

APPENDIX A

TRANSPORTATION DATA

TECHNICAL APPENDIX A
INTERSECTION TURNING MOVEMENT SUMMARY

Intersection Turning Movement

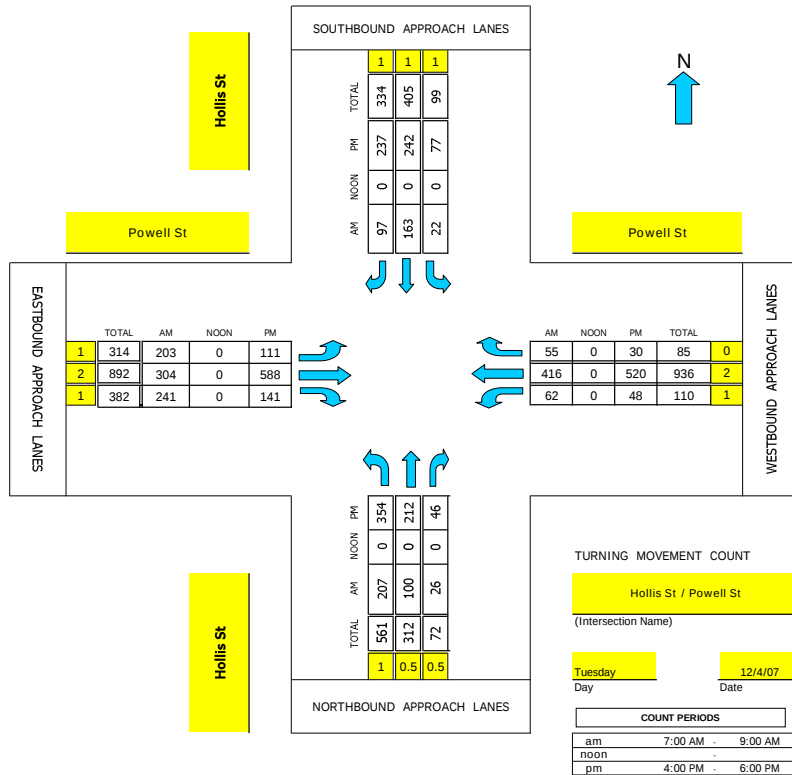


National Data & Surveying Services

1

TMC Summary of Hollis St/Powell St

Project #: 07-7535-001



CONTROL: Signalized

AM PEAK HOUR	800 AM
NOON PEAK HOUR	0 AM
PM PEAK HOUR	500 PM

Intersection Turning Movement

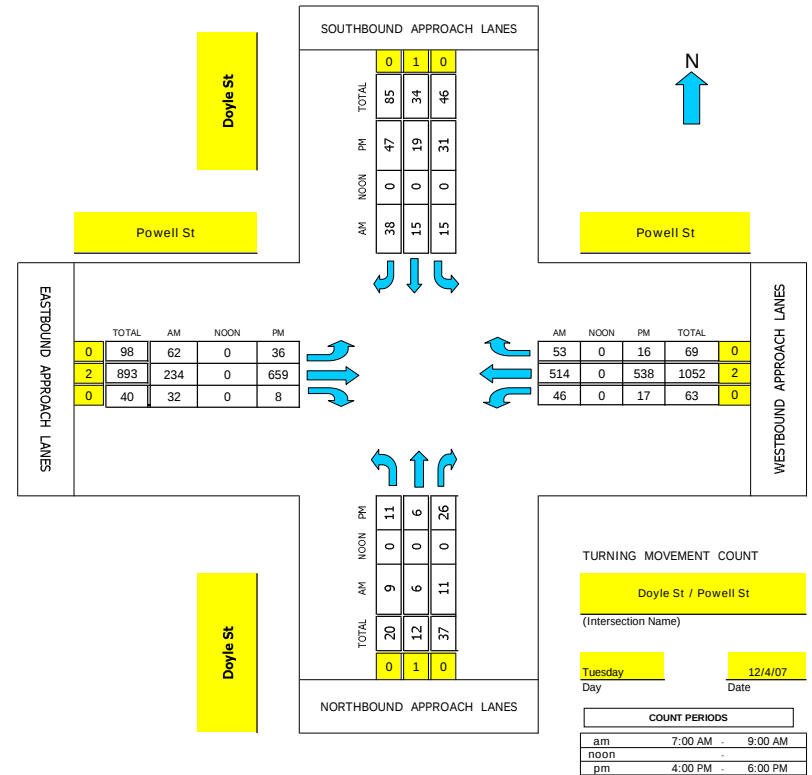


National Data & Surveying Services

2

TMC Summary of Doyle St/Powell St

Project #: 07-7535-002



CONTROL: 2-Way Stop Sign (N/S)

AM PEAK HOUR	800 AM
NOON PEAK HOUR	0 AM
PM PEAK HOUR	500 PM

Intersection Turning Movement

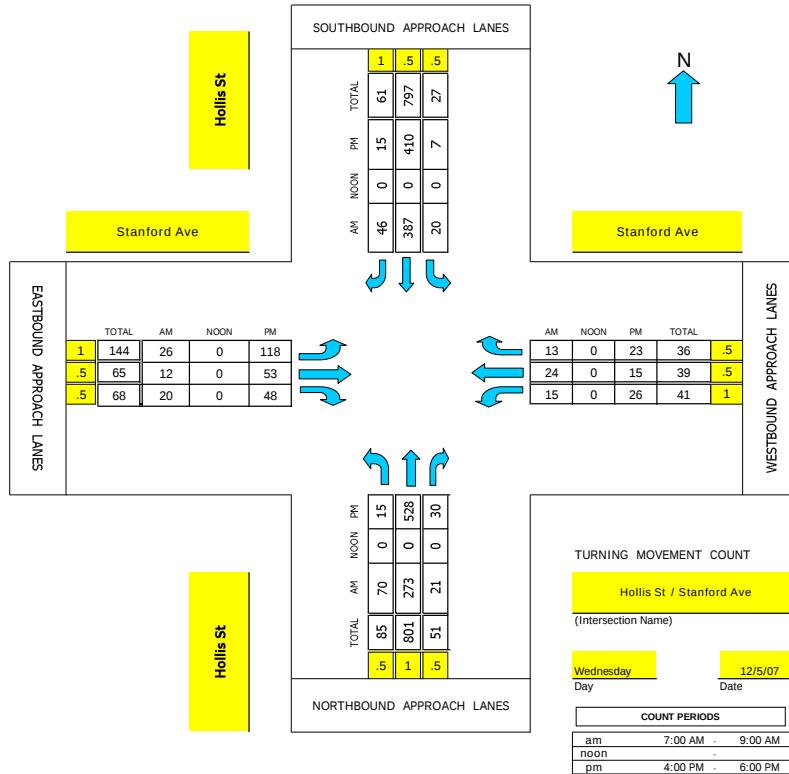
Prepared by:
NDS

National Data & Surveying Services

3

TMC Summary of Hollis St/Stanford Ave

Project #: 07-7535-003



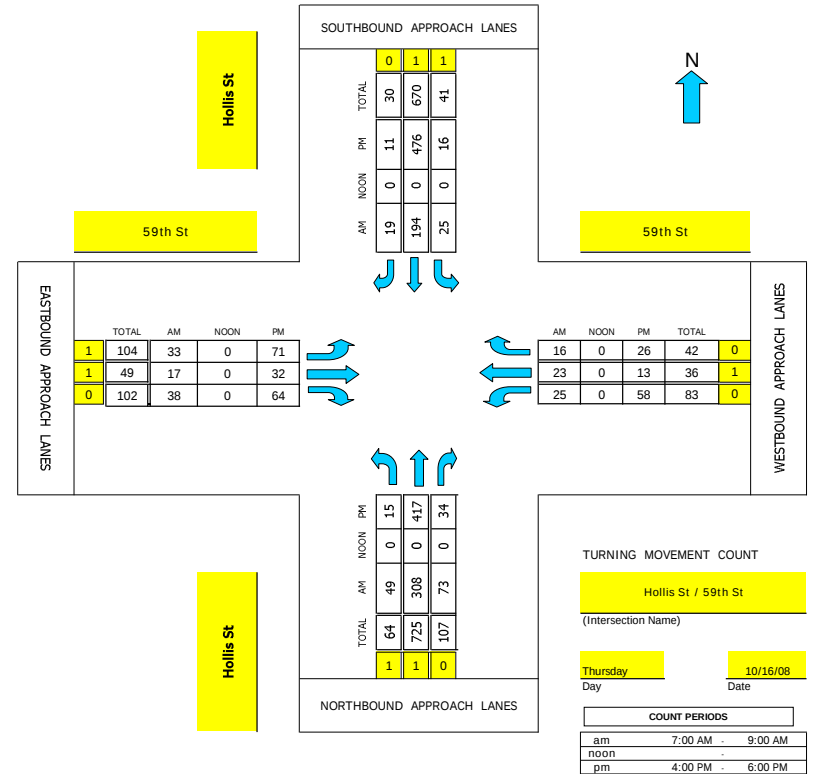
CONTROL: Signalized

AM PEAK HOUR 800 AM
NOON PEAK HOUR 0 AM
PM PEAK HOUR 445 PM

Intersection Turning Movement

4

TMC Summary of Hollis St/59th St.



