print legibly and use the other side for extended comments)

My primary concerns are the potential toxins & pollutants in the air that we breath & that are settled on edible gardens and settled on high human traffic surfaces. I have a young child + several pets.

? — How & will yr be testing the residencial areas near the clean up site? (soil / air / surfaces)

? — How will we be informed & be assured that we are not be slowly poisonded on a day to day basis?

Speaker # _____
(DTSC Use Only)

Department of Toxic Substances Control
Sherwin-Williams Site
- Speaker Card -

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PLEASE PRINT

Name: SRIDHAR AGRAHARAM (BAYER)

Address: 5650 HOLLIS STREET

Provide your comments and questions below:
(Please print legibly and use the other side for extended comments)

1) Soil management to prevent off gassing eg under plastic liners
2) Practices to be adopted to prevent off gassing & dust dispersion during non work hours.
3) Elaborate on emissions from water remediation.
4) Security ?
5) Impact on POTW water ?
6) Have abatement devices on trucks to reduce diesel (exhaust) Particulate evaluated ?
7) Dust monitoring for respirable fractions ? What criteria ?

Department of Toxic Substances Control
Sherwin-Williams Site
- Speaker Card -

Thank you for your interest in the **Sherwin-Williams site** draft Remedial Action Plan (RAP) public meeting. Please provide your comments and questions below. Your participation and comments are appreciated.

PLEASE PRINT

Name: Sylvie Hessini

Address: 1500 Park Ave #223 Emeryville

Provide your comments and questions below:
(Please print legibly and use the other side for extended comments)

Truck noise, diesel fumes & dust kicked up by the trucks heavily impacts our 141 unit building @ 1500 Park. Transport of toxic soil by rail would be optimal! The second choice would be that the trucks head north with their cargo, rather than using Hallech & Hubbard. Thanks!

Speaker # _____
(DTSC Use Only)

Department of Toxic Substances Control
Sherwin-Williams Site
- Speaker Card -

Thank you for your interest in the **Sherwin-Williams site** draft Remedial Action Plan (RAP) public meeting. Please provide your comments and questions below. Your participation and comments are appreciated.

PLEASE PRINT

Name: TIM CURRAN

Address: 4250 HORTON ST. #13

4

Provide your comments and questions below:
(Please print legibly and use the other side for extended comments)

"A DECONTAMINATION STATION WILL BE SET UP ON SITE TO DRY BRUSH AND/OR WET RINSE TRUCKS WHEN LEAVING"
from RAP Fact Sheet, October 2009

THE DIRT WILL BE CONTROLED BY A GUY WITH A HOSE A GUY WITH A BROOM AND PLASTIC SHEETING.

AIR MONITORING WILL OCCUR LESS THAN 30% OF THE TIME

(1) detailed Population characterization

(2) engineering recommendations result in guys with brooms & hoses

Department of Toxic Substances Control
Sherwin-Williams Site
- Speaker Card -

Thank you for your interest in the **Sherwin-Williams site** draft Remedial Action Plan (RAP) public meeting. Please provide your comments and questions below. Your participation and comments are appreciated

PLEASE PRINT

Name: Archana Horsting

Address: 1420 45th st. #27, Emeryville, CA 94608

Provide your comments and questions below:
(Please print legibly and use the other side for extended comments)

(1) I want to know why rail options for removal of the soil have not been discussed. What are the criteria for choosing trucks over rail? Rail is the obvious solution from the entire neighborhood's point of view. RAILCARS ARE AVAILABLE ON THE market NOW - What are the problems with rail delivery to an approved disposal site? Cost for Sherwin-Williams site owners should be less than trucks. over→ who is benefitting from the truck contracts?

Speaker # _____
(DTSC Use Only)

(2) What about the lead? in the site & in the environment.

(3) The artists living in the neighborhood are a cultural resource as well as a human beings. (The artwork being made at the coop is contemporary but is as important as the ancient artifacts potentially discovered at the site.) (other sites) So deserves mitigations.

From: <mafish99@sbcglobal.net>
To: Janet Naito <JNaito@dtsc.ca.gov>
Date: 11/4/2009 11:03 AM
Subject: Re: Sherwin-Williams November 5, 2009 Public Meeting

Dear Janet,

Thank you for the notice of the November 5th meeting. It has been over a year since I visited DTSC in Berkeley to show the video clips of the Sherwin Williams cleanup to you and your colleagues from Los Angeles, Sacramento, and the Bay Area. At that time you were preparing for a cleanup in the Spring. I very much appreciated the time and attention you gave to the presentation and the plight of the artists who were caught in the middle of an extensive and problematic cleanup. We hope this will never be repeated.

I am writing to urge you to keep us in mind when planning the routing for removal of the soil and incoming soil. Though I wasn't at the recent DTSC presentation to the community, I understand the current plan favors trucks and that the choice of routing, according to your mailing, is Halleck Street.

This choice will be very difficult for our neighbors. If they challenge it, we will be in a situation where neighbor must fight neighbor to avoid the hardship of the cleanup. I noticed in your recent mailing that noise and vibration and nonstop truck traffic, including fumes from trucks, were not part of your criteria for hardship. This surprised me.

No matter which traffic route is chosen, Halleck or Horton, it will be unacceptable. I believe eight hours are proposed, and they are repeated, day after day, week after week, month after month.

Having been through the previous cleanup, we know that even two hours of such traffic is very difficult. To increase that to a whole day amounts to a lost day or enforced vacancy of the live work unit during truck hours.

Especially after the first cleanup, this proposed use of trucks sends a message to us that our community is disregarded. There has to be a point at which the DTSC stands up to protect the people living along Horton and/or Halleck Streets, and not harm them. Otherwise the point of a cleanup overseen by the DTSC, a public agency, is moot, and the tone of the project turns cynical.

If a truck route on Horton Street is used, we will argue vigorously that it would be unjustly cruel to subject the Artists Cooperative yet again to a six-month period of noise, deisel fuel, vibration, dirt, and traffic on Horton Street. Once was enough. I think we used the term "the walking wounded" to describe the aftermath of the first Horton St. cleanup. Unfortunately, it still applies. We remember the first cleanup as if it were yesterday. We also don't wish this on our neighbors.

Rail is a solution that would favor both neighborhoods. Rail would be the right way to do this project.
Thank you very much for your community outreach.

Sincerely,

Margaret Fisher
1420-45th Street #16 (with studio windows along Horton Street)
Emeryville CA 94608
tel. 510-653-5009

From: mafish99 <mafish99@sbcglobal.net>
To: <JNaito@dtsc.ca.gov>
Date: 11/22/2009 8:39 PM
Subject: Sherwin Williams site cleanup

Dear Janet,
I'm sorry I was unable to attend the Thursday night meeting on the 5th. I talked to several of my neighbors to understand current developments. Thank you for your email and the opportunity to have input. I do have some questions I hope the DTSC will address:
1. a)How does DTSC characterize the population of the neighborhood involved?
b)What will the impact of the proposed cleanup be on special populations such as infants, children, persons with asthma, the elderly, etc? (It seems there are a lot more families, children, etc. in the neighborhood than there were in 1996-1997.)
c) The 10/23/09 Negative Declaration reports a negative impact of the cleanup on the environment. Where are the studies that show the projected impact on human beings? If there are no such studies, is there a study that reports on the need for such a study?
d) If these studies exist, do they address noise and vibration levels as well as dust? and
e) Are the human (rather than environmental) tolerance levels or limits calculated for a cumulative effect over hours, days, weeks, and months; or does one measurement for one instant of time apply to every instant over the duration of the 6 months? (In other words, what thresholds do human beings have regarding coping with noise, dust, vibration for time durations?)
2. What is the environmental impact on the Bay of the current runoff from the site soil? What is the date of the most recent environmental impact report concerning this site and its impact on the bay?
3. Why is rail not presented as a viable and likely option?
4. Why does the soil removal have to happen at all?
5. Are there funds available for the re-location of individuals/families/businesses who might not be able to inhabit their home/business during the cleanup because of the cleanup?
6. Regarding the monitoring reports '08 and '09, why does the amount of arsenic removed in a three month time period (e.g., for the 2 quarters reported July 2009 for 78 days and that removed for 84 days in July-Sept. 2008) vary dramatically and with no proportional relationship (given the difference in the # of gallons treated) ? Does the amount of arsenic extracted pose a danger to the bay?
Thank you,
Margaret Fisher
1420-45th Street #16
Emeryville CA 94608

Brian Donahue
4333 Holden Street
Emeryville CA 94608

November 8, 2009

To the DTSC-

My family was not able to attend the Thursday meeting at Emeryville City Hall regarding the Sherwin Williams (SW) site clean up. My family consists of my wife, our four-year-old daughter and myself. We live across Horton Street from the site. Of course, our daughter is our primary concern. As of right now, she has 'normal' levels of lead in her body as confirmed by her doctor.

These are my concerns regarding the clean up:

1. Sherwin Williams Corporation, the City of Emeryville and the State/Federal government thus far has no credibility as to cleaning up the Sherwin Williams site. Years ago, during the first action here, graders and other heavy machinery kicked up massive clouds of toxic dust that were released into our neighborhood. After Artist's Co-op members complained, Sherwin Williams admitted there was a problem and assured us this would not happen again. They blamed a "bad contractor". Where was the government during this time? Why were the resident's interests not adequately addressed?

2. At a meeting during the run-up to the current clean-up effort, residents asked for rail cars to be used to remove toxic soil. We were told none were available due to the over-heated economy, presumably not a problem any longer. Why is it that this changed railcar scenario was not volunteered by SW/Government to the residents? Why is it that the residents at the Thursday meeting had to bring this up themselves? The fact that the Government did not see fit to address the rail car solution after the initial argument became erronionous, and volunteer this information to the residents, makes me feel as if the resident's interests are not being taken seriously. We initially were told, ostensibly and as an aside, the rail car solution is more expensive than the trucking method, and were assured that cost saving was not the deciding factor in the decision to opt for trucks. With the revelation that the rail option is now possible, yet not acted on, I believe that SW money saving is why rail cars are not being taken seriously. The Government seems to have SW's interest at heart, not the resident's. This rail car controversy is evidence of that.

What I'm not interested in is years after this clean up, we come to find out the neighbors have been doused with lead and arsenic and we are offered up an apology and perhaps some money. I need to make sure my daughter is not doused in the first place. Owing to the lack of credibility demonstrated by SW/Government, we need some other entity

performing field verification, performed in real time to assure the neighbors will not be exposed. Private corporate testers are obviously not in any position to provide assurance to the neighbors due in no small part to the corrupting influence of money. Also, after 30 years of Republican rule in the nation, evisorating government function, the government doesn't seem capable to this task. Perhaps some other EPA type agency from say, Canada could be paid to provide assurances to the residents they will be protected. Worth entertaining since we can't seem to get satisfaction from the private sector or indeed our own government.

Brian Donahue
28-year resident
Parent

Brian Donahue
4333 Holden Street
Emeryville CA 94608

November 8, 2009

To the DTSC-

Please add this addendum to my previous letter, drafted today.

Add concern #3.

3- Why is this clean up even necessary at all? We have been told that the toxins are migrating towards Temescal Creek and therefore it is necessary to do this now. Frankly, I doubt it. After 80 years, with no mitigation at all, then after the concrete injection mitigation method employed a few years ago, it stretches the imagination that now…now this is a problem.

What seems so much more likely is that great development pressure in the wake of the Sherwin Williams abandonment of the site is what's driving this massive clean up. Especially since the Emeryville Redevelopment Agency, if history is any indicator, will likely pick up a lot of the tab and a future developer will receive massive taxpayer subsidies.

I find it highly objectionable that those who invocate simple human nature are to be put on the defensive. In the absence of trust, old-fashioned greed is the most likely driving force here. It is we, the neighbors that live next to the Sherwin Williams site, that ultimately must take this gamble; Will the decision makers be able to resist the force brought by tens of millions in potential profits and give an honest appraisal? Or is it more likely that Emeryville historic precedent will prevail and the loud chorus of development at any cost be assuaged? I say it is the latter, more reasonable assumption that is most likely to hold sway.

Janet Naito - Sherwin Willigams Site

From: "Eryka Milligan" <EMilligan@consumerfinancial.com>
To: <jnaito@dtsc.ca.gov>
Date: 11/19/2009 11:39 AM
Subject: Sherwin Willigams Site

Hello-
we have an office in the 1500 Park building with windows on Sherwin St. directly across from the site. Do you know if there are any funds available for noise reduction in our office? We'd like to see if we can install something to insulate the windows against some of the noise when the project really gets going.

Thank you,

Eryka Milligan

Consumer Financial Service Corporation
510-596-4100
510-596-4105 fax

Janet Naito - [CONTENT] Sherwin Williams Site -- Comment

From: martha boersch <marthaboersch@hotmail.com>
To: <jnaito@dtsc.ca.gov>
Date: 11/22/2009 1:38 PM
Subject: [CONTENT] Sherwin Williams Site -- Comment
CC: Isabelle Eyman <isabelle.eyman@gmail.com>

Dear Ms. Naito:

I am writing to comment on the draft plan for the clean-up of the Sherwin Williams site and to express my view that the ONLY way to remove the dirt safely and with the least amount of inconvenience and danger to the surrounding neighbors and businesses is by loading and removing the soil by rail car and NOT by 50-100 trucks per day on Halleck Street. I live at 1500 Park Avenue and the only exit for the several hundred residents of my building is out of our garage and onto Halleck.

The City of Emeryville has been using Halleck to stage the trucks and equipment now being used for the Park Avenue beautification project. This relatively small amount of traffic on Halleck is already creating a significant amount of traffic, dirt and dust, and air pollution. In my view Halleck simply cannot handle 50 to 100 semi-tractors per day without significantly and drastically impairing the use, enjoyment and safety of 1500 Park Avenue. The use of rail cars will obviate most of the problems that will be created by 50-100 trucks per day entering and exiting the Sherwin Williams property along Halleck. To accommodate that many trucks the street will be all but unusable for the residents of 1500 Park Ave. and the street is our ONLY means of entering and exiting our property. If 50-100 trucks per day are used for the clean-up, that will be 100 - 200 trips per day by large semi-tractors. That is 25 loads every hour or a truck every two minutes for eight hours a day!

Rail cars, on the other hand, can carry more soil, can be moved onto the site once or twice a day en masse -- maybe 10 or more cars at a time -- and can be filled and removed without affecting our ability to enter and exit our building, without the noise and air pollution caused by the trucks, and without other disturbance other residents and business in the area besides the dirt and dust, but even that should have a lesser impact.

I do not believe that the use of rail cars would be prohibitively expensive or impractical, and in any event I do not believe that a decision to use trucks should be made without a thorough analysis of a cost and logistical comparison between the use of rail cars versus the use of trucks.

Thank you, and please feel free to contact me if you have any questions.

Martha Boersch
415-875-5811 (work)
510-759-3848 (cell)

cc: Isabelle Eyman, Emeryville Warehouse Lofts Board

Janet Naito - [CONTENT] Re: Sherwin Williams Site -- Comment

From: Isabelle Eyman <isabelle.eyman@gmail.com>
To: martha boersch <marthaboersch@hotmail.com>
Date: 11/22/2009 6:29 PM
Subject: [CONTENT] Re: Sherwin Williams Site -- Comment
CC: <jnaito@dtsc.ca.gov>

The comment I would like to add here is that a significant amount of dust, dirt, and mud has been tracked into the building from the current project...bringing it directly into our living space. I would love to see something taken into consideration to reduce or avoid the scenario of tracking in toxic dirt. IZ

On Sun, Nov 22, 2009 at 1:37 PM, martha boersch <marthaboersch@hotmail.com> wrote:

> Dear Ms. Naito:
>
> I am writing to comment on the draft plan for the clean-up of the Sherwin Williams site and to express my view that the ONLY way to remove the dirt safely and with the least amount of inconvenience and danger to the surrounding neighbors and businesses is by loading and removing the soil by rail car and NOT by 50-100 trucks per day on Halleck Street. I live at 1500 Park Avenue and the only exit for the several hundred residents of my building is out of our garage and onto Halleck.
>
> The City of Emeryville has been using Halleck to stage the trucks and equipment now being used for the Park Avenue beautification project. This relatively small amount of traffic on Halleck is already creating a significant amount of traffic, dirt and dust, and air pollution. In my view Halleck simply cannot handle 50 to 100 semi-tractors per day without significantly and drastically impairing the use, enjoyment and safety of 1500 Park Avenue. The use of rail cars will obviate most of the problems that will be created by 50-100 trucks per day entering and exiting the Sherwin Williams property along Halleck. To accommodate that many trucks the street will be all but unusable for the residents of 1500 Park Ave. and the street is our ONLY means of entering and exiting our property. If 50-100 trucks per day are used for the clean-up, that will be 100 - 200 trips per day by large semi-tractors. That is 25 loads every hour or a truck every two minutes for eight hours a day!
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> I do not believe that the use of rail cars would be prohibitively expensive or impractical, and in any event I do not believe that a decision to use trucks should be made without a thorough analysis of a cost and logistical comparison between the use of rail cars versus the use of trucks.
>
> Thank you, and please feel free to contact me if you have any questions.
>
> Martha Boersch
> 415-875-5811 (work)
> 510-759-3848 (cell)
>
> cc: Isabelle Eyman, Emeryville Warehouse Lofts Board

December 3, 2009

TO: Janet Naito, DTSC
700 Heinz Ave. Suite 200
Berkeley CA 74710
JNaito@dtsc.ca.gov

FROM: Tim Curran
4250 Horton St. #13
Emeryville CA 96608
510-652-7110
2timcurran@gmail.com

RE: Questions: Sherwin Williams 60000189.

Horton Street is a bicycle boulevard and a growing pedestrian corridor. Joggers, mothers/fathers strollering babies, dog walkers, cyclists and Bayer/Novartis employees use Horton Street between 45th Street and 53rd Street on a daily basis.

1, Will pedestrian access to the public thoroughfare (sidewalks and roadways adjacent to the Horton Street work areas) be impinged during the remediation work?

--Will the sidewalk(s) be blocked at any time?
--Will there be changes to the street parking surrounding the site during the work period?
--Will the roadway be blocked at any time?
--Will there be any barrier erected between the work and the public sidewalk (ie: windscreen, plywood wall...)
-- Will the trench, all construction equipment and any disturbed soil be covered during every weekend and holiday to prevent the migration of dust from the site to the public right of way while construction crews are not present
--Will there be public notification before significant events which might expose the adjacent public right of way to vapor contamenents (the removal of the concrete cap)?If so how will the notification be distributed? How much advance warning?
--Will the street trees adjacent to the work area be disturbed?

If 99.9% of the 64,000 cubic yards of soil will be contained and effeciently removed from the site that still leaves 1% of the soil that can migrate from the site into the surrounding area. At 1%, 64 cubic yards of lead and arsenic contaminated soil may be distributed into the surrounding area. A 1/8th inch layer of contaminated soil could cover a 3.5 acre area (somewhere between 1 and 2 metropolitian blocks).

2. Street Sweeping/Cleaning

-- Will there be street cleaning by a contractor's street sweeper?
-- Will there be an increase in sweeping by city street sweeper?
-- Is the street sweeping frequency determined by the contractor/ city/ DTSC?
-- Is there a requirement for the street sweeping vehicle(s) to be inspected for maintenance problems?
--What happens to the dirt from the sweeper?
--Will there be any change in street parking to insure that street sweepers get access to ALL of the street? If so will this be a contractor responsibility or a city resposibility?
-- Is there a plan to keep sidewalks clean? What is it? Who is responsible for S.W. sidewalks and neighborhood sidewalks ?
-- Is there a monitoring plan for the accumulated lead and arsenic levels due to the work in the surrounding area? Trees, ground foliage, untouched horizontal surfaces all accumulate particulates. Real time air monitoring will notice spikes in the migration of vapors and particulates off site. Is there a testing/monitoring proticol to identify the amount of accumulated contaminants in the surrounding area (ie: collection plates)?
-- If there is no testing/monitoring proticol for accumulated contaminants in the surrounding area, why not?
-- Can I request and receive: before work begins, during work and after work is completed, wipe tests of my residence entry floors to insure that contaminants are not being tracked into my home?

3. Trucks

-- Who will inspect and hold the necessary permits for the trucks and operators hired for the transport of the contaminated soil?
-- Will the trucks remain only on concrete or also travel on disturbed soil while on the S.W. property?
-- Will the decontamination station for the transport trucks be enclosed and sheilded from wind?
-- Will the truck tires remain on concrete or other cleanable driving surface, after leaving the decontamination station until they are on the public roadway?
-- Will there be an inspector/worker insuring that all trucks are covered when departing from the decontamination station?

-- Is there any requirement that the trucks be cleaned at the disposal location, after the soil is off loaded?
-- Will the same trucks be used to transport the contaminated soil be used to transport the the clean fill soil ?
-- Will the clean fill truckloads be covered?
-- Will the clean fill be tested before it is delivered to S.W.?
-- Will the clean fill be tested periodically? If so, who determines the frequency of the testing?
-- Will the clean fill be sprayed with water during off loading to reduce the migration of particulates?
-- Who will determine when trucks should idle or shut off their engines? Each driver is given guidelines? Are large signs posted? Is there someone insuring that drivers remember/comply?
-- Is there an alternate truck route in place?
-- If an alternate truck route is needed for any reason, how will that route be communicated to the truck drivers to insure that they follow the alternate route?
-- How will the public be notified if an alternate truck route needs to be used?

4. Communication

-- Over the 6 month period of remediation work how many communications from DTSC should we expect to inform us about progress, problems, results of monitoring data, extensions to the schedule etc.?

My questions above reflect my concerns about living at my residence with my wife and 2 year old daughter during the 6 months of remediation work. I am considering relocating during the work. The answers to the above questions will influence my decision.

Thank you,

Tim Curran

Janet Naito - Sherwin Williams Written Comments

From: Gary Grimm <gjaygrimm@hotmail.com>
To: Janet Naito <jnaito@dtsc.ca.gov>
Date: 12/10/2009 7:46 PM
Subject: Sherwin Williams Written Comments
CC: Nathan Schumacher <nschumac@dtsc.ca.gov>, Jody Sparks <jodycs@mcn.org>, Ann Holsberry <aholsberry@hotmail.com>
Attachments: RAP & CEQA Written Comments 12.11.09.pdf

Dear Janet,
Attached are Ann's and my comments on the draft RAP and the CEQA Initial Study and proposed Mitigated Negative Declaration for the proposed Sherwin-Williams remediation.
Thanks you for this opportunity to provide written comments.
Gary & Ann

Windows LiveT Hotmail is faster and more secure than ever. Learn more.

Ann Holsberry
Gary Grimm

1420 45th Street, #32
Emeryville, CA 94608
Telephone: (510) 655-2130
Facsimile: (510) 848-4164
aholsberry@hotmail.com
gjaygrimm@hotmail.com

December 11, 2009

Via E-mail Jnaito@dtsc.ca.gov

Janet Naito,
Project Manager
DTSC
700 Heinz Ave., Suite 200
Berkeley, CA 94710

Re: Public Review & Comment
Sherwin-Williams Site
Draft Remedial Action Plan
Initial Study and Draft Mitigated Negative Declaration

Dear Janet:

This is in response to the Fact Sheet dated October 2009 with regard to the Sherwin-Williams Site draft Remedial Action Plan ("RAP") and the proposed California Environmental Quality Act ("CEQA") Initial Study and draft Mitigated Negative Declaration. Thank you for the opportunity to provide written comments on these important documents. We request that these comments be included in the administrative record of this proceeding.

As you know, Ann is a member of the 45th Street Artist's Coop at 1420 45th Street, located directly across the street to the east of the proposed project. We both understand the importance of this remediation to address the environmental and water quality related problems that have occurred on the Sherwin-Williams/Rifkin Site over the decades. A long history of contaminant releases that exist on this Site is disclosed in the relevant documents. We appreciate the DTSC regulatory oversight of this Site. At the same time, DTSC in its regulatory oversight role and Sherwin-Williams as the project proponent must fully and adequately address the effectiveness of the proposed remediation and its environmental impacts on the surrounding community. We appreciate an additional meeting was held at the Coop on December 9, 2009.

This is a very large project by San Francisco Bay Area standards – it involves the proposed excavation of 64,000 cu.yds. of contaminated soil and debris[1], transporting it by truck and/or rail to yet undisclosed disposal site(s) and backfilling the site with clean soil transported from off-site. If our math is correct, excavation of this amount of contaminated soil would be the equivalent of an amount of soil that would cover six football fields; each filled six feet high with contaminated soil.

After reviewing the draft RAP, the CEQA Initial Study and the proposed CEQA Mitigated Negative Declaration, it is our conclusion that these documents fail to adequately addresses the proposed remediation and environmental impacts on the Site and the surrounding community, and is therefore legally defective unless revised to address the concerns of the community and as addressed below. Randy Smith's presentation (CDM) at the meeting regarding further analysis of rail and truck transportation methods and possible off-site disposal locations, material that was not presented in the RAP or the CEQA documents, further demonstrated the inadequacies and incompleteness of the RAP and CEQA documents.

Draft Remedial Action Plan (RAP)

Based on our reading of the draft RAP, we've identified the following inadequacies and issues concern:

- **Remedial Action Objectives** in section 3.2 (p.3-3) – among the objectives identified are 1) minimization of migration and inhalation of airborne dust; 2) minimize exposure to and inhalation of constituents of concern (COCs); and 3) minimization of inhalation of organic compounds (VOCs). The assurance of achievement of these objectives is essential to the Coop community. However some of these concerns are not adequately addressed as described below.
- **Preliminary Implementation Schedule**, even the RAP details that are somewhat vague may change based on the remedial design implementation plan (RDIP), (not yet prepared), contractor plans and local permits. This will include a Community Safety Plan as well as a Dust and Vapor Control Plan described in section 6.1.1.1, p.6.2 – the Coop is generally downwind of the remediation activities. It seems essential that community input be sought and encouraged on the RDIP including the Community Safety Plan and the Dust and Vapor Control Plan, as it will contain a lot of the details that will directly affect us.
- **Project Schedule** - Figure 5-1 shows the planned 12-month schedule for this project and lists the planned tasks, dates and duration. It shows that the bulk of actual on-site activities will occur between May 1 – December 1, 2010. While this time period may in some respects be considered temporary, it is a long period of time for residents living in this area.
- **Work Hours** on the site will be 7am-6pm on weekdays and weekend workdays, if necessary, from 9am-6pm. (section 5.1, p.5-1). As this work will be very noisy

[1] The RAP and Initial Study state two inconsistent figures – at some points in the documents the excavation is described as 64,000 cu.yds. and in other discussion it is 60,000 cu.yds. The figure of 67,000 cu.yds was also suggested by CDM at the December 9 meeting at the Coop.

and disruptive to the adjacent community, are these reasonable hours? This also means that if truck transportation is used to haul contaminated soil away from the Site, they probably will be lining up well prior to 7am with their engines idling. This will cause additional noise and diesel fumes prior to the permitted work hours. Conditions should be imposed by Sherwin-Williams that clearly limit this practice.

- **Noise Monitoring** – section 6.2.2, p.6-7 describes noise monitoring and refers to the Emeryville noise ordinance – again 7am-6pm weekdays and 9am-6pm on weekends, if necessary. It notes that more restrictive hours may be established when residential use is very close and the work will involve a lot of heavy equipment – section 6.7 p.6-12 identifies the equipment that will be used for soil excavation. Stringent noise monitoring is essential for this project given the surrounding residential/work areas.
- **Loading and off-site Transport** – these sections are critical. Section 6.9, 6.9.1 and 6.9.2 (pp.6-14&15). Excavated soil will be removed from the site by rail and/or truck (very vague) and transported to yet undisclosed disposal sites. Rail cars will be used "to the extent possible" depending on availability and location of rail cars. Removal of soil from the site (estimated 9-18 weeks involving 50-100 trucks per day) and bringing clean fill back to the site will probably be done mostly by truck. This should be made more definite and specific with emphasize on requiring Sherwin-Williams to do as much removal as possible by rail car. If DTSC has concerns with mandating rail transport, a more through analysis of the truck related community disruption should be undertaken in revised CEQA documents. This should not be deferred to the RDIP process or any other future report.
- **Truck Transport Route** – It is anticipated that the large trucks will approach the site from the south along Hallack St.and Sherwin Ave.and leave by that same route. This appears to be the historic truck route for this facility. Noise and Encroachment permits will have to be obtained from the cities of Emeryville and Oakland. We understand that there may be some complications with the City's Park Ave.Improvement Project, thus, Sherwin-Williams should negotiate with the City as necessary to secure this preferred truck route to the extent that rail transport is not possible. Any other truck route is not acceptable and has not been sufficiently analyzed in the RAP and CEQA documents.
- **Reporting** – During remediation activities, the results of air monitoring and sampling activities will be submitted to DTSC. We think that it is important that Coop members have easy and prompt access to the results. Table 6-1 is a summary of controls for exposure risks relating to dust and vapor control. In addition, a process should be set up so that Coop members can immediately contact an appropriate DTSC staff person when and if the need arises.
- **Location of Noise and Air Monitoring Stations –** The preliminary locations of these monitoring stations are shown on Figure 6-1. While they propose monitoring stations across Horton from the Coop Horton Street parking lot entrance and another around the corner on Sherwin Ave, another monitoring station should be added somewhere between these two stations around the

intersection of 45th St & Horton. This would provide more complete air and noise monitoring around areas sensitive to the Coop.

- **Diesel Exhaust Air Pollution Issues** – this is a critical issue that is not addressed in the RAP – it should be addressed and monitored – this area is already a BAAQMD non attainment area for ozone and particulate matter, and any additional discharge of diesel pollutants will raise pollutant levels well beyond the non attainment thresholds. There will be a lot of diesel air emissions from all the heavy equipment, the truck transport and idling engines as the trucks line up and await their loads and use of rail transport. This should be further addressed in more detail in the RAP.

CEQA Initial Study and Proposed Mitigated Negative Declaration

It is our view that the CEQA Initial Study and proposed Mitigation Negative Declaration is inadequate in the follow respects:

- **Project Description** – Initial Study pp.1-3. The project description is inadequate in that the transportation methods and routes are not determined (left for later reports), the amount of clean soil backfill is not described, the off-site disposal sites are not identified and many of the environmental control protective measures for the community (monitoring, dust, VOC and odor control), are left for analysis in later reports. Without these details, the environmental impacts of the project cannot be effectively determined. The Initial Study now only considers certain segments of the environmental impacts.
- **Aesthetics** – Initial Study pp.5-8, pp.79-80. The description of the aesthetic impacts fails to adequately consider the impacts on the surrounding community. The noise, dust, changed traffic patterns and operation of heavy equipment and trucks will cause substantial aesthetic disruption to the residents in this area. While it is described as "temporary," this impact will continue for anywhere from 8-12 months in 2010-2011 – not so temporary if you live and/or work in the vicinity of the proposed project. This simply cannot be disregarded as "temporary" or mitigated – the only mitigation measure mentioned is "replacement of cushioning materials over the top of the intersection surfacing." This does little to address the aesthetic impacts on the surrounding residential community. This needs further environmental analysis and submission of mitigation measures.
- **Air Quality** – Initial Study pp.10-18, p.80. It is acknowledged that the project has the potential to generate dust and organic vapors. This is a certainty. The BAAQMD states that this area is already out of attainment and exceeds acceptable levels for ozone and particulate matter. The predominant winds are from the west/northwest that will carry dust and vapors from the remediation site directly over the Coop buildings. Thus, the fact that air quality in this neighborhood is already significantly compromised, would seem to call for extraordinary measures to prevent further deterioration of air quality. Diesel emissions from the trucks and heavy equipment are not considered. While a DVCP will eventually be developed, the cumulative impacts of this and

surrounding projects cannot be accurately determined prior to its development. To state that the impacts will be "less than significant" relies on incomplete information and fails to meet the analysis threshold necessary to protect this community without further environmental review.

- **Hazardous Materials** – Initial Study pp.31-34. The significance of the hazards and hazardous materials cannot be determined without more a definite determination of the transportation methods that will be used to transport the materials away from the site, without the off-site disposal facility being determined or without the details from the RDIP that will be critical in assessing the environmental impacts of the project. The analysis seems to rely heavily on a report that is not yet in existence – the RDIP. Thus, this section seems to be based on incomplete information and requires further environmental analysis.
- **Noise** – Initial Study pp.41-51. The Initial study describes the project vicinity as "noisy urban residential," or about 65dBA. The Emeryville General Plan describes the 60 to 70 dBA range as "conditionally acceptable" for residential use. Thus, it would appear that not much more noise can be added and still allow the residents to enjoy reasonable residential use. Unfortunately, the Initial Study states that City vibration standards do not apply to construction or demolition or to vibrations caused by motor vehicles, i.e. trucks. Table 4 demonstrates that there will be significant temporary increases (lasting up to 7 months) in the noise levels in the immediately surrounding community. Despite this data, the Initial Study concludes that this is "less than significant" impacts and provides no mitigation. This conclusion without mitigation does not follow from the data generated.
- **Transportation & Traffic** – Initial Study, pp 54- Table 8 estimates the maximum daily vehicle trips to be about 228 trips – mostly large trucks hauling soil off-site and delivering clean backfill. Cumulative construction in the project area is shown in Table 9 – they are significant. Alternative 5 is the preferred transport alternative as it exhibits the least overall impacts to the surrounding transportation system and community of Emeryville, as compared to the other alternatives. While we agree that this is the only viable truck transport route, for some reason truck and rail was not evaluated in a public setting. This is a serious shortcoming of the Initial Study and proposed Mitigated Negative Declaration. At the December 9 community meeting, Randy Smith of CDM described in more detail potential disposal sites for the contaminated soil and discussed rail transport. However, this information is not in the Initial Study as it should be, thus, demonstrating a serious shortcoming in the Initial Study and proposed Mitigated Negative Declaration. Many of the commentors at the December 9 meeting were focused on the rail alternative, but this consideration has not been evaluated. The documents should be revised to consider this option.

The "Findings of Significance" in the Initial Study concludes that the project does not have the potential to degrade the quality of the environment. DTSC then concludes that while the proposed project could have a significant effect on the environment, revisions have been made to the project or agreed to that would allow the issuance of a Mitigated Negative Declaration. However, the only mitigation measures identified in the propose

Mitigated Negative Declaration relate to truck impacts to street surfaces and archaeological monitoring. There are no mitigation measures proposed, or project revisions identified, that would directly relate to the noise, aesthetic, air quality, or truck and traffic significant impacts to the adjacent residential community. What are the revisions made to the project or that have been agreed to? We have not seen them in a public setting.

In summary, for the reasons described above, we feel that the RAP and the CEQA Initial Study and proposed Mitigated Negative Declaration are seriously flawed and should be revised to better assess the impacts and mitigate those impacts on the surrounding community. We look forward to your Response to Comments.

Sincerely,
Ann Holsberry
Gary Grimm

From: "M. Louise Stanley" <lulu@locrian.com>
To: <jnaito@dtsc.ca.gov>
CC: <nschumac@dtsc.ca.gov>, <jodycs@mcn.org>
Date: 12/14/2009 2:26 AM
Subject: Sherwin Williams - Comments
Attachments: SherwinWilliams Comments.doc

Dear Janet, I am attaching my comments on the proposed Sherwin-Williams remediation.

Louise
--
M.Louise Stanley
1420 45th Street #29
Emeryville, CA 94608
510.658.8468
http://lulu.artist-at-large.com (portfolio)
lulu@locrian.com

To: jnaito@dtsc.ca.gov
Janet Naito
Project Manager DTSC
700 Heinz Ave., Suite 200
Berkeley, CA 94710

Re: Public Review and Comment
Sherwin – Williams Site
Draft Remedial Action Plan
Date: Mon, 14 Dec 2009

Dear Janet:
I wish to express my concern that the remediation plan has not fully addressed the impacts to the adjoining neighborhood relating to noise, air quality and traffic. Having experienced one remediation that was terribly invasive, I do not have much faith that this will be any better as it is far more extensive. The horrific number of trucks spouting diesel in the neighborhood is a major issue for my neighbors and myself. Both prospective neighborhoods have narrow wind tunnels that capture exhaust which comes into our windows. As I have a stop sign out my window (45th and Horton Streets), I get diesel and gas fumes in my studio every time someone shifts gears. I smell diesel from trucks a block away and I cannot imagine the invasion these numerous trips will cause. It is not the dust I worry about, it is the diesel that will run **all** the equipment that will be needed for this project.

Using rail to and from the site will reduce the diesel. Please seriously consider this option.

Also, is it possible to test dust, particulate **and diesel** fumes that come into our windows and skylights?

M. Louise Stanley

1420 45th Street #29
Emeryville, CA 94608
(510)658-8468
lulu@locrian.com

Janet Naito - [CONTENT] questions re: Sherwin Williams site

From: Collin Jones <jonescollin@hotmail.com>
To: <jnaito@dtsc.ca.gov>
Date: 12/14/2009 9:57 PM
Subject: [CONTENT] questions re: Sherwin Williams site

Dear Ms. Naito,

I am a resident at Emeryville Warehouse Lofts at 1510 Park Avenue, one block from the Sherwin Williams cleanup site.

I am writing because even though I have reviewed the October 2009 Fact Sheet, I am still unclear on the effect of the cleanup and the existing toxic chemicals on myself and fellow residents. I understand that arsenic compounds are present in the groundwater, and in solid forms, but does this mean they are present in our building? Are they able to migrate through joints in pipes, and therefore are in our domestic water? Are the solid compounds present in the air?

I'd appreciate your input on these questions regarding the toxic compounds near my home.

Thank you,

Collin Jones
1510 Park Avenue, Studio D
Emeryville, CA

Your E-mail and More On-the-Go. Get Windows Live Hotmail Free. Sign up now.

From: Jan <janzv@sbcglobal.net>
To: Janet Naito <JNaito@dtsc.ca.gov>
Date: 12/16/2009 1:19 PM
Subject: Cleanup Pan for Sherwin Williams Site in Emeryville

Dear Ms. Naito:

I am a member & resident of the 45th Street Artists Coop. I am writing to voice my support for the railway option for removing toxic soil from the Sherwin Williams site. I am very concerned that the use of diesel trucks for this purpose would be extremely disruptive and destructive to the residents, workers, roads, traffic and general environment and well-being of the Emeryville community. The work and construction are already going to cause considerable disruption, and the suggestion of adding to it with thousands of truck trips in and out of the site can not possibly be taking the community into consideration. As I understand it, using railway cars and the available tracks is a reasonable and viable solution.

I would be grateful if you could see that my comments are included in your records, and if you could confirm that you received this communication.

Best regards:

Jan Zvaifler
1420 45th Street #33
Emeryville, CA 94608
510-420-0838

Janet Naito - S/W: Comments on Draft RAP and Draft CEQA Initial Study

From: "Jody Sparks" <jodycs@mcn.org>
To: "Janet Naito" <JNaito@dtsc.ca.gov>
Date: 12/18/2009 3:37 PM
Subject: S/W: Comments on Draft RAP and Draft CEQA Initial Study
CC: "Nathan Schumacher" <NSchumac@dtsc.ca.gov>, "45th St. Artists Coop" <45thstartistscoop@sbcglobal.net>

Janet Naito:

Recently, I have attended two meetings and have provided verbal comments at those meetings on the Draft Rap and Draft Initial Study/Mitigated Negative Declaration. I do not plan on restating those comments in this correspondence.

First, let me state that as a member of the Consultative Work Group (CWG), I am extremely disappointed in the DTSC for not giving members of the CWG the opportunity to review the "pre" Draft Initial Study(Draft IS) and allow the participants the opportunity to review and provide comments. The norm for this CWG, is that we have reviewed and had the opportunity to comment on all documents prior to general release to the public. Apparently in the name of expediency, the DTSC chose to ignore the normal procedure for the CWG membership.

When comparing the two documents relative to transportation options, it appears that the various transportation options, specifically rail transportation, discussed in the Draft RAP are not discussed the Draft IS. Case law is clear that all alternatives that are analyzed in the Draft RAP must be analyzed in the Draft IS. Rail transportation is not analyzed in the Draft IS at all. Rail transportation is only eluded to Project description ["Loading of excavated soil and debris into containers (e.g., trucks, bins, rail cars) for offsite disposal;"], yet there is no analysis of the alternative/option for transportation of the wastes from the site by rail.

The Project description in the Draft IS does not include detail about the size of this project relative to what is being proposed. This is a very large removal action and the transportation of the materials from and to the site is significant. The Project Description does not elude this, but rather treats the amount of wastes to be removed and soils replaced, and the traffic associated with that activity, as if it were simply a "scoop and dump" operation associated with the remediation of a neighborhood corner gas station. The Project description, needs to be revisited and revised to reflect the true nature of the proposed remediation and the associated mitigation measures.

The Figure in Section 6.3 of the Draft RAP does not match the text in Section 6.9.2. Please ensure that all Figures, Tables and the like that are referenced in the text of the documents correlate.

Though the Draft RAP and Draft IS are intended to compliment one another, they are individual documents that must stand on their own. The Draft RAP does not include an Executive Summary outlining the proposed remediation. One can not determine what the proposed remediation is without going into the document itself and gleaning the information. The Draft RAP needs to have an Executive Summary.

Draft IS/MND, Noise. page 44: Statement that a permit request may be made to the City to allow noise-generating activities outside of normally permitted hours. No description is given

of what time periods might be involved. No analysis is provided of the possible associated effects. The is no indication of whether this City permit would be subject to CEQA analysis.

Draft IS/MND, Vibration analysis. page 45: I have concerns about this section and it seems suspect. I believe that expert opinion is needed on this issue.

Draft IS/MND, Construction noise. page 47: This section contains questionable noise attenuation assumptions related to windows. This section contains unsubstantiated conclusions. Given the proximity to sensitive receptors (live/work space), mitigations should be offered in order to reduce construction noise, including but not limited to, "quiet" construction equipment standards; limited hours of operation; and the requirement for installation of new double or triple pane windows.

Draft IS/MND, Transpiration and Traffic. page 54: This section includes an incomplete intersection analysis. It seems as if this section used incomplete existing data and no real traffic analysis was prepared. There is no discussion of the potential conflict between trucks and cars/pedestrians in an urban residential setting. There is no discussion of cumulative impacts, particularly with trucks on freeways. There is no discussion of haul routes or destinations for ultimate disposal. The Draft IS/ND fails to support conclusion of LTS conclusion re 50% increase in traffic on neighborhood. There is no discussion of traffic safety impacts of 1 truck every few minutes carrying hazardous wastes in a residential neighborhood. The Draft IS/MND fails to analyze the rail transport alternative and its potential for reducing traffic and safety impacts.

Finally, I am concerned that information (both verbally and in writing) was made available to the members of the Artists' Coop at the recent meeting at the Coop, that was not made available at the formal meeting for the community at large that took place some weeks ago. It is unfortunate that the other members of the community were not privy to such important and relevant information about the transportation options that are available associated with the remediation of the S/W site.

Thank you for considering my comments and concerns. Please confirm receipt of these comments.

Jody Sparks
Consultant for the 45th Street Coop

Janet Naito - Sherwin-Williams SIte - Draft Cleanup Plan Documents

From: "Michael G. Biddle" <mbiddle@ci.emeryville.ca.us>
To: "Janet Naito" <JNaito@dtsc.ca.gov>
Date: 12/18/2009 3:40 PM
Subject: Sherwin-Williams SIte - Draft Cleanup Plan Documents
CC: "Barbara Cook" <BCook@dtsc.ca.gov>
Attachments: 121809 Comment Letter re Sherwin Williams RAP and IS MND.pdf

Dear Janet

Attached is the comment letter from the City of Emeryville and the Emeryville Redevelopment Agency regarding the draft Remedial Action Plan and Mitigated Negative Declaration for the Sherwin-Williams Site. As indicated in the attached letter, I would be more than happy to meet with you to discuss the concerns of the Agency and City if you have any questions. Thank you and the Department for your good work on this site and hope you have an enjoyable holiday and New Year.

Sincerely,

Michael G. Biddle
City Attorney
City of Emeryville
1333 Park Avenue
Emeryville, CA 94608
Phone: (510) 596-4381
Facsimile: (510) 596-3724
mbiddle@emeryville.org

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December 18, 2009

Janet Naito, Project Manager
Department of Toxic Substances Control
700 Heinz Street, Suite 200
Berkeley, CA 94710

Subject: Comments of the City of Emeryville and Emeryville Redevelopment Agency on the draft Remedial Action Plan for the Sherwin-Williams Site (1450 Sherwin Avenue, Emeryville) and portion of Rifkin Property (4525-4563 Horton Street, Emeryville)(collectively the Sherwin-Williams Site) and the draft Mitigated Negative Declaration

Dear Ms. Naito:

The City of Emeryville and the Emeryville Redevelopment Agency have reviewed the draft Remedial Action Plan ("RAP") and the Mitigated Negative Declaration ("MND") prepared for the Sherwin-Williams Site and provides the following comments and questions.

1. Question: In Section 1 of the RAP, the "site" is defined as property owned by Sherwin-Williams as well as property owned by Novartis (i.e., the former Rifkin property). Given the separate ownership, is it appropriate to define both properties as one site or should separate RAPs corresponding to the distinct ownership areas be prepared?

2. Question: By defining the "site" in this fashion, is DTSC saying that contamination from Sherwin-Williams' operations never impacted any properties other than the Sherwin-Williams site and the former Rifkin property, or is it simply saying that only those two properties are the specific focus of this RAP document? If DTSC is saying that the pesticide operations conducted at the site never affected any property other than Sherwin-Williams property and the Rifkin property, what is the basis for that conclusion? Specifically, has DTSC considered the bridge that, according to Sherwin-Williams documents attached, once connected the 1450 Sherwin site to property west of the UPRR tracks?

3. Question: The Site History section of the RAP notes that pesticides were manufactured at the S-W facility, but it does not explain how or where wastes from the pesticide operation were disposed of (other than on-site such as through spillage). Has Sherwin-Williams submitted documentation comprehensively documenting the location or locations where wastes associated with its pesticide operation were disposed (no

discussion of that topic is included in the RAP)? Has someone determined that no off-site disposal of wastes from Sherwin-Williams' pesticide operation occurred, or is that simply a topic beyond the scope of the RAP document?

4. Question: In Section 2.4.2.1 of the RAP there are references to a "release beneath Horton Street." How could there be a release beneath Horton Street if the plant operations were conducted west of Horton Street and Horton Street is generally up gradient from the facility?

5. Question: In connection with Horton Street, has there been any investigation of the "6-inch [pipe] to lime sulphur plant" indicated on the map attached? Has Sherwin-Williams previously brought this pipe to DTSC's attention? Has Sherwin-Williams previously brought this pipe to the Regional Board's attention? The pipe does not seem to appear in the Entrix study in which other pipes and conduits associated with the plant are documented. In addition, when asked at a recent deposition (November 12, 2009) whether he had "any understanding of what that line was?" Larry Mencin of Sherwin-Williams responded "Not at all." Beyond the boundaries of that portion of Horton Street adjacent to the Artists Co-op previously remediated in the early 1990s, has any effort been undertaken to investigate potential releases further north on Horton Street?

6. Question: Section 2.4.3.1 (numbered paragraph 5) of the RAP refers to drying ovens, crushing and packaging operations. Are those operations further described in historic records that have been shared with the DTSC?

7. Question: The ARAR/TBC discussion in Section 3.1.3.1 of the RAP dentifies a settlement agreement involving Sherwin-Williams and Novartis. What does that document specify in relation to remediation at the site and what is its role as an ARAR or TBC?

8. Question: The ARAR Table (3-1) identifies the Park Avenue District Plan, the Chiron Planned Unit Development (PUD) and Preliminary Development Plan (PDP), and the City of Emeryville General Plan. How have those documents impacted the process of remedy design and evaluation? Are local land use documents such as those customarily and properly considered in preparing and evaluating a RAP?

9. Question: Section 4.1.3.7 (former Rifkin Property Remedial Action) of the RAP includes some discussion about excavating VOCs from the saturated zone, apparently based on locations where VOCs in soil gas exceeds cleanup goals. Is that aspect of the site (VOCs in soil gas) an appropriate basis on which to remediate VOCs in saturated material?

10. Question: Section 4.1.3.7 of the RAP makes reference to the Rifkin site being "returned to current use as a parking lot" and the same point is made in Section 6.11. Elsewhere, however, there is discussion about the Rifkin site being developed into a high rise tower. Which is it? If the Rifkin site is to become a high-rise tower, when will the tower development happen? Is it reasonable/appropriate to clean the site up in the near

term before the tower development is ready to proceed? The development into a tower does not show up in the project schedule (Figure 5-1). Is it possible/appropriate to clean up the site before the final decisions have been made about the eventual redevelopment? Is that a reasonable approach?

11. Question: Section 4.2.2.5 of the RAP on cost doesn't say what the cost is, but Table 7-1 in Appendix B indicates costs of either $37.9 or $42.4 million, or perhaps the total of those. Is the total cost the sum of those two numbers (approximately $80.3 million) or is the total $42.4 million? Does either of those figures account for what has been spent since the Regional Board issued its order in 1989 on the IRMs, the site investigation, feasibility study and the RAP? What is the approximate total cost when all of the interim cleanup actions, site characterization, treatability study tests, past and future investigation, feasibility evaluation, cleanup and post excavation treatment and monitoring work are considered?

12. Question: How will Sherwin-Williams/DTSC decide whether a vapor intrusion contingency mechanism is required? What happens if all the testing on that issue is not yet completed when the planned redevelopment begins? What happens then to assure protection of future occupants of a building on the Rifkin site? Is there some principle that if in doubt S-W/DTSC will err on the side of caution and require the vapor barrier?

13. Question: Near the end of Section 6.7 of the RAP there is a discussion about excavating around certain sampling locations that are outside the so-called source area, and the statement is made that "excavation beyond the limits presented above may be needed." Is it acceptable practice to excavate and rely on confirmation sampling rather than have the excavation area fully delineated and known before excavation begins? How does the public know what it is getting if the excavation area is not fully defined before the work starts?

Thank you for considering the comments of the City and Agency. Please note that I would be more than happy to meet with you to discuss the concerns of the City and Agency should you have any questions.

Sincerely,

Michael G. Biddle
City Attorney / Agency General Counsel

THE SHERWIN-WILLIAMS CO.

OF CALIFORNIA

454 - SECOND ST. SAN FRANCISCO, CAL.

FOR Cleveland OFFICE DATE June 4, 1920

MR. G. A. Martin SUBJECT. Lime Sulfur Plant

ANSWERING LETTER OF DICTATED BY

RETURN TO O. B.

Received your wire of the 3rd in reply to the one I sent you on the 2d, confirmation of which I am attaching.

I am pleased to advise you that I purchased from the Mee Estate 6 acres, on the Bay side of the Southern Pacific tracks and about 1500 feet North of our present factory site, for $34,000.00, one-third cash, the balance in four equal payments of six months' intervals. Interest at 7%.

This is connected with our present property by a splendid bridge across the Southern Pacific Right-of-way and a concrete road, making an ideal location, far enough away to avoid any danger whatever to our other plant, at the same time close enough to make it convenient and economical for handling.

I have wired Mr. Macklind, as per attached confirmation, so he can go ahead without any further delay in completing the plans. Work will be started tomorrow by Mr. Mee in sinking a test well and if we fail to obtain at least 105,000 gallons of fresh water, we will not be required to take the property and will be at no expense whatever.

I regret the necessity of having to pay this amount of money for property, but I have spent practically my entire time since returning, and Mr. Weir and Mr. Cole have put in considerable time after receiving my wire, only to find I had investigated, before leaving, practically every piece of property for a distance of 40 miles along the Bay shore. Where fresh water could be obtained, other complications interfered or labor was unobtainable. This is not the only site where we could obtain both fresh and salt water, together with track facilities, but it is as cheap as any other and has the advantage of being close to our other property and in the long run, I believe, that the amount we are investing will be well spent. I hope we will be able to develope the necessary fresh water and that there will be no further delays. If there should be, it will be my next recommendation to locate this plant either at Sacramento, Cal. or Portland, Oregon.

There is only one other location that I know of, which is suitable, and that is property in West Berkeley owned by the Pacific Guano & Fertilizer Co. which only includes 5 acres and the lowest price they will consider is $40,000, but there is nothing certain of our being able to get it at that price, and it would be two or three miles from our Plant.

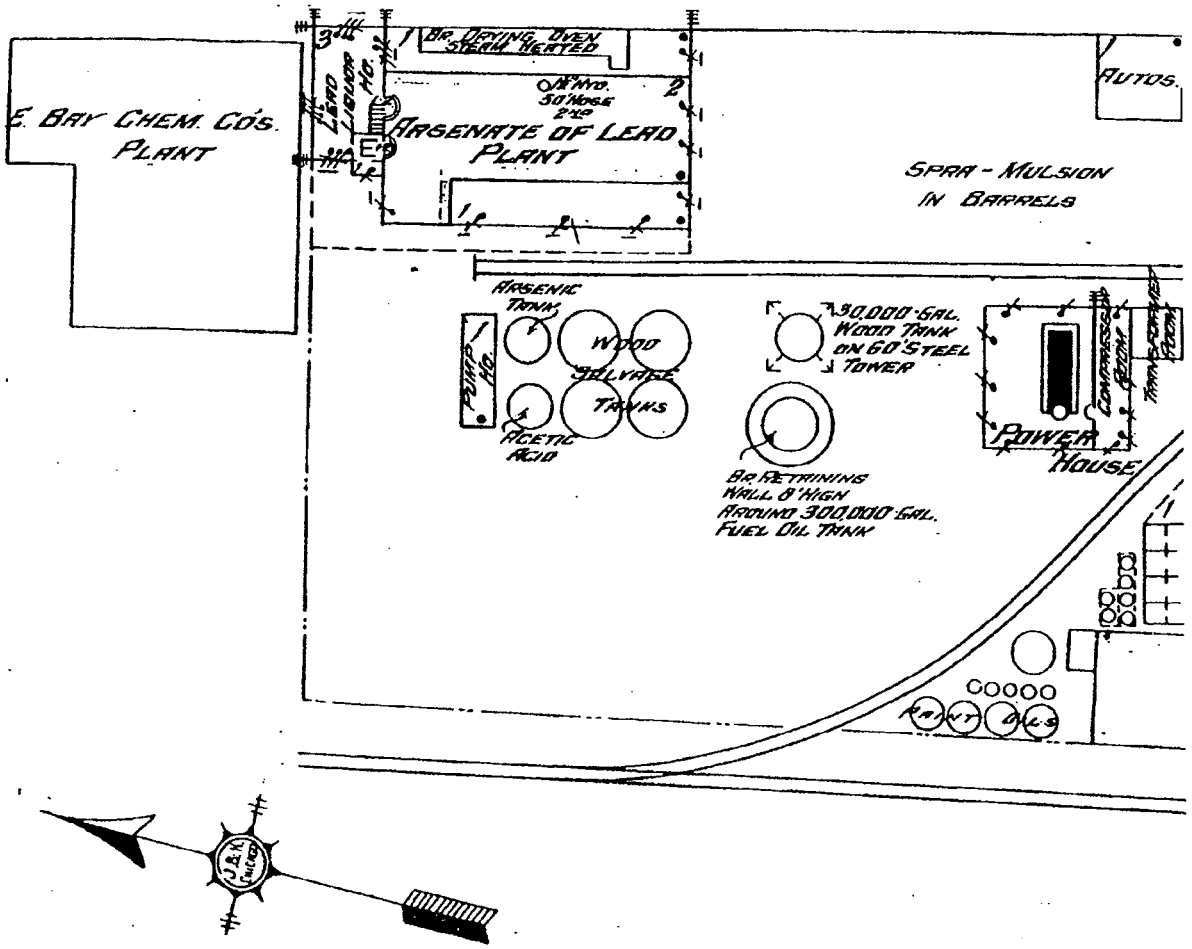
SW 002970

SW00143

SW000048

SW 01231

← 6" TO LIME SULPHUR PLANT ---------- HORTON ----



KEY TO PLAN NOTATIONS

NUMBER OF STORIES 4 — FIRE RESISTIVE
METAL, TILE OR SLATE ROOF — STONE OR CONCRETE WALLS
COMPOSITION ROOF — FIRE WALL 6" ABOVE ROOF
FRAME PARTITION — FRAME CORNICE
OR BASEMENT — S. STORE
(BRICK BUILDING) — METAL CORNICE
FIRE WALL 12" ABOVE ROOF
R HOIST — DENOTING FLOORS
E ELEVATOR — OPENING, NON-STANDARD FIRE DOOR
ELEVATOR SECTION — OPENING, STANDARD FIRE DOOR
STREET NUMBERS OF BUILDINGS
FIRE ESCAPE
STEEL BUILDING
STABLE — STABLE SHOWN BY CROSS
FRAME IRON CLAD
FRAME BUILDING
SHINGLE ROOF D. — D. DWELLING
BR. CH. 100' — DENOTING HEIGHT
STEAM BOILER BRICKED IN — WINDOW WITH NON-STANDARD SHUTTER
STEAM BOILER NOT BRICKED IN — WINDOWS WITH STANDARD SHUTTERS
WINDOWS PROTECTED 2d & 4th STORIES
FIRES UNPROTECTED, NO OPENINGS 3d
WINDOWS WITH WIRED GLASS

WATER PIPE (UNDERGROUND) KEY GATE
WATER PIPE (ABOVE GROUND)
SUCTION PIPE, FOOT VALVE & STRAINER
ORDINARY GATE VALVE, ANY TYPE
POST INDICATOR VALVE
CHECK-VALVE, APEX POINTING DIRECTION OF FLOW
SIAMESE STEAMER CONNECTION
ALARM VALVE, OUTSIDE SCREW & YOKE VALVE
DRY VALVE
WATER METER IN BY-PASS LOCATED IN BRICK PIT
DRY OR PIPE HYDRANT, SHOWING NON-STANDARD HOSE HOUSE
TWO WAY FROST-PROOF HYDRANT
FROST PROOF HYDRANT, STEAMER CONN. ALSO INDEPENDENT GATES FOR HOSE CONN.
FROST PROOF HYDRANT WITH HOSE VALVES ON OUTLETS. HYDRANT COVERED WITH STANDARD HOSE HOUSE
C.R.L. COTTON, RUBBER LINED
UND. UNDERWRITER

D.H. DOUBLE HYDRANT (CITY)
S.H. SINGLE HYDRANT (CITY)
V.P. VERTICAL PIPE
A.S.R. AUTOMATIC SPRINKLER RISER
A.S. AUTOMATIC SPRINKLER
W. WATCHMAN'S STATION
F.A. FIRE ALARM BOX
ALARM GONG WITH HOOD
PROPERTY BOUNDARIES OR FENCE LINES
OUTLINE OF PLATFORMS OPEN BRIDGES OR AWNINGS
OPEN SIDES OF BUILDINGS SUCH AS SHEDS, ETC.
PUMP
CHEMICAL ENGINE
I.E.P. INDEPENDENT ELECTRIC PLANT

From: Scott Donahue <tsdonahue@sbcglobal.net>
To: <JNaito@dtsc.ca.gov>
Date: 12/18/2009 4:55 PM
Subject: Sherwin-Williams site

Janet,
we need a way to measure cumulative toxic loads that we will be receiving from the site.
I understand the measuring devices measure to limits for a given. But this kind of measurement would calculate for our toxic exposure 24 hours a day for the duration of the project.
Sincerely,
Scott Donahue

CDM

The Sherwin-Williams Company

Remedial Action Plan
Emeryville, California

June 11, 2010

One Walnut Creek Center, 100 Pringle Avenue, Suite 300
Walnut Creek, California 94596
tel: 925 933-2900
fax: 925 933-4174

June 11, 2010

Barbara J. Cook, P.E., Chief
Department of Toxic Substances Control
Northern California Coastal Cleanup Operations Branch
700 Heinz Avenue, Suite 200
Berkeley, California 94710

Attention: Janet Naito

Subject: Transmittal of Remedial Action Plan, Sherwin-Williams Site, 1450 Sherwin Avenue, Emeryville, California, Imminent and Substantial Endangerment Determination and Order and Remedial Action Order, Docket No. IS/E 05/06-007

Dear Ms. Naito:

On behalf of The Sherwin-Williams Company, CDM is pleased to submit the enclosed Remedial Action Plan for the Sherwin-Williams Emeryville, California Site. The Site is the subject of the order issued on May 10, 2006 by the DTSC, entitled "Imminent and Substantial Endangerment Determination and Order and Remedial Action Order, Docket No. IS/E 05/06-007" ("the DTSC Order"). This report was prepared in accordance with Section 5.6 of the DTSC Order.

In accordance with the DTSC Order, this report is presented in both hard (paper) and electronic (as multiple pdf files on a CD) formats. If you have any questions, please call Pawan Sharma, Project Manager for CDM, (925) 296-8054, or Larry Mencin, Environmental Project Manager for the Sherwin-Williams Company, (216) 566-1768.

Very truly yours,

Randall T. Smith, P.E.
Camp Dresser & McKee Inc.

Pawan Sharma, P.E.
Camp Dresser & McKee Inc.

Enclosure

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Carson, CA 90810

Remedial Action Plan

June 11, 2010

Prepared For:

The Sherwin-Williams Company
101 Prospect Avenue NW
Cleveland, OH 44115-1075

CERTIFICATION:
This document was prepared under the direction and supervision of qualified, registered professionals.

Randall T. Smith, P.E.
Camp Dresser & McKee Inc.

Michael J. Smith, P.G.
Camp Dresser & McKee Inc.

Pawan K. Sharma, P.E.
Camp Dresser & McKee Inc.

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Acronyms

ARARs	applicable or relevant and appropriate requirements
BAAQMD	Bay Area Air Quality Management District
bgs	below ground surface
CA	California
CAA	Clean Air Act
Cal/OSHA	California Occupational Safety and Health Act
CCR	California Code of Regulations
CCRS	Current Conditions Risk Screen
CDM	Camp Dresser & McKee Inc.
CEQA	California Environmental Quality Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CH&SH	California Health and Safety Code
CKD	cement kiln dust
COC	chain-of-custody
COC	chemical of concern
CWA	Clean Water Act
DCA	dichloroethane
DCE	dichloroethene
DTSC	Department of Toxic Substances Control
EBMUD	East Bay Municipal Utility District
EIR	Environmental Impact Report
FS	feasibility study
ft	feet
GC	gas chromatograph
GWET	groundwater extraction and treatment
HASP	health and safety plan
HHRA	human health risk assessment
HSWA	Hazardous and Solid Waste Amendments
HWCA	Hazardous Waste Control Act
IRM	interim remedial measure
IS/MND	initial study/mitigated negative declaration
LDR	land disposal restriction
LFR	Levine-Fricke-Recon
LUC	land use control
MCL	maximum contaminant level
µg/kg	microgram per kilogram
µg/m^3	microgram per cubic meter
µg/cm	microgram per centimeter
mg/kg	milligram per kilogram
mg/L	milligram per liter
MSE	MSE Technology Applications, Inc.

MSL	mean sea level
MT2	Metals Treatment Technologies, LLC
NAAQS	National Primary and Secondary Ambient Air Quality Standards
NCP	National Contingency Plan
NESHAP	National Emissions Standards for Hazardous Air Pollutant
NOI	notice of intent
NPDES	National Pollutant Discharge Elimination System
OSHA	Occupational Safety and Health
PDP	preliminary development plan
PEL	permissible exposure limit
PM10	particle measuring 10 microns or less
POTW	publicly owned treatment works
PPE	personal protective equipment
ppb	parts per billion
ppm	parts per million
PRG	preliminary remedial goal
QA	quality assurance
QC	quality control
RA	risk assessment
RAL	remedial action level
RAO	remedial action objective
RBTL	risk-based target level
RCRA	Resource Conservation and Recovery Act
RG	remedial goal
RI	remedial investigation
RMP	risk management plan
S-W	Sherwin-Williams
SAAQS	State Ambient Air Quality Standards
SAP	sampling and analysis plan
SHSO	site health and safety officer
SPLP	synthetic precipitation leaching procedure
STLC	solubility threshold limit concentration
SVOC	semi-volatile organic compound
SWPPP	storm water pollution prevention plan
SWRCB	State Water Resource Control Board
TBC	to be considered
TCE	trichloroethene
TCLP	toxicity characteristic leaching procedure
TDS	total dissolved solids
TPH	total petroleum hydrocarbon
TSDF	treatment, storage, and disposal facility
TTLC	total threshold limit concentration
UHC	underlying hazardous constituent
UPRR	Union Pacific Railroad
USC	United States Code
USEPA	United States Environmental Protection Agency
UTS	Universal Treatment Standard

VOC	volatile organic compound
Water Board	California Regional Water Quality Control Board
WET	waste extraction method

Section 1
Introduction and Purpose

On behalf of the Sherwin-Williams Company (S-W), Camp Dresser & McKee Inc. (CDM) has prepared this Remedial Action Plan (RAP) to address remediation of the S-W property located at 1450 Sherwin Avenue in Emeryville, California and a portion of the adjacent former Rifkin property, located at 4525 – 4563 Horton Street, to which hazardous substances have migrated from the S-W property. Collectively the S-W property and this portion of the former Rifkin property are referred to as the "Site" within this document. The Site consists of approximately 10 acres and is identified by Assessor's Parcel numbers 049-1041-006-00, 049-1041-026-02, 049-1041-026-06, 049-1041-026-07, 049-1041-026-04, and 049-1041-005-00. Novartis Vaccines and Diagnostics, Inc. (Novartis) is the current owner of the former Rifkin property.

The RAP was prepared in accordance with the following:

- National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (USEPA, 1990);
- Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA (USEPA, 1988);
- A Guide to Developing and Documenting Cost Estimates During the Feasibility Study (USEPA, 2000);
- US Environmental Protection Agency (USEPA) Region IX Sampling and Analysis Plan Guidance (USEPA, 1997);
- California Health and Safety Code (CHSC) section 25356.1; and
- Department of Toxic Substances Control (DTSC) Imminent and Substantial Endangerment Determination and Order and Remedial Action Order No. 05/06-007 (the Order) (Cal/EPA, 2006b).

1.1 Background

S-W has owned and operated the coatings manufacturing plant at 1450 Sherwin Avenue since the early 1900s. Pesticides containing lead and arsenic were also manufactured at the plant from the 1920s until the late 1940s. The plant converted from oil-based to water-based paint production in 1987. The plant was used for latex paint manufacturing and packaging, storage of raw materials and paint products, and laboratory space until December 2006 when operation of the plant stopped and the plant was decommissioned. S-W initiated plant demolition activities in August 2007, which were completed in early November 2007.

Prior to the issuance of the current DTSC Imminent and Substantial Endangerment Determination and Order and Remedial Action Order No. 05/06-007 (the Order)

(Cal/EPA, 2006b) for the Site on May 10, 2006, the Site was regulated by the Regional Water Quality Control Board, San Francisco Bay Region, (Water Board) under Site Cleanup Requirements Order 98-009.

Several phases of soil and groundwater investigation have been conducted at the Site since 1988. The investigations have revealed that the chemicals of concern (COCs) in the soil and groundwater are metals, volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and total petroleum hydrocarbons (TPHs). The investigations concluded that COCs have migrated from the S-W property onto a portion of the adjacent former Rifkin property. Site soil and groundwater data through October 2000 are summarized in the remedial investigation (RI) report (ENTRIX, 2002). Since October 2000, results from periodic groundwater monitoring events have been summarized in a series of reports, the most recent for Second Half 2007 (LFR, 2008). In addition, several investigations have been conducted after October 2000 to complete characterization of the Site and to gather data in support of this FS report; these investigations are further discussed in Section 2.4.

Several interim remedial measures (IRMs) were implemented at the Site in the early 1990s to control the flow of COCs in groundwater off the Site and reduce the potential for human exposure to the COCs. The potential human health effects of the COCs in Site soil and groundwater for current and future scenarios are summarized in the Site risk assessment (RA) reports (EarthRisk, 2002 and Gradient, 2005). The IRMs are still in place at the Site and include a slurry wall, an asphalt cap, extraction and monitoring wells, and a groundwater treatment system.

In late 2006, a feasibility study (FS), including treatability studies, was initiated for selecting the final remedial action for the Site. The findings were presented in a FS report (CDM, 2009b). The FS report was approved by DTSC on May 7, 2009 (Cal/EPA, 2009).

1.2 Purpose

The purpose of the RAP is to summarize the selected final remedial action for the Site and its proposed implementation activities. In addition, the RAP summarizes previous investigations and studies, including evaluation of remedial action alternatives as presented in the FS.

Specific objectives of the RAP are to:

- Identify project administrative responsibilities;
- Present planning, pre-remediation, remediation, and reporting tasks of the selected remedial action; and
- Provide a tentative schedule for the remedial action.

1.3 Project Administration Responsibilities

Several entities and individuals will be responsible for the successful completion of the remedial action. Their specific responsibilities are described below.

Responsible Party: The Sherwin-Williams Company. Larry Mencin is the designated Project Manager for S-W. He is the corporate representative at all agency meetings; he is responsible for assuring that sufficient funding is available to complete the approved remedial activities; he is responsible for communication between senior corporate management and the rest of the remediation project team.

Lead Agency: Department of Toxic Substances Control (DTSC). Janet Naito is the designated Project Manager for the DTSC. She is responsible for assuring that S-W complies with all the requirements in the existing Order. As the lead agency representative, she is responsible for communicating all project activities to senior DTSC management as necessary. She is also responsible for all project communication with the general public, including the immediate residents around the Site. Representatives from the Water Board, City of Emeryville, Novartis, Shell Oil Company, S-W, and the local resident communities, serve advisory roles to the DTSC on this project.

Program Manager: Camp Dresser & McKee Inc. (CDM). CDM is the remediation program manager for the project. Randall Smith is the designated Program Manager for CDM. He and his representatives are responsible for all direct communication between CDM and S-W, and CDM and the DTSC. He is also responsible for the health and safety of all CDM workers and their subcontractors during all phases of site remediation. Working with Mr. Smith will be CDM Design Manager, Construction Manager, Field Environmental Manager, and a Health and Safety Manager.

Remediation Contractors: To Be Determined. S-W will select one or more contractors to perform the work described in this section and presented in more detail in the specifications yet to be prepared. CDM will oversee the remediation management. Selected remediation contractors will be responsible for preparation and implementation of required City permits, a worker Health and Safety Plan, and applicable noise, traffic, dust control, and/or other compliance plan submittals.

1.4 Report Organization

This RAP document is structured as follows:

- **Section 1, Introduction and Purpose**.
- **Section 2, Site Description**. Includes a summary of the Site location, description, and history; and, a summary of previous Site-specific remedial activities, including remedial investigations, risk assessments, current interim remedial measures, and treatability studies.

- **Section 3, Remedial Action Objectives**. Presents project-specific remedial action objectives (RAOs) and underlying applicable or relevant and appropriate requirements (ARARs) and preliminary remediation goals (PRGs).

- **Section 4, Remedial Action Alternatives**. Summarizes the findings of the FS, including identification, description, and evaluation of remedial action alternatives; and presents the basis for the selected action.

- **Section 5, Planning and Pre-Remediation**. Presents the preliminary implementation schedule for the action, planning activities prior to mobilization for the remedy, and pre-remediation Site activities to support the remedy.

- **Section 6, Remediation and Restoration**. Provides details on the implementation of the remediation activities, including excavation, backfill, off-hauling materials, and restoration.

- **Section 7, Post Remediation Monitoring**. Presents a summary of post remedy implementation monitoring.

- **Section 8, References**.

- **Appendix A, Selected Remedial Investigation Figures and Tables**. Presents figures and/or tables from the Site RI report and subsequent investigation reports showing sample locations, extent of impact for various COCs in soil and groundwater, and findings from these investigations.

- **Appendix B, Selected Feasibility Figures and Tables**. Presents figures and tables from the Site FS report showing remedial action alternatives and their evaluation process.

- **Appendix C, Determination of Chemicals of Potential Concern**. Summarizes the methods presented in the HHRA for selection of COCs for the Site, provides updated findings based on remedial investigations conducted subsequent to the HHRA being finalized.

- **Appendix D, Statement of Reasons**. Presents the reasons for selection of the preferred remedial action with respect to the six State of California evaluation criteria.

- **Appendix E, Non-Binding Allocation of Responsibility**. Presents DTSC's preliminary nonbonding allocation of responsibility for addressing contamination at the Site.

- **Appendix F, California Environmental Quality Act Documentation**. Presents DTSC's California Environmental Quality Act (CEQA) Mitigated Negative Declaration for this Site.

- **Appendix G, Selected Public Health Evaluation Figures and Tables**. Presents figures and tables from the Site PHERA report showing performance standards and action levels for COCs to be used during perimeter air monitoring.

- **Appendix H, Confirmation Vadose Zone Soil Sampling and Analysis Plan**. Presents the methods and scope for sampling and analysis of vadose zone soil during excavation.

- **Appendix I, Stockpile Soil Sampling and Analysis Plan**. Presents the methods and scope for sampling and analysis of stockpiles of excavated soils.

- **Appendix J, Criteria for Implementing Active Groundwater Extraction.** Presents the evaluation for determining the appropriate groundwater extraction contingency action criteria for arsenic at the slurry wall breaches along the Union Pacific Railroad property.

- **Appendix K, Contingency Groundwater Extraction Action Evaluation.** Presents the evaluation of groundwater extraction as a possible contingency action after implementation of the preferred remedy.

- **Appendix L, Responsiveness Summary.** Presents DTSC's response to comments submitted during the public comment period for the RAP and the CEQA Mitigated Negative Declaration.

Section 2
Site Description

This section describes the Site and surrounding area, and summarizes the Site history. In addition, summaries of the remedial investigations, risk assessments, interim remedial actions, and treatability studies performed to date at the Site are presented in this section.

2.1 Site Location and Description

The Site consists of the S-W property located at 1450 Sherwin Avenue in Emeryville, California, and a portion of the adjacent former Rifkin property, located at 4525 – 4563 Horton Street, to which hazardous substances have migrated from the S-W property. Figure 2-1 presents the location of the S-W property and the entire former Rifkin property. Figure 2-2 presents a plan view of the Site. This section provides a description of the S-W property, the former Rifkin property, and other adjacent properties.

2.1.1 Sherwin-Williams Property

The S-W property is located at 1450 Sherwin Avenue in Emeryville, Alameda County, California. The S-W property is located on the north side of Sherwin Avenue, between Horton Street and the Union Pacific Railroad (UPRR) lines. S-W has operated at the property since the early 1900's, most recently manufacturing water-based paints at the property. Subsequent to demolition activities that concluded in late November 2007, the property is now covered by asphalt/concrete paved areas, including the foundations for several demolished buildings, and two remaining buildings (Buildings 1 and 31). Past uses for the buildings have included: coating manufacturing; storage of raw materials and coating products; laboratories; and filling and packaging.

2.1.2 Former Rifkin Property

The former Rifkin property is located along the western side of Horton Street, adjacent to the north and east of portions of the S-W property. The former Rifkin property is owned by Novartis. The portion of the former Rifkin property included as part of the Site is currently covered by asphalt and serves as a parking lot.

2.1.3 Adjacent Properties

Properties located adjacent to or within close proximity to the Site include residential, commercial and industrial types. These other properties include: the former Shell Development property (currently South BGR property and 45th Street Artist Co-op); the former Southern Pacific Railroad (SPRR) (currently UPRR); the former Myers Container property and the former Elementis Pigment property (both currently Bay Street Partners LLC property); former Barbary Coast Steel property (currently IKEA Property Inc.); a former Sears Warehouse (currently Bayer-leased warehouse and East Bay Badminton Club); and multi-family residential buildings (i.e., Emeryville Lofts,

Horton Street Lofts, and Artists Co-op Annex). The nearest residences to the Site are opposite Sherwin Avenue and Horton Street, approximately 60 feet from the Site boundaries.

The South BGR/former Shell Development property, located east of Horton Street, consists of a few buildings that are currently leased to Novartis. The former Elementis Pigment property and the former Myers Container property, located northwest of the Site, have been remediated (through excavation with long-term groundwater monitoring) and developed for mixed-use purposes, including high-density residential, commercial, and retail use. The former Barbary Coast Steel property, located to the west of the Site, is currently occupied by an IKEA retail store.

2.2 Site History

This section provides a brief summary of the history of the S-W property and the former Rifkin property. The source of this information is the 2002 ENTRIX Site RI report (ENTRIX, 2002).

2.2.1 History of the Sherwin-Williams Property

From 1871 through 1915, the S-W property and much of the adjacent properties were initially part of a larger property first used as a horse track, known as the Oakland Trotting Park, and then as a gathering place for local aviators, known as the Oakland Aviation Field. By 1915, the field had fallen into disrepair, and the buildings were removed. The property was subdivided into smaller properties to sell to industries interested in moving to the Emeryville area.

The S-W property was part of the early wave of industrial development in the City of Emeryville. One of the earliest references to S-W presence in Emeryville was in the 1923 Oakland Tribune Yearbook. The Tribune indicated new businesses that had moved into their readership area with a location map. This map indicated that S-W built their plant in 1919 on three acres, and by 1923 had increased their property to six acres. A number of industries, warehouses, and railroad services developed over time on the adjacent properties. A general operational history of facilities at the S-W property and several nearby properties is provided below.

Since operations began, the S-W facility has been manufacturing various types of coating products. Lead-arsenate pesticides were also manufactured at the plant from the 1920s until the late 1940s. By 1987, S-W ceased manufacturing oil-based products and until late 2006 manufactured only water-based products.

In approximately 1920, buildings were constructed on the property for general warehouse, paint, and lead arsenate manufacturing and storage. Additional buildings were constructed in 1924 and 1926 for lead arsenate production and lacquer blending. Based on a 1933 aerial photo, areas adjacent to these buildings appear to have been unpaved. During this time, a railroad track spur was present in the middle of the S-W property, and seven sets of railroad tracks were present immediately off-site to the west. A production well to furnish water for the sprinkler system was

located in the north-central portion of the S-W property; the production well was taken offline in the 1980s and destroyed in the 1990s via pressure-grouting. The East Bay Chemical Company was located immediately north of the S-W property, and the east and south sides of the S-W property were bordered by Horton Street and Sherwin Avenue.

In the mid to late 1940s, lead-arsenate production and storage ceased, and only oil-based paints and varnishes were manufactured. By 1956, several of the older buildings at the S-W property had been demolished, and the railroad tracks immediately to the west of the S-W property were removed. New buildings were constructed over the footprint of demolished buildings, and storage tanks were installed to store alcohols and acetates. These chemicals were used in the production of lacquer.

In 1956, the solvents used in the manufacturing process were naphtha and kerosene. Through the 1970s, several types of solvents were used, such as naphtha, styrene, xylene, toluene, ketones, and acetone. Acetone was used as a low-boiling point thinner in some lacquers. Methyl isobutyl ketone was a medium boiling point thinner used in resins, enamels, and lacquers. Nitrocellulose was a binder being used in the early 1970s in the production of lacquers. Toluene and xylene were thinners commonly used in the late 1970s. The liquids were usually stored in aboveground storage tanks.

By 1964, Sherwin-Williams purchased the adjacent property to the west from the Southern Pacific Railroad creating the current 8.3-acre property. A large portion of this property was originally developed into a warehouse (Building 35) that was converted into manufacturing in 1987.

The 1987 switch from oil-based to water-based paint products was reflected by the following changes at the S-W property:

- Dismantling of the solvent tank farm and the removal of most of the solvents and oil.
- Removal of varnish production and storage facilities.
- Removal of the lacquer plant.
- Expansion of the latex and latex-product storage tanks.
- Expansion of water-based paint manufacturing into building 35.

Paint manufacturing operations ceased in December 2006 and the plant was decommissioned. S-W initiated plant demolition activities in August 2007, which were completed in November 2007.

2.2.2 History of Former Rifkin Property

The former Rifkin Property was also originally part of the larger area of the Oakland Trotting Park and later California Jockey Club Race Track until approximately 1915. It is uncertain what types of businesses operated on this property from 1915 to approximately 1928, although it is known that these early businesses included the East Bay Chemical Company.

Based on a chain-of-title search for the former Rifkin Property, during 1928 to 1937, one portion of the property was occupied by Rotary Oil and the other portion was occupied by Rheem Manufacturing and then owned by the Chubbucks. Both of these portions were combined and transferred to the California Container Corporation in 1937, which produced corrugated shipping containers and boxes. In 1958, the Container Corporation of America took control of California Container Corporation and the property. The Concora Corporation owned and operated the property between 1969 and 1978. Rifkin Investments purchased the property in 1978 and rented portions of building space to various small businesses including a small furniture refinisher, a silkscreen company, an automobile body and paint shop, and a foreign auto repair shop. The Chiron Corporation acquired the property in 1996. In 2006, Novartis acquired Chiron Corporation and became the property owner.

Several underground storage tanks (including heating oil, gasoline, coatings, and a diesel tank) existed on the Rifkin property as early as the 1940s.

2.3 Physical and Environmental Characteristics

This section provides a summary of the:

- regional geology;
- site geology;
- groundwater zones underlying the Site and their hydrogeology; and
- surface water system and groundwater-surface water interaction.

The source of this information is the 2002 ENTRIX Site RI report (ENTRIX, 2002).

2.3.1 Regional Geology

The Site is located on the eastern flank of the San Francisco Basin, which roughly corresponds to present day San Francisco Bay (herein referred to as the bay). The bay is formed by a major asymmetrical basement synform within the Coast Range Province. It is bounded on the east by the Hayward Fault and on the west by the San Andreas Fault. The trace of the Hayward Fault occurs in the Berkeley Hills, approximately 3.5 miles to the east of the Site. Basement rock underlying the bay consists of the Franciscan Complex. Bedrock features trend northwest-southeast through the area and have influenced the depositional history of the bay. The

Franciscan bedrock is unconformably overlain by the Early Pleistocene Santa Clara Formation, which consists of continental alluvial fan deposits.

As the Franciscan was uplifted in the eastern portion of the basin, these alluvial fan deposits were themselves eroded and re-deposited. The non-marine alluvial deposits on the eastern flank of the basin have been mapped as the Alameda, San Antonio, and Temescal Formations. The seas flooded the central portion of the basin and the Santa Clara Formation eroded into the Alameda Formation. The Alameda Formation is restricted to the marine units beneath the bay up to and including the Young Bay Mud. The alluvial fan units located between the bay and the hills are referred to as the San Antonio or Temescal Formations.

The basin sank during the time of deposition of the Alameda Formation, allowing marine incursion. The Site, however, continued to be an uplifted zone of continental deposition. The alluvial units of the Temescal Formation range in thickness from 10 to 300 feet and average 100 to 200 feet. The transition from the alluvial fan deposits to the marine bay muds west of the Site occurs approximately along the line of the existing railroad tracks.

The Young Bay Mud of the Alameda Formation currently being deposited in the bay is black, unconsolidated, saturated, organic rich clay containing some gravel and sand layers, shell fragment layers, peat, and organic debris. The mud generally ranges in thickness from 50 to 75 feet. The deeper Yerba Buena Mud (Old Bay Mud) of the Alameda Formation is widespread homogeneous estuarine mud. It consists of black organic-rich clay averaging 25 to 50 feet thick, and typically containing a gravel/shell layer in the middle of the unit. This formation occurs to the west of the Site.

2.3.2 Site Geology

The Site is located on the East Bay Plain, approximately 0.3 miles east of the current bay shoreline and 3.5 miles west of the Hayward Fault. Surface soil elevation ranges between 12 and 18 feet NAVD88 (1988 North American Vertical Datum). Several creeks drain the western Oakland hills, flowing west to the bay. The nearest creek to the S-W property is Temescal Creek, which originates in the Oakland hills at Lake Temescal and enters an engineered channel that runs under/through Oakland and passes along the northern edge of the Site. The Site lies entirely in the drainage basin of Temescal Creek.

The soils underlying the Site consist of Holocene through Early Pleistocene alluvial sediments of the Temescal Formation (ENTRIX, 2002). The Temescal Formation is primarily an alluvial fan deposit, comprised of interfingering lenses of clayey gravel, sandy silty clay, and sand-clay-silt mixtures. Total thickness of the sediments based on deep coring near the Site is approximately 200 to 300 feet. In addition, it is likely that north-south trending shoreline deposits (i.e., eolian sand deposits) have also been placed at the Site, given the shorelines historical vicinity to the Site location, concurrently with the alluvial fan deposits. The Temescal Formation has been penetrated to a depth of approximately 60 feet below ground surface (bgs) at the Site

in boring IS-BH-07 and can be broken down into four general units (fill material, Unit A, aquitard, and Unit B).

The shallowest unit beneath the Site is engineered fill that consists of sands, silts, and gravels with concrete fragments. This fill extends from ground surface and ranges from 0 to 4 feet in thickness. The fill material unconformably overlies Unit A (which includes the A-zone groundwater), which consists predominately of silt and clay with discontinuous lenses of sand from approximately 4 feet to 20 feet bgs. The lenses have been observed to range in thickness from approximately 1 to 10 feet at investigated boreholes and rapidly change in thickness between nearby boreholes. There is evidence of several discontinuous sand zones occurring in Unit A that vary in thickness from 1 to 5 feet between nearby boreholes.

Unit A is underlain by approximately 30 feet of silty clay that acts as a local aquitard separating Unit A from Unit B. The top of the aquitard begins at approximately 25 feet bgs (corresponding to an elevation of approximately -11.5 feet NAVD88). The top of the A/B aquitard appears to be laterally continuous across the Site. Investigations have not revealed evidence of erosional features on the surface of the aquitard.

Unit B (which includes the B-zone groundwater) consists of primarily silty clay and clayey silt beginning at approximately 50 feet bgs. The total depth of Unit B has not been characterized, but the top of Unit B ranges from approximately 45 to 55 feet bgs. Similar to Unit A, Unit B includes discontinuous lenses of silty sand ranging between 1 and 3 feet thick situated between 50 and 60 feet bgs. The A/B aquitard is distinguished from Unit B by the characteristics of the more permeable lenses within the Unit B formation. The lenses in the aquitard consist of clayey sand with some silt, while the Unit B lenses consist of silty sand.

Figure 2-3 presents the locations of three cross sections at the Site. Figures 2-4, 2-5, and 2-6 present these cross sections of Unit A, A/B aquitard, and an upper portion of Unit B for these three transects across the Site.

2.3.3 Hydrogeology

The two zones of groundwater (A-zone and B-zone) are part of a single hydrogeologic unit, containing multiple alluvial fan and eolian shoreline deposits. Accordingly, different groundwater zones beneath the Site are referred to as water-bearing zones rather than aquifers. The A-zone and B-zone groundwater underlying the Site is not currently being used for drinking water supply, and has not been used in the past. The Site is not located within a groundwater recharge area (Norfleet, 1998).

2.3.3.1 Groundwater Flow in the A-Zone

The A-zone is a predominantly shallow, unconfined to semi-confined water-bearing zone. A-zone groundwater is present in relatively thin (approximately 2- to 5-feet thick), discontinuous, lenses of sand that are interbedded within less permeable silty/clayey sediments. Depth to groundwater across the general area of the Site can vary seasonally from approximately 3 to 12 feet bgs. Prior to the installation of the slurry wall and the groundwater extraction system, the direction of groundwater flow

across the Site was predominately west to northwest toward San Francisco Bay and Temescal Creek. Groundwater flow in the northernmost portion of the Site appears to be locally influenced by Temescal Creek. Groundwater flow towards Temescal Creek partially discharges into the Temescal Creek's drainage channel, but not directly into the surface water. Tidal fluctuations occur in areas near the Temescal Creek and affect the amount of groundwater flow entering the drainage channel. The surface water associated with Temescal Creek is further discussed in Section 2.3.4.

The flow of groundwater in the A-zone beneath the Site has been altered by the installation of the slurry wall and the groundwater extraction system in the 1990s (ENTRIX, 2002). The flow inside the slurry wall is generally toward the extraction wells. The groundwater gradient is generally steeper in the southern portion of the area enclosed by the slurry wall and generally flows toward the west in this area. The groundwater flow outside of the slurry wall is toward the west-northwest, generally consistent with pre-slurry-wall groundwater flow regime on the northern portion of the Site, and is influenced by proximity to the slurry wall, groundwater extraction wells, and Temescal Creek.

Based on pumping tests summarized in the RI, the transmissivity has been estimated to range between 4.1 and 633 square feet per day (ft^2/day), and the hydraulic conductivity ranges between 0.28 and 28 feet per day (ft/day). The results of a tidal study also measured transmissivities, and found 18.7 ft^2/day for the northern portion of the Site adjacent to Temescal Creek (ENTRIX, 2002). This value is based upon a month of monitoring, and is considered a more reliable measure of sitewide transmissivity than the short-term pump tests. Pumping tests conducted in February 2007, in support of the soil treatability study and further discussed in Section 2.5, estimated a hydraulic conductivity of approximately 3 ft/day for the A-zone within the central portion of the raised cap part of the Site (CDM, 2007b); this value is within the range reported for the Site in the RI.

Based on an estimated effective porosity of 0.12 (Freeze and Cherry, 1979), the average linear velocity of groundwater beneath the Site is approximately 0.24 ft/day. Groundwater elevations vary seasonally between 4 and 10 feet NAVD88 within the A-zone. Groundwater levels can fluctuate up to 3 feet seasonally, with highest in the wet season between December and February.

2.3.3.2 Groundwater Flow in the B-Zone

The B-zone is a confined unit with several feet of piezometric pressure head above the top of the A/B aquitard. Groundwater elevation measurements have consistently measured a vertical upward hydraulic gradient from the Unit B to the Unit A groundwater zone (ENTRIX, 2002).

The groundwater flow conditions within the B-zone do not appear to have been significantly impacted by the installation of the slurry wall and the groundwater extraction system, indicating the limited permeability of the confining unit separating the A-zone and the B-zone. The groundwater flow direction both before and after the installation of the slurry wall and extraction system is from the southeast toward the

northwest. Pumping tests indicate the transmissivity ranges between 128 and 132 ft^2/day, and a hydraulic conductivity of approximately 28 ft/day (ENTRIX, 2002). Based on an estimated effective porosity of 0.12, the average groundwater linear velocity is approximately 1.07 feet/day. Groundwater elevations vary between 6 and 9 feet NAVD88 within the B-zone and can fluctuate up to 2 feet seasonally. The water levels are highest in the wet season between December and February.

2.3.3.3 Groundwater Use

The 2002 ENTRIX Site RI report concluded that groundwater at the Site cannot feasibly be used for long-term water supply. The conclusion was based on an interpretation of Site data and the exemption criteria set forth in State Water Resources Control Board (SWRCB) Resolution No. 88-63. According to Resolution No. 88-63, waters are considered suitable, or potentially suitable, for municipal or domestic water supply except where:

a. "Total Dissolved Solids (TDS) exceeds 3000 milligrams per liter (mg/L) (5000 microSeimen/centimeter (µS/cm) electrical conductivity);

b. Contamination exists, that cannot reasonably be treated for domestic use; and

c. The source is not sufficient to supply an average sustained yield of 200 gallons per day."

As reported in the 2002 ENTRIX Site RI report, the average TDS across the S-W Property is 1,200 mg/L, and the central portion of the property exceeds 3,000 mg/L on average. Development of the shallow groundwater for supply would likely lead to saltwater intrusion, as documented for several nearby areas in the Norfleet study (1998), and cause expansion of the area that currently exceeds 3,000 mg/L.

2.3.4 Temescal Creek

The Site resides within the Temescal Creek watershed. The northwest extent of the Site borders with Temescal Creek (see Figure 2-2).

2.3.4.1 Temescal Creek Watershed

The Temescal Creek watershed encompasses a 6.68 square mile (sq. mi.) area with headwaters in the Berkeley Hills on the north and south sides of Highway 24. The upper watershed has ridge elevations of approximately 1,200 to 1,300 feet and includes mixed open space and residential lands in the Berkeley Hills. The contributing area upstream of Lake Temescal is about 2.64 sq. mi. and includes the upper main stem of Temescal Creek (1.67 sq. mi.) and the Caldecott Tunnel branch (0.97 sq. mi.). Downstream of Lake Temescal, runoff from the other two upland subbasins, Vicente Branch (0.64 sq. mi.) and Claremont Creek (1.22 sq. mi.), combines with urban runoff within the densely developed lowlands of Berkeley and Emeryville. The mouth of Temescal Creek flows into San Francisco Bay about 0.4 mile north of the highway interchange leading to the Bay Bridge toll plaza, approximately 1,100 feet from the Site (ENTRIX, 2002).

A relatively small percentage of the main and tributary lengths of Temescal Creek still have earth-lined open channels with natural configuration. Those that remain are primarily within the Berkeley Hills. The lower 3.5 miles of the main stem and most of the tributary channel reaches are within engineered underground storm drain systems (ENTRIX, 2002).

2.3.4.2 "Old" Temescal Creek

In the vicinity of the Site, the surface channel of old Temescal Creek between Horton Street and the onsite railroad spur has been replaced by a relocated, underground culvert north of the Site and an open, engineered flood channel extending downstream (west) to Interstate 880. Old Temescal Creek (as part of the main flood channel) was abandoned following the 1968 construction of the flood control project.

The old channel persists as a topographic and drainage feature, although it no longer receives runoff from the upstream watershed. It crosses under Horton Street in two large concrete culverts and passes under the former Rifkin property in a concrete box culvert. Downstream of the former Rifkin property, a short section of the old constructed "U" shape channel exists (5 to 10 feet deep; 10 to 15 feet wide) with vertical banks supported by wood slats (ENTRIX, 2002). The location of the old channel is presented on Figure 2-2.

The old channel discharges through a 5-foot diameter culvert into the concrete-lined flood channel of the re-engineered Temescal Creek upstream of the railroad crossing. The old channel may receive surface flow from storm drains along Horton Street that appear connected, as well as local runoff from other nearby streets. Discharge of groundwater to the old channel was not observed during ENTRIX site visits (November 1998, November 2000, and December 2000) (ENTRIX, 2002). In addition, no flow was observed during CDM site visits in winter of 2006/2007.

2.3.4.3 Lower Temescal Flood Channel

Lower Temescal Creek from Horton Street to San Francisco Bay was constructed as an engineered flood control channel between 1964 and 1968 (ENTRIX, 2002). Within the Site vicinity, the only surface water contributions to the channel are the 5-foot diameter culvert from the old channel and a 21-inch diameter storm-water drain entering from the Sherwin-Williams property. No other storm drains have been observed within the Site vicinity.

Based on improvement plan design and as-built data, the flood control channel has a "U" shaped, concrete-lined cross section approximately 16 feet deep and 25 to 30 feet wide, with a long profile gradient of 0.00083 feet/feet (see Temescal Creek as presented on cross section K-K', Figure 5-3 of the ENTRIX RI, presented in Appendix A of this document) (ENTRIX, 2002).

The channel was excavated about five feet below the previously existing ground surface of old Temescal Creek, with side construction slopes of approximately 1 to 1. The area behind the vertical concrete walls and under the concrete bed was backfilled using filter material, crushed rock, gravel bedding, and reserved earthen materials.

The plans show a subdrain network was constructed under the channel, with pressure relief flap gates rising at intervals along the channel walls to minimize the risk of uplift, buckling, or shifting of the concrete liner. The subdrain network consists of 4-inch perforated pipe buried in the gravel bedding across the channel bed at relatively regular spacing (30 feet) that is connected by perforated pipes paralleling the channel left and right banks. Approximately every 90 to 120 feet along the channel length, vertical risers of 6-inch non-perforated pipe extend outside the channel walls to recessed openings in the concrete walls about two feet above the channel bed. Flap gates using 8-inch Waterman Drainage Gates (model F-10) were installed to allow one-way release of water from the subdrain system into the flood control channel when hydrostatic pressure is sufficient (hinges designed to require <1.0 foot of pressure head). The flap gates were not observed by ENTRIX in November 1998, November 2000, and December 2000) (ENTRIX, 2002).

The flap gates were observed by CDM during a visit in April 2005. The functionality of the flap gates has not been evaluated.

2.4 Previous Investigations, Risk Assessments, and Interim Remedial Actions

This section describes previous remedial investigations, nature and extent of COCs, fate and transport of COCs, groundwater modeling, risk assessments, and interim remedial actions.

2.4.1 Remedial Investigations

Soil, soil gas, and groundwater investigations have been conducted at the Site since 1988. The investigations have revealed that the COCs in the subsurface are metals, volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and petroleum hydrocarbons. The investigations concluded that several COCs have migrated from the S-W property onto a portion of the former Rifkin property. Site soil and groundwater data through October 2000 is summarized in the 2002 ENTRIX Site RI report (ENTRIX, 2002). The RI report was approved by the Water Board on October 21, 2002 (Water Board, 2002).

Since October 2000, results from periodic groundwater monitoring events have been summarized in a series of reports. This document utilizes this groundwater data through the December 2007 event (LFR, 2008). In addition, several investigations have been conducted after October 2000 to complete characterization of the Site:

CDM, 2008b. Report of Findings, Soil Characterization Study Addendum, Sherwin-Williams Site, 1450 Sherwin Avenue, Emeryville, California. February 22, 2008.

CDM, 2007d. Report of Findings, Soil Characterization Study, The Sherwin-Williams Company, Emeryville, CA. Camp Dresser & McKee Inc., on behalf of The Sherwin-Williams Company. June 28, 2007.

CDM, 2007h. Data Summary Report for Soil Gas Investigation Activities, Sherwin-Williams Site, 1450 Sherwin Avenue, Emeryville, California. January 30, 2007.

CDM, 2007i. Data Summary Report for Installation and Sampling of Well CDM-1, Sherwin-Williams Site, 1450 Sherwin Avenue, Emeryville, California. January 30, 2007.

CDM, 2005. Report of Findings, December 2004 Subsurface Investigation, 1450 Sherwin Avenue, Emeryville, California. Camp Dresser & McKee Inc. March 2005.

CDM, 2002. Report of Findings, Subsurface Investigation, Former Rifkin Property, Emeryville, California. Camp Dresser & McKee Inc. December 2002.

The 2002 ENTRIX Site RI report concluded that the primary Site-related contaminants present in soil and groundwater beneath the Site include metals (primarily arsenic and lead), VOCs (primarily aromatic constituents and ketones), and petroleum hydrocarbons. Chlorinated constituents were also detected in groundwater samples collected throughout the Site, but in most instances appear to be related to past releases on adjacent properties and not attributable to S-W. Subsequent investigations have confirmed these conclusions.

Appendix A includes selected figures from the RI presenting the extent of impact from various COCs in shallow soil (0 – 3 feet bgs), deep soil (3 – 10 feet bgs), and groundwater (ENTRIX, 2002). In addition, Appendix A includes selected figures and tables from these subsequent subsurface investigations (CDM, 2002; CDM, 2005; CDM, 2007d; CDM, 2007h; CDM, 2007i; and, CDM, 2008b).

Appendix B includes selected figures and tables from the FS presenting summaries of arsenic, lead, total VOCs, and TPH concentrations in vadose zone and saturated zone soil samples across several depth intervals.

2.4.2 Nature and Extent of COCs

2.4.2.1 Metals

The extent of impacts from the release of metals (arsenic and lead) is limited to unsaturated, vadose zone soil, and the soil and groundwater within the Unit A aquifer. Aside from sporadic arsenic concentrations above its cleanup goal, metals have not been detected above cleanup goals in B-zone groundwater samples. Arsenic detected in A-zone groundwater at the Site does not appear to have significantly affected the B-zone groundwater (ENTRIX, 2002 and LFR, 2008). The highest concentration of arsenic detected in B-zone groundwater was 0.32 mg/L at well LF-B5 in April 1996; the latest arsenic concentration in this well was 0.0064 mg/L in October 2007. Arsenic concentrations in B-zone groundwater in 2007 ranged from less than 0.005 mg/L (at well LF-B3) to 0.054 mg/L (at well RP-BW-02).

The highest concentrations of the primary metal and COC at the Site, arsenic, in unsaturated soil were found in the central portion of the S-W property (within the

southern slurry wall area) and in the southern portion of the former Rifkin property (outside the slurry wall area). Arsenic was also detected at concentrations above its California Department of Public Health (CDPH) drinking water Maximum Contaminant Level (MCL) in A-zone groundwater extending from the central portion of the S-W property westward and also to the adjacent former Rifkin property. The extents of other metal COCs in the unsaturated soils and A-zone groundwater at the Site are within the extents of arsenic. In addition, a second area of arsenic in groundwater is present under the central portion of the former Rifkin property, originating from Horton Street (ENTRIX, 2002).

Groundwater monitoring events at the Site and a subsurface investigation on the former Rifkin property have been conducted since the completion of the 2002 ENTRIX Site RI report. The groundwater monitoring events have shown that the extraction wells EX-14, EX-15, and EX-16 on the former Rifkin property are capturing contaminants that have historically migrated from the S-W property (prior to installation of the slurry wall) and historically migrated from a release beneath Horton Street.

In September 2002, CDM conducted a subsurface investigation at the former Rifkin property to:

- characterize the presumed longitudinal axis of the arsenic A-zone groundwater plume on the former Rifkin property, originating from Horton Street;
- evaluate total arsenic in Unit A aquifer saturated soils under the portion of former Rifkin property to which arsenic may have migrated from the S-W property; and
- evaluate the soil-water partition coefficient (K_d) for arsenic.

During the September 2002 investigation (CDM, 2002), CDM collected saturated soil and grab groundwater samples from nine Unit A locations within the former Rifkin property (see figures presented in Appendix A). The results from the investigation yielded the following conclusions:

The Unit A aquifer arsenic plume in the central portion of the former Rifkin property, which originated from a release beneath Horton Street, has appeared to attenuate since the previous characterization of the plume in August 1998. During the August 1998 investigation, arsenic in Unit A aquifer groundwater was reported between 0.063 and 0.12 mg/L along the length of the plume. During the September 2002 investigation, arsenic concentrations ranged from 0.034 to 0.095 mg/L.

In December 2004, CDM conducted a subsurface investigation on the raised cap area and the area immediately west of the raised cap on the S-W property, and on an area of the former Rifkin property immediately adjacent to the S-W property, collectively defined as the study area (CDM, 2005). The objectives of the investigation were to:

- Characterize contaminants in the raised cap material to assess treatment and disposal options for the raised cap material, and

- Better define the horizontal and vertical extent of impacted unsaturated and Unit A aquifer saturated soils under and adjacent to the raised cap.

During the December 2004 investigation, CDM collected raised cap material, unsaturated soil, Unit A aquifer saturated soil, and Unit A aquifer grab groundwater samples from 38 locations within the study area (see figures presented in Appendix A). The results from the investigation yielded the following conclusions:

Unit A aquifer soil at the study area generally consists of clay with interbeds of well graded sand and gravel. The raised cap material consists of asphalt pavement over fill soil/bentonite from excavation of the slurry wall, concrete debris, and historic concrete foundations with rebar.

Arsenic is the predominant (highest concentrations and most widely distributed) metal COC in both unsaturated and Unit A aquifer saturated soils within the study area. The distribution of arsenic generally decreases with depth, with the highest at-depth concentrations detected in boring CDM-SB15, -SB16, and –SB18 (see figures presented in Appendix A). The investigation confirmed that the extent of other metals above cleanup goals in the unsaturated soils and Unit A aquifer saturated soils are within the extent of arsenic.

In the area west of the raised cap, arsenic concentrations in soil diminish to below 24 mg/kg above the A/B aquitard.

In November 2006, CDM installed a new Unit A aquifer well onsite (CDM-1) (see figures presented in Appendix A) in order to evaluate the extent of arsenic present in the areas outside of the southern portion of slurry wall (CDM, 2007i). Due to the presence of Building 35, the southern portion of the arsenic plume could not be contained within the slurry wall system. The groundwater samples from CDM-1 further delineate the lateral extent of the arsenic Unit A aquifer groundwater plume present outside and to the south of the slurry wall system, which are consistent with the results from Unit A aquifer wells LF-3 and LF-11.

2.4.2.2 Organic Compounds

VOCs were detected in Unit A soil and groundwater throughout the Site. In general, the highest concentrations of aromatic constituents (primarily ethylbenzene, toluene, and xylenes) and ketones (primarily acetone) were found in unsaturated soil: (1) along the former Rifkin property/S-W property boundary line (both inside and outside the slurry wall); and (2) in the north-central portion of the S-W property (inside the slurry wall).

In groundwater, the primary VOCs found in A-zone groundwater included: aromatic constituents (benzene, ethylbenzene, toluene, xylenes, and 1,2,4-trimethylbenzene); chlorinated constituents (1,2-dichloroethane (1,2-DCA), cis-1,2-dichloroethene (cis-1,2-DCE), trans-1,2-DCE, trichloroethene (TCE), and vinyl chloride); and ketones (acetone and 2-butanone). Of these VOCs, chlorinated constituents were not historically used at the S-W facility.

Aromatic VOCs (excluding benzene) were detected above their MCLs in A-zone groundwater in two primary areas of the Site: (1) both inside and outside the slurry wall, generally in the area west of Horton Street between former Building 29 and the southern portion of the former Rifkin property and (2) inside the slurry wall on the west-central portion of the S-W property, a former solvent tank farm location. Benzene was detected above its MCL in A-zone groundwater in three primary areas of the Site: (1) within the central area of the slurry wall under the current raised cap area, (2) adjacent to the slurry wall on the southern former Rifkin property and near former Building 35, and (3) along Horton Street at the central portion of the former Rifkin property. Ketones were primarily detected above their MCLs in A-zone groundwater on both sides of the slurry wall at the former Rifkin property and S-W property line.

The highest concentrations of chlorinated constituents were detected in A-zone groundwater in two primary areas of the Site: (1) in the south-central portion of the former Rifkin property and along Horton Street and (2) within the slurry wall near and north of Building 38. In B-zone groundwater, only 1,2-DCA was detected consistently above its MCL in groundwater samples from wells (and detected historically in groundwater samples from borings). The 1,2-DCA concentrations in B-zone groundwater are significantly higher than in A-zone groundwater beneath the S-W property, indicating an upgradient off-site release.

Petroleum hydrocarbons (quantified as both total petroleum hydrocarbon (TPH) in the diesel and gasoline ranges, but likely representing thinners and other raw materials) are present in soil and A-zone groundwater, located primarily (1) inside the boundary of the slurry wall, (2) in the southern part of the former Rifkin property at the boundary with the S-W property, and (3) along Horton Street near the northeastern portion of the former Rifkin property.

For TPH detected in groundwater at the S-W property and in the southern part of the former Rifkin property, TPH in the diesel range appears to represent mineral spirits and mixed oil compounds (rather than diesel fuel) and TPH in the gasoline range appears to represent the lighter fraction of oils (including mineral spirits) and individual VOCs (such as toluene and xylenes) that were detected in soil in these same areas.

The results from the December 2004 investigation (CDM, 2005) yielded the following conclusions concerning organic COCs in soil and groundwater:

- The highest VOC detections in soil at the study area were reported across the raised cap area, primarily from boreholes CDM-SB16, -SB17, -SB18, -SB23, -SB24, and -SB30. The highest detections were from toluene and xylenes.

- VOCs attenuate significantly between the raised cap area and the area to west of the raised cap.

- SVOCs, VOCs, and TPH detected on the former Rifkin property do not appear to be completely from releases on the S-W property.

The results from the November and December 2006 investigation (CDM, 2007h) yielded the following conclusions concerning organic COCs in soil gas:

- VOCs are present in soil gas at the Site, as previously inferred from vadose zone soil and shallow groundwater sample results. The southern portion of the former Rifkin property and the adjacent western portion of the raised cap area have the highest VOCs in soil gas concentrations.

- The presence of these VOCs in the subsurface may be attributed to historic releases of raw materials at the northwest corner of the raised cap area, historic operations by various businesses formerly present on the former Rifkin property, and historic releases on properties located upgradient of the Site and migration of impacted groundwater from these properties to the Site.

- The only VOC detected above its residential soil gas screening level on both the S-W and former Rifkin properties was benzene in 6 of the 9 samples considered representative of soil gas quality (see table and figure presented in Appendix A).

- In addition to benzene, 1,2-dichloroethane was detected above its residential soil gas screening level on the former Rifkin property.

- Methane in soil gas was detected in samples collected at both the S-W and former Rifkin properties. The methane at these areas is attributed to pervasive methanogenic conditions within the silt/clay zones, which is typical of the bay muds, and localized methanogenic conditions within underlying groundwater in sandy zones that have been impacted with organic compounds.

2.4.3 Conceptual Site Model

Pursuant to the NCP and associated California guidance documents, a conceptual site model (CSM) was prepared for the Site. The decision-making framework for Site investigations was developed based on the CSM. The CSM presents the primary and secondary sources of COCs and their release mechanisms to soil, soil gas and groundwater. The CSM was developed based on: known or suspected historical operations at the Site (see Section 2.2); investigation results (see Section 2.4.1 and Section 2.4.2); properties of the chemicals present; suspected chemical release mechanisms based on types of operations conducted and knowledge of where materials were handled; transport mechanisms; and potential exposure scenarios.

A narrative description of the CSM is presented below. The CSM description is based on a forensic evaluation of historical documents, chemical formulations and an understanding of the properties of the COCs and Site data. This CSM adequately describes the nature and distribution of COCs found at the Site. The development of the CSM and underlying arsenic in groundwater attenuation mechanisms at the Site, as discussed below, are consistent with recent publication from USEPA: Monitored

Natural Attenuation of Inorganic Contaminants in Ground Water, Volume 1, Technical Basis for Assessment, dated October 2007 (USEPA, 2007). Figure 2-7 presents an illustration of the CSM for the release and transport of arsenic.

2.4.3.1 Release Mechanisms

The primary release mechanism of COCs to the subsurface is suspected to have been through historic releases of raw and finished materials at the Site. The Site produced lead-arsenate pesticides, coatings, and resins through its history.

The lead-arsenate pesticide manufacturing was centered at the current northern area of the Raised Cap area (see Figure 2-2). The primary raw materials used to generate the lead-arsenate pesticides (where arsenic is in the +5 oxidation state, arsenic [+5]) were litharge (a lead oxide) and arsenic acid (H_3AsO_4, where arsenic is also present as arsenic [+5]). Based on review of historic plant building plans from the 1920s and historical photographs depicting operations, the pesticides appear to have been prepared through the following process:

1. Raw materials included litharge, acid (unknown variety, but most likely multiple types of acids were used) and either arsenic acid and/or raw material for production of arsenic acid (arsenic trioxide and acid, mostly likely nitric acid) were delivered to the Site via railcars and transferred to storage areas and/or containers including wooden vats and/or tanks.

2. Litharge was combined with an acid (unknown, mostly likely acetic acid) to generate lead liquor. The lead liquor was generated in an historic facility building described as a lead tower in which acid was sprayed over a litharge at the top of a tower and allowed to percolate downward through a series of trays. The liquor was collected at the bottom of the tower and likely contained both dissolved lead and lead complex solids.

3. If arsenic acid was generated at the facility, arsenic trioxide would have been combined with an acid to generate arsenic acid. This arsenic acid may have been generated in a historic facility building described as the arsenic acid plant.

4. The arsenic acid and lead liquor were combined in a set of parallel settling chambers where the lead-arsenate precipitate was collected.

5. The precipitate was dewatered in a filter press and further dried in ovens. The dried material was crushed and packaged as a lead-arsenate solid.

Potential release mechanisms for the lead, arsenic, and associated acids include the following:

- Loss to surface and rail ballast of raw materials from storage areas and/or containers during transfer and within the process system;
- Loss to surface of finished materials during packaging and handling (product appeared to be shipped in both wooden barrels and paper sack packaging); and
- Loss to surface of wastewater from settling chambers and presses.

In the above, loss to surface may have involved one or all of the following potential points: building floors, floor drains, floor sumps, and/or bare ground. The daily operations over 25 years could have resulted in thousands of gallons of materials permeating the floor of the manufacturing buildings or pavement, resulting in the presence of COCs in both soil and groundwater.

The primary raw materials used to generate coatings and resins were organic solvents, water-based solvents, oils, polyhydric alcohols, dibasic acids, and pigments. Storage of much of these materials was in aboveground storage tanks located at the northwest corner of the Raised Cap area and near the central portion of the current railroad spur (Figure 2-2). The primary potential release mechanism for these materials appears to have been losses to the ground surface during tank filling or discharge.

As a result of releases, the COCs were present on the ground and floor surfaces and in catchment areas (e.g., cement storage areas, bare ground, sumps, drains, etc). Further releases of COCs, addition of water/liquids (e.g., wash water) or in some cases infiltration (in outside areas that were not covered) caused movement of the COCs into the soils below the surface. In this unsaturated vadose zone, the materials were adsorbed and/or retained in the soil until further liquid releases or mobilization by infiltrating water or other liquids. Eventually some of the COCs (e.g., arsenic, lead, and organic compounds) reached the groundwater and migrated with the groundwater to downgradient areas.

2.4.3.2 Natural Attenuation of Metals

Arsenate trioxide suspected to have been released at the Site would have contained arsenic in its more mobile (arsenic [+3]) state. Arsenic acid and lead-arsenate pesticides released at the Site contained arsenic in its less mobile (arsenic [+5]) state. However, arsenic (+5) in groundwater migrating from the release areas would have been reduced to arsenic (+3) as it encountered more reducing conditions. The relative distribution of oxidizing/reducing conditions is consistent with the CSM. Upgradient groundwater entering the arsenic release areas is less reducing and the arsenic is found primarily in its arsenic (+5) state. However, in the central portion of the Site, due to the reducing conditions in A-zone groundwater caused by releases of organic COCs and naturally occurring organic matter, groundwater in these zones is mildly reducing and both forms of arsenic are found.

Arsenic concentrations in groundwater attenuate by three to four orders of magnitude between the release areas and the downgradient property boundary. Studies were conducted (CDM, 2008b and CDM, 2007d) to further characterize the phases of arsenic present in the subsurface and the mechanisms for its attenuation in groundwater. The findings from these studies indicate a direct relationship between phases and extent of arsenic with the lithology, as discussed below. Although the primary focus of these investigations was the release areas, results from locations outside and downgradient of the release areas also confirm this relationship.

Lead is not mobile in Site soil, as a result, lead has not migrated beyond the current Raised Cap area (Figure 2-2).

2.4.3.3 Arsenic Distribution in High Permeability Sandy Zones

An acidic, arsenic-bearing solution containing organic ligands such as acetate was released into the ground via spills, leaking tanks and pipelines, etc. The acid with organic ligands appears to have dissolved much of the clays and feldspars and chemically attacked the quartz within the aquifer. As the arsenic plume migrated deeper within the aquifer and downgradient (within the High Permeability Sandy Zones under both the Sherwin-Williams and former Rifkin properties), the dissolution reactions appear to have eventually neutralized the water when the solubility of the amorphous silica phase was exceeded, at which point the phase precipitated, forming a coating on the existing grains or cementing grains together. The organic ligands within the High Permeability Sandy Zones were then oxidized due to the introduction of oxygen-bearing precipitates (i.e., amorphous silica phases) into the High Permeability Sandy Zones.

Even after the releases of arsenic ceased, the arsenic plume continued to move farther downgradient, as the arsenic-bearing amorphous silica precipitate provided a continuing source of arsenic to groundwater moving through continuous sand lenses, i.e., along the connected active sand zone flow paths. These connected sand layers are depicted on cross section B-B' (see Figure 2-3 and 2-5). The investigations have confirmed that the sand zones under the release areas on Sherwin-Williams property and under a portion of the former Rifkin property downgradient of the release area contain residual solid-phase arsenic silica precipitates, which through dissolution continue to be a source of arsenic to groundwater. The sand zones that contain residual solid-phase arsenic silica precipitates largely occur within the area bounded by the green line on Figure 2-2; these sand zones and their extents are further discussed in the FS (CDM, 2009b).

Downgradient of the release areas, movement of the arsenic (both arsenite [+3] and arsenate [+5]) in the sand zones appears to be controlled by sorption to aquifer matrix, with arsenate being relatively less soluble and mobile. Investigations have confirmed that in groundwater samples collected from outside the slurry wall system, between the slurry wall and the UPRR lines and areas on the former Rifkin property downgradient of the S-W property, arsenic is more oxidized and reduction-oxidation (redox) conditions are not as reducing as near the release area (CDM, 2008b; CDM, 2007d; CDM, 2007i; CDM, 2005; CDM, 2003; and, CDM, 2002). In the more oxidized

environment downgradient of the release areas, the primary attenuation mechanism for arsenic in groundwater is sorption with, or co-precipitation as, oxyhydroxide compounds within the active sand zone flow paths. Adsorbed arsenic has been observed in samples collected from sandy zones at borings CDM-SB82 and –SB84, and –SB87, located downgradient of the arsenic release areas (CDM, 2008b).

Arsenic (arsenate and arsenite) sorbs to surfaces of a variety of aquifer materials, including iron oxides, aluminum oxides, and clay minerals. Adsorption of arsenate to iron-oxide surfaces is particularly important in reducing groundwater concentrations of arsenic because arsenate adsorbs strongly to iron-oxide surfaces in acidic and near-neutral-pH water. Investigations have also revealed relatively high concentrations of both dissolved iron and manganese in the regions downgradient of the release area which indicates potential for continued sorption of arsenic as iron and manganese oxidation/precipitation is on-going in downgradient, more oxidizing groundwater.

2.4.3.4 Arsenic Distribution in Low Permeability Silt/Clay Zones

The Low Permeability Silt/Clay Zones do not appear to have provided a migration pathway for the released arsenic acid solution plume due to lower hydraulic conductivity, but were subject to diffusion of the arsenic-containing water. Within the clay/silt zones, the organic ligands were isolated from oxidizing surface waters, and together with the natural organic carbon and sulfate in these layers provided conditions favorable for sulfate-reducing bacteria. The organic carbon and sulfate was initially deposited within bay muds and/or salt marsh deposits, which are characterized with hydrogen sulfide (H_2S), indicating the oxidation of organic carbon via sulfate reduction (EKI, 2008; EKI, 1999).

Under sulfate reducing conditions in the low iron/high sulfur environment within the silt/clay zones, which is typical of the bay muds, biological mediated reduction likely resulted in precipitation of orpiment and/or other arsenic sulfides such as realgar. Arsenic sulfides with arsenic to sulfur ratios similar to orpiment were observed in several soil samples analyzed from these silt/clay zones within the arsenic release areas and downgradient areas. Analysis of individual grains from the samples containing arsenic sulfide revealed the presence of arsenic and sulfur within the phases, but no other metals. In addition, oxygen was not present, indicating that the arsenic sulfides being generated within the silt/clay zones did not require the presence of dissolved metals in groundwater.

However, the formation and stability of arsenic sulfide precipitates under reducing conditions, has been described as "quite narrow for relatively high total concentrations of arsenic in groundwater, although site-specific conditions may support precipitation of sulfides" (USEPA, 2007). Yet, others have reported that the specific conditions within the San Francisco Bay margin are ideal for formation of arsenic sulfides where (1) the solubility of the sulfide mineral is exceeded and (2) the groundwater flow rates is slow compared to the arsenic sulfide precipitation rates (O'Day et al., 2004). Also, it is reported that under these conditions the precipitation of arsenic sulfide minerals is often biologically mediated, as certain bacteria (e.g.,

Desulfomaculum) are capable of reducing arsenic (+5) to arsenic (+3) and precipitating orpiment (O'Day et al., 2004).

In addition, under the reducing conditions, arsenic may also sorb onto pyrite, followed by formation of an iron/arsenic/sulfur -type phase, which subsequently converts to As_2S_3 (Bostick et al., 2004). In general, sorption reactions are very fast; on the order of seconds (Langmuir et al., 1985). The redox reaction required to convert sulfate to sulfide is typically slower (half life of minutes to hours). While the abiotic precipitation/dissolution reactions maybe the slowest, occurring on the order of weeks, biological-mediated sulfate-reduction reactions are reported to occur within minutes. Due to the relatively slow groundwater velocity in the low permeability silt/clay zones, there is adequate groundwater residence time for dissolved arsenic within these zones to form arsenic sulfides at the Site. Therefore, the formation of stable arsenic sulfides under the low velocity, high concentration conditions found at the Site is consistent with the findings of other studies of arsenic geochemistry within the San Francisco Bay margin (O'Day et al., 2004).

The bacterially-mediated reaction that forms arsenic sulfide is as follows (O'Day et al., 2004):

$$7CH_2O\ (s)[\text{organic matter}] + 3SO_4^{-2}\ (aq)[\text{from GW}] + 2H_3AsO_4^0\ (aq)\ [\text{from GW}] + 6\ H^+(aq)[\text{from GW}] \rightarrow As_2S_3\ (s)\ [\text{precipitated within the Low Permeability Silt/Clay Zones}] + 7CO_2(g) + 13H_2O(l)$$

The Site samples containing arsenic sulfide minerals had total arsenic concentrations as high as 8,000 mg/kg. However, arsenic sulfides are not a source of arsenic to groundwater at the Site, but a sink. This conclusion is based on the following:

- Under reducing conditions found within the Low Permeability Silt/Clay Zones arsenic sulfides are relatively insoluble, with solubility ranging from less than 0.0075 to 0.750 mg/L (Wilkin et al., 2003).

- The Low Permeability Silt/Clay Zones do not transmit groundwater as fast as the High Permeability Sandy Zones (i.e., the hydraulic conductivity of the Low Permeability Silt/Clay Zones is at least two orders of magnitude less than for the sandy zones).

2.4.3.5 Natural Attenuation Mechanisms for Arsenic

Natural attenuation of arsenic at the Site involves primarily precipitation and sorption. These processes have been influenced by biotransformation of arsenic, specifically arsenic redox cycling. Arsenic has been immobilized by sorption onto aquifer solids and by precipitation of solids incorporating arsenic as a major constituent. The investigations have confirmed that it is the relative ratio of the reactive iron to sulfur that controls the distribution of solid phases of arsenic. The partitioning and stability of the arsenic solids are affected by the redox conditions. Because of the differences in solubility of iron and arsenic sulfides, precipitation of arsenic sulfide is a controlling factor where sulfur predominates under reducing

conditions. Under oxidizing conditions, arsenic is removed from solution by adsorption to or co-precipitation with ferric oxyhydroxides.

The following summarizes the findings from investigations that demonstrate how the natural attenuation processes have been decreasing arsenic concentrations in groundwater downgradient of the release areas. These natural attenuation processes are expected to remain stable over the foreseeable future and are expected to continue decreasing arsenic concentrations in groundwater. This discussion follows the tiered format presented in the Monitored Natural Attenuation of Inorganic Contaminants in Ground Water, Volume 1, Technical Basis for Assessment (USEPA, 2007).

Tier I of the USEPA document calls for demonstration that the groundwater plume is stable and that sorption and/or precipitation onto aquifer solids is occurring where immobilization is the predominant attenuation process. Appendix A presents the findings from the Groundwater Monitoring Plan Assessment report (LFR, 2006). An analysis of the groundwater data reveals that concentrations of arsenic in groundwater have been attenuating over time and distance, within and outside the slurry wall system, from the release areas, with stable and/or decreasing concentrations at downgradient wells LF-11, LF-18, LF-20, LF-24, and LF-25, ranging from less than 0.005 to 0.260 mg/L since 1997 (LFR, 2008). Since its installation in November 2006, arsenic in groundwater concentrations appear to be increasing at well CDM-1, which is located on the S-W property along its boundary with the UPRR property, in an area outside of the slurry wall system. Unlike the other wells mentioned above, CDM-1 is screened in the upper portion of the A-zone; the others are screened across both the upper and lower portions of the A-zone. Appendix A presents a summary of 2007 arsenic concentrations and concentration trend analysis results at Site wells (LFR, 2008).

As presented in Section 2.4.3.3 and 2.4.3.4, the primary mechanisms for this attenuation are the precipitation of the arsenic into sulfide compounds and sorption of arsenic to the aquifer solids. A lesser degree of attenuation is observed outside the slurry wall system, specifically between wells LF-3 and CDM-1/LF-11, than inside the slurry wall system. The attenuation of the arsenic plume outside the slurry wall system, originating in the area around LF-3, is likely affected by historical release of organics in this area of the Site and potentially higher connectivity of sand zones between LF-3 and CDM-1 (CDM, 2007i).

Tier II includes determining the mechanism and rate of the attenuation processes. Given the relationship established between arsenic phases and lithology, one of the mechanisms is the precipitation of arsenic sulfide as groundwater moves from High Permeability Sandy Zones through Low Permeability Silt/Clay Zones. The reducing conditions and presence of sulfur in the Low Permeability Silt/Clay Zones has resulted in the precipitation of the arsenic into sulfide compounds.

Biologically mediated formation of sulfides is typically much faster than the abiotic rate (O'Day et al., 2004). However, even when using the abiotic half life of weeks, there is sufficient residence time within the Low Permeability Silt/Clay Zones for the

precipitation of arsenic sulfide to occur. The fact that the groundwater in contact with the Low Permeability Silt/Clay Zones, such as found in monitoring well LF-26, is in approximate equilibrium with orpiment (CDM, 2008b), confirms that the reaction rates are as fast or faster than the residence time of the groundwater as it passes from High Permeability Sandy Zones through Low Permeability Silt/Clay Zones and then back into High Permeability Sandy Zones.

The other mechanism is the adsorption of arsenic to aquifer matrix within the High Permeability Sandy Zones, and to a lesser extent adsorption of arsenic within the Lower Permeability Silt/Clay Zones. However, based on testing conducting to determine the composition of arsenic bound to soil, arsenic sulfide precipitation appears to be dominant process for the attenuation of arsenic (CDM, 2008b).

Tier III, as presented in the USEPA document, includes the determination of the capacity of the aquifer to attenuate the dissolved mass of contaminant within the plume and the stability of the immobilized contaminant to resist re-mobilization.

Arsenic Sulfide Precipitation

As presented in Section 2.4.3.3, precipitation of arsenic in silt/clay zones into arsenic sulfides was determined to be one of the primary mechanisms for the attenuation of the arsenic plume. The naturally-occurring sulfate concentrations within the Low Permeability Silt/Clay Zones, which is typical of the bay muds, are stable under existing conditions and would remain stable under the proposed remedial alternatives. Sulfate within the Low Permeability Silt/Clay Zones will continue to provide an energy source for the resident bacteria and sulfur source for arsenic precipitation.

In addition, changes in redox conditions could affect the re-mobilization of arsenic sulfide precipitate (e.g., orpiment), within the Low Permeability Silt/Clay Zones. At a pH of 6.75 S.U., such as those conditions observed in monitoring well LF-26 and other downgradient margins of the Site, increases in dissolved oxygen within the Low Permeability Silt/Clay Zones could have an impact on the solubility of orpiment.

However, it does not appear that there would be an adequate source of oxygen to oxidize the arsenic sulfide precipitates. Stoichiometrically, six moles of oxygen are required to oxidize one mole of orpiment, i.e., for every gram of dissolved oxygen increase in water, up to 0.78 gram of arsenic would be dissolved. Based on the stoichiometric oxidation of orpiment as follows:

$$As_2S_{3(s)} + 6O_2 \rightarrow 2As^{+3} + 3SO_4^{2-}$$

Due to competing reactions for dissolved oxygen in a groundwater system, considerably more oxygen would be needed to dissolve one mole of orpiment than is actually present in the system.

The potential for changes in redox conditions from addition of oxygen is limited to: 1) diffusion of oxygen at the groundwater surface; 2) infiltration of rainwater with dissolved oxygen; and 3) movement of groundwater from upgradient containing

dissolved oxygen. Based on Fickian diffusion, less than 1 kilogram of oxygen per year would diffuse from atmospheric oxygen through the groundwater surface to the Low Permeability Silt/Clay Zones at the Site. Infiltration of 30 percent of incident rainwater with a dissolved oxygen content of 8 mg/L would result in approximately 3 kilograms of oxygen per year to the subsurface. Based on a groundwater velocity of 0.5 feet per day and 3 mg/L of dissolved oxygen, the movement of groundwater through the Site would add approximately 9.3 kilograms of oxygen per year, resulting in a total addition of approximately 13.2 kilograms per year of oxygen to the Site.

An analysis of the organic content of the Low Permeability Silt/Clay Zones indicates that sufficient organic carbon is present to maintain reducing conditions and limit oxidation of the arsenic sulfide. Sampling has revealed organic carbon in Site saturated zone soil ranging from 385 mg/kg to 16,900 mg/kg, with an average concentration of approximately 3,200 mg/kg and a 95 percent UCL of the mean of approximately 5,100 mg/kg (ENTRIX, 2002). In the presence of sulfate, i.e., electron acceptor, the anaerobic bacteria will facilitate the formation of arsenic sulfides (i.e., orpiment). Therefore, reduction of sulfate in the presence of organic carbon can be expressed, excluding consideration of nutrients, as follows (Metcalf & Eddy, 1979):

$$6CH_2O + 3SO_4^{2-} \text{ (bacteria)} \rightarrow 6CO_2 + 3S^{2-} + 6H_2O$$

Where two moles of organic substrate (CH_2O) are consumed for each mole of sulfate reduced. Combining the oxidation reaction with reduction reaction, one mole of carbon is needed to reduce each mole of oxygen or approximately 0.375 grams of carbon are needed to reduce each gram of oxygen added to the subsurface.

Based on the estimated volume of low permeability material and an average organic carbon of 3,200 mg/kg, there is enough organic carbon present to maintain the sulfate-reducing conditions at the Site for the foreseeable future.

Therefore, given the transport dynamics of the aquifer and identified geochemical conditions, changes in redox conditions are not anticipated to affect the long-term stability of the arsenic sulfide at the Site.

Arsenic Sorption

As presented in Section 2.4.3.2, adsorption of arsenic in sandy zones was determined to be one of the primary mechanisms for the attenuation of the arsenic plume. The sorbed arsenic in the sandy zones, unlike the arsenic sulfide precipitates generated in silt/clay zones, is in equilibrium with arsenic groundwater concentrations, i.e., is a sink for arsenic rather than a source. The partitioning of arsenic onto aquifer solids is strongly affected by redox conditions, pH, and relative abundance of competing ions.

The soil-water partition coefficient (K_d) for arsenic in these zones expresses the relationship between the arsenic present in soil and groundwater. The K_d is affected by the redox conditions. The redox conditions in the more permeable sandy zones have been reducing due to the presence of elevated anthropogenic organic compounds, which has resulted in bacterial consumption of dissolved oxygen and other potential electron donors (sulfate, nitrate, etc.) (see Section 2.4.2.2). As these

organic compounds attenuate, redox conditions could become less reducing in the permeable sand zones. However, even under relatively low redox conditions, sorption of arsenic has been the primary attenuation mechanism in the areas downgradient of the release area.

As redox conditions become more oxidizing, a higher fraction of dissolved iron in groundwater will precipitate as amorphous iron hydroxides, increasing the opportunity for arsenic adsorption and/or co-precipitation with the iron hydroxides. The adsorption capacity of amorphous iron hydroxides has been measured at approximately 34,000 mg of arsenic per kg of iron hydroxide at a pH value of 7 (Pierce and Moore, 1982).

Therefore, given the transport dynamics of the aquifer and identified geochemical conditions, changes in redox conditions in the more permeable continuous sand zones (currently reducing and becoming more oxidizing in the long-term) should act to enhance the attenuation of dissolved arsenic in groundwater downgradient of the release areas.

2.4.3.6 Natural Attenuation of Organic Compounds

Concentrations of organic compounds in groundwater have also attenuated by several orders of magnitude between the release areas and the downgradient property boundary (LFR, 2008). The attenuation is due to several processes, including naturally occurring biodegradation. Remedial investigations and continued groundwater monitoring for organic COCs have demonstrated this attenuation (ENTRIX, 2002 and CDM, 2005). Concentrations of organic COCs from wells near the downgradient property boundary are below Site cleanup goals.

2.4.4 Risk Assessment

Gradient completed a human health risk assessment (HHRA) of the Site in February 2005. This risk assessment supplements the Current Conditions Risk Screen (CCRS), completed by EarthRisk in 2002. The CCRS evaluated the potential human and ecological exposures to Site COCs assuming existing conditions with the interim remedial measures (IRMs) in place (discussed below in Section 2.4.5). The CCRS concluded that VOCs potentially migrating to the surface and into the air do not present an ecological or human health concern with the IRMs in place, under current conditions.

Since the remediation of COCs at the Site is already anticipated, the final HHRA does not follow the format of a typical baseline HHRA, which would calculate risks assuming that no remediation would be done. Instead, the primary goal of the final HHRA was to develop risk-based target levels (RBTLs), for COCs in soil and groundwater using exposure scenarios that correspond with the anticipated future land uses of the Site. These risk-based remediation standards are intended to be protective of potential human receptors after redevelopment of the Site.

2.4.4.1 Identification of COCs

Based on an evaluation of the remedial investigations conducted, the Site HHRA identified 34 COCs in Site soil and/or groundwater (Gradient, 2005):

1,2,3-trichloropropane	ethylbenzene
1,2,4-trimethylbenzene	iron
1,2-dichloroethane	isophorone
1,2-dichloropropane	lead
1,3,5-trimethylbenzene	manganese
2-butanone	methyl isobutyl ketone
4-chloroaniline	methyl tert butyl ether
acetone	naphthalene
antimony	phenanthrene
arsenic	selenium
barium	silver
benzene	tetrachloroethene
benzo(a)anthracene	toluene
benzo(b)fluoranthene	trichloroethene
benzo(b,k)fluoranthene	vinyl chloride
cadmium	xylenes
chromium	zinc

However, this evaluation in the 2005 HHRA did not include the data set from the December 2004 investigation. The methodologies utilized in the HHRA were applied to the December 2004 investigation data set and five additional COCs in soil and/or groundwater were identified:

chloroform	n-nitrosodiphenylamine
copper	thallium
mercury	

This evaluation is summarized in Appendix C.

2.4.4.2 Exposure Pathways

Exposure pathways for COCs at the Site were evaluated in the HHRA to assess the potential impacts to human health. Based on the analysis presented in the HHRA, it has been concluded that potential human exposure to COCs is limited to soil and groundwater (Note: soil and groundwater includes potential volatilization of COCs and exposure to receptors through soil vapor intrusion pathway) and to the following eight types of potential current and future receptors at the Site:

1. Construction Worker
2. Utility Worker
3. Landscape Worker

4. Commercial Worker
5. Teenage Recreational Visitor
6. Resident on the Ground Floor of a Multifamily Dwelling
7. Resident on the Second Floor (or higher) of a Multifamily Dwelling
8. Resident in a Single Family Home (Unrestricted Residential Use Scenario)

Exposure pathways for COCs at the Site for potential impacts to the environment are comprised of migration of COCs in groundwater to aquatic receptors to the Lower Temescal Flood Channel and San Francisco Bay.

2.4.4.3 Exposure Scenarios

The potential exposure scenarios for the COCs were presented in the HHRA. The primary goal of the final HHRA was to develop RBTLs, for COCs in soil and groundwater using exposure scenarios that corresponded with the anticipated future land uses of the Site, including unrestricted residential use. These risk-based remediation standards are intended to be protective of potential human receptors after redevelopment of the Site. An RBTL is that concentration of a COC that poses no significant adverse health effect for individuals at a specified level of risk. An RBTL reflects exposure patterns for the various receptors expected to use portions of the Site. Thus, there are unique RBTLs for each of the eight potential human receptors, reflecting the manner in which each of these receptors would be exposed to soils and groundwater at the Site.

RBTLs were calculated for individual COCs with both a target risk of 10^{-6} and for a target non-cancer hazard of 1.0. RBTLs based on a target risk of 10^{-5} were also calculated because the arsenic RBTL calculated using a target risk of 10^{-6} resulted in a concentration less than the background arsenic concentration for San Francisco Bay area soils. Unique RBTLs were developed for each receptor consistent with anticipated future land use – residents, recreational visitors, commercial/retail workers, utility workers, landscape workers, and construction workers. A total of 23 combinations of human receptor-type and target risk were evaluated for soil and 18 combinations for groundwater. RBTLs are applicable to all areas of the Site where that particular receptor is selected as the basis of risk management and remediation decisions.

2.4.4.4 Vadose Zone Soil

In the HHRA, Gradient developed RBTLs for COCs in vadose zone soil, which apply to all portions of the Site. Table 2-1 presents these RBTLs for commercial worker and unrestricted resident receptors with a cancer risk target of 1.0E-06 and a non-cancer hazard quotient of 1.0. Leaching of COCs from soil to groundwater at the Site poses a potential threat to the beneficial uses of groundwater. The RBTLs for the soil COCs listed in Table 2-1 have been evaluated against concentrations that would be protective of Site groundwater through comparison with USEPA Region 9 PRGs

migration to groundwater using a dilution attenuation factor of 1.0 and USEPA Region 9 PRGs for tap water (Gradient, 2005).

2.4.4.5 Groundwater

In the HHRA, Gradient also developed RBTLs for COCs in groundwater. For a cancer risk target of 10^{-6} and a non-cancer hazard quotient of 1.0, the most conservative RBTL (i.e., lowest RBTL) are presented in Table 2-2.

2.4.5 Interim Remedial Measures

2.4.5.1 Previous Removal Actions

There have been two removal actions at the Site:

- Between 1973 and 1994, the solvent and oil tank farm and the lacquer plant were removed from the Site. This was primarily due to the conversion from oil-based to water-based paint products. Soils in the area of the solvent tank farm impacted with toluene and other solvents were removed and disposed off-site prior to 1990.

- Based on an investigation of soil samples collected adjacent to the S-W Site, in 1997, soils along Horton Street impacted with arsenic and lead were excavated and disposed off-site.

2.4.5.2 Other Remedial Measures

In the early 1990s, S-W implemented the IRMs under the oversight of the Water Board, recognizing the need to control off-site migration of groundwater and human exposure to soils prior to implementation of a final Site remedy. The IRMs consisted of:

- A soil-bentonite slurry wall and a cement-bentonite slurry wall to contain chemically affected areas and to control the migration of chemically affected groundwater at the Site to off-site areas

- An asphalt and concrete cap and storm water collection system to reduce infiltration of storm water runoff into chemically affected soils

- A groundwater extraction and treatment (GWET) system to pump groundwater from inside the slurry wall in an attempt to create an inward hydraulic gradient across the slurry wall and treat the groundwater

S-W started construction of the slurry wall in 1993. The slurry wall was completed in November 1994. Construction of the cap and storm water collection system occurred between March 1995 and September 1995. The GWET system was installed between June and September 1995 and began operation in October 1995. Details on the installation of the IRMs are provided in the Interim Remedial Measures Completion Report dated April 19, 1996 (LFR 1996).

Between 1997 and 1998, S-W upgraded the IRMs:

- In late 1997, a multipoint collection system was installed to isolate the storm water collection system from infiltration of groundwater
- In 1998, an additional groundwater extraction wells were installed for improving hydraulic control of affected groundwater.

In 1998, LFR conducted an evaluation of the Site IRMs (LFR, 1998). LFR concluded in its evaluation that:

- The IRMs have been moderately effective in controlling off-site migration of impacted groundwater, as they have not consistently maintained an inward hydraulic gradient across the slurry wall
- Frequent system shutdowns have hindered the effectiveness of the IRMs
- Human exposure to impacted soils has been reduced through the installation of the asphalt and concrete cap.

Since the 1998 LFR report, changes made to the GWET system have improved the ability to maintain an inward hydraulic gradient and have increased chemical mass removal. The changes recommended and implemented were:

- Installation and operation of additional groundwater extraction wells, increasing the extraction system well count inside the slurry wall from three to 10, and installation of three extraction wells on the former Rifkin property
- Modifications to the groundwater treatment system technology by replacing the electrochemical co-precipitation system for metal removal (and the biological system for organics removal) with a proprietary reductive precipitation technology and activated coconut-shell based carbon

In 2006, CDM conducted an evaluation of the IRMs (CDM, 2006a). CDM concluded that the slurry wall layout was necessarily constrained by property boundaries to the north, east, and west, and most notably constrained to the south by the footprint of the plant's primary warehousing, production and shipping facility (i.e., Building 35). These physical constraints limited the effectiveness of the slurry wall to fully contain affected groundwater as demonstrated below:

- Soil and groundwater data indicate that prior to the IRMs, arsenic migration occurred northward from the S-W property, onto the former Rifkin property.
- Soil and groundwater data indicate that prior to the IRMs, arsenic migration occurred to the northwest and downgradient from the S-W property, onto the Union Pacific Railroad Emeryville Yard and active main line tracks.

- Soil and groundwater data indicate arsenic migration occurred along or under the northern portion of Building 35, outside of the slurry wall installation, in an area where plant operations limited the access for construction of the slurry wall.

- In general, the slurry wall is an effective barrier to migration of groundwater, as demonstrated by the differential groundwater gradients measured across piezometer/well pairs inside and outside the slurry wall; however, there are known weak points in the wall where utilities and other features penetrate the well and seasonal variations in the gradient direction across the slurry wall near Temescal Creek.

- The spur track within the slurry wall layout is a conduit for storm water infiltration.

- The groundwater extraction system is controlling groundwater elevations within the slurry wall layout. However, maintenance of an inward hydraulic gradient is strongly influenced by the proximity of extraction wells to the wall, the spur track, and the areas of the wall in relation to the northwesterly hydraulic gradient.

- The groundwater treatment system requires extensive operational and maintenance efforts, but has been and is effective at treating influent concentrations to comply with permitted discharge limits.

2.5 Summary of Treatability Study Findings

The CSM was used to assess the adequacy of the Site characterization for evaluation of appropriate response actions, and identify whether more information (i.e., data gap assessment) is required to evaluate possible treatment technologies under these response actions. This data gap assessment revealed additional information was required to evaluate retained groundwater and soil treatment technologies. The proposed methods for filling these data gaps were presented in the *Treatability Study Work Plan* (CDM, 2006b) and subsequent addenda (CDM, 2006a; CDM, 2007f; CDM, 2007e; and CDM, 2007a). The findings from the treatability studies, with respect to groundwater and soil, are summarized below.

2.5.1 In Situ Groundwater Treatment

The data gap analysis revealed the need for additional information to adequately evaluate the potential effectiveness of two in situ groundwater remedial technologies; a passive process and an active process. These two processes are described below.

- **Passive Process**: Use of natural or engineered materials can function to remove arsenic from groundwater via processes including physical adsorption, chemical precipitation, and biological precipitation. Various materials are commercially available and have various capacities for adsorption of arsenic(+3) and arsenic(+5). Some materials are also capable of oxidation of arsenic(+3) to arsenic(+5) which can be more strongly adsorbed to these materials.

Groundwater would passively flow through materials placed in the saturated zone and arsenic would be adsorbed. The materials may need to be periodically replaced if their capacity is exhausted or to maintain effective permeability through the media. Given appropriate oxidation-reduction conditions (either naturally occurring or induced), iron-rich materials can promote arsenic co-precipitation with ferric iron oxyhydroxides. Another passive in situ groundwater treatment option is based on biological production of sulfide that can precipitate arsenic. In this option, in-ground biological reactions could be induced via introduction of a slow release biodegradable electron donor and sulfur to produce sulfide. Upon contact with arsenic-containing groundwater, the sulfide would react with arsenic to generate an arsenic sulfide and precipitate the arsenic from the groundwater. The slow release electron donor and sulfur source may need to be periodically replaced and/or the precipitate periodically removed to maintain effective permeability.

- **Active Process**: Arsenic in groundwater can be treated using an active in situ treatment option via air sparging combined with iron addition to promote arsenic co-precipitation with or adsorption onto formed ferric iron oxyhydroxides. Preliminary laboratory studies were conducted by CDM to evaluate the potential for ferrous iron addition and air sparging for arsenic removal from Site groundwater (CDM, 2005). These studies were successful. However, additional data are needed to supplement the initial findings.

The evaluation of these options was conducted in a phased approach (i.e., Phase I - laboratory screening, Phase II - bench-scale-testing, and Phase III - pilot-scale testing).

2.5.1.1 Phase I Testing

As presented in the *Emeryville Facility Groundwater Treatability Study for Laboratory Screening Studies* (CDM, 2007f), materials selected for treatability testing as passive in situ groundwater treatment options included the following:

- Granular ferric hydroxide (e.g., US Filter GFH and Severn Trent Bayoxide E33)
- Taconite iron ore
- Blast furnace slag
- Steel furnace slag
- Zero-valent iron
- Anaerobic biological process option using slow release electron donor and sulfur source (e.g., Regenesis MRC™)

Granular ferric hydroxide, taconite iron ore, blast furnace slag, and steel furnace slag were tested for their effectiveness as arsenic adsorbents (adsorptive media). Zero-valent iron (ZVI) was evaluated for its effectiveness as a reductant and/or adsorbent for arsenic. The anaerobic biological process option was evaluated as a passive system to precipitate arsenic.

Two active in situ arsenic groundwater process options selected for treatability study testing are:

- Ferrous chloride addition and aeration with optional polymer addition
- Ferrous chloride addition and hydrogen peroxide addition

The addition of ferrous chloride addition and aeration of groundwater results in the formation of fresh ferric oxyhydroxides, which are effective for arsenic adsorption. Aeration functions to promote biodegradation of organic contaminants in groundwater and other biodegradable organic carbon, which impacts whether the formed ferric oxyhydroxide arsenic co-precipitates remain in an oxidized and solid-phase state. Polymer addition to this process facilitates larger floc formation, which is important for settling and/or filtration of solids from groundwater. Hydrogen peroxide can also be used to oxidize added ferrous iron to ferric oxides that can co-precipitate or adsorb arsenic

Conclusions of Laboratory Testing

Passive Adsorption

Analytical results showed that adsorptive media, GFH and Bayoxide E33 in particular, had the greatest arsenic removals; followed by ZVI, taconite iron ore, steel furnace slag, and blast furnace slag. GFH, Bayoxide E33, and ZVI were successful in reducing arsenic concentrations to less than 0.010 mg/L.

GFH, Bayoxide E33, and taconite iron ore resulted in the lowest final dissolved iron concentrations, followed by steel furnace slag and blast furnace slag. ZVI resulted in the highest dissolved iron concentrations. An advantage of dissolved iron generation in a field application is that it can migrate downgradient and eventually become oxidized and adsorb or co-precipitate additional arsenic. A disadvantage of elevated dissolved iron is that is can precipitate and potentially cause aquifer plugging. These passive adsorption tests were only conducted for 48 hours. Over a longer period of time, anaerobic microbial activity by iron-reducing bacteria may also lead to reduction of GFH and Bayoxide E33 and possibly taconite iron ore and result in generation of greater amounts of dissolved ferrous iron.

The higher doses of media resulted in greater reductions of dissolved arsenic when compared to the respective lower dose tests. However, both low and high doses of the media resulted in greater than 50 percent arsenic removal, the performance metric for this Phase I study.

Active Precipitation

Arsenic concentrations were reduced by more than 50 percent in tests using groundwater from LF-10 and MW-5 and the active precipitation process. Arsenic concentrations were reduced to less than 0.010 mg/L with LF-10 groundwater. Greater arsenic removal in MW-5 groundwater tests would likely have occurred if buffer was added to control pH reduction. Reduction of dissolved arsenic

concentrations in LF-10 groundwater to less than 0.010 mg/L required addition of 300 mg/L iron. This iron addition rate resulted in generation of 600 to 700 mg/L TSS.

Oxidative Precipitation

Use of iron-containing materials in the presence or absence of a reducing agent (i.e., dithionite) resulted in maximum generation of about 3 mg/L of dissolved iron after about 5 weeks of incubation. This concentration of dissolved iron was less than 10 percent of the baseline dissolved iron concentration in groundwater from LF-10 and did not significantly contribute to arsenic removal. Hydrogen peroxide addition did promote arsenic removal from LF-10 groundwater because it oxidized ambient dissolved iron. Hydrogen peroxide resulted in minor reduction of TOC and COD in LF-10 groundwater.

Biological Reduction

The biological process for arsenic removal was ineffective with groundwater from EX-8, removing more than 50 percent arsenic in some but not all of the tests. However, arsenic removal was also greater than 50 percent in the absence of added MRC™, indicating that arsenic removal was predominately attributable to factors other than MRC addition.

2.5.1.2 Phase II Testing

In Phase II testing, as outlined in the *Treatability Study Report for Phase II In Situ Groundwater Treatment - Groundwater Column Studies* (CDM, 2007a), bench-scale column studies were conducted on several media combinations to determine their suitability for use in treatment of contaminated groundwater at the Site. The groundwater used in this study was extracted from two wells, LF-10 and CDM-1 at the Site (see figures presented in Appendix A).

Column packing materials were selected based on results from Phase I of the treatability study. In Phase II of the treatability study, five packing materials were studied. The materials used and rationale behind their selection are described below:

- 20% zero valent iron (ZVI), 20% organic compost, 20% gypsum, 40% sand (columns 1, 6, 11, and 16) – This mixture was designed to reduce the quantity of ZVI tested (and thus the full-scale cost) and to provide a source of sulfate (i.e., gypsum) and electron donor (i.e., compost) to promote biogeochemical reduction of sulfate to sulfide and effective arsenic removal. One potential risk from the mixture was the potential for the formation of hydrogen sulfide. ZVI usually precipitates sulfide, but this risk was evaluated during the study.

- 20% ZVI, 20% organic compost, 60% sand (columns 2, 7, 12, and 17) – This mixture was similar to the previous mix but replaces the gypsum with sand. This mixture would not benefit from any positive attributes of the gypsum, but it also would not carry the risk of hydrogen sulfide formation.

- 20% ZVI, 80% taconite (columns 3, 8, 13, and 18) – This mixture was intended to test the potentially synergistic effects of ZVI and taconite while reducing cost compared to pure ZVI. Both materials were effective in the Phase I test. The first batch of taconite procured for the study contained an excessive level of fine particles not consistent with the particle size distribution of ZVI. Only material retained in a #20 sieve was used in the TS. The second batch of taconite used for the study was pre-sieved off-site using the same sieve size.

- 100% Taconite (columns 4, 9, 14, and 19) – This test was intended to further evaluate this material. As noted above, only material retained in a #20 sieve was used in the TS.

- 20% ZVI, 80% sand (columns 5, 10, 15, and 20) – This test was intended to further evaluation of ZVI, but at a lower volumetric fraction to reduce the cost of the mixture.

- 100% Sand (columns 21, and later, 22) – These columns were used as controls to determine any positive or negative effects of the testing configuration that are independent of the packing material.

Testing Setup

Columns 1 through 10 were operated with groundwater from well LF-10 and Columns 11 through 22 were operated with groundwater from well CDM-1. Columns 1 through 5 and 11 through 15 were designed to operate at a hydraulic residence time of approximately 1 day. Columns 6 through 10 and 16 through 21 were designed to operate at a hydraulic residence time of approximately 7 days. Samples were taken from the sampling port installed at the inlet and outlet of the columns.

Conclusions

- All columns with mixtures of 20% ZVI and 80% sand produced effluent with non-detect levels of arsenic for the first month of operation (approximately 50 pore volumes).

- One column with the mixture of ZVI, sand, gypsum and compost, demonstrated arsenic breakthrough above 0.036 mg/L after approximately 50 pore volumes of water from the more contaminated well (CDM-1).

- One column with the mixture of ZVI, sand, and compost, demonstrated arsenic breakthrough above 0.036 mg/L after approximately 50 pore volumes of water from the more contaminated well (CDM-1). A duplicate of this column and other columns with this material and less arsenic loading did not break through.

- All columns containing taconite or taconite mixtures except one demonstrated arsenic breakthrough. One column had arsenic breakthrough at levels below 0.036 mg/L, but the remainder had effluent arsenic concentrations above 0.036 mg/L with less than 1 pore volume of total flow.

Constant head tests indicated that columns filled with 100% taconite had the highest permeability constant, 1.44 centimeters/second (cm/s), while columns containing gypsum had the lowest observed permeability on average (0.011 cm/s). The sand control column had higher permeability as expected (0.96 cm/s). The addition of ZVI and/or compost to sand also reduced its permeability, although not as significantly as the gypsum.

Based on these data collected during the first month, the best-performing material or mix of materials to date is the 20% ZVI and 80% sand mixture. Dilution of this mixture with additional compost or compost and gypsum in place of sand did not provide any measurable benefit with respect to arsenic removal during this first month.

In addition, the Phase II testing results, along with an economic analysis, concluded that an active in situ treatment process may be as cost-effective for in situ treatment of arsenic in groundwater as the tested passive treatment process materials and that an active treatment process involving precipitation should be carried forward into Phase III testing.

2.5.1.3 Phase III Testing

Phase III testing of the passive treatment process, as outlined in the *Treatability Study Report for Phase III In Situ Groundwater Treatment - Groundwater Column Studies* (CDM, 2008c), involved long-term operation of select Phase II testing columns, primarily those with ZVI, sand, and/or compost mixtures, for potential remedial design evaluation.

The Phase III testing of the active treatment process tested a precipitation, coagulation, and flocculation process for either an in situ or ex situ treatment system. In the Phase III testing system, groundwater entered the first stage of the active treatment where iron in the form of ferric chloride or ferrous sulfate was mixed in the groundwater. Air sparging to promote mixing and oxidation of iron and arsenic was also be introduced in stage one. This oxidation step results in iron precipitation and subsequent arsenic precipitation. Polymer, also injected in the first stage of the process, was injected to help the iron oxides form a flocculate to aide in precipitation. The groundwater was then discharged into the second stage of the active treatment, which was designed to provide sufficient residence time for the flocculent to settle out of the groundwater. The final stage, stage 3, provided additional settling for carry over of particulate from stage 2.

In an in situ active treatment system, the treatment stages would be achieved through a series of concrete vaults placed within each of three breaches in the existing slurry wall. Flow through the vaults would be driven by the hydraulic gradient. The aboveground active treatment system would pump groundwater through above ground tanks and clarifiers comprising the 3 treatment stages and into Temescal Creek. An additional option for either active treatment system that was tested was the addition of permanganate in the first stage to break potential arsenic-organic complexes and reduce sludge production.

Conclusions

- One column with the mixture of ZVI, compost, and sand removed high concentrations of arsenic from well CDM-1 groundwater to nondetectable concentrations for approximately 110 pore volumes. However, a duplicate of this column demonstrated arsenic breakthrough above 0.036 mg/L after approximately 45 pore volumes of water.

- Columns with mixtures of sand and ZVI remove arsenic from well CDM-1 groundwater to less than 0.036 mg/L for approximately 50 pore volumes.

- When subjected to the lower concentrations of arsenic from LF-10, both the ZVI/sand and ZVI/sand/compost mixtures continue to remove arsenic to below detection limits for the duration of the study and at least 175 pore volumes of groundwater.

- A larger 6-inch column filled with the ZVI/sand mixture demonstrated similar performance to the corresponding 3-inch column with respect to potential number of pore volumes that could be treated.

- An active process can effectively precipitate arsenic from groundwater extracted from wells CDM-1 and LF-10. Consistent reduction in dissolved concentrations below the 0.036 mg/L threshold was accomplished.

- In the active process, total concentrations were reduced below 0.10 mg/L, but not 0.036 mg/L. It is expected that additional optimizations in chemical dosage and the proportionally larger settling basins that would be used in a full scale system would be sufficient to reduce total concentrations below the 0.036 mg/L threshold consistently.

- In the active process, the optimal chemical doses for treatment of groundwater from LF-10 were approximately 20 mg/L of ferric chloride and 0.078 mg/L of organic polymer. The optimal chemical doses for treatment at CDM-1 were 59 mg/L of ferric chloride, 37 mg/L of sodium hydroxide, 2.6 mg/L of potassium permanganate, and 0.053 mg/L of organic polymer.

With respect to long-term arsenic removal with a PRB process option, the ZVI/compost/sand and ZVI/sand mixtures performed best at the conclusion of Phase III testing. For the purposes of conceptual remediation design within the FS evaluation, the 20% ZVI and 80% sand mixture, with a conservative number of 50 pore volumes of groundwater treatment prior to arsenic breakthrough, will be used as the basis for a PRB process option.

2.5.2 In Situ Soil Treatment

The data gap analysis revealed the need for additional information to adequately evaluate the potential effectiveness of two soil remedial technologies: grout injection and soil mixing. Under both of these in situ soil treatment options, the primary

objective for reducing the mobility of arsenic is decreasing the permeability of the targeted soil mass.

2.5.2.1 Grout Injection

Grout injection can be used to improve soil strength and reduce permeability of targeted soils via injection of grout into the soil through driven probes at low to moderate pressures to permeate the voids. This is accomplished without significantly changing the soil's structure or volume. Effectiveness of this technique is dependent upon the volume or percentage of voids that can be penetrated by the grout mixture. Grout mixture design and proper spacing of the injection points are critical to the effectiveness of the treatment technique.

The grout injection treatability study (CDM, 2007b) followed the procedures outlined below:

1. Pre-grout injection aquifer testing, including installation of an extraction well and two piezometers in the test area.

2. Abandonment of the extraction well and two piezometers in the test area.

3. Grout injection.

4. Post-grout injection aquifer testing, including installation of a new set of one extraction well and two piezometers in the test area.

Grout injection testing consisted of 25 grout injection points in a 5 by 5 grid, within an area approximately 12 feet by 12 feet (plus one additional point outside of this grid). This spacing pattern was selected after a review of the pre-injection aquifer testing results which yielded a higher than expected net aquifer permeability.

The original grout injection treatability plan called for Ultrafine cement in a 3:1 to 5:1 by weight to water grout mixture to be injected at all 25 grout locations. However, due to the lithologies encountered during the installation of the pre-grout injection extraction well and piezometers and the pre-injection aquifer testing results, Type III cement was hypothesized to be potentially suitable in a grout mixture for injection. Therefore, Type III cement was substituted for Ultrafine cement at two grout injection locations.

Results

In summary, the grout injection had a distinct affect on aquifer hydraulics. Using the pre-grout pumping rate of approximately 1 gallon per minute (gpm), the post-grout draw down was so rapid in the pumping well that the extraction lasted only 23 minutes in the May 2007 and only 19 minutes in the July 2007 testing. During pre-grout injection aquifer testing conducted in February 2007, significant draw down of the well was not achieved over an 8-hour pumping period.

However, grout injection only achieved an overall permeability reduction to 10^{-5} cm/sec, which was less than the data quality objective of 10^{-7} cm/sec. In addition, grout injection was accompanied with temporary fluctuations of pH, which may contribute to a release of arsenic into groundwater from the sandy lithologies (i.e., source material for arsenic to groundwater).

2.5.2.2 Soil Mixing

The practice of mixing soil with various reagents, such as cement, lime, and bentonite, has been used in the United States since the mid 1930s. Early applications were used for improving the engineering properties of soil for civil construction projects, including road and dam construction. Current soil mixing techniques involve construction of overlapping piles by injecting cement mixed grout from the tip of a drill rig's auger into the soil.

A bench-scale study for assessing the effectiveness of soil mixing for reducing soil permeability was conducted (CDM, 2007g). The testing included seventeen (17) potential grout mixes with various proportions of potable water, Site groundwater, cement, bentonite and a cement plasticizer. This was performed not only to test a variety of potential cement and bentonite mixes but also to determine whether Site soil and/or groundwater had any adverse effects on the slurry. Nine (9) grout mixes were composed of 100 percent potable water, bentonite content of 2 or 4 percent, cement ranging from 10 to 30 percent and 0 to .3 percent of a cement plasticizer. Eight (8) grout mixes were composed of 50 percent potable water and 50 percent Site water with the same percentage of bentonite, cement and cement plasticizer.

Based on this testing, two grout mixes were selected for permeability testing. The selected grout mixes consisted of a 1:2 grout soil ratio with 4% bentonite, 20% cement and 0.2 cement plasticizer. One mix was composed a 100% potable water and other mix was composed 50% potable water and 50% Site groundwater. Additionally, two samples were prepared at a 1:4 grout to soil ratio, both having 40 percent cement and 0.4 percent cement plasticizer at a 100 percent potable water and a 50-50 potable/groundwater and no bentonite. The second set of samples was tested to evaluate how bentonite affects the hydraulic conductivity of the soil.

Hydraulic conductivity testing was performed on these samples. Test results showed that samples mixed with bentonite achieved lower hydraulic conductivities than samples that did not have bentonite. Soil-grout mixtures exhibited hydraulic conductivities of 10^{-7} cm/sec.

Long-term hydraulic conductivity testing was performed on these soil-grout samples. Testing was conducted over 76 days and readings were recorded every two to four days. Long-term permeability is lower than short-term permeability and range from 4.6×10^{-8} to 7.3×10^{-9} cm/sec.

In both cases the soil-grout mixes with bentonite had a lower hydraulic conductivity than the sample without bentonite. The hydraulic conductivity was not affected by the water conditions.

Results

The bench-scale studies demonstrated that soil mixing can achieve a reduction in permeability of less than 10^{-7} cm/sec. While soil mixing caused an increase in pH due to the bentonite and cement in the mix, this was offset by actual mixing of the sandy lithologies containing the amorphous silica phase with more reducing sandy clay and clay material,. Analyses of both potable and Site groundwater run though the bench-scale mixes showed no increase in arsenic concentration in the leachate.

In support of including soil mixing within potential remedial action alternatives based solely on the favorable results from the scale testing, CDM presented DTSC with a memorandum (CDM, 2008a) presenting an overview of soil mixing technology, including:

- History and use of soil mixing,
- Its use as the industry standard for improving soil characteristics and for environmental remediation,
- Recognition and acceptance of soil mixing by regulatory agencies, and
- Soil mixing design and construction procedures, including effectiveness bench testing for design and implementation sequence (consistent with the standard of practice in the industry).

Table 2-1
RBTLs for COCs in Vadose Zone Soil
Sherwin-Williams Emeryville Remedial Action Plan

	RBTL (mg/kg)	
	Commercial Worker	***Unrestricted Resident***
Volatile Organic Compounds		
ACETONE	1800000	70000
BENZENE	0.076	0.015
4-CHLOROANILINE	8200	310
ETHYLBENZENE	200000	7800
TETRACHLOROETHENE	0.32	0.063
TOLUENE	440	100
XYLENES	11000	2300
Semivolatile Organic Compounds		
BENZO(A)ANTHRACENE	9.5	1.1
BENZO(B)FLUORANTHENE	9.5	1.1
BENZO(B,K)FLUORANTHENE	9.5	1.1
NAPHTHALENE	41000	1300
PHENANTHRENE	160000	4500
Inorganic Compounds		
ANTIMONY	820	31
ARSENIC	24 (1)	24 (1)
BARIUM	140000	5500
CADMIUM	15	3.1
CHROMIUM (+3)	3100000	120000
CHROMIUM (+6)	41000	1600
LEAD	5600	250
SELENIUM	10000	390
ZINC	610000	23000

Notes:
RBTL - Risk Based Threshold Level
COC - Chemical of Concern
mg/kg - milligram per kilogram
(1) - The RBTL for arsenic in soil is the naturally occurring background concentration, as presented in Human Health Risk Assessment.

CDM

Table 2-2
RBTLs for COCs in Groundwater
Sherwin-Williams Emeryville Remedial Action Plan

	RBTL (mg/L)
Volatile Organic Compounds	
ACETONE	34000
BENZENE	0.046
2-BUTANONE	94
1,2-DICHLOROETHANE	0.35
1,2-DICHLOROPROPANE	0.52
ETHYLBENZENE	35
METHYL ISOBUTYL KETONE	27000
METHYL TERT BUTYL ETHER	0.66
TOLUENE	1100
TRICHLOROETHENE	6.6
1,2,3-TRICHLOROPROPANE	0.036
1,3,5-TRIMETHYLBENZENE	0.46
1,2,4-TRIMETHYLBENZENE	0.14
VINYL CHLORIDE	0.004
XYLENES	64
Semivolatile Organic Compounds	
NAPHTHALENE	7.3
Inorganic Compounds	
ARSENIC	0.8
IRON	5100
MANGANESE	2400
ZINC	8500

Notes:
RBTL - Risk Based Threshold Level from Human Health Risk Assessment
COC - Chemical of Concern
mg/L - milligram per liter

CDM

Figure 2-1
Site Location Map
Sherwin-Williams Company
Emeryville, California

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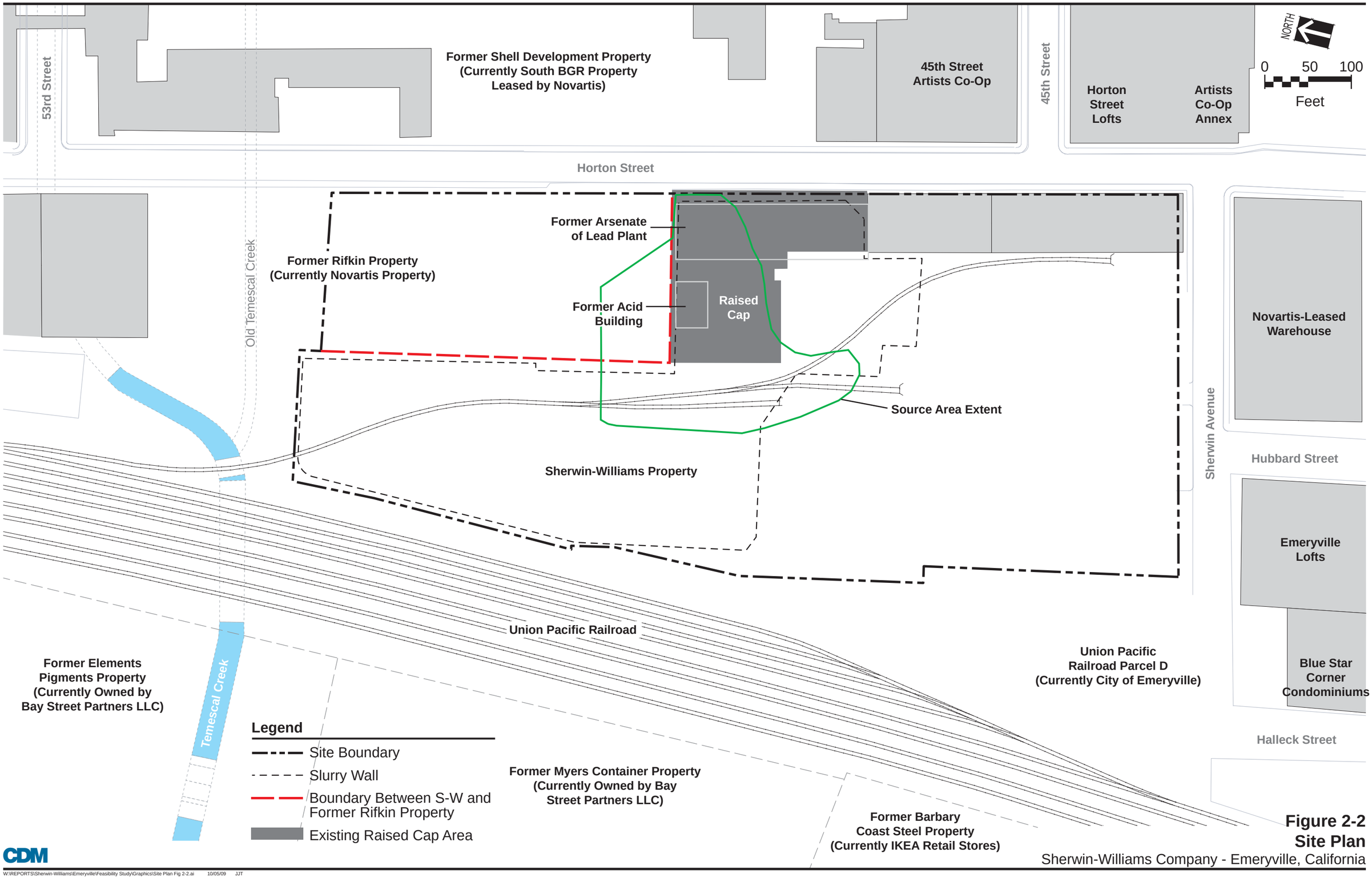

Figure 2-2
Site Plan
Sherwin-Williams Company - Emeryville, California

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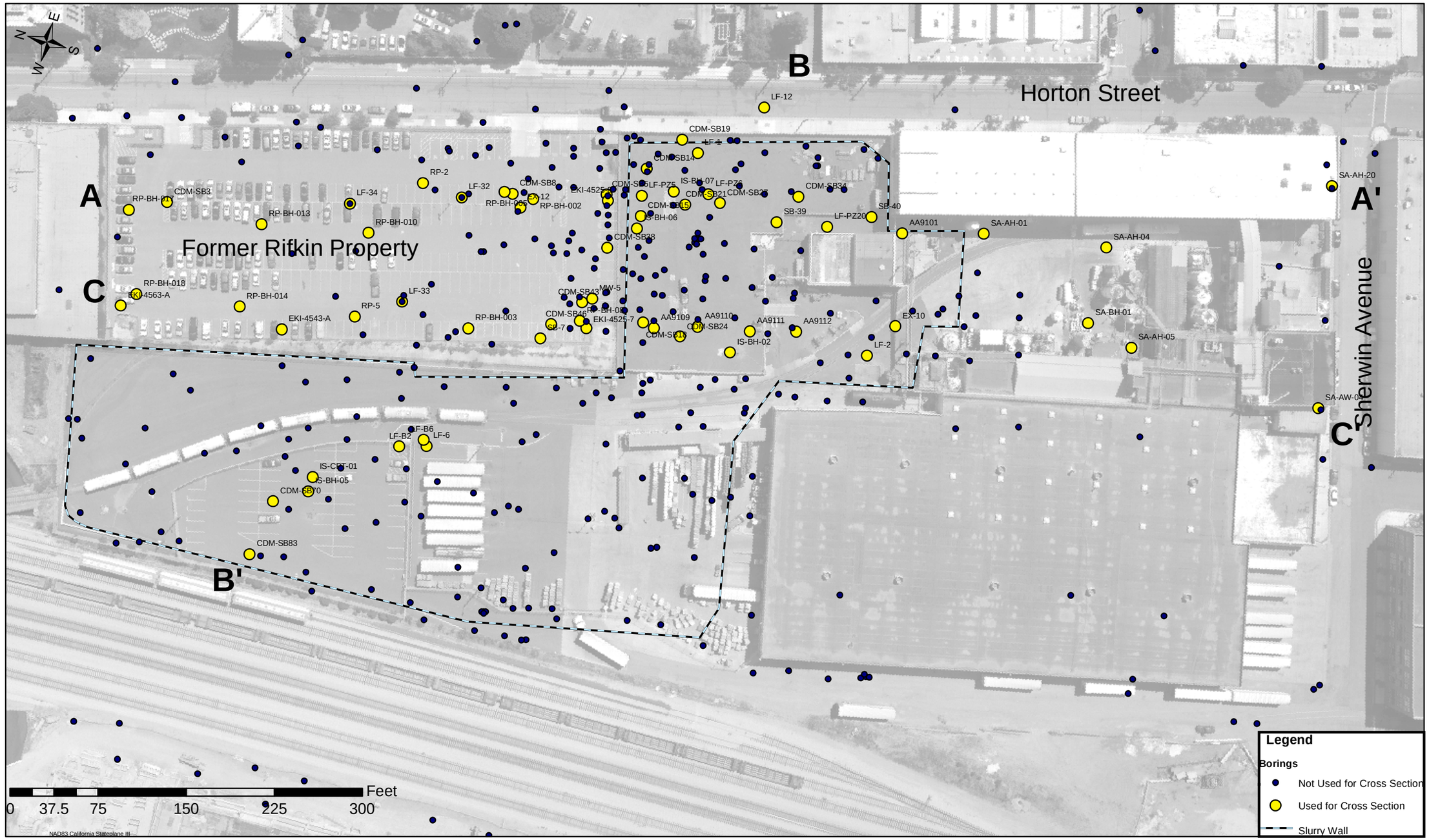
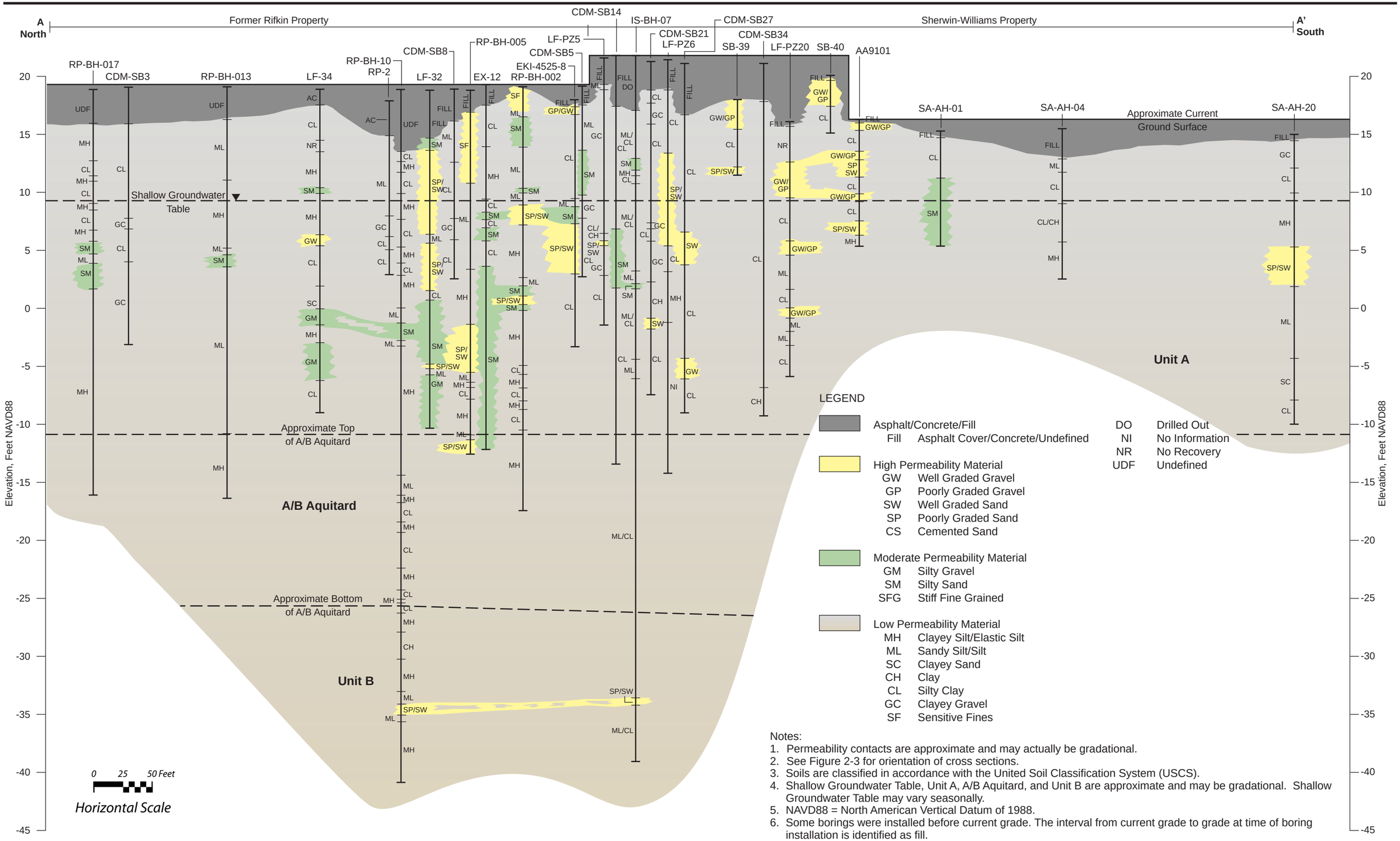


Figure 2-3
Geologic Cross Section Locations
Sherwin-Williams Company - Emeryville, California



Notes:
1. Permeability contacts are approximate and may actually be gradational.
2. See Figure 2-3 for orientation of cross sections.
3. Soils are classified in accordance with the United Soil Classification System (USCS).
4. Shallow Groundwater Table, Unit A, A/B Aquitard, and Unit B are approximate and may be gradational. Shallow Groundwater Table may vary seasonally.
5. NAVD88 = North American Vertical Datum of 1988.
6. Some borings were installed before current grade. The interval from current grade to grade at time of boring installation is identified as fill.

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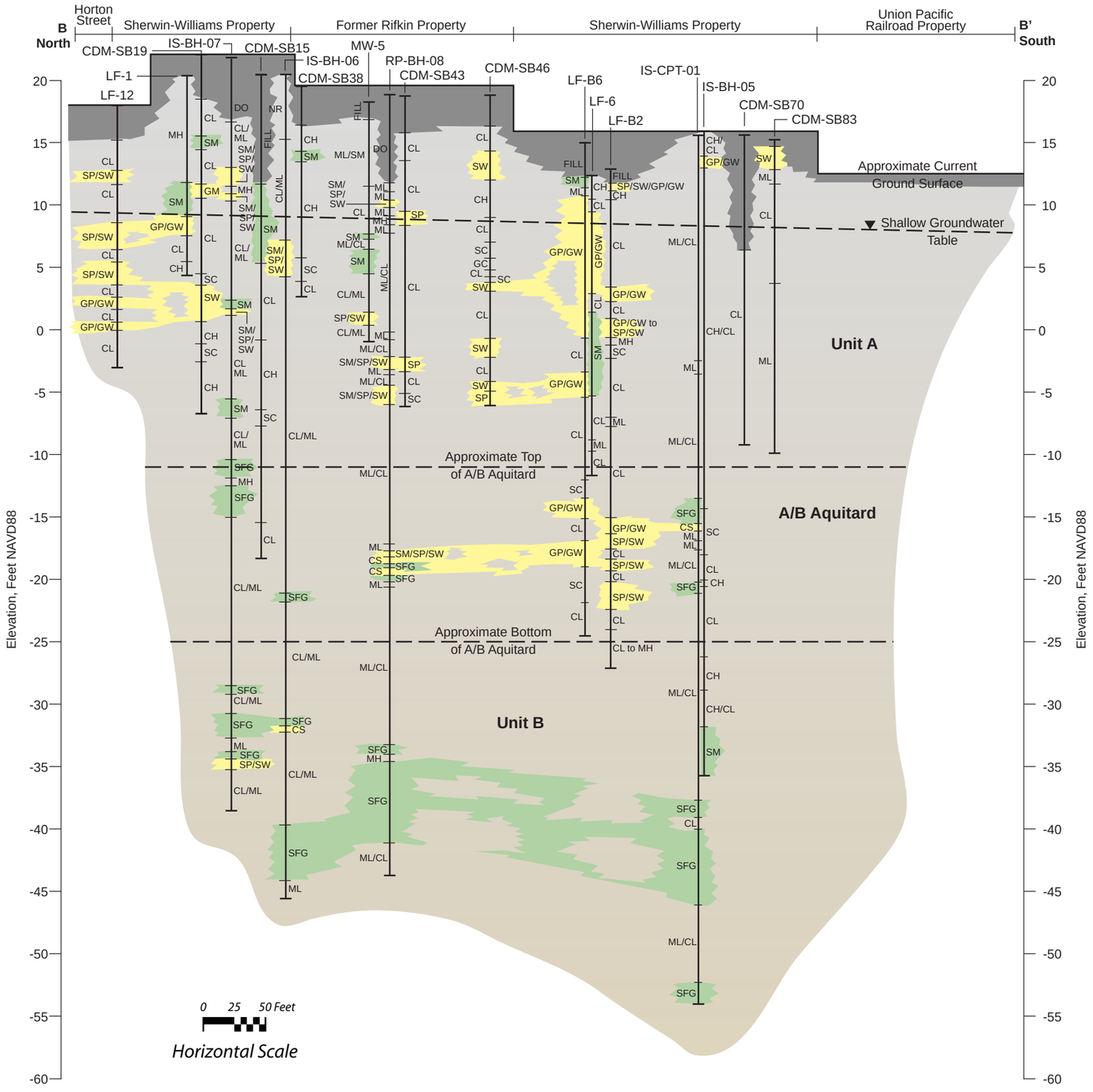
Figure 2-4
Geologic Cross Section A - A'
Sherwin-Williams Company - Emeryville, California



LEGEND

Asphalt/Concrete/Fill
Fill Asphalt Cover/Concrete/Undefined

High Permeability Material
GW Well Graded Gravel
GP Poorly Graded Gravel
SW Well Graded Sand
SP Poorly Graded Sand
CS Cemented Sand

Moderate Permeability Material
GM Silty Gravel
SM Silty Sand
SFG Stiff Fine Grained

Low Permeability Material
MH Clayey Silt/Elastic Silt
ML Sandy Silt/Silt
SC Clayey Sand
CH Clay
CL Silty Clay
GC Clayey Gravel
SF Sensitive Fines

DO Drilled Out
NI No Information
NR No Recovery
UDF Undefined

Notes:
1. Permeability contacts are approximate and may actually be gradational.
2. See Figure 2-3 for orientation of cross sections.
3. Soils are classified in accordance with the United Soil Classification System (USCS).
4. Shallow Groundwater Table, Unit A, A/B Aquitard, and Unit B are approximate and may be gradational. Shallow Groundwater Table may vary seasonally.
5. NAVD88 = North American Vertical Datum of 1988.
6. Some borings were installed before current grade. The interval from current grade to grade at time of boring installation is identified as fill.

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Figure 2-5
Geologic Cross Section B - B'
Sherwin-Williams Company - Emeryville, California

C North — Former Rifkin Property — Sherwin-Williams Property — C' South

EKI-4563-A, RP-BH-018, RP-BH-014, EKI-4543-A, RP-5, LF-33, RP-BH-003, CDM-SB46, SB-7, RP-BH-08, EKI-4525-7, CDM-SB18, AA9109, AA9110, CDM-SB24, IS-BH-02, AA9111, AA9112, LF-2, EX-10, SA-BH-01, SA-AH-05, SA-AW-04

Approximate Current Ground Surface

Approximate Shallow Groundwater Table

Unit A

Approximate Top of A/B Aquitard

Approximate Bottom of A/B Aquitard

Elevation, Feet NAVD88

20, 10, 0, -10, -20, -30, -40, -50

LEGEND

Asphalt/Concrete/Fill
- Fill — Asphalt Cover/Concrete/ Undefined

High Permeability Material
- GW — Well Graded Gravel
- GP — Poorly Graded Gravel
- SW — Well Graded Sand
- SP — Poorly Graded Sand
- CS — Cemented Sand

Moderate Permeability Material
- GM — Silty Gravel
- SM — Silty Sand
- SFG — Stiff Fine Grained

Low Permeability Material
- MH — Clayey Silt/Elastic Silt
- ML — Sandy Silt/Silt
- SC — Clayey Sand
- CH — Clay
- CL — Silty Clay
- GC — Clayey Gravel
- SF — Sensitive Fines

- DO — Drilled Out
- NI — No Information
- NR — No Recovery
- UDF — Undefined

Notes:
1. Permeability contacts are approximate and may actually be gradational.
2. See Figure 2-3 for orientation of cross sections.
3. Soils are classified in accordance with the United Soil Classification System (USCS).
4. Shallow Groundwater Table, Unit A, A/B Aquitard, and Unit B are approximate and may be gradational. Shallow Groundwater Table may vary seasonally.
5. NAVD88 = North American Vertical Datum of 1988.
6. Some borings were installed before current grade. The interval from current grade to grade at time of boring installation is identified as fill.

0 25 50 Feet

Horizontal Scale

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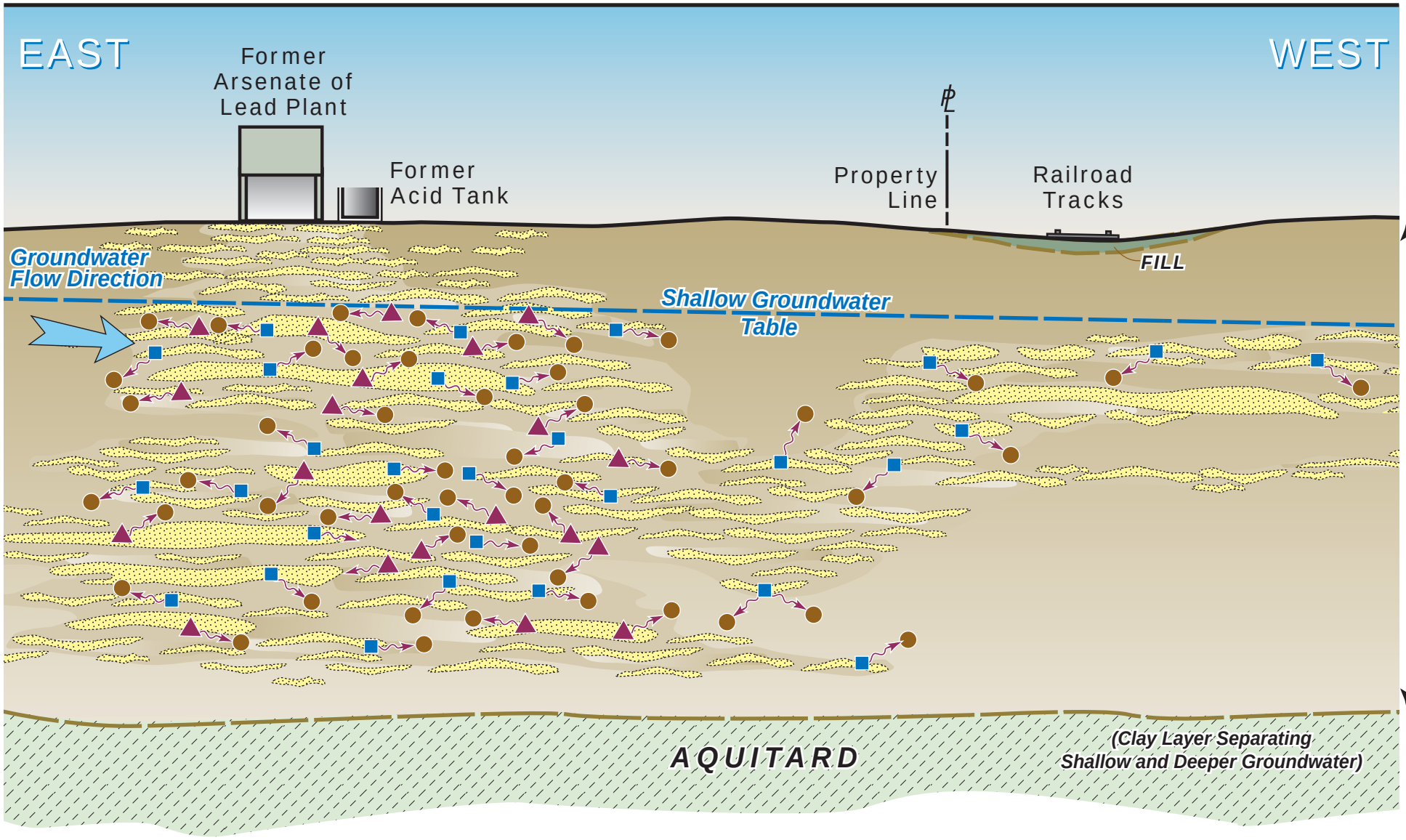
Figure 2-6
Geologic Cross Section C - C'
Sherwin-Williams Company - Emeryville, California



Drawing not to scale

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Figure 2-7
Conceptual Site Model
Sherwin-Williams Company - Emeryville, California

Section 3
Remedial Action Objectives

This section presents the remedial action objectives (RAOs) for the remedial action and their associated cleanup goals. RAOs were developed based on action-, location-, and chemical-specific federal and state applicable or relevant and appropriate requirements (ARARs), as well as on appropriate federal, state, and local criteria, advisories, guidance, and proposed standards (i.e., TBCs). RAOs are also based on site-specific human health and environmental exposure concerns identified in the Site RA documents, which are based on the data generated from remedial investigations.

3.1 Applicable or Relevant and Appropriate Requirements

CERCLA, as amended by Superfund Amendments and Reauthorization Act, and analogous California regulations, require that remedial actions achieve a level of cleanup that protects human health and the environment. In addition, cleanup actions generally must attain ARARs, which are standards, criteria, or limits promulgated under federal or state law. Only those state standards that are promulgated, identified by the state in a timely manner, and more stringent than federal requirements may be considered ARARs (40 CFR 300.400 (g) (4)). An ARAR may describe a cleanup requirement that is either "applicable" or "relevant and appropriate." The identification of ARARs is site-specific and involves the following two-part analysis:

- Assessing the applicability of a given requirement; and
- If a given requirement is not applicable, evaluating whether it is relevant and appropriate.

3.1.1 Definition of ARARs

An applicable requirement is a promulgated federal or state standard or other substantive environmental protection requirement, criteria, or limitation that specifically addresses a hazardous constituent, remedial action, location, or other circumstance at a Superfund site. For a requirement to be "applicable," the remedial actions or the circumstances at the site must be within the intended scope and authority of the requirement. For example, MCLs are standards that must be met by owners/operators of public drinking-water supply systems. MCLs are applicable "at the tap" and are enforced by either the USEPA or the state for water supplied by a public water supply system.

A "relevant and appropriate" requirement is a promulgated federal or state standard or other substantive environmental protection requirement, criteria, or limitation that addresses problems or situations similar to those encountered, even though the requirement is not legally "applicable." In some circumstances, a requirement may be "relevant" but not appropriate for the site-specific situation. Such a requirement would not be an ARAR for the Site. If only part of a requirement is "relevant and

appropriate," the portion that is not considered "relevant and appropriate" need not be addressed. If a determination is made that a requirement is both "relevant and appropriate," such a requirement should be given the same consideration as an "applicable" requirement. The criteria for determining relevance and appropriateness are listed in 40 CFR 300.400 (g) (2) of the NCP as follows:

i. The purpose of the requirement and the purpose of the CERCLA action;

ii. The medium regulated or affected by the requirement and the medium contaminated or affected at the CERCLA site;

iii. The substances regulated by the requirement and the substances found at the CERCLA site;

iv. The actions or activities regulated by the requirement and the remedial action contemplated at the CERCLA site;

v. Any variances, waivers, or exemptions of the requirement and their availability for the circumstances at the CERCLA site;

vi. The type of place regulated and the type of place affected by the release or CERCLA action;

vii. The type and size of structure or facility regulated and the type and size of structure or facility affected by the release or contemplated by the CERCLA action;

viii. Any consideration of use or potential use of affected resources in the requirement and the use or potential use of the affected resource at the CERCLA site; and

ix. Non-promulgated federal and state standards, policies, advisories, guidance documents, and local requirements are not ARARs. However, they are considered to be other criteria and guidelines to be considered (TBCs) when remediating to protect human health and the environment.

3.1.2 Types of ARARs

There are three types of ARARs: chemical-, action-, and location-specific:

- Chemical-specific ARARs are health- or risk-based concentration limits for specific hazardous substances or contaminants. Examples of this type of ARAR are federal and state drinking-water standards.

- Action-specific ARARs are technology-based requirements that are triggered by the type of remedial action under consideration. Examples of action-specific ARARs

are the National Pollutant Discharge Elimination System (NPDES) requirements, which prohibit discharge of pollutants to waters of the United States unless a permit is issued in conformance with Clean Water Act standards. RCRA regulations for hazardous waste generation, handling, transportation, storage, treatment, and disposal are another example of an action-specific ARAR.

- Location-specific ARARs impose restrictions on certain types of activities, based onsite characteristics. Examples of location-specific ARARs include restrictions on activities in wetlands, flood plains, and historical sites.

3.1.3 Identification Process for ARARs/TBCs

NCP §300.430 (b) (9) provides for identification of potential ARARs and TBCs to be initiated during the scoping phase of the project. However, the ARAR and TBC identification process continues throughout the RI/FS process, as a better understanding is gained of site conditions, site contaminants, and remedial action alternatives. Table 3-1 provides a summary of ARARs and TBCs for the Site remedial action.

3.1.3.1 Settlement Agreement between Sherwin Williams and Novartis

In Table 3-1, the settlement agreement between S-W and Novartis is identified as a TBC. Therefore, the current provisions of the settlement agreement were used for evaluation purposes in the FS (CDM, 2009b). Based on ongoing discussions, S-W and Novartis are renegotiating this agreement and therefore, the provisions of this TBC will need to change in order to implement the remedial action presented in this RAP. Modification to the agreement will be addressed by DTSC through the RAP review and approval process.

3.2 Remedial Action Objectives

RAOs are media-specific remediation goals for protecting human health and the environment. RAOs specify the compounds of concern, exposure routes and receptors, and remediation goals for each exposure route. They are developed based on action-, location-, and chemical-specific federal and state ARARs, as well as on appropriate federal, state, and local criteria, advisories, guidance, and proposed standards (i.e., TBCs). They are also based on the site-specific human health and environmental exposure concerns identified in the HHRA, which is based on the data generated during the RI.

The following RAOs are identified for the Site remedial actions:

- Minimize direct contact/ingestion by humans with Site soil containing COCs at concentrations exceeding the cleanup goals;

- Minimize migration of and/or inhalation of airborne dust by humans from the Site containing COCs at concentrations exceeding the cleanup goals;

- Minimize exposure to and inhalation by humans of volatile organic COCs at concentrations in indoor air exceeding the cleanup goals;
- Minimize risk to down-gradient ecological receptors from off-site groundwater migration containing COCs at concentrations exceeding the cleanup goals; and
- Minimize on-site human contact with groundwater containing COCs at concentrations exceeding the cleanup goals.

RAOs can be fulfilled by one or more of the following processes: reducing the mass, volume, toxicity, or mobility of the COCs and reducing the potential exposure pathways for the COCs.

3.3 Cleanup Goals

Cleanup goals, serving as quantitative proposed cleanup goals for the RAOs, are developed based on action levels as defined in ARARs, TBCs, and/or the Site HHRA. The cleanup goals are "conservatively calculated threshold values below which particular chemicals are believed to present no significant risk to humans or natural resources that might be exposed to the particular hazardous material." (USEPA, 2004).

Chemical specific-cleanup goals were developed from two general sources: concentrations based on appropriate or relevant and applicable requirements (ARARs); and concentrations based on risk assessments. Concentration-based ARARs for selection of cleanup goals included: USEPA Region IX PRGs; California Environmental Protection Agency (CalEPA) California Human Health Screening Levels (CHHSLs); Regional Water Board Basin Plan numerical water quality objectives; California DHS MCLs; and the Office of Environmental Health Hazard Assessment (OEHHA) Public Health Goals (PHGs).

The development of remedial goals (RGs) constitutes a core component of the development and screening of potential remedial alternatives conducted during the Feasibility Study. It should be noted that until the final remedy is selected, these cleanup goals, whether ARARs-based or risk-based, constitute initial guidelines, not final RGs (NCP, 40CFR 300.430(e)(2)(i)).

As summarized in Section 2.4.5, the HHRA (Gradient, 2005) presented site-specific RBTLs for various human activity and exposure assumptions. The cleanup goals presented in Table 3-2 for soil are based on these RBTLs for the unrestricted resident exposure scenarios, with the exception of arsenic. The arsenic cleanup goal is the proposed naturally occurring background concentration.

For groundwater, concentration-based ARARs/TBCs for selection of cleanup goals included: DTSC California Human Health Screening Levels (CHHSLs); Regional Water Quality Control Board (Water Board) Basin Plan numerical water quality objectives; Water Board Environmental Screening Levels (ESLs); and California

Department of Health Services (CDHS) Maximum Contaminant Levels (MCLs). A summary of groundwater cleanup goals are presented in Table 3-3.

The USEPA advises that exceeding a cleanup goal concentration "suggests that further evaluation of the potential risks that may be posed by site contaminants is appropriate" (USEPA, 1999). The USEPA advises that further evaluation steps may include "consideration of ambient levels in the environment, or a reassessment of the assumptions contained in the screening level estimates (e.g., appropriateness of route-to-route extrapolations)" (USEPA, 1999).

3.3.1 Comparative Analysis

A comparative analysis of laboratory analytical results from soil samples collected was conducted against the soil cleanup goals identified above. All the soil COCs have been detected above their respective cleanup goals within vadose zone soil at the Site. However, the extents of these soil COC detections are bounded within the extent of arsenic.

A comparative analysis of laboratory analytical results from groundwater samples collected through March 2006 was conducted against the groundwater cleanup goals identified above. The following COCs have been detected above their respective cleanup goals within groundwater under the Site (S-W property and portion of the former Rifkin property):

- 1,2-dichloroethane
- 1,2,3-trichloropropane
- acetone
- arsenic
- methyl tert butyl ether
- toluene
- xylenes

The following COCs have been detected above their cleanup goals in groundwater immediately downgradient of the Site (including that portion of the former Rifkin property not considered part of the Site):

- 1,2-dichloroethane
- arsenic
- methyl tert butyl ether
- toluene

Arsenic is the only inorganic COC detected in groundwater above its cleanup goal. The other COCs are organic and attenuate significantly across the Site and are at or near their cleanup goals at the downgradient property boundary. The organic COCs are expected to continue to attenuate into the future and eventually decrease to concentrations below their cleanup goals.

Table 3-1
Summary of Applicable or Relevant and Appropriate Requirements
Sherwin-Williams Emeryville Remedial Action Plan

Reference				*Reasons*	*Media*		*ARAR*[1]	*TBC*
					Soil	*Water*		
FEDERAL								
I. Contaminant Specific								
	A.		Clean Air Act (CAA) (42 USC 7401-7642) (40 CFR 50-69)	Remediation of soil or groundwater that could produce a vapor or dust discharge would be required to meet National Ambient Air Quality Standards (NAAQS).	**X**	**X**	**X-RA**	
	B.		Clean Water Act (CWA) as amended by the Water Quality Act of 1987 (33 USC 1251-1376) (40 CFR 100-149)	Storm run off water, extracted groundwater, or soil remediation process water from the Site discharged to a surface water body (including discharge to a storm drain or flood channel) would require attainment of Water Quality Criteria.	**X**	**X**	**X-A**	
		1	Maximum Contaminant Levels (MCLs)	MCLs may be used to establish water discharge standards and groundwater remediation standards.		**X**	**X-A**	
		2	Maximum Contaminant Levels Goal (MCLGs)	Some contaminants of concern (COCs) present in soil and groundwater may not yet be formally regulated and MCLGs may provide guidance for remediation standards for water discharge.		**X**		**X**
		3	Secondary Maximum Contaminant Levels (SMCLs) (40 CFR 143.3)	The aquifer is a potential drinking water source. Therefore, quality of color or odor of the water source should be considered.		**X**		**X**
II. Location Specific								
	A.		Resource Conservation and Recovery Act (RCRA) as amended by Hazardous and Solid Waste Amendments (HSWA) (42 USC 7401-7462) (40 CFR 260-280)	The treatment facility for remediation of soil or groundwater (if the soil or groundwater is considered to be a hazardous waste) may be required to be a certain minimum distance from a fault and not within a floodplain.	**X**	**X**	**X-RA**	

Table 3-1
Summary of Applicable or Relevant and Appropriate Requirements
Sherwin-Williams Emeryville Remedial Action Plan

Reference				*Reasons*	*Media*		*ARAR*[1]	*TBC*
					Soil	*Water*		
	B.		Executive Order on Flood Plain Management (Exec. Order No. 11,988) (40 CFR 6.302 and Appendix A)	Remedial Actions occurring in a floodplain should avoid adverse effects, minimize potential harm, restore and preserve natural and beneficial values. Federal agencies are directed to ensure that planning programs reflect consideration of floodplain management	**X**	**X**	**X-RA**	
	C.		National Archaeological and Historical Preservation Act (16 USC 469) (36 CFR Part 65)	Requires action to recover and preserve artifacts if removal action threatens significant scientific, prehistoric, historic, archeological data. No = historic artifacts are currently known to be present at the Site. However, due to Emeryville's Bay shoreline location and the existence of known nearby archaeological sites, there is a potential of encountering previously unrecorded Native American cultural resources at the Site.	**X**	**X**	**X-RA**	
	D.		National Historic Preservation Act (NHPA) (16 USC 470 et seq.) (36 CFR Part 800)	Established to preserve historic properties. Buildings 1 and 31 are designated Tier 1 (primary architectural significance) in the Park Avenue Overlay District. These buildings contribute to the National Register-eligible Emeryville Historic Industrial District	**X**	**X**	**X-A**	
	E.		Endangered Species Act (16 USC 1531 et seq.) (50 CFR Part 17, 200, 402) (40 CFR 6.302(h))	Remedial actions should avoid disturbance of endangered or threatened species or to terrain which is habitat for endangered or threatened species. No known endangered species or their habitat are present at this Site.	**X**	**X**	**X-RA**	
	F.		Fish and Wildlife Coordination Act (16 USC 661et seq.) (33 CFR Parts 320-330)	Designed to protect waters where fish, plant life, or bird life exist. Water discharge from any potential Site soil or groundwater remediation is not expected to enter surface waters.	**X**	**X**	**X-RA**	

Table 3-1
Summary of Applicable or Relevant and Appropriate Requirements
Sherwin-Williams Emeryville Remedial Action Plan

Reference				*Reasons*	*Media*		*ARAR*[1]	*TBC*
					Soil	*Water*		
	G.		Clean Water Act (CWA) (33 USC 1251-1376) (40 CFR Part 6, Appendix A)	Designed to protect wetlands and the drainage areas which feed wetlands. Water discharge from any potential Site soil or groundwater remediation is not expected to enter any wetlands.	**X**	**X**	**X-A**	
III. Action Specific								
	A.		Resource Conservation and Recovery Act (RCRA) as amended by Hazardous and Solid Waste Amendments (HAWS) (42 USC 7401-7642)(40 CFR 260-280)	Regulates treatment, storage and disposal of hazardous wastes. Soil, which may be considered hazardous waste under RCRA, may be accumulated, stored, transported, treated or disposed.	**X**		**X-RA**	
	B.		Clean Water Act (CWA) as amended by the Water Quality Act of 1987 (33 USC 1251-1376) (40 CFR 100-149)	Storm run off water, extracted groundwater, or soil remediation process water from the Site discharged to a surface water body (including discharge to a storm drain or flood channel) would require attainment of Water Quality Criteria.	**X**	**X**	**X-RA**	
		1	National Pollutant Discharge Elimination System (NPDES) (40 CFR 122-125)	Treated groundwater may require permit for on-site or off-site disposal.		**X**	**X-RA**	
		2	Water Quality Standards [CWA 402 (a)(1)]	Remediation of groundwater may require treatment to promulgated water quality standards.		**X**	**X-RA**	
		3	Discharge to Publicly Owned Treatment Works (POTWs) (CWA 307)	Establishes discharge limits for disposal to the sanitary sewer system. Treated groundwater could potentially be disposed to the sanitary sewer.		**X**	**X-RA**	
		4	Storm Water Discharge Requirements [CWA 402(p)]	Establishes requirements for storm water discharge. Groundwater or soil remedial action should ensure storm water discharge at the Site is in compliance.	**X**	**X**	**X-RA**	

Table 3-1
Summary of Applicable or Relevant and Appropriate Requirements
Sherwin-Williams Emeryville Remedial Action Plan

Reference				*Reasons*	*Media*		*ARAR*[1]	*TBC*
					Soil	*Water*		
	C.		Safe Drinking Water Act (SWDA) (42 USC 300f-300j) (40 CFR 144-146)	Establishes National primary drinking water standards (MCLs) and regulates injection of wastes to the subsurface through wells. MCLs may be used to establish water discharge standards and groundwater remediation standards.		**X**	**X-RA**	
	D.		Clean Air Act (CAA)(42 USC 7401-7642)(40 CFR 60.50-60.54)	Remedial alternatives for soil or groundwater may produce a vapor effluent stream or dusts.	**X**	**X**	**X-RA**	
	E.		Occupational Safety and Health Act (OHSA)(29 USC 651 et seq.) (19 CFR 1910)	Remedial action operations for soil and groundwater remediation are subject to health and safety requirements for protection of workers.	**X**	**X**	**X-RA**	
	F.		Noise Control Act of 1972 as amended by the Quiet Communities Act of 1978 (CFR 204, 205, 211)	Construction, transportation, and treatment equipment may increase noise levels at property boundaries.	**X**	**X**		**X**
STATE AND LOCAL								
I. Contaminant Specific								
	A.		Hazardous Waste Control Act (HWCA) (CH&SC 25100-25395) as administered by the CA Department of Toxic Substance Control (DTSC) under the CA Code of Standards for Management of Hazardous and Extremely Hazardous Wastes.	Establishes standards for management of hazardous waste. Groundwater or soil that may be considered to be hazardous waste, may be treated, stored, transported, and/or disposed.	**X**	**X**	**X-RA**	
		1	Criteria for identifying Hazardous Wastes (22 CCR 66261.1-66262.7)	Establishes criteria for identifying RCRA and non-RCRA hazardous wastes.	**X**	**X**	**X-RA**	
		a)	Persistent and Bioaccumulative Toxic Substances (22 CCR 66262.7)	Regulatory levels have been set for COCs identified at the Site.	**X**	**X**	**X-RA**	
	B.		Porter-Cologne Water Quality Control Act (CWC 13000-13806) as administered by the State Water Resources Control Board (SWRCB) and the Regional Water Quality Control Board (Water Board) under 23 CCR 2200 - 2714	Treated groundwater may be discharged to a surface water source or to an injection well.		**X**	**X-RA**	

Table 3-1
Summary of Applicable or Relevant and Appropriate Requirements
Sherwin-Williams Emeryville Remedial Action Plan

Reference				*Reasons*	*Media*		*ARAR*[1]	*TBC*
					Soil	*Water*		
		1	San Francisco Bay Regional Water Quality Control Board Basin Plan and associated implementation policies	Establishes beneficial uses and water quality objectives. Remediation of soil and groundwater includes consideration of State and regional water quality objectives. Surface water and groundwater designated for use as domestic or municipal supply shall not contain concentrations of COCs at or above MCLs.	**X**	**X**	**X-A**	
	C.		San Francisco Bay Regional Water Quality Control Environmental Screening Levels (ESLs)	ESLs may be utilized to determine potential concern to human health and the environmental from residual concentrations of COCs in Site soil, soil gas, and groundwater.	**X**	**X**		**X**
	D.		California Human Health Screening Levels (CHHSLs)	CHHSLs may be utilized to determine potential concern to human health from residual concentrations of COCs in Site soil and soil gas.	**X**	**X**		**X**
II. Location Specific								
	A.		Fish and Game Code Division 6, Part 1, Chapter 2, Sections 5650-5656	If treated groundwater or processed water from soil remediation is discharged to a surface water source or a storm drain, the discharged water should contain no deleterious compounds that will affect fish, plant, or bird life.	**X**	**X**	**X-RA**	
	B.		State Water Resources Control Board Sources of Drinking Water Supply (Resolution 88-63)	Soil cleanup goals and groundwater numerical water quality objectives may be controlled by applicability of drinking water standards as determined by site-specific yield and total dissolved solids in groundwater.	**X**	**X**	**X-A**	
	C.		Department of Toxic Substances Control (DTSC) Imminent and Substantial Endangerment Determination and Order and Remedial Action Order No. 05/06-007 (the Order)	The Order specifies specific requirements for the development and implementation of remedial actions for soil and groundwater at the Site.	**X**	**X**	**X-A**	

Table 3-1
Summary of Applicable or Relevant and Appropriate Requirements
Sherwin-Williams Emeryville Remedial Action Plan

Reference				*Reasons*	*Media*		*ARAR*[1]	*TBC*
					Soil	*Water*		
	D.		Settlement Agreement between Sherwin-Williams and Novartis regarding the Former Rifkin Property	Establishes criteria for remedial actions on the Former Rifkin Property.	**X**	**X**		**X**
	E.		City of Emeryville Noise Ordinance (Ordinance No. 03-002) http://www.ci.emeryville.ca.us/gov/pdf/ord-noise.pdf	Establishes criteria for noise generation within the City of Emeryville.	**X**	**X**	**X-RA**	
	F.		San Francisco Regional Board Basin Plan and associated implementation policies	Establishes beneficial uses and water quality objectives. Remediation of soil and groundwater includes consideration of State and regional water quality objectives. The Plan sets discharge prohibitions of impacted groundwater containing COCs into clean water.	**X**	**X**	**X-A**	
	G.		Park Avenue District Plan	The Site is within the Park Avenue District. The plan guides redevelopment of sites within the District. As such the planed use of the property with respect to evaluation of remedial actions should be consistent with Park Avenue District Plan.	**X**	**X**		**X**
	H.		Chiron Planned Unit Development (PUD) and Preliminary Development Plan (PDP)	The Former Rifkin Property future use is governed by the City of Emeryville-approved development plan. As such the planed use of the property with respect to evaluation of remedial actions should be consistent with development plan.	**X**	**X**		**X**
	I.		City of Emeryville General Plan	The Site is within the City of Emeryville. The City General Plan. The plan is the blueprint for the future growth and development of the city. As such the planed use of the property with respect to evaluation of remedial actions should be consistent with General Plan.	**X**	**X**		**X**

Table 3-1
Summary of Applicable or Relevant and Appropriate Requirements
Sherwin-Williams Emeryville Remedial Action Plan

Reference				*Reasons*	*Media*		*ARAR*[1]	*TBC*
					Soil	*Water*		
III. Action Specific								
	A.		Hazardous Waste Control Act (HWCA) (Health and Safety Code Section 25100-25395) as administered by the DTSC under CCR Title 22: Standards for Management of Hazardous Wastes	Site soil or groundwater with COCs may be considered hazardous waste which would require compliance with regulations for accumulation, transportation, treatment, or disposal.	**X**	**X**	**X-RA**	
		1	Identification and Listing of Hazardous wastes (22 CCR Division 4.5, Chapter 11, 22 CCR 66261.2-66261.126)	Treated soil or groundwater that is identified as hazardous waste would be identified as "listed" or as "characteristic".	**X**	**X**	**X-RA**	
		2	Standards Applicable to Generators of Hazardous Waste (22 CCR Division 4.5, Chapter 12, 22 CCR 66261.1-66262.7)	Offsite disposal requires characterization of waste	**X**	**X**	**X-RA**	
			Hazardous Waste Accumulation (22 CCR 66262.34)	On-site hazardous waste accumulation is allowed for up to 90 days as long as the waste is stored in containers or in tanks, on drip pads, inside buildings, is labeled and dated, etc.	**X**	**X**	**X-RA**	
		3	Deed Restrictions (22 CCR Division 4.5, Chapter 39; 22 CCR 67390.2)	The property may be restricted from certain future development, if COCs identified on-site, are not addressed to unrestricted standards.	**X**	**X**	**X-RA**	
		4	Corrective Action Management Units and Temporary Units. (22 CCR 66264.552-66264.53)	A temporary treatment unit may be set up at the Site. Soil pending treatment may be stockpiled at the Site.	**X**		**X-RA**	
		5	Hazardous Waste Haulers Act (22 CCR Chapter 30)	Governs transportation of hazardous materials in California.	**X**	**X**	**X-RA**	
		6	Land Disposal Restrictions (22 CCR Chapter 18)	Requires that certain hazardous wastes meet minimum treatment standards prior to land disposal.	**X**	**X**	**X-RA**	

Table 3-1
Summary of Applicable or Relevant and Appropriate Requirements
Sherwin-Williams Emeryville Remedial Action Plan

Reference				*Reasons*	*Media*		*ARAR*[1]	*TBC*
					Soil	*Water*		
	B.		Porter-Cologne Water Quality Control Act, (CWC 13000-13806) as administered by the State Water Resources Control Board (SWRCB) and the Regional Water Quality Control Board (Water Board) under 23 CCR 2050-2836	The San Francisco Regional Water Quality Control Board (Water Board) may require that treatment technology perform at a level near Best Available Technology (BAT) and may establish waste disposal requirements.	**X**	**X**	**X-RA**	
		1	Waste Discharge to Land Requirements (23 CCR Chapter 15) (23, CCR 2260-2597)	Remediation projects are exempt, but regulations should be considered and followed to the extent possible.	**X**	**X**	**X-RA**	
		2	State Water Resources Control Board Antidegradation Policy (Resolution 68-16)	If treated groundwater is disposed to a water source of the state, then the quality of the water source is to be protected.	**X**	**X**	**X-RA**	
		3	Discharge to Sanitary Sewer	Treated groundwater may be disposed to a sanitary sewer.	**X**	**X**	**X-RA**	
	C.		California Safe Drinking Water Act (Cal-SWDA) (CH&SC 4010-4095) (22 CCR 64401-64475)	Treated groundwater may be disposed of to an injection well. The aquifer that the injection well feeds may be a potential drinking source.		**X**	**X-RA**	
		1	Maximum Contaminant Levels (MCLs) (22 CCR 64435, 64444.5)	MCLs may be used to establish the standard for groundwater remediation or water discharge.		**X**	**X-RA**	
		2	Advisory Drinking Water Action Levels (ALs)	Some COCs present at the Site may not yet be formally regulated. Action Levels would provide a non-binding guidance for allowable concentrations.		**X**		**X**
		3	Advisory Applied Action Levels	The risk posed to biological receptors by a potential groundwater remediation system must be evaluated.		**X**		**X**

Table 3-1
Summary of Applicable or Relevant and Appropriate Requirements
Sherwin-Williams Emeryville Remedial Action Plan

Reference				*Reasons*	*Media*		*ARAR*[1]	*TBC*
					Soil	*Water*		
	D.		Bay Area Air Quality Management District (BAAQMD) regulations	The BAAQMD has is that local implementation agency for the Federal Clean Air Act.				
		1.	BAAQMD Regulation 2, Rule 5	This rule addresses conditions where a health screening assessment must be completed. As arsenic is a COC a health screening assessment needs to be addressed. Human health risk criterion is set at ten in a million for this assessment.	**X**	**X**	**X-RA**	
		2.	BAAQMD Regulation 6, Particulate Matter	This rule limits emissions of particulate matter. This rule may apply as air-borne particulate matter may be generated during soil removal and soil handling.	**X**	**X**	**X-RA**	
		3.	BAAQMD Regulation 8, Rules 40 and 47, Volatile Organics	This rule sets limits on the quantity of odorous emissions from any general operation and may be applicable during the implementation of the remedial action. This rule may apply as portions of the source area proposed to be excavated contain odorous organic compounds. These rules may apply as VOC-impacted soils may require on-site aeration or soil vapor extraction prior to off-site disposal.	**X**	**X**	**X-RA**	
		4.	BAAQMD Regulation 11, Lead	This rule limits emission of lead to the atmosphere and may be applicable as excavation and handling of soils may occur.	**X**	**X**	**X-RA**	
	E.		California Safe Drinking Water and Toxic Enforcement Act (Proposition 65) (Health and Safety Code Section 25249.5 et seq.) as implemented under Title 26 CCR Sections 22-12000 et seq.	Some COCs at the Site are identified as carcinogens or reproductive toxins	**X**	**X**	**X-RA**	

Table 3-1
Summary of Applicable or Relevant and Appropriate Requirements
Sherwin-Williams Emeryville Remedial Action Plan

Reference				*Reasons*	*Media*		*ARAR*[1]	*TBC*
					Soil	*Water*		
	F.		California Clean Air Act (CH&SC 39000-44563) as implemented by the local Air Quality Management Districts and overseen by the Air Resources Board under 17 CCR Division 3	Groundwater or soil treatment process may produce a vapor effluent subject to discharge limitations.	**X**	**X**	**X-RA**	
		1	Air Pollution Control District (APCD) Rules and Regulations	Groundwater or soil treatment process may produce a vapor effluent subject to Rules and Regulations of the APCD.	**X**	**X**	**X-RA**	
	G.		California Occupational Health and Safety Act, CLC 6300 et seq.	Remedial actions require appropriate worker protection.	**X**	**X**	**X-RA**	
	H.		City of Emeryville Municipal Code, Title 7, Public Works	Outlines requirements for excavation and grading activities, including obtaining a permit from the City Public Works Department.	**X**		**X-RA**	
	I.		City of Emeryville Stormwater Guidelines for Green, Dense Redevelopment: Stormwater Quality Solutions	Guidelines for complying with stormwater requirements.	**X**	**X**		**X**
	J.		Stockpiling Requirements for Contaminated Soil (CH&SC 25123.3(a)(20))	Establishes standards for stockpiling of non-RCRA contaminated soil.	**X**		**X-RA**	
	K.		California Environmental Quality Act	Mandates environmental review of projects considered for approval by governmental agencies, including DTSC, Water Board, BAAQMD, and others.	**X**	**X**	**X-RA**	
	L.		Land Use Controls (LUCs)	LUCs may be implemented if COCs identified on-site, are not addressed.	**X**	**X**		**X**
		1	ASTM Standard E 2091-00: "Standard Guide for Use of Activity and Use Limitations, Including Institutional and Engineering Controls, American Society for Testing and Materials (ASTM)"	LUCs may need to be evaluated similar to the evaluation criteria of remedial technologies and process options.	**X**	**X**		**X**

Table 3-1
Summary of Applicable or Relevant and Appropriate Requirements
Sherwin-Williams Emeryville Remedial Action Plan

Reference				*Reasons*	*Media*		*ARAR*[1]	*TBC*
					Soil	*Water*		
		2	DTSC Management Memo #EO-02-002-MM: "Response Action for Sites Where Future Use May Include Sensitive Uses"	LUCs may need to be incorporated into remedial alternatives. DTSC expects that any remedial alternative, that includes leaving contaminants at levels not suitable for unrestricted use, include LUCs that protect human health and the environment.	**X**	**X**		**X**

Notes:
ARAR - applicable or relevant and appropriate requirement for the remedial action
TBC - other criteria or guideline to be considered for the remedial action
Abbreviated regulatory codes:
USC - United States Code
CFR - Code of Federal Regulations
CCR - California Code of Regulations
CH&SC - California Health and Safety Code
CWC - California Water Code
CLC - California Labor Code
1 – For ARARs, X-A indicates an applicable requirement; X-RA indicates a relevant and appropriate requirement.

Table 3-2
Cleanup Goals for COCs in Vadose Zone Soil
Sherwin-Williams Emeryville Remedial Action Plan

	Cleanup Goal (mg/kg)	*Basis*
Volatile Organic Compounds		
ACETONE	70000	RBTL
BENZENE	0.015	RBTL
4-CHLOROANILINE	310	RBTL
ETHYLBENZENE	7800	RBTL
TETRACHLOROETHENE	0.063	RBTL
TOLUENE	100	RBTL
XYLENES	2300	RBTL
Semivolatile Organic Compounds		
BENZO(A)ANTHRACENE	1.1	RBTL
BENZO(B)FLUORANTHENE	1.1	RBTL
BENZO(B,K)FLUORANTHENE	1.1	RBTL
NAPHTHALENE	1300	RBTL
PHENANTHRENE	4500	RBTL
Inorganic Compounds		
ANTIMONY	31	RBTL
ARSENIC	24	Background Level
BARIUM	5500	RBTL
CADMIUM	3.1	RBTL
CHROMIUM (+3)	120000	RBTL
CHROMIUM (+6)	1600	RBTL
LEAD	250	RBTL
SELENIUM	390	RBTL
ZINC	23000	RBTL

Notes:
COC - Chemical of Concern
RBTL - Risk Based Threshold Level
Background Level - for arsenic as presented in Human Health Risk Assessment
mg/kg - milligram per kilogram

CDM

Table 3-3
Cleanup Goals for COCs in Groundwater
Sherwin-Williams Emeryville Remedial Action Plan

	Cleanup Goal (mg/L)	***Basis***
Volatile Organic Compounds		
ACETONE	1.5	ESL
BENZENE	0.001	MCL
2-BUTANONE	4.2	ESL
1,2-DICHLOROETHANE	0.0005	MCL
1,2-DICHLOROPROPANE	0.005	MCL
ETHYLBENZENE	0.3	MCL
METHYL ISOBUTYL KETONE	0.12	ESL
METHYL TERT BUTYL ETHER	0.013	MCL
TOLUENE	0.15	MCL
TRICHLOROETHENE	0.005	MCL
1,2,3-TRICHLOROPROPANE	0.005	ESL
1,3,5-TRIMETHYLBENZENE	0.46	RBTL
1,2,4-TRIMETHYLBENZENE	0.14	RBTL
VINYL CHLORIDE	0.0005	MCL
XYLENES	0.02	ESL
Semivolatile Organic Compounds		
NAPHTHALENE	0.017	ESL
Inorganic Compounds		
ARSENIC	0.036	Aquatic Protection
IRON	0.3	secondary MCL
MANGANESE	0.05	secondary MCL
ZINC	0.081	ESL

Notes:
COC - Chemical of Concern
ESL - Water Board Environmental Screening Level
MCL - California Department of Health Services Maximum Contaminant Level
RBTL - Risk Based Threshold Level from Human Health Risk Assessment
Aquatic Protection - Water Board Basin Plan, Marine Water Quality Objective for Arsenic in Surface Waters, 4-day average
mg/L - milligram per liter

CDM

Section 4
Remedial Action Alternatives

In this section of the RAP, the FS is summarized by presenting remedial action alternatives considered in the FS and the basis for the selected action (CDM, 2009b).

Remedial action alternatives were developed using combinations of technologies and process options that passed the screening. These alternatives contain both soil and groundwater treatment options combined to provide Site-wide treatment of contamination.

4.1 Description of Remedial Action Alternatives

The following alternatives were developed from the retained process options (see Appendix B). These options were combined to form alternatives that address groundwater and soil/soil gas contamination rather than presenting separate alternatives for each contaminated media type.

- **Alternative 1 –** No Action
- **Alternative 2 –** Limited Action
- **Alternative 3A –** Vadose Zone Excavation/Active *In-Situ* Groundwater Treatment/Rifkin Excavation/Groundwater Monitoring/LUCs
- **Alternative 3B –** Vadose Zone Excavation/S-W Source Area Soil Mixing/Active *In-Situ* Groundwater Treatment/Rifkin Excavation /Groundwater Monitoring/LUCs
- **Alternative 3C –** Vadose Zone Excavation/S-W Source Area Excavation/Rifkin Groundwater Extraction and Aboveground Treatment/MNA/Groundwater Monitoring/LUCs
- **Alternative 4A –** Vadose Zone Excavation/Upgradient Interceptor Drain Installation/Passive *In-Situ* Groundwater Treatment/Rifkin Excavation/ Groundwater Monitoring/LUCs
- **Alternative 4B –** Vadose Zone Excavation/Upgradient Interceptor Drain Installation/Active *In-Situ* Groundwater Treatment/Rifkin Excavation/ Groundwater Monitoring/LUCs
- **Alternative 5A –** Vadose Zone Excavation/Excavation Upgradient of Interceptor Drain/Downgradient Interceptor Drain Installation/Passive *In-Situ* Groundwater Treatment/Rifkin Excavation/Groundwater Monitoring/LUCs

- **Alternative 5B –** Vadose Zone Excavation/Excavation Upgradient of Interceptor Drain/Downgradient Interceptor Drain Installation/Active *In-Situ* Groundwater Treatment/Rifkin Excavation/Groundwater Monitoring/LUCs

- **Alternative 6 –** Vadose Zone Excavation/Source Area Excavation/MNA/ Groundwater Monitoring/LUCs

- **Alternative 7 –** A-Zone Aquifer Excavation/LUCs

Each alternative is described in detail below.

4.1.1 Alternative 1 – No Action

Alternative 1 would discontinue operations of the existing GWETS and storm water management practices. The Site would be left "as is" after completion of demolition activities in November, retaining the slurry wall and existing paved sections of the Site, and ongoing long-term groundwater monitoring. Under Alternative 1, the raised cap materials would remain on-Site and there would be no immediate cleanup on former Rifkin property. Existing LUCs such as prohibitions on the use of A-zone groundwater as a drinking water source would continue to be applied to future Site development. No new LUCs would be implemented for residual chemical concentration.

4.1.2 Alternative 2 – Limited Action

Under Alternative 2, the IRMs present at the Site, for both S-W and former Rifkin properties, would continue to be managed, including, groundwater elevation monitoring of piezometer pairs along the slurry wall as part of the ongoing long-term groundwater monitoring, GWETS operations and maintenance, and storm water management practices. The existing pavement after completion of demolition activities in November 2007 would be maintained to control infiltration to groundwater. The raised cap materials would remain on-Site. Existing LUCs would be retained and a new set of LUCs would be implemented prohibiting consumptive use of A-zone groundwater from areas where concentrations in extractable groundwater exceed MCLs, restricting subsurface drilling or excavation on the Site, and requiring the use of appropriate personal protective equipment (PPE) for any necessary subsurface work.

4.1.3 Alternative 3A – Vadose Zone Excavation/Active *In-Situ* Groundwater Treatment/Rifkin Excavation/Groundwater Monitoring/LUCs

Alternative 3A includes several components for addressing contaminated soils and groundwater on both the S-W and former Rifkin properties. Detailed descriptions of these components are presented below and proposed locations for each component are presented graphically on Figure 4-1.

4.1.3.1 Removal of Raised Cap

The raised cap material and old foundations under the raised cap would be removed. Approximately 7,000 cubic yards of debris and soil would be removed and transported to an appropriate disposal/reuse facility. This excavated material is anticipated to contain hazardous waste, which would be transported to a Class I hazardous waste landfill for treatment and disposal.

4.1.3.2 Vadose Zone Excavation

Vadose zone soil on the S-W and former Rifkin properties would be excavated in order to achieve the vadose zone soil cleanup for arsenic of 24 mg/kg on each property. The planned limits of soil excavation extend approximately 285 feet along Horton Street (60 feet on the former Rifkin property and 225 feet on the S-W property) and approximately 330 feet west of Horton Street, or approximately 95,000 square feet. In addition, elevated detections of arsenic in vadose zone soil are present at locations outside these limits, including SA-AH-01 (110 mg/kg), SB-7AB (130 mg/kg), CDM-SB50 (200 mg/kg), and SA-BH-04 (211 mg/kg). Vadose zone soil surrounding these locations would also be removed to a radius of 10 feet surrounding each location. These four locations are presented on Figure 4-1.

The vadose zone soil would be excavated to an average depth of approximately 7.5 feet, the approximate depth to groundwater across this area. Approximately, 26,500 cubic yards of vadose zone soil across the Site would be excavated and transported to and disposed at an appropriate landfill. This excavated soil is anticipated to contain hazardous waste, which would be transported to a Class I hazardous waste landfill for treatment and disposal.

Confirmation sampling and analysis would be conducted to confirm that the vadose zone soil cleanup goal for arsenic is met. In order to meet this goal, additional, excavation beyond the limits presented above may be needed.

4.1.3.3 Backfill, Compaction, Grading, and Installation of Cover

All areas undergoing excavation would be backfilled to grade with fill material, compacted, and graded for storm water management. In order to control infiltration into groundwater, the backfill areas would be re-paved and/or vegetated and would direct water runoff along the Site surface towards the Temescal Creek channel.

4.1.3.4 Active Groundwater Treatment System

Groundwater would pass through slurry wall breaches and be treated through an *In-Situ* treatment system through precipitation, coagulation, and flocculation systems. At each slurry wall breach location, shown on Figure 4-1, would be formed through the existing slurry wall. Breaching would be accomplished by installing the system into the barrier, and sealing the space between the system and the barrier wall with flowable low-permeability backfill.

An *in-situ* active treatment system would be installed at each breach of the slurry wall. The conceptual design of the active treatment system involves the following treatment steps:

- Groundwater would flow into a 25-ft tall drainage maintenance structure through multiple pipes that span the height of the aquifer at the gate.
- Groundwater would be aerated via flow from an air compressor located above ground.
- Ferric chloride, which reacts with dissolved arsenic to form co-precipitants, would be added to the water in the aeration basin through a meter pump and tank.
- Organic polymer to assist with flocculation and settling would be added to the water in the aeration basin through a metering pump and tank.
- Groundwater would flow into one or two additional maintenance structures, where precipitants have sufficient residence time to settle out.
- Treated groundwater would flow out of the settling basins through another series of pipes, and into a gravel distribution trench.

A groundwater flow and fate and transport model was used to develop the design flow rates and arsenic concentrations at these breaches. The model results are presented in Appendix B of the FS.

In order to evaluate the effectiveness of the system, groundwater monitoring wells would be placed within and downgradient of the system. Monitoring of these wells is further discussed below.

4.1.3.5 Extending the Existing Slurry Wall

A slurry wall extension would be constructed in locations shown on Figure 4-1 in order to capture the existing plume that has been identified to the south of the existing slurry wall. The slurry wall extension would be approximately 340 linear feet and tie back into the southern end of the existing slurry wall**.**

A breach in the existing slurry wall near this extension, as shown on Figure 4-1, would be installed to prevent mounding and facilitate impacted groundwater between the existing and extended slurry wall system to migrate across the Site and toward the active groundwater treatment systems at the northern slurry wall breaches.

4.1.3.6 LUCs

LUCs would be established to maintain the long-term permanence of this remedy and to control future human exposure. These LUCs would prohibit the use of A-zone groundwater beneath the Site; restrict the future land use on the S-W portion of the Site; and facilitate continued access to and operation and maintenance of remediation

and monitoring facilities on the Site. LUCs on the former Rifkin property would not preclude proposed redevelopment plan for the former Rifkin property, which includes a high-rise tower option with installation of piles and pile caps.

4.1.3.7 Former Rifkin Property Remedial Actions

Under Alternative 3A, remedial actions on the former Rifkin property would consist of: excavation of vadose zone soils above background (as discussed above), excavation of impacted saturated soils, breaching of existing slurry wall along the south end of the former Rifkin property, installation of two interceptor trenches with associated membrane barriers to control hydraulic gradient on the former Rifkin property by directing groundwater flow toward the S-W property, and groundwater monitoring to support the effectiveness of these interceptor trenches. As part of this alternative, a contingency would be to pump from the trench systems, if needed, to direct groundwater flow toward the S-W property. The proposed redevelopment plan for the former Rifkin property, which includes a high-rise tower option with installation of piles and pile caps, is not inconsistent with, and would not impede implementation or long-term operations, maintenance, and monitoring (OM&M) of this alternative.

Excavation of vadose zone soils with arsenic concentrations greater than 24 mg/kg is included within the 95,000 square-foot area discussed above. Saturated zone soils within the portion of the source area located on the former Rifkin property, estimated to be present to a depth of approximately 18 feet bgs, would be excavated as shown on Figure 4-1. This excavated soil is anticipated to contain hazardous waste, which would be transported to a Class I hazardous waste landfill for treatment and disposal. In addition, saturated zone soils in areas with documented VOCs in soil gas concentrations above the cleanup goals, outside of the arsenic source area, would be excavated to address any soil vapor issues. This saturated soil volume has been estimated to be approximately 5,400 additional cubic yards.

All areas undergoing excavation would be backfilled with low-permeability fill material (approximately 0.283 ft/day under this alternative), compacted, and graded for storm water management. An asphalt cover would be placed over these areas and the area would be returned to current use as a parking lot. The cover would prevent infiltration into groundwater.

Based on the proposed redevelopment plan for the former Rifkin property, it is anticipated that for the high-rise tower option up to 4,000 cubic yards of vadose and saturated zone soils could be excavated during installation of piles and pile caps. For soil excavated and removed for Site development that requires increased handling and disposal due to concentrations of arsenic or other COCs, S-W would be responsible for reimbursement to Novartis of the incremental costs. This incremental increase in this operation is considered part of this alternative and S-W would prepare a risk management plan stating their responsibilities.

The existing slurry wall along the south side of the former Rifkin property along the boundary with the S-W property would be breached and replaced with a high permeability interceptor trench. The interceptor trench would be located on the S-W property and be designed to capture and redirect groundwater flow from S-W property away from the former Rifkin property. The trench would be approximately 325 feet long, extend to approximately 18 feet bgs, and be designed to maintain a hydraulic gradient (as demonstrated by potentiometric data collected from both the S-W and former Rifkin properties) away from former Rifkin property, other than that within the drain itself. A second interceptor drain approximately 150 linear feet in length would be installed to capture and redirect flow from the B-line on the former Rifkin property and onto the S-W property.

These trenches are designed to maintain hydraulic gradient of impacted groundwater away from and minimize potential arsenic mass migration to the former Rifkin property. Based on this design basis, the trenches would be approximately 30 inches wide, approximately 18 feet deep and be located as shown on Figure 4-1. The trenches would be backfilled with 3/8 inch minus material and contain a basal perforated pipe to reduce flow resistance from the backfill material. With this design, the trenches would have an effective permeability of approximately 500 ft/day. Soil excavated from the installation of these trenches is anticipated to contain hazardous waste, which would be transported to a Class I hazardous waste landfill for treatment and disposal.

4.1.3.8 Groundwater Monitoring and MNA of Organic COCs

Groundwater monitoring would be performed after implementation of this alternative. The groundwater monitoring program would consist of three parts, demonstrating the overall effectiveness of the remedy, monitoring the performance of the active treatment systems, and demonstrating hydraulic containment and arsenic concentrations in the interceptor trenches on the former Rifkin property.

Overall effectiveness of the remedy would be demonstrated through groundwater samples collected at upgradient and downgradient points along the existing slurry wall as well as at the drain of the interceptor trenches on the former Rifkin property.

Through sampling and analysis of groundwater, trends in the changes in COC concentrations in groundwater would be demonstrated. These monitoring data would be used to evaluate the effectiveness of the remedy outlined in Alternative 3A, and would serve as a demonstration over time of MNA of all organic COCs through comparison with Site data collected prior to remedial action implementation. This comparison would be conducted annually and summarized as part of the five-year review of the S-W property following completion of remedial action.

The performance of the active treatment system would be demonstrated through the collection and evaluation of groundwater samples from wells immediately upgradient and downgradient of the active system.

4.1.3.9 Operations, Maintenance, and Monitoring of Installed Components

This alternative includes long-term operations, maintenance, and monitoring (OM&M) of several installed components, including the surface cover, groundwater treatment system, slurry wall and/or breach system, interceptor trenches and/or drains, groundwater monitoring well network, and/or LUCs. As such, this alternative would include an OM&M plan, OM&M agreement with Site property owners, and financial assurance to DTSC for continued OM&M of these components.

4.1.4 Alternative 3B – Vadose Zone Excavation/Source Area Soil Mixing/Active *In-Situ* Groundwater Treatment/Rifkin Excavation /Groundwater Monitoring/LUCs

Alternative 3B is the same as Alternative 3A with the exception of the inclusion of soil mixing on the S-W property. The proposed layout of all Alternative 3B components is presented graphically on Figure 4-2.

4.1.4.1 Soil Mixing

In-situ soil mixing, as described in Section 2.5.2.2, would be implemented in the A-zone saturated soil within the source area on the S-W property. Soil mixing on the S-W property will complement the excavation performed on the former Rifkin property. The A-zone saturated soils in the source area would be mixed to a depth of approximately 25 feet bgs and would be tied into the A/B aquitard. The final soil mix will have a permeability of approximately 0.000283 ft/day under this alternative. Since soil mixing increases the total soil volume through introduction of the cement mix, the volume of expanded treated soil within the source mixing area would be excavated, transported to, and disposed at an appropriate landfill consistent with the procedures for the vadose zone excavation. The expanded treated soil located above the groundwater table would not be left in place to serve as backfill for the vadose zone, as it would contain total arsenic concentrations above the remediation goal for vadose zone soil.

A groundwater flow and fate and transport model was used to develop the design flow rates and arsenic concentrations at these breaches. The model results are presented in Appendix B of the FS.

4.1.5 Alternative 3C - Vadose Zone Excavation/S-W Source Area Excavation/Rifkin Groundwater Extraction and Aboveground Treatment/MNA/Groundwater Monitoring/LUCs

Alternative 3C includes the following components for addressing soil and groundwater contamination, as they were described under Alternative 3A:

- Removal of Raised Cap
- Vadose Zone Excavation
- Installation of a Cover

- Extending and Breaching Existing Slurry Wall
- LUCs
- Groundwater Monitoring and MNA of COCs
- Operations, Maintenance, and Monitoring of Installed Components

For the S-W property, Alternative 3C would also include source area excavation; breaching and extending the existing slurry wall; and, MNA for arsenic and other COCs as described below.

For the former Rifkin property, Alternative 3C includes installation of an interceptor trench, located on the S-W property, adjacent to the east/west S-W/Rifkin property boundary. A membrane barrier would be placed on one side of the trench, along the property boundary, to prevent groundwater flow toward the former Rifkin property. The trench would have a similar construction to those presented in Alternative 3A. The trench would be approximately 30 inches wide, approximately 25 feet deep and be located as shown on Figure 4-3 The trench would be backfilled with 3/8 inch minus material and contain a basal perforated pipe to reduce flow resistance from the backfill material. With this design, the trench would have an effective permeability of approximately 500 ft/day.

Alternative 3C also contains provisions for operating and maintaining a GWETS, as described under Alternative 2, however the groundwater extraction and treatment would apply only to groundwater extracted from an extraction well on the former Rifkin property and an extraction well on the S-W property. The two extraction wells would contain the arsenic plume underlying the former Rifkin property, as described below.

The proposed layout of Alternative 3C is presented graphically in Figure 4-3.

4.1.5.1 Source Area Excavation

Alternative 3C includes excavation of source area saturated soils on the S-W property. The limits of this excavation are illustrated on Figure 4-3. The source area saturated soils would be removed down to the A/B aquitard (approximately 25 feet bgs) on the S-W property, corresponding to approximately 25,300 cubic yards of saturated soil. The source area excavation would remove source material to groundwater in order to support natural attenuation of the downgradient arsenic concentrations. The MNA sampling would demonstrate the naturally occurring attenuation of arsenic and other COCs in the groundwater over time following the source removal.

During backfill operations of the saturated zone, a reagent (e.g., organic-based tannin or inorganic powdered sulphite) would be added with the backfill material to minimize the potential adverse affects to arsenic sulfides present in the subsurface. The purpose of the reagent would be to act as an oxygen scavenger so that a minimal amount of dissolved oxygen is introduced to the subsurface. As shown on Figure 4-3, the majority of the areas undergoing excavation would be backfilled with low-permeability fill material (approximately 0.283 ft/day under this alternative),

compacted, and graded for storm water management. The remaining area would be backfilled with high-permeability fill material (approximately 28.3 feet/day for this alternative). The high-permeability fill material would be placed downgradient of the interceptor trench and would serve to collect and distribute groundwater into the surrounding, natural formation.

4.1.5.2 Continued Groundwater Extraction and Treatment for Former Rifkin Property

Active groundwater extraction underlying the former Rifkin property would continue, with aboveground treatment of the extracted water at a treatment facility relocated to the northeast corner of the S-W property, adjacent to Horton Street and former Rifkin property. This continued groundwater extraction would continue to prevent further migration of dissolved arsenic plume on the former Rifkin property.

Groundwater elevation monitoring at the Site would continue, as the means to demonstrate effectiveness of the barrier/trench/extraction system on maintaining an inward gradient towards the S-W property along the east/west S-W/Rifkin property boundary. As part of this alternative, a contingency would be to increase extraction rates from the trench/extraction system and/or install additional extraction points, if needed, to direct groundwater flow toward the S-W property.

The proposed redevelopment plan for the former Rifkin property, which includes a high-rise tower option with installation of piles and pile caps, is not inconsistent with, and would not impede implementation or long-term operations, maintenance, and monitoring (OM&M) of this alternative.

Based on the proposed redevelopment plan for the former Rifkin property, it is anticipated that for the high-rise tower option up to 4,000 cubic yards of vadose and saturated zone soils could be excavated during installation of piles and pile caps. For soil excavated and removed for Site development that requires increased handling and disposal due to concentrations of arsenic or other COCs, S-W would be responsible for reimbursement to Novartis of the incremental costs. This incremental increase in this operation is considered part of this alternative and S-W would prepare a risk management plan stating their responsibilities.

4.1.5.3 Breaching and Extending the Existing Slurry Wall

A slurry wall extension would be constructed in locations shown on Figure 4-3 in order to have the existing plume that has been identified to the south of the existing slurry wall migrate through the Site, toward the breaches in the slurry wall. The slurry wall extension would be approximately 340 linear feet along the western property line toward Sherwin Avenue. Unlike Alternatives 3A and 3B which address S-W source material through containment, Alternative 3C removes source material from the S-W property. Therefore, the slurry wall extension under this alternative does not need to tie back into the southern edge of the existing slurry wall.

In order to restore groundwater flow across the S-W property, the existing slurry wall would be breached at locations shown on Figure 4-3. Breaching would be accomplished by removing and replacing the low-permeability materials in the wall with high-permeability fill.

A breach in the existing slurry wall near this extension, as shown on Figure 4-3, would be installed to prevent mounding of groundwater upgradient of this extension and to facilitate impacted groundwater south of the existing slurry wall and east of the extension to migrate across the Site before exiting the Site at the northern slurry wall breaches. This extended migration across the Site is designed to promote additional attenuation of COCs present in the area of the Site, specifically arsenic, prior to migration to downgradient properties.

A groundwater flow model was used to develop the design flow rates at these breaches. Alternative 3C does not include treatment at the breaches and hence does not require a groundwater fate and transport analysis for design of the breaches. The model results are presented in Appendix B of the FS.

4.1.5.4 MNA of COCs in Groundwater

Under Alternative 3C, COC concentration data in groundwater collected in MNA sampling and analysis would provide lines of evidence supporting the occurrence of attenuation of COCs in groundwater. Sampling and analysis of groundwater samples upgradient and downgradient of the existing slurry wall would be performed after completion of source area excavation. This data set would be compared to historical groundwater data to demonstrate long-term decreasing trends in COC concentrations over time across the Site and in downgradient, off-site groundwater. As part of this alternative, a contingency to treat groundwater, if needed, would be implemented in the event that COC concentrations migrating off-site through the slurry wall breaches are not attenuating to the cleanup goals in a reasonable timeframe.

4.1.5.5 LUCs and OM&M Plan

S-W understands that some additional LUCs are needed for Alternative 3C, as compared to Alternative 3A. S-W has access from the current owner to operate, monitor, and maintain (OM&M) a groundwater extraction system on the former Rifkin property. The proposed redevelopment plan for the former Rifkin property, which includes a high-rise tower option with installation of piles and pile caps, is not inconsistent with, and would not impede implementation or long-term OM&M of this system. However, DTSC has advised S-W that the following LUCs will be required for the S-W property and the former Rifkin property to assure DTSC that potential future changes in land use and property ownership do not impair the effectiveness of this alternative:

- Land use restrictions to facilitate OM&M of a groundwater extraction system on the former Rifkin property;

- Land use restriction to facilitate OM&M of a groundwater conveyance system on the former Rifkin property and treatment system on the S-W property;

- Land use restrictions to prevent interference with and operation and maintenance of a groundwater monitoring well network for the Site; and

- Land use restrictions to prevent interference with and operation and maintenance of interceptor trench, slurry wall and breach systems on the S-W property.

In addition, DTSC has advised S-W that an operations, maintenance, and monitoring (OM&M) agreement with financial assurance for OM&M of the groundwater extraction, conveyance and treatment systems and for any other installed feature incorporated in the alternative will be required. The OM&M agreement would apply for both the S-W property and the former Rifkin property. Financial assurance for implementation of the OM&M agreement for the Site would be provided by S-W.

4.1.6 Alternative 4A – Vadose Zone Excavation/Upgradient Interceptor Drain Installation/Passive *In-Situ* Groundwater Treatment/Rifkin Excavation/ Groundwater Monitoring/LUCs

Alternative 4A includes the following components for addressing soil and groundwater contamination, as they were described under Alternative 3A:

- Removal of Raised Cap
- Vadose Zone Excavation
- Installation of a Cover
- Extending and Breaching Existing Slurry Wall
- LUCs
- Groundwater Monitoring and MNA of COCs
- Operations, Maintenance, and Monitoring of Installed Components

In addition to these common components, Alternative 4A also includes construction of an interceptor drain to capture and direct clean groundwater flow upgradient of the source area. The proposed layout of all Alternative 4A components is presented graphically on Figure 4-4.

A groundwater flow and fate and transport model was used to develop the design flow rates and arsenic concentrations at these breaches and the design flow rates for the interceptor drain. The model results are presented in Appendix B of the FS.

4.1.6.1 Upgradient Interceptor Drain

Alternative 4A includes installation of an interceptor drain to collect groundwater upgradient of the S-W property and route this water around the impacted soils into areas downgradient of the Site. The upgradient interceptor drain would extend along all but the western side of the existing slurry wall and down to tie into the new extension of the existing slurry wall (See Figure 4-4 of the FS in Appendix B) for a

total length of 1575 linear feet. The drain design would consist of a 30-inch nominal drain excavated approximately 25 feet to the A/B aquitard. The drain would contain a membrane liner and concrete barrier on one side, prohibiting collection of any impacted groundwater flow from the S-W property. The interceptor drain would replace the slurry wall sections that border the former Rifkin property. The drain would be backfilled with 3/8 inch minus material and would contain a basal perforated pipe to reduce flow resistance from the backfill material. With this design, the trench would have an effective permeability of approximately 500 ft/day.

4.1.6.2 Passive Treatment System

The existing slurry wall would be breached via caisson installation. The caissons filled with reactive media assumed to consist of 20% zero-valent iron (ZVI) and 80% playground sand based on the Phase II treatability study. The reactive caissons would be surrounded by a corridor of caissons backfilled with bentonite or similar low-permeability material that would act as gates to funnel groundwater through the entire length of the treatment zone.

Gravel or similar high-permeability material would be used to backfill additional caissons located immediately upgradient and downgradient of the reactive caissons, to provide mixing and improved distribution of groundwater through the reactive gate.

Each of these backfills would be installed as flowable slurry with high pressure, so as to avoid the formation of voids during backfill when the caisson casing is removed. The number and configuration of the caissons depends on expected influent flow rates and concentrations at each location in each alternative.

The conceptual design and cost estimate for this type of treatment is based on 30 years of operation. However, because of the relative lack of long-term performance data for this type of removal technology, there is uncertainty in the long-term performance. Therefore, some maintenance and rehabilitation costs are included in the cost estimate as a contingency measure.

4.1.6.3 Rifkin Excavation

Under Alternative 4A, all impacted vadose and saturated soil material on the former Rifkin property upgradient of interceptor drain would be excavated, up to 15 feet bgs. The volume of saturated soil contained within the limits of this excavation as shown on Figure 4-4 would be approximately 14,300 cubic yards. The excavation would encompass that portion of former Rifkin property extending from the S-W property north to the B-line. The excavated area would be backfilled with low-permeability fill material (approximately 0.283 ft/day under this alternative).

This excavation would effectively remove all contaminated source material in contact with A-zone groundwater. Installation of the upgradient interceptor drain would prevent migration of impacted groundwater from the S-W property to the former Rifkin property.

4.1.7 Alternative 4B – Vadose Zone Excavation/Upgradient Interceptor Drain Installation/Active *In-Situ* Groundwater Treatment/Rifkin Excavation/ Groundwater Monitoring/LUCs

Alternative 4B is identical to Alternative 4A except that downgradient groundwater would be treated with an active treatment system, as presented under Alternative 3A. The proposed layout of all Alternative 4B components is presented graphically on Figure 4-5.

The active system for Alternative 4B would be similar in conceptual design as that presented for Alternative 3A.

4.1.8 Alternative 5A – Vadose Zone Excavation/Excavation Upgradient of Interceptor Drain/Downgradient Interceptor Drain Installation/Passive *In-Situ* Groundwater Treatment/Rifkin Excavation/Groundwater Monitoring/LUCs

Alternative 5A includes several components for addressing soil and groundwater contamination on both S-W and former Rifkin properties described under Alternatives 3A and/or 4A as listed below:

- Removal of Raised Cap
- Vadose Zone Excavation
- Extending and Breaching Existing Slurry Wall
- Passive Groundwater Treatment
- Installation of a Cover
- Rifkin Excavation
- LUCs
- Groundwater Monitoring and MNA of COCs
- Operations, Maintenance, and Monitoring of Installed Components

Alternative 5A also includes construction of an interceptor drain to capture and direct clean groundwater flow downgradient of the source area. The proposed layout of all Alternative 5A components is presented graphically on Figure 4-6.

A groundwater flow and fate and transport model was used to develop the design flow rates and arsenic concentrations at these breaches and the design flow rates for the interceptor drain. The model results are presented in Appendix B of the FS.

4.1.8.1 Saturated Soil Excavation

Under Alternative 5A, all impacted, saturated soil impacted upgradient of the interceptor drain would be excavated, to 25 feet bgs under S-W property and 15 feet bgs on the former Rifkin property. The limits of this excavation are shown on Figure 4-6. The volume of saturated soils removed within these excavations would

correspond to 14,300 cubic yards on the former Rifkin property and 38,600 cubic yards on the S-W property. Excavated areas would be backfilled with clean material, compacted and graded for storm water control. The excavated area would be backfilled with low-permeability fill material (approximately 0.283 ft/day under this alternative) on the former Rifkin property and lower-permeability fill material (approximately 0.0283 ft/day under this alternative) on the S-W property.

4.1.8.2 Downgradient Interceptor Drain

Alternative 5A includes installation of an interceptor drain to collect groundwater downgradient of the Site source areas and route this water downgradient for treatment. The downgradient interceptor drain would extend along the western side of the former Rifkin property and the existing raised cap area and down to tie into the extension of the existing slurry wall for a total length of 1,100 linear feet. The drain design would consist of a 30 inch nominal drain excavated approximately 25 feet to the A/B aquitard. The drain would contain a membrane liner and concrete barrier on one side, prohibiting collection of any impacted groundwater flow from the S-W property. The drain would be backfilled with 3/8 inch minus material and would also contain a basal perforated pipe to reduce flow resistance from the backfill material. With this design, the trench would have an effective permeability of approximately 500 ft/day.

4.1.9 Alternative 5B – Vadose Zone Excavation/Excavation Upgradient of Interceptor Drain/Downgradient Interceptor Drain Installation/Active *In-Situ* Groundwater Treatment/Rifkin Excavation/Groundwater Monitoring/LUCs

Alternative 5B is identical to Alternative 5A except that downgradient groundwater would be treated via *in-situ* active treatment system described in detail under Alternative 3A. The proposed layout of all Alternative 5B components is presented graphically on Figure 4-7.

4.1.10 Alternative 6 – Vadose Zone Excavation/Source Area Excavation/MNA/Groundwater Monitoring/LUCs

Alternative 6 includes the same components for addressing soil and groundwater contamination described under Alternatives 3A listed below:

- Removal of Raised Cap
- Vadose Zone Excavation
- Installation of a Cover
- Groundwater Monitoring and MNA of COCs
- Operations, Maintenance, and Monitoring of Installed Components

Alternative 6 also includes excavation of source area soils on the S-W and former Rifkin properties and extending and breaching the slurry wall. Alternative 6 also includes MNA for COCs, similar to Alternative 3C. In addition, Alternative 6

contains a contingency plan including a vapor intrusion control system for the former Rifkin property to mitigate potential exposure pathways should future property development include erection of buildings over areas with elevated levels of VOCs in soil gas. The proposed layout of all Alternative 6 components is presented graphically on Figure 5-8.

For the former Rifkin property, Alternative 6 includes installation of an interceptor trench, located on the S-W property, adjacent to the east/west S-W/Rifkin property boundary, as described in Alternative 3C. A membrane barrier would be placed on one side of the trench, along the property boundary, to prevent groundwater flow toward the former Rifkin property. The trench would have a similar construction to those presented in Alternative 3A. The trench would be approximately 30 inches wide, extend to the top of the aquitard, approximately 25 feet deep, and be located as shown on Figure 4-8. The trench would be backfilled with 3/8 inch minus material and contain a basal perforated pipe to reduce flow resistance from the backfill material. With this design, the trench would have an effective permeability of approximately 500 ft/day.

4.1.10.1 Source Area Excavation

In addition to vadose zone excavation, Alternative 6 includes excavation of source area saturated soils on the S-W and former Rifkin properties. The limits of these excavations are shown on Figure 4-8. The source area saturated soils would be removed down to the A/B aquitard (approximately 25 feet bgs) on the S-W property and to 18 feet bgs on the former Rifkin property (Section 4.2.3.1), corresponding to approximately 25,300 and 4,600 cubic yards of saturated soil on each property, respectively.

The source area excavation would remove source material to groundwater in order to support natural attenuation of the downgradient arsenic and other COC concentrations. Saturated soils in areas with documented VOCs in soil gas concentrations above the PRGs, outside of the source area, would be addressed through MNA The MNA sampling described below would demonstrate the naturally occurring attenuation of arsenic and other COCs in the groundwater over time following the source removal.

During backfill operations of the saturated zone, a reagent (e.g., organic-based tannin or inorganic powdered sulphite) would be added with the backfill material to minimize the potential adverse affects to arsenic sulfides present in the subsurface. The purpose of the reagent would be to act as an oxygen scavenger so that a minimal amount of dissolved oxygen is introduced to the subsurface.

As shown on Figure 4-8, the majority of the areas undergoing excavation would be backfilled with low-permeability fill material (approximately 0.283 ft/day under this alternative), compacted, and graded for storm water management. The remaining area would be backfilled with high-permeability fill material (approximately 28.3 feet/day for this alternative). The high-permeability fill material would be placed

downgradient of the interceptor trench and would serve to collect and distribute groundwater into the surrounding, natural formation. As part of this alternative, a contingency would be to pump from the high-permeability fill material and/or trench, if needed, to direct groundwater flow toward the S-W property. As such, backfill design considerations for both the S-W property and the former Rifkin property would be further assessed as part of remedial design of this alternative.

4.1.10.2 Breaching and Extending the Existing Slurry Wall

As presented in Alternative 3C, a slurry wall extension would be constructed in locations shown on Figure 4-8 in order to have the existing plume that has been identified to the south of the existing slurry wall migrate through the Site, toward the breaches in the slurry wall. The slurry wall would be constructed in accordance with procedures described in Section 2.4.5. The slurry wall extension would be approximately 340 linear feet along the western property line toward Sherwin Avenue. Unlike Alternatives 3A and 3B which address source material through containment, Alternative 6 does not. Therefore, the slurry wall extension under this alternative does not need to tie back into the southern end of the existing slurry wall**.**

A breach in the existing slurry wall near this extension, as shown on Figure 4-8, would be installed to prevent mounding of groundwater upgradient of this extension and to facilitate impacted groundwater south of the existing slurry wall and east of the extension to migrate across the Site before exiting the Site at the northern slurry wall breaches. This extended migration across the Site is designed to promote additional attenuation of COCs present in the area of the Site, specifically arsenic, prior to migration to downgradient properties, as discussed below.

A groundwater flow model was used to develop the design flow rates at these breaches. Alternative 6 does not include treatment at the breaches and hence does not require a groundwater fate and transport analysis for design of the breaches. The model results are presented in Appendix B of the FS.

4.1.10.3 MNA of COCs in Groundwater

As in Alternative 3C, COC concentration data in groundwater collected in MNA sampling and analysis would provide lines of evidence supporting the occurrence of attenuation of COCs in groundwater. Sampling and analysis of groundwater samples upgradient and downgradient of the existing slurry wall would be performed after completion of source area excavation. This data set would be compared to historical groundwater data to demonstrate long-term decreasing trends in COC concentrations over time across the Site and in downgradient, off-site groundwater. As part of this alternative, a contingency to treat groundwater, if needed, would be implemented in the event that COC concentrations migrating off-site through the slurry wall breaches or across the former Rifkin property are not attenuating to the cleanup goals in a reasonable timeframe.

4.1.10.4 LUCs

LUCs would be established to maintain the long-term permanence of this remedy and to control future human exposure. These LUCs would prohibit the use of A-zone groundwater beneath the Site; restrict the future land use on the S-W portion of the Site; and facilitate continued access to and operation and maintenance of remediation and monitoring facilities on the Site. LUCs on the former Rifkin property would not preclude proposed redevelopment plan for the former Rifkin property, which includes a high-rise tower option with installation of piles and pile caps.

4.1.11 Alternative 7 – A-Zone Aquifer Excavation /LUCs

Alternative 7 includes the following components in common with Alternative 3A and 4A:

- Removal of Raised Cap
- Installation of a Cover
- LUCs
- Operations, Maintenance, and Monitoring of Installed Components

Alternative 7 also includes excavation of all impacted, saturated A-zone saturated soil from both the S-W property and former Rifkin properties vertically to the A/B aquitard and laterally to the 24 mg/kg background arsenic concentration and/or 0.036 mg/L arsenic concentration for aquatic protection. An estimated 194,000 cubic yards of vadose zone and saturated soils would be excavated, transported off-site, and replaced with clean soil.

The A/B aquitard would remain in place to protect the integrity of the B-zone aquifer. Groundwater monitoring would be postponed until completion of remedial activities. Groundwater monitoring would resume with installation of several new (replacement) wells as necessary and implementation of the groundwater monitoring plan. With the entire affected A-zone aquifer removed and replaced, groundwater monitoring would only be required for a maximum of two or three annual monitoring events to demonstrate residual concentrations in groundwater. The removal of the A-zone aquifer does not include MNA monitoring.

The proposed layout of all Alternative 7 components is presented graphically on Figure 4-9.

4.2 Evaluation of Remedial Action Alternatives

Based on a screening evaluation against effectiveness, implementability, and cost, the following alternatives were retained for detailed analysis:

- **Alternative 1 –** No Action

- **Alternative 2 –** Limited Action

- **Alternative 3A –** Vadose Zone Excavation/Active *In-Situ* Groundwater Treatment/Rifkin Excavation/Groundwater Monitoring/LUCs

- **Alternative 3B –** Vadose Zone Excavation/S-W Source Area Soil Mixing/Active *In-Situ* Groundwater Treatment/Rifkin Excavation /Groundwater Monitoring/LUCs

- **Alternative 3C –** Vadose Zone Excavation/ S-W Source Area Excavation/Rifkin Groundwater Extraction and Aboveground Treatment/MNA/Groundwater Monitoring/LUCs

- **Alternative 6 –** Vadose Zone Excavation/Source Area Excavation/MNA/ Groundwater Monitoring/LUCs

- **Alternative 7 –** A-Zone Aquifer Excavation/LUCs

A detailed and comparative analysis of these retained alternatives was performed. The comparative analysis is summarized in Table 7-1 of the FS (see Appendix B). This analysis applies nine Federal NCP evaluation criteria to each alternative listed above. These criteria are grouped into the following three categories: threshold criteria, primary balancing criteria, and modifying criteria.

4.2.1 Threshold Criteria

Two threshold criteria relate directly to the statutory compliance of the alternative: (1) overall protection of human health and the environment and (2) compliance with ARARs. A given alternative must meet these criteria to be considered as a remedy.

4.2.1.1 Overall Protection of Human Health and Environment

Under this criterion, the adequacy of the protection afforded by a remedial action must be addressed. How risks will be eliminated, reduced, or controlled through treatment, engineering controls, or ICs must be described.

4.2.1.2 Compliance with ARARs

Under this criterion, the means by which a given remedial alternative will meet the ARARs identified in Section 3 must be established. Compliance with the chemical, location, and action-specific ARARs must be attained by the alternative to be considered as a remedy.

Existing settlement agreement between S-W and Novartis is identified as a TBC. Based on ongoing discussions, S-W and Novartis may renegotiate this agreement and therefore, the provisions of this TBC may change.

4.2.2 Primary Balancing Criteria

Five primary balancing criteria address the technical and cost criteria for each alternative: (1) long-term effectiveness and permanence; (2) reduction of toxicity,

mobility, or volume through treatment; (3) short-term effectiveness; (4) implementability; and (5) cost.

4.2.2.1 Long-Term Effectiveness and Permanence

Under this criterion, the effectiveness and permanence of the remedial action is established in terms of risk remaining at the site after the remedial action. The adequacy and reliability of LUCs required with the alternative are evaluated to determine if appropriate risk management of the treatment residuals or untreated waste is in place.

4.2.2.2 Reduction of Toxicity, Mobility, or Volume through Treatment

Under this criterion, the degree and quantity of contaminant toxicity, mobility, and/or volume reduction by use of the specified treatment is evaluated. The anticipated performance of a treatment technology employed by remedial action in terms of long-term reliability of the treatment process and the type and quantity of treatment residuals is discussed.

4.2.2.3 Short-Term Effectiveness

Under this criterion, the impacts on the community, site workers, and the environment during the construction and implementation phase are evaluated. This phase lasts through the construction phase of the remedial action. The duration until protection is achieved is also considered. In addition to the impacts on human health, the potential adverse environmental impacts during the construction are evaluated.

4.2.2.4 Implementability

Under this criterion, the technical and administrative feasibility of implementing the alternative is evaluated. The availability of needed materials and services is also considered. The technical feasibility considerations include the technical difficulties anticipated in construction, reliability of the selected technology, and ease of implementing the remedy. Administrative feasibility considers coordination of interested parties, as well as any required permits.

4.2.2.5 Cost

Under this criterion, estimates are made of capital costs, engineering expenses, and the present worth of future O&M and periodic costs. Cost estimates are developed according to *A Guide to Developing and Documenting Cost Estimates During the Feasibility Study* (EPA 2000). All alternatives have the same future land use and site development cost components. While flexibility has been incorporated into each alternative for the location of remedial facilities, the selection of cleanup levels, the time frame in which remedial action will be completed, and the project scope and duration must be defined in order to provide a cost estimate. As a result, a number of assumptions must be made to provide cost estimates for the various remedial alternatives. Important assumptions specific to each alternative are summarized in the description of the alternative.

The levels of detail employed in making these estimates are approximate, but are considered appropriate for making choices between alternatives. The information provided in the cost estimate is based on the best available information regarding the anticipated scope of the remedial alternatives. The cost estimate is expected to be within +50/-30 percent of the actual cost. The costs are discussed with respect to the following items:

- Capital costs consist of direct (construction) and indirect (non-construction and overhead) costs.
- O&M costs refer to post-construction cost items necessary to ensure the continued effectiveness of a remedial action and typically consist of long-term labor, power, and material costs.
- Periodic costs include items that are required intermittently at greater than 1-year intervals.

A present worth analysis has been used to normalize all capital, O&M, and periodic costs of a remedial alternative. In this analysis, all capital costs are assumed to be incurred within the first year of implementation. Future O&M and periodic costs are included and reduced by the appropriate future value/present worth discount factor of 3 percent.

4.2.3 Modifying Criteria

Two modifying criteria relate directly to the regulatory and community acceptance of the alternative. These criteria will be addressed by DTSC through the RAP review and approval process.

4.3 Basis for Selected Remedial Action

Based on the individual and comparative analyses performed in the FS, the selected alternative is Alternative 6 - Vadose Zone Excavation/Source Area Excavation MNA/ Groundwater Monitoring/LUCs (CDM, 2009b).

The following summarizes the rationale for selection of Alternative 6 as the preferred alternative:

- It provides for the best combination of overall protection to both human health and the environment, and long-term effectiveness and permanence. It is equal to the other alternatives with respect to the other NCP criteria, excluding cost evaluation.
- It provides the best fit with the RAOs, in particular for minimizing risk to downgradient ecological receptors from off-site groundwater migration. As Alternative 6 removes the source of arsenic to groundwater, it provides for the best assurance for long-term protection of ecological receptors. In addition, the removal of the source will prevent further migration of arsenic onto the former Rifkin property.

- Alternative 6 also does not include long-term operation of a treatment system (aboveground or in place) at the Site. This attribute is favorable as it reduces potential need for future evaluation and intrusive operations/modifications to remedy elements (i.e., removal of sludge, change out of reactive media, rehabilitation of extraction wells, etc.).

- It provides the flexibility with respect to S-W plans for future redevelopment of the facility. Other than Alternative 7, Alternative 6 removes the most impacted soils at the Site and reduces the areas within the Site that require LUCs for future redevelopment.

4.4 State Evaluation Process

The evaluation and selection of Alternative 6 as the preferred remedial alternative through the NCP process complies with State evaluation process identified in California H&SC Section 25356.1(c). The six State evaluation criteria correlate with the nine NCP criteria as presented above. A draft statement of reasons for selection of the preferred alternative, correlating to the six State evaluation criteria, is included in Appendix D. The statement of reasons also proposes a preliminary non-binding apportionment of responsibility for the Site, which is included in Appendix E.

4.4.1 Health and Safety Risks

This criterion evaluates the current and future health and safety risks associated with no remediation and with implementing the preferred alternative. This criterion is fully considered under NCP evaluation criterion of Overall Protection of Human Health and Environment.

4.4.2 Beneficial Uses of Site Resources

This criterion evaluates present and potential future beneficial uses of Site resources. This criterion is fully considered under the NCP criterion of Overall Protection of Human Health and Environment and Compliance with ARARs. In the development of RAOs for this Site (Section 3.2), a Site beneficial uses analysis was conducted.

4.4.3 Effect of Remedial Actions on Groundwater Resources

This criterion evaluates the effect of the preferred alternative on Site groundwater resources. The NCP criterion of Overall Protection of Human Health and Environment and Compliance with ARARs fully incorporate this State criterion.

4.4.4 Site-Specific Characteristics

This State criterion requires remedy selection evaluation to consider Site-specific characteristics. Remedy selection considered all Site-specific characteristics, such as Site geology, hydrogeology, chemicals, and previous remedial actions. Extensive Site characterization has been conducted. This State criterion is fully considered in the NCP criterion of Long-Term Effectiveness and Permanence, Short-Term Effectiveness, and Implementablity.

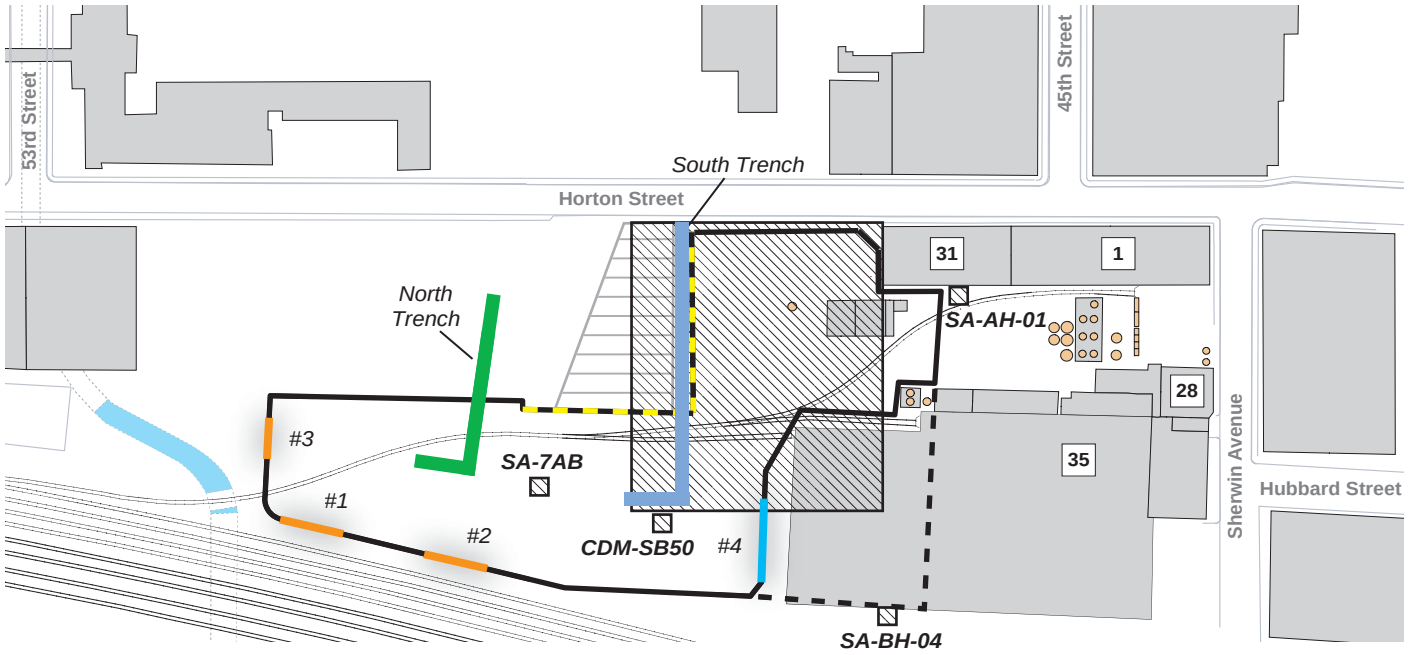
4.4.5 Cost-Effectiveness of Alternative Remedial Action Measures

This criterion evaluates the relative cost-effectiveness of various remediation alternatives in light of their expected success in meeting RAOs. This State criterion is fully considered in the NCP criteria entitled Long-Term Effectiveness and Permanence, and Cost.

4.4.6 Potential Environmental Impacts of Remedial Action

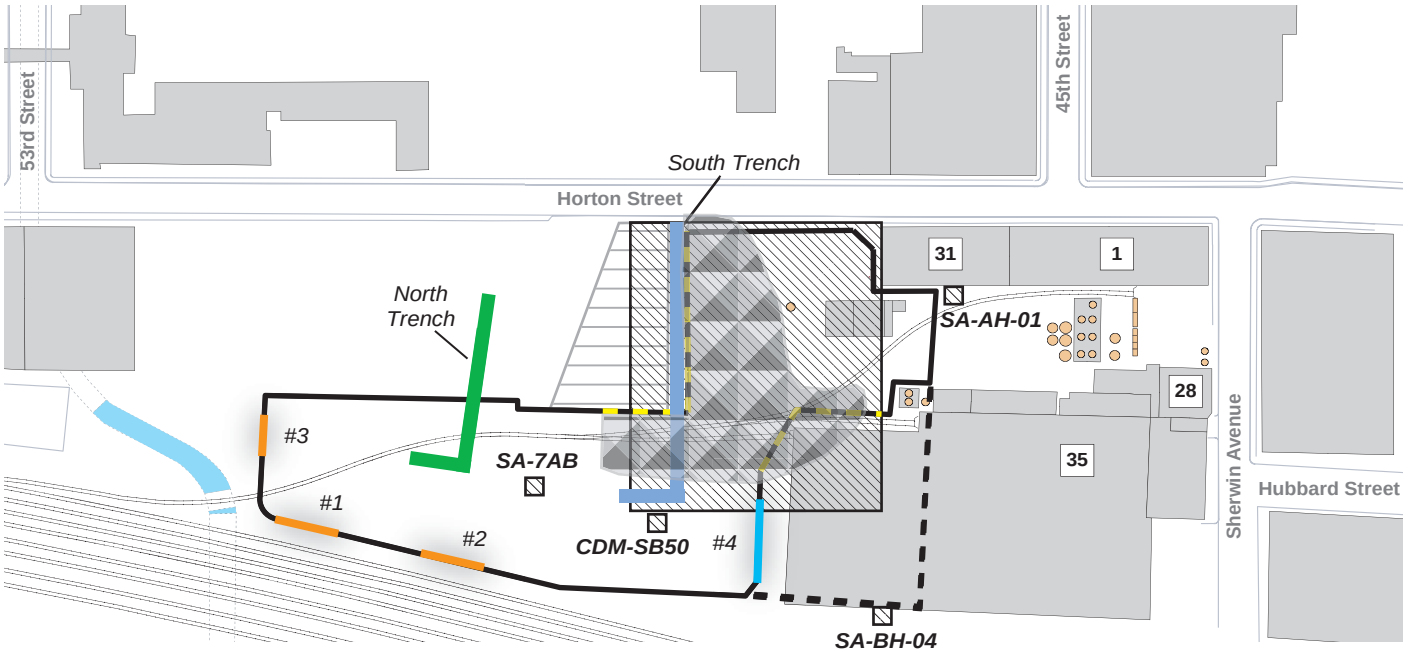
This criterion evaluates the potential environmental impacts of the preferred alternative. The NCP criteria of Short-Term Effectiveness and Long-Term Effectiveness and Permanence consider environmental impacts during and after remedy implementation. In addition, CEQA documentation (see Appendix F) also evaluates environmental impacts from the remedy.

Figure 4-1
Remedial Alternative 3A: Vadose Zone Excavation/Active In-Situ Groundwater Treatment/Rifkin Excavation/Groundwater Monitoring/LUCs



Vadose Zone Soil Excavation
Saturated Soil Excavation on Rifkin
Breach with Active Treatment (#1, #2 & #3)
Gradient Control Trench
Slurry Wall Extension
Breach without Treatment (#4)
Interceptor Trench
Current Slurry Wall
Slurry Wall Removal

Figure 4-2
Remedial Alternative 3B: Vadose Zone Excavation/S-W Source Area Soil Mixing/ Active In-Situ Groundwater Treatment/Rifkin Excavation/Groundwater Monitoring/LUCs



Saturated Soil Mixing on S-W

Gradient Control Trench

Interceptor Trench

Vadose Zone Soil Excavation

Saturated Soil Excavation on Rifkin

Slurry Wall Extension

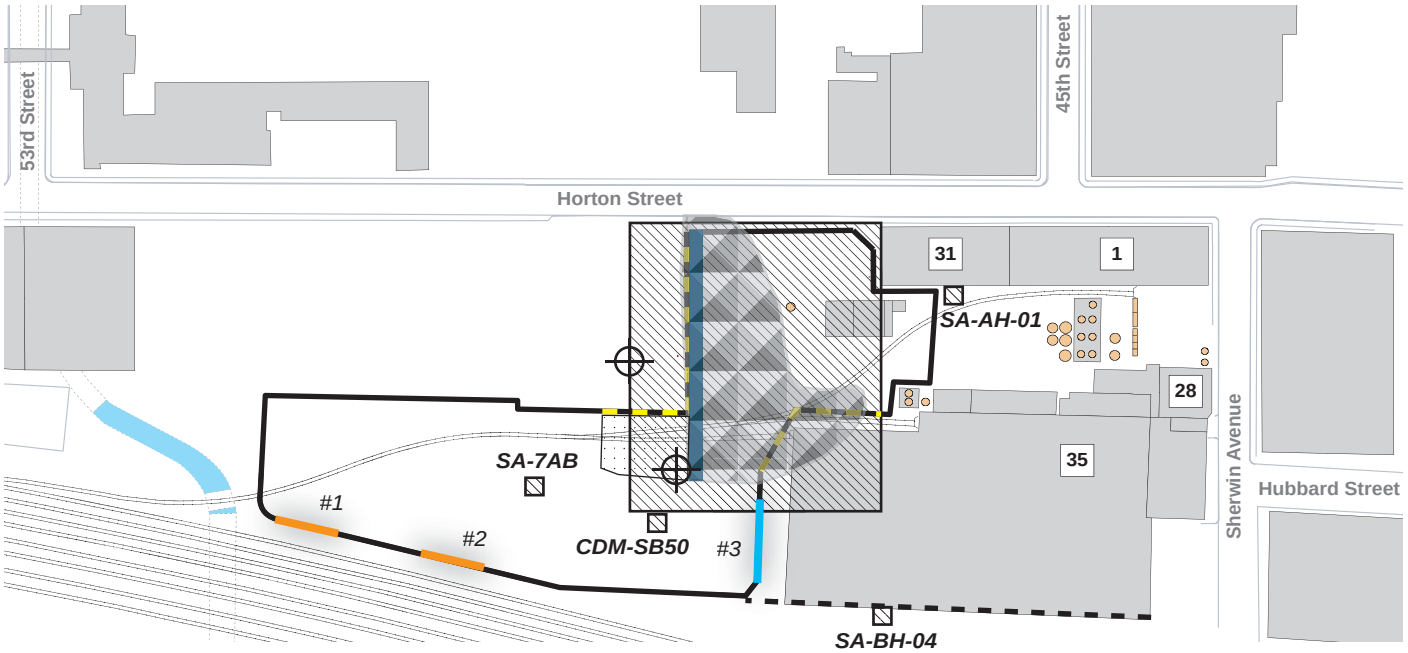
Current Slurry Wall

Breach with Active Treatment (#1, #2 & #3)

Breach without Treatment (#4)

Slurry Wall Removal

Figure 4-3
Remedial Alternative 3C: Vadose Zone Excavation/S-W Source Area Excavation/Rifkin Groundwater Extraction and Aboveground Treatment/MNA/Groundwater Monitoring/LUCs



Saturated Soil Excavation on S-W and Low Permeability Backfill

Saturated Soil Excavation on S-W and High Permeability Backfill

Vadose Zone Soil Excavation

Interceptor Trench with Membrane Barrier Along Rifkin Property Boundary

Extraction Well

Slurry Wall Extension

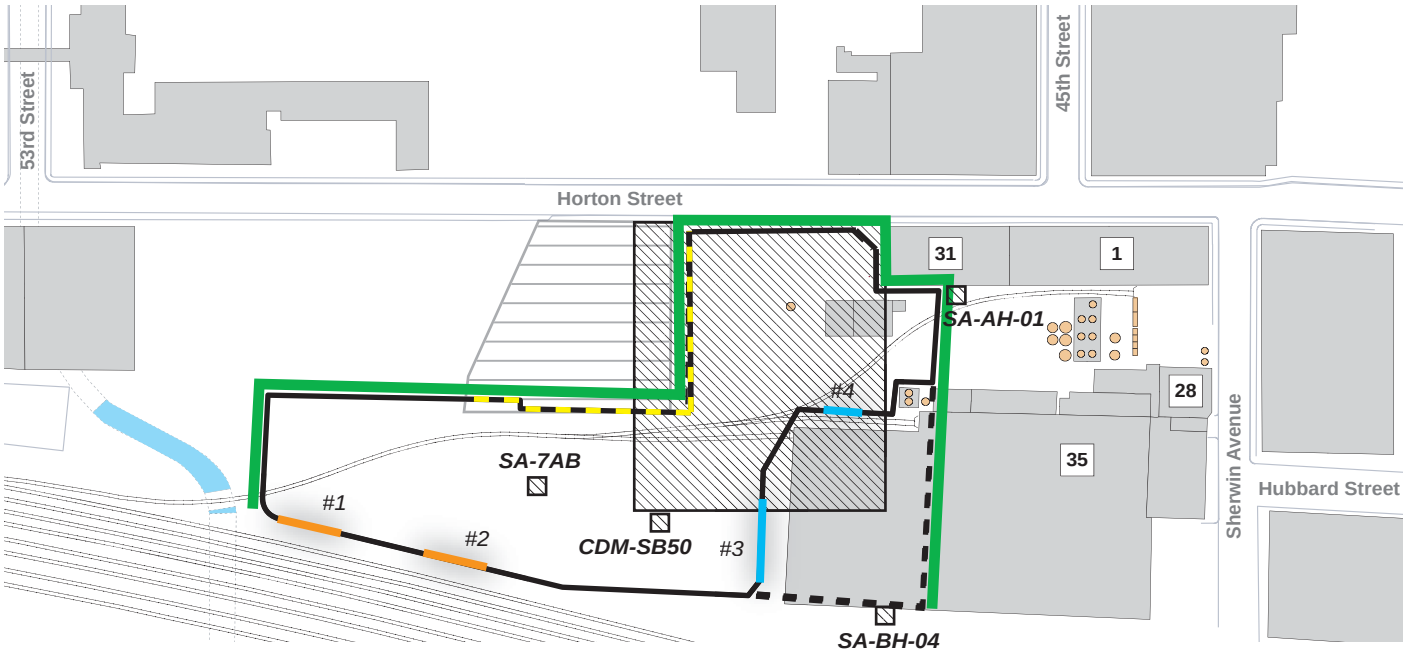
Current Slurry Wall

Breach without Treatment (#1 & #2)

Breach without Treatment (#3)

Slurry Wall Removal

Figure 4-4
Remedial Alternative 4A: Vadose Zone Excavation/Upgradient Interceptor Drain Installation/Passive In-Situ Groundwater Treatment/Rifkin Excavation/Groundwater Monitoring/LUCs



Current Slurry Wall

Slurry Wall Extension

Slurry Wall Removal

Saturated Soil Excavation on Rifkin

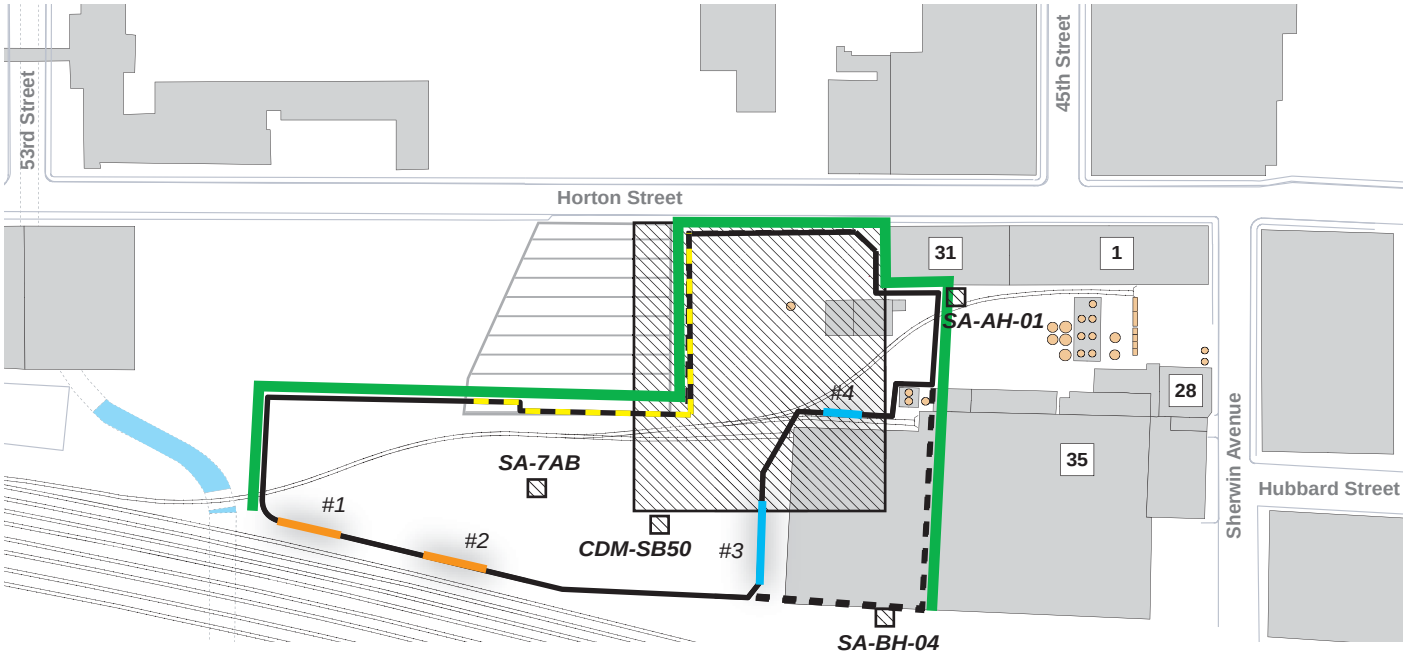
Interceptor Drain

Vadose Zone Soil Excavation

Breach with Passive Treatment (#1 & #2)

Breach without Treatment (#3 & #4)

Figure 4-5
Remedial Alternative 4B: Vadose Zone Excavation/Upgradient Interceptor Drain Installation/Active In-Situ Groundwater Treatment/Rifkin Excavation/Groundwater Monitoring/LUCs



Current Slurry Wall

Slurry Wall Extension

Slurry Wall Removal

Saturated Soil Excavation on Rifkin

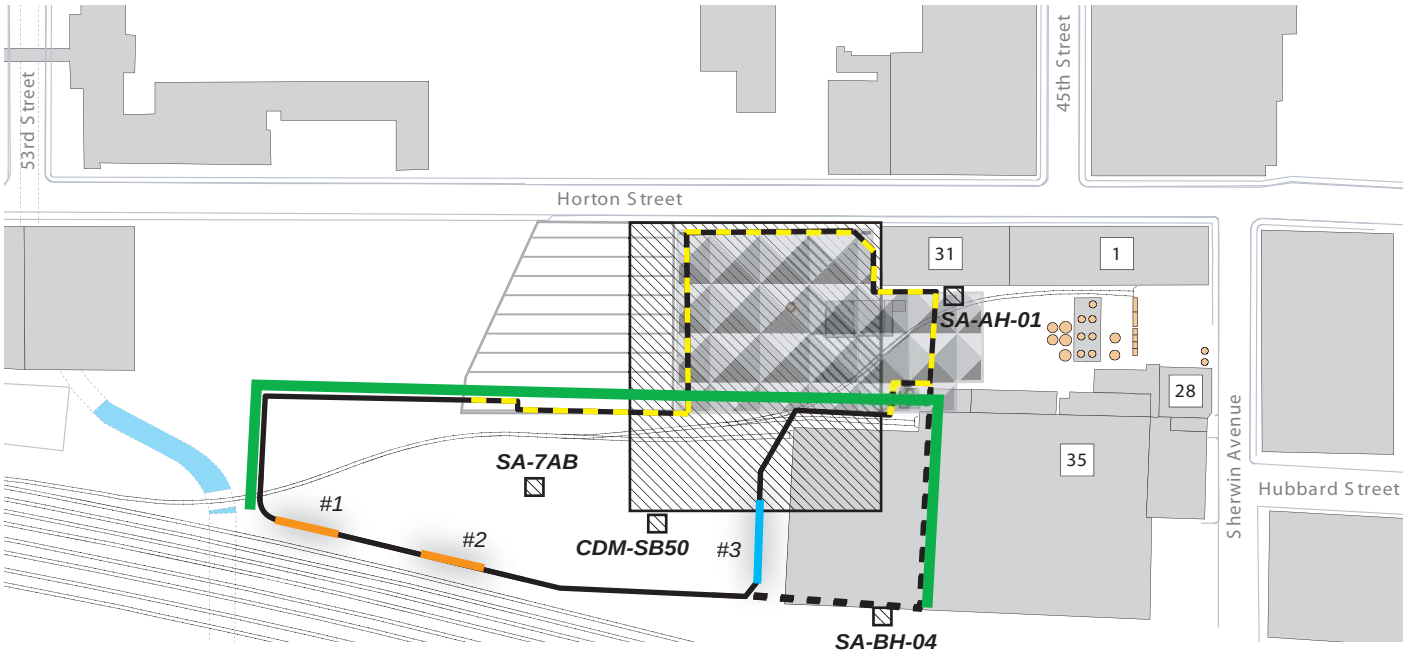
Interceptor Drain

Vadose Zone Soil Excavation

Breach with Active Treatment (#1 & #2)

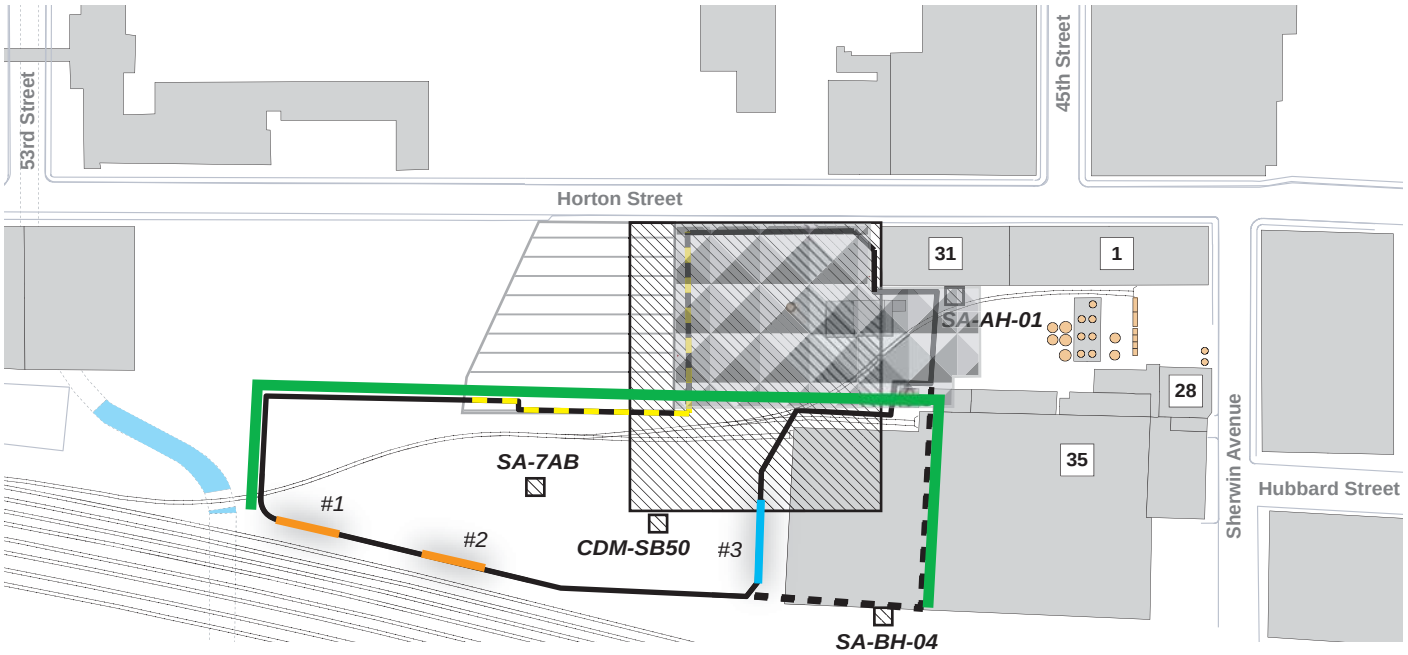
Breach without Treatment (#3 & #4)

Figure 4-6
Remedial Alternative 5A: Vadose Zone Excavation/Excavation Upgradient of Interceptor Drain/Downgradient Interceptor Drain Installation/Passive In-Situ Groundwater Treatment/Rifkin Excavation/Groundwater Monitoring/LUCs



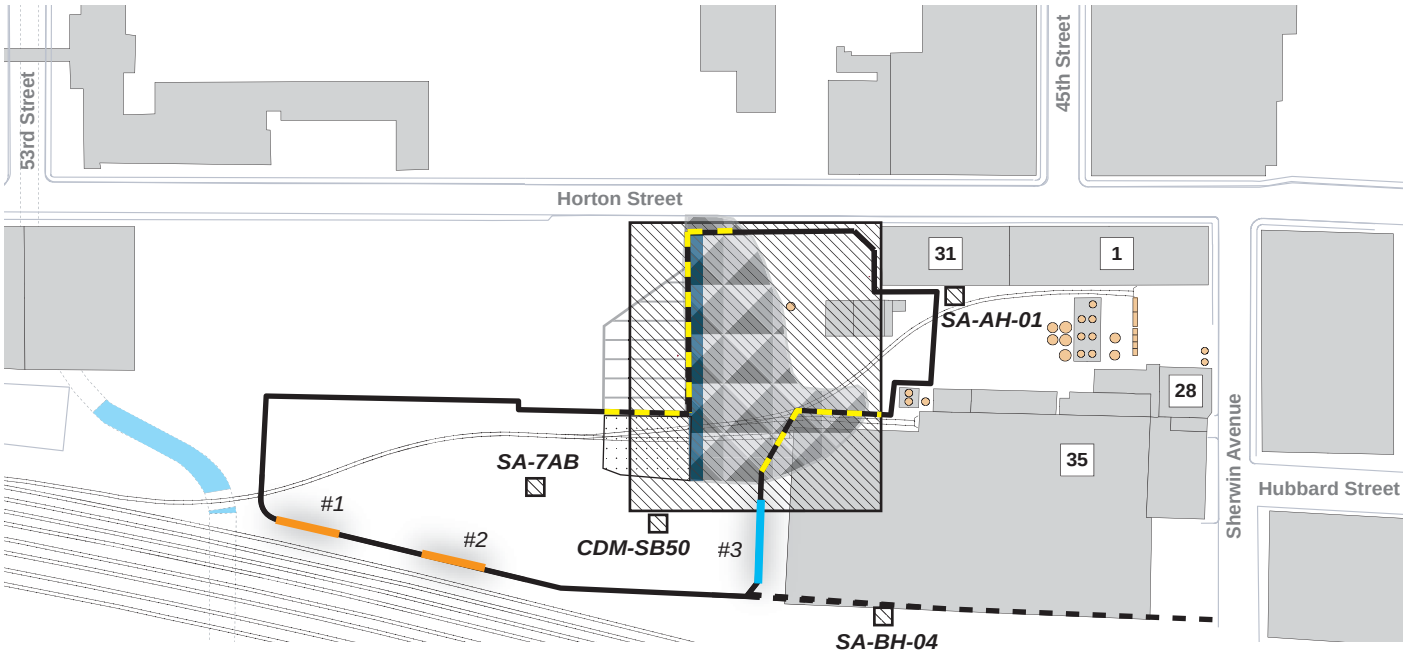
Current Slurry Wall
Slurry Wall Extension
Slurry Wall Removal
Saturated Soil Excavation on Rifkin
Interceptor Drain
Saturated Soil Excavation on S-W
Breach with Passive Treatment (#1 & #2)
Breach without Treatment (#3)
Vadose Zone Soil Excavation

Figure 4-7
Remedial Alternative 5B: Vadose Zone Excavation/Excavation Upgradient of Interceptor Drain/Downgradient Interceptor Drain Installation/Active In-Situ Groundwater Treatment/Rifkin Excavation/Groundwater Monitoring/LUCs



Current Slurry Wall
Slurry Wall Extension
Slurry Wall Removal
Saturated Soil Excavation on Rifkin
Interceptor Drain
Saturated Soil Excavation on S-W
Breach with Active Treatment (#1 & #2)
Breach without Treatment (#3)
Vadose Zone Soil Excavation

Figure 4-8
Remedial Alternative 6: Vadose Zone Excavation/Source Area Excavation/MNA/Groundwater Monitoring/LUCs



Saturated Soil Excavation on S-W and Low Permeability Backfill

Saturated Soil Excavation on S-W and High Permeability Backfill

Saturated Soil Excavation on Rifkin and Low Permeability Backfill

Interceptor Trench with Membrane Barrier Along Rifkin Property Boundary

Slurry Wall Extension

Vadose Zone Soil Excavation

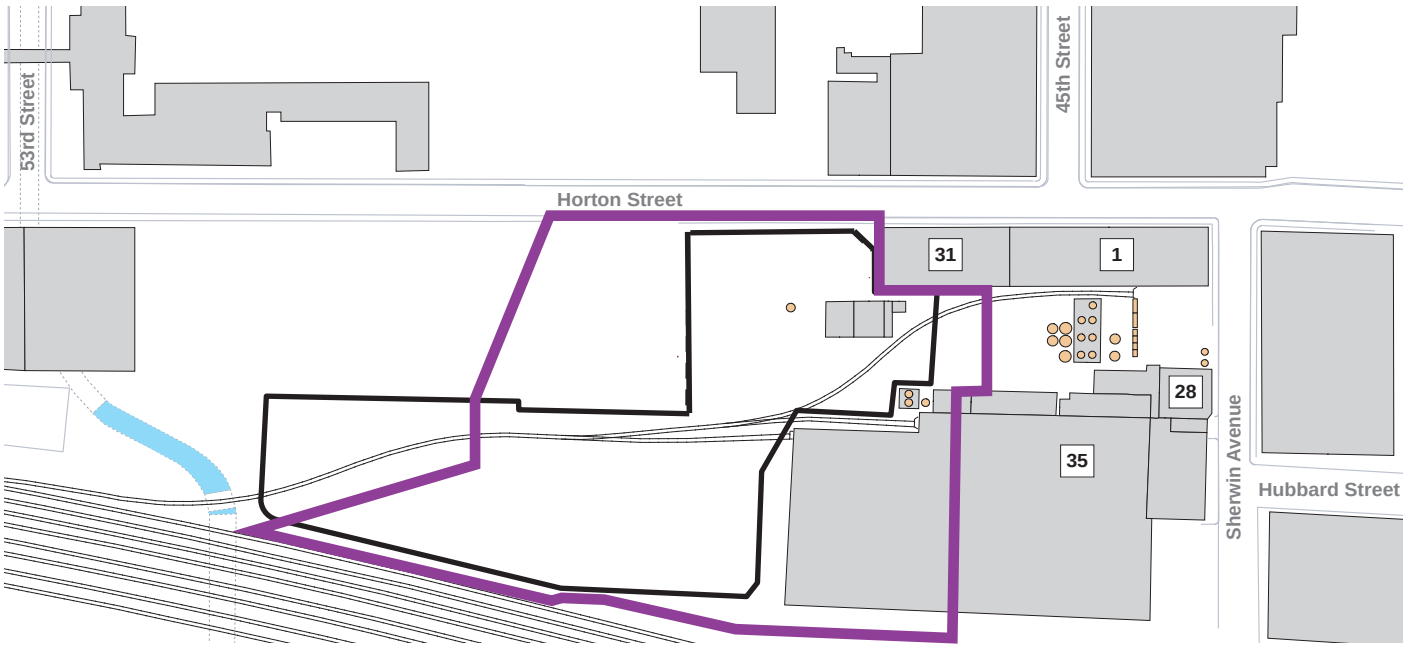
Current Slurry Wall

Breach without Treatment (#1 & #2)

Breach without Treatment (#3)

Slurry Wall Removal With Excavation

Figure 4-9
Remedial Alternative 7: A-Zone Aquifer Excavation/LUCs



A-Zone Aquifer Excavation (vadose and saturated)

Section 5
Planning and Pre-Remediation

This section presents descriptions of the anticipated remedy implementation schedule and details activities to be conducted during the remediation planning stage.

5.1 Preliminary Implementation Schedule

The general remedy implementation schedule described here presents remediation planning and implementation activities in its appropriate time sequence. Following approval by DTSC, the remedy will be implemented in accordance with the planning and design elements presented in this section. Remedy implementation is divided into five sets of activities:

- Planning,
- Pre-remediation,
- Remediation,
- Restoration, and
- Reporting.

Figure 5-1 presents a preliminary schedule for the remedy implementation. The schedule may change upon review and approval of the RAP. Further changes to the schedule may become apparent during preparation of the remedial design implementation plan (RDIP), submittal of remediation contractor plans, coordination with other Site activities, and/or procurement of local permits.

Work hours at the Site during remedy implementation activities will be 7:00 a.m. to 6:00 p.m. Work and transportation days are anticipated to be Monday through Friday, although weekend work may occur depending upon the schedule of activities. Weekend work hours will be 9:00 a.m. to 6:00 p.m., if necessary. These hours and work days may be modified based on conditions encountered during remediation.

5.2 Planning

Key activities to be conducted during the remediation planning stage include:

- Publication of the Public Notice and Fact Sheet;
- Preparation of Remedial Design Implementation Plan (RDIP); and,
- Selection of the remediation contractors.

These planning activities are identified on the preliminary project schedule presented in Figure 5-1.

5.3 Pre-Remediation

Key activities to be conducted during the Pre-Remediation stage include:

- Procurement of appropriate construction-related permits, including but not limited to: the Bay Area Air Quality Management District's Permit to Construct and Permit to Operate and Rule 8 Notification; Water Board's Notice of Intent for Coverage under the General Construction Storm Water Permit; Alameda County's well abandonment and construction permits; and appropriate wastewater discharge permit(s);
- Shutdown of the onsite groundwater extraction and treatment system. The system cessation would occur four weeks prior to remediation contractor mobilization to allow for adequate time to remove piping and equipment;
- Proper abandonment of Site wells within the excavation limits and wells not included in the post-remedy implementation groundwater monitoring[1], a list of existing wells proposed for abandonment is presented in Table 5-1 and their locations shown on Figure 5-2;
- Submittal of required RDIP for DTSC review and approval. Components of the RDIP will include: Dust and Vapor Control Plan (DVCP), Perimeter Air-Monitoring Plan (PAMP), and Transportation Plan; Health and Safety Plan (HASP); Operations, Maintenance and Monitoring Plan (OM&M Plan); Storm Water Pollution Prevention Plan (SWPPP); and, an updated schedule for remedy implementation; and
- Coordination of remediation construction-related activities with Novartis operations, including communication protocols, use of the former Rifkin parking area, schedule constraints, and Site security.

5.3.1 Health and Safety Plans

A Site HASP for onsite workers and a Community Safety Plan will be developed and included in the RDIP.

The Site HASP will generally consist of: identification of physical and chemical hazards; minimum training requirements for Site workers; criteria for upgrading levels of personal protective equipment (PPE); emergency information (e.g., directions to the nearest hospital and emergency telephone numbers); and administrative requirements (e.g., documentation of training and safety tailgate meetings).

During most of the remediation construction, PPE for Site workers is anticipated to be Level D (i.e., hard hats, steel-toed boots, chemical resistant gloves, ear protection, and

[1] Certain wells outside the excavation limits are not suitable for a long-term groundwater monitoring program due to their construction as large-diameter wells that would require large volume purge prior to sampling, monitoring wells not screened properly across the aquifer, or located away from critical post-remedy implementation groundwater flow patterns.

eye protection). Level C PPE (i.e., respiratory protection) may be required in some areas until the results of personal air monitoring indicate that it is unnecessary. Dust and vapor control measures will be implemented to limit exposure to COCs. Personal air monitoring will be performed using individual air pumps and hand held ionizing detectors for selected Site workers.

The Community Safety Plan will provide information for the community regarding the measures to control exposures to chemicals in soil and groundwater that could be released during the implementation. In addition, the Community Safety Plan will present the protocols for implementing the PAMP and for providing the air monitoring results from the PAMP. The substance of the Community Safety Plan will be presented to the community during a meeting prior to remediation.

5.3.2 Storm Water Pollution Prevention Plan

A SWPPP will be developed to address issues that could arise during rainfall events. A Notice of Intent (NOI) will be filed with the State Water Resources Control Board for coverage under the State's General Permit for Construction Activities. State guidelines for storm water control will be followed, including, but not limited to, silt fences and hay bales to limit erosion and/or off-site movement of sediment. The detailed methods for sediment control will be provided in the SWPPP.

Table 5-1
Existing Wells Proposed for Abandonment
Sherwin-Williams Emeryville Remedial Action Plan

Well Number	Well Construction Details and Other Information														*Basis for Abandonment*
	Type	*Location Relative to Current Slurry Wall*	*Existing Well Status or Condition*	*Hydraulic Zone Monitored*	*Date Constructed*	*Top of Casing Elevation* (feet NAVD88)	*Total Depth* (feet bgs)	*Casing Material*	*Casing Diameter* (inches)	*Screen Slot Size* (inches)	*Screen Interval Depths* Top (feet bgs)	*Screen Interval Depths* Bottom (feet bgs)	*Screen Interval Elevations* Top (feet NAVD88)	*Screen Interval Elevations* Bottom (feet NAVD88)	
EX-1	Extraction	Inside on SW	Active extraction	A	7/17/1995	12.78	20.0	SS	6	0.010	5.0	20.0	7.8	-7.2	Large diameter well
EX-10	Extraction	Inside on SW	Active extraction	A	8/27/1998	14.49	23.0	SS	6	0.010	8.0	23.0	6.5	-8.5	Within excavation limits
EX-2	Extraction	Inside on SW	Active extraction	A	7/17/1995	12.78	19.0	SS	6	0.010	4.0	19.0	8.8	-6.2	Within excavation limits
EX-3	Extraction	Inside on SW	Active extraction	A	7/17/1995	17.60	20.0	SS	6	0.010	5.0	20.0	12.6	-2.4	Within excavation limits
EX-4	Extraction	Inside on SW	Active extraction	A	8/31/1998	13.11	26.0	SS	6	0.010	7.0	25.0	6.1	-11.9	Large diameter well
EX-5	Extraction	Inside on SW	Active extraction	A	8/31/1998	13.04	23.5	SS	6	0.010	6.0	21.5	7.0	-8.5	Large diameter well
EX-6	Extraction	Inside on SW	Active extraction	A	8/28/1998	12.46	21.5	SS	6	0.010	6.0	20.5	6.5	-8.0	Large diameter well
EX-7	Extraction	Inside on SW	Active extraction	A	8/28/1998	14.02	23.5	SS	6	0.010	6.0	21.0	8.0	-7.0	Within excavation limits
EX-8	Extraction	Inside on SW	Active extraction	A	9/1/1998	18.98	29.5	SS	6	0.010	9.0	29.0	10.0	-10.0	Within excavation limits
EX-9	Extraction	Inside on SW	Active extraction	A	9/2/1998	20.15	26.0	SS	6	0.010	11.0	25.5	9.2	-5.4	Within excavation limits
EX-16	Extraction	Outside on Rifkin	Active extraction	A	12/29/1999	17.88	17.5	SS	6	0.010	7.5	17.0	10.4	0.9	Within excavation limits
LF-10	Monitoring	Inside on SW	Active monitoring	A	10/27/1989	13.69	18.0	PVC	4	0.020	5.0	15.0	8.7	-1.3	Within slurry wall breach
LF-17	Monitoring	Inside on SW	Active monitoring	A	2/1/1996	15.26	14.5	PVC	2	0.010	8.0	14.0	7.3	1.3	Within excavation limits
LF-22	Monitoring	Inside on SW	Active monitoring	A	1/30/1996	21.86	23.0	PVC	2	0.010	12.0	22.0	9.9	-0.1	Within excavation limits
LF-26	Monitoring	Inside on SW	Active monitoring	A	1/30/1996	15.60	18.5	PVC	2	0.010	8.5	18.0	7.1	-2.4	Within slurry wall breach
LF-4	Monitoring	Inside on SW	Active monitoring	A	5/17/1989	15.31	14.5	PVC	2	0.010	6.0	11.0	9.3	4.3	Improperly screened
LF-6	Monitoring	Inside on SW	Active monitoring	A	5/16/1989	13.37	24.0	PVC	2	0.010	6.0	11.0	7.4	2.4	Improperly screened
LF-7	Monitoring	Inside on SW	Active monitoring	A	5/17/1989	17.14	20.0	PVC	2	0.010	7.0	17.0	10.1	0.1	Historically non detect for COCs
LF-8	Monitoring	Inside on SW	Active monitoring	A	11/2/1989	15.61	15.0	PVC	4	0.020	5.0	15.0	10.6	0.6	Large diameter well
MW-4	Monitoring	Outside on Rifkin	Active monitoring	A	12/9/1994	18.26	18.5	PVC	2	0.010	7.0	17.0	11.3	1.3	Within excavation limits
MW-5	Monitoring	Outside on Rifkin	Active monitoring	A	12/9/1994	17.94	17.0	PVC	2	0.010	7.0	17.0	10.9	0.9	Within excavation limits
CDM-1	Monitoring	Outside on SW	Active monitoring	A	11/27/2006	13.60	12.0	PVC	1	0.020	7.0	12.0	6.6	1.6	Within slurry wall extension
LF-11	Monitoring	Outside on SW	Active monitoring	A	10/30/1989	12.75	15.5	PVC	4	0.020	5.0	15.0	7.8	-2.3	Within slurry wall extension
LF-20	Monitoring	Outside on SW	Active monitoring	A	2/5/1996	14.47	18.3	PVC	2	0.010	8.0	18.0	6.5	-3.5	Within slurry wall breach
LF-3	Monitoring	Outside on SW	Active monitoring	A	5/18/1989	14.70	11.5	PVC	2	0.010	6.0	11.0	8.7	3.7	Within excavation limits
SA-AW-01	Monitoring	Outside on SW	Active monitoring	A	6/24/2001	12.33	15.0	PVC	2	0.010	5.0	15.0	7.3	-2.7	Within slurry wall extension
SA-AW-05	Monitoring	Outside on SW	Active monitoring	A	6/22/1999	15.42	15.0	PVC	2	0.010	5.0	15.0	10.4	0.4	Historically non detect for COCs
SP-AW-06	Monitoring	Outside on SW	Active monitoring	A	?	21.42	?	?	?	?	?	?	?	?	Historically non detect for COCs
LF-PZ1	Piezometer	Inside on SW	Active monitoring	A	11/4/1997	17.62	25.0	PVC	3/4	?	5.0	20.0	12.6	-2.4	Within excavation limits
LF-PZ10	Piezometer	Inside on SW	Active monitoring	A	10/30/1997	14.96	19.5	PVC	3/4	?	4.5	19.5	10.5	-4.5	Within excavation limits
LF-PZ13	Piezometer	Inside on SW	Active monitoring	A	10/31/1997	13.63	19.5	PVC	3/4	?	4.5	19.5	9.1	-5.9	Within excavation limits
LF-PZ14	Piezometer	Inside on SW	Active monitoring	A	10/31/1997	12.91	19.0	PVC	3/4	?	4.0	19.0	8.9	-6.1	Piezometer not needed
LF-PZ15	Piezometer	Inside on SW	Active monitoring	A	10/31/1997	17.03	16.0	PVC	3/4	?	6.0	16.0	11.0	1.0	Piezometer not needed
LF-PZ16	Piezometer	Inside on SW	Active monitoring	A	11/3/1997	13.73	17.0	PVC	3/4	?	3.0	13.0	10.7	0.7	Within excavation limits
LF-PZ17	Piezometer	Inside on SW	Active monitoring	A	11/3/1997	12.82	17.0	PVC	3/4	?	3.0	13.0	9.8	-0.2	Piezometer not needed
LF-PZ18	Piezometer	Inside on SW	Active monitoring	A	11/3/1997	15.71	19.0	PVC	3/4	?	3.0	13.0	12.7	2.7	Piezometer not needed
LF-PZ19	Piezometer	Inside on SW	Active monitoring	A	11/3/1997	16.37	19.0	PVC	3/4	?	5.0	15.0	11.4	1.4	Piezometer not needed
LF-PZ20	Piezometer	Inside on SW	Active monitoring	A	11/4/1997	16.15	22.0	PVC	3/4	?	5.0	20.0	11.2	-3.9	Within excavation limits
LF-PZ26	Piezometer	Inside on SW	Active monitoring	A	11/14/2000	21.40	22.0	PVC	3/4	0.010	7.0	22.0	14.4	-0.6	Within excavation limits
LF-PZ29	Piezometer	Inside on SW	Active monitoring	A	1/6/2000	14.45	16.0	PVC	2	0.020	7.0	16.0	7.5	-1.6	Within excavation limits
LF-PZ3	Piezometer	Inside on SW	Active monitoring	A	12/28/1997	20.70	23.0	PVC	3/4	?	8.0	23.0	12.7	-2.3	Within excavation limits
LF-PZ34	Piezometer	Inside on SW	Active monitoring	A	1/4/2000	21.45	17.0	PVC	2	0.020	7.0	17.0	14.5	4.5	Within excavation limits
LF-PZ6	Piezometer	Inside on SW	Active monitoring	A	10/28/1997	21.14	23.0	PVC	3/4	?	8.0	23.0	13.1	-1.9	Within excavation limits
LF-PZ8	Piezometer	Inside on SW	Active monitoring	A	10/39/97	19.73	23.0	PVC	3/4	?	8.0	23.0	11.7	-3.3	Within excavation limits
LF-PZ9	Piezometer	Inside on SW	Active monitoring	A	10/30/1997	15.46	19.5	PVC	3/4	?	4.5	19.5	11.0	-4.0	Piezometer not needed
LF-PZ2	Piezometer	Outside on Rifkin	Active monitoring	A	10/30/1996	20.74	23.0	PVC	3/4	?	8.0	23.0	12.7	-2.3	Within excavation limits
LF-PZ27	Piezometer	Outside on Rifkin	Active monitoring	A	12/28/1999	19.08	16.0	PVC	2	0.020	7.0	16.0	12.1	3.1	Within excavation limits
LF-PZ28	Piezometer	Outside on Rifkin	Active monitoring	A	1/6/2000	14.83	16.0	PVC	2	0.020	7.0	16.0	7.8	-1.2	Within excavation limits
LF-PZ30	Piezometer	Outside on Rifkin	Active monitoring	A	12/28/1999	18.41	15.0	PVC	2	0.020	7.0	15.0	11.4	3.4	Within excavation limits
LF-PZ31	Piezometer	Outside on Rifkin	Active monitoring	A	12/28/1999	18.25	26.5	PVC	2	0.020	17.5	26.5	0.8	-8.3	Within excavation limits
LF-PZ32	Piezometer	Outside on Rifkin	Active monitoring	A	1/3/2000	19.19	16.0	PVC	2	0.020	7.0	16.0	12.2	3.2	Piezometer not needed
LF-PZ33	Piezometer	Outside on Rifkin	Active monitoring	A	1/4/1999	21.59	17.0	PVC	2	0.020	7.0	17.0	14.6	4.6	Within excavation limits
LF-PZ11	Piezometer	Outside on SW	Active monitoring	A	10/30/1997	15.49	19.5	PVC	3/4	?	4.5	19.5	11.0	-4.0	Piezometer not needed
LF-PZ12	Piezometer	Outside on SW	Active monitoring	A	10/31/1997	13.71	19.0	PVC	3/4	?	4.0	19.0	9.7	-5.3	Within excavation limits
LF-PZ7	Piezometer	Outside on SW	Active monitoring	A	10/29/1997	21.74	23.0	PVC	3/4	?	8.0	23.0	13.7	-1.3	Within excavation limits

Table 5-1
Existing Wells Proposed for Abandonment
Sherwin-Williams Emeryville Remedial Action Plan

Well Number	Well Construction Details and Other Information														*Basis for Abandonment*
	Type	*Location Relative to Current Slurry Wall*	*Existing Well Status or Condition*	*Hydraulic Zone Monitored*	*Date Constructed*	*Top of Casing Elevation* (feet NAVD88)	*Total Depth* (feet bgs)	*Casing Material*	*Casing Diameter* (inches)	*Screen Slot Size* (inches)	*Screen Interval Depths* Top (feet bgs)	*Screen Interval Depths* Bottom (feet bgs)	*Screen Interval Elevations* Top (feet NAVD88)	*Screen Interval Elevations* Bottom (feet NAVD88)	
LF-B3	Monitoring	Inside on SW	Active monitoring	B	11/3/1989	13.00	39.5	PVC	2	0.010	34.0	39.0	-21.0	-26.0	Within slurry wall breach
LF-B5	Monitoring	Inside on SW	Active monitoring	B	2/2/1996	20.99	44.0	PVC	2	0.010	34.0	44.0	-13.0	-23.0	Within excavation limits
LF-B6	Monitoring	Inside on SW	Active monitoring	B	2/2/1996	14.69	39.0	PVC	2	0.010	28.0	38.5	-13.3	-23.8	B-zone well not needed
LF-B4	Monitoring	Outside on Horton	Active monitoring	B	6/29/1990	17.25	48.0	PVC	2	0.020	36.0	46.0	-18.8	-28.8	B-zone well not needed
RP-BW-02	Monitoring	Outside on Rifkin	Active monitoring	B	7/9/1999	18.67	44.0	PVC	2	0.010	34.0	44.0	-15.3	-25.3	Within excavation limits
SA-BW-01	Monitoring	Outside on SW	Active monitoring	B	6/9/1999	12.77	45.0	PVC	2	0.010	35.0	45.0	-22.2	-32.2	Within slurry wall extension

Notes:
NADV88: North American Vertical Datum of 1988
bgs: below ground surface
toc: top of casing
PVC: polyvinyl chloride
SS: stainless steel

ID	Task Name	Duration	Start	Finish
1	**Remediation Planning**	**105 days**	**Tue 9/7/10**	**Tue 2/1/11**
2	Submittal of Remedial Design Implementation Plan	0 days	Tue 9/7/10	Tue 9/7/10
3	Contractor Selection	3 mons	Fri 10/8/10	Thu 12/30/10
4	Distribute Fact Sheet	0 days	Tue 2/1/11	Tue 2/1/11
5	**Pre-Remediation**	**20 days**	**Tue 2/1/11**	**Mon 2/28/11**
6	Permits, Plans & Submittals	1 mon	Tue 2/1/11	Mon 2/28/11
7	**Remediation**	**161 days**	**Tue 3/1/11**	**Tue 10/11/11**
8	Contractor Mobilization	5 days	Tue 3/1/11	Mon 3/7/11
9	GW Monitoring Well Abandonment	20 days	Tue 3/8/11	Mon 4/4/11
10	Soil Vapor Extraction Implementation and Operation	20 days	Tue 3/8/11	Mon 4/4/11
11	Establish Public Protection and Security	10 days	Tue 3/8/11	Mon 3/21/11
12	Set up Air Monitoring and Determine Background Levels	10 days	Tue 3/8/11	Mon 3/21/11
13	Implement SWPP and Waste Stockpile Berms	5 days	Tue 3/22/11	Mon 3/28/11
14	Install Dewatering System	15 days	Tue 3/22/11	Mon 4/11/11
15	Operate Dewatering System	121 days	Tue 4/12/11	Tue 9/27/11
16	Remove Raised Cap	11 days	Tue 4/12/11	Tue 4/26/11
17	Install Shoring	20 days	Thu 4/21/11	Wed 5/18/11
18	Excavate Vadose & Saturated Soil	90 days	Wed 4/27/11	Tue 8/30/11
19	Backfill	90 days	Wed 5/11/11	Tue 9/13/11
20	Install Slurry Wall Breaches	20 days	Wed 8/31/11	Tue 9/27/11
21	Extend Slurry Wall	20 days	Wed 8/31/11	Tue 9/27/11
22	Site Restoration and Demobilization	10 days	Wed 9/28/11	Tue 10/11/11
23	**Post-Remediation**	**40 days**	**Wed 9/28/11**	**Tue 11/22/11**
24	Install New GW Monitoring Wells	30 days	Wed 9/28/11	Tue 11/8/11
25	Remedy Completion Report	40 days	Wed 9/28/11	Tue 11/22/11

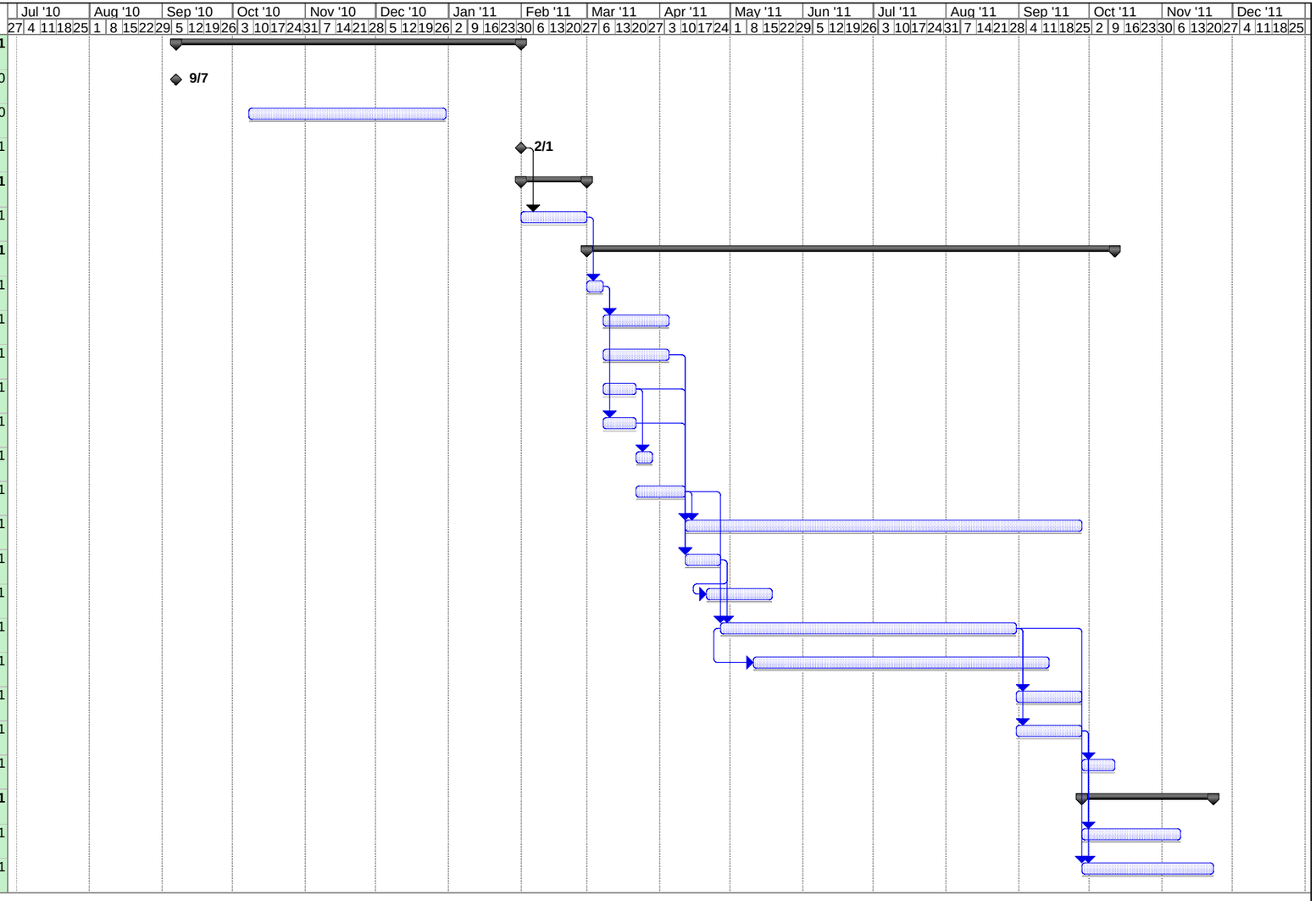


Figure 5-1
Preliminary Project Schedule
Sherwin-Williams Company - Emeryville, California

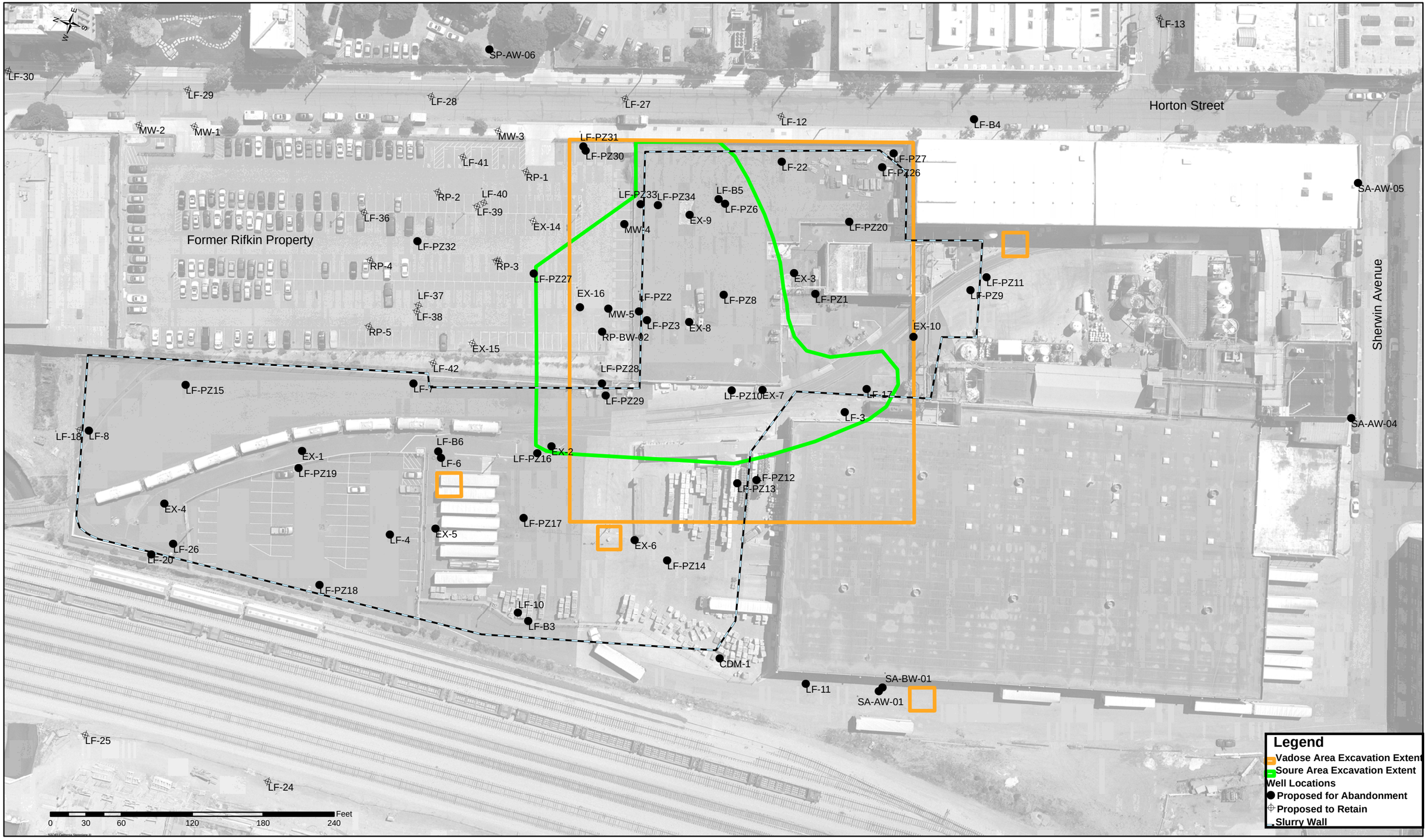


Figure 5-2
Existing Wells Proposed for Abandonment
Sherwin-Williams Company - Emeryville, California

Section 6
Remediation and Restoration

This section provides an expanded description for the implementation of the selected remedy (FS alternative 6, see Section 4). While this section describes specific design and technical components for remedy implementation, the final design, as presented in the RDIP, may be different, but will achieve the identified objectives.

During remedy implementation, potential exposure to COCs could occur from inhalation of dust and organic vapors generated during soil handling. The DTSC-approved Public Health Evaluation of the Remedial Alternative (PHERA) (CDM, 2009a) document determined that use of appropriate emission control technologies (e.g., dust, vapor, and odor controls) can effectively control potential exposure of the community to unacceptable concentrations of COCs during remedy implementation. This section provides additional details on the emission control and monitoring procedures.

Major activities to be conducted during remedy implementation are:

- Establishment of Site exclusion zones, security areas and signage;
- Mobilization of contractor equipment to the Site;
- Establishment of the Site construction office;
- Installation of monitoring systems;
- Installation of roadway within the Site and within roadway easement along western Site boundary;
- Abandonment of selected groundwater monitoring wells;
- Extraction and treatment of soil vapors within and underlying the Raised Cap;
- Removal, handling, and off-site disposal of the Raised Cap;
- Installation of shoring system for excavation along Horton Street;
- Dewatering of groundwater from the excavation and on-site water treatment;
- Excavation, handling, and off-site disposal of material;
- Installation of slurry wall breaches;
- Extension of existing slurry wall;
- Backfilling and compaction of imported fill in the excavation;
- Installation of groundwater monitoring wells; and
- Demobilization of remediation equipment.

6.1 Construction Area Layout and Controls

Remedy implementation activities will utilize many of the remaining building slabs for equipment and supplies storage, waste stockpiling and handling prior to off-site transport and disposal. Building foundations that do not interfere with the excavation will be left in place pending further redevelopment of the Site.

Figure 6-1, Preliminary Site Layout and Controls, presents a preliminary layout of work areas and general Site controls for the remedy implementation activities. This figure is intended as a general guideline. The final layout is subject to refinements during preparation of the RDIP and will be established by the remediation contractor.

6.1.1 Engineered Controls During Remediation

Remedy implementation activities will include engineered controls to reduce short-term exposure risks from releases of COCs to the environment and/or community in the form of dust, vapors, and/or surface water runoff. Remedy implementation activities are presented in Table 6-1, under individual rows. Categories of potential emissions are listed as column headings in the table. Engineered controls for these emission types comprise the columns in Table 6-1.

6.1.1.1 Dust Control

A Dust and Vapor Control Plan (DVCP) will be prepared in accordance with the remediation specifications and compliance requirements as applicable. The DVCP will identify techniques, supplies, and equipment needed to control dust emissions during remedy implementation. The DVCP will include but are not limited to the following elements for dust control: water sprays/mist, surfactants, wetting agents, dust suppressants, covers, and windscreens. The DVCP will be reviewed by the DTSC prior to remedy implementation as part of the RDIP. The DVCP will be consistent with the findings presented in the PHERA regarding appropriate use of dust controls.

If observations or measurements, or complaints from people in the community indicate a need for more stringent dust control, the contractor will increase the magnitude and frequency of the dust control. If further dust control measures are needed due to winds, the contractor may be required to stop certain portions of the work until conditions improve or the contractor employs satisfactory compliance methods.

6.1.1.2 Vapor and Odor Control

The highest VOC concentrations are anticipated to be encountered during excavation in the northwest portion of the planned excavation area. The DVCP will identify techniques, supplies, and equipment needed to control vapor emissions during remedy implementation. The DVCP will include, but not be limited to, the following elements for vapor and odor control: water spray/mist; vapor suppressant foam; and covers. The DVCP will be reviewed by the DTSC prior to remedy implementation as part of the RDIP.

Prior to removal of the Raised Cap, a network of vapor extraction wells will be installed on the Raised Cap and surrounding vadose zone soil excavation area. These vapor extraction wells will be utilized to remove stagnant VOCs present in the Raised Cap material and vadose zone soils prior to excavation. The vapor stream will be treated through a combination of adsorption media. The soil vapor extraction and treatment system will be operated pursuant to a BAAQMD permit.

The vapor extraction system is expected to operate for up to four weeks prior to excavation activities. The total VOC concentrations are expected to decrease and stabilize (as monitored at the influent of the vapor treatment system) to equilibrium with mass transfer processes that are generating the vapors from VOCs absorbed to soil and dissolved in water. The extracted soil vapor will be field monitored for total VOC concentrations. Removal of the Raised Cap and soil excavation will be initiated when total VOC concentrations reach relatively stabilized levels. Portions of the soil vapor extraction system will continue to operate during the removal of the Raised Cap and soil excavation activities. Vapor extraction wells will be removed as the Raised Cap removal and soil excavation proceeds. In addition, during Raised Cap removal and soil excavation, potential volatilization of VOCs will be managed through engineering controls.

Perimeter air monitoring will be used to confirm the effectiveness of vapor control methods. If vapor emission concentrations at the perimeter are detected above pre-set action levels (as presented in Section 6.2.1), vapor control methods will be modified until vapor concentrations are reduced below the action levels.

During Raised Cap removal and soil excavation, odors associated with Site COCs will be managed through engineering controls. During remedy implementation, odors unrelated to impacted soil/debris (i.e., odors not associated with COCs) could also be generated. These types of odors will also be controlled during remedy implementation, using the same engineering controls as those for odors associated with COCs.

6.1.1.3 Surface Water Runoff Control

An array of isolated sumps, pumps, and hoses are used currently at the S-W Site for storm water management. This current storm water management system would continue under a construction SWPPP during remedy implementation, as discussed in Section 5.

This current storm water management system replaced the former underground piping network. This former network has been plugged through installation of temporary plugs at several locations in the main storm sewer connecting to Temescal Creek channel. These plugs are routinely monitored for effectiveness. Storm water is collected in the sumps and pumped directly to the Temescal Creek channel.

The construction SWPPP will be developed to address issues that could arise during rainfall events during remedy implementation. As part of the SWPPP, sections of the

main storm sewer connecting to Temescal Creek channel will be removed and filled with grout to create permanent plugs. The remaining parts of the existing system will continue to operate as needed during remedy implementation.

Water that has been in contact with impacted materials, and water extracted from the excavation, will be isolated from non-impacted storm water by construction and maintenance of berms. This contact water will be treated on-site and discharged to Temescal Creek, discharged to the sanitary sewer (if permitted), or transported off-site for treatment and discharge.

6.2 Monitoring of Engineering Controls

The engineered controls for limiting potential short-term exposures from releases of COCs to the environment and/or community in the form of dust, vapors, and/or surface water runoff, will be monitored to confirm their effectiveness. In addition to health-based exposure risks, monitoring is needed to confirm control of noise, odor, and vibration.

The DTSC-approved Public Health Evaluation of the Remedial Alternative (PHERA) (CDM, 2009a) document determined performance standards to be used during air monitoring for evaluating the effectiveness of dust and vapor controls. The performance standards are concentrations of respirable COCs in air that should not be exceeded, as defined in Table 6-2 and 6-3. Adherence to performance standards helps to provide protection of people in the community from unacceptable exposure to COCs. The performance standards established in the PHERA for the COCs are summarized in Tables 6-2 and 6-3.

Action levels for respirable dust and total VOCs were developed by which COCs can be evaluated immediately as remedy implementation activities proceed. Particulate matter with an effective diameter of less than or equal to 10 microns (µm) (PM10) is considered respirable (National Ambient Air Quality Standards). The action levels established in the PHERA for total VOCs and PM10 are summarized in Tables 6-2 and 6-3, respectively.

6.2.1 Perimeter Air Monitoring and Sampling

As discussed in Section 5, a Site safety plan will be developed to address personal protective equipment (PPE) for Site workers and visitors and personal air monitoring for Site workers to evaluate the potential for exposure. This section focuses on perimeter air monitoring and sampling to evaluate potential exposure to the community.

During material handling activities (i.e., excavation, loading, stockpiling, etc.), perimeter air monitoring will be conducted to confirm the effectiveness of dust and vapor controls. As presented on Figure 6-1, air monitoring stations are anticipated to be placed along all perimeters of the Site. Final number and location of the stations is subject to refinements during preparation of the RDIP.

S-W has operated a meteorological station at the Site since August 2002. The station records wind speed, direction, temperature, and rainfall at 30-minute intervals. The station, was originally located in the approximate center of the S-W property at the end of the then existing rail car loading dock extending north from the northeast corner of former Building 35 and was positioned approximately 20 feet above ground. The station was relocated to a nearby utility pole in July 2007, prior to Site demolition activities. The station data collected between August 2002 and July 2007 confirmed a predominantly on-shore wind direction from the west northwest, with average wind speeds of 3 mph and recorded gusts as high as 9 mph from this direction. Existing Site wind data indicate maximum recorded winds from the south southeast at 18 mph. The existing meteorological station, or a replacement unit, will remain operational to monitor changes in wind direction during remedy implementation.

As part of the RDIP, a Perimeter Air-Monitoring Plan (PAMP) will be prepared for review and approval by DTSC and implemented. The PAMP will include the following tasks (subject to DTSC approval):

- **Real-time dust monitoring –** This task will involve using fixed-location direct-reading monitor at the perimeter air monitoring stations to measure PM10 concentrations at the Site boundaries. The dust monitors will consist of ThermoMIE brand DataRam units or equivalent that reliably respond to PM10 concentrations as low as 0.1 microgram per cubic meter (µg/m3). The dust monitors will be used to automatically record PM10 concentrations, and provide an alert if the PM10 action level is exceeded. The proposed locations for these monitors during remedy implementation are shown on Figure 6-1, subject to refinements during preparation of the RDIP. Additionally, during construction operations, portable dust monitors will be utilized near on-site activities so that real-time feedback can be provided to adjust construction operations and/or dust controls to limit potential exceedance of the PM10 action level at the perimeter air monitoring stations.

- **Real-time VOC Monitoring –** Volatile organic compounds (VOCs) concentrations will be measured utilizing portable field gas chromatographs (GCs) such as a Photovac Voyager GC or equivalent. The GCs measure volatile organic compounds by passing the air sample through an analytical detector and electronically measuring the resulting response. The GCs will be configured to operate in total and compound-specific modes so that total and individual VOC concentrations can be quantified and compared to the VOC action levels. The GC instrument will be selected to reliably respond to total VOC concentrations as low as 1 part per billion by volume (ppbv). Additionally, during construction operations, portable total VOC monitors will be utilized near on-site activities so that real-time feedback can be provided to adjust operations and/or vapor controls to limit potential exceedance of the VOC action levels at the perimeter air monitoring stations.

- **Time-integrated ambient air sampling and analysis for VOCs –** During the initial weeks of remedy implementation, 24-hour time-integrated perimeter air samples will be collected daily for VOC analysis. Collection will be performed using high-volume size selective inlet (SSI) samplers located in the predominantly downwind position. This high-volume air sampling will be performed each work day during removal of the Raised Cap material. Data collected from these sampling events will be compared to VOC performance standards and correlated with real-time total VOC concentrations. Once a reliable correlation is established, a modified, reduced sampling frequency will be proposed to DTSC and implemented after DTSC approval. Daily sampling will be maintained on periods of work during which the highest VOC-impacted soil excavation activities will occur.

- **Time-integrated ambient air sampling and analysis for Arsenic –** During the initial weeks of remedy implementation, two consecutive 4-hour time-integrated perimeter air samples during dust generating work hours (8:00 a.m. to 4:00 p.m.) and one 16-hour time-integrated perimeter air samples during non dust generating hours will be collected daily will be collected daily for respirable arsenic analysis. As needed on any given day, a third four-hour sample will be collected if dust generating work persists outside these hours, and the non-work hour sample will become a 12-hour time-integrated sample. Collection and analysis of these samples on a daily basis will allow for confirmation that both the acute (4-hour) performance standard and subchronic performance standard for arsenic are being met. Collection will be performed using high-volume size selective inlet (SSI) samplers located in a predominantly downwind position. This high-volume air sampling will be performed each work day during removal of the Raised Cap material. Data collected from these sampling events will be compared to performance standards for arsenic to correlate real-time PM10 readings with respirable arsenic concentration. Daily sampling will continue at the start of the soil excavation activities. Once a reliable correlation is established, a modified, reduced sampling frequency will be proposed to DTSC and implemented after DTSC approval. Daily sampling will be maintained on periods of work during which the highest arsenic-impacted soil excavation activities will occur.

- **Time-integrated ambient air sampling and analysis for Lead–** During the initial weeks of remedy implementation, 24-hour time-integrated perimeter air samples will be collected daily for respirable lead analysis. Collection and analysis of this sample on a daily basis will allow for confirmation that the performance standard for lead is being met. Collection will be performed using high-volume size selective inlet (SSI) samplers located in a predominantly downwind position. This high-volume air sampling will be performed each work day during removal of the Raised Cap material. Data collected from these sampling events will be compared to performance standards for lead to correlate real-time PM10 readings with respirable lead concentration. Once a reliable correlation is established, a modified, reduced sampling frequency will be proposed to DTSC and implemented after DTSC approval. Daily sampling will be maintained on periods

of work during which the highest lead-impacted soil excavation activities will occur.

Comparison of detected COC concentrations in air with its respective performance standards will be used to confirm the validity of the developed action levels. Action levels will also be compared to real-time dust and vapor levels. Comparison of measured dust and vapor levels with the action levels and VOC odor thresholds will be used to adjust the dust, vapor, and odor control measures, if needed.

6.2.1.1 Action Level Exceedance and Adjustment

If the air monitoring action levels are exceeded, Site air emission controls will be evaluated and adjusted, as necessary. If during a consecutive 4-hour period in a single work day the average PM10 measurements exceeds the acute PM10 action level or if the rolling-average PM10 and/or total VOC measurement exceeds the respective subchronic action level, operations will be reviewed, the cause for the exceedance determined, and appropriate actions taken. As necessary, remedy implementation activities will be suspended until the cause is identified and additional control measures are implemented.

The action levels are based on calculations that utilize existing Site Raised Cap material, soil, and groundwater data. As the air samples to be collected during remedy implementation are analyzed to determine actual COC concentrations in air during remedy implementation, the action level calculations may be revised based on the correlation between soil/groundwater COC concentrations to those in air, i.e., update the VOC action levels.

6.2.2 Noise Monitoring

Emeryville Noise Ordinance No. 03-002, dated August 19, 2003, specifies the requirements for minimizing noise-related impacts during remedy implementation. Specifically, general construction noise (Section 5-13.05 of the Noise Ordinance) shall be limited to weekdays from 7:00 am to 6:00 pm. Although not anticipated for this remedy implementation, pile driving and similarly loud activities are limited to weekdays from 8:00 am to 5:00 pm. More restrictive hours for allowable construction noise may be established as appropriate, given the surrounding neighborhood and type of noise.

Weekend work, and/or work outside the established weekday time limits, may be allowed at the discretion of the City Manager, the Planning and Building Director, or the Public Works Director. Weekend construction work, if allowed, would be limited to 9:00 am to 6:00 pm.

Remedy implementation activities are anticipated to be conducted during the allowable weekday construction noise time limits. Activities related to Site security, such as stockpile maintenance, may be conducted during night-time hours, if needed. If activities are proposed outside of the weekday allowable construction noise time limits, the remediation contractor will apply to the City for a waiver, as described in

Section 5-13.06 of the Ordinance. The procedures for waiver application require submittal of a description of the type of work to be performed, the type of equipment to be used, notifications to neighbors, and, among other requirements, a description of the types of construction practices to be used to minimize noise.

As appropriate, the source(s) of the noise will be identified and additional noise reduction methods and supplies will be used including, but not limited to, those presented below:

- Relocate stationary equipment (if feasible) to minimize noise impacts on the community;
- Provide portable enclosures for stationary equipment and particularly noisy areas on the Site;
- Use self-adjusting ambient-sensitive back-up alarms, manually-adjustable alarms on low setting, use of observers, and/or schedule activities so that alarm noise is minimized;
- Install and maintain intake and exhaust mufflers on all equipment, particularly pneumatic impact tools;
- Install acoustically attenuating shields, shrouds, or enclosures on noise producing equipment;
- Line or cover hoppers, conveyor transfer points, storage bins and chutes with sound-deadening media;
- Minimize the use of air or gasoline-driven hand tools;
- Maintain all equipment such that parts of vehicles and loads are secure against rattling and banging; and/or
- Use shields, impervious fences, or other physical sound barriers, to inhibit transmission of noise to sensitive receptors.

6.3 Vapor Extraction and Treatment

Prior to removal of the Raised Cap, a network of vapor extraction wells will be installed from the surface to above the groundwater table on the Raised Cap and surrounding vadose zone soil excavation area. These vapor extraction wells will be utilized to remove stagnant VOCs present in the Raised Cap material and vadose zone soils prior to excavation. The vapor stream will be treated through a combination of adsorption media, including zeolite and activated carbon. The soil vapor extraction and treatment system will be operated pursuant to a BAAQMD permit.

The system as currently developed consists of a network of vapor extraction wells each piped to a corresponding vapor extraction-blower unit (SVE Unit). Figure 6-2 shows a plan view of the soil vapor extraction area and the proposed locations for extraction wells, SVE units, and treatment system. The proposed well locations are based on preliminary design data and the spacing of the vapor extraction wells will be refined during preparation of the RDIP.

It is anticipated that up to three electric-powered SVE units will operate simultaneously to extract soil vapor from across the Site. The SVE units will consist of a positive displacement blower; a liquid-vapor separation tank with auto discharge pump and level switches to remove moisture from vapor stream; and a heat exchanger to allow vapor stream temperature adjustment for optimum treatment efficiency.

Effluents from each SVE units will be directed to the treatment system, which is anticipated to include both zeolite and granular activated carbon vessels to effectively capture the range of anticipated organic vapors. The effluent will not be thermally treated. Treated vapor with COC concentrations below BAAQMD's emission trigger levels will be discharged to the atmosphere. The treated vapor emission will be monitored per BAAQMD permit requirements.

The SVE and treatment system will operate for up to four weeks prior to initiation of excavation activities. During this time, the initially stagnant total VOC concentrations are expected to decrease and stabilize (as monitored at the influent of the vapor treatment system) to an equilibrium with mass transfer processes that are generating the vapors from VOCs absorbed to soil and dissolved in water. The extracted soil vapor will be field monitored for total VOC concentrations. When total VOC concentrations reach relatively stabilized levels, the extracted soil vapor will be sampled and the samples analyzed by a State-certified laboratory for VOC concentrations. These VOC concentrations will be compared to those modeled in the PHERA, and as appropriate VOC actions levels modified.

Portions of the SVE system will continue to operate as excavation activities are initiated with the removal of the Raised Cap and vadose zone soil excavation. Phased shutdown of the SVE system will be performed as the excavation proceeds to encompass the entire SVE area.

6.4 Removal of Raised Cap

After the implementation, operation, and subsequent removal of the vapor extraction system, the first stage of excavation will be the removal of the Raised Cap material, down to the underlying former building foundations and piping where encountered. The RDIP will present the techniques, supplies, and equipment to conduct the removal of the Raised Cap. The RDIP will be provided to DTSC for review prior to remedy implementation.

The combination of impacted soil, concrete rubble, and possibly other material will be loaded for off-site transport and disposal. It is estimated that approximately 7,000 cubic yards of Raised Cap material will be removed. It is anticipated that surface asphalt and some of the concrete can be segregated for off-site recycling. For evaluation purposes it is assumed that all other Raised Cap material will be hazardous waste and will therefore require transport under hazardous waste manifests to an appropriate disposal facility.

The types of heavy equipment anticipated to be used during removal of the Raised Cap will include:

- Tracked diesel-powered excavator to excavate soil and segregate concrete;
- Tracked diesel-powered excavator with hydraulic attachments (jack hammer & nibbler) for breaking and processing concrete foundations for shipment;
- Front-end loader, for placing excavated soil and processed concrete into a dump truck; and
- One or two 25-yard off road dump trucks, for transporting soil from the excavation to the stockpile area.

6.5 Shoring Along Horton Street

Due to Site constraints and the proximity of the excavation to Horton Street and Building 31, shoring systems will be required. The design for the shoring system(s) will be provided to DTSC as part of the RDIP. It is anticipated that two different systems will be utilized.

For areas along Horton Street with excavation up to 25 feet in depth, it is anticipated that a retaining wall utilizing a solider pile with lagging system will be constructed. The location of this deep shoring wall is presented on Figure 6-1 and will be approximately 60 feet in length.

Specialized equipment using vertical augers will be utilized to generate large-diameter boreholes on the Site along Horton Street. It is anticipated that the boreholes will be installed at approximately eight-foot centers. In the area of vadose zone excavation, the boreholes will be less than 25 feet deep (typical depth of the A/B aquitard). In the area of the saturated zone excavation, the boreholes (a total of nine) will be approximately 50 feet deep.

Soldier piles will be installed in the bottom of the boreholes. In the area of the vadose zone excavation, it is anticipated the soldier piles will be up to 25 feet deep with the lower portion encased in structural concrete. In the area of the saturated zone excavation, it is estimated the soldier piles will be about 50 feet long with the lower 25 feet encased in structural concrete. For these deeper soldier piles, boreholes will be installed using casing and bentonite slurry to control heave.

Excavation of vadose and saturated zone soils along Horton Street will be completed to allow installation of lagging between soldier piles as the excavation is lowered. The lagging will consist of steel plates behind the soldier pile flanges driven in advance of the excavation. As the excavation is advanced into the saturated zone, additional lagging will be installed.

As the excavation proceeds deeper into the saturated zone, a dewatering system will be implemented (see Section 6.6). Counterforts will be installed to provide lateral support to the retaining wall. Each counterfort will be perpendicular to the soldier piles and installed at alternating soldier piles (for a total of up to 6 counterforts). The length of counterfort slots is estimated at 25 to 35 feet and the depth will be to the top of the A/B aquitard. Fill slots will be filled to form the counterfort buttresses for the soldier pile wall. After installation of the counterforts, the saturated soil between the counterforts will be excavated, to a maximum depth equal to the depth of the counterforts. Details on excavation implementation are discussed in Section 6.7.

For areas along the west side of Building 31, vadose zone soil along the building will be excavated and sloping, instead of retaining wall utilizing soldier piles with lagging system, will be installed. The slope will have a horizontal to vertical distance ratio of 1.5: 1 outside the base of building 31's footing. After installation of the slope, the vadose zone soil in areas north of building 31 will be excavated.

It is anticipated that the entire shoring activity, including soil excavation and handling, will take up to four weeks. After this has been completed, remaining saturated soils will be excavated. Shoring on other sides of the excavation will consist of benching and over-excavating with a 1.5:1 horizontal to vertical slope.

Upon completion of excavation/backfilling, counterforts will be removed and soldier piles will be cut flush to the surface.

6.6 Excavation Dewatering

Dewatering of the excavation will consist of using one or more sump pumps installed at the bottom of the excavation on the S-W property. Water collected within the sump(s) will be pumped to the Dewatering Equipment Storage and Pretreatment Unit, and subsequently the groundwater treatment system (Figure 6-1). By pumping water from sumps installed on the S-W property, the water table on the S-W property will be lower compared to the former Rifkin property, inducing groundwater flow towards the S-W property. As a result, contaminated groundwater from the S-W property will not migrate towards the former Rifkin property. Based on groundwater pump tests conducted at the Site, it is anticipated that a maximum of 10 gallons per minute of groundwater will be generated from the dewatering system.

Groundwater extracted from the sump will be conveyed into a dewatering settling tank system (the Dewatering Equipment Storage and Pretreatment Unit) and subsequently pumped to the existing and/or a new groundwater treatment system prior to discharge to Temescal Creek or to the POTW under permit, or transported

offsite for treatment and disposal/reuse. Figure 6-1 presents the preliminary locations of the pretreatment and treatment units. The final layout is subject to refinements during preparation of the RDIP and will be established by the remediation contractor.

The excavation dewatering activities will be limited to the A-zone aquifer and are anticipated to have a de minimis effect on the distribution of contaminants in groundwater near the Site.

6.7 Soil Excavation and Handling

Approximately 57,000 cubic yards of soil will be excavated for off-site disposal. Some of the excavated soil is anticipated be hazardous waste and will require transport under hazardous waste manifests to an appropriate disposal facility. The RDIP will present the techniques, supplies, and equipment to conduct the excavation and soil handling activities. The RDIP will be provided to DTSC for review prior to remedy implementation.

The types of heavy equipment needed during soil excavation are anticipated to include:

- Tracked diesel-powered excavators;
- Front-end loaders, for managing stockpiles and placing excavated soil into a dump truck;
- Two or more 25-yard off road dump trucks, for transporting soil from the excavation to the stockpile staging area;
- Dewatering system including sump within the excavation, above-ground pump, settling tank system, and groundwater treatment system (treated water will be discharged to Temescal Creek);
- Water trucks for spraying/misting for dust control; and
- Foam unit for applying vapor suppressant foam.

Vadose zone soil on the S-W and former Rifkin properties will be excavated in order to achieve the vadose zone soil cleanup for arsenic of 24 mg/kg on each property. The planned vadose zone excavation limits are presented on Figure 6-1. The planned limits of soil excavation extend approximately 285 feet along Horton Street (60 feet on the former Rifkin property and 225 feet on the S-W property) and approximately 330 feet west of Horton Street, or approximately 95,000 square feet. In addition, elevated detections of arsenic in vadose zone soil are present at locations outside these limits, including SA-AH-01 (110 mg/kg), SB-7AB (130 mg/kg), CDM-SB50 (200 mg/kg), and SA-BH-04 (211 mg/kg). Vadose zone soil surrounding these locations would also be removed to a radius of 10 feet surrounding each location. The vadose zone soil would

be excavated to an average depth of approximately 7.5 feet, the approximate depth to groundwater across this area.

Confirmation sampling and analysis, as described in Appendix H, would be conducted to confirm that the vadose zone soil cleanup goal for arsenic is met. In order to meet this goal, additional, excavation beyond the limits presented above may be needed.

In addition to vadose zone soil, the excavation includes removal of saturated zone soil identified as source of COCs to groundwater (CDM, 2009b). The planned saturated zone excavation limits are presented on Figure 6-1. The source area saturated soils would be removed down to the A/B aquitard (approximately 25 feet bgs) on the S-W property and to 18 feet bgs on the former Rifkin property. Confirmation of final source area removal extents will be based on geologic observation for permeable materials along the sidewalls of the excavation below the groundwater table.

6.8 Waste Stockpiles

Waste stockpiles will be used during remedy implementation. The design criteria for managing the stockpiles will be detailed in the RDIP and is anticipated to include the following:

- The waste stockpiles will be located on the former Building 35 concrete slab.
- If additional area is needed, additional waste stockpiles will be located on areas covered by existing asphalt pavement, as shown on Figure 6-1. The final layout is subject to refinements during preparation of the RDIP and will be established by the remediation contractor.
- This exterior paved area will first be inspected for cracks, and repairs will be made as necessary to create or maintain an integral surface.
- Berms and lined cement barriers (i.e., k-rails) will be constructed around the waste stockpile area as needed to control possible water run-on and runoff. The existing surface grade and pumping system will be used to control and capture water. The design of berms around these areas, and the construction supplies used for the berms & barriers, will be provided in the RDIP.
- Any accumulated water within the bermed area(s) will be pumped into a dewatering settling tank and subsequently pumped to the groundwater treatment system prior to discharge or off-site disposal.
- Waste stockpiles will be covered with nylon-reinforced polyethylene or sprayed with stabilizing foam each night, on weekends, and all other non-work days, or when the pile is not being actively worked. If polyethylene covers are used they will be secured with ties or a sufficient number of sandbags or other weighted objects designed to keep the cover in place.