CONTROL: Signalized

AM PEAK HOUR 800 AM
NOON PEAK HOUR 0 AM
PM PEAK HOUR 500 PM

Intersection Turning Movement

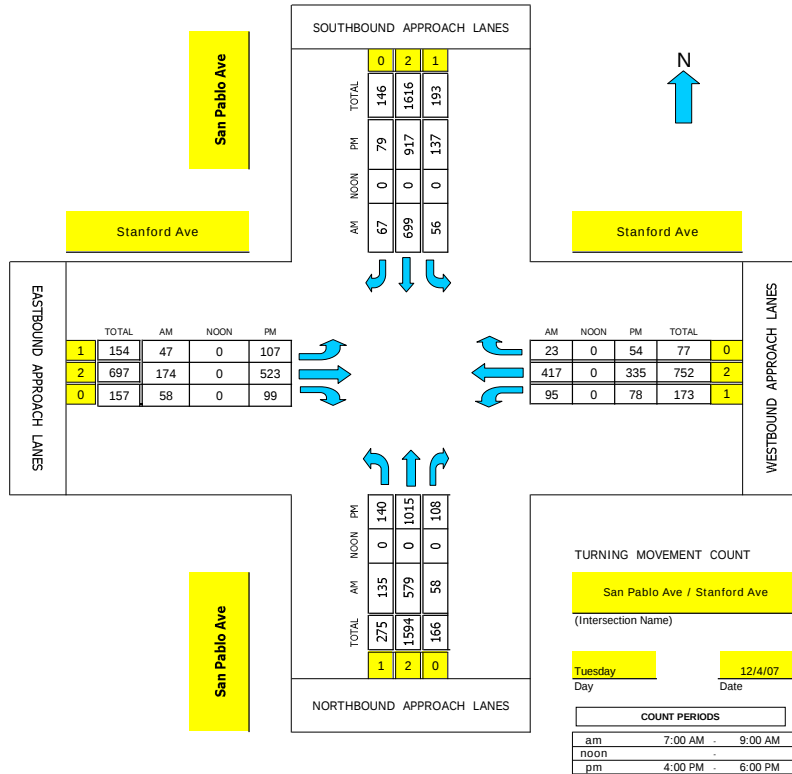


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5

TMC Summary of San Pablo Ave/Stanford Ave

Project #: 07-7535-005



CONTROL: Signalized

AM PEAK HOUR	800 AM
NOON PEAK HOUR	0 AM
PM PEAK HOUR	430 PM

Intersection Turning Movement

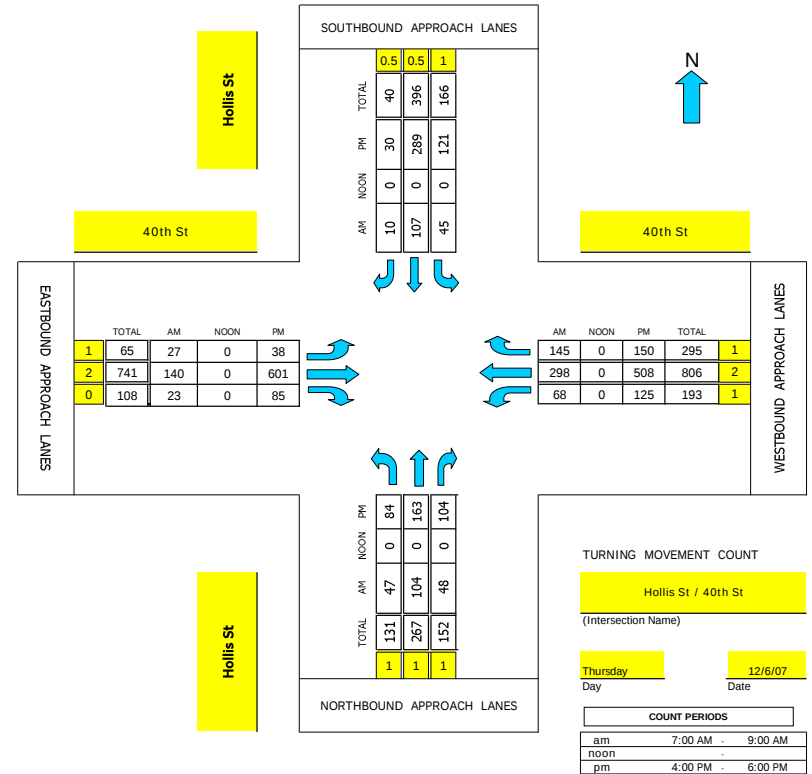


National Data & Surveying Services

6

TMC Summary of Hollis St/40th St

Project #: 07-7535-006



CONTROL: Signalized

AM PEAK HOUR	800 AM
NOON PEAK HOUR	0 AM
PM PEAK HOUR	415 PM

Intersection Turning Movement

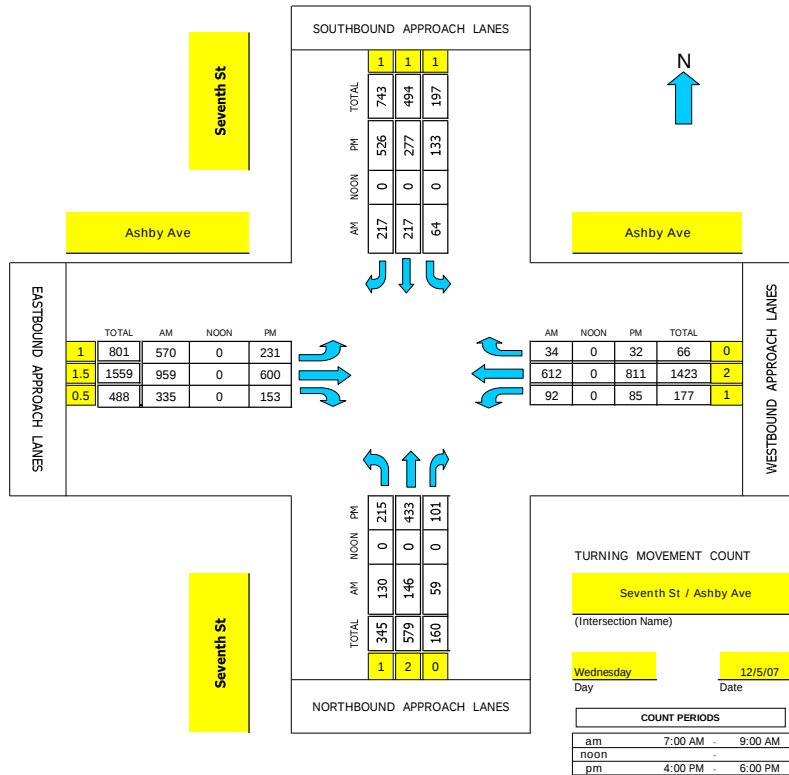


National Data & Surveying Services

7

TMC Summary of Seventh St/Ashby Ave

Project #: 07-7535-007



CONTROL: Signalized

AM PEAK HOUR	800 AM
NOON PEAK HOUR	0 AM
PM PEAK HOUR	445 PM

Intersection Turning Movement

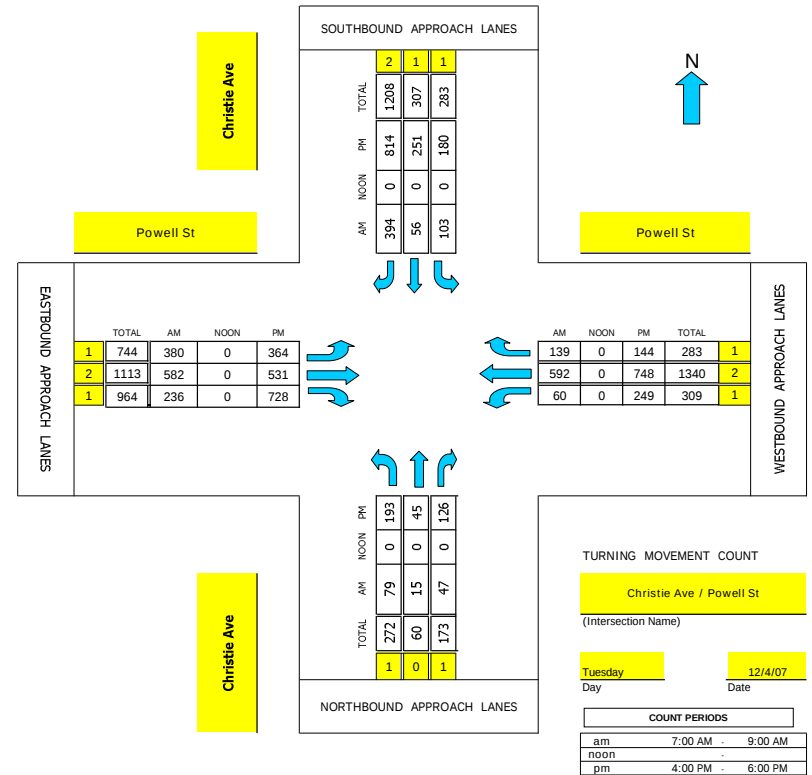


National Data & Surveying Services

8

TMC Summary of Christie Ave/Powell St

Project #: 07-7535-008



CONTROL: 0

AM PEAK HOUR	800 AM
NOON PEAK HOUR	0 AM
PM PEAK HOUR	445 PM

Intersection Turning Movement

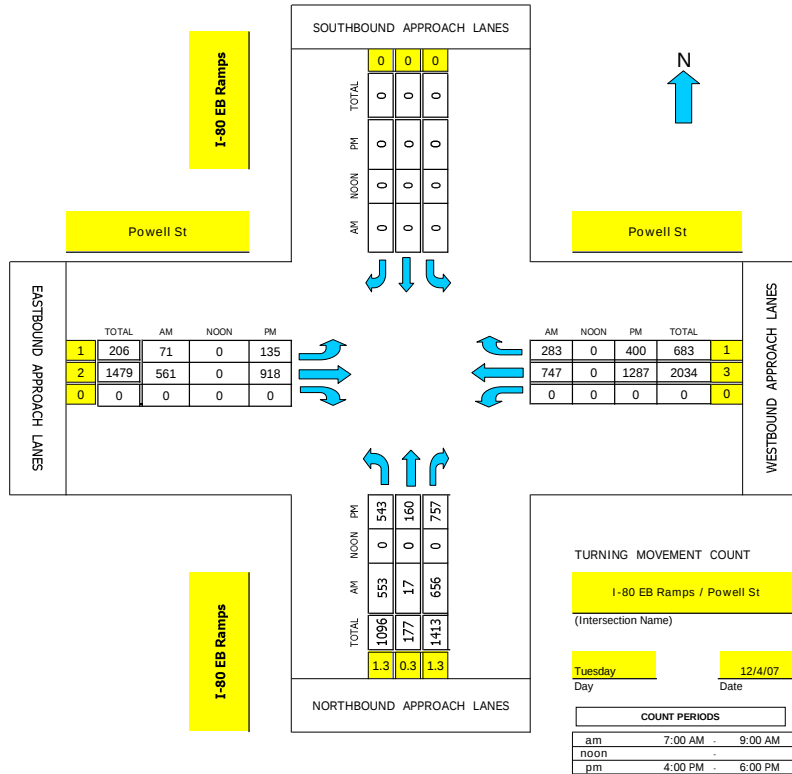


National Data & Surveying Services

9

TMC Summary of I-80 EB Ramps/Powell St

Project #: 07-7535-009



CONTROL: Signalized

AM PEAK HOUR 800 AM
NOON PEAK HOUR 0 AM