- While the stockpiles are in operation, the berms and cover will be inspected several times daily, including non-work days, to detect evidence of tears, loose seams, punctures, and the presence of water and proper functioning of water collection and removal systems.

The use of waste stockpiles is intended to accommodate scheduling imbalances between relatively continual excavation activity and intermittent loading and transport as well as allow for sampling and profiling as described in Appendix I. It is anticipated that the volume of stockpiled material will be equivalent to 5 days of excavation, i.e., up to an estimated 5,000 cubic yards. If the rate of accumulation exceeds this amount, excavation activities will be slowed down and, if possible, loading and transport activities will be accelerated until material handling flow rates are approximately equal.

6.9 Loading and Off-Site Transport

Materials removed from the Site for off-site disposal is anticipated to vary in waste classifications. The determination of waste classifications will be made in accordance with applicable regulations and disposal facility acceptance criteria.

The testing, manifest tracking, and record-keeping requirements will be conducted in accordance with Title 40 CFR Section 268.7 and 22CFR Chapter 18, Article 332 CCR. A manifest will be generated for each load of hazardous waste leaving the Site. The weight of material will either be recorded by on-site scales, or will be estimated at the Site and confirmed by weigh tickets generated at the receiving disposal facility. The manifest will be signed by an authorized S-W representative or agent and will accompany the load of material to the disposal facility.

Materials removed from the Site will be transported by rail and/or truck. The RDIP will identify the techniques, supplies, and equipment needed to perform the loading and transport of the materials. The RDIP will be provided to DTSC for review prior to remedy implementation. General descriptions of loading and transport activities for each transport modes are discussed below.

6.9.1 Rail Car

To the extent possible, materials removed from the Site will be loaded into rail cars for transport for off-site disposal. Rail cars may be loaded on the existing spur track within the Site as shown on Figure 6-1. However to maintain efficient production, an additional rail spur on the S-W property may be needed. To the extent rail cars can be used for off-site transport, S-W will work with UPRR and the transport/disposal contractor to utilize the UPRR Emeryville Yard tracks for rail car staging. Both empty rail cars and rail cars containing excavated soil would be staged at the UPRR Emeryville Yard tracks.

The estimated duration of rail car loading is dependent on the availability and location of the rail cars.

It is anticipated that off-site transport of some portion of the materials removed from the Site may occur by truck. Not all disposal facilities accept material by rail car as they are not located along railroads.

6.9.2 Truck

Figure 6-1, Preliminary Site Layout and Controls, depicts the plan for trucking of excavated materials off-site and the trucking of clean backfill onto the Site. The final layout is subject to refinements during preparation of the RDIP and will be established by the remediation contractor.

If all materials removed from the Site were to be trucked, the duration for truck loading and off-site transport is estimated at 9 to 18 weeks. This duration is based on the approximate 64,000 cubic yards of materials to be excavated, an in-place material density of 1.4 tons per cubic yard, 20 tons of material per truckload, and 50 to 100 truck trips per day. The actual rates of loading will vary due to on-site logistics and/or truck availability.

Material will be loaded into truck trailers, which will be covered and secured prior to leaving the Site to limit dust or odor emissions. Truck and trailer wheels will be decontaminated and inspected prior to leaving the Site. A Transportation Plan will be prepared in accordance with Health and Safety Code Section 25169.3 and DTSC's Guidance for Developing Transportation Plans for Removal or Remedial Actions (DTSC, 2001). The Transportation Plan will present the procedures to be used by the hauler to protect the public during the transportation process. Specific aspects to be addressed in the Transportation Plan include: container selection, Site entry and egress, routing and supervision of transportation activities. The Transportation Plan will be included in the RDIP for review and approval by DTSC.

It is anticipated trucks will approach the Site northbound on Halleck Street to Sherwin Avenue, and then enter into the property, as shown on Figure 6-1. Once on-site, the trucks will follow roadways identified by the contractor. It is anticipated that loaded trucks will leave through the plant truck entrance north of former building 35, cross the easement on the City's property and proceed southbound on Halleck Street, across Park Avenue, under 40th Street, and south to 32nd Street. From 32nd Street, trucks will access Mandela Parkway to Grand Avenue and freeway connections. Necessary traffic or encroachment permits for use of these streets will be obtained from the Cities of Emeryville and Oakland. Figure 6-3, Preliminary Truck Transportation Route Map, shows the regional truck route anticipated for transport of excavated materials from the Site and backfill to the Site.

6.9.3 Decontamination

A decontamination station will be setup (see Figure 6-1) at the Site. During excavation and material handling activities, equipment and vehicles will be decontaminated and inspected prior to leaving the Site. Trucks, rail cars, and equipment will be decontaminated using dry brush and/or wet rinsing. Rinse water will be collected, tested, and disposed of in accordance with applicable regulatory

requirements. Trucks, rail cars, and equipment exiting the Site will be inspected and logged for compliance with the Site decontamination requirements.

6.10 Slurry Wall Breach and Extension

As excavation and backfill operations are nearing completion, the slurry wall will be breached in two locations along the western, down gradient property boundary and one up gradient location near the north end of former building 35, and extend the existing slurry wall south along the western property boundary to Sherwin Avenue (see Figure 6-1). The detailed design for the slurry wall breaches and extension will be provided to DTSC prior to remedy implementation as part of the RDIP. General descriptions of these activities are discussed below.

The existing slurry wall will be breached to provide an outlet for groundwater that accumulates within the formerly closed slurry wall system, or to provide a pathway for groundwater flow from areas outside the formerly closed slurry wall system into these areas, specifically the arsenic-impacted groundwater in the vicinity of well LF-3.

The slurry wall breaches will consist of three components: an upgradient collection zone; a connector zone crossing the existing slurry wall; and, a distribution zone to disperse the flow back into the regional flow system. The locations for the slurry wall breaches have been selected to be placed in areas where permeable soils are present to provide a hydraulic connection with the existing groundwater flow. Figure 6-1 presents the locations of the breaches and Figure 6-3 presents details of the slurry wall breaches.

The upgradient, or the collection portion, of the breach system will be excavated to the top of the A/B aquitard, using an appropriate method to maintain the stability of the excavation and allow placement of a high permeability backfill (i.e., a graded sand or gravel) and drain pipe. A drain pipe will be placed at a depth of 5 feet below the seasonal low water table (approximately 0 feet NAVD88). This collector trench will be installed a minimum of 10 feet upgradient of the confirmed location of the existing slurry wall, approximately parallel to the orientation of the wall. The downgradient distributor trench will be constructed in a similar manner on the downgradient side of the existing slurry wall. This distributor trench will overlap the upgradient collector trench by approximately 30 percent of its length. Two to three connector trenches will be excavated, using the same methods, to a minimum depth of 2 feet below the elevation of the drain pipe in the collector and distributor trenches (approximate trench bottom elevation of -2 feet NAVD88). These connector trenches will be excavated to cross the slurry wall at a right angle, and intersect the collector and distributor trenches. The connector trenches will also include the drain pipe, which will either be directly connected to the drain pipes in the adjacent trenches, or be placed in contact with the other lines in the open trench to allow efficient hydraulic communication between all segments of the breach system.

The backfill in the breaches will consist of a graded sand or gravel to control the potential mobilization of fines from the formation into the trenches. The permeability of this backfill will be specified at a minimum of 500 ft/day. Piezometers will be installed into the collector and distributor trenches to allow monitoring of the hydraulic performance of the breaches.

The slurry wall breach backfill will be delivered by truck. It is estimated 35 truckloads of backfill will be needed for the breaches.

In conjunction with the breaching operation, the existing slurry wall will be extended south along the western property boundary to Sherwin Avenue (see Figure 6-1). This wall extension will modify groundwater flow through the upgradient slurry wall breaches. It is anticipated that this slurry wall will be constructed using a long reach tracked excavator and the installation of a bentonite slurry mixture or flexible membrane. As with the breaches, the excavated material will be sampled and if found acceptable will be reused on-site. If off-site disposal is required and the material is transported by truck, approximately 70 truckloads will be required. On-site mixing and staging of bentonite slurry may be performed in the area designated as the waste staging area (see Figure 6-1). The importation of the bentonite slurry will require the delivery of approximately 70 truckloads.

Together, the three slurry wall breaches, surrounding existing slurry wall segments along Temescal Creek channel and UPRR tracks, and the slurry wall extension will be used to control groundwater flow at the Site. The other existing slurry wall segments that will remain after remedy implementation, along the former Rifkin property boundary and within the Site, are not required to maintain appropriate groundwater flow conditions. Groundwater monitoring to assess the performance of the slurry wall segment and breach system is discussed in Section 7.

6.11 Excavation Backfilling

Backfilling below the groundwater table will occur concurrently with excavation. Geotechnically appropriate backfill will be delivered to the Site in trucks or rail cars. Figure 6-3, Preliminary Truck Transportation Route Map, shows the regional truck route proposed for transport to and from the Site.

If possible, backfill will be brought to the Site in the trucks or rail cars used for off-site disposal of excavated materials. Backfill stockpiles will be kept separate from the waste stockpiles (see Figure 6-1). The RDIP will present the techniques, supplies, and equipment needed to perform the backfilling activities.

Truck traffic into and out of the Site will follow the Transportation Plan and as described in Section 6.9. Import fill will be unloaded on-site. It is anticipated that one or more loaders and 25-yard off road trucks will be used to move fill from the stockpile area to the excavation for placement and compaction.

As shown on Figure 6-1, the majority of the areas undergoing excavation will be backfilled with low-permeability backfill (approximately 0.283 ft/day). The remaining area will be backfilled with high-permeability fill backfill (approximately 28.3 feet/day). The high-permeability backfill will be placed downgradient of an interceptor trench and will serve to collect and distribute groundwater into the surrounding formation. During backfill operations of the saturated zone, a reagent (e.g., organic-based tannin or inorganic powdered sulphite) will be added with the backfill. The purpose of the reagent is to act as an oxygen scavenger to control oxidation-reduction conditions in the subsurface. Increased oxidation has the potential to mobilize solid phase arsenic that may be present in the surrounding, natural formation. The reagent will be selected to minimize potential detrimental impacts to the soil or groundwater quality and to avoid generating odors. The RDIP will present the techniques and equipment needed to confirm the backfill operations meet the designed permeability values.

As part of the selected remedy, a contingency would be to pump from the high-permeability backfill and/or trench, if needed, to direct groundwater flow toward the S-W property. As such, backfill design considerations for both the S-W property and the former Rifkin property will be included as part of the RDIP.

During backfill operations, an interceptor trench will be placed on the S-W property, adjacent to the S-W/Rifkin property boundary as shown on Figure 6-1. A membrane barrier will be placed on one side of the trench, along the property boundary, to prevent groundwater flow toward the former Rifkin property. The trench will be approximately 30 inches wide, approximately 25 feet deep and be located as shown on Figure 6-1. The trench will be backfilled with 3/8 inch minus backfill and contain a basal perforated pipe to reduce flow resistance from the backfill. With this design, the trench will have an effective permeability of approximately 500 ft/day. The trench will be closed on the Horton Street side with the membrane barrier. The membrane barrier will be tied into the aquitard without compromising its integrity, i.e., the excavation will be limited in extent and, as appropriate, conducted through slurry to maintain adequate downward force to prevent heaving.

Final surface elevation following excavation and backfill will conform to redevelopment plans, if appropriate, and/or target Site elevations, to the extent practical. If redevelopment construction will not immediately follow completion of remedy implementation, then the S-W property will be graded to an elevation consistent with the Horton Street sidewalk and the adjoining Site elevation along the rail spur. The area will be sloped and re-paved and/or vegetated, and would direct water runoff along the Site surface towards the Temescal Creek channel. The remaining portions of the spur track outside of the excavation limits will be removed and/or paved as part of remedy implementation. The former Rifkin property will be backfilled to a final elevation consistent with the remaining parking area, repaved, and striped.

6.12 Reporting

During remedy implementation activities, summaries of work activities will be provided to DTSC. These summaries will include material excavation locations, results from waste characterization of excavated materials, results from confirmatory soil samples, and results from air monitoring and sampling.

After remedy implementation is completed, a completion report will be prepared and submitted to DTSC. The report will document all activities performed, including definition of the actual extent of excavation, collection of soil samples, classification and/or treatment of waste, final disposition of waste, air monitoring and sampling, and all analytical reports of waste characterization, soil confirmatory samples, and air sampling.

Photographic documentation will be provided including pictures of excavated materials prior to removal and the final configuration of the excavation. The report will detail deviations from this RAP or the RDIP, if any, and provide an explanation for the deviations.

Table 6-1
Summary of Engineered Controls for Short-Term Exposure Risks
Sherwin-Williams Emeryville Remedial Action Plan

Implementation Activity	*Dust Control*	*Vapor Control*	*Surface Water Runoff Control*
Excavation	Water sprays/mist, surfactants, wetting agents, dust suppressants, covers, and windscreens.	Water spray/mist, vapor suppressant foam, covers, and vapor extraction and treatment.	Water runoff entering excavation will be pumped to holding tanks and pretreatment prior to being routed to a groundwater treatment system along with other water from excavation dewatering.
Shoring	Water spray/mist system.	Shroud over auger to collect vapors and direct vapors through treatment system, if needed, and/or use of vapor suppressant foam or vapor oxidation media will be applied.	Berms will divert surface water runoff contacting Site materials towards the excavation so it may be collected and sent to groundwater holding and treatment system.
Stockpiling and Handling	Water spray/mist; covers on stockpiles; slow vehicle speeds to control dust.	Vapor suppressant foam, vapor oxidation media, covers, and vapor extraction and treatment.	Berms and lined k-rail barriers will divert water runoff from contaminated stockpiles towards the excavation so it may be collected and sent to groundwater holding and treatment system. Berms and k-rail will divert water runoff from clean backfill stockpiles through filter system for discharge to surrounding storm water system.
Loading	Water spray/mist; covers over loaded trucks and/or rail cars; slow vehicle speeds to control dust; minimize drop heights during loading.	Bag contaminated soils in transports. Covers over loaded trucks and/or rail cars; minimize drop heights during loading.	Berms will divert water runoff contacting contaminated Site materials towards the excavation so it may be collected and sent to groundwater holding and treatment system.
Backfilling	Water spray/mist.	Not Applicable.	Berms will divert water runoff away from the excavation. Excess precipitation into the excavation will be pumped so it may be collected and sent to groundwater holding and treatment system.

Table 6-2
Action Levels for Volatile Organic Compounds
Sherwin Williams Emeryville Remedial Action Plan

Volatile Organic Compounds	BAAQMD Regulatory Limit ($\mu g/m^3$)	AIHA Odor Threshold ($\mu g/m^3$)	Selected Noncancer Performance Standards[1] ($\mu g/m^3$)	Selected Cancer Risk-Based Performance Standards[1] ($\mu g/m^3$)	Selected Subchronic Action Level in Air[2] ($\mu g/m^3$)	Selected Acute Action Level in Air[3] ($\mu g/m^3$)
Volatile Organic Compounds						
Benzene	60	4,792	10	0.6	0.6	29
1,2-Dichloroethane	NE	45,331	607	0.03	0.03	45,331
Ethylbenzene	2,000	9,986	608	8.9	8.9	9,986
Methyl ethyl ketone	NE	737	1,000	NA	737	737
Tetrachloroethylene	35	41,852	88	0.2	0.2	1,358
Toluene	300	603	1,167	NA	300	603
Trichloroethylene	600	7,309	90	0.7	0.7	7,309
1,2,4-Trimethylbenzene	NE	11,798	12	NA	12	11,798
1,3,5-Trimethylbenzene	NE	11,798	12	NA	12	11,798
Vinyl chloride	26	647	19	0.01	0.01	647
Xylenes	700	1,302	434	NA	434	1,302
Total Volatile Organic Compounds[4]					1,505	

BAAQMD - Bay Area Air Quality Management District Rules and Regulations.

AIHA - American Association of Industrial Hygienists, 1989, Odor thresholds for Chemicals with established occupational health standards.

NE - Not established.

NA - Not applicable.

levels.

2. Selected Subchronic Action Level in Air is based on the more stringent of the BAAQMD regulatory limit, MRL, AIHA odor threshold, and the cancer and noncancer perform

3. Selected Acute Action Level in Air is based on the more stringent of the BAAQMD regulatory limit, MRL, AIHA odor threshold, and Cal/EPA RELs.

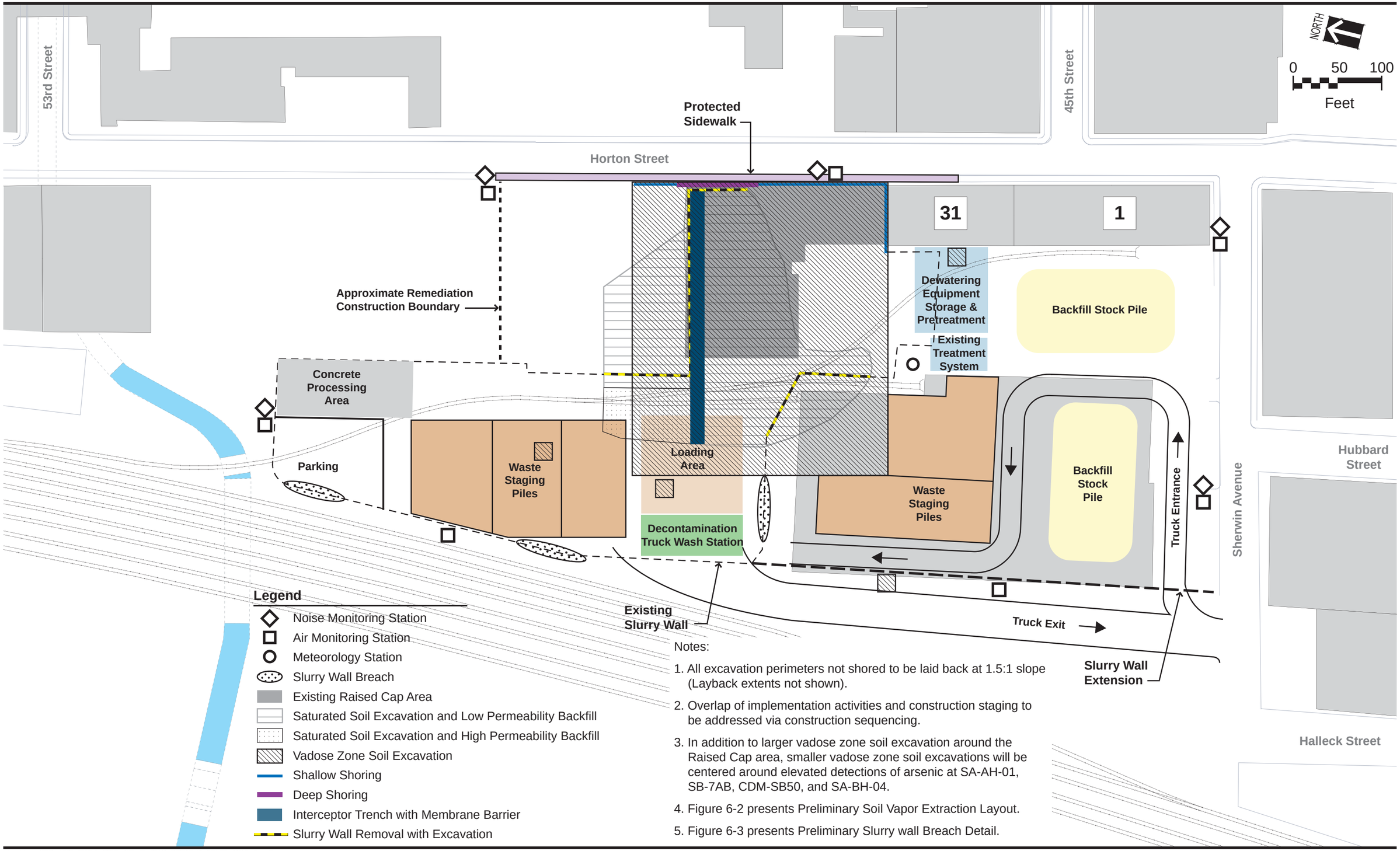
4. Total VOCs Action Level is based on the total sum of each VOC Action Level.

Table 6-3
Action Levels for PM10, Arsenic, and Lead
Sherwin Williams Emeryville Remedial Action Plan

Chemical	Source Concentration (mg/kg)	BAAQMD Regulatory Limit ($\mu g/m^3$)	Performance Standard ($\mu g/m^3$)	Action Level as PM_{10} in Air ($\mu g/m^3$)
Arsenic Acute REL-Based Performance Standard [1]				
Raised Cap Materials	110,000	NA	0.2	1.8
Vadose Zone Soils	3,898	NA	0.2	51
Soils for Shoring Installation	1,237	NA	0.2	162
Saturated Soils	3,782	NA	0.2	53
Arsenic Subchronic Risk-Based Performance Standard [2]				
Raised Cap Materials	110,000	NA	0.015	0.6
Vadose Zone Soils	3,898	NA	0.015	16
Soils for Shoring Installation	1,237	NA	0.015	51
Saturated Soils	3,782	NA	0.015	17
Other Performance Standards [3]				
Lead Subchronic Performance Standard	4,687	0.15	NA	134
Total PM_{10} Subchronic Performance Standard	NA	50	NA	50

BAAQMD - Bay Area Air Quality Management District Rules and Regulations.
REL - Reference Exposure Level
NA - Not applicable.

1. Based on arsenic acute inhalation REL and arsenic concentration in each excavation event.
2. Based on arsenic risk-based performance standard and arsenic concentration in each excavation event.
3. Lead is based on National Ambient Air Quality Standard for chronic exposure. Total PM_{10} based on chronic exposure, per BAAQMD rules and regulations.



Notes:

1. All excavation perimeters not shored to be laid back at 1.5:1 slope (Layback extents not shown).
2. Overlap of implementation activities and construction staging to be addressed via construction sequencing.
3. In addition to larger vadose zone soil excavation around the Raised Cap area, smaller vadose zone soil excavations will be centered around elevated detections of arsenic at SA-AH-01, SB-7AB, CDM-SB50, and SA-BH-04.
4. Figure 6-2 presents Preliminary Soil Vapor Extraction Layout.
5. Figure 6-3 presents Preliminary Slurry wall Breach Detail.

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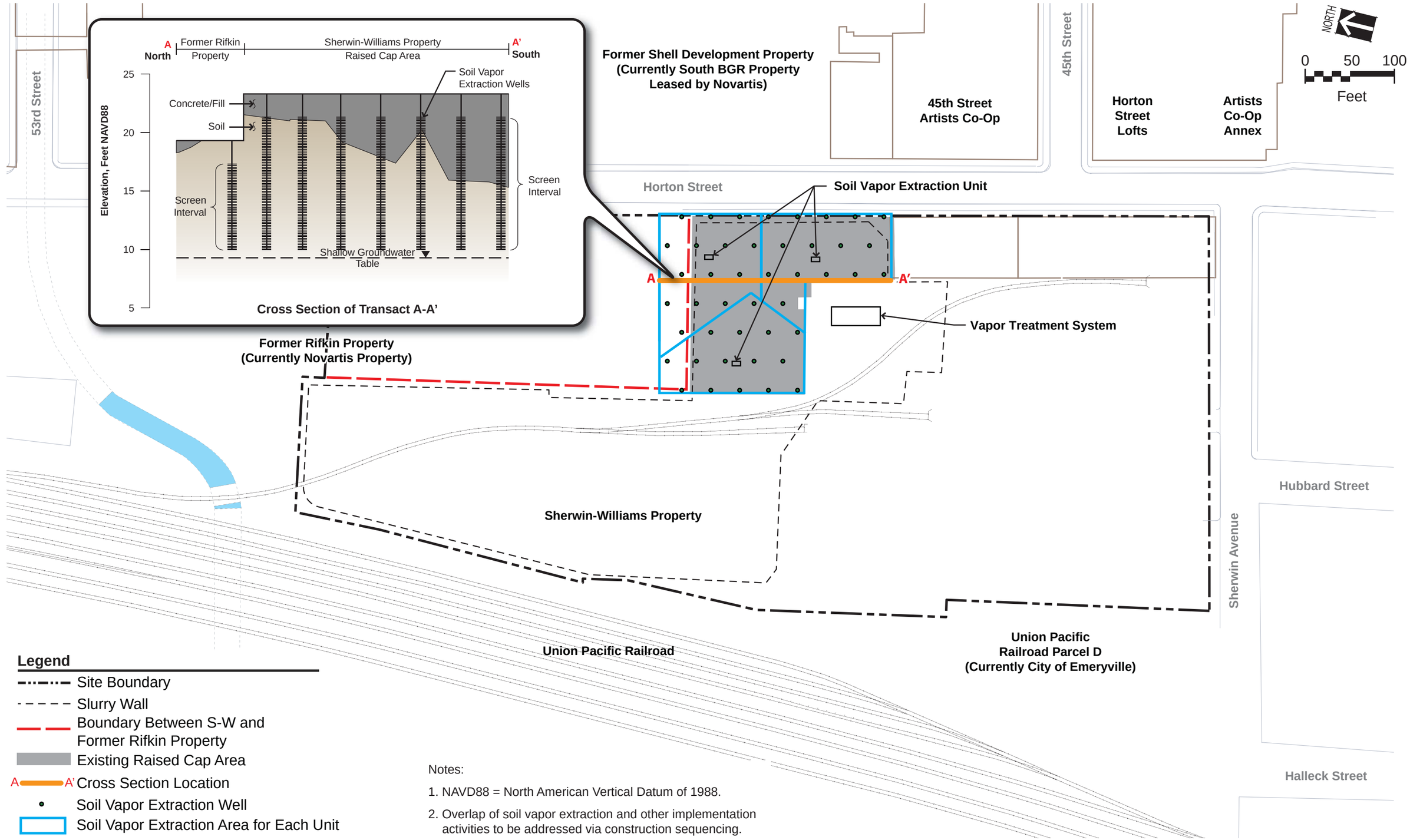
CDM

Figure 6-1
Preliminary Site Layout and Controls
Sherwin-Williams Company - Emeryville, California



Legend

- Site Boundary
- Slurry Wall
- Boundary Between S-W and Former Rifkin Property
- Existing Raised Cap Area
- A — A' Cross Section Location
- Soil Vapor Extraction Well
- Soil Vapor Extraction Area for Each Unit

Notes:

1. NAVD88 = North American Vertical Datum of 1988.
2. Overlap of soil vapor extraction and other implementation activities to be addressed via construction sequencing.

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CDM

Figure 6-2
Preliminary Soil Vapor Extraction Layout
Sherwin-Williams Company - Emeryville, California

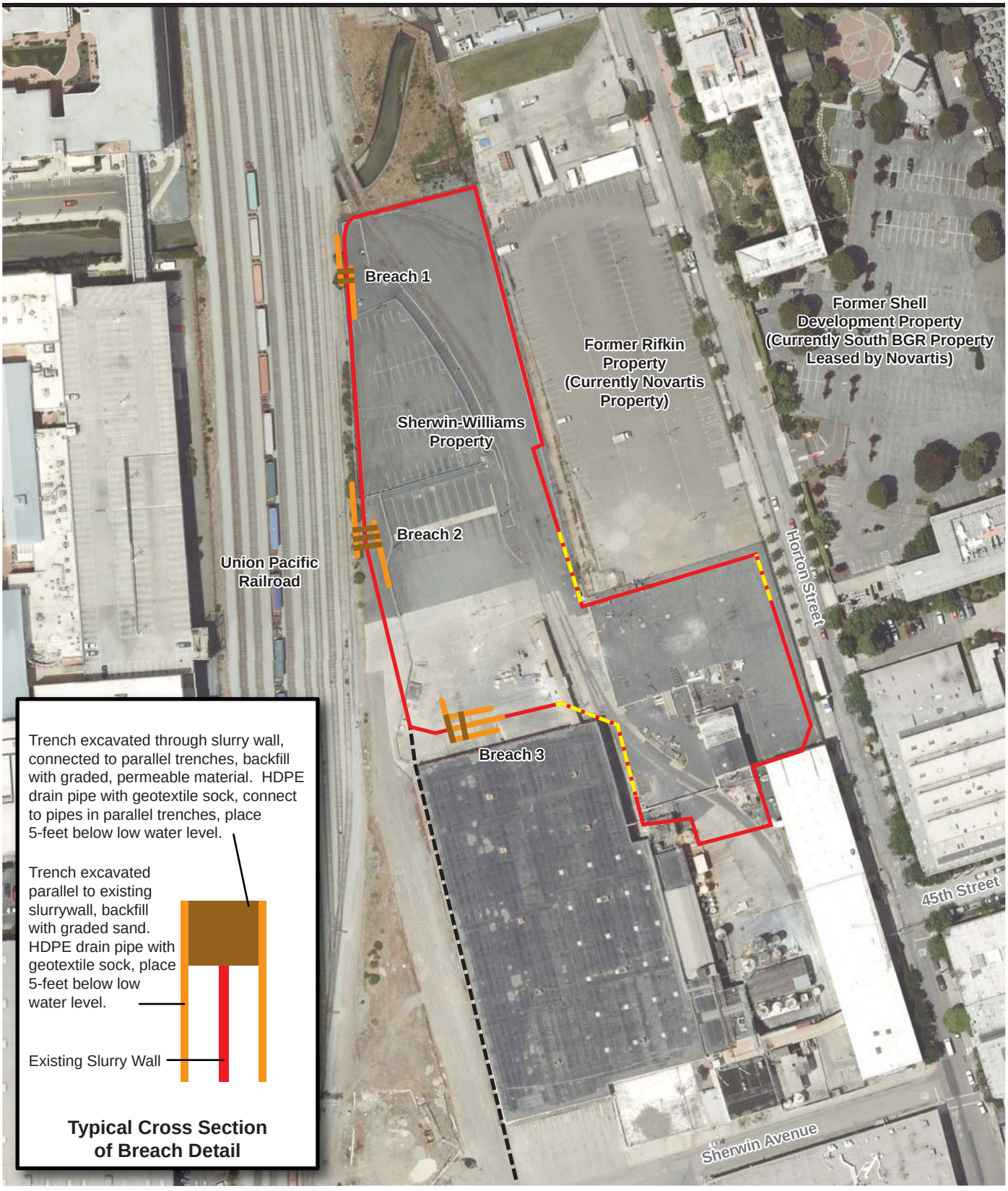

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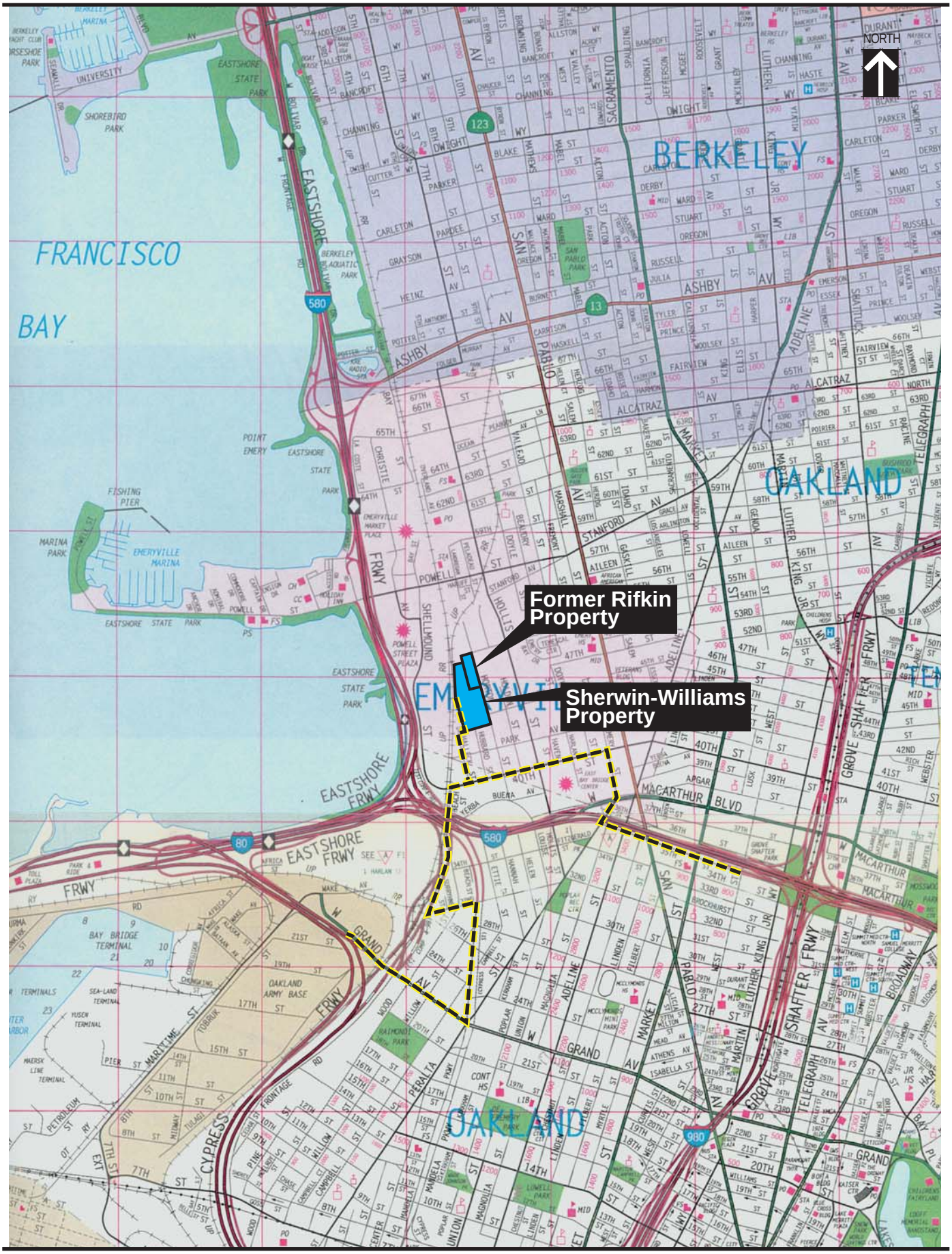
Figure 6-3

Preliminary Slurry Wall Breach Detail

Sherwin-Williams Company - Emeryville, California

CDM



W:\REPORTS\Sherwin-Williams\Emeryville\Remedial Action Plan\Graphics\Prelim Truck Transportation (Fig6-4).ai 05/11/10 JJT

Figure 6-4

Preliminary Truck Transportation Route Map

Sherwin-Williams Company - Emeryville, California

CDM

Section 7
Post Remediation Monitoring

This section presents descriptions of the anticipated post remediation activities. These activities will include OM&M of installed components, including a Land Use Covenant (LUC); groundwater monitoring; remedy effectiveness evaluation; and, annual reporting.

7.1 Operations, Maintenance, and Monitoring Program

Along with the remedy implementation completion report (as discussed in Section 6.12), an Operations, Maintenance & Monitoring Plan ("OM&M Plan") will be submitted to DTSC after remedy implementation. The OM&M Plan will outline provisions for long-term operations, maintenance, and monitoring (OM&M) of installed components of the remedy. These components include the surface cover, slurry wall and breach system, interceptor trench with membrane barrier, groundwater monitoring well network, and a LUC. A draft of the OM&M Plan will be included with the RDIP for DTSC review.

The OM&M Plan will present background information on Site conditions, remedial actions, and residual COCs in the subsurface above cleanup goals. The OM&M Plan will include Site maps depicting areas of known subsurface COC extents. The OM&M Plan will provide a soil gas evaluation strategy, soil management plan and updated construction HASP for potential post-remediation activities (e.g., Site development). The OM&M Plan will include financial assurance for OM&M of the installed components and an agreement between Site property owners for continued access.

7.1.1 Soil Gas Evaluation

The OM&M Plan will outline the strategy, locations, methods, and protocols for evaluating soil gas conditions at the Site after excavation and backfilling are completed. In addition, the plan will include appropriate engineering controls that would be implemented as part of redevelopment if post-excavation sampling reveals that residual soil gas is present above indoor air protective levels. Engineering controls could include: increased building indoor air ventilation; sub-slab depressurization; and/or vapor barriers in combination with other controls.

7.1.2 Soil Management

During post-remediation activities (e.g., Site development) and OM&M, soil and/or groundwater containing residual Site COCs may be encountered. The OM&M Plan will outline the procedures for managing soil and groundwater generated from Site activities, including: dust control; excavated soil stockpile management; soil sampling procedures and disposition characterization procedures; and, groundwater dewatering and treatment. In addition, the OM&M Plan will outline procedures for implementing storm water pollution control measures at the Site during construction

activities and Site maintenance activities. Best management practices to control storm water runoff at the Site will include, where necessary: 1) covering of soil stockpiles; 2) berming the Site to contain runoff; 3) installation of storm drain filters to remove sediments prior to discharge; and 4) installation of hay bales at appropriate locations to contain storm water runoff and to enhance settling of solids. The OM&M Plan will include a listing of agencies to be notified prior to initiating onsite activities, which may expose or disturb soil or groundwater containing residual Site COCs.

7.1.3 Health and Safety

The HASP will address worker health and safety during implementation of future activities that require excavation in areas of the Site where residual COCs are present. The HASP will provide personal air monitoring requirements during subsurface activities, dust control, and PPE. The HASP will be prepared in accordance with Occupational Health and Safety Administration (OSHA) 29 CFR 1910.120 guidelines and Title 8 CCR Section 5192. The HASP will be submitted separately detailing health and safety procedures, compliance with OSHA and air monitoring during construction.

7.1.4 Site Maintenance

Current and future owners, occupants, managers, and contractors, who are delegated or authorized to perform property maintenance or construction will be required to comply with the measures identified in the OM&M Plan for long-term maintenance of the Site. The provisions of the Site maintenance will also be incorporated into the LUC.

7.1.5 Land Use Covenants

As part of the OM&M Plan, Land Use Covenants (LUCs) will be recorded to identify specific land use restrictions associated with the Site. The LUCs will preclude owners, operators or occupants of the property from drilling, boring, or otherwise encountering the water table through excavation or other means unless expressly permitted in writing by the DTSC.

The LUCs will require that the Site be developed in a manner that maintains and preserves the integrity of the remedy, allows OM&M of installed features of the remedy, controls potential future human exposure to residual COCs in the subsurface, and controls potential future pathways from the Site to Temescal Creek channel (e.g., storm sewers). The LUCs will also require future utilities to be placed above the groundwater table, or with engineering controls if below the groundwater, to limit potential preferential movement of groundwater toward Temescal Creek channel along the utilities. Future development must be consistent with the assumptions for future use of the Site that were developed to constrain the groundwater model design conditions on which the remedy is based, particularly for implementation of natural attenuation to achieve the cleanup goals within a reasonable time period (CDM, 2009b).

The LUCs will be designed so that future owners/occupants will not have direct contact with the shallow groundwater during either redevelopment or future use unless permitted in writing by the DTSC. The LUCs will include language that indicates owners or occupants of the property should not drill, bore, otherwise construct, or use a well for the purpose of extracting water for any use, including, but not limited to, domestic, potable, or industrial uses, unless expressly permitted in writing by the DTSC. It will also require access to and non-interference with installed features of the remedy and the groundwater-monitoring network. In addition, the LUCs will also require unfettered access to and non-interference with the DTSC's access to the Site to conduct inspections, surveillance, monitoring or other activities necessary to protect public health safety or the environment.

Engineering controls will be used to support the LUCs. When the Site is developed, engineering controls will be used to limit surface water infiltration and potential exposure to residual COCs at the Site. Engineering controls will consist of the use of hardscape surfaces, including soil, asphalt, concrete, aboveground planters and building foundations.

The LUCs will not preclude redevelopment of the former Rifkin property in a manner consistent with the Novartis (formerly Chiron) Preliminary Development Plan (PDP) approved by the City of Emeryville on June 7, 1996. The PDP includes a high-rise tower option with installation of piles and pile caps (CDM, 2009b).

7.2 Groundwater Monitoring Program

A Groundwater Monitoring Plan will be prepared that outlines provisions for a long-term groundwater monitoring program. The purpose of the groundwater monitoring program is to collect data to evaluate the effectiveness of the soil excavation, backfill, and slurry wall breaches/extension. The effectiveness of this remedy will be evaluated based on its ability: (1) to promote natural attenuation of residual COCs in groundwater, primarily arsenic; (2) to achieve Site cleanup goals within a reasonable timeframe; and (3) to control groundwater movement through the Site without producing long-term groundwater mounding.

The groundwater monitoring program will consist of:

- Designation of a well network;
- Collection and evaluation of depths to groundwater and concentrations of COCs in groundwater in the well network;
- Development of criteria and methodologies to evaluate data that are collected; and
- Development of contingency actions with a decision framework for their initiation.

To the extent feasible, depths to groundwater and concentrations of COCs will be evaluated in the same monitoring well network. Statistical analysis will be used to

evaluate trends in the concentration data. The depth to groundwater, and COC concentrations and concentration trends will be evaluated to determine if contingency action(s) are needed to achieve Site cleanup goals.

Based on the timing and nature of future redevelopment and future construction activities, and/or results from the groundwater monitoring program, it may be necessary to modify the groundwater monitoring network or monitoring requirements at some point in the future. As such, at any time after implementation of the remedy, S-W may provide written recommendations to DTSC to modify the groundwater monitoring program presented in this document. S-W will implement the changes to the groundwater monitoring program only after approval by DTSC.

7.2.1 Groundwater Monitoring Well Locations

After soil excavation, backfill, and installation of slurry wall breaches/extension, twelve (12) additional groundwater monitoring wells (CDM-101 thru CDM-112) and three piezometers (PZ-101, PZ-102, and PZ-103) will be installed at the Site. Also, a contingent groundwater monitoring well (CDM-113) may be installed (see Section 7.2.2.1). In addition, 27 existing Site monitoring wells will continue to be utilized as part of the groundwater monitoring network. Figure 7-1 provides the tentative locations for these 12 additional groundwater monitoring wells, the contingent monitoring well, and 3 additional piezometers, along with the existing monitoring wells that will remain.

Tables 7-1 and 7-2 provide a summary of construction details and locations for the wells to be included in this monitoring program during and after remedy implementation, respectively. As discussed in Section 5 of the RAP, all other existing wells associated with the Site will be destroyed prior to remedy implementation. Table 5-1 provides a listing of wells that will be destroyed. Proposed additional groundwater monitoring wells on the former Rifkin property will be installed at the same time that the proposed wells on the S-W property are installed, unless the property owner initiates redevelopment on the former Rifkin property that would require a separate installation schedule.

The new groundwater monitoring wells will be similar in construction to the remaining A-zone wells present at the Site. Specifically, they will be 2-inch diameter wells screened across the upper portion of the A-zone, approximately 10 feet in total screen length from an elevation of approximately 8 to -2 feet NAVD88 (North American Vertical Datum of 1988). The new piezometers will be 1 inch in diameter, screened across the upper portion of the A-zone, approximately 10 feet in total screen length from an elevation of approximately 8 to -2 feet NAVD88. For selected monitoring wells, soil boring and grab groundwater investigations in these respective well location areas may be conducted after remedy implementation to confirm the locations and design of the wells prior to their installations.

7.2.1.1 Excavated and Backfilled Area on Former Rifkin Property

Two (2) of the new proposed wells (CDM-101 and CDM-102) will be installed within the excavated and backfilled area on the former Rifkin property, at or near the locations shown on Figure 7-1. CDM-101 and CDM-102 will be installed within low permeability fill.

7.2.1.2 Excavated and Backfilled Area on S-W Property

Two (2) of the new proposed wells (CDM-103 and CDM-104) and the new proposed piezometer (PZ-101) will be installed within the excavated and backfilled area on the S-W property, at or near the locations shown on Figure 7-1. PZ-101 and CDM-103 will be installed within low permeability fill and CDM-104 within high permeability fill.

7.2.1.3 North Side on Former Rifkin Property

Selected existing wells on the former Rifkin property located outside of the excavated and backfilled area will be retained (see Figure 7-1). These existing wells to be retained are: EX-14, EX-15, LF-35, LF-36, LF-37, LF-38, LF-39, LF-40, LF-41, LF-42, MW-1, MW-2, MW-3, RP-1, RP-2, RP-3, RP-4, and RP-5. Six (6) of these existing wells on the former Rifkin property (RP-1, LF-41, LF-36, RP-2, RP-4, and RP-5) will be used as "Rifkin Guard Wells" to verify that additional migration of arsenic and other S-W COCs is not occurring northward across the former Rifkin property.

These wells discussed above are located outside and to the north of the excavated and backfilled area, and will be protected during remedy implementation.

7.2.1.4 North Side on Horton Street

Six existing wells on Horton Street will be retained: LF-12, LF-13, LF-27, LF-28, LF-29, and LF-30 (see Figure 7-1). These wells are located outside and upgradient or cross gradient to the excavated and backfilled area on the SW property and former Rifkin property. Of these wells, LF-12 and LF-28 will be utilized to monitor conditions not affected by the source area.

7.2.1.5 Central Site on S-W Property

Two (2) of the new proposed wells (CDM-105 and CDM-106) will be installed in the central area of the S-W portion of the Site, at or near the locations shown on Figure 7-1. Based on groundwater modeling of conditions after remedy implementation, as presented in Appendix B of the FS (CDM, 2009b), these wells are projected to be downgradient of excavated and backfilled area wells CDM-103 and CDM-104 and upgradient of the slurry wall breaches.

In addition, two (2) of the new proposed wells (CDM-110 and CDM-111) will be installed outside and cross gradient to the excavated and backfilled area on the S-W property, at or near the location shown on Figure 7-1. These proposed wells will be utilized to monitor conditions not affected by the source area.

Two (2) new proposed piezometers will be installed, one near the northeast corner of the S-W property (in the vicinity of existing piezometer LF-PZ-15) and one west of Building 31 (in the vicinity of existing piezometer LF-PZ-11). The piezometers will assist with evaluating the groundwater movement patterns.

7.2.1.6 West Side on S-W Property

Two (2) of the new proposed wells (CDM-107 and CDM-108) will be installed within the downgradient portions of the slurry wall breach locations, at or near the locations shown on Figure 7-1. These two wells will be located within the S-W property.

In addition, one (1) of the new proposed wells (CDM-109) will be installed west, on the downgradient side, of the slurry wall extension, at or near the location shown on Figure 7-1. This proposed well will be located within the S-W property.

7.2.1.7 West Side on Union Pacific Railroad Property

Existing wells LF-24 and LF-25, located on the western, downgradient side of the Union Pacific Railroad property, will be retained (see Figure 7-1). Based on groundwater modeling of conditions after remedy implementation, as presented in the FS (CDM, 2009b), wells LF-24 and LF-25 are projected to be downgradient of wells CDM-107, CDM-108, and CDM-109, and upgradient of the Temescal Creek channel.

7.2.1.8 North Side on S-W Property

Existing well LF-18 on the S-W property will be retained (see Figure 7-1). LF-18 is located outside of the slurry wall system, near the Temescal Creek channel.

7.2.1.9 South Side on Sherwin Avenue

One (1) of the new proposed monitoring wells (CDM-112) will be installed along Sherwin Avenue, at or near the location shown on Figure 7-1. The well will be used to constrain the southern plume extent and assist with evaluating the groundwater movement patterns.

7.2.2 Monitoring Frequency and Sample Analysis

This section presents the monitoring and analysis programs 1) during remedy implementation and 2) for the first four years after remedy implementation.

7.2.2.1 Groundwater Quality Sampling and Analysis

During Remedy Implementation

Table 7-1 provides a summary of the groundwater well monitoring program during remedy implementation.

Dewatering during soil excavation and backfill is expected to temporarily alter groundwater movement paths and, as a result, may draw impacted, upgradient groundwater onto or further onto the former Rifkin property (i.e., drawing groundwater from the east side of Horton Street towards the former Rifkin property). This water movement may also result in the movement of offsite chemical(s) toward

the former Rifkin property. As such, the six Rifkin Guard Wells and well MW-3, which are located closest to apparent source(s) of upgradient, offsite plume(s), will be sampled quarterly during remedy implementation. Results from these samples will be used to assess potential impacts to groundwater on the former Rifkin property from potential spreading of upgradient, offsite plume(s). Any changes in arsenic concentrations for these seven wells that occur during remedy implementation can thus be evaluated.

Groundwater samples from these seven wells will be collected in accordance with methodology for well sampling presented in the existing project Groundwater Monitoring Plan Assessment (LFR, 2006a) and Quality Assurance Project Plan (LFR, 2006b). The samples will be analyzed for arsenic by EPA Method 6010B and VOCs by EPA Method 8260B. In addition, the samples will be measured for the following field parameters during sample collection:

- Temperature
- pH
- Turbidity
- Dissolved Oxygen
- Oxidation-Reduction Potential
- Specific Conductivity

The field parameter results will be used to support the representativeness of the well samples and monitor the relative distribution of oxidizing/reducing conditions.

After Remedy Implementation

Table 7-2 provides a summary of the groundwater well monitoring program after remedy implementation.

With the exception of wells CDM-103, CDM-104, and CDM-112 which will be sampled annually, new monitoring wells installed on the S-W property will be sampled on a semi-annual basis for the first two years after remedy implementation. Following these two years, data from the well samples and the data quality objectives will be used to determine if semi-annual sampling should continue or whether the frequency can be reduced to annual.

If the arsenic concentration for a Rifkin Guard Well or well MW-3 increases above its respective historical maximum detection during remedy implementation, the frequency of groundwater sampling for that well will continue on a quarterly basis after remedy implementation. Quarterly sampling for the well will continue until statistical analysis of the results demonstrates that the arsenic concentration for the well is stable or decreasing; the frequency of sampling for the well will then be

adjusted to semi-annual. Historical maximum arsenic detections for the Rifkin Guard wells and well MW-3 are listed in Table 7-1.

If no increases in arsenic concentrations are observed for these seven wells during remedy implementation, the frequency of groundwater sampling and analysis for arsenic for the Rifkin Guard Wells and all other Site wells for the first four years after remedy implementation will be in accordance with Table 7-2.

If arsenic concentrations in groundwater samples collected from any of the six Rifkin Guard Wells or well MW-3 increase to greater than 500 µg/L during remedy implementation, an additional monitoring well (to be designated CDM-113) would be installed on the former Rifkin property, near former grab groundwater sampling locations RP-BH-012 and CDM-SB1, approximately 120 feet northwest of MW-3 along Horton Street. Well CDM-113 would be similar in construction to the 10 proposed new wells for the Site and would monitor the migration of arsenic in groundwater that could have been pulled onto the former Rifkin property from upgradient, offsite plume(s) during remedy implementation. The frequency of groundwater sampling for CDM-113 would be on a quarterly basis until such time that the data demonstrate that arsenic concentrations are stable or decreasing for CDM-113. The frequency of sampling would then be adjusted to semi-annual.

Groundwater samples will be collected in accordance with the methodology for well sampling presented in the existing project Groundwater Monitoring Plan Assessment (LFR, 2006a) and Quality Assurance Project Plan (LFR, 2006b). The samples will be analyzed for arsenic by EPA Method 6010B and VOCs by EPA Method 8260B. In addition, the samples will be measured for the following field parameters during sample collection:

- Temperature
- pH
- Turbidity
- Dissolved Oxygen
- Specific Conductivity
- Oxidation-Reduction Potential

The field parameter results will be used to support the representativeness of the well samples and monitor the relative distribution of oxidizing/reducing conditions.

7.2.2.2 Depth to Groundwater Measurements

During Remedy Implementation

Table 7-1 provides a summary of the groundwater well monitoring program during remedy implementation.

Dewatering during soil excavation and backfill is anticipated to alter groundwater movement paths and, as a result, may draw upgradient, offsite plume(s) onto or further onto the former Rifkin property. As such, groundwater elevation data will be collected monthly from the six Rifkin Guard Wells and well MW-3. These seven wells are located closest to apparent source(s) of upgradient, offsite plume(s). The monthly data sets will be used to assess potential impacts to groundwater movement conditions on the former Rifkin property regarding potential spreading of upgradient, offsite plume(s) and potential changes in arsenic concentrations for these seven wells.

After Remedy Implementation

Table 7-2 provides a summary of the groundwater well monitoring program for the first four years after remedy implementation.

As the remedy has been designed to control groundwater movement, groundwater elevation data will be collected monthly for the first year from the six Rifkin Guard Wells and well MW-3 to monitor whether groundwater movement patterns are consistent with projected design groundwater model conditions for the remedy, as presented in the FS (CDM, 2009b). The first year's data set will be used to evaluate the effectiveness of the slurry wall segments to divert groundwater, and the effectiveness of the slurry wall breaches to facilitate groundwater movement. After the first year, if groundwater elevations and movement patterns are consistent with projected design conditions, the frequency of groundwater elevation monitoring will be revised to quarterly. The quarterly elevation monitoring data sets will be utilized to continue evaluation of potential seasonal variation in groundwater movement. The frequency of groundwater elevation monitoring will be reevaluated annually.

Should future construction activities affect groundwater movement or rates of infiltration (e.g., redevelopment of the former Rifkin property or S-W property), monthly monitoring will be reinitiated during and post-construction for a period of at least one year to monitor whether groundwater movement patterns continue to be consistent with projected design groundwater model conditions.[1] If groundwater elevations and movement patterns are consistent with projected design conditions, groundwater elevation monitoring will return to its previously established frequency.

Changes to the frequency of groundwater elevation monitoring resulting from a determination that groundwater movement patterns are inconsistent with projected design conditions are further discussed in Section 7.2.5.3.

[1] Based on the type and location of future construction activities, there may be a future need to modify the groundwater monitoring network. As such, S-W may provide written recommendations to DTSC to modify the groundwater monitoring program presented in this document. S-W will implement the changes to the groundwater monitoring program only after approval by DTSC.

7.2.3 Groundwater Quality Effectiveness Criteria

After remedy implementation, samples from the groundwater monitoring wells will be analyzed to evaluate the effectiveness of the remedy. Table 7-3 provides a summary of the groundwater quality effectiveness criteria to be utilized to evaluate the effectiveness of the remedy. The criteria are discussed below.

7.2.3.1 Excavated and Backfilled Area on Former Rifkin Property

It is anticipated that COC concentrations in groundwater within this area will fluctuate after remedy implementation, as the groundwater comes into equilibrium with the backfill material and surrounding groundwater conditions. Samples from wells CDM-101 and CDM-102 will be analyzed to evaluate whether COC concentrations in groundwater in this area are stable or decreasing by no later than four years after remedy implementation. In addition, samples from these wells will be analyzed to evaluate whether arsenic concentrations in this area are less than 5,000 µg/L by no later than four years after remedy implementation.

7.2.3.2 Excavated and Backfilled Area on S-W Property

It is anticipated that COC concentrations in groundwater within this area will fluctuate after remedy implementation, as the groundwater comes into equilibrium with the backfill material and surrounding groundwater conditions. Therefore, samples from wells CDM-103 and CDM-104 will be analyzed to evaluate whether, COC concentrations in groundwater in this area are stable or to decreasing by no later than four years after remedy implementation.

7.2.3.3 North Side on Former Rifkin Property

Samples from the Rifkin Guard Wells will be analyzed to evaluate whether arsenic concentration trends are statistically stable or decreasing after remedy implementation.

7.2.3.4 Central Site on S-W Property

Samples from wells CDM-105 and CDM-106 will be analyzed to determine if there is potential movement of COCs in groundwater toward the west side groundwater monitoring wells CDM-107 and CDM-108.

Samples from wells CDM-110 and CDM-111 will be analyzed to determine if there is potential change in groundwater quality outside of the area affected by the excavated and backfilled area.

7.2.3.5 West Side on S-W Property

Samples from wells CDM-107 and CDM-108 will be analyzed to evaluate whether trends of COC concentrations in groundwater migrating offsite through the slurry wall breaches toward the Union Pacific Railroad property are statistically stable or decreasing, and whether arsenic concentrations exceed 250 µg/L for CDM-107 or 500 µg/L for CDM-108. These arsenic concentration criteria are based on protection of Temescal Creek channel and further discussed in Section 7.3.1.2.

Samples from well CDM-109 will be analyzed to evaluate the effectiveness of the slurry wall extension in containing the onsite groundwater plume and to evaluate whether trends of COC concentrations in groundwater present outside the slurry wall are statistically stable or decreasing.

7.2.3.6 West Side on Union Pacific Railroad Property

Samples from wells LF-24 and LF-25 will be analyzed to evaluate whether COC concentrations in groundwater near the Temescal Creek channel are less than Site cleanup goals or whether their trends are statistically stable or decreasing. Since installation in 1996, arsenic concentrations in samples from these wells have been stable or decreasing. Arsenic concentrations in samples from monitoring well LF-24 since the time of installation in 1996 have been less than 36 µg/L. Arsenic concentrations for LF-25 have been less than 36 µg/L since 2006 and are currently demonstrating a decreasing trend.

7.2.3.7 North Side on S-W Property

Samples from well LF-18 will be analyzed to evaluate whether COC concentrations in groundwater near the Temescal Creek channel are less than Site cleanup goals or whether their trends are statistically stable or decreasing.

7.2.3.8 South Side on Sherwin Avenue

Samples from well CDM-112 will be analyzed to evaluate whether COC concentrations in groundwater in this area are less than Site cleanup goals or whether their trends are statistically stable or decreasing.

7.2.4 Groundwater Movement Effectiveness Criteria

Table 7-3 provides a summary of the groundwater movement criteria to be utilized to monitor the effectiveness of the remedy. The criteria are further discussed below.

7.2.4.1 Groundwater Movement Patterns

Measurements of depths to groundwater in Site wells will be monitored to determine if long-term groundwater movement patterns within the S-W property are consistent with projected design groundwater model conditions for the remedy, as presented in the FS (CDM, 2009b), or as updated during preparation of the RDIP. These conditions include groundwater movement towards the slurry wall breaches and the absence of long-term, localized groundwater mounding.

7.2.4.2 Depths to Groundwater

Groundwater elevation measurements will be evaluated to determine if the depths to groundwater are sufficient to avoid a surface expression of groundwater with a goal of minimizing potential inundation of subsurface utility corridors.

7.2.4.3 Arsenic Mass Flux between CDM-101, CDM-102, CDM-104, and PZ-101

Groundwater elevation measurements, along with concentrations of arsenic in groundwater, from CDM-101, CDM-102, CDM-104, and/or PZ-101 will be evaluated to determine if the net arsenic mass flux within the excavated and backfilled area between the locations of these proposed wells is towards the S-W property west of the former Rifkin property.

As appropriate, the criterion of net mass flux towards the S-W property could be evaluated for other COCs. However, it is not likely to be needed for other COCs as their concentrations for these wells are anticipated to be approximately equal.

7.2.5 Remedy Effectiveness Evaluation

After remedy implementation, the groundwater monitoring data sets will be utilized to evaluate the effectiveness of the remedy and determine if contingency action(s) are needed to achieve Site cleanup goals. The following text summarizes the evaluation process and criteria to be used to determine the need for contingency actions.

7.2.5.1 Groundwater Quality for Wells CDM-101 thru CDM-104, CDM-107 thru CDM-109, CDM-112, LF-18, LF-24, LF-25, and Rifkin Guard Wells

COC concentration trends for these 17 wells will be evaluated by statistical testing, including but not limited to the Mann-Kendall (Gilbert, 1997) nonparametric statistical test. Consistent with U.S. EPA guidance (EPA, 1994), a significance level of 0.05 (i.e., a 95% confidence level) will be used in applying the Mann-Kendall nonparametric test. If an increasing COC concentration trend is found, the frequency of monitoring for the well will be increased to monthly for three months and the 95% UCL concentrations from these four events (the previous scheduled event and subsequent three monthly events) will be used in the Mann-Kendall nonparametric test in place of the previous quarterly event result. If this re-evaluation demonstrates a return to a stable or decreasing COC concentration trend, the frequency of monitoring for the well will return to its previously established frequency listed in Table 7-2. Otherwise, S-W will provide written recommendations to DTSC for implementation of a contingency action (see Section 7.3).

If during establishment of a statistical arsenic concentration trend for wells CDM-107 and CDM-108, arsenic concentrations exceed 250 µg/L for CDM-107 or 500 µg/L for CDM-108, S-W will provide written recommendations to DTSC for implementation of a contingency action (see Section 7.3). These arsenic concentration criteria are based on protection of Temescal Creek channel and further discussed in Section 7.3.1.2.

7.2.5.2 Groundwater Quality for Wells CDM-101 and CDM-102

If four years after remedy implementation the arsenic concentration threshold criterion of 5,000 µg/L is exceeded in samples from either wells CDM-101 or CDM-102, S-W will provide written recommendations to DTSC for implementation of a contingency action (see Section 7.3).

7.2.5.3 Groundwater Movement Patterns

An estimate of groundwater flow direction and hydraulic gradient will be performed following each groundwater elevation monitoring event. The groundwater flow direction and measured hydraulic gradient then will be compared to the projected design groundwater model conditions for the remedy, as presented in the FS (CDM, 2009b), or as updated during preparation of the RDIP. As discussed in Section 7.2.2, the first assessment of this criterion will be conducted after the first year of monthly groundwater elevation monitoring. The groundwater movement conditions that will be monitored as part of the annual assessment will include:

- The slurry wall extension controls groundwater movement to the north and south in the area south of CDM-111;
- Net groundwater movement within the Excavated and Backfilled Area on S-W Property is toward the interceptor trench or the wall breaches near the Union Pacific Railroad property, and not toward Horton Street;
- Net groundwater movement within Excavated and Backfilled Area on Former Rifkin Property is to the north-northwest;
- Net groundwater movement from the high permeability fill area surrounding CDM-104 is toward the slurry wall breaches near the Union Pacific Railroad property, and not toward the former Rifkin property; and
- Mounding of groundwater, to the extent it occurs, is seasonal and generally follows above average precipitation events and does not result in net groundwater movement toward the Rifkin property, movement of water over the top of the slurry wall, or flow around the slurry wall extension.

If the first assessment determines that groundwater movement patterns are consistent with projected design conditions, the frequency of groundwater elevation monitoring will proceed to quarterly as discussed in Section 7.2.2.

If the first assessment or any subsequent annual assessment determines that groundwater movement patterns differ significantly from projected design conditions, S-W will provide written recommendation to DTSC for either implementation of additional monitoring/investigation steps or a contingency action.

Additional monitoring/investigation may include but is not limited to continued/return to monthly groundwater monitoring for an additional year, at

which time a follow up assessment would be made and the monitoring revised as appropriate. Possible contingency action is discussed in Section 7.3.

7.2.5.4 Depths to Groundwater

If one year after remedy implementation the depth to groundwater in any well is measured at or less than four (4) feet bgs, monthly monitoring will be reinitiated for the well to determine if depth to groundwater is exhibiting a rising trend. If the depth to groundwater from three consecutive monthly events is greater than four (4) feet bgs, the frequency of monitoring for the well will return to its previously established frequency. Otherwise, monthly monitoring will continue. If the depth to groundwater in any well is measured at or less than three (3) feet bgs, S-W will provide written recommendations to DTSC for implementation of a contingency action (see Section 7.3).

7.2.5.5 Arsenic Mass Flux between CDM-101, CDM-102, CDM-104, and PZ-101

The projected groundwater model design conditions are intended to prevent long-term (steady-state) groundwater and residual COC movement within the excavated and backfilled area between the locations of these proposed wells towards the former Rifkin property. This additional criterion for monitoring the effectiveness of the remedy includes maintaining a positive mass flux from the former Rifkin property to the S-W property for each COC. As discussed in Section 7.2.4.3, this criterion is anticipated to apply only to arsenic.

After each groundwater elevation monitoring event for the three wells and one piezometer, the hydraulic gradient within the excavated and backfilled area on the former Rifkin property and the contiguous backfilled area to the west, on the S-W property will be calculated. Using the transect method (API, 2003), the arsenic mass flux in groundwater through the cross-sectional area underlying the Rifkin/S-W property line between these wells will be calculated for each event by the following equation:

$$w = (C)(K)(i)(A)(CF)$$

where, w = chemical mass flux through the transect (g/day)
C = concentration of chemical through the transect (mg/L)
K = hydraulic conductivity at the transect (cm/sec)
i = hydraulic gradient at the transect (cm/cm)
A = cross-sectional area associated with the transect (ft^3)
CF = conversion factor, 80.3 (ft/cm)/(sec/day)(L/ft^3)(g/mg)

The calculated mass flux, w, value for each event will include both the magnitude and direction. The direction will be based on assigning a positive hydraulic gradient, i, if groundwater movement is toward Rifkin and negative for movement away from Rifkin. The concentration, C, for each event will be either (1) the concentration of CDM-104 if the groundwater movement is toward Rifkin, or (2) the average of the

arsenic concentration of CDM-101 and CDM-102 if groundwater movement is away from Rifkin.

Due to the uncertainty introduced by variations in percent recovery; quality control; and matrix interferences, there will be inherent variations in the precision and bias of laboratory analytical results for the groundwater samples from the wells used in the flux calculations. Therefore, a default tolerance limit of 20 percent will be used to determine if concentrations are considered different for use in calculating mass flux, i.e., mass flux, w, will be set at zero for each event where arsenic concentrations from wells CDM-101, 102, and CDM-104 differ by or less than 20 percent. As appropriate, this criterion would be applied to other COCs, if concentrations of other COCs for these three wells differ by more than 20 percent.

After the first year of monthly groundwater monitoring, the monthly arsenic mass flux values will be summed to calculate the annual net arsenic mass flux. Each of the monthly mass flux values will represent an approximately equal duration (i.e., one month). If this first year net arsenic mass flux is negative (movement of arsenic away from Rifkin), groundwater monitoring will proceed to quarterly, as discussed in Section 7.2.2.

If the net arsenic mass flux during the first year or any subsequent year is positive (movement of arsenic toward Rifkin), S-W will provide written recommendation to DTSC for either implementation of additional monitoring/investigation steps or a contingency action.

Additional monitoring/investigation may include, but is not limited to, continued/return to monthly groundwater monitoring at these wells for an additional year, at which time a follow up assessment would be made and the monitoring revised as appropriate. Possible contingency action is discussed in Section 7.3.

If the net arsenic mass flux during the first year or any subsequent year exceeds the equivalent to arsenic concentrations of 500 µg/L with a groundwater migration rate of 1 foot/day, S-W will provide written recommendation to DTSC for contingency action (see Section 7.3).

7.3 Contingency Action

Section 7.2.5 presented the criteria for which written recommendations to DTSC for contingency action will be required. The recommendations for contingency action will be consistent with best engineering practices to minimize the potential for any further spread of the COCs and to strive to restore a stable or decreasing groundwater plume. Such contingency action may include, but not be limited to: additional soil excavation and backfill; modifications to permeability of placed fill; in-situ groundwater treatment or in-place geochemistry modifications within the Site or at the slurry wall breaches; modification to the groundwater containment system; and/or active groundwater extraction and treatment.

The submittal to DTSC for the recommended contingency action would also include effectiveness evaluation criteria for the contingency action. S-W would implement the contingency action after approval by DTSC.

7.3.1 Active Groundwater Extraction and Treatment

7.3.1.1 Criteria for Rifkin Guard Wells

If verified arsenic concentrations in samples from any Rifkin Guard Well during evaluation of the contingency action exceed the criteria listed in Table 7-4, S-W will provide written recommendations to DTSC to implement active groundwater extraction and treatment with disposal/reuse of treated water. The objective of the groundwater extraction contingency action, to address exceedance of the Rifkin Guard Well criteria, would be to prevent further migration of arsenic contaminated groundwater onto the former Rifkin property. For this action, further arsenic migration is defined as northerly groundwater movement across the alignment of the Rifkin Guard Wells.

The submittal to DTSC for active groundwater extraction would also include criteria for evaluating the effectiveness of the extraction. Consistent with existing DTSC procedures, S-W would implement active groundwater extraction and evaluate its effectiveness. This evaluation would include consideration of (1) terminating active groundwater extraction and returning to the original remedy (i.e., natural attenuation of arsenic in groundwater) if criteria listed in Table 7-5 are met, or (2) implementation of additional contingency action, if criteria listed in Table 7-5 are not met.

7.3.1.2 Criteria for Wells CDM-107 and CDM-108

If verified arsenic concentrations in samples from CDM-107 or CDM-108 during evaluation of the contingency action exceed the criteria listed in Table 7-4, S-W will provide written recommendations to DTSC to implement active groundwater extraction and treatment with disposal/reuse of treated water. The objective of the groundwater extraction contingency action, to address exceedance of the CDM-107/108 criteria, would be to prevent further migration of arsenic contaminated groundwater through one or both of the slurry wall breaches along the Union Pacific Railroad property, as necessary, to maintain protection of Temescal Creek channel. Supporting information for the contingency action criteria for arsenic listed in Table 7-4 for CDM-107 and CDM-108 is presented in Appendix J.

The submittal to DTSC for active groundwater extraction would also include criteria for evaluating the effectiveness of the extraction. Consistent with existing DTSC procedures, S-W would implement active groundwater extraction and evaluate its effectiveness. This evaluation would include consideration of (1) terminating active groundwater extraction and returning to the original remedy (i.e., natural attenuation of arsenic in groundwater) if criteria listed in Table 7-5 are met, or (2) implementation of additional contingency action if criteria listed in Table 7-5 are not met.

7.3.1.3 Implementation of Active Groundwater Extraction

The objective of the active groundwater extraction contingency action would be to control further migration of arsenic impacted groundwater on the former Rifkin property or through the slurry wall breaches. A contingency action that includes groundwater extraction would be implemented within the area of the higher permeability backfill on the S-W property (as discussed in Section 6). The uniform nature of this higher permeability backfill would facilitate enhanced hydraulic communication with surrounding native materials, backfill in the remainder of the Site, and the interceptor trench.

Using the groundwater model for the Unit A aquifer (A-zone) developed for the FS (CDM, 2009b), a groundwater extraction scenario has been evaluated for conditions anticipated to be present after implementation of the preferred remedy. Based on the groundwater model simulation results, a single groundwater extraction well within the higher permeability backfill on the S-W property would be sufficient to simultaneously meet the objectives of contingency actions for both the former Rifkin property and the slurry wall breaches. Under this selected groundwater extraction scenario, a pumping rate of approximately 3.1 gallons per minute (gpm) from this well would be sufficient to maintain a hydraulic capture zone that extends to the Rifkin Guard Wells and the downgradient slurry wall breach nearest to the source area. The model indicates that of the two downgradient slurry wall breaches along the Union Pacific Railroad property, the one associated with well CDM-108 is the more likely to first have potential increases in COC concentrations that would trigger a need for contingency action.

The groundwater model simulation results include a presentation of the steady-state potentiometric surface contours and particle tracking showing groundwater movement in the A-zone that would develop due to pumping from this single groundwater extraction well within the high permeability backfill on the S-W property. The results demonstrate that this contingency groundwater extraction action would adequately provide control of migration of COCs in groundwater. Details of the groundwater model evaluation and simulation results are included in Appendix K.

7.4 Reporting

Results from post-remediation activities will be provided to DTSC on a quarterly basis for the first four years, at which time an evaluation will be made as to appropriate reporting frequency. These reports will include summaries of OM&M events and results of the groundwater monitoring program. The reports will detail deviations from this OM&M and groundwater monitoring plans, if any, provide an explanation for the deviations and recommendations for future actions or changes to monitoring protocols. If at anytime, data or other information indicates that there is an immediate issue or impact to human health or environment, this data or information will be reported immediately to DTSC.

Table 7-1
Well Construction Details and Monitoring Program During Remedy Implementation
Sherwin-Williams Emeryville Remedial Action Plan

Well Number	Well Construction Details										*Well Monitoring Program During Excavation/Backfill*				*Maximum Arsenic Concentration Detected from Well (ug/L) thru April 2008* [2]
	Date Constructed	*Top of Casing Elevation* (feet NAVD88)	*Total Depth* (feet bgs)	*Casing Material*	*Casing Diameter* (inches)	*Screen Slot Size* (inches)	*Screen Interval Depths* Top (feet toc)	Bottom (feet toc)	*Screen Interval Elevations* Top (feet NAVD88)	Bottom (feet NAVD88)	*Depth To Groundwater*	*Arsenic by EPA Method 6010B*	*Volatile Organic Compounds by EPA Method 8260B*	*Field Parameters* [1]	
Existing Wells															
Former Rifkin Property															
RP-1	7/26/1994	17.84	13	PVC	2	0.010	7.0	12.0	10.8	5.8	Monthly	Quarterly	Quarterly	Each Event	95
RP-2	7/25/1994	17.94	15	PVC	2	0.010	8.5	14.5	9.4	3.4	Monthly	Quarterly	Quarterly	Each Event	37
RP-4	7/25/1994	17.83	17	PVC	2	0.010	7.0	17.0	10.8	0.8	Monthly	Quarterly	Quarterly	Each Event	15
RP-5	7/25/1994	17.74	15	PVC	2	0.010	7.0	15.0	10.7	2.7	Monthly	Quarterly	Quarterly	Each Event	11
LF-36	1/3/2000	18.87	16	PVC	2	0.020	7.0	16.0	11.9	2.9	Monthly	Quarterly	Quarterly	Each Event	65
LF-41	12/29/1999	18.24	15	PVC	2	0.020	7.0	15.0	11.2	3.2	Monthly	Quarterly	Quarterly	Each Event	97
MW-3	12/8/1994	17.30	19.5	PVC	2	0.010	6.5	19.5	10.8	-2.2	Monthly	Quarterly	Quarterly	Each Event	120

Notes:
NADV88: North American Vertical Datum of 1988
bgs: below ground surface
toc: top of casing
PVC: polyvinyl chloride
ug/L: microgram per liter
1 - Field parameters include: temperature, pH, turbidity, dissolved oxygen, and oxidation-reduction potential.
2 - LFR Inc. 2008. Combined Groundwater and NPDES Self-Monitoring Report, Sherwin-Williams Facility, 1450 Sherwin Avenue, Emeryville, California. July 30.

Table 7-2
Well Construction Details and Monitoring Program After Remedy Implementation
Sherwin-Williams Emeryville Remedial Action Plan

Well Number	Well Construction Details										*Well Monitoring Program After Excavation/Backfill* [1]			
	Date Constructed	*Top of Casing Elevation* (feet NAVD88)	*Total Depth* (feet bgs)	*Casing Material*	*Casing Diameter* (inches)	*Screen Slot Size* (inches)	*Screen Interval Depths* Top (feet toc)	*Screen Interval Depths* Bottom (feet toc)	*Screen Interval Elevations* Top (feet NAVD88)	*Screen Interval Elevations* Bottom (feet NAVD88)	*Depth To Groundwater* [2]	*Arsenic by EPA Method 6010B*	*Volatile Organic Compounds by EPA Method 8260B*	*Field Parameters* [3]
Existing Wells														
Horton Street														
LF-12	11/2/1989	17.65	18	PVC	4	0.020	7.5	17.5	10.2	0.1	Monthly/Quarterly	Annually	Annually	Each Event
LF-13	11/2/1989	17.48	18	PVC	4	0.020	7.0	17.0	10.5	0.5	Well retained for possible future monitoring, if needed			
LF-27	12/22/1997	17.83	18	PVC	2	0.010	10.0	18.0	7.8	-0.2	Well retained for possible future monitoring, if needed			
LF-28	12/22/1997	17.09	18	PVC	2	0.010	6.5	18.0	10.6	-0.9	Monthly/Quarterly	Annually	Annually	Each Event
LF-29	12/23/1997	16.40	20	PVC	2	0.010	6.0	19.0	10.4	-2.6	Well retained for possible future monitoring, if needed			
LF-30	12/23/1997	15.86	19	PVC	2	0.010	6.0	18.5	9.9	-2.6	Well retained for possible future monitoring, if needed			
Former Rifkin Property														
RP-1[a]	7/26/1994	17.84	13	PVC	2	0.010	7.0	12.0	10.8	5.8	Monthly/Quarterly	Quarterly/Semi-Annually [4]	Annually	Each Event
RP-2[a]	7/25/1994	17.94	15	PVC	2	0.010	8.5	14.5	9.4	3.4	Monthly/Quarterly	Quarterly/Semi-Annually [4]	Annually	Each Event
RP-3	7/26/1994	17.87	13	PVC	2	0.010	8.0	12.5	9.9	5.4	Monthly/Quarterly	Semi-Annually	Annually	Each Event
RP-4[a]	7/25/1994	17.83	17	PVC	2	0.010	7.0	17.0	10.8	0.8	Monthly/Quarterly	Quarterly/Semi-Annually [4]	Annually	Each Event
RP-5[a]	7/25/1994	17.74	15	PVC	2	0.010	7.0	15.0	10.7	2.7	Monthly/Quarterly	Quarterly/Semi-Annually [4]	Annually	Each Event
LF-35	9/21/199	18.93	27	PVC	2	0.010	24.0	27.0	-5.1	-8.1	Monthly/Quarterly	Annually	Annually	Each Event
LF-36[a]	1/3/2000	18.87	16	PVC	2	0.020	7.0	16.0	11.9	2.9	Monthly/Quarterly	Quarterly/Semi-Annually [4]	Annually	Each Event
LF-37	1/4/2000	18.54	16	PVC	2	0.020	7.0	16.0	11.5	2.5	Monthly/Quarterly	Semi-Annually	Annually	Each Event
LF-38	1/4/2000	18.51	27	PVC	2	0.020	20.0	27.0	-1.5	-8.5	Monthly/Quarterly	Annually	Annually	Each Event
LF-39	1/3/2000	18.97	26	PVC	2	0.020	18.0	26.0	1.0	-7.0	Monthly/Quarterly	Annually	Annually	Each Event
LF-40	1/4/2000	18.84	15	PVC	2	0.020	7.0	15.0	11.8	3.8	Monthly/Quarterly	Semi-Annually	Annually	Each Event
LF-41[a]	12/29/1999	18.24	15	PVC	2	0.020	7.0	15.0	11.2	3.2	Monthly/Quarterly	Quarterly/Semi-Annually [4]	Annually	Each Event
LF-42	1/5/2000	17.29	16	PVC	2	0.020	7.0	15.0	10.3	2.3	Monthly/Quarterly	Semi-Annually	Annually	Each Event
EX-14	12/29/1999	18.74	16	SS	6	0.010	5.5	15.5	13.2	3.2	Well retained for possible future monitoring, if needed			
EX-15	12/29/1999	17.88	17	SS	6	0.010	7.0	17.0	10.9	0.9	Well retained for possible future monitoring, if needed			
MW-1	12/9/1994	16.48	19	PVC	2	0.010	7.0	17.0	9.5	-0.5	Well retained for possible future monitoring, if needed			
MW-2	12/8/1994	16.29	19	PVC	2	0.010	5.0	17.0	11.3	-0.7	Well retained for possible future monitoring, if needed			
MW-3	12/8/1994	17.30	20	PVC	2	0.010	6.5	19.5	10.8	-2.2	Monthly/Quarterly	Quarterly/Semi-Annually [4]	Annually	Each Event
Sherwin-Williams Property														
LF-18	2/5/1996	15.75	19	PVC	2	0.010	8.0	18.0	7.8	-2.3	Monthly/Quarterly	Annually	Annually	Each Event
Union Pacific Railroad Property														
LF-24	4/4/1996	12.92	17	PVC	2	0.010	7.0	17.0	5.9	-4.1	Monthly/Quarterly	Annually	Annually	Each Event
LF-25	4/4/1996	14.01	18	PVC	2	0.010	8.0	18.0	6.0	-4.0	Monthly/Quarterly	Annually	Annually	Each Event

Table 7-2
Well Construction Details and Monitoring Program After Remedy Implementation
Sherwin-Williams Emeryville Remedial Action Plan

Well Number	**Well Construction Details**										***Well Monitoring Program After Excavation/Backfill*** [1]			
	Date Constructed	***Top of Casing Elevation*** (feet NAVD88)	***Total Depth*** (feet bgs)	***Casing Material***	***Casing Diameter*** (inches)	***Screen Slot Size*** (inches)	***Screen Interval Depths*** Top (feet toc)	Bottom (feet toc)	***Screen Interval Elevations*** Top (feet NAVD88)	Bottom (feet NAVD88)	***Depth To Groundwater*** [2]	***Arsenic by EPA Method 6010B***	***Volatile Organic Compounds by EPA Method 8260B***	***Field Parameters*** [3]
Proposed Wells [5]														
Former Rifkin Property														
CDM-101	--	--	--	PVC	2	0.010	--	--	8	-2	Monthly/Quarterly	Semi-Annually	Semi-Annually	Each Event
CDM-102	--	--	--	PVC	2	0.010	--	--	8	-2	Monthly/Quarterly	Semi-Annually	Semi-Annually	Each Event
Sherwin-Williams Property														
CDM-103	--	--	--	PVC	2	0.010	--	--	8	-2	Monthly/Quarterly	Annually	Annually	Each Event
CDM-104	--	--	--	PVC	2	0.010	--	--	8	-2	Monthly/Quarterly	Annually	Annually	Each Event
CDM-105	--	--	--	PVC	2	0.010	--	--	8	-2	Monthly/Quarterly	Semi-Annually/Annually [6]	Annually	Each Event
CDM-106	--	--	--	PVC	2	0.010	--	--	8	-2	Monthly/Quarterly	Semi-Annually/Annually [6]	Annually	Each Event
CDM-107	--	--	--	PVC	2	0.010	--	--	8	-2	Monthly/Quarterly	Semi-Annually	Semi-Annually	Each Event
CDM-108	--	--	--	PVC	2	0.010	--	--	8	-2	Monthly/Quarterly	Semi-Annually	Semi-Annually	Each Event
CDM-109	--	--	--	PVC	2	0.010	--	--	8	-2	Monthly/Quarterly	Semi-Annually/Annually [6]	Annually	Each Event
CDM-110	--	--	--	PVC	2	0.010	--	--	8	-2	Monthly/Quarterly	Semi-Annually/Annually [6]	Annually	Each Event
CDM-111	--	--	--	PVC	2	0.010	--	--	8	-2	Monthly/Quarterly	Semi-Annually/Annually [6]	Annually	Each Event
CDM-112	--	--	--	PVC	2	0.010	--	--	8	-2	Monthly/Quarterly	Annually	Annually	Each Event
Proposed Piezometers														
Sherwin-Williams Property														
PZ-101	--	--	--	PVC	1	0.010	--	--	8	-2	Monthly/Quarterly	--	--	--
PZ-102	--	--	--	PVC	1	0.010	--	--	8	-2	Monthly/Quarterly	--	--	--
PZ-103	--	--	--	PVC	1	0.010	--	--	8	-2	Monthly/Quarterly	--	--	--

Notes:

NADV88: North American Vertical Datum of 1988

bgs: below ground surface

toc: top of casing

PVC: polyvinyl chloride

SS: stainless steel

a - Designated Rifkin Guard Well.

1 - Monitoring program is only for the first four years after remedy implementation.

2 - Depth to groundwater measured monthly for first year and then quarterly for next three years; should there be a change in the rate of infiltration that affects groundwater flow conditions, monthly monitoring would be reinitiated for at least one year.

3 - Field parameters include: temperature, pH, turbidity, dissolved oxygen, oxidation-reduction potential, and specific conductivity.

4 - Frequency of monitoring for arsenic for this well will be quarterly if arsenic concentrations for this well increases above its historical maximum detection during remedy implementation; otherwise, the frequency will be semi-annually.

5 - In addition to the 12 proposed wells presented in this table, a thirteenth contingent well (CDM-113) will be installed if arsenic concentrations from any of the Rifkin Guard Wells or MW-3 increase to above 500 micrograms per liter (ug/L) during remedy implementation; CDM-113 would be installed in the vicinity of soil boring locations CDM-SB1 and RP-BH-012, approximately 120 feet northwest of MW-3 along Horton Street. If installed, the well would be monitored and sampled similar to LF-36.

6 - Frequency of monitoring for arsenic for this well will be semi-annually for the first two years; if after two years arsenic concentration is stable to decreasing, frequency of monitoring will be modified to annually; otherwise, it will remain semi-annually.

Table 7-3
Remedy Effectiveness Evaluation Criteria
Sherwin-Williams Emeryville Remedial Action Plan

Groundwater Quality Effectiveness Criteria [1]	
Well	**Remedy Effectiveness Evaluation Criteria**
Former Rifkin Property	
CDM-101	COC concentrations are less than Site cleanup goals or their trends are statistically stable to decreasing four years after remedy implementation, and arsenic is less than 5,000 ug/L four years after remedy implementation
CDM-102	COC concentrations are less than Site cleanup goals or their trends are statistically stable to decreasing four years after remedy implementation, and arsenic is less than 5,000 ug/L four years after remedy implementation
RP-1[a]	Arsenic concentrations are less than Site cleanup goals or their trends are statistically stable to decreasing
RP-2[a]	Arsenic concentrations are less than Site cleanup goals or their trends are statistically stable to decreasing
RP-4[a]	Arsenic concentrations are less than Site cleanup goals or their trends are statistically stable to decreasing
RP-5[a]	Arsenic concentrations are less than Site cleanup goals or their trends are statistically stable to decreasing
LF-36[a]	Arsenic concentrations are less than Site cleanup goals or their trends are statistically stable to decreasing
LF-41[a]	Arsenic concentrations are less than Site cleanup goals or their trends are statistically stable to decreasing
Sherwin-Williams Property	
LF-18	COC concentrations are less than Site cleanup goals or their trends are statistically stable to decreasing
CDM-103	COC concentrations are less than Site cleanup goals or their trends are statistically stable to decreasing
CDM-104	COC concentrations are less than Site cleanup goals or their trends are statistically stable to decreasing
CDM-107	COC concentrations are less than Site cleanup goals or their trends are statistically stable to decreasing
CDM-108	COC concentrations are less than Site cleanup goals or their trends are statistically stable to decreasing
CDM-109	COC concentrations are less than Site cleanup goals or their trends are statistically stable to decreasing
CDM-112	COC concentrations are less than Site cleanup goals or their trends are statistically stable to decreasing
Union Pacific Property	
LF-24	COC concentrations are less than Site cleanup goals or their trends are statistically stable to decreasing
LF-25	COC concentrations are less than Site cleanup goals or their trends are statistically stable to decreasing

Groundwater Movement Effectiveness Criteria
1. Long-term groundwater flow patterns are consistent with projected design groundwater model conditions.
2. Long-term arsenic in groundwater mass flux at the Rifkin/S-W property line between CDM-101/CDM-102 and PZ-101/CDM-104 is westward, from the former Rifkin property to the S-W property.
3. Absence of long-term groundwater mounding at the Site.
4. Depths to groundwater at all wells are more than 3 feet below ground surface.

Notes:

COC: chemical of concern

ug/L: microgram per liter

a - Designated Rifkin Guard Well.

1 - Wells not presented do not have groundwater quality remedy effectiveness evaluation criteria. In addition to the wells indentified on the former Rifkin property, contingent well CDM-113 (see Table 7-2), if installed, would be monitored and evaluated for remedy effectiveness, similar to LF-36.

Table 7-4
Criteria for Implementing Active Groundwater Extraction
Sherwin-Williams Emeryville Remedial Action Plan

Well	Criteria for Implementing Active Groundwater Extraction [1]
Former Rifkin Property (Guard) Wells	
RP-1[a]	Increasing arsenic concentration trend with concentration greater than higher of 150 ug/L or 150% of the maximum arsenic concentration detected for the well prior to or during remedy implementation
RP-2[a]	Increasing arsenic concentration trend with concentration greater than higher of 75 ug/L or 150% of the maximum arsenic concentration detected for the well prior to or during remedy implementation
RP-4[a]	Increasing arsenic concentration trend with concentration greater than higher of 75 ug/L or 150% of the maximum arsenic concentration detected for the well prior to or during remedy implementation
RP-5[a]	Increasing arsenic concentration trend with concentration greater than higher of 75 ug/L or 150% of the maximum arsenic concentration detected for the well prior to or during remedy implementation
LF-36[a]	Increasing arsenic concentration trend with concentration greater than higher of 75 ug/L or 150% of the maximum arsenic concentration detected for the well prior to or during remedy implementation
LF-41[a]	Increasing arsenic concentration trend with concentration greater than higher of 150 ug/L or 150% of the maximum arsenic concentration detected for the well prior to or during remedy implementation
Sherwin-Williams Property Wells	
CDM-107	Increasing arsenic concentration trend with concentration greater than 250 ug/L
CDM-108	Increasing arsenic concentration trend with concentration greater than 500 ug/L

Notes:

COC: chemical of concern

ug/L: microgram per liter

a - Designated Rifkin Guard Well.

1 - Wells not presented do not have criteria for implementing active groundwater extraction.

Table 7-5
Criteria to Terminate Active Groundwater Extraction
Sherwin-Williams Emeryville Remedial Action Plan

Well	*Criteria to Terminate Active Groundwater Extraction and Return to Monitored Natural Attenuation* [1]	*Maximum Arsenic Concentration Detected from Well thru April 2008* [2]
Former Rifkin Property		
RP-1[a]	Arsenic concentration less than higher of 100 ug/L or maximum arsenic concentration detected prior to or during remedy implementation	95
RP-2[a]	Arsenic concentration less than higher of 50 ug/L or maximum arsenic concentration detected prior to or during remedy implementation	37
RP-4[a]	Arsenic concentration less than higher of 50 ug/L or maximum arsenic concentration detected prior to or during remedy implementation	15
RP-5[a]	Arsenic concentration less than higher of 50 ug/L or maximum arsenic concentration detected prior to or during remedy implementation	11
LF-36[a]	Arsenic concentration less than higher of 65 ug/L or maximum arsenic concentration detected prior to or during remedy implementation	65
LF-41[a]	Arsenic concentration less than higher of 100 ug/L or maximum arsenic concentration detected prior to or during remedy implementation	97
Sherwin-Williams Property		
CDM-107	Arsenic concentration less than 250 ug/L	Not applicable [3]
CDM-108	Arsenic concentration less than 500 ug/L	Not applicable [3]

Notes:

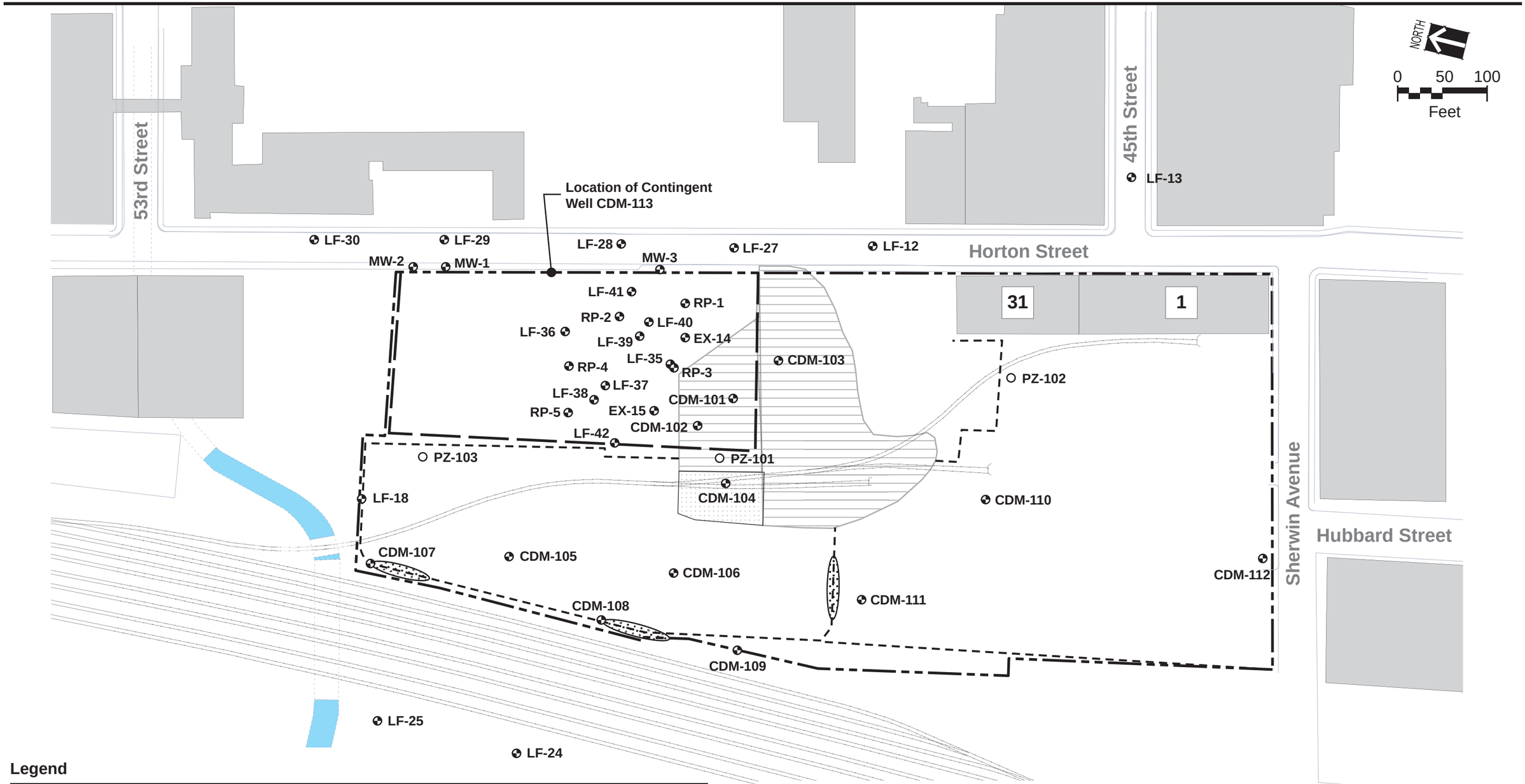
ug/L: microgram per liter

a - Designated Rifkin Guard Well.

1 - Wells not presented do not have criteria to terminate active groundwater extraction and return to monitored natural attenuation.

2 - LFR Inc. 2008. Combined Groundwater and NPDES Self-Monitoring Report, Sherwin-Williams Facility, 1450 Sherwin Avenue, Emeryville, California. July 30.

3 - CDM-107 and CDM-108 to be installed during remedy implementation.



Legend

- Site Boundary
- Slurry Wall
- Post Remedy Implementation Monitoring Well
- Post Remedy Implementation Piezometer
- Slurry Wall Breach
- Saturated Soil Excavation and Low Permeability Backfill
- Saturated Soil Excavation and High Permeability Backfill

Notes:

1. New wells CDM-101 through CDM-112 and piezometers PZ-101 through PZ-103 will be installed at end of implementation activities. All other wells shown are existing and will be protected during implementation activities.
2. Existing site wells not shown will be destroyed before or with implementation activities.

W:\REPORTS\Sherwin-Williams\Emeryville\Remedial Action Plan\Graphics\Monitoring Locations (Fig7-1).ai 05/11/10 JJT

CDM

Figure 7-1

Preliminary Post Remedy Implementation Groundwater Monitoring Locations

Sherwin-Williams Company - Emeryville, California

Section 8
References

Bostick et al., 2004. Arsenite retention mechanisms within estuarine sediments of Pescadero, CA. Environ. Sci. Technol. v. 38 p. 3299-3304. Bostick, B. C., Chen, C. and S. Fendorf.

Cal/EPA, 2009. Letter providing conditional approval of the April 1, 2009 Feasibility Study and April 10, 2009 Report for Public Health Evaluation of the Remedial Alternative. California Environmental Protection Agency, Department of Toxic Substances Control. May 7, 2009.

Cal/EPA, 2007. Letter providing conditional approval of the November 8, 2006 Feasibility Study Work Plan. California Environmental Protection Agency, Department of Toxic Substances Control. January 16, 2007.

Cal/EPA, 2006a. Letter providing conditional approval of the November 22, 2006 Treatability Study Work Plan and December 8, 2006 Addendum to Treatability Study Work Plan. California Environmental Protection Agency, Department of Toxic Substances Control. December 13, 2006.

Cal/EPA, 2006b. Imminent and Substantial Endangerment Determination and Order and Remedial Action Order. Docket No. IS/E 05/06-007. California Environmental Protection Agency, Department of Toxic Substances Control. May 10, 2006.

Cal/EPA, 2005. Use of California Human Health Screening Levels (CHHSLs) in Evaluation of Contaminated Properties. California Environmental Protection Agency, Office of Environmental Health Hazard Assessment. January 2005.

CDM, 2009a. Report for Public Health Evaluation of the Remedial Alternative, Sherwin-Williams Company, Emeryville, California. April 10, 2009.

CDM, 2009b. Feasibility Study, Sherwin-Williams Company, Emeryville, California. April 1, 2009.

CDM, 2008a. Soil Mixing Overview, Phase II Bench Scale Testing, In Situ Soil Treatment Treatability Study, Sherwin-Williams Company, Emeryville, California. February 22, 2008.

CDM, 2008b. Report of Findings, Soil Characterization Study Addendum, Sherwin-Williams Site, 1450 Sherwin Avenue, Emeryville, California. February 22, 2008.

CDM, 2008c. Report of Findings, Phase III Groundwater Treatability Study, Groundwater Column Studies, Sherwin-Williams Site, 1450 Sherwin Avenue, Emeryville, California. February 6, 2008.

CDM, 2007a. Report of Findings, Phase II Groundwater Treatability Study, Groundwater Column Studies, Sherwin-Williams Site, 1450 Sherwin Avenue, Emeryville, California. October 15, 2007.

CDM, 2007b. Phase III Pilot Scale Testing, In Situ Soil Treatment Study, Sherwin-Williams Site, 1450 Sherwin Avenue, Emeryville, California. September 24, 2007.

CDM, 2007c. Addendum to Treatability Study Work Plan for Additional Arsenic Speciation and Characterization Study – Additional Sample Collection and Characterization, The Sherwin-Williams Company, Emeryville, CA. Camp Dresser & McKee Inc., on behalf of The Sherwin-Williams Company. June 28, 2007.

CDM, 2007d. Report of Findings, Soil Characterization Study, The Sherwin-Williams Company, Emeryville, CA. Camp Dresser & McKee Inc., on behalf of The Sherwin-Williams Company. June 28, 2007.

CDM, 2007e. Phase II Groundwater Treatability Study Work Plan Addendum, Emeryville, California. Camp Dresser & McKee Inc., on behalf of The Sherwin-Williams Company. June 28, 2007.

CDM, 2007f. Phase I Groundwater Treatability Study Report for Laboratory Screening Studies, Emeryville, California. Camp Dresser & McKee Inc., on behalf of The Sherwin-Williams Company. June 21, 2007.

CDM, 2007g. Stage II Procedure and Findings, Phase II Bench Scale Testing, In Situ Soil Treatment Study, Sherwin-Williams Site, 1450 Sherwin Avenue, Emeryville, California. June 15, 2007.

CDM, 2007h. Data Summary Report for Soil Gas Investigation Activities, Sherwin-Williams Site, 1450 Sherwin Avenue, Emeryville, California. January 30, 2007.

CDM, 2007i. Data Summary Report for Installation and Sampling of Well CDM-1, Sherwin-Williams Site, 1450 Sherwin Avenue, Emeryville, California. January 30, 2007.

CDM, 2006a. Addendum to Treatability Study Work Plan, The Sherwin-Williams Company, Emeryville, CA. Camp Dresser & McKee Inc., on behalf of The Sherwin-Williams Company. December 8, 2006.

CDM, 2006b. Treatability Study Work Plan for Laboratory Screening Studies, The Sherwin-Williams Company, Emeryville, CA. Camp Dresser & McKee Inc., on behalf of The Sherwin-Williams Company. November 22, 2006.

CDM, 2006c. Feasibility Study Work Plan, the Sherwin Williams Company, Emeryville, CA. Camp Dresser & McKee Inc., on behalf of The Sherwin-Williams Company. November 8, 2006.

CDM, 2006d. Interim Remedial Measures Evaluation Report, The Sherwin-Williams Company, 1450 Sherwin Avenue, Emeryville, CA. Camp Dresser & McKee Inc. July 14, 2006.

CDM, 2005. Report of Findings, December 2004 Subsurface Investigation, 1450 Sherwin Avenue, Emeryville, California. Camp Dresser & McKee Inc. March 2005.

CDM, 2003. Arsenic Stabilization and Distribution Treatability Study. Camp Dresser & McKee Inc. January 3, 2003.

CDM, 2002. Report of Findings, Subsurface Investigation, Former Rifkin Property, Emeryville, California. Camp Dresser & McKee Inc. December 2002.

EarthRisk, 2002. Current Conditions Risk Screen, Sherwin-Williams Emeryville Plant. EarthRisk, Inc. and ENTRIX. May 13, 2002.

EKI, 2008. Final Feasibility Study and Remedial Action Plan, Site B Project Area, Emeryville, California. March 2008.

EKI, 1999. Final Remedial Action Plan, Elementis, McKinley, Sepulveda, and Old Shellmound Street Properties, Emeryville, California. May 1999.

ENTRIX, 2002. Remedial Investigation, Sherwin-Williams Site, Emeryville, California. ENTRIX. March 8, 2002.

Freeze and Cherry, 1979. Groundwater, Freeze, A. and J. Cherry, Prentice-Hall, Englewood Cliffs, N.J.

Gradient, 2005. Human Health Risk Assessment for 1450 Sherwin Avenue, Emeryville, California. Gradient Corporation. February 11, 2005.

Langmuir et al., 1985. Chemical equilibrium and kinetics of geochemical processes in ground water studies. In Practical Applications of Ground Water Geochemistry (ed. B. Hitchon and E.I. Wallick). Proceedings of the First Canadian/American Conference on Hydrogeology. National Water Well Association. Worthington, Ohio. Langmuir, D.L. and J. Mahoney. 1985.

LBNL, 2002. Analysis of Background Distributions of Metals in the Soil at Lawrence Berkeley National Laboratory. Lawrence Berkeley National Laboratory, University of California (Berkeley). June 2002.

LBNL, 1995. Protocol for Determining Background Concentrations of Metals in Soils at Lawrence Berkeley National Laboratory. Lawrence Berkeley National Laboratory, University of California (Berkeley). August 1995.

LFR, 2008. Groundwater Monitoring Report, July 1 through December, 2007, The Sherwin-Williams Company, 1450 Sherwin Avenue, Emeryville, CA. LFR Inc. January 30, 2008.

LFR, 1998. Evaluation of Interim Remedial Measures and Workplan for Implementation of Future Interim Remedial Measures (Draft Final), The Sherwin-Williams Facility, 1450 Sherwin Avenue, Emeryville, California. Levine-Fricke Recon. May 20, 1998.

Metcalf & Eddy, 1979. Wastewater Engineering: Treatment Disposal Reuse, Second Edition, McGraw-Hill. 1979.

Norfleet Consultants, 1998. Groundwater Study and Water Supply History of the East Bay Plain, Alameda & Contra Costa Counties, CA prepared for: The Friends of the San Francisco Estuary.

O'Day, et al., 2004. The Influence of Sulfur and Iron on Dissolved Arsenic Concentrations in Shallow Subsurface Under Changing Redox Conditions, National Academy of Sciences, PNAS, Vol. 101, No. 38. pp. 13703 to 13708. O'Day, P.A., Vlassopolous, D., Root, R. and Rivera, N. September 21, 2004.

Pierce and Moore. 1982. Adsorption of Arsenite and Arsenate on Amorphous Iron Hydroxide. Water Resource. V. 16 pp 1247-1253.

Portland Cement Association, 1991. Solidification And Stabilization of Wastes Using Portland Cement, W. Adaska, S. Tresouthick, and P. West.

PQ Quartz Corporation, 1999. Treatability Study Manual: Solidification/Stabilization, M. Kovacs.

USEPA, 2007 Monitored Natural Attenuation of Inorganic Contaminants in Ground Water, Volumes I and II. EPA/600/R07/139. United States Environmental Protection Agency. October 2007.

USEPA, 2006. Guidance on Systematic Planning using the Data Quality Objectives Process. United States Environmental Protection Agency. February 2006.

USEPA, 2002. Arsenic Treatment Technologies for Soil, Waste, and Water. Office of Solid Waste and Emergency Response. EPA-542-R-02-004. United States Environmental Protection Agency. September 2000.

USEPA, 2000. A Guide to Developing and Documenting Cost Estimates During the Feasibility Study. United States Environmental Protection Agency. July 2000.

USEPA, 1999. Presumptive Remedies: Policies and Procedures, OSWER 9355.0-47FS. United States Environmental Protection Agency. September 1999.

USEPA, 1997. USEPA Region IX Sampling and Analysis Plan Guidance. United States Environmental Protection Agency, Region IX. April 1997.

USEPA, 1994. Statistical Training Course for Ground-water Monitoring Data Analysis. EPA530-R-003. United States Environmental Protection Agency, Office of Solid Waste and Emergency Response. April 1994.

USEPA, 1990. Preamble to CFR Part 300 National Oil and Hazardous Substances Pollution Contingency. United States Environmental Protection Agency. April 9, 1990.

USEPA, 1991. Risk Assessment Guidance for Superfund: Volume 1, Human Health Evaluation Manual (Part B: Development of Risk-Based Remediation Goals), Office of Emergency and Remedial Response. Publication 9285.7-01B. States Environmental Protection Agency. December 1991.

USEPA, 1988. Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA. United States Environmental Protection Agency. October 1988.

Water Board, 2002. Water Board Approval of RI report. 2002.

Water Board, 1998. Order No. 98-009, Adoption of Site Cleanup Requirements and Rescission of Cleanup and Abatement Order No. 97-047 for: The Sherwin-Williams Company, 1450 Sherwin Avenue, Emeryville, Alameda County.

Water Board, 1995. Water Quality Control Plan, San Francisco Bay Basin (Region 2). California Regional Water Quality Control Board, San Francisco Bay Region. June 21, 1995.

Wilkin et al., 2003. Speciation of Arsenic in Sulfidic Waters, Geochem Trans. Wilkin, R.T., Wallschlager, D., Ford, R.G. March 18, 2003.

Wilkin et al., 2002. Use of hydrochloric acid for determining solid-phase arsenic partitioning in sulfidic sediments. Environ. Sci. Technol. v 36 p. 4921-4927. Wilkin, R.T. and R. G. Ford.

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June 14, 2010

Larry Mencin
The Sherwin-Williams Company
101 Prospect Avenue, N.W.
Cleveland, Ohio 44115

Dear Mr. Mencin:

The Department of Toxic Substances Control (DTSC) has completed its review of the June 14, 2010 Final Remedial Action Plan (Final RAP) for the Sherwin Williams Site located at 1450 Sherwin Avenue in Emeryville, Alameda County, California. DTSC has determined that the Final RAP satisfactorily addresses all applicable state and federal statutes and regulations and therefore approves the document.

Copies of the approved Final RAP and this approval letter must be placed in each of the Information Repositories for the Site. A notice announcing the finalization of the RAP must either be sent to the Site mailing list or a public notice published in the Oakland Tribune.

The Sherwin-Williams Company has the option to seek judicial review of the RAP (within 30 days of the date that the Final FS/RAP was issued). Based upon the percentage of financial responsibility assigned, The Sherwin-Williams Company may also be eligible to dispute the preliminary allocation of financial responsibility, as specified in the FS/RAP, by convening an arbitration proceeding (within 15 days of the date of the issuance of the Final RAP) and agreeing to binding arbitration by the arbitration panel. To exercise the arbitration option, it is necessary that the party or parties making the request be assigned a greater than 50% of the responsibility for the site. You should also be aware that neither filing for judicial review or requesting arbitration will stay implementation of the cleanup actions specified in the final RAP.

We look forward to the implementation of the RAP and appreciate your cooperation in achieving our mutual cleanup objectives. If you have any questions or comments, please contact Janet Naito at 510-540-3833 or jnaito@dtsc.ca.gov.

Sincerely,

Barbara J. Cook, P.E., Acting Assistant Deputy Director
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May 7, 2009

Larry Mencin
The Sherwin-Williams Company
101 Prospect Avenue, N.W.
Cleveland, Ohio 44115

Dear Mr. Mencin:

Department of Toxic Substances Control (DTSC) staff have completed their review of the following documents prepared for the Sherwin-Williams site located at 1450 Sherwin Avenue in Emeryville, California:

1. *Feasibility Study, Sherwin-Williams Site, 1450 Sherwin Avenue, Emeryville, California* prepared by Camp Dresser & McKee Inc. and dated April 1, 2009.
2. *Report for Public Health Evaluation of the Remedial Alternative* (PHERA Report) for the Sherwin-Williams Site in Emeryville, California prepared by Camp Dresser & McKee Inc. and dated April 10, 2009.

The Feasibility Study Report identifies and evaluates alternatives for cleaning up the Sherwin-Williams site and recommends an appropriate clean-up alternative. The PHERA Report was prepared to determine whether the alternative recommended by the feasibility study evaluation could be implemented without significant risk or hazard to the surrounding community. Members of the Consultative Work Group established for this Site under California Health and Safety Code, Chapter 6.65 provided comments on these documents. These two documents were then revised, as appropriate, in response to comments provided by members of the Consultative Work Group and by DTSC.

Based upon the PHERA results, dust and vapor control measures and requirements for air monitoring have been incorporated into the alternative to ensure that implementation

of the proposed alternative will not put the surrounding community at risk. Therefore, the PHERA and the Feasibility Study reports are approved with the following modifications and clarifications.

1. Feasibility Study Report, Table 4-1, Page 1 of 4, Containment. The description should read: "Improve existing surface cap or install new surface cap to prevent human exposure (direct contact, incidental ingestion, and/or release of particles to the air). Structural elements of cap can include asphalt, concrete, building slab foundation, and/or flexible membrane liner (FML). FML can be also be used to minimize migration of gases and liquids."

2. As the alternative recommended in the Feasibility Study includes monitored natural attenuation, the Remedial Action Plan should outline the requirements for a monitoring program and contain contingencies in case there is unexpected migration of residual contamination from the Site towards Temescal Creek, unexpected arsenic behavior/movement, or arsenic present at a slurry wall breach above triggering criteria or goals. The triggering criteria and/or goals should be contained in the Remedial Action Plan.

3. PHERA Report. As stated in the report, the VOC emissions calculated based upon soil and groundwater concentrations are not similar to those detected in soil gas sampling conducted at the Site. This difference is thought to be due to the detection of organic vapors trapped under the existing cap in the soil gas sampling conducted at the Site. Soil vapor extraction will be conducted prior to initiating excavation activities to remove these trapped soil gases. Soil gas sampling will be conducted during soil vapor extraction activities. The sampling results will be compared to levels calculated based upon groundwater concentrations in the PHERA. If there is a significant difference, performance standards and the total volatile organic compound action level will be recalculated.

4. PHERA Report. The PHERA Report looks at potential risks associated with the potential release of hazardous substances in soil, soil vapor and groundwater during implementation of the proposed final remedy for the Site. It does not evaluate the potential risks associated with exhaust emissions from construction equipment or trucks/rail used to remove and transport this material for offsite disposal. The impact of these types of emissions is typically evaluated in the California Environmental Quality Act (CEQA)-compliance document prepared to consider the effects of the proposed cleanup activities on the environment. The CEQA-compliance document looks at the existing conditions, identifies sensitive natural and cultural resources, describes activities conducted as part of the cleanup process that may affect them, and evaluates what can be done to protect people and the environment from harmful effects.

The next step in the cleanup process is the preparation of a cleanup plan for public review. As the estimated cost of the recommended alternative is greater than $2,000,000, a Remedial Action Plan (RAP) shall be prepared. The draft RAP shall be submitted to DTSC no later than May 29, 2009. Based upon the proposed remedial activities described in the Remedial Action Plan, DTSC shall begin preparation of its CEQA-compliance document.

If you have any questions, please contact Janet Naito at (510) 540-3833 or jnaito@dtsc.ca.gov.

Sincerely,

Janet Naito
Senior Hazardous Substance Scientist
Brownfields and Environmental Restoration Program – Berkeley Office

Barbara J. Cook, P.E., Performance Manager
Brownfields and Environmental Restoration Program – Berkeley Office

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August 6, 2012

Mr. Larry Mencin
The Sherwin-Williams Company
101 Prospect Avenue
N.W. Cleveland, Ohio 44115-1075

Dear Mr. Mencin:

DTSC has reviewed the final Remedy Implementation Completion Report (Report) dated July 25, 2012, prepared by CDM Smith Inc. DTSC has no further comments. The Report is hereby approved.

If you have any questions, please feel free to contact me at jbacey@dtsc.ca.gov or (510) 540-2480.

Sincerely,

Nina Bacey, Project Manager
Brownfields and Environmental Restoration Program

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January 23, 2013

Mr. Larry Mencin
The Sherwin-Williams Company
101 Prospect Avenue
N.W. Cleveland, Ohio 44115-1075

Dear Mr. Mencin:

The Department of Toxic Substances Control (DTSC) is the Administering Agency for the Sherwin-Williams Site (Site), located at 1450 Sherwin Avenue in the City of Emeryville, California, per the California Environmental Protection Agency (Cal/EPA) Site Designation Committee's February 23, 2006 Resolution No. 06-02. DTSC has overseen the characterization and remediation of the Site pursuant to an Imminent and Substantial Endangerment Determination and Remedial Action Order (Order), Docket No. IS/E 05/06-007, executed on May 10, 2006.

The Site consists of approximately 10 acres, 8.3 of which are owned by Sherwin-Williams, and the remaining is currently owned and operated by Novartis. Several phases of soil and groundwater investigation have been conducted at the Site since 1988. The investigations revealed the following chemicals of concern (COCs) in soil and groundwater: arsenic and lead, volatile organic compounds (VOCs), primarily benzene, ethylbenzene, toluene, xylenes and 1,2,4-trimethylbenzene, ketones (primarily acetone and 2-butanone), chlorinated constituents (1,2-dichloroethane (1,2-DCA), cis-1,2-dichloroethene (cis-1,2-DCE), trans-1,2-DCE, trichloroethene (TCE), and vinyl chloride); and total petroleum hydrocarbons (TPHs).

- The Remedial Action Plan was approved by DTSC on June 14, 2010. The objective of the Removal Action Workplan was to excavate the lead, arsenic and VOC contaminated soil from a portion of the site, install sub-surface remedial features to control and manage the arsenic contaminated groundwater, and execute a land use covenant to restrict the use of the Site.

- The Remedial Action Completion Report prepared by CDM Smith, Inc. and dated July 25, 2012, documents the excavation of the Site and the installation of the remedial features.

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- On January 23, 2013, the Sherwin-Williams Company entered into an Operation and Maintenance Agreement with DTSC that includes an adequate plan for long-term operation and maintenance of the Site.

- The Sherwin-Williams Company and DTSC executed a land use covenant restricting the use of the Site on December 19, 2012. The land use covenant prohibits the use of the Property in any way that may adversely affect the integrity and effectiveness of the installed remedial features, prohibits the use of groundwater for any purposes other than groundwater monitoring as described in the Operation and Maintenance Plan or upon DTSC's approval of a Groundwater Management Plan, and prohibits activities that will disturb the soil (e.g., excavation, grading, removal, trenching, filling, earth movement, mining, or drilling) without DTSC's approval.

Based upon DTSC's evaluation of the Completion Report and subject to compliance with the conditions in the land use covenant and Operation and Maintenance Agreement, the Site should not pose a threat to human health or the environment. Therefore, with the exception of compliance with the land use covenant and Operation and Maintenance Agreement requirements, DTSC determines that no further action is necessary with respect to investigation and remediation of hazardous substances at the Site.

Pursuant to Section 6.23 Termination and Satisfaction of the Order, DTSC has determined that except for the Sherwin-Williams Company's obligations under Sections 5.10 Operation and Maintenance, 5.11 Five-Year Review, 5.16 Financial Assurance, 6.12 Record Retention, 6.17 Liability for Costs, and 6.18 Payment of Costs, the Sherwin-Williams Company's obligations under this Order have been terminated.

As with any real property, if previously unidentified contamination is discovered at the Site, additional assessment, investigation and/or cleanup may be required.

If you have any questions regarding this determination, please contact the project manager Nina Bacey at 510-540-2480 or Juanita.Bacey@dtsc.ca.gov.

Sincerely,

Karen M. Toth, P.E., Unit Chief
Brownfields and Environmental Restoration Program

cc: Pawan K. Sharma
CDM (via email)
SharmaPK@cdmsmith.com

In the matter of:	)	Docket No. HSA-O&MEA 11/12-096
	)	
Sherwin-Williams	)	
1450 Sherwin Avenue	)	OPERATION AND MAINTENANCE
Emeryville, CA 94608	)	AGREEMENT
	)	
Proponent:	)	
	)	Health and Safety Code
The Sherwin-Williams Company	)	Section 25355.5 (a)(1)(C)
101 Prospect Avenue, 4M	)	
Cleveland, OH 44115	)	

The California Department of Toxic Substances Control (DTSC) and land owner The Sherwin-Williams Company (Proponent) enter into this Operation and Maintenance Agreement (Agreement) for the Proponent's property located at 1450 Sherwin Avenue, Emeryville, Alameda County, California, 94608 and a portion of the adjacent former Rifkin property located at 4525-4563 Horton Street, Emeryville, Alameda County, California, 94608, to which hazardous substances have migrated from the Proponent's property. Collectively the Proponent's property and this portion of the former Rifkin property are referred to as the "Site". Novartis Vaccines and Diagnostics, Inc. (Novartis) is the current owner of the former Rifkin property. The Site consists of approximately 10 acres and was formerly identified by Assessor's Parcel Numbers 049-1041-026-02, 049-1041-026-04, 049-1041-026-06, 049-1041-026-07, 049-1041-005-00 and 049-1041-006-00. The Assessor's Office has subsequently consolidated these Assessor's Parcel Numbers for the two properties and assigned the following new numbers: 049-1041-026-15 for the Proponent's property and 049-1544-001-01 for the former Rifkin property. DTSC and Proponent agree as follows:

1. Jurisdiction. This Agreement is entered into by DTSC and Proponent pursuant to Health and Safety Code section 25355.5(a)(1)(C) which authorizes DTSC to enter into an enforceable agreement to oversee the investigation and/or remediation of a release or threatened release of any hazardous substance at or from the Site, and to oversee the operation and maintenance of any remediation system installed at the Site.

2. Remediation System. After completion of the remedy as described in the Remedial Action Plan (RAP), including removal of over 100,000 tons of impacted vadose zone and saturated zone soils and operation of a groundwater pump and treat system, a long-term groundwater Remediation System was installed consisting of a slurry wall with breaches, an interceptor trench with a membrane barrier, and vadose zone and saturated zone backfill with differing permeabilities, all part of an integrated design to passively control and regulate groundwater movement. The Remediation System also includes a groundwater monitoring well network and monitoring program to evaluate the effectiveness of the groundwater remedy, a soil gas monitoring network and program to evaluate post-remedy soil gas conditions, and a Covenant of Environmental Restrictions recorded on the Property. A site location map and the

assessor's parcel map are attached as Exhibit A and Exhibit B. A site map or diagram showing the location(s) of the Remediation System is attached as Exhibit C.

3. Operation and Maintenance of Remediation System. Operation and maintenance of the Remediation System are required at the Site, and shall be left in place, and operated and maintained by Proponent or with DTSC's approval, any successor property owner. Operation and maintenance of the Remediation System will continue at the Site until and except to the extent that DTSC authorizes Proponent in writing to discontinue or modify part or all of the Remediation System.

4. Implementation of Operation and Maintenance Plan. Proponent shall fully implement the DTSC-approved Operation and Maintenance Plan dated December 11, 2012, and approved by DTSC on December 17, 2012, or any other Operation and Maintenance Plan subsequently approved by DTSC. The current DTSC-approved Operation and Maintenance Plan is attached hereto as Exhibit D, and that Plan or any other Operation and Maintenance Plan subsequently approved by DTSC are hereby incorporated into this Agreement by reference, including any requirements for inspections, monitoring, reporting and record keeping.

5. Modification or Discontinuation of Remediation System. Before modifying or discontinuing any Remediation System component, Proponent shall submit a written request for DTSC's authorization for any modification or discontinuation of the Remediation System or any part thereof, including but not limited to the Operation, Maintenance, and Monitoring Plan, the slurry wall, membrane, backfill, groundwater monitoring well network and/or program, and soil gas monitoring point network and/or program, at least 60 days, to the extent feasible, prior to the intended date of any proposed modification or discontinuation. The written request to DTSC shall include the reasons for the request, a detailed description of any work to be done or modification to be made, and a map showing the exact location of the proposed work. Proponent may seek DTSC's authorization for any such modification or discontinuation of the Remediation System or any part thereof, if: (a) Proponent has met the remediation objectives for the site; or (b) the modification would better or more efficiently and/or more cost-effectively achieve the remediation objectives; or (c) the Remediation System could not achieve the remediation objectives and other cleanup methods will be implemented; or (d) it has been demonstrated that the maximum achievable remediation has occurred; or (e) the modification would be a suitable replacement for an existing component that interferes or otherwise unnecessarily affects development or future use of the property.

6. DTSC-Required Modification. DTSC may require modification, replacement, or additions to the Remediation System if the Remediation System or part of thereof is not achieving the remediation objectives or is not protecting human health or the environment. DTSC may require additional evaluations, designs and the construction and operation of facilities to achieve these objectives. Proponent reserves all of its rights, defenses and remedies available to Proponent under law or equity.

7. Five-Year Review. Proponent shall review and reevaluate the Remediation System after a period of five years from the completion of construction and startup of the Remediation System and every 5 years thereafter, until Proponent demonstrates that it has met the remedial goals for the Site or DTSC issues a written determination that no further five-year reviews are required. The review and reevaluation shall be conducted to determine if human health and the environment are being adequately protected by the Remediation System. Within 30 days before the end of each five-year period, Proponent shall submit a five-year review workplan to DTSC for review and approval. The first five-year review workplan will be submitted by June 1, 2017. Within 60 days of DTSC's approval of the workplan, Proponent shall implement the workplan and submit a report of the results of the five-year review. The report shall describe the results of all sampling analyses, tests and other data generated or received by Proponent and evaluate the adequacy of the implemented remedy in protecting human health and the environment. As a result of any review work performed under this Agreement, DTSC may require Proponent to perform additional review work or modify the review work previously performed by Proponent.

8. Quality Control/Quality Assurance (QC/QA). All sampling and analysis conducted by Proponent under this Agreement shall be performed in accordance with the QC/QA procedures submitted by Proponent and approved by DTSC pursuant to this Agreement.

9. Financial Assurance. Proponent must assure that sufficient funds are available to implement all the requirements of this Agreement and to pay DTSC's costs as specified in Paragraph 10. Proponent has established a letter of credit as the financial assurance mechanism that meets DTSC's requirements pursuant to California Code of Regulations, title 22, section 66265.143.

10. Cost Recovery and Payment.

10.1. Proponent agrees to pay for all of DTSC's costs incurred, in accordance with law, in implementing this Agreement, including costs of overseeing the work performed by Proponent, and in responding to any contamination at the Site. Cost recovery may be pursued by DTSC pursuant to applicable state or federal laws or common law. DTSC will invoice Proponent for DTSC's costs on a quarterly basis. Proponent reserves all of its rights, defenses and remedies available to Proponent under law or equity.

10.2. All payments made by Proponent pursuant to this Agreement shall be by check payable to the "Department of Toxic Substances Control", and bearing on its face the project code for the Site (Site # 200956) and the docket number of this Agreement (Docket No. HSA-O&MEA 11/12-096). Upon request by Proponent, DTSC may accept payments made by credit cards. Payments by check shall be sent to:

Department of Toxic Substances Control
Accounting Office

1001 I Street, 21st Floor
P.O. Box 806
Sacramento, California 95812-0806

A photocopy of the check shall be sent concurrently to DTSC's Project Manager.

10.3. DTSC shall retain all cost records associated with the work performed under this Agreement as may be required by state law. DTSC will make all documents that support DTSC's cost determination available for inspection and copying upon request in accordance with the Public Records Act, Government Code section 6250 et seq.

11. Endangerment During Implementation.

11.1. Proponent shall notify DTSC's Project Manager promptly upon learning of the actual release and/or threatened release of hazardous substances, as defined in Health and Safety Code section 25320, at the Site that may present an imminent and substantial endangerment to the public health or welfare or to the environment. Within seven days of learning of the actual release and/or threatened release, Proponent's Project Manager shall furnish a report to DTSC, signed by Proponent's Project Manager, setting forth the conditions and events that occurred and the measures taken in response thereto.

11.2. In the event DTSC determines that any activity (whether or not pursued in compliance with this Agreement) may pose an imminent or substantial endangerment to the health or safety of people on the Site or in the surrounding area or to the environment, DTSC may order Proponent to conduct additional activities or to stop further implementation of this Agreement for such period of time as may be needed to abate the endangerment. DTSC may request that Proponent implement interim measures to address any immediate threat or imminent or substantial endangerment. Proponent reserves all of its rights, defenses and remedies available to Proponent under law or equity.

12. Site Access. Proponent shall provide, and/or obtain access to the Site and take all reasonable efforts to obtain access to offsite areas to which access is necessary to implement this Agreement. Such access shall be provided to DTSC's employees, contractors, and consultants at all reasonable times to the extent allowed by law. Such access shall also be provided to any other Proponent who is in compliance with this Agreement for the purpose of conducting activities pursuant to this Agreement or for activities deemed necessary by DTSC to meet the objectives of this Agreement. Nothing in this paragraph is intended or shall be construed to limit in any way the right of entry or inspection that DTSC or any other agency may otherwise have by operation of law.

13. Sampling, Data and Document Availability. When requested by DTSC, Proponent shall make available for DTSC's inspection, and shall provide an electronic

copy of, unprivileged data and information related to the performance of this Agreement. For all final reports, Proponent shall submit one hard (paper) copy and one electronic copy with all applicable signatures and certification stamps as a text-readable Portable Document Formatted (pdf) file Adobe Acrobat or Microsoft Word formatted file to DTSC's Project Manager. Proponent reserves all of its rights, defenses and remedies available to Proponent under law or equity.

14. Record Preservation. Proponent shall retain, during the implementation of this Agreement and for a minimum of ten years after its termination, all data, reports, and other documents generated in accordance with this Agreement. If DTSC requests that some or all of these documents be preserved for a longer period of time, Proponent shall either comply with the request, deliver the documents to DTSC, or provide DTSC with a copy of the documents at Proponent's expense prior to destruction.

15. Notification of Field Activities. Proponent shall inform DTSC at least seven calendar days in advance of all field activities pursuant to this Agreement and shall allow DTSC and its authorized representatives to take duplicates of any samples collected by Proponent pursuant to this Agreement.

16. Project Managers. DTSC has designated Nina Bacey as their Project Manager and the Proponent has designated Larry Mencin as their Project Manager. Each Project Manager shall be responsible for overseeing the implementation of this Agreement and for designating a person to act in his/her absence. All communications between DTSC and Proponent, and all notices, documents and correspondence concerning the activities performed pursuant to this Agreement shall be directed through the Project Managers. Each party may change its Project Manager with at least seven days prior written notice.

17. Proponent's Consultant and Contractor. All work performed pursuant to this Agreement shall be under the direction and supervision of a professional engineer or professional geologist, licensed in California, with expertise in hazardous substances site cleanup. Proponent's Project Manager, contractor or consultant shall have the technical expertise sufficient to fulfill his or her responsibilities. Within 14 days of the effective date of this Agreement, Proponent shall notify DTSC's Project Manager in writing of the name, title, and qualifications of the professional engineer or professional geologist and of any contractors or consultants and their personnel to be used in carrying out the work under this Agreement in conformance with applicable state law, including but not limited to, Business and Professions Code sections 6735 and 7835.

18. DTSC Review and Approval. All work performed pursuant to this Agreement is subject to DTSC's review and approval. If DTSC determines that any report, plan, schedule or other document submitted for approval pursuant to this Agreement fails to comply with this Agreement or fails to protect public health or safety or the environment, DTSC may (a) return comments to Proponent with recommended changes and a date by which the Proponent must submit to DTSC a revised document incorporating or addressing the recommended changes; or (b) modify the document in consultation with

Proponent and approve the document as modified. All DTSC approvals and decisions made regarding submittals and notifications will be communicated to Proponent in writing by DTSC's Branch Chief or his/her designee. No informal advice, guidance, suggestions or comments by DTSC regarding reports, plans, specifications, schedules or any other writings by the Proponent shall be construed to relieve Proponent of the obligation to obtain such written approvals.

19. Amendments. This Agreement, including the DTSC-approved Operation and Maintenance Plan, may be amended or terminated by mutual written agreement of DTSC and Proponent. Such amendment or termination shall be effective the third business day following the day the last party signing the amendment or termination sends its notification of signing to the other party. The parties may agree to a different effective date.

20. Incorporation of Exhibits, Plans and Reports. All exhibits are incorporated into this Agreement by reference. All plans, schedules and reports that require DTSC's approval and are submitted by Proponent pursuant to this Agreement are incorporated in this Agreement upon DTSC's approval.

21. Reservation of Rights. DTSC reserves all of its statutory and regulatory powers, authorities, rights, and remedies under applicable laws to protect public health or the environment, including the right to recover its costs incurred therefor. Proponent reserves all of its rights, defenses and remedies available to Proponent under law or equity.

22. Non-Admission of Liability. By entering into this Agreement, Proponent does not admit to any finding of fact or conclusion of law set forth in this Agreement or any fault or liability under applicable laws or equity.

23. Proponent Liabilities. Nothing in this Agreement shall constitute or be considered a covenant not to sue, release or satisfaction from liability by DTSC for any condition or claim arising as a result of Proponent's past, current, or future operations or ownership of the Site.

24. Government Liabilities. The State of California or DTSC shall not be liable for any injuries or damages to persons or property resulting from acts or omissions by Proponent or by related parties in carrying out activities pursuant to this Agreement, nor shall the State of California or DTSC be held as a party to any contract entered into by Proponent or its agents in carrying out the activities pursuant to this Agreement.

25. Third Party Actions. In the event that Proponent is a party to any suit or claim for damages or contribution relating to the Site to which DTSC is not a party, Proponent shall notify DTSC in writing within 10 days after service of the complaint in the third-party action. Proponent shall pay all costs incurred by DTSC relating to such third-party actions, including but not limited to responding to subpoenas. Proponent's agreement

to pay DTSC's costs shall not prevent Proponent from seeking recovery of such costs from the party bringing the litigation.

26. California Law. This Agreement shall be governed, performed and interpreted under the laws of the State of California.

27. Severability. If any portion of this Agreement is ultimately determined not to be enforceable, that portion will be severed from the Agreement and the severability shall not affect the enforceability of the remaining provisions of the Agreement.

28. Parties Bound. This Agreement applies to and is binding, jointly and severally, upon Proponent and its agents, receivers, trustees, successors and assignees, if any, and upon DTSC and any successor agency that may have responsibility for and jurisdiction over the subject matter of this Agreement. Proponent shall ensure that its contractors, subcontractors and agents receive a copy of this Agreement.

29. Effective Date. The effective date of this Agreement is the date of signature by DTSC's authorized representative after this Agreement is first signed by Proponent's authorized representative. Except as otherwise specified, "days" means calendar days.

30. Representative Authority. Each undersigned representative of the party to this Agreement certifies that she or he is fully authorized to enter into the terms and conditions of this Agreement and to execute and legally bind the party to this Agreement.

31. Counterparts. This Agreement may be executed and delivered in any number of counterparts, each of which when executed and delivered shall be deemed to be an original, but such counterparts shall together constitute one and the same document.

Nina Bacey Date: 1/23/13

Nina Bacey,
Project Manager
Brownfields and Environmental Restoration Program
Department of Toxic Substances Control

Richard M. Weaver, VP. Date: 1/10/2013

Richard M. Weaver
Vice President, Corporate Administration
The Sherwin-Williams Company

CALIFORNIA ENVIRONMENTAL QUALITY ACT
INITIAL STUDY

The Department of Toxic Substances Control (DTSC) has completed the following document for this project in accordance with the California Environmental Quality Act (CEQA) [Pub. Resources Code, div. 13, § 21000 et seq.] and accompanying Guidelines [Cal. Code Regs., tit. 14, § 15000 et seq.].

PROJECT TITLE: **Approval of Sherwin-Williams Site Draft Remedial Action Plan**		**CALSTARS CODING:** **200956-00**
PROJECT ADDRESS: 1450 Sherwin Avenue, and 4525 – 4563 Horton Street	**CITY:** Emeryville	**COUNTY:** Alameda County
PROJECT SPONSOR: The Sherwin-Williams Company	**CONTACT:** Larry Mencin	**PHONE:** 216 566-1768

APPROVAL ACTION UNDER CONSIDERATION BY DTSC:

☒ **Remedial Action Plan**

STATUTORY AUTHORITY:

☐ California H&SC, Chap. 6.5 ☒ California H&SC, Chap. 6.8 ☐ Other (specify):

DTSC PROGRAM/ ADDRESS: 700 Heinz Avenue, Berkeley, CA 94710-2721	**CONTACT:** Janet Naito	**PHONE:** 510 540-3833

PROJECT DESCRIPTION:

The California Department of Toxic Substances Control (DTSC) proposes to approve the Draft Remedial Action Plan (RAP) for the former Sherwin-Williams Company (S-W) Site located at 1450 Sherwin Avenue in Emeryville, California. **Figure 1** shows the location of the S-W site. The Draft RAP proposes a cleanup plan for soil and groundwater containing chemicals in concentrations above Preliminary Remediation Goals (PRGs). The proposed cleanup activities include a combination of: excavation of unsaturated-zone soil; excavation of source area soil within the shallow groundwater; monitored natural attenuation of arsenic and volatile organic compounds (VOCs) within the shallow groundwater; groundwater monitoring; and Land Use Controls (LUCs).

The recommended remedial alternative in the Draft RAP consists of:

- Excavation and offsite disposal of approximately 60,000 cubic yards of soil and debris containing arsenic; lead; and/or VOCs above site screening levels:. The planned limits of soil excavation extend approximately 285 feet along Horton Street (60 feet on the former Rifkin property and 225 feet on the S-W property) and approximately 330 feet west of Horton Street to a depth of up to 30 feet below the ground surface;

- Stockpiling of excavated soil and debris in prepared onsite areas;
- Loading of excavated soil and debris into containers (e.g., trucks, bins, rail cars) for offsite disposal;
- Importing backfill soil. Soil would be tested to ensure that it does not contain chemicals of concern above Site cleanup goals prior to bringing the material onsite;
- Extending the existing slurry wall along the southwestern Sherwin-Williams property boundary;
- Removing portions of the existing slurry wall to facilitate groundwater movement;
- Removing up to 50 groundwater monitoring wells that are no longer needed or are located within the proposed excavation area and installing a minimum of 12 permanent groundwater monitoring wells following the completion of backfilling activities;
- Conducting periodic groundwater monitoring and submitting reports documenting the results to the DTSC; and
- Recording land use restrictions that run with the land to ensure that future development of the Site incorporates physical protections against exposure to or release of remaining environmental hazards, and to require non-interference with and ongoing operation and maintenance of any remediation systems.

The project has to be implemented in accordance with all applicable federal, State and local requirements. Project elements necessary to implement these actions are discussed throughout this document and include:

- Obtaining City of Emeryville grading permits to conduct the soil excavation and backfilling activities;
- Complying with the City of Emeryville Noise Ordinance with respect to work hours;
- Complying with the Emeryville Urban Forestry Ordinance (Title 7, Chapter 10 of the Emeryville City Code) if tree removal is required;
- Removing pavement to expose the underlying soil;
- Installing shoring to stabilize excavations. The procedures to be used for shoring installation, and the locations where shoring is required, are discussed in Section 6, Geology and Soils, and in Section 11, Noise and Vibration;
- Dewatering of excavations to facilitate soil excavation below groundwater table. Procedures for removing, treating, and discharging water from the excavation are discussed in Section 8, Hydrology and Water Quality;
- Treating water generated during dewatering activities using the existing groundwater treatment system or a new groundwater treatment system and discharging the treated water to the storm drain under an existing Water Board permit;

- Extracting soil vapor containing VOCs from soil, prior to and during excavation activities and treating the soil vapor under a permit from the Bay Area Air Quality Management District. The procedures for installing and operating the vapor capture and treatment system are discussed in Section 3, Air Quality, and in Attachment D;
- Installing a roadway along the western site boundary;
- Abandoning and installing groundwater wells under permit from the Alameda County Department of Environmental Health. Shallow wells would be removed by overdrilling, deeper wells may be abandoned by pressure grouting in accordance with Alameda County requirements;
- Controlling dust, VOCs and odor utilizing dust, soil vapor extraction and odor control measures while excavation activities are occurring, pursuant to a Dust and Vapor Control Plan (DVCP), to control levels of dust and VOCs released during remedial activities. These controls would be implemented in accordance with the procedures outlined in the *Public Health Evaluation of the Remedial Alternative* (PHERA) (CDM, 2009b) and in the Bay Area Air Quality Management District's CEQA Guidelines (BAAQMD, 1999). The PHERA is included as Attachment D to this document;
- Monitoring compliance with the DVCP by establishing air monitoring stations around the Site and collecting and analyzing air samples in accordance with the Dust and Vapor Control Plan. The proposed locations for the air monitoring stations are illustrated on Figure 3;
- Implementing storm water pollution control procedures in accordance with Best Management Practices (BMPs) as outlined in the Storm Water Pollution Prevention Plan (SWPPP) approved by the San Francisco Bay Regional Water Quality Control Board (Water Board). Storm water control procedures to be implemented during construction activities are discussed in Section 8, Hydrology and Water Quality;
- Conducting work pursuant to a site-specific health and safety plan (HASP) prepared to meet the California Division of Occupational Safety and Health **(**Cal/OSHA) requirements by the contractor performing the work. Section 7, Hazards and Hazardous Materials, includes discussion of the exposure risks and an evaluation of accidental releases;
- Using workers who meet the Cal/OSHA training requirements to implement the remedial plan; and
- Utilizing licensed hazardous waste haulers and hazardous waste manifests to transport any soil classified as hazardous waste to a Class 1 Waste Management Unit (WMU).

It is anticipated that these actions would be implemented during a six-month period beginning in the Spring of 2010.

The Project includes contingency actions that would be implemented if future groundwater monitoring results indicate increasing chemical concentrations or groundwater flow directions other than anticipated. While specific contingent actions are not fully designed at this time, implementation of such contingent actions could include: additional soil excavation; installation of subsurface barriers; additional monitoring or groundwater extraction and treatment of the extracted groundwater.

Project Background

The Sherwin-Williams site consists of S-W property located at 1450 Sherwin Avenue and a portion of the adjacent former Rifkin property, located at 4525-4563 Horton Street in Emeryville, California. Manufacturing operations at the S-W property were conducted from the 1920s until

December 2006. The plant manufactured a wide variety of paints/coatings including oil-based paints until 1987, and water-based paints until 2006. In addition, pesticides containing lead and arsenic were also manufactured at the plant from around the 1920s until the late 1940s. In December 2006, S-W discontinued its operations and decommissioned the manufacturing plant. In the fall 2007, S-W demolished former structures on the S-W property to the ground level, with the exception of two historic buildings and the groundwater treatment system facilities.

S-W continues to own the property. The Site is paved and fenced. Two buildings (Buildings 1 and 31) are classified as "Tier 1 Architecturally Significant Building" by the City of Emeryville. **Figure 2** shows the location of these two buildings. The groundwater treatment system facilities also remain on the property.

The Water Board provided oversight for the site investigation and remediation activities until early 2006, when DTSC assumed responsibility for oversight. DTSC is overseeing the remediation activities at this Site pursuant to Imminent or Substantial Endangerment Determination and Order and Remedial Action Order, Docket No. 05/06-007.

Beginning in the late 1980s, remedial investigations were initiated to delineate chemically-affected soils and groundwater that resulted from historic releases during manufacturing operations. The investigations determined that chemically-affected soils and groundwater at the S-W property extended onto a portion of the adjacent former Rifkin property, located at 4525 – 4563 Horton Street. **Figure 2** shows the location of the former Rifkin property. The former Rifkin property is currently owned by Novartis Vaccines and Diagnostics, Inc. (Novartis). As noted, the S-W property and this portion of the former Rifkin property are referred to collectively as the "Site" in this document.

Between 1993 and 1995, the Water Board required installation of interim remedial measures (IRMs) to control off-site migration of chemically-affected groundwater until a final remedy could be implemented for the Site. The IRMs are still operating at the Site and they include a surface cap, storm water collection system, subsurface slurry wall, and groundwater extraction and treatment (GWET) system.

The slurry wall was constructed around chemically-affected soils within the S-W property and minimizes the migration of chemically-affected groundwater to off-site areas. The slurry wall extends from approximately five feet below ground surface to a minimum of three feet into the underlying bay mud. The surface cap and storm water collection system reduce infiltration of storm water runoff into chemically-affected soils. The surface cap also prevents physical contact with the chemically-affected subsurface soil and groundwater. The GWET system pumps groundwater from inside the slurry wall and from a portion of the adjacent former Rifkin property to contain it within these areas and to minimize its potential migration to off-site areas. This groundwater is then treated before it is discharged to the Temescal Creek Channel under a permit from the Water Board.

On May 7, 2009, the Department of Toxic Substances Control (DTSC) approved the *Feasibility Study* (FS) for the Site (CDM, 2009a). The Feasibility Study evaluates different feasible alternatives for addressing the chemicals found in soil and groundwater underlying the site and recommends a preferred alternative. The Feasibility Study evaluated a number of different alternatives including:

- **Alternative 1** – No Action. This alternative serves as a baseline for comparison to other alternatives and was not selected as it was not protective of public health or the environment;
- **Alternative 2** – Limited Action. This alternative would continue the operation of the interim remedial measures. It was not being recommended as it would allow contaminated groundwater outside of the slurry wall to continue to migrate and would significantly impact future uses of the property;
- **Alternative 3A** – Vadose Zone Excavation/Active *In-Situ* Groundwater Treatment/Rifkin Excavation/Groundwater Monitoring/ Land Use Controls. This alternative required ongoing operations and maintenance of a groundwater treatment system, and left more impacted saturated soil in place than Alternatives 6 and 7;
- **Alternative 3B** – Vadose Zone Excavation/S-W Source Area Soil Mixing/Active *In-Situ* Groundwater Treatment/Rifkin Excavation /Groundwater Monitoring/ Land Use Controls. This alternative was more costly than 3A and still left more impacted saturated soil in place than Alternatives 6 and 7;
- **Alternative 3C** – Vadose Zone Excavation/S-W Source Area Excavation/Rifkin Groundwater Extraction and Aboveground Treatment/ Monitored Natural Attenuation of Arsenic in Groundwater/ Groundwater Monitoring/ Land Use Controls. This alternative removed impacted saturated soil from the S-W property but left impacted soil in-place on the former Rifkin property and required long-term operation and maintenance of a groundwater extraction and treatment system.
- **Alternative 6** – Vadose Zone Excavation/Source Area Excavation/Monitored Natural Attenuation of Arsenic in Groundwater/Groundwater Monitoring/Land Use Controls. Alternative 6, described above in the Project Description, is the preferred alternative because it calls for more removal of impacted saturated soil than prior numbered alternatives, and does not require a long-term operation and maintenance of groundwater extraction and treatment.
- **Alternative 7** – A-Zone Aquifer Excavation/LUCs. This alternative was not selected because it has the highest duration of construction disruption to the community due to the excavation of the entire impacted vadose and saturated zone soils. The significant incremental cost and disruption would not provide a commensurate improvement in human health and environmental protection.

Alternative 6 is the recommended alternative as it provides the best combination of overall protection to both human health and the environment, and long-term effectiveness and permanence. It removes the source of arsenic to groundwater, providing assurance for long-term protection of ecological receptors and for groundwater downgradient of the Site.

The *Draft Remedial Action Plan* (RAP) summarizes the FS, recommends a final remedy and discusses its proposed implementation activities, hereafter referred to as the “proposed project” or “project” in this document.

ENVIRONMENTAL IMPACT ANALYSIS:

1. Aesthetics

Project Activities Likely to Create an Impact:

- Soil excavation and backfilling activities may be visible for a six month period from the surrounding commercial and residential properties.
- Removal of the Raised Cap area.
- Truck and vehicle traffic across Park Avenue and Halleck Street.

Description of Baseline Environmental Conditions:

The Site is paved and fenced, with two buildings (Buildings 1 and 31) and the groundwater treatment system facilities remaining on the property. The two buildings are classified as "Tier 1 Architecturally Significant Buildings" by the City of Emeryville. A portion of the site adjacent to Horton Street (Raised Cap Area) is elevated approximately three feet above the surface elevation of the adjacent areas. This area is shown on Figure 2. Groundwater monitoring wells are installed flush with the ground surface. Groundwater extraction wells are installed below grade within traffic rated Christie boxes.

The Site is located in a mixed land use area with commercial, industrial, and residential properties on nearby and adjacent parcels (see Figure 2). The surroundings are characterized as follows:

- **To the west:** Union Pacific Railroad main line tracks; vacant former Union Pacific Railroad (UPRR) Parcel D currently owned by the City of Emeryville and currently used for construction staging for the City's Park Avenue improvement project.

- **To the north:** Former Chiron Corporation headquarters and research/manufacturing facilities, currently owned by Novartis and leased by Bayer Pharmaceuticals, beyond a surface-level parking lot immediately north of the S-W property (i.e., the former Rifkin property).

- **To the east:** Horton Street, across which are 45th Street Artists' Co-op live-work studios, as well as the former Shell development property (currently South BGR property leased by Novartis). Bayer Pharmaceuticals occupies one building between the parking area and the Artist Co-op building for manufacturing operations.

- **To the south:** Sherwin Avenue, across which is a warehouse (leased by Bayer), multi-story residential lofts (Emeryville Lofts, Blue Star Corner Condominiums).

The City of Emeryville is implementing the Park Street Beautification project, which includes Park Street between Halleck Street and Hollis Street, and Horton Street, between 40th Street and 45th Street.

Analysis as to whether or not project activities would:

a. Have a substantial adverse effect on a scenic vista.

Impact Analysis:

No scenic resources exist in proximity to the Site; therefore the project activities would not create a significant impact to scenic resources.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☐ Less Than Significant Impact
☒ **No Impact**

b. Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings and historic buildings within a state scenic highway.

Impact Analysis:
The nearest scenic highway is a 10.6 mile stretch of Highway 580 from the San Leandro city limit to State Route 24 in Oakland between Posts R34.545 and 45.151 (Caltrans, 2009). The Site is located over a mile from this feature.

No scenic resources exist in proximity to the Site; therefore the project activities would not create a significant impact to scenic resources.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☐ Less Than Significant Impact
☒ **No Impact**

c. Substantially degrade the existing visual character or quality of the site and its surroundings.

Impact Analysis:

The existing visual character is defined by industrial, commercial and residential structures one to three stories high and open views of paved parking and industrial storage areas, active rail tracks, and a multi-story parking garage and cinema complex. Construction equipment and project activities would be temporary and would not result in permanent changes to the existing visual character of the Site surroundings. Removal of the Raised Cap would lower the ground surface elevation in that area, restoring it back to its original grade. The elevation change would be permanent, but less than significant as the final elevation would be closer to surrounding properties.

The City of Emeryville is implementing the Park Street Beautification project, which includes Park Street between Halleck Street and Hollis Street, and Horton Street, between 40th Street and 45th Street. This street project will terminate at the western extension of Park Avenue at the confluence with the preferred truck route. Impacts may arise from legally loaded truck traffic travelling along the preferred route over the newly finished street.

Mitigation of these potential impacts may be necessary (e.g., via placement of cushioning materials over the top of the intersection surfacing).

Conclusion:

☐ Potentially Significant Impact
☒ Potentially Significant Unless Mitigated
☐ Less Than Significant Impact
☐ No Impact

d. Create a new source of substantial light or glare that would adversely affect day or nighttime views in the area.

Impact Analysis:

Project activities would be conducted during weekday daylight hours. There would not be any new sources of substantial light or glare that would adversely affect day or nighttime views in the area. The project is limited to the remediation of soil and groundwater. No permanent structures, including light sources would be introduced to the project area as a result of the remediation. Vehicle or hand-held lighting used by on-site security staff during implementation of the project activities would not constitute a new source of substantial light or glare. Therefore, the project would not change existing day or nighttime views with respect to light or glare either temporarily or permanently.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☐ Less Than Significant Impact
☒ **No Impact**

2. Agricultural Resources

Project Activities Likely to Create an Impact:

None.

Description of Baseline Environmental Conditions:

The Site is situated entirely within an area defined as “urban and built-up land” in the California Department of Conservation (DOC) Alameda County Important Farmland 2008 map (DOC, 2008a). Nearby and adjacent properties are also classified with this designation. There are no Williamson Act Lands depicted within the City of Emeryville on the DOC Williamson Act Lands Map for Alameda County that shows lands enrolled in the Williamson Act and Farmland Security Zone Contracts as of January 1, 2008 (DOC, 2008b). The nearest Williamson Act land is a non-prime agricultural land located over 12 miles away from the Site. The Site area is an urban environment that includes industrial and residential land uses. The Site has been used for over 80 years for manufacturing purposes.

Analysis as to whether or not project activities would:

a. Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland) as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use.

Impact Analysis:

The project involves remediation of contaminated soils from an industrial facility in an urbanized area. No farmland of any type exists on or within nine miles of the Site (DOC, 2008a), and the activities associated with the project would not have the potential to affect any farmland or other agricultural resources. The proposed project would not remove any farmland from active production or otherwise adversely affect or contribute to cumulative impacts on farmland.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☐ Less Than Significant Impact
☒ **No Impact**

b. Conflict with existing zoning or agriculture use, or Williamson Act contract.

Impact Analysis:

The California Land Conservation Act, commonly referred to as the Williamson Act, enables local governments to enter into contracts with private landowners for the purpose of restricting specific parcels of land to agriculture or related open space use. Landowners benefit by receiving lower property tax assessments on their Williamson Act lands over set periods of time – typically ten years. No Williamson Act Lands are identified in the area on the California Department of Conservation website (DOC, 2008b). As no Williamson Act contract lands or other agricultural lands are present in the project vicinity, the project would not affect such resources. The proposed project would not contribute to cumulative impacts on Williamson Act contract lands or other agricultural properties and all project activities would be consistent with existing zoning.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☐ Less Than Significant Impact
☒ **No Impact**

c. Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural uses.

Impact Analysis:

The Site is not a Farmland and has not been operated by S-W for agricultural use; it has been used for manufacturing since the 1920s. The activities associated with the project would result in limited, temporary excavations at an industrial site. After completion of the project, the Site would be restored to pre-project conditions and would not change the land uses on-site in any way. Therefore, there would be no potential to cause, directly or

indirectly, conversion of farmland to non-agricultural use. As a result, no direct or cumulative impacts to farmland would occur as a result of this project.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☐ Less Than Significant Impact
☒ **No Impact**

3. Air Quality

Project Activities Likely to Create an Impact:

The Project has the potential to generate dust and organic vapors.

- Removal of paving and the Raised Cap area;
- The excavation, stockpiling, loading and transport of contaminated soils and debris;
- Reducing the size of concrete rubble within the "concrete processing area;"
- Backfilling and grading the soil excavation;
- Extracting and treating soil vapors;
- Addition of a maximum of approximately 228 vehicles/truck trips per day, including personnel, construction vehicles, vehicles and trucks delivering supplies, trucks used to transport excavated soil to an appropriately permitted offsite disposal facility, and trucks used to transport backfill material to the site.
- Adding rail cars to trains to transport contaminated soil to an appropriately permitted offsite disposal facility and to transport backfill material to the site.
- Use of diesel-powered equipment during the project activities. The diesel equipment includes excavators, front end loaders, backhoes, trucks, and possibly diesel-electric locomotives. Such emissions would include oxides of nitrogen (NOx), volatile organic compounds (VOCs), particulate matter up to 10 microns in diameter (PM_{10}), particulate matter up to 2.5 microns in diameter ($PM_{2.5}$), and carbon dioxide (CO_2).

Description of Baseline Environmental Conditions:

The project is located within the San Francisco Bay Area Air Basin, which encompasses a nine-county region including all of Alameda, Contra Costa, Santa Clara, San Francisco, San Mateo, Marin and Napa Counties and the southern portion of Solano and Sonoma Counties.

The Site lies on the eastern shore of San Francisco Bay and normally is exposed to marine air from the west. Wind measurements taken at the National Weather Service (NWS) San Francisco Surface Monitoring Station (San Francisco Airport) indicate that the wind originates out of the west, west-northwest, and northwest approximately 55 percent of the time. In the Emeryville area, late-summer winds are predominantly from the west. Light winds are frequent

in the area with approximately one-third of the readings recording wind speed less than 3 miles per hour (mph). Average yearly temperature is approximately 60 degrees Fahrenheit.

The on-site meteorological station data collected between August 2002 and July 2007 confirmed a predominantly on-shore wind direction from the west northwest, with average wind speeds of 3 mph and recorded gusts up to 9 mph. Existing Site wind data indicate maximum winds from the south southeast at 18 mph. The existing meteorological station, or a replacement unit, would remain operational to monitor wind conditions during the project.

The Bay Area Air Quality Management District (BAAQMD) is the regulatory agency responsible for regulating stationary sources of air pollution in the project vicinity. The BAAQMD provides guidance and recommendations regarding acceptable vapor and dust threshold concentrations. The site area is out of attainment (i.e., exceeds acceptable levels) for ozone (O_3) and for particulate matter in excess of 10 microns and 2.5 microns in diameter (PM_{10} and $PM_{2.5}$, respectively), sometimes termed “fugitive dust.”

Strategies to achieve ozone emissions reductions are developed in the 2005 Ozone Strategy. The BAAQMD has also started the process of preparing the 2009 Bay Area Clean Air Plan, which would update the 2005 Ozone Strategy. These plans outline regional programs and control measures to reduce future emissions based on population projections. These plans are based on Association of Bay Area Governments (ABAG) projections as well as the requirements and projections included in the General Plans for those communities located within the Bay Area Air Basin.

In order to make progress towards attainment of state and national PM_{10} and $PM_{2.5}$ standards, the California Legislature enacted Senate Bill (SB 656) in 2003. This bill requires the California Air Resources Board (CARB) to work with local air districts to adopt an implementation schedule for appropriate CARB and air district measures. CARB adopted a Particulate Matter Implementation Schedule in 2005.

Analysis as to whether or not project activities would:

a. Conflict with or obstruct implementation of the applicable air quality plan.

Impact Analysis:

Air emissions in the Bay Area are regulated by the BAAQMD. The BAAQMD is required, pursuant to the Clean Air Act, to reduce emissions of criteria pollutants for which the BAAQMD is in non-attainment. The site area is out of attainment for ozone, PM_{10} and $PM_{2.5}$.

The project would not involve or induce population growth or cause an exceedance of established population or growth projections. Furthermore, the project would not produce long-term significant quantities of any criteria pollutant or violate ambient air quality standard. Therefore, the project is consistent with the 2005 Ozone Strategy (BAAQMD, 2006), the 2009 Bay Area Clean Air Plan (BAAQMD, 2009), and the Particulate Matter Implementation Schedule (BAAQMD, 2005) and would not conflict with or obstruct their implementation.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☒ **Less Than Significant Impact**
☐ No Impact

b. Violate any air quality standard or contribute substantially to an existing or projected air quality violation.

Impact Analysis:

The operation of the soil vapor extraction and treatment system would require a permit from the BAAQMD and one shall be obtained from the BAAQMD before proceeding with the installation of the equipment.

The Project soil handling and loading activities will be conducted in accordance with the Remedial Design and Implementation Plan (RDIP), which would include a Dust and Vapor Control Plan (DVCP). The DVCP would specify the techniques, materials, and equipment to be used to control emissions during implementation activities. The DVCP would include the following elements for dust control: water sprays/mist, surfactants, wetting agents, dust suppressants, covers, and windscreens. The DVCP would also include the following elements for vapor control: water spray/mist; vapor suppressant foam; and impervious tarps/covers. A network of vapor extraction wells would also be installed prior to the removal of the raised cap. These vapor extraction wells would be used to remove stagnant VOCs present in the raised cap material and vadose zone soils prior to excavation. The vapor stream would be treated through a combination of adsorption media.

The DVCP would be implemented consistent with the findings presented in the PHERA (See Attachment D) regarding appropriate use of dust and vapor controls (CDM, 2009b). The RDIP will be submitted to DTSC for review and approval prior to implementation of the project. The DVCP will include mitigation requirements set forth in this Initial Study as applicable. If control measures are not adequate, the contractor will be required to stop activities causing the exceedance of action levels until conditions improve or the contractor employs satisfactory mitigation methods.

The first 8 to 10 feet of excavation into Site soil would encounter unsaturated silty clay and clays that may generate fine dust as soil is removed and handled on-Site. The dust from excavated soil could contain arsenic and lead at concentrations that have the potential to exceed acceptable health standards if inhaled by on-site workers or down-wind, off-site receptors. The subject excavation activities do not require a permit from the Bay Area Air Quality Management District (BAAQMD). The BAAQMD does not currently have quantitative thresholds of significance for construction impacts, citing the short-term duration of construction operations. Although construction activities can potentially cause localized impacts of PM_{10}, the BAAQMD has found that control measures can be effectively implemented to avoid generating significant levels of emissions. The following control measures will be implemented at the construction site to minimize emissions of fugitive dust in accordance with BAAQMD requirements for sites of this size and located near sensitive receptors:

- Water all active construction areas at least twice daily.
- Cover all vehicles hauling soil, sand, and other loose materials or require at least two feet of freeboard.
- Pave, apply water three times daily, or apply (non-toxic) soil stabilizers on all unpaved access roads, parking areas and staging areas.
- Sweep daily (with water sweepers) all paved access roads, parking areas, and staging areas.
- Sweep streets daily (with water sweepers) if visible soil material is carried onto adjacent public streets.
- Hydroseed or apply (non-toxic) soil stabilizers to inactive construction areas (previously graded areas inactive for ten days or more).
- Enclose, cover, water twice daily or apply (non-toxic) soil binders to exposed stockpiles (dirt, sand, etc.).
- Limit traffic speeds on unpaved roads to 15 mph.
- Install sandbags or other erosion control measures to prevent silt runoff to public roadways.
- Replant vegetation in disturbed areas as quickly as possible.
- Install wheel washers for all exiting trucks, or wash off the tires or tracks of all trucks and equipment leaving the site.
- Suspend excavation and grading activity when winds (instantaneous gusts) exceed 25 mph.
- Limit the area subject to excavation, grading, and other construction activity at any one time.

Project Construction Activities

Although the BAAQMD does not require the quantification of construction activities, emissions were estimated using the URBEMIS2007 model to meet disclosure requirements (see **Table 1**). This model includes emissions from construction equipment, vehicles used to transport workers to and from the Site, vehicles used to transport supplies to and from the Site, and trucks used to transport contaminated soil from the Site and backfill material to the Site. Since existing rail routes would be used to transport rail cars to and from the Site, a separate analysis was not conducted for the use of rail cars.

Table 1
2010 Summary of Emissions from Construction Activities

	ROG	NOx	CO	SO_2	PM_{10}	$PM_{2.5}$
2010 Daily Emissions (lbs/day unmitigated)	11.15	122.15	48.86	0.08	5.49	4.88
2010 Annual Emissions (tons/year unmitigated)	0.50	5.48	2.17	0.00	0.25	0.22

Temporary Project Operation Activities

The project will include the temporary operation of a soil vapor extraction and treatment (SVE) system, which will be subject to the stationary source permitting requirements at the BAAQMD. The SVE system will be the only source of project operations emissions.

The BAAQMD has published quantitative thresholds of significance for project operations. The current thresholds for project operation emissions as set by BAAQMD can be found below in **Table 2**.

Table 2
BAAQMD Operations Emission Thresholds
(BAAQMD 1999)

BAAQMD Thresholds	***ROG***	***NOx***	***PM_{10}***
Daily Emissions (lbs/day)	80	80	80
Annual Emissions (tons/yr)	15	15	15

Emissions of volatile organic compounds from the SVE system will be treated and emissions from this system will not exceed the operations emissions threshold. Therefore, the impacts to air quality would be less than significant from this temporary project operation.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☒ **Less Than Significant Impact**
☐ No Impact

c. Conflict with the State goal of reducing GHG emissions in California to 1990 levels by 2020, as set forth by the timetable established in AB 32, California Global Warming Solutions Act of 2006.

Impact Analysis:

Although the BAAQMD presently has no guidance concerning CEQA evaluation of greenhouse gas (GHG) and no regulatory requirements, the emission of GHG is a rising concern in California and around the world. The primary sources of GHG for this project are the on-road trucks used for transportation of soil and off-road construction equipment.

Global climate change is caused by combined worldwide greenhouse gas (GHG) emissions, and mitigating global climate change will require worldwide solutions. GHGs play a critical role in the Earth's radiation budget by trapping infrared radiation emitted from the Earth's surface, which could have otherwise escaped into space. Prominent GHGs contributing to this process include water vapor, carbon dioxide (CO2), nitrous oxide (N2O), methane (CH4), ozone (O3), and certain hydro- and fluorocarbons. This phenomenon, known as the "greenhouse effect", keeps the Earth's atmosphere near the surface warmer than it would be otherwise and allows for successful habitation by humans and other forms of life. Increases in these gases lead to more absorption of radiation and warm the lower atmosphere further, thereby increasing evaporation rates and temperatures near the surface. Climate change is a global problem, and GHGs are global pollutants, unlike criteria air pollutants (such as ozone precursors) and toxic air contaminants (TACs), which are pollutants of regional and local concern.

Senate Bill 97 (SB 97) mandated that the Governor's Office of Planning and Research (OPR) amend the state's CEQA Guidelines to address impacts from GHG. In compliance with this requirement, OPR released Preliminary Draft CEQA Guideline Amendments in January 2009; the draft Guideline Amendments were forwarded to the Natural Resources

Agency in April 2009 and made available for public review and comment through August 27, 2009.

In the draft CEQA Guideline Amendments, OPR recommended the following criteria for significance related to GHG emissions:

- The extent to which the project could help or hinder attainment of the state's goals of reducing GHG emissions to 1990 levels by the year 2020 as stated in the Global Warming Solutions Act of 2006 (AB 32). A project may be considered to help attainment of the state's goals by being consistent with an adopted statewide 2020 GHG emissions limit, or the plans, programs, and regulations adopted to implement AB 32;

- The extent to which the project may increase the consumption of fuels or other energy resources, especially fossil fuels, that contribute to GHG emissions when consumed; and

- The extent to which the project impacts or emissions exceed any threshold of significance that applies to the project.

CARB released a Preliminary Draft Staff Proposal for Recommended Approaches for Setting Interim Significance Thresholds for Greenhouse Gases under the California Environmental Quality Act (CEQA) in October 2008 (CARB 2008). CARB's guidelines provide recommendations for assessing significance from operational and construction emissions from industrial and commercial/residential projects.

Although CARB's preliminary draft staff proposal suggests a quantitative threshold for assessing impacts from the operation of industrial projects, it prescribes the use of performance standards for construction-related emissions from all types of projects. CARB does not provide specific performance standards that should be used to address construction-related impacts. CARB is taking no further action at this time regarding the interim thresholds of significance, based largely on the fact that OPR is proceeding with amendments to the CEQA Guidelines that will better define the analytical requirements for climate change and GHG emissions in environmental documents (Ito 2009).

The GHG emissions of interest for this project were from carbon dioxide (CO_2), nitrous oxide (N_2O), and methane (CH_4). CO_2 emissions levels were calculated using URBEMIS 2007 and the default parameters for the relevant construction equipment. N_2O and CH_4 emissions for off-road construction equipment were calculated using the default horsepower from URBEMIS 2007 along with emissions factors from the CARB OFFROAD 2007 model. N_2O and CH_4 emissions for on-road trucks used for soil hauling were calculated using emission factors and calculation methods from the California Regulation for the Mandatory Reporting of GHG Emissions (CARB 2007). The estimated GHG emissions from this project are shown below in **Table 3**.

Table 3 *Greenhouse Gas Emissions Estimates from Construction Activities*			
Greenhouse Gas	***Emission (MT/yr)***	***Global Warming Potential (GWP)***	***CO_2 Equivalent Emissions (MT/yr)***
CO_2	631	1	631
N_2O	0.0009	310	0.3
CH_4	0.0014	21	0.03
		Total CO_2 Equivalent	631

Based on the proposed project and equipment uses, the project could generate approximately 630 metric tons of carbon dioxide equivalents (CO_2e). CARB has proposed a preliminary threshold of significance of 7,000 metric tons CO_2e for industrial projects (CARB, 2008b). The amount of GHG emitted from this project is less than 10 percent of this preliminary threshold; therefore this Project would not contribute significantly to GHG emissions and would not conflict with State goals to reduce GHG emissions in California.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☒ **Less Than Significant Impact**
☐ No Impact

d. Result in cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors).

Impact Analysis:

The BAAQMD CEQA Guidelines (BAAQMD, 1999) require that a project be evaluated with respect to its contribution to cumulative impacts. This contribution with respect to air emissions would include both construction and operational emissions. Cumulative projects include local development as well as general growth within the project area. However, as with most development, the greatest source of emissions is from mobile sources, which travel well out of the local area. Therefore, from an air quality standpoint, the cumulative analysis extends beyond any local projects and when wind patterns are considered would cover an even larger area.

As noted above, the project area is out of attainment for O_3, PM_{10}, and $PM_{2.5}$. Cumulative construction and operation of projects will further degrade the local air quality. Air quality will be temporarily degraded during construction activities that occur separately or simultaneously. However, the greatest cumulative impact on the quality of the regional air "cell" will be the incremental addition of pollutants mainly from increased traffic from residential, commercial and industrial development and the use of heavy equipment and trucks associated with the construction of these projects.

The proposed project, would not, however, result in a net increase in operational air emissions, as temporary construction emissions would stop once project activities are complete. Project-related emissions would result from on-Site excavation and transport of

soil and other materials, as well as from Site restoration, which would be temporary activities.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☒ **Less Than Significant Impact**
☐ No Impact

e. Expose sensitive receptors to substantial pollutant concentrations.

Impact Analysis:

As mentioned, the potential level of exposure of identified chemicals of concern (COCs) to the people in the community was examined in the PHERA (CDM, 2009b), Attachment D. The health risk to receptors was evaluated for two scenarios. The first scenario involved no use of emission controls and the second scenario was the use of emission controls resulting in a 60% reduction in PM_{10} and 90% reduction in organic vapors.

The PHERA concluded that that the implementation of the Project without emission controls could pose an unacceptable risk to the community. Thus, emission control measures are included as part of the Project. To address Site areas with the highest concentrations of COCs in the soil/material, minimum dust and vapor control measure efficiencies required to reduce risks to target levels were determined to be up to 96 percent for dust and 90 percent for organic vapors. The higher concentration material, however, is limited in volume (i.e., approximately 10 percent of the soil to be excavated). For the remaining approximately 90 percent of soil/material with lower COC concentration, minimum dust and vapor control measure efficiencies to reduce risks to target levels were determined to be 60 percent for dust and 90 percent for organic vapors.

The proposed dust and vapor control measures can reduce dust and organic vapor emissions by 99.9 percent. Therefore, the use of emission control measures can and will be used to reduce risk to the community to acceptable levels.

Diesel particulate matter (DPM) is listed as a toxic air contaminant (TAC) by the California Air Resources Board (CARB). BAAQMD's CEQA Guidelines (BAAQMD 1999) do not contain a methodology for quantifying impacts from diesel exhaust emissions; however, the CEQA Guidelines state that the lead agency should address potential impacts based on the best information available at the time of the analysis.

The BAAQMD is currently in the process of updating its CEQA Guidelines and released a White Paper to discuss various thresholds of significance for CEQA (BAAQMD 2009). Although the district acknowledges that DPM is designated as a TAC, it does not recommend establishing a specific threshold of significance to evaluate TAC impacts from construction activities. The following points are used in its rationale:

1. Construction activities are temporary and would only be within an influential distance to a sensitive receptor for a short period;
2. Most models and methods to evaluate impacts are associated with long-term exposures of 9, 40, and 70 years; and
3. The primary health concern with DPM is long-term impacts.

BAAQMD staff is in the process of developing a screening level method (based on the size of the project) for assessment of a construction project's health risks; this screening level will be provided in the methodologies section of the updated CEQA Guidelines.

Based on the temporary and variable nature of DPM emissions from construction activities, emissions of DPM from this proposed construction project would result in a less than significant impact.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☒ **Less Than Significant Impact**
☐ No Impact

f. Create objectionable odors affecting a substantial number of people.

Impact Analysis:

To assess the possibility of odors affecting nearby sensitive receptors, SCREEN3 modeling analysis was used to estimate the maximum concentration at the nearest sensitive receptor and this concentration was compared to an odor threshold concentration provided in the American Industrial Hygiene Association's Odor Thresholds for Chemicals with Established Occupational Health Standards (1993).

The concentrations of the various COCs can be controlled below their respective odor threshold level with the methods identified in the PHERA (Attachment D) The Project includes the necessary emission controls to reduce the emissions to acceptable levels; therefore the air quality impacts from objectionable odors would be less than significant.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☒ **Less Than Significant Impact**
☐ No Impact

g. Result in human exposure to Naturally Occurring Asbestos (see also Geology and Soils, f.).

Impact Analysis:

Based upon information in the California Department of Conservation (DOC) maps showing the general location of areas more likely to contain naturally-occurring asbestos (DOC, 2000) and lithologic information collected during the site investigation (CDM, 2009c), no naturally-occurring asbestos is likely to be encountered on the Site. Therefore, the project would not expose people to naturally-occurring asbestos and the there would be no related air quality impact.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☐ Less Than Significant Impact
☒ **No Impact**

4. Biological Resources

Project Activities Likely to Create an Impact:

- Noise and vibration during the excavation and transportation of soil/debris and during the installation of shoring.
- Discharge of treated water generated during dewatering activities.

Description of Baseline Environmental Conditions:

The Site is located within the Oakland West U.S. Geological Survey 7.5 Minute Quadrangle. The list of federal and state special status species with potential habitat or known occurrences within this quadrangle is maintained by the California Natural Diversity Database (CNDDB). Several federal and state listed species are included in the Oakland West quad, although many species occurrences are now believed to be extirpated based on the high level of development that has occurred in the region, and the absence of suitable habitat. The CNDDB list of special status species and the U.S. Fish and Wildlife Service (USFWS) Sacramento Office list are included in Attachment B. There are no known occurrences of these species and no potential habitat for them within the Site or immediate vicinity.

The Site is located in a highly urbanized area with little, if any native plant communities. The Site is paved and there are no known biological resources in the area other than fennel and other opportunistic species along the Temescal Creek channel to the north of the Site and trees planted in the sidewalk on the western side of Horton Street adjacent to the Site. The project area does not contain any candidate, sensitive, special status species, or their habitats. Additionally, the Site and its surroundings do not contain any wetlands, and there is no habitat conservation plan for land within the City of Emeryville (City of Emeryville 2009c). The Temescal Creek Channel is located north of the Site and, as a concrete-lined storm drain channel, does not contain any potential riparian habitat, sensitive natural communities, or associated species.

The City of Emeryville General Plan Environmental Impact Report (City of Emeryville, 2009d) acknowledges that the majority of Emeryville is developed with few open spaces and very little of the native habitat remains with exception of the Emeryville Crescent.

Analysis as to whether or not project activities would:

a. Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service.

Impact Analysis:

As noted above, no special status plant species have been identified. The activities associated with the project would not have the potential to affect any sensitive or protected species, as all activities would occur on-site and the Site does not contain habitats that are occupied by, or are suitable for, such species. No habitat will be modified, and the land use

currently on-site will continue to exist. Therefore, the project would not impact sensitive species or their habitats.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☐ Less Than Significant Impact
☒ **No Impact**

b. Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service.

Impact Analysis:

As noted above, the Site does not contain any riparian habitat, sensitive natural communities, or sensitive species. The Site and its surroundings are highly urbanized with industrial, commercial, and residential uses. The activities associated with the project would occur entirely on-site and will therefore not have the potential to affect any riparian habitat or sensitive natural community.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☐ Less Than Significant Impact
☒ **No Impact**

c. Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means.

Impact Analysis:

No wetlands, federally protected or otherwise, exist on or adjacent to the Site (USFWS, 2009). The nearest wetlands are the coastal wetlands along the shoreline of the Bay, approximately 0.4 miles to the west of the Site, UPRR mainline tracks, the Bay Street commercial/residential development, and U.S. Interstate Highway 80. The proposed project would involve the excavation and backfilling of soils within an existing urbanized area. Therefore, the project would not impact any wetlands.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☐ Less Than Significant Impact
☒ **No Impact**

d. Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites.

Impact Analysis:

The proposed project would not interfere in any way with the migration, movement, or use of wildlife nursery sites by native fish or wildlife species. No wildlife corridors or nursery sites are located on, or in proximity to, the Site. Furthermore, the project would not have any effect on any wildlife corridors or nursery sites. As such, no impacts to wildlife migration corridors or nursery sites would occur.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☐ Less Than Significant Impact
☒ **No Impact**

e. Conflict with local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance.

Impact Analysis:

No protected or special status species or plant communities exist on the Site. Trees within Emeryville are protected by the Emeryville Urban Forestry Ordinance (Title 7, Chapter 10 of the Emeryville City Code). There are "street trees" as defined by this ordinance, along the western side of Horton Street. Protection measures during construction, as identified in the ordinance, would be implemented. It is not anticipated that the project activities would require removal of any of these trees. However, if the contractor later determines a need to remove a tree, removal activities would follow the requirements identified in the ordinance and any removed trees would be replanted after the project activities have been completed. Upon completion of the project, the Site will either be covered by concrete or seeded soil. Therefore, the proposed project would not conflict with this ordinance, or any others protecting biological resources.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☒ **Less Than Significant Impact**
☐ No Impact

f. Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan.

Impact Analysis:

The Site is not subject to any adopted Habitat Conservation Plans or other conservation plans (City of Emeryville 2009c). Therefore, the on-site activities will not conflict with the provisions of any such plans. No impacts are anticipated.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☐ Less Than Significant Impact
☒ **No Impact**

5. Cultural Resources

Project Activities Likely to Create an Impact:

- Soil excavation to a maximum depth of 30 feet below ground surface.
- Vibration impacts associated with removal of former building foundations.
- Drilling and potential vibration during installation of the shoring.
- Installation of the slurry wall.

Description of Baseline Environmental Conditions:

A cultural resources assessment was prepared for the Project Site by William Self Associates, Inc. (WSA) in 2003 and updated in 2009. With the exception of confidential site-specific archaeological content, the original report and the update are included with this document as Attachment C. A total of 27 cultural resource surveys have been conducted within a one-quarter mile radius of the project area since 1977, none of which identified cultural resources on the Project Site. Six cultural resources that have been identified within one-quarter mile of the property in a records search conducted by the Northwest Information Center of the California Historical Resources Inventory System (CHRIS). These include:

- An historic industrial building, the Nabisco Bakery;
- Five prehistoric archaeological sites (shellmounds).

Nels C. Nelson conducted the first intensive archaeological survey of the San Francisco Bay Area in the early 20th century. Nelson documented more than 100 shellmounds along the bay shore in Alameda and Contra Costa counties, when the area was still ringed by salt marshes three to five miles wide. The Emeryville shellmound was the largest of several located near or at the mouth of Temescal Creek, and was one of the largest shell mounds in the bay region. The Emeryville shellmound covered an area approximately 300 by 900 feet, and was nearly 30 feet in height. In 1926, W. E. Schenk recorded the precise locations of the Emeryville shellmound and four other separate mounds in the area along Temescal Creek. None of these archaeological sites documented in the CHRIS records is located on S-W property or on the former Rifkin property.

The project area lies within the region occupied by the Ohlone or Costanoan group of Native Americans at the time of historic contact with Europeans (Kroeber 1925: 462-473). Chochenyo or East Bay Costanoan was the language spoken by the estimated 2,000 people who occupied the ". . . east shore of San Francisco Bay between Richmond and Mission San Jose, and probably also in the Livermore Valley" (Levy 1978: 485).