PM PEAK HOUR 500 PM

Intersection Turning Movement

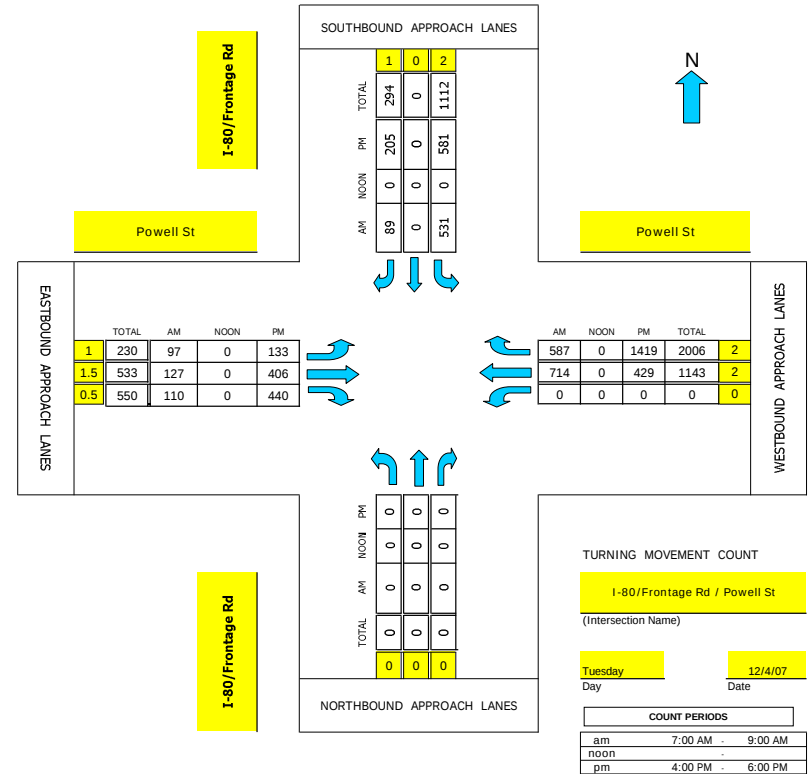


National Data & Surveying Services

10

TMC Summary of I-80/Frontage Rd/Powell St

Project #: 07-7535-010



CONTROL: Signalized;

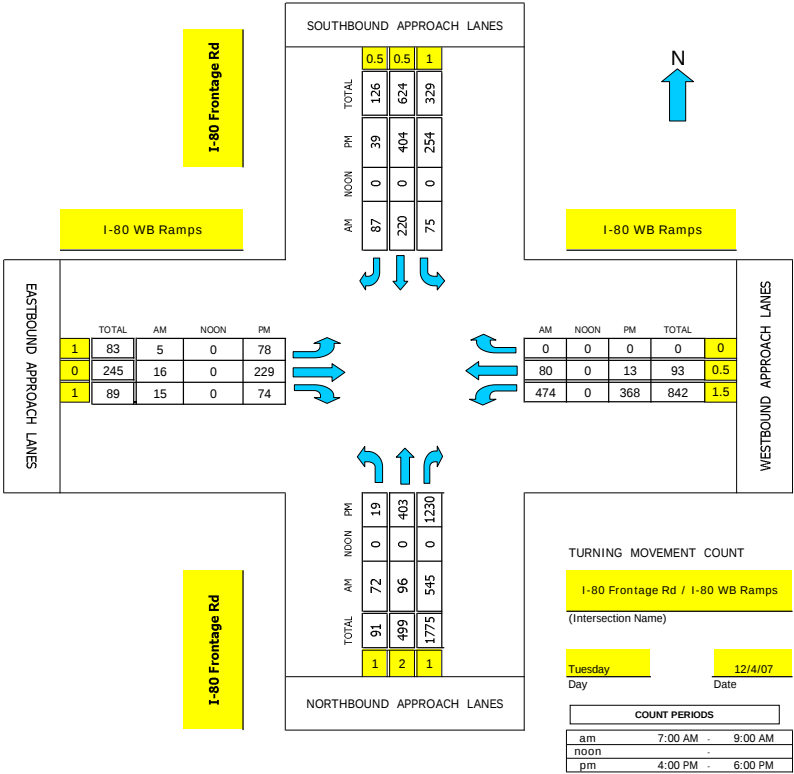
AM PEAK HOUR 800 AM
NOON PEAK HOUR 0 AM
PM PEAK HOUR 445 PM

Intersection Turning Movement

11

TMC Summary of I-80 Frontage Rd/I-80 WB Ramps

Project #: 07-7535-011



CONTROL: Signalized

AM PEAK HOUR	800 AM
NOON PEAK HOUR	0 AM
PM PEAK HOUR	445 PM

All Traffic Data

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File Name : 09-7261-001 HORTON-59TH-F

Site Code : 00000000

Start Date : 30/06/2009

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Groups Printed- Unshifted

	HORTON ST. Southbound				59TH ST. Westbound				HORTON ST. Northbound				AMTRAK STATION Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
07:00	2	3	0	5	6	1	3	10	1	21	8	30	0	0	0	0	45
07:15	2	5	0	7	4	1	7	12	4	21	29	54	0	0	0	0	73
07:30	6	1	0	7	8	0	2	10	4	13	15	32	0	0	0	0	49
07:45	3	5	1	9	9	3	4	16	4	23	19	46	0	0	0	0	71
Total	13	14	1	28	27	5	16	48	13	78	71	162	0	0	0	0	238
08:00	7	11	1	19	7	1	4	12	4	19	25	48	0	0	0	0	79
08:15	3	10	1	14	14	2	8	24	6	20	29	55	0	0	0	0	93
08:30	8	16	0	24	12	2	11	25	5	30	32	67	0	0	0	0	116
08:45	10	15	1	26	13	1	12	26	2	26	25	53	0	0	0	0	105
Total	28	52	3	83	46	6	35	87	17	95	111	223	0	0	0	0	393