The Oakland Trotting Park, completed in 1871, was located west of San Pablo Avenue and east of and adjacent to the Project Site. In 1896, the Oakland Trotting Park was replaced by the California Jockey Club which operated until 1911. The California Jockey Club rebuilt the track complex on an area roughly bounded by today's Union Pacific Railroad tracks to the west, Stanford Avenue to the north, Watts Street to the east, and Park Avenue to the south.

The extant buildings on the Project Site (Buildings 1 and 31) are identified as Tier 1 - Architecturally Significant Buildings (City of Emeryville, 2009d, Table 3.8-1) Building 1 was constructed sometime between 1919 and 1924. Building 31 was added to Building 1 in 1936. These buildings are outside of, yet adjacent to, project activities that could potentially damage the structures due to excessive ground-borne vibration and/or undermining of the building foundation.

Analysis as to whether or not project activities would:

a. Cause a substantial adverse change in the significance of a historical resource as defined in 15064.5.

Impact Analysis:

Section 15126.4 of CEQA directs public agencies to "avoid damaging effects" on an archaeological resource whenever feasible. If avoidance is not feasible, the importance of the site shall be evaluated as a means of determining impact and developing mitigation measures. As defined by Section 15064.5(a)(3)(A-D) of the State CEQA Guidelines, a resource shall be considered by the lead agency historically significant if the resource meets the criteria for listing on the California Register of Historical Resources, that is, if the resource meets the following criteria:

A. Is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage; or
B. Is associated with the lives of persons important in our past;
C. Embodies the distinctive characteristics of a type, period, region or method of construction, or represents the work of an important creative individual, or possesses high artistic values; or
D. Has yielded, or may be likely to yield, information important in prehistory or history.

The California Register of Historical Resources (CRHR) and many local preservation ordinances have employed the criteria for eligibility to the National Register of Historic Places (NRHP) as a model, since the National Historic Preservation Act of 1966 (NHPA) provides the highest standard for evaluating the significance of historical resources. A resource that meets the NHRP criteria is clearly an historical resource. In addition, a resource that does not meet the NHRP standards may still be considered historically significant at a local or state level. CEQA specifically states that a resource need not be listed on any register to be found historically significant (Public Resources Code Section 21084.1).

Ground-disturbing construction activities have the potential to impact cultural resources by disturbing both surface and subsurface soils. These resources could be prehistoric (Native American artifacts, features or burials) or historic (features or artifacts associated with ca. post-1840 land use in the area, including the Oakland Trotting Park, early industry, residences, etc.). Such disturbance could result in the loss of integrity of cultural deposits,

or loss of information through the alteration of site setting, both of which would be considered significant impacts under CEQA if not mitigated. There is also the potential for unanticipated discoveries during construction.

In terms of potential damage to Building 31 from removal of the raised cap and foundations, vibration levels are estimated to be less than 0.5 in/sec, which is below the threshold at which there is a risk of architectural damage to buildings with plastered ceilings and walls. (See the Vibration discussion in Section 11.)

DTSC concurs in recommendations presented by WSA in the updated 2009 cultural resources assessment, including:

- an Archaeological Monitoring and Data Recovery Plan (AMDRP) will be developed and implemented by a qualified archaeologist;
- a qualified archaeologist should monitor construction-related excavations to determine the presence or absence of buried resources. Such archaeological monitoring should occur to the maximum depth of construction excavation or to when the archaeological monitor determines that soils with little or no potential for cultural material have been encountered;
- the archaeological monitor shall have 40 hour Hazardous Waste Operations and Emergency Response (HAZWOPER) training and use appropriate personal protective equipment (PPE) to eliminate exposure to contaminated soils;
- should unanticipated finds be uncovered during construction, work within 30 ft. of the find shall cease until the archaeological monitor can conduct an assessment of the resource and develop treatment measures as appropriate;
- should significant cultural resources be discovered during construction, a data recovery plan shall be developed by a qualified archaeologist and implemented; and
- should human remains or funerary objects be located, the provisions of the California Health and Safety Code shall be followed.

Therefore, with the implementation of these measures there would be no significant impacts to cultural resources.

Conclusion:
☐ Potentially Significant Impact
☒ **Potentially Significant Unless Mitigated**
☐ Less Than Significant Impact
☐ No Impact

b. Cause a substantial adverse change in the significance of an archeological resource pursuant to 15064.5.

Impact Analysis:

Section 15064.5(c) of CEQA applies to the analysis of effects on archaeological sites. When a project will affect an archaeological site, a lead agency must determine whether the archaeological site is an historic resource, and therefore subject to the NRHP criteria listed above (particularly Criterion D), or whether the archaeological site is a unique

archaeological resource, as defined in Section 21083.2 of CEQA, and whether the provisions of that section for mitigation apply. Section 21083.2(g) of CEQA defines a unique archaeological resource as an archaeological artifact, object, or site about which it can be clearly demonstrated that, without merely adding to the current body of knowledge, there is a high probability that it meets any of the following criteria:

(1) Contains information needed to answer important scientific research questions and that there is a demonstrable public interest in that information.
(2) Has a special and particular quality such as being the oldest of its type or the best available example of its type.
(3) Is directly associated with a scientifically recognized important prehistoric or historic event or person.

If a lead agency determines that an archaeological site is neither historic nor unique, Section 21083.2(h) of CEQA states that the resource requires no further consideration, other than recordation.

No archaeological resources have been documented on the Project Site. In addition, excavations and borings advanced on the property have not revealed indications of cultural resources. Should any resources be discovered, their significance would be determined in relation to the criteria for eligibility to the CRHR.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☒ **Less Than Significant Impact**
☐ No Impact

c. Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature.

Impact Analysis:

The types of geological deposits present in an area determine the area's potential for paleontological resources. The project corridor lies upon alluvial soils and bay mud of recent origin (see the detailed discussion of the area's geological stratigraphy in Section 6 Geology and Soils). Since mud and alluvium are not fossil-bearing, no significant paleontological resources are expected to occur with the Project area.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☐ Less Than Significant Impact
☒ **No Impact**

d. Disturb any human remains, including those interred outside of formal cemeteries.

Impact Analysis:

Should unanticipated finds be uncovered during construction, work in the immediate vicinity (within 30 feet) will cease until an archaeologist conducts an assessment of the historic or

prehistoric resources. Section 7050.5(b) of the California Health and Safety Code will be implemented in the event that human remains or possible human remains are located. This section of the Code states that if human remains are discovered, all excavation work in the area must stop until the County Coroner has evaluated the discovery. The County Coroner, upon recognizing the remains as being of Native American origin, is responsible for contacting the Native American Heritage Commission within 24 hours. The Commission has various powers and duties to provide for the ultimate disposition of any Native American remains, as does the assigned Most Likely Descendant. Section 5097.98 and 5097.99 of the Public Resources Code also call for "protection to Native American human burials and skeletal remains from vandalism and inadvertent destruction". Worker training typically instructs workers as to the potential for discovery of cultural or human remains, and both the need for proper and timely reporting of such finds, and the consequences of failure to properly report such finds. The aforementioned requirements provide adequate protection, such that no mitigation measures are required.

Conclusion:
☐ Potentially Significant Impact
☒ **Potentially Significant Unless Mitigated**
☐ Less Than Significant Impact
☐ No Impact

6. Geology and Soils

Project Activities Likely to Create an Impact:

The project will include several specific activities that could impact geology and soils. These are described below:

- Excavating approximately 60,000 cubic yards of soil to a depth of up to 30 feet below ground surface.
- Installing shoring, as necessary, in compliance with California Division of Occupational Safety and Health requirements (California Code of Regulations, title 8, subchapter 4, Construction Safety Orders, Article 6, Excavations). Shoring will be used along Horton Street to protect the street. The design for the shoring system(s) will be provided to DTSC as part of the RDIP. It is anticipated that two different systems will be utilized.
- Installing and operating a dewatering system.

Description of Baseline Environmental Conditions:

The soil underlying the Site consists of Holocene through Early Pleistocene alluvial sediments of the Temescal Formation (ENTRIX, 2002). The Temescal Formation is primarily an alluvial fan deposit, comprised of interfingering lenses of clayey gravel, sandy silty clay, and sand-clay-silt mixtures. The sediments are approximately 200 to 300 feet thick, based on deep coring drilled near the Site. In addition, north-south trending shoreline deposits (i.e., Aeolian sand deposits) were likely placed at the Site, given the proximity of the historical shoreline to the Site location, concurrently with the alluvial fan deposits. Soil borings drilled to characterize the nature and extent of contamination at the Site have characterized the Temescal Formation to a depth of

approximately 60 feet below ground surface (bgs). Four general units were encountered: fill material, Unit A, aquitard, and Unit B (ENTRIX, 2002).

Engineered fill is the shallowest unit beneath the Site, consisting of sands, silts, and gravels with concrete fragments. This fill extends from ground surface and ranges from 0 to 4 feet in thickness. The fill material unconformably overlies Unit A (which includes the A-zone groundwater). Unit A consists predominately of silt and clay with discontinuous lenses of sand from approximately 4 feet to 20 feet bgs. The sand lenses have been observed to range in thickness from approximately 1 to 10 feet below the Site and rapidly change in thickness between nearby boreholes. There is evidence of several discontinuous sand zones occurring in Unit A that vary in thickness from 1 to 5 feet between nearby boreholes.

Unit A is underlain by approximately 30 feet of silty clay that acts as a local aquitard separating Unit A from Unit B. The top of the aquitard begins at approximately 25 feet bgs (corresponding to an elevation of approximately -11.5 feet NAVD88). Unit B (which includes the B-zone groundwater) consists of primarily silty clay and clayey silt beginning at approximately 50 feet bgs. The top of Unit B ranges from approximately 45 to 55 feet bgs. Similar to Unit A, Unit B includes discontinuous lenses of silty sand ranging between 1 and 3 feet thick situated between 50 and 60 feet bgs. The A/B aquitard is distinguished from Unit B by the characteristics of the more permeable lenses within the Unit B formation. The lenses in the aquitard consist of clayey sand with some silt, while the Unit B lenses consist of silty sand.

FAULTING AND SEISMICITY

The Site is not within a currently designated State of California “Special Studies Zone” for active faults (Hart, 1992). No known active or inactive faults or segments occur at the Site.

The Site is located on the eastern flank of the San Francisco Basin, which roughly corresponds to present day San Francisco Bay. The San Francisco Bay Region is considered by geologists and seismologists to be a seismically very active region. The bay is formed by a major asymmetrical basement synform within the Coast Range Province. It is bounded on the east by the Hayward Fault and on the west by the San Andreas Fault. The trace of the Hayward Fault occurs in the Berkeley Hills, approximately 3.5 miles to the east of the Site. Basement rock underlying the bay consists of the Franciscan Complex. Earthquakes along major active faults create very strong ground motion that can cause severe damage to structures and destabilize ground.

The Site is located on the East Bay Plain, approximately 0.3 miles east of the current bay shoreline and 3.5 miles west of the Hayward Fault. The closest seismic fault, the Hayward Fault is located three miles east of the Site. The Hayward Fault is estimated to generate a maximum credible earthquake of 7.5 (Richter Scale).

According to the Association of Bay Area Governments (ABAG), the Site is in a zone at risk for violent shaking (IX on the Modified Mercalli Intensity scale) during an earthquake of magnitude 7.1 on the Hayward Fault, and at risk for strong shaking (VII) during earthquakes on the Northern Calaveras Fault and the Peninsula segment of the San Andreas Fault (ABAG, 1999). The Site is in a high liquefaction hazard level for earthquakes on the Hayward Fault and a moderate level for earthquakes on the Peninsula segment of San Andreas Fault and Northern Calaveras Fault (ABAG, 2001).

Analysis as to whether or not project activities would:

a. Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:

❖ **Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault.**

The project is not located on or adjacent to a known active or potential active earthquake fault mapped on the Alquist-Priolo Earthquake Fault Zoning Map (Hart, 1997). No impacts are expected.

❖ **Strong seismic ground shaking.**

The project is located in a seismically active region and could potentially be subject to strong ground shaking if an earthquake were to occur in the region. The project includes excavation of soils to up to 30 feet bgs next to existing occupied structures, sidewalks, streets, and rail spur tracks. As a part of the planned excavation, a shoring wall (utilizing a soldier pile with lagging system) will be designed to support the excavation sidewalls and adjacent structures along Horton Street. Specific shoring methodology will differ based on the soil zone (either vadose or saturated). The shoring wall design will incorporate the 2007 California Building Code (2007 CBC, based on the 2006 International Building Code) requirements that account for seismic loads, as part of the local requirements with the City of Emeryville. Although the 2007 CBC does not require temporary structures to be designed for seismic forces, the wall design analysis will consider seismic forces. Therefore, any impacts would be less than significant.

❖ **Seismic-related ground failure, including liquefaction.**

The project is located in an area that may be susceptible to liquefaction due to the presence of shallow, saturated, loose granular sediments. The project includes excavation of soil next to existing occupied structures, sidewalks, streets, and rail spur tracks. The excavation will penetrate into liquefiable soils only when excavated into the saturated soil zone. The shoring wall will be designed to support the planned excavation sidewalls and adjacent structures in accordance with 2007 California Building Code requirements. The counterforts design will account for the loss of soil bearing that could be experienced in saturated, loose sand layers. In the area where excavated (and liquefiable) native soil has been removed, the backfill soil will be engineered and no longer liquefiable, thus reducing the risk of future liquefaction hazard. Therefore, any impacts are expected to be less than significant.

❖ **Landslides.**

Impact Analysis:

The project is not located in an area subject to landslides due to its flat topography. The proposed excavation activities would not increase the risk to people or structures from landslides.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☒ **Less Than Significant Impact**
☐ No Impact

b. Result in substantial soil erosion or the loss of topsoil.

Impact Analysis:

The project is in a flat area with no significant exposed areas of bare soil. Project activities will not expose bare soil on slopes where storm water runoff would generate sufficient velocity to erode soil. Storm water runoff in non-excavated areas is by sheet flow where runoff velocities would not be sufficient to erode soil. The project is planned in a fully-developed, urbanized area currently covered with several feet of artificial fill and pavement. Therefore, no topsoil is present. A majority of the area planned for excavation has previously been excavated or disturbed. Therefore, the proposed project activities would not result in substantial soil erosion or loss of topsoil.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☒ **Less Than Significant Impact**
☐ No Impact

c. Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on or off-site landslide, lateral spreading, subsidence, liquefaction or collapse.

Impact Analysis:

The Site is located in an area with potentially liquefiable soil (ABAG, 2001); however, the proposed activities will not increase the risks to people or structures on-site from on- or off-site landslides, lateral spreading, subsidence, liquefaction or collapse. The engineered fill that will replace excavated soil will equal or enhance the stability of the subsurface in and nearby the planned excavation. Other than liquefiable soil, no other unique, unstable geologic unit or soil exists in the Site or area. Because no excavation would take place under buildings or other structures, there is limited potential for project activities to affect, or be affected by, unstable soil. As such, impacts related to unstable geologic units or soils will be less than significant.

Conclusion:

☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☒ **Less Than Significant Impact**
☐ No Impact

d. Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property.

Impact Analysis:

The Site is potentially located on expansive soil, which has the potential to exhibit shrink-swell characteristics when exposed to wetting and drying. However, the proposed project will remove soil and replace it with engineered fill to a depth not prone to wetting and drying conditions that cause expansive soil to shrink and swell. Therefore, project activities will not increase the risks to life or property from expansive soil.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☒ **Less Than Significant Impact**
☐ No Impact

e. Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of water.

Impact Analysis:

The Site is located in an area where sewers are available. Therefore, the project will not result in impacts to alternative waste water disposal systems.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☐ Less Than Significant Impact
☒ **No Impact**

f. Be located in an area containing naturally occurring asbestos (see also Air Quality, f.).

Impact Analysis:

The Site is not located in any area depicted on the California Department of Conservation's General Location Guide for Ultramafic Rocks in California (DOC, 2000) as containing naturally-occurring asbestos. Therefore, there would be no impact.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☐ Less Than Significant Impact
☒ **No Impact**

7. Hazards and Hazardous Materials

Project Activities Likely to Create an Impact:

- Removal of the Raised Cap;
- Excavation of soil;
- Transport of excavated soil to the on-site soil management stockpiles;
- Loading of soil into trucks and/or railroad gondola cars;
- Pumping of excavation water;
- Refueling of heavy equipment.

Description of Baseline Environmental Conditions:

Soil, soil gas, and groundwater investigations have been conducted at the Site since 1988. The primary Site-related contaminants present in soil and groundwater beneath the Site are metals (primarily arsenic and lead), VOCs (primarily aromatic constituents and ketones), and petroleum hydrocarbons (CDM, 2009c). Several of these contaminants migrated from the S-W property onto a portion of the former Rifkin property. (CDM, 2009c). Chlorinated volatile organic compounds were also detected in groundwater samples collected from the Site, but in most instances appear to be related to past releases on adjacent properties.

A high pressure natural gas line owned by Pacific Gas and Electric Company (PG&E) is located parallel to Horton Street under the west sidewalk along the Site.

Analysis as to whether or not project activities would:

a. Create a significant hazard to the public or the environment throughout the routine transport, use or disposal of hazardous materials.

Impact Analysis:

The proposed project involves the transport of hazardous materials (contaminated soil) from the project Site to an off-site disposal facility via a mixture of rail and/or gondola cars as well as trucks. The RDIP will present the techniques, materials, and equipment to be used for the loading activities. The RDIP will be submitted to DTSC for review and approval prior to implementation of the project.

Soil will be loaded into truck trailers, which will be covered and secured prior to leaving the Site to prevent dust or odor from escaping. The truck trailer will be covered and secured prior to leaving the Site. Truck and trailer wheels will be cleaned at a wheel wash station prior to departing the Site. In addition, equipment and vehicles may require decontamination prior to leaving the Site. A station will be setup for decontamination and the methods for decontamination will be established by the contractor.

All excavation, handling, transport, and disposal of such materials will be carried out according to applicable policies and regulations of the California Department of Transportation (Caltrans) in accordance with a DTSC-approved RDIP, which will include a transportation and traffic plan and the techniques, materials, and equipment needed to execute the removal of the Raised Cap, excavation, and soil/debris handling activities. The RDIP will be submitted to DTSC for

review and approval prior to implementation of the project. Because all handling and transport of hazardous materials would be carried out in accordance with applicable regulations of Title 49 of the Federal Code Regulations and applicable regulations of Title 22 California Code of Regulations and applicable policies of affected agencies, impacts related to risks to the public or environment from hazardous materials would be less than significant.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☒ **Less Than Significant Impact**
☐ No Impact

b. Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident involving the release of hazardous materials into the environment.

Impact Analysis:

The proposed project would expose, excavate, transport, and dispose of the soil containing concentrations of arsenic, lead, toluene, and other chemicals of concern above health-based preliminary remediation goals. The excavated soil will be identified, characterized for waste disposal, and handled as a non-hazardous, California-only hazardous waste, or RCRA hazardous waste (depending on the characterization results). Groundwater pumped from the open excavation will contain concentrations of arsenic and other COCs that will require on-site treatment prior to its discharge to the Temescal Creek Channel.

The proposed project will require excavation, transport, and off-site disposal of lead, arsenic, and VOC-contaminated soils, as well as treatment and discharge of groundwater. All project operations occur at ambient temperature and pressure, and a release of soil from a container, gondola, truck, or excavator bucket would not result in an uncontrolled chemical reaction, explosion, fire, pressure wave, or other significant hazard to the public or environment. Any accident scenario involving such materials in a soil medium would not have the potential to significantly affect individuals, groups, or the environment. The potential health risks have been fully assessed in the PHERA (CDM, 2009b). Any accident condition (e.g., rail gondola car with contaminated soil overturns) would be addressed with immediate emergency procedures, and possible halting of work, and would not pose an immediate danger to the public or environment. As such, impacts related to the release of hazardous materials from accident conditions would be less than significant.

PG&E owns a high pressure natural gas line located parallel to Horton Street under the west sidewalk along the Site which, if damaged during excavation activities, could release flammable gas. PG&E will be contacted to mark the specific location of the line. In coordination with PG&E, S-W will (or will have PG&E) physically locate the gas line prior to installation of the shoring by hand digging at selected intervals and “daylighting” the line. The shoring system and gas line will be monitored by survey during the excavation to confirm that excessive deflection is not occurring.

The proposed project incorporates the following major design components that address potential releases of hazardous materials:

- Dust and vapor controls;

- Air Monitoring;
- Transportation Plan;
- Groundwater control and treatment;
- Site-specific Health and Safety Plan; with an Emergency Response Plan.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☒ **Less Than Significant Impact**
☐ No Impact

c. Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances or waste within one-quarter mile of an existing or proposed school.

Impact Analysis:

No existing or proposed school is located within one-quarter mile of the Site. Project activities, however, will take place across Horton Street from existing residences and commercial buildings. Measures to control fugitive dust (from contaminated soils) will be implemented during excavation to minimize the potential for any impacts to nearby sensitive receptors will be included with the RDIP. The RDIP will be submitted to DTSC for review and approval prior to implementation of the project. DTSC staff will also be present during the project to oversee the activities. In addition, the PAMP during project activities will provide indication to the contractor if perimeter air monitoring action levels are exceeded. Such an occurrence would require halting of operations to restore perimeter air quality conditions to acceptable levels of any hazardous vapors or dust particles. These perimeter air monitoring action levels were developed in the PHERA (CDM, 2009b). Based on the evaluation in the PHERA, and the control measures that have been incorporated into the design of the Project, potential impacts to the community would be less than significant.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☒ **Less Than Significant Impact**
☐ No Impact

d. Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would create a significant hazard to public or the environment.

Impact Analysis:

The Site is listed by the California Environmental Protection Agency (and more specifically, DTSC), as a contaminated Site (Cal/EPA, 2009), as characterized in the environmental setting, above. However, the purpose of the proposed project is to remediate the Site. As such, the proposed project will improve the environmental quality of the Site by removing the contamination for which the Site is listed by DTSC. Therefore, impacts related to hazardous materials sites, including the Site itself, would not be significant.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☒ **Less Than Significant Impact**
☐ No Impact

e. Impair implementation of, or physically interfere with, an adopted emergency response plan or emergency evacuation plan.

Impact Analysis:

The project activities associated with the proposed project will occur in limited areas, and within a scheduled, temporary timeframe. As such, these activities would not be widespread on the Site, and would therefore not interfere with emergency response or evacuation plans, since emergency crews or groups of people evacuating the Site would not be significantly impeded by construction equipment or other project-related obstructions.

In inquiries to the City of Emeryville (EPD 2009, EBD 2009), [cite each of these in the references as "personal communication with Randall Smith 10/21/09"] no adopted emergency response or evacuation plan was identified; however, all on-site activities affecting traffic lanes or access will be conducted in accordance with City police and fire department requirements and with the DTSC-approved transportation and traffic plan, which will be included with the RDIP. Emergency access will not be compromised by on-site activities, since no roadways would be closed as part of the proposed project and no walkways or internal corridors between occupied buildings would be significantly obstructed during excavation.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☐ Less Than Significant Impact
☒ **No Impact**

8. Hydrology and Water Quality

Project Activities Likely to Create an Impact:

As identified in the project description, and described in the geology and soils section, the project requires excavation and other activities that will impact groundwater. These activities include:

- removal of the Raised Cap material,
- dewatering of the excavation,
- soil excavation and backfilling, and
- breeching/removal of the slurry walls to facilitate groundwater movement.
- shutdown of the groundwater extraction system.

Description of Baseline Environmental Conditions:

The Site is located over alluvial sediments as described in Section 6, Geology and Soils. Industrial, commercial, and domestic water supplies are provided by the East Bay Municipal Utility District (EBMUD); shallow or deep groundwater resources under the Site or under nearby properties are not extracted for water supply use. In addition, the Site is not located within a groundwater recharge area (Norfleet, 1998). Shallow groundwater (groundwater contained in Unit A in the range of four feet to 20 feet below ground surface) under the Site has been impacted by historical releases of chemicals to the subsurface; the purpose of the proposed project is to remediate these subsurface soils and restore groundwater quality impacted by the historical releases.

The Site resides within the Temescal Creek watershed. The northwest extent of the Site borders with Temescal Creek. In the vicinity of the Site, the surface channel of old Temescal Creek between Horton Street and the on-site railroad spur has been replaced by a relocated, underground culvert north of the Site and an open, engineered flood channel extending downstream (west) to Interstate 880.

Analysis as to whether or not project activities would:

a. Violate any water quality standards or waste discharge requirements.

Impact Analysis:

Current groundwater extraction and treatment activities operate within the terms of a National Pollutant Discharge Elimination System (NPDES) permit that allows treated groundwater to be discharged to Temescal Creek. Excavation water will be removed from sumps on the S-W property and pumped to the Dewatering Equipment Storage and Pretreatment Unit, and subsequently to the existing and/or a new groundwater treatment system prior to discharge to Temescal Creek or to the sanitary sewer under permit, or transported offsite for treatment and disposal/reuse. If treated water is discharged to Temescal Creek, it will be discharged in accordance with the current NPDES permit terms and conditions.

The dewatering activities, therefore, will not create an incremental impact to water flows or water quality into Temescal Creek or violate any water quality standards or waste discharge requirements. Once groundwater extraction and treatment operations are terminated, associated discharges of treated water to Temescal Creek will cease. By pumping water from sumps installed on the S-W property, the water table on the S-W property will be lower compared to the former Rifkin property, inducing groundwater flow towards the S-W property. As a result, contaminated groundwater from the S-W property will not migrate towards the former Rifkin property.

The project would require dewatering at the excavation that would initially occur at a maximum rate estimated at 30 gallons per minute, and reduce to an estimated maximum of 10 gallons per minute. Groundwater extracted from the sump(s) will be conveyed into a dewatering settling tank system (the Dewatering Equipment Storage and Pretreatment Unit) and subsequently pumped to the groundwater treatment system prior to discharge under permit.

Runoff from the Site could potentially lead to impacts on surface water quality during the construction. Runoff from the Site is currently directed to Temescal Creek. During the project activities, Site runoff that comes into contact with contaminated soils or water will be treated in the existing on-site treatment system, and other runoff will continue to be directed to Temescal Creek. The completion of the project would not have any potential impact on surface water.

The existing slurry wall will be breached to provide an outlet for groundwater that accumulates within the formerly closed slurry wall system, or to provide a pathway for groundwater flow from areas outside the formerly closed slurry wall system into these areas, specifically the arsenic-impacted groundwater. The locations for the slurry wall breaches have been selected to be placed in areas where permeable soils are present to provide a hydraulic connection with the existing groundwater flow. **Figure 3** presents the locations of the breaches.

Removal of the accessible subsurface vadose and saturated zone soil will reduce the source of contaminants migrating to groundwater. Groundwater concentrations of arsenic are expected to decline. This is considered a beneficial impact.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☒ **Less Than Significant Impact**
☐ No Impact

b. Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficient in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted).

Impact Analysis:

Shallow or deep groundwater resources under the Site or under nearby properties are not extracted for water supply use. In addition, the Site is not located within a groundwater recharge area (Norfleet, 1998). The currently operating groundwater extraction and treatment system extracts one to eight gallons of shallow A-zone groundwater per minute. At the initiation of excavation, up to approximately 30 gallons per minute of groundwater may be drawn from the A-zone, with the rate reducing to an estimated maximum of 10 gallons per minute. Following backfilling of the excavation, the groundwater extraction system will be turned off and the Site re-paved, or hydro-seeded. The Project will create no permanent change in groundwater recharge, and the Project will have no impact on the depletion of currently used groundwater supplies.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☒ **Less Than Significant Impact**
☐ No Impact

c. Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on or off-site.

Impact Analysis:

The existing Site is paved and sloped for collection and diversion of storm water to pumps connected to hoses discharging directly to the Temescal Creek channel. Treated groundwater currently extracted from within the existing slurry wall also discharges to the channel. Implementation of excavation activities will alter the drainage pattern in the immediate area of the excavation, although the required contractor-prepared storm water management plan, and the scheduling of excavation during the seasonally dry summer, will result in no change to existing storm water volumes entering the Temescal Creek channel. Discharge of treated groundwater will continue throughout the excavation activities, at discharge rates at or above current discharge levels. Even if treated groundwater discharge rates double from current rates, up to 20 gallons per minute, such water will continue to discharge into the concrete-lined Temescal Creek channel and therefore will not alter the existing drainage pattern and will not impact erosion or siltation within the channel.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☐ Less Than Significant Impact
☒ **No Impact**

d. Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on or off-site.

Impact Analysis:

No impact. See the discussion under item c. above.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☐ Less Than Significant Impact
☒ **No Impact**

e. Create or contribute runoff water which would exceed the capacity of existing or planned storm water drainage systems or provide substantial additional sources of polluted runoff.

Impact Analysis:

No impact. As described under the items above, all anticipated excavation dewatering will be treated and discharged in accordance with the existing NPDES permit; therefore project water will not impact storm sewer facilities. Currently, Site storm water is directed to existing City storm drains along Horton Street and Sherwin Avenue. As rain water flows towards the western S-W property boundary and within the northern half of the S-W property, it is collected in surface sumps and pumped directly to the Temescal Creek Channel. The Project will not increase runoff water to existing or planned storm water drainage systems.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☐ Less Than Significant Impact
☒ **No Impact**

f. Otherwise substantially degrade water quality.

Impact Analysis:

The project is designed to physically remove subsurface contaminants that have historically degraded the quality of groundwater under the Site. Implementation of the project, including all related storm water and groundwater control activities, will not degrade current surface or groundwater quality. One of the project's remedial action objectives is to improve water quality.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☐ Less Than Significant Impact
☒ **No Impact**

g. Place within a 100-flood hazard area structures which would impede or redirect flood flows.

Impact Analysis:

No permanent structures will be constructed as part of the project. All project activities are scheduled to occur during the seasonally dry summer months. Therefore, there would be no impact.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☐ Less Than Significant Impact
☒ **No Impact**

h. Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam.

Impact Analysis:

The only dam or levee in the area is at Temescal Reservoir, approximately 3.5 miles upstream at the headwaters of Temescal Creek. No project activities will alter the potential flow of floodwater from an upstream failure of the Temescal Reservoir dam. Although there is the potential for flooding in the event of an upstream dam failure, the risk to the on-site people and structures would not be affected by activities associated with the proposed project. The proposed project would not expose people or structures to any more risk of flooding than is currently experienced on-site; as such, impacts would be less than significant.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☒ **Less Than Significant Impact**
☐ No Impact

i. Inundation by seiche, tsunami or mudflow.

Impact Analysis:

While the Site may be subject to inundation due to its proximity to the Bay, project activities will have no impact on the potential inundation.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☐ Less Than Significant Impact
☒ **No Impact**

9. Land Use and Planning

Project Activities Likely to Create an Impact:

None

Description of Baseline Environmental Conditions:

The Site is located in an urbanized area that is undergoing redevelopment. The General Plan land use designation for the Site is Industrial (City of Emeryville, General Plan Land Use Map, 2009b). It is surrounded by transportation (railroad), retail, commercial, open space, and live-work uses.

The City of Emeryville General Plan also identifies the zoning designations for the area, which indicates the types of properties that can be built in the area (City of Emeryville, Zoning District Map, 2009a). The zoning designation for the Site is primarily light industrial, and it is within the boundary of the Park Avenue District Plan. This plan establishes policies and guidelines to enhance Emeryville's historic center into a pedestrian scaled urban environment (City of Emeryville, 2006). Additionally, the northeastern portion of the Site that is the former Rifkin Property and currently owned by Novartis, is included in the Planned Unit Development (PUD) Industrial Ordinance [ORD] 95-6. This designation indicates that it is part of a Master Plan Area that is likely to change over the next 20 years, and has already been approved by the City Council.

Analysis as to whether or not project activities would:

a. Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect.

Impact Analysis:

The proposed on-site project activities will not change land uses or conflict with applicable land use plans, policies, or regulations. Remediation of the Site supports the restoration and enhancement objectives of the Emeryville General Plan and the Park Avenue District Plan. For example, General Plan Policy CSN-P-36 states: "Prior to reuse, development sites will be remediated, according to relevant State and federal regulations." The proposed project would result in temporary excavations; such activities would have no potential to affect plans, policies, or regulations related to land use. No impact would occur.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☐ Less Than Significant Impact
☒ **No Impact**

b. Conflict with any applicable habitat conservation plan or natural community conservation plan.

Impact Analysis:

As discussed in Section 4, Biological Resources, the Site has no biological resources and only unimpacted storm water and treated groundwater are discharged to the Temescal Creek Channel. The Site is not subject to any adopted Habitat Conservation Plans or other conservation plans. Therefore, no impacts would occur with respect to a habitat conservation plan or natural community conservation plan.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☐ Less Than Significant Impact
☒ **No Impact**

10. Mineral Resources

Project Activities Likely to Create an Impact:

None.

Description of Baseline Environmental Conditions:

The Site consists of a former coatings manufacturing facility, surrounded by light industrial, commercial, transportation, and live-work uses. No on-site mineral resources are known to exist and no current petroleum production activities occur on the Site.

Analysis as to whether or not project activities would:

a. Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state.

Impact Analysis:

The Site is underlain with alluvial soils and bay mud of recent origin (see the detailed discussion of the area's geological stratigraphy in Section 6 Geology and Soils). Since mud and alluvium are not mineral-bearing, no significant mineral resources are expected to be present within the Project Site. Therefore, the proposed project would not affect the availability of a known mineral resource.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☐ Less Than Significant Impact
☒ **No Impact**

b. Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan.

Impact Analysis:

There are no locally important mineral resource recovery sites located on or near the Site (City of Emeryville, 2009d). Therefore, on-site project activities would not have the potential to affect the availability of any locally-important mineral resource recovery site.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☐ Less Than Significant Impact
☒ **No Impact**

11. Noise

Activities Likely to Create an Impact:

- Removal of former concrete building foundations and pavement under the Raised Cap Area and immediately above the target soil excavation area, including use of jackhammers.
- Soil excavation
- Shoring installation
- Soil vapor extraction and treatment
- Use of construction and trucking equipment

Description of Baseline Environmental Conditions:

The S-W project Site is located in a mixed land use area with commercial, industrial, and residential properties on the adjacent and nearby parcels. The surroundings are characterized as follows:

- **To the west:** Union Pacific Railroad main line tracks (which operate at all hours of the day and night)—both freight trains and AMTRAK passenger trains use these tracks; vacant Union Pacific railroad Parcel D, currently owned by the City of Emeryville and currently used for construction staging for the City's Park Avenue Beautification project. Interstate 80 is about 0.3 miles west of the Site.

- **To the north:** Former Chiron Corporation headquarters and research/manufacturing facilities, currently owned by Novartis and leased to Bayer, beyond a surface-level parking lot immediately north of the S-W property.

- **To the east:** Horton Street, across which are the Artists Co-op live-work studios, as well as the former Shell development property (currently South BGR property leased by Novartis). Bayer occupies one building between the parking area and the Artists Co-op building.

- **To the south:** Sherwin Avenue, across which is a warehouse (leased by Bayer) and multi-story residential lofts (Emeryville Lofts, Blue Star Corner Condominiums).

The Emeryville Challenges and Opportunities report indicates a day-time noise level from rail operations alone of 60 dBA on Horton Street north of 45th Street. This indicates that freight and passenger train activity on the nearby railroad tracks is a major source of noise in the Site vicinity. Based on the mix of urban residential and industrial land uses in the project vicinity and the presence of the Union Pacific main line railroad tracks and major highways nearby, the most appropriate land use descriptor for the project vicinity would be "Noisy Urban Residential," i.e., an average daytime noise level in the project vicinity would be 65 dBA.

NOISE DESCRIPTORS

Noise is defined as unwanted sound. Airborne sound is a rapid fluctuation of air pressure above and below atmospheric pressure. The human ear perceives sound, which is mechanical energy, as pressure on the ear. Sound levels are usually measured and expressed in decibels (dB), a measurement of pressure, with zero decibels roughly corresponding to the threshold of human hearing. Most sounds heard in the environment do not consist of a single frequency but, rather, a broad band of frequencies with each frequency differing in sound level. The intensities of each frequency combine to generate a sound. The method commonly used to quantify environmental sounds consists of evaluating all the frequencies of a sound using the "A-weighted scale" that reflects the fact that human hearing is less sensitive at low frequencies and extreme high frequencies than in the mid-range frequencies. Thus, the A scale simulates the frequency response of the human ear. A-weighted sound levels are designated as dBA.

Although the A-weighted noise level may adequately indicate the level of environmental noise at any instant in time, community noise levels vary continuously. Two methods are used to describe time variable sounds. These are exceedance levels and equivalent levels, both of which are derived from a large number of moment-to-moment A-weighted noise level

measurements. Most environmental noise includes a conglomeration of noise from distant sources, which creates a relatively steady background noise in which no particular source is identifiable. To describe the time-varying character of environmental noise, the statistical noise descriptors $L_{10,}$ $L_{50,}$ and L_{90} are commonly used. They are the A-weighted noise levels equaled or exceeded during ten, 50, and 90 per cent of a stated time period. A single number descriptor called the L_{eq} is also widely used. The L_{eq} is the average A-weighted noise level during a stated period of time. The L_{eq} provides a methodology for combining noise from individual events and steady background sources into a measure of cumulative noise exposure. It is used by local jurisdictions and the Federal Highway Administration to evaluate noise impacts.

The day-night noise level (L_{dn}) is the energy average sound level for a 24-hour day determined after the addition of a 10-dBA penalty to all noise events occurring at night between 10:00 p.m. and 7:00 a.m. The L_{dn} is a useful metric of community noise impact because people in their homes are much more sensitive to noise at night, when they are relaxing or sleeping, than they are to noise in the daytime. The L_{dn} is used by local jurisdictions to rate community noise impacts from transportation noise sources.

In the State of California, the community noise equivalent level (CNEL) is widely used. It is similar to the L_{dn} noise level, except that evening noise events (occurring between the evening hours of 7:00 p.m. and 10:00 p.m.) are weighted 5 dB higher than daytime events and 5 dB lower than nighttime (10:00 p.m. to 7:00 a.m.).

HEALTH EFFECTS OF NOISE

Excessive noise is undesirable and may cause physical and/or psychological harm. Health effects of noise can be characterized as auditory or non-auditory. Auditory effects include interference with communication and, in extreme circumstances, hearing loss. Non-auditory effects include physiological reactions such as change in blood pressure or breathing rate, interference with sleep, adverse effects in human performance, and annoyance.

The amount of annoyance or harm cause by noise is dependant primarily upon three factors: the amount and nature of the noise; the level of ambient noise before the intruding noise; and the activity of persons (“receptors”) working or living in the area of the noise source. Noise ranges from constant background noise to more individualized noise events. The amount of ambient noise present before the introduction of project-generated noise is an important factor in noise analysis under CEQA. A relatively low level of noise will have a much greater impact in a quiet, rural environment than an urban environment.

TYPICAL A-WEIGHTED SOUND LEVELS OF COMMON NOISE SOURCES

Decibels	Description
130	Threshold of pain
120	Jet aircraft take-off at 100 feet
110	Riveting machine at operators position
100	Shotgun at 200 feet
90	Bulldozer at 50 feet
80	Diesel locomotive at 300 feet
70	Commercial jet aircraft interior during flight
60	Normal conversation speech at 5 - 10 feet
50	Open office background level
40	Background level within a residence
30	Soft whisper at 2 feet
20	Interior of recording studio

Source: Bollard Acoustical Consultants, Inc. & Egan, Architectural Acoustics, McGraw Hill 1988.

REGULATORY JURISDICTION

Noise

The City of Emeryville General Plan Noise Element establishes a noise level of 60 dBA L_{dn} as "normally acceptable" and 60-70 dBA L_{dn} as "conditionally acceptable" for residential uses. The City of Emeryville Noise Ordinance (Emeryville Municipal Code – Title 5, Chapter 13) does not set quantitative noise level criteria. The ordinance provides guidance on minimizing noise-related impacts during implementation activities. Specifically, general construction noise (Section 5-13.05 of the Noise Ordinance) shall be limited to weekdays from 7:00 am to 6:00 pm. Pile driving and similarly loud activities are limited to weekdays from 8:00 am to 5:00 pm. More restrictive hours for allowable construction noise may be established as appropriate, given the surrounding neighborhood, type of noise, or other unique factors.

Weekend work, and/or work outside the established weekday time limits, may be allowed at the discretion of the City Manager, the Planning and Building Director, or the Public Works Director. Weekend construction work, if allowed, would be limited to the period between 9:00 am to 6:00 pm.

Proposed project activities are anticipated to be conducted during the allowable weekday construction noise time limits. Certain activities, such as truck loading, stockpile/ maintenance and off-site transport of hazardous waste (debris and soil), may be conducted during nighttime hours to avoid daytime truck traffic impacts. If activities are proposed outside of the weekday allowable construction noise time limits, the contractor will apply to the City for a waiver, as described in Section 5-13.06 of the Ordinance. The procedures for waiver application require submittal of a description of the type of work to be performed, the type of equipment to be used, notifications to neighbors, and, among other requirements, a description of the types of construction practices to be used to minimize noise.

The City of Emeryville zoning ordinance at Section 9.4.59.7 limits noise at lot lines to the sound levels stated in the Noise Standards table adopted by the City Council. However, these performance standards apply to land use operations, not to temporary construction activities.

Vibration

The City of Emeryville zoning ordinance at Section 9.4.59.8 limits vibration at any lot line as stated in the Vibration Standards table adopted by the City Council. However, these performance standards do not apply to operations involved in the construction or demolition of structures or caused by motor vehicle or trains.

Analysis as to whether or not project activities would result in:

a. Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies.

Impact Analysis:

In terms of compliance with applicable standards, the Emeryville noise ordinance, the proposed project would have a less than significant impact because the project activities are anticipated to be scheduled between 7:00 am and 6:00 pm, with heavy equipment-based

activities limited to 8:00 am to 5:00 pm. If activities are proposed outside of the weekday allowable construction noise time limits, the contractor will apply to the City for a waiver, as described in Section 5-13.06 of the Ordinance. The procedures for waiver application require submittal of a description of the type of work to be performed, the type of equipment to be used, notifications to neighbors, and, among other requirements, a description of the types of construction practices to be used to minimize noise.

Conclusion:

☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☒ **Less Than Significant Impact**
☐ No Impact

b. Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels.

Impact Analysis:

Installation of the excavation shoring would generate groundborne vibration. Based on the geotechnical investigation and the preliminary shoring design, the preferred installation procedure is a soldier pile with lagging retaining wall. Since the shoring installation would be near to and parallel to Horton Street, any groundborne vibration from this area would be initiated within 55 feet of potential receptors in the 45th Street Artists Co-op building, within 125 feet of the Bayer Pharmaceuticals lab building and adjacent to Building 31. Because pile driving could generate substantial vibration at adjacent structures the geotechnical design for shoring evaluated lower-vibration installation methods in lieu of pile driving, such as: cast-in-drilled-hole (CIDH) piles, pre-drilled piles, soil-mix wall technology, shielded pile drivers, or vibratory pile drivers.

The preferred method, i.e., pre-drilled piles, would eliminate the need to drive piles and limit potential exposure to excessive vibration levels. This would result in a lower-vibration method of installing piles than the pile-driving method recently used for the Pixar Studios project. The estimated peak particle velocity from drilling of the boreholes (based on vibration data for caisson drilling (FTA, 2006)) at the 45th Street Artists Co-op is 0.027 in/sec. The threshold of human perception is approximately 0.005 in/sec PPV, and the threshold amplitude at which annoyance can occur is approximately 0.02 to 0.05 in/sec PPV. The lower threshold of 0.005 in/sec PPV is considered appropriate to evaluate annoyance caused by vibration in residential buildings, and 0.05 in/sec PPV is considered appropriate to evaluate vibration in commercial or office buildings. Therefore, this vibration level is in the range of levels at which continuous vibrations begin to annoy people in buildings, but is a level tolerable by most people if short term in length, i.e., not excessive. The drilling for the shoring system is expected to take less than a month. The estimated vibration level would have no effect on the buildings.

At the Bayer Labs building, the estimated peak particle velocity is 0.008 in/sec, which would be barely perceptible to people and have no effect on the building.

Another potential source of excessive vibrations is the removal of the concrete building foundations below the raised cap. The estimated peak particle velocity from jack-hammering of the concrete (FTA, 2006) at the Artists Loft is 0.011 in/sec. At the Bayer Labs,

the peak particle velocity from jack-hammering is estimated as 0.003 in/sec. These levels fall into the imperceptible to barely perceptible to humans range with no effects on buildings.

In terms of potential damage to Building 31 from removal of the raised cap and foundations, vibration levels are estimated to be less than 0.5 in/sec, which is below the threshold at which there is a risk of architectural damage to buildings with plastered ceilings and walls.

The preliminary construction schedule indicates the installation of the shoring system would overlap the removal of the raised cap (jack-hammering). Since these are the first few days of mobilizing for the shoring system installation, the combined vibrations from the two activities occurring simultaneously are not expected to be substantially higher than the individual activities.

Construction vibrations from excavation, trucks, and other activities would on average occur at greater distances from the buildings on Horton Street and Sherwin Avenue than the activities analyzed above and would not be expected to expose the Horton Street and Sherwin Avenue buildings to vibration levels as high as the above-calculated activity levels. Note that the nearby railroad tracks and area truck traffic are two existing sources of ambient groundborne vibration in the study area.

No permanent sources of vibration that would expose persons to excessive groundborne vibration or noise levels would be created by the project.

The Emeryville City Ordinance does not establish a vibration limit for construction activities. Therefore, an evaluation of potential vibration impacts cannot be conducted. However, measures (described above) have been incorporated within the project to minimize the potential for vibration effects to a less than significant level.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☒ **Less Than Significant Impact**
☐ No Impact

c. A substantial permanent increase in ambient noise levels in the vicinity above levels existing without the project.

Impact Analysis:

The remediation activities proposed at the Site would be temporary in nature and would therefore generate no permanent increase in ambient noise levels.

Conclusion:

☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☐ Less Than Significant Impact
☒ **No Impact**

d. A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project.

Impact Analysis:

Given the nature of the required construction activities and the types of equipment required, temporary increases in noise level would be unavoidable. As a result, a construction noise impact analysis was conducted to identify the ambient noise levels prior to implementation of project activities. Ambient noise levels provide a baseline for measuring project-generated construction noise levels at the receptors closest to the anticipated noisiest temporary activities, namely the 45th Street Artists Co-op and Bayer lab property boundaries across Horton Street.

CONSTRUCTION NOISE IMPACT ANALYSIS

The construction noise analysis evaluated noise based on the anticipated use of construction equipment, both quantity and type, and for specified distances from construction activities. Because there are no specific construction noise limits defined under CEQA, the following general guidelines were used to assess construction (e.g. temporary) noise impacts:

- A less than 3-dBA increase in existing noise level is considered no impact (0 to 3 dBA increase is barely perceptible);
- A 3- to 5-dBA increase in existing noise level is considered a slight temporary impact (3 to 5 dBA increase is readily perceptible);
- A 6- to 10-dBA increase in existing noise level is considered a moderate temporary impact (6 to 10 dBA increase is perceptible to twice as loud); and
- A greater than 10-dBA increase in existing noise level is considered a substantial temporary impact (greater than 10 dBA increase is more than twice as loud).

Source: FHWA, Highway Traffic Noise Analysis and Abatement Policy and Guidance, June 1995.

Noise levels in this analysis are presented in A-weighted decibels (dBA) and are one-hour equivalent sound levels (L_{eq}) unless otherwise noted. The L_{eq} represents an energy average for the daytime construction period and includes the effects of intermittent loud events. Maximum sound levels (L_{max}) are also presented as additional information for this impact assessment.

CONSTRUCTION ACTIVITIES AND EQUIPMENT

Table 4 presents the anticipated construction equipment that will operate during each project activity.

Removal of former building foundations, currently under the raised cap area and immediately above the target Source Area soil, may require the use of large, excavator-mounted hydraulic jackhammers to break out the concrete.

Typical construction equipment such as excavators, trucks, dozers, and backhoes, will generate lower one hour noise levels than the jack-hammer equipment, although the typical equipment will be in use for a longer duration than the jack hammer equipment. Excavators and other typical construction equipment will be on-site for an estimated six months.

Table 4 also presents the L_{max} sound level and percent of time the equipment is expected to be operated at full power (usage factor) for each piece of construction equipment used. The L_{max} sound levels represent typical maximum noise that normally occurs during full power operation of the equipment. These levels typically only occur for a short duration, since the equipment is not operated at full power for an entire workday. The effects of both the L_{max} sound level and duration are included in the L_{eq} impact assessment.

The construction noise predictions are based on the following parameters:

- Type of equipment expected to be utilized;
- Quantity of equipment expected to be utilized;
- L_{max} sound level for full power operation of each type of equipment;
- Percentage of time equipment typically operates at full power;
- Noise attenuation from energy dissipation with distance;
- Noise attenuation from portable and stationary barriers adjacent to soil excavation operation.

Table 4 Construction Equipment Noise Levels					
Implementation Activity	***Equipment***	***Number of Units***	***Lmax @ 50 feet (dBA)***	***Usage Factor (%)***	***Leq @ 50 feet (dBA)***
Removal of Raised Cap	Excavator	1	81	40%	77
	Excavator/Jack Hammer	1	90	20%	83
	Front End Loader	1	79.1	40%	75
	Dump Truck	2	76.5	40%	76
				Total	**85**
Shoring/Soldier Pile Installation	Auger Drill Rig	1	85	20%	78
	Excavator	1	81	40%	77
	Cement Truck	1	79	40%	75
				Total	**82**
Dewatering	Drill rig	1	79	20%	72
	Pumps	2	81	50%	81
				Total	**82**
Excavation	Water Truck	1	74.3	40%	70
	Excavator	1	81	40%	77
	Dump Truck	1	76.5	40%	73
	Front End Loader	1	79.1	40%	75
	Foam Application Truck	1	74.3	40%	70
				Total	**81**
Waste Pile Staging	Front End Loader	1	79.1	40%	75
				Total	**75**
Backfilling	Front End loader	1	79.1	40%	75
	Dozer	1	82	40%	78
				Total	**80**
Truck loading[(1)]	Front End Loader	1	79.1	40%	75
	Haul Trucks	3	76.5	40%	78
				Total	**79**
Slurry Wall Breach	Excavator	1	81	40%	77
				Total	**77**
Final Grading	Dozer	1	82	40%	78
	Front End Loader	1	79.1	40%	75
				Total	**80**

(1) Assumes that haul trucks exporting material are also importing backfill and borrow material on return trips.

The L_{eq} noise level was calculated using the following equations:

$$L_{eq}\,(\text{equipment}) = EL - 20\log_{10}(d/50) + 10\log_{10}(UF)$$

Where:

EL is the estimated noise level at 50 feet (dBA)

d is the distance from the equipment to nearest receptor (feet)

UF is the daily usage fraction of time that equipment is used at full power

This formula results in a 6-dBA loss for each doubling of distance. This formula includes the effect of geometrical spreading of noise with distance.

The individual contributions of each piece of equipment were combined to obtain an approximation of overall combined noise level at each location using:

$$L_{eq}\ (\text{overall}) = 10 \log_{10} \sum 10^{(Leq(equipment) / 10)}$$

Based on this general equation, the estimated daytime L_{eq} noise level at the exterior of the 45th Street Artists Co-op building (midpoint of building wall fronting Horton Street) from these overlapping construction activities would be 77 dBA. Inside the building, the estimated uncontrolled noise level would be approximately 62 dBA (15 dBA of sound attenuation is typically provided by a building with open windows). This level is comparable to the typical level of normal conversational speech at 5-10 feet (See earlier table of typical A-weighted sound levels of common noise sources). Although this would be considered a substantial and potentially annoying short-term noise increase (greater than 10 dBA increase or more above existing noise levels) at the 45th Street Artists Co-op this worst-case substantial increase would occur only for a few days based on the preliminary construction schedule when removal of the raised cap would be occurring simultaneously with initiation of the shoring installation. Furthermore, the 62 dBA noise level would be below the level where health effects could occur.

The estimated daytime L_{eq} noise level at the exterior of the Bayer facility would be approximately 78 dBA. Inside the building, the estimated uncontrolled noise level would be approximately 58 dBA (20-25 dBA of sound attenuation is typically provided by a building without openable windows). Inside the building, the estimated uncontrolled noise level would be approximately 58 dBA (20-25 dBA of sound attenuation is typically provided by a building without openable windows). The typical noise level inside a business office is 55 dBA. Based on this typical indoor noise level, the construction L_{eq} level would be 3 dBA over the typical existing interior L_{eq} level of 55 dBA. This level would be considered a slight noise impact (3 to 5 dBA increase above existing noise levels) at the Bayer facility.

Material used to cover stockpiles can also potentially generate noise when not adequately secured against winds. However, the cover material would be held down with weights, the stockpiles will be inspected daily, and any loose covering would be addressed. Therefore, this would not have a significant impact.

It is anticipated that the daytime construction noise impacts will last up to seven months. Based on the estimated potential increase in noise, and the relatively short duration of the activity, the impacts would be less than significant.

TRAFFIC-RELATED NOISE

Transportation-related noise sources would include construction worker vehicles, haul trucks, visitors and equipment deliveries. According to the traffic analysis, the volume of construction traffic generated by these sources would be low in relation to existing traffic volumes. Because a doubling of traffic in passenger-cars increases noise levels by 3 dBA, the noise generated by this short-term traffic would increase area noise levels by less than 3 dBA and therefore would have a barely perceptible to imperceptible impact.

The traffic analysis estimates that 228 truck trips per day would occur on Halleck Street south of Sherwin Avenue. While no traffic count data are available for Halleck Street, the traffic analysis provides a rough estimate of ADT on Halleck Street of 450 vehicles per day (vpd) with a majority of this traffic occurring during the daytime hours of 7:00 am to 6:00 pm. The estimated average increase in noise due to haul truck traffic on Halleck Street is less than 3 dBA, which would represent a barely perceptible daytime impact.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☒ **Less Than Significant Impact**
☐ No Impact

12. Population and Housing

Project Activities Likely to Create an Impact:

None.

Description of Baseline Environmental Conditions:

The Site is located in an industrial area surrounded by transportation (railroad), retail, commercial, and live-work uses. Residences are located east of the Site at the intersection of 45th Street and Horton Street, and south of the Site at the intersection of Hubbard Street and Sherwin Avenue, as well as Halleck and Sherwin Avenue.

Analysis as to whether or not project activities would:

a. Induce substantial population growth in area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure).

Impact Analysis:

The proposed project does not involve construction of new homes or buildings or installation of permanent infrastructure. Therefore, the project activities would not induce population growth directly or indirectly. .

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☐ Less Than Significant Impact
☒ **No Impact**

b. Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere.

Impact Analysis:

Although the proposed activities involve work within a mixed land use area, project activities will have no affect on existing housing. Therefore, the project activities would not displace

substantial numbers of existing housing or require the construction of replacement housing elsewhere.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☐ Less Than Significant Impact
☒ **No Impact**

c. Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere.

Impact Analysis:

See b. above.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☐ Less Than Significant Impact
☒ **No Impact**

13. Public Services

Project Activities Likely to Create an Impact:

- On-site excavation and other project activities.

Description of Baseline Environmental Conditions:

The Site is a former industrial facility in a highly urbanized area of Emeryville. As such, the community is served by the City of Emeryville Police Department (EPD), Fire Department (EFD), Community Services Department (Parks), and the Emeryville Unified School District.

Analysis as to whether or not project activities would:

a. Result in substantial adverse physical impacts associated with the provision of new or physically altered government facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the following public services:

Impact Analysis:

❖ **Fire protection**
The on-site project activities would not require new or expanded fire protection services from EFD, as the nature and intensity of on-site land use would not change as a result of the excavation and restoration activities. As such, no impacts to fire protection services would result.

- **Police protection**
  The on-site project activities would not require new or expanded police protection services from EPD, as the nature and intensity of on-site land use would not change as a result of the excavation and restoration activities. As such, no impacts to police protection services would result.

- **Schools**
  The on-site project activities would not require new or expanded school facilities, since no net population growth would results from the project. No neighborhood schools will be affected by the project. No impacts to school services would result.

- **Parks**
  No parkland or other recreational facilities would be affected by the project, nor will any new or expanded parks or other recreational facilities be necessitated by project implementation. The land to the west of the Site is owned by the City of Emeryville and the City plans to construct a public park on its property after the proposed project is completed. Therefore, no impacts to existing or proposed park facilities would occur.

- **Other public facilities**
  The project entails temporary activities at the Site; no permanent or net change to the nature or intensity of current on-site land uses would result from the project. No impacts to other public facilities would result.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☐ Less Than Significant Impact
☒ **No Impact**

14. Recreation

Project Activities Likely to Create an Impact:

None.

Description of Baseline Environmental Conditions:

The Site is an industrial facility in a highly urbanized area of Emeryville. Land to the west and north of the Site was formerly owned by Union Pacific Railroad and is currently owned by the City and is designated as for use as open space. However a portion of this parcel is currently (Fall 2009) being used as a staging area for the City's Park Avenue beautification project. At the completion of the proposed project and the Park Avenue project, this area is to be restored to a public park.

Analysis as to whether or not project activities would:

a. Increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated.

Impact Analysis:

The proposed project involves remediation activities that will neither require use of, nor access through any parks or other recreational facilities. Therefore, the proposed project will not result in the physical deterioration of any recreational facilities.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☐ Less Than Significant Impact
☒ **No Impact**

b. Include recreational facilities or require construction or expansion of recreational facilities which might have an adverse physical effect on the environment.

Impact Analysis:

The proposed project is limited to remediation activities with no construction or expansion of public recreational facilities. Therefore, the project will not have an adverse physical effect on the environment due to construction of recreational facilities.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☐ Less Than Significant Impact
☒ **No Impact**

15. Transportation and Traffic

Project Activities Likely to Create an Impact:

- Mobilization of equipment, trucks and personnel to the Site.
- Transportation of excavated materials off the site.
- Transportation of backfill material to the site.

Description of Baseline Environmental Conditions:

The Site is located in an urbanized area of the City. The Site is bounded by the Novartis (former Rifkin) parking area to the north, Horton Street to the east, Sherwin Avenue to the south, and the Union Pacific Railroad (UPRR) tracks to the west. 45th Street connects to Horton Street just north of the intersection of Horton Street and Sherwin Avenue. Hubbard Street and Halleck Street are parallel (Halleck is west of Hubbard) and connect to Sherwin Avenue at the central and western, respectively, parts of the facility. No intersections in the immediately

vicinity are signalized. The closest routes to the Site of Emeryville's bus service, Emery Go-Round, and the Alameda-Contra Costa Transit District (AC Transit) follow Hollis Street (east of the Site) and 40th Street (south of the Site). There is no bus service along roads adjacent to the Site.

The following narratives summarize the key features of the City's transportation system as presented in the City's General Plan Draft Environmental Impact Report (City of Emeryville, May 2009).

The City has classified its streets as arterials, collectors, and local streets. The City's streets carry thousands of vehicle and transit trips daily and are primarily based on a grid, with several major north-south and east-west roadways interlaced with a system of intersecting minor streets.

Street Classifications

Streets in Emeryville are classified as follows:

- **Arterial** - City arterial streets are intended to provide most of the City's required internal traffic capacity, carry the heaviest traffic volumes and provide the most direct routes between internal and external places.

- **Collector** - This type of street provides arterial access to residential neighborhoods and other development areas, but protects those areas from heavier through traffic.

- **Local** - Local streets are intended to provide access only for the areas immediately adjacent to them and are planned to be free from use by through traffic. The local streets are integral with the development areas they serve. Local streets generally connect to other local streets or to collectors.

Key roadways are described below:

- **Shellmound Street** is a two- to four-lane north/south arterial with on-street parking at select locations. Shellmound Street becomes 40th Street to the south of a railroad overcrossing.

- **Hollis Street** is a two-lane, north/south arterial, with on-street parking that begins in Oakland at Peralta Street and ends in Berkeley at Folger Avenue. North of Folger Avenue, Hollis Street becomes 7th Street extending northwards through Berkeley.

- **San Pablo Avenue,** designated as State Route 123 (SR 123), is a four-lane, north/south arterial. San Pablo Avenue extends north from downtown Oakland to Crockett. In Emeryville, San Pablo Avenue generally has four lanes with left-turn lanes, raised medians, and on-street parking (in some locations).

- **40th Street** is an east/west four-lane arterial with left-turn pockets and on-street parking in some locations. 40th Street turns into Shellmound Street to the west of the railroad overcrossing. Eastward, 40th Street passes on the north side of the MacArthur BART Station and terminates at Piedmont Avenue in Oakland.

- **Powell Street** is an east/west arterial, generally with four lanes, with an interchange at I-80. It extends westward from I-80 to the Emeryville Marina, and east from I-80 to west of San Pablo Avenue, where it becomes Stanford Avenue and continues to Adeline Street in Berkeley.

- **Adeline Street** is a two to four-lane north/south arterial with on-street parking that begins at the Port of Oakland and extends northward to Shattuck Avenue in Berkeley. It is the principal vehicular route to the Ashby BART Station from Emeryville.

- **65th Street** is a two-lane, east/west street that extends eastward from Lacoste Street. Land uses along 65th Street include residential, commercial, and office and on-street parking is available. An at-grade railroad crossing is located just east of Shellmound Street.

- **Frontage Road** is a two-lane, north/south street that parallels I-80 on the west. Left-turn pockets are provided at major intersections, including I-80 access points. This roadway extends northward from Powell Street in Emeryville to Gilman Street in Berkeley.

- **Shellmound Way** is a short four-lane east/west roadway that connects Christie Avenue and Shellmound Street. On-street parking is prohibited on Shellmound Way.

- **Christie Avenue** is generally a two-lane, north/south Street extending from Shellmound Street, south of Powell Street, north to 65th Street. On-street parking is permitted at select locations on Christie Avenue.

- **45th Street** is a two-lane, east/west street that extends eastward from Horton Street. On-street parking is permitted. An AC Transit yard is located near the intersection of 45th Street and San Pablo Avenue.

- **Park Avenue** is a wide two-lane street running east/west between Halleck Street and San Pablo Avenue. Between San Pablo Avenue and Hollis Street, angled on-street parking is generally provided on the north side of the street and parallel on-street parking is on the south side. West of Hollis Street portions of Park Avenue are unimproved and have a mix of perpendicular and parallel parking.

- **Horton Street** is a north/south two-lane street with on-street parking provided at select locations. Class II bike lanes are provided north of 53rd Street.

- **Emery Street** is a two-lane north/south street extending southward from Park Avenue. On-street parking is available. Emery Street becomes Peralta Street south of MacArthur Boulevard.

- **MacArthur Boulevard** is an arterial stretching from Hollis Street in the west, through Oakland and continuing east. MacArthur Boulevard has one lane in each direction. It forms a one-way couplet (each direction is separated by a wide median) between Linden Street and Hollis Street although it is discontinuous at the San Pablo Avenue / Adeline Street intersection. MacArthur Boulevard also goes under the San Pablo Avenue / Adeline Street intersection and connects to eastbound 1-580 via left-hand ramps.

- **36th Street** is the westbound portion of a one-way couplet formed with 35th Street. This two-lane street is a major access point for vehicles inbound to Emeryville due to the I-580 and SR 24 ramps. 36th Street terminates in the west where it meets Peralta Street and West MacArthur Boulevard.

- **35th Street** is the eastbound portion of a one-way couplet formed with 36th Street. This two-lane street provides access to the I-580 and SR 24 freeway on-ramps.

The City is in the process of changing their street classification system to reflect the trend towards multi-modal travel and less reliance on the automobile. The proposed new classification system is defined in the Emeryville General Plan (January 2009). It carries forward concepts of a complete street system and proposes to categorize City transportation facilities as follows according to newly defined "typologies". The following typology definitions apply to the streets and other facilities that make up the City's transportation system plan:

- **Transit Street** – These are primary routes for AC Transit, Emery Go-Round, and other public transit providers. Signal preemption for transit vehicles, bus stops, and, where appropriate, bus lanes, are provided. Other travel modes, including automobiles, bicycles, and trucks, are accommodated in the roadway, but if there are conflicts, transit has priority. These streets accommodate moderate to high volumes of through-traffic within and beyond the City. Pedestrians are accommodated with ample sidewalks on both sides of the street, and amenities around bus stops (e.g. shelters, benches, lighting, etc).

- **Bicycle Boulevard** – These are through-routes for bicycles providing continuous access and connections to the local and regional bicycle route network. Through-motor vehicle traffic is discouraged. High volumes of motor vehicle traffic are also discouraged, but may be allowed in localized areas where necessary to accommodate adjacent land uses. Local automobile, truck, and transit traffic are accommodated in the roadway, but if there are conflicts, bicycles have priority. Traffic calming techniques to slow and discourage through-automobile and truck traffic may be appropriate. Pedestrians are accommodated with ample sidewalks on both sides of the road.

- **Connector Street** – Automobiles, bicycles, and trucks are accommodated equally in the roadway. Transit use, if any, is incidental. These streets accommodate moderate to high volumes of through-traffic within and beyond the City. Pedestrians are accommodated with ample sidewalks on both sides of the street.

- **Local Street** – Automobiles, bicycles, and trucks are accommodated equally in the roadway. Transit use, if any, is incidental. These streets accommodate low volumes of local traffic and primarily provide access to property. Through-traffic is discouraged. Traffic calming techniques to slow and discourage through-automobile and truck traffic may be appropriate. Pedestrians are accommodated with ample sidewalks on both sides of the street.

- **Auto Dominant Highway** – These are freeways and approach roads (e.g. Ashby Avenue and West MacArthur Boulevard underpass) that serve high volumes of high speed regional motor vehicle traffic including automobiles and trucks. Transbay and express transit buses are also accommodated. Bicycles and pedestrians are prohibited.

- **Intercity Rail** – This is the mainline Union Pacific/Amtrak railroad line serving long distance and local freight and passenger traffic. The Capitol Corridor line is the third busiest route in the U.S. Other passenger routes include cross country trains (California Zephyr and Coast Starlight), San Joaquin, and future "East Bay Express".

- **Major Transit Hub** – These are transfer points where high volume transit lines intersect. These are located in the Amtrak station with access from both sides of the rail line, and at 40th Street and San Pablo Avenue.

- **Bicycle Path** – Class I Bicycle path as defined by Caltrans standards accommodates both bicycles and pedestrians. Motor vehicle traffic is prohibited.

- **Bike Route** – Class II (bike lanes) or Class III (signed route) bike facilities as defined by Caltrans standards, are overlaid on transit, connector, and local streets. While bicycle use is always accommodated on these streets, it is encouraged along designated bike routes, which provide continuous access and connections to the local and regional bicycle route network.

- **Pedestrian Path** – These are exclusive walkways for pedestrians. Bicycles and motor vehicles are prohibited.

- **Pedestrian Priority Zones** – These are zones on which high volumes of pedestrian traffic are encouraged along the sidewalk. This includes zones around neighborhood centers, regional retail areas, and around school and other public facilities.

INTERSECTION LEVELS OF SERVICE

In order to evaluate the Level of Service (LOS), a number of intersections were selected for this transportation technical analysis based on the availability of traffic count data from previous traffic studies. To that end, adjacent to and in the immediate vicinity of the Site, 12 specific intersections were identified within the limits of Emeryville along the various truck route alternatives. These intersections are as presented in **Table 5**.

Based upon the available information from other studies, the operational characteristics of each intersection were obtained. Note that for each intersection, data are primarily presented for the peak hour period between 4:00 p.m. to 6:00 p.m. (e.g. PM peak hour), to ensure that the intersection's peak volumes were represented.

Table 5 ***Existing Intersection Level of Service – Locations within Emeryville (2007 Data)***				
Intersection	***AM Peak Hour***		***PM Peak Hour***	
	Delay (seconds)	***LOS***	***Delay (seconds)***	***LOS***
Powell Street / I-80 EB Ramps Note 3	SEE NOTE 2	SEE NOTE 2	73 sec.	E
Powell Street/Christie Avenue Note 3	SEE NOTE 2	SEE NOTE 2	38 sec.	D
Powell Street/Peladeau Street (U) Note 4	0 (14) sec.	A (B)	2 (17) sec.	A (C)
Powell Street / Hollis Street Note 3	SEE NOTE 2	SEE NOTE 2	51 sec.	D
Stanford Avenue/Hollis Street Note 4	4 sec.	A	6 sec.	A
Stanford Avenue/Peladeau Street (U) Note 4	8 (11) sec.	A (B)	5 (10) sec.	A (A)
Stanford Avenue/Horton Street Note 4	8 sec.	A	9 sec.	A
Horton Street/ 53rd Street Note 4	8 sec.	A	8 sec.	A
Horton Street/45th Street Note 4	8 sec.	A	8 sec.	A
Horton Street/Park Avenue Note 4	8 sec.	A	9 sec.	A
Horton Street/40th Street Note 3	SEE NOTE 2	SEE NOTE 2	37 sec.	D
Horton Street/Mandela Parkway/Yerba Buena Avenue Note 3	SEE NOTE 2	SEE NOTE 2	42 sec.	E

Note 1: Two delay values are reported for each side-street stop-controlled unsignalized intersection: (1) the intersection average delay and (2) the highest controlled movement delay.
Note 2: AM peak hour analysis was not completed for these locations in the existing data gathered for this analysis.
Note 3: Fehr and Peers Transportation Consultants. June 20, 2007. City of Emeryville Supplemental Cumulative Traffic Analysis – Appendix B: Intersection LOS Summary, Emeryville, California.
Note 4: City of Emeryville. May 2009. Emeryville General Plan Draft Environmental Impact Report, Emeryville, California.

To identify the order-of-magnitude increases associated with the project activities, estimates for (Average Daily Traffic) ADT's along selected streets in the area were made by taking the PM peak hour traffic volume from an adjacent nearby intersection and multiplying the value by 10. The logic behind this method is the rule-of-thumb that on any given roadway system the PM peak hour is approximately 10 percent of the total ADT on the road. In reality, this adjustment can be anywhere between 8 percent and 15 percent, but in absence of clear data, the 10 percent rule has been used. **Table 6** contains estimated ADT's for some of the roadways in the vicinity of the Site.

Table 6 ***Estimated ADT Volumes on Various Area Roadways***			
Location of Estimated ADT	***Adjacent Intersection Count Used***	***Total PM Peak Hour Count from Adjacent Intersection***	***Estimated ADT***
Horton Street (immediately north of 53rd Street) Note 2	Horton Street & 53rd Street	338 vehicles	3,380 vehicles
Horton Street (immediately north of 45th Street) Note 2	Horton Street & 45th Street	351 vehicles	3,510 vehicles
Powell Street (immediately west of Hollis Street) Note 1	Powell Street & Hollis Street	2,191 vehicles	21,900 vehicles
Park Avenue (immediately west of Horton Street) Note 2	Horton Street & Park Avenue	138 vehicles	1,380 vehicles
Halleck Street (immediately north of 40th Street) Note 3	Harlan Street & Park Avenue	45 vehicles	450 vehicles

Note 1: Fehr and Peers Transportation Consultants. June 20, 2007. City of Emeryville Supplemental Cumulative Traffic Analysis – Appendix B: Intersection LOS Summary, Emeryville, California.

Note 2: City of Emeryville. May 2009. Emeryville General Plan Draft Environmental Impact Report, Emeryville, California.

Note 3: No traffic data are available for Halleck Street and/or its intersections. Harlan Street, between Park Avenue and 40th Street, was used as a similar roadway facility for purposes of estimating existing ADT volumes.

Based on the types of roadways found within the vicinity of the Site, the following level of service volume thresholds were estimated as shown in **Table 7**. Note that the values contained within **Table 7** do not incorporate any possible adjustments to the gross planning level volumes, which may be allowed for the presence of left-turn bays on the roadway facility.

Table 7 ***Theoretical Planning Level ADTs for City Roads in an Urbanized Area***						
Lanes	***Separation Features***	***LOS A***	***LOS B***	***LOS C***	***LOS D***	***LOS E***
2	Undivided	**	**	9,100	14,600	15,600
4	Undivided / Divided	**	**	21,400	31,100	32,900
6	Divided	**	**	33,400	46,800	49,300

Source: Transportation Research Board - National Research Council. 2000. *Highway Capacity Manual (HCM2000)* - Chapter 9 Analytical Procedures Overview, Section VI Service Volume Tables, Page 9-9, Washington D.C.

Source: Florida Department of Transportation, Systems Planning Office. 2002. *Quality/Level of Service Handbook* - Chapter 4 General Planning Analysis, Table 4-1 Generalized Annual Average Daily Volumes for Florida's Urbanized Areas (page 85), Tallahassee, Florida.

** As per HCM2000, levels of service A and B planning level volumes cannot be calculated in urbanized areas using default values.

PUBLIC TRANSIT (CITY OF EMERYVILLE, MAY 2009)

Several public transit options serve the City, including the Emery Go-Round shuttle to the MacArthur BART station, the 72 Rapid Bus on San Pablo Avenue, several other AC Transit bus routes, and commuter trains at the Amtrak station. Amtrak also operates buses between Emeryville and San Francisco, but non-train passengers are not allowed to ride those buses. There are two transit hubs in Emeryville including the Amtrak station and the San Pablo Avenue/40th Street intersection.

PEDESTRIAN CIRCULATION (CITY OF EMERYVILLE, MAY 2009)

The City's pedestrian network consists of sidewalks, multi-use paths, and street crossings. Emeryville has many areas that are conducive to walking for recreation and transportation, particularly in the neighborhoods east of the railroad tracks and north of 40th Street, such as Park Avenue District, the Hollis Street corridor, the San Pablo Avenue corridor, and the Doyle Street Greenway.

BICYCLE CIRCULATION (CITY OF EMERYVILLE, MAY 2009)

The City of Emeryville has endorsed policies to encourage bicycling as a form of transportation and has implemented changes to roadways for bicyclists. Given that 28 percent of Emeryville's working population is employed within Emeryville, a comprehensive citywide bikeway network and associated support facilities planning, such as bicycle parking at employment locations and other destinations, has greatly increased the mode share of bicycling as a form of transportation in Emeryville.

PARKING (CITY OF EMERYVILLE, MAY 2009)

Emeryville currently has an abundance of free parking for residents, visitors, and workers, making driving an attractive alternative to taking public transit, walking or bicycling. In the past, zoning requirements have prescribed parking requirements by land use type, but have not allowed for appropriate off-sets to account for shared parking, transit availability, or to promote bicycling and walking.

Analyses of Project Impacts

This section presents the impacts of the proposed project on the surrounding transportation system. The transportation system impacts are categorized for each transport alternative defined for transport of materials and arrival and departure of Site personnel. There are five (5) alternatives that have been defined for transportation routes. These alternatives are described later in this section and are shown on **Figure 4**.

Project Activities

TRIP GENERATION

Table 8, Estimated Vehicle Trips presents a summary of estimated total and maximum daily vehicle trips (one trip represents one vehicle movement to the Site or away from the Site).

Table 8 ***Estimated Vehicle Trips***		
Project Activity	***Total Truck Trips***	***Maximum Daily Vehicle Trips***
Mobilization of Construction Workers (associated with Shoring along Horton Street)	3 (pieces of equipment)	7
Off-Site Transport of Excavated Material [Note 1] (assumes 64,000 yd^3 max. w/1.4 expansion factor; 20 yd^3/truck)	4,480	114 (57 leaving & 57 returning)
Delivery of Clean Backfill [Note 2] (assumes 68,274 yd^3 ; 20 yd^3/truck)	3,414	106 (53 leaving & 53 returning)
Demobilization	12	--
TOTAL		228 trips (114 leaving & 114 returning)

Note 1: Because of volume expansion factors associated with removal and loading of excavated materials, volumes of excavation and import of clean backfill are not identical.

Anticipated additional daily vehicle volumes include 114 vehicle trips associated with excavation activities to haul material off-site, 106 vehicle trips associated with the delivery of clean backfill to the Site, and 8 additional vehicle trips for worker travel associated with the shoring activities along Horton Street. This represent a total of approximately 228 additional trips per day on the transportation system, distributed between the hours of 7 am and 6 pm. Based on a one hour lunch break, the new vehicle trips equate to 22.7 (i.e., 23) new vehicle trips per hour on the roadway system. These trips are both entering (11.5 per hour) and leaving (11.5 per hour) the Site. This volume of additional trips, which amounts to one vehicle trip every 2.6 minutes, would result in a negligible change in roadway and intersection operations and capacities. Note that the three project activities described above in Table 8 are expected to be concurrent activities, and as such reflect the maximum daily vehicle trips expected to occur during the project at any given time.

CURRENT AND/OR PLANNED PROJECTS FOR CUMULATIVE IMPACT ASSESSMENT

There are several current and/or planned projects within the vicinity of the Site that may attribute to potential cumulative impacts. These are described in **Table 9**.

Potential cumulative impacts on transportation would only occur during construction, as there would be no permanent new traffic trips at the completion of the S-W proposed project. Of the seven other current and/or planned projects listed in **Table 9**, the potential does exist that one or more planned project may undertake construction activities during the same timeframe that the S-W proposed project activities occur - with associated hauling of material off-site and delivery of clean backfill on-site. In this circumstance, there may be a less than significant cumulative impact on the transportation system resulting from the occurrence of more than one project in the area. However, none of the transportation route alternatives described below will realize these impacts to be “cumulatively considerable”, primarily due to the short-term nature of the S-W proposed project and the presence and function of the urban street system in

Emeryville and Oakland. This is further discussed in the analysis of the five transportation alternatives.

Table 9
Current and/or Planned Local Projects

Project Name, Location	***Description***	***Project Construction Schedule***
Park Street Beautification; Park St between Halleck St. and Hollis St, And Horton St between 40th St and 45th St.	Sidewalk widening; additional street tree plantings; limit truck turning on to Park Avenue west of Hollis St. to Hollis and Halleck Streets; place corner bulbouts at the intersection of Park Avenue with Holden, Horton, and Hubbard Streets; bike racks on every block face of Park avenue; create a park north of Sherwin Avenue and west of Horton St.; create a public space on Park Avenue and west of Halleck St.; a park potentially on the north side of perk avenue midway between Hollis St. and the railroad.	Present through August 2010.
Pixar Project, 1200 park Avenue Between Hollis and Watt.	New production building of about 155,000 square feet at northeast corner of Park Avenue and Hollis Street. Phase II includes expansion of surface parking lot and construction of new City park and bike path at east end of campus. (Not anticipated to affect S-W traffic).	Present through 2011
Horton Landing Park/South Bayfront Pedestrian-Bicycle Bridge, over Union Pacific Railroad.	A pedestrian-bicycle overpass over the Union Pacific Railroad to the north of the Sherwin Williams Property and the Former Rifkin Property	October 2009-Summer 2010
Transit Center, Horton and 59th	Mixed use transit-oriented development and public parking structure with about 248,000 square feet of office/lab/retail space, and 300 parking spaces in a 135- foot tall tower on the "Mound" site; and a 600-space, 7 level parking garage with 3,620 square feet of retail/office space on the Heritage Square site.	November 2009-Spring 2010
Emery Station Greenway, Hollis and 59th	New 91,000 square foot laboratory building on southern portion; existing 39,000 square foot industrial building on northern portion to remain for now. Project includes Greenway improvements on northern portion of block and expansion of plaza at Powell and Hollis Streets.	August 2009- Spring 2010
Public Market Redevelopment; Christie and 64th	Approximately 210 residential rental units and 7 ground floor "shopkeeper" units in a six-story building.	Start in Spring 2010
Bay Street Site B Development, Christie/Shellmound/Powell/ railroad	Northern expansion of Bay Street mixed use project, with 150-room hotel in 240-foot tower, 140 to 240 residential units, 80,000 to 130,000 s.f. of retail, possibly including a Nordstrom's department store, and 800- 900 parking spaces.	Start in November 2010

IMPACTS ANALYSIS

Alternative Truck Route Number 1

Description

This route utilizes Horton Street as the main travel route to and from the Site. Access is provided through the Former Rifkin Property to the north via Horton Street, then to Hollis Street, and then onto Powell Street to freeway connections. It is not anticipated that any rail car usage would occur with this proposed transportation alternative, although that would be a potential beneficial "add-on" subject to contractor operations.

Potential Transportation System Impacts

The intersection of Powell Street & Hollis Street presently operates at a level of service of D during the PM peak hour. Powell Street & Christie Avenue operates at a level of service of D during the PM peak hour. Powell Street and the I-80 EB Ramps operate at a level of service of E during the PM peak hour. Level of service of D is acceptable according to City of Emeryville standards. The usage of this route may require the need for construction flaggers and/or lane closures at the intersection of Powell Street and Hollis Street.

Impacts of this alternative include potential intersection operational delays along Hollis Street and Powell Street. Additionally, there is a queuing concern due to the short merge required for access onto I-80 from Powell Street.

This route would avoid primary residential areas within the community and traverses the industrial areas in northern Emeryville.

This route potentially impacts businesses in the area, directly adjacent to the alternative haul route, including Novartis and Bayer. Coordination would need to occur with both businesses for this route to be viable.

The addition of 228 additional trips per day, superimposed on an estimated existing ADT of 3,380 vehicles, would result in a total estimated existing ADT of 3,608 vehicle trips for Horton Street just north of the Site. This is well below the planning level threshold for this type of facility of 14,600 vehicles per day as defined in **Table 7**.

Cumulative Potential Transportation System Impacts

For potential cumulative impacts, there are two projects identified in **Table 9** that are planned along the general route of Alternative 1. The first project is the Horton Landing Park/South Bayfront Pedestrian-Bicycle Bridge (over UPRR). Construction activities are expected to occur between October, 2009 and Summer, 2010. Due to the proximity of this project near the Site, the potential does exist for additional construction traffic over and above that solely generated with the S-W proposed project along Horton Street, Stanford Avenue, and Powell Street.

The second project is the Bay Street Site B Development, and construction is expected to begin in November of 2010. It is expected that the S-W proposed project activities at the Site will be completed prior to the beginning of this project.

The cumulative impacts associated with the addition of these two projects on the area's transportation system, in concert with the transportation impacts of the S-W proposed project, are not cumulatively considerable.

Alternative Truck Route Number 2

Description

This alternative utilizes a combination of truck traffic and rail car loading and transport. For truck traffic, the route would enter and exit through the Horton Landing Park site north of Hollis Street and traverse onto Powell Street to freeway connections. The existing rail spur would also be utilized for rail car loading and transport.

Potential Transportation System Impacts

The intersection of Powell Street & Hollis Street presently operates at a level of service of D during the PM peak hour. Powell Street & Christie Avenue operates at a level of service of D during the PM peak hour. Powell Street and the I-80 EB Ramps operate at a level of service of E during the PM peak hour. Level of service of D is acceptable according to City of Emeryville standards. The usage of this route may require the need for construction flaggers and/or lane closures at the intersection of Powell Street and Hollis Street.

Impacts associated with this alternative include potential intersection incremental operational delays along Hollis Street and Powell Street. Additionally, there is a queuing concern due to the short merge required for access onto I-80 from Powell Street.

This route would avoid primary residential areas within the community and traverses the industrial areas in northern Emeryville. This route would potentially impact businesses in the area, including Novartis and Bayer.

The potential usage of the rail spur for material transport is considered beneficial. At the present time, it is expected that only hauling of excavated material could occur (i.e., clean backfill will not likely be brought to the Site by rail). The usage of gondola cars would need to be coordinated with the selected contractor, S-W, and the UPRR. It is estimated that each gondola rail car could accommodate the equivalent of five 20-ton truckloads. It is further expected that the Site could accommodate up to 8 gondola rail cars, the equivalent of 40 trucks.

For rail to be viable, an additional rail spur may need to be constructed on the Site. The addition of a revised 188 additional trips per day (228 minus 40 trips removed), superimposed on an estimated existing ADT of 3,380 vehicles, would result in a total estimated ADT of 3,568 vehicle trips for Horton Street just north of the Site. This is well below the planning level threshold for this type of facility of 14,600 vehicles per day as defined in **Table 7.**

Cumulative Potential Transportation System Impacts

For potential cumulative impacts, there are two projects identified in **Table 9** that are planned along the general route of Alternative 2. The first project is the Horton Landing Park/South Bayfront Pedestrian-Bicycle Bridge (over UPRR tracks). Construction activities are expected to occur between October 2009 and Summer, 2010. Due to the proximity of the bicycle bridge project near the Site, the potential does exist for additional construction traffic over and above

that solely generated with the S-W proposed project along Horton Street, Stanford Avenue, and Powell Street.

The second project is the Bay Street Site B Development, and construction is expected to begin in November of 2010. It is expected that S-W proposed project activities at the Site will be completed prior to the beginning of the Site B Development project.

The cumulative impacts associated with the addition of these two projects on the area's transportation system, in concert with the transportation impacts of the S-W proposed project, are not cumulatively considerable.

Alternative Truck Route Number 3

Description

This route utilizes Horton Street as the main travel route to and from the Site, however access is provided to the south rather than the north, as was the case with Alternative 1. Access is provided through the Former Rifkin Property to the south via Mandela Parkway to and from freeway connections. It is not anticipated that any rail car usage would occur with this alternative, although that would be a potential beneficial "add-on" subject to contractor operations.

Potential Transportation System Impacts

The intersection of Horton Street and Mandela Parkway/Yerba Buena Avenue presently operates at a level of service of E during the PM peak hour below the City's standard. The intersection of Horton Street and 40th Street operates at a level of service of D during the PM peak hour. Both Horton Street and Park Avenue and Horton Street and 45th Street function at a level of service of A. Because of high pedestrian usage and the presence of loading/unloading trucks, the usage of this route may require the need for construction flaggers and/or brief lane closures along Horton Street south of the Site.

This alternative includes potential surface impacts to the newly constructed intersection of Park Avenue and Horton Street. By the time hauling operations begin, it is likely this intersection will have been constructed as part of the Park Avenue Beautification project. This particular intersection is a highlight of that project and will receive aesthetic and operational enhancements. Given the aesthetic design and construction component of the intersection surfacing, coupled with pedestrian features such as bollards and curb bulb-outs, care must be exercised to avoid impacts to this particular intersection.

Impacts of this alternative include potential intersection operational delays along Horton Street between the Site and 40th Street.

This route generally traverses a primarily residential area of both Emeryville and North Oakland.

This route would directly impact several key businesses in the area, directly adjacent to the alternative haul route, including Novartis and Bayer. Coordination would need to occur with both businesses for this route to be viable. This impact is considered to be an adverse impact.

The addition of 228 additional trips per day, superimposed on an estimated existing ADT of 3,510 vehicles, would result in a total estimated ADT of 3,738 vehicle trips for Horton Street just south of the Site. This is well below the planning level threshold for this type of facility of 14,600 vehicles per day as defined in **Table 7**.

Cumulative Potential Transportation System Impacts

For potential cumulative impacts, there is one project identified in **Table 9** that is planned along the general route of Alternative 3. This project is the Park Street Beautification project, which includes Park Street between Halleck Street and Hollis Street, and Horton Street, between 40th Street and 45th Street. Construction activities are currently underway and will be completed by August 2010. Due to the proximity of this project near the Site, especially the intersection of Horton Street and Park Avenue, minor cumulative impacts could occur. These include the combination of construction activities from both projects and the need to protect the aesthetic features of the intersection of Horton Street and Park Avenue during S-W proposed project hauling activities.

The cumulative impacts associated with the addition of this project on the area's transportation system, in concert with the transportation impacts of the S-W proposed project, are not cumulatively considerable.

Alternative Truck Route Number 4

Description

This route utilizes a combination of Hubbard Street to enter the Site northbound, and Halleck Street to leave the Site southbound. Vehicles leaving the Site southbound on Halleck Street would follow the same route as defined in the preferred truck route Alternative 5 and as shown on **Figure 5**, (i.e. across Park Avenue, under 40th Street, south to 32nd Street, then Mandela Parkway to Grand Avenue and freeway connections). It is not anticipated that any rail car usage would occur with this proposed alternative, although that would be a potential beneficial "add-on" subject to contractor operations.

Potential Transportation System Impacts

It is not anticipated that any rail car usage would occur with this proposed alternative, although that would be a potential beneficial "add-on" subject to contractor operations. This route follows Emeryville and North Oakland roadways south to Grand Avenue and then onto freeway connections.

Impacts of this alternative include potential surface impacts to the newly constructed intersection of Park Avenue and Halleck Street, and also Park Avenue and Hubbard Street. By the time hauling operations begin, it is likely both of these intersections will have been constructed as part of the Park Avenue Beautification project. Given the aesthetic design and construction component of the intersection surfacing, coupled with pedestrian features such as bollards and curb bulb-outs, care must be exercised to avoid impacts to these particular intersections.

This route includes the avoidance of several key intersections north of the Site that have operational issues along Horton Street and Powell.

This route allows the avoidance of trucks maneuvering directly adjacent to several key businesses in the area, including Novartis and Bayer. The route does, however, traverse through a primarily residential area, which is considered undesirable.

The usage of Hubbard Street may be problematic, as it is not a designated truck route within the City, and travels through the heart of the Park Avenue Beautification project. Additionally, this route would be slightly longer than the "preferred truck route" due to the usage of one-way traffic flows on Hubbard Street and Halleck Street.

There are no existing or planned transit facilities along this route.

Cumulative Potential Transportation System Impacts

For potential cumulative impacts, there is one project identified in **Table 9** that is planned along the general route of Alternative 4. This project is the Park Street Beautification project, which includes Park Street between Halleck Street and Hollis Street, and Horton Street, between 40th Street and 45th Street. Construction activities are currently underway and will be completed by August 2010. Due to the proximity of this project near the Site, especially the intersection of Halleck Street and Park Avenue, and also Hubbard Street and Park Avenue, minor cumulative impacts could occur. These include the combination of construction activities from both projects, as well as the need to protect the aesthetic features of the intersections of Halleck Street and Hubbard Street with Park Avenue during S-W proposed project hauling activities.

The cumulative impacts associated with the addition of this project on the area's transportation system, in concert with the transportation impacts of the S-W proposed project, are not cumulatively considerable.

Alternative Truck Route Number 5

Description

This route utilizes roadways south of the Site, and is the truck route for the former Sherwin-Williams plant. Traffic would enter the Site northbound on Halleck Street, through Sherwin Avenue. Traffic would exit the Site southbound on Halleck Street, across Park Avenue, under 40th Street, and south to 32nd Street. From 32nd Street, trucks would access Mandela Parkway to Grand Avenue and freeway connections.

Potential Transportation System Impacts

It is not anticipated that any rail car usage would occur with this proposed alternative, although that would be a potential beneficial "add-on" subject to contractor operations. This route follows Emeryville and North Oakland roadways south to Grand Avenue and then onto freeway connections.

Impacts of this alternative include potential surface impacts to the newly constructed intersection of Park Avenue and Halleck Street. By the time hauling operations begin, it is likely this intersection will have been constructed as part of the Park Avenue Beautification project. Given the aesthetic design and construction component of the intersection surfacing, coupled with pedestrian features such as bollards and curb bulb-outs, care must be exercised to avoid impacts to this particular intersection.

This route includes the avoidance of several key intersections north of the Site that have operational issues along Horton Street and Powell Street.

This route allows the avoidance of trucks maneuvering directly adjacent to several key businesses in the area, including Novartis and Bayer.

The southern portion of Halleck Street, and subsequently Beach Street, are proposed collector routes for vehicular traffic in the Emeryville General Plan, thereby encouraging the movement of vehicles along these facilities.

As described earlier, trip generation estimates anticipated 114 truck trips for excavation related activities, 106 truck trips delivery of clean backfill to the Site, and 7 additional vehicle trips for worker travel associated with the shoring activities along Horton Street. This amounts to a total of approximately 228 additional trips on the transportation system, per day, spread out between the hours of 7 am and 6 pm. Assuming a one hour lunch break, the new vehicle trips equate to 22.7 (23) new vehicle trips per hour on the roadway system. These trips are both entering (11.5 per hour) and leaving (11.5 per hour) the Site. This low volume of additional trips will have a negligible impact on roadway and intersection operations.

The addition of 228 additional trips per day, superimposed on an estimated existing ADT of 450 vehicles, will result in a total estimated ADT of 668 vehicle trips for Halleck Street just south of the Site. This is well below the planning level threshold for this type of facility of 14,600 vehicles per day as defined in **Table 7**.

There are no existing or planned transit facilities along this route.

Cumulative Potential Transportation System Impacts

For potential cumulative impacts, there is one project identified in **Table 9** that is planned along the general route of Alternative 5. This project is the Park Street Beautification project, which includes Park Street between Halleck Street and Hollis Street, and Horton Street, between 40th Street and 45th Street. Construction activities are currently underway and will be completed by August 2010. Due to the proximity of this project near the Site, especially the intersection of Halleck Street and Park Avenue, less than significant cumulative impacts could occur. These include the combination of construction activities from both projects, as well as the need to protect the aesthetic features of the intersection of Halleck Street and Park Avenue during S-W proposed project hauling activities.

The cumulative impacts associated with the addition of this project on the area's transportation system, in concert with the transportation impacts of the S-W proposed project, are not cumulatively considerable.

SELECTION OF PREFERRED TRUCK ROUTE

The preferred truck route is Alternative Number 5, as shown on **Figure 5**. This alternative is selected as the preferred truck route because it exhibits the least overall impacts to the surrounding transportation system and community of Emeryville, as compared to the other alternatives. Alternative 5 is preferred for the following reasons:

- The preferred truck route avoids the high volume and congested corridor of Powell Street. As a major link to the Interstate system, several intersections along Powell Street

exhibit a poor level of service and possibly may require flaggers and/or lane closures to accommodate truck movements on a periodic basis.

- The preferred truck route avoids impacts to both the Novartis and Bayer facilities - from a noise, aesthetics and possible traffic congestion perspective.

- The preferred truck route utilizes Halleck Street as the primary haul route within Emeryville's city limits. This route has an estimated average daily traffic (ADT) volume of 450 vehicles per day, which is the lowest volume route of any routes considered within Emeryville.

- The roadway network for the preferred truck route, outside of Emeryville and within North Oakland, is better able to accommodate the potential truck traffic via the more extensive network of commuter streets and connections to the freeway system.

- The preferred truck route impacts only one intersection of the Park Avenue Beautification project, Halleck Street and Park Avenue, and will provide for only "thru movements" at the intersection in a north-south direction, thereby eliminating potential street damage from turning trucks at the recently modified intersections.

- The preferred truck route avoids many of the problem areas associated with existing bicycle travel within Emeryville. The route keeps truck traffic moving in a north-south direction on the western side of the Site, eliminating east-west conflict points that bicyclists currently encounter along Horton Street

- The preferred truck route utilizes two proposed "connector" streets as identified in the current draft Emeryville General Plan. These two routes are Halleck Street and Beach Street. The preferred truck route accordingly directs project truck movements on these two Emeryville streets.

In accordance with the Department of Toxic Substances Control (DTSC) California Environmental Quality Act (CEQA) Initial Study guidelines, the following impact analysis is prepared for the preferred truck route (e.g. alternative truck route number 5).

Analysis as to whether or not project activities would:

a. Cause an increase in traffic which is substantial in relation to the existing traffic load and capacity of the street system (i.e., result in a substantial increase in either the number of vehicle trips, the volume to capacity ratio on roads, or congestion at intersections).

Impact Analysis:

The proposed project includes hauling and disposal of material off-site and the importing of suitable materials back to the Site. This will result in an increase in truck traffic adjacent to and throughout the immediate project vicinity. Construction workers will also drive to and from the Site and supplies (e.g. equipment) will be delivered to the Site. Taken together, the proposed project activities would increase truck traffic and, to some extent, passenger vehicle traffic, above that which is currently observed in the Site vicinity. This traffic is

expected to be of short duration, as these project activities would occur over a six-month period.

The following general types of heavy equipment and supplies would be transported to the Site: excavators, dump trucks, water tanks/clarifier, lights, and hoses. During Site mobilization, stationary materials would be delivered to the Site by truck. These materials would remain on-site throughout their use during project activities.

During the various project activities, construction workers would be on Site. Most if not all of these workers are expected to drive their own vehicle to the Site each workday. Project workers would use the west side access road into the facility and park in the northwest corner of the site, in the proposed parking area shown on **Figure 3**.

Excavated soil would be loaded and transported off-Site to one or more licensed landfills. Asphalt and concrete debris, to the extent such materials are analyzed and found suitable, may be loaded into trucks for regional recycling or disposal. A maximum of 57 trucks, or an estimated 114 truck trips per day, would be scheduled to transport all excavated soil, debris and pavement, assuming trucks are used with capacities of 20 cubic yards. The 114 truck trips would be comprised of 57 vehicle trips leaving the Site, and 57 vehicle trips returning to the Site. A conservative estimate of 3,414 truck trips, based on 20 cubic yards per truck, would be required to deliver clean import material. If the selected contractor utilizes trucks with larger capacities or rail cars are used, fewer trips would be required.

Project-related truck traffic would use the truck route for the former S-W plant. Truck traffic would enter the Site northbound on Halleck Street through Sherwin Avenue and would exit the Site southbound on Halleck Street, across Park Avenue, under 40th Street, and south to 32nd Street. From 32nd Street, trucks would access Mandela Parkway to Grand Avenue and freeway connections.

The material transport analysis assumed a maximum of 114 truck trips per day during excavation and backfilling operations. Such traffic increases, given the temporary nature of S-W proposed project operations and the volume of existing traffic in the Emeryville area, are not expected to result in significant traffic load/system capacity impacts. This volume of truck traffic would potentially create temporary congestion south of the Site on the one block of Halleck Street between Park Avenue and Sherwin Avenue. The entrance to the E-loft parking structure is located on Halleck Street immediately north of Park Avenue. Cars exiting the parking structure could experience minor delays as empty trucks wait at the southbound stop sign to cross Park Avenue. Cross traffic on Park Avenue at this intersection, however, is limited since Park Avenue terminates one block west of Halleck. Deliveries of supplies and clean backfill would be scheduled as much as possible to avoid peak travel hours on Halleck Street.

If an encroachment permit is required by the City of Emeryville, and if required as part of that permit, traffic control personnel would be utilized during designated time periods to direct vehicular traffic through this area of Halleck Street. Such traffic control practices would maintain temporary traffic impacts to a less than significant level.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☒ **Less Than Significant Impact**
☐ No Impact

b. Exceed, either individually or cumulatively, a level of service standard established by the country congestion management agency for designated roads or highway.

Impact Analysis:

The temporary increase in truck traffic on Halleck Street would be of a short duration (varying levels of traffic over approximately four months), resulting in no significant long-term impact on Level of Service. No other construction projects or long-term modifications to land use have been identified that would contribute to a cumulative change in the level of service along the proposed vehicle transportation corridor. Alternative 5 is preferred based upon the following factors:

- The preferred truck route avoids the high volume and congested corridor of Powell Street. As a major link to the Interstate system, several intersections along Powell Street exhibit a poor level of service and possibly may require flaggers and/or lane closures to accommodate truck movements on a periodic basis.

- The preferred truck route avoids impacts to both the Novartis and Bayer facilities - from a noise, aesthetics and possible traffic congestion perspective.

- The preferred truck route utilizes Halleck Street as the primary haul route within Emeryville's city limits. This route has an estimated average daily traffic (ADT) volume of 450 vehicles per day, which is the lowest volume route of any routes considered within Emeryville.

- The roadway network for the preferred truck route, outside of Emeryville and within North Oakland, is better able to accommodate the potential truck traffic via the more extensive network of commuter streets and connections to the freeway system.

- The preferred truck route impacts only one intersection of the Park Avenue Beautification project, Halleck Street and Park Avenue, and will provide for only "thru movements" at the intersection in a north-south direction, thereby minimizing potential street damage from turning trucks at the recently modified intersections.

- The preferred truck route avoids many of the problem areas associated with existing bicycle travel within Emeryville. The route keeps truck traffic moving in a north-south direction on the western side of the Site, eliminating east-west conflict points that bicyclists currently encounter along Horton Street

- The preferred truck route utilizes two proposed "connector" streets as identified in the current draft Emeryville General Plan. These two routes are Halleck Street and Beach Street. The preferred truck route accordingly directs project truck movements on these two Emeryville streets.

From a quantitative perspective, the temporary project activities are of short duration with no anticipated long-term impacts to the transportation system. The City of Emeryville does not specify when full level of service impact analyses are required for potential traffic increases associated with temporary, short duration construction activities. However, the anticipated addition of 23 new vehicle trips per hour (11.5 entering and 11.5 leaving the Project Site)

amounts to one vehicle trip every 2.6 minutes. This increase is less than significant as it would not have a significant effect on intersection levels of service.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☒ **Less Than Significant Impact**
☐ No Impact

c. Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment).

Impact Analysis:

The project does not propose any changes to the existing street system, or any structures that could affect such roadways. See also impact analysis in section b. Therefore, the project would not have a significant traffic impact related to design feature hazards.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☒ **Less Than Significant Impact**
☐ No Impact

d. Result in inadequate emergency access.

Impact Analysis:

The Sherwin-Williams Company will notify the first responders with schedules and the type of response that might be required and the potential hazards that may be encountered during a response. The Emeryville Fire Department is the primary first responder for onsite emergencies and would be assisted by Alameda County Hazardous Materials Response Team as required. Offsite responders are contacted by dialing 911 or in the case of a fire automatically or manually by various alarms.

Any onsite emergencies will be handled as outlined in the Health and Safety Plan prepared for the site. Offsite responders would access the site from either Sherwin Avenue or Halleck Avenue. Project activities will be arranged (see Figure 3) so that they will not affect existing access routes for offsite entities responding to an onsite emergency; emergency ingress and egress shall be maintained at all times.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☐ Less Than Significant Impact
☒ **No Impact**

e. Result in inadequate parking capacity.

Impact Analysis:

The proposed on-site project activities would be temporary in nature and would only affect portions of the Site at any given time. A City of Emeryville encroachment permit will be

obtained to use of the east side of Halleck Street to queue trucks, if required, arriving with backfill material. Remediation workers will be directed to park their vehicles on the northwestern portion of the S-W property during project implementation. Therefore, the project would not have a significant impact to on-street parking.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☒ Less Than Significant Impact
☐ **No Impact**

f. Conflict with adopted policies, plans, or programs supporting alternative transportation (e.g., bus turnouts, bicycle racks).

Impact Analysis:

Project-related project activities would be temporary in nature and would not affect alternative transportation. The local bus and bicycle routes will not be affected by on-site project activities as noted in b. above. Therefore, no impacts to alternative transportation would result from project implementation.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☐ Less Than Significant Impact
☒ **No Impact**

16. Utilities and Service Systems

Project Activities Likely to Create an Impact:

- Soil excavation
- Disposal of treated excavation dewatering fluids.
- Disposal of decontamination fluids
- Applying water to soil for dust and vapor control during excavation, stockpiling and loading activities

Description of Baseline Environmental Conditions:

Pacific Gas and Electric (PG&E) provides electrical service to the Site; natural gas service remains connected but was shut off by PG&E prior to decommissioning and demolition activities in late 2007. P&GE owns a high pressure natural gas line located under the sidewalk adjacent to the eastern edge of the Site.

EBMUD provides water and wastewater services. Underground utility cables/pipelines exist within the Site but are not present in the excavation areas. Prior to the start of construction, the contractor will consult with utility providers, to identify underground utilities.

The existing storm water management system on the S-W property includes an array of isolated sumps, pumps, and hoses. Storm water runoff, and other discharged surface water, is collected in the sumps and pumped directly to the Temescal Creek channel. In addition, there is currently a groundwater treatment system on-site treating the contaminated groundwater and discharging it to the Temescal Creek channel in accordance with an existing NPDES permit.

Analysis as to whether or not project activities would:

a. Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board.

Impact Analysis:

Excavation dewatering would collect water in sumps installed in the excavation. Based on groundwater pump tests conducted at the Site, approximately10 gallons per minute of groundwater would be generated from the dewatering system to keep the excavation free of groundwater, although initial rates may reach a maximum of 30 gallons per minute. The collected water would be pumped to the Dewatering Equipment Storage and Pretreatment Unit, and then through the existing groundwater treatment system on-site before being discharged to Temescal Creek or to the sanitary sewer under permit.

A storm water pollution prevention plan (SWPPP) would be developed to address storm water runoff impacts that could arise during rainfall events. Although water would be used for dust control, the work is proposed for the dry season and erosion controls would be in place in accordance with the SWPPP. The existing storm water collection system will continue to operate as needed during implementation activities. Storm water from the Site that does not contact areas impacted by project activities, will be directed (and pumped as needed) to the Temescal Creek channel.

In Site areas where implementation activities and/or construction laydown are planned, berms would be constructed as needed to isolate water runoff and Site water. Collected water runoff would be discharged to the Temescal Creek channel following on-site treatment, discharged to the sanitary sewer (if permitted), or transported off-site for treatment and discharge.

Treatment and discharge of groundwater to Temescal Creek is currently authorized by existing permits, and the proposed project would not significantly increase the volume of treated water to be discharged or exceed the limits of the permit. In addition, this minimal increase would be temporary, as it would primarily occur during the dewatering process.

Wastewater generated by the decontamination of field equipment would be collected and conveyed to the Dewatering pretreatment unit where solids would settle for removal and water would be pumped to the groundwater dewater treatment system and the treated water discharged to the Temescal Creek channel or to the sanitary sewer under permit]

With the implementation of these measures, the proposed project would comply with wastewater treatment requirements.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☒ **Less Than Significant Impact**
☐ No Impact

b. Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects.

Impact Analysis:

The proposed project would not permanently change the existing on-site land use type or intensity; hence, construction of new or expanded water or wastewater facilities is not required. Water from on-site fire hydrants will be used for dust and vapor suppression and decontamination. Dust and vapor suppression activities will be conducted in a manner that avoids creating runoff.

Any increase in wastewater discharge to the sanitary sewer (if permitted) associated with the dewatering or decontamination activities would be minimal and temporary and would not result in a need for expanded treatment capacity at the EBMUD sanitary sewer treatment plant.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☒ **Less Than Significant Impact**
☐ No Impact

c. Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects.

Impact Analysis:

The existing storm water management system on the Site that collects storm water and discharges it to Temescal Creek will continue to operate as needed during implementation activities. Collected water runoff from areas impacted by project activities will be discharged to: 1) Temescal Creek following on-site treatment; 2) discharged to the sanitary sewer (if permitted); or 3) transported off-site for treatment and discharge. Any such discharges would be conducted in accordance with all applicable requirements and policies of the DTSC. No new impervious surface area will be added to the Site as a result of the proposed project, and therefore no additional flow of storm water will be generated from additional pavement. As such, no new storm water facilities will be constructed and the project will not have a significant impact on storm water drainage facilities.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☒ **Less Than Significant Impact**
☐ No Impact

d. Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed.

Impact Analysis:

The proposed project activities would require water from on-site fire hydrants for equipment decontamination, dust control, and vapor control measures during excavation, shoring, stockpiling and handling, loading, and backfilling. This use of this water would be minimal and temporary. The proposed project activities would therefore not have a significant impact on water supplies in the area.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☒ **Less Than Significant Impact**
☐ No Impact

e. Result in determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the providers existing commitments.

Impact Analysis:

The proposed project activities on-site would be temporary and would require minimal sanitary wastewater disposal to EBMUD. Therefore, it would not have a significant impact on wastewater service capacity.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☐ Less Than Significant Impact
☒ **No Impact**

f. Be served by a landfill with sufficient permitted capacity to accommodate the projects solid waste disposal needs.

Impact Analysis:

The project will excavate impacted soil/debris that will be loaded into trucks and/or railroad gondola cars for off-site disposal at an approved disposal facilities. The estimated 64,000 cubic yards of material transported off-site for disposal, represents a one-time disposal volume that, based upon preliminary communications with potential transport and disposal contractors, can be accommodated within planned receiving facility capacity with no significant change to the planned facility life expectancy. Therefore, the project will not have a significant impact on landfill capacity.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☒ **Less Than Significant Impact**
☐ No Impact

g. Comply with federal, state, and local statutes and regulations related to solid waste.

Impact Analysis:

All excavation, transport, and disposal of the contaminated soils from the Site would be carried out in accordance with applicable statutes and regulations, as described in the FS (CDM, 2009a). This would include development of and compliance with the DTSC-approved RDIP.

Conclusion:
☐ Potentially Significant Impact
☐ Potentially Significant Unless Mitigated
☐ Less Than Significant Impact
☒ **No Impact**

Mandatory Findings of Significance

Based on evidence provided in this Initial Study, DTSC makes the following findings:

a. The project ☐ has ☒ does not have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal, or eliminate important examples of the major periods of California history or prehistory.

b. The project ☐ has ☒ does not have impacts that are individually limited but cumulatively considerable. "Cumulatively considerable" means that the incremental effects of an individual project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects.

The proposed project is to remove impacted soil and to replace it with clean, imported soil. The project will take approximately six months to complete. Following completion of the project, no long-term effects will remain that could impact the issues defined in this section. However, concurrent projects must be considered for potential cumulative results that could arise, even if temporary. The concurrent projects considered for cumulative effects are indicated in **Figure 6**. These projects are summarized in **Table 10**.

This CEQA analysis demonstrates that several resources with the potential to be impacted by the proposed project would not be significantly affected. Therefore, the project would not contribute to any cumulatively considerable impacts on these resources when added to the impacts from concurrent projects. The resources that would not be affected by the proposed project include: agricultural resources, biological resources, land use and planning, mineral resources, population and housing, and recreation.

The project would have less than significant impacts on other resources, and it must be determined if these impacts could become cumulatively considerable when added to potential impacts identified in **Table 10**.

Table 10 ***Concurrent Projects Considered for Cumulative Effects***		
Project Name, Location	***Description***	***Project Construction Schedule***
Park Street Beautification; Park St between Halleck St. and Hollis St, And Horton St between 40th St and 45th St.	Sidewalk widening; additional street tree plantings; limit truck turning on to Park Avenue west of Hollis St. to Hollis and Halleck Streets; place corner bulbouts at the intersection of Park Avenue with Holden, Horton, and Hubbard Streets; bike racks on every block face of Park avenue; create a park north of Sherwin Avenue and west of Horton St.; create a public space on Park Avenue and west of Halleck St.; a park potentially on the north side of perk avenue midway between Hollis St. and the railroad.	Present through August 2010.
Pixar Project, 1200 park Avenue Between Hollis and Watt.	New production building of about 155,000 square feet at northeast corner of Park Avenue and Hollis Street. Phase II includes expansion of surface parking lot and construction of new City park and bike path at east end of campus. (Not anticipated to affect S-W traffic).	Present through 2011
Horton Landing Park/South Bayfront Pedestrian-Bicycle Bridge, over Union Pacific Railroad.	A pedestrian-bicycle overpass over the Union Pacific Railroad to the north of the S-W Property and the former Rifkin Property	October 2009-Summer 2010
Transit Center, Horton and 59th	Mixed use transit-oriented development and public parking structure with about 248,000 square feet of office/lab/retail space, and 300 parking spaces in a 135- foot tall tower on the “Mound” site; and a 600-space, 7 level parking garage with 3,620 square feet of retail/office space on the Heritage Square site.	November 2009-Spring 2010
Emery Station Greenway, Hollis and 59th	New 91,000 square foot laboratory building on southern portion; existing 39,000 square foot industrial building on northern portion to remain for now. Project includes Greenway improvements on northern portion of block and expansion of plaza at Powell and Hollis Streets.	August 2009- Spring 2010
Public Market Redevelopment; Christie and 64th	Approximately 210 residential rental units and 7 ground floor “shopkeeper” units in a six-story building.	Start in Spring 2010
Bay Street Site B Development, Christie/Shellmound/Powell/railroad	Northern expansion of Bay Street mixed use project, with 150-room hotel in 240-foot tower, 140 to 240 residential units, 80,000 to 130,000 s.f. of retail, possibly including a Nordstrom’s department store, and 800- 900 parking spaces.	Start in November 2010

AESTHETICS

The proposed project could have an impact on aesthetics due to the visibility of the Site from the surrounding residences. However, any impacts would be temporary, as the Site would be restored to existing conditions (and potentially improved with the addition of hydro-seed, pending determinations of the City of Emeryville). Therefore, the aesthetic impacts would be less than significant.

The proposed project may impact improvements made to the Park Avenue and Halleck Street intersection by the City of Emeryville’s Park Street Beautification project. Impacts may arise from legally loaded truck traffic travelling along the preferred route over the newly finished

street. Mitigation of these potential impacts may be necessary (e.g., via placement of cushioning materials over the top of the intersection surfacing).

Based on the temporary nature of the visual impact and the implementation of mitigation measures for potential physical impacts at Park Avenue and Halleck Street, the proposed project would not contribute to cumulatively considerable impacts on aesthetics.

AIR QUALITY

The proposed project would not have cumulative impacts with the concurrent projects. All projects in the area are required to follow the BAAQMD's requirements for fugitive dust control and thus, impacts would be less than significant. The proposed project would not result in any net increase in operational air emissions, as temporary construction emissions would stop once project activities are complete. As a result, there would be no cumulatively significant impacts from project operations.

CULTURAL

The proposed project is not anticipated to have any significant impacts on cultural resources. However, unknown cultural resources could potentially be impacted during construction activities, and mitigation measures have been outlined to ensure that these potential impacts would be less than significant if cultural resources were unexpectedly encountered. Based on the absence of known cultural resources that could be impacted by the proposed project, and the guidelines that will also be adhered to by concurrent projects, there would not be cumulatively considerable impacts from the proposed project.

GEOLOGY AND SOILS

The proposed project would have less than significant impacts on geology and soils, and the design of the project includes measures to maintain the integrity of the surrounding surfaces. None of the concurrent projects considered would involve deep excavation within the area and therefore, would not be expected to have significant impacts on geology and soils. Therefore, the project would not result in cumulatively considerable impacts on geology and soils.

HAZARDOUS MATERIALS

The proposed project would remove contaminated soil and debris, some of which would be classified as a hazardous waste. None of the projects considered for cumulative impacts would generate hazardous materials, or involve the use of such materials in any significant amount. In addition, the technologies applied to manage the excavated soil are feasible and are standard to the waste treatment industry, and the proposed project actions would not require development of new technologies in order to be completed. Furthermore, the amount of waste material from the proposed excavations would be finite, and their treatment and/or disposal would be a temporary activity that would cease at the completion of the project. No significant impacts associated with hazardous materials would occur, and the project would not contribute to cumulatively considerable impacts.

HYDROLOGY AND WATER QUALITY

The proposed project would have less than significant impacts on water quality. The project is designed to improve the quality of groundwater and to prevent further spread of contamination,

while protecting surrounding groundwater and surface water. Concurrent projects are not anticipated to have a significant effect on groundwater or surface water, as they occur within developed areas and do not directly involve hydrology components. In addition, concurrent projects would also be required to implement construction best management practices (BMPs) to avoid impacts from Site runoff during construction. Therefore, the proposed project would not contribute to cumulatively considerable impacts on hydrology and water quality.

NOISE

The proposed project would not result in significant cumulative noise impacts when considered with the concurrent projects. Except for the Horton Landing Park pedestrian-bicycle bridge, the concurrent projects are located at a distance from the Site so that the noise generated by these projects when combined with the noise generated by the proposed project would not produce perceptibly higher noise levels at the project Site. The noise generated by the Horton Landing Park bridge project may overlap the proposed project activities but the combined noise level would be expected to be less than 3 dBA higher than the proposed project alone, which is an insignificant change (impact).

TRANSPORTATION AND TRAFFIC

The proposed project would have less than significant impacts on cumulative transportation and traffic impacts with the concurrent projects. The less than significant transportation and traffic impacts of the project would occur in close proximity to the Site, to the south along the preferred truck route. Except for the Park Street Beautification project, which includes Park Street between Halleck Street and Hollis Street, and Horton Street, between 40th Street and 45th Street, all of the concurrent projects are located far enough away that transportation impacts for those projects will be focused on the transportation system north of the project Site. By mandating truck traffic to the south of the Site, to be specified in the Transportation and Traffic Control Plan created for the project, the mixing of project traffic with current and/or future concurrent project traffic will be minimized. Depending on construction timing, there may be some observed overlap between this project's hauling activities and construction activities associated with the Park Street Beautification project, however these will be temporary in nature and are not considered to be cumulatively considerable. Employee traffic is estimated at 30 vehicle trips per day, which would temporarily add imperceptible volume to area roadways and intersections.

UTILITIES AND SERVICES

The proposed project would have less than significant impacts on utilities and services. It would not increase demand on local utilities or services, or create a new need for these. Concurrent projects may require additional utility services, such as water or electricity for new facilities; however the proposed project would be temporary, and would not be contribute to these new demands. Therefore, the proposed project would not contribute to cumulatively considerable impacts on utilities and services.

c. The project ☐ has ☒ does not have environmental effects that will cause substantial adverse effects on human beings, either directly or indirectly.

Determination of Appropriate Environmental Document:

Based on evidence provided in this Initial Study, DTSC makes the following determination:

☐ The proposed project COULD NOT HAVE a significant effect on the environment. A **Negative Declaration** will be prepared.

☒ The proposed project COULD HAVE a significant effect on the environment. However, there will not be a significant effect in this case because revisions in the project have been made by or agreed to by the project proponent. A **Mitigated Negative Declaration** will be prepared.

☐ The proposed project MAY HAVE a significant effect on the environment. An **Environmental Impact Report** is required.

☐ The proposed project MAY HAVE a "potentially significant impact" or "potentially significant unless mitigated" impact on the environment, but at least one effect 1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and 2) has been addressed by mitigation measures based on the earlier analysis as described on attached sheets. An **Environmental Impact Report** is required, but it must analyze only the effects that remain to be addressed.

☐ The proposed project COULD HAVE a significant effect on the environment. However, all potentially significant effects (a) have been analyzed adequately in an earlier Environmental Impact Report or Negative Declaration pursuant to applicable standards, and (b) have been avoided or mitigated pursuant to that earlier Environmental Impact Report or Negative Declaration, including revisions or mitigation measures that are imposed upon the proposed project. Therefore, nothing further is required.

Certification:

I hereby certify that the statements furnished above and in the attached exhibits, present the data and information required for this initial study evaluation to the best of my ability and that the facts, statements and information presented are true and correct to the best of my knowledge and belief.

Preparer's Signature		Date
Preparer's Name	Preparer's Title	Phone #
Branch or Unit Chief Signature		Date
Branch or Unit Chief Name	Branch or Unit Chief Title	Phone #

ACRONYMS AND ABBREVIATIONS

AB	Assembly Bill
ABAG	Association of Bay Area Governments
AC Transit	Alameda-Contra Costa Transit District
ADT	Average Daily Traffic
AMDRP	Archaeological Monitoring and Data Recovery Plan
BAAQMD	Bay Area Air Quality Management District
bgs	below ground surface
BMPs	Best Management Practices
Cal/OSHA	California Division of Occupational Safety and Health
Caltrans	California Department of Transportation
CARB	California Air Resources Board
CDM	Camp Dresser & McKee Inc.
CEQA	California Environmental Quality Act
CH_4	methane
CHRIS	California Historical Resources Inventory System
CIDH	cast-in-drilled-hole
CNDDB	California Natural Diversity Database
CNEL	community noise equivalent level
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
COCs	Chemicals of concern
CRHR	California Register of Historical Resources
dB	decibels
dBA	A-weighted decibels
DOC	California Department of Conservation
DPM	diesel particulate matter
DTSC	California Department of Toxic Substances Control
DVCP	Dust and Vapor Control Plan
EBMUD	East Bay Municipal Utility District
EFD	City of Emeryville Fire Department
EPD	City of Emeryville Police Department
FS	Feasibility Study
GHG	greenhouse gas
GWET	groundwater extraction and treatment
GWP	Global Warming Potential
HAZWOPER	Hazardous Waste Operations and Emergency Response
HASP	health and safety plan
in	inch
IRMs	interim remedial measures
L_{dn}	day-night noise level
L_{eq}	one-hour equivalent sound levels

L_{max}	Maximum sound levels
lbs	pounds
LOS	Level of Service
LUCs	Land Use Controls
mph	miles per hour
MT	metric tons
Novartis	Novartis Vaccines and Diagnostics, Inc.
N_2O	nitrous oxide
NHPA	National Historic Preservation Act of 1966
NOx	oxides of nitrogen
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
NWS	National Weather Service
O_3	ozone
Parks	Emeryville Community Services Department
PG&E	Pacific Gas and Electric Company
PHERA	Public Health Evaluation of the Remedial Alternative
$PM_{2.5}$	particulate matter up to 2.5 microns in diameter
PM_{10}	particulate matter up to 10 microns in diameter
PPE	personal protective equipment
PRG	Preliminary Remediation Goal
PUD	Planned Unit Development
RAP	Draft Remedial Action Plan
RDIP	Remedial Design and Implementation Plan
S-W	The Sherwin-Williams Company
SB	Senate Bill
sec	second
SVE	soil vapor extraction
SWPPP	Storm Water Pollution Prevention Plan
TAC	toxic air contaminant
UPRR	Union Pacific Railroad
USFWS	U.S. Fish and Wildlife Service
VOCs	volatile organic compounds
vpd	vehicles per day
Water Board	San Francisco Bay Regional Water Quality Control Board
Williamson Act	California Land Conservation Act
WMU	Waste Management Unit
WSA	William Self Associates, Inc.
yr	year

FIGURES

Figure 1 Site Location
Figure 2 Site Plan
Figure 3 Preliminary Site Layout and Controls
Figure 4 Truck Transportation Route Alternatives
Figure 5 Preferred Truck Transportation Route Map
Figure 6 Concurrent Emeryville Projects

ATTACHMENTS

Attachment A References
Attachment B CNNDB List
Attachment C Cultural Resource Assessment
Attachment D Public Health Evaluation of the Remedial Alternative

Figure 1
Site Location Map
Sherwin-Williams Company
Emeryville, California

CDM

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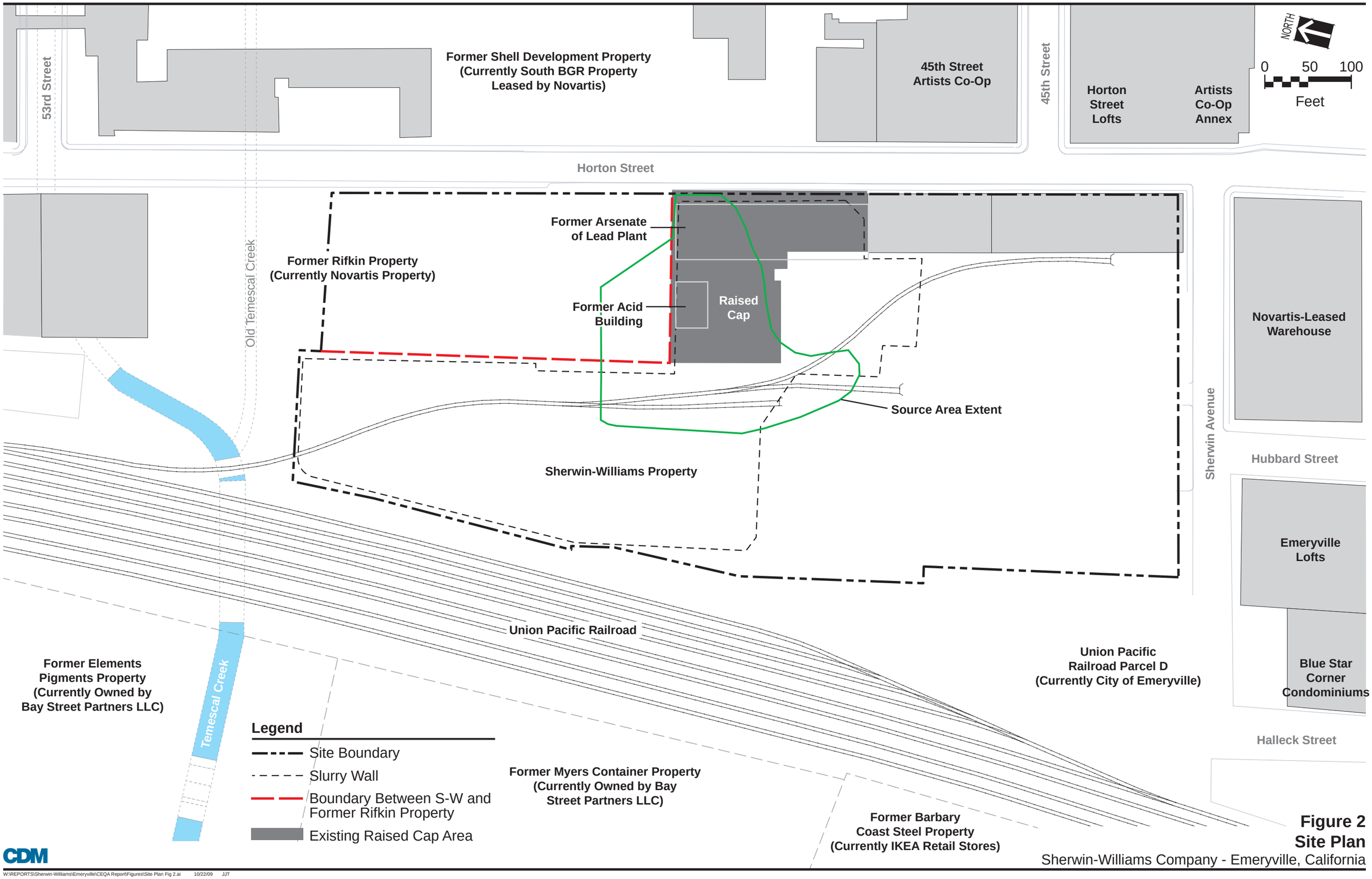

Figure 2
Site Plan
Sherwin-Williams Company - Emeryville, California

CDM

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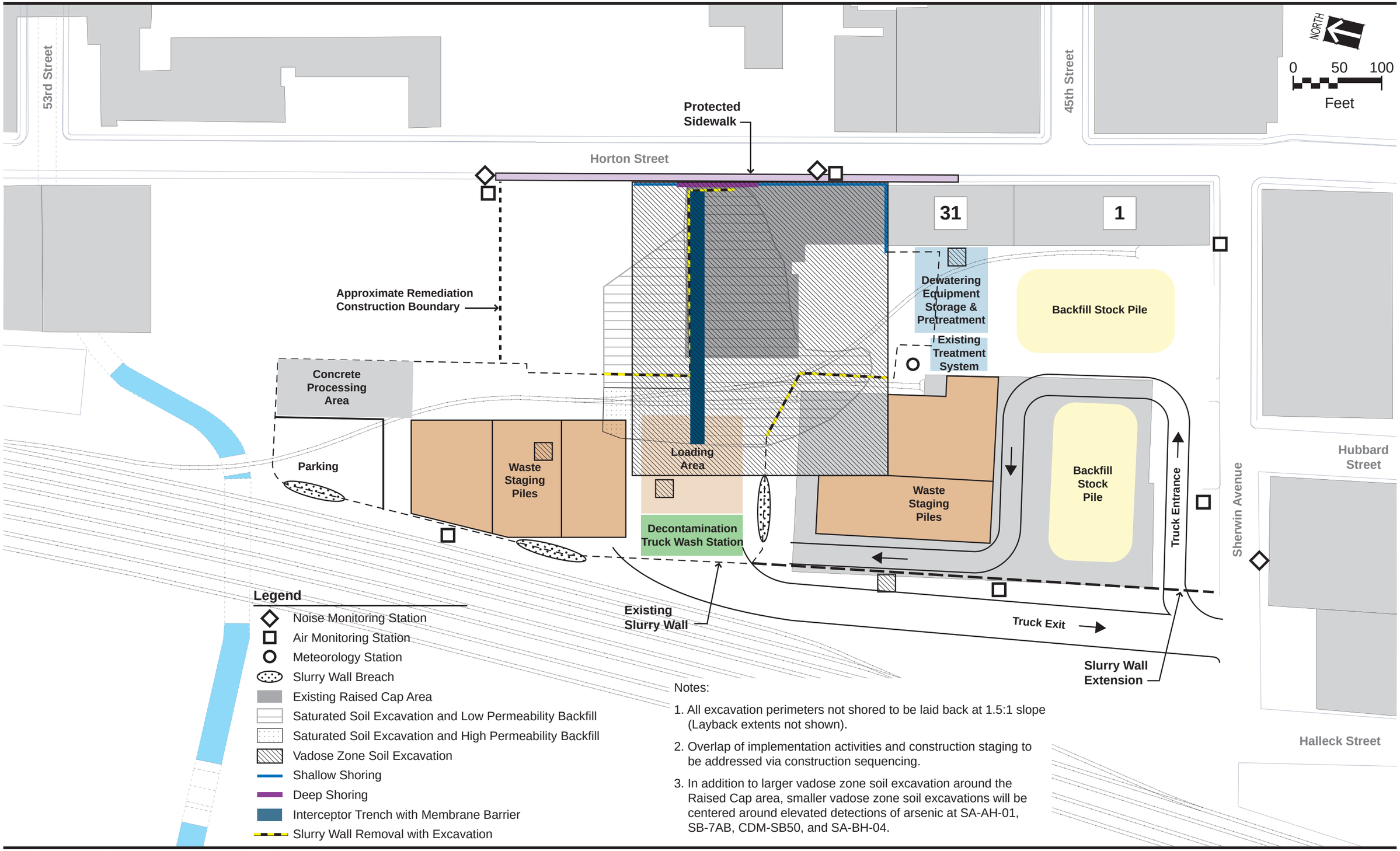

Notes:

1. All excavation perimeters not shored to be laid back at 1.5:1 slope (Layback extents not shown).
2. Overlap of implementation activities and construction staging to be addressed via construction sequencing.
3. In addition to larger vadose zone soil excavation around the Raised Cap area, smaller vadose zone soil excavations will be centered around elevated detections of arsenic at SA-AH-01, SB-7AB, CDM-SB50, and SA-BH-04.

W:\REPORTS\Sherwin-Williams\Emeryville\CEQA Report\Figures\Preliminary Site Layout and Controls Fig 2.ai 10/22/09 JJT

CDM

Figure 3
Preliminary Site Layout and Controls
Sherwin-Williams Company - Emeryville, California

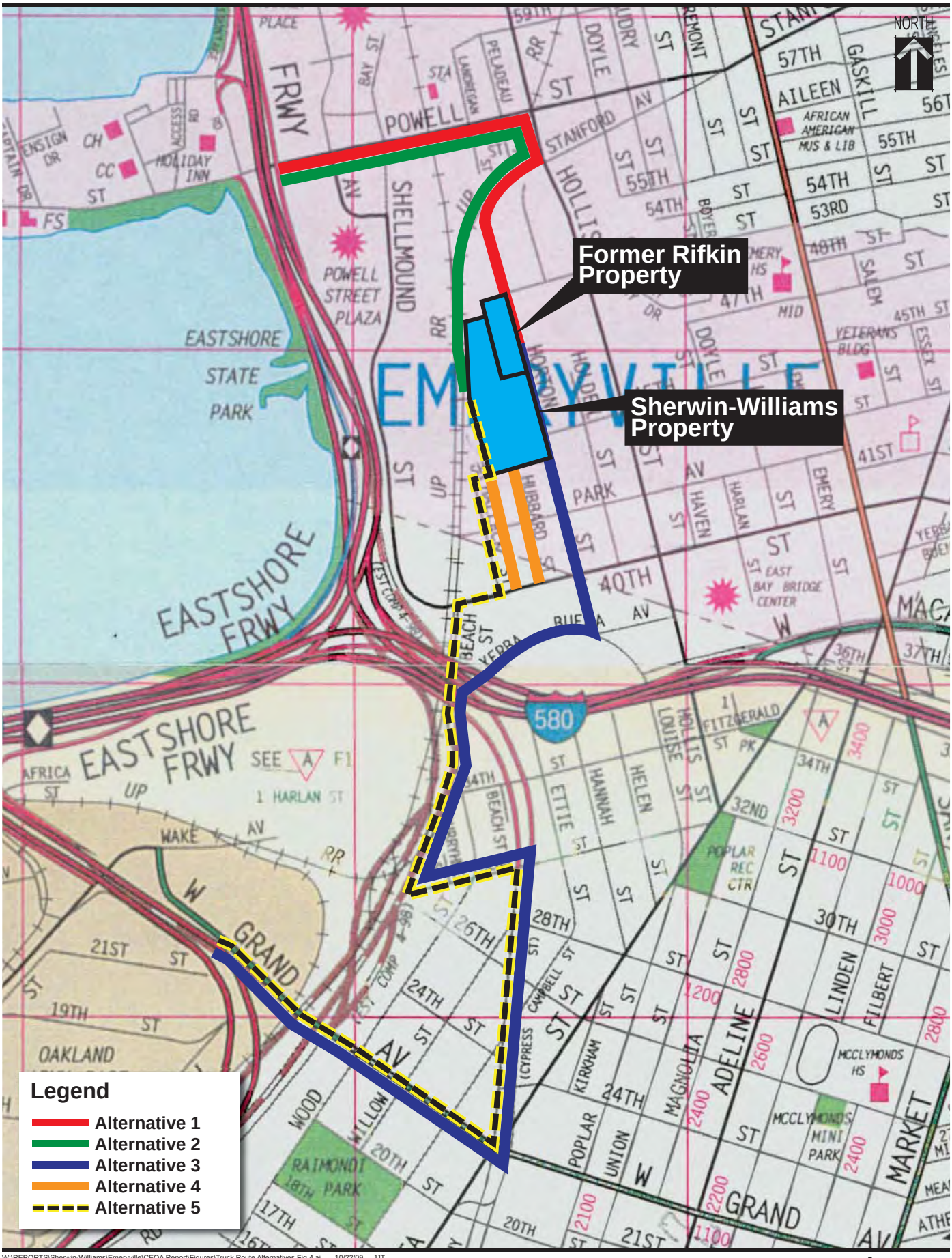

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Figure 4

Truck Transportation Route Alternatives

Sherwin-Williams Company - Emeryville, California

CDM

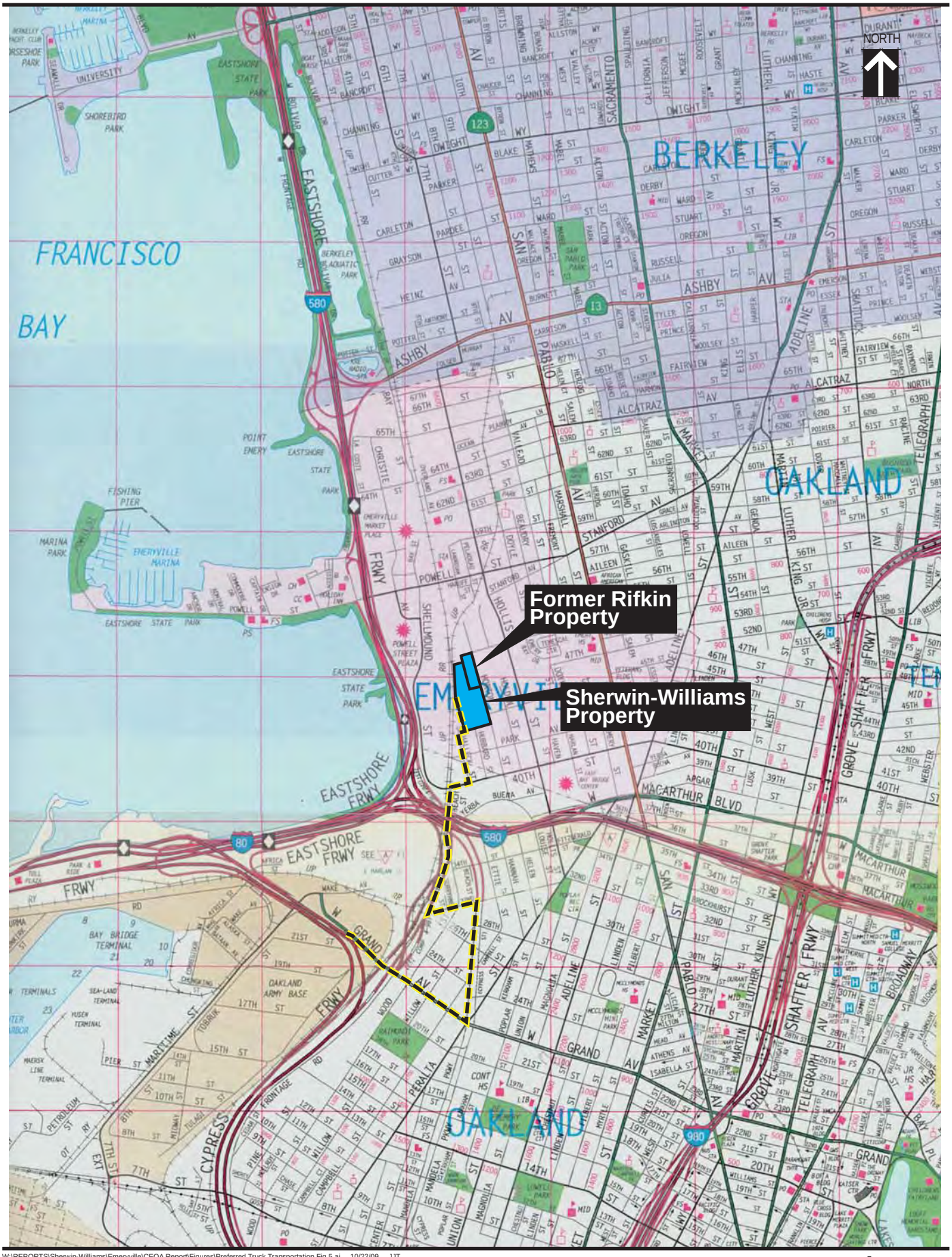

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Figure 5

Preferred Truck Transportation Route Map

Sherwin-Williams Company - Emeryville, California

CDM

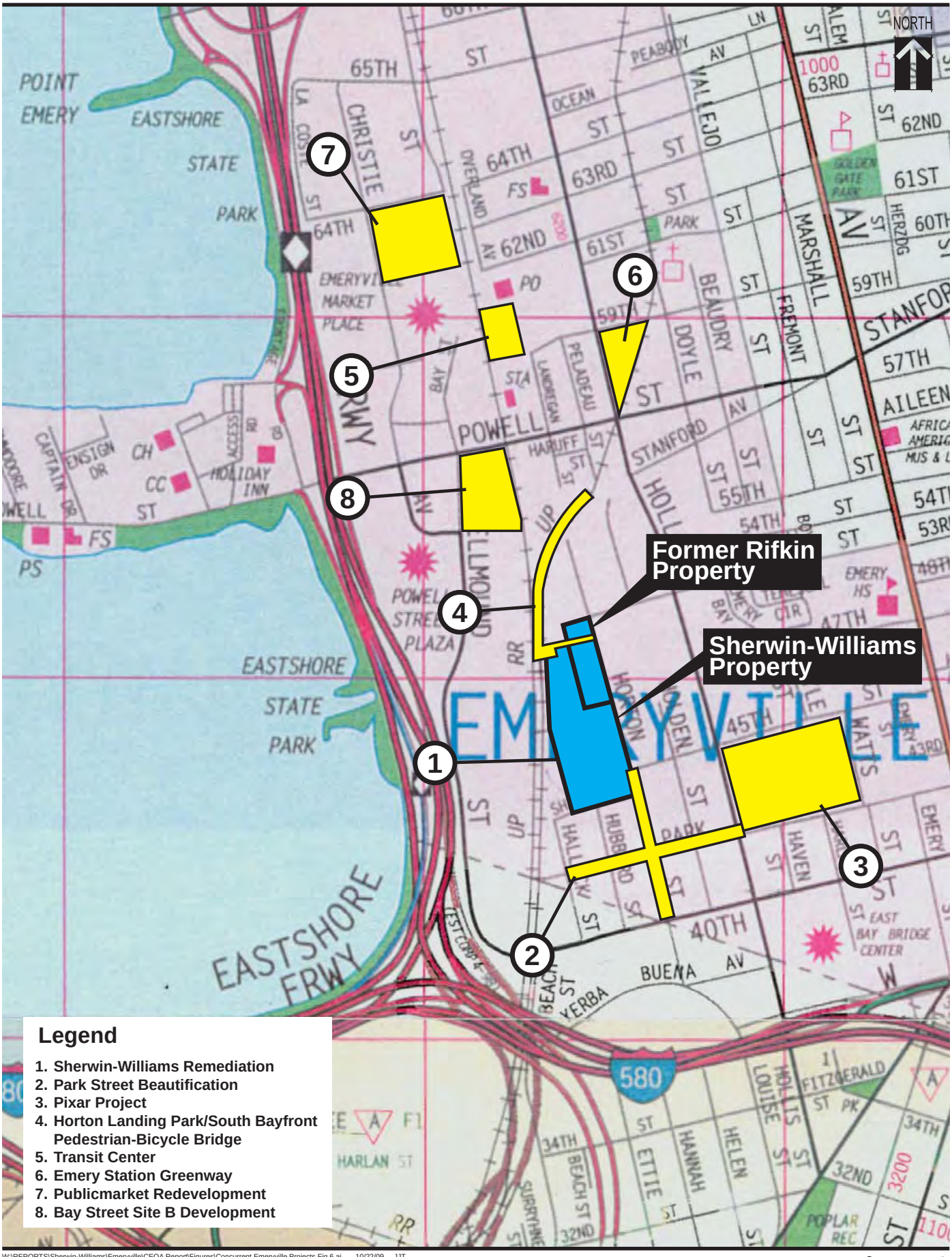

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Figure 6

Concurrent Emeryville Projects

Sherwin-Williams Company - Emeryville, California

CDM

Attachment A
References

ATTACHMENT A

REFERENCES

ABAG, Bay Area Shaking Hazard Maps, http://quake.abag.ca.gov/mapsba.html, 1999.

ABAG, The REAL Dirt on Liquefaction, http://quake.abag.ca.gov/liquefac/liquefac.html, 2001.

American Industrial Hygiene Association (AIHA). 1993. *Odor Thresholds for Chemicals with Established Occupational Health Standards*. 1993.

Bay Area Air Quality Management District (BAAQMD). 1999. *BAAQMD CEQA Guidelines: Assessing the Air Quality Impacts of Projects and Plans*. December 1999. Available online at: http://www.baaqmd.gov/Divisions/Planning-and-Research/Planning-Programs-and-Initiatives/CEQA-GUIDELINES.aspx

Bay Area Air Quality Management District (BAAQMD). 2005. Particulate Matter Implementation Schedule. November 2005

Bay Area Air Quality Management District (BAAQMD). 2009. *California Environmental Quality Act Thresholds of Significance*. Workshop Draft Options Report. April. Available online at: http://www.baaqmd.gov/pln/ceqa/index.htm [Accessed June 5, 2009]

Bolt, Beranek and Newman, Inc., Fundamentals and Abatement of Highway Traffic Noise, Report PB222-703. Prepared for the Federal Highway Administration, June 1973.

California Air Resources Board (CARB). 2007 Regulation for the Mandatory Reporting of Greenhouse Gas Emissions. December 2007. Available online at: http://www.arb.ca.gov/regact/2007/ghg2007/frofinoal.pdf

California Air Resources Board (CARB). 2008a *Ambient Air Quality Standards Chart*. November 17 2008. Available online at: http://www.arb.ca.gov/research/aaqs/aaqs2.pdf.

California Air Resources Board (CARB). 2008b *Recommended Approaches for Setting Interim Significance Thresholds for Greenhouse Gases under the California Environmental Quality Act. Preliminary Draft Staff Report.* October 24 2008. Available online at: http://www.arb.ca.gov/cc/localgov/ceqa/meetings/102708/prelimdraftproposal102408.pdf.

California Department of Conservation (DOC), Division of Land Resource Protection, Farmland Mapping and Monitoring Program, Alameda County Important Farmland 2008 Map, 2008 (DOC, 2008a). Available online at: http://www.consrv.ca.gov/dlrp/fmmp/Pages/index.aspx (Accessed September 16, 2009)

California Department of Conservation (DOC), Division of Land Resource Protection, Farmland Mapping and Monitoring Program, Alameda County Williamson Act Lands 2008, (DOC, 2008b). Available online at: ftp://ftp.consrv.ca.gov/pub/dlrp/wa/Map%20and%20PDF/Alameda/AlamedaWA_08_09.pdf.

California Department of Conservation (DOC), A General Location Guide for Ultramafic Rocks in California - Areas More Likely to Contain Naturally-Occurring Asbestos, 2000, Compiled by Ronald K. Churchill and Robert L. Hill, August 2000. Available online at: ftp://ftp.consrv.ca.gov/pub/dmg/pubs/ofr/ofr_2000-019.pdf (Accessed on September 16, 2009)

California Department of Conservation (DOC), Division of Mines and Geology, Special Publication 42, Fault-Rupture Hazard Zones in California, 1997 edition. Available online at: ftp://ftp.consrv.ca.gov/pub/dmg/pubs/sp/Sp42.pdf (Accessed on September 16, 2009)

California Department of Fish and Game (DFG), 2009, California Natural Diversity Database. http://www.dfg.ca.gov/biogeodata/cnddb/, (Accessed on August 5, 2009).

California Department of Transportation (Caltrans), Officially Designated Scenic Highways. Available online at: http://itvendors.dot.ca.gov/hq/LandArch/scenic/schwy.htm Accessed September 16, 2009.

California Environmental Protection Agency, Cortese List Data Resources, 2009. Available online at: http://www.calepa.ca.gov/SiteCleanup/CorteseList/ (Accessed on September 16, 2009)

Camp Dresser & McKee Inc., May 26 2009. *The Sherwin-Williams Company Remedial Action Plan Draft Report – DTSC Review Version, Chapter 6 Remediation and Restoration*, Emeryville, California.

CDM, 2009a. Feasibility Study, Sherwin-Williams Company, Emeryville, California. April 1, 2009.

CDM, 2009b. Report for Public Health Evaluation of the Remedial Alternative. The Sherwin-Williams Company Emeryville, California. April 10, 2009.

City of Emeryville, 2009a. *Draft General Plan, General Plan Land Use Map*. http://ca-emeryville.civicplus.com/index.aspx?NID=518

City of Emeryville, 2009b. *Zoning Districts Map, 2009*. http://ca-emeryville.civicplus.com/DocumentView.aspx?DID=377

City of Emeryville. January 2009. *Emeryville Draft General Plan – Chapter 3 Transportation*, Emeryville, California.

City of Emeryville General Plan, Noise Element. http://ca-emeryville.civicplus.com/index.aspx?NID=518 , Chapter 6: Conservation, Safety and Noise.

City of Emeryville Noise Ordinance. http://ca-emeryville.civicplus.com/DocumentView.aspx?DID=325

City of Emeryville Zoning Ordinance. http://ca-emeryville.civicplus.com/DocumentView.aspx?DID=369

City of Emeryville, 2006. *Park Avenue District Plan*, *City of Emeryville*. August 2006. http://ca-emeryville.civicplus.com/DocumentView.asp?DID=143

City of Emeryville, 2009c, Planning Commission Staff Report, Housing Element of the General Plan (GPA 09-01), April 15, 2009.

City of Emeryville, 2009d, Emeryville General Plan Draft Environmental Impact Report, May 2009. http://www.ci.emeryville.ca.us/DocumentView.aspx?DID=665

City of Emeryville. May 2009. *Emeryville General Plan Draft Environmental Impact Report*, Emeryville, California. Available online at: http://ca-emeryville.civicplus.com/DocumentView.aspx?DID=665

City of Emeryville (EPD, 2009), personal communication with Emeryville Police Department by Randall Smith, 21 October 2009.

City of Emeryville (EBD, 2009), personal communication with Emeryville Building Department by Randall Smith, 21 October 2009.

ENTRIX, 2002. Remedial Investigation, Sherwin-Williams Site, Emeryville, California, March 8.

Fehr and Peers Transportation Consultants. June 20, 2007. *City of Emeryville Supplemental Cumulative Traffic Analysis – Appendix B: Intersection LOS Summary*, Emeryville, California.

FHWA, *Highway Traffic Noise Analysis and Abatement Policy and Guidance*, June 1995.

FHWA, *Noise Fundamentals Training Document, "Highway Noise Fundamentals",* September, 1980

Florida Department of Transportation, Systems Planning Office. 2002. *Quality/Level of Service Handbook - Chapter 4 General Planning Analysis, Table 4-1 Generalized Annual Average Daily Volumes for Florida's Urbanized Areas (page 85)*, Tallahassee, Florida.

FTA, *Noise and Vibration Impact Assessment,* 2006

Gradient, 2005. Human Health Risk Assessment for 1450 Sherwin Avenue, Emeryville, California. Gradient Corporation. February 11, 2005.

Harris, Cyril M., *Handbook of Acoustical Measurements and Noise Control, Third Edition,* http://ca-emeryville.civicplus.com/DocumentView.aspx?DID=143 Last modified February 19, 2009.

Hart, E.W., (Hart,1997) Fault-Rupture Hazard Zones in California: Alquist-Priolo Special Studies Zones Act of 1972 with Index to Special Studies Zones Maps, California Division of Mines and Geology, Special Publication 42, 1990 (revised and updated 1997),

Michael Minor & Associates, Vibration Primer http://www.drnoise.com/ PDF_files/Vibration%20Primer.pdf.

Noise Control Engineering Journal, Construction Noise Control Program and Mitigation Strategy at the Central Artery/Tunnel Project, Sep-Oct, 2000.

Norfleet Consultants, 1998. Groundwater Study and Water Supply History of the East Bay Plain, Alameda & Contra Costa Counties, CA prepared for: The Friends of the San Francisco Estuary.

Transportation Research Board - National Research Council. 2000. *Highway Capacity Manual (HCM2000) - Chapter 9 Analytical Procedures Overview, Section VI Service Volume Tables, Page 9-9*, Washington D.C.

U.S. EPA, Information on Levels of Environmental Noise Requisite to Protect Public Health and USGS, 2008. The Uniform California Earthquake Rupture Forecast, Version 2 (UCERF 2), by 2007 Working Group on California Earthquake Probabilities, USGS Open File Report 2007-1437 / CGS Special Report 203 / SCEC Contribution #1138. 2008. Welfare with an Adequate Margin of Safety, March 1974.

US Fish and Wildlife Service, National Wetlands Inventory Mapper, 2009. http://www.fws.gov/wetlands/data/GoogleEarth.html

Attachment B
CNNDB List

California Department of Fish and Game
Natural Diversity Database
Selected Elements by Common Name - Portrait

	Common Name/Scientific Name	Element Code	Federal Status	State Status	GRank	SRank	CDFG or CNPS
1	A leaf-cutter bee *Trachusa gummifera*	IIHYM80010			G1	S1	
2	Alameda Island mole *Scapanus latimanus parvus*	AMABB02031			G5T1Q	S1	SC
3	Alameda song sparrow *Melospiza melodia pusillula*	ABPBXA301S			G5T2?	S2?	SC
4	California black rail *Laterallus jamaicensis coturniculus*	ABNME03041		Threatened	G4T1	S1	
5	California clapper rail *Rallus longirostris obsoletus*	ABNME05016	Endangered	Endangered	G5T1	S1	
6	California least tern *Sternula antillarum browni*	ABNNM08103	Endangered	Endangered	G4T2T3Q	S2S3	
7	California tiger salamander *Ambystoma californiense*	AAAAA01180	Threatened	unknown code...	G2G3	S2S3	SC
8	Choris' popcorn-flower *Plagiobothrys chorisianus var. chorisianus*	PDBOR0V061			G3T2Q	S2.2	1B.2
9	Cooper's hawk *Accipiter cooperii*	ABNKC12040			G5	S3	
10	Kellogg's horkelia *Horkelia cuneata ssp. sericea*	PDROS0W043			G4T1	S1.1	1B.1
11	Northern Coastal Salt Marsh	CTT52110CA			G3	S3.2	
12	Point Reyes bird's-beak *Cordylanthus maritimus ssp. palustris*	PDSCR0J0C3			G4?T2	S2.2	1B.2
13	San Francisco Bay spineflower *Chorizanthe cuspidata var. cuspidata*	PDPGN04081			G2T2	S2.2	1B.2
14	San Joaquin spearscale *Atriplex joaquiniana*	PDCHE041F3			G2	S2	1B.2
15	Santa Cruz tarplant *Holocarpha macradenia*	PDAST4X020	Threatened	Endangered	G1	S1.1	1B.1
16	adobe sanicle *Sanicula maritima*	PDAPI1Z0D0		Rare	G2	S2.2	1B.1
17	alkali milk-vetch *Astragalus tener var. tener*	PDFAB0F8R1			G1T1	S1.1	1B.2
18	beach layia *Layia carnosa*	PDAST5N010	Endangered	Endangered	G2	S2.1	1B.1
19	bent-flowered fiddleneck *Amsinckia lunaris*	PDBOR01070			G2	S2.2	1B.2
20	big free-tailed bat *Nyctinomops macrotis*	AMACD04020			G5	S2	SC
21	blue coast gilia *Gilia capitata ssp. chamissonis*	PDPLM040B3			G5T2	S2.1	1B.1
22	bristly sedge *Carex comosa*	PMCYP032Y0			G5	S2?	2.1
23	double-crested cormorant *Phalacrocorax auritus*	ABNFD01020			G5	S3	
24	hoary bat *Lasiurus cinereus*	AMACC05030			G5	S4?	

	Common Name/Scientific Name	Element Code	Federal Status	State Status	GRank	SRank	CDFG or CNPS
25	mimic tryonia (=California brackishwater snail) *Tryonia imitator*	IMGASJ7040			G2G3	S2S3	
26	northern harrier *Circus cyaneus*	ABNKC11010			G5	S3	SC
27	pallid bat *Antrozous pallidus*	AMACC10010			G5	S3	SC
28	robust spineflower *Chorizanthe robusta var. robusta*	PDPGN040Q2	Endangered		G2T1	S1.1	1B.1
29	rose leptosiphon *Leptosiphon rosaceus*	PDPLM09180			G1	S1.1	1B.1
30	round-leaved filaree *California macrophylla*	PDGER01070			G3	S3.1	1B.1
31	saline clover *Trifolium depauperatum var. hydrophilum*	PDFAB400R5			G5T2?	S2.2?	1B.2
32	salt-marsh harvest mouse *Reithrodontomys raviventris*	AMAFF02040	Endangered	Endangered	G1G2	S1S2	
33	saltmarsh common yellowthroat *Geothlypis trichas sinuosa*	ABPBX1201A			G5T2	S2	SC
34	sandy beach tiger beetle *Cicindela hirticollis gravida*	IICOL02101			G5T2	S1	
35	seaside tarplant *Hemizonia congesta ssp. congesta*	PDAST4R065			G5T2T3	S2S3	1B.2
36	tidewater goby *Eucyclogobius newberryi*	AFCQN04010	Endangered		G3	S2S3	SC
37	white-tailed kite *Elanus leucurus*	ABNKC06010			G5	S3	

United States Department of the Interior

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FISH AND WILDLIFE SERVICE

Fish & Wildlife Service logo

Sacramento Fish and Wildlife Office
2800 Cottage Way, Room W-2605
Sacramento, California 95825

August 5, 2009

Document Number: 090805113529

Ilana Cohen
CDM
2295 Gateway Oaks Drive
Suite 240
Sacramento, CA 95833

Subject: Species List for Sherwin-Williams Remedial Action Plan

Dear: Ms. Cohen

We are sending this official species list in response to your August 5, 2009 request for information about endangered and threatened species. The list covers the California counties and/or U.S. Geological Survey 7½ minute quad or quads you requested.

Our database was developed primarily to assist Federal agencies that are consulting with us. Therefore, our lists include all of the sensitive species that have been found in a certain area *and also ones that may be affected by projects in the area*. For example, a fish may be on the list for a quad if it lives somewhere downstream from that quad. Birds are included even if they only migrate through an area. In other words, we include all of the species we want people to consider when they do something that affects the environment.

Please read Important Information About Your Species List (below). It explains how we made the list and describes your responsibilities under the Endangered Species Act.

Our database is constantly updated as species are proposed, listed and delisted. If you address proposed

and candidate species in your planning, this should not be a problem. However, we recommend that you get an updated list every 90 days. That would be November 03, 2009.

Please contact us if your project may affect endangered or threatened species or if you have any questions about the attached list or your responsibilities under the Endangered Species Act. A list of Endangered Species Program contacts can be found at www.fws.gov/sacramento/es/branches.htm.

Endangered Species Division

Take Pride in America

U.S. Fish & Wildlife Service

Sacramento Fish & Wildlife Office

Federal Endangered and Threatened Species that Occur in

or may be Affected by Projects in the

OAKLAND WEST (466D)

U.S.G.S. 7 1/2 Minute Quad

Database last updated: January 29, 2009

Report Date: August 5, 2009

Listed Species

Fish

Acipenser medirostris

green sturgeon (T) (NMFS)

Eucyclogobius newberryi

tidewater goby (E)

Hypomesus transpacificus

delta smelt (T)

Oncorhynchus kisutch

coho salmon - central CA coast (E) (NMFS)

Oncorhynchus mykiss

Central California Coastal steelhead (T) (NMFS)

Central Valley steelhead (T) (NMFS)

Critical habitat, Central California coastal steelhead (X) (NMFS)

Oncorhynchus tshawytscha

Central Valley spring-run chinook salmon (T) (NMFS)

Critical habitat, winter-run chinook salmon (X) (NMFS)

winter-run chinook salmon, Sacramento River (E) (NMFS)

Amphibians

Rana aurora draytonii

California red-legged frog (T)

Reptiles

Masticophis lateralis euryxanthus

Alameda whipsnake [=striped racer] (T)

Birds

Charadrius alexandrinus nivosus

western snowy plover (T)

Pelecanus occidentalis californicus

California brown pelican (E)

Rallus longirostris obsoletus

California clapper rail (E)

Sternula antillarum (=Sterna, =albifrons) browni

California least tern (E)

Mammals

Reithrodontomys raviventris

salt marsh harvest mouse (E)

Key:

- (E) *Endangered* - Listed as being in danger of extinction.

- (T) *Threatened* - Listed as likely to become endangered within the foreseeable future.
- (P) *Proposed* - Officially proposed in the Federal Register for listing as endangered or threatened.
- (NMFS) Species under the Jurisdiction of the National Oceanic & Atmospheric Administration Fisheries Service. Consult with them directly about these species.
- *Critical Habitat* - Area essential to the conservation of a species.
- (PX) *Proposed Critical Habitat* - The species is already listed. Critical habitat is being proposed for it.
- (C) *Candidate* - Candidate to become a proposed species.
- (V) Vacated by a court order. Not currently in effect. Being reviewed by the Service.
- (X) *Critical Habitat* designated for this species

CNPS Inventory of Rare and Endangered Plants

Status: Plant Press Manager window with 3 items - Fri, Sep. 11, 2009 16:00 c

Reformat list as: Standard List - with Plant Press controls

ECOLOGICAL REPORT

scientific	family	life form	blooming	communities	elevation	CNPS
Amsinckia lunaris	Boraginaceae	annual herb	Mar-Jun	•Coastal bluff scrub (CBScr) •Cismontane woodland (CmWld) •Valley and foothill grassland (VFGrs)	3 - 500 meters	List 1B.2
Gilia capitata ssp. chamissonis	Polemoniaceae	annual herb	Apr-Jul	•Coastal dunes (CoDns) •Coastal scrub (CoScr)	2 - 200 meters	List 1B.1
Trifolium depauperatum var. hydrophilum	Fabaceae	annual herb	Apr-Jun	•Marshes and swamps (MshSw) •Valley and foothill grassland (VFGrs)(mesic, alkaline) •Vernal pools (VnPls)	0 - 300 meters	List 1B.2

Attachment C
Cultural Resource Assessment

ARCHAEOLOGY AND HISTORIC PRESERVATION

MEMORANDUM

TO: **Randy Smith**
CDM

DATE: September 24, 2009

FROM: **James M. Allan, Ph.D., RPA**
Vice-President

SUBJECT: **Sherwin-Williams Remediation Project, Emeryville, California**

In accordance with our agreement, William Self Associates, Inc. (WSA) has implemented an updated records search and assessment of the Sherwin-Williams Remediation Project in Emeryville, California. This memo is to supplement the Cultural Resources Assessment Report prepared by WSA for the project in 2003.

Records Search Results

On behalf of WSA, staff at the California Historical Resources Information System, Northwest Information Center (NWIC) at Sonoma State University conducted an updated records search of the project area and a surrounding ¼-mile radius on July 30, 2009 (File No. 09-0129). The records search was undertaken to determine whether additional cultural resources studies have been undertaken since 2002, if there are any newly recorded cultural resources within the project vicinity that were unknown during the 2002 records search, or if there have been any recently prepared updates to previously recorded sites.

The Cultural Resources Assessment Report prepared by WSA in 2003 for the Sherwin-Williams Remediation Project is the only report on file at the NWIC that encompasses the proposed project area. A total of 27 cultural resources studies have been undertaken within ¼-mile of the project area (Table 1).

Table 1. Cultural Resources Studies Undertaken Within ¼-Mile of the Project Area

Study No.	Author(s)	Year	Title
S-000779	Chavez	1977	Preliminary Cultural Resources Assessment of the East Bay Municipal Utility District (EBMUD) Wet Weather Facilities/Overflow Project Facilities Sites, Alameda and Contra Costa Counties, California.
S-004950	Buss	1982	Archaeological Survey Report for Proposed High Occupancy Vehicle Lanes from the Bay Bridge to Carquinez Bridge, 04-ALNCC-80 2.0/8.0,0.0/14.1 04209-400211.
S-007571	Cope	1985	The Mammalian Fauna of the Emeryville Shellmound, CA-ALA-309.
S-011406	Roop	1989	An Evaluation of the Potential for Archaeological Deposits within the Chiron Development Parcel, City of Emeryville, California.
S-012125	Garaventa, Fong, Jarvis, Banet, Melandry and Pape	1990	Archaeological Survey Report, I-880/Cypress Replacement Project, 04-ALA-880 32.12/34.31, 04-ALA-580 45.99/46.95, 04-ALA-80 1.99/3.39, E.A.#04195-190271 MEQ 85001, Cities of Oakland and Emeryville, Alameda County, California.
S-012221	Garaventa, Jarvis and Busby	1990	First Addendum Archaeological Survey Report, I-880/Cypress Replacement Project, 04-ALA-880 32.12/34.31, 04-ALA-580 45.99/46.95, 04-ALA-80 1.99/3.39, E.A. 04195-190271 MEQ 85001, Cities of Oakland and Emeryville, Alameda County, California.
S-012289	Garaventa, Fong, Jarvis, Banet and Busby	1990	Archaeological Survey Report, I-880/Cypress Replacement Project, 04-ALA-880 P.M. 32.4/34.3 E.A.# 04195-190271 MEQ 85001, Cities of Oakland and Emeryville, Alameda County, California.
S-013824	Ambro	1992a	Report on Archival Research and a Preliminary Inventory of Potential Prehistoric and Historic Archaeological Resources in the Del Monte Project.
S-015610	Holman & Associates	1993	Report on Archival Research and a Preliminary Inventory of Potential Prehistoric and Historic Archaeological Resources in the Kaiser Hospital Project Area, Emeryville, Alameda County, California.
S-016217	Praetzellis, Olmsted, Olmsted, Johnson, McIlroy, Medin, Praetzellis, Spires, Woods, Guedon, Tannam and Pape	1994	West Oakland--A Place to Start From, Research Design and Treatment Plan, Cypress I-880 Replacement Project, Volume 1: Historical Archaeology, ALA-880 P.M. 31.9/35.8; ALA-80 P.M. 2.3/4.0, in the Cities of Oakland and Emeryville, Alameda County, California.
S-016800	Ambro	1992b	Archaeological Cultural Resource Study for the Bay/Shellmound Street Project.
S-017835	Myers Suchey	1975	Biological Distance of Prehistoric Central California Populations Derived from Non-Metric Traits of the Cranium.

Study No.	Author(s)	Year	Title
S-017895	Rhode, Hudson, Blackburn, Beardsley, Heizer, Ragir, Lillard, Schenk, Latta, Gerow, Bickel, Coberly, Davis, Elsasser and Moorehead	1989	A Charmstone Compendium for Central California.
S-018248	Garaventa, Jarvis, Knecht, Chiappetta, Corbett, Liskin, Lombardi, Marvin, Minor, Polito, Winans and Woods	1990	First Addendum Historic Property Survey Report for the Proposed I-880 Reconstruction Project in the Cities of Oakland and Emeryville, Alameda County, California.
S-018249	Knecht, Liskin, Lombardi, Marvin and Winans	1991	Second Addendum Historic Property Survey Report for the Proposed Reconstruction of Interstate 880 within the City Limits of Oakland and Emeryville, Alameda County, 04-ALA-880 32.12/34.31, 04-ALA-580 45.99/46.95, 04-ALA-80 1.99/3.79,4195-190270.
S-019176	Allan, Wills and Self	1997	Archaeological Testing and Monitoring Report: Chiron Life Sciences Center.
S-019466	Pape and White	1995	Archaeological Research Design and Treatment Plan, Volume II: Prehistoric Archaeology, I-880 Cypress Replacement Project in the Cities of Oakland and Emeryville, Alameda County, ALA-880 31.6/35.8, ALA-80 2.3/4.0.
S-021880	Nelson and Broughton	1996	Excavation of the Emeryville, Shellmound, 1906: Nels C. Nelson's Final Report.
S-022820	Nelson, Norton, Chiea and Mitsanis	2000	Cultural Resources Survey for the Level (3) Communications Long Haul Fiber Optics Project, Segment WS07: Oakland to San Jose.
S-023012	URS Greiner Woodward Clyde	1999	Archaeological Mitigation and Data Recovery Plan for the South Bayfront Project: Archaeological Sites CA-ALA-309 and CA-ALA-310, The Emeryville Shellmound.
S-023367	Busby and Guedon	1999	Archaeological Monitoring Closure Report -IKEA Project, 4400 Shellmound Street, Cities of Emeryville and Oakland, Alameda County (letter report).
S-024028	Self	2001	Chiron Campus Expansion Program, Report on Pre-construction Archaeological Test Borings for Building 12a Parking Structure.
S-025127	Popetz, Brown, Strother, Summerlin and Self	2002	Report on the Archaeological Monitoring at the Chiron Campus Expansion: Building 12A Parking Structure, Emeryville, CA.
S-026291	Mason and Lander	1999	Cultural Resources and Paleontological Resources Literature Review Report for Level 3 Long Haul Fiber Optic Project: Emeryville ILA D-Node, in the City of Emeryville, Alameda County.
S-026419	Chavez and Hupman	2002	Archaeological Resources Investigations for the EBMUD East Bayshore Recycled Water Project, Alameda County, California, Additional Pipeline Alignments.

Study No.	Author(s)	Year	Title
S-027814	Self	2003	Archaeological Monitoring of the Demolition of the Rifkin Building Foundation, Located along Horton Street, Emeryville, Alameda County, California (letter report).
S-027893	Munns and Mason	2000	Cultural Resources Survey Report, Level (3) Long Haul Fiber Optic Project: Segment WS02 in Emeryville and Oakland, Alameda County, California.
S-028124	Montero, Marvin and McKale	2004	A Cultural and Paleontological Resources Study and Historical Evaluation for the Pixar Animation Studios Headquarters Expansion Project.

There are no newly recorded cultural resources within the project area. Six cultural resources are within ¼-mile of the project area (Table 2). Four of these are shellmounds that are discussed in WSA (2003). There have been no updates to these site records since the 2002 records search was completed. However in 2004, Richard Schwartz submitted a copy of an 1875 newspaper article that refers to a shellmound located behind the racetrack (presumably the Oakland Trotting Park), which has been appended to the site record for P-01-000086/CA-ALA-309 (Schwartze 2004). The information contained in the newspaper article does not affect the significance of the site. Two cultural resources have been recorded within ¼ -mile of the project area since 2002, P-01-010873 and P-01-010657. P-01-010873 is a concentration of shell with dark soil found alongside a city sidewalk (Schwartz 2007), [redacted]. It was not recorded by a qualified archaeologist and does not address the integrity of the materials (e.g. if it is in its primary context or if it is disturbed shellmidden material from surrounding sites). P-01-010657 is a historic industrial building located to the east of the project area. The building will not be impacted by the proposed project.

Table 2. Recorded Sites Within ¼-Mile of the Project Area

Site No.	Description	Newly Recorded (2002-2009)	Updated Since 2002	Reference
P-01-000086/ CA-ALA-309	prehistoric shellmound (Emeryville Mound)	no	no site update but in 2004, Richard Schwartz provided a copy of an 1875 newspaper article that discusses a shellmound "to the rear of the racetrack"	Schwartz 2004; Nelson 1998; Pilling 1952; Pilling n.d. a
P-01-000088/ CA-ALA-311	prehistoric shellmound	no	no	Pilling n.d. b
P-01-000089/ CA-ALA-312	prehistoric shellmound	no	no	Pilling n.d. c
P-01-000090/ CA-ALA-313	prehistoric shellmound	no	no	Pilling n.d. d
P-01-010657	Nabisco Bakery, 4240 Hollis St	yes	n/a	Marvin 2003

Site No.	Description	Newly Recorded (2002-2009)	Updated Since 2002	Reference
P-01-010873	concentration of shell, dark soil	yes, however the site was not recorded by a qualified archaeologist	n/a	Schwartz 2007

Recommendations

In the 2003 cultural resources assessment of the Sherwin-Williams Remediation Project, WSA determined that, although none of the previously recorded historic or prehistoric resources in the immediate area are believed to be located within the boundaries of the project area, there exists the potential to encounter significant cultural deposits during project excavations. In summary, WSA recommends that:

- an Archaeological Monitoring and Data Recovery Plan (AMDRP) should be developed and implemented by a qualified archaeologist;
- a qualified archaeologist should monitor all construction-related excavations to determine the presence or absence of buried resources;
- archaeological monitoring should occur to the maximum depth of construction excavation or when the archaeological monitor determines that soils with little or no potential for cultural material have been encountered;
- the archaeological monitor should have 40 hour Hazardous Waste Operations and Emergency Response (HAZWOPER) training and use appropriate personal protective equipment (PPE) to eliminate exposure to contaminated soils;
- should unanticipated finds be uncovered during construction, work within 30 ft. of the find should cease until the archaeological monitor can conduct an assessment of the resource and develop treatment measures as appropriate;
- should significant cultural resources be discovered during construction, a data recovery plan should be developed by a qualified archaeologist and implemented; and
- should human remains or funerary objects be located, the provisions of the California Health and Safety Code should be followed.

The results of the updated records search and reassessment of the proposed project impacts will not have an effect on the findings and recommendations prepared by WSA in 2003 and reiterated here. The recommendations provided in WSA (2003) on pages 23 to 25 and summarized on page 26 should be adhered to for the Sherwin-Williams Remediation Project.

References

Allan, James M., Carrie D. Wills and William Self

1997 Archaeological Testing and Monitoring Report: Chiron Life Sciences Center (S-019176). Prepared by William Self Associates, Inc. On file at the Northwest Information Center, Sonoma State University, Rohnert Park, CA.

Ambro, Richard D

1992a Report on Archival Research and a Preliminary Inventory of Potential Prehistoric and Historic Archaeological Resources in the Del Monte Project (S-013824). Prepared by Holman & Associates. On file at the Northwest Information Center, Sonoma State University, Rohnert Park, CA.

1992b Archaeological Cultural Resource Study for the Bay/Shellmound Street Project (S-016800). Prepared by Holman & Associates . On file at the Northwest Information Center, Sonoma State University, Rohnert Park, CA.

Busby, Colin I. and Stuart A. Guedon

1999 Archaeological Monitoring Closure Report -IKEA Project, 4400 Shellmound Street, Cities of Emeryville and Oakland, Alameda County (letter report) (S-023367). Prepared by Basin Research Associates, Inc. On file at the Northwest Information Center, Sonoma State University, Rohnert Park, CA.

Buss, Margaret

1982 Archaeological Survey Report for Proposed High Occupancy Vehicle Lanes from the Bay Bridge to Carquinez Bridge, 04-ALNCC-80 2.0/8.0,0.0/14.1 04209-400211 (S-004950).Prepared by the California Department of Transportation. On file at the Northwest Information Center, Sonoma State University, Rohnert Park, CA.

Chavez, David

1977 Preliminary Cultural Resources Assessment of the East Bay Municipal Utility District (EBMUD) Wet Weather Facilities/Overflow Project Facilities Sites, Alameda and Contra Costa Counties, California (S-000779). On file at the Northwest Information Center, Sonoma State University, Rohnert Park, CA.

Chavez, David and Jan M. Hupman

2002 Archaeological Resources Investigations for the EBMUD East Bayshore Recycled Water Project, Alameda County, California, Additional Pipeline Alignments (S-026419). Prepared by David Chavez and Associates. On file at the Northwest Information Center, Sonoma State University, Rohnert Park, CA.

Cope, Carol Robin
1985 The Mammalian Fauna of the Emeryville Shellmound, CA-ALA-309 (S-007571). Masters thesis, Sonoma State University, California. On file at the Northwest Information Center, Sonoma State University, Rohnert Park, CA.

Garaventa, Donna M., Michael R. Fong, Sondra A. Jarvis, Angela M. Banet and Colin I. Busby
1990 Archaeological Survey Report, I-880/Cypress Replacement Project, 04-ALA-880 P.M. 32.4/34.3 E.A.# 04195-190271 MEQ 85001, Cities of Oakland and Emeryville, Alameda County, California (S-012289). Prepared by Basin Research Associates, Inc. On file at the Northwest Information Center, Sonoma State University, Rohnert Park, CA.

Garaventa, Donna M., Michael R. Fong, Sondra A. Jarvis, Angela M. Banet, Mara Melandry and Janet Pape
1990 Archaeological Survey Report, I-880/Cypress Replacement Project, 04-ALA-880 32.12/34.31, 04-ALA-580 45.99/46.95, 04-ALA-80 1.99/3.39, E.A.#04195-190271 MEQ 85001, Cities of Oakland and Emeryville, Alameda County, California (S-012125). Prepared by Basin Research Associates, Inc. and the California Department of Transportation. On file at the Northwest Information Center, Sonoma State University, Rohnert Park, CA.

Garaventa, Donna M., Sondra A. Jarvis and Colin I. Busby
1990 First Addendum Archaeological Survey Report, I-880/Cypress Replacement Project, 04-ALA-880 32.12/34.31, 04-ALA-580 45.99/46.95, 04-ALA-80 1.99/3.39, E.A. 04195-190271 MEQ 85001, Cities of Oakland and Emeryville, Alameda County, California (S-012221). Prepared by Basin Research Associates, Inc. On file at the Northwest Information Center, Sonoma State University, Rohnert Park, CA.

Garaventa, Donna M., Sondra A. Jarvis, Gary Knecht, Alex G. Chiappetta, Michael R. Corbett, Miriam Liskin, Gail G. Lombardi, Betty Marvin, Woodruff C. Minor, Donnalynn Polito, Christine Winans and Aicha S. Woods
1990 First Addendum Historic Property Survey Report for the Proposed I-880 Reconstruction Project in the Cities of Oakland and Emeryville, Alameda County, California (S-018248). Prepared by the California Department of Transportation, Basin Research Associates, Inc., and Oakland Cultural Heritage Survey. On file at the Northwest Information Center, Sonoma State University, Rohnert Park, CA.

Holman & Associates
1993 Report on Archival Research and a Preliminary Inventory of Potential Prehistoric and Historic Archaeological Resources in the Kaiser Hospital Project Area, Emeryville,

Alameda County, California (S-015610). Prepared by Holman & Associates. On file at the Northwest Information Center, Sonoma State University, Rohnert Park, CA.

Knecht, Gary, Miriam Liskin, Gail G. Lombardi, Betty Marvin and Christine Winans
1991 Second Addendum Historic Property Survey Report for the Proposed Reconstruction of Interstate 880 within the City Limits of Oakland and Emeryville, Alameda County, 04-ALA-880 32.12/34.31, 04-ALA-580 45.99/46.95, 04-ALA-80 1.99/3.79,4195-190270 (S-018249). Prepared by the California Department of Transportation. On file at the Northwest Information Center, Sonoma State University, Rohnert Park, CA.