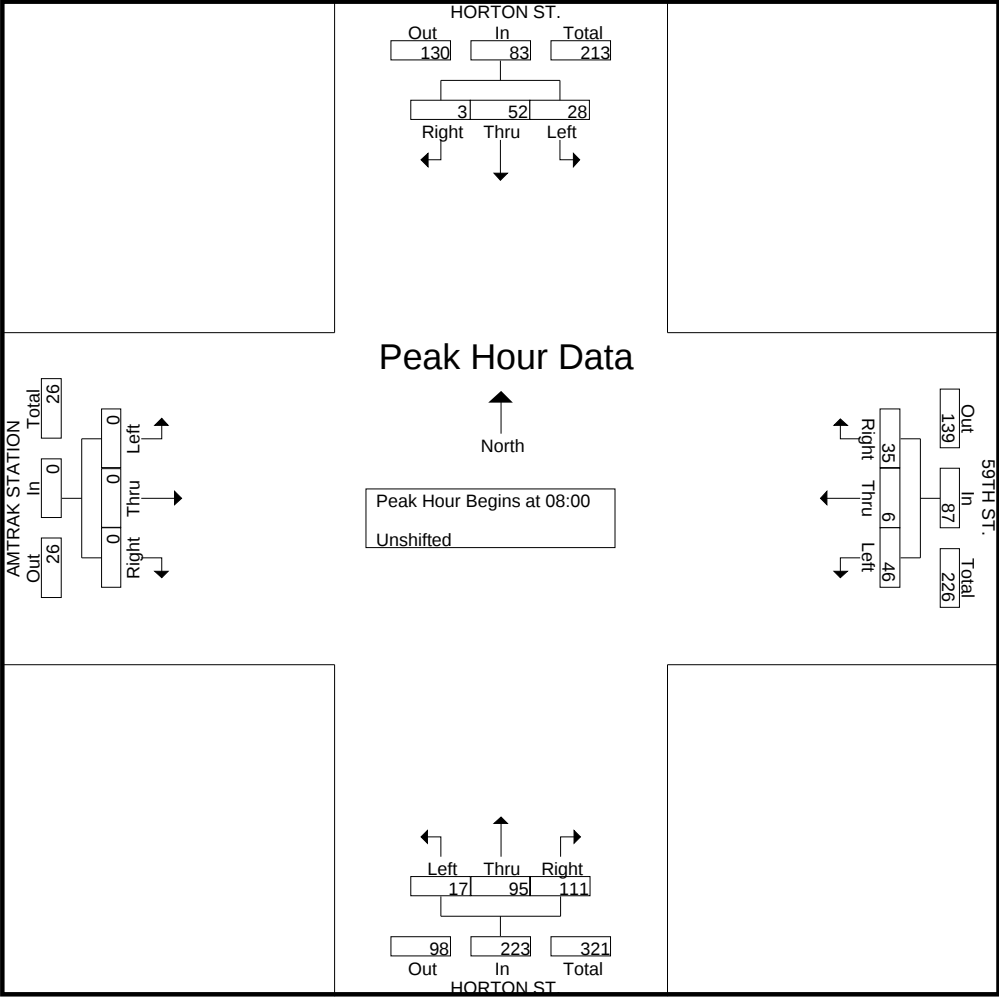
*** BREAK ***

16:00	20	13	1	34	7	4	5	16	2	29	32	63	0	0	0	0	113
16:15	17	17	4	38	6	4	1	11	2	22	34	58	0	0	0	0	107
16:30	21	15	0	36	4	3	4	11	1	21	43	65	0	0	0	0	112
16:45	23	10	0	33	9	4	6	19	6	33	41	80	0	0	0	0	132
Total	81	55	5	141	26	15	16	57	11	105	150	266	0	0	0	0	464
17:00	30	14	0	44	13	3	3	19	2	19	60	81	0	0	0	0	144
17:15	32	21	0	53	7	2	7	16	2	19	47	68	0	0	0	0	137
17:30	21	12	2	35	6	1	6	13	8	36	38	82	0	0	0	0	130
17:45	20	8	0	28	5	2	3	10	3	22	46	71	0	0	0	0	109
Total	103	55	2	160	31	8	19	58	15	96	191	302	0	0	0	0	520
Grand Total	225	176	11	412	130	34	86	250	56	374	523	953	0	0	0	0	1615
Apprch %	54.6	42.7	2.7		52	13.6	34.4		5.9	39.2	54.9		0	0	0		
Total %	13.9	10.9	0.7	25.5	8	2.1	5.3	15.5	3.5	23.2	32.4	59	0	0	0	0	

	HORTON ST. Southbound				59TH ST. Westbound				HORTON ST. Northbound				AMTRAK STATION Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
08:00	7	11	1	19	7	1	4	12	4	19	25	48	0	0	0	0	79
08:15	3	10	1	14	14	2	8	24	6	20	29	55	0	0	0	0	93
08:30	8	16	0	24	12	2	11	25	5	30	32	67	0	0	0	0	116
08:45	10	15	1	26	13	1	12	26	2	26	25	53	0	0	0	0	105
Total Volume	28	52	3	83	46	6	35	87	17	95	111	223	0	0	0	0	393
% App. Total	33.7	62.7	3.6		52.9	6.9	40.2		7.6	42.6	49.8		0	0	0		
PHF	.700	.813	.750	.798	.821	.750	.729	.837	.708	.792	.867	.832	.000	.000	.000	.000	.847

Peak Hour Analysis From 07:00 to 08:45 - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 08:00



Peak Hour Analysis From 16:00 to 17:45 - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 16:45

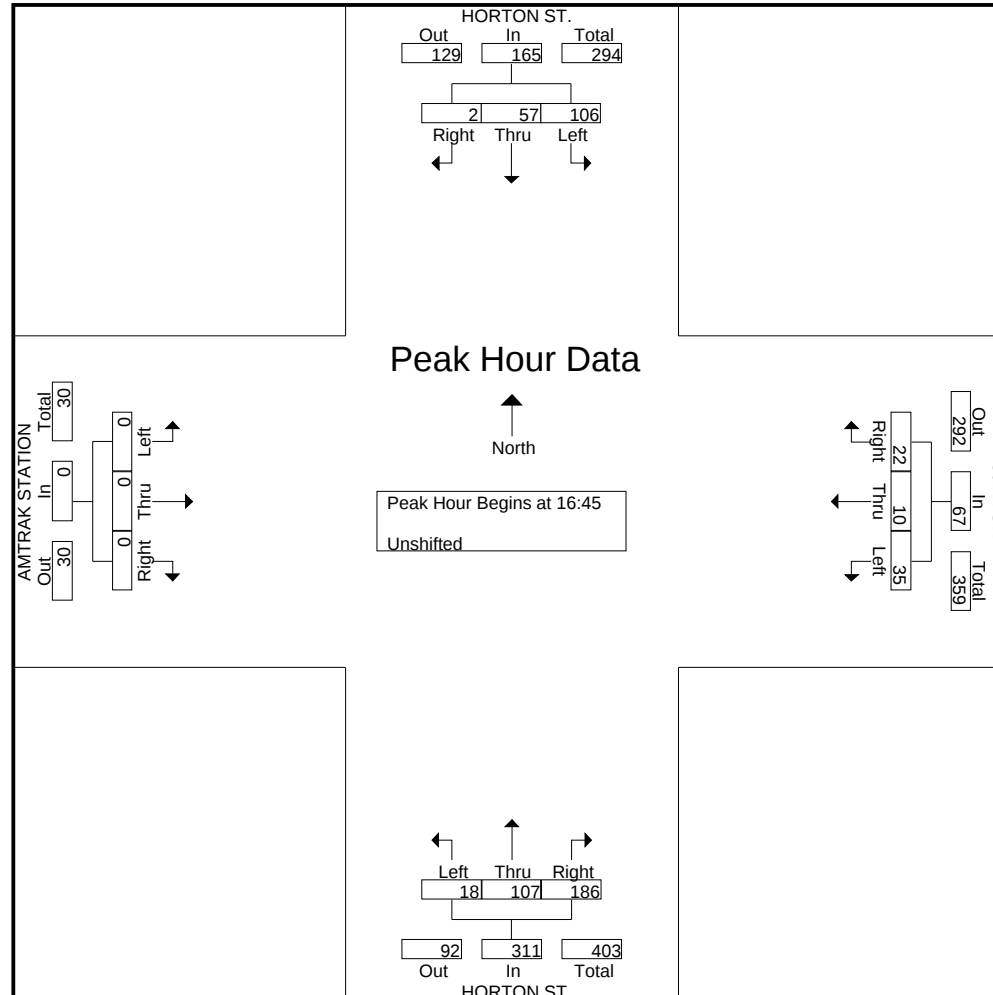
16:45	23	10	0	33	9	4	6	19	6	33	41	80	0	0	0	0	132
17:00	30	14	0	44	13	3	3	19	2	19	60	81	0	0	0	0	144
17:15	32	21	0	53	7	2	7	16	2	19	47	68	0	0	0	0	137
17:30	21	12	2	35	6	1	6	13	8	36	38	82	0	0	0	0	130
Total Volume	106	57	2	165	35	10	22	67	18	107	186	311	0	0	0	0	543
% App. Total	64.2	34.5	1.2		52.2	14.9	32.8		5.8	34.4	59.8		0	0	0		
PHF	.828	.679	.250	.778	.673	.625	.786	.882	.563	.743	.775	.948	.000	.000	.000	.000	.943