Marvin, Judith
2003 Department of Parks and Recreation 523 Recording Forms for P-01-010657. On file at the Northwest Information Center, Sonoma State University, Rohnert Park, CA.

Mason, Roger D. and E. Bruce Lander
1999 Cultural Resources and Paleontological Resources Literature Review Report for Level 3 Long Haul Fiber Optic Project: Emeryville ILA D-Node, in the City of Emeryville, Alameda County (S-026291). Prepared by Chambers Group, Inc. and Paleo Environmental Associates. On file at the Northwest Information Center, Sonoma State University, Rohnert Park, CA.

Montero, Carie S., Judith Marvin and George McKale
2004 A Cultural and Paleontological Resources Study and Historical Evaluation for the Pixar Animation Studios Headquarters Expansion Project (S-028124). Prepared by LSA Associates, Inc. On file at the Northwest Information Center, Sonoma State University, Rohnert Park, CA.

Munns, Ann M. and Roger D. Mason
2000 Cultural Resources Survey Report, Level (3) Long Haul Fiber Optic Project: Segment WS02 in Emeryville and Oakland, Alameda County, California (S-027893). Prepared by Chambers Group, Inc. On file at the Northwest Information Center, Sonoma State University, Rohnert Park, CA.

Myers Suchey, Judy
1975 Biological Distance of Prehistoric Central California Populations Derived from Non-Metric Traits of the Cranium (S-017835). PhD dissertation, University of California, Riverside. On file at the Northwest Information Center, Sonoma State University, Rohnert Park, CA.

Nelson, Jim
1998 Department of Parks and Recreation 523 Recording Form for P-01-000086/CA-ALA-309 (Update). On file at the Northwest Information Center, Sonoma State University, Rohnert Park, CA.

Nelson, Nels C. and Jack M. Broughton
1996 Excavation of the Emeryville, Shellmound, 1906: Nels C. Nelson's Final Report (S-021880). On file at the Northwest Information Center, Sonoma State University, Rohnert Park, CA.

Nelson, Wendy J., Tammara Norton, Larry Chiea and Eugenia Mitsanis
2000 Cultural Resources Survey for the Level (3) Communications Long Haul Fiber Optics Project, Segment WS07: Oakland to San Jose (S-022820). Prepared by Far Western Anthropological Research Group, Inc. On file at the Northwest Information Center, Sonoma State University, Rohnert Park, CA.

Pape, Janet L. and Greg White
1995 Archaeological Research Design and Treatment Plan, Volume II: Prehistoric Archaeology, I-880 Cypress Replacement Project in the Cities of Oakland and Emeryville, Alameda County, ALA-880 31.6/35.8, ALA-80 2.3/4.0 (S-019466). Prepared by the California Department of Transportation and Anthropological Studies Center, Sonoma State University. On file at the Northwest Information Center, Sonoma State University, Rohnert Park, CA.

Pilling, Arnold R.
n.d. a Archaeological Site Survey Record for P-01-000086/CA-ALA-309. On file at the Northwest Information Center, Sonoma State University, Rohnert Park, CA.
n.d. b Archaeological Site Survey Record for P-01-000088/CA-ALA-311. On file at the Northwest Information Center, Sonoma State University, Rohnert Park, CA.
n.d. c Archaeological Site Survey Record for P-01-000089/CA-ALA-312. On file at the Northwest Information Center, Sonoma State University, Rohnert Park, CA.
n.d. d Archaeological Site Survey Record for P-01-000090/CA-ALA-313. On file at the Northwest Information Center, Sonoma State University, Rohnert Park, CA.
1952 Archaeological Site Survey Record for P-01-000086/CA-ALA-309. On file at the Northwest Information Center, Sonoma State University, Rohnert Park, CA.

Popetz, Kimberley, Kyle Brown, Eric Strother, Nacy Summerlin and William Self
2002 Report on the Archaeological Monitoring at the Chiron Campus Expansion: Building 12A Parking Structure, Emeryville, CA (S-025127). Prepared by William Self Associates, Inc. On file at the Northwest Information Center, Sonoma State University, Rohnert Park, CA.

Praetzellis, Mary, Nancy Leigh Olmsted, Roger Wolcott Olmsted, Katherine Johnson, Jack McIlroy, Anmarie Medin, Adrian Praetzellis, Will Spires, Aicha Woods, Stuart Guedon, Melody Tannam and Janet Pape

1994 West Oakland--A Place to Start From, Research Design and Treatment Plan, Cypress I-880 Replacement Project, Volume 1: Historical Archaeology, ALA-880 P.M. 31.9/35.8; ALA-80 P.M. 2.3/4.0, in the Cities of Oakland and Emeryville, Alameda County, California (S-016217). Prepared by Anthropological Studies Center, Sonoma State University, Basin Research Associates, Inc., and the California Department of Transportation. On file at the Northwest Information Center, Sonoma State University, Rohnert Park, CA.

Rhode, Pete, T. Hudson, T. C. Blackburn, R. K. Beardsley, R. Heizer, S. Ragir, J. B. Lillard, W. E. Schenk, Frank Latta, B. A. Gerow, Polly Bickel, Mary Coberly, James Davis, Albert Elsasser and Warren K. Moorehead

1989 A Charmstone Compendium for Central California (S-017895). On file at the Northwest Information Center, Sonoma State University, Rohnert Park, CA.

Roop, William

1989 An Evaluation of the Potential for Archaeological Deposits within the Chiron Development Parcel, City of Emeryville, California (S-011406). Prepared by Archaeological Resource Service. On file at the Northwest Information Center, Sonoma State University, Rohnert Park, CA.

Schwartz, Richard

2004 Letter to Leigh Jordan and Annette Schachter. Attached to P-01-000086/CA-ALA-309. On file at the Northwest Information Center, Sonoma State University, Rohnert Park, CA.

2007 Archaeological Site Record for P-01-010873. On file at the Northwest Information Center, Sonoma State University, Rohnert Park, CA.

Self, William

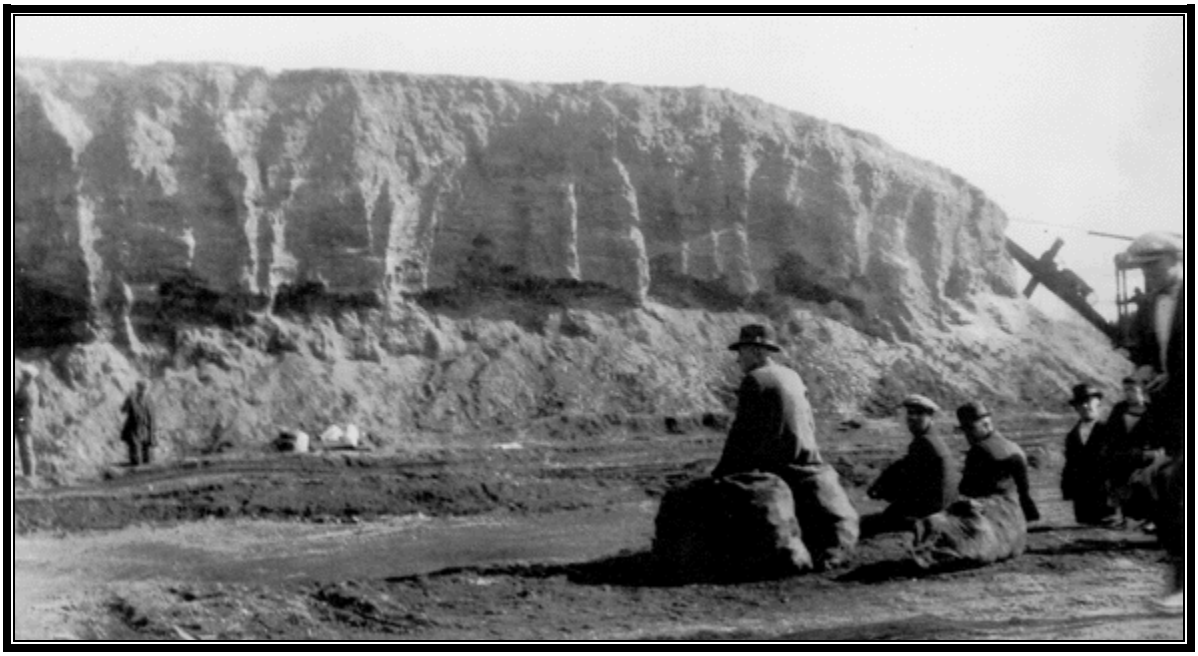
2001 Chiron Campus Expansion Program, Report on Pre-construction Archaeological Test Borings for Building 12a Parking Structure (S-024028). Prepared by William Self Associates, Inc. On file at the Northwest Information Center, Sonoma State University, Rohnert Park, CA.

2003 Archaeological Monitoring of the Demolition of the Rifkin Building Foundation, Located along Horton Street, Emeryville, Alameda County, California (letter report) (S-027814). Prepared by William Self Associates, Inc. On file at the Northwest Information Center, Sonoma State University, Rohnert Park, CA.

URS Greiner Woodward Clyde

1999 Archaeological Mitigation and Data Recovery Plan for the South Bayfront Project: Archaeological Sites CA-ALA-309 and CA-ALA-310, The Emeryville Shellmound (S-023012). Prepared by URS Greiner Woodward Clyde. On file at the Northwest Information Center, Sonoma State University, Rohnert Park, CA.

CULTURAL RESOURCES ASSESSMENT REPORT
SHERWIN-WILLIAMS REMEDIATION PROJECT
EMERYVILLE, CALIFORNIA



Excavation of the Emeryville Shellmound, 1924

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January 2003

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EXECUTIVE SUMMARY

The Sherwin-Williams Company (Sherwin-Williams) will be conducting a soils remediation project to remove potentially hazardous soils that exist on the company property in Emeryville. Soils will be excavated in a prescribed area up to about 19 feet in depth, stockpiled on site, and hauled off site to an acceptable hazardous waste disposal facility. This report examines the potential for encountering significant cultural resources during the work (prehistoric human burials and cultural deposits have been found and removed by the hundreds in the immediate vicinity of the property), and presents measures that can be followed to address potential impact to these resources should they exist on the parcel.

PROJECT LOCATION AND DESCRIPTION

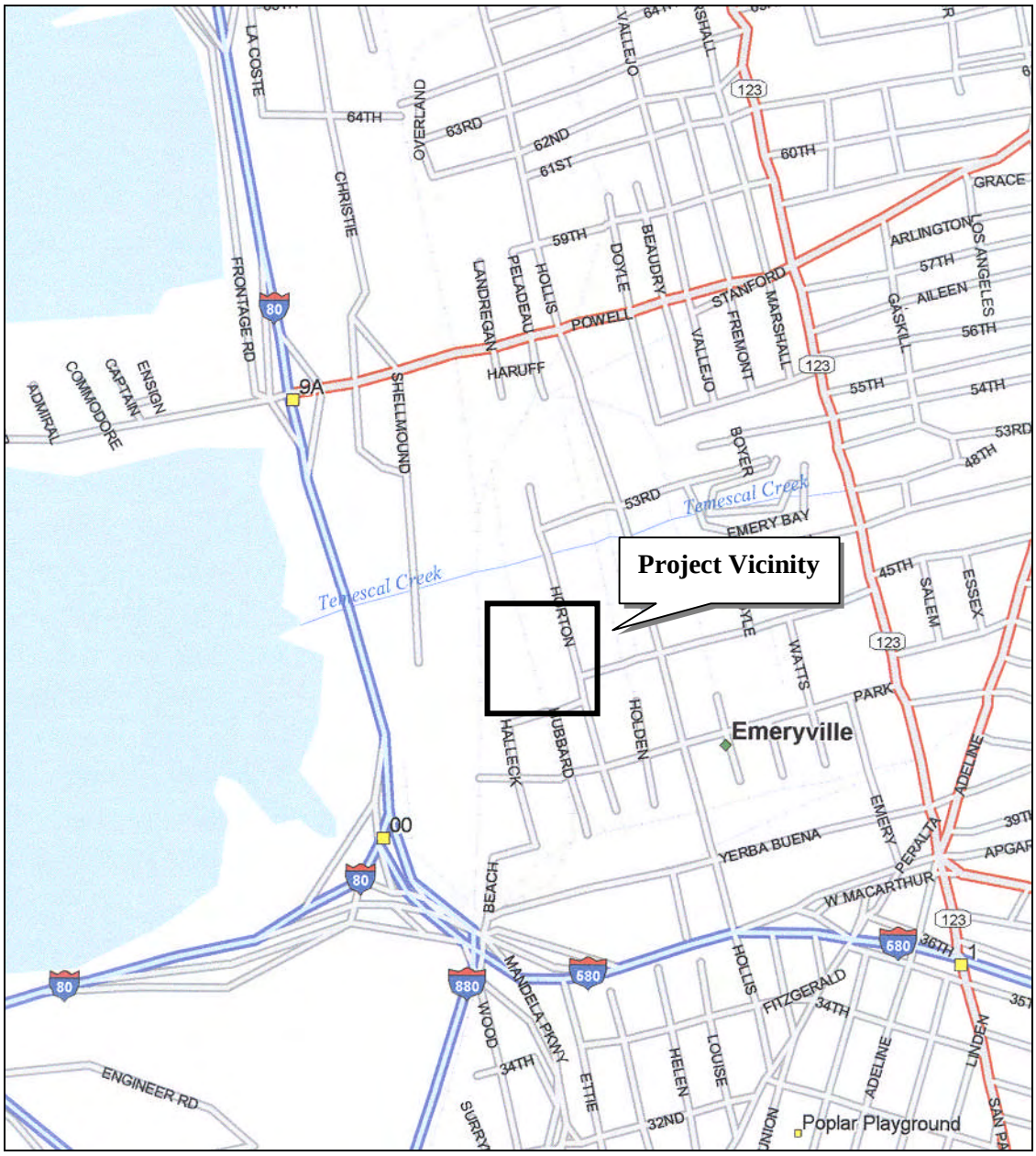
Sherwin-Williams will be conducting a remediation project to remove potentially hazardous soils from a portion of the Sherwin-Williams property in Emeryville, California. The project area is located in a former industrial neighborhood approximately ¾-mile east of the San Francisco Bay along Temescal Creek (Figure 1). The boundaries of the project area are the Union Pacific Railroad tracks on the west, Chiron Corporation on the north, Horton Ave. on the east and Sherwin Ave. on the south. The general location of the project is shown on the Oakland West, California USGS 7.5' topographic map and is located in Township 1 South, Range 4 West, MDBM (Figure 2).

NATURAL AND CULTURAL SETTING

Existing Environment

The Sherwin-Williams property is situated near the eastern shore of San Francisco Bay, the largest estuarine system in California. The project area, located near the southern city limits of Emeryville, comprises a flat, developed industrial area. Temescal Creek, which drains the Berkeley Hills to the east, has been channelized and flows in a subterranean conduit south of 53rd Street.

Annual precipitation in the Bay region varies from 20 to 40 inches with precipitation concentrated in the fall, winter, and spring months. This climate is much like that found in the Mediterranean: mild, rainy winters, and dry, warm summers. After the first rain at the end of October or early November, the vegetation becomes green and remains green, but not growing, until late February, when the grasses that cover the surrounding Berkeley Hills begin to grow rapidly. By early May, these have usually changed to dry golden-colored grasses that remain that way until fall (Brown 1985). Due to the cooling effects of the local bay environment, temperatures in the project area are mild in the summer, usually averaging 55-



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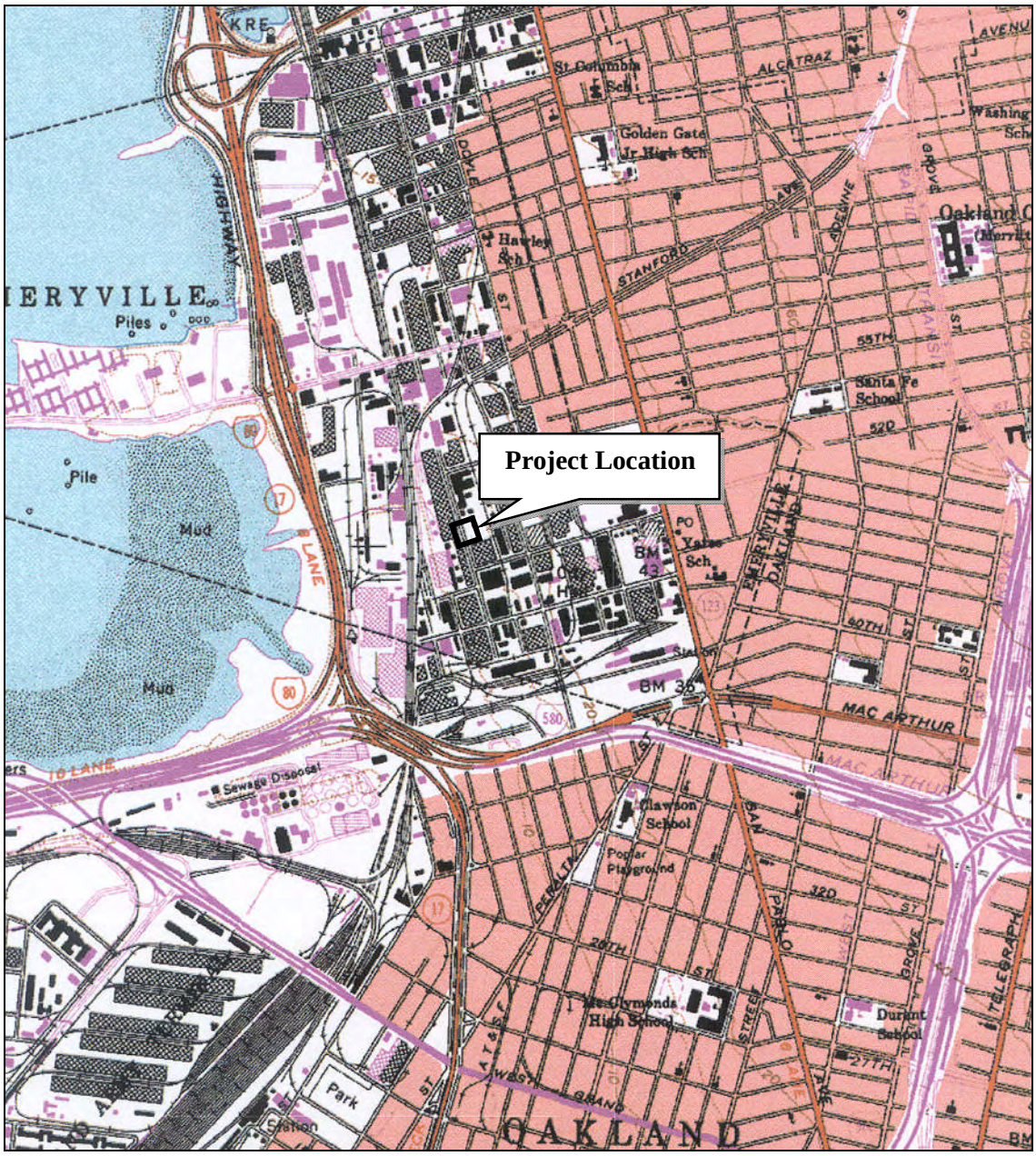
Project Vicinity Map

Scale: 1inch equals approximately ¼-mile

Figure 1
Sherwin-Williams Remediation Project
Emeryville, California



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Project Location Map
USGS 7.5' Oakland West (1959, PR 1980)
Scale 1:2000

Figure 2
Sherwin-Williams Remediation Project
Emeryville, California

65° (Moratto 1984:223). The cold water of the bay also creates frequent fog, and relative humidity remains high most of the time (Schoenherr 1992:627).

Prehistory

In 1902, under the auspices of the University of California, Max Uhle excavated a portion of a large shellmound located in Emeryville, near the shoreline of San Francisco Bay. The Emeryville Shellmound (CA-ALA-309) was one of the largest in the bay region, covering an area approximately 100 x 300 meters, and was nearly 10 meters in height (Moratto 1984:228-229). It was used to define the Emeryville facies of the Augustine Pattern, 500 - 1500 A.D. (see below).

N. C. Nelson of the University of California at Berkeley conducted the first intensive archaeological survey of the San Francisco Bay region from 1906 to 1908. He was the first person to recognize that the Bay Area was a discrete archaeological entity. He maintained that the intensive use of shellfish, a subsistence strategy reflected in both coastal and bay shore middens, was an indication of a general economic unity in the prehistoric region (Moratto 1984). Nelson documented more than 100 shellmounds along the bay shore in Alameda and Contra Costa Counties, when the area was still ringed by salt marshes three to five miles wide (Nelson 1909: 316).

In 1911, Nelson supervised excavations at CA-SFR-7 (the Crocker mound) near Hunter's Point, a site later dated to 3000-1500 BP[1]. L.L. Loud identified archaeological components from this same period in Santa Clara County in 1911 while excavating at CA-SCL-1 (the Ponce, Mayfield, or Castro Mound site). R.J. Drake recognized them in San Mateo County in 1941-42 at CA-SMA-23 (Mills Estate) in San Bruno (Moratto 1984).

The work of Nelson and Loud in the Bay Area provided the impetus for investigation into the prehistory of Central California, which began in earnest in the 1920s. Stockton-area amateur archaeologists J.A. Barr and E.J. Dawson excavated a number of sites and made substantial collections in the area from 1893 to the 1930s. On the basis of artifact comparisons, Barr identified what he felt were two distinct cultural traditions. Dawson later refined his work into a series of "Early," "Middle," and "Late" sites (Ragir 1972; Schenck and Dawson 1929).

Professional or academic-sponsored archaeological investigations began in the 1930s when J. Lillard and W. Purves of Sacramento Junior College formed a field school, which conducted excavations throughout the Sacramento Delta area. By means of artifact and burial data they identified a three-phase sequence similar to Barr's and Dawson's, which

[1] All BP (before present) dates are calculated from 1950 AD.

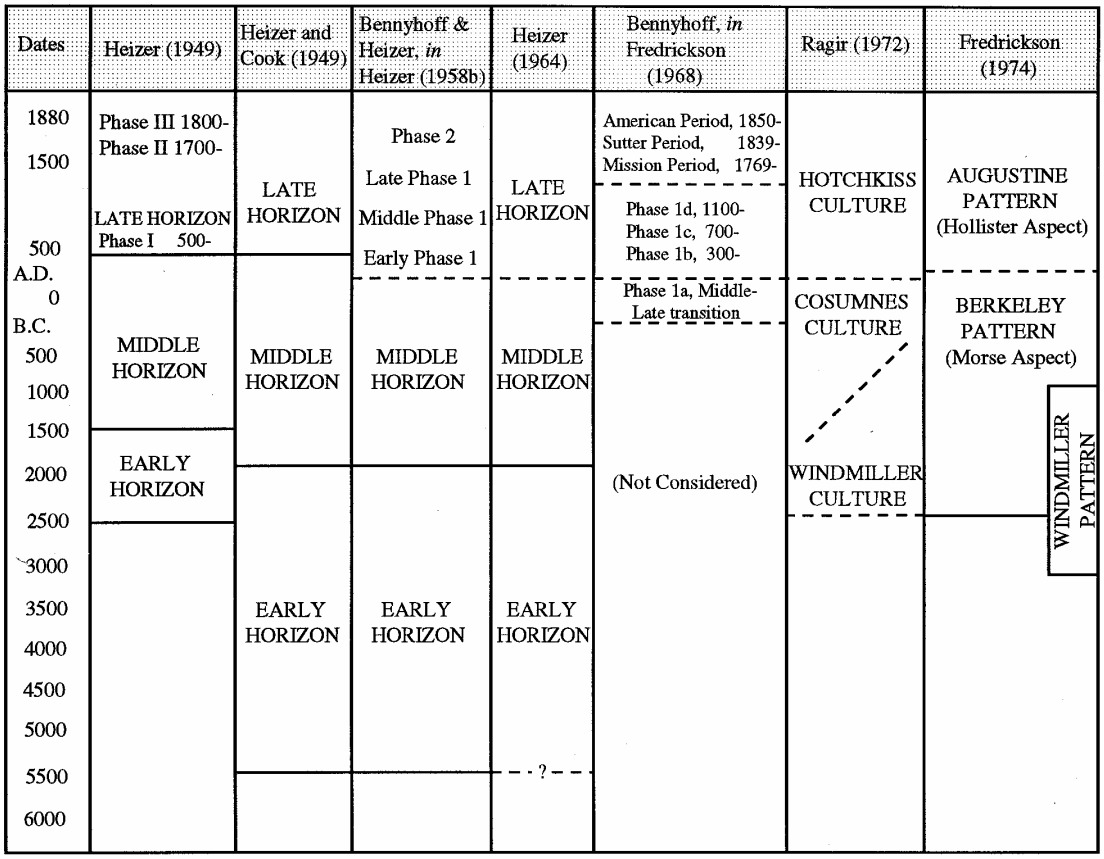
they called "Early," "Intermediate," and "Recent" cultures (Lillard and Purves 1936). In 1954, Richard Beasley refined this system and extended it to include the region of San Francisco Bay. The result was referred to as the Central California Taxonomic System (CCTS) (Lillard, Heizer and Fenenga 1939; Moratto1984). Subsequently the CCTS system was applied widely to site dating and taxonomy throughout Central California (Figure 3).

Much of the subsequent archaeological investigation in the Central Valley focused on a refinement of the CCTS through an analysis of environmental change, settlement and subsistence strategy, exchange, population movement, and related topics. These studies established sub-sequences for many regions of Central California. The best received of these studies has been Fredrickson's (1973) concept of cultural "patterns" (Moratto 1984:201-214). His idea was that, in spite of local variations, widespread cultural patterns are identifiable. He characterized patterns as:

> …adaptive mode[s] extending across one or more regions, characterized by particular technological skills and devices, particular economic modes, including participation in trade networks and practices surrounding wealth, and by particular mortuary and ceremonial practices (Fredrickson 1973:7-8).

The chronological sequence for the Central California region begins with the Windmiller Pattern, which possesses cultural elements belonging to both the Early and Middle Horizons. Sites from this period date from about 6950 to 3950 BP. Although earlier occupations no doubt existed, sites from the Paleo-Indian Period, dating from about 11950 to 7950 BP, are thought to be buried beneath Holocene alluvial deposits and are not well documented in this part of California (Ragir 1972). Some scholars have suggested that Windmiller Pattern sites are associated with an influx of people from outside of California, who introduced survival skills for life in river-wetlands (Moratto 1984:207).

Windmiller Pattern sites are often situated in riverine, marshland, or valley floor settings, as well as atop small knolls above prehistoric seasonal floodplains. Such an area provided a wide variety of plant and animal resources. Most Windmiller Pattern sites have contained burials with remains that are extended ventrally, oriented to the west, and that contain copious amounts of mortuary artifacts. These artifacts often include large projectile points and a variety of fishing paraphernalia – net weights, bone hooks, and spear points. The faunal remains indicate that the inhabitants hunted a range of large and small mammals. Stone mortars and grindstones for seed and nut processing are common finds. Other artifacts – such as charmstones, ochre, quartz crystals, *Olivella* and *Haliotis* shell beads – suggest a practice of ceremonialism and trade.



Source: Moratto 1984

San Francisco Bay Area
Cultural Chronology

Figure 3
Sherwin-Williams Remediation Project
Emeryville, California

The subsequent Berkeley Pattern (previously included in the Middle Horizon culture) covers a period from about 3500 to 1500 BP in the San Francisco Bay region. At the beginning of the sequence this pattern shares some attributes with the Windmiller Pattern and with the Late Horizon period at the end. Berkeley Pattern sites are much more common and well documented, and therefore better understood, than Windmiller Pattern sites. These sites are scattered in more diverse environmental settings, but riverine settings are prevalent.

Deeply stratified midden deposits, which develop over generations of occupation, are common to Berkeley Pattern sites. These middens contain numerous milling and grinding stones for food preparation. Projectile points become progressively smaller and lighter over time, culminating in the introduction of the bow-and-arrow during the Late Horizon period. Slate pendants, steatite beads, stone tubes, ear ornaments, and burial techniques that utilize variable directional orientation, flexed body positioning, and a general reduction of mortuary goods are unique to Berkeley Pattern sites (Fredrickson 1973; Moratto 1984).

The Late Prehistoric Period (formerly the Late Horizon) ranges from about 950 to 150 BP. This period coincides with Fredrickson's Augustine Pattern, which is typified by intensive fishing, hunting, and gathering (especially acorns), a large population increase, expanded trade and exchange networks, increased ceremonial and social attributes, and the practice of cremation in addition to flexed burials. Certain artifacts are also distinctive of this pattern: bone awls used in basketry, small notched and serrated projectile points indicative of bow-and-arrow usage, occasional pottery, clay effigies, bone whistles, and stone pipes. The Augustine Pattern and the Late Prehistoric period are recognized as the apex of Native American cultural development in this part of California.

In 1951, prehistoric burials and artifacts were exposed by heavy equipment operators on the southwestern bank of San Francisquito Creek in Santa Clara County. Dubbed the University Village Site (CA-SMA-77), it was excavated in 1951 and 1952 by G.A. Gerow of Stanford University. The cultural pattern identified was a mixture of Windmiller Pattern traits with materials markedly dissimilar to other Early Horizon period sites. To explain this, Gerow argued for a cultural expression different from that found in the Central Valley, which had been used to define the Windmiller Pattern. Gerow suggested that an Early Bay Culture inhabited the area from 3400 to 2900 BP. It eventually merged with the culture of the Central Valley.

Evidence of even earlier occupation in the Bay Area came to light in 1970 during construction of the Bay Area Rapid Transit system (BART) when workers unearthed a skeleton in San Francisco's Civic Center. W.G. Henn and R.E. Schenk of San Francisco State University examined the skeleton and confirmed, through radiocarbon dating, that the skeletal remains dated to approximately 5660 BP (Henn and Schenk 1970). Further confirmation for early

occupation came from Sunnyvale when Bada and Helfman provided radiocarbon dates of about 4410 ±95 BP for charcoal found in association with a skeleton unearthed there.

In 1922, B. Seymour, a student at Stanford University, found a skull eroding out of the bank of San Francisquito Creek. It was located about six meters below the surface and was in primary context. Labeled Stanford Man I, it was dated in 1974 to 5080 ±70 BP (Berger 1974). B. Gerow discovered Stanford Man II, a flexed human skeleton, 1150 meters downstream from Stanford Man I in 1963. Radiocarbon dates for Stanford Man II were 4350 ±70 BP (Berger 1974).

Data recovered from these and other Bay Area sites indicate a widespread but sparsely populated culture of hunters and gatherers in the region as early as 5660 BP (Henn and Schenk 1970; Henn et al 1972). This culture was replaced around 3950 BP by one adapted to bayshore and marshland habitation. The Berkeley Pattern specifies this culture although there is considerable regional variation (Moratto 1984). Moratto suggests that this replacement culture corresponds to the spread of Utian (Miwok-Costanoan) people from eastern Contra Costa County. By 3400 BP, this group had settled the southern Bay Area. From here they spread northward to the peninsula, westward to the coast, and southward to the Santa Clara Valley. They would remain in these areas until historic times.

By 1920 BP, the Berkeley Pattern was developing into the Augustine Pattern, with its characteristic bow-and-arrow, tubular tobacco pipe, cremation, intensive acorn utilization, and complicated exchange systems. It was this emerging pattern that was destroyed by the Spanish mission system and subsequent historical developments (Moratto 1984; 283).

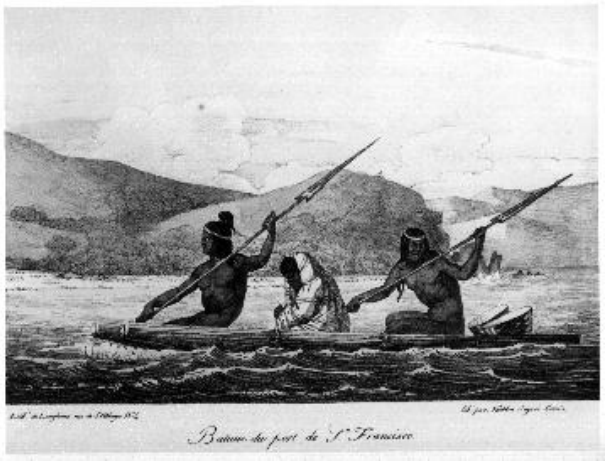
Ethnography

There is a considerable body of ethnographic literature on the Native American inhabitants of the project region. This section provides a brief summary of the ethnography of the area and is intended to provide a general background only. For a more extensive review of Ohlone ethnography, see Bocek (1986), Cambra (et al. 1996), Kroeber (1925), Levy (1978), Milliken (1983), and Shoup with Milliken and Brown (1995).

The project area lies within the region occupied by the Ohlone or Costanoan group of Native Americans at the time of historic contact with Europeans (Kroeber 1925: 462-473). Although the term Costanoan is derived from the Spanish word Costaños, or "coast people," its application as a means of identifying this population is based in linguistics. The Costanoans spoke a language now considered one of the major subdivisions of the Miwok- Costanoan, which belonged to the Utian family within the Penutian language stock (Shipley 1978: 82-84). Costanoan actually designates a family of eight languages. Of these, Chochenyo or East Bay

Costanoan was the language spoken by the estimated 2,000 people who occupied the ". . . east shore of San Francisco Bay between Richmond and Mission San Jose, and probably also in the Livermore Valley" (Levy 1978: 485).

Tribal groups occupying the area from the Pacific Coast to the Diablo Range, and from San Francisco to Point Sur spoke the other seven languages of the Costanoan family. Modern descendants of the Costanoan prefer to be known as Ohlone. The name Ohlone is derived from the Oljon group, which occupied the San Gregorio watershed in San Mateo County (Bocek 1986: 8). The two terms (Costanoan and Ohlone) are used interchangeably in much of the ethnographic literature.



Indians of the San Francisco Bay Area (Lithographic plate by Louis Choris [1822])

On the basis of linguistic evidence, it has been suggested that the ancestors of the Ohlone arrived in the San Francisco Bay area about 500 A.D., having moved south and west from the Sacramento-San Joaquin Delta region. The ancestral Ohlone displaced speakers of a Hokan language and were probably the producers of the artifact assemblages that constitute the Augustine Pattern described above (Levy 1978:486).

Although linguistically linked as a family, the eight Costanoan languages actually comprised a continuum in which neighboring groups could probably understand each other. However, beyond neighborhood boundaries, each group's language was unrecognizable to the other. Each of the eight language groups was subdivided into smaller village complexes or tribal groups. The groups were independent political entities, each occupying specific territories defined by physiographic features. Each group controlled access to the natural resources of their territories, which also included one or more permanent villages and numerous smaller campsites used as needed during a seasonal round of resource exploitation.

Leadership was provided by a chief, who inherited the position patrilineally and who could be either a man or woman. The chief and a council of elders served mainly as community advisers. Specific responsibility for feeding visitors, providing for the impoverished and directing ceremonies, hunting, fishing, and gathering activities fell to the chief. Only in times of warfare was the chief's role as absolute leader recognized by group members (Levy 1978:487).

Extended families lived in domed structures thatched with tule, grass, wild alfalfa, or ferns (Levy 1978: 492). Semi-subterranean sweathouses were built into pits excavated in stream banks and covered with a structure against the bank. The tule raft, propelled by double-bladed paddles similar to those that were used in the Santa Barbara Island region, were used to navigate across San Francisco Bay (Kroeber 1925: 468).

Mussels were an important staple in the Ohlone diet as were acorns of the coast live oak, valley oak, tanbark oak and California black oak. Seeds and berries, roots and grasses, as well as the meat of deer, elk, grizzly, rabbit, and squirrel formed the Ohlone diet. Careful management of the land through controlled burning served to insure a plentiful and reliable source of all these foods (Levy 1978: 491).

The Chochenyo usually cremated a corpse immediately upon death but, if there were no relatives to gather wood for the funeral pyre, interment occurred. Mortuary goods comprised most of the personal belongings of the deceased (Levy 1978: 490).

The arrival of the Spanish in the San Francisco Bay Area in 1775 led to a rapid and major reduction in native California populations. Diseases, declining birth rates, and the effects of the mission system served to largely eradicate the aboriginal life ways (which are currently experiencing resurgence among Ohlone descendants). Brought into the missions, the surviving Ohlone, along with former neighboring groups of Esselen, Yokuts, and Miwok were transformed from hunters and gatherers into agricultural laborers (Levy 1978; Shoup with Milliken and Brown 1995). With abandonment of the mission system and the Mexican takeover in the 1840s, numerous ranchos were established. Generally, the few Indians who remained were then forced, by necessity, to work on the ranchos.

Today, descendents of the Ohlone live throughout the Bay Area. Several Ohlone groups (Muwekma, Amah) have banded together to seek Federal recognition. Many Ohlone, both as individuals and as groups, are active in preserving and reviving elements of their traditional culture, such as dance, basketry, and song, and are active participants in the monitoring and excavation of archaeological sites.

Regional History

The historic period in the eastern San Francisco Bay region begins with the Fages-Crespi expedition of 1770. The Fages party explored the eastern shore of San Francisco Bay, eventually reaching the location of modern Fremont, where they traded with the local Costanoans. Members of the expedition eventually sighted the entrance to San Francisco Bay from the Oakland Hills. In 1772, a second Fages expedition traveled from Monterey through what is now Milpitas, San Lorenzo, Oakland, and Berkeley, finally reaching Pinole on March

28, 1772 (Cook 1957:131). From there they traveled through Rodeo and Crockett to Martinez, made a brief foray into the delta region of the Central Valley, and then camped somewhere near Pittsburg or Antioch. On 31 March, the Fages party began the return journey to Monterey. They traveled to Walnut Creek, turned south, and then made their way to Danville, where they spent the night. On 1 April they passed through San Ramon, Dublin, and Pleasanton, finally arriving back in the area of Milpitas on the following day.

In 1776, the Anza-Font expedition traveled through the same area and also traded with residents of native villages encountered along the way. The significant impact of the European presence on the local California natives, however, was not felt until the Spanish missions were established in the region.

In 1775, Captain Juan Manuel Ayala's expedition studied the San Francisco Bay and ventured up the Sacramento and San Joaquin Rivers in search of a suitable mission site. The first mission in the region was established the following year with the completion of Mission San Francisco de Asis (Mission Dolores) in San Francisco. Mission Santa Clara de Asis followed in 1777, and Mission San Jose in 1797. The ensuing Mission era lasted for the next 46 years and proved to be the downfall of the native inhabitants of the region, who were brought to the missions as conscripts for labor under the pretense of "Christianization." The missions became the loci of native "missionization," which brought disease, subjugation, and ultimately decimation, to the native Californian groups. It is reported that by 1810, the traditional Costanoan lifestyle ceased to exist (Levy 1978:486). Diseases introduced by the early expeditions and missionaries, and the contagions associated with the forced communal life at the missions, killed a large number of local peoples, exemplified by a mass burial of 18 individuals adjacent to the Hotchkiss Mound site near Oakley (Heizer 1954). On an expedition through the Central Valley in 1832-1833, Ewing Young observed:

> *In the Fall of 1832...the banks of the Sacramento River, in its whole course through the valley, were studded with Indian villages.... On our return, late in the summer of 1833, we found the valleys depopulated. From the head of the Sacramento to the great bend and slough of the San Joaquin, we did not see more than six or eight Indians; while large numbers of their skulls and dead bodies were to be seen under almost every shade-tree near water, where the uninhabited and deserted villages had been converted into graveyards....* (Cook 1957:318).

Cook (1943) estimates that by 1832, the Costanoan population had been reduced from a high of over 10,000 in 1770 to less than 2000.

In 1820, Sergeant Luis Maria Peralta received a grant of 10 square leagues of land in the East Bay in recognition of his long, faithful military service in California. Peralta named his grant Rancho San Antonio. It comprised the land that lay from the water's edge to the crest of the Oakland hills between San Leandro Creek in the south and El Cerrito Creek in the north (Hendry and Bowman 1940:585). The entire Emeryville area was encompassed in Peralta's holdings.

In 1842, Peralta formally divided his holdings among his four sons. Vicente Peralta received the area between Lake Merritt and the southern border of Berkeley. On the north bank of Temescal Creek, in the vicinity of the intersection of Telegraph Avenue, 55th Street, and Highway 24, he built his home, a chapel, corrals, storerooms, and other buildings (Bowman 1951: 225-226; Hendry and Bowman 1940: 589-591; Judd 1984:2). Corrals were also situated along the lower course of Temescal Creek and two structures stood at its mouth. Hides and tallow from the Peralta cattle herds were processed at the mouth of the creek and then shipped to San Francisco.

Following the U.S. takeover of Alta California from Mexico in 1846, Rancho lands began to be divided up and generally overrun by the Anglo immigration to the area coincident with the land boom following the Gold Rush of 1849. By the beginning of 1850, Vicente Peralta had lost nearly $100,000 in rustled cattle, and squatters were usurping his land (Davis 1967:252). Rancho San Antonio suffered the fate of most Mexican land grants in northern California, with squatters taking quasi-legal title to lands, and the courts denying title to the original grantees. By 1870, most of the Peralta grant was divided; what remained in title to the Peralta family was but a fraction of the original grant (Hendry and Bowman 1940:585) (Figure 4).

Although early maps show scattered residences and structures in the Emeryville area as early as the 1850s, significant development didn't occur in the area until Edward Wiard purchased a 115 acre tract of land from Joseph Emery (after whom Emeryville is named) for $7000 in 1859. Wiard's property was located west of San Pablo Avenue, north of Park Avenue, and south of Stanford Avenue. In the late 1860s, Wiard built the Oakland Trotting Park on the eastern portion of his tract. The one-mile track, 2000 feet long and 900 feet wide, was completed in 1871 (Hausler 1994: 5). Temescal Creek flowed through the center of the track and the racetrack itself crossed the creek on bridges (Figure 5).

The track complex included a two-story hotel, stables, and grandstand. The tack rooms and Jockey Club were located between what are now 45th and 53rd Streets. The track housed a number of commercial establishments to the area, including saloons, hotels, restaurants, and bordellos.

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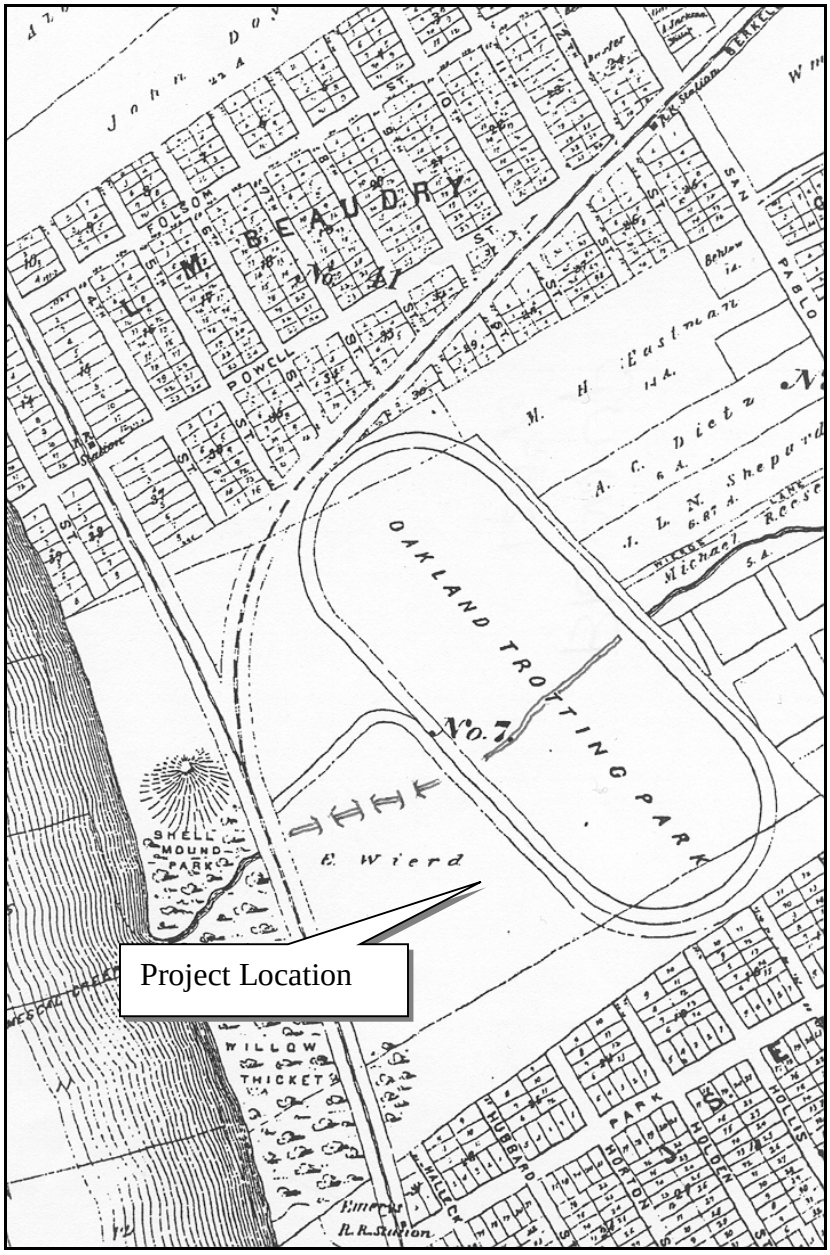
1878 Map of Project Vicinity

Source: Historical Atlas of Alameda County, by Thompson and West *In* Hausler 1994

Figure 4
Sherwin-Williams Remediation Project
Emeryville, California



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Oakland Trotting Park

Source: Historical Atlas of Alameda County, by Thompson and West *In* Hausler 1994

Figure 5
Sherwin-Williams Remediation Project
Emeryville, California

Harness racing was the track's primary feature for its first twenty-five years. In 1873, the first California Derby was held at the Trotting Park, featuring thoroughbred races between the harness racing heats (Hausler 1994:6).

In 1874, Wiard's property was bisected by the tracks of the Northern Railway that connected Oakland with Martinez. Two years later, Wiard leased the land west of the tracks to Captain L. Seibe, who developed Shell Mound Park, the famous resort and picnic area on top of the largest Emeryville shellmound.

In the 1880s, Wiard fell on hard times, eventually lost the track, and died a broken man in 1885. San Francisco judge James Mee assumed ownership of the track in 1886, maintaining its operation until his death in 1894. In May of that year, Thomas H. Williams, president of the California Jockey Club, leased the property from Mee's estate. Williams rebuilt the track and its infrastructure, replacing the stables, paddocks, barns, jockey club, and other buildings. He replaced the grandstand with one resembling a large Japanese pagoda, insuring that it was connected to the nearby train depot with a covered walkway. The track itself was redesigned and relayed:

> Underlying the track is nine inches of rock, which acts as a subdrain. Above this is a dressing of twelve inches of soil. In making the base of the course, some twenty thousand yards of broken rock were required. . .(*Oakland Enquirer*: 10/23/1896 in Hausler 1994).

Renamed the New California Jockey Club, the track flourished for another fifteen years. To protect their investment in the track, which was situated on unincorporated land, Williams and his investors promoted the incorporation of Emeryville into a town. In December 1896, local voters approved incorporation and the town of Emeryville was established (Hausler 1994:11).

The track flourished into the twentieth century, serving as a magnet for commercial development in the surrounding neighborhoods. In 1906 it also provided a haven for thousands of people displaced by the 1906 San Francisco earthquake and fire. By 1910, the political climate embodied in the Progressive movement was such that the state legislature passed the Walker-Young anti-gambling law, which made racetrack betting illegal. The bill took effect in February 1911 and the last race on the track was held on February 15th (Hausler 1994:13).

Barnstorming pilots subsequently used the track facilities and in 1912 the California Jockey Club was the site of the Third International Aviation Meet. Two years later, the track was the site of the famed race between Lincoln Beachey, piloting a Curtiss Biplane, and renowned

racecar driver Barney Oldfield, behind the wheel of a Simplex racer. Oldfield won the race by a scant twenty feet (Hausler 1994:14).

In 1915, the Mee's estate announced the property was to be subdivided into factory sites and demolition of the track and its infrastructure began in the fall of that year. On December 15, 1915, the portion of the grandstand not yet dismantled and the remaining outbuildings of the track caught fire and burned to the ground (San Francisco Chronicle, Dec. 16, 1915).

Development of the property proceeded and in the 1920s PG& E built two plants on the west side of Hollis Street, the Watkins Company established a brick factory at what was once the south end of the track, and Western Electric built a factory on the former north end of the track, a structure that now houses a portion of the Chiron Life Sciences Center (Hausler 1994:14). Over the next two decades, several other industrial enterprises established operations on the former grounds of the racetrack. Pacific Telephone and Telegraph, and the Shell Development Company both built offices and warehouses on the northern end of former track grounds. The Thorsen Tools Company, an electrical contractor, and an asbestos products company also had commercial enterprises in that immediate area.

RESULTS OF THE RECORD AND LITERATURE SEARCH

WSA has conducted numerous record searches on the Emeryville area at the California Archeological Inventory, Northwest Information Center at Sonoma State University, UC Berkeley and elsewhere as part of recent work conducted there. All known archeological sites and previous cultural resource surveys within one-half mile of the Sherwin-Williams project boundary were identified on topographic maps of the area. The National Register of Historic Places, the California Inventory of Historic Resources, and California Historical Landmarks were examined to determine if any county, state, or federal historic landmarks or National Register of Historic Places properties were located in the project area.

Previous Cultural Resource Surveys

Nine cultural resource surveys have been conducted within a one-half mile radius of the project area, none of which encompassed the immediate project boundary. Surveys which have taken place within a one-half mile radius of the project boundary include those conducted by Basin Research (1990), Buss (1982), Chavez (1977, 1992), Holman (1992a, 1992b, 1993), Montizambert and Bingham (1982), and Roop (1989). William Self Associates, Inc. has conducted recent work at Chiron, including removal of human remains during construction monitoring (WSA 2002). Archaeological sites identified during the record search are discussed below.

Known Cultural Resources

In addition to potential remains from the Oakland Trotting park and associated facilities, as well as 19th century residences, five prehistoric archaeological sites (CA-ALA-309, -310, -311, -312, -313) lie within a one-half mile radius of the project area (Figure 6).

[redacted]

[redacted]

. . .there were two large mounds just east of the tracks. . . An old history of

[redacted]

APPLICABLE LAWS, ORDINANCES, REGULATIONS AND STATURES (LORS)

The following LORS could apply to the project depending on land jurisdiction:

a. Federal Regulations (applicable if federal permits, funding, or approvals are required on any aspect of the work).

National Historic Preservation Act (NHPA), Title 16, United States Code, Section 470, establishes a national policy to preserve for public use historic sites, buildings, and objects of national significance for the inspiration and benefit of the people of the United States.

National Environmental Policy Act (NEPA): Title 42 United States Code, Sections 4321-4327; requires federal agencies to consider potential environmental impacts of projects with federal involvement and requires application of appropriate mitigation measures.

American Indian Religious Freedom Act; Title 42 United States Code, Section 1996: protects Native American religious practices, ethnic heritage sites, and land uses.

Native American Graves Protection and Repatriation Act (1990); Title 25, United States Code Section 3001, *et seq*: defines "cultural items", "sacred objects", and "objects of cultural patrimony"; establishes an ownership hierarchy; provides for review; allows excavation of human remains, but stipulates return of the remains according to ownership; sets penalties; calls for inventories; and provides for return of specified cultural items. The Act applies only on Federal or Indian lands.

b. State Policies

Title 14, Public Resources Code, Section 5020.1 defines several terms, including the following:

> (f) "DPR Form 523" means the Department of Parks and Recreation Historic Resources Inventory Form.
>
> (i) "Historical resource" includes, but is not limited to, any object, building, structure, site, area, place, record, or manuscript which is historically or archaeologically significant in the architectural, engineering, scientific, economic, agricultural, educational, social, political, military, or cultural annals of California.
>
> (j) "Local register of historical resources" means a list of properties officially designated or recognized as historically significant by a local government pursuant to a local ordinance or resolution.
>
> (l) "National Register of Historic Places" means the official federal list of districts, sites, buildings, structures, and objects significant in

American history, architecture, archaeology, engineering, and culture as authorized by the National Historic Preservation Act of 1966 (Title 16 United States Code Section 470 et seq.).

(q) "Substantial adverse change" means demolition, destruction, relocation, or alteration such that the significance of an historical resource would be impaired.

Title 14, Public Resources Code, Section 5024.1 establishes a California Register of Historic Places; sets forth criteria to determine significance; defines eligible properties; lists nomination procedures.

Title 14, Public Resources Code, Section 5097.5 – any unauthorized removal or destruction of archaeological, paleontological resources on sites located on public lands is a misdemeanor.

Title 14, Public Resources Code 5097.98 prohibits obtaining or possessing Native American artifacts or human remains taken from a grave or cairn; sets penalties.

Title 14, Public Resources Code, Section 21083.2. – the lead agency determines whether a project may have a significant effect on unique archaeological resources; if so, an Environmental Impact Report (EIR) shall address these resources. If a potential for damage to unique archaeological resources can be demonstrated, such resources must be avoided; if they can't be avoided, mitigation measures shall be required; discusses excavation as mitigation; discusses cost of mitigation for several types of projects; sets time frame for excavation; defines "unique and non-unique archaeological resources"; provides for mitigation of unexpected resources; sets limitation for this section.

Title 14, Public Resources Code, Section 21084.1 – indicates that a project may have a significant effect on the environment if it causes a substantial change in the significance of a historic resource; the section further describes what constitutes a historic resource and a significant historic resource.

Guidelines for the Implementation of the California Environmental Quality Act (CEQA) – Section 15064.5 specifically addresses effects on historic and prehistoric archaeological resources, in response to problems that have arisen in the application of CEQA to these resources.

Title 14, Penal Code, Section 622.5 – anyone who damages an item of archaeological or historic interest is guilty of a misdemeanor.

California Environmental Quality Act (CEQA): Public Resources Code Sections 5020.1, 5024.1, 21083.2, 21084.1, *et seq*; requires analysis of potential environmental impacts of proposed projects application of feasible mitigation measures.

California Environmental Quality Act (CEQA) Guidelines: California Code of Regulations, Sections 15000, *et seq*, Appendix G (j), specifically defines a potentially significant environment effect as occurring when the proposed project will "…disrupt or adversely affect…an archeological site, except as part of a scientific study."

Public Resources Code, Section 5097.5. Any unauthorized removal of archaeological resources on sites located on public lands is a misdemeanor. As used in this section, "public lands" means lands owned by, or under the jurisdiction of, the state, or any city, county, district, authority or public corporation, or any agency thereof.

POTENTIAL IMPACTS AND MITIGATION

Impact Evaluation Criteria

The California Environmental Quality Act (CEQA) contains provisions relative to preservation of historic and prehistoric cultural sites. Section 15126.4 of CEQA directs public agencies (i.e., City of Antioch) to "avoid damaging effects" on an archeological resource whenever feasible. If avoidance is not feasible, the importance of the site shall be evaluated as a means of determining impact and developing mitigation measures. CEQA Section 15064.5 states:

> "Generally, a resource shall be considered by the lead agency to be "historically significant" if the resource meets the criteria for listing on the California Register of Historical Resources (Pub. Res. Code SS5024.1, Title 14 CCR, Section 4852) including the following:
>
> (A) Is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage;
>
> (B) Is associated with the lives of persons important in our past;

(C) Embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possesses high artistic values; or

(D) Has yielded, or may be likely to yield, information important in prehistory or history."

To evaluate cultural resource sites against these CEQA criteria requires consideration of, among other things, the overall integrity of the site, the regional culture history (the types, ages, and distribution of other sites in the region), and the nature of questions that researchers are attempting to address regarding the history or prehistory of the region.

Potential Project Impacts

Ground-disturbing construction activities have the potential to directly impact cultural resources in the project area by disturbing both surface and subsurface soils (refer to Figure 6). These resources could be prehistoric (Native American artifacts, features or burials) or historic (features or artifacts associated with ca. post-1840 land use in the area, including the Oakland Trotting Park, early industry, residences, etc). Such disturbance could result in the loss of integrity of cultural deposits, or loss of information through the alteration of site setting, both of which would be considered significant impacts under CEQA if not mitigated. There is also the potential for inadvertent discoveries during construction.

Although none of the known historic or prehistoric resources in the immediate area are believed to be located within the boundaries of the project area (refer to Figure 6), there is nonetheless the potential to encounter significant cultural deposits during project excavations. The exact location of the known resources has not been pinpointed (except those within the Bay Street development), and both historic and prehistoric deposits are likely in the area given the previous land uses there over the past 5,000 years. Should any resources be discovered, their significance would have to be determined in relation to the criteria for eligibility to the California Register of Historic Resources (CRHR). Simply because a shellmound has been leveled, or historic structures removed does not necessarily reduce the significance insofar as CRHR eligibility is concerned. Buried features of many kinds can remain undetected until being discovered during construction; at that time they must be evaluated and a determination made as to their significance.

The preferred mitigation under CEQA is always avoidance of the resource. In this case, given the prescribed area of excavation and the nature of the work – toxic soil remediation – it is unlikely that avoidance will be possible. Should significant resources be discovered during construction, data recovery would be required to gather sufficient information from

the site to consider its loss a less-then-significant impact under CEQA. Should preconstruction excavation or borings be conducted within the project area, it would be advantageous for a qualified archaeologist to monitor the work to define the presence or absence of buried resources to promote advance planning for mitigation purposes.

Preparation of an Archaeological Monitoring and Data Recovery Plan

It has been established that potentially significant cultural resources are known to exist within the immediate project vicinity. Failure to address impacts to these resources during project implementation would be a significant impact under CEQA. City of Emeryville mitigation measures established for the Chiron campus expansion (abutting the northern project boundary) include the formulation of a "...general archaeological monitoring program..." to be implemented "...during excavation, grading, and other earthmoving activities below grade on the project site..." Should the City require Sherwin-Williams to implement similar measures, then an Archaeological Monitoring and Data Recovery Plan (AMDRP) would need to be prepared.

The AMDRP would be prepared as required to meet CEQA mitigation measures, and to reduce impacts to a less-than-significant level. All aspects of cultural resource mitigation would comply with the general requirements of the CEQA Guidelines and CEQA section 15064.5. No additional historic preservation regulations (e.g. Section 106 of the [federal] National Historic Preservation Act) would be applicable, except for those pertaining to the discovery of human remains during construction. Such an occurrence would require compliance with Section 7050.5(b) of the California Health and Safety Code as it pertains to human remains (see below).

The purpose of the AMDRP, therefore, would be to establish construction protocols focused on implementation of specific mitigation measures, monitoring procedures and data recovery methods intended to protect subsurface cultural resources from project-related impacts. Construction monitoring during remediation excavations by a qualified archaeologist(s) would be required to assess whether or not buried deposits are encountered, and to evaluate resources if they area found. The AMDRP would describe monitoring methods, excavation methods, research questions, lab analysis methods, and cataloging and curation requirements for artifacts recovered as part of the work.

Health and Safety issues associated with monitoring and excavating in hazardous soils would have to be addressed in the AMDRP. Archaeological monitors and excavators should not be working in conditions that require OSHA 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPE) or other training if at all possible. A protocol will have to

be established to address how resources will be recovered under hazardous soil conditions and under what conditions resources may be unrecoverable.

Discoveries During Construction

Typically, should unanticipated finds be uncovered during construction, work in the immediate vicinity (within 30 feet) would cease until an archaeologist conducts an assessment of the historic or prehistoric resources. Treatment measures following AMDRP protocol would be implemented on significant finds. In the event that Native American human remains or funerary objects are discovered, the provisions of the California Health and Safety Code should be followed. Section 7050.5(b) of the California Health and Safety Code should be implemented in the event that human remains or possible human remains are located. It states:

> *In the event of discovery or recognition of any human remains in any location other than a dedicated cemetery, there shall be no further excavation or disturbance of the site or any nearby area reasonably suspected to overlie adjacent remains until the coroner of the county in which the human remains are discovered has determined, in accordance with Chapter 10 (commencing with Section 27460) of Part 3 of Division 2 of Title 3 of the Government Code, that the remains are not subject to the provisions of Section 27492 of the Government Code or any other related provisions of law concerning investigation of the circumstances, manner and cause of death, and the recommendations concerning treatment and disposition of the human remains have been made to the person responsible for the excavation, or to his or her authorized representative, in the manner provided in Section 5097.98 of the Public Resources Code.*

The County Coroner, upon recognizing the remains as being of Native American origin, is responsible to contact the Native American Heritage Commission within 24 hours. The Commission has various powers and duties to provide for the ultimate disposition of any Native American remains, as does the assigned Most Likely Descendant. Sections 5097.98 and 5097.99 of the Public Resources Code also call for "protection to Native American human burials and skeletal remains from vandalism and inadvertent destruction". A combination of preconstruction worker training and construction monitoring by a qualified archaeologist (and the likely presence of an onsite Native American monitor) would serve to achieve compliance with this requirement for protection of human remains. Worker training typically instructs workers as to the potential for discovery of cultural or human remains, and both the need for proper and timely reporting of such finds, and the consequences of failure thereof.

SUMMARY

It has been determined on the basis of a record and literature search that there is a potential for significant historic and prehistoric deposits, including whole or partial human remains, to be located in the Sherwin-Williams remediation project area. It is likely that such remains, particularly human remains, would qualify for listing on the CRHR, and would therefore be considered important under CEQA, requiring mitigation. The preferred mitigation is always avoidance, however given the nature of the project, it may not be feasible to avoid resources within the project area should they occur. In anticipation of the need to monitor construction to address the presence or absence of cultural resources, and the need for data recovery should such resources be discovered, an Archaeological Monitoring and Data Recovery Plan should be prepared which describes the protocol under which monitoring will be conducted, and the research questions to be addressed should significant resources be found which require data recovery. Data recovery methods, lab analysis, and cataloging and curation requirements will also be specified in the AMDRP. The need for a Health and Safety Plan should be specified as well, to address monitoring and excavation in hazardous soil conditions.

REFERENCES

Basin Research Associates, Inc.

1990 Archaeological Survey Report. I-880/Cypress Replacement Project. Cities of Oakland and Emeryville, Alameda County, California for DeLeuw, Cather, & Co., San Francisco, California.

Berger, Rainer

1974 Letters of Bert Gerow, January 24, 1974; November 4, 1974. On file in Stanford University Planning Office.

Bocek, Barbara Rose

1986 Hunter-Gatherer Ecology and Settlement Mobility Along San Francisquito Creek. Ph.D. dissertation: Stanford University.

Bolton, Herbert E., ed.

1930 *Anza's California Expeditions*. 5 vols. Berkeley: University of California Press.

Bowman, J.N.

1951 The Peraltas and their Houses. *California Historical Society Quarterly*. 30(3). San Francisco.

Brown, Lauren, ed.

1985 The Audubon Society Nature Guides. *Grasslands*. Alfred A. Knopf, Inc. New York.

Buss, Margaret

1982 *Archaeological Survey Report for Proposed High Occupancy Vehicle Lanes from Bay Bridge to Carquinez Bridge*. Caltrans District 4, Environmental Planning Branch.

Cambra, R., A. Leventhal, L. Jones, L. Field, and N. Sanchez

1996 Archaeological Investigations at *Kaphan Umux* (Three Wolves) site, CA-SCL-732: A Middle Period Prehistoric Cemetery on Coyote Creek in Southern San Jose, Santa Clara County, California. Report on file at Caltrans District 4 Offices, Oakland, California.

Chavez, David

1977 Preliminary Cultural Resources Assessment of the East Bay Municipal Utility District (EBMUD) Wet Weather Facilities/Overflow Project Facilities Sites, Alameda and Contra Costa Counties, California. Prepared for Earth Metrics, Inc.

Chavez, David

1992 Archaeological Resources Investigations for the Hollis Street Sewer Rehabilitation Project, City of Emeryville, Alameda County, California. Submitted to East Bay Municipal Utility District.

Cook, Sherburne F.

1943 The Conflict Between the California Mission Indians and White Civilization. *Ibero-Americana,* Vol. 22. Berkeley.

1957 The Aboriginal Populations of Alameda and Contra Costa Counties, California, *Anthropological Records of the University of California Anthropological Survey,* Berkeley, CA.

Davis, William Heath

1967 *Seventy-five Years in California.* John Howell Books. San Francisco.

Fredrickson, David

1973 Early Cultures of the North Coast Ranges, California. Ph.D. Dissertation, University of California Davis.

Hausler, Donald

1994 The Emeryville Horse Race Track: 1871-1915. *Journal of the Emeryville Historical Society*. Vol. V, No. 1. Spring, 1994.

Heizer, Robert F.

1954 The Archeology of Central California I: The Early Horizon. *University of California Anthropology Records,* Volume 12, No.1:1-84. Berkeley.

Hendry, G.W. and J.N. Bowman

1940 The Spanish and Mexican adobe and other buildings in the nine San Francisco Bay Counties, 1776 About 1850. Ms. on file at the Bancroft Library, University of California, Berkeley.

Henn, W.G., and R.E. Schenk

1970 An Archaeological analysis of Skeletal Material Excavated from the Civic Center of BART. San Francisco: *Society for California Archaeology, R.E. Schenk Memorial Archives of California Archaeology 11*.

Henn, W.G., T.L. Jackson, and J. Schlocker

1972 Buried human bones at the "BART" site, San Francisco, California. Sacramento: *California Geology* 25(9):208-209.

Holman and Associates

1993 Report on Archival Research and a Preliminary Inventory of Potential Prehistoric and Historic Archaeological Resources in the Kaiser Hospital Project Area, Emeryville, Alameda County, California. Submitted to David Powers Associates.

1992a Archaeological Culture Resource Study for the Bay/Shellmound Street Project. Prepared for the City of Emeryville, City of Oakland, Caltrans. Prepared by Richard D. Ambro, Ph.D.

1992b Report on Archival Research and a Preliminary Inventory of Potential Prehistoric and Historic Archaeological Resources in the Del Monte Project Area, Emeryville, Alameda County, California. Submitted to David Powers Associates. Prepared by Richard Ambro, Ph.D.

Jones, Olive and Catherine Sullivan

1989 *The Parks Canada Glass Glossary for the Description of Containers, Tableware, Flat Glass, and Closures*. Revised edition Canada Parks Service, Ottawa.

Judd, D.R.

1984 Early Days in Temescal. *Oakland Heritage Alliance Newsletter.* 4(1):1-6.

Kroeber, Alfred

1970 *Handbook of the Indians of California*. Third Edition. California Book Company, Berkeley.

1925 Handbook of the Indians of California. *Bureau of American Ethnology Bulletin* 78. Washington.

Levy, Richard

1978 Costanoan. In *Handbook of North American Indians*, Volume 8, California, Robert F. Heizer, Ed., pp. 485-495. Smithsonian Institution, Washington.

Lillard, J.B and W.K. Purves

1936 The Archeology of the Deer Creek - Cosumnes Area, Sacramento County, California. *Sacramento Junior College, Department of Anthropology Bulletin* 1. Sacramento.

Lillard J.B., R.F. Heizer and F. Fenenga

1939 An Introduction to the Archeology of Central California. *Sacramento Junior College, Department of Anthropology Bulletin* 2. Sacramento.

Milliken, R.T.

1983 The Spatial Organization of Human Population on Central California's San Francisco Peninsula at the Spanish Arrival. M.A. thesis on file at Sonoma State University, Rohnert Park, CA.

Montizambert, Eric and Jefferey Bingham

1982 Negative Archaeological Survey Report: Proposed HOV Lanes from the Oakland Bay Bridge Toll Plaza on Route 80 to the Route 580/24 interchange in the City of Oakland.. Report on file at the Northwest Information Center, Sonoma State University.

Moratto, M. J., T. F. King, and W. B. Woolfenden

1978 Archaeology and California's climate. *The Journal of California Anthropology* 5(2): 147-161.

Moratto, M. J.

1984 *California Archeology*. Academic Press, Orlando.

Nelson, Nels C.

1909 Shellmounds of the San Francisco Bay Region. *American Archaeology and Ethnology.* University of California Publications. Volume 7, No. 4. Berkeley.

Pilling, Arnold

n.d. Archaeological Site Survey Records for CA-ALA-309, 310, 311, 312, 313. Compiled from Nelson Maps. Records on file at the Northwest Information Center, Sonoma State University.

Schenck, W.E. and E.J. Dawson

1926 The Emeryville Shellmound: Final Report. *University of California Publications in American Archaeology and Ethnology* 23(3):147-282.

Schoenherr, Allan A.

1992 *A Natural History of California*. Berkeley: University of California Press.

Shoup, L.H. with Randall T. Milliken and Alan K. Brown

1995 Ingio of Rancho Posolmi: The Life and Times of A Mission Indian and His Land. Submitted to Woodward-Clyde Consultants, Oakland.

Ragir, S.R.

1972 The Early Horizon in Central California Prehistory. *Contributions of the University of California Archeological Research Facility* 15. Berkeley.

Roop, William

1989 An Evaluation of the Potential for Archaeological Deposits within the Chiron Development Parcel, City of Emeryville, California.. Submitted to EIP Associates.

Schenck, W. E. and E.J. Dawson

1929 Archeology of the Northern San Joaquin Valley. *University of California Publications in American Archeology and Ethnology* 25(4):289-413. Berkeley.

Schoenherr, Allan

1992 *A Natural History of California.* Berkeley: University of California Press.

Shipley, William

1978 Native Languages of California. In *Handbook of North American Indians*, Volume 8, California, Robert F. Heizer, Ed., pp. 80-90. Smithsonian Institution, Washington.

Thompson and West

1878 *Official and Historical Atlas Map of Alameda County, California.* Thompson & West Publishers, Oakland. Bicentennial Reprint in 1976 by Valley Publishers, Fresno.

Uhle, Max

1907 The Emeryville Shellmound. *University of California Publications. American Archaeology and Ethnology, Vol. 7, No.1.* Berkeley: The University Press.

Wallace, W. J.

1978 Post-Pleistocene Archaeology, 9000 to 2000 B.C. In *Handbook of North American Indians Volume 8 California* (W.C. Sturtevant ed.). Smithsonian Institute, Washington. p. 25-36.

William Self Associates, Inc. (WSA)

2002 Report on the Archaeological Monitoring at the Chiron Campus Expansion: Building 12A Parking Structure, Emeryville, CA. Report on file at the Northwest Information Center, Sonoma State University, Rohnert Park.Ca.

Attachment D
Public Health Evaluation of the Remedial Alternative

CDM

The Sherwin-Williams Company

Report for Public Health Evaluation of the Remedial Alternative Emeryville, California

April 10, 2009

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Acronyms

1,2-DCA	1,2-dichloroethane
95%UCL	95 percent upper confidence limit
10^{-6}	one-in-one million
AIHA	American Industrial Hygiene Association
ARARs	Applicable or Relevant and Appropriate Requirements
ATc	averaging time - carcinogens
ATn	averaging time – non-carcinogens
ATSDR	Agency for Toxic Substances and Disease Registry
BAAQMD	Bay Area Air Quality Management District
BWa	body weight - adult
BWc	body weight - child
CAAQS	California Ambient Air Quality Standards
Cal/EPA	California Environmental Protection Agency
CDM	Camp, Dresser & McKee Inc.
COC	chemical of concern
COPC	chemical of potential concern
DTSC	Department of Toxic Substances Control
DVCP	Dust and Vapor Control Plan
ECF	emission control factor
ED	exposure duration
EF	exposure frequency
ET	exposure time
HAZWOPER	Hazardous Waste Operations and Emergency Response Standard
HEAST	USEPA Health Effects Assessment Summary Tables
HHRA	Human Health Risk Assessment
HI	hazard index
IRa	inhalation rate - adult
IRc	inhalation rate – child
kg	kilogram
m^3	cubic meter
mg	milligrams
MNA	monitored natural attenuation
mph	miles per hour
MRLs	Minimal Risk Levels
NAAQS	National Ambient Air Quality Standard
OEHHA	Office of Environmental Health Hazard Assessment
OSHA	Occupational Safety and Health Administration
PAMP	Perimeter Air Monitoring Plan
PCE	tetrachloroethylene
PHERA	Public Health Evaluation of the Remedial Alternative
PM_{10}	particulate matter of 10 microns or less
PPE	personal protection equipment

PPRTV	Provisional Peer Reviewed Toxicity Value
RfC	reference concentration
REL	reference exposure level
RME	reasonable maximum exposure
SCREEN3	Screening Air Dispersion Model
S-W	Sherwin-Williams Company
SVOC	semi-volatile organic compound
TCE	trichloroethylene
TPH	total petroleum hydrocarbons
µg	microgram
USEPA	U.S. Environmental Protection Agency
VOC	volatile organic compound

Executive Summary

The purpose of this Public Health Evaluation of the Remedial Alternative (PHERA) is to provide results from evaluations of potential health effects to people in the surrounding community during implementation of the preferred remedial action associated with the Sherwin-Williams Company (S-W) Emeryville, California site ("Site"). The implementation activities will include excavation and offsite transport of approximately 64,000 cubic yards of soil/material, and take place over a 6-month duration. Chemicals of concern (COCs) for the remedial action include: arsenic, lead, and volatile organic compounds (VOCs). Based on the use of appropriate emission control technologies, e.g., dust and vapor controls, evaluations presented herein show that people in the community will not be put at risk from implementation of the preferred remedial action.

The primary objective of the PHERA is to estimate possible risk to people in the community for adverse health effects during implementation of the preferred remedial action. Two types of potential health effects are typically evaluated: cancer and noncancer. Federal and California governmental agencies have developed thresholds for these two types of risks, and consider estimated risks that fall below these thresholds to be acceptable. For cancer effects, a one-in-one million (10^{-6}) risk level is at the conservative lower range of the health effects commonly used by Federal and California regulatory agencies to determine whether health-protective measures are needed for a community. For noncancer effects, a hazard index (HI) of 1 is generally used by Federal and California regulatory agencies as a risk level above which more detailed toxicology evaluations should be conducted. Neither of these risk levels for cancer or noncancer are direct indicators that health effects will or are likely to occur. They are, however, useful for helping to ensure protection of people in the community from unacceptable exposure to COCs.

During implementation activities, potential exposure to COCs could occur from inhalation of dust and organic vapors from the implementation activities. Dust could be generated during excavation, loading/unloading of excavated soil/material, and offsite transport of excavated soil/material. Organic vapors could be generated from off-gassing of VOCs found in the soil and groundwater.

Based on concentrations of COCs in soil and groundwater samples collected within the planned excavation footprint, an air dispersion computer model was used to estimate unmitigated respirable concentrations of COCs that might be present in the air at the nearest downwind Site fence line location. In this case, unmitigated means without consideration of implementing dust and vapor control measures. Possible exposure to people in the community was then evaluated at the nearest downwind Site fence line location rather than at their offsite property locations. The evaluations of potential health effects to people in the community (i.e., this PHERA) included adult and young children (0 to 6 years old) residents. Young children are the most

sensitive population. Exposure levels that are acceptable for young children residents would also be acceptable for other people in the community, including older children and adult residents, adult workers at nearby commercial and industrial buildings, as well as incidental exposure to neighborhood visitors and pedestrians. Potential exposures were evaluated for the expected total duration of 6 months for implementation activities. Dust at the Site was assumed to be generated 8 hours per day, 5 days per week during excavation and loading activities, and organic vapor generated 24 hours per day, 7 days per week while excavated soils are exposed. The evaluations considered long-term exposure over the total duration of implementation activities as well as short-term exposure to address possible acute health effects. The evaluations considered possible cumulative effects from both inhalation of respirable dust containing arsenic and lead, and air containing VOCs.

The PHERA concludes that that theoretical excess lifetime cancer risk and noncancer hazard index to people in the community without implementation of emission control measures could exceed the target levels (i.e., acceptable cancer risk level of 10^{-6} and noncancer HI of 1). Thus, emission control measures are necessary during implementation activities. Minimum dust and vapor control measure efficiencies required to reduce cancer and noncancer risks to target levels were determined to be 96 percent for dust and 90 percent for organic vapors for soil/material at the Site with the highest concentrations of COCs. This material comprises approximately 7,000 cubic yards of the 64,000 cubic yards of soil/material proposed for excavation. For the remaining approximately 57,000 cubic yards of soil/material with lower COC concentration, minimum dust and vapor control measure efficiencies to reduce risks to target levels were determined to be 60 percent for dust and 90 percent for organic vapors.

Proposed dust and vapor control measures can reduce dust and organic vapor emissions by 99.9 percent. Therefore, the use of emission control measures can and will be used to reduce health risk to people in the community to acceptable levels. Dust and vapor control measures will include: water sprays, surfactants, wetting agents, dust suppressants, plastic covers, and windscreens for dust control; and water sprays, wetting agents, foam covers, and plastic covers for vapor control.

The second objective in the PHERA is to develop performance standards. Performance standards are respirable concentrations for COCs in air that should not be exceeded. Adherence to performance standards helps to ensure protection of people in the community from unacceptable exposure to COCs. A performance standard was calculated for each COC based on Federal and California regulatory enforcement and guidance standards. During implementation activities, samples will be collected on a periodic basis to measure actual respirable COC concentrations in air for comparison to these performance standards. These comparisons will be used to demonstrate that people in the community are not being exposed to unacceptable concentrations of COCs during proposed implementation activities. That is, concentrations of COCs in air monitoring samples are below conservative risk-based performance standards. Ongoing monitoring of respirable COC concentrations in air

will allow implementation activities to be adjusted if and as required to ensure that performance standards are met. Performance standards for the COCs are presented in Table 4-3.

COC concentrations in air cannot be evaluated in "real-time"; that is, concentrations of individual COCs in collected samples will not be available until some hours or days after samples are taken and submitted for analytical testing. Some alternative means is thus needed to assess short-term emissions. Action levels were therefore developed by which COCs can be evaluated immediately, as implementation activities proceed. For this purpose, chemical-specific performance standards were converted into action levels based on real-time measurements of respirable dust and total organic vapors using hand-held and stationary monitors. Comparison of real-time dust and total organic vapor concentrations with these action levels will facilitate real-time decision making regarding the adequacy of emission control measures. As needed, control measures would be modified to maintain emissions below respirable dust and total organic vapor risk-based action levels.

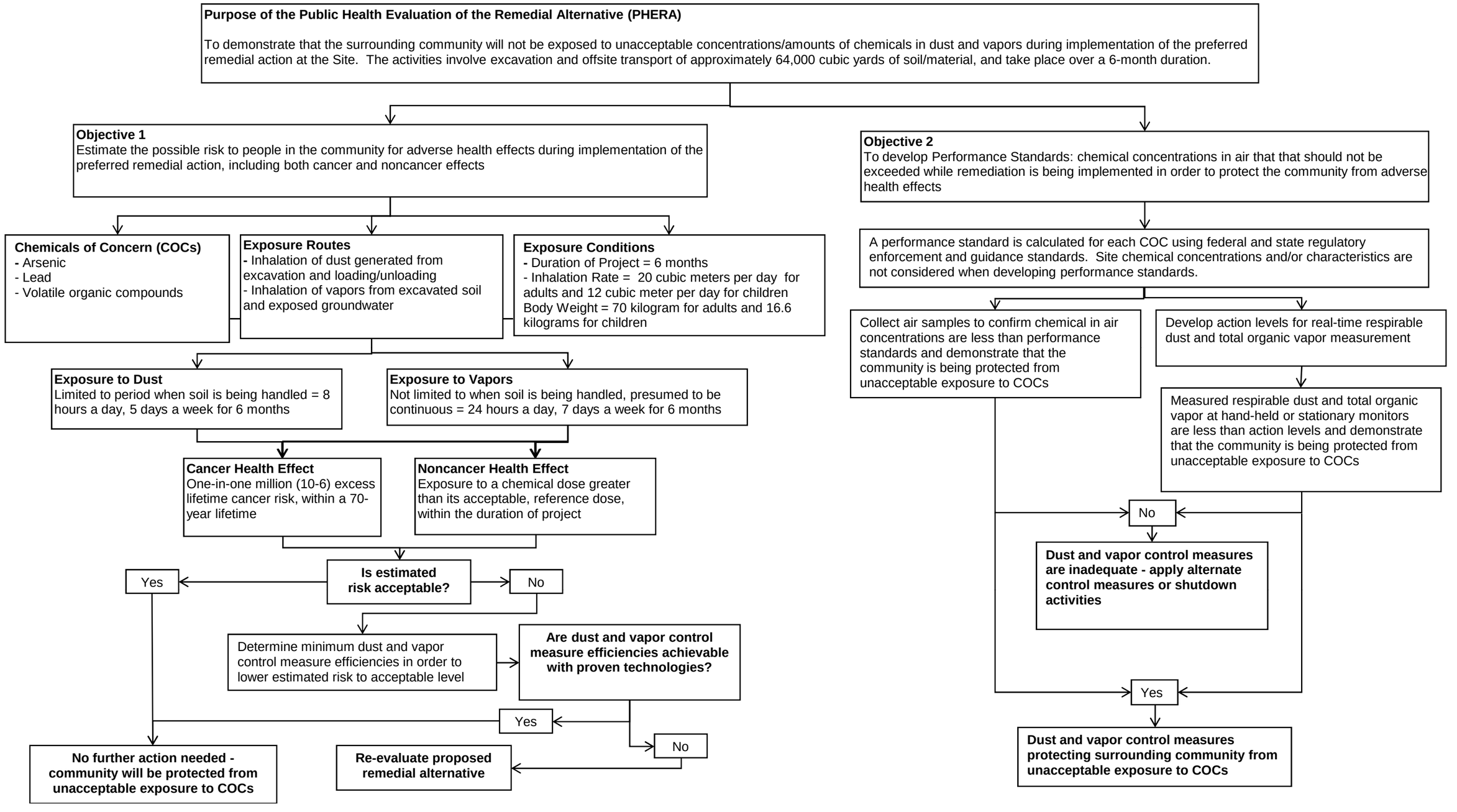
The respirable dust action level to be utilized will vary depending on the concentrations of arsenic and lead for the soil being handled from different parts of the excavation. The calculated action level for respirable dust thus varies from 0.6 micrograms per cubic meter ($\mu g/m^3$) for those excavation areas with the highest concentrations to 50 $\mu g/m^3$ for those excavation areas with lower concentrations.

The calculated action level for total organic vapors is 1,505 $\mu g/m^3$ and does not vary with the excavation activities because off-gassing of organic vapors is not solely a function of soil handling.

Based on these evaluations presented in this report, the preferred remedial action can be implemented in a manner which protects people in the community from unacceptable exposure to COCs.

S-W will ensure protection of public health from unacceptable exposure to COCs during implementation activities with a combination of actions including: (1) implementing a variety of control technologies designed to reduce the generation of dust and organic vapors during implementation activities; (2) continuous monitoring of COC concentrations in air and comparison of these concentrations with chemical-specific performance standards that address long-term exposure; and, (3) real-time measurement of respirable dust and organic vapor concentrations and comparison of these concentrations with action levels that address short-term exposure.

FIGURE ES-1: OVERVIEW OF THE PUBLIC HEALTH EVALUATION OF THE REMEDIAL ALTERNATIVE



Section 1
Introduction

On behalf of the Sherwin-Williams Company (S-W), Camp Dresser & McKee Inc. (CDM) has prepared this Public Health Evaluation of the Remedial Alternative (PHERA) report for the S-W property located at 1450 Sherwin Avenue in Emeryville, California and a portion of the adjacent former Rifkin property, located at 4525-4563 Horton Street. Collectively, these two properties are referred to as the "Site" within this document. Figure 1-1 shows the location of the Site, and Figure 1-2 presents a plan view of the Site.

Several phases of soil and groundwater investigation have been conducted at the Site since 1998. The investigations have revealed that soil and shallow groundwater at the Site contain elevated concentrations of arsenic and lead, from historic lead arsenate manufacturing at the Site and elevated concentrations of volatile organic compounds (VOC) from other historical Site uses. These constituents are chemicals of concern (COCs) for the Site and are the focus of this PHERA. The investigations concluded that COCs have migrated from the S-W property onto a portion of the adjacent former Rifkin property.

Other chemicals detected at the Site include other metals, semi-volatile organic compounds (SVOCs), and total petroleum hydrocarbons (TPHs). However, concentrations of these other chemicals reported in Site soils are not expected to be of concern for public health and are not further addressed.

In the Feasibility Study report for the Site, dated April 1, 2009 (CDM, 2009), S-W identified its preferred remedial action that includes the following implementation activities:

- Raised cap removal;
- Vadose zone soil excavation;
- Source area saturated soil excavation;
- Modification of the existing the slurry wall system;
- Monitored natural attenuation (MNA);
- Groundwater monitoring; and
- Update land use controls.

The implementation activities will include excavation and offsite transport of approximately 64,000 cubic yards of soil/material, and are scheduled to take place over a 6-month duration. The approximate locations of the raised cap removal area,

vadose zone soil excavation, source area saturated soil excavation, and extension of slurry wall are shown on Figure 1-2.

Properties located adjacent to or within close proximity to the Site support residential, commercial, and industrial land uses. Multi-family residential buildings, including Emeryville Lofts, Horton Street Lofts, and 45th Street Artists Co-op (and Annex), are located directly to the east and southwest of the Site. S-W installed a meteorological station at the Site in August 2002, and began recording wind speed, direction, temperature, and rainfall at 30-minute intervals through mid 2007. The station, was located in the approximate center of the S-W property at the end of the existing railcar loading dock extending north from the northeast corner of former Building 35, and was positioned approximately 20 feet above ground. The station confirms a predominantly on-shore wind direction from the west northwest, with average wind speeds of 3 miles per hour (mph) and recorded gusts as high as 9 mph from this direction. Existing Site wind data indicate maximum recorded winds from the south southeast at 18 mph.

Prevailing winds at the Site could thus carry any COCs released to air during implementation activities toward people in the community. To assess this possibility, the Department of Toxic Substances Control (DTSC) requested the completion of a PHERA to characterize potential human health cancer risk and noncancer risks (i.e., hazards) posed by implementation of the preferred remedial action. This report provides a detailed description of the findings of these evaluations. This PHERA was developed following preparation and approval of the PHERA Work Plan (CDM, 2008)[1].

The purpose of the PHERA is to quantitatively evaluate possible risks to people in the surrounding community associated with fugitive dust and organic vapor emissions during implementation activities. Conservative logic indicates that the Site workers, surrounding offsite workers, and transient population will also be protected from unacceptable exposure to COCs by the standards established for the residential population who are in proximity for more hours per day and more days per week.

Further, during implementation activities, Site workers will be required to have 40 hours of Occupational Safety and Health Administration (OSHA) Hazardous Waste Operations and Emergency Response Standard (HAZWOPER) training and use appropriate personal protection equipment (PPE) to control exposure to COCs. This training and PPE can be anticipated to protect workers implementing the preferred remedial action from unacceptable exposure to COCs. Therefore, the PHERA does

[1] Prior to conducting this evaluation, a PHERA Work Plan, dated September 30, 2008 (CDM, 2008), was developed in accordance with the guidelines from U.S. Environmental Protection Agency (USEPA), California EPA (Cal/EPA) and DTSC, and other pertinent risk assessment documents. DTSC approved the PHERA Work Plan in a letter dated October 6, 2008 (DTSC, 2008).

not address exposure assessments for construction workers during implementation of the preferred remedial action.

1.1 Purpose and Objectives

This PHERA provides the results of quantitative evaluations of possible risks to people in the surrounding community from potential exposure to COCs as fugitive dust and organic vapor could be released to ambient air during implementation activities.

The specific objectives of PHERA include:

1. Evaluate possible risks to residents living near the Site from potential exposures to fugitive dust and organic vapor emissions that could be generated during implementation of the preferred remedial action.

2. Develop Site-specific performance standards for COCs in air to limit long-term exposure to fugitive dust and organic vapors that could result from implementation of the preferred remedial action. These performance standards would be used to evaluate respirable COC concentrations in air, which would be continuously monitored through collection and laboratory analysis of air monitoring samples. Comparison of detected COC concentrations in air monitoring samples with performance standards would be used to confirm the effectiveness of dust and vapor control measures.

3. Develop action levels for fugitive dust and total organic vapor concentrations in air that would be used to limit short-term exposure to COCs during implementation of the preferred remedial action. These action levels would be used to evaluate real-time dust and total organic vapor concentrations measured by hand-held or stationary monitors. Comparison of measured dust and total organic vapor concentrations with the action levels would facilitate real-time evaluation of the adequacy of dust and vapor control measures; and, as appropriate, would be used to modify these control measures.

Implementation activities will be managed under the specifications of a Site-specific dust and vapor control plan (DVCP) and monitored for effectiveness under a Site-specific perimeter air-monitoring plan (PAMP). The PAMP will specify that background and ambient air quality will be monitored so that airborne dust and organic vapor generated by implementation activities are maintained below the risk-based performance standards.

1.2 Organization of Report

This PHERA report is organized in the following sections:

- Section 1 Introduction: Background and objectives of the report, and the report organization are presented.

- Section 2 Chemicals of Concern: Chemicals of concern (COCs) are chemicals that drive the need for remediation. Selection of these chemicals as COCs is based on findings from previous remedial investigations and risk assessment studies.

- Section 3 Public Health Evaluation: Results from estimating risk from potential exposure to COCs during implementation activities to nearby residents through inhalation is presented. Potential exposure assessment parameters and toxicity criteria are identified. Values used for estimating appropriate soil, groundwater, and/or air concentrations are also provided.

- Section 4 Development of Performance Standards: Development of Site-specific, risk-based performance standards is provided.

- Section 5 Development of Action Levels: Development of action levels is provided.

- Section 6 References: References cited in the report are provided.

Figure 1-1
Site Location Map
Sherwin-Williams Company
Emeryville, California

CDM

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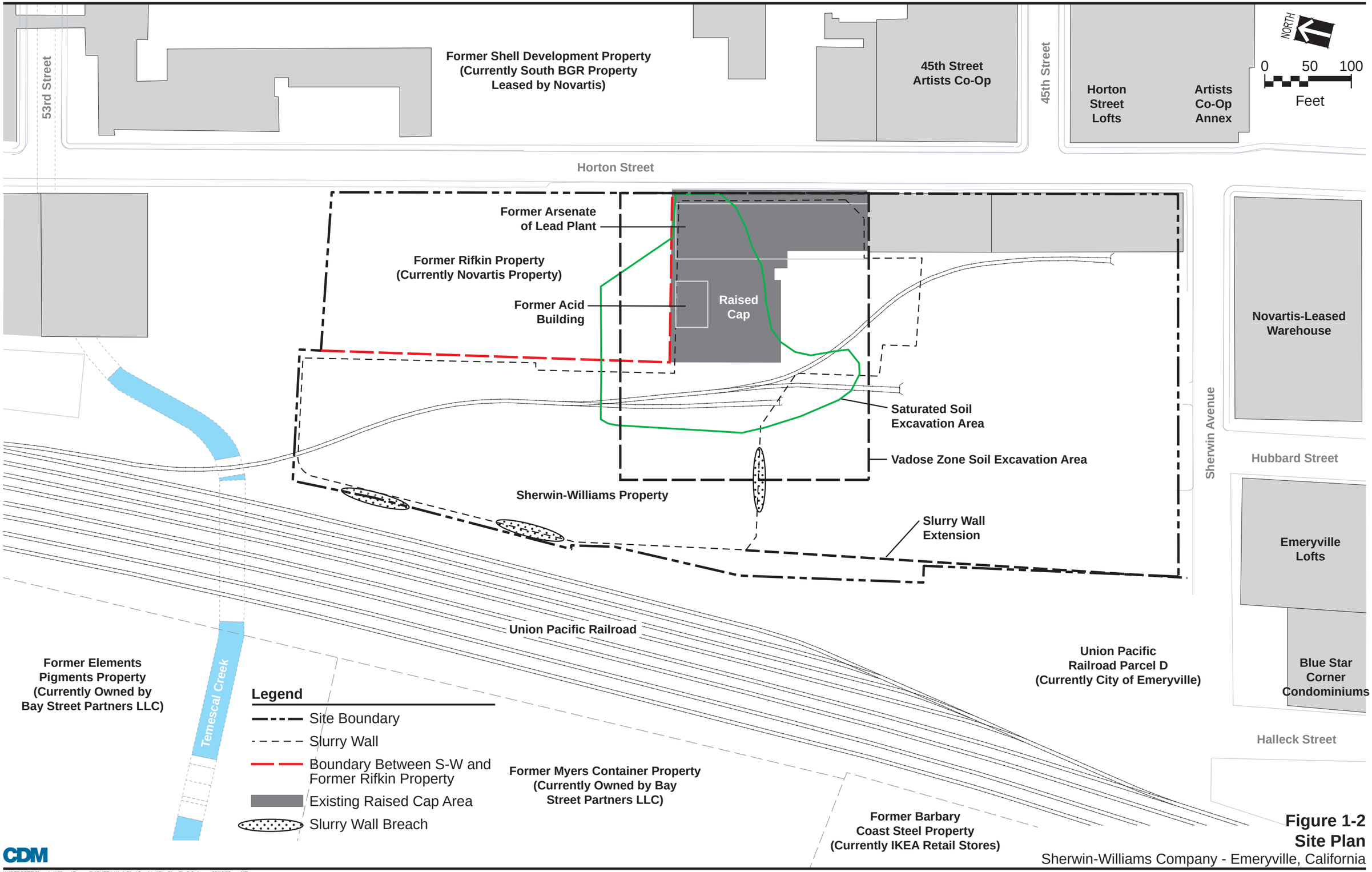

Figure 1-2
Site Plan
Sherwin-Williams Company - Emeryville, California

CDM

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Section 2
Chemicals of Concern

Fugitive dust containing arsenic and lead may be generated and organic vapors may be released to ambient air during the following soil handling activities at the Site:

- Excavation of vadose and saturated zone soils
- Dewatering of excavated material
- Excavation and installation of the slurry wall
- Transferring of soil into trucks/stockpiles
- Transport of the excavated material to offsite facilities

Excavation of soils, transferring of soil into trucks and stockpiles, and removal and installation of the slurry wall are anticipated to be the primary origins for dust emissions. Organic vapors are anticipated to be emitted as a result of excavation of soil, dewatering of soil, and excavation during the installation of the slurry wall, all of which may expose subsurface soil containing VOCs to ambient air. Based on these activities, chemicals of concern (COCs) for the PHERA were identified for soil, groundwater, and soil gas within the excavation.

To the extent appropriate, VOCs selected for the air exposure assessment portion of the Site Human Health Risk Assessment (HHRA) (Gradient, 2005) are evaluated as COCs in the PHERA. Potential exposure of offsite residents associated exposures of several months to COC in dust and as organic vapors can reasonably be evaluated as a subchronic exposure. Chronic exposure scenarios were evaluated in the HHRA and are based on the assumption of continuous lifetime exposure. The approach of using VOCs selected for chronic exposure scenarios in the HHRA as COCs in the PHERA is conservative.

During a 2004 subsurface investigation conducted by CDM at the Site (CDM, 2009), benzene, ethylbenzene, methyl isobutyl ketone, toluene, trichloroethylene (TCE), and xylenes were identified as chemicals comprising total VOCs. Benzene and xylenes were already identified as chemicals of potential concern (COPCs)[2] in the HHRA air assessment (Gradient, 2005). For the purpose of air monitoring, ethylbenzene, methyl isobutyl ketone, toluene, and TCE are selected as COCs for the PHERA. Including all of these chemicals helps ensure that exposure to multiple VOC is adequately addressed.

[2] Chemicals of potential concern are chemicals, among all chemicals detected, that are selected for additional assessment for human health risks. COC are a subset of COPCs that are used to help define the scope and limits of remedial actions.

During a 2006 soil gas investigation conducted by CDM at the Site (CDM, 2009), benzene and 1,2-dichloroethane (1,2-DCA) were detected above their respective soil gas screening levels (Cal/EPA, 2005a). The HHRA air assessment already identified benzene as a COPC for groundwater (Gradient, 2005); however, 1,2-DCA was not identified in the HHRA and was added as a COC for the PHERA.

1,2-Dichloropropane was identified as a COPC in the PHERA Work Plan (CDM, 2008). However, it was not detected in the soil and groundwater samples collected within the planned excavation footprint. Thus it is not evaluated in the PHERA.

COCs evaluated for the PHERA are summarized in Table 2-1. These COCs include:

- Two (2) metals: arsenic and lead.
- Eleven (11) VOCs: benzene, 1,2-DCA, ethylbenzene, methyl ethyl ketone, tetrachloroethylene (PCE), toluene, TCE, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, vinyl chloride, and xylenes.

TABLE 2-1
CHEMICALS OF CONCERN FOR PUBLIC HEALTH EVALUATION

Volatile Organic Compounds[1]	Metals[2]
Benzene	Arsenic
1,2-Dichloroethane	Lead
Ethylbenzene	
Methyl ethyl ketone	
Tetrachloroethylene	
Toluene	
Trichloroethylene	
1,2,4-Trimethylbenzene	
1,3,5-Trimethylbenzene	
Vinyl chloride	
Xylenes	

1. Volatile organic compounds (VOCs) present in air as organic vapors.
2. Metals present in air as respirable dust.

Section 3
Public Health Evaluation

This section presents the public health evaluations based on potential exposures to COCs by people in the community near the Site that could be released during implementation of the preferred remedial action. The steps in these evaluations include: exposure assessment; toxicity assessment; and, risk characterization.

3.1 Exposure Assessment

Exposure assessment identifies and discusses the exposure scenarios, receptor populations, pathways of exposure, and exposure parameters that are used to perform the public health evaluations.

3.1.1 Exposure Scenario and Potential Receptors

During implementation activities, fugitive dust and organic vapors could be released during excavation of vadose and saturated zone soils, dewatering of excavated material, transferring of soil into trucks and stockpiles, removal and installation of the slurry wall, implementation of the slurry wall modifications, and other implementation activities. Arsenic and lead containing particles could be entrained in air as fugitive dust. Particulate matter with an effective diameter of less than or equal to 10 microns (µm) (PM_{10}) is considered respirable (National Ambient Air Quality Standards). Arsenic and lead in these respirable particles that deposit in the deep lung are the basis for toxic effects following inhalation exposure.

VOCs present in soil and groundwater at the excavation could volatilize into ambient air as organic vapors during many of the same activities that might release arsenic and lead. Receptors (i.e., residents in the community) could be exposed to these emitted dusts and organic vapors through inhalation. Potential exposures to COCs in air as respirable dust and organic vapors are evaluated in the PHERA.

The PHERA focuses on evaluating possible risks to residents in the community, specifically adults and young children (0 to 6 years old exposure. Exposure levels that are acceptable for residents in the community would also be acceptable for other possible receptors, including older children, adult workers at nearby commercial and industrial buildings, as well as incidental exposure to neighborhood visitor and pedestrians. In addition, the evaluations have been conservatively based on receptors being continuously present at the nearest downwind Site fence line location rather than at their offsite property locations.

3.1.2 Exposure Concentrations and Parameter Values

Exposure concentrations of COCs for soil and groundwater used in the PHERA are either maximum concentrations or 95 percent upper confidence limits (95%UCLs) of mean concentrations from samples collected within the planned excavation footprint,

whichever is lower. Computation of a 95%UCL of the mean concentration for soil and groundwater was performed using ProUCL Version 4.0, which was developed by USEPA (2007) to recommend an appropriate exposure concentration based on the statistical data distribution, numbers of non-detect data points, and other factors. Table 3-1 presents summary statistics, the distribution type, the 95%UCLs of the mean concentrations, and representative values for exposure concentrations.

Exposure parameters for the PHERA are selected based on USEPA and Cal/EPA guidance for a reasonable maximum exposure (RME) scenario. The intent of RME is to estimate a conservative case that is among the highest exposures possible, but still within the range of possible exposures. For some parameters, either Site-specific values or best professional judgment are used in selecting appropriate exposure parameters. Exposure parameters and the basis for each parameter used for the PHERA are summarized in Table 3-2 and described below.

Exposure Time, Exposure Frequency, and Exposure Duration – The total duration for the implementation activities is expected to be six months. This duration is estimated based on a daily excavation rate of 800 cubic yards for 80 work days (approximately 16 weeks or 3.5 months). Additional time is allowed for contingency and other unforeseeable activities or delays. In order to provide incentive for the selected remediation contractor to complete the work within six months, S-W will impose financial requirements (e.g., liquidated damages) in its agreement with the contractor to complete the work within this time period.

Excavation activities (digging and soil handling) will be performed at the Site for 8 hours per day or 40 hours per week for an estimated total duration of 6 months. Dust generation is expected to only occur during these times. Soil stockpiles and excavations will be covered and no dust-generating activities will occur after work hours. Workers will be present at the Site to monitor the effectiveness of dust mitigation controls. Therefore, the evaluations are based on offsite residents being exposed to dust for approximately 8 hours per workweek day, for the total duration of excavation of half year (i.e., six months)[3].

Organic vapor emissions are anticipated to continue at all times when an excavation is open and are therefore not limited to periods of implementation activities. The PHERA is based on offsite residents being exposed to organic vapors for 24 hours per day, for the total duration of excavation (i.e., six months).

Averaging Time - As recommended by USEPA, an averaging time of a 70-year lifetime of 25,550 days is used for evaluating possible cancer risk. Averaging time for noncancer hazards is equal to the exposure duration of 0.5 year multiplied by 365 days per year (i.e., 183 days). Shorter averaging times are used to estimate possible

[3] Actual exposure to dust is estimated to be 130 days, equivalent to 260 workweek days per year times 0.5 year. Exposure to volatiles is similarly estimated as 183 days, equivalent to 365 total days per year times 0.5 year. Exposure to volatiles could be possible on weekend days as well as weekdays, while exposure to dust could be possible only on weekdays.

subchronic noncancer risk associated with specific "excavation events" of shorter duration. Excavation events represent the planned stages of excavation activities and are further discussed below.

Inhalation Rate – In accordance with regulatory guidance, an inhalation rate of 20 cubic meters per day (m^3/day, 0.83 m^3/hour) for adults and 12 m^3/day (0.5 m^3/hour) for children (birth to 11 years old) are used in the PHERA (USEPA, 2006).

Body Weight - A body weight of 70 kg is used for adults and 16.6 kg for children (0 to 6 years old) (USEPA, 1991 and USEPA, 1997a).

Since arsenic concentrations for soil vary by orders of magnitudes within the excavation, possible concentrations for arsenic in air will vary as the implementation proceeds. Therefore, risk calculations for subchronic exposure to dust containing arsenic are performed separately for the entire excavation and for each excavation event. Exposure parameters for potentially exposed populations are presented in Table 3-2.

3.1.3 Modeling Air Concentrations

Concentrations of COC in soil and groundwater samples collected within the planned excavation event footprints are used to estimate chemical emissions to air. Particulate and volatile emission rates are calculated using USEPA methodologies (USEPA, 1989a and 1993).

3.1.3.1 Particulate Emissions

Particulate emission rates during excavation are estimated using empirically-based equations developed by USEPA (1989a and 1993). Emission rates for arsenic and lead in PM_{10} are estimated based on their corresponding fraction of the total PM_{10} emission rate from soil during excavation activities.

Hourly and long-term (i.e., over the total duration) emission rates are estimated with the appropriate emission factors presented in the PHERA Work Plan (CDM, 2008). The following operations are analyzed for emissions:

- Fugitive dust from excavation activities; and,
- Loading/unloading of excavated material for onsite and offsite transport (materials to be covered during transport).

The emission of fugitive dust from soil movement, including excavation (as discussed above), loading or unloading onto trucks or rail cars and adding or removing from stockpiles, is estimated with Equation 3-1(USEPA, 1993):

$$EF_U = \frac{k(0.0016)(M)\left(\frac{U}{2.2}\right)^{1.3}}{\left(\frac{X_{H2O}}{2}\right)^{1.4}} \qquad (3-1)$$

where:

EF_U	=	PM_{10} emission rate from unloading (g/day)
k	=	particle size multiplier, 0.35 for PM_{10}
M	=	Mass of soil handled (kg/day)
U	=	Mean wind speed (m/sec)
X_{H2O}	=	Soil moisture content (%)
2.2	=	Empirical constant (m/sec)
0.0016	=	Empirical constant (g/kg)

The total emissions from soil excavation and loading and unloading process (i.e., the soil will be excavated and transferred once into the trucks for onsite handling, transferred a second time into stockpiles, and transferred a third time for offsite transport) are estimated by Equation 3-2:

$$ER_{PM10}\left(\frac{kg}{hr}\right) = EF_U\left(\frac{g}{day}\right)(3)\left(\frac{kg}{1000g}\right)\left(\frac{day}{8hr}\right)(1-ECF) \qquad (3-2)$$

where:

ER_{PM10}	=	Total PM_{10} emission rate (kg/hr)
EF_U	=	Emission rate for single transfer processes (g/day) from Equation 3-1
ECF	=	Emission control factor (unitless) (Table 3-11)

Several particle emission control technologies will be used to minimize fugitive dust generation during implementation. Emission control measures that will be used during implementation activities are discussed in Section 3.3 of the report.

Table 3-3 presents the input parameters and estimated particulate emission rates for PM_{10}. Particulate emission rates for arsenic and lead are calculated using 95%UCLs of mean concentrations from soil samples collected within the planned excavation footprint. Results are then incorporated into the air dispersion model discussed in Section 3.1.3.3.

3.1.3.2 Volatile Emissions

During implementation activities, volatile emissions could occur from:

- Exposed soil surfaces within the excavation pit and stockpiles;
- Exposed groundwater within the excavation pit; and,
- Loading /unloading of excavated material for onsite and offsite transport.

Emissions of volatiles from exposed excavation stockpiles will be minimized through several emission control technologies (Table 3-11) and is not be considered in the PHERA. Exposed soils will be sprayed with water and/or foams to inhibit volatilization by filling available pore spaces and thereby decreasing volatilization rate. Plastic sheeting will be used to control vapor emissions from soil stockpiles and transport trucks.

In addition, prior to raised cap materials excavation, soil vapor extraction will be used to remove vapors from soil above the water table. Extracted soil vapor will be treated using granular activated carbon or other treatment technology in compliance with the Bay Area Air Quality Management District requirements. Soil vapor extraction surrounding the excavation pit would continue during excavation and dewatering activities to control release of vapors from exposed excavation walls. The excavation will be dewatered via the installation of a sump pump and conveyance piping.

Possible total volatile emissions from soil are estimated using empirically-based equations developed by USEPA (1993).

$$ER_{vs} = \frac{(S_V)(C)(\beta)(1.0)(1 - ECF)}{t} \qquad (3-3)$$

where:

ER_{vs}	=	Emission rate of chemical i (g/sec)
S_V	=	Total volume of excavated soil (m^3)
C	=	Concentration of chemical i in soil (µg/g)
β	=	Soil bulk density (g/cm^3)
1.0	=	Constant ($g/ 10^6 \mu g \times 10^6 cm^3/m^3$)
ECF	=	Emission control factor (unitless) (Table 3-11)
t	=	Duration of activity (sec)

This equation estimates that, in absence of any emission control technologies and offsite transport, all of the VOC present in the soil will eventually volatize. Thus the estimated possible total emission is conservative.

The chemical flux from soil volatilization is given by Equation 3-4 (USEPA, 1995 and Lakes Environmental, 2007):

$$F_s = \frac{ER_{vs}}{A} \qquad (3-4)$$

where:

F_S	=	Chemical emission rate from soil volatilization (g/m^2-s)
ER_{vs}	=	Emission rate of chemical i (g/sec)
A	=	Surface area of bottom of excavation pit (m^2)

Table 3-4 presents the input parameters and modeling results for the estimation of VOC emissions from the excavation of soil. The evaluation is based on the excavation pit being 76 meters long, 30 meters long and 9 meters deep. This is the longest anticipated length and width of the excavation where VOCs were detected above their associated California Human Health Screening Level (CHHSL) (Cal/EPA, 2005a).

The excavation will be dewatered via the installation of a sump pump and conveyance piping. However, it is unlikely that the pit will be completely free of water at all times. Therefore, potential exposures to organic vapors from groundwater that could be present within the pit are evaluated by using the Virginia Department of Environmental Quality Trench Model (Trench Model) (Virginia Department of Environmental Quality, 2008). The Trench Model is based on a combination of a vadose zone model to estimate volatilization of organic vapors from groundwater into a trench and a box model to estimate dispersion of the VOCs from the air inside the trench into the aboveground atmosphere in order to estimate the air concentration in a construction trench.

VOC concentration in a trench is estimated using Equation 3-5:

$$C_{pit} = (C_{GW})(VF) \qquad (3-5)$$

where:

C_{pit} = Concentration of VOC in the pit (µg/m^3)
C_{GW} = Concentration of VOC in groundwater (µg/L)
VF = Volatilization factor (L/m^3) derived from Equation 3-6

Since a dewater system will be used in the excavation, it is expected that the excavation pit will only intercept the groundwater for a few inches. Volatilization factor, VF, is estimated using Equation 3-6:

$$VF = \frac{(K_i)(A)(F)(10^{-3})(10^4)(3600)}{(ACH)(V)} \qquad (3-6)$$

where:

K_i = Overall mass transfer coefficient of VOC (cm/sec) derived from Equation 3-7
A = Area of excavation pit (m^2)
F = Fraction of floor through which VOC can enter
ACH = Air exchange per hour (/hr)
V = Volume of excavation pit (m^3)
10^{-3} = Conversion factor (L/cm^3)
10^4 = Conversion factor (cm^2/m^2)
3600 = Conversion factor (s/hr)

$$K_i = \frac{1}{\frac{1}{k_{iL}} + \frac{RT}{H_i k_{iG}}} \qquad (3\text{-}7)$$

where:

k_{iL}	=	Liquid-phase mass transfer coefficient of i (cm/sec) derived from Equation 3-8
R	=	Ideal gas constant (atm-m^3/mole- ^{0}K)
T	=	Average system absolute temperature (^{0}K)
H	=	Henry's Law constant of i (atm-m^3/mol)
k_{iG}	=	Gas-phase mass transfer coefficient of i (cm/sec) derived from Equation 3-9

$$k_{iL} = \left(\frac{MW_{O2}}{MW_i}\right)^{0.5} + \frac{T}{298} \times k_{L,O2} \qquad (3\text{-}8)$$

where:

k_{iL}	=	Liquid-phase mass transfer coefficient of i (cm/sec)
MW_{O2}	=	Molecular weight of oxygen (g/mol)
MW_i	=	Molecular weight of i (g/mol)
$K_{L,O2}$	=	Liquid-phase mass transfer coefficient of oxygen at 25 ^{0}C (cm/sec)

$$k_{iG} = \left(\frac{MW_{H2O}}{MW_i}\right)^{0.335} + \left(\frac{T}{298}\right)^{1.005} \times k_{G,H2O} \qquad (3\text{-}9)$$

where:

k_{iG}	=	gas-phase mass transfer coefficient of i (cm/sec)
MW_{O2}	=	Molecular weight of water (g/mol)
MW_i	=	Molecular weight of i (g/mol)
$K_{G,H2O}$	=	gas-phase mass transfer coefficient of water vapor at 25 ^{0}C (cm/sec)

The chemical flux from groundwater volatilization is given by Equation 3-10:

$$F = \left(\frac{C_{pit} \times ACH \times V}{A}\right) \times \left(\frac{g}{1000\,mg}\right) \times \left(\frac{hr}{3600\,s}\right) \qquad (3\text{-}10)$$

where:

F	=	Chemical emission rate from groundwater (g/m^2-s)

C_{pit}	=	Chemical concentration in excavation pit air (mg/m^3)
ACH	=	Air exchange per hour (/hr)
V	=	Volume of excavation pit (m^3)
A	=	Surface area of bottom of excavation pit (m^2)

Table 3-5 presents the input parameters and modeling assumptions for the Trench Model. Estimated VOC emissions from groundwater are presented in Table 3-6. For each COC, volatilization fluxes are calculated using the 95%UCLs of the mean concentrations from soil and groundwater samples collected within the planned excavation footprint. Combined volatilization fluxes are the sum of the calculated soil and groundwater fluxes.

The estimated VOC emissions calculated using the Trench Model are not similar to those detected in soil gas sampling conducted at the Site. This difference is likely due to the detection of organic vapors trapped under the existing cap being detected in the soil gas sampling conducted at the Site.

3.1.3.3 Air Dispersion Model

Once released into the air, organic vapors from soil or groundwater and dust particles from soil could be transported and dispersed by winds to downwind areas. The SCREEN3 (USEPA, 1995) air dispersion model is used to predict downwind air concentrations at the nearest downwind Site fence line location using the above estimated emission rates. The SCREEN3 model is run under "full meteorology" mode, in which all meteorological combinations between stability classes and their associated wind speeds are considered in identifying the "worst case" meteorological condition. The "worst case" condition is the combination that results in the maximum ground level concentrations of COCs. Consequently, estimated fence line air concentrations are conservative (i.e., overestimations of exposure concentrations).

SCREEN3 Model

The SCREEN3 air dispersion model is recommended by USEPA for predicting maximum short-term (1-hour) air concentrations resulting from a point, area, or volume source. It is also one of the preferred models by Cal/EPA Office of Environmental Health Hazard Assessment (OEHHA) for human health risk assessment (OEHHA, 2003).

The SCREEN3 model uses a Gaussian plume model that incorporates source-related factors and meteorological factors to estimate pollutant concentration from contiguous sources. It is assumed that COCs do not go through any chemical reactions and that wet or dry deposition is inconsequential during transport of COCs from source to receptors.

Depending on the location of the source and surrounding land use, the SCREEN3 model uses a set of standard rural and urban dispersion coefficients. Urban atmospheric dispersion coefficients are used for the Site.

SCREEN3 Modeling Parameters

SCREEN3 modeling parameters for the excavation air modeling are presented in Tables 3-7 and 3-8. The exposure area is modeled as a ground level area source. Since the predicted air concentrations vary linearly with the emission rate, a "unit" emission rate per unit area of 1 gram per square meter per second (g/m^2–sec) is used for the model run. This emission rate was selected to determine the maximum ground level concentration at $1g/m^2$-sec, and not to represent the actual emission rate of any specific chemical. The air concentration based on the emission rate of $1g/m^2$-sec is calculated, and the ratio of the true mass flux for each chemical to its ground level concentration is derived.

$$C_{air} = \frac{(C)(PM_{10})(1000)}{10^9} \qquad (3-11)$$

where:

C_{air}	=	Chemical-specific maximum receptor concentration (µg COC/m^3 air)
C	=	Concentration of metal in soil (mg/kg)
PM_{10}	=	Particulate matter (< 10 µm) concentration (µg/m^3)
1000	=	Conversion factor (1000 µg/mg)
10^9	=	Conversion factor (10^9 µg/kg)

The receptors were modeled to be present at the nearest downwind Site fence line location with a breathing height of 1.5 meters.

The excavation is modeled as one area source corresponding to a 76 by 30 meter excavation pit. As shown in Tables 3-7 and 3-8, the plume is assumed to have an initial release height of 0 meters. The distance from the source to the receptors was modeled to be 42 meters, which is the approximate distance from the center of the excavation (Figure 1-2) to the nearest downwind Site fence line location, that along Horton Street based on a predominantly on-shore wind direction from the west northwest.

The SCREEN3 model provides the maximum 1-hour averaging concentration estimations. In order to determine the maximum 8-hour, 24-hour, 30-day and annual ground level concentrations, the maximum 1-hour concentration averages are converted to other averaging periods by using the conversion factors provided by USEPA (1995) and OEHHA (2003). The predicted maximum 1-hour, 8-hour, 24-hour, 30-day and annual ground concentrations for each COC are presented in Table 3-7 for the entire excavation and in Table 3-8 for each excavation event.

The maximum 8-hour concentrations and the maximum 24-hour concentrations in air at the nearest downwind Site fence line location are used for PM_{10} and organic vapor as exposure point concentrations (EPCs), respectively.

3.2 Toxicity Assessment

3.2.1 Cancer and Noncancer

In general, the PHERA utilizes the Cal/EPA OEHHA Toxicity Criteria Database for unit risk factors for inhalation exposure.

Reference exposure levels (RELs) developed by OEHHA are indicators of concentrations at which potential chronic and acute adverse health effects may occur. Acute and chronic RELs are concentrations at which no adverse health effects are anticipated for given short-term (i.e., 1 to 7 hours)[4] and long-term (i.e., greater than 8 years) exposure periods, respectively. Similar to RELs are reference concentrations (RfCs) developed by USEPA. RfCs are derived for short-term (up to 30 days), subchronic (up to 10% of average life span, or 7 years), and chronic exposures (7 years and longer). The anticipated period of excavation when emissions of COCs could occur at the Site is approximately 6 months, which corresponds to the subchronic exposure duration. Subchronic RfCs are thus obtained from the following hierarchy of references and are used preferentially for the risk assessment and development of performance standards:

- Agency for Toxic Substances and Disease Registry 's Minimal Risk Levels (MRLs) (ATSDR, 2007b; http://www.atsdr.cdc.gov/mrls/)
- Provisional Peer Reviewed Toxicity Value (PPRTV) by the Superfund Health Risk Technical Support Center
- USEPA Health Effects Assessment Summary Tables (HEAST) (USEPA, 1997b)

Cal/EPA OEHHA recently published an updated chronic and a new subchronic (8-hour) inhalation REL for arsenic of 0.015 µg/m^3 (Cal/EPA, 2008). The chronic arsenic REL is protective of the general public continuously exposed (i.e., 24 hours per day for 7 days per week) for their total lifetime. The subchronic (8-hour) arsenic REL is designed to address repeated 8-hour exposures occurring as often as daily. Typically, subchronic refers to exposures of not more than a few years, while chronic often means many years to decades of exposure. For example, workers may be exposed in the workplace or children/students may be exposed in schools for 8 hours per day over a total duration of a few years. Subchronic RELs are appropriate to address such exposure situations. Therefore, OEHHA developed an 8-hour arsenic REL for repeated exposure. This 8-hour REL represents a concentration at or below which adverse noncancer health effects are not likely to occur.

Exposures to arsenic in the key study relied upon by OEHHA to derive the REL were long-term rather than intermittent (e.g. 8-hour) exposures and these exposures were daily doses that on average were 30 times higher than the adopted 8-hour arsenic REL

[4] Acute RELs are typically developed for one-hour exposure duration. Because of the uncertainty of extrapolating from repeated dose studies to a one-hour concentration, the arsenic acute REL is for a four-hour exposure (OEHHA 1999).

based on direct ingestion-to-inhalation extrapolation. The subchronic (8-hour) arsenic REL, however, is being established for shorter (8-hour) exposures. OEHHA acknowledges that some arsenic will be metabolized and excreted during the 16 hours of non-exposure but does not believe that excretion is sufficiently well understood to account for it in the development of the subchronic value (Cal/EPA, 2008). Consequently, OEHHA has adopted the chronic arsenic REL as the subchronic value. This approach is likely to be conservative as several studies in humans indicate that 45 to 85% of ingested arsenic is excreted in urine within 1 to 3 days (ATSDR, 2007).

For other COCs where subchronic RELs or RfCs are not available, the more conservative chronic REL or RfC values are used. Chronic criteria are developed based on longer periods of exposure and hence risks for subchronic exposure using the chronic toxicity criteria will overestimate anticipated risks posed by the evaluated exposure. Chronic RELs are obtained from OEHHA (Cal/EPA, 2005b).

Tables 3-9 and 3-10 provide cancer and noncancer toxicity values utilized for the PHERA.

3.2.2 Lead

Risk from inhalation of lead cannot be evaluated in the same manner as arsenic and VOCs because USEPA and Cal/EPA do not have a reference concentration for lead. Instead, the National Ambient Air Quality Standard (NAAQS) for lead of 0.15 µg lead/m^3 will be used as the acceptable respirable lead concentration in air (i.e., its subchronic performance standard). The lead NAAQS was revised in the fall of 2008 by a factor of 10 from 1.5 µg/m^3 to 0.15 µg/m^3 (USEPA, 2008). The California Ambient Air Quality Standards (CAAQS) for lead is 1.5 µg/m^3, averaged over 1 month.

As presented in Table 3-7, the highest modeled exposure concentration for respirable lead of 0.024 µg/m^3 (1-hour without emission control measures) is less than its NAAQS. As such emission control measures are not needed to mitigate possible exposure to respirable lead.

3.3 Emission Control Measures

Measures to control fugitive particulates will be used during implementation activities. Conventional emission control measures to be employed during the implementation include: water sprays, surfactants, wetting agents, dust suppressants, covers, and windscreens. Emission control factors for these technologies have been derived from USEPA references (1989b, 1997c, and 2001).

PM_{10} control efficiencies (i.e., reduction in uncontrolled emissions during soil movement using water spraying) range from 100% at time of application to 75% at up to 2 hours after wetting (USEPA, 2001). Application of water twice daily was reported to result in an average dust emission reduction of 66% to 69% during soil transfer (USEPA, 1989b). Application of water has the potential to cause surface water runoff or ponding, and thus potential migration of COCs. In order to mitigate this concern,

stockpile management areas will have water collection and treatment systems and care will be taken that other areas will not be over-watered, thus, preventing runoff/ponding and potential migration of COCs.

Studies have shown control efficiencies for reduction of dust using windscreens at approximately 60% (USEPA, 1989b).

Emissions of volatiles from exposed soils will be controlled through spraying with water and/or foams to inhibit volatilization by filling available soil pore spaces and thereby decreasing volatilization rate. Temporary foam cover applied during excavation has been shown to have emission control factors of 75 to 95% for up to 1 hour after application, while long-term foam materials have emission control factors of near 100% for up to 24 hours after application. Plastic sheeting will be used to control vapor emissions from soil stockpiles and soil loading onto transport trucks. Plastic sheeting has been reported to also have emission control factors of near 100%.

In addition, prior to material excavation, soil vapor extraction will be used in the raised cap area to remove vapors in soil pores. Soil vapor extraction surrounding the excavation pit will continue during excavation and dewatering activities to minimize volatilization of organic vapors from exposed excavation walls prior to application of foam cover.

Emission control factors for various technologies for dust and organic vapors are summarized in Table 3-11. The emission reductions that these technologies can achieve are sufficient to meet the reductions of 60 to 96% for PM_{10} and 90% for organic vapor, as derived below.

3.4 Risk Characterizations

This section summarizes estimated cancer and noncancer risks to receptors (i.e., residents in the community) due to inhalation of fugitive dust and organic vapors. These estimates are based on a number of conservative assumptions and do not represent estimates of anticipated cancer risks and noncancer hazards for the community. Actual risks and hazards to people in the community are anticipated to be less than those estimated below. Actual respirable concentrations of COCs in air are anticipated to be lower than those estimated for this PHERA, and will be monitored according to the PAMP. Implementation activities will be performed and managed in accordance with the specifications of the DVCP so that airborne dust and organic vapors generated by implementation activities are maintained below risk-based performance standards that are protective of the general public. Risk estimates presented below inform risk managers about the potential impacts to people in the community during implementation activities with the appropriate emission control technologies.

Cancer risk and noncancer hazards to receptors due to inhalation of fugitive dust and organic vapors are estimated for the entire excavation and for each excavation event. Excavation activities will be staged so that only a portion of the excavation footprint is

"open" at any time. Since arsenic soil concentrations vary by orders of magnitudes in samples collected within the planned excavation footprint, possible exposure concentrations in air will vary as the implementation activities proceed. Therefore, risks for exposure to arsenic, based on dust concentrations of PM_{10}, are estimated for the entire excavation and for each excavation event. These two methods for estimating risk are not additive, but represent two different methods to evaluate possible risks during implementation activities.

In addition, risks are estimated by these two methods under two situations: without and with emission control. The first situation characterizes the possible risks to receptors associated with implementation of the preferred remedial action at the Site in the absence of emission control measures. This initial risk evaluation was performed to examine the need for and extent of emissions controls. Since emission controls are necessary for implementation activities, the second situation provides a more representative characterization of possible risks associated with implementation of the preferred remedial action at the Site.

3.4.1 Cancer and Noncancer Risk Estimates for Entire Excavation

As previously mentioned, possible cancer and noncancer risks to receptors are evaluated under two different situations. The first situation assumes that no emission control measures will be used during the excavation. The second situation is based on the assumption that an average emission reduction efficiency of 60% for PM_{10} and 90% for organic vapor will be achieved during the excavation. Risk and hazard calculations are summarized in Table 3-12.

With no emission controls, excess lifetime cancer risk for adult and child residents is 3.3×10^{-6} and 8.4×10^{-6}, respectively. These risk estimates exceed the *de minimis* or lower bound, USEPA and Cal/EPA acceptable risk level of one-in-one million (10^{-6}). For both adult and child residents, organic vapors are the dominant chemical contributors to the cancer risk. Noncancer hazards for adult and child residents is 1.4 and 3.6, respectively, which exceeds the USEPA and Cal/EPA hazard index (HI) risk level of 1. The majority of the calculated noncarcinogenic hazard is attributable to inhalation of organic vapors.

With the above mentioned emission controls, excess lifetime cancer risk for adult and child residents are reduced to 3.7×10^{-7} and 9.3×10^{-7}, respectively. These risk estimates are below the target level of 10^{-6} for acceptable cancer risk. Noncancer HIs for adult and child residents are 0.24 and 0.62 respectively, below the risk level of 1 for an acceptable HI.

3.4.2 Cancer and Noncancer Risk Estimates for Excavation Events

Risk and hazards to receptors from potential inhalation of fugitive dust and organic vapors for the excavation events are calculated under two situations: without emission control and with emission control. The first situation is based on no emission control measures being used during the proposed implementation activities. The second situation is based on an average emission reduction efficiency of 96% of PM_{10}

and a 90% reduction of organic vapor during the raised cap materials excavation event, and 60% for PM_{10} with the 90% reduction of organic vapor during the other excavation events (vadose zone soils, soils for shoring installation, and saturated soils) will be achieved. Risk and hazard calculations are summarized in Table 3-13.

With no emission controls, the sums of excess lifetime cancer risks for adults and children during the excavation events are above the target risk level of 10^{-6}. For both adults and children, organic vapors are the primary contributors to the cancer risk. Unacceptable noncancer hazards exceeding a risk level of 1 are estimated for both adults and children for all excavation events in the absence of emission control measures. For all events except the raised cap materials, the majority of the noncancer hazards are attributable to organic vapors. For the raised cap materials excavation event, they are attributable to arsenic.

With an emission reduction efficiency of 96% of PM_{10} and 90% reduction of organic vapor during the raised cap materials excavation event, and 60% for PM_{10} with the 90% reduction of organic vapor during the other excavation events (vadose zone soils, soils for shoring installation, and saturated soils), the sums of the excess lifetime cancer risks and the noncancer hazards for all excavation events are less than target levels for acceptable risk (i.e., 10^{-6} for cancer and a HI estimates of 1). The higher PM_{10} emission reduction efficiency of 96% is only required for the raised cap materials excavation event, where the highest concentrations of arsenic have been found in soil samples.

3.4.3 Acute Arsenic Risk Evaluation for Excavation Events

Since arsenic soil concentrations vary by orders of magnitudes in samples collected within the planned excavation footprint, acute exposures for excavation is in places where arsenic concentrations are highest was evaluated. The OEHHA provides an acute (4-hour) REL for arsenic of 0.2 micrograms per cubic meter ($\mu g/m^3$), averaged over 4 hours. Table 3-14 presents modeled maximum 4-hour concentrations in air of respirable arsenic at the nearest downwind Site fence line location. Based on an average emission reduction efficiency of 96% for PM_{10} for the raised cap materials excavation event and 60% for other excavation events (vadose zone soils, soils for shoring installation, and saturated soils), estimated respirable arsenic concentrations in air for each excavation event meet the acute (4-hour) REL for arsenic. That is, with the above mentioned emission controls, particulate emissions will not be sufficient to cause respirable arsenic concentrations in air to exceed for 0.2 ug/m^3 for any 4-hour period.

TABLE 3-1
EXPOSURE CONCENTRATIONS

Medium	Chemical of Concern	Unit	Maximum Concentration	Exposure Concentration	Rationale	Statistics
Groundwater	Benzene	µg/L	250	77	95%UCL	KM(BCA)
	1,2-Dichloroethane	µg/L	6.5	4.0	95%UCL	KM(Percentile Bootstrap)
	Ethylbenzene	µg/L	1,000	457	95%UCL	KM(BCA)
	Methyl ethyl ketone	µg/L	30,000	16,335	95%UCL	KM(Chebyshev)
	Tetrachloroethylene	µg/L	1.5	1.5	maximum	
	Toluene	µg/L	62,000	13,974	95%UCL	KM(t)
	Trichloroethylene	µg/L	5.1	4.0	95%UCL	KM(Percentile Bootstrap)
	1,2,4-Trimethylbenzene	µg/L	270	80	95%UCL	KM(BCA)
	1,3,5-Trimethylbenzene	µg/L	60	17	95%UCL	KM(BCA)
	Vinyl chloride	µg/L	0.70	0.70	maximum	
	Xylenes	µg/L	6,340	2,055	95%UCL	KM(BCA)
Soil - Entire Excavation	Arsenic	mg/kg	110,000	5,948	97.5%UCL	KM(Chebyshev)
	Lead	mg/kg	120,000	4,687	97.5%UCL	KM(Chebyshev)
	1,2,4-Trimethylbenzene	mg/kg	210	0.92	95%UCL	KM(t)
	1,3,5-Trimethylbenzene	mg/kg	28	2.0	97.5%UCL	KM(Chebyshev)
	Benzene	mg/kg	0.065	0.007	95%UCL	KM(t)
	Ethylbenzene	mg/kg	220	14	95%UCL	KM(Chebyshev)
	Toluene	mg/kg	2,600	203	95%UCL	KM(Chebyshev)
	Xylenes	mg/kg	670	91	95%UCL	KM(Chebyshev)
Soil - Excavation Event						
Raised Cap Materials	Arsenic	mg/kg	110,000	110,000	maximum	
Vadose Zone Soils	Arsenic	mg/kg	110,000	3,898	95%UCL	Chebyshev(Mean, Sd)
Soils for Shoring Installation	Arsenic	mg/kg	2,100	1,237	95%UCL	Adjusted gamma
Saturated Soils	Arsenic	mg/kg	51,000	3,782	95%UCL	Chebyshev(Mean, Sd)

95%UCL - 95 percentile of upper confidence limit of the mean.

97.5%UCL - 97.5 percentile of upper confidence limit of the mean.

Statistics:

KM(t) - UCL based upon Kaplan-Meier estimates using the Student's t-distribution cutoff value.

KM(BCA) - UCL based upon biased-corrected accelerated bootstrap method.

KM(Percentile Bootstrap) - UCL based upon Kaplan-Meier estimates using the bootstrap method.

KM(Chebyshev) - UCL based upon Kaplan-Meier estimates using the Chebyshev inequality

Chebyshev (Mean, Sd) - UCL based upon Chebyshev Theorem using samples mean and standard deviation.

Adjusted gamma - UCL based upon gamma method.

TABLE 3-2
EXPOSURE PARAMETER VALUES

Parameter	Symbol	Value	Unit	Reference
Inhalation rate - Adult	IR_a	20	m^3/day	USEPA, 1991
inhalation rate - Child	IR_c	12	m^3/day	USEPA, 2006
Body weight - Adult	BW_a	70	kg	USEPA, 1991
Body weight - Child	BW_c	16.6	kg	USEPA, 1997
Exposure Parameters for Entire Project				
Exposure time - PM_{10}	ET	8	hours/day	Professional Judgment[1]
Exposure time - Vapor	ET	24	hours/day	Professional Judgment[1]
Exposure frequency - PM_{10}	EF	260	days/year	Professional Judgment[1]
Exposure frequency - Vapor	EF	365	days/year	Professional Judgment[1]
Exposure duration	ED	0.5	years	Professional Judgment[1]
Averaging Time				
Carcinogens	AT_c	25,550	days	USEPA, 1989
Noncarcinogens	AT_n	183	days	USEPA, 1991
Exposure Parameters for Each Excavation Event				
Exposure time - PM_{10}	ET	8	hours/day	Professional Judgment[1]
Exposure time - Vapor	ET	24	hours/day	Professional Judgment[1]
Exposure days - PM_{10}				
Raised Cap Materials	EF	18	days	Professional Judgment[2]
Vadose Zone Soils	EF	47	days	Professional Judgment[2]
Soils for Shoring Installation	EF	18	days	Professional Judgment[2]
Saturated Soils	EF	47	days	Professional Judgment[2]
Averaging Time				
Carcinogens	AT_c	25,550	days	USEPA, 1989
Noncarcinogens - Vapor	AT_n	183	days	USEPA, 1991
Noncarcinogens - PM_{10}				
Raised Cap Materials	AT_n	25	days	Professional Judgment[3]
Vadose Zone Soils	AT_n	66	days	Professional Judgment[3]
Soils for Shoring Installation	AT_n	25	days	Professional Judgment[3]
Saturated Soils	AT_n	66	days	Professional Judgment[3]

1. Dust assumed to be generated 8 hours per day, 5 days per week during excavation and loading activities and organic vapors assumed to be generated 24 hours per day, 7 days per week while excavated soils are exposed. Total duration for the implementation activities is expected to be 6 months (0.5 year; 130 work days).
2. Work days for each excavation event for PM_{10} exposure, totaling 130 days (260 days/year for 0.5 year).
3. Averaging time is equal to exposure duration, adjusted for 7 days per week.

USEPA, 1989. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual, Part A
USEPA, 1991. Human Health Evaluation Manual, Supplemental Guidance: Standard Default Exposure Factors.
USEPA, 1997. Exposure Factors Handbook Volume I General Factors.
USEPA, 2006. Child-Specific Exposure Factors Handbook (External Review Draft).

TABLE 3-3
PARTICULATE EMISSION RATES FROM SOIL

Parameter	Unit	Calculation	Value	Reference
Emission rate for single transfer processes ($EF_{U)}$	g/day	$EF_U = \frac{k\,(0.0016)(M)\left(\frac{U}{2.2}\right)^{1.3}}{\left(\frac{X_{H2O}}{2}\right)^{1.4}}$	7.29	USEPA, 1993
	g/day	$ERPM_{10} = (EF_u)(3)(1\text{-ECF})$	21.87	Assumes ECF=0
	g/hour	$ERPM_{10} = (EF_u)(3)(1\text{-ECF})$(1 day/8 hours)	2.73	Assumes ECF=0, 8 work hours per day
Total PM_{10} emission rate ($ER_{PM10)}$ (for excavation, loading, and unloading)	g/sec	$ERPM_{10} = (EF_u)(3)(1\text{-ECF})$(1 day/28800 sec)	7.59E-04	Assumes ECF=0, 28,800 work seconds per day (Input for SCREEN3 Model (see Table 3-7))

Parameter	Unit	Description	Value	Reference
EF_U[1]	g/day	Emission rate for single transfer process	see above	site-specific
ER_{PM10}	g/day	Total PM10 emission rate	see above	site-specific
X_{H2O}	percentage	Moisture content	23	site-specific
U	m/s	Wind speed	1.73	site-specific; Gradient, 2005
TM	kg	Total mass to be excavated	70,640,100	site-specific
T	day	Duration of excavation (work days)	130	from Table 3-2
M	kg/day	Mass of soil/material handled per day	543,385	calculated
k	unitless	PM_{10} particle size multiplier	0.35	USEPA, 1993
0.0016	g/kg	Empirical constant	0.0016	USEPA, 1993
2.2	m/sec	Empirical constant	2.2	USEPA, 1993
ECF[2]	unitless	Emission control factor	Table 3-11	site-specific

Gradient, 2005. Human Health Risk Assessment for 1450 Sherwin Avenue, Emeryville, California. February 11.

USEPA, 1993. Models for Estimating Air Emission Rates from Superfund Remedial Actions.

1. EF_U is an input parameter to the SCREEN3 air dispersion model (Table 3-7).

2. ECF values obtained from Table 3-11.

Particulate matter with an effective diameter of less than or equal to 10 microns (µm) (PM_{10}) is considered respirable (National Ambient Air Quality Standards). Arsenic and lead in these respirable particles that deposit in deep lung are the basis for toxic effects following inhalation exposure.

TABLE 3-4
VOLATILE EMISSION RATES FROM SOIL

Chemical of Concern	Exposure Concentration (µg/g) (from Table 3-1)	Possible Emission Rate[1] (g/sec)
Benzene	0.007	1.38E-05
Ethylbenzene	14	2.85E-02
Toluene	203	4.02E-01
1,2,4-Trimethylbenzene	0.92	1.82E-03
1,3,5-Trimethylbenzene	2.0	3.96E-03
Xylenes	91	1.80E-01

1. Possible emission rate for each chemical (ER_{vs}) is estimated based on the following equation (USEPA, 1993):

$$ER_{vs} = \frac{(S_V)(C)(\beta)(1.0)(1-ECF)}{t}$$

Parameter	Unit	Description	Value	Reference
C	µg/g (ppm, mg/kg)	Chemical concentration	see above	from Table 3-1
β	g/cm^3	dry bulk density	1.52	site-specific
t	sec	Duration of excavation	15,768,000	assumed, 183 days
S_v	m^3	total volume of soil to be excavated	20,520	site-specific; excavation pit size
1.0	$g/10^6$ µg × 10^6 cm^3/m^3	constant	-	-
ECF	unitless	Emission control factor	0	no emission control

USEPA, 1993. Models for Estimating Air Emission Rates from Superfund Remedial Actions.

TABLE 3-5
INPUT PARAMETERS FOR GROUNDWATER TRENCH MODEL

Chemical of Concern	Molecular Weight (VDEP, 2008) MW_i (g/mol)	Henry's Law Constant (VDEP, 2008) H_i (atm-m^3/mol)	Exposure Concentration (from Table 3-1) C_{GW} (µg/L)
Benzene	78.11	5.55E-03	77
Methyl ethyl ketone	72.11	1.38E-04	16,335
1,2-Dichloroethane	98.96	9.79E-04	4.0
Ethylbenzene	106.17	7.88E-03	457
Tetrachloroethylene	165.83	1.84E-02	1.5
Toluene	92.14	6.64E-03	13,974
Trichloroethylene	131.39	1.03E-02	4.0
1,2,4-Trimethylbenzene	120.00	5.70E-03	80
1,3,5-Trimethylbenzene	120.00	7.70E-03	17
Vinyl chloride	62.50	2.70E-02	0.70
Xylenes	106.16	5.18E-03	2,055

Parameter	Value	Unit	Reference
For Emission Flux and Concentration in Trench			
CF1	1E-03	L/cm^3	-
CF2	1E+04	cm^2/m^2	-
CF3	3,600	s/hr	-
F	1	unitless	VDEP, 2008
ACH	360	hr-1	VDEP, 2008
Trench dimensions			
Length	249	ft	site-specific; excavation pit size
	76	m	site-specific; excavation pit size
Width	98	ft	site-specific; excavation pit size
	30	m	site-specific; excavation pit size
Depth	30	ft	site-specific; excavation pit size
	9	m	site-specific; excavation pit size
Width/Depth	3.27	unitless	calculated

CF - Conversion factor.

F - Fraction of floor through which VOC can enter

ACH - Air exchange per hour

Virginia Department of Environmental Quality (VDEP), 2008. Voluntary Remediation Program Risk Assessment Guidance.

TABLE 3-6
VOLATILE EMISSION RATES FROM GROUNDWATER

Chemical of Concern	Molecular Weight (VDEP, 2008) (g/mole)	Henry's Law Constant (VDEP, 2008) (atm-m^3/mole)	Gas-Phase Mass Transfer Coefficient[1] (cm/s)	Liquid-Phase Mass Transfer Coefficient[1] (cm/s)	Overall Mass Transfer Coefficient[1] (cm/s)	Exposure Concentration (from Table 3-5) (µg/L)	Trench Model Volatilization Factor[2] (L/m^3)	Concentration of Chemical in Trench[3]		Chemical Emission Rate[4] (g/m^2-s)
								(µg/m^3)	(mg/m^3)	
	MW_i	H_i	k_{iG}	k_{iL}	K_i	C_{GW}	VF	C_{pit}		F
Benzene	78.11	5.55E-03	5.09E-01	1.28E-03	1.27E-03	7.70E+01	1.38E-02	1.07E+00	1.07E-03	9.75E-07
1,2-Dichloroethane	98.96	9.79E-04	4.71E-01	1.14E-03	1.07E-03	4.00E+00	1.17E-02	4.69E-02	4.69E-05	4.29E-08
Ethylbenzene	106.17	7.88E-03	4.60E-01	1.10E-03	1.09E-03	4.57E+02	1.19E-02	5.45E+00	5.45E-03	4.98E-06
Methyl ethyl ketone	72.11	1.38E-04	5.23E-01	1.33E-03	9.18E-04	1.63E+04	6.90E-03	1.13E+02	1.13E-01	1.03E-04
Tetrachloroethylene	165.83	1.84E-02	3.96E-01	8.79E-04	8.76E-04	1.50E+00	9.58E-03	1.44E-02	1.44E-05	1.31E-08
Toluene	92.14	6.64E-03	4.82E-01	1.18E-03	1.17E-03	1.40E+04	1.28E-02	1.79E+02	1.79E-01	1.63E-04
Trichloroethylene	131.39	1.03E-02	4.28E-01	9.87E-04	9.82E-04	4.00E+00	1.07E-02	4.29E-02	4.29E-05	3.93E-08
1,2,4-Trimethylbenzene	120.00	5.70E-03	4.41E-01	1.03E-03	1.02E-03	8.00E+01	1.12E-02	8.95E-01	8.95E-04	8.18E-07
1,3,5-Trimethylbenzene	120.00	7.70E-03	4.41E-01	1.03E-03	1.03E-03	1.70E+01	1.12E-02	1.91E-01	1.91E-04	1.74E-07
Vinyl chloride	62.50	2.70E-02	5.49E-01	1.43E-03	1.43E-03	7.00E-01	1.56E-02	1.09E-02	1.09E-05	9.99E-09
Xylenes	106.16	5.18E-03	4.60E-01	1.10E-03	1.09E-03	2.06E+03	1.19E-02	2.44E+01	2.44E-02	2.23E-05

1. For Mass-Transfer Coefficients:

Gas-Phase Mass-Transfer Coefficient

$$k_{iG} = \left(\frac{MW_{H2O}}{MW_i}\right)^{0.335} + \left(\frac{T}{298}\right)^{1.005} \times k_{G,H2O} \quad \text{(Eq. 3-9)}$$

Liquid-Phase Mass-Transfer Coefficient

$$k_{iL} = \left(\frac{MW_{O2}}{MW_i}\right)^{0.5} + \frac{T}{298} \times k_{L,O2} \quad \text{(Eq. 3-8)}$$

Overall Mass Transfer Coefficient

$$K_i = \frac{1}{\frac{1}{k_{iL}} + \frac{RT}{H_i k_{iG}}} \quad \text{(Eq. 3-7)}$$

Parameter	Value	Unit
$K_{G,H2O}$	0.833	cm/s
MW_{H2O}	18	g/mole
$K_{G,O2}$	0.002	cm/s
MW_{O2}	32	g/mole
T	77	F
T	298	K
R	8.20E-05	atm-m^3/mol-K

2. For Emission Flux:

Volatilization Factor

$$VF = \frac{(K_i)(A)(F_{floor})(10^{-3})(10^4)(3600)}{(ACH)(V)} \quad \text{(Eq. 3-6)}$$

3. For Concentration in Trench:

$$C_{pit} = (C_{GW})(VF) \quad \text{(Eq. 3-5)}$$

4. For Chemical Emission Rate:

$$F = \left(\frac{C_{pit} \times ACH \times V}{A}\right) \times \left(\frac{g}{1000\ mg}\right) \times \frac{hr}{3600\ s} \quad \text{(Eq. 3-10)}$$

Parameter	Value	Unit
F_{floor}	1	
ACH	360	hr^{-1}
Trench Dimensions (from Table 3-5)		
Length	76	m (249 ft)
Width	30	m (98 ft)
Depth	9	m (30 ft)
Volume	20730	m^3
Area	2267	m^2
Width/Depth	3.27	m^2

$K_{G,H2O}$ - gas-phase mass transfer coefficient of water vapor at 25 C (VDEP, 2008)

MW_{H2O} - molecular weight of water vapor (VDEP, 2008)

$K_{G,O2}$ - gas-phase mass transfer coefficient of oxygen gas at 25 C (VDEP, 2008)

MW_{O2} - molecular weight of oxygen gas (VDEP, 2008)

V - volume of excavation pit; site-specific

A - area of excavation pit; site-specific

F_{floor} - fraction of floor through which VOC can enter (VDEP, 2008)

ACH - air exchange per hour (VDEP, 2008)

T - average system absolute temperature; site-specific

R - ideal gas constant (VDEP, 2008)

Virginia Department of Environmental Quality (VDEP), 2008. Voluntary Remediation Program Risk Assessment Guidance.

TABLE 3-7
SCREEN3 AIR DISPERSION MODELING FOR ENTIRE EXCAVATION

SCREEN3 Model Input Parameters:

Source Type:	Area
Emission Rate Modeled:	1.0 g/m^2-s
Release Height:	0.0 m
Receptor Height:	1.5 m
Distance From Source to Fence Line:	42 m
Receptor Distance:	42 m

Chemical of Concern	Exposure Concentration (µg/g) (from Table 3-1)
Arsenic	5,948
Lead	4,687

SCREEN3 Model Input Excavation Dimensions:

Length of Larger Side:	76 m
Length of Smaller Side:	30 m
Area:	2,280 m^2

SCREEN3 Model Input Site Characteristics:

Urban/Rural:	Urban

SCREEN3 Model Results for PM_{10} and VOC Emission Rates and Flux from Soil, and Calculated Respirable Metal Values:

Chemical	Emission Rate (g/s)	Flux (g/m^2-s)
Particulates		
PM_{10}	7.59E-04	3.33E-07
Respirable Arsenic	4.52E-06	1.98E-09
Respirable Lead	3.56E-06	1.56E-09
Organic Vapors		
Benzene	1.38E-05	6.06E-09
Ethylbenzene	2.84E-02	1.25E-05
Toluene	4.00E-01	1.76E-04
1,2,4-Trimethylbenzene	1.81E-03	7.96E-07
1,3,5-Trimethylbenzene	3.95E-03	1.73E-06
Xylene	1.80E-01	7.87E-05

Respirable arsenic and lead values for emission rate and flux calculated by multiplying PM_{10} values with respective exposure concentration.

Only those VOCs detected in soil samples collected from within the excavation footprint were modeled.

Trench Model Results for VOC Emission Rates from Groundwater (from Table 3-6):

Chemical	Trench Concentration (from Table 3-6) ($\mu g/m^3$)	Flux (from Table 3-6) (g/m^2-s)
Benzene	1.07E+00	9.75E-07
1,2-Dichloroethane	4.69E-02	4.29E-08
Ethylbenzene	5.45E+00	4.98E-06
Methyl ethyl ketone	1.13E+02	1.03E-04
Tetrachloroethylene	1.44E-02	1.31E-08
Toluene	1.79E+02	1.63E-04
Trichloroethylene	4.29E-02	3.93E-08
1,2,4-Trimethylbenzene	8.95E-01	8.18E-07
1,3,5-Trimethylbenzene	1.91E-01	1.74E-07
Vinyl Chloride	1.09E-02	9.99E-09
Xylene	2.44E+01	2.23E-05

SCREEN3 Model Results for Ground Level Concentrations at Fence Line with Assumed Flux:

Modeled Chemical Ground Level Concentration at Fence Line with assumed flux of 1 g/m^2-s:	1.53E+07 µg/m3

Chemical Ground Level Concentrations at Fence Line with SCREEN3 and Trench Model Result Flux Values:

Chemical	1-Hour ($\mu g/m^3$)	4-Hour ($\mu g/m^3$)	8-Hour ($\mu g/m^3$)	24-Hour ($\mu g/m^3$)	30-Day ($\mu g/m^3$)	Annual ($\mu g/m^3$)
Particulates (using SCREEN3 model flux results)						
PM_{10}	5.09E+00	4.33E+00	3.57E+00	2.04E+00	1.53E+00	4.08E-01
Respirable Arsenic	3.03E-02	2.58E-02	2.12E-02	1.21E-02	9.09E-03	2.42E-03
Respirable Lead	2.39E-02	2.03E-02	1.67E-02	9.55E-03	7.16E-03	1.91E-03
Organic Vapors (using sum of Trench Model and SCREEN3 Model flux results, as appropriate)						
Benzene	1.50E+01	1.28E+01	1.05E+01	6.00E+00	4.50E+00	1.20E+00
Ethylbenzene	2.67E+02	2.27E+02	1.87E+02	1.07E+02	8.00E+01	2.13E+01
Toluene	5.18E+03	4.41E+03	3.63E+03	2.07E+03	1.56E+03	4.15E+02
1,2,4-Trimethylbenzene	2.47E+01	2.10E+01	1.73E+01	9.88E+00	7.41E+00	1.98E+00
1,3,5-Trimethylbenzene	2.91E+01	2.48E+01	2.04E+01	1.17E+01	8.74E+00	2.33E+00
Xylenes	1.55E+03	1.31E+03	1.08E+03	6.18E+02	4.64E+02	1.24E+02
1,2-Dichloroethane	6.56E-01	5.58E-01	4.60E-01	2.63E-01	1.97E-01	5.25E-02
Methyl ethyl ketone	1.58E+03	1.34E+03	1.10E+03	6.30E+02	4.73E+02	1.26E+02
Tetrachloroethylene	2.01E-01	1.71E-01	1.41E-01	8.04E-02	6.03E-02	1.61E-02
Trichloroethylene	6.01E-01	5.11E-01	4.21E-01	2.40E-01	1.80E-01	4.81E-02
Vinyl chloride	1.53E-01	1.30E-01	1.07E-01	6.12E-02	4.59E-02	1.22E-02

8-Hour, 24-Hour, 30-Day and Annual concentrations were determined by multiplying the 1-Hour concentration by the typical recommended factor that is in Table 4.3 of OEHHA's Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments. The factors are shown in the table below. A 4-hour adjustment factor was developed according to the regression relationship of averaging time and the recommended factor.

Averaging Time	Range	Recommended Factor
3 hours	0.8-1.0	0.9
4 hours	NE	0.85
8 hours	0.5-0.9	0.7
24 hours	0.2-0.6	0.4
30 days	0.2-0.3	0.3
Annual	0.06-0.1	0.08

Particulate matter with an effective diameter of less than or equal to 10 microns (µm) (PM_{10}) is considered respirable (National Ambient Air Quality Standards). Arsenic and lead in these respirable particles that deposit in the deep lung are the basis for toxic effects following inhalation exposure.

TABLE 3-8
SCREEN3 AIR DISPERSION MODELING FOR EXCAVATION EVENTS

SCREEN3 Model Input Parameters:

Source Type:	Area
Emission Rate Modeled:	1.0 g/m^2-s
Release Height:	0.0 m
Receptor Height:	1.5 m
Distance From Source to Fence Line:	42 m
Receptor Distance:	42 m

SCREEN3 Model Input Excavation Dimensions:

Length of Larger Side:	76 m
Length of Smaller Side:	30 m
Area:	2,267 m^2

SCREEN3 Model Input Site Characteristics:

Urban/Rural:	Urban

Excavation Event	Exposure Concentration for Arsenic (µg/g) (from Table 3-1)	Maximum Concentration for Arsenic (µg/g) (from Table 3-1)
Raised Cap Materials	110,000	110,000
Vadose Zone Soils	3,898	110,000
Soils for Shoring Installation	1,237	2,100
Saturated Soils	3,782	51,000

SCREEN3 Model Result for PM_{10} Emission Rate and Flux, and Calculated Respirable Arsenic Values for Excavation Event and Exposure/Maximum Concentrations:

Chemical	Emission Rate (g/s)		Flux (g/m^2-s)	
PM_{10}	7.59E-04		3.35E-07	
Respirable Arsenic	Exposure	Maximum	Exposure	Maximum
Raised Cap Materials	8.35E-05	8.35E-05	3.68E-08	3.68E-08
Vadose Zone Soils	2.96E-06	8.35E-05	1.31E-09	3.68E-08
Soils for Shoring Installation	9.39E-07	1.59E-06	4.14E-10	7.03E-10
Saturated Soils	2.87E-06	3.87E-05	1.27E-09	1.71E-08

Respirable arsenic values for emission rate and flux calculated by multiplying PM_{10} values with respective concentration.

SCREEN3 Model Results for Ground Level Concentrations at Fence Line with Assumed Flux:

Modeled Chemical Ground Level Concentration at Fence Line with Assumed Flux of 1 g/m^2-s:	1.53E+07 µg/m3

Chemical Ground Level Concentrations at Fence Line with Model Result Flux Values for Exposure Concentration:

Chemical	1-Hour (µg/m^3)	4-Hour (µg/m^3)	8-Hour (µg/m^3)	24-Hour (µg/m^3)	30-Day (µg/m^3)	Annual (µg/m^3)
PM_{10}	5.12E+00	4.36E+00	3.59E+00	2.05E+00	1.54E+00	4.10E-01
Respirable Arsenic						
Raised Cap Materials	5.64E-01	4.79E-01	3.95E-01	2.25E-01	1.69E-01	4.51E-02
Vadose Zone Soils	2.00E-02	1.70E-02	1.40E-02	7.99E-03	5.99E-03	1.60E-03
Soils for Shoring Installation	6.34E-03	5.39E-03	4.44E-03	2.54E-03	1.90E-03	5.07E-04
Saturated Soils	1.94E-02	1.65E-02	1.36E-02	7.75E-03	5.81E-03	1.55E-03

Chemical Ground Level Concentrations at Fence Line with Model Result Flux Values for Maximum Concentration:

Chemical	1-Hour (µg/m^3)	4-Hour (µg/m^3)	8-Hour (µg/m^3)	24-Hour (µg/m^3)	30-Day (µg/m^3)	Annual (µg/m^3)
PM_{10}	5.12E+00	4.36E+00	3.59E+00	2.05E+00	1.54E+00	4.10E-01
Respirable Arsenic						
Raised Cap Materials	5.64E-01	4.79E-01	3.95E-01	2.25E-01	1.69E-01	4.51E-02
Vadose Zone Soils	5.64E-01	4.79E-01	3.95E-01	2.25E-01	1.69E-01	4.51E-02
Soils for Shoring Installation	1.08E-02	9.15E-03	7.53E-03	4.30E-03	3.23E-03	8.61E-04
Saturated Soils	2.61E-01	2.22E-01	1.83E-01	1.05E-01	7.84E-02	2.09E-02

8-Hour, 24-Hour, 30-Day and Annual concentrations were determined by multiplying the 1-Hour concentration by the typical recommended factor that is in Table 4.3 of OEHHA's Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments. The factors are shown in the table below. A 4-hour adjustment factor was developed according to the regression relationship of averaging time and the recommended factor.

Averaging Time	Range	Recommended Factor
3 hours	0.8-1.0	0.9
4 hours	NE	0.85
8 hours	0.5-0.9	0.7
24 hours	0.2-0.6	0.4
30 days	0.2-0.3	0.3
Annual	0.06-0.1	0.08

Particulate matter with an effective diameter of less than or equal to 10 microns (µm) (PM_{10}) is considered respirable (National Ambient Air Quality Standards). Arsenic and lead in these respirable particles that deposit in the deep lung are the basis for toxic effects following inhalation exposure.

TABLE 3-9
CANCER TOXICITY VALUES

Chemical of Concern	Unit Risk ($\mu g/m^3)^{-1}$	Unit Risk Reference	Inhalation Slope Factor $(mg/kg/day)^{-1}$	Weight of Evidence/Cancer Guideline Description
Volatile Organic Compounds				
Benzene	2.9E-5	Cal/EPA	1.0E-1	A
1,2-Dichloroethane	2.1E-5	Cal/EPA	7.2E-2	B2, 2B
1,2-Dichloropropane	1.0E-5	Cal/EPA	3.6E-2	3
Ethylbenzene	2.5E-6	Cal/EPA	8.7E-3	D, B2
Methyl ethyl ketone	NE	NE	NE	NE
Tetrachloroethylene	5.9E-6	Cal/EPA	2.1E-2	2B
Toluene	NE	NE	NE	NE
Trichloroethylene	2.0E-6	Cal/EPA	7.0E-3	2A
1,2,4-Trimethylbenzene	NE	NE	NE	D
1,3,5-Trimethylbenzene	NE	NE	NE	D
Vinyl chloride	7.8E-5	Cal/EPA	2.7E-1	A, 1
Xylenes	NE	NE	NE	NE
Metals				
Lead	NE	NE	NE	NE
Arsenic	3.3E-3	Cal/EPA	1.2E+1	A, 1

Cal/EPA – California EPA Office of Environmental Health Hazard Assessment Toxicity Criteria Database.

EPA Weight of Evidence (EPA 1986, EPA 1996):

A,1 - Human Carcinogen.

B1, 2A - Probable human carcinogen - indicates limited evidence in humans.

B2, 2B - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans.

C - Possible human carcinogen.

D - Not classifiable as human carcinogen.

NE - Not established.

Group 3: Carcinogenic properties not classifiable.

Group 4: Probable human non-carcinogen.

TABLE 3-10
NONCANCER TOXICITY VALUES

Chemical of Concern	Chronic RfC/REL ($\mu g/m^3$)	Inhalation RfD (mg/kg/day)	Chronic RfC/REL Reference	Subchronic RfC/REL ($\mu g/m^3$)	Subchronic Inhalation RfD (mg/kg/day)	Subchronic RfC/REL Reference	Acute RfC/REL ($\mu g/m^3$)	Chronic RfC/REL Reference	Primary Target Organ(s)
Volatile Organic Compounds									
Benzene	60	1.7E-2	Cal/EPA	NA	NA	NA	1,300	Cal/EPA	blood, developmental, nerve
1,2-Dichloroethane	2,429	6.9E-1	ADSTR	NA	NA	NA	NA		liver
1,2-Dichloropropane	4	1.1E-3	IRIS	32	9.1E-3	ATSDR 2007b			nasal mucosa
Ethylbenzene	2,000	5.7E-1	Cal/EPA	3,040	8.7E-1	ATSDR 2007b	NA		development, liver, kidney,
Methyl ethyl ketone	5,000	1.4E+00	IRIS	NA	NA	NA	13,000	Cal/EPA	developmental
Tetrachloroethylene	272	7.8E-2	ATSDR	350	1.0E-1	HEAST[1]	20,000	Cal/EPA	liver, kidney
Toluene	300	8.6E-2	Cal/EPA	7000	2.0E+0	HEAST[1]	37,000	Cal/EPA	nerve, development, respiratory
Trichloroethylene	600	1.7E-1	Cal/EPA	537	1.5E-1	ATSDR 2007b	NA		nerve, eye
1,2,4-Trimethylbenzene	7	2.0E-3	PPRTV	70	2.0E-2	PPRTV	NA		central nerve system
1,3,5-Trimethylbenzene [2]	7	2.0E-3	PPRTV	70	2.0E-2	PPRTV	NA		central nerve system
Vinyl chloride	100	2.9E-2	IRIS	77	2.2E-2	ATSDR 2007b	180,000	Cal/EPA	liver
Xylenes	700	2.0E-1	Cal/EPA	2606	7.4E-1	ATSDR 2007b	22,000	Cal/EPA	nerve, respiratory
Metals									
Lead	NE	NE	NE	NE	NE	NE	NE	NE	NE
Arsenic	0.015	8.6E-6	Cal/EPA	0.015	4.3E-6	Cal/EPA[3]	0.20	Cal/EPA	development

1. Converted from subchronic oral reference dose (RfD).

2. 1,2,4-Trimethylbenzene is used as a surrogate.

3. Subchronic REL from OEHHA December 2008.

NE - Not established.

NA – Subchronic RfC is not available or subchronic RfC or subchronic RfC is more stringent than chronic RfC.

Cal/EPA - California EPA, Chronic Reference Exposure Levels (RELs).

ATSDR – Agency for Toxic Substances and Disease Control. Chronic RfCs are based on chronic inhalation Minimal Risk Levels (MRLs). Subchronic RfCs are based on intermediate inhalation MRL (November 2007).

HEAST - EPA's Health Effects Assessment Summary Tables.

PPRTV - Provisional Peer Reviewed Toxicity Value (PPRTV) by the EPA Superfund Health Risk Technical Support Center.

RfC = Reference concentration; RfD = Reference dose

TABLE 3-11
SUMMARY OF EMISSION CONTROL TECHNOLOGIES

Control Technology		Emission Control Factor (ECF)		Comments
		Particulates[1]	Volatile Organic Compounds[2]	
Cover	Clean Soil	NA	>95%	
	Synthetic Cover		NA	
	Mulch		NA	
Foam	Temporary foam cover	NA	75% to 95%	up to an hour
	Long-term foam cover		99% to 100%	24 hours
Water Sprays	Spray of active excavation	42 to 63%	NA	
	spray of dumping area	46 to 77%		
Dust suppressant	unpaved road	40 to 99%	NA	
	soil pile	50 to 70%		
Operational controls	rate of excavation		NA	
	amount of soil exposed			
	duration of soil pile left uncovered			
	timing of excavation			
Wind Barrier			NA	
Other factors on soil pile	placement		NA	shield from prevailing wind
	surface area			minimize surface area
	orientation	60%		length perpendicular to the prevailing wind direction

1. From USEPA, 1989. Air/Superfund national technical guidance study series: Volume III - Estimation of air emissions from cleanup activities at Superfund Sites. Interim Final.

2. From USEPA 1997. Air emissions from the treatment of soils contaminated with petroleum fuels and other substances.

NA - Not available.

TABLE 3-12
CANCER AND NONCANCER RISK ESTIMATES FOR ENTIRE EXCAVATION

				Exposure Frequency	Receptor	Adult		Child	
					PM_{10}	130 days		130 days	
					Vapor	183 days		183 days	
	Chemical of Concern	Inhalation Cancer Slope Factor (from Table 3-9) $(mg/kg/day)^{-1}$	Inhalation Reference Dose (from Table 3-10) (mg/kg/day)	Concentration in Air (from Table 3-7) ($\mu g/m^3$)	Cancer Risk	Hazard Index	Cancer Risk	Hazard Index
No Emission Control								
PM_{10}	Arsenic	1.20E+01	4.29E-06	2.12E-02	1.2E-07	3.4E-01	3.1E-07	8.5E-01
Vapor	Benzene	1.00E-01	1.70E-02	6.00E+00	1.2E-06	1.0E-01	3.1E-06	2.6E-01
	Ethylbenzene	8.70E-03	8.69E-01	1.07E+02	1.9E-06	3.5E-02	4.8E-06	8.9E-02
	Toluene	NE	2.00E+00	2.07E+03	NE	3.0E-01	NE	7.5E-01
	1,2,4-Trimethylbenzene	NE	2.00E-02	9.88E+00	NE	1.4E-01	NE	3.6E-01
	1,3,5-Trimethylbenzene[1]	NE	2.00E-02	1.17E+01	NE	1.7E-01	NE	4.2E-01
	Xylenes	NE	7.45E-01	6.18E+02	NE	2.4E-01	NE	6.0E-01
	1,2-Dichloroethane	7.20E-02	6.94E-01	2.63E-01	3.9E-08	1.1E-04	9.8E-08	2.7E-04
	Methyl ethyl ketone	NE	1.43E+00	6.30E+02	NE	1.3E-01	NE	3.2E-01
	Tetrachloroethylene	2.10E-02	1.00E-01	8.04E-02	3.4E-09	2.3E-04	8.7E-09	5.8E-04
	Trichloroethylene	7.00E-03	1.53E-01	2.40E-01	3.4E-09	4.5E-04	8.7E-09	1.1E-03
	Vinyl chloride	2.70E-01	2.20E-02	6.12E-02	3.4E-08	7.9E-04	8.5E-08	2.0E-03
			TOTAL		**3.3E-06**	**1.4E+00**	**8.4E-06**	**3.6E+00**
With Emission Control (60% reduction of PM_{10} and 90% reduction of vapor)				Reduction of PM_{10}=	60%	Reduction of vapor=	90%	
PM_{10}	Arsenic	1.20E+01	4.29E-06	8.48E-03	4.9E-08	1.3E-01	1.2E-07	3.4E-01
Vapor	Benzene	1.00E-01	1.70E-02	6.00E-01	1.2E-07	1.0E-02	3.1E-07	2.6E-02
	Ethylbenzene	8.70E-03	8.69E-01	1.07E+01	1.9E-07	3.5E-03	4.8E-07	8.9E-03
	Toluene	NE	2.00E+00	2.07E+02	NE	3.0E-02	NE	7.5E-02
	1,2,4-Trimethylbenzene	NE	2.00E-02	9.88E-01	NE	1.4E-02	NE	3.6E-02
	1,3,5-Trimethylbenzene[1]	NE	2.00E-02	1.17E+00	NE	1.7E-02	NE	4.2E-02
	Xylenes	NE	7.45E-01	6.18E+01	NE	2.4E-02	NE	6.0E-02
	1,2-Dichloroethane	7.20E-02	6.94E-01	2.63E-02	3.9E-09	1.1E-05	9.8E-09	2.7E-05
	Methyl ethyl ketone	NE	1.43E+00	6.30E+01	NE	1.3E-02	NE	3.2E-02
	Tetrachloroethylene	2.10E-02	1.00E-01	8.04E-03	3.4E-10	2.3E-05	8.7E-10	5.8E-05
	Trichloroethylene	7.00E-03	1.53E-01	2.40E-02	3.4E-10	4.5E-05	8.7E-10	1.1E-04
	Vinyl chloride	2.70E-01	2.20E-02	6.12E-03	3.4E-09	7.9E-05	8.5E-09	2.0E-04
			TOTAL		**3.7E-07**	**2.4E-01**	**9.3E-07**	**6.2E-01**

Equation Definition:

Cancer Risk = (CSF x ET x EF x ED x IR x C_A x CF1) / (BW x AT_C x CF2)

Hazard Quotient = (ET x EF x ED x IR x C_A x CF1) / (RfD x BW x AT_{NC} x CF2)

Parameter	Definition	Value - Adult	Value - Child	Reference
C_A	chemical-specific concentration in air ($\mu g/m^3$)	chemical-specific, ground level concentrations (see Table 3-7 for vapor for 24-hr, and arsenic for 8-hr)		SCREEN3 Model
BW	body weight (kg)	70	16.6	Table 3-2
AT_C	cancer -averaging time (days)	25550	25550	Table 3-2
AT_{NC}	Noncancer average time (days)	183	183	Table 3-2
ET_{AS}	Exposure time (hours/day) - arsenic	8	8	Table 3-2
EF_{AS}	exposure frequency (d/yr) - arsenic	260	260	Table 3-2
ET_{Vapor}	Exposure time (hours/day) - vapor	24	24	Table 3-2
EF_{Vapor}	exposure frequency (d/yr) - vapor	365	365	Table 3-2
ED	exposure duration (yrs)	0.5	0.5	Table 3-2
CSF	inhalation cancer slope factor $(mg/kg/day)^{-1}$	chemical-specific		Table 3-9
RfD	inhalation reference dose (mg/kg/day)	chemical-specific		Table 3-10
IR	inhalation rate, m^3/day	20	12	Table 3-2
CF1	conversion factor (mg/µg)	1E-03	1E-03	-
CF2	conversion factor (hours/day)	24	24	-

1. 1,2,4-Trimethylbenzene is used as a surrogate.

TABLE 3-13
CANCER AND NONCANCER RISK ESTIMATES FOR EXCAVATION EVENTS

					Excavation Event	Raised Cap Materials			Vadose Zone Soils			Soils for Shoring Installation			Saturated Soils			Entire Excavation	
					Exposure Frequency	PM10 Vapor	18 days 25 days		PM10 Vapor	47 days 66 days		PM10 Vapor	18 days 25 days		PM10 Vapor	47 days 66 days			
Receptor	**Chemical of Concern**		**Inhalation Cancer Slope Factor (from Table 3-9) (mg/kg/day)$^{-1}$**	**Inhalation Reference Dose (from Table 3-10) (mg/kg/day)**	**Concentration in Air (from Tables 3-7 and 3-8) (µg/m^3)**	**Cancer Risk**	**Hazard Index**	**Concentration in Air (from Tables 3-7 and 3-8) (µg/m^3)**	**Cancer Risk**	**Hazard Index**	**Concentration in Air (from Tables 3-7 and 3-8) (µg/m^3)**	**Cancer Risk**	**Hazard Index**	**Concentration in Air (from Tables 3-7 and 3-8) (µg/m^3)**	**Cancer Risk**	**Hazard Index**	**Total Cancer Risk**	**Maximum Hazard Index**
No Emission Control																			
Adult	PM_{10}	Arsenic	1.20E+01	4.29E-06	3.95E-01	3.2E-07	6.3E+00	1.40E-02	2.9E-08	2.2E-01	4.44E-03	3.6E-09	7.0E-02	1.36E-02	2.9E-08	2.2E-01		
	Vapor	Benzene	1.00E-01	1.70E-02	6.00E+00	1.7E-07	1.0E-01	6.00E+00	4.4E-07	1.0E-01	6.00E+00	1.7E-07	1.0E-01	6.00E+00	4.4E-07	1.0E-01		
		Ethylbenzene	8.70E-03	8.69E-01	1.07E+02	2.6E-07	3.5E-02	1.07E+02	6.8E-07	3.5E-02	1.07E+02	2.6E-07	3.5E-02	1.07E+02	6.8E-07	3.5E-02		
		Toluene	NE	2.00E+00	2.07E+03	NE	3.0E-01	2.07E+03	NE	3.0E-01	2.07E+03	NE	3.0E-01	2.07E+03	NE	3.0E-01		
		1,2,4-Trimethylbenzene	NE	2.00E-02	9.88E+00	NE	1.4E-01	9.88E+00	NE	1.4E-01	9.88E+00	NE	1.4E-01	9.88E+00	NE	1.4E-01		
		1,3,5-Trimethylbenzene [1]	NE	2.00E-02	1.17E+01	NE	1.7E-01	1.17E+01	NE	1.7E-01	1.17E+01	NE	1.7E-01	1.17E+01	NE	1.7E-01		
		Xylenes	NE	7.45E-01	6.18E+02	NE	2.4E-01	6.18E+02	NE	2.4E-01	6.18E+02	NE	2.4E-01	6.18E+02	NE	2.4E-01		
		1,2-Dichloroethane	7.20E-02	6.94E-01	2.63E-01	5.3E-09	1.1E-04	2.63E-01	1.4E-08	1.1E-04	2.63E-01	5.3E-09	1.1E-04	2.63E-01	1.4E-08	1.1E-04		
		Methyl ethyl ketone	NE	1.43E+00	6.30E+02	NE	1.3E-01	6.30E+02	NE	1.3E-01	6.30E+02	NE	1.3E-01	6.30E+02	NE	1.3E-01		
		Tetrachloroethylene	2.10E-02	1.00E-01	8.04E-02	4.8E-10	2.3E-04	8.04E-02	1.2E-09	2.3E-04	8.04E-02	4.8E-10	2.3E-04	8.04E-02	1.2E-09	2.3E-04		
		Trichloroethylene	7.00E-03	1.53E-01	2.40E-01	4.7E-10	4.5E-04	2.40E-01	1.2E-09	4.5E-04	2.40E-01	4.7E-10	4.5E-04	2.40E-01	1.2E-09	4.5E-04		
		Vinyl chloride	2.70E-01	2.20E-02	6.12E-02	4.7E-09	7.9E-04	6.12E-02	1.2E-08	7.9E-04	6.12E-02	4.7E-09	7.9E-04	6.12E-02	1.2E-08	7.9E-04		
				Total		**7.6E-07**	**7.4E+00**		**1.2E-06**	**1.3E+00**		**4.5E-07**	**1.2E+00**		**1.2E-06**	**1.3E+00**	**3.6E-06**	**7.4E+00**
Child	PM_{10}	Arsenic	1.20E+01	4.29E-06	3.95E-01	8.0E-07	1.6E+01	1.40E-02	7.4E-08	5.6E-01	4.44E-03	9.0E-09	1.8E-01	1.36E-02	7.2E-08	5.4E-01		
	Vapor	Benzene	1.00E-01	1.70E-02	6.00E+00	4.3E-07	2.6E-01	6.00E+00	1.1E-06	2.6E-01	6.00E+00	4.3E-07	2.6E-01	6.00E+00	1.1E-06	2.6E-01		
		Ethylbenzene	8.70E-03	8.69E-01	1.07E+02	6.6E-07	8.9E-02	1.07E+02	1.7E-06	8.9E-02	1.07E+02	6.6E-07	8.9E-02	1.07E+02	1.7E-06	8.9E-02		
		Toluene	NE	2.00E+00	2.07E+03	NE	7.5E-01	2.07E+03	NE	7.5E-01	2.07E+03	NE	7.5E-01	2.07E+03	NE	7.5E-01		
		1,2,4-Trimethylbenzene	NE	2.00E-02	9.88E+00	NE	3.6E-01	9.88E+00	NE	3.6E-01	9.88E+00	NE	3.6E-01	9.88E+00	NE	3.6E-01		
		1,3,5-Trimethylbenzene [1]	NE	2.00E-02	1.17E+01	NE	4.2E-01	1.17E+01	NE	4.2E-01	1.17E+01	NE	4.2E-01	1.17E+01	NE	4.2E-01		
		Xylenes	NE	7.45E-01	6.18E+02	NE	6.0E-01	6.18E+02	NE	6.0E-01	6.18E+02	NE	6.0E-01	6.18E+02	NE	6.0E-01		
		1,2-Dichloroethane	7.20E-02	6.94E-01	2.63E-01	1.3E-08	2.7E-04	2.63E-01	3.5E-08	2.7E-04	2.63E-01	1.3E-08	2.7E-04	2.63E-01	3.5E-08	2.7E-04		
		Methyl ethyl ketone	NE	1.43E+00	6.30E+02	NE	3.2E-01	6.30E+02	NE	3.2E-01	6.30E+02	NE	3.2E-01	6.30E+02	NE	3.2E-01		
		Tetrachloroethylene	2.10E-02	1.00E-01	8.04E-02	1.2E-09	5.8E-04	8.04E-02	3.1E-09	5.8E-04	8.04E-02	1.2E-09	5.8E-04	8.04E-02	3.1E-09	5.8E-04		
		Trichloroethylene	7.00E-03	1.53E-01	2.40E-01	1.2E-09	1.1E-03	2.40E-01	3.1E-09	1.1E-03	2.40E-01	1.2E-09	1.1E-03	2.40E-01	3.1E-09	1.1E-03		
		Vinyl chloride	2.70E-01	2.20E-02	6.12E-02	1.2E-08	2.0E-03	6.12E-02	3.1E-08	2.0E-03	6.12E-02	1.2E-08	2.0E-03	6.12E-02	3.1E-08	2.0E-03		
				Total		**1.9E-06**	**1.9E+01**		**3.0E-06**	**3.4E+00**		**1.1E-06**	**3.0E+00**		**3.0E-06**	**3.3E+00**	**9.0E-06**	**1.9E+01**
With Emission Control (60 to 96% reduction of PM10 and 90% reduction of vapor)					Reduction of PM10 in Raised Cap Materials Event= 96% , PM10 Reduction in Other Events= 60% ; Reduction of Vapor= 90%													
Adult	PM_{10}	Arsenic	1.20E+01	4.29E-06	1.58E-02	1.3E-08	2.5E-01	5.59E-03	1.2E-08	8.9E-02	1.77E-03	1.4E-09	2.8E-02	5.43E-03	1.1E-08	8.6E-02		
	Vapor	Benzene	1.00E-01	1.70E-02	6.00E-01	1.7E-08	1.0E-02	6.00E-01	4.4E-08	1.0E-02	6.00E-01	1.7E-08	1.0E-02	6.00E-01	4.4E-08	1.0E-02		
		Ethylbenzene	8.70E-03	8.69E-01	1.07E+01	2.6E-08	3.5E-03	1.07E+01	6.8E-08	3.5E-03	1.07E+01	2.6E-08	3.5E-03	1.07E+01	6.8E-08	3.5E-03		
		Toluene	NE	2.00E+00	2.07E+02	NE	3.0E-02	2.07E+02	NE	3.0E-02	2.07E+02	NE	3.0E-02	2.07E+02	NE	3.0E-02		
		1,2,4-Trimethylbenzene	NE	2.00E-02	9.88E-01	NE	1.4E-02	9.88E-01	NE	1.4E-02	9.88E-01	NE	1.4E-02	9.88E-01	NE	1.4E-02		
		1,3,5-Trimethylbenzene [1]	NE	2.00E-02	1.17E+00	NE	1.7E-02	1.17E+00	NE	1.7E-02	1.17E+00	NE	1.7E-02	1.17E+00	NE	1.7E-02		
		Xylenes	NE	7.45E-01	6.18E+01	NE	2.4E-02	6.18E+01	NE	2.4E-02	6.18E+01	NE	2.4E-02	6.18E+01	NE	2.4E-02		
		1,2-Dichloroethane	7.20E-02	6.94E-01	2.63E-02	5.3E-10	1.1E-05	2.63E-02	1.4E-09	1.1E-05	2.63E-02	5.3E-10	1.1E-05	2.63E-02	1.4E-09	1.1E-05		
		Methyl ethyl ketone	NE	1.43E+00	6.30E+01	NE	1.3E-02	6.30E+01	NE	1.3E-02	6.30E+01	NE	1.3E-02	6.30E+01	NE	1.3E-02		
		Tetrachloroethylene	2.10E-02	1.00E-01	8.04E-03	4.8E-11	2.3E-05	8.04E-03	1.2E-10	2.3E-05	8.04E-03	4.8E-11	2.3E-05	8.04E-03	1.2E-10	2.3E-05		
		Trichloroethylene	7.00E-03	1.53E-01	2.40E-02	4.7E-11	4.5E-05	2.40E-02	1.2E-10	4.5E-05	2.40E-02	4.7E-11	4.5E-05	2.40E-02	1.2E-10	4.5E-05		
		Vinyl chloride	2.70E-01	2.20E-02	6.12E-03	4.7E-10	7.9E-05	6.12E-03	1.2E-09	7.9E-05	6.12E-03	4.7E-10	7.9E-05	6.12E-03	1.2E-09	7.9E-05		
				Total		**5.7E-08**	**3.6E-01**		**1.3E-07**	**2.0E-01**		**4.6E-08**	**1.4E-01**		**1.3E-07**	**2.0E-01**	**3.6E-07**	**3.6E-01**
Child	PM_{10}	Arsenic	1.20E+01	4.29E-06	1.58E-02	3.2E-08	6.3E-01	5.59E-03	3.0E-08	2.2E-01	1.77E-03	3.6E-09	7.1E-02	5.43E-03	2.9E-08	2.2E-01		
	Vapor	Benzene	1.00E-01	1.70E-02	6.00E-01	4.3E-08	2.6E-02	6.00E-01	1.1E-07	2.6E-02	6.00E-01	4.3E-08	2.6E-02	6.00E-01	1.1E-07	2.6E-02		
		Ethylbenzene	8.70E-03	8.69E-01	1.07E+01	6.6E-08	8.9E-03	1.07E+01	1.7E-07	8.9E-03	1.07E+01	6.6E-08	8.9E-03	1.07E+01	1.7E-07	8.9E-03		
		Toluene	NE	2.00E+00	2.07E+02	NE	7.5E-02	2.07E+02	NE	7.5E-02	2.07E+02	NE	7.5E-02	2.07E+02	NE	7.5E-02		
		1,2,4-Trimethylbenzene	NE	2.00E-02	9.88E-01	NE	3.6E-02	9.88E-01	NE	3.6E-02	9.88E-01	NE	3.6E-02	9.88E-01	NE	3.6E-02		
		1,3,5-Trimethylbenzene [1]	NE	2.00E-02	1.17E+00	NE	4.2E-02	1.17E+00	NE	4.2E-02	1.17E+00	NE	4.2E-02	1.17E+00	NE	4.2E-02		
		Xylenes	NE	7.45E-01	6.18E+01	NE	6.0E-02	6.18E+01	NE	6.0E-02	6.18E+01	NE	6.0E-02	6.18E+01	NE	6.0E-02		
		1,2-Dichloroethane	7.20E-02	6.94E-01	2.63E-02	1.3E-09	2.7E-05	2.63E-02	3.5E-09	2.7E-05	2.63E-02	1.3E-09	2.7E-05	2.63E-02	3.5E-09	2.7E-05		
		Methyl ethyl ketone	NE	1.43E+00	6.30E+01	NE	3.2E-02	6.30E+01	NE	3.2E-02	6.30E+01	NE	3.2E-02	6.30E+01	NE	3.2E-02		
		Tetrachloroethylene	2.10E-02	1.00E-01	8.04E-03	1.2E-10	5.8E-05	8.04E-03	3.1E-10	5.8E-05	8.04E-03	1.2E-10	5.8E-05	8.04E-03	3.1E-10	5.8E-05		
		Trichloroethylene	7.00E-03	1.53E-01	2.40E-02	1.2E-10	1.1E-04	2.40E-02	3.1E-10	1.1E-04	2.40E-02	1.2E-10	1.1E-04	2.40E-02	3.1E-10	1.1E-04		
		Vinyl chloride	2.70E-01	2.20E-02	6.12E-03	1.2E-09	2.0E-04	6.12E-03	3.1E-09	2.0E-04	6.12E-03	1.2E-09	2.0E-04	6.12E-03	3.1E-09	2.0E-04		
				Total		**1.4E-07**	**9.1E-01**		**3.2E-07**	**5.0E-01**		**1.2E-07**	**3.5E-01**		**3.2E-07**	**5.0E-01**	**9.0E-07**	**9.1E-01**

Equation Definition:
Cancer Risk = (CSF x ET x EF x ED x IR x C_A x CF1) / (BW x AT_C x CF2)
Hazard Quotient = (ET x EF x ED x IR x C_A x CF1) / (RfD x BW x AT_{NC} x CF2)

Parameter	Definition	Value - Adult	Value - Child	Reference
C_A	chemical-specific concentration in air (µg/m^3)	chemical-specific, ground level concentrations (see Table 3-8 - Vapor use 24-hr, As use 8-hr)		SCREEN3 Model
BW	body weight (kg)	70	16.6	Table 3-2
AT_C	cancer -averaging time (days)	25550	25550	Table 3-2
AT_{NC}	Noncancer average time (days)	specific by event and chemical[2]		Table 3-2
ET_{AS}	Exposure time (hours/day) - arsenic	8	8	Table 3-2
EF_{AS}	exposure frequency (d/yr) - arsenic	as noted above per event		Table 3-2
ET_{Vapor}	Exposure time (hours/day) - vapor	24	24	Table 3-2
EF_{Vapor}	exposure frequency (d/yr) - vapor	as noted above per event		Table 3-2
ED	exposure duration (yrs)	included in EF above		Table 3-2
CSF	inhalation cancer slope factor (mg/kg/day^{-1})	chemical-specific		Table 3-9
RfD	inhalation reference dose (mg/kg/day)	chemical-specific		Table 3-10
IR	inhalation rate, m^3/day	20.0	12.0	Table 3-2
CF1	conversion factor (mg/µg)	1E-03	1E-03	-
CF2	conversion factor (hours/day)	24	24	-

1. 1,2,4-Trimethylbenzene is used as a surrogate.
2. The non-cancer averaging time is specific by event and chemical. For vapor, it is the same as the exposure frequency, however, for PM the averaging time is adjusted to account for the fact that PM10 is only released on the weekdays. The exposure frequency for the event is converted into the average time by estimating the number of weeks for the event by dividing the exposure frequency by 5 days/wk (assuming a 5-day work week) to determine the number of weeks of exposure. This value is then multiplied by 7 days/week to determine the total number of days lapsed during the exposure including weekends.

TABLE 3-14
ACUTE ARSENIC RISK EVALUATION FOR EXCAVATION EVENTS

Excavation Event	Maximum Arsenic Air Concentration at Fence Line without Emission Control (4-Hour Conc, µg/m^3) (from Table 3-8)	Selected PM_{10} Emission Reduction Efficiency for Emission Control (Percent) (from Table 3-13)	Arsenic Air Concentration at Fence Line with Selected PM_{10} Emission Reduction Efficiency (4-Hour Conc, µg/m^3)	Acute (4-Hour) REL for Arsenic (µg/m^3) (from Table 3-10)	Additional Mitigation Needed to Address Acute Exposure
Raised Cap Materials	0.48	96%	0.02	0.20	no
Vadose Zone Soils	0.48	60%	0.19		no
Soils for Shoring Installation	0.0091	60%	0.0037		no
Saturated Soils	0.22	60%	0.089		no

Section 4
Development of Performance Standards

Risk-based performance standards were developed to set chemical concentrations in air that limit cancer and noncancer risks posed by COCs to offsite residents, during implementation of the preferred remedial action. Performance standards are developed based on an acceptable cancer risk of 10^{-6} and HI of 1. As discussed previously, performance standards based on residential exposure will also protect people in the community, such as commercial workers.

Arsenic and lead, and some or all VOCs addressed in this PHERA, are anticipated to be present in ambient air in small amounts in the absence of implementation activities. This urban/suburban background is considered in development of performance standards. Chemicals in background dust and organic vapors at the Site's perimeter will be measured at upwind locations. Concentrations measured at the Site during implementation will then be evaluated against the sum of background plus performance standard concentrations derived herein.

The Site is currently paved or covered by building foundations or existing buildings. Therefore, release of arsenic and lead from soil via fugitive dust is unlikely to occur unless the soil is exposed and actively handled at the Site. Thus, emissions should only occur when hardscape is removed and excavation and other soil handling is taking place. Excavation activities will be staged so that only a portion of the excavation footprint is "open" at any time.

Potential for organic vapor emissions will also vary across the excavation footprint but organic vapor emissions could continue outside of normal work hours. Therefore, performance standards for volatile COCs are developed based on the assumption that implementation activities for the entire footprint of the excavation will occur during the total duration of excavation. Because significant differences in concentration and makeup of VOCs calculated using the Trench Model and those detected during soil gas sampling at the Site were seen, soil gas sampling will be conducted during soil vapor extraction activities. The sampling results will be compared to those concentrations predicted by the Trench Model. If these concentrations vary significantly, the performance standard for volatile COCs must be recalculated prior to breaching the cap.

Performance standards are developed by back-calculating an acceptable air concentration based on an acceptable cancer risk or noncancer hazard. For cancer effects, the performance standard is a chemical concentration in air that corresponds to an acceptable cancer risk of 10^{-6}. For noncancer effects, the performance standard is a chemical concentration that corresponds to a noncancer hazard quotient of 1. A cumulative evaluation is then performed to adjust the performance standards in order to meet a total excess cancer risk of 10^{-6} and a total HI of 1. This correction accounts

for possible exposure to more than one COC. Calculations for the development of performance standards are summarized below.

4.1 Performance Standards for Carcinogenic COCs

The chemical-specific risk-based performance standards of carcinogenic COCs (Table 4-1) are calculated using the methodology provided in the PHERA Work Plan (CDM, 2008) and described below.

$$PS_{COC} = \frac{TR \times AT_c \times CF}{UR \times ET \times EF \times ED} \qquad (4\text{-}1)$$

where:

PS_{COC}	=	Chemical-specific performance standard, µg/m^3
TR	=	Target Risk, 10^{-6}
AT_c	=	Averaging time – carcinogens, days
CF	=	conversion factor (24 hours/day)
UR	=	Unit risk, (µg/m^3)$^{-1}$
ET	=	Exposure time, hours/day
EF	=	Exposure frequency, days/year
ED	=	Exposure duration, years

Initially, the risk-based performance standard for each carcinogenic COC is calculated based on an acceptable cancer risk of 10^{-6}. In order to meet a total excess lifetime cancer risk of 10^{-6} from simultaneous exposures to all the carcinogenic COCs, the performance standard for each carcinogen is adjusted by distributing the total risk of 10^{-6} among the carcinogenic COCs. The allocation of target risk is based on modeled air concentration and toxicity of the COCs. The monitoring requirements for measuring respirable COC concentrations in air will be discussed in the Remedial Action Plan. Specific methods and approaches to be implemented will be provided in the Perimeter Air Monitoring Plan submitted with the Remedial Design.

4.2 Performance Standards for Noncarcinogenic COCs

The chemical-specific risk-based performance standards of noncarcinogenic COCs (Table 4-2) are calculated using the methodology provided in the PHERA Work Plan (CDM, 2008) and described below.

$$PS_{COC} = \frac{AT_n \times CF \times RfC}{ET \times EF \times ED} \qquad (4\text{-}2)$$

where:

PS_{COC}	=	Chemical-specific performance standard, µg/m^3

AT_n	=	Averaging time – noncarcinogens, days
CF	=	conversion factor (24 hours/day)
RfC	=	Reference concentration (or REL), µg/m^3
ET	=	Exposure time, hours/day
EF	=	Exposure frequency, days/year
ED	=	Exposure duration, years

Initially, the risk-based performance standard for each noncarcinogenic COC is calculated based on a hazard quotient of 1. Since the total HI is more than one, the performance standard for each noncarcinogen is adjusted based on similar target organs. As an example, if there are 4 noncarcinogens that affect the liver, then the risk-based performance standard for each of these noncarcinogens is divided by 4. Where a COC affects more than one target organ, the lowest target HI associated with the target organ shared by the most COCs is chosen. Primary target organ information and target HI allocation are presented in Table 4-2.

In December 2008, Cal/EPA OEHHA established a subchronic (8-hour) inhalation reference exposure level (REL) for arsenic at the same concentration as the updated chronic arsenic REL (0.015 µg/m^3) (Cal/EPA, 2008). A REL is an airborne concentration of a chemical that is not anticipated to present a significant risk of an adverse noncancer health effect. An important factor to consider in the application of the new subchronic (8-hour) arsenic REL for the Site is the duration of the exposure, e.g., the duration of the implementation activities, and how this relates to the averaging period used for compliance with the REL. OEHHA has adopted the chronic arsenic REL as the subchronic (8-hour) arsenic REL based on frequency and duration as discussed in Section 3.2, assuming multiple 8-hour exposures on a daily basis. OEHHA considers the 8-hour arsenic REL appropriate for repeated, 8-hour exposures that may occur on a daily basis. Therefore, the subchronic (8-hour) arsenic REL should be implemented in a similar manner as the chronic arsenic REL and the total duration of the implementation activities is an appropriate time frame for averaging repeated 8-hour exposures.

S-W plans to implement the new subchronic (8-hour) arsenic REL at the Site as follows[5]:

[5] This approach is consistent with the method of exposure in the key study, the Wasserman study, on which the value is based. First, arsenic in drinking water was likely not ingested by the study subjects on a uniform 24 hour basis; rather the majority of the exposure took place in an 8 to 16 hour period, and possibly within shorter time frames within that 8 to 16 hour period. Second, for the preferred remedy, the potential exposure to arsenic would be limited to 8 work hours per day. Therefore, there should be at minimum 16 hours of "recovery" between work days. Third, it is expected that the potential exposure during the implementation of the preferred remedy will be limited to at most 5 work days per week.

Respirable arsenic will be measured from PM_{10} air monitoring samples collected over the total duration of the implementation activities for comparison to the subchronic (8-hour) arsenic REL. The dust mitigation measures are expected to ensure that this comparison will demonstrate that people in the community were not subjected to an unacceptable noncancer health effect from subchronic exposure to arsenic. These data will be collected as a continuous series of 8-hour samples starting prior to implementation activities and ending when implementation is complete. A running average respirable arsenic concentration will be maintained to confirm that dust control measures are effective and to make any adjustments to these measures that are deemed appropriate.

4.3 Selected Performance Standards

Since some VOCs can cause both carcinogenic and noncarcinogenic effects, the more stringent of the noncarcinogenic and carcinogenic risk-based performance standards is selected as the performance standard (Table 4-3). For arsenic, its subchronic (8-hour) arsenic REL is selected as the performance standard. The resulting performance standards are health-protective because these concentrations of all COCs would have to be observed at the location of the exposed receptors for the total 6-month duration to yield an excess lifetime cancer risk of $4x10^{-7}$ or a total HI of 1 (Table 4-3). Such an occurrence is unlikely as actual exposure concentrations are anticipated to be less.

As discussed in Section 3.2.2, lead cannot be evaluated in the same manner as arsenic and VOCs because USEPA and Cal/EPA do not have a reference concentration for lead. Therefore, the National Ambient Air Quality Standard (NAAQS) for lead of 0.15 $\mu g/m^3$ is used as its acceptable subchronic performance standard, evaluated as a rolling 3-month average. The lead NAAQS was revised in the fall of 2008 by a factor of 10 from 1.5 $\mu g/m^3$ to 0.15 $\mu g/m^3$ (USEPA, 2008). The California Ambient Air Quality Standards (CAAQS) for lead is 1.5 $\mu g/m^3$, averaged over 1 month.

Performance standards will be compared to analytical data from air and organic vapor samples collected at the perimeters of the Site to determine whether measures to mitigate offsite migration of COCs have been successful in adequately protecting people in the community, and to make any adjustments to these measures that are deemed appropriate.

The methods and approaches to be used to measure respirable COC concentrations in air will be discussed in the Remedial Action Plan and specific details will be provided in a perimeter air monitoring plan submitted as part of the Remedial Design.

TABLE 4-1
EVALUATION OF CANCER RISK

Chemical of Concern	Unit Risk[1] ($\mu g/m^3)^{-1}$	Cancer Risk-Based Performance Standard[2] ($\mu g/m^3$)	Estimated Chemical Air Concentration[3] (C_A) (from Table 3-7) ($\mu g/m^3$)	Percentage of VOC in Total Vapor[4]	Adjustment Factor[5]	Adjusted Cancer Risk-Based Performance Standard[6] ($\mu g/m^3$)	Excess Cancer Risk[7]
Metals							
Arsenic	3.3E-3	0.18	0.021	NA	0.74	0.13	7.4E-7
Lead	NE	NE	0.017	NE	NA	NA	NA
Volatile Organic Compounds (VOCs)							
Benzene	2.9E-5	5	6.00	0.2%	0.12	0.6	1.2E-7
1,2-Dichloroethane	2.1E-5	7	0.26	0.0%	0.005	0.03	5.0E-9
Ethylbenzene	2.5E-6	56	107	3.1%	0.159	8.9	1.6E-7
Methyl ethyl ketone	NE	NE	630	18.2%	NA	NA	NA
Tetrachloroethylene	5.9E-6	24	0.08	0.0%	0.01	0.2	1.0E-8
Toluene	NE	NE	2,074	60.0%	NA	NA	NA
Trichloroethylene	2.0E-6	70	0.24	0.0%	0.01	0.7	1.0E-8
1,2,4-Trimethylbenzene	NE	NE	9.88	0.3%	NA	NA	NA
1,3,5-Trimethylbenzene	NE	NE	11.66	0.3%	NA	NA	NA
Vinyl chloride	7.8E-5	2	0.06	0.0%	0.005	0.01	5.0E-9
Xylenes	NE	NE	618.41	17.9%	NA	NA	NA
				Adjustment Factor Total	1.0		

NE - Not established; performance standard for lead is based on National Ambient Air Quality Standard of 0.15 $\mu g/m^3$.

NA - Not applicable.

Total Excess Cancer Risk from all COCs **1.0E-6**

1. From Table 3-9.
2. Cancer Risk-Based Performance Standard is calculated by the following:

$$PS_{COC} = \frac{TR \times AT_c \times CF_1}{UR \times ET \times EF \times ED}$$

Definition	Parameter	Value
Target Risk	TR	1.0E-06
Average time – carcinogens, days	AT_c	25550
Unit risk, $(\mu g/m^3)^{-1}$	UR	chemical-specific
Exposure time, hours/day	ET-metal	8
Exposure time, hours/day	ET-VOC	24
Exposure frequency, days/year	EF-metal	260
Exposure frequency, days/year	EF-VOC	365
Exposure duration, years	ED	0.5
conversion factor (hours/day)	CF_1	24

3. Based on modeled air concentrations from Table 3-7. The maximum 8-hour concentrations in air are used for metals and the maximum 24-hour concentrations in air are used for VOCs.
4. Predicted percentage of each volatile COC present in total vapor.
5. Performance standard for each carcinogen is adjusted by distributing the total risk of 10^{-6} among the carcinogenic COCs. The allocation of target risk is based on modeled air concentrations and toxicity of each chemical.
6. Adjusted cancer risk-based performance standard is derived by multiplying the cancer risk-based performance standard by the adjustment factor.
7. Excess cancer risk after cumulative adjustment is calculated by dividing the adjusted cancer risk-based

TABLE 4-2
EVALUATION OF NONCANCER RISK

Chemical of Concern[2]	Subchronic RfC/REL[1] ($\mu g/m^3$)	Subchronic RfC/REL Refernece[1]	Noncancer Risk-Based Performance Standard[2] ($\mu g/m^3$)	Primary Target Organ[1]	Adjusted Noncancer Risk-Based Performance Standard[2] ($\mu g/m^3$)	Hazard Quotient[3]
Metals						
Arsenic	0.015	Cal/EPA	0.06	development	0.015	2.4E-1
Lead	NE	NE	NE	NE	NA	NA
Volatile Organic Compounds (VOCs)						
Benzene	60	Cal/EPA[4]	60	blood, developmental, nerve	10	1.7E-1
1,2-Dichloroethane	2,429	ATSDR[4]	2,429	liver	607	2.5E-1
Ethylbenzene	3,040	ATSDR	3,040	development, liver, kidney, endocrine system	608	2.0E-1
Methyl ethyl ketone	5,000	IRIS[4]	5,000	development	1,000	2.0E-1
Tetrachloroethylene	350	HEAST[5]	350	liver, kidney	88	2.5E-1
Toluene	7,000	HEAST[5]	7,000	nerve, development, respiratory	1,167	1.7E-1
Trichloroethylene	537	ATSDR	537	nerve, eye	90	1.7E-1
1,2,4-Trimethylbenzene	70	PPRTV	70	central nerve system	12	1.7E-1
1,3,5-Trimethylbenzene	70	PPRTV[6]	70	central nerve system	12	1.7E-1
Vinyl chloride	77	ATSDR	77	liver	19	2.5E-1
Xylenes	2,606	ATSDR	2,606	nerve, respiratory	434	1.7E-1

Cal/EPA - Chronic Reference Exposure Levels (RELs) by California EPA,

ATSDR – Intermediate inhalation Minimal Risk Levels (MRLs) by Agency for Toxic Substances and Disease Control (November 2007).

HEAST - EPA's Health Effects Assessment Summary Tables.

PPRTV - Provisional Peer Reviewed Toxicity Value (PPRTV) by the EPA Superfund Health Risk Technical Support Center.

NE - Not established; performance standard for lead is based on National Ambient Air Quality Standard of 0.15 $\mu g/m^3$.

NA - Not applicable.

Total Hazard Index	**2.4E+0**
Total Nerve Hazard Index	1.0E+0
Total Liver Hazard Index	9.5E-1
Total Developmental Hazard Index	9.7E-1
Total Blood Hazard Index	1.7E-1
Total Kidney Hazard Index	4.5E-1
Total Respiratory Hazard Index	3.7E-1

1. From Table 3-10.

2. Noncancer Risk-Based Performance Standard is calculated by the following:

$$PS_{COPC} = \frac{AT_n \times CF_1 \times RfC}{ET \times EF \times ED}$$

Definition	Parameter	Value
Target Hazard	TH	1.0E+00
Average time – noncinogens, days	AT_n	183
Reference concentrations, ($\mu g/m^3$)	RfC	chemical-specific
Exposure time, hours/day	ET-metal	8
Exposure time, hours/day	ET-VOC	24
Exposure frequency, days/year	EF-metal	260
Exposure frequency, days/year	EF-VOC	365
Exposure duration, years	ED	0.5
conversion factor (hours/day)	CF_1	24

2. The risk-based performance standard for a VOC is adjusted by dividing the number of chemicals affecting the same primary target organ. Where the chemical has more than one target organ, the highest number of chemicals associated with the target organ shared by the most chemicals was chosen. For arsenic, its subchronic REL is selected as the performance standard.

3. Hazard quotient (HQ) after cumulative adjustment.
HQ = Adjusted noncancer risk-based performance standard / Noncancer risk-based performance standard.

4. Based on chronic REL, chronic RfC, or chronic inhalation MRL.

5. Converted from subchronic oral reference dose (RfD).

6. 1,2,4-Trimethylbenzene is used as a surrogate.

TABLE 4-3
SELECTED RISK-BASED PERFORMANCE STANDARDS

Chemical of Concern	Subchronic RfC[1] ($\mu g/m^3$)	Subchronic RfC Reference[1]	Noncancer Risk-Based Performance Standard[2] ($\mu g/m^3$)	Primary Target Organ[1]	Adjusted Noncancer Risk-Based Performance Standard[2] ($\mu g/m^3$)	Adjusted Cancer Risk-Based Performance Standard[3] ($\mu g/m^3$)	Selected Risk-Based Performance Standard[4] ($\mu g/m^3$)	Hazard Quotient for Selected Risk-Based Performance Standard[5]	Excess Cancer Risk for Selected Risk-Based Performance Standard[6]
Metals									
Arsenic	0.015	Cal/EPA	0.06	development	0.015	0.13	0.015	2.4E-1	8.4E-8
Lead	NE	NE	NE	NE	NE	NE	NA	NA	NA
Volatile Organic Compounds (VOCs)									
Benzene	60	Cal/EPA[7]	60	blood, developmental, nerve	10	0.6	0.6	9.7E-3	1.2E-7
1,2-Dichloroethane	2,429	ATSDR[7]	2,429	liver	607	0.03	0.03	1.4E-5	5.0E-9
Ethylbenzene	3,040	ATSDR	3,040	development, liver, kidney, endocrine system	608	8.9	8.90	2.9E-3	1.6E-7
Methyl ethyl ketone	5,000	IRIS[7]	5,000	development	1,000	NA	1,000	2.0E-1	NA
Tetrachloroethylene	350	HEAST[8]	350	liver, kidney	88	0.2	0.2	6.8E-4	1.0E-8
Toluene	7,000	HEAST[8]	7,000	nerve, development, respiratory	1,167	NA	1,167	1.7E-1	NA
Trichloroethylene	537	ATSDR	537	nerve, eye	90	0.7	0.7	1.3E-3	1.0E-8
1,2,4-Trimethylbenzene	70	PPRTV	70	central nervous system	12	NA	12	1.7E-1	NA
1,3,5-Trimethylbenzene	70	PPRTV[9]	70	central nervous system	12	NA	12	1.7E-1	NA
Vinyl chloride	77	ATSDR	77	liver	19	0.01	0.01	1.2E-4	5.0E-9
Xylenes	2,606	ATSDR	2,606	nerve, respiratory	434	NA	434	1.7E-1	NA

Total Hazard Index	**1.1E+0**	**Total**	**3.9E-7**
Total Nerve Hazard Index	6.8E-1		
Total Liver Hazard Index	3.7E-3		
Total Developmental Hazard Index	6.2E-1		
Total Blood Hazard Index	9.7E-3		
Total Kidney Hazard Index	3.6E-3		
Total Respiratory Hazard Index	1.7E-1		

NE - Not established; performance standard for lead is based on National Ambient Air Quality Standard of 0.15 $\mu g/m^3$.

NA - Not applicable.

1. From Table 3-10.
2. From Table 4-2.
3. From Table 4-1.
4. The more stringent between the carcinogenic and noncarcinogenic risk-based performance standard is selected as the risk-based performance standard for VOCs.
5. Hazard quotient (HQ) for the selected performance standards. HQ = Selected action level / Noncancer risk-based performance standard.
6. Excess cancer risk for the selected performance standards from Table 4-1.
7. Based on chronic REL, chronic RfC, or chronic inhalation MRL.
8. Converted from subchronic oral reference dose (RfD).
9. 1,2,4-Trimethylbenzene is used as a surrogate.

Section 5
Development of Action Levels

Action levels were developed to provide real-time air monitoring goals during implementation of the preferred remedial action and evaluate the effectives of the controls implemented to limit fugitive emissions.

In addition to the Site-specific, cancer and subchronic noncancer, risk-based performance standards developed per Section 4, Applicable Relevant and Appropriate Requirements (ARARs) are also considered in developing subchronic action levels. These ARARs include standards published by the Bay Area Air Quality Management District (BAAQMD), Minimal Risk Levels (MRLs) published by the Agency for Toxic Substances and Disease Registry (ATSDR), NAAQS, and American Industrial Hygiene Association (AIHA) odor thresholds.

5.1 Bay Area Air Quality Management District Standards

The BAAQMD Regulation 2, Rule 5 (BAAQMD, 2005) provides emission levels of toxic air contaminants that would be protective of adverse health effects to exposed individuals. These regulatory limits are shown in Table 5-1 and are similar to the acute and chronic RELs developed by Cal/EPA OEHHA. In addition, BAAQMD provides an acceptable emission level for total PM_{10}.

5.2 Minimal Risk Levels

MRLs for toxic substances are screening levels developed by ATSDR. The MRL is an estimated concentration of a hazardous substance that is unlikely to result in adverse health effects based on a daily human exposure over a specified duration. MRLs are derived for

- Acute exposures (1 to 14 days),
- Intermediate exposures (more than 14 to 364 days of exposure), and
- Chronic exposures (365 days and longer).

Table 5-1 presents the acute, intermediate, and chronic MRLs for the COCs at the Site. There are inherent uncertainties associated with these MRLs; therefore to be conservative these concentrations are generally based on the most sensitive endpoint considered relevant to humans. Since the duration of implementation activities are not expected to extend beyond six months, intermediate MRLs are considered the appropriate criteria for the Site. If an intermediate MRL is not available, then the chronic MRL is selected.

5.3 National Ambient Air Quality Standards

The USEPA Office of Air Quality Planning and Standards has set National Ambient Air Quality Standards (NAAQS) for six principal pollutants including lead. The NAAQS for lead is 0.15 $\mu g/m^3$, evaluated as a rolling 3-month average. The lead NAAQS was revised in the fall of 2008 by a factor of 10 from 1.5 $\mu g/m^3$ to 0.15 $\mu g/m^3$ (USEPA, 2008). The California Ambient Air Quality Standards (CAAQS) for lead is 1.5 $\mu g/m^3$, averaged over 1 month.

5.4 American Industrial Hygiene Association Odor Thresholds

The American Industrial Hygiene Association (AIHA) provides odor threshold values for chemicals with established health standards. Reported odor thresholds vary several orders of magnitude since the method of defining and determining odor thresholds varies widely. Individuals could also respond differently to the same odor. To be conservative, the minimum value is used as odor threshold value. The selected odor thresholds are provided in Table 5-1.

5.5 Chemical-Specific Action Levels

The selected action levels for acute and subchronic exposure for the COCs are the lowest, or more stringent, among the following regulatory criteria or calculated performance standard. These include the following:

- BAAQMD regulatory limits
- MRLs from the ATSDR
- Odor threshold values from AIHA
- NAAQS for lead
- The calculated Site-specific risk-based performance standards based on the lower of cancer and noncancer risks (Table 4-3)

5.5.1 Total Volatile Organic Compound Action Levels

The selected subchronic action levels for the VOCs are presented in Table 5-2. The resulting action levels are health-protective because these sustained concentrations yield an excess lifetime cancer risk of $3x10^{-7}$ or a total HI of 0.7, which are below USEPA's acceptable criteria of 10^{-6} and 1, respectively. As shown in Table 5-2, exposures to these concentrations could result in a total HI up to 0.6 for individual primary target organ, which is well below the USEPA risk level of 1.

The real-time air monitoring data for VOCs will be compared with the subchronic VOC action levels and, as appropriate, implementation activities and/or actions levels will be modified to maintain fugitive emissions below acceptable risk levels.

Based on these subchronic VOC action levels, an action level for total VOCs is calculated. Total VOCs in air can be measured in real-time, through use of a high-sensitivity continuous VOC monitor, an organic vapor meter (OVM). As such, the subchronic action level for total VOCs is the sum of each VOC action level, and as presented in Table 5-2 is 1,505 $\mu g/m^3$.

Because VOC concentrations are not uniform across the excavation, the potential for acute exposures exists for those times when excavation is occurring where concentrations are the highest. The selected acute action levels for each of the VOCs are presented in Table 5-2.

5.5.2 Airborne Dust Action Levels

Concentrations of arsenic and lead in air cannot be readily measured in real-time. As such, a high-sensitivity monitor will be used to measure airborne dust and provide respirable PM_{10} correlated measurements. This PM_{10} monitor will be utilized to determine the estimated respirable arsenic and lead concentrations in air. Arsenic and lead concentrations in the dust measured as PM_{10}, are anticipated to be generally equal to those for the soil within the excavation. Thus, the PM_{10} action level is calculated by dividing the chemical-specific performance standard by the concentration for that COC in soil (CDM, 2008).

Arsenic concentrations for soil vary by orders of magnitude within the excavation; the potential for acute exposures will vary as the implementation proceeds. Therefore, PM_{10} action levels for acute exposures to arsenic are developed for each excavation event. Acute action levels for PM_{10} are based on OEHHA's acute (4-hour) REL for arsenic of 0.20 $\mu g/m^3$.

For the acute evaluation, the exposure arsenic concentrations are based on either the maximum concentration or the 95%UCL of the mean concentration, whichever is lower, from samples collected within each planned excavation event footprint. These exposure concentrations are appropriate estimates for the average 4-hour exposure for the acute evaluation. Table 5-3 presents acute REL-based PM_{10} action levels for arsenic for each excavation event. The acute REL-based PM_{10} action levels for arsenic for the excavation events range from 1.8 to 162 $\mu g/m^3$.

The expected total duration of excavation is approximately six months, which corresponds to the exposure duration used in the risk calculation. It is thus also important to develop PM_{10} action levels based on a subchronic inhalation REL or RfC. A subchronic REL-based action level is developed based on the following equation:

$$\text{Subchronic REL or RfC } (mg/m^3) = (mg\ PM_{10}/m^3)(mg\ As/kg\ soil)(1\ kg/1x10^6\ mg)$$

Rearrange the equation and adjust for dust exposures that occur for 40 hours per week (8 hours per day for 5 days per week) during excavation, a subchronic REL-based action level is calculated as follows:

$$PM_{10}\ Action\ Level\ (mg/m^3) = \frac{Subchronic\ REL(mg/m^3)}{Arsenic\ Concentration\ (mg/kg) \times 10^{-6}\ kg/mg} \times \frac{24\ hours}{8\ hours} \times \frac{7\ days}{5\ days}$$

For the subchronic evaluation, the exposure arsenic concentrations are based on either the maximum concentration or the 95%UCL of the mean concentration, whichever is lower, from samples collected within each planned excavation event footprint. Table 5-3 presents subchronic based PM_{10} action levels for arsenic for each excavation event using the selected risk-based performance standard developed for this PHERA (Table 4-2) of 0.015 µg/m³. The subchronic risk-based PM_{10} action levels for arsenic for the excavation events range from 0.6 to 51 µg/m³.

For the subchronic lead evaluation, the exposure lead concentration is based on the 95%UCL of the mean concentration from samples collected within the planned entire excavation footprint. Lead concentrations also vary across the Site. However, USEPA and Cal/EPA do not have an acute REL for lead. Thus, a PM_{10} action level for lead for the entire excavation was estimated. The subchronic PM_{10} action level for lead for the excavation is 134 µg/m³ (Table 5-3).

In addition, Table 5-3 presents BAAQMD's acceptable emission level for PM_{10} of 50 µg/m³.

The minimum subchronic PM_{10} action levels during the excavation events from these evaluations and BAAQMD's acceptable level are:

- Raised Cap Materials: 0.6 µg/m³;
- Vadose Zone Soils: 16 µg/m³;
- Soils for Shoring Installation: 50 µg/m³; and,
- Saturated Soils: 17 µg/m³.

TABLE 5-1
PUBLISHED AIR QUALITY STANDARDS

Chemical of Concern	BAAQMD or NAAQS Regulatory Limit ($\mu g/m^3$)		ATSDR Minimal Risk Level (MRL) ($\mu g/m^3$)				AIHA Odor Threshold ($\mu g/m^3$)
	Acute	Chronic	Acute (1-14 days)	Intermediate (>14-364 days)	Chronic (≥365 days)	Selected MRL	
Metals							
Arsenic	NE	NE	NE	NE	NE	NE	NE
Lead[1]	NE	0.15	NE	NE	NE	NE	NE
Volatile Organic Compounds							
Benzene	1,300	60	29	19	10	19	4792
1,2-Dichloroethane	NE	NE	NE	NE	2,429	2,429	45,331
Ethylbenzene	NE	2,000	43,354	3,035	1,301	3,035	9,986
Methyl ethyl ketone	NE	NE	NE	NE	NE	NE	737
Tetrachloroethylene	20,000	35	1,358	NE	272	NE	41,852
Toluene	37,000	300	3,763	NE	301	NE	603
Trichloroethylene	NE	600	10,716	536	NE	536	7,309
1,2,4-Trimethylbenzene	NE	NE	NE	NE	NE	NE	11,798
1,3,5-Trimethylbenzene	NE	NE	NE	NE	NE	NE	11,798
Vinyl chloride	180,000	26	1,278	77	NE	77	647
Xylenes	22,000	700	8,671	2,601	217	2,601	1,302
PM_{10} (24 hours)	NE	50	NE	NE	NE	NE	NE

NE - Not established.

NA - Not applicable.

BAAQMD - Bay Area Air Quality Management District.

NAAQS - National Ambient Air Quality Standard.

ATSDR – Agency for Toxic Substances and Disease Control (November 2007) inhalation Minimal Risk Levels (MRLs). MRLs are converted from units in ppmv to $\mu g/m^3$ using the following equation:

MRL ($\mu g/m^3$) = (ppmv)(12.187)(Molecular weight)(1000 µg/mg)/(273.15+ ^{0}C)

where ^{0}C = ambient air temperature in degrees Centigrade (assumed to be 25 ^{0}C)

AIHA - American Association of Industrial Hygienists, 1989, Odor thresholds for Chemicals with established occupational health standards.

1. Lead is based on NAAQS for chronic exposure. Total PM_{10} based on chronic exposure, per BAAQMD rules and regulations.

TABLE 5-2
ACTION LEVELS FOR VOLATILE ORGANIC COMPOUNDS

Volatile Organic Compounds	BAAQMD Regulatory Limit[1] (µg/m^3)	Selected MRL[1] (µg/m^3)	AIHA Odor Threshold[1] (µg/m^3)	Selected Noncancer Performance Standards[2] (µg/m^3)	Selected Cancer Risk-Based Performance Standards[2] (µg/m^3)	Selected Subchronic Action Level in Air[3] (µg/m^3)	Hazard Quotient[4]	Excess Cancer Risk[5]	Selected Acute Action Level in Air[6] (µg/m^3)
Volatile Organic Compounds (VOCs)									
Benzene	60	19	4,792	10	0.6	0.6	9.7E-3	1.2E-7	29
1,2-Dichloroethane	NE	2,429	45,331	607	0.03	0.03	1.4E-5	5.0E-9	45,331
Ethylbenzene	2,000	3,035	9,986	608	8.9	8.9	2.9E-3	1.6E-7	9,986
Methyl ethyl ketone	NE	NE	737	1,000	NA	737	1.5E-1	NA	737
Tetrachloroethylene	35	NE	41,852	88	0.2	0.2	6.8E-4	1.0E-8	1,358
Toluene	300	NE	603	1,167	NA	300	4.3E-2	NA	603
Trichloroethylene	600	536	7,309	90	0.7	0.7	1.3E-3	1.0E-8	7,309
1,2,4-Trimethylbenzene	NE	NE	11,798	12	NA	12	1.7E-1	NA	11,798
1,3,5-Trimethylbenzene	NE	NE	11,798	12	NA	12	1.7E-1	NA	11,798
Vinyl chloride	26	77	647	19	0.01	0.01	1.2E-4	5.0E-9	647
Xylenes	700	2,601	1,302	434	NA	434	1.7E-1	NA	1,302
Total VOCs[7]						1,505			
						Total Hazard Index	**7.0E-1**	**Total** **3.1E-7**	
						Total Nerve Hazard Index	5.5E-1		
						Total Liver Hazard Index	3.7E-3		
						ıpmental Hazard Index	2.0E-1		
						Total Blood Hazard Index	9.7E-3		
						Total Kidney Hazard Index	3.6E-3		
						Total Respiratory Hazard Index	4.6E-2		

NE - Not established.

NA - Not applicable.

BAAQMD - Bay Area Air Quality Management District Rules and Regulations.

ATSDR – Agency for Toxic Substances and Disease Control (November 2007) intermediate inhalation Minimal Risk Levels (MRLs) .

AIHA - American Association of Industrial Hygienists, 1989, Odor thresholds for Chemicals with established occupational health standards.

1. From Table 5-1.
2. From Table 4-3. Adjusted Noncancer Risk-Based Performance Standard for final Noncancer action levels. Adjusted Cancer Risk-Based Performance Standard for final cancer action levels.
3. Selected Subchronic Action Level in Air is based on the more stringent of the BAAQMD regulatory limit, MRL, AIHA odor threshold, and the cancer and noncancer performance standards.
4. Hazard quotient for final action levels. HQ = Selected action level / Noncancer risk-based performance standard from Table 4-2.
5. Excess cancer risk for final action level. Excess cancer risk = Selected action level / Cancer risk-based performance standard from Table 4-1.
6. Selected Acute Action Level in Air is based on the more stringent of the BAAQMD regulatory limit, MRL, AIHA odor threshold, and Cal/EPA RELs.
7. Total VOCs Action Level is based on the total sum of each VOC Action Level.

TABLE 5-3
ACTION LEVELS FOR PM_{10}

Chemical	Exposure Concentration (from Table 3-1) (mg/kg)	BAAQMD or NAAQS Regulatory Limit ($\mu g/m^3$)	Performance Standard ($\mu g/m^3$)	Action Level as PM_{10} in Air ($\mu g/m^3$)
Arsenic Acute REL-Based Performance Standard [1]				
Raised Cap Materials	110,000	NA	0.2	1.8
Vadose Zone Soils	3,898	NA	0.2	51
Soils for Shoring Installation	1,237	NA	0.2	162
Saturated Soils	3,782	NA	0.2	53
Arsenic Subchronic Risk-Based Performance Standard [2]				
Raised Cap Materials	110,000	NA	0.015	0.6
Vadose Zone Soils	3,898	NA	0.015	16
Soils for Shoring Installation	1,237	NA	0.015	51
Saturated Soils	3,782	NA	0.015	17
Other Subchronic Performance Standards [3]				
Lead Subchronic Performance Standard	4,687	0.15	NA	134
Total PM_{10} Subchronic Performance Standard	NA	50	NA	50

BAAQMD - Bay Area Air Quality Management District Rules and Regulations.

NAAQS - National Ambient Air Quality Standard.

NA - Not applicable.

1. Based on arsenic acute inhalation REL (see Table 3-14) and arsenic concentration for each excavation event.

2. Based on arsenic risk-based performance standard (see Table 4-3) and arsenic concentration for each excavation event.

3. Lead is based on NAAQS for chronic exposure. Total PM_{10} based on chronic exposure, per BAAQMD rules and regulations.

Section 6
References

Agency for Toxic Substances and Disease Registry, 2007a. Toxicological Profile for Arsenic.

Agency for Toxic Substances and Disease Registry, 2007b. Minimal Risk Levels (MRLs) (http://www.atsdr.cdc.gov/mrls/).

American Industrial Hygiene Association (AIHA), 1989. Odor thresholds for Chemicals with established occupational health standards.

Bay Area Air Quality Management District (BAAQMD), 2005. Bay Area Air Quality Management District Rules and Regulations, Regulation 2, Rule 5, New Source Review of Toxic Air Contaminants.

CDM, 2008. Work Plan for Public Health Evaluation of the Remedial Alternative, The Sherwin-Williams Company, Emeryville, California.

CDM, 2009. Feasibility Study, The Sherwin-Williams Company, Emeryville, California. April 1.

Cal/EPA, 2005a. Use of California Human Health Screening Levels (CHHSLs) in Evaluation of Contaminated properties.

Cal/EPA, 2005b. All Chronic Reference Exposure Levels Adopted by OEHHA.

Cal/EPA, 2008. Technical Support Document for the Derivation of Noncancer Reference Exposure Levels and RELs for Six Chemicals. Office of Environmental Health Hazard Assessment. December 17.

Gradient, 2005. Human Health Risk Assessment for 1450 Sherwin Avenue, Emeryville, California. February 11.

Lakes Environmental, 2007. User's Guide for Screen View: Screening Air Dispersion Model (SCREEN3), Version 2.5.0.

OEHHA 1999. Determination of Acute Reference Exposure Levels for Airborne Toxicants: Arsenic and Inorganic Arsenic Compounds.

OEHHA 2000. Air Toxics Hot Spots Program Risk Assessment Guidelines, Part III, Technical Support Document for the Determination of Noncancer Chronic Reference Exposure Levels.

OEHHA, 2003. The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments.

USEPA, 1974. Development of Emission Factors for Fugitive Dust Sources.

USEPA, 1989a. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual Part A.

USEPA, 1989b. Estimation of Air Emission from Cleanup Activities at Superfund Sites. Interim Final.

USEPA, 1991a. Risk Assessment Guidance for Superfund: Human Health Evaluation Manual, Part C, Risk Evaluation of Remedial Alternatives.

USEPA, 1991b. Human Health Evaluation Manual, Supplemental Guidance: Standard Default Exposure Factors.

USEPA, 1992. Air/Superfund National Technical Guidance Study Series, Estimation of Air Impacts from the Excavation of Contaminated Soil.

USEPA, 1993. Models for Estimating Air Emission Rates from Superfund Remedial Actions.

EPA, 1995. Screening Procedures for Estimating the Air Quality Impact of Stationary Sources, Revised. EPA-450/R-92-019. U.S. Environmental Protection Agency, Research Triangle Park, NC.

USEPA, 1996. Soil Screening Guidance, Technical Background Document.

USEPA, 1997a. Exposure Factors Handbook Volume I General Factors.

USEPA, 1997b. Health Effects Assessment Summary Tables.

USEPA, 1997c. Air Emissions from the Treatment of Soils Contaminated with Petroleum Fuels and Other Substances (October 1997). Final Report,

USEPA, 2001. Particulate Emission Measurements from Controlled Construction Activities.

USEPA, 2002. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites.

USEPA, 2006. Child-Specific Exposure Factors Handbook (External Review Draft). EPA/600/R/06/096A.

USEPA, 2007a. ProUCL Version 4.0 Technical Guide.

USEPA, 2007b. ProUCL Version 4.00.02 User Guide.

USEPA, 2008. National Ambient Air Quality Standards for Lead; Final Rule. Fed. Reg. 73:66964-67062. 40 CFR Parts 50, 51, 53, and 58.

Virginia Department of Environmental Quality, 2008. Voluntary Remediation Program Risk Assessment Guidance. http://www.deq.virginia.gov/vrprisk/raguide.html

Analysis of Brownfields Cleanup Alternatives

UPRR Parcel D
Emeryville, California

27 November 2007

Prepared for:

City of Emeryville Redevelopment Agency
Emeryville, California

Prepared by:

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(EKI A60021.00)

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27 November 2007

Michael G. Biddle, Esq.
City Attorney/Agency Counsel
City of Emeryville/Emeryville Redevelopment Agency
Office of the City Attorney
1333 Park Avenue
Emeryville, California 94608-3517

Subject: Analysis of Brownfields Cleanup Alternatives Report
UPRR Parcel D Property
Emeryville, California
(EKI A60021.00)

Dear Mr. Biddle:

Erler & Kalinowski, Inc. ("EKI") is pleased to present this Analysis of Brownfields Cleanup Alternatives ("ABCA") Report for the UPRR Parcel D site ("Site"), located at the intersection of Sherwin Avenue and Halleck Street in Emeryville, California. This ABCA describes the nature and extent of contamination at the Site, remedial action objectives and Site cleanup goals, description of alternatives for Site cleanup, comparison of remedial alternatives, and recommended remedial alternative. This work has been conducted in accordance with our agreement dated 12 September 2006 and our proposal dated 4 April 2007.

We are pleased to have the opportunity to work with you on this project. Please call if you have any questions or wish to discuss these matters in greater detail (650-292-9100).

Very truly yours,

ERLER & KALINOWSKI, INC.

FOR

Earl D. James, P.G.
Vice President

Mason Albrecht
Project Engineer

Cc: Ignacio Dayrit, City of Emeryville Redevelopment Agency (2 copies)

Analysis of Brownfields Cleanup Alternatives
UPRR Parcel D
Emeryville, California

EXECUTIVE SUMMARY

Erler & Kalinowski, Inc. ("EKI") is pleased to present this Analysis of Brownfields Cleanup Alternatives ("ABCA") for the Union Pacific Railroad ("UPRR") Parcel D property (the "Site"), located in Emeryville, California (Figure 1-1). The Site is owned by our client, the City of Emeryville Redevelopment Agency ("City"). This report has been prepared by EKI on behalf of the City in accordance with our agreement dated 12 September 2006. This ABCA conforms to 40 CFR 300.415 of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). EKI originally identified past uses of the Site and adjacent properties that may have resulted in releases of chemicals of concern ("COCs") to soil and groundwater in the *Phase I Environmental Site Assessment Report*, dated 2 October 2006 (the "Phase I Report"). EKI prepared the *Proposal and Workplan for Phase II Investigation,* dated 2 October 2006 (the "Phase II Workplan") that describes the general scope of work that was conducted at the Site and is described herein. The results of investigations conducted pursuant to the Phase II Workplan were described in the *Soil and Groundwater Investigation Data Report* dated 14 November 2006 ("Phase II Report").

The City of Emeryville acquired the Site from Union Pacific Railroad in 2006. This report describes the proposed remedial approach for soil and groundwater contamination issues related to the presence of hazardous substances or petroleum hydrocarbons in soil and groundwater that may affect potential future use and redevelopment of the Site.

The Site is approximately 2 acres and is located to the north of the intersection of Sherwin Avenue and Halleck Street in Emeryville, California (Figure 1-1). The Site is bounded by the UPRR tracks on the west, the Sherwin Williams property on the east and north, and the southern edge of Sherwin Avenue on the south. The Site was used historically as a railroad spur, and surrounding sites were generally used for industrial and manufacturing purposes. The Site is currently undeveloped with the exception of access roads along the eastern and southern boundaries of the Site.

Based on the soil boring logs prepared as part of the Phase I Report, the shallow stratigraphy at the Site generally consists of units (in order from ground surface) of as much as 14-inches of asphalt and/or concrete, approximately 3 feet of artificial fill, and Upper and Lower Members of Young Bay Mud (Figures 2-15 and 2-16).

Two groundwater zones (A-zone and B-zone) are locally defined beneath the Sherwin Williams property: 1) the A-zone is a predominantly shallow, unconfined to semi-confined water-bearing zone with a groundwater gradient that is predominantly westerly to northwesterly, and 2) the B-zone is a deeper confined unit with a piezometric head above the top of the A/B aquitard.

Analysis of Brownfields Cleanup Alternatives
UPRR Parcel D
Emeryville, California

Groundwater elevations vary between 6 and 9 feet MSL within the B-zone and can fluctuate up to 2 feet seasonally. The groundwater gradient in the B-zone is predominantly to the northwest.

During the Phase II Investigation conducted at the Site during October 2006, EKI drilled 20 soil borings in order to collect surface and subsurface soil samples, and grab groundwater samples for analysis. Concentrations of chemicals detected in soil were compared with applicable screening criteria to identify preliminary COCs. A majority of metals and TPH constituents in soil exceeded one or more screening criteria at one or more sampling locations. Based on the number and frequency of screening criteria exceeded, the primary COCs in soil are considered to be TPH, arsenic, cadmium, lead, cobalt, and zinc. Arsenic was identified as the primary COC in groundwater due to the magnitude at which arsenic concentrations in groundwater exceeded the California Maximum Contaminant Level. It is likely that arsenic in Site groundwater originates from one or more off-Site sources.

The primary removal action objective ("RAO") for Site cleanup is to reduce the volume, toxicity and mobility of Site COCs to acceptable, risk-based levels for anticipated future Site use in an effective and expedient manner. Preliminary Site specific remedial goals ("SSRGs") were selected for individual COCs that are based on the applicable screening criteria described above. The SSRGs were selected to assist in achieving the RAO for the Site.

The remediation technologies considered for the reduction of COCs in Site soil are: 1) No action, 2) Excavation and off-Site disposal, and 3) Limited excavation with off-Site disposal and capping. The remediation technologies were compared in terms of their effectiveness, implementability, and cost. Excavation and Off-Site Disposal is the recommended removal action alternative. Excavation and Off-Site Disposal entails physical removal of the soils from the Site, transporting those soils to either a permitted landfill or treatment facility for disposal, and groundwater monitoring for five years to evaluate the effectiveness of the remedy in terms preventing COCs in shallow soil from impacting Site groundwater. Prior to soil excavation at the Site, existing asphalt and concrete slabs, roadways, and debris would be demolished.

On-Site soil to be excavated under the Excavation and Off-Site Disposal alternative was preliminarily classified for disposal based on screening soil analytical results against state and federal hazardous waste regulations. The estimated volume of non-hazardous (Class II) waste for off-Site disposal is 300 bcy (500 tons), and the estimated volume of non-RCRA hazardous (Class I) waste for off-Site disposal is 7,300 bcy (12,100 tons).

The Excavation and Off-Site Disposal alternative will be most effective in the long term by reducing health risks from potential exposures to construction workers, park patrons, and ecological receptors on Site. The removal of contaminated soil from the Site will also reduce the risk of the contaminant source migrating to local groundwater. The Excavation and Off-Site Disposal alternative can be readily implemented because soil can be easily excavated, stored, and

transported to designated disposal facilities, and experienced contractors with appropriate equipment are available to perform the work.

Costs associated with Excavation and Off-Site Disposal would include excavation equipment, soil profiling, soil removal, transport, disposal charges, and installation and short-term monitoring of four perimeter groundwater monitoring wells. The total estimated present worth cost for the Excavation and Off-Site Disposal alternative is $2,500,000 to $5,100,000, which assumes a -30% to +50% accuracy range and a 30% contingency for the total estimated capital cost

According to the City, remediation is scheduled for early 2008. Although no formal timeline for soil remediation has been established for this Site, field work would ideally be completed within 6 months.

Analysis of Brownfields Cleanup Alternatives
UPRR Parcel D
Emeryville, California

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Emeryville, California

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1 INTRODUCTION

Erler & Kalinowski, Inc. ("EKI") is pleased to present this Analysis of Brownfields Cleanup Alternatives ("ABCA") for the Union Pacific Railroad ("UPRR") Parcel D property (the "Site"), located in Emeryville, California (Figure 1-1). The Site is owned by our client, the City of Emeryville Redevelopment Agency ("City"). This report has been prepared by EKI on behalf of the City in accordance with our agreement dated 12 September 2006. This ABCA conforms to 40 CFR 300.415 of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). EKI originally identified past uses of the Site and adjacent properties that may have resulted in releases of chemicals of concern ("COCs") to soil and groundwater in the *Phase I Environmental Site Assessment Report,* dated 2 October 2006 (the "Phase I Report"). EKI prepared the *Proposal and Workplan for Phase II Investigation,* dated 2 October 2006 (the "Phase II Workplan") that describes the general scope of work that was conducted at the Site and is described herein. The results of investigations conducted pursuant to the Phase II Workplan were described in the *Soil and Groundwater Investigation Data Report* dated 14 November 2006 ("Phase II Report").

The City of Emeryville acquired the Site from Union Pacific Railroad in 2006. This report describes the proposed remedial approach for soil and groundwater contamination issues related to the presence of hazardous substances or petroleum hydrocarbons in soil and groundwater that may affect potential future use and redevelopment of the Site.

1.1 Site Description

The Site is approximately 2 acres and is located to the north of the intersection of Sherwin Avenue and Halleck Street in Emeryville, California (Figure 1-1). The Site is bounded by the UPRR tracks on the west, the Sherwin Williams property on the east and north, and the southern edge of Sherwin Avenue on the south. The Site was formerly a railroad spur with a loading and unloading area. A small area at the southeast corner was developed for what was apparently a chemical handling operation in the 1990's. The Site is currently undeveloped with the exception of access roads along the eastern and southern boundaries of the Site.

1.2 Report Organization

The ABCA report is organized into 9 sections as follows:

- Section 1.0 – Introduction
- Section 2.0 – Site Background and Setting
- Section 3.0 – Soil and Groundwater Investigation Activities.
- Section 4.0 – Summary of Investigation Results
- Section 5.0 – Identification of Removal Action Objectives
- Section 6.0 – Identification and Analysis of Removal Action Alternatives
- Section 7.0 – Description of Recommended Alternative
- Section 8.0 – Implementation Schedule

2 SITE BACKGROUND AND SETTING

This section describes the Site background and the geologic and hydrogeologic setting of the Site.

2.1 Site Use History

The Site use history is summarized below based on findings from the Phase I Report. The recent conditions on the Site and in the vicinity are shown on Figure 2-1.

The Site was undeveloped in the late 1800's. Between the early 1900's and continuing to the late 1980's, the Site was generally used as a railroad spur with a loading and unloading area (See Figures 2-2 through 2-7). In the late 1980s, the Site appears to have ceased to be used as a railroad spur, and the railroad tracks appear to have been removed by 1989 (See Figures 2-7 and 2-8). A fenced area is present in the southwest corner of the Site that appears to be associated with the adjacent building that is not located on the Site (See Figure 2-9). This area may have been used for chemical handling by the adjacent Technichem.

Historical uses of surrounding properties have included: a) New California Jockey Club Race Track, b) additional railroad spurs, c) the Judson Manufacturing Company/Barbary Coast Steel that manufactured steel, d) a furniture warehouse and cabinet varnishing shop, e) the Sherwin Williams Company that has historically manufactured oil-based coating products and water-based paint products, f) an oxygen plant operated by the Air Reduction Pacific Co., g) an auto repair and storage shop, and h) a dry cleaning solvent recycling facility (Technichem).

2.2 Geology and Hydrogeology

2.2.1 Site Geology

Based on the soil boring logs, the shallow stratigraphy at the Site generally consists of the following units (Figures 2-15 and 2-16):

1. Asphalt, concrete, or multi-layer asphalt and concrete slab or roadway surface from the ground surface to as much as 14-inches below ground surface ("bgs") along Sherwin Avenue;
2. Artificial fill from the ground surface to a maximum of 3.5 feet bgs;
3. Upper Member of the Young Bay Mud, approximately 1 foot thick where encountered, and located beneath the overlying fill material; and
4. Lower Member of the Young Bay Mud, located beneath the Upper Member that generally graded into the Lower Member over an interval of 1 to 2 feet.

2.2.1.1 *Artificial Fill*

Based upon stratigraphic logging conducted during the EKI investigations, the artificial fill generally consisted of multiple layers of dry, sandy gravel material with varying colors and textures. Gray brown, yellow brown, dark brown, and tan colored fill were most common. The different fill layers were apparently emplaced at different times and may be derived from different sources. Brick debris and railroad ballast were found sporadically in some of the fill layers. The gravel clasts found within the fill appeared to be mostly sandstones and some minor volcanic rocks found in the nearby East Bay hills. Minor red chert and greenstone were observed, but serpentinite was not.

As discussed in the Phase I Report, a photograph of the Site likely from the late 1990s indicated that the ground surface elevation in the central portion of the Site was lower than currently observed and that fill material was likely brought to the Site since that time. The source of this fill is not known.

Along Sherwin Avenue from sample location UPD-16 through UPD-19 (Figure 2-15), there appeared to be approximately 1-foot of black silty clay fill that was probably locally derived. Small brick fragments, occasional metal fragments, and a more silty texture were the only visual characteristics which distinguished this dark fill from the underlying Upper Member of the Young Bay Mud.

In sampling locations between railroad tracks, i.e., UPD-13 and UPD-15 (Figure 2-16), gravelly railroad ballast made up about 1-foot of the artificial fill.

2.2.1.2 *Upper and Lower Members of the Young Bay Mud*

The Upper Member of the Young Bay Mud generally consisted of a soft, black, silty clay with traces of rootlets and wood. The Upper Member was generally about 1 foot thick at the Site and graded into the Lower Member of the Young Bay Mud over an interval of 1 to 2 feet.

The lower member of the Young Bay Mud generally consisted of stiff, silty clay to clayey silt with occasional angular gravel. The lower member was generally a greenish-gray clay with varying amounts of yellowish-brown to orange mottles. Fine to medium sand and gravel was generally encountered between 5 and 6.5 feet bgs. When present, this portion of the Lower Member of the Young Bay Mud was wet and sufficient groundwater was present to collect grab groundwater samples. Below this, the Lower Member of the Young Bay Mud generally became a silt or sandy silt with distinctive brown mottling.

2.2.2 Site Hydrogeology

The following discussion on the Site hydrogeology is based upon information gathered at the Sherwin Williams property to the east (Figure 2-1) (CDM, 2005). Two groundwater zones (A-zone and B-zone) are locally defined beneath the Sherwin Williams property. The A-zone is a predominantly shallow, unconfined to semi-confined water-bearing zone located within Unit A. Depth to groundwater within the A-zone varies from approximately 3 to 12 feet bgs. The A-zone

was the water-bearing unit consistently encountered during the Parcel D work; all the grab groundwater samples were collected from this zone.

Within the A-zone, Sherwin Williams installed a slurry wall in 1994 and a groundwater extraction system within the slurry wall in 1995 on the northern portion of their property (LFR, 2006b: Figure 3). Groundwater hydraulic gradient directions outside of the slurry wall have generally been consistent before and after installation of the slurry wall (CDM, 2005). The groundwater gradient direction in the A-zone is approximately to the west-northwest (LFR, 2006b) and varies slightly between the northern and southern portions of the Sherwin Williams property. In the northern portion of the Sherwin Williams property, the groundwater gradient direction is more northwesterly and is potentially influenced by Temescal Creek to the north. In the southern portion of the Sherwin Williams property that is immediately adjacent to the east of the majority of the subject property, the groundwater gradient direction is more westerly.

Potential preferential conduits for groundwater migration in the A-zone at the subject property include: 1) a 12- to 18-inch diameter storm drain located along the western boundary of the subject property that discharges into Temescal Creek to the north and 2) a 15-inch diameter storm drain located on the southern portion of the subject property that flows south towards Oakland (Figure 2-1).

The B-zone is a deeper confined unit with a piezometric head above the top of the A/B aquitard. Groundwater elevations vary between 6 and 9 feet MSL within the B-zone and can fluctuate up to 2 feet seasonally. The groundwater gradient in the B-zone is predominantly to the northwest and does not appear to have been significantly impacted by installation and operation of the slurry wall and the extraction system.

3 SOIL AND GROUNDWATER INVESTIGATION ACTIVITIES

A summary of soil and groundwater investigation activities was conducted during October 2006 in general accordance with the EKI Work Plan for conducting a Phase II environmental investigation and is summarized below:

- Drilling of 20 soil borings;
- Collection of 53 surface and subsurface soil samples at 20 boring locations;
- Collection of grab groundwater samples at 6 boring locations;
- Analysis of selected soil and grab groundwater samples; and
- Surveying of the soil boring locations.

A summary of field methods and procedures is included in Appendix B.

3.1 Pre- and Post-Investigation Activities

Prior to the field investigation, the following pre-investigation activities were conducted:

- Contacted Underground Services Alert and Subdynamic Locating Services, a private utility locating company, to investigate the presence of underground conflicts at the proposed boring locations.
- Contacted UPRR per Right of Entry Agreement to notify UPRR of the commencement of investigation activities and to determine if an underground fiber optic cable was present at the Site.
- Obtained drilling permit from the Alameda County Public Works Agency ("ACPWA") to drill soil borings. A copy of the drilling permit is attached in Appendix B.

After completion of field investigation activities, Kister, Savio, & Rei Inc., a licensed land surveying company, surveyed the horizontal coordinates and vertical elevation of the soil boring locations.

3.2 Soil Borings

Soil borings were advanced by Precision Sampling, Inc. of Richmond, California, using direct-push technology, under the supervision of an EKI geologist. Field methods and procedures for boring installation are described in Appendix B.

A total of 20 borings (UPD-1 to UPD-20) were drilled on the Site from 16 to 18 October 2006, as shown on Figure 3-1. Soil borings extended to a depth of approximately 10 to 12 feet bgs. Borehole logs are included in Appendix B.

3.3 Soil and Grab Groundwater Sampling Methods

3.3.1 Soil Sampling Methods

Soil samples for laboratory analysis and stratigraphic logging were collected during drilling of the soil borings. A total of 53 soil samples were collected and analyzed from 20 soil borings and are listed on Table 3-1. Sampling methods and procedures are described further in Appendix B.

Collected soil samples were screened using a photoionization detector ("PID") in the field, and PID readings were noted on each boring log (Appendix B). Soil samples were collected and selected for analysis based on PID readings and field observations. Soil samples were delivered under chain-of-custody to the analytical laboratory for analysis.

3.3.2 Groundwater Sampling Methods

A total of 7 grab groundwater samples were collected from soil borings UPD-1 through UPD-6 and are listed on Table 3-2. A grab groundwater sample was collected from UPD-6 for total petroleum hydrocarbons as diesel ("TPH-d") analysis to replace the total petroleum hydrocarbon ("TPH") container from UPD-1, which was broken during shipping to the analytical laboratory. A duplicate groundwater sample was also collected from UPD-2.

Grab groundwater samples were collected using a polyethylene bailer or a peristaltic pump depending on the chemical analytes. For dissolved metals analysis, grab groundwater samples were field filtered using a peristaltic pump and a disposable 0.45-micron membrane-type filter. Sampling methods and procedures are described further in Appendix B.

3.4 Analytical Methods

Soil samples were sent to Calscience Environmental Laboratories Inc. ("Calscience") of Garden Grove, California for chemical analyses in accordance with current EPA test methods. Calscience is a California state certified analytical laboratory. Soil samples for chemical analysis were selectively analyzed for one or more of the following analytes using the following methods:

- Title 22 metals using inductively coupled plasma/mass spectrometry ("ICP/MS") EPA Method 6020;
- Hexavalent chromium using EPA Method 7199;
- TPH gasoline range organics ("TPH-g") using EPA Method 8015 (C4-C12);
- TPH-d range organics with silica gel cleanup using EPA Method 8015 (C7-C28);
- TPH motor oil range organics ("TPH-mo") with silica gel cleanup using EPA Method 8015 (C14-greater than C44);
- Semi-volatile organic compounds ("SVOCs") using EPA Method 8270C;
- Organochlorine pesticides using EPA Method 8081;
- Polychlorinated Biphenyls ("PCBs") using EPA Method 8082;
- Volatile organic compounds ("VOCs") and fuel oxygenates using EPA Method 8260; and

- Total Organic Carbon using EPA Method 9060.

Grab groundwater samples were sent to Calscience for chemical analyses, with the exception of hexavalent chromium. Groundwater samples for hexavalent chromium analysis were sent to Curtis and Tompkins, Ltd. ("C&T") of Berkeley, California. C&T is a California state certified analytical laboratory. Groundwater samples for chemical analysis were selectively analyzed for the following analytes using the following methods:

- Title 22 metals using ICP/MS EPA Method 200.8;
- Hexavalent chromium using EPA Method 7199;
- TPH-g using EPA Method 8015 (C4-C12);
- TPH-d with silica gel cleanup using EPA Method 8015 (C7-C28);
- TPH-mo with silica gel cleanup using EPA Method 8015 (C14-greater than C44); and
- VOCs and fuel oxygenates using EPA Method 8260.

Table 3-1 provides a summary of chemical analyses for each soil and grab groundwater sample submitted for analysis. Copies of the laboratory reports and chain of custody documents for the soil and groundwater samples are attached in Appendix B.

3.5 Surveying of Sampling Locations

Horizontal coordinates and elevations of the soil boring locations were surveyed by Kister, Savio, and Rei, Inc., a licensed land surveyor from Richmond, California. Horizontal coordinates were surveyed relative to the California Coordinate System North American Datum ("NAD") 1983, Zone 3. Vertical elevations were surveyed relative to mean sea level based on the National Geodetic Vertical Datum ("NGVD") 1929. Survey coordinates are attached in Appendix B.

4 SUMMARY OF INVESTIGATION RESULTS

This section summarizes the results of soil and groundwater investigation activities performed at the Site by EKI during October 2006 and includes: a) field observations made during drilling, b) soil analytical results, and c) groundwater analytical results.

4.1 Observations During Drilling

As indicated on the borings logs in Appendix B, the following observations were made during drilling:

- A strong chemical odor was noted in the soils within the upper 5-feet at UPD-5. These soils were also black and oily (see Photos in Appendix B).
- A strong sulfurous odor was noted during collection of the grab groundwater sample at UPD-4.
- Small, potentially metal fragments noted in the black silty fill at the top of UPD-18.
- A thin (approximately 6-inches) layer of rusty brown sand was noted at about 1-foot bgs in UPD-14. Potential presence of oxidized metal fragments or slag.

4.2 Soil Analytical Results

4.2.1 Soil Screening Criteria

Concentrations of chemicals detected in soil were compared with applicable screening criteria to identify preliminary COCs. Applicable screening criteria included the California Human Health Screening Levels ("CHHSLs") (CAL/EPA, 2005), the EPA Region 9 Preliminary Remediation Goals ("PRGs") for residential exposure (EPA, 2004), and the California Regional Water Quality Control Board, San Francisco Bay Region's ("SFRWQCB") Environmental Screening Levels ("ESLs") for residential shallow soil where groundwater is not a potential drinking water source (SFRWQCB, 2007). For metals, which are naturally occurring, screening criteria also included background concentrations reported in the Lawrence Berkeley National Laboratory ("LBNL") study (LBNL et al, 2002).

4.2.2 Metals

Analytical results of metals analyses for soil are presented in Table 4-1. A majority of metals in soil exceeded one or more screening criteria at one or more sampling locations. Based on the number and frequency of screening criteria exceeded, the primary metal COCs in soil are considered to be arsenic, cadmium, lead, cobalt, and zinc, and are further discussed below. The suite of metal COCs observed in fill soil samples from the Site is generally consistent with the suite of metals observed in the soils excavated from the adjacent former Southern Pacific Transportation Company ("SPTC") Site, located at 4226 Halleck Street in Emeryville, California. The SPTC Site was formerly the southern extension of the railroad spur tracks that

used to be located on the Site and is currently being developed as the northwest extension of the Emeryville Warehouse Lofts complex (Figure 2-1).

4.2.2.1 Arsenic

Arsenic in soil exceeded the CHHSL and PRG at all sampling locations but exceeded the LBNL background concentration of 24 milligrams per kilogram ("mg/kg") at 13 of 20 sampling locations. Arsenic concentrations detected in soil ranged from 1.99 to 145 mg/kg and generally exceeded LBNL background concentrations in the 0 to 3 feet bgs depth interval on the main portion of the Site. Shallow soils along the eastern arm of Sherwin Avenue may not be as impacted due to: 1) the generally smaller thickness of fill along Sherwin Avenue, 2) the fill present along Sherwin Avenue appears to be generally locally derived Young Bay Mud instead of artificial fill from other sources, and 3) the fill beneath Sherwin Avenue was also capped by up to a foot of concrete and asphalt.

Arsenic concentrations in fill soils at the Site were substantially lower in concentration relative to the pre-excavation soil samples analyzed from the SPTC Site. The historical maximum concentration of arsenic in soil at the SPTC Site was 6,800 mg/kg, and the highest arsenic concentrations in soil appeared to be located within a fine black sand layer in the shallow subsurface (Geomatrix, 2005). This may reflect the fact that the fine black sand layer at the SPTC Site was not observed in boreholes drilled during this investigation. As discussed in the Phase I report and in Section 2.2.1.1, it appears that earthwork may have been performed at the Site in the late 1990s and may have removed or disturbed this layer at the Site, if historically present.

4.2.2.2 Cadmium

Cadmium concentrations in soil exceeded the CHHSL of 1.7 mg/kg at 11 of 20 sampling locations and exceeded the LBNL background concentration of 5.6 mg/kg at 6 of 20 sampling locations. None of the soil samples exceeded the PRG of 37 mg/kg for cadmium. Cadmium concentrations detected in soil ranged from not detected to 10 mg/kg. Similar to the distribution of arsenic in soil, cadmium concentrations generally exceeded LBNL background concentrations in the 0 to 3 feet bgs depth interval on the main portion of the Site.

4.2.2.3 Lead

Lead concentrations in soil exceeded the CHHSL and PRG of 150 mg/kg at 13 of 20 sampling locations and exceeded the LBNL background concentration of 57 mg/kg at 16 of 20 sampling locations. Lead concentrations detected in soil ranged from 5.9 to 684 mg/kg and were greater than the CHHSL and PRG in the 0 to 3 feet bgs depth interval on the main portion of the Site. Elevated concentrations of lead also generally correlated with elevated concentrations of arsenic and/or cadmium, as discussed above.

4.2.2.4 Cobalt

Cobalt concentrations in soil exceeded the ESL of 40 mg/kg at 1 of 20 sampling locations and exceeded the LBNL background concentration of 25 mg/kg at 4 of 20 sampling locations. Cobalt concentrations detected in soil ranged from 4.27 to 44.4 mg/kg and were greater than the LBNL in depths from 0 to 7 feet bgs. The cobalt concentration that exceeded the ESL occurred in the 3 to 6 feet bgs depth interval. Elevated concentrations of cobalt also generally correlated with elevated concentrations of arsenic, lead, and/or zinc, as discussed above and in the following section.

4.2.2.5 Zinc

Zinc concentrations in soil exceeded the ESL of 600 mg/kg at 6 of 20 sampling locations and exceeded the LBNL background concentration of 140 mg/kg at 16 of 20 sampling locations. Zinc concentrations detected in soil ranged from 58.4 to 2,970 mg/kg and were greater than the ESL and LBNL in the 0 to 3 feet bgs depth interval on the main portion of the Site. Elevated concentrations of zinc also generally correlated with elevated concentrations of the other metals discussed above.

4.2.3 TPH

Analytical results for TPH in soil are presented in Table 4-2 and are shown on Figure 4-1. CHHSLs and PRGs are not available for TPH. TPH in soil exceeded either the TPH-g, TPH-d, or TPH-mo ESL at 10 of 20 sampling locations. The highest TPH-d and TPH-mo concentrations in soil of 5,400 mg/kg and 19,000 mg/kg were detected at UPD-5, located in the southwest corner of the Site, and corresponds with field observations of a strong chemical odor and black oily soils within the upper 5 feet bgs. UPD-5 is located in the fenced enclosure that was likely associated with the former Technichem facility, a dry cleaning solvent recycler (EKI, 2006a).

In other areas of the Site, elevated concentrations of TPH were generally detected in the upper 3 feet bgs along the eastern and southern portions of the Site that are currently used as access roads or parking areas for delivery vehicles.

4.2.4 SVOCs

Analytical results for SVOCs in soil are presented in Table 4-3. One or more SVOCs were detected at 5 of 20 sampling locations. Benzo(a)anthracene, benzo(a)pyrene, and benzo(b)fluoranthene exceeded CHHSLs or PRGs at one location (UPD-18) at a depth interval of 0.5 to 1 foot. 1,4-dichlorobenzene exceeded the ESL but not the PRG at one location (UPD-14) at a depth interval of 0 to 2 feet.

4.2.5 PCBs and Organochlorine Pesticides

Analytical results for PCBs and organochlorine pesticides in soil are presented in Table 4-4. Organochlorine pesticides were detected at 4 of 20 sampling locations within the upper 3 feet bgs. Detected pesticides in soil (DDD, DDE, DDT, and dieldrin) did not exceed their respective CHHSLs, PRGs, or ESLs.

Aroclor 1254 was the one PCB detected in soil at the Site, and detected concentrations at 5 of 20 sampling locations ranged from 0.065 to 0.74 mg/kg. Aroclor 1254 exceeded the ESL of 0.089 mg/kg at 4 of 20 locations. Aroclor 1254 exceeded the PRG of 0.22 mg/kg at 2 of 20 sampling locations (UPD-4 and UPD-20) within the upper 3 feet bgs.

4.2.6 VOCs

Analytical results for VOCs are presented in Table 4-5. There are no CHHSLs for VOCs. VOCs were not detected above chemical specific PRGs or ESLs. Therefore, VOCs are not considered to be COCs at the Site.

4.3 Groundwater Analytical Results

4.3.1 Groundwater Screening Criteria

Concentrations of constituents detected in groundwater were compared with applicable screening criteria to identify preliminary COCs. Concentrations of constituents detected in groundwater samples were compared to California Maximum Contaminant Levels ("MCLs") (DHS, 2006) and the SFRWQCB ESLs for groundwater as a non-drinking water source (SFRWQCB, 2007).

4.3.2 Metals

Analytical results of dissolved metals in Site groundwater are presented in Table 4-6, and the analytical results of metals in Site and regional groundwater are shown on Figures 4-2 and 4-3. Antimony in Site groundwater (UPD-4) exceeded the MCL only once at a concentration of 6.04 micrograms per liter ("ug/L"). Arsenic in Site groundwater exceeded the MCL of 10 ug/L at 4 of 5 sampling locations and ranged in concentration from 6.1 to 398 ug/L. The highest arsenic concentrations in Site groundwater were detected in the northwest (UPD-1) and southwest (UPD-4 and -5) corners of the Site. UPD-1 is located in the dowgradient direction of A-zone groundwater monitoring well, LF-11, on the Sherwin Williams property (Figure 4-2). The arsenic concentration in groundwater at UPD-1 is 398 ug/L and is consistent with the 1,500 ug/L detected in LF-11 during 7 July 2006 (LFR, 2006a).

Elevated arsenic concentrations in Site groundwater of 106 ug/L at UPD-4 and 59 ug/L at UPD-5 were also detected in the southwest corner of the Site. Based on the location of these sampling points in relation to the Site and the west-northwest hydraulic gradient, there may potentially be an off-Site groundwater source for arsenic. The potential for an off-Site groundwater source for arsenic is further supported by lower groundwater concentrations of arsenic observed along the

central western portion of the Site in UPD-2 (6.2 ug/L) and UPD-3 (12.1 ug/L) while elevated concentrations of arsenic in shallow soil are generally pervasive across the majority of the Site (Figures 4-1 and 4-2).

4.3.3 TPH and VOCs

Analytical results of TPH and VOCs in Site groundwater are presented in Table 4-7, and the analytical results of TPH-mo in Site and regional groundwater are shown on Figures 4-2 and 4-3. The highest TPH-mo concentration detected in Site groundwater was 1,100 ug/L. TPH in Site groundwater was not detected above screening criteria.

VOCs were not detected above reporting limits in groundwater samples collected at the Site. Therefore, VOCs are not considered to be COCs in groundwater.

4.4 Conceptual Site Model

The conclusions of this soil and groundwater investigation of the Site are summarized below:

- The Site is underlain by up to 3.5 feet of gravelly fill soils, the source of which are not known. Young Bay Muds underlie the fill soils.

- The primary COCs in soil are metals (arsenic, cadmium, cobalt, lead, and zinc) and TPH (primarily TPH-d and TPH-mo) generally within the upper 3 feet bgs.
    - Elevated concentrations of metals in soil were detected across the majority of the Site with the general exception of the eastern arm of Sherwin Avenue and are generally found within the artificial fill materials.

    - Elevated concentrations of TPH in soil were detected generally near or along eastern and southern boundaries of the Site that include the access road used for deliveries to the Sherwin Williams property and Sherwin Avenue. The highest concentrations of TPH were observed in the southwest corner of the Site within a fenced area that is likely associated with the former Technichem facility (EKI, 2006a).

- The primary COC in groundwater is arsenic.
    - Arsenic was identified as the primary metal COC in groundwater due to the magnitude at which arsenic concentrations in groundwater exceeded the MCL. Elevated concentration of arsenic in groundwater was detected on the northern portion of the Site and is likely associated with arsenic-impacted groundwater from the Sherwin Williams property, as observed in groundwater along the western boundary of the Sherwin Williams property in monitoring well LF-11 (Figure 4-2). Elevated concentrations of arsenic in groundwater were also detected in the southwest portion of the Site and may potentially be the result of an unknown off-Site groundwater source given the west-northwest hydraulic

gradient reported for the area. However, this will need to be confirmed with additional information or investigations.

5 IDENTIFICATION OF REMOVAL ACTION OBJECTIVES

5.1 Identification Of Removal Action Objectives

The primary removal action objective ("RAO") for Site cleanup is to reduce the volume, toxicity and mobility of Site contaminants to acceptable, risk-based levels for anticipated future Site use. This will be done to eliminate exposure pathways for human and ecological receptors. Specifically, the RAO for this Site is to reduce the concentration of TPH and metals in Site soil to below their established cleanup levels in an effective and expedient manner.

5.2 Planned Future Site Use

Potential future site uses include a park or a mixed use development. Both of these potential future uses are described below.

The park would likely be developed by the City. Proposed park amenities might include multi use lawn areas, a basketball court, an amphitheater, and a children's play area. Potential exposure pathways for receptors (park patrons and construction workers using and working in the multi-use lawn area) include inhalation of vapors and/or fugitive dust. A basketball court or amphitheatre would most likely be capped with asphalt and/or concrete, so exposures to vapors and/or fugitive dust will be limited to construction workers developing the area. Any children's play area would warrant the most conservative remediation approach.

A mixed use development on the Site might include ground floor residential or commercial/retail uses. Any residential use would be "urban" residential, meaning there would be no direct contact with site soils. Potential exposure pathways for receptors (residents, commercial workers, and construction workers) include inhalation of vapors and/or fugitive dust.

The following section proposes cleanup levels based on the potential future Site use.

5.3 Cleanup Goals

Preliminary Site specific remedial goals ("SSRGs") were selected to allow for relatively unrestricted use of the Site for any development that may be contemplated and are also generally consistent with remedial goals at neighboring sites in the vicinity. No specific development scenario was considered. Concentrations of constituents detected in soil were compared with applicable screening criteria to identify preliminary COCs. Applicable screening criteria included CHHSLs, PRGs, ESLs, and LBNL concentrations described in Section 4.2.1. These applicable screening criteria were chosen as preliminary SSRGs and are presented for Site COCs in Table 5-1.

Based on the investigation data, the primary COCs in soil and groundwater at the Site are TPH and metals. Metal COCs in soil that exceed SSRGs include arsenic, cadmium, cobalt, lead, and zinc. The primary metal COC in groundwater is arsenic. Groundwater is not a source of drinking

water on Site and was not encountered within 10 feet bgs during groundwater collection activities; therefore, Site specific cleanup goals for groundwater have not been proposed. Future cleanup goals for groundwater may have to be established if a parking structure is planned for the Site to depths where groundwater may be encountered.

Site soil cleanup goals proposed for TPH-g, TPH-d, TPH-mo, arsenic, cadmium, cobalt, lead, and zinc are similar to previously established cleanup goals used for other projects in the City of Emeryville, including the Pinnacle property on 64th Street and Christie Avenue, and the Union Pacific property west of the Airgas business near Powell and Hollis Streets. Preliminary SSRGs for TPH constituents in soil are based on the SFRWQCB ESLs for residential shallow soil (<3 meters) where potentially impacted groundwater is not a current or potential drinking water resource (SFRWQCB, 2007). The proposed SSRGs for TPH-g and TPH-d are 100 mg/kg for each constituent; and the proposed SSRG for TPH-mo is 410 mg/kg. Because these cleanup goals were established for a residential land use, they provide a conservative estimate for park use by recreational visitors with much more limited Site exposures. Preliminary SSRGs for arsenic, cadmium, cobalt, and zinc are based on the LBNL background. The SSRGs for arsenic, cadmium, cobalt, and zinc are 24 mg/kg, 5.6 mg/kg, 25 mg/kg, and 140 mg/kg, respectively. The preliminary SSRG for lead is 150 mg/kg, and is based on the PRG, and CHHSL.

At UPD-10, cobalt was detected at 25.3 mg/kg and exceeded the LBNL screening criteria at a depth of 7 feet bgs; however, the removal alternatives do not include removal of cobalt in soil to this depth. UPD-10 will be backfilled with three feet of clean fill material after excavation and removal of other metal COCs in shallow soil (see Section 6 and Figure 6-1).

Zinc was detected at several locations on-Site at concentrations that exceeded the LBNL screening criteria for zinc. However, zinc detections exceeded the LBNL by a relatively small amount, and generally correlate with detections of other metal COCs that exceed SSRGs. Therefore, removal alternatives due not include specific removal actions for zinc. Most areas on-Site with zinc detections above screening levels will be backfilled with clean fill material after excavation and removal of other metal COCs in shallow soil (see Section 6 and Figure 6-1).

6 IDENTIFICATION AND ANALYSIS OF REMOVAL ACTION ALTERNATIVES

The remediation technologies considered for the reduction of COCs in Site soil are: 1) No action, 2) Excavation and off-Site disposal, and 3) Limited excavation with off-Site disposal and capping. The remediation technologies are described in the following sections in terms of their effectiveness, implementability, and cost.

The acceptance criteria of effectiveness, implementability, and cost were selected to determine how the alternatives compare with one another and to identify tradeoffs between them.

1. Effectiveness: This criterion addresses how well a removal action satisfies the RAOs in the short and long term, and addresses protection of human health and the environment during construction and implementation of removal actions.

2. Implementability: This criterion is meant to assess implementability considering the technical and administrative feasibility of each alternative, as well as the availability of needed goods and services to perform the removal action. Other implementability considerations include the ability to monitor remedial effectiveness and the ability to obtain approvals and permits.

3. Cost: This criterion evaluates the cost of removal action alternatives, including both total long-term and short-term costs.

Table 6-1 summarizes the comparison of alternatives in terms of these acceptance criteria.

An on-Site soil treatment alternative was not chosen for detailed alternative analysis in this ABCA. On-Site soil treatment was considered to be an infeasible remedial action for the Site in terms of the acceptance criteria of effectiveness, implementability, and cost.

6.1 Alternative 1: No Action

Under the No Action alternative, COCs would remain in place at their current concentrations. Concentrations of several COCs (including TPH, arsenic, cadmium, cobalt, lead, and zinc) were above SSRGs in soil samples collected up to 4.5 feet bgs. A No Action alternative would allow potential human and ecological receptor exposure to the existing Site soil contamination. The No Action alternative may require institutional controls ("ICs") (including zoning restrictions, deed restrictions, well drilling prohibitions and easements and covenants) to reduce the potential for migration of Site COCs to groundwater or the risk of exposures to Site COCs if existing barriers are weakened or damaged. Specifically, the No Action alternative would require restrictions for redevelopment of the Site for park use. Additional consultant and regulatory agency costs would be associated with establishing these future ICs, when needed.

6.1.1 Effectiveness

Because no demolition of Site facilities occurs under this scenario, asphalt surfaces and concrete pads would continue to function as barriers limiting the potential exposures to COCs for Site workers and the public. This alternative does not meet the RAO of reducing the concentrations of TPH and metals in Site soil to below their established cleanup levels. The potential for mobilizing soil contaminants to groundwater via precipitation infiltration could increase if impacted soils are not isolated or removed. The only reduction in toxicity, mobility, or volume of Site COCs that would result under this alternative is from natural degradation of TPHs. Metal concentrations in soils would likely remain unaffected.

6.1.2 Implementability

The No Action alternative is easily implemented, requiring minimal effort to establish the ICs defined above, when needed.

6.1.3 Cost

Consultant and regulatory agency costs would be associated with establishing the future ICs defined above, when needed.

6.2 Alternative 2: Excavation and Off-Site Disposal

Excavation and Off-Site Disposal entails physical removal of the soils from the Site, transporting those soils to either a permitted landfill or treatment facility for disposal, and groundwater monitoring for five years to evaluate the effectiveness of the remedy in terms preventing COCs in shallow soil from impacting Site groundwater. Prior to soil excavation at the Site, existing asphalt and concrete slabs, roadways, and debris would be demolished.

EKI used a standard polygonal method to develop an area of influence for each boring sampled during the Phase I and Phase II ESAs for excavation volume estimation and waste disposal classification purposes. The resulting polygons or excavation "cells" are shown on Figure 6-1. Impacted soil volumes were calculated by estimating the depth of soil in each boring having concentrations of COCs above the proposed SSRGs. When COCs exceeding cleanup levels were detected in a sample from a 2-foot depth and not detected (at levels exceeding preliminary SSRGs) in the sample at the 3.5 foot depth, the impacted depth was considered to be halfway between the two sample depths, or at a depth of 2.75 feet. This approach was used for all borings, resulting in impacted soil depths of 0, 2.75, 4.25, or 5.5 feet for each cell.

The estimated volume of non-hazardous (Class II) waste for off-Site disposal is 300 bcy (500 tons), and the estimated volume of non-RCRA hazardous (Class I) waste for off-Site disposal is 7,300 bcy (12,100 tons). The basis for waste disposal classification and the waste disposal classification index is defined in Appendix C - Table C3. Preliminary waste disposal classification is based on review of soil data and classification criteria listed in Table C3 and as discussed in the *Summary of Additional Chemical and Geotechnical Soil Data* (EKI, 2006c). Several cells proposed for excavation are preliminarily classified as non-RCRA hazardous

(Class I) based on TCLP results from selected soil samples. Further analyses would need to be performed to determine if proposed excavated soils could be classified as non-hazardous (Class II) waste.. Additional soil characterization is assumed necessary as a pre-excavation task to facilitate obtaining pre-approvals of final waste classifications and to better define excavation dimensions. Costs associated with Excavation and Off-Site Disposal would include excavation equipment, soil profiling, soil removal, transport, disposal charges, and installation and short-term monitoring of four perimeter groundwater monitoring wells.

6.2.1 Effectiveness

The Excavation and Off-Site Disposal alternative will effectively reduce health risks from potential exposures to construction worker and park patrons, as well as ecological receptors on Site. The contaminated soil will be removed in areas where contamination is above cleanup levels (Figure 4-1) and transported to either a non-hazardous (Class II) landfill, or a non-RCRA hazardous (Class I) landfill for storage and/or treatment. Disposing of the soil in a permitted landfill will reduce potential future ecological and human health risks associated with contaminated soil. The removal of contaminated soil from the Site will also reduce the risk of the contaminant source migrating to local groundwater.

The anticipated duration of excavation activities under the Excavation and Off-Site Disposal alternative is approximately six weeks. The Excavation and Off-Site Disposal alternative may have decreased effectiveness in the short term as a result of dust and odor generated during excavation that may affect the health of on-Site workers and public receptors off-Site. In addition, the Excavation and Off-Site Disposal alternative may not be effective in the short term due to transportation restrictions at the Site during excavation activities (i.e., truck routes, staging, and decontamination). However, the alternative would include appropriate engineering controls such as personal protective equipment for on-Site workers, dust and odor suppressant measures, and other traffic controls, that may increase the short-term effectiveness of the alternative. It is anticipated that the Excavation and Off-Site Disposal alternative will be most effective in the long term.

6.2.2 Implementability

The Excavation and Off-Site Disposal alternative is easily implemented because contaminated soil that would need to be excavated and transported off-Site could be both loaded and transported off-Site during excavation activities (pending regulatory approval), or stockpiled in specified areas with impacted soils and removed after the stockpiled soils are characterized. This alternative uses readily available equipment and experienced contractors to perform work. Adequate transportation capacity exists in the area with numerous licensed hazardous waste haulers available. It is assumed that excavated soil will be loaded into trucks on-Site and that trucks will use Sherwin Avenue as a point of access to and egress from the Site. Several disposal facilities are easily accessible from the Site for disposal of non-hazardous (Class II) or non-RCRA hazardous (Class I) wastes. Adequate capacity exists at many permitted disposal facilities to provide treatment (if needed) and disposal of 12,600 tons of COC impacted soils. The Excavation and Off-Site Disposal alternative would include additional effort to install,

develop, and annually monitor four perimeter groundwater monitoring wells. The Excavation and Off-Site Disposal alternative may require additional effort to develop and execute the engineering controls described above in order to protect the health of on- and off-Site receptors, and to manage on-Site transportation.

6.2.3 Cost

The cost to excavate contaminated soil into end-load dump trucks is $6.50 per bcy. The cost for transportation and disposal of non-hazardous (Class II) waste is $60 per ton. The estimated cost for soil removal, transportation, and disposal of 300 bcy (500 tons) of non-hazardous (Class II) waste would be approximately $30,200. The cost for transportation and disposal of non-RCRA hazardous (Class I) waste is $100 per ton. The estimated cost for soil removal, transportation, and disposal of 7,300 bcy (12,100 tons) of non-RCRA hazardous (Class I) waste would be approximately $1,200,000. Imported backfill would cost approximately $30 per ton, which would total approximately $400,000 to backfill 12,600 tons of excavated soil. The cost for installation and development of four perimeter groundwater monitoring wells, and preparation of a groundwater monitoring report is $30,000. The present worth of annual costs for groundwater sampling and analysis ($40,000 for a five-year duration) is approximately $190,000. The total estimated present worth cost for Alternative 2 is $2,500,000 to $5,100,000, which assumes a -30% to +50% accuracy range and a 30% contingency for the total estimated capital cost (Table 6-2).

6.3 Alternative 3: Limited Excavation with Off-Site Disposal and Capping

Limited Excavation with Off-Site Disposal and Capping entails physical removal of the top 1 foot of soil from the Site, additional trenching below initial excavation finish grade for two, 3'x3' utility corridors that border the parcel on the south and west sides, and one, 3'x3' utility corridor at the centerline of the portion of Sherwin Avenue that borders the property, and transporting those soils to either a permitted landfill or treatment facility for disposal. The excavation extents for the utility corridors is conceptual and for cost estimating purposes only. The exact extents of the utility corridors will be determined during redevelopment. Alternative 3 also includes a low-permeability cover system that would be installed to promote surface water drainage away from the cap to minimize infiltration of water into the soil containing the remaining COCs and to avoid direct contact with the soil containing COCs. Groundwater monitoring will be conducted for thirty years to assess the effectiveness of the cap. It is anticipated that long-term groundwater monitoring is necessary to evaluate the impact of the remedy on Site groundwater because excavation activities will have resulted in only partial removal of COCs above SSRGs. Prior to soil excavation at the Site, existing asphalt and concrete slabs, roadways, and debris would be demolished.

EKI used the excavation cells described in Section 6.2 and shown on Figure 6-1 for estimating volumes of soil for excavation and disposal. The estimated volume of waste for off-Site disposal is 600 bcy (1,000 tons) of non-hazardous (Class II) waste, and 2,900 bcy (4,800 tons) of non-RCRA hazardous (Class I) waste. The basis for waste disposal classification and the waste disposal classification index is defined in Table C3. Preliminary non-hazardous (Class II) and

non-RCRA hazardous (Class I) waste disposal classifications are based on review of soil data and classification criteria listed in Table C3 and as discussed in the *Summary of Additional Chemical and Geotechnical Soil Data* (EKI, 2006c). Several cells proposed for excavation are preliminarily classified as non-RCRA hazardous (Class I) based on TCLP results from selected soil samples. Further analysis would need to be performed to determine if proposed excavated soils classified as non-RCRA hazardous (Class I) waste could be classified as non-hazardous (Class II) waste. Additional soil characterization is assumed necessary as a pre-excavation task to facilitate obtaining pre-approvals of final waste classifications and to better define excavation dimensions. Costs associated with Limited Excavation with Off-Site Disposal and Capping would include excavation equipment, soil profiling, soil removal, transport, disposal charges, materials and labor for construction of a low-permeability cap, and installation and long-term monitoring of four perimeter groundwater monitoring wells.

6.3.1 Effectiveness

The Limited Excavation with Off-Site Disposal and Capping alternative will effectively reduce health risks from potential exposures to construction worker and park patrons, as well as ecological receptors on Site. The top one foot of soil containing COCs above cleanup levels as shown in Figure 4-1 will be removed and transported to a non-hazardous (Class II) or non-RCRA hazardous (Class I) landfill for storage and/or treatment. Disposing of the soil in a permitted landfill will reduce potential future ecological and human health risks associated with contaminated soil. The removal of contaminated soil from the Site will also reduce the risk of the contaminant source migrating to local groundwater. The installation of a low-permeability cap will prevent water from infiltrating through shallow soils and leaching remaining COCs to Site groundwater.

The anticipated duration of excavation activities under the Limited Excavation with Off-Site Disposal and Capping alternative is approximately six weeks. The Limited Excavation with Off-Site Disposal and Capping alternative may have decreased effectiveness in the short term as a result of dust and odor generated during excavation that may affect the health of on-Site workers and public receptors off-Site. In addition, the Limited Excavation with Off-Site Disposal and Capping alternative may not be effective in the short term due to transportation restrictions at the Site during excavation activities (i.e., truck routes, staging, and decontamination). However, the alternative would include appropriate engineering controls such as personal protective equipment for on-Site workers, dust and odor suppressant measures, and other traffic controls, that may increase the short-term effectiveness of the alternative. It is anticipated that with on-going monitoring and maintenance of the low-permeability cap, the Limited Excavation with Off-Site Disposal and Capping alternative will be most effective in the long term. Alternative 3 may not be as effective as Alternative 2 because limited excavation would remove less COC mass than the excavation activities described under Alternative 2, resulting in decreased long-term protectiveness.

6.3.2 Implementability

The excavation and disposal portion of the Limited Excavation with Off-Site Disposal and Capping alternative can be implemented in the same manner as Alternative 2, with the advantage of smaller quantities of waste soil. Under Alternative 3, only the top one foot of Site soils would be excavated along with excavation of trenches for utility corridors, whereas excavation for complete COC source removal under Alternative 2 requires excavation from 0-to-5 feet bgs. Additional effort would be required under Alternative 2 for the installation and on-going monitoring of the cover system. Implementation of Alternative 2 would require soil to be excavated to the water table (i.e., 3 to 5 feet bgs) at several locations. Although excavation of utility trenches could extend to the water table under Alternative 3, dewatering would not likely be required. Adequate capacity exists at many permitted disposal facilities to provide treatment (if needed) and disposal of 5,800 tons of COC impacted soils.

The Limited Excavation with Off-Site Disposal and Capping alternative may require additional effort to develop and execute the engineering controls described above in order to protect the health of on- and off-Site receptors, and to manage on-Site transportation. The Limited Excavation with Off-Site Disposal and Capping alternative may not be feasible in terms of proposed redevelopment because 1) additional excavation may be required for above-grade structures (e.g., amphitheatre) that would require the cap to be punctured, resulting in decreased effectiveness of the cap, and 2) planting trees or vegetation on-Site would require the cap to be punctured, and root systems would likely develop within the cap, thereby decreasing the effectiveness of the cap.

6.3.3 Cost

The cost to excavate contaminated soil into end-load dump trucks is $6.50 per bcy. The cost for transportation and disposal of non-hazardous (Class II) waste is $60 per ton. The estimated cost for soil removal, transportation, and disposal of 600 bcy (1,000 tons) of non-hazardous (Class II) waste would be approximately $60,000. The cost for transportation and disposal of non-RCRA hazardous (Class I) waste is $100 per ton. The estimated cost for soil removal, transportation, and disposal of 2,900 bcy (4,800 tons) of non-RCRA hazardous (Class I) waste would be approximately $480,000. Imported backfill would cost approximately $30 per ton, which would total approximately $174,000 to backfill 5,800 tons of excavated soil. The cost of the low-permeability cap, which includes geomembrane, geocomposite drainage net, geosynthetic clay liner, and top soil and vegetation for Site restoration, would be approximately $284,000, assuming the cap would be installed over the entire 85,400 square foot excavation area on the property. The cost for installation and development of four perimeter groundwater monitoring wells, and preparation of a groundwater monitoring report is $30,000. The present worth of annual costs for groundwater sampling and analysis ($40,000 for a thirty-year duration) is approximately $780,000. The present worth of annual costs for annual cap maintenance is approximately $290,000 (assumed thirty-year maintenance schedule). The total estimated present worth cost for Alternative 3 is $2,700,000 to $4,400,000, which assumes a -30% to +50% accuracy range and a 30% contingency for the total estimated capital cost (Table 6-2).

7 DESCRIPTION OF RECOMMENDED ALTERNATIVE

Based on the evaluation of alternatives presented above, Alternative 2 – Excavation and Off-Site Disposal is the recommended alternative. Alternative 1 does not meet the RAO for the Site of reducing the concentration of TPH and metals in Site soil to below their established cleanup levels in an effective and expedient manner, so it is not an effective alternative. Alternative 3 requires long-term monitoring and maintenance, does not provide complete COC mass removal from contaminated shallow soils on-Site, and may be infeasible in terms of proposed redevelopment. Table 6-2 shows that Alternatives 2 and 3 are comparatively cost effective, and Alternative 3 is slightly more cost effective. Overall, EKI believes that Alternative 2 best meets the RAO considering effectiveness, implementability, and cost.

8 IMPLEMENTATION SCHEDULE

According to the City, remediation is scheduled for early 2008. Although no formal timeline for soil remediation has been established for this Site, field work would ideally be completed within 6 months.

9 REFERENCES

CAL/EPA, 2005. *Use of California Human Health Screening Levels ("CHHSLs") in Evaluation of Contaminated Properties*, January 2005.

California Department of Health Services ("DHS"), 2006. *MCLs, DLRs, and PHGs for Regulated Drinking Water Contaminants*, 7 March 2006.

CDM, 2005. *Feasibility Study/Remedial Action Plan*, The Sherwin Williams Company, 1450 Sherwin Avenue, Emeryville, California, Camp Dresser & McKee Inc., 5 May 2005.

ERRG, 2006. *Groundwater Monitoring Report*, Former Barbary Coast Steel Facility, Emeryville, California, Engineering/Remediation Resources Group, Inc., August, 2006.

EKI, 2006a. *Phase I Environmental Site Assessment*, UPRR Parcel D at the Intersection of Sherwin Avenue and Halleck Street, Emeryville, California, Erler & Kalinowski, Inc., 2 October 2006.

EKI, 2006b. *Soil and Groundwater Investigation Data Report*, UPRR Parcel D, Emeryville, California, Erler & Kalinowski, Inc., 14 November 2006.

EKI, 2006c. *Summary of Additional Chemical and Geotechnical Soil Data*, UPRR Parcel D, Emeryville, California, Erler & Kalinowski, Inc., 17 November 2006.

EKI, 2007. *First Semi-Annual 2007 Groundwater Monitoring Report*, Bay Street Project Area, Emeryville, California, Erler & Kalinowski, Inc., 11 July 2007.

Geomatrix, 2005. *Summary of Past and Current Environmental Site Investigations and Remediation Activities*, Toxics Case No. RO0002619, 4226 Halleck Street, Emeryville, California, Geomatrix Consultants, Inc., 28 February 2005.

Lawrence Berkeley National Laboratory ("LBNL") and Parsons Engineering Science, Inc., 2002. *Analysis of Background Distributions of Metals in the Soil and Lawrence Berkeley National Laboratory*, June 2002.

LFR, 2006a. *Combined Groundwater and NPDES Self-Monitoring Reports for the Quarterly Period April 1 to June 30, 2006*, Sherwin-Williams Site, 1450 Sherwin Avenue, Emeryville, California, LFR Inc., 28 July 2006.

LFR, 2006b. *Combined Groundwater and NPDES Self-Monitoring Reports for the Quarterly Period January 1 to March 31, 2006*, Sherwin-Williams Site, 1450 Sherwin Avenue, Emeryville, California, LFR Inc., 28 April 2006.

LFR, 2007. *Combined Groundwater and NPDES Self-Monitoring Report for the Quarterly Period January 1 to March 31, 2007,* Sherwin-Williams Site, 1450 Sherwin Avenue, Emeryville, California, LFR Inc., 30 April 2007.

SES, 2006. *Second Semi-Annual 2006 Groundwater Monitoring Report,* Former Myers Container Corporation, 4500 Shellmound Street, Emeryville, California, SES, 10 November 2006.

SFRWQCB, 2007. *Screening for Environmental Concerns at Sites with Contaminated Soil and Groundwater (Interim Final)*, San Francisco Bay Regional Water Quality Control Board, November 2007.

U.S. EPA, 2004. *Region 9 Preliminary Remediation Goals ("PRGs") 2004 Table*, 28 December 2004.

TABLE 3-1
SUMMARY OF LABORATORY ANALYTICAL METHODS FOR SOIL SAMPLES
UPRR Parcel D
Emeryville, California

Sample Location	Sample ID	Sample Date	Sample Depth (ft bgs)	Chemical Analytical Methods (a)									Percent Moisture
				TPH-g	TPH-d	TPH-mo	VOCs	SVOCs	Organochlorine Pesticides	PCBs	Title 22 Metals	Hexavalent Chromium	
UPD-1	UPD-1-0-2.25	10/16/2006	0 - 2.25		X	X		X	X	X	X	X	X
	UPD-1-2-2.5	10/16/2006	2 - 2.5	X	X	X	X	X	X	X	X	X	X
	UPD-1-4-4.5	10/16/2006	4 - 4.5	X	X	X	X	X	X	X	X	X	X
UPD-2	UPD-2-1-1.5	10/16/2006	1 - 1.5	X	X	X	X	X	X	X	X	X	X
	UPD-2-5-5.5	10/16/2006	5 - 5.5	X	X	X	X	X	X	X	X	X	X
UPD-3	UPD-3-0-2	10/16/2006	0 - 2		X	X		X	X	X	X	X	X
	UPD-3-3-3.5	10/16/2006	3 - 3.5	X	X	X	X	X	X	X	X	X	X
	UPD-3-7.5-8	10/16/2006	7.5 - 8	X	X	X	X	X	X	X	X	X	X
UPD-4	UPD-4-0-3	10/16/2006	0 - 3		X	X		X	X	X	X	X	X
	UPD-4-3-3.5	10/16/2006	3 - 3.5	X	X	X	X	X	X	X	X	X	X
	UPD-4-7.5-8	10/16/2006	7.5 - 8	X	X	X	X	X	X	X	X	X	X
UPD-5	UPD-5-1.5-2	10/16/2006	1.5 - 2	X	X	X	X	X	X	X	X	X	X
	UPD-5-5.5	10/16/2006	5 - 5.5	X	X	X	X	X	X	X	X	X	X
	UPD-5A-0-2	10/18/2006	0 - 2		X	X		X	X	X	X	X	X
	UPD-5A-4-4.5	10/18/2006	4 - 4.5	X	X	X	X	X	X	X	X	X	X
	UPD-5A-7.5-8	10/18/2006	7.5 - 8	X	X	X	X	X	X	X	X	X	X
UPD-6	UPD-6-0-3.5	10/18/2006	0 - 3.5		X	X		X	X	X	X	X	X
	UPD-6-1.5-2	10/18/2006	1.5 - 2	X			X						
	UPD-6-3-3.5	10/18/2006	3 - 3.5	X	X	X	X	X	X	X	X	X	X
UPD-7	UPD-7-0-2	10/18/2006	0 - 2		X	X		X	X	X	X	X	X
	UPD-7-2.5-3	10/18/2006	2.5 - 3	X	X	X	X	X	X	X	X	X	X
	UPD-7-2-2.5	10/18/2006	2 - 2.5	X	X	X	X	X	X	X	X	X	X
UPD-8	UPD-8-0-2	10/17/2006	0 - 2		X	X		X	X	X	X	X	X
	UPD-8-2.5-3	10/17/2006	2.5 - 3	X	X	X	X	X	X	X	X	X	X
	UPD-8-2-2.5	10/17/2006	2 - 2.5	X	X	X	X	X	X	X	X	X	X
UPD-9	UPD-9-0-2	10/17/2006	0 - 2		X	X		X	X	X	X	X	X
	UPD-9-2.5-3	10/17/2006	2.5 - 3	X	X	X	X	X	X	X	X	X	X
	UPD-9-2-2.5	10/17/2006	2 - 2.5	X	X	X	X	X	X	X	X	X	X

TABLE 3-1
SUMMARY OF LABORATORY ANALYTICAL METHODS FOR SOIL SAMPLES
UPRR Parcel D
Emeryville, California

Sample Location	Sample ID	Sample Date	Sample Depth (ft bgs)	Chemical Analytical Methods (a)									Percent Moisture
				TPH-g	TPH-d	TPH-mo	VCCs	SVOCs	Organochlorine Pesticides	PCBs	Title 22 Metals	Hexavalent Chromium	
UPD-10	UPD-10-0-2.5	10/17/2006	0 - 2.5		X	X		X	X	X	X	X	X
	UPD-10-2.5-3	10/17/2006	2.5 - 3	X	X	X	X	X	X	X	X	X	X
	UPD-10-6.5-7	10/17/2006	6.5 - 7	X	X	X	X	X	X	X	X	X	X
UPD-11	UPD-11-0-2.5	10/18/2006	0 - 2.5		X	X		X	X	X	X	X	X
	UPD-11-2.5-3	10/18/2006	2.5 - 3	X	X	X	X	X	X	X	X	X	X
	UPD-11-4-4.5	10/18/2006	4 - 4.5	X	X	X	X	X	X	X	X	X	X
UPD-12	UPD-12-0-2.5	10/17/2006	0 - 2.5		X	X		X	X	X	X	X	X
	UPD-12-2-2.5	10/17/2006	2 - 2.5	X			X						
	UPD-12-4.5-5	10/17/2006	4.5 - 5	X	X	X	X	X	X	X	X	X	X
UPD-13	UPD-13-0-2	10/17/2006	0 - 2		X	X		X	X	X	X	X	X
	UPD-13-1-1.5	10/17/2006	1 - 1.5	X			X						
	UPD-13-3-3.5	10/17/2006	3 - 3.5	X	X	X	X	X	X	X	X	X	X
	UPD-13-6-6.5	10/17/2006	6 - 6.5	X	X	X	X	X	X	X	X	X	X
UPD-14	UPD-14-0-2	10/17/2006	0 - 2		X	X		X	X	X	X	X	X
	UPD-14-1.5-2	10/17/2006	1.5 - 2	X			X						
	UPD-14-2-2.5	10/17/2006	2 - 2.5	X	X	X	X	X	X	X	X	X	X
UPD-15	UPD-15-0.75-1.25	10/17/2006	0.75 - 1.25	X			X						
	UPD-15-0-2.5	10/17/2006	0 - 2.5		X	X		X	X	X	X	X	X
	UPD-15-2.5-3	10/17/2006	2.5 - 3	X	X	X	X	X	X	X	X	X	X
UPD-16	UPD-16-0.5-1	10/18/2006	0.5 - 1	X	X	X	X	X	X	X	X	X	X
	UPD-16-1.5-2	10/18/2006	1.5 - 2	X	X	X	X	X	X	X	X	X	X
	UPD-16-4-4.5	10/18/2006	4 - 4.5	X	X	X	X	X	X	X	X	X	X

TABLE 3-1
SUMMARY OF LABORATORY ANALYTICAL METHODS FOR SOIL SAMPLES
UPRR Parcel D
Emeryville, California

Sample Location	Sample ID	Sample Date	Sample Depth (ft bgs)	Chemical Analytical Methods (a)									Percent Moisture
				TPH-g	TPH-d	TPH-mo	VOCs	SVOCs	Organochlorine Pesticides	PCBs	Title 22 Metals	Hexavalent Chromium	
UPD-17	UPD-17-0.5-1	10/18/2006	0.5 - 1	X	X	X	X	X	X	X	X	X	X
	UPD-17-2.5-3	10/18/2006	2.5 - 3	X	X	X	X	X	X	X	X	X	X
UPD-18	UPD-18-0.5-1	10/18/2006	0.5 - 1	X	X	X	X	X	X	X	X	X	X
	UPD-18-2-2.5	10/18/2006	2 - 2.5	X	X	X	X	X	X	X	X	X	X
UPD-19	UPD-19-0.25-0.75	10/17/2006	0.25 - 0.75	X	X	X	X	X	X	X	X	X	X
	UPD-19-3-3.5	10/17/2006	3 - 3.5	X	X	X	X	X	X	X	X	X	X
UPD-20	UPD-20-0-0.5	10/18/2006	0 - 0.5	X	X	X	X	X	X	X	X	X	X
	UPD-20-1.5-2	10/18/2006	1.5 - 2	X	X	X	X	X	X	X	X	X	X

Abbreviations:
PCBs - Polychlorinated Biphenyls
SVOCs - Semi-Volatile Organic Compounds
TOC - Total Organic Carbon
TPH-d - Total Petroleum Hydrocarbons as Diesel
TPH-g - Total Petroleum Hydrocarbons as Gasoline
VOCs - Volatile Organic Compounds

Notes:
(a) Soil samples were selectively analyzed for one or more of the following analytes using the following methods:
TPH-g (C4-C12) using EPA Method 8015B (modified);
TPH-d (C7-C28) with silica gel cleanup using EPA Method 8015B (modified);
TPH-mo (C14->C44) with silica gel cleanup using EPA Method 8015B (modified);
VOCs using EPA Methods 8260B;
SVOCs using EPA Method 8270C;
Organochlorine Pesticides using EPA Method 8081A;
PCBs using EPA Method 8082;
Title 22 metals using EPA Method 6020/7471A;
Hexavalent Chromium using EPA Method 7199;
Percent Moisture using ASTM D2216.

TABLE 3-2
SUMMARY OF LABORATORY ANALYTICAL METHODS FOR GROUNDWATER SAMPLES
UPRR Parcel D
Emeryville, California

Sample Location	Sample ID	Sample Date	Chemical Analytical Methods (a)					
			TPH-g	TPH-d	TPH-mo	VOCs	Title 22 Metals	Hexavalent Chromium
UPD-1	UPD-1	10/16/2006	X	X	X	X	X	X
UPD-2	UPD-2	10/16/2006	X	X	X	X	X	X
UPD-2	UPD-2 DUP	10/16/2006	X	X	X	X	X	X
UPD-3	UPD-3	10/16/2006	X	X	X	X	X	X
UPD-4	UPD-4	10/16/2006	X	X	X	X	X	X
UPD-5	UPD-5	10/16/2006	X	X	X	X	X	X
UPD-6	UPD-6	10/18/2006		X	X			

Abbreviations:
TPH-d - Total Petroleum Hydrocarbons as Diesel
TPH-g - Total Petroleum Hydrocarbons as Gasoline
TPH-mo - Total Petroleum Hydrocarbons as Motor Oil
VOCs - Volatile Organic Compounds

Notes:
(a) Groundwater samples were using the following methods:
TPH-g (C4-C12) using EPA Method 8015B (modified);
TPH-d (C7-C28) with silica gel cleanup using EPA
TPH-mo (C14->C44) with silica gel cleanup using
VOCs using EPA Methods 8260B;
Title 22 metals using EPA Method 200.8/245.1;
Hexavalent Chromium using EPA Method 7199.

TABLE 4-1
SUMMARY OF SOIL ANALYTICAL RESULTS FOR METALS
UPRR Parcel D
Emeryville, California

Sample Location	Sample ID	Sample Date	Sample Depth (ft bgs) (a)	Lithologic Unit (b)	Analytical Results (mg/kg) (c)(d)(e)(f)																
					Antimony	Arsenic	Barium	Beryllium	Cadmium	Hexavalent Chromium	Chromium, Total	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
UPD-1	UPD-1-0-2.25	10/16/2006	0 - 2.25	Fill	1.52	**51.9**	115	0.166	1.13	0.33	53	9.99	67.1	120	0.157	0.623	47.6	<0.521	0.14	0.115	**37.5**	160
	UPD-1-2-2.5	10/16/2006	2 - 2.5	Fill	**13.5**	**10.2**	216	0.433	0.551	0.15	54.8	14.8	214	**472**	0.318	1.08	80.6	0.835	0.339	0.134	**42.5**	279
	UPD-1-4-4.5	10/16/2006	4 - 4.5	YBM - upper	<0.633	**10.2**	153	0.547	0.174	0.12	52.2	11.1	23.9	29.6	<0.106	0.913	54.7	<0.633	0.179	<0.127	**42.7**	83.1
UPD-2	UPD-2-1-1.5	10/16/2006	1 - 1.5	YBM - upper	<0.602	**17.2**	173	0.493	0.444	0.39	38.9	11.6	27.7	9.9	<0.101	0.93	48.1	1.43	<0.12	0.13	**39.6**	68.6
	UPD-2-5-5.5	10/16/2006	5 - 5.5	YBM - lower	<0.61	**35.9**	225	0.676	0.37	<0.049	51.6	**44.4**	25.2	13.7	<0.102	1.25	68.5	0.899	0.123	<0.122	**57.2**	70.6
UPD-3	UPD-3-0-2	10/16/2006	0 - 2	Fill	0.83	**75.2**	198	0.241	1.16	<0.043	46.8	10.2	65.1	104	0.326	0.79	57.8	<0.538	0.148	0.122	**35.5**	200
	UPD-3-3-3.5	10/16/2006	3 - 3.5	YBM - upper	<0.617	**5.38**	145	0.395	0.427	<0.05	50.4	11.7	23.9	19.2	0.225	0.596	76.3	1.15	<0.123	<0.123	**36.5**	70.5
	UPD-3-7.5-8	10/16/2006	7.5 - 8	YBM - lower	<0.641	**4.84**	163	0.463	<0.128	0.12	41.2	8.23	22.3	6.38	<0.107	0.412	49.5	<0.641	<0.128	<0.128	**38.1**	58.4
UPD-4	UPD-4-0-3	10/16/2006	0 - 3	Fill	1.62	**26.1**	195	0.319	**8.28**	**9.8**	87.1	19.7	160	**684**	0.896	2.05	62.2	<0.549	1.03	0.117	**57.3**	**1,060**
	UPD-4-3-3.5	10/16/2006	3 - 3.5	YBM - upper	<0.667	**14.9**	238	0.485	0.903	<0.053	96.1	28.9	56.4	**254**	0.281	1.12	**190**	0.953	0.136	0.188	**61.5**	251
	UPD-4-7.5-8	10/16/2006	7.5 - 8	YBM - lower	<0.649	**2.6**	246	0.55	1.31	<0.052	41.1	10	48.5	11.5	<0.109	1.35	55.7	0.927	<0.13	<0.13	**37.6**	136
UPD-5	UPD-5-1.5-2	10/16/2006	1.5 - 2	Fill	1.24	**17.8**	256	0.248	**2.78**	<0.044	42.7	9.94	104	**474**	0.298	0.963	55.7	<0.549	0.291	<0.11	**26.9**	489
	UPD-5-5-5.5	10/16/2006	5 - 5.5	YBM - lower	<0.714	**6.07**	299	0.714	0.619	<0.057	60.9	14.1	35.6	10	<0.12	1.44	72.7	1.65	0.167	0.182	**48.9**	115
	UPD-5A-0-2	10/18/2006	0 - 2	Fill	0.753	**11.1**	202	0.247	**3.18**	0.55	46.5 B	9.65	75	**328**	0.398	1.33	55.5	<0.602	0.382	<0.12	**64.7**	438
	UPD-5A-4-4.5	10/18/2006	4 - 4.5	YBM - upper	<0.685	**6.09**	232	0.465	0.539	<0.055	105 B	19.1	30.7	50.1	0.316	0.848	**202**	0.894	<0.137	<0.137	**40.6**	122
	UPD-5A-7.5-8	10/18/2006	7.5 - 8	YBM - lower	<0.641	**2.37**	263	0.526	0.216	<0.051	41.5 B	17.7	30.9	7.54	<0.107	0.42	47.5	0.663	<0.128	<0.128	**27**	84.2
UPD-6	UPD-6-0-3.5	10/18/2006	0 - 3.5	Fill	1.91	**70.1**	357	0.233	**3.49**	0.073	43.4 B	10.5	115	**344**	0.441	2.68	49.3	0.561	0.427	0.16	**33**	561
	UPD-6-3-3.5	10/18/2006	3 - 3.5	Fill	<0.568	**8.45**	110	0.327	<0.114	0.31	40.9 B	19.2	60.7	10.6	<0.095	0.325	47.9	<0.568	<0.114	<0.114	**58.4**	103
UPD-7	UPD-7-0-2	10/18/2006	0 - 2	Fill	3.85	**145**	161	0.168	**6.91**	1	43 B	8.96	96.9	**469**	0.198	1.25	44.9	<0.532	0.537	0.622	**31.4**	**660**
	UPD-7-2-2.5	10/18/2006	2 - 2.5	Fill	<0.556	**56.3**	118	0.266	0.912	0.24	39.7 B	14.1	65	50.3	0.108	0.605	45.9	1.01	0.142	0.207	**45.6**	268
	UPD-7-2.5-3	10/18/2006	2.5 - 3	YBM - upper	<0.667	**4.91**	174	0.476	0.542	<0.054	37.3 B	10.9	25	7.04	<0.112	0.895	48	1.04	<0.133	<0.133	**38.9**	78.4
UPD-8	UPD-8-0-2	10/17/2006	0 - 2	Fill	1.29	**48.4**	103	0.218	**3.71**	0.29	41.3 B	11.7	79.5	**258**	0.151	0.815	55.8	<0.521	0.37	<0.104	**38.5**	395
	UPD-8-2-2.5	10/17/2006	2 - 2.5	Fill	<0.588	**15.5**	180	0.369	0.233	0.33	41.6 B	24.9	66.8	25.4	<0.098	1.05	51.9	<0.588	<0.118	0.192	**62.5**	148
	UPD-8-2.5-3	10/17/2006	2.5 - 3	YBM - upper	<0.658	**3.97**	180	0.417	0.401	<0.053	32 B	8.88	23.1	8.72	<0.11	0.459	38.8	1.12	<0.132	0.133	**35.6**	72.8
UPD-9	UPD-9-0-2	10/17/2006	0 - 2	Fill	0.612	**11.7**	103	0.195	**6.57**	0.32	35.8 B	10.4	68.7	**579**	0.195	1.07	46.5	0.564	0.87	<0.105	**35.9**	**828**
	UPD-9-2-2.5	10/17/2006	2 - 2.5	Fill	<0.602	**8.76**	129	0.369	<0.12	0.27	41.6 B	22.9	66.3	11.7	<0.101	0.304	48.8	<0.602	<0.12	0.13	**61.2**	115
	UPD-9-2.5-3	10/17/2006	2.5 - 3	YBM - upper	<0.694	**3.84**	224	0.619	0.495	<0.056	43.7 B	11.4	32.4	10	<0.116	0.857	59.4	1.25	<0.139	<0.139	**38.7**	106
UPD-10	UPD-10-0-2.5	10/17/2006	0 - 2.5	Fill	1.43	**57.8**	187	0.225	**9.99**	0.57	44.6 B	11.4	104	**401**	0.465	1.58	52.7	<0.526	0.536	0.142	**38**	**1,340**
	UPD-10-2.5-3	10/17/2006	2.5 - 3	Fill	<0.667	**23.5**	208	0.446	**3.95**	0.11	209 B	20.5	79.8	93	<0.112	0.936	54.8	1.17	0.39	0.147	**70.7**	225
	UPD-10-6.5-7	10/17/2006	6.5 - 7	YBM - lower	<0.685	**6.88**	371	0.748	0.513	0.47	56.2 B	25.3	36.9	11	<0.115	0.669	65.3	0.835	0.202	0.185	**47.5**	114
UPD-11	UPD-11-0-2.5	10/18/2006	0 - 2.5	Fill	0.685	**19.3**	152	0.152	**10**	0.52	28.1 B	11.8	152	**307**	0.156	1.83	32.4	<0.526	0.754	<0.105	**54.1**	**1,020**
	UPD-11-2.5-3	10/18/2006	2.5 - 3	Fill	1.73	**66.9**	131	0.309	**4.6**	0.19	42.4 B	18.7	87.2	**365**	0.184	0.966	54.1	<0.617	0.427	0.144	**50.6**	481
	UPD-11-4-4.5	10/18/2006	4 - 4.5	YBM - upper	<0.704	**7.35**	213	0.613	0.711	0.1	55.2 B	11.3	36.3	17.9	<0.118	0.802	72.8	1.69	<0.141	0.171	**38.4**	122
CHHSL for Residential Soil					**30**	**0.07**	**5,200**	**150**	**1.7**	**17**	**na**	**660**	**3,000**	**150**	**18**	**380**	**1,600**	**380**	**380**	**5**	**530**	**23,000**
PRG for Residential Soil					**31**	**0.062**	**5,400**	**150**	**37**	**30**	**210**	**900**	**3,100**	**150**	**23**	**390**	**1,600**	**390**	**390**	**5.2**	**78**	**23,000**
ESL for Residential Shallow Soil (<3 meters)					**6.1**	**0.38**	**750**	**4**	**1.7**	**8**	**na**	**40**	**230**	**200**	**1**	**40**	**150**	**10**	**20**	**1.2**	**15**	**600**
LBNL Background (g)					**10**	**24**	**410**	**1.1**	**5.6**	**na**	**120**	**25**	**63**	**57**	**0.5**	**5**	**270**	**5.1**	**3**	**10**	**90**	**140**

TABLE 4-1
SUMMARY OF SOIL ANALYTICAL RESULTS FOR METALS
UPRR Parcel D
Emeryville, California

Sample Location	Sample ID	Sample Date	Sample Depth (ft bgs) (a)	Lithologic Unit (b)	Analytical Results (mg/kg) (c)(d)(e)(f)																	
					Antimony	Arsenic	Barium	Beryllium	Cadmium	Hexavalent Chromium	Chromium, Total	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
UPD-12	UPD-12-0-2.5	10/17/2006	0 - 2.5	Fill	0.766	**98.9**	157	0.205	**6.78**	0.51	34.1 B	12.8	84.2	**301**	0.171	0.789	46.7	0.691	0.655	0.127	**38.9**	501
	UPD-12-4.5-5	10/17/2006	4.5 - 5	YBM - upper	<0.685	**7.05**	236	0.66	0.447	<0.055	49 B	12.7	32	14.1	<0.115	0.653	65.1	1.14	0.156	0.155	**41.4**	110
UPD-13	UPD-13-0-2	10/17/2006	0 - 2	Fill	<0.568	**70.9**	132	0.245	1.41	0.13	44.3 B	17.7	64.8	112	0.134	0.441	57.2	<0.568	0.886	<0.114	**46.9**	228
	UPD-13-3-3.5	10/17/2006	3 - 3.5	YBM - upper	<0.704	**4.76**	194	0.582	0.606	0.065	54.3 B	11	29.9	9.22	0.12	1.34	76.3	1.63	<0.141	0.155	**38**	127
	UPD-13-6-6.5	10/17/2006	6 - 6.5	YBM - lower	<0.617	**1.99**	167	0.357	0.166	<0.05	27.1 B	4.27	23.6	5.88	<0.103	0.324	23.3	<0.617	<0.123	<0.123	**18.6**	62.9
UPD-14	UPD-14-0-2	10/17/2006	0 - 2	Fill	1.31	**29.9**	**863**	0.393	**2.73**	0.45	33.9 B	34.3	**411**	**175**	0.285	6.47	36	0.761	2.29	0.358	**33.2**	**2,970**
	UPD-14-2-2.5	10/17/2006	2 - 2.5	YBM - upper	<0.746	**6.68**	235	0.607	0.722	<0.06	67.9 B	12.9	36.2	15.4	0.528	0.959	112	2.53	0.178	0.168	**34.9**	115
UPD-15	UPD-15-0-2.5	10/17/2006	0 - 2.5	Fill	<0.556	**20.3**	90	0.273	0.337	0.22	39.3 B	19.2	61.6	31.3	0.105	0.528	52.6	0.57	0.314	<0.111	**48.6**	173
	UPD-15-2.5-3	10/17/2006	2.5 - 3	YBM - upper	<0.694	**6.26**	255	0.631	0.621	<0.056	56.4 B	14	37.5	12	<0.116	0.979	67	1.62	0.148	0.19	**43.9**	114
UPD-16	UPD-16-0.5-1	10/18/2006	0.5 - 1	YBM - upper	**11.7**	**7.22**	154	0.316	0.823	0.094	41.5 B	11.6	80.5	**480**	0.316	0.631	50.2	0.67	0.175	<0.122	**32.6**	215
	UPD-16-1.5-2	10/18/2006	1.5 - 2	YBM - upper	<0.694	**4.69**	266	0.676	0.621	<0.055	59.6 B	9.3	37.5	17.1	<0.116	0.7	55	1.81	0.148	0.204	**43.1**	141
	UPD-16-4-4.5	10/18/2006	4 - 4.5	YBM - lower	<0.633	**16.2**	247	0.485	0.742	<0.051	43.3 B	15	21.3	6.87	<0.106	0.975	50.9	<0.633	<0.127	<0.127	**41.2**	71.5
UPD-17	UPD-17-0.5-1	10/18/2006	0.5 - 1	YBM - upper	<0.704	**6.2**	252	0.671	0.611	<0.057	55.9 B	13.6	37.7	25.7	0.721	1.14	62.7	1.7	0.158	0.201	**42.2**	120
	UPD-17-2.5-3	10/18/2006	2.5 - 3	YBM - upper	<0.676	**4.98**	208	0.7	0.212	0.17	54.8 B	14.2	30	10.3	<0.113	0.529	64.6	<0.676	0.139	0.179	**49.9**	86.3
UPD-18	UPD-18-0.5-1	10/18/2006	0.5 - 1	YBM - upper	<0.588	**3.71**	376	0.363	0.203	<0.047	33 B	11.4	32.6	61.2	0.202	0.503	39.8	0.795	<0.118	<0.118	**37.6**	80.1
	UPD-18-2-2.5	10/18/2006	2 - 2.5	YBM - lower	<0.649	**7.33**	216	0.709	0.339	0.1	57.6 B	13.9	31.5	10.5	0.111	0.763	70.4	0.713	0.137	0.159	**55.4**	90.5
UPD-19	UPD-19-0.25-0.75	10/17/2006	0.25 - 0.75	YBM - upper	<0.685	**3.85**	226	0.565	0.552	0.16	48 B	9.85	35.1	23.2	0.33	0.705	51.4	2.62	0.157	0.146	**36.6**	122
	UPD-19-3-3.5	10/17/2006	3 - 3.5	YBM - lower	<0.617	**2.92**	169	0.377	0.288	0.11	37.5 B	5.22	16.4	5.9	<0.103	0.401	40.7	<0.617	<0.123	<0.123	**27.5**	74
UPD-20	UPD-20-0-0.5	10/18/2006	0 - 0.5	Fill	2.86	**46.6**	187	0.279	**4.41**	0.23	47.3 B	11.4	90.9	**350**	0.328	0.91	59.5	<0.543	0.51	0.122	**38.7**	540
	UPD-20-1.5-2	10/18/2006	1.5 - 2	YBM - upper	<0.575	**7.79**	163	0.466	0.379	0.22	41.7 B	14.6	21.3	12.1	<0.096	0.883	58	0.857	0.116	<0.115	**35.8**	66
CHHSL for Residential Soil					**30**	**0.07**	**5,200**	**150**	**1.7**	**17**	**na**	**660**	**3,000**	**150**	**18**	**380**	**1,600**	**380**	**380**	**5**	**530**	**23,000**
PRG for Residential Soil					**31**	**0.062**	**5,400**	**150**	**37**	**30**	**210**	**900**	**3,100**	**150**	**23**	**390**	**1,600**	**390**	**390**	**5.2**	**78**	**23,000**
ESL for Residential Shallow Soil (<3 meters)					**6.1**	**0.38**	**750**	**4**	**1.7**	**8**	**na**	**40**	**230**	**200**	**1**	**40**	**150**	**10**	**20**	**1.2**	**15**	**600**
LBNL Background (g)					**10**	**24**	**410**	**1.1**	**5.6**	**na**	**120**	**25**	**63**	**57**	**0.5**	**5**	**270**	**5.1**	**3**	**10**	**90**	**140**

TABLE 4-1
SUMMARY OF SOIL ANALYTICAL RESULTS FOR METALS
UPRR Parcel D
Emeryville, California

Abbreviations:
<0.50 - Compound not detected at or above indicated laboratory reporting limit
CHHSL - California Human Health Screening Level (California EPA, dated January 2005, Table 1--California Human Health Screening Levels for Soil and Comparison to Other Potential Environmental Concerns)
ESLs - Regional Water Quality Control Board - San Francisco Bay Region, Environmental Screening Levels, Residential shallow soil less than 3 meters and groundwater as a non-drinking water resource (November 2007)
ft bgs - feet below ground surface
LBNL - Lawrence Berkeley National Laboratory
mg/kg - Milligrams per kilogram
na - not applicable or not available
PRG - US EPA Region IX Preliminary Remediation Goals for Soil at Residential Sites, December 2004

Notes:
(a) Sampling depths at each borehole location do not include the thickness of overlying asphalt or concrete layers that range from approximately 0.5 to 1-foot in thickness.
(b) Fill – generally dry, sandy gravel material of varying colors and textures with sporadic brick debris and railroad ballast
YBM - upper (upper member of the Young Bay Mud) – soft, black, silty clay with traces of rootlets and wood.
YBM - lower (lower member of the Young Bay Mud) – stiff, silty clay to clayey silt with occasional/local sand and gravel lenses.
(c) Results are reported on a dry weight basis.
(d) Concentrations of metals that equal or exceed CHHSLs, PRGs, or ESLs are shown in bold.
(e) Concentrations of metals that equal or exceed LBNL Background Levels are underlined.
(f) Concentrations of metals followed by a "B" indicates that the analyte was present in the associated method blank.
(g) LBNL and Parsons Engineering Science, Inc. Analysis of Background Distributions of Metals in Soil and Lawrence Berkeley National Laboratory, June 2002

TABLE 4-2
SUMMARY OF SOIL ANALYTICAL RESULTS FOR TPH
UPRR Parcel D
Emeryville, California

Sample Location	Sample ID	Sample Date	Sample Depth (ft bgs) (a)	Lithologic Unit (b)	Analytical Results (mg/kg) (c)(d)		
					TPH-g	TPH-d	TPH-mo
UPD-1	UPD-1-0-2.25	10/16/2006	0 - 2.25	Fill	--	55	170
	UPD-1-2-2.5	10/16/2006	2 - 2.5	Fill	<0.23	**290**	**750**
	UPD-1-4-4.5	10/16/2006	4 - 4.5	YBM - upper	<0.28	<6.3	<32
UPD-2	UPD-2-1-1.5	10/16/2006	1 - 1.5	YBM - upper	<0.27	<6	<30
	UPD-2-5-5.5	10/16/2006	5 - 5.5	YBM - lower	<0.27	<6.1	46
UPD-3	UPD-3-0-2	10/16/2006	0 - 2	Fill	--	47	140
	UPD-3-3-3.5	10/16/2006	3 - 3.5	YBM - upper	<0.26	<6.2	<31
	UPD-3-7.5-8	10/16/2006	7.5 - 8	YBM - lower	<0.3	16	<32
UPD-4	UPD-4-0-3	10/16/2006	0 - 3	Fill	--	64	200
	UPD-4-3-3.5	10/16/2006	3 - 3.5	YBM - upper	<0.33	<6.7	<33
	UPD-4-7.5-8	10/16/2006	7.5 - 8	YBM - lower	<0.31	<6.5	<33
UPD-5	UPD-5-1.5-2	10/16/2006	1.5 - 2	Fill	8.5	**5,400**	**19,000**
	UPD-5-5-5.5	10/16/2006	5 - 5.5	YBM - lower	<0.34	<7.2	<36
	UPD-5A-0-2	10/18/2006	0 - 2	Fill	--	**3,200**	**12,000**
	UPD-5A-4-4.5	10/18/2006	4 - 4.5	YBM - upper	**240**	**340**	**1,400**
	UPD-5A-7.5-8	10/18/2006	7.5 - 8	YBM - lower	<0.29	22	250
UPD-6	UPD-6-0-3.5	10/18/2006	0 - 3.5	Fill	--	**570**	**2,000**
	UPD-6-1.5-2	10/18/2006	1.5 - 2	Fill	<0.23	--	--
	UPD-6-3-3.5	10/18/2006	3 - 3.5	Fill	<0.24	13	35
UPD-7	UPD-7-0-2	10/18/2006	0 - 2	Fill	--	**120**	**410**
	UPD-7-2-2.5	10/18/2006	2 - 2.5	Fill	<0.25	6.5	35
	UPD-7-2.5-3	10/18/2006	2.5 - 3	YBM - upper	<0.3	<6.7	<34
UPD-8	UPD-8-0-2	10/17/2006	0 - 2	Fill	--	**100**	**500**
	UPD-8-2-2.5	10/17/2006	2 - 2.5	Fill	<0.24	<5.9	<30
	UPD-8-2.5-3	10/17/2006	2.5 - 3	YBM - upper	<0.33	<6.7	<34
UPD-9	UPD-9-0-2	10/17/2006	0 - 2	Fill	--	56	260
	UPD-9-2-2.5	10/17/2006	2 - 2.5	Fill	<0.25	<6	<30
	UPD-9-2.5-3	10/17/2006	2.5 - 3	YBM - upper	<0.35	<7	<35
UPD-10	UPD-10-0-2.5	10/17/2006	0 - 2.5	Fill	--	93	**440**
	UPD-10-2.5-3	10/17/2006	2.5 - 3	Fill	<0.26	<6.7	<34
	UPD-10-6.5-7	10/17/2006	6.5 - 7	YBM - lower	<0.37	<6.8	<34
UPD-11	UPD-11-0-2.5	10/18/2006	0 - 2.5	Fill	--	**230**	**870**
	UPD-11-2.5-3	10/18/2006	2.5 - 3	Fill	<0.25	30	140
	UPD-11-4-4.5	10/18/2006	4 - 4.5	YBM - upper	<0.34	<7.1	<36
CHHSL for Residential Soil					**na**	**na**	**na**
PRG for Residential Soil					**na**	**na**	**na**
ESL for Residential Shallow Soil (<3 meters)					**100**	**100**	**410**

TABLE 4-2
SUMMARY OF SOIL ANALYTICAL RESULTS FOR TPH
UPRR Parcel D
Emeryville, California

Sample Location	Sample ID	Sample Date	Sample Depth (ft bgs) (a)	Lithologic Unit (b)	Analytical Results (mg/kg) (c)(d)		
					TPH-g	TPH-d	TPH-mo
UPD-12	UPD-12-0-2.5	10/17/2006	0 - 2.5	Fill	--	82	**410**
	UPD-12-2-2.5	10/17/2006	2 - 2.5	Fill	<0.238	--	--
	UPD-12-4.5-5	10/17/2006	4.5 - 5	YBM - upper	0.67	62	<34
UPD-13	UPD-13-0-2	10/17/2006	0 - 2	Fill	--	**110**	**420**
	UPD-13-1-1.5	10/17/2006	1 - 1.5	Fill	<0.227	--	--
	UPD-13-3-3.5	10/17/2006	3 - 3.5	YBM - upper	<0.35	<7.1	<35
	UPD-13-6-6.5	10/17/2006	6 - 6.5	YBM - lower	<0.27	<6.2	33
UPD-14	UPD-14-0-2	10/17/2006	0 - 2	Fill	--	18	120
	UPD-14-1.5-2	10/17/2006	1.5 - 2	Fill	<0.229	--	--
	UPD-14-2-2.5	10/17/2006	2 - 2.5	YBM - upper	<0.37	<7.5	<37
UPD-15	UPD-15-0-2.5	10/17/2006	0 - 2.5	Fill	--	12	120
	UPD-15-0.75-1.25	10/17/2006	0.75 - 1.25	Fill	<0.234	--	--
	UPD-15-2.5-3	10/17/2006	2.5 - 3	YBM - upper	<0.36	<7	<35
UPD-16	UPD-16-0.5-1	10/18/2006	0.5 - 1	YBM - upper	<0.27	**720**	**1,800**
	UPD-16-1.5-2	10/18/2006	1.5 - 2	YBM - upper	<0.32	<6.9	<35
	UPD-16-4-4.5	10/18/2006	4 - 4.5	YBM - lower	<0.27	<6.4	<32
UPD-17	UPD-17-0.5-1	10/18/2006	0.5 - 1	YBM - upper	<0.38	<7.1	<36
	UPD-17-2.5-3	10/18/2006	2.5 - 3	YBM - upper	<0.28	<6.7	<34
UPD-18	UPD-18-0.5-1	10/18/2006	0.5 - 1	YBM - upper	<0.25	12	32
	UPD-18-2-2.5	10/18/2006	2 - 2.5	YBM - lower	<0.28	<6.6	<33
UPD-19	UPD-19-0.25-0.75	10/17/2006	0.25 - 0.75	YBM - upper	<0.33	<6.9	<34
	UPD-19-3-3.5	10/17/2006	3 - 3.5	YBM - lower	<0.27	<6.2	<31
UPD-20	UPD-20-0-0.5	10/18/2006	0 - 0.5	Fill	<0.23	17	59
	UPD-20-1.5-2	10/18/2006	1.5 - 2	YBM - upper	<0.26	<5.8	<29
CHHSL for Residential Soil					**na**	**na**	**na**
PRG for Residential Soil					**na**	**na**	**na**
ESL for Residential Shallow Soil (<3 meters)					**100**	**100**	**410**

TABLE 4-2
SUMMARY OF SOIL ANALYTICAL RESULTS FOR TPH
UPRR Parcel D
Emeryville, California

Abbreviations:
"--" - not analyzed
<0.50 - Compound not detected at or above indicated laboratory reporting limit
CHHSL - California Human Health Screening Level (California EPA, dated January 2005, Table 1--California Human Health Screening Levels for Soil and Comparison to Other Potential Environmental Concerns)

ESLs - Regional Water Quality Control Board - San Francisco Bay Region, Environmental Screening Levels, Residential shallow soil less than 3 meters and groundwater as a non-drinking water resource (November 2007)

ft bgs - feet below ground surface
mg/kg - Milligrams per kilogram

PRG - PRG - US EPA Region IX Preliminary Remediation Goals for Soil at Residential Sites, December 2004

TPH - Total Petroleum Hydrocarbons
TPH-g - TPH as gasoline
TPH-d - TPH as diesel
TPH-mo - TPH as motor oil

Notes:
(a) Sampling depths at each borehole location do not include the thickness of overlying asphalt or concrete layers that range from approximately 0.5 to 1-foot in thickness
(b) Fill – generally dry, sandy gravel material of varying colors and textures with sporadic brick debris and railroad ballast
YBM - upper (upper member of the Young Bay Mud) – soft, black, silty clay with traces of rootlets and wood.
YBM - lower (lower member of the Young Bay Mud) – stiff, silty clay to clayey silt with occasional/local sand and gravel lenses.
(c) Results are reported on a dry weight basis.
(d) Concentrations of TPHs that equal or exceed CHHSLs, PRGs, or ESLs for residential soil are shown in bold.

TABLE 4-3
SUMMARY OF SOIL ANALYTICAL RESULTS FOR SVOCs
UPRR Parcel D
Emeryville, California

Sample Location	Sample ID	Sample Date	Sample Depth (ft bgs) (a)	Lithologic Unit (b)	Analytical Results (mg/kg) (c)(d)												
					Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Chrysene	1,4-Dichlorobenzene	Fluoranthene	Indeno(1,2,3-cd)pyrene	1-methylnaphthalene	2-methylnaphthalene	Phenanthrene	Pyrene	1,2,4-Trichlorobenzene	Other SVOCs
UPD-1	UPD-1-0-2.25	10/16/2006	0 - 2.25	Fill	<0.42	<0.36	<0.42	<0.42	<0.52	<0.42	<0.42	<0.42	<0.42	<0.42	0.5	<0.52	ND
	UPD-1-2-2.5	10/16/2006	2 - 2.5	Fill	<0.47	<0.41	<0.47	<0.47	<0.59	<0.47	<0.47	<0.47	<0.47	<0.47	<0.47	<0.59	ND
	UPD-1-4-4.5	10/16/2006	4 - 4.5	YBM - upper	<0.51	<0.44	<0.51	<0.51	<0.63	<0.51	<0.51	<0.51	<0.51	<0.51	<0.51	<0.63	ND
UPD-2	UPD-2-1-1.5	10/16/2006	1 - 1.5	YBM - upper	<0.48	<0.42	<0.48	<0.48	<0.6	<0.48	<0.48	<0.48	<0.48	<0.48	<0.48	<0.6	ND
	UPD-2-5-5.5	10/16/2006	5 - 5.5	YBM - lower	<0.49	<0.43	<0.49	<0.49	<0.61	<0.49	<0.49	<0.49	<0.49	<0.49	<0.49	<0.61	ND
UPD-3	UPD-3-0-2	10/16/2006	0 - 2	Fill	<0.43	<0.38	<0.43	<0.43	<0.54	<0.43	<0.43	<0.43	<0.43	<0.43	<0.43	<0.54	ND
	UPD-3-3-3.5	10/16/2006	3 - 3.5	YBM - upper	<0.5	<0.43	<0.5	<0.5	<0.62	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.62	ND
	UPD-3-7.5-8	10/16/2006	7.5 - 8	YBM - lower	<0.52	<0.45	<0.52	<0.52	<0.65	<0.52	<0.52	<0.52	<0.52	<0.52	<0.52	<0.65	ND
UPD-4	UPD-4-0-3	10/16/2006	0 - 3	Fill	<0.44	<0.39	<0.44	<0.44	<0.55	<0.44	<0.44	<0.44	<0.44	<0.44	<0.44	<0.55	ND
	UPD-4-3-3.5	10/16/2006	3 - 3.5	YBM - upper	<0.53	<0.47	<0.53	<0.53	<0.67	<0.53	<0.53	<0.53	<0.53	<0.53	<0.53	<0.67	ND
	UPD-4-7.5-8	10/16/2006	7.5 - 8	YBM - lower	<0.52	<0.46	<0.52	<0.52	<0.65	<0.52	<0.52	<0.52	<0.52	<0.52	<0.52	<0.65	ND
UPD-5	UPD-5-1.5-2	10/16/2006	1.5 - 2	Fill	<0.44	<0.39	<0.44	0.6	<0.55	<0.44	0.61	0.74	0.45	0.55	2.1	<0.55	ND
	UPD-5-5-5.5	10/16/2006	5 - 5.5	YBM - lower	<0.57	<0.5	<0.57	<0.57	<0.71	<0.57	<0.57	<0.57	<0.57	<0.57	<0.57	<0.71	ND
	UPD-5A-0-2	10/18/2006	0 - 2	Fill	<0.48	<0.42	<0.48	<0.48	<0.6	<0.48	<0.48	0.95	0.96	0.7	2.3	<0.6	ND
	UPD-5A-4-4.5	10/18/2006	4 - 4.5	YBM - upper	<0.55	<0.48	<0.55	<0.55	<0.69	<0.55	<0.55	<0.55	<0.55	<0.55	<0.55	<0.69	ND
	UPD-5A-7.5-8	10/18/2006	7.5 - 8	YBM - lower	<0.51	<0.45	<0.51	<0.51	<0.64	<0.51	<0.51	<0.51	<0.51	<0.51	<0.51	<0.64	ND
UPD-6	UPD-6-0-3.5	10/18/2006	0 - 3.5	Fill	<0.43	<0.38	<0.43	<0.43	<0.54	<0.43	<0.43	<0.43	<0.43	<0.43	0.6	<0.54	ND
	UPD-6-3-3.5	10/18/2006	3 - 3.5	Fill	<0.46	<0.4	<0.46	<0.46	<0.57	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.57	ND
UPD-7	UPD-7-0-2	10/18/2006	0 - 2	Fill	<0.43	<0.37	<0.43	<0.43	<0.54	<0.43	<0.43	<0.43	<0.43	<0.43	<0.43	<0.54	ND
	UPD-7-2-2.5	10/18/2006	2 - 2.5	Fill	<0.44	<0.39	<0.44	<0.44	<0.56	<0.44	<0.44	<0.44	<0.44	<0.44	<0.44	<0.56	ND
	UPD-7-2.5-3	10/18/2006	2.5 - 3	YBM - upper	<0.54	<0.47	<0.54	<0.54	<0.67	<0.54	<0.54	<0.54	<0.54	<0.54	<0.54	<0.67	ND
UPD-8	UPD-8-0-2	10/17/2006	0 - 2	Fill	<0.42	<0.37	<0.42	<0.42	<0.52	<0.42	<0.42	<0.42	<0.42	<0.42	<0.42	<0.52	ND
	UPD-8-2-2.5	10/17/2006	2 - 2.5	Fill	<0.47	<0.41	<0.47	<0.47	<0.59	<0.47	<0.47	<0.47	<0.47	<0.47	<0.47	<0.59	ND
	UPD-8-2.5-3	10/17/2006	2.5 - 3	YBM - upper	<0.53	<0.46	<0.53	<0.53	<0.66	<0.53	<0.53	<0.53	<0.53	<0.53	<0.53	<0.66	ND
UPD-9	UPD-9-0-2	10/17/2006	0 - 2	Fill	<0.42	<0.37	<0.42	<0.42	<0.53	<0.42	<0.42	<0.42	<0.42	<0.42	<0.42	<0.53	ND
	UPD-9-2-2.5	10/17/2006	2 - 2.5	Fill	<0.48	<0.42	<0.48	<0.48	<0.6	<0.48	<0.48	<0.48	<0.48	<0.48	<0.48	<0.6	ND
	UPD-9-2.5-3	10/17/2006	2.5 - 3	YBM - upper	<0.56	<0.49	<0.56	<0.56	<0.7	<0.56	<0.56	<0.56	<0.56	<0.56	<0.56	<0.7	ND
UPD-10	UPD-10-0-2.5	10/17/2006	0 - 2.5	Fill	<0.42	<0.37	<0.42	<0.42	<0.53	<0.42	<0.42	<0.42	<0.42	<0.42	<0.42	<0.53	ND
	UPD-10-2.5-3	10/17/2006	2.5 - 3	Fill	<0.54	<0.47	<0.54	<0.54	<0.67	<0.54	<0.54	<0.54	<0.54	<0.54	<0.54	<0.67	ND
	UPD-10-6.5-7	10/17/2006	6.5 - 7	YBM - lower	<0.54	<0.48	<0.54	<0.54	<0.68	<0.54	<0.54	<0.54	<0.54	<0.54	<0.54	<0.68	ND
CHHSL for Residential Soil					**na**	**0.038**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**
PRG for Residential Soil					**0.62**	**0.062**	**0.62**	**3.8**	**3.4**	**2,300**	**0.62**	**na**	**na**	**na**	**2,300**	**62**	**na**
ESL for Residential Shallow Soil (<3 meters)					**0.38**	**0.038**	**0.38**	**40**	**1.2**	**40**	**0.62**	**na**	**12**	**40**	**500**	**7.8**	**na**

TABLE 4-3
SUMMARY OF SOIL ANALYTICAL RESULTS FOR SVOCs
UPRR Parcel D
Emeryville, California

Sample Location	Sample ID	Sample Date	Sample Depth (ft bgs) (a)	Lithologic Unit (b)	Analytical Results (mg/kg) (c)(d)												
					Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Chrysene	1,4-Dichlorobenzene	Fluoranthene	Indeno(1,2,3-cd)pyrene	1-methylnaphthalene	2-methylnaphthalene	Phenanthrene	Pyrene	1,2,4-Trichlorobenzene	Other SVOCs
UPD-11	UPD-11-0-2.5	10/18/2006	0 - 2.5	Fill	<0.42	<0.37	<0.42	<0.42	<0.52	<0.42	<0.42	<0.42	<0.42	<0.42	<0.42	<0.52	ND
	UPD-11-2.5-3	10/18/2006	2.5 - 3	Fill	<0.49	<0.43	<0.49	<0.49	<0.62	<0.49	<0.49	<0.49	<0.49	<0.49	<0.49	<0.62	ND
	UPD-11-4-4.5	10/18/2006	4 - 4.5	YBM - upper	<0.57	<0.5	<0.57	<0.57	<0.71	<0.57	<0.57	<0.57	<0.57	<0.57	<0.57	<0.71	ND
UPD-12	UPD-12-0-2.5	10/17/2006	0 - 2.5	Fill	<0.43	<0.38	<0.43	<0.43	<0.54	<0.43	<0.43	<0.43	<0.43	<0.43	<0.43	<0.54	ND
	UPD-12-4.5-5	10/17/2006	4.5 - 5	YBM - upper	<0.54	<0.48	<0.54	<0.54	<0.68	<0.54	<0.54	<0.54	<0.54	<0.54	<0.54	<0.68	ND
UPD-13	UPD-13-0-2	10/17/2006	0 - 2	Fill	<0.45	<0.4	<0.45	<0.45	<0.57	<0.45	<0.45	<0.45	<0.45	<0.45	<0.45	<0.57	ND
	UPD-13-3-3.5	10/17/2006	3 - 3.5	YBM - upper	<0.56	<0.49	<0.56	<0.56	<0.7	<0.56	<0.56	<0.56	<0.56	<0.56	<0.56	<0.7	ND
	UPD-13-6-6.5	10/17/2006	6 - 6.5	YBM - lower	<0.5	<0.43	<0.5	<0.5	<0.62	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.62	ND
UPD-14	UPD-14-0-2	10/17/2006	0 - 2	Fill	<0.46	<0.4	<0.46	<0.46	**1.3**	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	1.8	ND
	UPD-14-2-2.5	10/17/2006	2 - 2.5	YBM - upper	<0.6	<0.52	<0.6	<0.6	<0.75	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.75	ND
UPD-15	UPD-15-0-2.5	10/17/2006	0 - 2.5	Fill	<0.45	<0.39	<0.45	<0.45	<0.56	<0.45	<0.45	<0.45	<0.45	<0.45	<0.45	<0.56	ND
	UPD-15-2.5-3	10/17/2006	2.5 - 3	YBM - upper	<0.56	<0.49	<0.56	<0.56	<0.7	<0.56	<0.56	<0.56	<0.56	<0.56	<0.56	0.75	ND
UPD-16	UPD-16-0.5-1	10/18/2006	0.5 - 1	YBM - upper	<0.49	<0.43	<0.49	<0.49	<0.61	<0.49	<0.49	<0.49	<0.49	<0.49	<0.49	<0.61	ND
	UPD-16-1.5-2	10/18/2006	1.5 - 2	YBM - upper	<0.55	<0.48	<0.55	<0.55	<0.69	<0.55	<0.55	<0.55	<0.55	<0.55	<0.55	<0.69	ND
	UPD-16-4-4.5	10/18/2006	4 - 4.5	YBM - lower	<0.51	<0.44	<0.51	<0.51	<0.64	<0.51	<0.51	<0.51	<0.51	<0.51	<0.51	<0.64	ND
UPD-17	UPD-17-0.5-1	10/18/2006	0.5 - 1	YBM - upper	<0.57	<0.5	<0.57	<0.57	<0.71	<0.57	<0.57	<0.57	<0.57	<0.57	<0.57	<0.71	ND
	UPD-17-2.5-3	10/18/2006	2.5 - 3	YBM - upper	<0.54	<0.47	<0.54	<0.54	<0.67	<0.54	<0.54	<0.54	<0.54	<0.54	<0.54	<0.67	ND
UPD-18	UPD-18-0.5-1	10/18/2006	0.5 - 1	YBM - upper	**0.49**	**0.5**	**0.68**	0.54	<0.58	0.88	<0.47	<0.47	<0.47	<0.47	0.69	<0.58	ND
	UPD-18-2-2.5	10/18/2006	2 - 2.5	YBM - lower	<0.4	<0.35	<0.4	<0.4	<0.5	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.5	ND
UPD-19	UPD-19-0.25-0.75	10/17/2006	0.25 - 0.75	YBM - upper	<0.55	<0.48	<0.55	<0.55	<0.69	<0.55	<0.55	<0.55	<0.55	<0.55	<0.55	<0.69	ND
	UPD-19-3-3.5	10/17/2006	3 - 3.5	YBM - lower	<0.5	<0.43	<0.5	<0.5	<0.62	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.62	ND
UPD-20	UPD-20-0-0.5	10/18/2006	0 - 0.5	Fill	<0.44	<0.38	<0.44	<0.44	<0.54	<0.44	<0.44	<0.44	<0.44	<0.44	<0.44	<0.54	ND
	UPD-20-1.5-2	10/18/2006	1.5 - 2	YBM - upper	<0.46	<0.4	<0.46	<0.46	<0.58	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.58	ND
CHHSL for Residential Soil					**na**	**0.038**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**
PRG for Residential Soil					**0.62**	**0.062**	**0.62**	**3.8**	**3.4**	**2,300**	**0.62**	**na**	**na**	**na**	**2,300**	**62**	**na**
ESL for Residential Shallow Soil (<3 meters)					**0.38**	**0.038**	**0.38**	**40**	**1.2**	**40**	**0.62**	**na**	**12**	**40**	**500**	**7.8**	**na**

TABLE 4-3
SUMMARY OF SOIL ANALYTICAL RESULTS FOR SVOCs
UPRR Parcel D
Emeryville, California

Abbreviations:
<0.50 - Compound not detected at or above indicated laboratory reporting limit
CHHSL - California Human Health Screening Level (California EPA, dated January 2005, Table 1--California Human Health Screening Levels for Soil and Comparison to Other Potential Environmental Concerns)
ESLs - Regional Water Quality Control Board - San Francisco Bay Region, Environmental Screening Levels, Residential shallow soil less than 3 meters and groundwater as a non-drinking water resource (November 2007)
ft bgs - feet below ground surface
mg/kg - Milligrams per kilogram
na - not applicable or not available
ND - not detected
PRG - US EPA Region IX Preliminary Remediation Goals for Soil at Residential Sites, December 2004

Notes:
(a) Sampling depths at each borehole location do not include the thickness of overlying asphalt or concrete layers that range from approximately 0.5 to 1-foot in thickness.
(b) Fill – generally dry, sandy gravel material of varying colors and textures with sporadic brick debris and railroad ballast
YBM - upper (upper member of the Young Bay Mud) – soft, black, silty clay with traces of rootlets and wood.
YBM - lower (lower member of the Young Bay Mud) – stiff, silty clay to clayey silt with occasional/local sand and gravel lenses.
(c) Results are reported on a dry weight basis.
(d) Concentrations which equal or exceed CHHSLs, PRGs, or ESLs are shown in bold.

TABLE 4-4
SUMMARY OF SOIL ANALYTICAL RESULTS FOR PCBs AND ORGANOCHLORINE PESTICIDES
UPRR Parcel D
Emeryville, California

Sample Location	Sample ID	Sample Date	Sample Depth (ft bgs) (a)	Lithologic Unit (b)	Analytical Results (mg/kg) (c)(d)						
					Pesticides					PCBs	
					DDD	DDE	DDT	Dieldrin	Other Pesticides	Aroclor 1254	Other PCBs
UPD-1	UPD-1-0-2.25	10/16/2006	0 - 2.25	Fill	<0.0052	<0.0052	<0.0052	<0.0052	ND	0.065	ND
	UPD-1-2-2.5	10/16/2006	2 - 2.5	Fill	<0.0059	<0.0059	<0.0059	<0.0059	ND	<0.059	ND
	UPD-1-4-4.5	10/16/2006	4 - 4.5	YBM - upper	<0.0063	<0.0063	<0.0063	<0.0063	ND	<0.063	ND
UPD-2	UPD-2-1-1.5	10/16/2006	1 - 1.5	YBM - upper	<0.006	<0.006	<0.006	<0.006	ND	<0.06	ND
	UPD-2-5-5.5	10/16/2006	5 - 5.5	YBM - lower	<0.0061	<0.0061	<0.0061	<0.0061	ND	<0.061	ND
UPD-3	UPD-3-0-2	10/16/2006	0 - 2	Fill	<0.0054	<0.0054	0.088	<0.0054	ND	<0.054	ND
	UPD-3-3-3.5	10/16/2006	3 - 3.5	YBM - upper	<0.0062	<0.0062	<0.0062	<0.0062	ND	<0.062	ND
	UPD-3-7.5-8	10/16/2006	7.5 - 8	YBM - lower	<0.0065	<0.0065	<0.0065	<0.0065	ND	<0.065	ND
UPD-4	UPD-4-0-3	10/16/2006	0 - 3	Fill	<0.0055	<0.0055	<0.0055	<0.0055	ND	**0.74**	ND
	UPD-4-3-3.5	10/16/2006	3 - 3.5	YBM - upper	<0.0067	<0.0067	<0.0067	<0.0067	ND	<0.067	ND
	UPD-4-7.5-8	10/16/2006	7.5 - 8	YBM - lower	<0.0065	<0.0065	<0.0065	<0.0065	ND	<0.065	ND
UPD-5	UPD-5-1.5-2	10/16/2006	1.5 - 2	Fill	<0.0055	<0.0055	<0.0055	<0.0055	ND	<0.055	ND
	UPD-5-5-5.5	10/16/2006	5 - 5.5	YBM - lower	<0.0071	<0.0071	<0.0071	<0.0071	ND	<0.071	ND
	UPD-5A-0-2	10/18/2006	0 - 2	Fill	<0.006	<0.006	<0.006	<0.006	ND	<0.06	ND
	UPD-5A-4-4.5	10/18/2006	4 - 4.5	YBM - upper	<0.0069	<0.0069	<0.0069	<0.0069	ND	<0.069	ND
	UPD-5A-7.5-8	10/18/2006	7.5 - 8	YBM - lower	<0.0064	<0.0064	<0.0064	<0.0064	ND	<0.064	ND
UPD-6	UPD-6-0-3.5	10/18/2006	0 - 3.5	Fill	<0.0054	<0.0054	<0.0054	<0.0054	ND	**0.17**	ND
	UPD-6-3-3.5	10/18/2006	3 - 3.5	Fill	<0.0057	<0.0057	<0.0057	<0.0057	ND	<0.057	ND
CHHSL for Residential Soil					**2.3**	**1.6**	**1.6**	**0.035**	**na**	**na**	**na**
PRGs for Residential Soil					**2.4**	**1.7**	**1.7**	**0.03**	**na**	**0.22**	**na**
ESL for Residential Shallow Soil (<3 meters) (e)					**2.3**	**1.6**	**1.6**	**0.034**	**na**	**0.089**	**na**

TABLE 4-4
SUMMARY OF SOIL ANALYTICAL RESULTS FOR PCBs AND ORGANOCHLORINE PESTICIDES
UPRR Parcel D
Emeryville, California

Sample Location	Sample ID	Sample Date	Sample Depth (ft bgs) (a)	Lithologic Unit (b)	Analytical Results (mg/kg) (c)(d)						
					Pesticides					PCBs	
					DDD	DDE	DDT	Dieldrin	Other Pesticides	Aroclor 1254	Other PCBs
UPD-7	UPD-7-0-2	10/18/2006	0 - 2	Fill	<0.0053	<0.0053	<0.0053	<0.0053	ND	**0.14**	ND
	UPD-7-2-2.5	10/18/2006	2 - 2.5	Fill	<0.0056	<0.0056	<0.0056	<0.0056	ND	<0.056	ND
	UPD-7-2.5-3	10/18/2006	2.5 - 3	YBM - upper	<0.0067	<0.0067	<0.0067	<0.0067	ND	<0.067	ND
UPD-8	UPD-8-0-2	10/17/2006	0 - 2	Fill	<0.0052	<0.0052	<0.0052	<0.0052	ND	<0.052	ND
	UPD-8-2-2.5	10/17/2006	2 - 2.5	Fill	<0.0059	<0.0059	<0.0059	<0.0059	ND	<0.059	ND
	UPD-8-2.5-3	10/17/2006	2.5 - 3	YBM - upper	<0.0066	<0.0066	<0.0066	<0.0066	ND	<0.066	ND
UPD-9	UPD-9-0-2	10/17/2006	0 - 2	Fill	<0.0053	<0.0053	0.013	<0.0053	ND	<0.053	ND
	UPD-9-2-2.5	10/17/2006	2 - 2.5	Fill	<0.006	<0.006	<0.006	<0.006	ND	<0.06	ND
	UPD-9-2.5-3	10/17/2006	2.5 - 3	YBM - upper	<0.007	<0.007	<0.007	<0.007	ND	<0.07	ND
UPD-10	UPD-10-0-2.5	10/17/2006	0 - 2.5	Fill	0.0075	0.012	0.078	<0.0053	ND	<0.053	ND
	UPD-10-2.5-3	10/17/2006	2.5 - 3	Fill	<0.0067	<0.0067	<0.0067	<0.0067	ND	<0.067	ND
	UPD-10-6.5-7	10/17/2006	6.5 - 7	YBM - lower	<0.0068	<0.0068	<0.0068	<0.0068	ND	<0.068	ND
UPD-11	UPD-11-0-2.5	10/18/2006	0 - 2.5	Fill	<0.0052	<0.0052	<0.0052	<0.0052	ND	<0.052	ND
	UPD-11-2.5-3	10/18/2006	2.5 - 3	Fill	<0.0061	<0.0061	<0.0061	<0.0061	ND	<0.061	ND
	UPD-11-4-4.5	10/18/2006	4 - 4.5	YBM - upper	<0.0071	<0.0071	<0.0071	<0.0071	ND	<0.071	ND
UPD-12	UPD-12-0-2.5	10/17/2006	0 - 2.5	Fill	<0.0054	<0.0054	0.0064	0.0064	ND	<0.054	ND
	UPD-12-4.5-5	10/17/2006	4.5 - 5	YBM - upper	<0.0068	<0.0068	<0.0068	<0.0068	ND	<0.068	ND
CHHSL for Residential Soil					**2.3**	**1.6**	**1.6**	**0.035**	**na**	**na**	**na**
PRGs for Residential Soil					**2.4**	**1.7**	**1.7**	**0.03**	**na**	**0.22**	**na**
ESL for Residential Shallow Soil (<3 meters) (e)					**2.3**	**1.6**	**1.6**	**0.034**	**na**	**0.089**	**na**

TABLE 4-4
SUMMARY OF SOIL ANALYTICAL RESULTS FOR PCBs AND ORGANOCHLORINE PESTICIDES
UPRR Parcel D
Emeryville, California

Sample Location	Sample ID	Sample Date	Sample Depth (ft bgs) (a)	Lithologic Unit (b)	Analytical Results (mg/kg) (c)(d)						
					Pesticides					PCBs	
					DDD	DDE	DDT	Dieldrin	Other Pesticides	Aroclor 1254	Other PCBs
UPD-13	UPD-13-0-2	10/17/2006	0 - 2	Fill	<0.0057	<0.0057	<0.0057	<0.0057	ND	<0.057	ND
	UPD-13-3-3.5	10/17/2006	3 - 3.5	YBM - upper	<0.007	<0.007	<0.007	<0.007	ND	<0.07	ND
	UPD-13-6-6.5	10/17/2006	6 - 6.5	YBM - lower	<0.0062	<0.0062	<0.0062	<0.0062	ND	<0.062	ND
UPD-14	UPD-14-0-2	10/17/2006	0 - 2	Fill	<0.0057	<0.0057	<0.0057	<0.0057	ND	<0.057	ND
	UPD-14-2-2.5	10/17/2006	2 - 2.5	YBM - upper	<0.0075	<0.0075	<0.0075	<0.0075	ND	<0.075	ND
UPD-15	UPD-15-0-2.5	10/17/2006	0 - 2.5	Fill	<0.0056	<0.0056	<0.0056	<0.0056	ND	<0.056	ND
	UPD-15-2.5-3	10/17/2006	2.5 - 3	YBM - upper	<0.007	<0.007	<0.007	<0.007	ND	<0.07	ND
UPD-16	UPD-16-0.5-1	10/18/2006	0.5 - 1	YBM - upper	<0.0061	<0.0061	<0.0061	<0.0061	ND	<0.061	ND
	UPD-16-1.5-2	10/18/2006	1.5 - 2	YBM - upper	<0.0067	<0.0067	<0.0067	<0.0067	ND	<0.067	ND
	UPD-16-4-4.5	10/18/2006	4 - 4.5	YBM - lower	<0.0063	<0.0063	<0.0063	<0.0063	ND	<0.063	ND
UPD-17	UPD-17-0.5-1	10/18/2006	0.5 - 1	YBM - upper	<0.0071	<0.0071	<0.0071	<0.0071	ND	<0.071	ND
	UPD-17-2.5-3	10/18/2006	2.5 - 3	YBM - upper	<0.0067	<0.0067	<0.0067	<0.0067	ND	<0.067	ND
UPD-18	UPD-18-0.5-1	10/18/2006	0.5 - 1	YBM - upper	<0.0058	<0.0058	<0.0058	<0.0058	ND	<0.058	ND
	UPD-18-2-2.5	10/18/2006	2 - 2.5	YBM - lower	<0.0065	<0.0065	<0.0065	<0.0065	ND	<0.065	ND
UPD-19	UPD-19-0.25-0.75	10/17/2006	0.25 - 0.75	YBM - upper	<0.0069	<0.0069	<0.0069	<0.0069	ND	<0.069	ND
	UPD-19-3-3.5	10/17/2006	3 - 3.5	YBM - lower	<0.0062	<0.0062	<0.0062	<0.0062	ND	<0.062	ND
UPD-20	UPD-20-0-0.5	10/18/2006	0 - 0.5	Fill	<0.0054	<0.0054	<0.0054	<0.0054	ND	**0.24**	ND
	UPD-20-1.5-2	10/18/2006	1.5 - 2	YBM - upper	<0.0058	<0.0058	<0.0058	<0.0058	ND	<0.058	ND
CHHSL for Residential Soil					**2.3**	**1.6**	**1.6**	**0.035**	**na**	**na**	**na**
PRGs for Residential Soil					**2.4**	**1.7**	**1.7**	**0.03**	**na**	**0.22**	**na**
ESL for Residential Shallow Soil (<3 meters) (e)					**2.3**	**1.6**	**1.6**	**0.034**	**na**	**0.089**	**na**

TABLE 4-4
SUMMARY OF SOIL ANALYTICAL RESULTS FOR PCBs AND ORGANOCHLORINE PESTICIDES
UPRR Parcel D
Emeryville, California

Abbreviations:
<0.50 - Compound not detected at or above indicated laboratory reporting limit
CHHSL - California Human Health Screening Level (California EPA, dated January 2005, Table 1--California Human Health Screening Levels for Soil and Comparison to Other Potential Environmental Concerns)
ESLs - Regional Water Quality Control Board - San Francisco Bay Region, Environmental Screening Levels, Residential shallow soil less than 3 meters and groundwater as a non-drinking water resource (November 2007)
ft bgs - feet below ground surface
mg/kg - Milligrams per kilogram
na - not applicable or not available
ND - not detected
PCBs - Polychlorinated Biphenyls
PRG - US EPA Region IX Preliminary Remediation Goals for Soil at Residential Sites, December 2004

Notes:
(a) Sampling depths at each borehole location do not include the thickness of overlying asphalt or concrete layers that range from approximately 0.5
(b) Fill – generally dry, sandy gravel material of varying colors and textures with sporadic brick debris and railroad ballast
YBM - upper (upper member of the Young Bay Mud) – soft, black, silty clay with traces of rootlets and wood.
YBM - lower (lower member of the Young Bay Mud) – stiff, silty clay to clayey silt with occasional/local sand and gravel lenses.
(c) Results are reported on a dry weight basis.
(d) Concentrations which equal or exceed CHHSLs, PRGs, or ESLs are shown in bold.
(e) The ESL used for Arorclor 1254 is the ESL for total PCBs as the ESLs do not provide PCB-specific criteria.

TABLE 4-5
SUMMARY OF SOIL ANALYTICAL RESULTS FOR VOCs
UPRR Parcel D
Emeryville, California

Sample Location	Sample ID	Sample Date	Sample Depth (ft bgs) (a)	Lithologic Unit (b)	Analytical Results (mg/kg) (c)(d)															
					Acetone	Benzene	2-Butanone	n-Butylbenzene	sec-Butylbenzene	Ethylbenzene	Isopropylbenzene	4-Isopropyltoluene	n-Propylbenzene	Tetrachloroethene	Toluene	1,2,4-Trimethylbenzene	1,3,5-Trimethylbenzene	o-Xylene	Xylenes, m & p	Other VOCs
UPD-16	UPD-16-0.5-1	10/18/2006	0.5 - 1	YBM - upper	0.076	<0.0011	<0.023	<0.0011	<0.0011	<0.0011	<0.0011	<0.0011	<0.0011	<0.0011	<0.0011	<0.0023	<0.0023	<0.0011	<0.0023	ND
	UPD-16-1.5-2	10/18/2006	1.5 - 2	YBM - upper	0.12	<0.0012	<0.024	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0024	<0.0024	<0.0012	<0.0024	ND
	UPD-16-4-4.5	10/18/2006	4 - 4.5	YBM - lower	<0.061	<0.0012	<0.024	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0024	<0.0024	<0.0012	<0.0024	ND
UPD-17	UPD-17-0.5-1	10/18/2006	0.5 - 1	YBM - upper	0.12	<0.0015	0.035	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0024	<0.0024	<0.0012	<0.0024	ND
	UPD-17-2.5-3	10/18/2006	2.5 - 3	YBM - upper	<0.061	<0.0012	<0.024	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0029	<0.0029	<0.0015	<0.0029	ND
UPD-18	UPD-18-0.5-1	10/18/2006	0.5 - 1	YBM - upper	0.054	0.0061	<0.021	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0026	<0.0021	<0.0021	<0.001	<0.0021	ND
	UPD-18-2-2.5	10/18/2006	2 - 2.5	YBM - lower	<0.055	<0.0011	<0.022	<0.0011	<0.0011	<0.0011	<0.0011	<0.0011	<0.0011	<0.0011	<0.0011	<0.0022	<0.0022	<0.0011	<0.0022	ND
UPD-19	UPD-19-0.25-0.75	10/17/2006	0.25 - 0.75	YBM - upper	0.094	<0.0013	<0.025	<0.0013	<0.0013	<0.0013	<0.0013	<0.0013	<0.0013	<0.0013	<0.0013	<0.0025	<0.0025	<0.0013	<0.0025	ND
	UPD-19-3-3.5	10/17/2006	3 - 3.5	YBM - lower	<0.054	<0.0011	<0.021	<0.0011	<0.0011	<0.0011	<0.0011	<0.0011	<0.0011	0.0013	<0.0011	<0.0021	<0.0021	<0.0011	<0.0021	ND
UPD-20	UPD-20-0-0.5	10/18/2006	0 - 0.5	Fill	<0.047	<0.00095	<0.019	<0.00095	<0.00095	<0.00095	<0.00095	<0.00095	<0.00095	<0.00095	<0.00095	<0.0019	<0.0019	<0.00095	<0.0019	ND
	UPD-20-1.5-2	10/18/2006	1.5 - 2	YBM - upper	<0.052	<0.001	<0.021	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0021	<0.0021	<0.001	<0.0021	ND
CHHSL for Residential Soil					**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**
PRG for Residential Soil					**14,000**	**0.64**	**22,000**	**240**	**220**	**400**	**570**	**na**	**240**	**0.48**	**520**	**52**	**21**	**na**	**na**	**na**
ESL for Residential Shallow Soil (<3 meters)					**17**	**0.18**	**na**	**na**	**na**	**33**	**na**	**na**	**na**	**0.34**	**29**	**na**	**na**	**31**	**31**	**na**

Abbreviations:
"--" - not analyzed
<0.50 - Compound not detected at or above indicated laboratory reporting limit
CHHSL - California Human Health Screening Level (California EPA, dated January 2005, Table 1--California Human Health Screening Levels for Soil and Comparison to Other Potential Environmental Concerns)
ESLs - Regional Water Quality Control Board - San Francisco Bay Region, Environmental Screening Levels, Residential shallow soil less than 3 meters and groundwater as a non-drinking water resource (November 2007)
ft bgs - feet below ground surface
mg/kg - Milligrams per kilogram
na - not applicable or not available
ND - not detected
PRG - US EPA Region IX Preliminary Remediation Goals for Soil at Residential Sites, December 2004
VOCs - Volatile Organic Compounds

Notes:
(a) Sampling depths at each borehole location do not include the thickness of overlying asphalt or concrete layers that range from approximately 0.5 to 1-foot in thickness.
(b) Fill – generally dry, sandy gravel material of varying colors and textures with sporadic brick debris and railroad ballast
YBM - upper (upper member of the Young Bay Mud) – soft, black, silty clay with traces of rootlets and wood.
YBM - lower (lower member of the Young Bay Mud) – stiff, silty clay to clayey silt with occasional/local sand and gravel lenses.
(c) Results are reported on a dry weight basis.
(d) Concentrations which equal or exceed CHHSLs, PRGs, or ESLs are shown in bold.