All Traffic Data

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Site Code : 00000000

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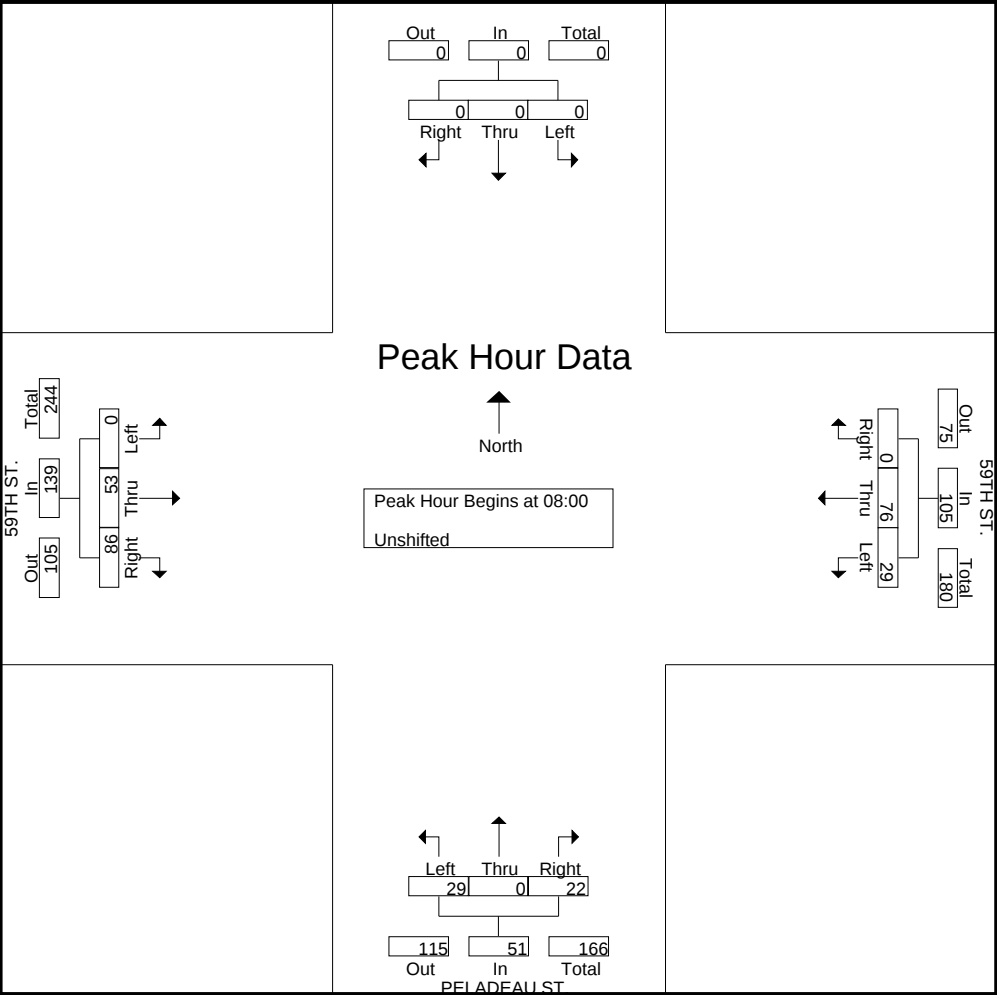
Groups Printed- Unshifted

	Southbound				59TH ST. Westbound				PELADEAU ST. Northbound				59TH ST. Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
07:00	0	0	0	0	1	9	0	10	1	0	0	1	0	3	7	10	21
07:15	0	0	0	0	5	7	0	12	4	0	2	6	0	9	21	30	48
07:30	0	0	0	0	4	7	0	11	3	0	2	5	0	10	11	21	37
07:45	0	0	0	0	2	10	0	12	6	0	3	9	0	7	15	22	43
Total	0	0	0	0	12	33	0	45	14	0	7	21	0	29	54	83	149
08:00	0	0	0	0	11	8	0	19	5	0	5	10	0	7	24	31	60
08:15	0	0	0	0	2	23	0	25	8	0	11	19	0	14	19	33	77
08:30	0	0	0	0	12	16	0	28	9	0	2	11	0	14	24	38	77
08:45	0	0	0	0	4	29	0	33	7	0	4	11	0	18	19	37	81
Total	0	0	0	0	29	76	0	105	29	0	22	51	0	53	86	139	295

*** BREAK ***

16:00	0	0	0	0	2	8	0	10	5	0	4	9	0	23	26	49	68
16:15	0	0	0	0	1	6	0	7	4	0	13	17	0	25	27	52	76
16:30	0	0	0	0	4	6	0	10	6	0	9	15	0	25	38	63	88
16:45	0	0	0	0	1	14	0	15	6	0	7	13	0	25	35	60	88
Total	0	0	0	0	8	34	0	42	21	0	33	54	0	98	126	224	320
17:00	0	0	0	0	4	15	0	19	5	0	13	18	0	29	63	92	129
17:15	0	0	0	0	0	11	0	11	3	0	16	19	0	32	48	80	110
17:30	0	0	0	0	3	10	0	13	4	0	10	14	0	23	34	57	84
17:45	0	0	0	0	3	7	0	10	4	0	9	13	0	25	42	67	90
Total	0	0	0	0	10	43	0	53	16	0	48	64	0	109	187	296	413
Grand Total	0	0	0	0	59	186	0	245	80	0	110	190	0	289	453	742	1177
Apprch %	0	0	0		24.1	75.9	0		42.1	0	57.9		0	38.9	61.1		
Total %	0	0	0	0	5	15.8	0	20.8	6.8	0	9.3	16.1	0	24.6	38.5	63	

	Southbound				59TH ST. Westbound				PELADEAU ST. Northbound				59TH ST. Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 to 08:45 - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 08:00																	
08:00	0	0	0	0	11	8	0	19	5	0	5	10	0	7	24	31	60
08:15	0	0	0	0	2	23	0	25	8	0	11	19	0	14	19	33	77
08:30	0	0	0	0	12	16	0	28	9	0	2	11	0	14	24	38	77
08:45	0	0	0	0	4	29	0	33	7	0	4	11	0	18	19	37	81
Total Volume	0	0	0	0	29	76	0	105	29	0	22	51	0	53	86	139	295
% App. Total	0	0	0		27.6	72.4	0		56.9	0	43.1		0	38.1	61.9		
PHF	.000	.000	.000	.000	.604	.655	.000	.795	.806	.000	.500	.671	.000	.736	.896	.914	.910



Peak Hour Analysis From 16:00 to 17:45 - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 16:30

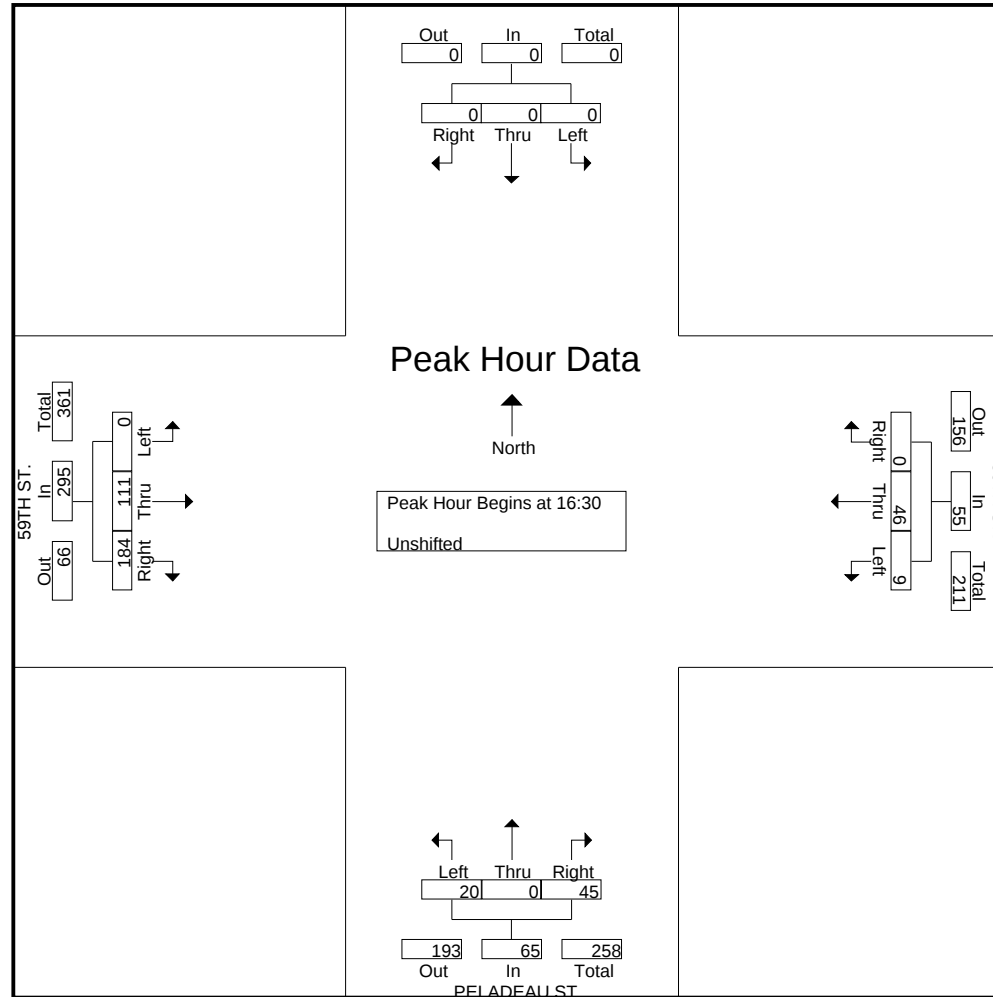
16:30	0	0	0	0	4	6	0	10	6	0	9	15	0	25	38	63	88
16:45	0	0	0	0	1	14	0	15	6	0	7	13	0	25	35	60	88
17:00	0	0	0	0	4	15	0	19	5	0	13	18	0	29	63	92	129
17:15	0	0	0	0	0	11	0	11	3	0	16	19	0	32	48	80	110
Total Volume	0	0	0	0	9	46	0	55	20	0	45	65	0	111	184	295	415
% App. Total	0	0	0	0	16.4	83.6	0		30.8	0	69.2		0	37.6	62.4		
PHF	.000	.000	.000	.000	.563	.767	.000	.724	.833	.000	.703	.855	.000	.867	.730	.802	.804