TABLE 4-6
SUMMARY OF GROUNDWATER ANALYTICAL RESULTS FOR METALS
UPRR Parcel D
Emeryville, California

Sample Location	Sample ID	Sample Date	Analytical Results (µg/L) (a)(b)(c)																	
			Antimony	Arsenic	Barium	Beryllium	Cadmium	Hexavalent Chromium	Chromium, Total	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
UPD-1	UPD-1	10/16/2006	1.35	**398**	86.6	<1	<1	<0.5	<1	3.73	<1	<1	<0.5	29.5	7.96	1.57	<1	<1	4.7 B	12.1 B
UPD-2	UPD-2	10/16/2006	<1	6.17	102	<1	<1	<0.5	<1	4.74	1.23	<1	<0.5	10.6	10.8	1.58	<1	<1	4.01 B	12.1 B
	UPD-2 DUP	10/16/2006	<1	6.12	102	<1	<1	<0.5	<1	4.79	1.24	<1	<0.5	10.7	11.1	1.51	<1	<1	4.12 B	12.9 B
UPD-3	UPD-3	10/16/2006	1.29	**12.1**	164	<1	<1	<0.5	<1	4.29	<1	<1	<0.5	7.76	10.5	2.02	<1	<1	4.28 B	12.6 B
UPD-4	UPD-4	10/16/2006	**6.04**	**106**	112	<1	<1	<0.5	1.98	1.62	1.33	<1	<0.5	10.3	3.74	7.07	<1	<1	<1	20.9 B
UPD-5	UPD-5	10/16/2006	<1	**59**	199	<1	<1	<0.5	<1	3.9	<1	<1	<0.5	28.3	7.84	3.5	<1	<1	2.32 B	22.4 B
CAL EPA MCLs			**6**	**10**	**1,000**	**4**	**5**	**50**	**50**	**na**	**1,300**	**15**	**2**	**na**	**100**	**50**	**na**	**2**	**na**	**na**
ESL for non-drinking water			**5,000**	**5,000**	**5,000**	**5,000**	**5,000**	**5,000**	**5,000**	**5,000**	**5,000**	**5,000**	**5,000**	**5,000**	**5,000**	**5,000**	**5,000**	**5,000**	**5,000**	**5,000**

Abbreviations:
<0.50 - Compound not detected at or above indicated laboratory reporting limit
CAL EPA MCLs - California Environmental Protection Agency Maximum Contaminant Levels (March 2006)
ESLs - Regional Water Quality Control Board - San Francisco Bay Region, Environmental Screening Levels, Groundwater as a non-drinking water resource (November 2007)
DUP - duplicate sample
na - not applicable or not available
µg/L - Micrograms per liter

Notes:
(a) Concentrations which equal or exceed CAL EPA MCLs or ESLs are shown in bold.
(b) Reported results are representative of dissolved metals concentrations in groundwater. Each sample was field filtered through a new disposable 0.45 µm filter.
(c) Concentrations of metals followed by a "B" indicates that the analyte was present in the associated filter blank and that the reported concentration is less than the standard 5 times rule, potentially indicating that the reported concentration is an artifact of sample filtration and handling. A filter blank was collected to determine potential influence of disposable tubing, disposable filters, and laboratory containers and preservatives on reported concetrations.

TABLE 4-7
SUMMARY OF GROUNDWATER ANALYTICAL RESULTS FOR TPH AND VOCs
UPRR Parcel D
Emeryville, California

Sample Location	Sample ID	Sample Date	Analytical Results (µg/L) (a)(b)(c)			
			TPH-g	TPH-d	TPH-mo	VOCs
UPD-1	UPD-1	10/16/2006	<50	--	--	ND
UPD-2	UPD-2	10/16/2006	<50	59	<250	ND
	UPD-2 DUP	10/16/2006	<50	<50	<250	ND
UPD-3	UPD-3	10/16/2006	<50	<50	<250	ND
UPD-4	UPD-4	10/16/2006	<50	250	1,100	ND
UPD-5	UPD-5	10/16/2006	130	210	490	ND
UPD-6	UPD-6	10/18/2006	--	430	1,100	--
CAL EPA MCLs			**na**	**na**	**na**	**na**
ESL for non-drinking water			**5,000**	**2,500**	**2,500**	**na**

Abbreviations:
"--" - not analyzed
<0.50 - Compound not detected at or above indicated laboratory reporting limit
CAL EPA MCLs - California Environmental Protection Agency Maximum Contaminant Levels (March 2006)
DUP - duplicate sample
ESLs - Regional Water Quality Control Board - San Francisco Bay Region, Environmental Screening Levels, Groundwater as a non-drinking water resource (November 2007)
na - not available
ND - not detected
TPH - Total Petroleum Hydrocarbons
TPH-g - TPH as gasoline
TPH-d - TPH as diesel
TPH-mo - TPH as motor oil
VOCs - Volatile Organic Compounds
µg/L - Micrograms per liter

Notes:
(a) Concentrations which equal or exceed ESL for non-drinking water are shown in bold.
(b) The TPH-d and TPH-mo sample bottle for UPD-1 broke during shipping. Therefore, a grab groundwater sample was collected at UPD-6 for TPH-d and TPH-mo analysis.

TABLE 5-1
SOIL REMEDIAL CRITERIA
UPRR Parcel D Project Area
Emeryville, California

COCs (a)	Detected Concentration Range (mg/kg)	Preliminary SSRGs for soil (mg/kg)	Basis for Preliminary SSRG
TPH-g	< 0.23 to 240	100	ESL (b)
TPH-d	< 5.8 to 5,400	100	ESL (b)
TPH-mo	< 29 to 19,000	410	ESL (b)
Arsenic	1.99 to 145	24	LBNL Background (c)
Cadmium	<0.114 to 10	5.6	LBNL Background (c)
Cobalt	4.27 to 44.4	25	LBNL Background (c)
Lead	5.88 to 684	150	PRG, and CHHSL (b, d, e)
Zinc	58.4 to 2,970	140	LBNL Background (c)

Abbreviations
CHHSL: California Human Health Screening Level
COCs: constituents of concern
ESLs: California Regional Water Quality Control Board - San Francisco Bay Region, Environmental Screening Levels
ft bgs: feet below ground surface
PRG: US EPA Region IX Preliminary Remediation Goals
SSRG: site-specific remedial goal
TPH: total petroleum hydrocarbons
TPH-g: total petroleum hydrocarbons as gasoline
TPH-d: total petroleum hydrocarbons as diesel
TPH-mo: total petroleum hydrocarbons as motor oil
mg/kg: milligrams per kilogram

References/Notes
a) Soil analytical data, the basis for the preliminary SSRGs, and the identification of COCs are discussed in the EKI, 2006a. *Soil and Groundwater Investigation Data Report*, UPRR Parcel D, Emeryville, California, Erler & Kalinowski, Inc., 14 November 2006. Soil analytical data for COCs are presented on Figures 2 and 3.
b) ESL: California Regional Water Quality Control Board - San Francisco Bay Region, Environmental Screening Level for Residential Shallow Soil (<3 meters) where potentially impacted groundwater is not a current or potential drinking water resource (Table K-1), Revised November 2007.
c) LBNL Background: LBNL and Parsons Engineering Science, Inc. Analysis of Backgrour Distributions of Metals in Soil and Lawrence Berkeley National Laboratory, June 2002. Based on 99th percentile.
d) PRG: US EPA Region IX Preliminary Remediation Goals for Soil at Residential Sites, October 2004.
e) CHHSL: California EPA, Table 1 - California Human Health Screening Levels for Soil and Comparison to Other Potential Environmental Concerns, January 2005.

Assumptions
1) Soil remediation is assumed to primarily consist of soil excavation and disposal.
2) Preliminary SSRGs were selected to allow for relatively unrestricted use of the site for any development that may be contemplated and are also generally consistent with remedial goals at neighboring sites in the vicinity. No specific development scenario was considered.

TABLE 6-1
ANALYSIS OF REMOVAL ACTION ALTERNATIVES
UPRR Parcel D
Emeryville, California

REMOVAL ACTION ALTERNATIVE		Alternative 1	Alternative 2	Alternative 3
Description (a)		**No Action:** The No Action Alternative does not include remedial action for removal of COCs above SSRGs from Site soil. The No Action alternative may require institutional controls (including zoning restrictions, deed restrictions, well drilling prohibitions and easements and covenants) to reduce the potential for migration of Site COCs to groundwater or the risk of exposures to Site COCs if existing barriers are weakened or damaged.	**Excavation and Off-Site Disposal:** Excavation and Off-Site Disposal entails physical removal of the soils from the Site, transporting those soils to either a permitted landfill or treatment facility for disposal, and groundwater monitoring for five years to evaluate the effectiveness of the remedy in terms preventing COCs in shallow soil from impacting Site groundwater. Prior to soil excavation at the Site, existing asphalt and concrete slabs, roadways, and debris would be demolished.	**Limited Excavation with Off-Site Disposal and Capping:** Limited Excavation with Off-Site Disposal and Capping entails physical removal of the top 1 foot of soil from the Site, additional trenching below initial excavation finish grade for utility corridors, transportation of excavated soils to either a permitted landfill or treatment facility for disposal, and installation of a low-permeability cover system. Groundwater monitoring will be conducted for thirty years to assess the effectiveness of the cover system. Prior to soil excavation at the Site, existing asphalt and concrete slabs, roadways, and debris would be demolished.
ACCEPTANCE CRITERIA FOR ANALYSIS OF REMOVAL ACTION ALTERNATIVES	Long-Term Effectiveness	Not Effective	Effective for long-term protection of human health from direct exposure to soil. Potentially effective in the long-term for environment and groundwater as excavation of potential COC sources in shallow soils will reduce COCs leaching to groundwater. Meets RAO of reducing the concentration of COCs in Site soil to below their established cleanup levels in an effective and expedient manner.	Effective for long-term protection of human health from direct exposure to soil. Potentially effective in the long-term for environment and groundwater as limited excavation of potential COC sources in shallow soils and installation of a low-permeability cover system will reduce COCs leaching to groundwater. Does not satisfy Site-specific RAO in long term because COC mass remains in shallow soil after excavation.
	Short-Term Effectiveness	Not Effective	Effective for short-term protection of human health from direct exposure to soil. Potential on-site and off-site impacts from dust, odor, and traffic would be addressed by available mitigation measures and engineering controls.	Effective in the short-term for protection of human health from direct exposure to soil. Potential on-site and off-site impacts from dust, odor, and traffic would be addressed by available mitigation measures and engineering controls.
	Implementability	Readily implementable.	Likely Implementable. May require extensive control measures to reduce potential noise, dust, and odor impacts to the on-Site workers and local community.	May Be Implementable. May require extensive control measures to reduce potential noise, dust, and odor impacts to the local community. Annual monitoring of the cover system is required to evaluate the effectiveness of the remedy. Cover system may be infeasible for proposed redevelopment.
	Costs	See Table 6-2	See Table 6-2	See Table 6-2
CONCLUSION		Lack of effectiveness and non-compliance with acceptance criteria precludes selection.	Recommended Alternative	Uncertainty associated with the long-term effectiveness in protecting the environment and groundwater due to the incomplete removal of source COCs in shallow soil. Implementation of Alternative requires on-going monitoring of cover system to evaluate effectiveness of remedy. May be infeasible for redevelopment.

Abbreviations:
COC = chemical of concern
GW = groundwater
GWM = groundwater monitoring
IC = institutional controls
RAO = Removal Action Objective

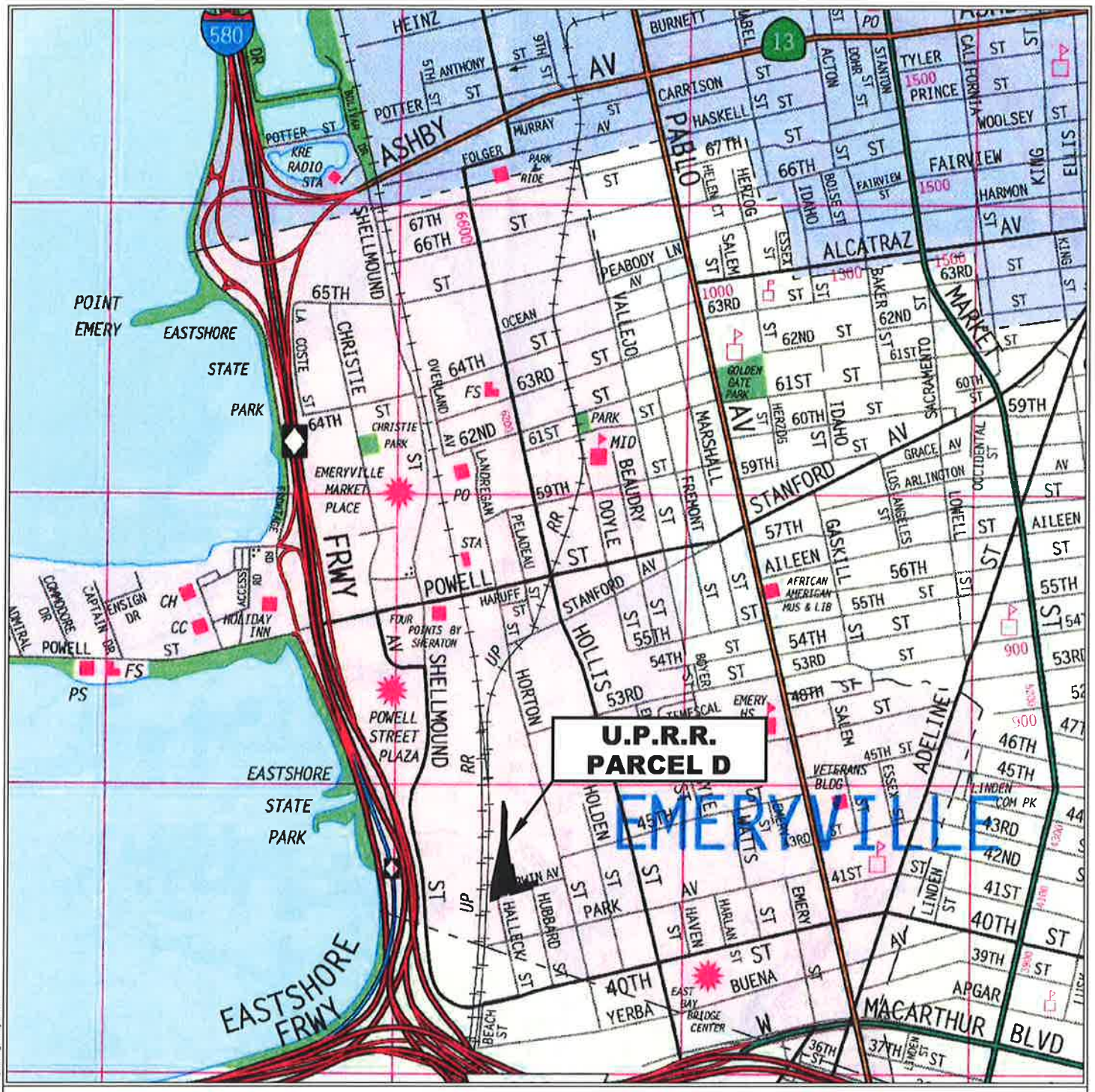
Notes:
(a) A detailed description of Alternatives 1 to 3 is provided in Section 6 of the text.

TABLE 6-2
SUMMARY OF ESTIMATED RELATIVE COSTS OF POTENTIAL REMOVAL ACTION ALTERNATIVES
UPRR Parcel D
Emeryville, California

REMEDIAL ALTERNATIVE		Alternative 1	Alternative 2	Alternative 3
Description (a)		1) On-site Shallow Soil: No Action 2) On-site GW: No Action 3) Potential Institutional Controls	1) On-site Shallow Soil: Excavation 2) On-site GW: Short-term GWM	1) On-site Shallow Soil: Limited Excavation with Capping 2) On-site GW: Long-term GWM
Capital Costs (2007 Dollars) (b,c)	On-site Soil (d)	--	$2,300,000 to $4,900,000	$1,600,000 to $3,300,000
Recurring Annual GWM Costs (2007 Dollars)		--	$40,000	$40,000
Recurring Annual Cap Monitoring Costs (2007 Dollars)		--	--	$15,000
Present Worth of Annual Costs (2007 Dollars)		--	$190,000	$1,100,000
Total Present Worth of Costs (2007 Dollars) (b,c)		--	$2,500,000 to $5,100,000	$2,700,000 to $4,400,000

Abbreviations:
GW = groundwater
GWM = groundwater monitoring

Notes:
(a) A detailed description of Alternatives 1 to 3 is provided in Section 6.0 of the text.
(b) See Appendix C. Includes 30-percent contingency and a -30 to +50 percent accuracy range is applied to the estimated total capital costs per US EPA guidelines (US EPA, 2000).
(c) Total costs are rounded.
(d) Capital costs for on-site soil include installation and development of perimeter groundwater monitoring wells.



Reference: The Thomas Guide; San Francisco, Alameda and Contra Costa Counties.

Note:

1. All locations are approximate.

N

0 1000 2000

(Approximate Scale in Feet)

Erler & Kalinowski, Inc.

Site Location Map

UPRR Parcel D
Emeryville, CA
November 2007
EKI A60021.00

Figure 1-1

20071127.14083161 G:\A60021.00\Nov07\Figure 1-1 - Site Location Map.dwg Layout1

Legend:

- Approximate Subject Property Boundary
- Storm Drain with Manhole (from ALIQUOT, "U.P.R.R. Parcels Aquisition Exhibit", April 2002)
- Sanitary Sewer (from Department of Public Works, 18 January 1982)

Notes:

1. All locations are approximate.
2. Basemap source: Pacific Aerial Surveys, Oakland, CA., dated 9 March 2005.

Erler & Kalinowski, Inc.

2005 Aerial Photo and Neighboring Properties

UPRR Parcel D
Emeryville, CA
November 2007
EKI A60021.00

Figure 2-1

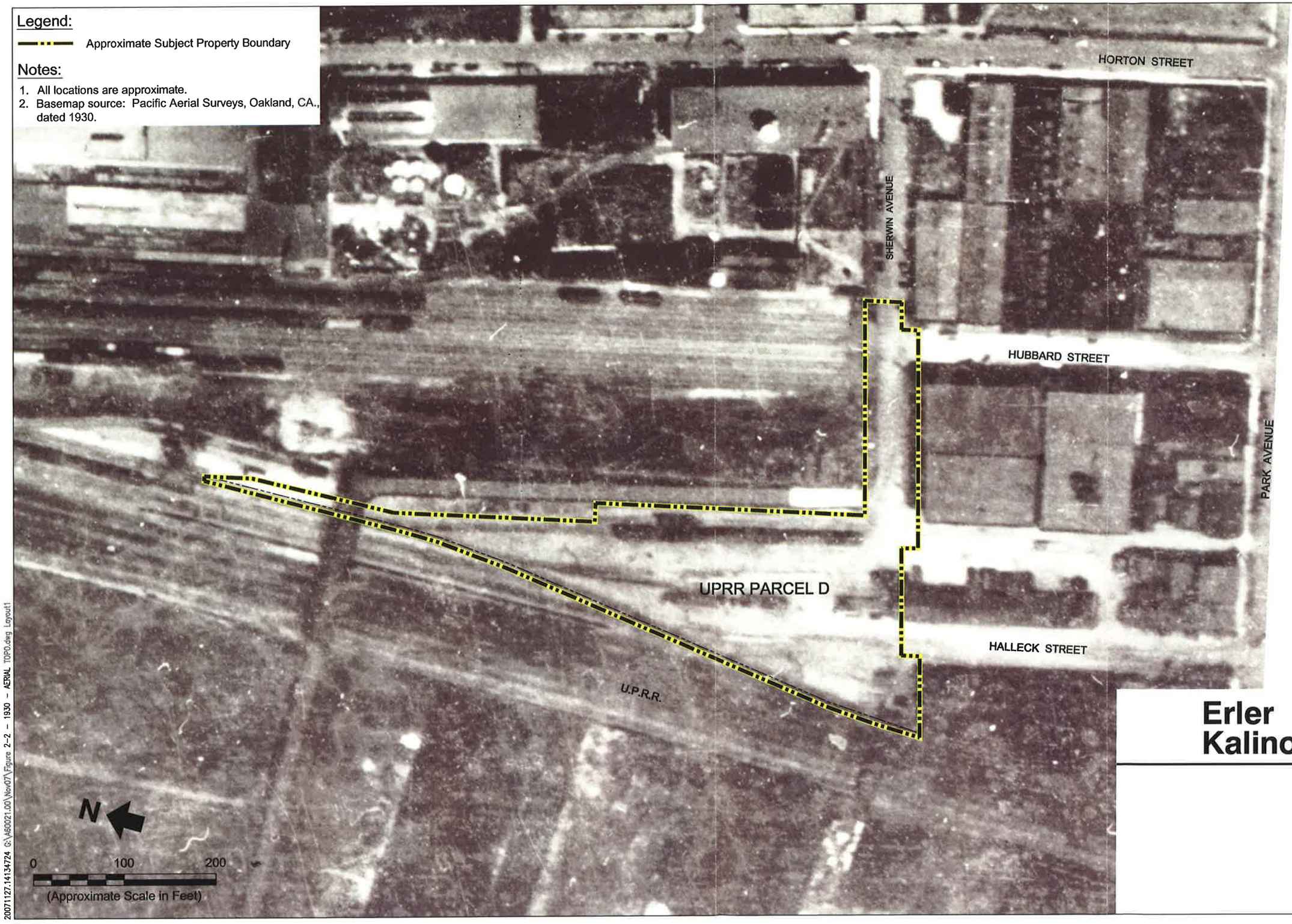
20071127.141130849 G:\A60021.00\Nov07\Figure 2-1 - 2005 - AERIAL TOPO SD SS.dwg Layout1

Legend:

Approximate Subject Property Boundary

Notes:

1. All locations are approximate.
2. Basemap source: Pacific Aerial Surveys, Oakland, CA., dated 1930.



Erler & Kalinowski, Inc.

1930 Aerial Photo

UPRR Parcel D
Emeryville, CA
November 2007
EKI A60021.00

Figure 2-2

20071127.14134724 G:\A60021.00\Nov07\Figure 2-2 - 1930 - AERIAL TOPO.dwg Layout1

Legend:

Approximate Subject Property Boundary

Notes:

1. All locations are approximate.
2. Basemap source: Pacific Aerial Surveys, Oakland, CA., dated 16 September 1949.

HORTON STREET

SHERWIN AVENUE

PARK AVENUE

HUBBARD STREET

UPRR PARCEL D

HALLECK STREET

U.P.R.R.

N

0 100 200

(Approximate Scale in Feet)

Erler & Kalinowski, Inc.

1949 Aerial Photo

UPRR Parcel D
Emeryville, CA
November 2007
EKI A60021.00
Figure 2-3

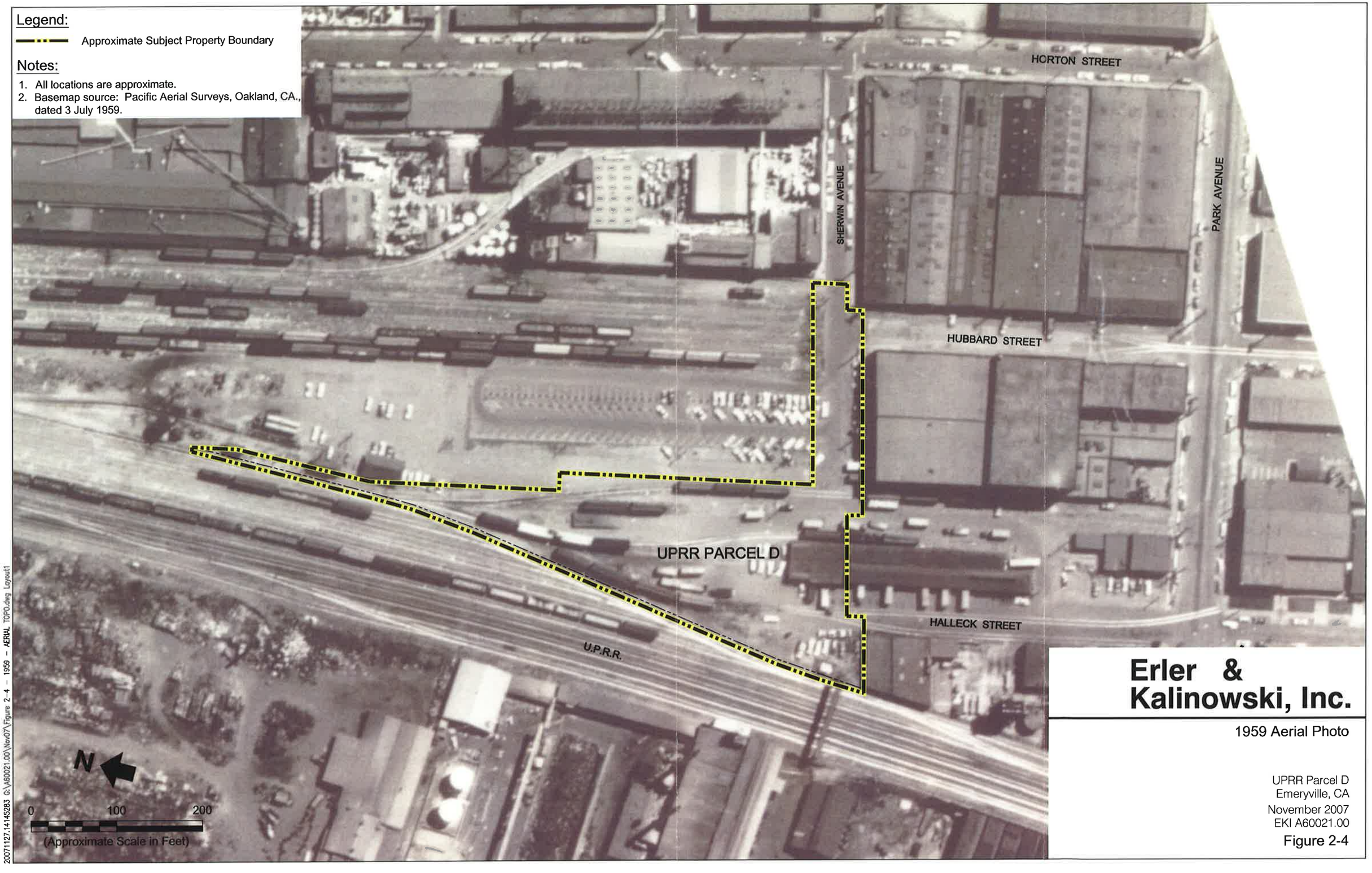
20071127.14142339 G:\A60021.00\Nov07\Figure 2-3 - 1949 - AERIAL TOPO.dwg Layout1

Legend:

Approximate Subject Property Boundary

Notes:

1. All locations are approximate.
2. Basemap source: Pacific Aerial Surveys, Oakland, CA., dated 3 July 1959.



Erler & Kalinowski, Inc.

1959 Aerial Photo

UPRR Parcel D
Emeryville, CA
November 2007
EKI A60021.00
Figure 2-4

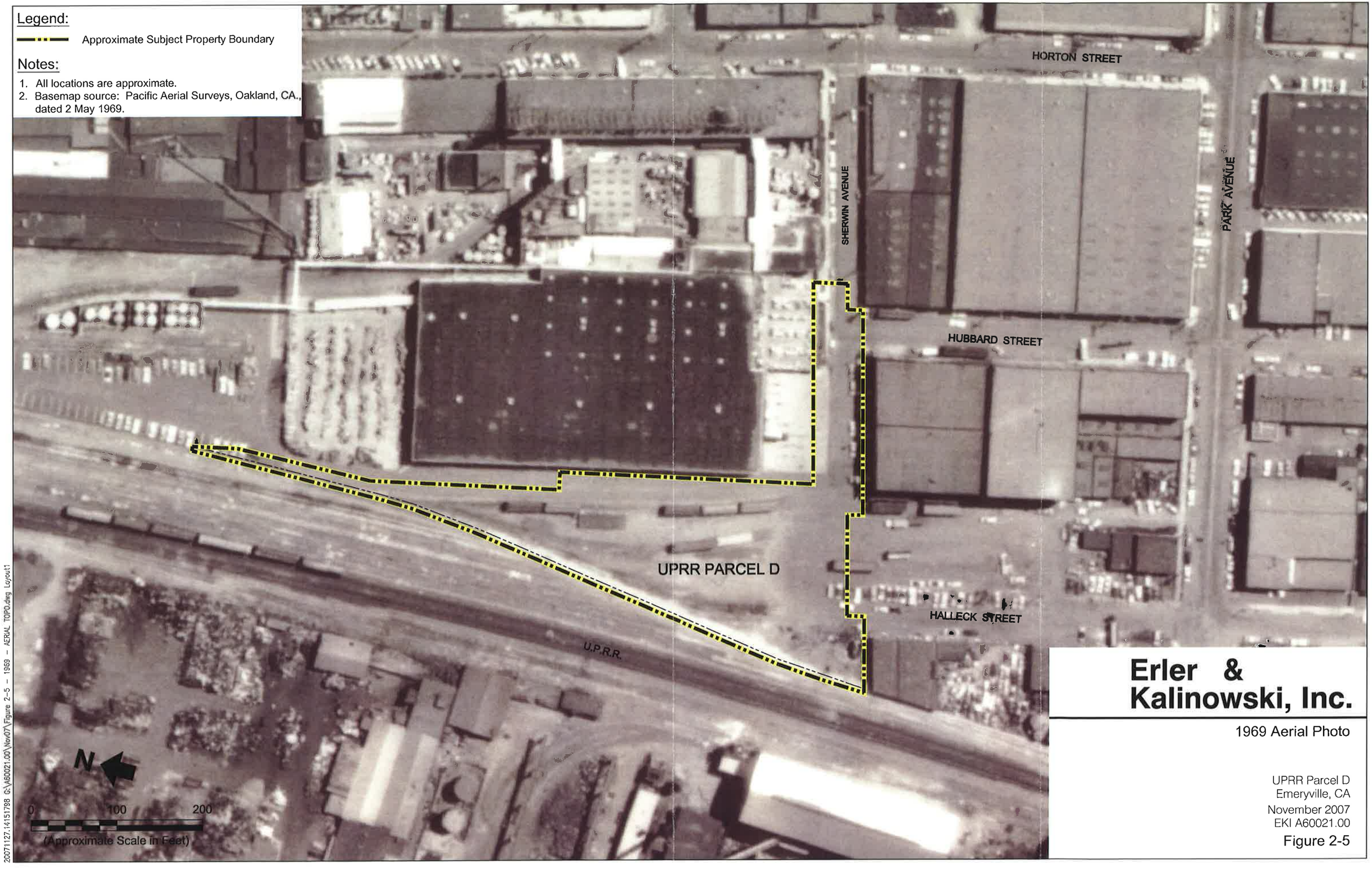
20071127.1445283 G:\A60021.00\Nov07\Figure 2-4 - 1959 - AERIAL TOPO.dwg Layout1

Legend:

Approximate Subject Property Boundary

Notes:

1. All locations are approximate.
2. Basemap source: Pacific Aerial Surveys, Oakland, CA., dated 2 May 1969.



Erler & Kalinowski, Inc.

1969 Aerial Photo

UPRR Parcel D
Emeryville, CA
November 2007
EKI A60021.00

Figure 2-5

20071127.14151798 G:\A60021.00\Nov07\Figure 2-5 - 1969 - AERIAL TOPO.dwg Layout1

Legend:

Approximate Subject Property Boundary

Notes:

1. All locations are approximate.
2. Basemap source: Pacific Aerial Surveys, Oakland, CA., dated 19 July 1977.

HORTON STREET

SHERWIN AVENUE

PARK AVENUE

HUBBARD STREET

UPRR PARCEL D

HALLECK STREET

U.P.R.R.

N

0 100 200

(Approximate Scale in Feet)

20071127.1415443 G:\A60021.00\Nov07\Figure 2-6 - 1977 - AERIAL TOPO.dwg Layout1

Erler & Kalinowski, Inc.

1977 Aerial Photo

UPRR Parcel D
Emeryville, CA
November 2007
EKI A60021.00

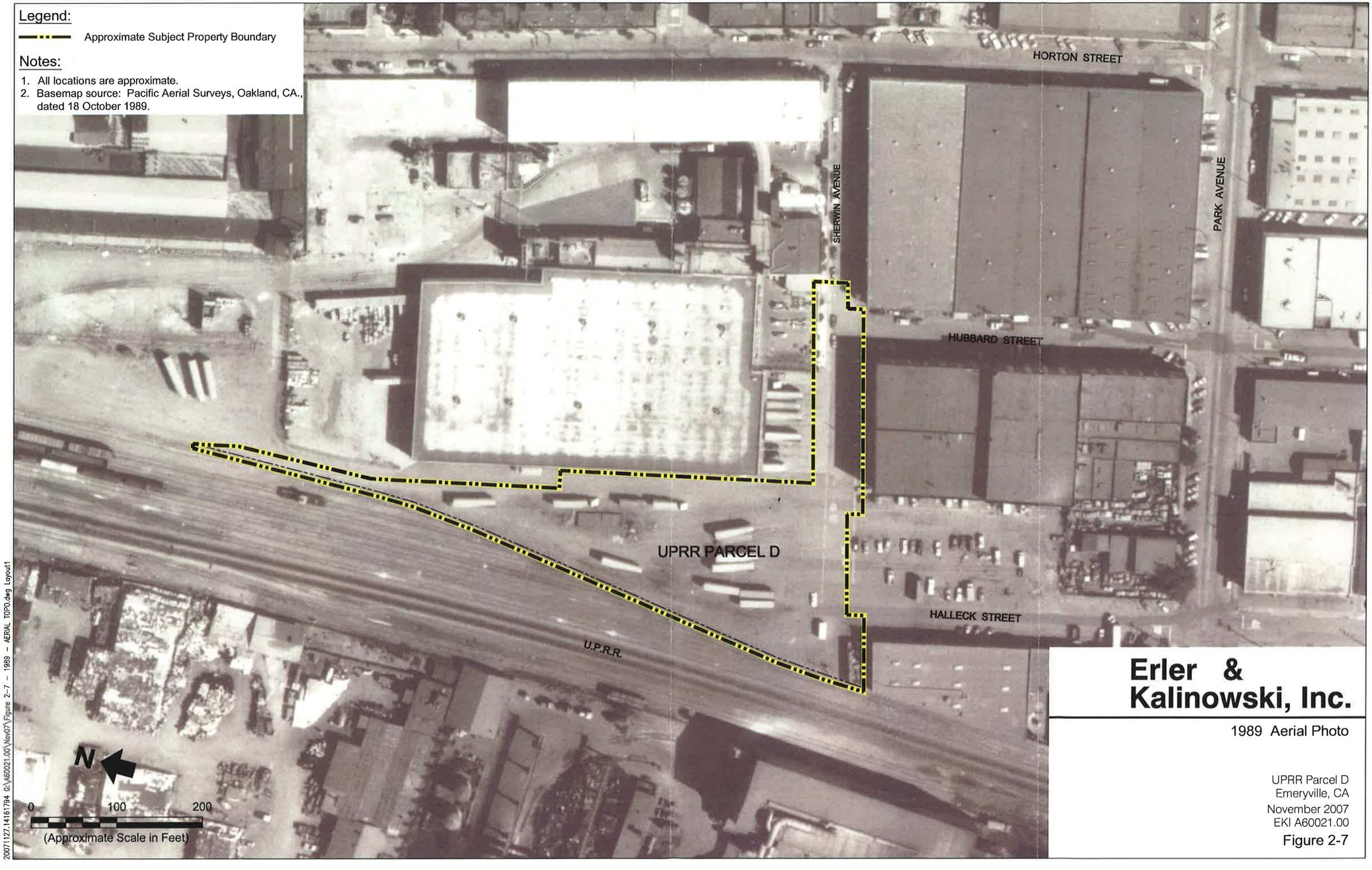
Figure 2-6

Legend:

Approximate Subject Property Boundary

Notes:

1. All locations are approximate.
2. Basemap source: Pacific Aerial Surveys, Oakland, CA., dated 18 October 1989.



Erler & Kalinowski, Inc.

1989 Aerial Photo

UPRR Parcel D
Emeryville, CA
November 2007
EKI A60021.00

Figure 2-7

20071127.14161794 G:\A60021.00\Nov07\Figure 2-7 - 1989 - AERIAL TOPO.dwg Layout1

Legend:

Approximate Subject Property Boundary

Notes:

1. All locations are approximate.
2. Basemap source: Pacific Aerial Surveys, Oakland, CA., dated 30 September 1995.

HORTON STREET

SHERWIN AVENUE

PARK AVENUE

HUBBARD STREET

SHELLMOUND DRIVE

HALLECK STREET

UPRR PARCEL D

U.P.R.R.

N

0 100 200

(Approximate Scale in Feet)

20071127.14164635 G:\A60021.00\Nov07\Figure 2-8 - 1995 - AERIAL TOPO.dwg Layout1

Erler & Kalinowski, Inc.

1995 Aerial Photo

UPRR Parcel D
Emeryville, CA
November 2007
EKI A60021.00

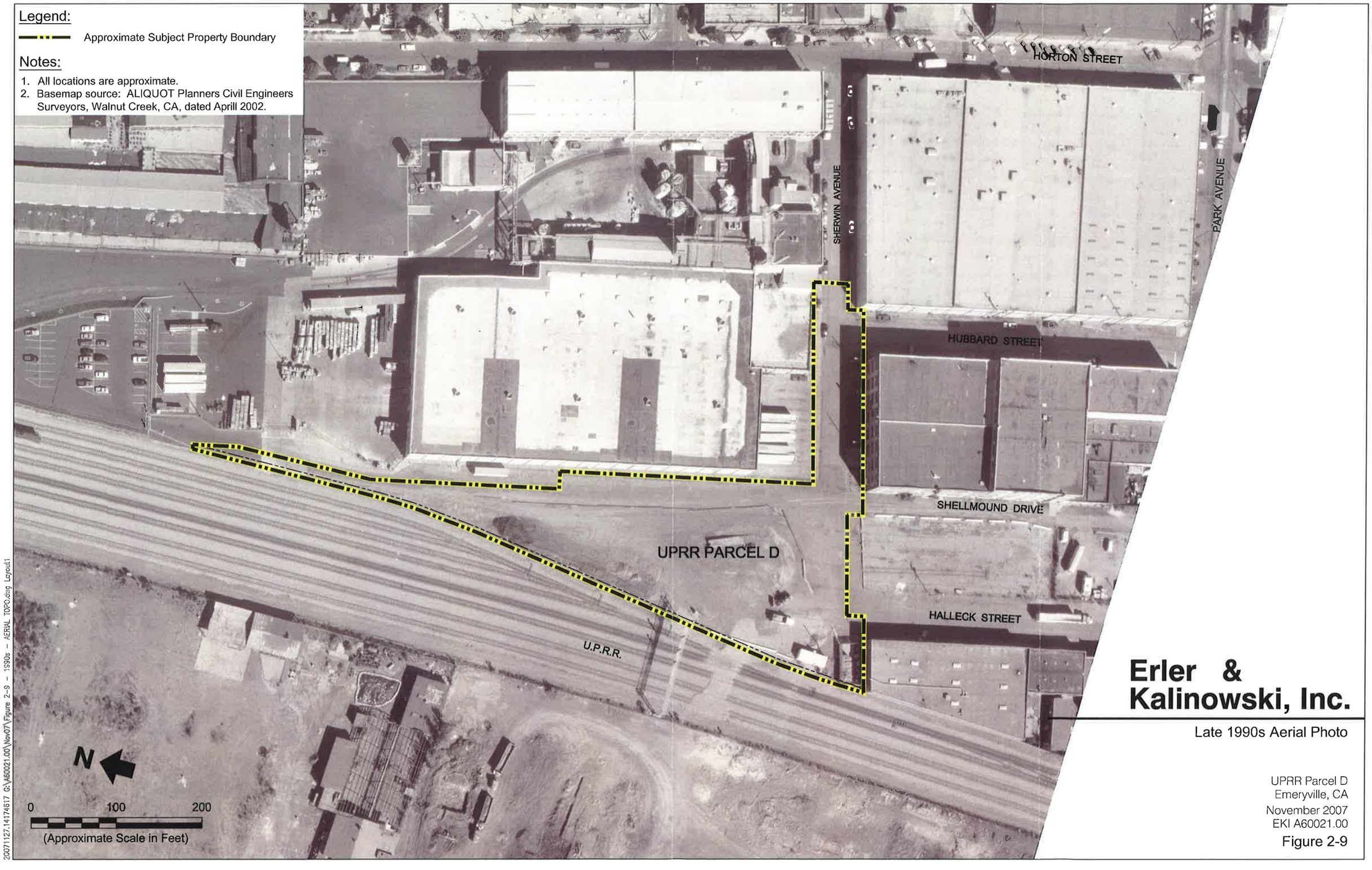
Figure 2-8

Legend:

Approximate Subject Property Boundary

Notes:

1. All locations are approximate.
2. Basemap source: ALIQUOT Planners Civil Engineers Surveyors, Walnut Creek, CA, dated Aprill 2002.



20071127,14174617 G:\A60021.00\Nov07\Figure 2--9 - 1990s - AERIAL TOPO.dwg Layout1

Erler & Kalinowski, Inc.

Late 1990s Aerial Photo

UPRR Parcel D
Emeryville, CA
November 2007
EKI A60021.00

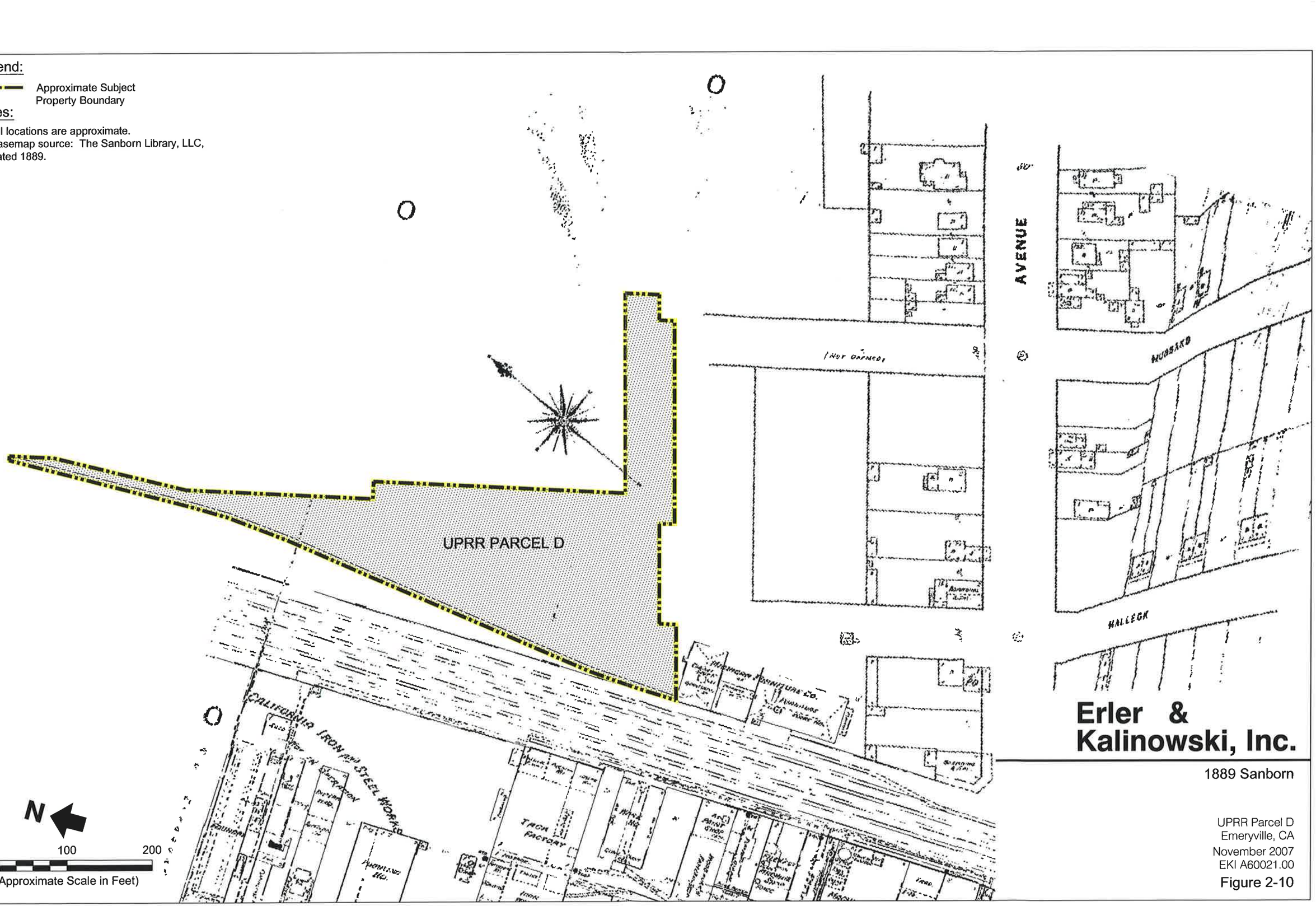
Figure 2-9

Legend:

Approximate Subject Property Boundary

Notes:

1. All locations are approximate.
2. Basemap source: The Sanborn Library, LLC, dated 1889.



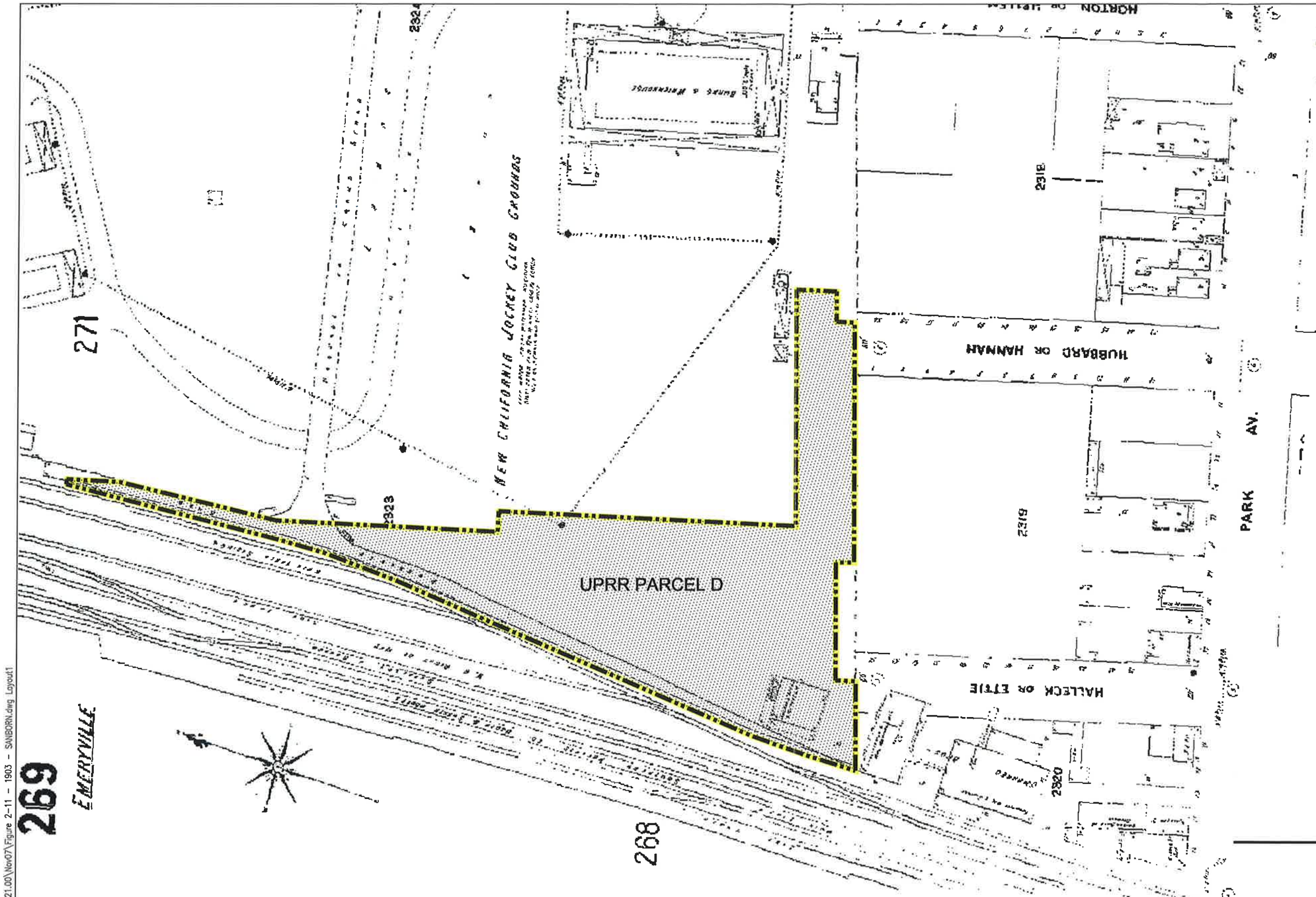
Erler & Kalinowski, Inc.

1889 Sanborn

UPRR Parcel D
Emeryville, CA
November 2007
EKI A60021.00

Figure 2-10

20071127.1418125 G:\A60021.00\Nov07\Figure 2-10 - 1889 - SANBORN.dwg Layout1



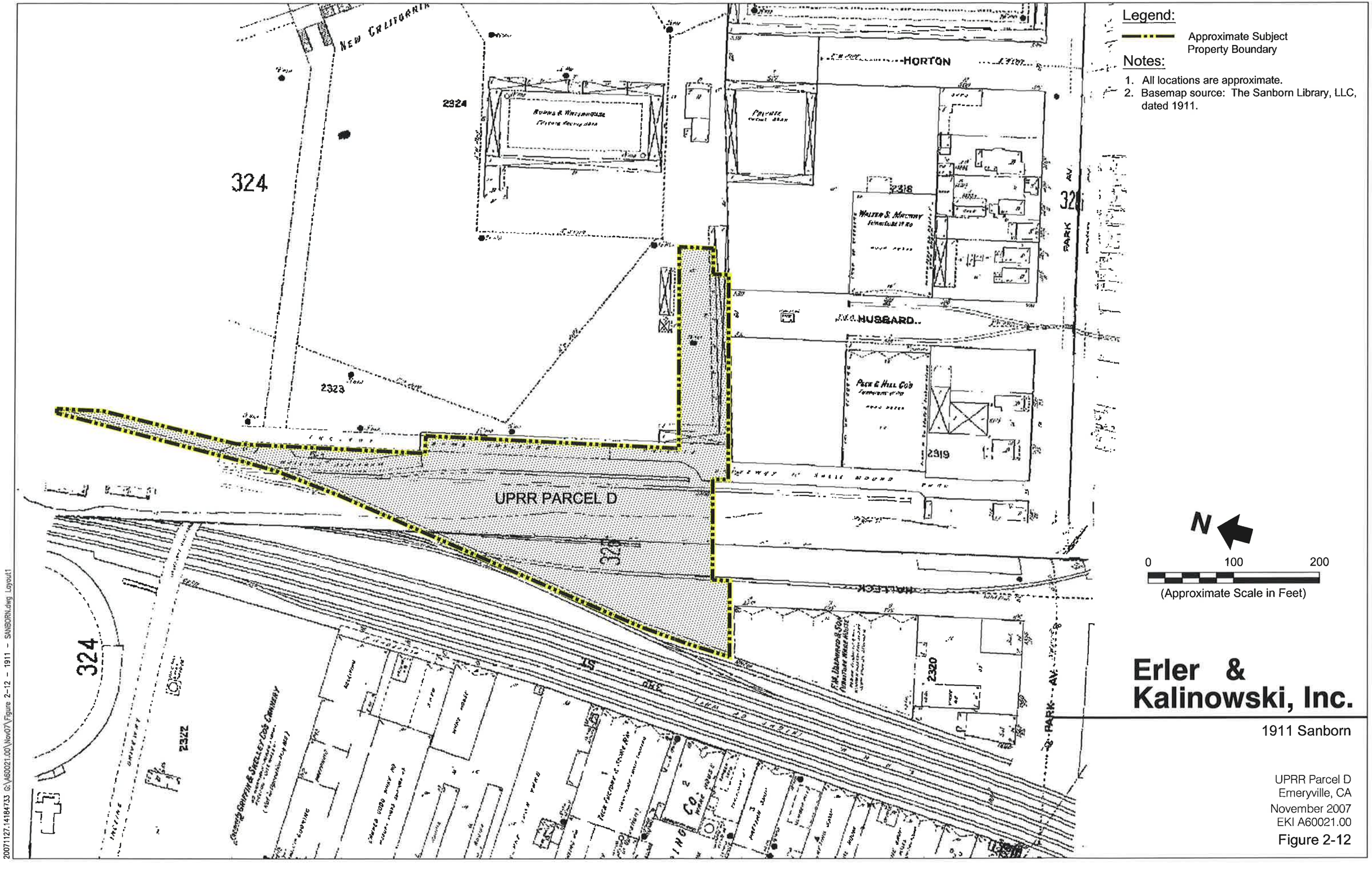
Erler & Kalinowski, Inc.

1903 Sanborn

UPRR Parcel D
Emeryville, CA
November 2007
EKI A60021.00

Figure 2-11

20071127.1418\3069 G:\A60021.00\Nov07\Figure 2-11 - 1903 - SANBORN.dwg Layout1



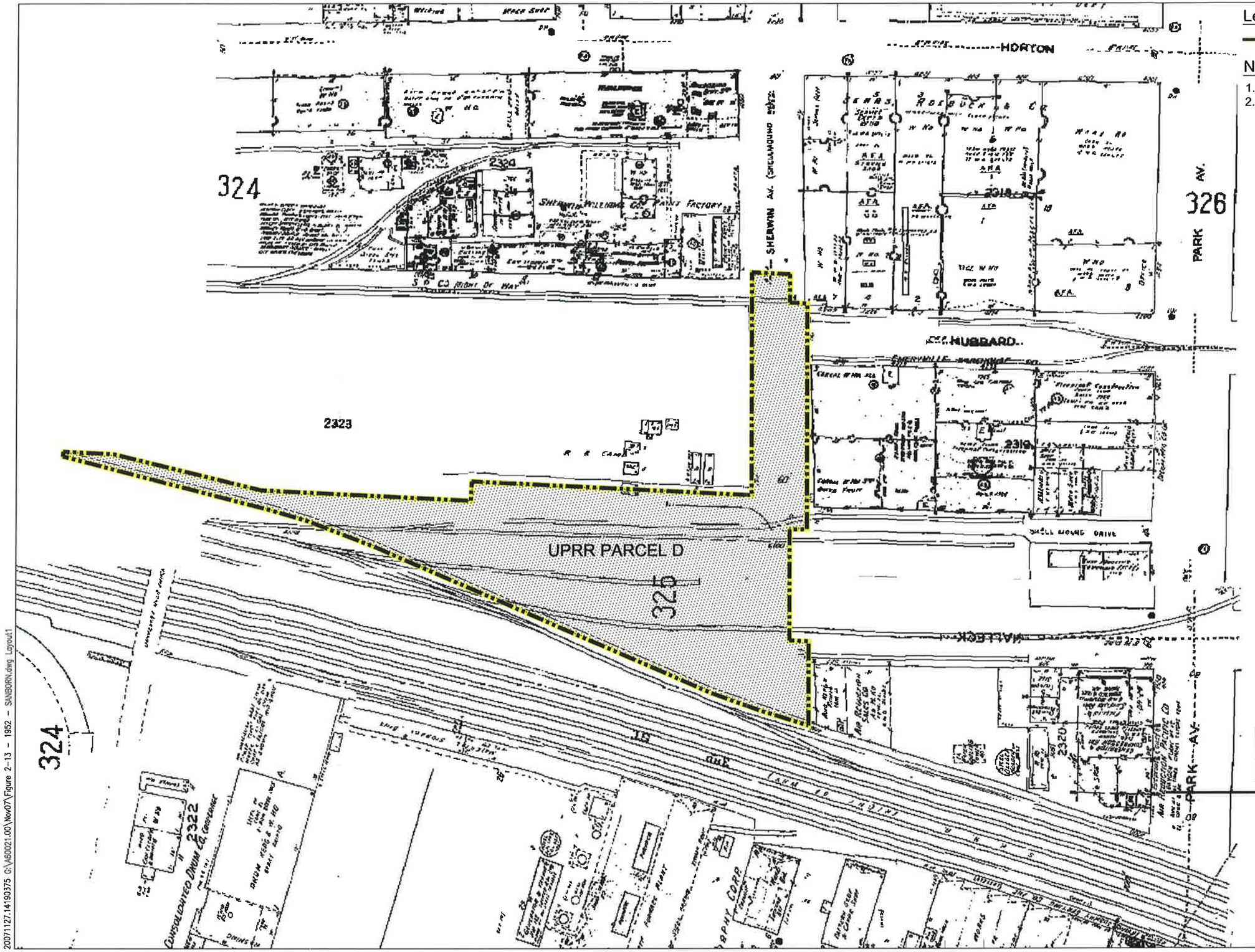
Erler & Kalinowski, Inc.

1911 Sanborn

UPRR Parcel D
Emeryville, CA
November 2007
EKI A60021.00

Figure 2-12

20071127.14184733 G:\A60021.00\Nov07\Figure 2-12 - 1911 - SANBORN.dwg Layout1



Legend:

Approximate Subject Property Boundary

Notes:

1. All locations are approximate.
2. Basemap source: The Sanborn Library, LLC, dated 1952.

N

0 100 200

(Approximate Scale in Feet)

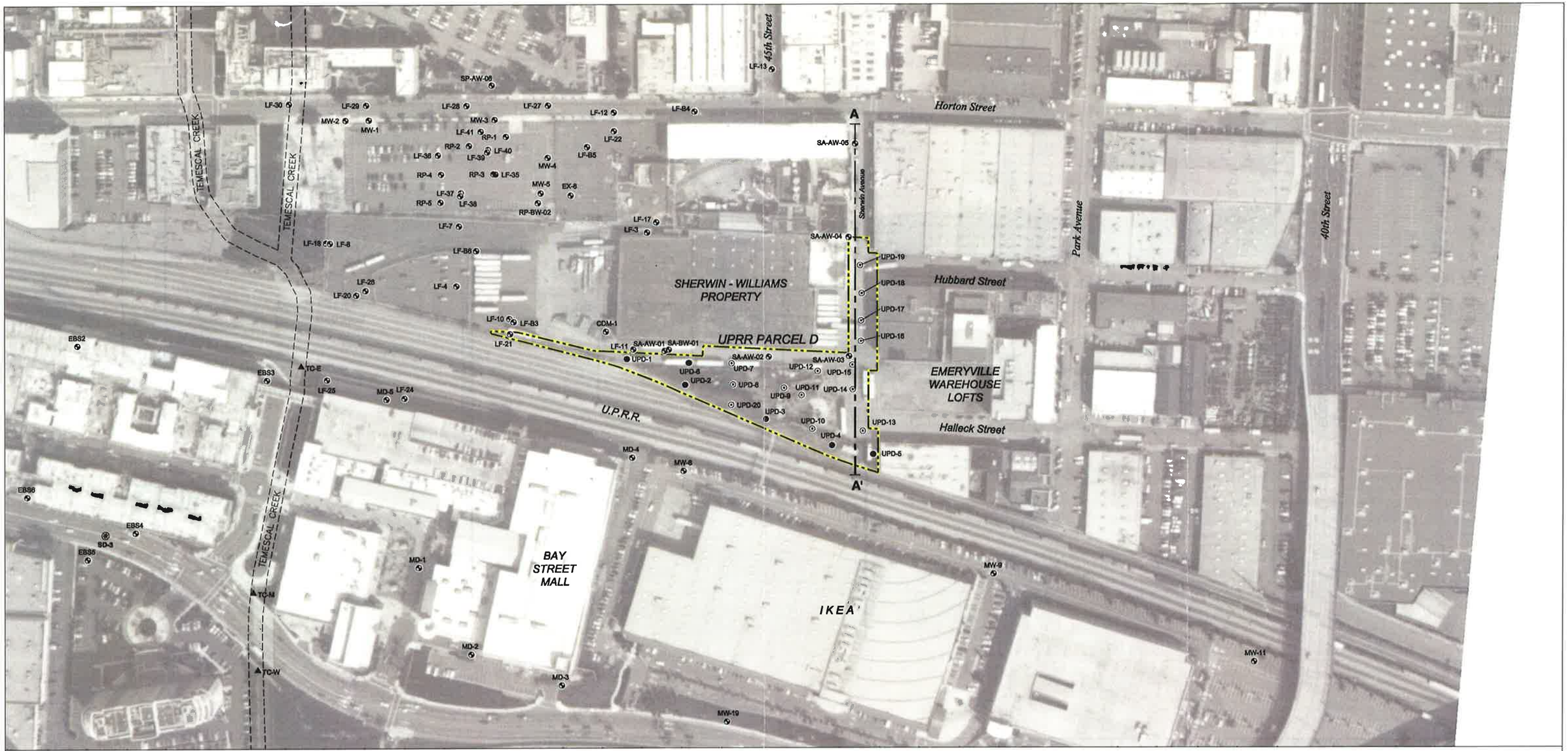
Erler & Kalinowski, Inc.

1952 Sanborn

UPRR Parcel D
Emeryville, CA
November 2007
EKI A60021.00

Figure 2-13

20071127.14190375 G:\A60021.00\Nov07\Figure 2-13 - 1952 - SANBORN.dwg Layout1



Legend:

- Approximate Subject Property Boundary
- Approximate Location of Monitoring Wells
- Approximate Location of Grab Groundwater Sampling Locations
- Soil Sampling Location
- Temescal Creek Surface Water Sampling Point
- Storm Drain Manhole

Notes:

1. All locations are approximate.

N

0 200 400

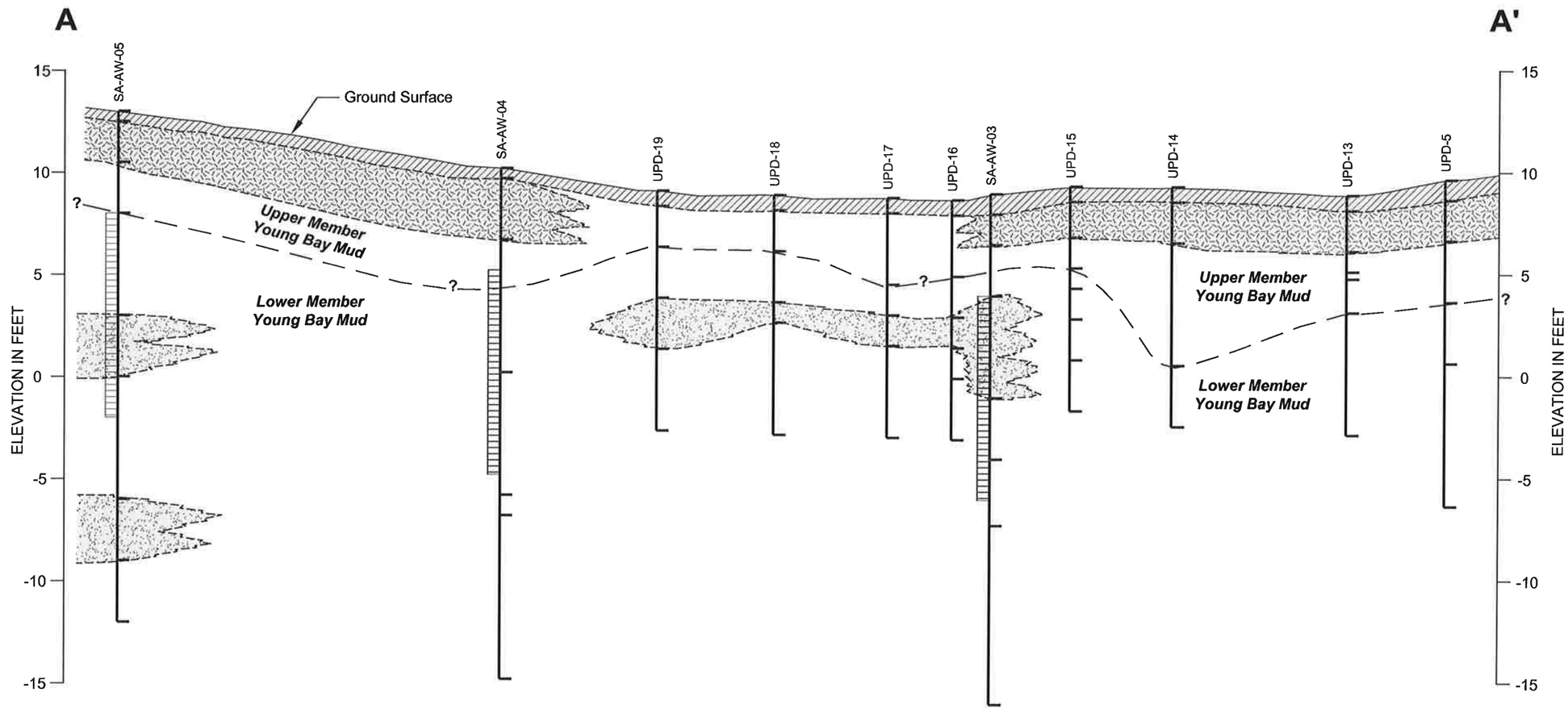
(Approximate Scale in Feet)

Erler & Kalinowski, Inc.

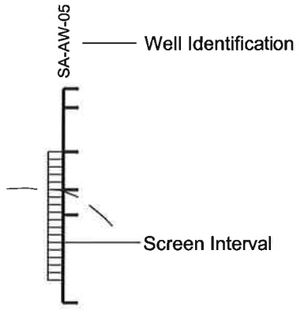
Geologic Data Points

UPRR Parcel D
Emeryville, CA
November 2007
EKI A60021.00

Figure 2-15

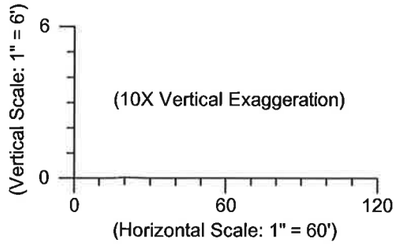


Legend:



Explanation:

- Asphalt and/or Concrete
- Fill (Gravel and Sand)
- Sand and/or Gravel
- Silt and/or Clay

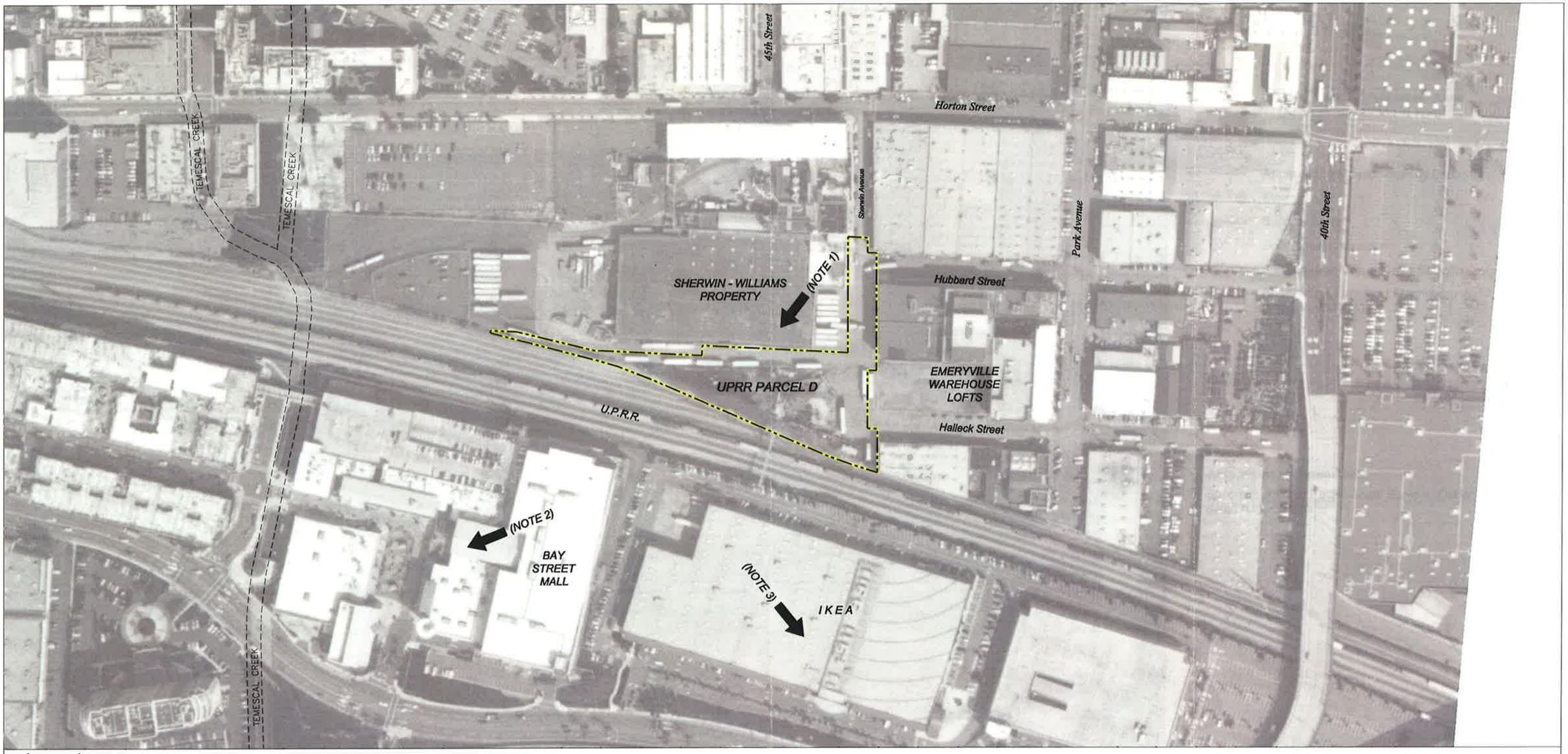


Erler & Kalinowski, Inc.

Cross Section A - A'

UPRR Parcel D
Emeryville, CA
November 2007
EKI A60021.00

Figure 2-16



Legend:

Approximate Subject Property Boundary

Approximate Groundwater Gradient Direction

Notes:

1. Approximate shallow groundwater gradient from Figure of Levine-Fricke-Recon's *"Combined Groundwater and NPDES Self-Monitoring Reports for the Quarterly Period July 1 to September 30, 2006, Sherwin Williams Site, 1450 Sherwin Avenue, Emeryville, California,"* dated 30 October 2006.
2. Approximate shallow groundwater gradient from Figure 2 of Strategic Engineering & Science's *"Second Semi-Annual 2006 Groundwater Monitoring Report for the Former Myers Container Corporation Site, 4500 Shellmound Street, Emeryville, California,"* dated 30 November 2006.
3. Approximate shallow groundwater gradient from IT Corporation's *"Five-Year Review of Groundwater Monitoring Results and Risk-Based Criteria, Former Barbary Coast Steel Facility,4400 Shellmound Street, Emeryville, California,"* dated January 2002.

N

0 200 400

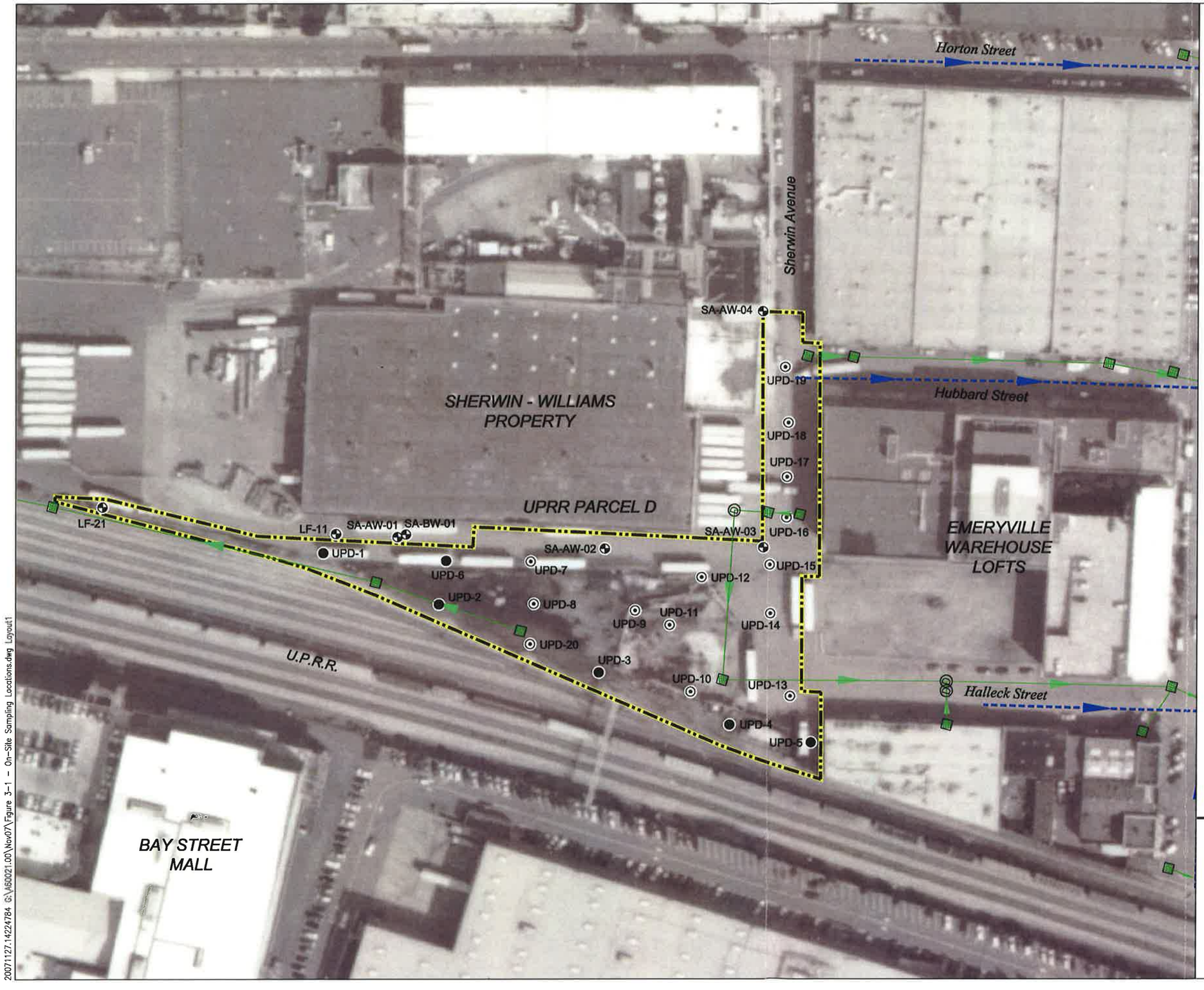
(Approximate Scale in Feet)

Erler & Kalinowski, Inc.

Approximate Groundwater Gradient Directions

UPRR Parcel D
Emeryville, CA
November 2007
EKI A60021.00

Figure 2-17



N

0 100 200

(Approximate Scale in Feet)

Legend:

- Approximate Subject Property Boundary
- Storm Sewer
- Sanitary Sewer
- Soil Sampling Location
- Soil and Grab Groundwater Sampling Location
- Approximate Location of Monitoring Wells (Sherwin-Williams)

Notes:

1. All locations are approximate.
2. Basemap source: Pacific Aerial Surveys, Oakland, CA., dated 9 March 2005.

Erler & Kalinowski, Inc.

On-Site Sampling Locations

UPRR Parcel D
Emeryville, CA
November 2007
EKI A60021.00
Figure 3-1

20071127.14224784 G:\A60021.00\Nov07\Figure 3-1 - On-Site Sampling Locations.dwg Layout1

UPD-7	Depth (feet bgs)		
	0 - 2	2 - 2.5	2.5 - 3
TPH-d	**120**	6.5	<6.7
TPH-g	NA	<0.25	<0.3
TPH-mo	**410**	35	<34
Arsenic	**145**	**56.3**	**4.91**
Cadmium	**6.91**	0.912	0.542
Cobalt	8.96	14.1	10.9
Lead	**469**	50.3	7.04
Zinc	**660**	268	78.4

UPD-9	Depth (feet bgs)		
	0 - 2	2 - 2.5	2.5 - 3
TPH-d	56	<6	<7
TPH-g	NA	<0.25	<0.35
TPH-mo	260	<30	<35
Arsenic	**11.7**	**8.76**	**3.84**
Cadmium	**6.57**	<0.12	0.495
Cobalt	10.4	22.9	11.4
Lead	**579**	11.7	10
Zinc	**828**	115	106

UPD-12	Depth (feet bgs)		
	0 - 2.5	2 - 2.5	4.5 - 5
TPH-d	82	NA	62
TPH-g	NA	<0.238	0.67
TPH-mo	**410**	NA	<34
Arsenic	**98.9**	NA	**7.05**
Cadmium	**6.78**	NA	0.447
Cobalt	12.8	NA	12.7
Lead	**301**	NA	14.1
Zinc	501	NA	110

UPD-17	Depth (feet bgs)	
	0.5 - 1	2.5 - 3
TPH-d	<7.1	<6.7
TPH-g	<0.38	<0.28
TPH-mo	<36	<34
Arsenic	**6.2**	**4.98**
Cadmium	0.611	0.212
Cobalt	13.6	14.2
Lead	25.7	10.3
Zinc	120	86.3

UPD-19	Depth (feet bgs)	
	0.25 - 0.75	3 - 3.5
TPH-d	<6.9	<6.2
TPH-g	<0.33	<0.27
TPH-mo	<34	<31
Arsenic	**3.85**	**2.92**
Cadmium	0.552	0.288
Cobalt	9.85	5.22
Lead	23.2	5.9
Zinc	122	74

UPD-8	Depth (feet bgs)		
	0 - 2	2 - 2.5	2.5 - 3
TPH-d	**100**	<5.9	<6.7
TPH-g	NA	<0.24	<0.33
TPH-mo	**500**	<30	<34
Arsenic	**48.4**	**15.5**	**3.97**
Cadmium	**3.71**	0.233	0.401
Cobalt	11.7	24.9	8.88
Lead	**258**	25.4	8.72
Zinc	395	148	72.8

UPD-6	Depth (feet bgs)		
	0 - 3.5	1.5 - 2	3 - 3.5
TPH-d	**570**	NA	13
TPH-g	NA	<0.23	<0.24
TPH-mo	**2,000**	NA	35
Arsenic	**70.1**	NA	**8.45**
Cadmium	**3.49**	NA	<0.114
Cobalt	10.5	NA	19.2
Lead	**344**	NA	10.6
Zinc	561	NA	103

UPD-1	Depth (feet bgs)		
	0 - 2.25	2 - 2.5	4 - 4.5
TPH-d	55	**290**	<6.3
TPH-g	NA	<0.23	<0.28
TPH-mo	170	**750**	<32
Arsenic	**51.9**	**10.2**	**10.2**
Cadmium	1.13	0.551	0.174
Cobalt	9.99	14.8	11.1
Lead	120	**472**	29.6
Zinc	160	279	83.1

UPD-2	Depth (feet bgs)	
	1 - 1.5	5 - 5.5
TPH-d	<6	<6.1
TPH-g	<0.27	<0.27
TPH-mo	<30	46
Arsenic	**17.2**	**35.9**
Cadmium	0.444	0.37
Cobalt	11.6	**44.4**
Lead	9.9	13.7
Zinc	68.6	70.6

UPD-20	Depth (feet bgs)	
	0 - 0.5	1.5 - 2
TPH-d	17	<5.8
TPH-g	<0.23	<0.26
TPH-mo	59	<29
Arsenic	**46.6**	**7.79**
Cadmium	**4.41**	0.379
Cobalt	11.4	14.6
Lead	**350**	12.1
Zinc	540	66

UPD-11	Depth (feet bgs)		
	0 - 2.5	2.5 - 3	4 - 4.5
TPH-d	**230**	30	<7.1
TPH-g	NA	<0.25	<0.34
TPH-mo	**870**	140	<36
Arsenic	**19.3**	**66.9**	**7.35**
Cadmium	**10**	**4.6**	0.711
Cobalt	11.8	18.7	11.3
Lead	**307**	**365**	17.9
Zinc	**1,020**	481	122

UPD-3	Depth (feet bgs)		
	0 - 2	3 - 3.5	7.5 - 8
TPH-d	47	<6.2	16
TPH-g	NA	<0.26	<0.3
TPH-mo	140	<31	<32
Arsenic	**75.2**	**5.38**	**4.84**
Cadmium	1.16	0.427	<0.128
Cobalt	10.2	11.7	8.23
Lead	104	19.2	6.38
Zinc	200	70.5	58.4

UPD-10	Depth (feet bgs)		
	0 - 2.5	2.5 - 3	6.5 - 7
TPH-d	93	<6.7	<6.8
TPH-g	NA	<0.26	<0.37
TPH-mo	**440**	<34	<34
Arsenic	**57.8**	**23.5**	**6.88**
Cadmium	**9.99**	**3.95**	0.513
Cobalt	11.4	20.5	25.3
Lead	**401**	93	11
Zinc	**1,340**	225	114

UPD-4	Depth (feet bgs)		
	0 - 3	3 - 3.5	7.5 - 8
TPH-d	64	<6.7	<6.5
TPH-g	NA	<0.33	<0.31
TPH-mo	200	<33	<33
Arsenic	**26.1**	**14.9**	**2.6**
Cadmium	**8.28**	0.903	1.31
Cobalt	19.7	28.9	10
Lead	**684**	**254**	11.5
Zinc	**1,060**	251	136

UPD-5	Depth (feet bgs)				
	0 - 2	1.5 - 2	4 - 4.5	5 - 5.5	7.5 - 8
TPH-d	**3,200**	**5,400**	**340**	<7.2	22
TPH-g	NA	8.5	**240**	<0.34	<0.29
TPH-mo	**12,000**	**19,000**	**1,400**	<36	250
Arsenic	**11.1**	**17.8**	**6.09**	**6.07**	**2.37**
Cadmium	**3.18**	**2.78**	0.539	0.619	0.216
Cobalt	9.65	9.94	19.1	14.1	17.7
Lead	**328**	**474**	50.1	10	7.54
Zinc	438	489	122	115	84.2

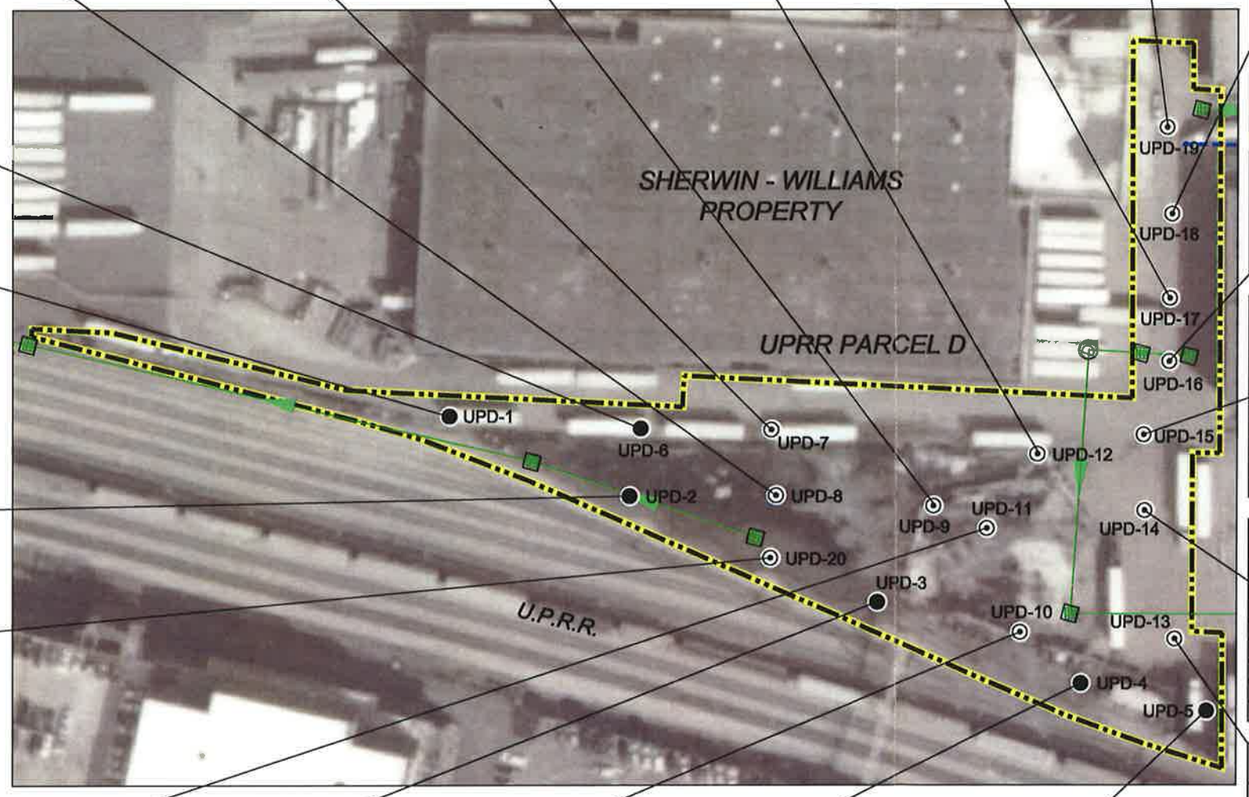
UPD-18	Depth (feet bgs)	
	0.5 - 1	2 - 2.5
TPH-d	12	<6.6
TPH-g	<0.25	<0.28
TPH-mo	32	<33
Arsenic	**3.71**	**7.33**
Cadmium	0.203	0.339
Cobalt	11.4	13.9
Lead	61.2	10.5
Zinc	80.1	90.5

UPD-16	Depth (feet bgs)		
	0.5 - 1	1.5 - 2	4 - 4.5
TPH-d	**720**	<6.9	<6.4
TPH-g	<0.27	<0.32	<0.27
TPH-mo	**1,800**	<35	<32
Arsenic	**7.22**	**4.69**	**16.2**
Cadmium	0.823	0.621	0.742
Cobalt	11.6	9.3	15
Lead	**480**	17.1	6.87
Zinc	215	141	71.5

UPD-15	Depth (feet bgs)		
	0 - 2.5	0.75 - 1.25	2.5 - 3
TPH-d	12	NA	<7
TPH-g	NA	<0.234	<0.36
TPH-mo	120	NA	<35
Arsenic	**20.3**	NA	**6.26**
Cadmium	0.337	NA	0.621
Cobalt	19.2	NA	14
Lead	31.3	NA	12
Zinc	173	NA	114

UPD-14	Depth (feet bgs)		
	0 - 2	1.5 - 2	2 - 2.5
TPH-d	18	NA	<7.5
TPH-g	NA	<0.229	<0.37
TPH-mo	120	NA	<37
Arsenic	**29.9**	NA	**6.68**
Cadmium	**2.73**	NA	0.722
Cobalt	34.3	NA	12.9
Lead	**175**	NA	15.4
Zinc	**2,970**	NA	115

UPD-13	Depth (feet bgs)			
	0 - 2	1 - 1.5	3 - 3.5	6 - 6.5
TPH-d	**110**	NA	<7.1	<6.2
TPH-g	NA	<0.227	<0.35	<0.27
TPH-mo	**420**	NA	<35	33
Arsenic	**70.9**	NA	**4.76**	**1.99**
Cadmium	1.41	NA	0.606	0.166
Cobalt	17.7	NA	11	4.27
Lead	112	NA	9.22	5.88
Zinc	228	NA	127	62.9



N

0 100 200

(Approximate Scale in Feet)

Legend:

- Approximate Subject Property Boundary
- Storm Sewer
- Sanitary Sewer
- Soil Sampling Location
- Soil and Grab Groundwater Sampling Location

Abbreviations:

<5	= not detected above the stated laboratory reporting limit
bgs	= below ground surface
NA	= Not Analyzed or Not Available
TPH-d	= Total Petroleum Hydrocarbons as diesel
TPH-g	= Total Petroleum Hydrocarbons as gasoline
TPH-mo	= Total Petroleum Hydrocarbons as motor oil

Notes:

1. All locations are approximate.
2. Basemap source: Pacific Aerial Surveys, Oakland, CA., dated 9 March 2005.
3. All surveyed samples and monitoring wells were surveyed by Kister, Savio & Rei, Inc. Coordinates based on the California Coordinate System NAD 1983, Zone 3. Elevations are based on NGVD 1929.
4. Concentrations in micrograms per kilograms (mg/kg).
5. Concentrations that equal or exceed selected screening levels are shown in **BOLD**.
6. Metal Concentrations that exceed background levels are underlined.
7. Sampling depths at each borehole do not include the thickness of overlying asphalt or concrete layers that range from approximately 0.5 to 1-foot in thickness.

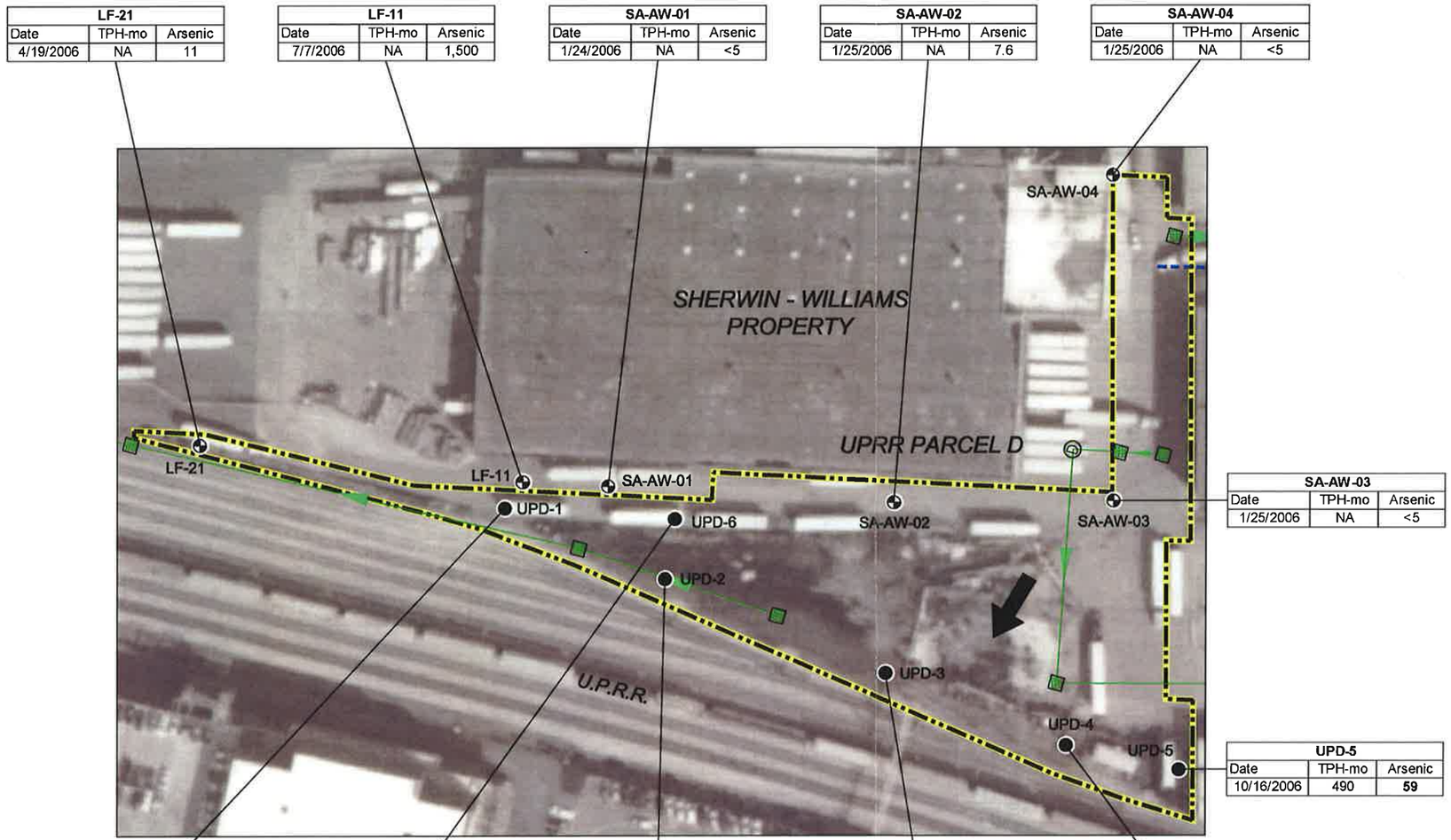
Erler & Kalinowski, Inc.

Identified Primary COCs in Soil

UPRR Parcel D
Emeryville, CA
November 2007
EKI A60021.00

Figure 4-1

20071127.14233428 G:\A60021.00\Nov07\NewFigure 4-1 - Identified COCs in Soil.dwg Layout1



LF-21		
Date	TPH-mo	Arsenic
4/19/2006	NA	11

LF-11		
Date	TPH-mo	Arsenic
7/7/2006	NA	1,500

SA-AW-01		
Date	TPH-mo	Arsenic
1/24/2006	NA	<5

SA-AW-02		
Date	TPH-mo	Arsenic
1/25/2006	NA	7.6

SA-AW-04		
Date	TPH-mo	Arsenic
1/25/2006	NA	<5

SA-AW-03		
Date	TPH-mo	Arsenic
1/25/2006	NA	<5

UPD-5		
Date	TPH-mo	Arsenic
10/16/2006	490	**59**

UPD-1		
Date	TPH-mo	Arsenic
10/16/2006	NA	**398**

UPD-6		
Date	TPH-mo	Arsenic
10/18/2006	1,100	NA

UPD-2		
Date	TPH-mo	Arsenic
10/16/2006	<250	6.17

UPD-3		
Date	TPH-mo	Arsenic
10/16/2006	<250	**12.1**

UPD-4		
Date	TPH-mo	Arsenic
10/16/2006	1,100	**106**

N

0 100 200

(Approximate Scale in Feet)

Legend:

- Approximate Subject Property Boundary
- Storm Sewer
- Sanitary Sewer
- Soil Sampling Location
- Soil and Grab Groundwater Sampling Location
- Approximate Location of Monitoring Wells (Sherwin-Williams)
- Approximate Groundwater Gradient Direction (LFR, 2006a)

Abbreviations:

<5	= not detected above the stated laboratory reporting limit
NA	= Not Analyzed or Not Available
TPH-d	= Total Petroleum Hydrocarbons as diesel
TPH-g	= Total Petroleum Hydrocarbons as gasoline
TPH-mo	= Total Petroleum Hydrocarbons as motor oil

Notes:

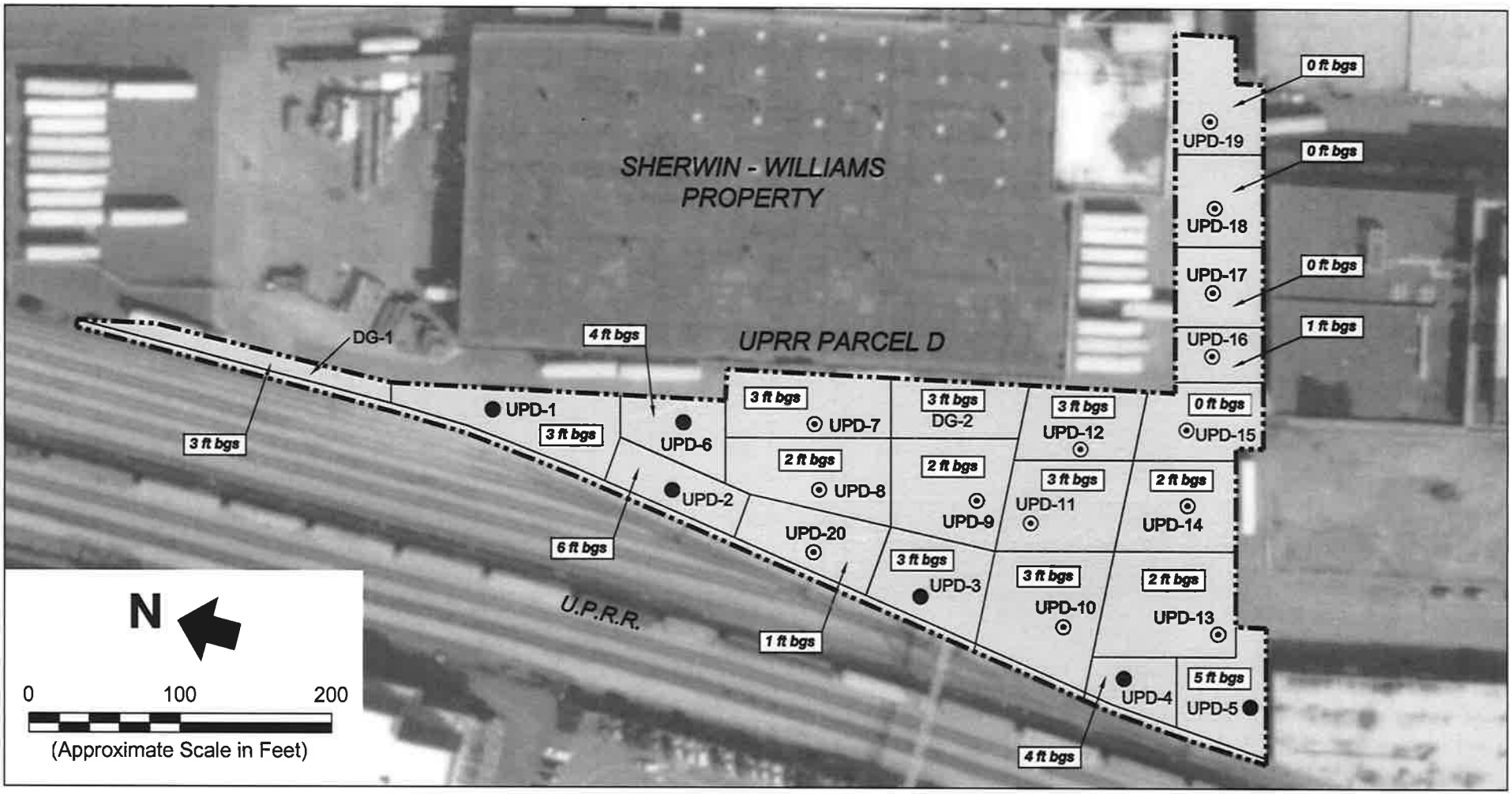
1. All locations are approximate.
2. Basemap source: Pacific Aerial Surveys, Oakland, CA., dated 9 March 2005.
3. All surveyed samples and monitoring wells were surveyed by Kister, Savio & Rei, Inc. Coordinates based on the California Coordinate System NAD 1983, Zone 3. Elevations are based on NGVD 1929.
4. Concentrations in micrograms per Liter (µg/L).
5. Sherwin-Williams groundwater monitoring data obtained from LFR, 2006a and LFR, 2006b. See report for references.
6. Concentrations that equal or exceed selected screening levels are shown in **BOLD**.

Erler & Kalinowski, Inc.

Identified Primary COCs in Groundwater

UPRR Parcel D
Emeryville, CA
November 2007
EKI A60021.00
Figure 4-2

20071127.14235897 C:\A60021.00\Nov07\NewFigure 4-2 – Identified COCs in Groundwater.dwg Layout1



Legend:

- Approximate Subject Property Boundary
- Soil Sampling Location (2-Inch Boreholes)
- Soil and Grab Groundwater Sampling Location (4-Inch Boreholes)
- 6 ft bgs — Target Excavation Depth
- ft bgs — feet below ground surface

Notes:

1. All locations are approximate.
2. Basemap source: Pacific Aerial Surveys, Oakland, CA., dated 9 March 2005.
3. All surveyed samples and monitoring wells were surveyed by Kister, Savio & Rei, Inc. Coordinates based on the California Coordinate System NAD 1983, Zone 3. Elevations are based on NGVD 1929.

Erler & Kalinowski, Inc.

Conceptual Site Excavation Plan

UPRR Parcel D
Emeryville, CA
November 2007
EKI A60021.00
Figure 6-1

APPENDIX A

EKI Phase I Report (on CD)

APPENDIX B

EKI Phase II Report (on CD)

APPENDIX C

Supporting Information for Remedial Cost Estimate

TABLE C1
Soil Remedial Criteria
UPRR Parcel D Project Area
Emeryville, California

COCs (a)	Detected Concentration Range (mg/kg)	Preliminary SSRGs for soil (mg/kg)	Basis for Preliminary SSRG
TPH-g	< 0.23 to 240	100	ESL (b)
TPH-d	< 5.8 to 5,400	100	ESL (b)
TPH-mo	< 29 to 19,000	410	ESL (b)
Arsenic	1.99 to 145	24	LBNL Background (c)
Cadmium	<0.114 to 10	5.6	LBNL Background (c)
Cobalt	4.27 to 44.4	25	LBNL Background (c)
Lead	5.88 to 684	150	PRG, and CHHSL (b, d, e)
Zinc	58.4 to 2,970	140	LBNL Background (c)

Abbreviations

CHHSL: California Human Health Screening Level
COCs: constituents of concern
ESLs: California Regional Water Quality Control Board - San Francisco Bay Region, Environmental Screening Levels
ft bgs: feet below ground surface
PRG: US EPA Region IX Preliminary Remediation Goals
SSRG: site-specific remedial goal
TPH: total petroleum hydrocarbons
TPH-g: total petroleum hydrocarbons as gasoline
TPH-d: total petroleum hydrocarbons as diesel
TPH-mo: total petroleum hydrocarbons as motor oil
mg/kg: milligrams per kilogram

References/Notes

a) Soil analytical data, the basis for the preliminary SSRGs, and the identification of COCs are discussed in the EKI, 2006a. *Soil and Groundwater Investigation Data Report*, UPRR Parcel D, Emeryville, California, Erler & Kalinowski, Inc., 14 November 2006. Soil analyical data for COCs are presented on Figures 2 and 3.
b) ESL: California Regional Water Quality Control Board - San Francisco Bay Region, Environmental Screening Level for Residential Shallow Soil (<3 meters) where potentially impacted groundwater is not a current or potential drinking water resource (Table K-1), Revised November 2007.
c) LBNL Background: LBNL and Parsons Engineering Science, Inc. Analysis of Background Distributions of Metals in Soil and Lawrence Berkeley National Laboratory, June 2002. Based on 99th percentile.
d) PRG: US EPA Region IX Preliminary Remediation Goals for Soil at Residential Sites, October 2004.
e) CHHSL: California EPA, Table 1 - California Human Health Screening Levels for Soil and Comparison to Other Potential Environmental Concerns, January 2005.

Assumptions

1) Soil remediation is assumed to primarily consist of soil excavation and disposal.
2) Preliminary SSRGs were selected to allow for relatively unrestricted use of the site for any development that may be contemplated and are also generally consistent with remedial goals at neighboring sites in the vicinity. No specific development scenario was considered.

TABLE C2a
Summary of Soil Excavation Volumes and Preliminary Waste Disposal Classification for Alternative 2 - Excavation and Off-Site Disposal
UPRR Parcel D Project Area
Emeryville, California

Cell (a)	Approximate Area of Cell Within Property Boundary (sq ft)	Depth Interval (ft bgs)	Excavation Thickness (b) (ft)	Overall Excavation Depth (b) (ft bgs)	Approximate Cell Volume/Weight (bcy)	Approximate Cell Volume/Weight (tons)	Basis for Excavation (c)	Preliminary Waste Disposal Classification (d)
DG-1	2,172	0 - 3	3	3	360	590	Based on data from nearby cells.	2
		3 - 6	0		0	0	Based on data from nearby cells.	NA
DG-2	3,226	0 - 3	3	3	360	590	Based on data from nearby cells.	2
		3 - 6	0		0	0	Based on data from nearby cells.	NA
UPD-1	5,054	0 - 3	3	3	560	920	TPH, Arsenic, Lead, and Zinc > SSRG	2
		3 - 6	0		0	0	No excavation - COCs < SSRGs	NA
UPD-2	2,814	0 - 3	3	6	310	510	COCs < SSRGs, excavate to access 3 to 6 ft bgs interval.	1
		3 - 6	3		310	510	Arsenic and Cobalt > SSRGs	2
UPD-3	3,704	0 - 3	3	3	410	680	Arsenic and Zinc >SSRG	2
		3 - 6	0		0	0	No excavation - COCs < SSRGs	NA
UPD-4	2,308	0 - 3	3	4	260	430	Arsenic, Cadmium, Lead, and Zinc > SSRGs	2
		3 - 6	1		90	150	Cobalt, Lead, and Zinc > SSRG	2
UPD-5	3,657	0 - 3	3	5	410	680	TPH, Lead, and Zinc > SSRG	2
		3 - 6	2		270	450	TPH > SSRG	2
UPD-6	2,822	0 - 3	3	4	310	510	TPH, Arsenic, Lead, anc Zinc > SSRGs	2
		3 - 6	1		100	170	TPH, Arsenic, Lead, anc Zinc > SSRGs	2
UPD-7	4,547	0 - 3	3	3	510	840	TPH, Arsenic, Cadmium, Lead, and Zinc > SSRGs	2
		3 - 6	0		0	0	COCs < SSRGs at depths >2.5 ft	NA
UPD-8	4,984	0 - 3	2	2	370	610	TPH, Arsenic, Lead, and Zinc > SSRGs. No excavation for zinc below 2 ft bgs (see text for rationale).	2
		3 - 6	0		0	0	COCs < SSRGs at depths >2 ft	NA
UPD-9	5,110	0 - 3	2	2	380	630	Cadmium, Lead, and Zinc > SSRGs	2
		3 - 6	0		0	0	COCs < SSRGs at depths >2 ft	NA
UPD-10	6,013	0 - 3	3	3	670	1,110	Arsenic, Cadmium, Lead, and Zinc > SSRGs	2
		3 - 6	0		0	0	Cobalt > SSRG, no excavation (see text for rationale)	NA
UPD-11	4,710	0 - 3	3	3	520	860	TPH, Arsenic, Cadmium, Lead, and Zinc > SSRGs	2
		3 - 6	0		0	0	No excavation - COCs < SSRGs	NA
UPD-12	3,674	0 - 3	3	3	410	680	Arsenic, Cadmium, Lead, and Zinc > SSRGs	2
		3 - 6	0		0	0	No excavation - COCs < SSRGs	NA
UPD-13	6,028	0 - 3	2	2	450	740	TPH, Arsenic, and Zinc > SSRGs	2
		3 - 6	0		0	0	No excavation - COCs < SSRGs	NA
UPD-14	4,410	0 - 3	2	2	330	540	Arsenic, Cobalt, Lead, and Zinc > SSRGs	2
		3 - 6	0		0	0	COCs < SSRGs at depths >2 ft	NA

TABLE C2a
Summary of Soil Excavation Volumes and Preliminary Waste Disposal Classification for Alternative 2 - Excavation and Off-Site Disposal

UPRR Parcel D Project Area
Emeryville, California

Cell (a)	Approximate Area of Cell Within Property Boundary (sq ft)	Depth Interval (ft bgs)	Excavation Thickness (b) (ft)	Overall Excavation Depth (b) (ft bgs)	Approximate Cell Volume/Weight (bcy)	Approximate Cell Volume/Weight (tons)	Basis for Excavation (c)	Preliminary Waste Disposal Classification (d)
UPD-15	3,843	0 - 3	0	0	0	0	Zinc > SSRG, no excavation (see text for rationale)	NA
		3 - 6	0		0	0	No excavation - COCs < SSRGs	NA
UPD-16	2,101	0 - 3	1	1	80	130	TPH, Lead, and Zinc > SSRG	2
		3 - 6	0		0	0	No excavation - COCs < SSRGs	NA
UPD-17	3,034	0 - 3	0	0	0	0	No excavation - COCs < SSRGs	NA
		3 - 6	0		0	0	No excavation - COCs < SSRGs	NA
UPD-18	3,529	0 - 3	0	0	0	0	No excavation - COCs < SSRGs	NA
		3 - 6	0		0	0	No excavation - COCs < SSRGs	NA
UPD-19	3,936	0 - 3	0	0	0	0	No excavation - COCs < SSRGs	NA
		3 - 6	0		0	0	No excavation - COCs < SSRGs	NA
UPD-20	3,688	0 - 3	1	1	140	230	Arsenic, Lead, and Zinc > SSRGs	2
		3 - 6	0		0	0	No excavation - COCs < SSRGs	NA
TOTAL (e)	**85,400**				**7,600**	**12,600**		
Subtotals (Non-Hazardous Material):					**300**	**500**		
Subtotals (Non-RCRA Hazardous Waste):					**7,300**	**12,100**		
Subtotals (RCRA Hazardous Waste):					**0**	**0**		

TABLE C2a
Summary of Soil Excavation Volumes and Preliminary Waste Disposal Classification for Alternative 2 - Excavation and Off-Site Disposal

UPRR Parcel D Project Area
Emeryville, California

Cell (a)	Approximate Area of Cell Within Property Boundary (sq ft)	Depth Interval (ft bgs)	Excavation Thickness (b) (ft)	Overall Excavation Depth (b) (ft bgs)	Approximate Cell Volume/Weight (bcy)	Approximate Cell Volume/Weight (tons)	Basis for Excavation (c)	Preliminary Waste Disposal Classification (d)

Abbreviations

bcy: bank (in-place) cubic yards
bgs: below ground surface
COCs: chemicals of concern
NA: not applicable
sq ft: square feet
SSRGs: site-specific remedial goals
STLC: Soluble Threshold Limit Concentration
TCLP: Toxicity Characteristic Leaching Procedure
TPH: total petroleum hydrocarbons
UTS: Universal Treatment Standard

Notes

a) Delineation of the representative area of each cell based on density of sampling locations and current understanding of lithological conditions. Existing access roads and the shape of the site limited the locations of where some samples could be collected; therefore, two data gap areas have identified and are designated with cell names beginning with "DG-."
b) See "Basis for Excavation" column for explanation of the excavation thickness for each cell within each depth interval and the overall excavation depth for each cell.
c) COCs and SSRGs are defined in Table 1. Excavation depth is based on review of data regarding fill thickness and depth of samples where COCs exceeded SSRGs. A preliminary estimate was made for excavation depth based on available data. The actual depth of excavation may vary.
d) The basis for waste disposal classification and the waste disposal classification index is defined in Table 3. Preliminary waste disposal classification is based on review of soil data and classification criteria listed in Table 3 and as discussed in the EKI, 2006b. Memorandum regarding *Summary of Additional Chemical and Geotechnical Soil Data*, UPRR Parcel D, Emeryville, California, Erler & Kalinowski, Inc., 17 November 2006. Proposed excavated soils are preliminarily classified as non-RCRA hazardous waste based on TCLP results from selected soil samples. Further analysis would be need to be performed to determine if proposed excavated soils could be classified as non-hazardous waste.
e) Totals and subtotals are rounded.

Assumptions

1) Assume 1.65 tons per bcy.
2) Active railroad tracks border the site to the west. Assume that excavation will not extend to within 25 feet of a railroad track.
3) The Sherwin Williams building currently borders the site to the east. Assume that excavation methods and lateral extent of excavation will not be impacted by the Sherwin Williams building.

TABLE C2b
Summary of Soil Excavation Volumes and Preliminary Waste Disposal Classification for Alternative 3 - Limited Excavation with Off-Site Disposal and Capping

UPRR Parcel D Project Area
Emeryville, California

Cell (a)	Approximate Area of Cell Within Property Boundary (sq ft)	Depth Interval (ft bgs)	Excavation Thickness (b) (ft)	Overall Excavation Depth (b) (ft bgs)	Approximate Cell Volume/Weight (bcy)	Approximate Cell Volume/Weight (tons)	Basis for Excavation (c)	Preliminary Waste Disposal Classification (d)
UPRR Parcel D								
DG-1	2,172	0 - 3	1	1	80	130	Based on data from nearby cells.	2
DG-2	3,226				120	200	Based on data from nearby cells.	2
UPD-1	5,054				190	310	TPH, Arsenic, Lead, and Zinc > SSRG	2
UPD-2	2,814				100	170	COCs < SSRGs, but excavate for Alternative	1
UPD-3	3,704				140	230	Arsenic and Zinc >SSRG	2
UPD-4	2,308				90	150	Arsenic, Cadmium, Lead, and Zinc > SSRGs	2
UPD-5	3,657				140	230	TPH, Lead, and Zinc > SSRG	2
UPD-6	2,822				100	170	TPH, Arsenic, Lead, anc Zinc > SSRGs	2
UPD-7	4,547				170	280	TPH, Arsenic, Cadmium, Lead, and Zinc > SSRGs	2
UPD-8	4,984				180	300	TPH, Arsenic, Lead, and Zinc > SSRGs	2
UPD-9	5,110				190	310	Cadmium, Lead, and Zinc > SSRGs	2
UPD-10	6,013				220	360	Arsenic, Cadmium, Lead, and Zinc > SSRGs	2
UPD-11	4,710				170	280	TPH, Arsenic, Cadmium, Lead, and Zinc > SSRGs	2
UPD-12	3,674				140	230	Arsenic, Cadmium, Lead, and Zinc > SSRGs	2
UPD-13	6,028				220	360	TPH, Arsenic, and Zinc > SSRGs	2
UPD-14	4,410				160	260	Arsenic, Cobalt, Lead, and Zinc > SSRGs	2
UPD-15	3,843				140	230	Zinc > SSRG	1
UPD-16	2,101				80	130	TPH, Lead, and Zinc > SSRG	2
UPD-17	3,034				110	180	COCs < SSRGs, but excavate for Alternative	1
UPD-18	3,529				130	210	COCs < SSRGs, but excavate for Alternative	2
UPD-19	3,936				150	250	COCs < SSRGs, but excavate for Alternative	1
UPD-20	3,688				140	230	Arsenic, Lead, and Zinc > SSRGs	2

TABLE C2b
Summary of Soil Excavation Volumes and Preliminary Waste Disposal Classification for Alternative 3 - Limited Excavation with Off-Site Disposal and Capping

UPRR Parcel D Project Area
Emeryville, California

Cell (a)	Approximate Area of Cell Within Property Boundary (sq ft)	Depth Interval (ft bgs)	Excavation Thickness (b) (ft)	Overall Excavation Depth (b) (ft bgs)	Approximate Cell Volume/Weight (bcy)	Approximate Cell Volume/Weight (tons)	Basis for Excavation (c)	Preliminary Waste Disposal Classification (d)
UPRR Parcel D Utility Corridors								
UPD-7	324	0 - 3	2	3	20	30	Excavation for Utility Corridor, no excavation for COCs > SSRGs. See Basis for Excavation for Cells under UPRR Parcel D for excavation of COCs > SSRGs under this Alternative.	2
		3 - 6	1		10	20		2
DG-2	272	0 - 3	2		20	30		2
		3 - 6	1		10	20		2
UPD-12	233	0 - 3	2		20	30		2
		3 - 6	1		10	20		2
UPD-5	163	0 - 3	2		10	20		2
		3 - 6	1		10	20		2
UPD-13	208	0 - 3	2		20	30		2
		3 - 6	1		10	20		1
UPD-14	180	0 - 3	2		10	20		2
		3 - 6	1		10	20		2
UPD-15	240	0 - 3	2		20	30		1
		3 - 6	1		10	20		1
UPD-16	378	0 - 3	2		30	50		2
		3 - 6	1		10	20		1
UPD-17	314	0 - 3	2		20	30		1
		3 - 6	1		10	20		1
UPD-18	366	0 - 3	2		30	50		2
		3 - 6	1		10	20		1
UPD-19	468	0 - 3	2		30	50		1
		3 - 6	1		20	30		1
TOTAL (e)	**85,400**				**3,500**	**5,800**		
Subtotals (Non-Hazardous Material):					**600**	**1,000**		
Subtotals (Non-RCRA Hazardous Waste):					**2,900**	**4,800**		
Subtotals (RCRA Hazardous Waste):					**0**	**0**		

TABLE C2b
Summary of Soil Excavation Volumes and Preliminary Waste Disposal Classification for Alternative 3 - Limited Excavation with Off-Site Disposal and Capping

UPRR Parcel D Project Area
Emeryville, California

Cell (a)	Approximate Area of Cell Within Property Boundary (sq ft)	Depth Interval (ft bgs)	Excavation Thickness (b) (ft)	Overall Excavation Depth (b) (ft bgs)	Approximate Cell Volume/Weight (bcy)	Approximate Cell Volume/Weight (tons)	Basis for Excavation (c)	Preliminary Waste Disposal Classification (d)

Abbreviations

bcy: bank (in-place) cubic yards
bgs: below ground surface
COCs: chemicals of concern
NA: not applicable
sq ft: square feet
SSRGs: site-specific remedial goals
STLC: Soluble Threshold Limit Concentration
TCLP: Toxicity Characteristic Leaching Procedure
TPH: total petroleum hydrocarbons
UPRR: Union Pacific Railroad
UTS: Universal Treatment Standard

Notes

a) Delineation of the representative area of each cell based on density of sampling locations and current understanding of lithological conditions. Existing access roads and the shape of the site limited the locations of where some samples could be collected; therefore, two data gap areas have identified and are designated with cell names beginning with "DG-."
b) See "Basis for Excavation" column for explanation of the excavation thickness for each cell within each depth interval and the overall excavation depth for each cell.
c) COCs and SSRGs are defined in Table 1. Excavation depth is based on review of data regarding fill thickness and depth of samples where COCs exceeded SSRGs. A preliminary estimate was made for excavation depth based on available data. The actual depth of excavation may vary.
d) The basis for waste disposal classification and the waste disposal classification index is defined in Table 3. Preliminary waste disposal classification is based on review of soil data and classification criteria listed in Table 3 and as discussed in the EKI, 2006b. Memorandum regarding *Summary of Additional Chemical and Geotechnical Soil Data*, UPRR Parcel D, Emeryville, California, Erler & Kalinowski, Inc., 17 November 2006. Proposed excavated soils are preliminarily classified as non-RCRA hazardous waste based on TCLP results from selected soil samples. Further analysis would need to be performed to determine if proposed excavated soils could be classified as non-hazardous waste. If soil analytical data was not available for the 3-6 ft bgs interval, preliminary waste disposal classifications for cells under UPRR Parcel D Utility Corridors were given the same classification as the same cell excavated within the 0-3 ft bgs interval under UPRR Parcel D.
e) Totals and subtotals are rounded. The total approximate area of excavation cells within property boundary does not recount utility corridors.

Assumptions

1) Assume 1.65 tons per bcy.
2) Active railroad tracks border the site to the west. Assume that excavation will not extend to within 25 feet of a railroad track.
3) The Sherwin Williams building currently borders the site to the east. Assume that excavation methods and lateral extent of excavation will not be impacted by the Sherwin Williams building.

TABLE C3
Preliminary Waste Disposal Classification Criteria
UPRR Parcel D Project Area
Emeryville, California

Index	Proposed Waste Disposal Classification	Preliminary Waste Disposal Classification Criteria (a, b)	Basis
1	Non-hazardous	TPH-d and TPH-mo < 15,000 mg/kg TPH-g < 5,000 mg/kg	West Contra Costa County Landfill Requirements
		Arsenic < 50 mg/kg Cadmium < 10 mg/kg Chromium < 50 mg/kg Cobalt < 800 mg/kg Lead < 50 mg/kg Zinc < 2,500 mg/kg	Not likely to exceed STLC criteria
2	Non-RCRA hazardous (California hazardous)	TPH-d and TPH-mo > 15,000 mg/kg TPH-g > 5,000 mg/kg	Exceeds West Contra Costa County Landfill Requirements
		Arsenic > 50 mg/kg and TCLP Arsenic < 5 mg/L 50 mg/kg < Chromium < 100 mg/kg 10 mg/kg < Cadmium < 20 mg/kg Cobalt > 800 mg/kg Lead > 50 mg/kg and TCLP Lead < 5 mg/L Zinc > 2,500 mg/kg	Likely to exceed STLC criteria but not likely to exceed TCLP criteria
3	RCRA hazardous	TCLP Arsenic >= 5 mg/L TCLP Lead >= 5 mg/L	RCRA hazardous waste classification if TCLP results are greater than or equal to TCLP criteria.

Abbreviations
mg/kg: milligrams per kilogram
mg/L: milligrams per liter
TPH-d: total petroleum hydrocarbons as diesel
TPH-g: total petroleum hydrocarbons as gasoline
TPH-mo: total petroleum hydrocarbons as motor oil
RCRA: Resource Conservation and Recovery Act
STLC: Soluble Threshold Limit Concentration (indicator of California hazardous waste)
TCLP: Toxicity Characteristic Leaching Procedure (indicator of Federal hazardous waste)
UTS: Universal Treatment Standard (Federal standard)

Notes
a) Soil analytical data are presented in the EKI, 2006a. *Soil and Groundwater Investigation Data Report*, UPRR Parcel D, Emeryville, California, Erler & Kalinowski, Inc., 14 November 2006.
b) RCRA hazardouse waste characterization data are presented in the EKI, 2006b. Memorandum regarding *Summary of Additional Chemical and Geotechnical Soil Data*, UPRR Parcel D, Emeryville, California, Erler & Kalinowski, Inc., 17 November 2006.

TABLE C4
Derivation of Unit Costs
UPRR Parcel D Project Area
Emeryville, California

Task Description	Unit	Unit Cost	Comments
CAPITAL COSTS			
General Site Preparation			
• Erect and maintain perimeter temporary fence	ft	$27	Temporary construction fencing for site security, Means, 01560-250-0400.
Excavate and Dispose of Waste and Soil, Lay Geotextile Fabric, Place Backfill, and Compact Site (a)			
• Excavate waste (3 1/2 cy bucket) and place in end-dump truck	cy	$6.5	3 1/2 cy backhoe, 6-16 cy dump trailers, 1 mile round trip, Means G1030-120-3400
• Transport and dispose of non-hazardous material at Class II facility (a)	ton	$60	Local landfill quotation.
• Transport and dispose of soil as non-RCRA hazardous waste (a)	ton	$100	Local landfill cost estimate.
• Transport and dispose of soil as RCRA hazardous waste (a)	ton	$140	Based on local landfill cost estimate.
• Transport and dispose of soil as RCRA hazardous waste, with stabilization (a)	ton	$200	Local landfill cost estimate.
• Import, place, and compact backfill material (a)	ton	$30	Assumes standard backfill material, local contractor quotation.
• Lay non-woven, 120 lb tensile strength geotextile fabric	sy	$1.69	Means 2006, 02340-300-1550
Site Capping (Low Permeability Cover) and Restoration			
• Purchase and install textured 40-mil geomembrane	cf	$0.80	Erler & Kalinowski, Inc. project experience, assumes HDPE or LLDPE membrane.
• Purchase and install geocomposite drainage net (2 sides)	cf	$1.00	Drainage net, heat bonded 2 sides, Erler & Kalinowski, Inc. project experience, ECHOS 33-08-0152
• Purchase and install geosynthetic clay liner	cf	$0.80	Erler & Kalinowski, Inc. project experience, geosynthetic clay liner, ECHOS 33-08-0520.
• Import and place 6 inches of topsoil	cf	$0.70	Erler & Kalinowski, Inc. project experience, Means 02910-810-0800
• Restore site vegetation	cf	$0.04	Erler & Kalinowski, Inc. project experience, Means 02920-320-3500
Construct Groundwater Monitoring Wells			
• Log lithology of borings for monitoring wells	ea	$1,200	Assumes 1 geologist at $100/hr, 6 hr/well, plus $600 for permitting and equipment
• Construct 2-inch PVC monitoring wells	ea	$3,500	Assumes 20 ft deep well, local contractor quotation. No analytical sampling of soil.
• Sample and dispose of drill cuttings	ea	$700	Assumes disposal of 2 55-gallon drums of waste per well.
• Develop monitoring wells	ea	$420	Assumes 1 geologist at $100/hr develops 3 wells in 10 hr day, plus $250 materials and equipment rental.

TABLE C4
Derivation of Unit Costs
UPRR Parcel D Project Area
Emeryville, California

Task Description	Unit	Unit Cost	Comments
Design and Construction Management Services			
• Construction observation			
Provide senior engineering manager	week	$2,100	Assumes engineer $160/hr, 1/3 time throughout construction.
Provide resident engineer	week	$7,500	Assumes 1 engineer $150/hr, 10 hr/day, 5 day/week throughout construction.
Provide engineer to coordinate disposal issues and data	week	$6,500	Assumes 1 engineer $130/hr, 10 hr/day, 5 day/week for a week during construction to coordinate disposal issues with waste management facilities and to track shipments of waste.
Provide office support	week	$1,700	Assumes 1 junior engineer $85/hr, 4 hr/day, 5 day/week throughout construction.
Lease vehicle	mo	$1,200	Assumes monthly vehicle lease for field engineer(s) throughout construction.
Provide equipment	week	$325	Assumes field supplies, photographs, OVM, and other H&S equipment.
ANNUAL COSTS			
• Sample monitoring wells	ea	$250	Assume 1 geologist at $100/hr samples 5 wells in 10 hr day, plus $250 of materials and equipment rental.
Laboratory Analysis			
• Sample analysis/preparation (b)			
Title 22 metals (EPA Method 6020)	ea	$170	Local lab quotation.
Total petroleum hydrocarbons as gasoline ("TPH-g") (EPA Method 8015M)	ea	$110	Local lab quotation.
Total petroleum hydrocarbons as diesel/motor oil ("TPH-d" / "TPH-mo"), with silica gel cleanup (EPA Method 8015M)	ea	$50	Local lab quotation.
Extraction for STLC or TCLP	ea	$40	Local lab quotation.
Sample preparation for TPH-g analysis in soil	ea	$40	Local lab quotation.
Encore samplers for TPH-g	ea	$10	Local lab quotation. 3 Encore samplers for each TPH-g sample.
Inspect and Repair Cover System			
• Perform topographic survey to monitor settling every 5 years	ls	$500	$2,500 min/acre every 5 years or equivalent annual cost of $500/yr, EKI project experience.
• Repair periodic breaches to cover	ls	$5,000	Assume $25,000 to repair significant breaches of cover system every 5 years, or equivalent annual cost of $5,000 per year, EKI project experience.
• Prepare annual letter report of cover status	ls	$1,000	Assume $1,000 for site visit and annual letter report to document cover status. EKI project experience.
• Conduct five year review of remedy performance	ls	$1,000	Assume $5,000 to prepare report to regulatory agencies on effectiveness of remedial action every 5 years or equivalent annual cost of $1,000/yr. EKI project experience.

TABLE C4
Derivation of Unit Costs
UPRR Parcel D Project Area
Emeryville, California

Task Description	Unit	Unit Cost	Comments

Abbreviations
cf: cubic feet
cy: cubic yards
ea: each
ft: feet
HDPE: High Density Polyethylene
hr: hour
lb: pound
LLDPE: Linear Low Density Polyethylene
ls: lump sum
mo: month
OVM: Organic Vapor Meter
PVC: Polyvinyl Chloride
RCRA: Resource Conservation and Recovery Act
sq ft: square feet
STLC: Soluble Threshold Limit Concentration
sy: square yard
TCLP: Toxicity Characteristic Leaching Procedure

Notes
(a) Transportation costs are based on November 2006 conditions and could subject to fuel surcharges depending on the cost of diesel. Such fuel charges, if any, are unknown and are not included in this preliminary cost estimate.
(b) Analyte list based on current understanding of subsurface conditions and chemicals of concern in November 2006.

TABLE C5a
Preliminary Cost Estimate for Alternative 2 - Excavation and Off-Site Disposal
UPRR Parcel D Project Area
Emeryville, California

Item (see notes page for additional assumptions)	Estimated Costs (a,b,c)				
	Unit	Quantity	Unit Cost	Line Totals	Subtotals
CAPITAL COSTS					
REGULATORY NEGOTIATIONS					
Develop Remedial Action Plan	ls	1	$50,000	$50,000	
Develop Remedial Design & Implementation Plan	ls	1	$50,000	$50,000	
Agency and property owner discussions	ls	1	$50,000	$50,000	
Subtotal: Regulatory Negotiations					**$150,000**
SOIL EXCAVATION AND DISPOSAL					
Contractor Costs					
Mobilization / demobilization	ls	1	$30,000	$30,000	
Surveying					
Pre-Excavation Surveying - delineate excavation cells	ls	1	$5,000	$5,000	
Post-Excavation Surveying - survey completed excavation	ls	1	$7,500	$7,500	
Dewatering	gallons	300,000	$0.30	$90,000	
Erect and maintain perimeter temporary fence	ft	2,400	$27	$63,700	
Excavate and load fill into end dump trucks	bcy	7,600	$6.50	$49,400	
Soil transportation and disposal					
Non-hazardous (Class II)	ton	500	$60	$30,200	
Non-RCRA hazardous waste	ton	12,100	$100	$1,200,000	
RCRA hazardous waste	ton		$140		
Site Restoration					
Import, place, and compact structural fill	ton	12,600	$30	$400,000	
Subtotal: Soil Excavation and Disposal (Contractor costs including disposal)					**$1,880,000**
Average contractor cost, per cubic yard					*$247/yd3*

TABLE C5a
Preliminary Cost Estimate for Alternative 2 - Excavation and Off-Site Disposal
UPRR Parcel D Project Area
Emeryville, California

Item (see notes page for additional assumptions)	Estimated Costs (a,b,c)				
	Unit	Quantity	Unit Cost	Line Totals	Subtotals
ENGINEERING SERVICES					
Engineering Services During Pre-Design Phase					
Additional investigation for pre-excavation waste classification and coordination with landfill	ls	1	$100,000	$100,000	
Engineering Services During Remediation Design Phase					
Design / Contracting	ls	1	$50,000	$50,000	
Engineering Services During Remediation					
Pre-mobilization contractor management and planning	ls	1	$10,000	$10,000	
Provide senior engineering manager	week	6	$2,100	$12,600	
Provide resident engineer	week	6	$7,500	$45,000	
Provide engineer to coordinate disposal issues and data	week	6	$6,500	$39,000	
Provide office support	week	6	$1,700	$10,200	
Lease vehicle	mo	2	$1,200	$2,400	
Perimeter air monitoring	week	6	$1,250	$7,500	
Provide equipment	week	6	$325	$1,950	
Analytical (confirmation samples)	sample	100	$600	$60,000	
Analytical (additional disposal samples)	sample	6	$830	$4,980	
Prepare excavation completion report	ls	1	$50,000	$50,000	
Subtotal: Engineering Services without Project Management					$394,000
Engineering Project Management (10% of Engineering Subtotal)	ls	1	$39,400	$39,400	
Subtotal: Engineering Services					**$430,000**
GROUNDWATER MONITORING					
Monitoring Plan					
Prepare groundwater monitoring plan, obtain DTSC approval	ls	1	$15,000	$15,000	
Install perimeter monitoring wells	ls	4	$3,000	$12,000	
Develop monitoring wells	ls	4	$700	$2,800	
Subtotal: Groundwater Monitoring					**$30,000**

TABLE C5a
Preliminary Cost Estimate for Alternative 2 - Excavation and Off-Site Disposal
UPRR Parcel D Project Area
Emeryville, California

Item (see notes page for additional assumptions)	Estimated Costs (a,b,c) Unit	Quantity	Unit Cost	Line Totals	Subtotals
Not Included in Cost Estimate					
Concrete and surface debris demolition / removal (if necessary)					
Existing building demolition / removal / relocation (if necessary)					
Underground utility relocation and restoration (if necessary)					
Final grading (assumed part of redevelopment)					
Health & safety upgrade to Level B (if necessary)					
Subtotal Cost Range - Estimated for Soil Transportation and Disposal (d)				$900,000	to $1,800,000
Subtotal Cost Range - Estimated or Remaining Capital Costs (d)				$900,000	to $1,900,000
Legal and Administrative Cost Range (assumed to be 5% of subtotal)				$45,000	to $95,000
Subtotal Cost Range - Including Legal and Administrative Costs				$1,800,000	to $3,800,000
Contingency Range (assumed to be 30% of subtotal range) (e)				$540,000	to $1,100,000
ESTIMATED TOTAL CAPITAL COST RANGE (d)				**$2,300,000**	**to $4,900,000**
ANNUAL COSTS					
GROUNDWATER MONITORING					
Annual Groundwater Sampling and Analysis					
Sampling planning and coordination	event	1	$1,000	$1,000	
Measure water levels, purge/sample wells, dispose of purge water	event	1	$2,000	$2,000	
Groundwater sample analyses (4 wells, 1 duplicate, 1 trip blank)					
Title 22 metals (EPA Method 6020)	ea	5	$170	$900	
Total petroleum hydrocarbons as gasoline ("TPH-g") (EPA Method 8015M)	ea	6	$110	$660	
Total petroleum hydrocarbons as diesel/motor oil ("TPH-d" / "TPH-mo"), with silica gel cleanup (EPA Method 8015M)	ea	5	$50	$300	
Groundwater monitoring report					
Prepare groundwater monitoring report, submit to DTSC	event	1	$15,000	$15,000	
Annual Subtotal: Groundwater Monitoring	*(cost per year)*				$40,000
Present Worth of Annual Costs: Groundwater Monitoring	***(assumed 30-year duration)***				**$190,000**
ESTIMATED TOTAL PRESENT WORTH COST RANGE (d)				**$2,500,000**	**to $5,100,000**

TABLE C5a
Preliminary Cost Estimate for Alternative 2 - Excavation and Off-Site Disposal
UPRR Parcel D Project Area
Emeryville, California

Notes

(a) See Table 4 for derivation of unit costs for several line items. Line items listed above but not listed in Table 4 are based on EKI's experience with similar projects.
(b) Actual remediation costs would be affected by determination of final cleanup levels, determination of the final scope of excavation, acutal waste classification and quantities, selection of actual disposal facilities, actual material and contractor pricing, and current bidding environment.
(c) Subtotals are rounded.
(d) A -30 to +50 percent accuracy range is applied to the estimated total capital costs per US EPA guidelines (US EPA, 2000).
(e) A 30% contingency on overall costs has been included. Actual costs may exceed this level of contingency depending on further evaluations, regulatory agency determinations, field conditions encountered during construction, worksite restrictions, bidding environment at time of work, contractor's costs, actual volume and classification of soil, and other site conditions.

Abbreviations

BOE: Board of Equalization
bcy: bank cubic yards
cy: cubic yards
ea: each
ls: lump sum
mo: month
sq ft: square feet
STLC: Soluble Threshold Limit Concentration
TAT: turn around time
TCLP: Toxicity Characteristic Leaching Procedure

Assumptions for Pre-Excavation Tasks

1) Assume that the following tasks, if needed, will be performed by others as separate cost items and are not included herein:
   - Costs of land, easements and rights-of-way
   - Demolition and removal of concrete, asphalt, and surface debris
   - Archaeological investigations and impacts
   - Removal or relocation of existing underground utilities or other site improvements
   - Final grading or paving

TABLE C5a
Preliminary Cost Estimate for Alternative 2 - Excavation and Off-Site Disposal
UPRR Parcel D Project Area
Emeryville, California

Assumptions for Soil Excavation and Disposal

1) Assume design such that negotiations and coordination with Union Pacific Railroad are not required.
2) Assume shoring not required and sidewall sloping is sufficient based on preliminary excavation depths.
3) Potential limited dewatering required based on seasonal variations in depth to water and estimated excavation depths in specific areas of the site. Assume disposal dewatering water is non-hazardous. Assume 2-foot depth of water in each cell with excavation depth greater than 4 feet will be dewatered two times. Actual cost of dewatering would be affected by depth of excavation, final design, selection of disposal facility, quantity of water, and disposal classification. Assume that dewatering water will meet criteria for disposal off-site without on-site treatment.
4) Assume work is limited to regular working hours.
5) Assume Level C health and safety protection is sufficient to complete soil excavation and disposal activities.
6) Assume excavated soil will be transported off-site for disposal at approriately permitted land disposal facilities.
7) Assume no BOE disposal taxes if City of Emeryville responsible for disposal.
8) Assume no BOE generator fees if City of Emeryville responsible for disposal.
9) Assume non-hazardous waste is disposed within Alameda County and out of county local taxes are not applicable.
10) Assume that excavation will occur during the dry season. Assume that soils will not generate free water after placement in the truck.
11) Assume clean fill will be imported to backfill the excavation to existing grade. No excavated soil is assumed to be reused as backfill.
12) Assume soil excavation and disposal and ongoing groundwater monitoring are sufficient remedial measures to satisfy state regulatory agencies.

Assumptions for Engineering Services

1) Assume that waste classifications for disposed soil will be pre-approved by the landfills prior to excavation due to limited on-site space for stockpiling after soil is excavated. Assume additional soil characterization is necessary to facilitate obtaining pre-approvals of final waste classifications from the landfills.
2) Assume excavation rate of 500 bcy per day.
3) Assume import, place, and compact fill at 1000 bcy per day.
4) Confirmation sampling - assume every 2,500 sq ft for bottom samples and every 50 ft for sidewall samples with 10% retest rate. Assume 2 day TAT with 50% increase in unit cost.
5) Confirmation analysis - confirmation sample to be analyzed for Title 22 metals, TPH-g, TPH-d, and TPH-mo.
6) Disposal sampling - assume additional samples collected every ~1,500 bcy with 10% retest rate. Assume 2 day TAT with 50% increase in unit cost.
7) Disposal analysis - disposal samples to be a) extracted per STLC and TCLP procedures and analyzed for Title 22 metals and b) analyzed for TPH-g and TPH-d.

TABLE C5a
Preliminary Cost Estimate for Alternative 2 - Excavation and Off-Site Disposal
UPRR Parcel D Project Area
Emeryville, California

Assumptions for Groundwater Monitoring

1) Assume short-term groundwater monitoring would be conducted to confirm the effectiveness of the source removal activities.
1) Assume 4 perimeter monitoring wells (4 along western boundary).
2) Assume 5 year duration for groundwater monitoring.
3) 5-year real interest rate = 2.6% based on OMB Circular No. A-94, Revised December 2006.

TABLE C5b

Preliminary Cost Estimate for Alternative 3 - Limited Excavation with Off-Site Disposal and Capping

UPRR Parcel D Project Area
Emeryville, California

Item (see notes page for additional assumptions)	Estimated Costs (a.b.c) Unit	Quantity	Unit Cost	Line Totals	Subtotals
CAPITAL COSTS					
REGULATORY NEGOTIATIONS					
Develop Remedial Action Plan	ls	1	$50,000	$50,000	
Develop Remedial Design & Implementation Plan	ls	1	$50,000	$50,000	
Agency and property owner discussions	ls	1	$50,000	$50,000	
Subtotal: Regulatory Negotiations					**$150,000**
CONTRACTOR COSTS					
Contractor Costs					
Mobilization / demobilization	ls	1	$30,000	$30,000	
Surveying					
Pre-Excavation Surveying - delineate excavation cells	ls	1	$5,000	$5,000	
Post-Excavation Surveying - survey completed excavation	ls	1	$7,500	$7,500	
Erect and maintain perimeter temporary fence	ft	2,400	$27	$63,700	
Excavate and load fill into end dump trucks	bcy	3,500	$6.50	$22,800	
Soil transportation and disposal					
Non-hazardous (Class II)	ton	1,000	$60	$60,000	
Non-RCRA hazardous waste	ton	4,800	$100	$480,000	
RCRA hazardous waste	ton		$140		
Lay Geotextile Fabric	sy	9,489	$1.69	$16,000	
Import, place, and compact structural fill	ton	5,800	$30	$174,000	
Site Capping (Low Permeability Cover) and Restoration					
Purchase and install textured 40-mil geomembrane	sf	85,400	$0.80	$68,000	
Purchase and install geocomposite drainage net (2 sides)	sf	85,400	$1.00	$85,000	
Purchase and install geosynthetic clay liner	sf	85,400	$0.80	$68,000	
Import and place 6 inches of topsoil	sf	85,400	$0.70	$60,000	
Restore site vegetation	sf	85,400	$0.04	$3,000	
Subtotal: Contractor costs					**$1,140,000**
Average contractor cost, per cubic yard					*$326/yd3*
ENGINEERING SERVICES					
Engineering Services During Pre-Design Phase					
Additional investigation for pre-excavation waste classification and coordination with landfill	ls	1	$100,000	$100,000	
Engineering Services During Remediation Design Phase					
Design / Contracting	ls	1	$50,000	$50,000	
Engineering Services During Remediation					
Pre-mobilization contractor management and planning	ls	1	$10,000	$10,000	
Provide senior engineering manager	week	3	$2,100	$6,300	
Provide resident engineer	week	3	$7,500	$22,500	
Provide engineer to coordinate disposal issues and data	week	3	$6,500	$19,500	
Provide office support	week	3	$1,700	$5,100	
Lease vehicle	mo	1	$1,200	$1,200	
Perimeter air monitoring	week	3	$1,250	$3,750	
Provide equipment	week	3	$325	$975	
Analytical (additional disposal samples)	sample	3	$830	$2,490	
Prepare excavation completion report	ls	1	$50,000	$50,000	
Subtotal: Engineering Services without Project Management					$272,000
Engineering Project Management (10% of Engineering Subtotal)	ls	1	$27,200	$27,200	
Subtotal: Engineering Services					**$300,000**

TABLE C5b
Preliminary Cost Estimate for Alternative 3 - Limited Excavation with Off-Site Disposal and Capping
UPRR Parcel D Project Area
Emeryville, California

Item (see notes page for additional assumptions)	Estimated Costs (a,b,c) Unit	Quantity	Unit Cost	Line Totals	Subtotals
GROUNDWATER MONITORING					
Monitoring Plan					
Prepare groundwater monitoring plan, obtain DTSC approval	ls	1	$15,000	$15,000	
Install perimeter monitoring wells	ls	4	$3,000	$12,000	
Develop monitoring wells	ls	4	$700	$2,800	
Subtotal: Groundwater Monitoring					**$30,000**
Not Included in Cost Estimate					
Concrete and surface debris demolition / removal (if necessary)					
Existing building demolition / removal / relocation (if necessary)					
Underground utility relocation and restoration (if necessary)					
Final grading (assumed part of redevelopment)					
Health & safety upgrade to Level B (if necessary)					
Subtotal Cost Range - Estimated for Soil Transportation and Disposal (d)				$400,000	to $800,000
Subtotal Cost Range - Estimated or Remaining Capital Costs (d)				$800,000	to $1,600,000
Legal and Administrative Cost Range (assumed to be 5% of subtotal)				$40,000	to $80,000
Subtotal Cost Range - Including Legal and Administrative Costs				$1,200,000	to $2,500,000
Contingency Range (assumed to be 30% of subtotal range) (e)				$360,000	to $800,000
ESTIMATED TOTAL CAPITAL COST RANGE (d)				**$1,600,000**	**to $3,300,000**
ANNUAL COSTS					
COVER SYSTEM INSPECTION AND REPAIR					
Perform topographic survey to monitor settling every 5 years	ls	1	$500	$500	
Repair periodic breaches to cover	ls	1	$5,000	$5,000	
Prepare annual letter report of cover status	ls	1	$1,000	$1,000	
Conduct five year review of remedy performance	ls	1	$1,000	$1,000	
Annual Subtotal: Cover System Inspection and Repair	*(cost per year)*				$15,000
Present Worth of Annual Costs: Cover System Inspection and Repair	***(assumed 30-year duration)***				**$290,000**
GROUNDWATER MONITORING					
Annual Groundwater Sampling and Analysis					
Sampling planning and coordination	event	1	$1,000	$1,000	
Measure water levels, purge/sample wells, dispose of purge water	event	1	$2,000	$2,000	
Groundwater sample analyses (4 wells, 1 duplicate, 1 trip blank)					
Title 22 metals (EPA Method 6020)	ea	5	$170	$900	
Total petroleum hydrocarbons as gasoline ("TPH-g") (EPA Method 8015M)	ea	6	$110	$660	
Total petroleum hydrocarbons as diesel/motor oil ("TPH-d" / "TPH-mo"), with silica gel cleanup (EPA Method 8015M)	ea	5	$50	$300	
Groundwater monitoring report					
Prepare groundwater monitoring report, submit to DTSC	event	1	$15,000	$15,000	
Annual Subtotal: Groundwater Monitoring	*(cost per year)*				$40,000
Present Worth of Annual Costs: Groundwater Monitoring	***(assumed 5-year duration)***				**$780,000**
TOTAL PRESENT WORTH OF ANNUAL COSTS					**$1,100,000**
ESTIMATED TOTAL PRESENT WORTH COST RANGE (d)				**$2,700,000**	**to $4,400,000**

TABLE C5b

Preliminary Cost Estimate for Alternative 3 - Limited Excavation with Off-Site Disposal and Capping

UPRR Parcel D Project Area
Emeryville, California

Notes

(a) See Table 4 for derivation of unit costs for several line items. Line items listed above but not listed in Table 4 are based on EKI's experience with similar projects.
(b) Actual remediation costs would be affected by determination of final cleanup levels, determination of the final scope of excavation, acutal waste classification and quantities, selection of actual disposal facilities, actual material and contractor pricing, and current bidding environment.
(c) Subtotals are rounded.
(d) A -30 to +50 percent accuracy range is applied to the estimated total capital costs per US EPA guidelines (US EPA, 2000).
(e) A 30% contingency on overall costs has been included. Actual costs may exceed this level of contingency depending on further evaluations, regulatory agency determinations, field conditions encountered during construction, worksite restrictions, bidding environment at time of work, contractor's costs, actual volume and classification of soil, and other site conditions.

Abbreviations

BOE: Board of Equalization
bcy: bank cubic yards
cy: cubic yards
ea: each
ls: lump sum
mo: month
sq ft: square feet
STLC: Soluble Threshold Limit Concentration
TAT: turn around time
TCLP: Toxicity Characteristic Leaching Procedure

Assumptions for Pre-Excavation Tasks

1) Assume that the following tasks, if needed, will be performed by others as separate cost items and are not included herein:
   - Costs of land, easements and rights-of-way
   - Demolition and removal of concrete, asphalt, and surface debris
   - Archaeological investigations and impacts
   - Removal or relocation of existing underground utilities or other site improvements
   - Final grading or paving

Assumptions for Soil Excavation and Disposal

1) Assume design such that negotiations and coordination with Union Pacific Railroad are not required.
2) Assume shoring not required and sidewall sloping is sufficient based on preliminary excavation depths.
3) Assume work is limited to regular working hours.
4) Assume Level C health and safety protection is sufficient to complete soil excavation and disposal activities.
5) Assume excavated soil will be transported off-site for disposal at approriately permitted land disposal facilities.
6) Assume no BOE disposal taxes if City of Emeryville responsible for disposal.
7) Assume no BOE generator fees if City of Emeryville responsible for disposal.
8) Assume non-hazardous waste is disposed within Alameda County and out of county local taxes are not applicable.
9) Assume that excavation will occur during the dry season. Assume that soils will not generate free water after placement in the truck.
10) Assume clean fill will be imported to backfill the excavation to existing grade, and that the imported fill material will also be used to provide bedding for utilities and to backfill utility trenches. No excavated soil is assumed to be reused as backfill.
11) Assume soil excavation and disposal, capping, and short-term groundwater monitoring are sufficient remedial measures to satisfy state regulatory agencies

Assumptions for Engineering Services

1) Assume that waste classifications for disposed soil will be pre-approved by the landfills prior to excavation due to limited on-site space for stockpiling after soil is excavated. Assume additional soil characterization is necessary to facilitate obtaining pre-approvals of final waste classifications from the landfills.
2) Assume excavation rate of 500 bcy per day.
3) Assume import, place, and compact fill at 1000 bcy per day.
4) Disposal sampling - assume additional samples collected every ~1,500 bcy with 10% retest rate. Assume 2 day TAT with 50% increase in unit cost.
5) Disposal analysis - disposal samples to be a) extracted per STLC and TCLP procedures and analyzed for Title 22 metals and b) analyzed for TPH-g and TPH-d.

Assumptions for Groundwater Monitoring

1) Assume long-term groundwater monitoring would be conducted to confirm the effectiveness of the source removal activities.
1) Assume 4 perimeter monitoring wells (4 along western boundary).
2) Assume 30 year duration for groundwater monitoring.
3) 30-year real interest rate = 3.0% based on OMB Circular No. A-94, Revised December 2006.

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CHAPTER 13.
STORMWATER TREATMENT DESIGN, MANAGEMENT, AND DISCHARGE CONTROL PROGRAM

Sections:

Article 1. Title, Purpose and General Provisions

6-13.101 Title

6-13.102 Purpose and Intent

6-13.103 Definitions

6-13.104 Responsibility for Administration

6-13.105 Construction and Application

6-13.106 Taking

Article 2. Discharge Regulations and Requirements

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Article 1. Title, Purpose and General Provisions

6-13.101 Title.

This chapter shall be known as the "City of Emeryville stormwater treatment design, management, and discharge control program," and may be so cited.

(Sec. 2 (part), Ord. 92-01, eff. Feb. 20, 1992; Sec. 2 (part), Ord. 07-015, eff. Jan. 3, 2008)

6-13.102 Purpose and Intent.

The purpose of this chapter is to ensure the future health, safety, and general welfare of Emeryville citizens by:

(a) Eliminating non-stormwater discharges to the municipal separate storm sewer;

(b) Controlling the discharge to municipal separate storm sewers from spills, dumping or disposal of materials other than stormwater;

(c) Reducing pollutants in stormwater discharges to the maximum extent practicable. The intent of this chapter is to protect and enhance the water quality of our watercourses, water bodies, and wetlands in a manner pursuant to and consistent with the Clean Water Act.

(Sec. 2 (part), Ord. 92-01, eff. Feb. 20, 1992; Sec. 2 (part), Ord. 07-015, eff. Jan. 3, 2008)

6-13.103 Definitions.

(a) Any terms defined in the Federal Clean Water Act and acts amendatory thereof or supplementary thereto, and/or defined in the regulations for the stormwater discharge permitting program issued by the Environmental Protection Agency on November 16, 1990 (as may from time to time be amended) as used in this chapter shall have the same meaning as in that statute or regulations. Specifically, the definitions of the following terms included in that statute or regulations are hereby incorporated by reference, as now applicable or as may hereafter be amended: discharge; illicit discharge; pollutant; and stormwater.

These terms presently are defined as follows:

(1) “Discharge” means any addition of any pollutant to navigable waters from any point source, or any addition of any pollutant to the waters of the contiguous zone or the ocean from any point source other than a vessel or other floating craft.

(2) “Illicit discharge” means any discharge to the City storm sewer system that is not composed entirely of stormwater, except discharges pursuant to an NPDES permit and discharges resulting from firefighting activities.

(3) “Pollutant” means dredged soil, solid waste, incinerator residue, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive material, gasoline, petroleum (including without limitation crude oil or any fraction thereof), rock, sand, earth material and industrial, municipal, and agricultural waste discharge into water.

(4) “Stormwater” means stormwater runoff, snowmelt runoff, and surface runoff and drainage.

(b) When used in this chapter, the following words shall have the meanings ascribed to them in this section:

(1) “Authorized enforcement official” means the Public Works Director or his/her designee, so designated in writing.

(2) “Best management practices (BMPs)” means schedules of activities, prohibitions of practices, general good housekeeping practices, pollution prevention practices, maintenance procedures, and other management practices to prevent or reduce the discharge of pollutants directly or indirectly to waters of the United States. BMPs also include treatment requirements, permanent site design and treatment measures, operating procedures, and practices to control plant-site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

(3) “City” means the City of Emeryville.

(4) “City storm sewer system” means and includes but is not limited to those facilities within the City by which stormwater may be conveyed to waters of the United States, including any roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, manmade channels or storm drains, which are not part of a Publicly Owned Treatment Works (POTW) as defined at 40 CFR Section 122.2.

(5) “Development” and “redevelopment” mean the creation or replacement of impervious surfaces, including but not limited to buildings, rooftops, decks, patios,

covered and uncovered walkways, parking and circulation areas.

(6) "Impervious surface" means any material that prevents the infiltration of stormwater into the ground, including but not limited to impermeable concrete, asphalt, brick, and pavers.

(7) "Mechanical treatment measure" means a treatment facility that filters stormwater via an artificial medium, swirl separating, or settling; examples include, but are not limited to, storm drain inlet filters, vault-based media filters, swirl separators, and oil-water separators. To satisfy the requirements of this chapter, mechanical treatment measures must remove fine sediments, dissolved metals, trash, and oil.

(8) "Non-stormwater discharge" means any discharge that is not substantially composed of stormwater.

(9) "Permanent stormwater treatment facility" means a system designed to remove or reduce stormwater pollutants and/or control the rate of flow or volume of stormwater runoff into the City storm drain system or the waters of the United States.

(10) "Premises" means any building, lot, parcel, real estate, or land, or portion of land, whether improved, or unimproved, including adjacent sidewalks and parking strips.

(11) "Stormwater treatment permit" means a permit, issued in accordance with the provisions of Article 4 of this chapter, regulating the design, construction, and operation of permanent stormwater treatment facilities.

(12) "Vegetative treatment measure" means a treatment facility that filters stormwater through plants and soil; examples include, but are not limited to flow-through planter boxes, rain gardens, biofiltration swales, podium and roof plantings, and lowered landscape strips.

(Sec. 2 (part), Ord. 92-01, eff. Feb. 20, 1992; Sec. 2 (part), Ord. 07-015, eff. Jan. 3, 2008)

6-13.104 Responsibility for Administration.

This chapter shall be administered for the City by the Director of Public Works. Where storm drain facilities and/or watercourses have been accepted for maintenance by the Alameda County Flood Control and Water Conservation District (ACFCWCD) or other public agency legally responsible for certain watercourses, then the responsibility for enforcing the provisions of this chapter may be assigned to such agency (through contract or agreement executed by the City and such agency) with respect to those watercourses for which they have accepted maintenance.

(Sec. 2 (part), Ord. 92-01, eff. Feb. 20, 1992; Sec. 2 (part), Ord. 07-015, eff. Jan. 3, 2008)

6-13.105 Construction and Application.

This chapter shall be construed to assure consistency with the requirements of the Federal Clean Water Act and acts amendatory thereof or Section 6-13.106, supplementary thereto, applicable implementing regulations, and NPDES Permit No. CA 0029831 and any amendment, revision or reissuance thereof.

(Sec. 2 (part), Ord. 92-01, eff. Feb. 20, 1992; Sec. 2 (part), Ord. 07-015, eff. Jan. 3, 2008)

6-13.106 Taking.

The provisions of this chapter shall not operate to deprive any landowner of substantially all of the market value of his/her property or otherwise constitute an unconstitutional taking without compensation. If application of this chapter to a specific project would create a taking, then the City Council may allow additional land uses, but only to the extent necessary to avoid a taking. Such uses shall be consistent with and carry out the purposes of this chapter as stated in Section 6-13.102 above.

(Sec. 2 (part), Ord. 92-01, eff. Feb. 20, 1992; Sec. 2 (part), Ord. 07-015, eff. Jan. 3, 2008)

Article 2. Discharge Regulations and Requirements

6-13.201 Discharge of Pollutants.

The discharge of non-stormwater discharges to the City storm sewer system is prohibited. All discharges of material other than stormwater must be in compliance with an NPDES permit issued for the discharge (other than NPDES Permit No. CA 0029831).

(a) Exceptions to Discharge Prohibition. The following discharges are exempt from the prohibition set forth in Section 16-13.201 above:

(1) The prohibition to discharges shall not apply to any discharge regulated under a National Pollutant Discharge Elimination System (NPDES) permit issued to the discharger and administered by the State of California under authority of the United States Environmental Protection Agency; provided, that the discharger is in full compliance with all requirements of the permit and other applicable laws or regulations.

(2) Discharges from the following activities will not be considered a source of pollutants to waters of the United States when properly managed in accordance with the requirements of the NPDES stormwater permit for the Alameda County Clean Water Program agencies: water line flushing and other discharges from potable water sources, diverted stream flows, rising groundwater, infiltration to separate storm drains, uncontaminated pumped groundwater, foundation and footing drains, water from crawl

space pumps, air conditioning condensation, springs, individual residential car washing, flows from riparian habitats and wetlands, de- chlorinated swimming pool discharges, or flows from firefighting, and accordingly are not subject to the prohibition on discharges.

(Sec. 2 (part), Ord. 92-01, eff. Feb. 20, 1992; Sec. 2 (part), Ord. 07-015, eff. Jan. 3, 2008)

6-13.202 Discharge in Violation of Permit.

Any discharge that would result in or contribute to a violation of NPDES Permit No. CA 0029831, a copy of which is on file with the City Clerk, or any amendment, revision or reissuance thereof, either separately considered or when combined with other discharges, is prohibited. Liability for any such discharge shall be the responsibility of the person(s) causing or responsible for the discharge, and such person(s) shall defend, indemnify and hold harmless the City in any administrative or judicial enforcement action relating to such discharge.

(Sec. 2 (part), Ord. 92-01, eff. Feb. 20, 1992; Sec. 2 (part), Ord. 07-015, eff. Jan. 3, 2008)

6-13.203 Illicit Discharge and Illicit Connections.

It is prohibited to establish, use, maintain, or continue illicit drainage connections to the City storm sewer system, and to commence or continue any illicit discharges to the City storm sewer system. This prohibition is expressly retroactive and applies to connections made in the past, regardless of whether made under a permit or other authorization or whether permissible under the law or practices applicable or prevailing at the time of the connection.

(Sec. 2 (part), Ord. 92-01, eff. Feb. 20, 1992; Sec. 2 (part), Ord. 07-015, eff. Jan. 3, 2008)

6-13.204 Reduction of Pollutants in Stormwater.

Any person engaged in activities which will or may result in pollutants entering the City storm sewer system shall undertake all practicable measures to reduce such pollutants. Examples of such activities include ownership and use of facilities which may be a source of pollutants such as parking lots, gasoline stations, industrial facilities, commercial facilities, stores fronting city streets, etc. The following minimal requirements shall apply:

(a) Littering.

(1) No person shall throw, deposit, leave, maintain, keep, or permit to be thrown, deposited, placed, left or maintained, any refuse, rubbish, garbage, or other discarded or abandoned objects, articles, and accumulations in or upon any street, alley, sidewalk, storm drain, inlet, catch basin, conduit or other drainage structures, business place, or upon any public or private lot of land in the City, so that the same might be or

become a pollutant, except in containers or in lawfully established dumping grounds.

(2) The occupant or tenant or, in the absence of the occupant or tenant, the owner, lessor, or proprietor of any real property in the City of Emeryville in front of which there is a paved sidewalk shall maintain said sidewalk free of dirt or litter to the maximum extent practicable.

Sweepings from said sidewalk shall not be swept or otherwise made or allowed to go into the gutter or roadway, but shall be disposed of in receptacles maintained on said real property as required for the disposal of garbage.

(3) No person shall throw or deposit litter in any fountain, pond, lake, stream or any other body of water in a park or elsewhere within the City.

(b) Standard for Parking Lots and Similar Structures. Persons owning or operating a parking lot, gas station pavement or similar structure shall clean those structures as frequently and thoroughly as practicable in a manner that does not result in discharge of pollutants to the City storm sewer system.

(c) Notification of Intent and Compliance with General Permits. Each industrial discharger, discharger associated with construction activity, or other discharger, described in any general stormwater permit addressing such discharges, as may be adopted by the United States Environmental Protection Agency, the State Water Resources Control Board, or the California Regional Water Quality Control Board, San Francisco Bay Region, shall provide notice of intent, comply with, and undertake all other activities required by any general stormwater permit applicable to such discharges. Each discharger identified in an individual NPDES permit relating to stormwater discharges shall comply with and undertake all activities required by such permit.

(d) Compliance with Best Management Practices. Where best management practices, guidelines or requirements have been adopted by any Federal, State of California, regional, and/or City agency, for any activity, operation, or facility which may cause or contribute to stormwater pollution or contamination, illicit discharges, and/or discharge of non-stormwater to the stormwater system, every person undertaking such activity or operation, or owning or operating such facility, shall comply with such guidelines or requirements as may be identified by the Director of Public Works.

(Sec. 2 (part), Ord. 92-01, eff. Feb. 20, 1992; Sec. 1, Ord. 04-009, eff. Aug. 19, 2004; Sec. 2 (part), Ord. 07-015, eff. Jan. 3, 2008)

6-13.205 Watercourse Protection.

Every person owning property through which a watercourse passes, or such person's lessee or tenant, shall keep and maintain that part of the watercourse within the property reasonably free of trash, debris, excessive vegetation, and other obstacles which would pollute, contaminate, or significantly retard the flow of water through the watercourse; shall maintain existing privately owned structures within or adjacent to a watercourse so that such structures will not become a hazard to the use, function, or physical integrity of the watercourse; and shall not remove healthy bank vegetation beyond that actually necessary for said maintenance, nor remove said vegetation in such a manner as to increase the vulnerability of the watercourse to erosion. No person shall commit or cause to be committed any of the following acts, unless a written permit has first been obtained from the Director of Public Works:

(a) Discharge into or connect any pipe or channel to a watercourse;

(b) Modify the natural flow of water in a watercourse;

(c) Carry out development within thirty feet (30') of the centerline of any creek or twenty feet (20') of the top of a bank;

(d) Deposit in, plant in, or remove any material from a watercourse, including its banks, except as required for necessary maintenance;

(e) Construct, alter, enlarge, connect to, change, or remove any structure in a watercourse; or

(f) Place any loose or unconsolidated material along the side of or within a watercourse or so close to the side as to cause a diversion of the flow, or to cause a probability of such material being carried away by stormwaters passing through such watercourse.

(Sec. 2 (part), Ord. 92-01, eff. Feb. 20, 1992; Sec. 2 (part), Ord. 07-015, eff. Jan. 3, 2008)

Article 3. Requirements for New Development

6-13.301. Site Design and Source Control Measures.

All works of grading, paving, construction, reconstruction, or rehabilitation that create or replace impervious surface shall incorporate:

(a) Site planning that maximizes pervious surfaces and minimizes impervious surfaces; and

(b) Source control measures that prevent pollutant sources from contacting rainfall and stormwater, as specified by the City Engineer.

Facilities and activities that require source control measures include but are not limited to the following: recycling and trash areas; loading areas; food service equipment cleaning areas; vehicle service and cleaning areas; outdoor processing and equipment and materials storage areas; fuel storage and dispensing areas; parking garages; spas, fountains and pools; and fire sprinkler testing.

(Sec. 2 (part), Ord. 07-015, eff. Jan. 3, 2008)

6-13.302. Stormwater Management During Construction.

Any person engaged in construction or grading work in the City shall install, maintain, and replace controls and best management practices in order to prevent non-stormwater discharges such as pollution, erosion and sediment runoff onto roadways or into the City storm drain system. The City Engineer shall require and approve a Construction Stormwater Pollution Prevention Plan for any works of construction and/or grading for which such a plan is deemed necessary by the City Engineer. The City Engineer and his or her designee shall have the authority to stop construction and/or grading work on a site where adequate controls and/or best management practices are not in place.

(Sec. 2 (part), Ord. 07-015, eff. Jan. 3, 2008)

6-13.303. Permanent Stormwater Treatment Measures.

All works of grading, paving, construction, reconstruction, or rehabilitation that create or replace impervious surface shall be designed to incorporate permanent vegetative stormwater treatment measures that, to the maximum extent practicable, comply with the City's Stormwater Guidelines for Green, Dense Redevelopment. Vegetative treatment measures include, but are not limited to, flow-through planter boxes, rain gardens, biofiltration swales, podium and roof plantings, and lowered landscape strips.

(Sec. 2 (part), Ord. 07-015, eff. Jan. 3, 2008)

6-13.304. Design of Permanent Stormwater Treatment Measures.

(a) To the maximum extent practicable, permanent stormwater treatment measures shall be designed and constructed to use vegetative, rather than mechanical, measures. Preferred vegetative treatment measures include but are not limited to those defined in the City's Stormwater Guidelines for Green, Dense Redevelopment.

(b) Only if vegetative treatment measures are determined infeasible due to site characteristics, building uses, or other legitimate reasons, may the City Engineer allow the use of a combination of vegetative and mechanical treatment measures (preferred) or mechanical treatment measures.

(Sec. 2 (part), Ord. 07-015, eff. Jan. 3, 2008)

6-13.305. Operation and Maintenance of Permanent Stormwater Treatment Measures.

(a) Any person engaged in work of development or redevelopment that requires a stormwater treatment permit shall enter into the City of Emeryville's standard stormwater treatment measures operations and maintenance agreement assuring the continued operation and maintenance of such treatment measures and allowing access and inspection by the City, the local vector control agency and the Regional Water Quality Control Board. The agreement shall be recorded in the office of the County Recorder and be binding upon all owners of the property.

(b) A stormwater treatment measures operations and maintenance agreement shall be accompanied by a stormwater treatment measures maintenance plan.

(1) A stormwater treatment measures maintenance plan shall include, but is not limited to:

(i) A description of the general characteristics of the site, which may include soil types, groundwater levels, vegetation and natural runoff, impervious surfaces, propensity for erosion and sedimentation, etc.;

(ii) The location and nature of the City's storm drain system and creeks and/or waters of the United States to which the site drains;

(iii) Location and description of all permanent stormwater treatment measures;

(iv) A plan for routine inspection and maintenance of stormwater treatment measures, including items such as trimming, care and replacement of vegetation, replacement of mulch and compost; sweeping of pavement; and cleaning of screens and filters.

(2) The City Engineer shall have the authority to review and amend maintenance plans for stormwater treatment measures.

(Sec. 2 (part), Ord. 07-015, eff. Jan. 3, 2008)

Article 4. Stormwater Treatment Permits

6-13.401. Applicability.

The following works of development or redevelopment shall require a stormwater treatment permit issued by the City Engineer or his or her designee:

(a) Works that create or replace impervious surfaces greater than or equal to the surface area subject to the hydraulic numerical treatment requirements of the City's NPDES permit (ten thousand (10,000) square feet or requirement in current NPDES permit, whichever is less).

(b) Works that construct, modify, remove, or replace a permanent stormwater treatment facility.

(Sec. 2 (part), Ord. 07-015, eff. Jan. 3, 2008)

6-13.402. Application.

The City Engineer shall determine the application requirements for a stormwater treatment permit. Stormwater treatment permit application requirements shall include, but are not limited to, plans and specifications, amount of impervious surface created or replaced, stormwater treatment calculations by a licensed civil engineer, and a description of the total scope of work. The City Engineer shall have the authority to require additional information and/or supplementary submittals.

(Sec. 2 (part), Ord. 07-015, eff. Jan. 3, 2008)

6-13.403. Application and Plan Check Fees.

A stormwater treatment permit application shall include application and plan check fees as listed in the master fee schedule.

(Sec. 2 (part), Ord. 07-015, eff. Jan. 3, 2008)

6-13.404. Requirements for Stormwater Treatment Permit Approval.

(a) The City Engineer shall not issue a stormwater treatment permit until he or she is satisfied that:

(1) The project design complies with the City's Stormwater Guidelines for Green, Dense Redevelopment; and

(2) All stormwater treatment requirements are met with vegetative measures, to the maximum extent practicable.

(b) Approval of any stormwater treatment permit shall be contingent upon the applicant submitting a proposed stormwater treatment measures operations and maintenance agreement ("agreement") as described in Section 6▌13.305(a), modified for the project and approved by the City Engineer or his or her designee. A finalized, fully executed agreement, approved by the City Engineer or his or her designee, shall be required before a certificate of occupancy is issued for the project.

(Sec. 2 (part), Ord. 07-015, eff. Jan. 3, 2008)

6-13.405. Expiration and Renewal.

Stormwater treatment permits shall expire at the same time as the building permit for the associated project. Extension and renewal procedures shall be the same for a building permit, as defined in the Building Code. In the event that a stormwater treatment permit has expired, the City Engineer may require a new stormwater treatment permit application be submitted, including an application fee, inspection fee, and deposits, as defined by the master fee schedule.

(Sec. 2 (part), Ord. 07-015, eff. Jan. 3, 2008)

6-13.406. Inspections and Inspection Fees.

The applicant shall arrange for the City Engineer or his or her designee to inspect stormwater treatment measures at the excavation and grading, plumbing, planting and completion stages of construction. The permittee shall pay inspection fees as listed in the master fee schedule.

(Sec. 2 (part), Ord. 07-015, eff. Jan. 3, 2008)

Article 5. Security Bonds and Maintenance Deposit

6-13.501. Security Bonds.

In order to ensure the faithful performance of work authorized by a stormwater treatment permit, the City Engineer shall have the authority to require the deposit of a security bond prior to issuance of the stormwater treatment permit.

(a) The minimum bond amount shall equal one hundred fifty percent (150%) of the estimated cost of the work authorized by the stormwater treatment permit.

(b) The security bond will be released upon satisfactory completion of the work authorized by the stormwater treatment permit, or, at the discretion of the City Engineer, the satisfactory operation of the stormwater treatment facility over the course of one (1) full rainy season (October 1 through April 15).

(c) In the event that the work authorized by the stormwater treatment permit is not completed, or the completed facility fails to perform satisfactorily, the City Engineer shall order the work completed or the premises restored, at the expense of the permittee or his or her surety.

(Sec. 2 (part), Ord. 07-015, eff. Jan. 3, 2008)

6-13.502. Maintenance Deposit.

(a) In order to ensure the faithful maintenance of permanent stormwater treatment facilities authorized by a stormwater treatment permit, the City Engineer shall have the authority to require a maintenance deposit, in cash, as a condition of approval.

(b) To ensure ongoing maintenance, a maintenance security may be held for up to ten (10) years from the date of deposit.

(Sec. 2 (part), Ord. 07-015, eff. Jan. 3, 2008)

Article 6. Inspection and Enforcement

6-13.601 Authority to Inspect.

Whenever it is necessary to make an inspection to enforce any of the provisions of this chapter, or if an authorized enforcement official has reasonable cause to believe that a violation of the provisions of this chapter has or will occur, he or she may enter a premises or building at all reasonable times to inspect the same or perform any duty imposed by this chapter; provided, that:

(a) If such building or premises be occupied, he or she shall first present proper credentials and request entry; and

(b) If such building or premises be unoccupied, he or she shall first make a reasonable effort to locate the owner or other persons having charge or control of the building or premises and request entry.

Any such request for entry shall state that the property owner or occupant has the right to refuse entry and that, in the event such entry is refused, inspection may be made only upon issuance of a search warrant by a duly authorized magistrate. In the event the owner and/or occupant refuses entry after such request has been made, the official is hereby empowered to seek assistance from any court of competent jurisdiction in obtaining such entry. Routine or area inspections shall be based upon such reasonable selection processes as may be deemed necessary to carry out the objectives of this chapter, including but not limited to random sampling and/or sampling in areas with evidence of stormwater contamination, illicit discharges, discharge of non-stormwater to the stormwater system, or similar factors.

(Sec. 2 (part), Ord. 92-01, eff. Feb. 20, 1992; Sec. 2 (part), Ord. 07-015, eff. Jan. 3, 2008. Formerly 6-13.301)

6-13.602 Authority to Sample and Establish Sampling Devices.

The City shall have the right to establish on any property such devices as are necessary to

conduct sampling or metering operations. During all inspections as provided herein, the official may take any samples deemed necessary to aid in the pursuit of the inquiry or in the recordation of the activities on site.

(Sec. 2 (part), Ord. 92-01, eff. Feb. 20, 1992; Sec. 2 (part), Ord. 07-015, eff. Jan. 3, 2008. Formerly 6-13.302)

6-13.603 Notification of Spills.

As soon as any person in charge of a facility or responsible for emergency response for a facility has knowledge of any confirmed or unconfirmed release of materials, pollutants or waste which may result in pollutants or non-stormwater discharges entering the City storm sewer system, such person shall take all necessary steps to ensure the discovery, containment and cleanup of such release and shall notify the City of the occurrence by telephoning (510) 596-4330 and confirming the notification by correspondence to the Director of Public Works, 1333 Park Avenue, Emeryville, CA 94608.

(Sec. 2 (part), Ord. 92-01, eff. Feb. 20, 1992; Sec. 2 (part), Ord. 07-015, eff. Jan. 3, 2008. Formerly 6-13.303)

6-13.604 Requirement to Test or Monitor.

Any authorized enforcement official may request that any person engaged in any activity and/or owning or operating any facility which may cause or contribute to stormwater pollution or contamination, illicit discharges, and/or discharge of non-stormwater to the stormwater system undertake such monitoring activities and/or analyses and furnish such reports as the official may specify. The burden, including costs, of these activities, analyses and reports shall bear a reasonable relationship to the need for the monitoring, analyses and reports and the benefits to be obtained. The recipient of such request shall undertake and provide the monitoring, analyses and/or reports requested.

(Sec. 2 (part), Ord. 92-01, eff. Feb. 20, 1992; Sec. 2 (part), Ord. 07-015, eff. Jan. 3, 2008. Formerly 6-13.304)

6-13.605 Violations Constituting Misdemeanors.

The violation of any provision of this chapter or failure to comply with any of the mandatory requirements of this chapter shall constitute a misdemeanor; except that, notwithstanding any other provisions of this chapter, any such violation constituting a misdemeanor under this chapter may, in the discretion of the enforcing authority, be charged and prosecuted as an infraction.

(Sec. 2 (part), Ord. 92-01, eff. Feb. 20, 1992; Sec. 2 (part), Ord. 07-015, eff. Jan. 3, 2008. Formerly 6-13.305)

6-13.606 Penalty for Violation.

Upon conviction of a misdemeanor, a person shall be subject to payment of a fine, or imprisonment, or both, not to exceed the limits set forth in California Government Code Section 36901. Upon conviction of an infraction, a person shall be subject to payment of a fine, not to exceed the limits set forth in California Government Code Section 36900. After a third conviction for a violation of the same provision, subsequent violations within a twelve (12) month period may be charged as a misdemeanor.

(Sec. 2 (part), Ord. 92-01, eff. Feb. 20, 1992; Sec. 2 (part), Ord. 07-015, eff. Jan. 3, 2008. Formerly 6-13.306)

6-13.607 Continuing Violation.

Unless otherwise provided, a person, firm, corporation or organization shall be deemed guilty of a separate offense for each and every day during any portion of which a violation of this chapter is committed, continued or permitted by the person, firm, corporation or organization, and shall be punishable accordingly as herein provided.

(Sec. 2 (part), Ord. 92-01, eff. Feb. 20, 1992; Sec. 2 (part), Ord. 07-015, eff. Jan. 3, 2008. Formerly 6-13.307)

6-13.608 Concealment.

Causing, permitting, aiding, abetting or concealing a violation of any provision of this chapter shall constitute a violation of such provision.

(Sec. 2 (part), Ord. 92-01, eff. Feb. 20, 1992; Sec. 2 (part), Ord. 07-015, eff. Jan. 3, 2008. Formerly 6-13.308)

6-13.609 Acts Potentially Resulting in Violation of Federal Clean Water Act and/or Porter-Cologne Act.

Any person who violates any provision of this chapter or any provision of any permit issued pursuant to this chapter; or who discharges waste or wastewater which causes pollution; or who violates any cease and desist order, prohibition, or effluent limitation; may also be in violation of the Federal Clean Water Act and/or Porter-Cologne Act and may be subject to the sanctions of those Acts including civil and criminal penalty. Any enforcement action authorized under this Article should also include notice to the violator of such potential liability.

(Sec. 2 (part), Ord. 92-01, eff. Feb. 20, 1992; Sec. 2 (part), Ord. 07-015, eff. Jan. 3, 2008. Formerly 6-13.309)

6-13.610 Violations Deemed a Public Nuisance.