All Traffic Data

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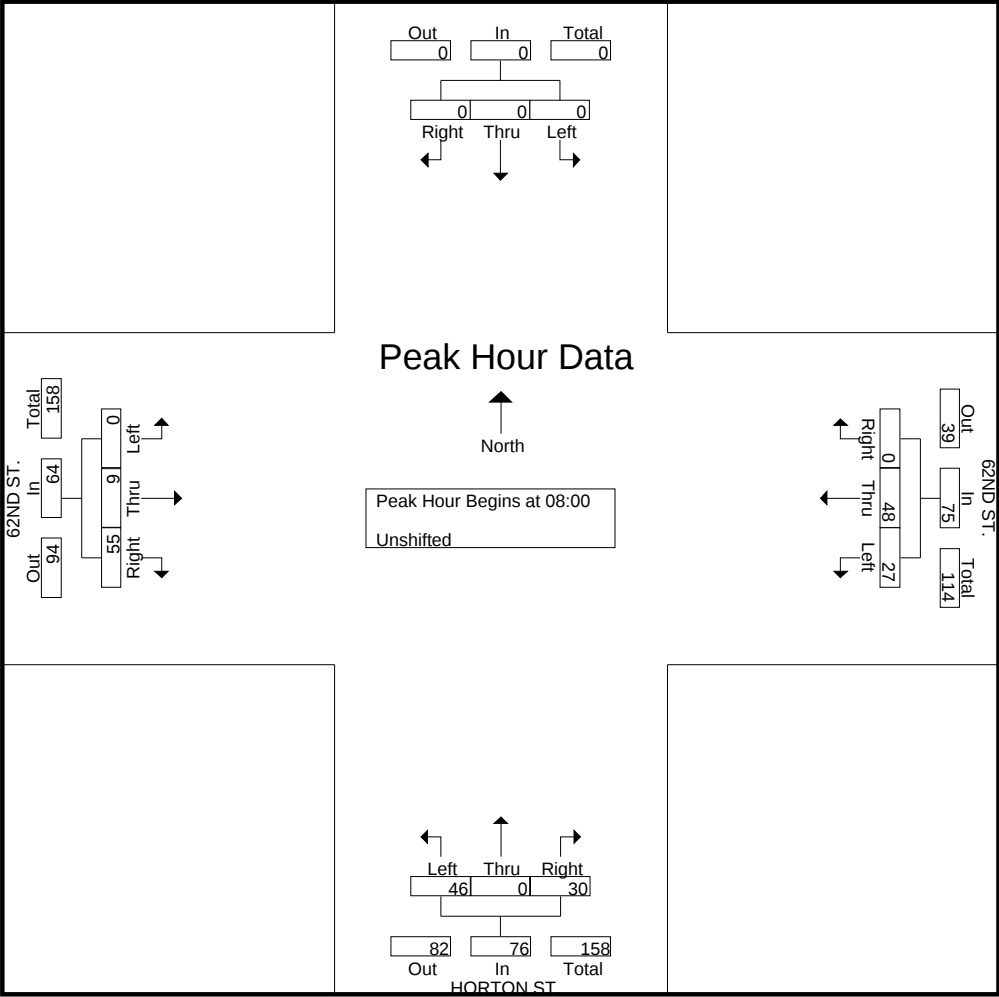
Groups Printed- Unshifted

	Southbound				62ND ST. Westbound				HORTON ST. Northbound				62ND ST. Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
07:00	0	0	0	0	1	5	0	6	8	0	5	13	0	2	2	4	23
07:15	0	0	0	0	2	3	0	5	10	0	6	16	0	1	3	4	25
07:30	0	0	0	0	1	6	0	7	12	0	5	17	0	6	3	9	33
07:45	0	0	0	0	3	8	0	11	10	0	5	15	0	2	4	6	32
Total	0	0	0	0	7	22	0	29	40	0	21	61	0	11	12	23	113
08:00	0	0	0	0	7	12	0	19	10	0	4	14	0	1	12	13	46
08:15	0	0	0	0	6	12	0	18	7	0	7	14	0	2	11	13	45
08:30	0	0	0	0	7	13	0	20	10	0	10	20	0	3	16	19	59
08:45	0	0	0	0	7	11	0	18	19	0	9	28	0	3	16	19	65
Total	0	0	0	0	27	48	0	75	46	0	30	76	0	9	55	64	215

*** BREAK ***

16:00	0	0	0	0	5	15	0	20	21	0	17	38	0	2	13	15	73
16:15	0	0	0	0	9	22	0	31	14	0	16	30	0	6	9	15	76
16:30	0	0	0	0	3	28	0	31	31	0	10	41	0	5	11	16	88
16:45	0	0	0	0	5	26	0	31	29	0	22	51	0	7	10	17	99
Total	0	0	0	0	22	91	0	113	95	0	65	160	0	20	43	63	336
17:00	0	0	0	0	2	12	0	14	19	0	15	34	0	8	13	21	69
17:15	0	0	0	0	7	13	0	20	22	0	13	35	0	2	15	17	72
17:30	0	0	0	0	7	9	0	16	39	0	10	49	0	4	9	13	78
17:45	0	0	0	0	4	8	0	12	14	0	11	25	0	4	8	12	49
Total	0	0	0	0	20	42	0	62	94	0	49	143	0	18	45	63	268
Grand Total	0	0	0	0	76	203	0	279	275	0	165	440	0	58	155	213	932
Apprch %	0	0	0		27.2	72.8	0		62.5	0	37.5		0	27.2	72.8		
Total %	0	0	0	0	8.2	21.8	0	29.9	29.5	0	17.7	47.2	0	6.2	16.6	22.9	

	Southbound				62ND ST. Westbound				HORTON ST. Northbound				62ND ST. Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 to 08:45 - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 08:00																	
08:00	0	0	0	0	7	12	0	19	10	0	4	14	0	1	12	13	46
08:15	0	0	0	0	6	12	0	18	7	0	7	14	0	2	11	13	45
08:30	0	0	0	0	7	13	0	20	10	0	10	20	0	3	16	19	59
08:45	0	0	0	0	7	11	0	18	19	0	9	28	0	3	16	19	65
Total Volume	0	0	0	0	27	48	0	75	46	0	30	76	0	9	55	64	215
% App. Total	0	0	0		36	64	0		60.5	0	39.5		0	14.1	85.9		
PHF	.000	.000	.000	.000	.964	.923	.000	.938	.605	.000	.750	.679	.000	.750	.859	.842	.827



Peak Hour Analysis From 16:00 to 17:45 - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 16:00

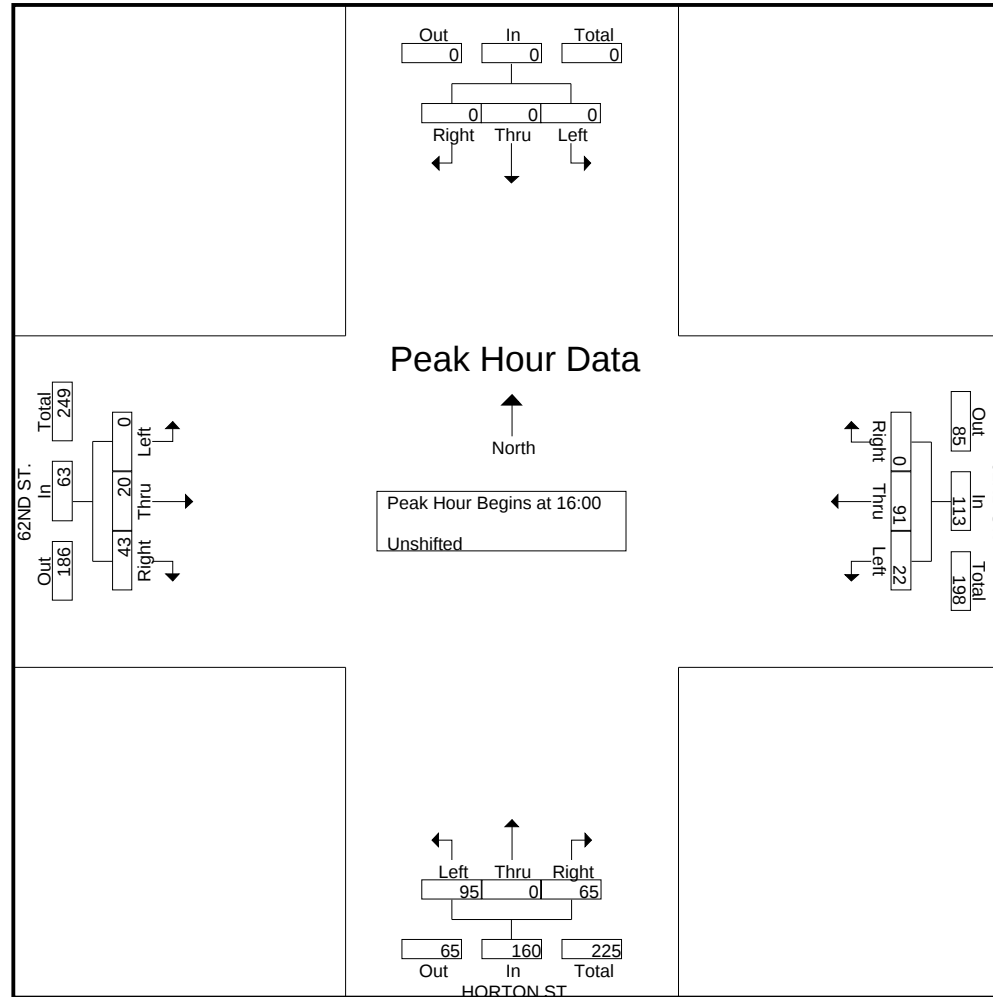
16:00	0	0	0	0	5	15	0	20	21	0	17	38	0	2	13	15	73
16:15	0	0	0	0	9	22	0	31	14	0	16	30	0	6	9	15	76
16:30	0	0	0	0	3	28	0	31	31	0	10	41	0	5	11	16	88
16:45	0	0	0	0	5	26	0	31	29	0	22	51	0	7	10	17	99
Total Volume	0	0	0	0	22	91	0	113	95	0	65	160	0	20	43	63	336
% App. Total	0	0	0	0	19.5	80.5	0		59.4	0	40.6		0	31.7	68.3		
PHF	.000	.000	.000	.000	.611	.813	.000	.911	.766	.000	.739	.784	.000	.714	.827	.926	.848

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Site Code : 00000000

Start Date : 30/06/2009

Page No : 1

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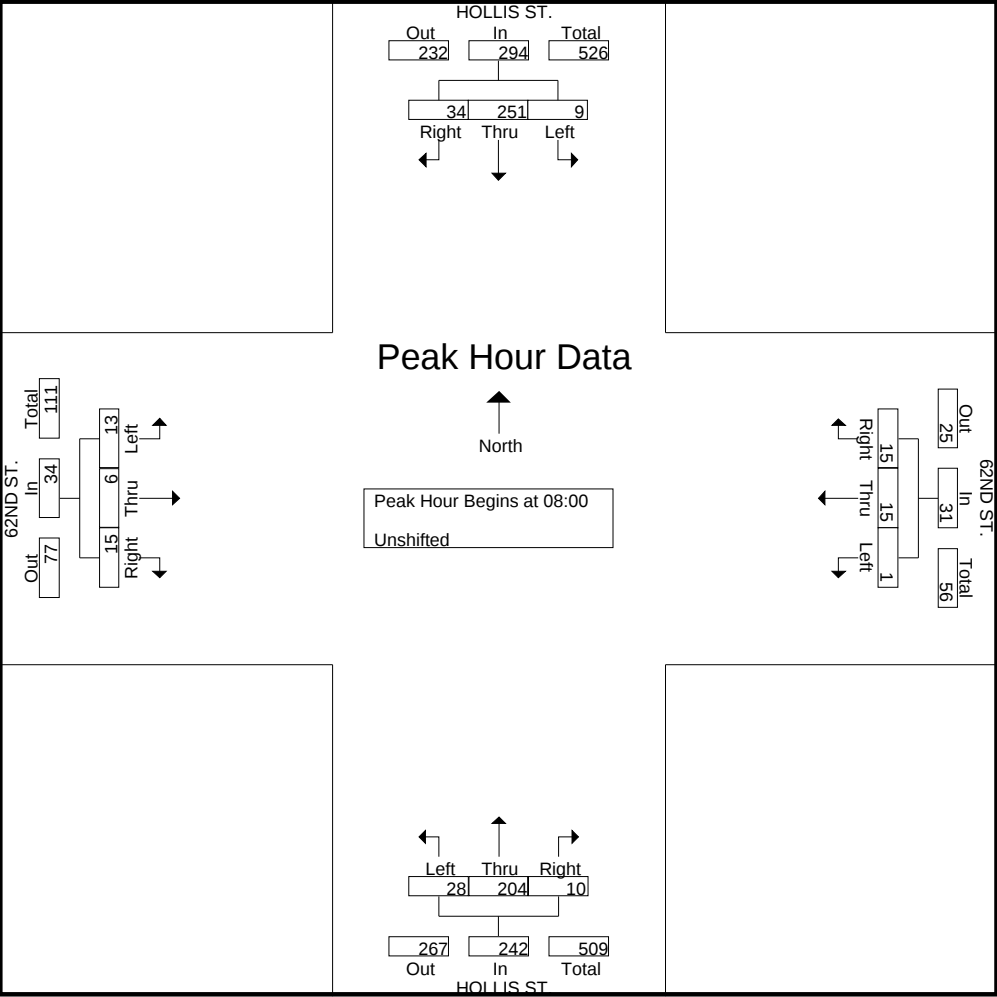
Groups Printed- Unshifted

	HOLLIS ST. Southbound				62ND ST. Westbound				HOLLIS ST. Northbound				62ND ST. Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
07:00	4	39	4	47	1	1	3	5	1	29	0	30	1	2	3	6	88
07:15	1	26	3	30	0	2	2	4	1	23	1	25	1	2	5	8	67
07:30	1	51	4	56	1	2	2	5	2	34	2	38	3	0	7	10	109
07:45	3	50	5	58	0	2	7	9	6	47	0	53	1	1	6	8	128
Total	9	166	16	191	2	7	14	23	10	133	3	146	6	5	21	32	392
08:00	3	59	10	72	0	2	3	5	9	39	1	49	1	1	3	5	131
08:15	3	62	7	72	0	3	0	3	8	44	0	52	4	1	3	8	135
08:30	0	69	6	75	0	5	7	12	10	48	1	59	4	2	6	12	158
08:45	3	61	11	75	1	5	5	11	1	73	8	82	4	2	3	9	177
Total	9	251	34	294	1	15	15	31	28	204	10	242	13	6	15	34	601

*** BREAK ***

16:00	3	99	9	111	4	1	8	13	8	73	1	82	8	6	8	22	228
16:15	2	63	10	75	2	9	6	17	13	82	1	96	13	3	9	25	213
16:30	2	96	13	111	3	4	8	15	16	97	0	113	10	2	6	18	257
16:45	0	85	17	102	2	4	3	9	8	93	2	103	10	12	9	31	245
Total	7	343	49	399	11	18	25	54	45	345	4	394	41	23	32	96	943
17:00	1	95	6	102	4	1	2	7	7	93	3	103	14	2	10	26	238
17:15	2	97	10	109	2	4	4	10	5	124	0	129	9	1	6	16	264
17:30	1	96	8	105	3	4	7	14	3	99	3	105	5	3	6	14	238
17:45	1	75	4	80	1	3	4	8	6	108	1	115	7	3	7	17	220
Total	5	363	28	396	10	12	17	39	21	424	7	452	35	9	29	73	960
Grand Total	30	1123	127	1280	24	52	71	147	104	1106	24	1234	95	43	97	235	2896
Apprch %	2.3	87.7	9.9		16.3	35.4	48.3		8.4	89.6	1.9		40.4	18.3	41.3		
Total %	1	38.8	4.4	44.2	0.8	1.8	2.5	5.1	3.6	38.2	0.8	42.6	3.3	1.5	3.3	8.1	

	HOLLIS ST. Southbound				62ND ST. Westbound				HOLLIS ST. Northbound				62ND ST. Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 to 08:45 - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 08:00																	
08:00	3	59	10	72	0	2	3	5	9	39	1	49	1	1	3	5	131
08:15	3	62	7	72	0	3	0	3	8	44	0	52	4	1	3	8	135
08:30	0	69	6	75	0	5	7	12	10	48	1	59	4	2	6	12	158
08:45	3	61	11	75	1	5	5	11	1	73	8	82	4	2	3	9	177
Total Volume	9	251	34	294	1	15	15	31	28	204	10	242	13	6	15	34	601
% App. Total	3.1	85.4	11.6		3.2	48.4	48.4		11.6	84.3	4.1		38.2	17.6	44.1		
PHF	.750	.909	.773	.980	.250	.750	.536	.646	.700	.699	.313	.738	.813	.750	.625	.708	.849



Peak Hour Analysis From 16:00 to 17:45 - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 16:30