In addition to the penalties hereinbefore provided, any condition caused or permitted to exist in violation of any of the provisions of this chapter is a threat to the public health, safety and welfare, and is declared and deemed a nuisance. Any authorized enforcement official may abate the violation, and the City Attorney may take civil action to abate, enjoin or otherwise compel the cessation of such nuisance. The cost of such abatement and restoration shall be borne by the owner of the property and the cost thereof shall be in a lien upon and against the property and such lien shall continue in existence until it is paid. If the lien is not satisfied by the owner of the property within three (3) months after the completion by the authorized enforcement official of the removal of the nuisance and the restoration of the property to its original condition, the property may be sold in satisfaction thereof in a like manner as other real property is sold under execution. If any violation of this chapter constitutes a seasonal and recurrent nuisance, the City Council shall so declare. Thereafter such seasonal and recurrent nuisance shall be abated every year without the necessity of any further hearing.

(Sec. 2 (part), Ord. 92-01, eff. Feb. 20, 1992; Sec. 2 (part), Ord. 07-015, eff. Jan. 3, 2008. Formerly 6-13.310)

6-13.611 California Code of Civil Procedure Section 1094.6.

The provisions of Section 1094.6 of the California Code of Civil Procedure are applicable to judicial review of City decisions pursuant to this chapter.

(Sec. 2 (part), Ord. 92-01, eff. Feb. 20, 1992; Sec. 2 (part), Ord. 07-015, eff. Jan. 3, 2008. Formerly 6-13.311)

6-13.612 Civil Actions.

In addition to any other remedies provided in this section, any violation of this chapter may be enforced by civil action brought by the City. In any such action, the City may seek, and the court shall grant, as appropriate, any or all of the following remedies:

(a) A temporary and/or permanent injunction;

(b) Assessment of the violator for the costs of any investigation, inspection, or monitoring survey which led to the establishment of the violation, and for the reasonable costs of preparing and bringing legal action under this chapter;

(c) Costs incurred in removing, correcting, or terminating the adverse effects resulting from the violation;

(d) Compensatory damages for loss or destruction to water quality, wildlife, fish, and aquatic life. Assessments under this subsection shall be paid to the City to be used

exclusively for costs associated with monitoring and establishing stormwater discharge pollution control systems and/or implementing or enforcing the provisions of this chapter.

(Sec. 2 (part), Ord. 92-01, eff. Feb. 20, 1992; Sec. 2 (part), Ord. 07-015, eff. Jan. 3, 2008. Formerly 6-13.312)

6-13.613 Administrative Enforcement Powers.

In addition to the other enforcement powers and remedies established by this chapter, any authorized enforcement official has the authority to utilize the following administrative remedies:

(a) Cease and Desist Orders. When an authorized enforcement official finds that a discharge has taken place or is likely to take place in violation of this chapter, the official may issue an order to cease and desist such discharge, or practice or operation likely to cause such discharge, and direct that those persons not complying shall:

(1) Comply with the requirement;

(2) Comply with a time schedule for compliance; and/or

(3) Take appropriate remedial or preventive action to prevent the violation from recurring.

(b) Notice to Clean. Whenever an authorized enforcement official finds any oil, earth, dirt, grass, weeds, dead trees, cans, bottles, rubbish, refuse, waste or any other material of any kind, in or upon the sidewalk abutting or adjoining any parcel of land, or upon any parcel of land or grounds, which may result in an increase in pollutants entering the City storm sewer system or a non-stormwater discharge to the City storm sewer system, he or she may give notice to remove such material in any manner that he or she may reasonably provide. The recipient of such notice shall undertake the activities as described in the notice.

(Sec. 2 (part), Ord. 92-01, eff. Feb. 20, 1992; Sec. 2 (part), Ord. 07-015, eff. Jan. 3, 2008. Formerly 6-13.313)

6-13.614. Authority to Arrest or Issue Citations.

Authorized enforcement officials shall have and are hereby vested with the authority to arrest or cite any person who violates any section of this chapter in the manner provided by the California Penal Code for the arrest or release on citation of misdemeanor infractions as prescribed by Chapters 5, 5c, and 5d of Title 3, Part 2 of the Penal Code (or as the same may hereafter be amended). Such authorized enforcement officials or employees may issue a citation and notice to appear in the manner prescribed by Chapter 5c of Title 3, Part 2 of the Penal Code, including Section 853.6 (or as the same may hereafter be amended).

It is the intent of the City Council that the immunities prescribed in Section 836.5 of the Penal Code be applicable to public officers or employees or employees acting in the course and scope of employment pursuant to this chapter.

(Sec. 2 (part), Ord. 92-01, eff. Feb. 20, 1992; Sec. 2 (part), Ord. 07-015, eff. Jan. 3, 2008. Formerly 6-13.314)

6-13.615. Remedies Not Exclusive.

Remedies under this Article are in addition to and do not supersede or limit any and all other remedies, civil or criminal. The remedies provided for herein shall be cumulative and not exclusive.

(Sec. 2 (part), Ord. 92-01, eff. Feb. 20, 1992; Sec. 2 (part), Ord. 07-015, eff. Jan. 3, 2008. Formerly 6-13.315)

6-13.616. Appeal.

Any person aggrieved by a decision of the City Engineer regarding this Article may appeal to the Planning Commission within fifteen (15) days after final action by the City Engineer. The appeal procedures set forth in Article 88 of Title 9 of the Emeryville Municipal Code shall apply.

(Sec. 2 (part), Ord. 07-015, eff. Jan. 3, 2008)

RESOLUTION NO. 15-129

Resolution Of The City Council Of The City Of Emeryville Amending The General Plan To Reduce The Base Levels For Floor Area Ratio, Building Height, And Residential Density

WHEREAS, the Emeryville General Plan was adopted by the City Council by Resolution No. 09-208 on October 13, 2009; and

WHEREAS, there is a need to amend the General Plan to reduce the base levels for floor area ratio, building height, and residential density to provide greater incentives for affordable and ownership housing; and

WHEREAS, these issues were considered by the City Council and Planning Commission at a joint study session on May 2, 2015, by the Planning Commission at a study session on May 28, 2015, and by the City Council at a study session on September 1, 2015; and

WHEREAS, the Planning Commission held a duly and properly noticed public hearing on September 24, 2015 to consider the proposed amendment to the General Plan, approved the proposed amendment, and voted to recommend that the City Council adopt the proposed amendment; and

WHEREAS, the City Council held a duly and properly noticed public hearing on October 20, 2015 to solicit public comments and consider the proposed amendment; and

WHEREAS, the City Council has reviewed and considered the staff report and attachments thereto, all public comments, the proposed General Plan amendment, and the applicable provisions of the Emeryville Municipal Code ("the Record"); now, therefore, be it

RESOLVED, that the City Council hereby finds that this proposal is exempt from environmental review under the "general rule" at Section 15061(b)(3) of the State CEQA Guidelines because it can be seen with certainty that there is no possibility that the proposal may have a significant effect on the environment; and be it further

RESOLVED, that in approving the proposed General Plan Amendment, the City Council makes the following findings required by Emeryville Municipal Code Section 9-7.1205 based on its review and consideration of the Record:

General Plan Amendments Pursuant to Section 9-7.1205:

(a) The proposed amendment will contribute to the public health, safety, and general welfare or will be of benefit to the public.

The proposed General Plan Amendment will be of benefit to the public because it will provide incentives for the provision of affordable units and ownership housing.

(b) The proposed amendment is consistent with the General Plan Guiding Principles, unless the Guiding Principles themselves are proposed to be amended.

The proposed General Plan Amendment will facilitate the development of affordable, family-friendly, and ownership housing which is consistent with Guiding Principle 7, "A diverse, balanced, and inclusive community", which states that "the General Plan embraces physical, social, and economic diversity, ... [and] furthers a variety of housing types and emphasizes family-friendly housing, and linkages to Emeryville's school system to promote the success of its youth and to encourage new residents to actively contribute to the community."

(c) The proposed amendment retains the internal consistency of the General Plan and is consistent with other adopted plans, unless concurrent amendment to those plans is also proposed and will result in consistency.

The proposed General Plan Amendment will retain internal consistency between the Maximum Floor Area Ratios map (Figure 2-3), Maximum Building Heights map (Figure 2-4), Maximum Residential Densities map (Figure 2-6), and the text that describes them, and with the concurrent amendments to the Planning Regulations.

(d) The proposed amendment has been reviewed in compliance with the requirements of the California Environmental Quality Act.

The proposed General Plan Amendment is exempt from environmental review under the "general rule" at Section 15061(b)(3) of the State CEQA Guidelines because it can be seen with certainty that there is no possibility that the proposal may have a significant effect on the environment.

(e) The proposed amendment complies with State law for the preparation, adoption, and amendment of general plans at California Government Code Section 65350 et seq.

The proposed General Plan Amendment complies with applicable State law in that the procedures required by Government Code Section 65350 et seq. are satisfied.

and be it further

RESOLVED, that in approving the proposed General Plan Amendment to reduce the base levels for residential density on sites that have been relied upon in the Emeryville

Housing Element to meet the City's Regional Housing Needs Allocation (RHNA) obligation, the City Council makes the following findings as required by California Government Code Section 65863(b):

(1) The reduction is consistent with the adopted general plan, including the housing element.

The proposed General Plan amendment is consistent with the following General Plan goals and policies:

H-2-1. Ensure that the Planning Regulations continue to facilitate the development of affordable housing.

H-6-2. Promote homeownership opportunities and encourage the development of new for-sale residences.

LU-P-16 A point-based system will be established for intensity, height and density bonus, as well as review and approval process.

(2) The remaining sites identified in the housing element are adequate to accommodate the jurisdiction's share of the regional housing need pursuant to Section 65584.

The City of Emeryville Housing Element, adopted by the City Council on November 18, 2014 and certified by the California Department of Housing and Community Development on January 28, 2015, contains an analysis showing that there is potential in Emeryville to develop far more than the RHNA number of units. This development potential consists of planned and approved projects and the development capacity of identified vacant and underutilized sites that are zoned for residential use. The number of units in planned and approved projects is taken from the plans submitted. The number of units on vacant and underutilized sites is calculated by using 75% of the base density permitted on each site, assuming no development bonuses. This results in a surplus of 3,807 units over the RHNA, as indicated in the "As Described in Housing Element" column in the table below.

	As Described in Housing Element	As Revised
A - 2014 – 2022 RHNA	1,498	1,498
B - Planned/Approved Projects	1,837	1,906
C - Vacant/Underutilized Sites	3,468	2,253
D - Total Development Potential (B + C)	5,305	4,159
Surplus Development Potential (D – A)	**3,807**	**2,661**

The proposed reduction in base residential densities does not affect the City's ability to meet its RHNA obligations for two reasons, as indicated in the "As Revised" column in the above table. First, the number of units in planned and approved projects has increased slightly since the Housing Element was prepared. Second, the number of units assumed on vacant and underutilized sites has been revised to reflect the proposed decrease in base density levels, still assuming that the sites would develop at 75% of their base density with no bonuses. These revisions result in a surplus of 2,661 units, less than projected in the Housing Element, but still providing for a development potential that is more than 275% of the City's RHNA. Thus, the proposed revisions to the development bonus system would not affect the City's ability to meet its RHNA obligations. It should be noted that one of the main reasons for the amendment is to promote more affordable housing, a major goal of the Housing Element and the RHNA.

and be it further

RESOLVED, that the current base and bonus levels as shown on the Maximum Floor Area Ratios map in Figure 2-3 of the General Plan are hereby replaced with the new base and bonus levels as indicated in the table below and shown in the revised Maximum Floor Area Ratios map, which is attached as Exhibit A and incorporated into this Resolution by this reference;

Maximum Permitted Building Intensity (FAR)					
Current			New		
Map Designation	Base	Bonus	Map Designation	Base	Bonus
0.5/No Bonus	Up to 0.5	None	0.5/1.0	Up to 0.5	Up to 1.0
1.0/No Bonus	Up to 1.0	None	1.0/No Bonus	Up to 1.0	None
1.2/1.6	Up to 1.2	Up to 1.6	1.0/1.6	Up to 1.0	Up to 1.6
2.0/3.0	Up to 2.0	Up to 3.0	1.5/3.0	Up to 1.5	Up to 3.0
3.0/4.0	Up to 3.0	Up to 4.0	2.0/4.0	Up to 2.0	Up to 4.0
4.0/6.0	Up to 4.0	Up to 6.0	3.0/6.0	Up to 3.0	Up to 6.0

and be it further

RESOLVED, that the current base and bonus levels as shown on the Maximum Building Heights map in Figure 2-4 of the General Plan are hereby replaced with the new base and bonus levels as indicated in the table below and shown in the revised Maximum Building Heights map, which is attached as Exhibit B and incorporated into this Resolution by this reference;

Maximum Permitted Height (Feet)					
Current			**New**		
Map Designation	**Base**	**Bonus**	**Map Designation**	**Base**	**Bonus**
30 ft/No Bonus	Up to 30	None	30 ft/No Bonus	Up to 30	None
30/55 ft	Up to 30	Up to 55	30/55 ft	Up to 30	Up to 55
55/75 ft	Up to 55	Up to 75	40/75 ft	Up to 40	Up to 75
75/100 ft	Up to 75	Up to 100	50/100 ft	Up to 50	Up to 100
100+ ft	Up to 100	Over 100	75/100+ ft	Up to 75	75 to over 100

and be it further

RESOLVED, that the current base levels as shown on the Maximum Residential Densities map in Figure 2-6 of the General Plan are hereby replaced with the new base levels as indicated in the table below and shown in the revised Maximum Residential Densities map, which is attached as Exhibit C and incorporated into this Resolution by this reference;

Maximum Permitted Residential Density (Units per Acre)					
Current			**New**		
Map Designation	**Base**	**Bonus**	**Map Designation**	**Base**	**Bonus**
20/35	Up to 20	Up to 35	20/35	Up to 20	Up to 35
50/60	Up to 50	Up to 60	35/60	Up to 35	Up to 60
85/100	Up to 85	Up to 100	50/100	Up to 50	Up to 100
100/135	Up to 100	Up to 135	70/135	Up to 70	Up to 135
115/170	Up to 115	Up to 170	85/170	Up to 85	Up to 170

and be it further

RESOLVED, that the first and third paragraphs on page 2-15 of the General Plan are hereby revised to read as follows. Additions are in underlined text. Deletions are in ~~strikethrough text~~.

> The first number describes the maximum base FAR. Proposed base development intensities in the General Plan range from 0.5 to ~~4.0~~3.0, modulated to provide diversity, as well as high intensities in selected locations. Intensities are low in the eastern residential neighborhoods and the western end of the peninsula, gradually increasing to the highest values at the Powell Street/Christie Avenue core area.
>
> Maximum bonus FARs range from ~~1.6~~1.0 to 6.0. (There is no bonus in the ~~0.5 or~~ 1.0 FAR ~~categories~~category.) Maximum FARs shown on the map may not be attainable on all sites as superseding development regulations and/or site conditions may reduce development potential. The bonus program is described on page 2-19 and detailed in the Zoning Ordinance.

and be it further

RESOLVED, that the fifth and sixth paragraphs on page 2-15 of the General Plan are hereby revised to read as follows. Additions are in underlined text. Deletions are in ~~strikethrough text~~.

> Maximum base building heights range from 30 feet to ~~100+~~75 feet. Buildings heights gradually step up from the lowest in the east—reflecting the scale of the older residential neighborhoods—and the western edge of the Peninsula, to create a high-rise core in the Powell Street/Christie Avenue area. The Triangle and Doyle Street neighborhoods have a maximum height of 30 feet. These step up to 30 feet/55 feet (base/maximum) in the North Hollis and Park Avenue areas and the Watergate residential complex; these moderate heights will allow light to filter in into the streets in the North Hollis area, maintain the character and scale of the historic Park Avenue area while allowing modest increases, and maintain the scale of the Watergate residential complex, which is an area of stability.
>
> The next step up in height (~~55~~ 40 feet/70 feet) provides transition between the low-rise areas and the ~~70~~ 50 feet/100 feet height limit that applies to much of Sherwin Williams, East Bay Bridge, as well majority of the sites west of the railroad. The tallest heights (75 feet/100+ feet) apply to the core which extends on both sides of Powell Street, extending to Pacific Park Plaza in the north (the tallest building in the city with a height of 320 feet), as well a small portion land at the southern edge of the City at the edge of I-580 (which is elevated in the area) that is in joint Oakland/Emeryville planning jurisdiction. Several buildings have previously been approved at heights greater than these height districts would allow; these buildings are "grandfathered", and are indicated by yellow asterisks on Figure 2-4.

and be it further

RESOLVED, that the last paragraph on page 2-15 (extending onto page 2-19) of the General Plan is hereby revised to read as follows. Additions are in underlined text. Deletions are in ~~strikethrough text~~.

> Figure 2-6 shows maximum permitted residential density in units per acre. As described in the FAR and heights sections, the first number refers to the base maximum density value, while the second number represents the maximum value permitted with discretionary bonus allowance. Residential densities range from 20 units per acre (base) in the eastern neighborhood to ~~115~~ 85 units per acre (base) in the Powell/Christie core. Assuming a 1.79 persons per household ratio citywide population density is projected

to range from 36 persons per acre in the eastern residential neighborhood to 206 persons per acre in portions of the Powell/Christie core. Higher residential densities may be achieved through the bonus program.

and be it further

RESOLVED, that the second full paragraph on page 2-19 is hereby revised to read as follows. Additions are in underlined text.

Intensity, height, and density bonuses are permitted after developers provide certain community amenities, such as family-friendly housing, green architecture, and public open space. Bonuses are discretionary and contingent on excellence in design. (In the Medium Density Residential areas, additional FAR and greater residential density would be allowed through a conditional use permit. These are not part of the bonus system.) Existing approved Planned Unit Developments (PUDs) may exceed the base intensity, height, and density, as specified in the ordinances by which they were approved, without requiring bonuses.

ADOPTED by the City Council of the City of Emeryville at a regular meeting held on Tuesday, October 20, 2015.

MAYOR

ATTEST:

CITY CLERK

APPROVED AS TO FORM:

CITY ATTORNEY

Exhibits:

A. Revised Figure 2-3 of the General Plan, "Maximum Floor Area Ratios"
B. Revised Figure 2-4 of the General Plan, "Maximum Building Heights"
C. Revised Figure 2-6 of the General Plan, "Maximum Residential Densities"

FIGURE 2-3

Maximum Floor Area Ratios

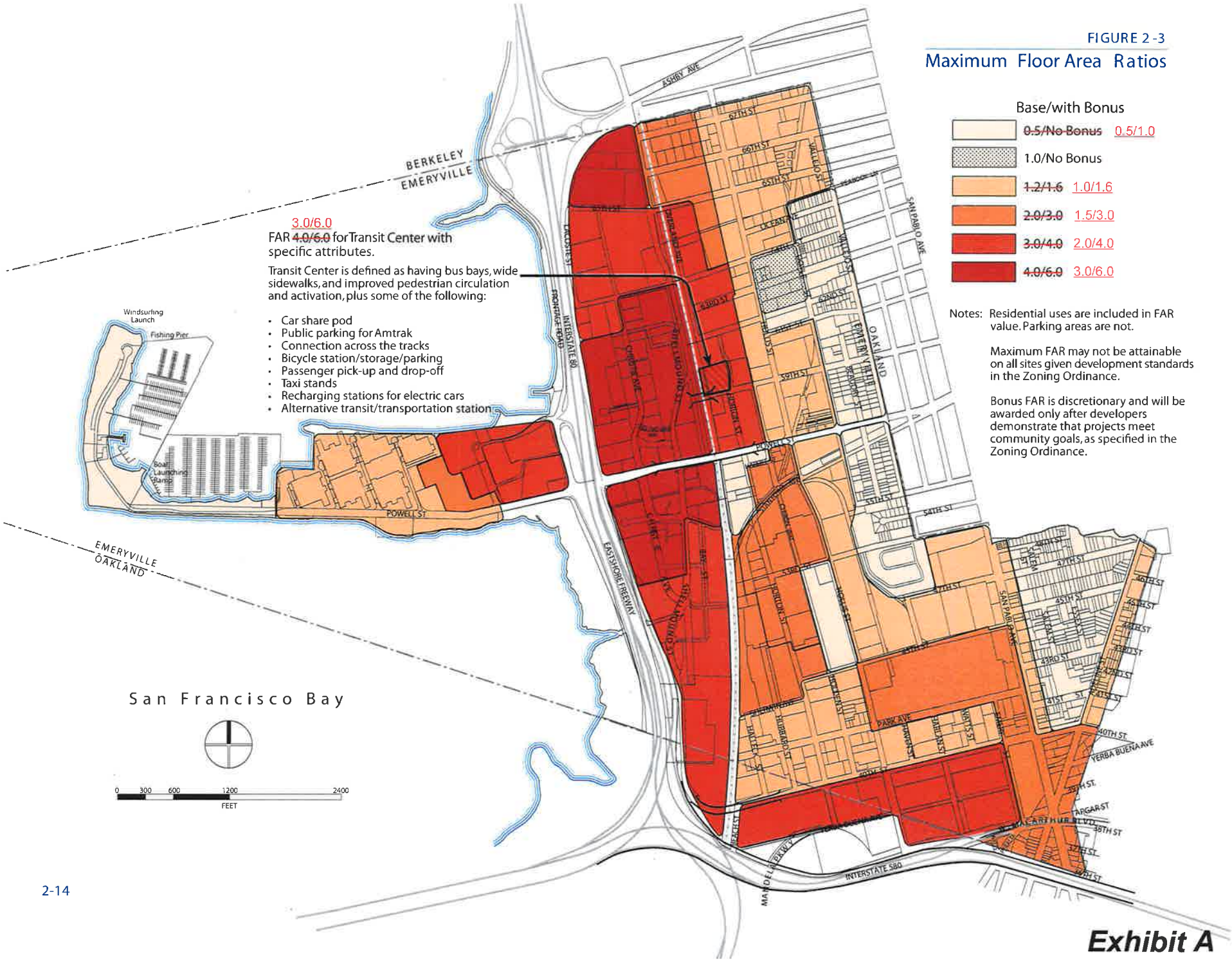


Exhibit A

FIGURE 2-4

Maximum Building Heights

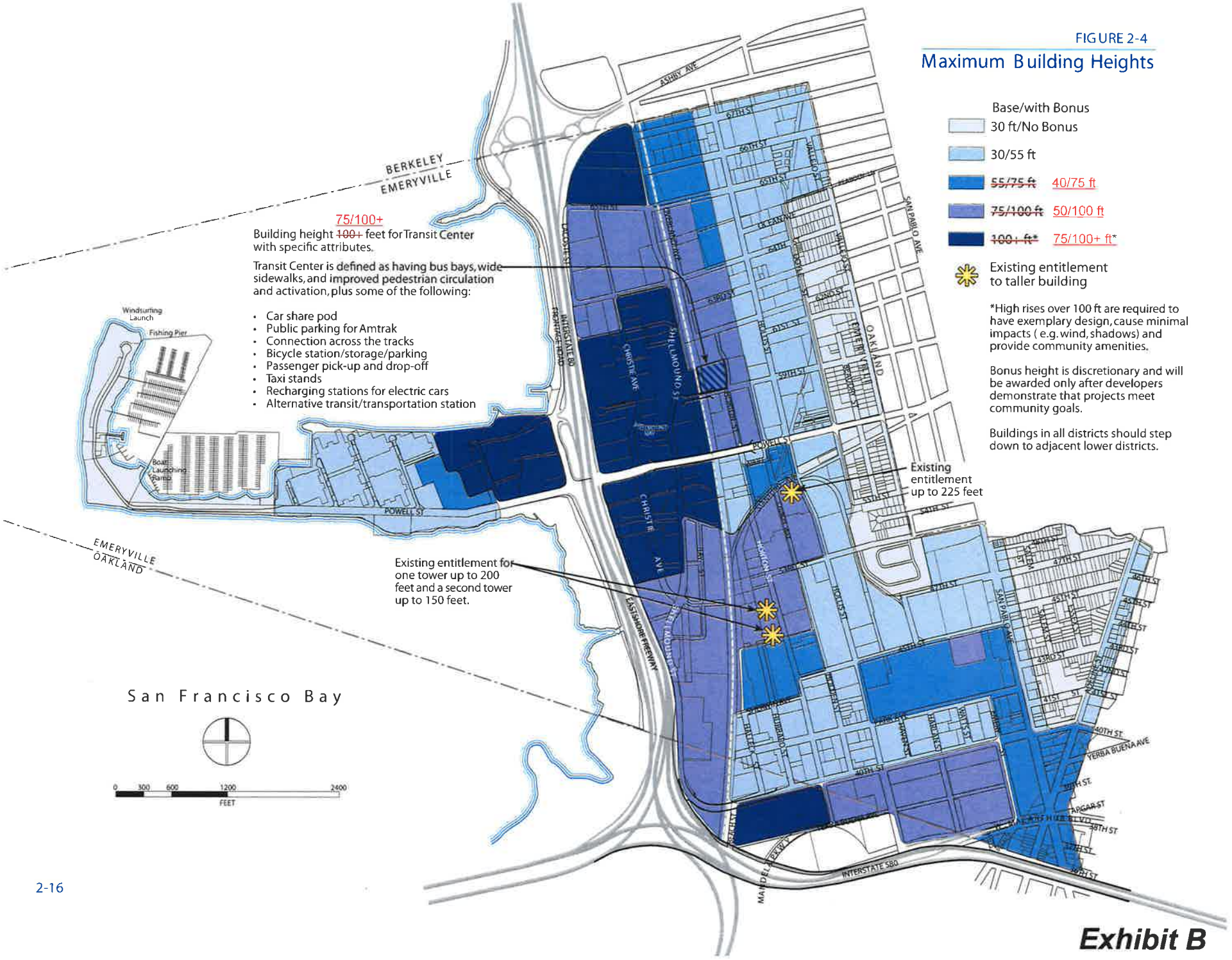
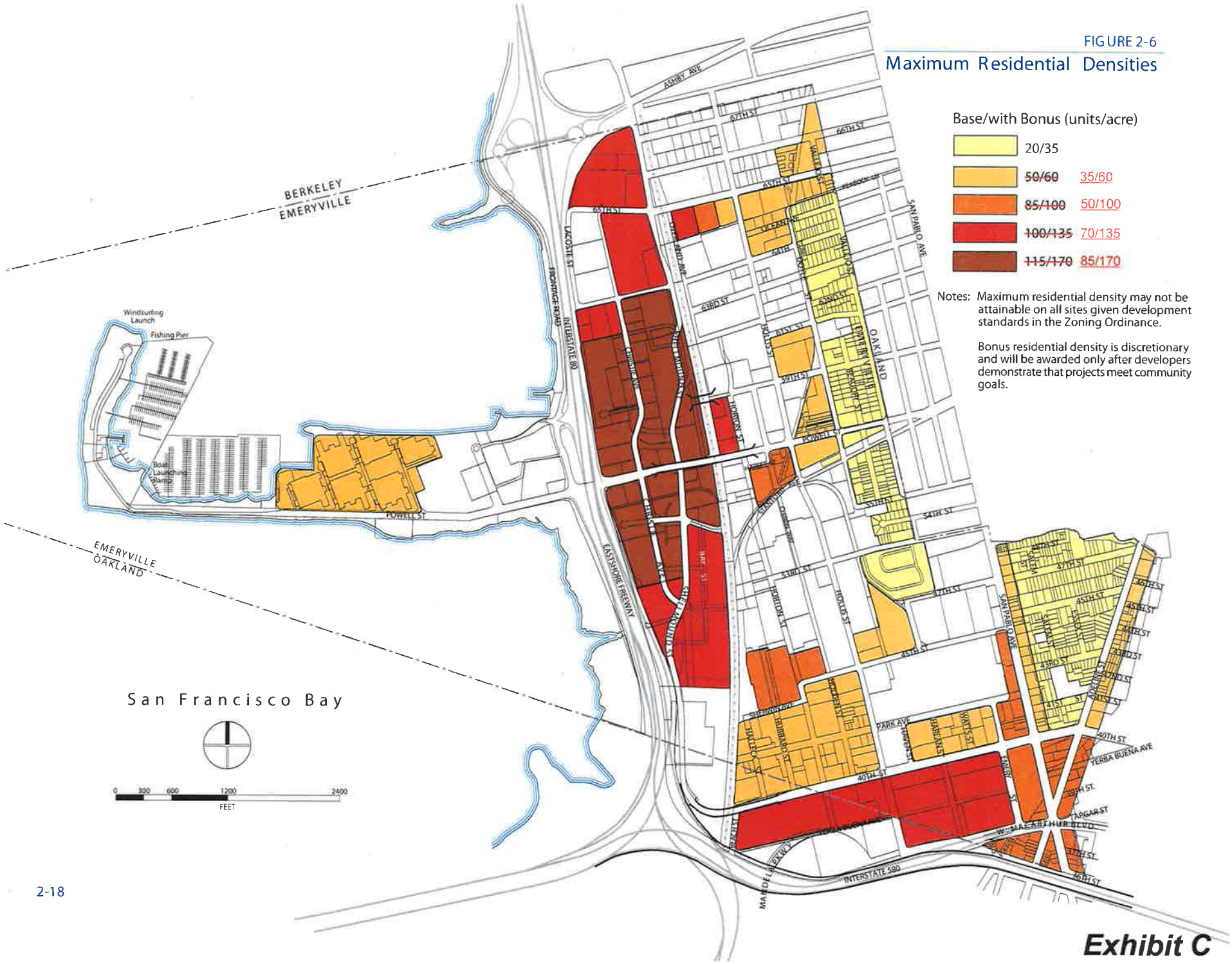


Exhibit B

FIGURE 2-6

Maximum Residential Densities



Notes: Maximum residential density may not be attainable on all sites given development standards in the Zoning Ordinance.

Bonus residential density is discretionary and will be awarded only after developers demonstrate that projects meet community goals.

Exhibit C

SHERWIN WILLIAMS PRELIMINARY DEVELOPMENT PLAN

PROJECT GRAPHICS

Submitted by:

Owner: SWACE LLC
Project Sponsor: LMC Emeryville I Investor LLC

Prepared by: ROMA Design Group in association with LPAS and BKF
and in consultation with Sedgwick LLP

January 20, 2015

SHERWIN WILLIAMS PRELIMINARY DEVELOPMENT PLAN

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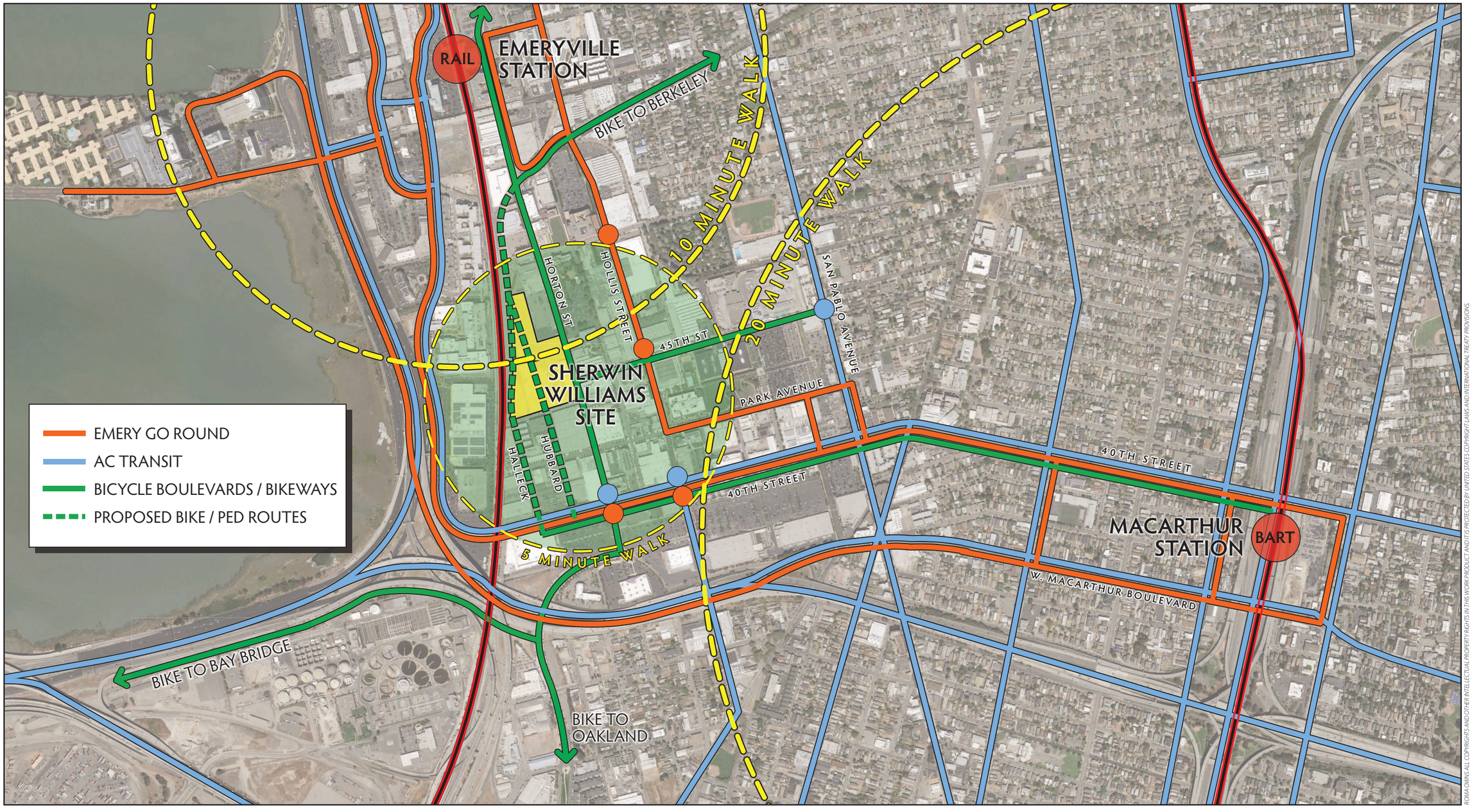

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VICINITY MAP

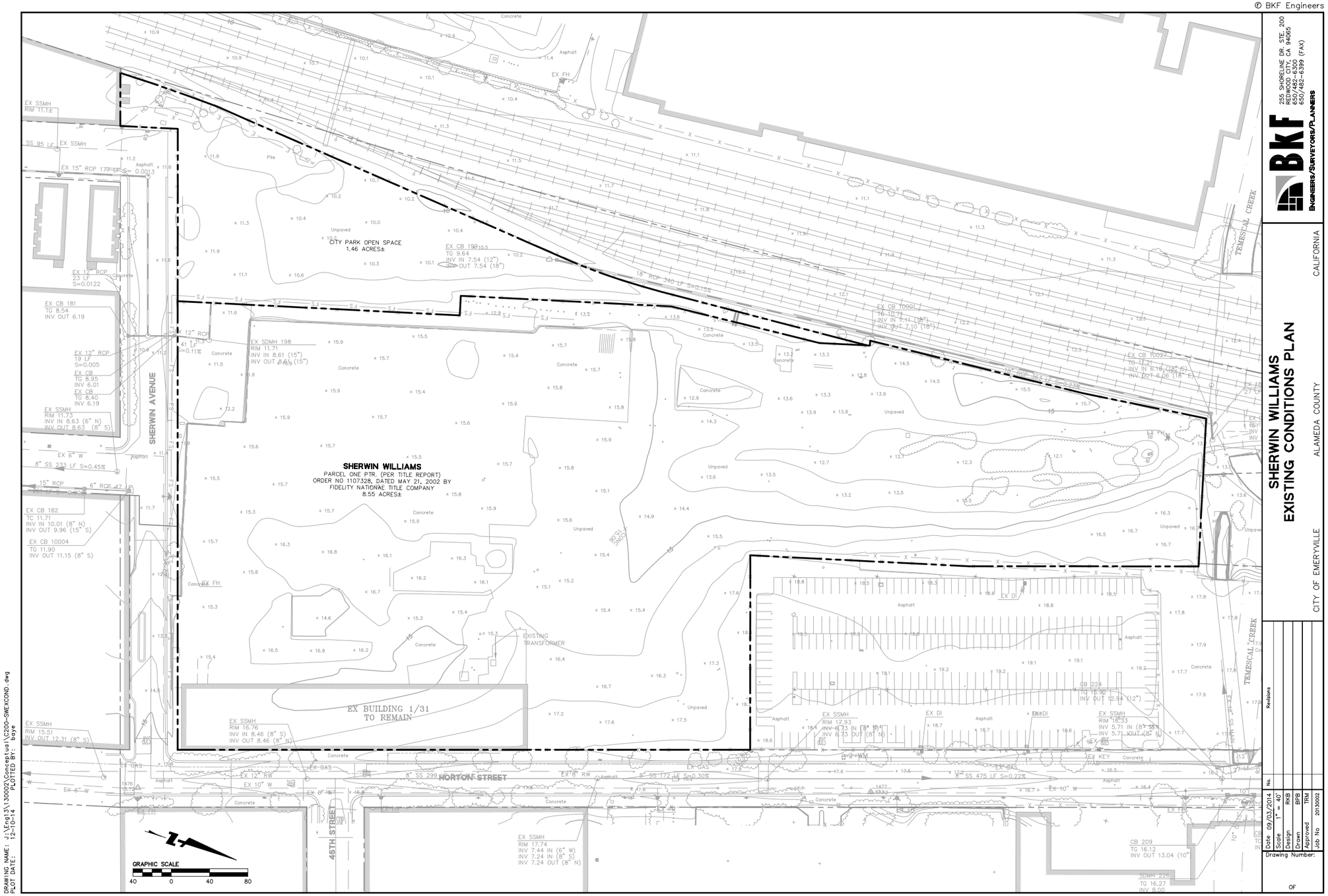
SHERWIN WILLIAMS PRELIMINARY DEVELOPMENT PLAN SUBMITTAL

JANUARY 20, 2015 • PREPARED FOR LMC EMERYVILLE I INVESTOR LLC BY ROMA DESIGN GROUP IN ASSOCIATION WITH LPAS AND BKF

HALLECK STREET
1.46 ACRE CITY
PARK / OPEN SPACE SITE
HUBBARD STREET
8.55 ACRE SHERWIN WILLIAMS PROPERTY
SHERWIN AVENUE
BUILDING 1-31
HORTON STREET
45TH STREET
53RD STREET
0
50'
100'
200'

SITE PHOTO

© BKF Engineers



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PLOT DATE: 12-10-14 PLOTTED BY: baye

BKF ENGINEERS/SURVEYORS/PLANNERS
255 SHORELINE DR. STE. 200
REDWOOD CITY, CA 94065
650/482-6300
650/482-6399 (FAX)

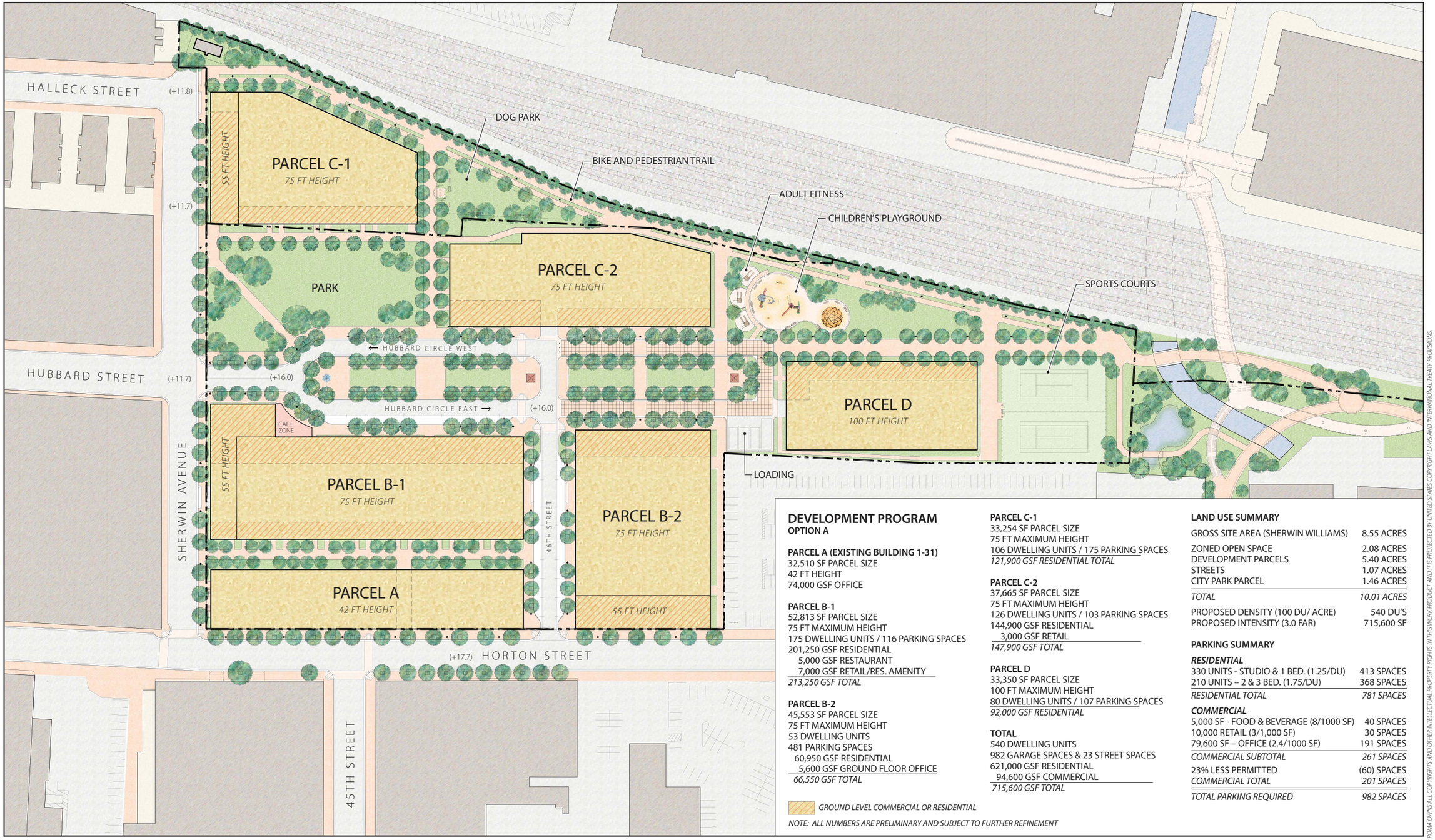
SHERWIN WILLIAMS
EXISTING CONDITIONS PLAN
ALAMEDA COUNTY CALIFORNIA
CITY OF EMERYVILLE

No.	Revisions
Date	09/03/2014
Scale	1" = 40'
Design	RKB
Drawn	BPB
Approved	TRM
Job No	20130002

Drawing Number:

OF

EXISTING CONDITIONS PLAN



DEVELOPMENT PROGRAM
OPTION A

PARCEL A (EXISTING BUILDING 1-31)
32,510 SF PARCEL SIZE
42 FT HEIGHT
74,000 GSF OFFICE

PARCEL B-1
52,813 SF PARCEL SIZE
75 FT MAXIMUM HEIGHT
175 DWELLING UNITS / 116 PARKING SPACES
201,250 GSF RESIDENTIAL
5,000 GSF RESTAURANT
7,000 GSF RETAIL/RES. AMENITY
213,250 GSF TOTAL

PARCEL B-2
45,553 SF PARCEL SIZE
75 FT MAXIMUM HEIGHT
53 DWELLING UNITS
481 PARKING SPACES
60,950 GSF RESIDENTIAL
5,600 GSF GROUND FLOOR OFFICE
66,550 GSF TOTAL

PARCEL C-1
33,254 SF PARCEL SIZE
75 FT MAXIMUM HEIGHT
106 DWELLING UNITS / 175 PARKING SPACES
121,900 GSF RESIDENTIAL TOTAL

PARCEL C-2
37,665 SF PARCEL SIZE
75 FT MAXIMUM HEIGHT
126 DWELLING UNITS / 103 PARKING SPACES
144,900 GSF RESIDENTIAL
3,000 GSF RETAIL
147,900 GSF TOTAL

PARCEL D
33,350 SF PARCEL SIZE
100 FT MAXIMUM HEIGHT
80 DWELLING UNITS / 107 PARKING SPACES
92,000 GSF RESIDENTIAL

TOTAL
540 DWELLING UNITS
982 GARAGE SPACES & 23 STREET SPACES
621,000 GSF RESIDENTIAL
94,600 GSF COMMERCIAL
715,600 GSF TOTAL

GROUND LEVEL COMMERCIAL OR RESIDENTIAL

NOTE: ALL NUMBERS ARE PRELIMINARY AND SUBJECT TO FURTHER REFINEMENT

LAND USE SUMMARY

GROSS SITE AREA (SHERWIN WILLIAMS)	8.55 ACRES
ZONED OPEN SPACE	2.08 ACRES
DEVELOPMENT PARCELS	5.40 ACRES
STREETS	1.07 ACRES
CITY PARK PARCEL	1.46 ACRES
TOTAL	*10.01 ACRES*
PROPOSED DENSITY (100 DU/ ACRE)	540 DU'S
PROPOSED INTENSITY (3.0 FAR)	715,600 SF

PARKING SUMMARY

RESIDENTIAL	
330 UNITS - STUDIO & 1 BED. (1.25/DU)	413 SPACES
210 UNITS – 2 & 3 BED. (1.75/DU)	368 SPACES
RESIDENTIAL TOTAL	*781 SPACES*
COMMERCIAL	
5,000 SF - FOOD & BEVERAGE (8/1000 SF)	40 SPACES
10,000 RETAIL (3/1,000 SF)	30 SPACES
79,600 SF – OFFICE (2.4/1000 SF)	191 SPACES
COMMERCIAL SUBTOTAL	*261 SPACES*
23% LESS PERMITTED	(60) SPACES
COMMERCIAL TOTAL	*201 SPACES*
TOTAL PARKING REQUIRED	*982 SPACES*

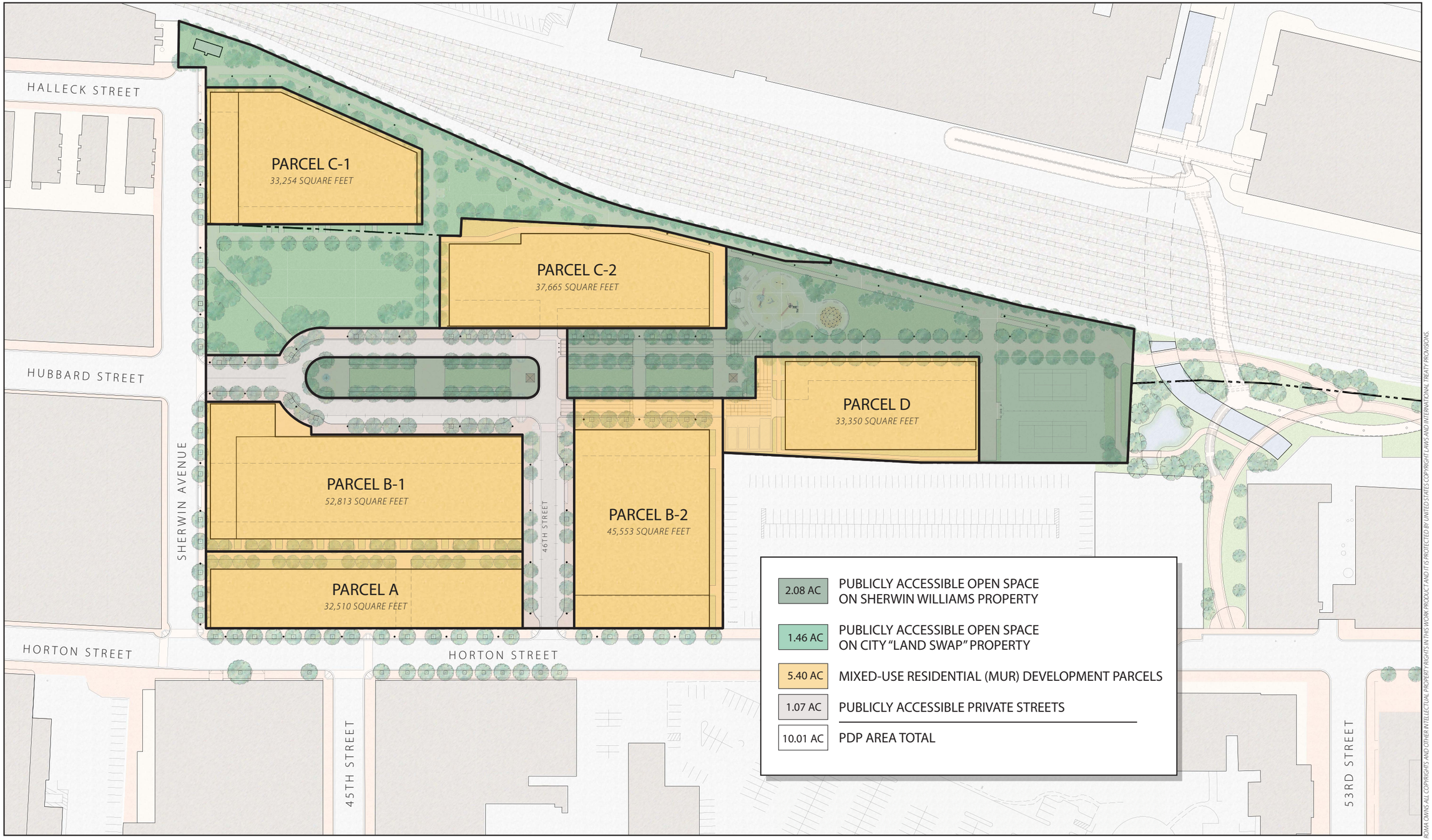
ROMA OWNS ALL COPYRIGHTS AND OTHER INTELLECTUAL PROPERTY RIGHTS IN THIS WORK PRODUCT AND IT IS PROTECTED BY UNITED STATES COPYRIGHT LAWS AND INTERNATIONAL TREATY PROVISIONS.

0 50′ 100′ 200′

OPTION A: SITE DEVELOPMENT PLAN

SHERWIN WILLIAMS PRELIMINARY DEVELOPMENT PLAN SUBMITTAL

JANUARY 20, 2015 • PREPARED FOR LMC EMERYVILLE I INVESTOR LLC BY ROMA DESIGN GROUP IN ASSOCIATION WITH LPAS AND BKF



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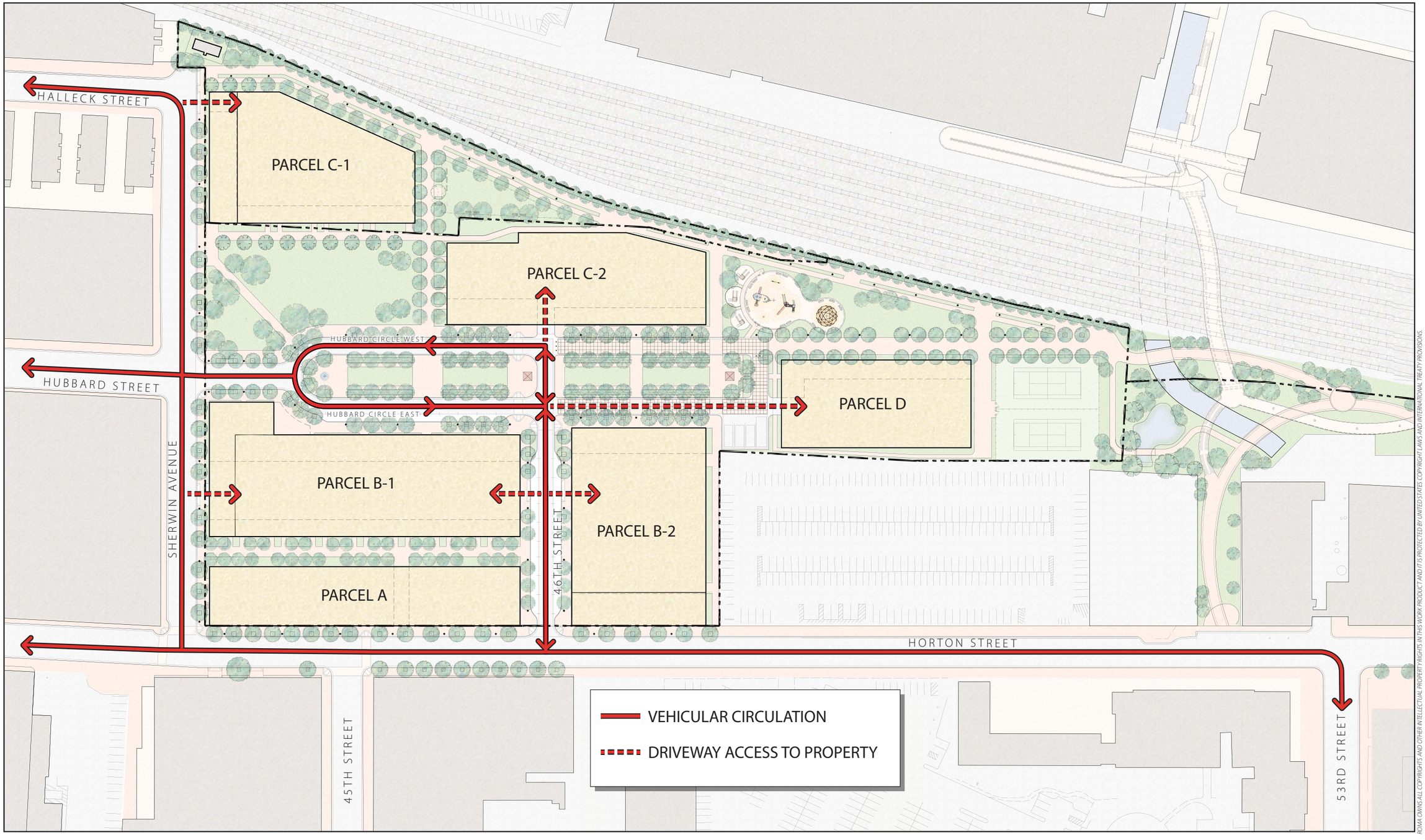
OPTION A: LAND USE DIAGRAM



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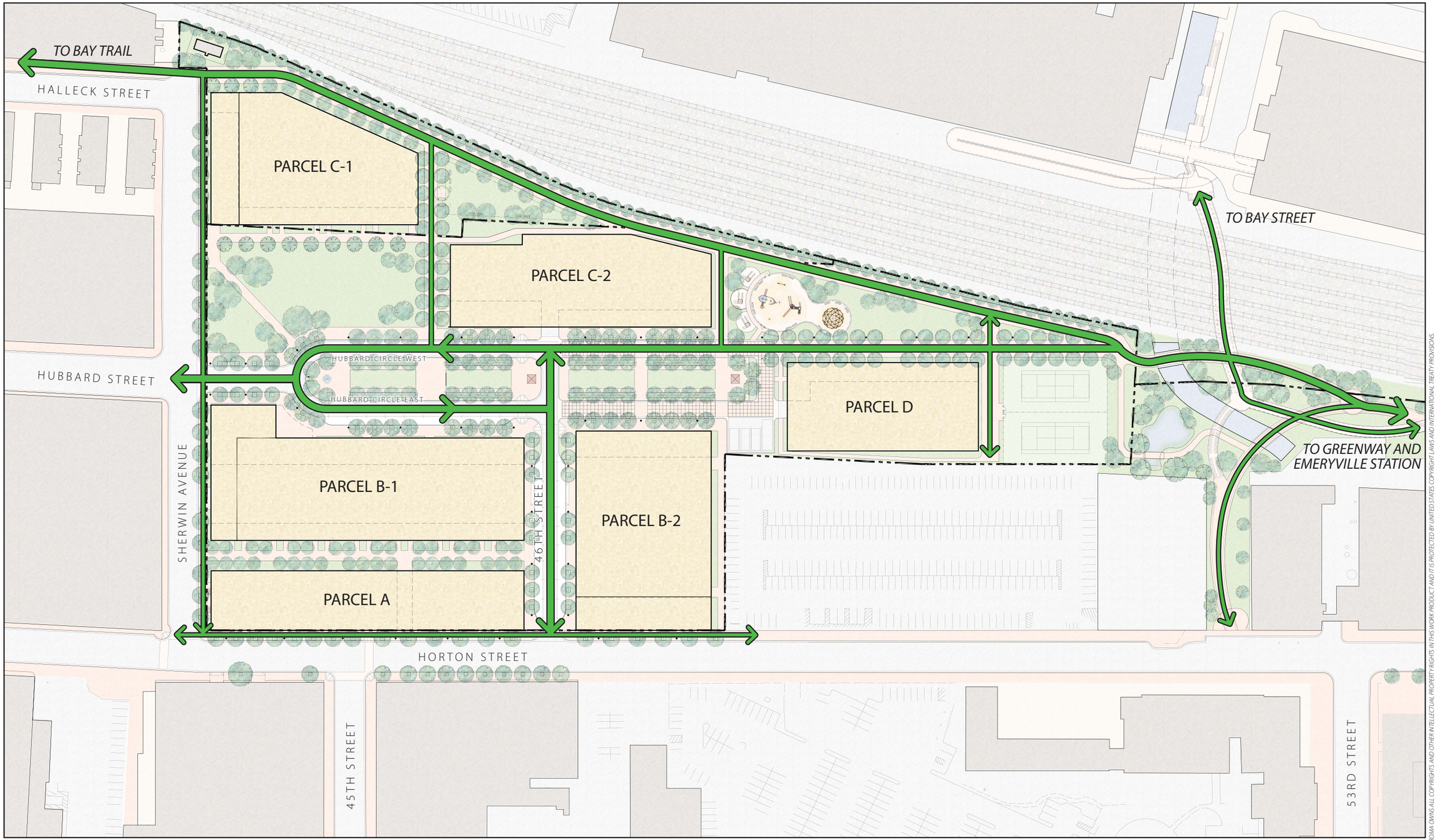
OPTION A: VEHICULAR CIRCULATION



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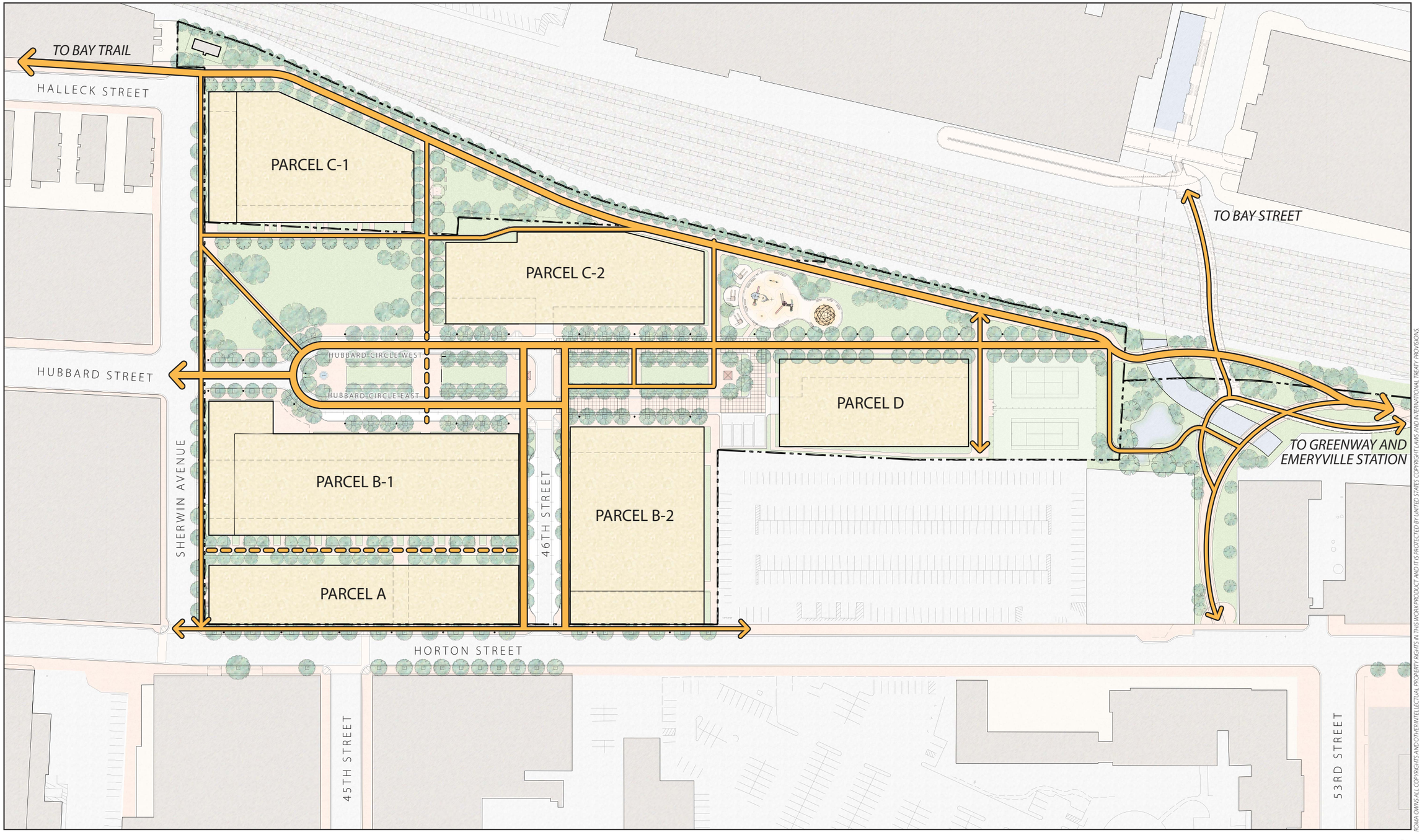
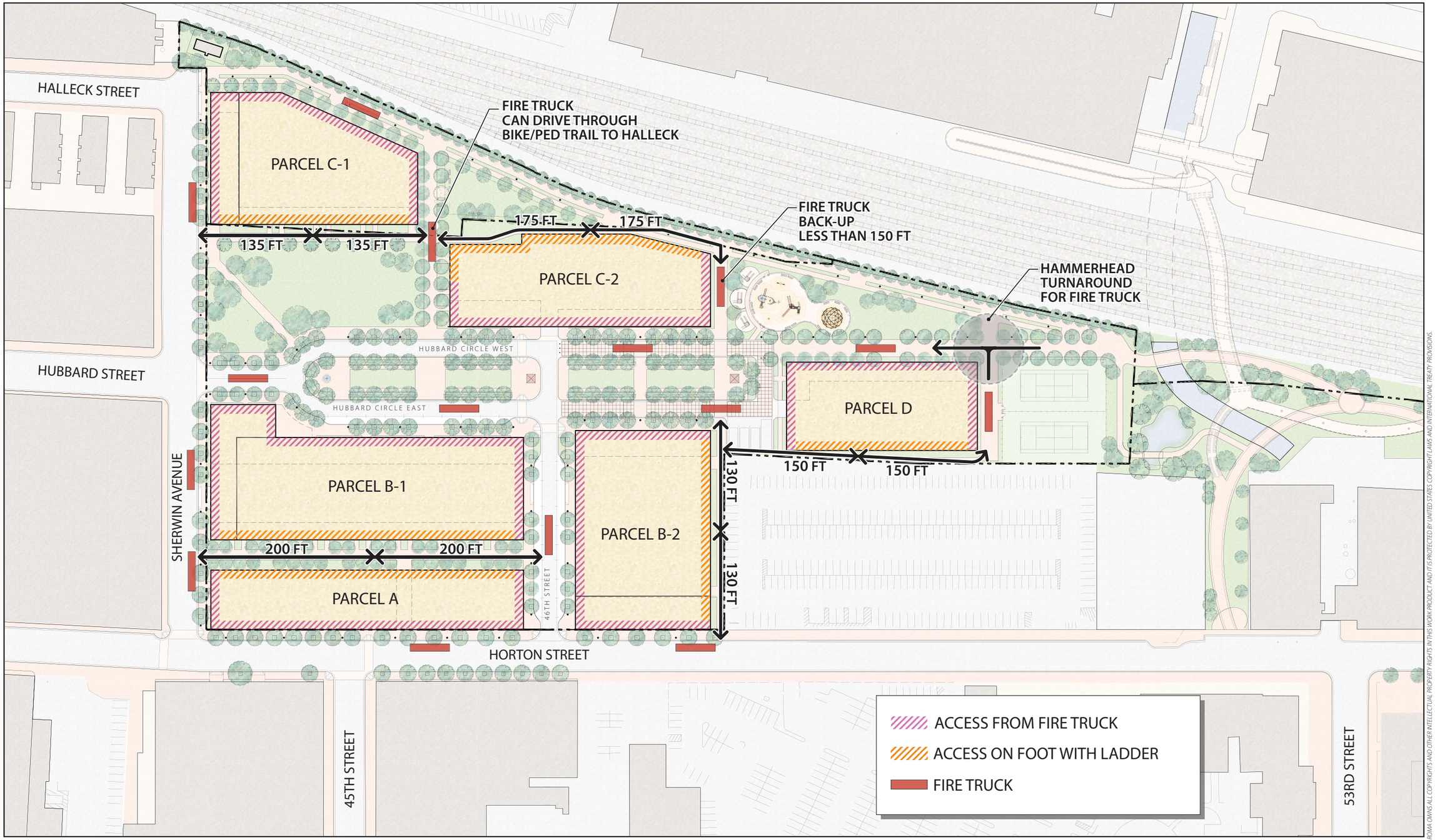
OPTION A: BICYCLE CIRCULATION



ROMA OWNS ALL COPYRIGHTS AND OTHER INTELLECTUAL PROPERTY RIGHTS IN THIS WORK PRODUCT AND IT IS PROTECTED BY UNITED STATES COPYRIGHT LAWS AND INTERNATIONAL TREATY PROVISIONS.

OPTION A: PEDESTRIAN CIRCULATION

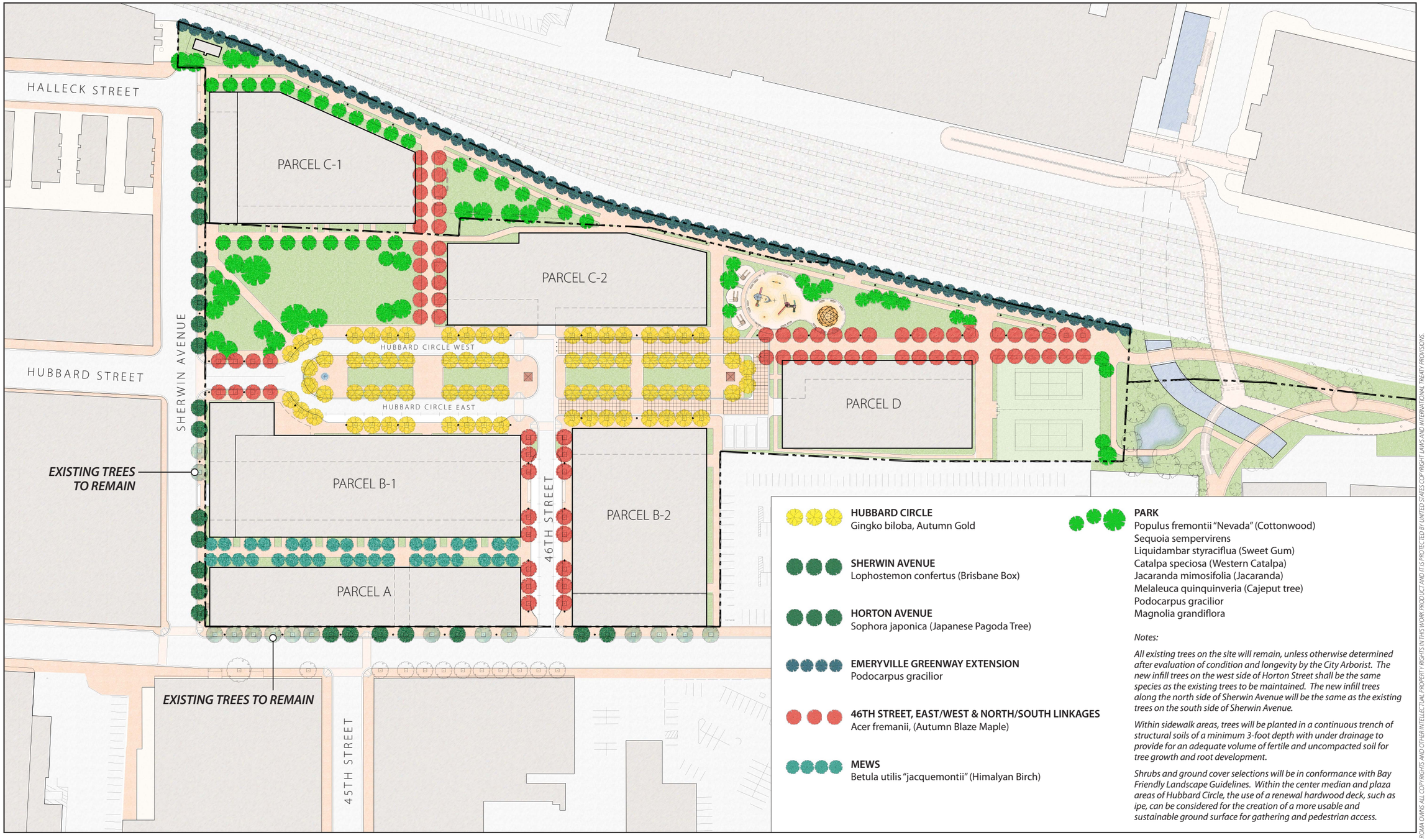


ROMA OWNS ALL COPYRIGHTS AND OTHER INTELLECTUAL PROPERTY RIGHTS IN THIS WORK PRODUCT AND IT IS PROTECTED BY UNITED STATES COPYRIGHT LAWS AND INTERNATIONAL TREATY PROVISIONS.

OPTION A: FIRE ACCESS PLAN

ROMA OWNS ALL COPYRIGHTS AND OTHER INTELLECTUAL PROPERTY RIGHTS IN THIS WORK PRODUCT AND IT IS PROTECTED BY UNITED STATES COPYRIGHT LAWS AND INTERNATIONAL TREATY PROVISIONS.

OPTION A: LIGHTING PLAN



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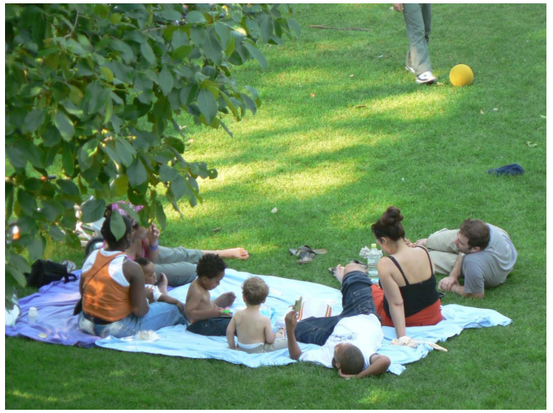
OPTION A: LANDSCAPE PLAN

Bike / Pedestrian Path



Open Meadow

Dog Park

Sports Courts

Central Plaza

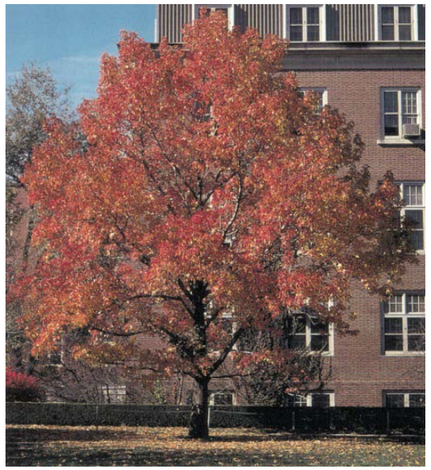
Central Plaza

Children's Playground

Adult Fitness

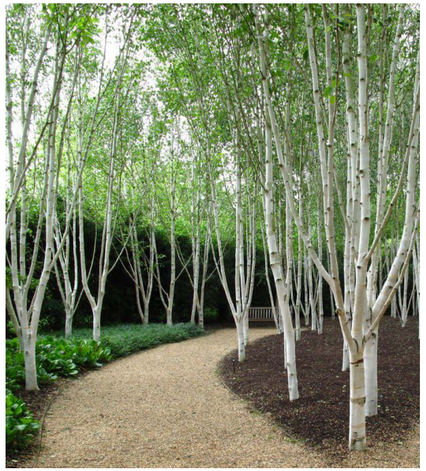
OPTION A: OPEN SPACE PRECEDENTS

Populus fremontii “Nevada” (Cottonwood)



Liquidambar styraciflua (Sweet Gum)

Jacaranda mimosifolia (Jacaranda)



Betula utilis “jacquemontii” (Himalyan Birch)

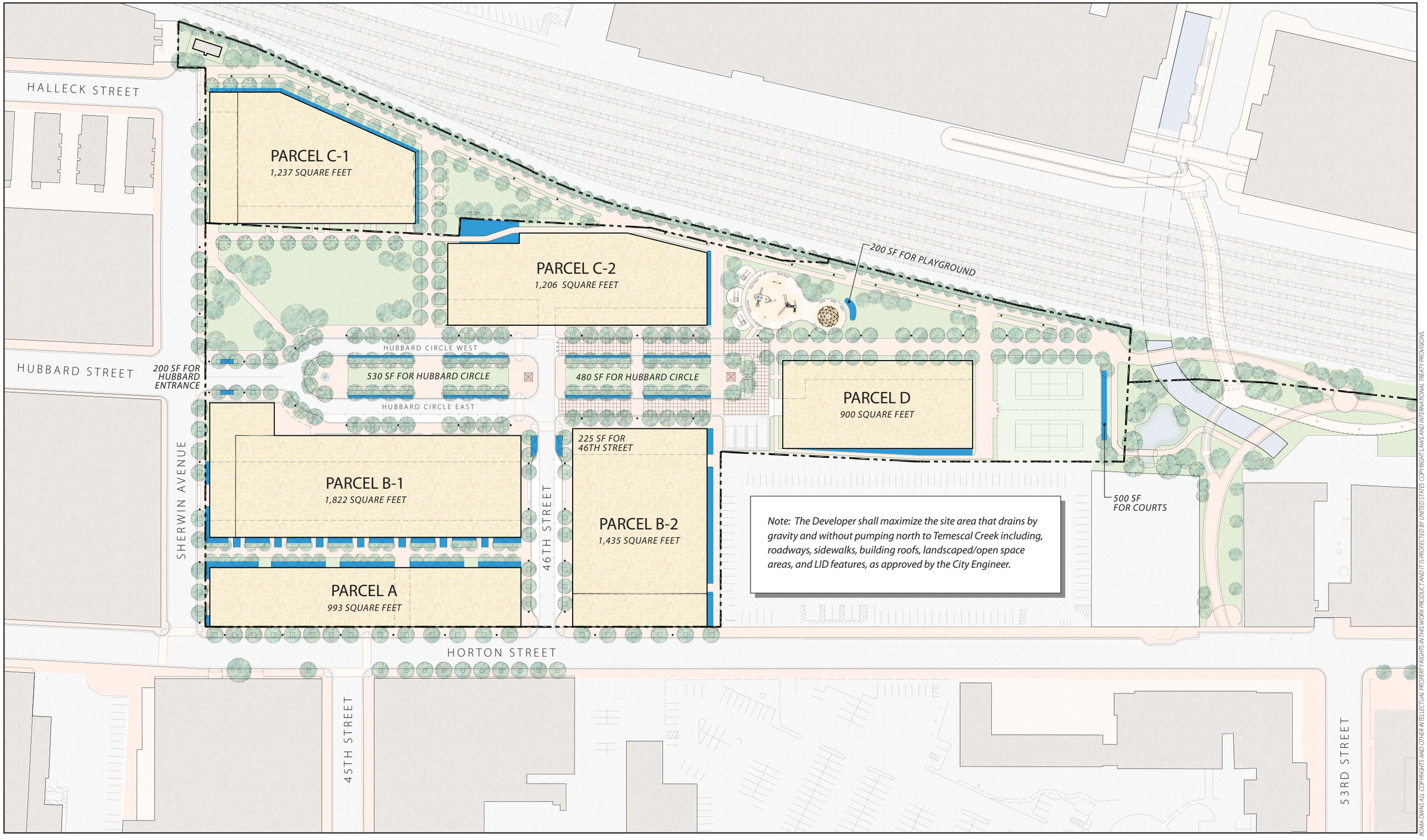
Gingko biloba, Autumn Gold

Acer fremanii, (Autumn Blaze Maple)

Lophostemon confertus
(Brisbane Box)

Podocarpus gracilior

OPTION A: LANDSCAPE PRECEDENTS



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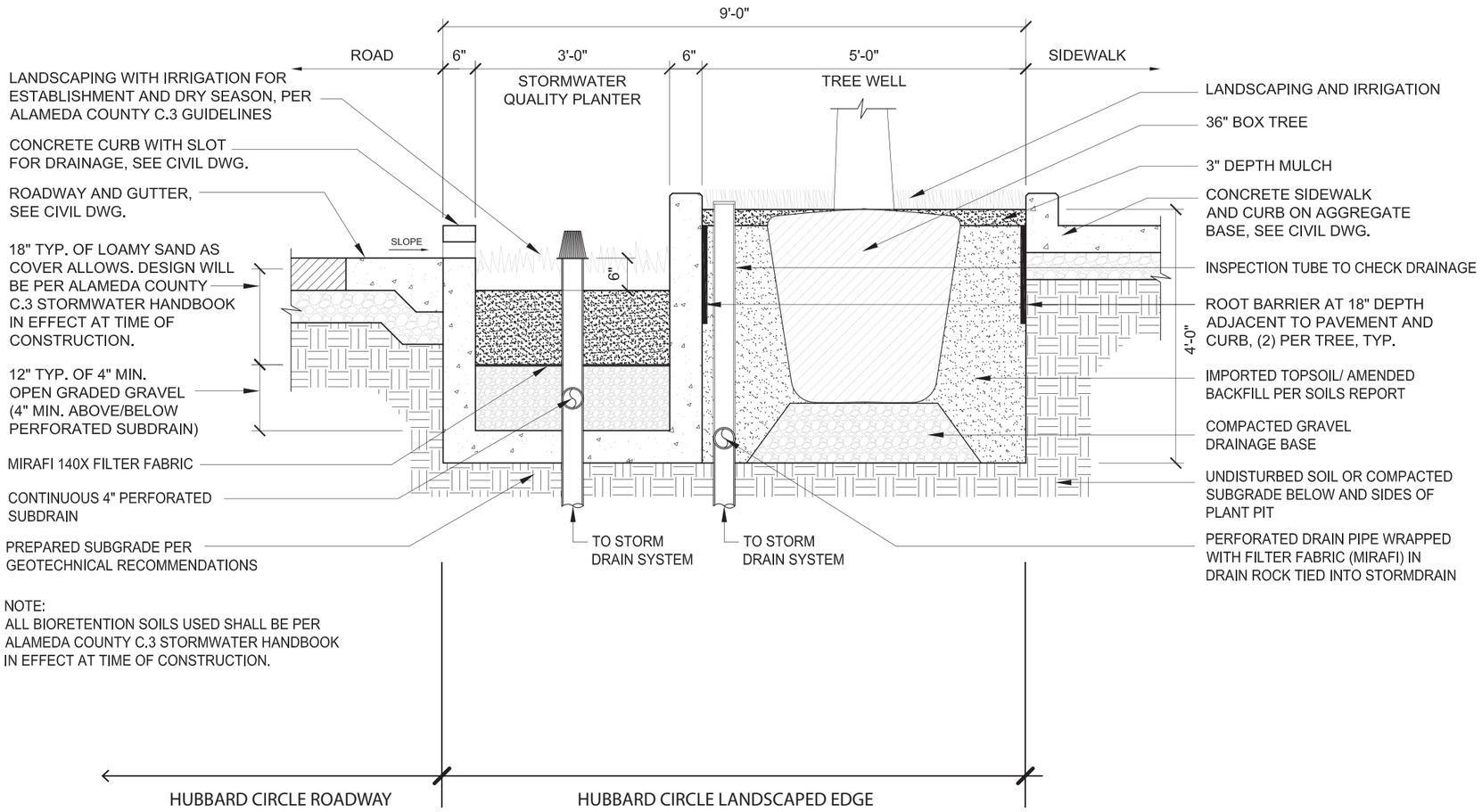
OPTION A: STORMWATER TREATMENT CONCEPT PLAN



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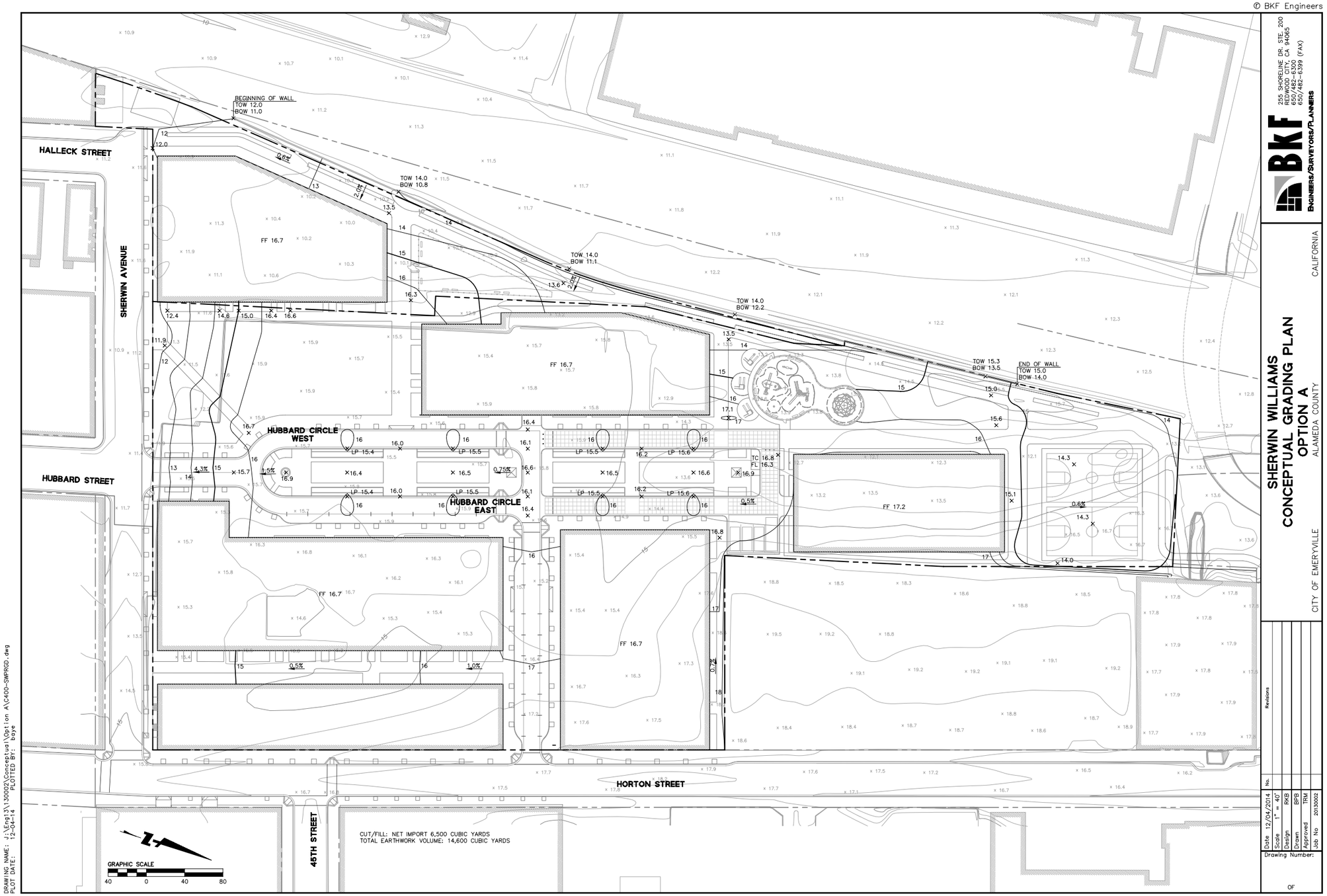
TYPICAL SECTION FOR STORMWATER AND STREET TREE PLANTERS

© BKF Engineers



BKF
ENGINEERS/SURVEYORS/PLANNERS
255 SHORELINE DR. STE. 200
REDWOOD CITY, CA 94065
650/482-6300
650/482-6399 (FAX)

SHERWIN WILLIAMS
CONCEPTUAL GRADING PLAN
OPTION A
ALAMEDA COUNTY, CALIFORNIA
CITY OF EMERYVILLE

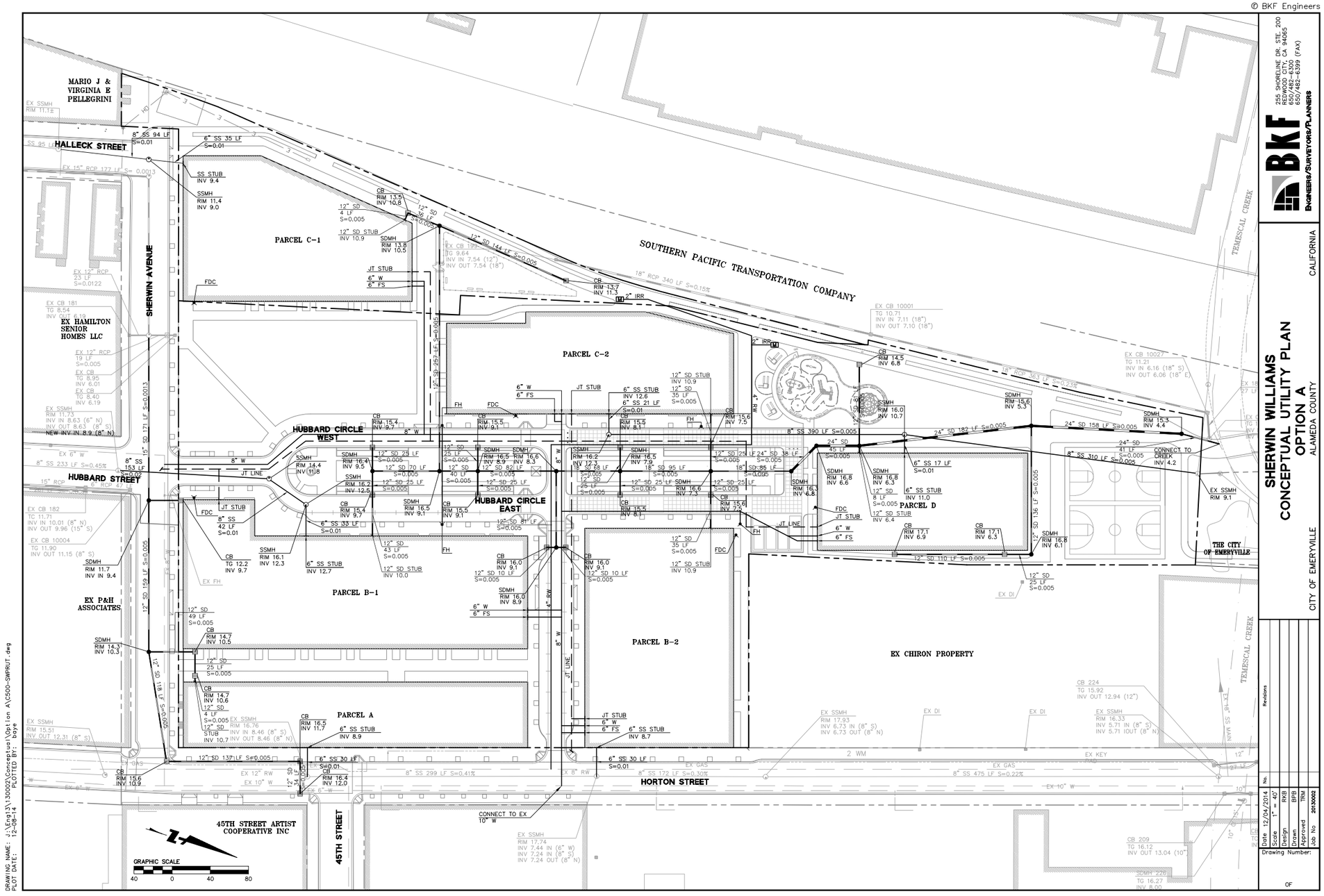
Revisions	No.
Date	12/04/2014
Scale	1" = 40'
Design	RKB
Drawn	BPB
Approved	TRM
Job No	20130002

Drawing Number:
OF

DRAWING NAME: J:\Eng13\130002\Conceptual\Option A\C400-SWPRGD.dwg
PLOT DATE: 12-04-14 PLOTTED BY: baye

OPTION A: CONCEPTUAL GRADING PLAN

© BKF Engineers



BKF
ENGINEERS/SURVEYORS/PLANNERS
255 SHORELINE DR. STE. 200
REDWOOD CITY, CA 94065
650/482-6300
650/482-6399 (FAX)

SHERWIN WILLIAMS
CONCEPTUAL UTILITY PLAN
OPTION A
ALAMEDA COUNTY CALIFORNIA
CITY OF EMERYVILLE

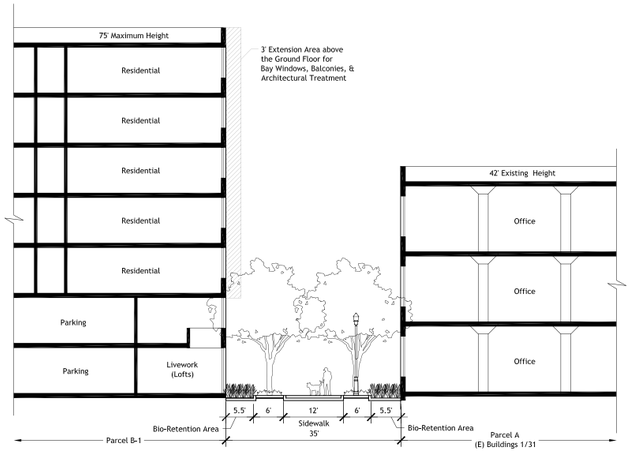
Revisions	No.
Date	12/04/2014
Scale	1" = 40'
Design	RKB
Drawn	BPB
Approved	TRM
Job No	20130002
Drawing Number:	
	OF

DRAWING NAME: J:\Engl3\130002\Concptua\Option A\C500-SWPRUT.dwg
PLOT DATE: 12-08-14
PLOTTED BY: boye

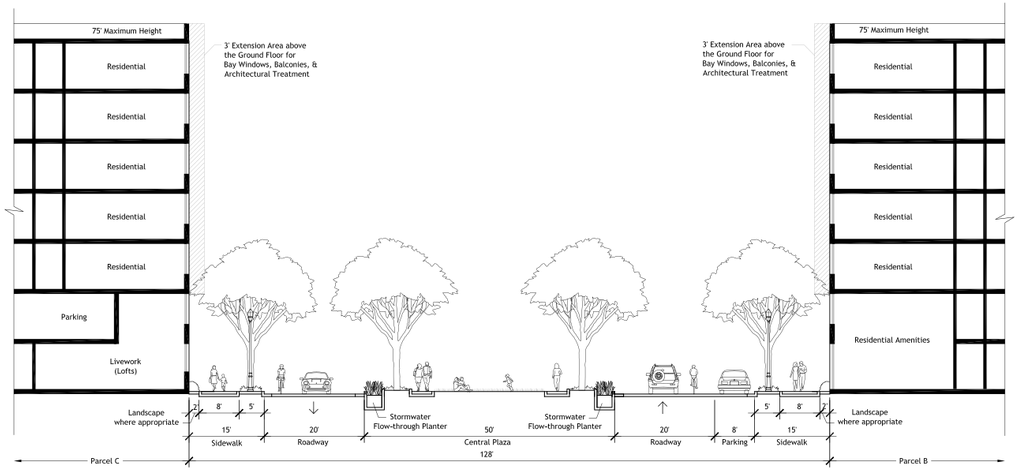
OPTION A: UTILITIES

ROMA OWNS ALL COPYRIGHTS AND OTHER INTELLECTUAL PROPERTY RIGHTS IN THIS WORK PRODUCT AND IT'S PROTECTED BY UNITED STATES COPYRIGHT LAWS AND INTERNATIONAL TREATY PROVISIONS.

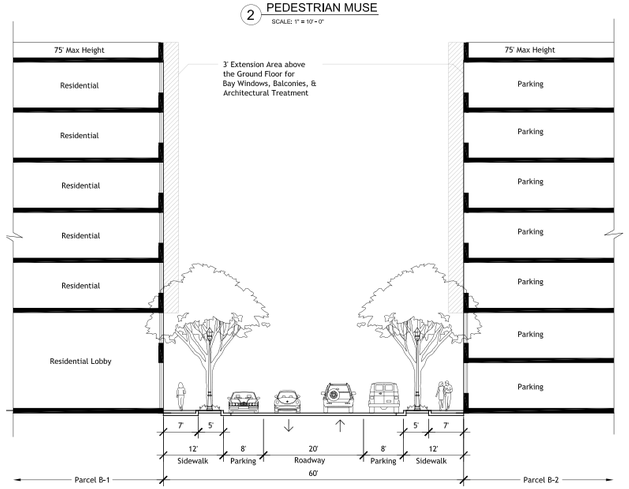
OPTION A: ILLUSTRATIVE DEVELOPMENT CONCEPT



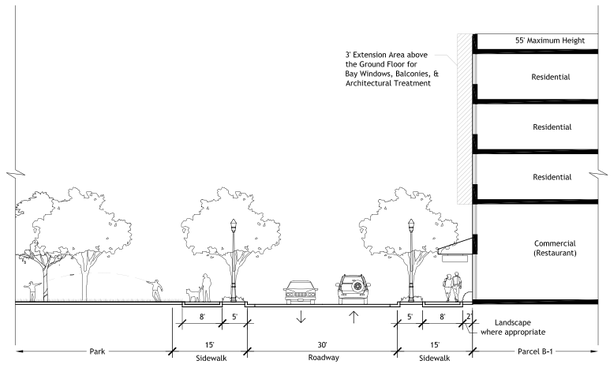
2 PEDESTRIAN MUSE
SCALE: 1" = 10'-0"



3 HUBBARD CIRCLE
SCALE: 1" = 10'-0"



1 46TH STREET ENTRANCE
SCALE: 1" = 10'-0"



4 HUBBARD STREET ENTRANCE
SCALE: 1" = 10'-0"

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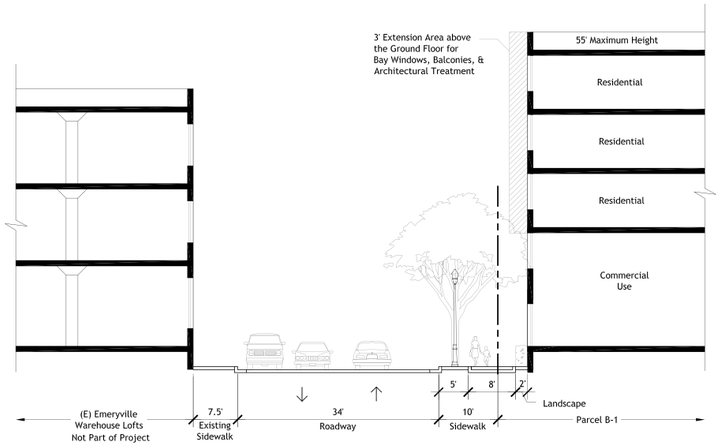
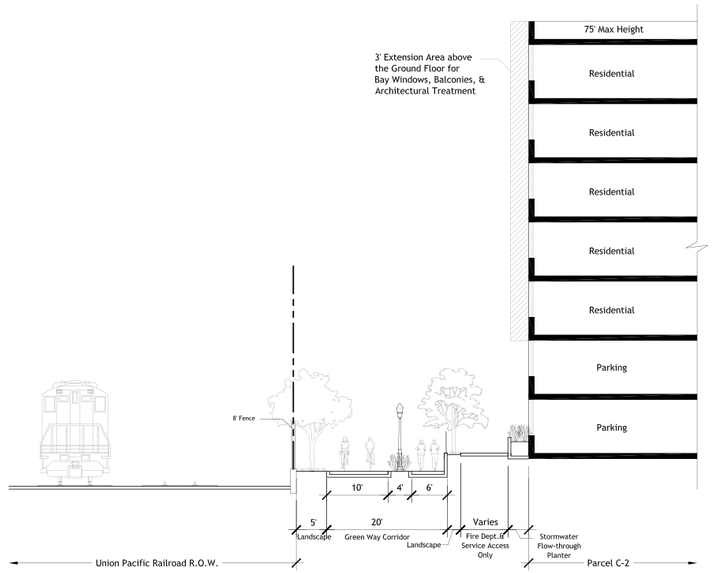
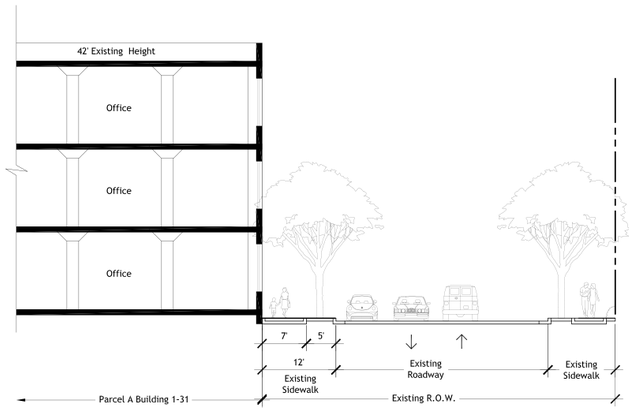
OPTION A: STREET SECTIONS (INTERNAL)



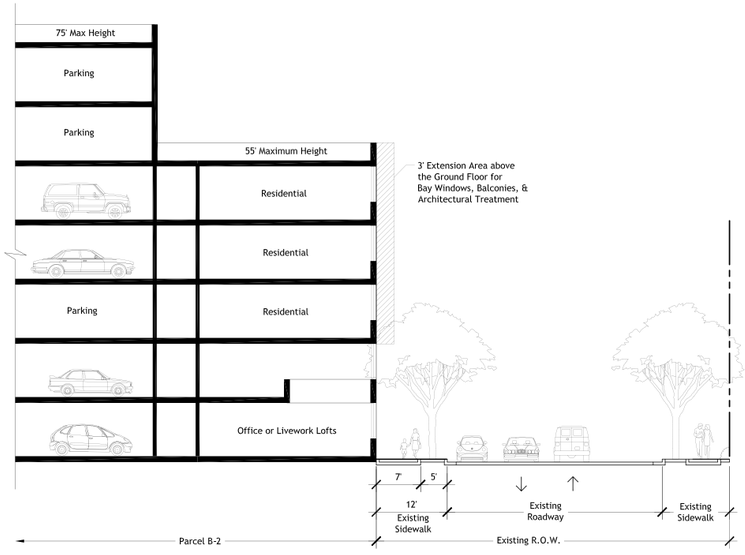
5 SHERWIN AVENUE
SCALE: 1" = 10' - 0"



6 TYPICAL BIKE PED TRAIL
SCALE: 1" = 10' - 0"



7 HORTON STREET
SCALE: 1" = 10' - 0"



8 HORTON STREET
SCALE: 1" = 10' - 0"

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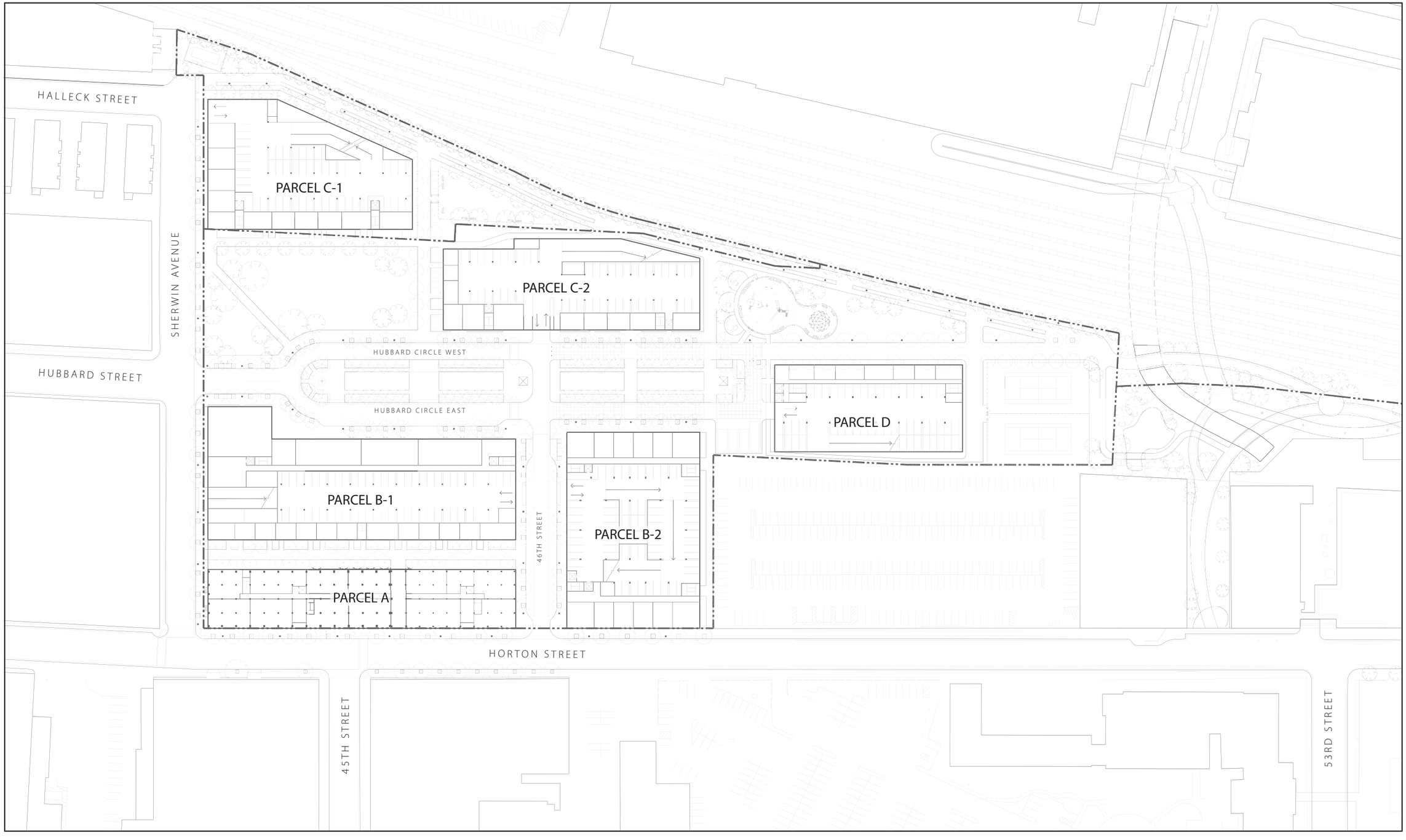
OPTION A: STREET SECTIONS (PERIMETER)



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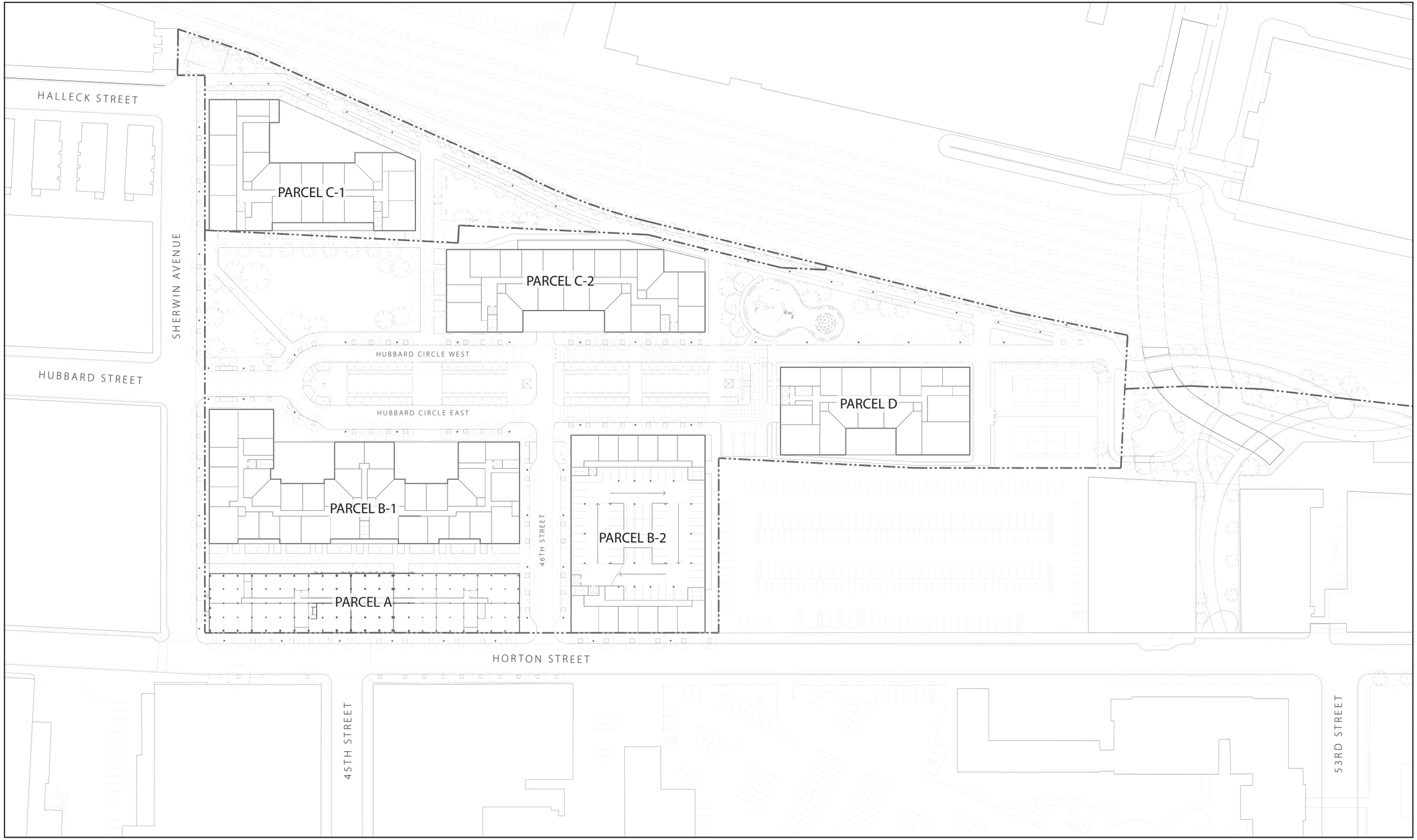
OPTION A: ILLUSTRATIVE GROUND LEVEL PLAN

0 50′ 100′ 200′

SHERWIN WILLIAMS PRELIMINARY DEVELOPMENT PLAN SUBMITTAL

JANUARY 20, 2015 • PREPARED FOR LMC EMERYVILLE I INVESTOR LLC BY ROMA DESIGN GROUP IN ASSOCIATION WITH LPAS AND BKF



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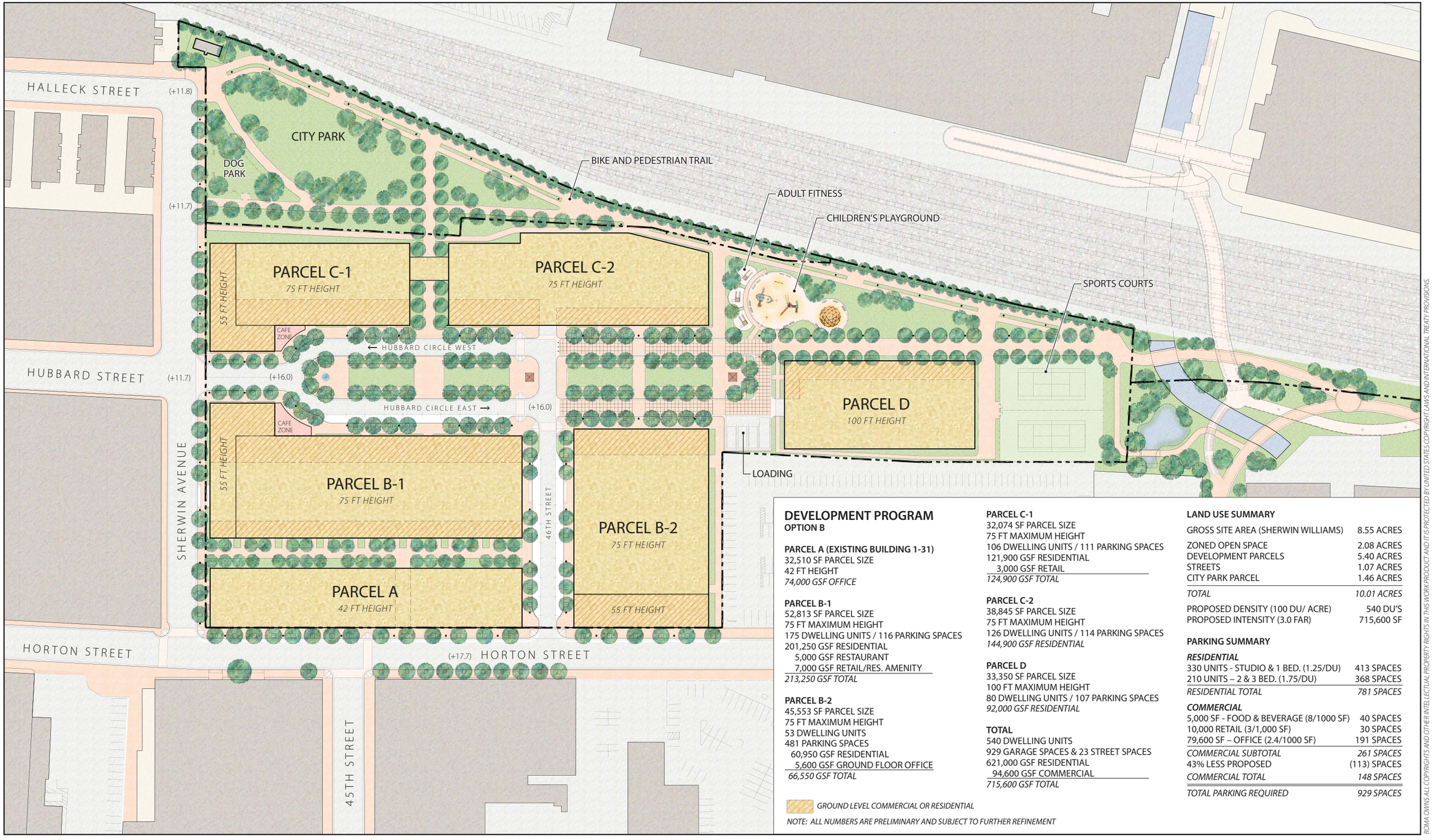
OPTION A: ILLUSTRATIVE UPPER LEVEL PLAN

0 50′ 100′ 200′



DEVELOPMENT PROGRAM
OPTION B

PARCEL A (EXISTING BUILDING 1-31)
32,510 SF PARCEL SIZE
42 FT HEIGHT
74,000 GSF OFFICE

PARCEL B-1
52,813 SF PARCEL SIZE
75 FT MAXIMUM HEIGHT
175 DWELLING UNITS / 116 PARKING SPACES
201,250 GSF RESIDENTIAL
5,000 GSF RESTAURANT
7,000 GSF RETAIL/RES. AMENITY
213,250 GSF TOTAL

PARCEL B-2
45,553 SF PARCEL SIZE
75 FT MAXIMUM HEIGHT
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481 PARKING SPACES
60,950 GSF RESIDENTIAL
5,600 GSF GROUND FLOOR OFFICE
66,550 GSF TOTAL

PARCEL C-1
32,074 SF PARCEL SIZE
75 FT MAXIMUM HEIGHT
106 DWELLING UNITS / 111 PARKING SPACES
121,900 GSF RESIDENTIAL
3,000 GSF RETAIL
124,900 GSF TOTAL

PARCEL C-2
38,845 SF PARCEL SIZE
75 FT MAXIMUM HEIGHT
126 DWELLING UNITS / 114 PARKING SPACES
144,900 GSF RESIDENTIAL

PARCEL D
33,350 SF PARCEL SIZE
100 FT MAXIMUM HEIGHT
80 DWELLING UNITS / 107 PARKING SPACES
92,000 GSF RESIDENTIAL

TOTAL
540 DWELLING UNITS
929 GARAGE SPACES & 23 STREET SPACES
621,000 GSF RESIDENTIAL
94,600 GSF COMMERCIAL
715,600 GSF TOTAL

GROUND LEVEL COMMERCIAL OR RESIDENTIAL

NOTE: ALL NUMBERS ARE PRELIMINARY AND SUBJECT TO FURTHER REFINEMENT

LAND USE SUMMARY

GROSS SITE AREA (SHERWIN WILLIAMS)	8.55 ACRES
ZONED OPEN SPACE	2.08 ACRES
DEVELOPMENT PARCELS	5.40 ACRES
STREETS	1.07 ACRES
CITY PARK PARCEL	1.46 ACRES
TOTAL	*10.01 ACRES*
PROPOSED DENSITY (100 DU/ ACRE)	540 DU'S
PROPOSED INTENSITY (3.0 FAR)	715,600 SF

PARKING SUMMARY

RESIDENTIAL	
330 UNITS - STUDIO & 1 BED. (1.25/DU)	413 SPACES
210 UNITS – 2 & 3 BED. (1.75/DU)	368 SPACES
RESIDENTIAL TOTAL	*781 SPACES*
COMMERCIAL	
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10,000 RETAIL (3/1,000 SF)	30 SPACES
79,600 SF – OFFICE (2.4/1000 SF)	191 SPACES
COMMERCIAL SUBTOTAL	*261 SPACES*
43% LESS PROPOSED	(113) SPACES
COMMERCIAL TOTAL	*148 SPACES*
TOTAL PARKING REQUIRED	*929 SPACES*

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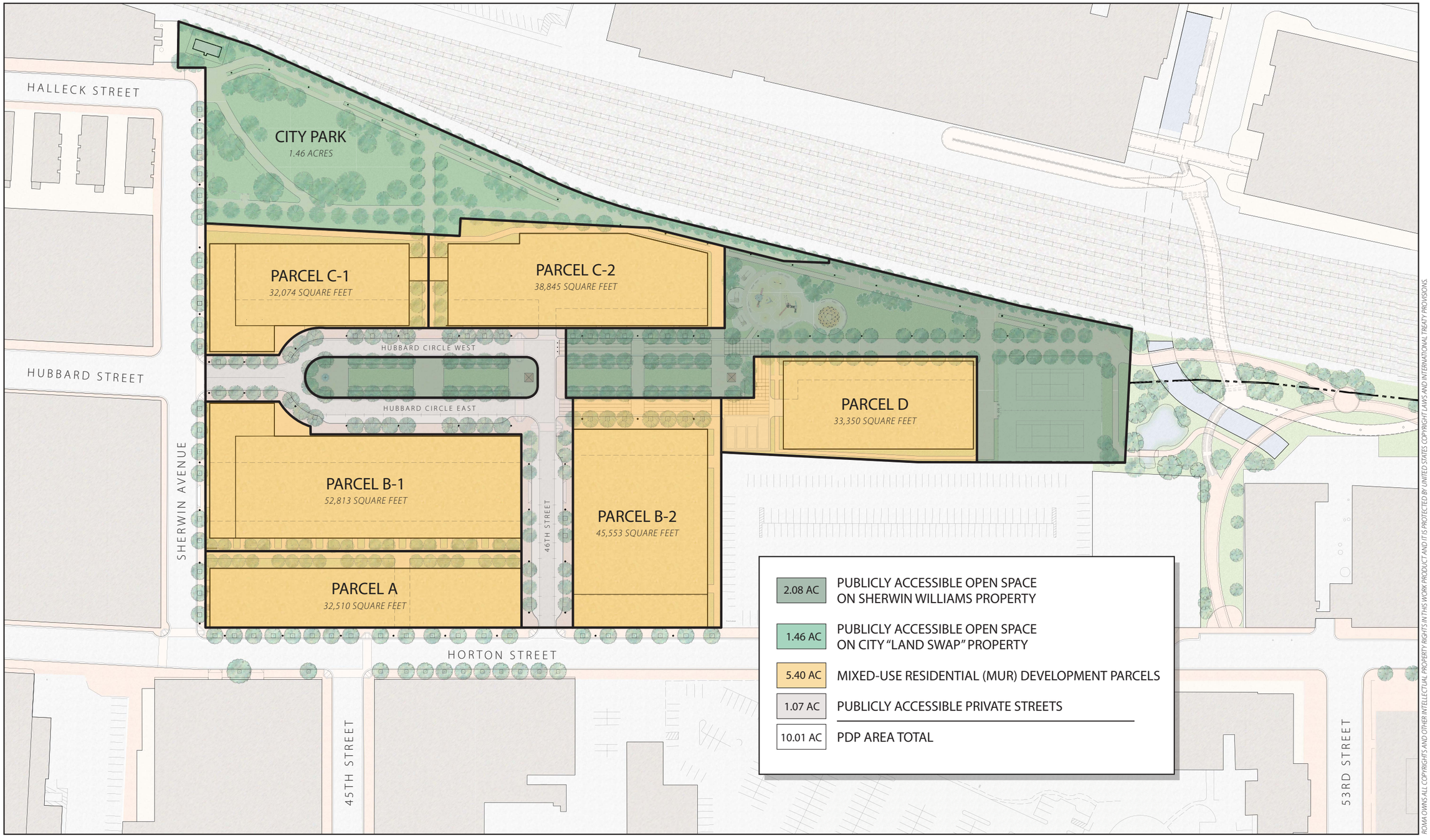
0 50' 100' 200'

OPTION B: SITE DEVELOPMENT PLAN



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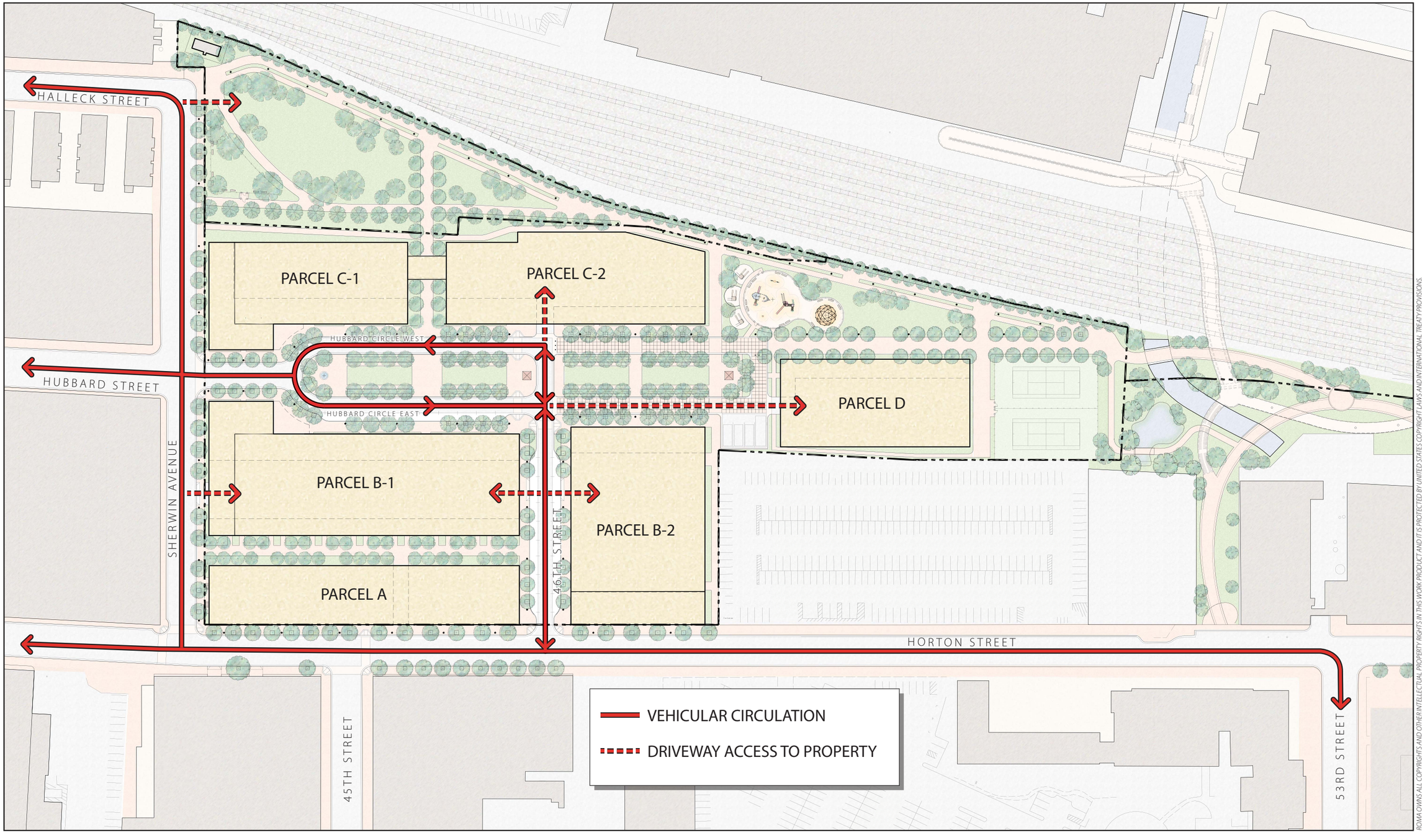
OPTION B: LAND USE DIAGRAM



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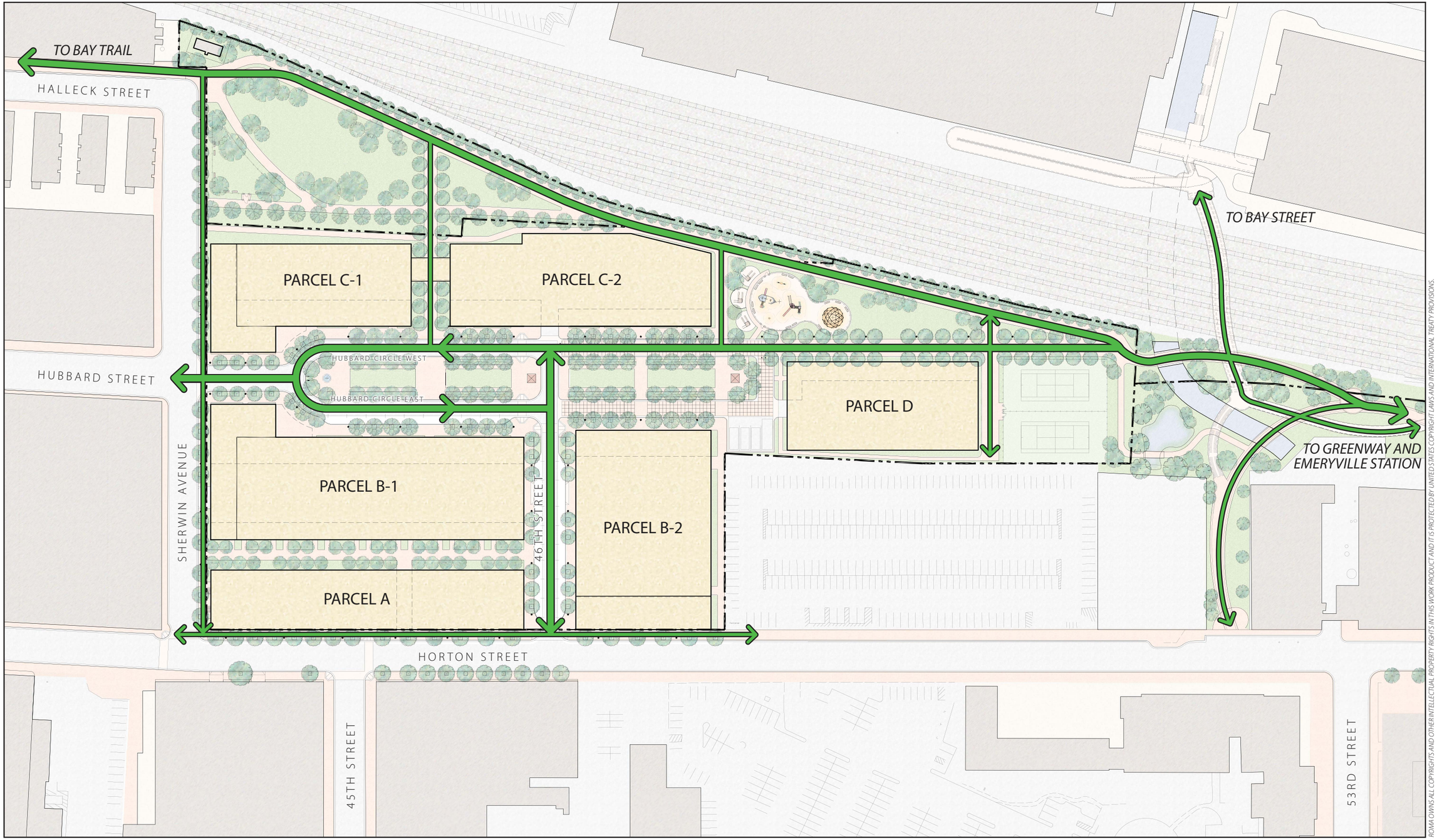
OPTION B: VEHICULAR CIRCULATION



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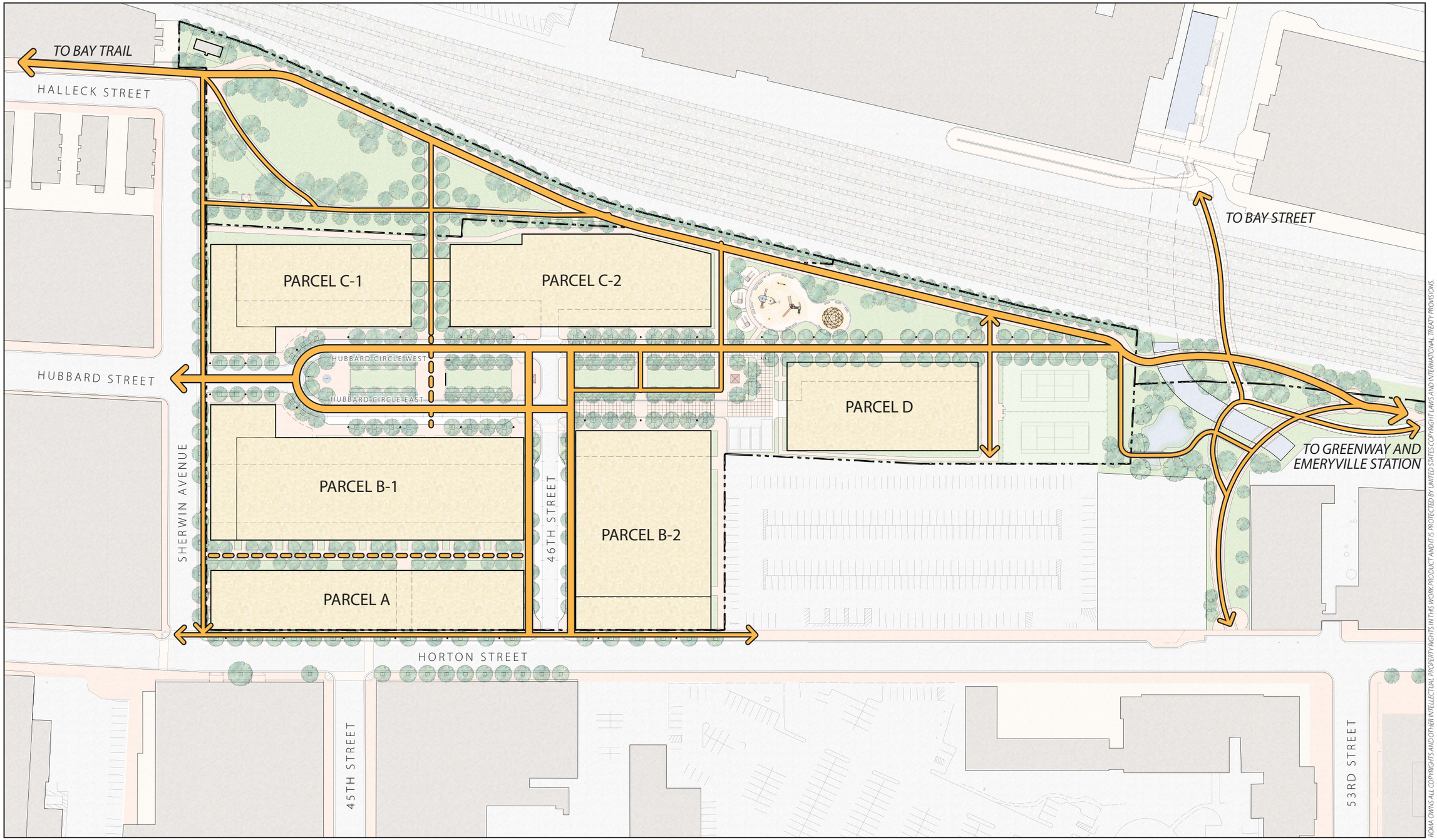
OPTION B: BICYCLE CIRCULATION



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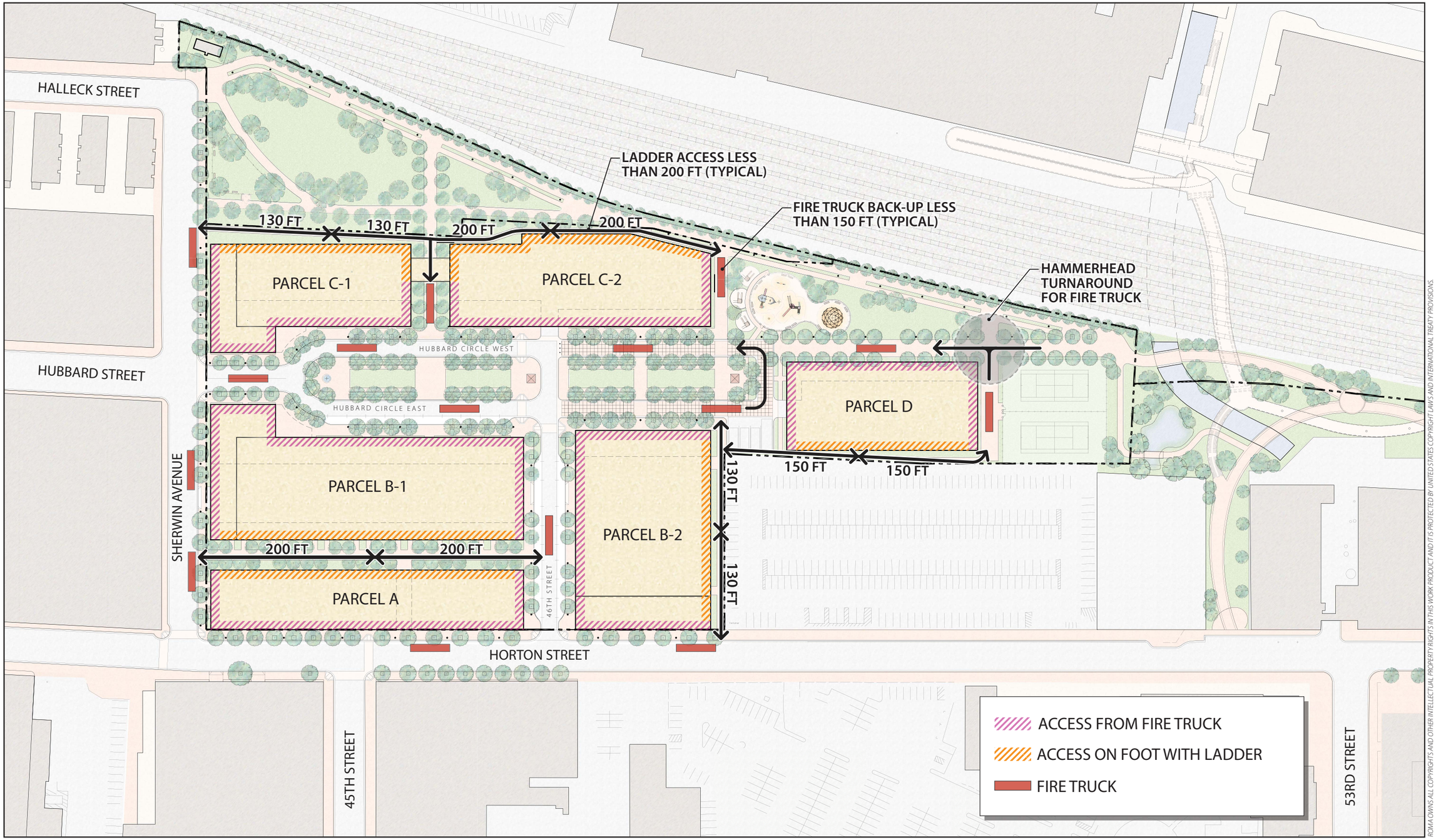
OPTION B: PEDESTRIAN CIRCULATION



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OPTION B: FIRE ACCESS PLAN

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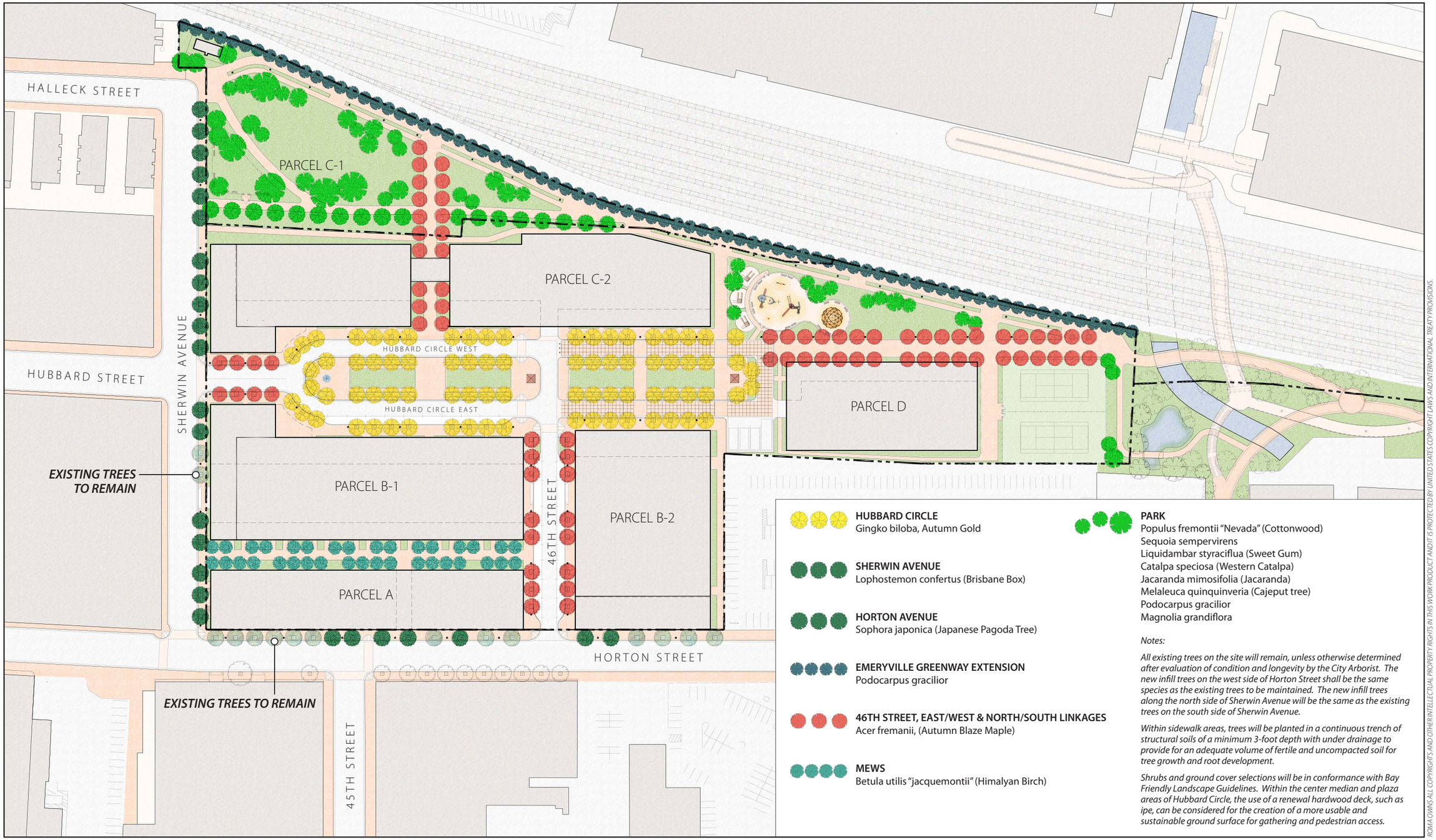
OPTION B: LIGHTING PLAN



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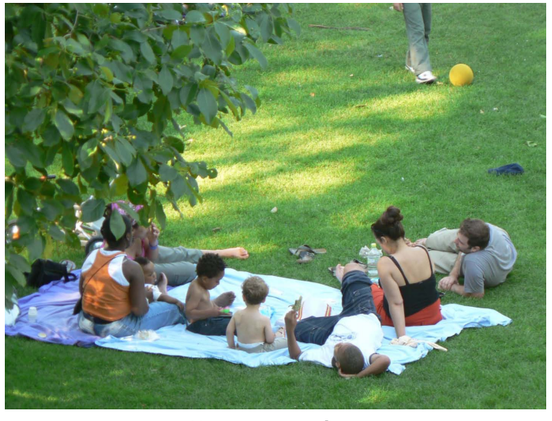
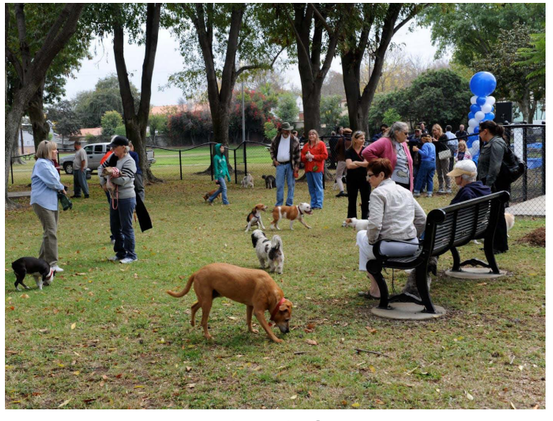
OPTION B: LANDSCAPE PLAN

Bike / Pedestrian Path



Open Meadow



Dog Park

Sports Courts

Central Plaza

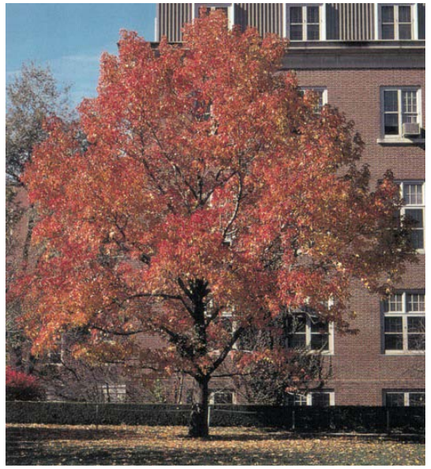
Central Plaza

Children's Playground

Adult Fitness

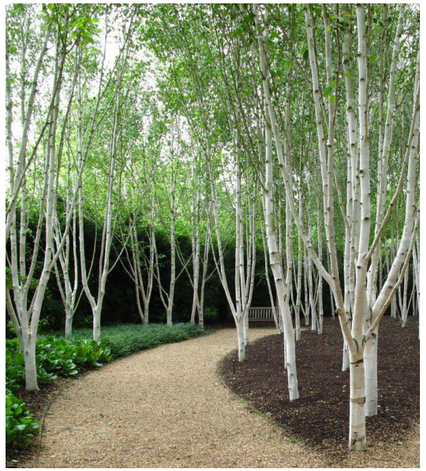
OPTION B: OPEN SPACE PRECEDENTS

Populus fremontii “Nevada” (Cottonwood)



Liquidambar styraciflua (Sweet Gum)

Jacaranda mimosifolia (Jacaranda)



Betula utilis “jacquemontii” (Himalyan Birch)

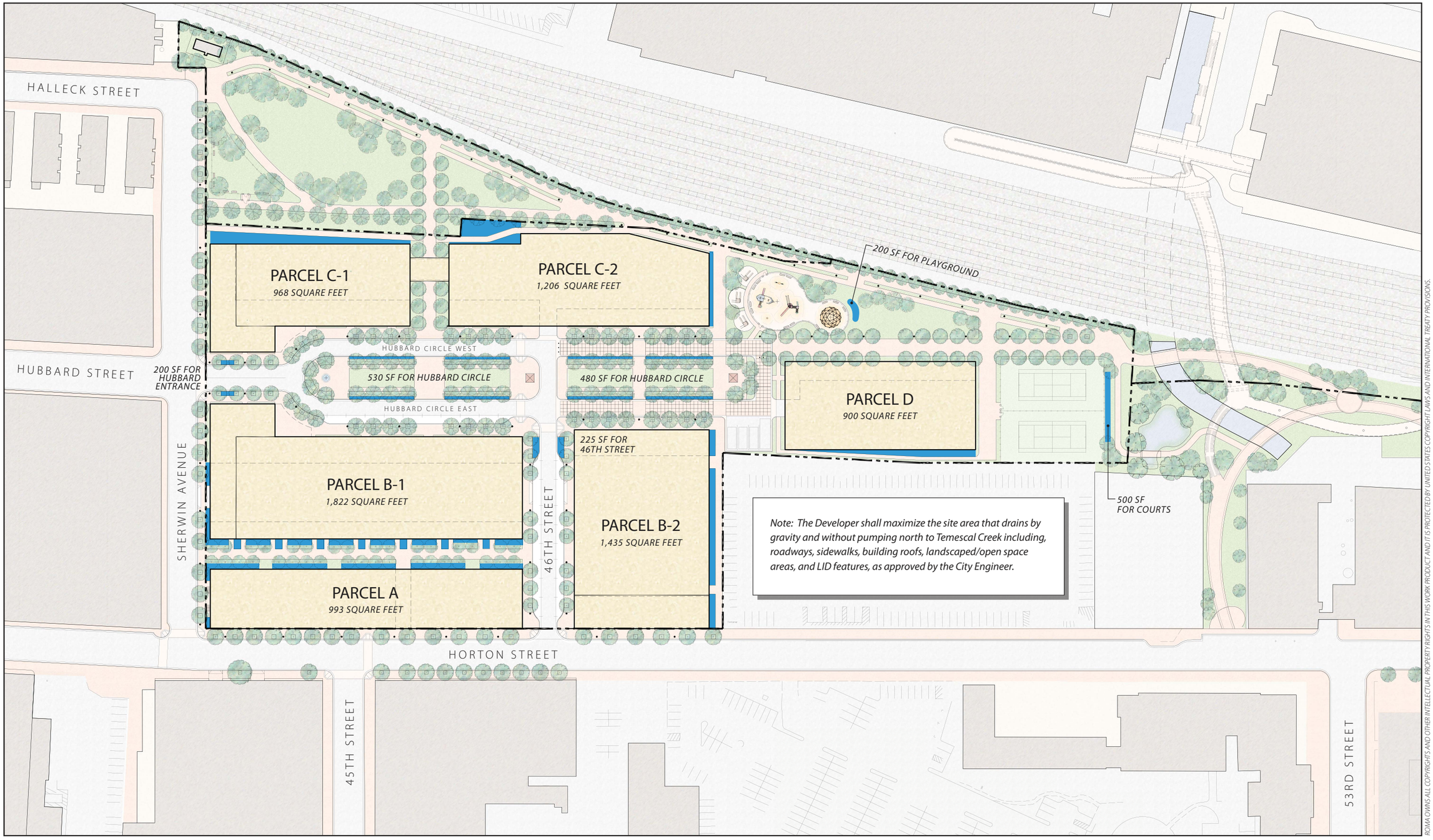
Gingko biloba, Autumn Gold

Acer fremanii, (Autumn Blaze Maple)

Lophostemon confertus
(Brisbane Box)

Podocarpus gracilior

OPTION B: LANDSCAPE PRECEDENTS



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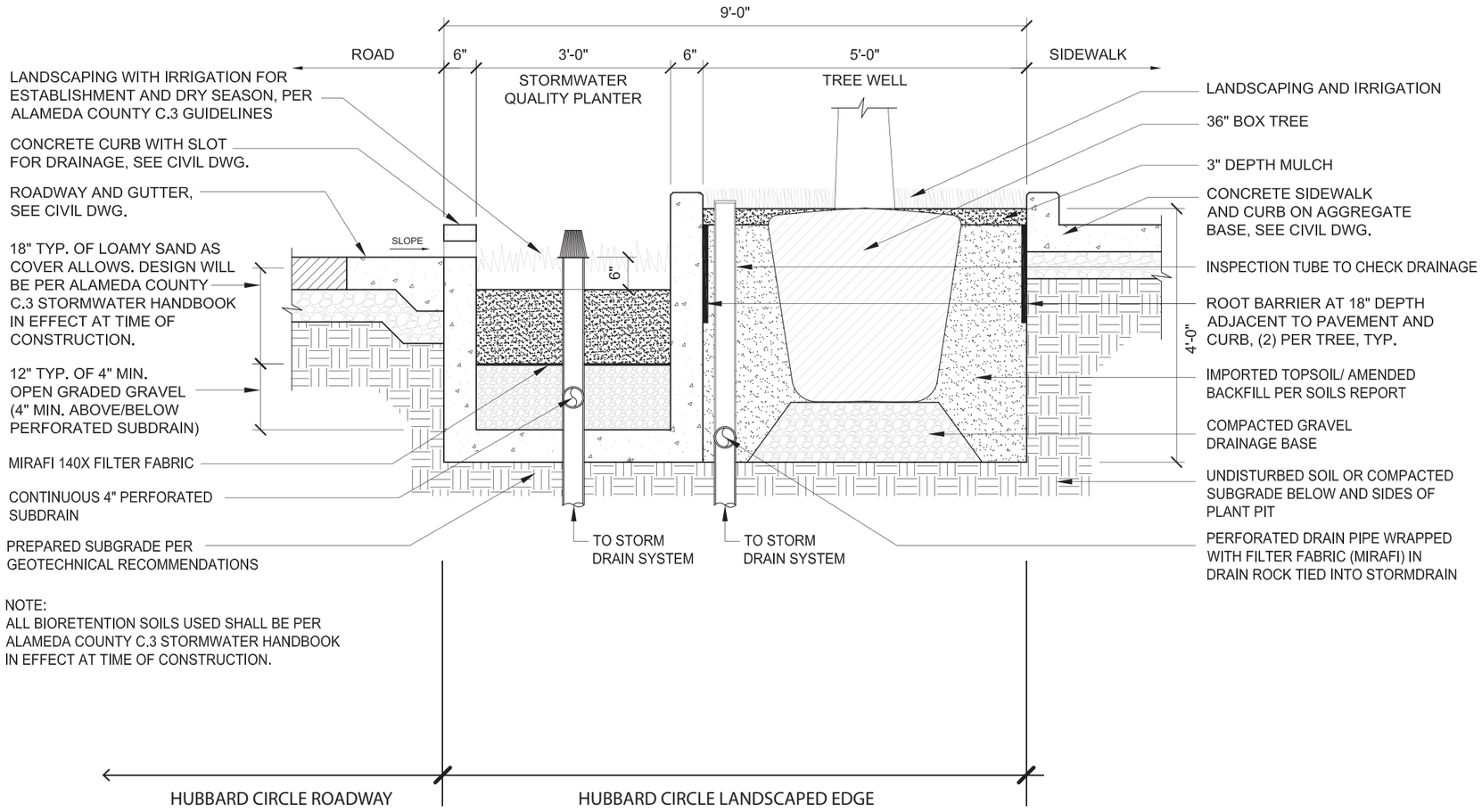
0 50′ 100′ 200′

OPTION B: STORMWATER TREATMENT CONCEPT PLAN



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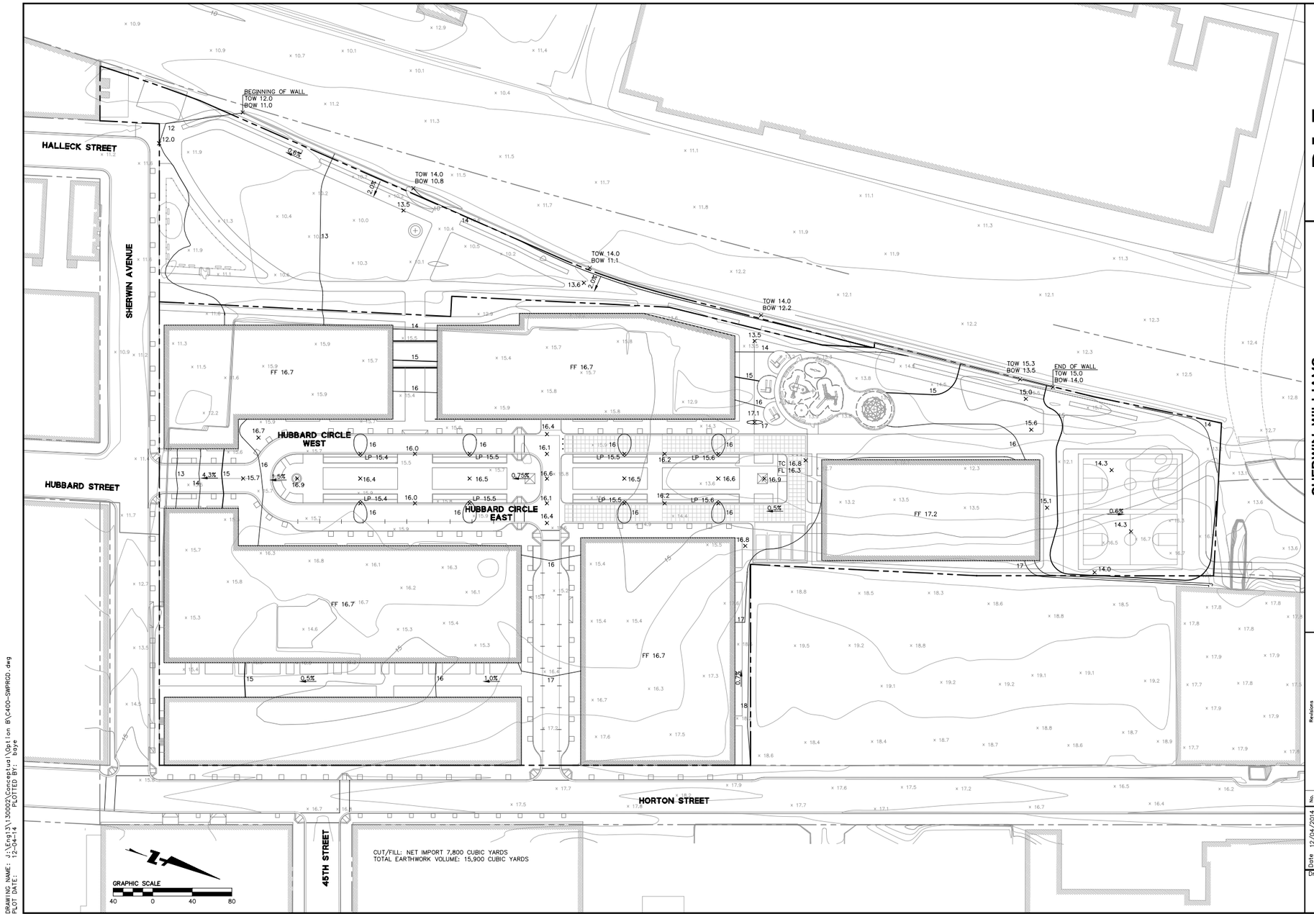
TYPICAL SECTION FOR STORMWATER AND STREET TREE PLANTERS

© BKF Engineers



BKF ENGINEERS/SURVEYORS/PLANNERS
255 SHORELINE DR. SITE. 200
REDWOOD CITY, CA. 94065
650/482-6300
650/482-6399 (FAX)

SHERWIN WILLIAMS
CONCEPTUAL GRADING PLAN
OPTION B
ALAMEDA COUNTY, CALIFORNIA
CITY OF EMERYVILLE

Revisions
No.

Date 12/04/2014
Scale 1" = 40'
Design RKB
Drawn MGT
Approved TRM
Job No 20130002

Drawing Number:
OF

DRAWING NAME: J:\Eng13\13002\Conceptual\Option B\C400-SWPRGD.dwg
PLOT DATE: 12-04-14 PLOTTED BY: baye

OPTION B: CONCEPTUAL GRADING PLAN

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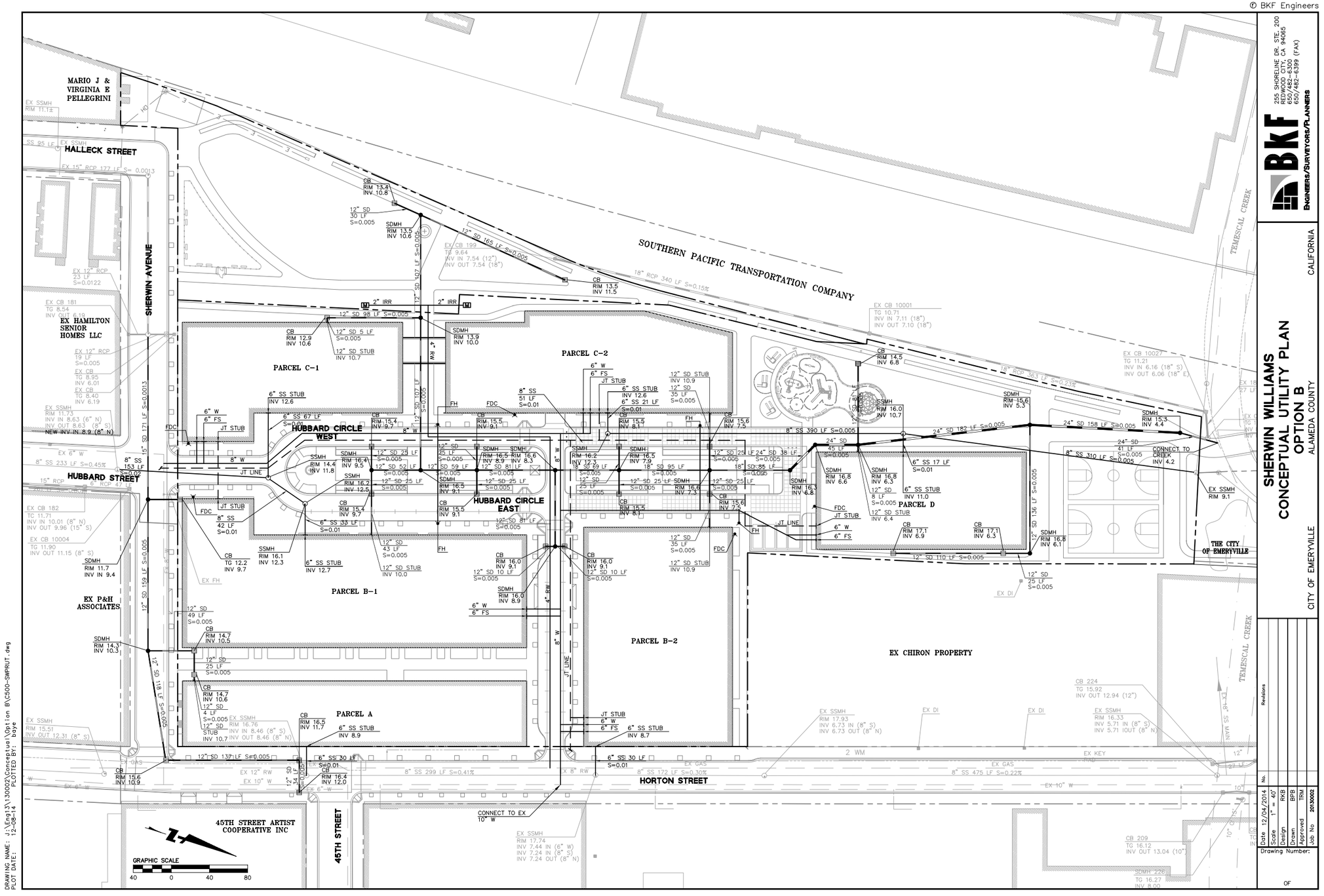

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ENGINEERS/SURVEYORS/PLANNERS
255 SHORELINE DR. STE. 200
REDWOOD CITY, CA 94065
650/482-6300
650/482-6399 (FAX)

SHERWIN WILLIAMS
CONCEPTUAL UTILITY PLAN
OPTION B
ALAMEDA COUNTY
CALIFORNIA
CITY OF EMERYVILLE

No.	Revisions

Date 12/04/2014
Scale 1" = 40'
Design RKB
Drawn BPB
Approved TRM
Job No 20150002

Drawing Number:

OF

DRAWING NAME: J:\Eng13\13002\Conceptual\Option B\C500-SWPRUT.dwg
PLOT DATE: 12-08-14
PLOTTED BY: baye

OPTION B: CONCEPTUAL UTILITY PLAN

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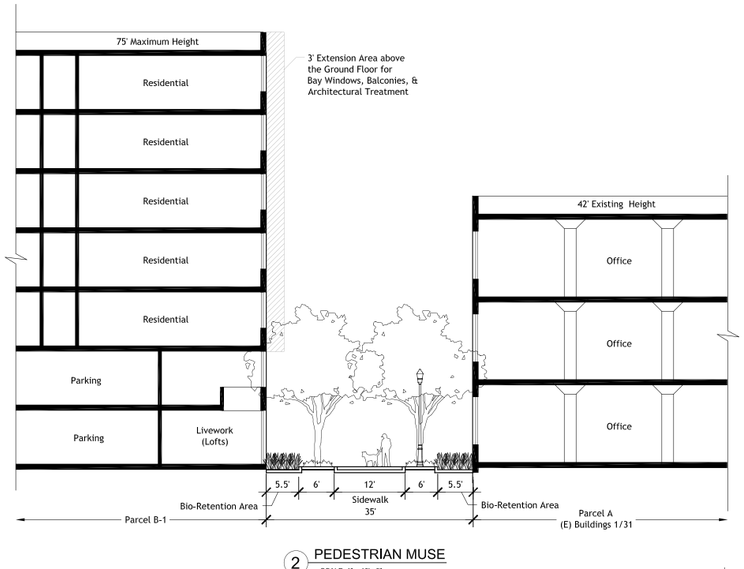
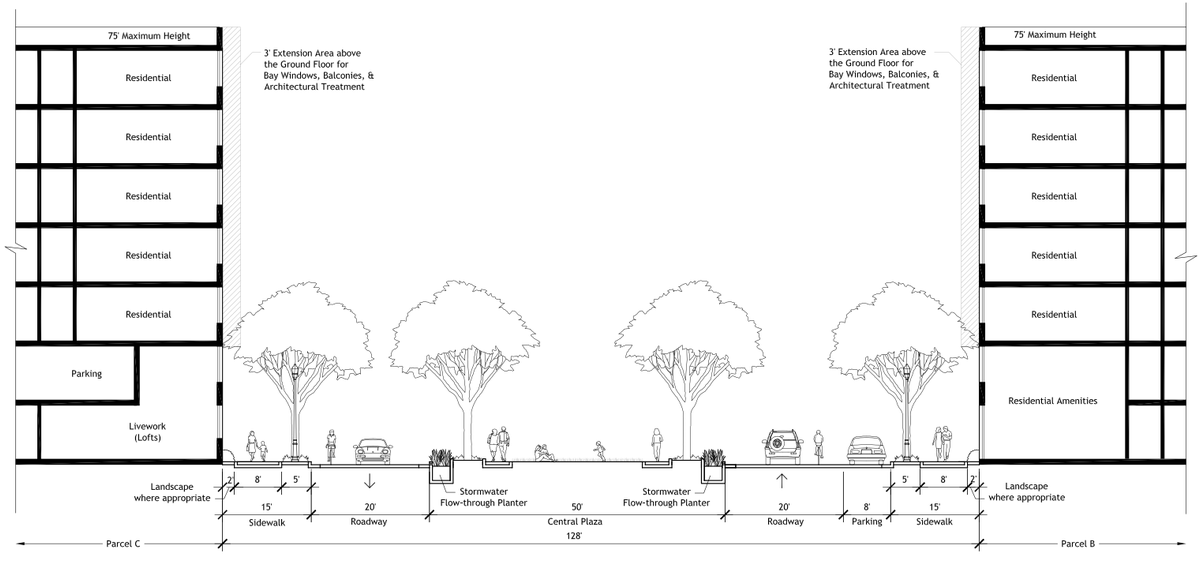
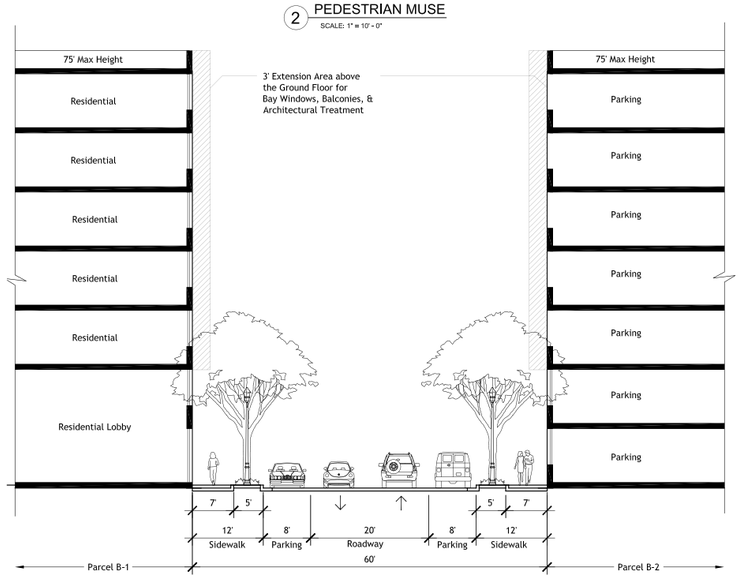
OPTION B: ILLUSTRATIVE DEVELOPMENT CONCEPT



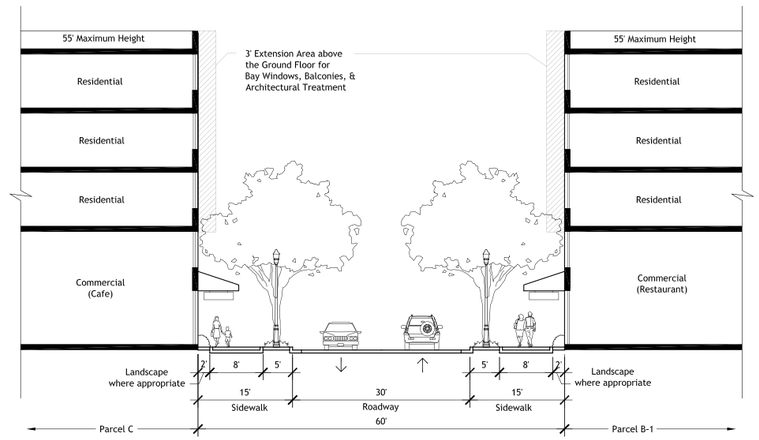
2 PEDESTRIAN MUSE
SCALE: 1" = 10' - 0"



3 HUBBARD CIRCLE
SCALE: 1" = 10' - 0"



1 46TH STREET ENTRANCE
SCALE: 1" = 10' - 0"



4 HUBBARD STREET ENTRANCE
SCALE: 1" = 10' - 0"

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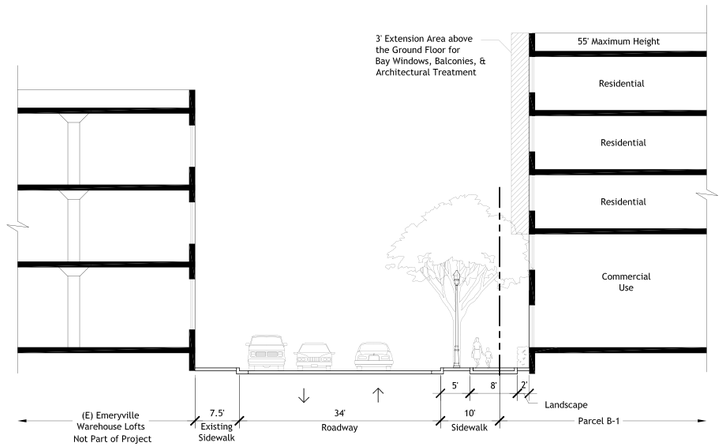
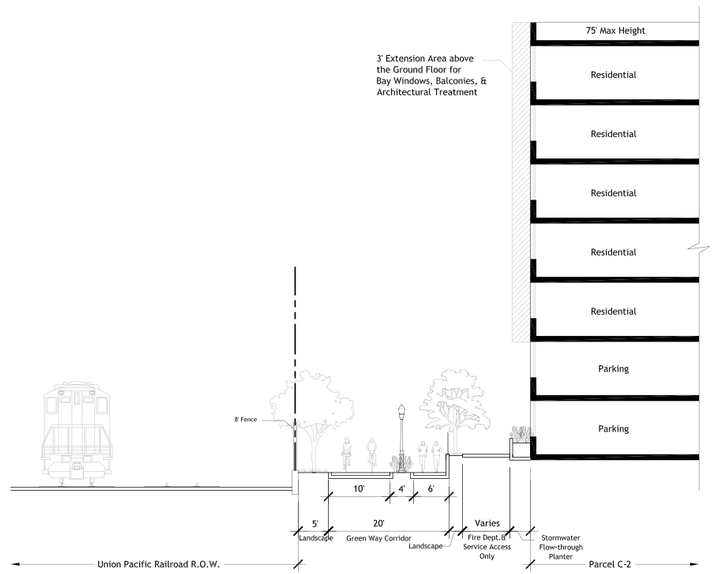
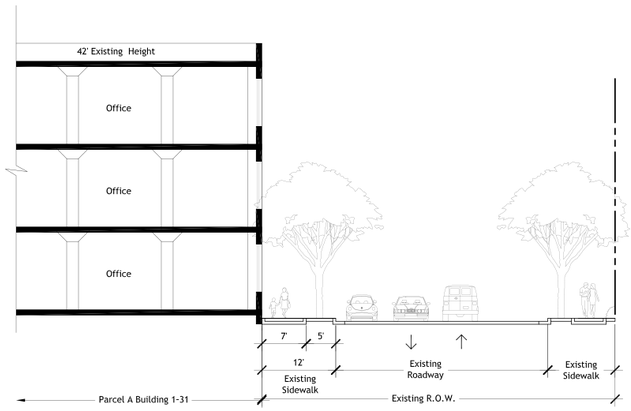
OPTION B: STREET SECTIONS (INTERNAL)



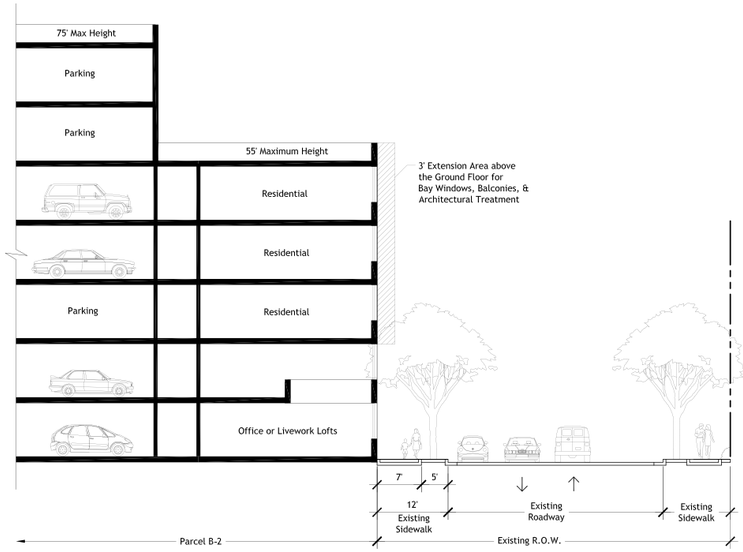
5 SHERWIN AVENUE
SCALE: 1" = 10' - 0"



6 TYPICAL BIKE PED TRAIL
SCALE: 1" = 10' - 0"



7 HORTON STREET
SCALE: 1" = 10' - 0"



8 HORTON STREET
SCALE: 1" = 10' - 0"

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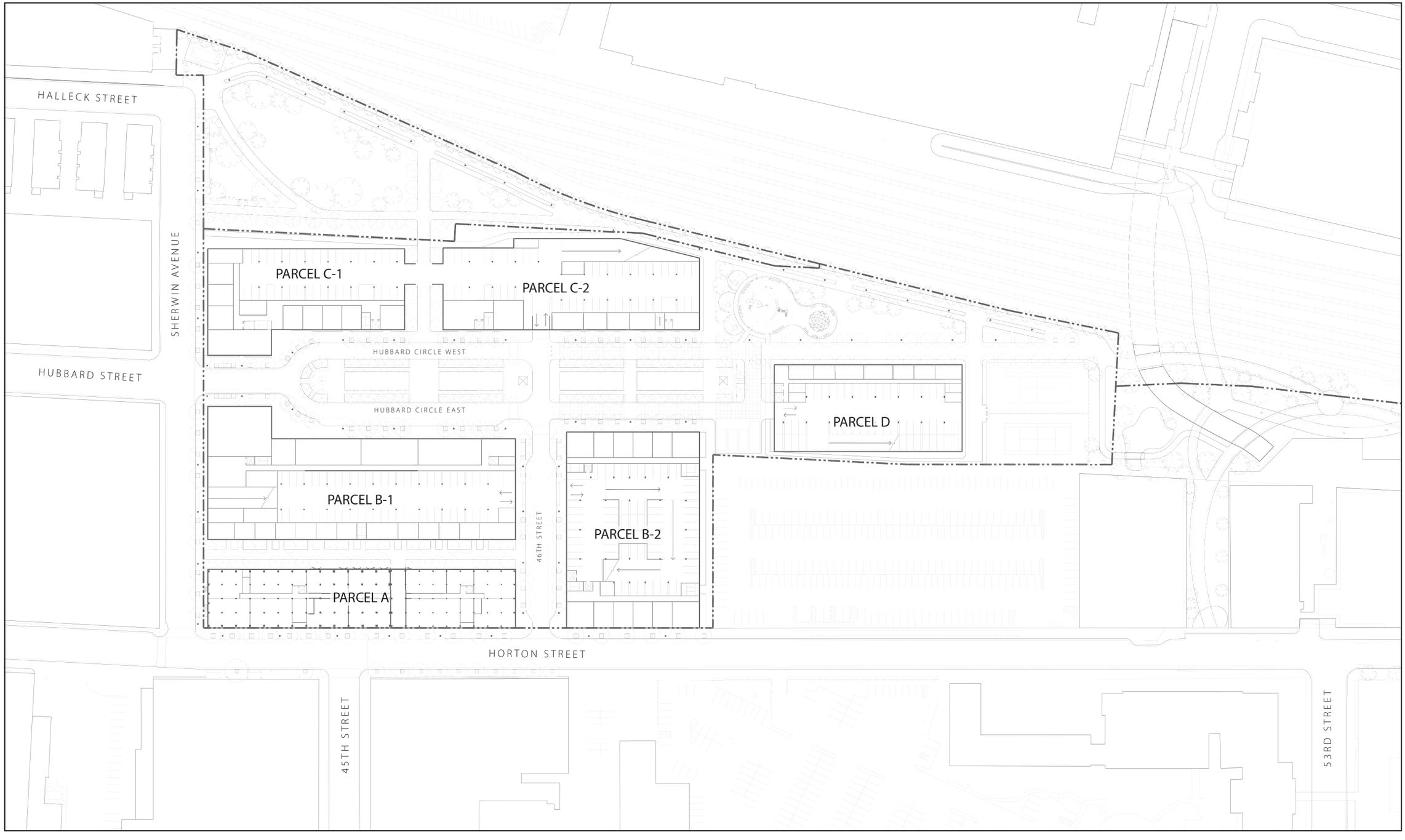
OPTION B: SITE DEVELOPMENT PLAN (PERIMETER)



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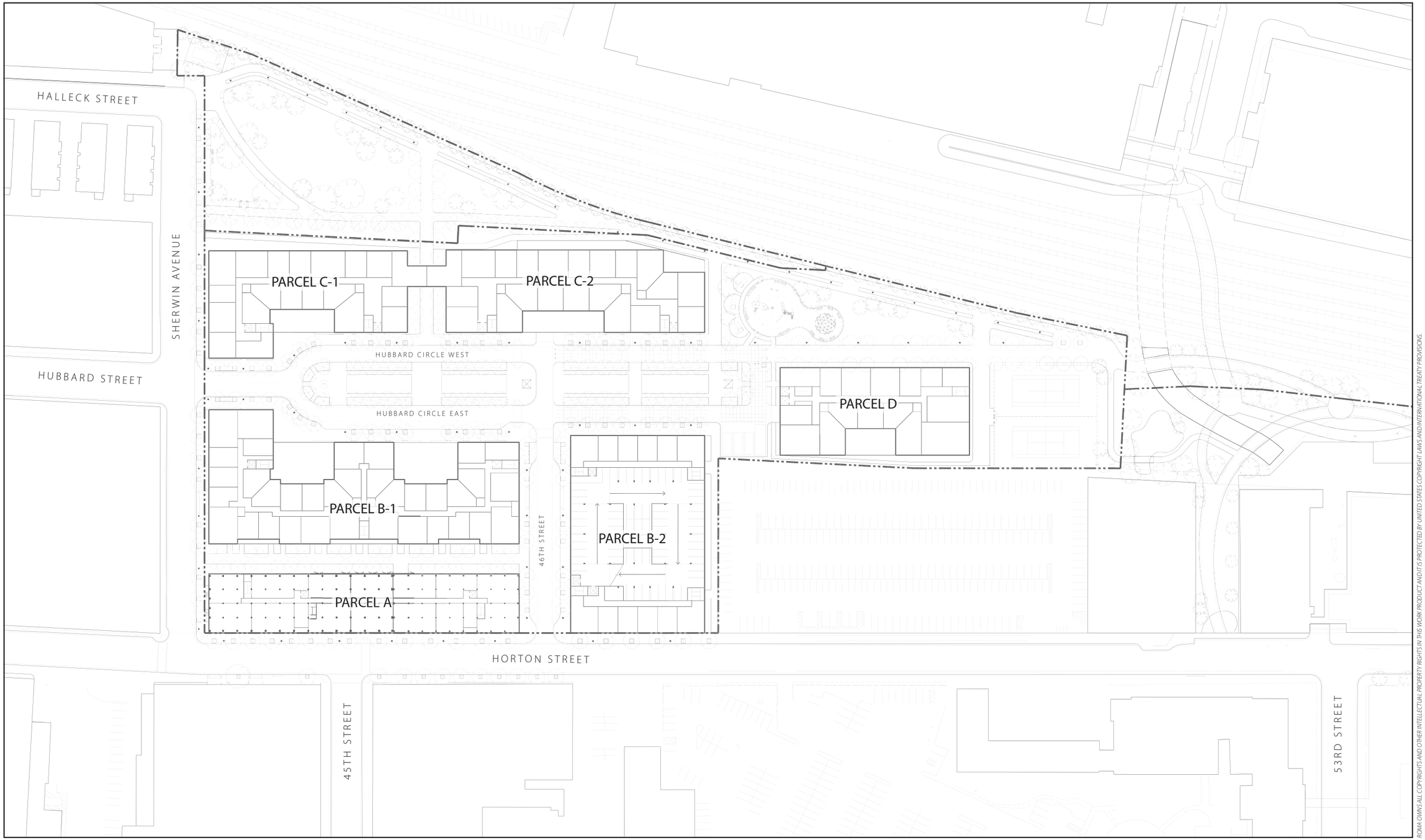
OPTION B: ILLUSTRATIVE GROUND LEVEL PLAN

0 50′ 100′ 200′

SHERWIN WILLIAMS PRELIMINARY DEVELOPMENT PLAN SUBMITTAL

JANUARY 20, 2015 • PREPARED FOR LMC EMERYVILLE I INVESTOR LLC BY ROMA DESIGN GROUP IN ASSOCIATION WITH LPAS AND BKF



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OPTION B: ILLUSTRATIVE UPPER LEVEL PLAN

0 50′ 100′ 200′

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