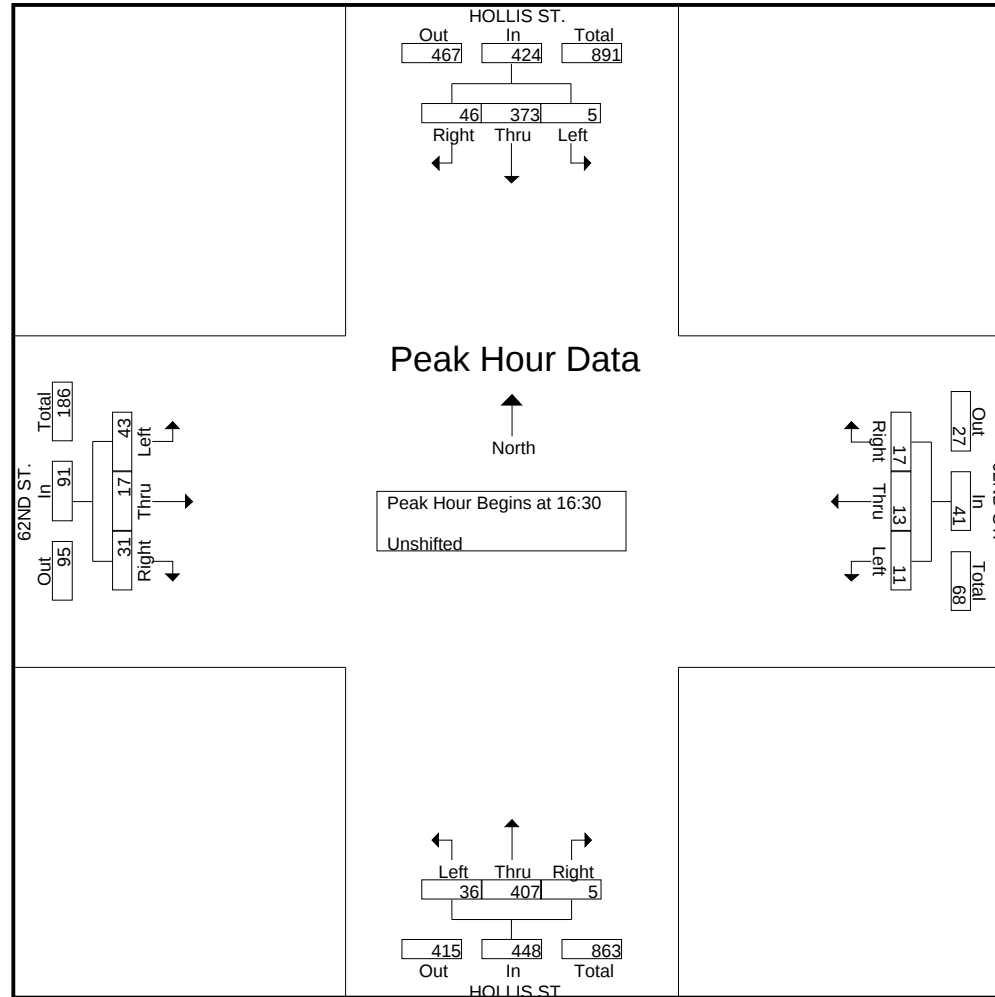
16:30	2	96	13	111	3	4	8	15	16	97	0	113	10	2	6	18	257
16:45	0	85	17	102	2	4	3	9	8	93	2	103	10	12	9	31	245
17:00	1	95	6	102	4	1	2	7	7	93	3	103	14	2	10	26	238
17:15	2	97	10	109	2	4	4	10	5	124	0	129	9	1	6	16	264
Total Volume	5	373	46	424	11	13	17	41	36	407	5	448	43	17	31	91	1004
% App. Total	1.2	88	10.8		26.8	31.7	41.5		8	90.8	1.1		47.3	18.7	34.1		
PHF	.625	.961	.676	.955	.688	.813	.531	.683	.563	.821	.417	.868	.768	.354	.775	.734	.951

All Traffic Data

(916) 771-8700
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EMERYVILLE

File Name : 09-7261-004 HOLLIS-62ND-F
Site Code : 00000000
Start Date : 30/06/2009
Page No : 3



All Traffic Data

(916) 771-8700

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EMERYVILLE

File Name : 09-7261-005 HORTON-STANFORD-F

Site Code : 00000000

Start Date : 30/06/2009

Page No : 1

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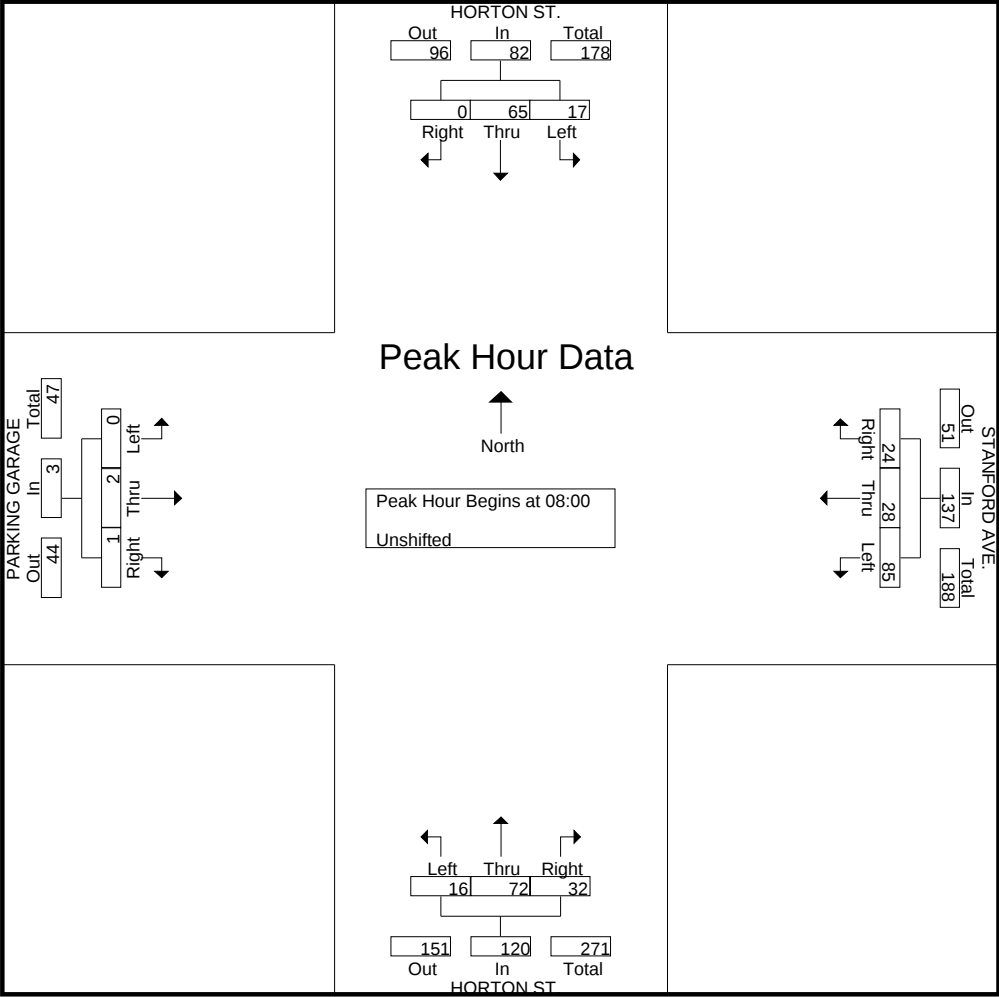
Groups Printed- Unshifted

	HORTON ST. Southbound				STANFORD AVE. Westbound				HORTON ST. Northbound				PARKING GARAGE Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
07:00	2	3	0	5	7	8	5	20	1	9	0	10	0	1	0	1	36
07:15	4	5	1	10	13	4	9	26	0	11	1	12	0	1	1	2	50
07:30	3	3	1	7	21	7	8	36	2	12	6	20	2	2	0	4	67
07:45	3	12	1	16	17	6	6	29	1	18	12	31	0	1	1	2	78
Total	12	23	3	38	58	25	28	111	4	50	19	73	2	5	2	9	231
08:00	3	14	0	17	24	8	6	38	3	12	9	24	0	0	0	0	79
08:15	4	19	0	23	22	8	4	34	3	19	4	26	0	1	0	1	84
08:30	4	19	0	23	24	5	8	37	6	24	8	38	0	0	0	0	98
08:45	6	13	0	19	15	7	6	28	4	17	11	32	0	1	1	2	81
Total	17	65	0	82	85	28	24	137	16	72	32	120	0	2	1	3	342

*** BREAK ***

16:00	4	18	0	22	10	1	9	20	0	22	9	31	1	7	3	11	84
16:15	3	26	1	30	10	1	8	19	3	21	9	33	1	4	2	7	89
16:30	2	22	0	24	9	0	2	11	3	16	9	28	5	8	4	17	80
16:45	6	19	2	27	10	2	6	18	0	21	16	37	4	6	3	13	95
Total	15	85	3	103	39	4	25	68	6	80	43	129	11	25	12	48	348
17:00	5	21	2	28	8	3	5	16	1	27	11	39	0	9	7	16	99
17:15	5	30	1	36	6	1	9	16	2	27	14	43	3	1	4	8	103
17:30	7	22	0	29	13	1	7	21	2	32	12	46	0	3	1	4	100
17:45	1	17	0	18	7	1	2	10	1	23	16	40	1	5	5	11	79
Total	18	90	3	111	34	6	23	63	6	109	53	168	4	18	17	39	381
Grand Total	62	263	9	334	216	63	100	379	32	311	147	490	17	50	32	99	1302
Apprch %	18.6	78.7	2.7		57	16.6	26.4		6.5	63.5	30		17.2	50.5	32.3		
Total %	4.8	20.2	0.7	25.7	16.6	4.8	7.7	29.1	2.5	23.9	11.3	37.6	1.3	3.8	2.5	7.6	

	HORTON ST. Southbound				STANFORD AVE. Westbound				HORTON ST. Northbound				PARKING GARAGE Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 to 08:45 - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 08:00																	
08:00	3	14	0	17	24	8	6	38	3	12	9	24	0	0	0	0	79
08:15	4	19	0	23	22	8	4	34	3	19	4	26	0	1	0	1	84
08:30	4	19	0	23	24	5	8	37	6	24	8	38	0	0	0	0	98
08:45	6	13	0	19	15	7	6	28	4	17	11	32	0	1	1	2	81
Total Volume	17	65	0	82	85	28	24	137	16	72	32	120	0	2	1	3	342
% App. Total	20.7	79.3	0		62	20.4	17.5		13.3	60	26.7		0	66.7	33.3		
PHF	.708	.855	.000	.891	.885	.875	.750	.901	.667	.750	.727	.789	.000	.500	.250	.375	.872



Peak Hour Analysis From 16:00 to 17:45 - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 16:45

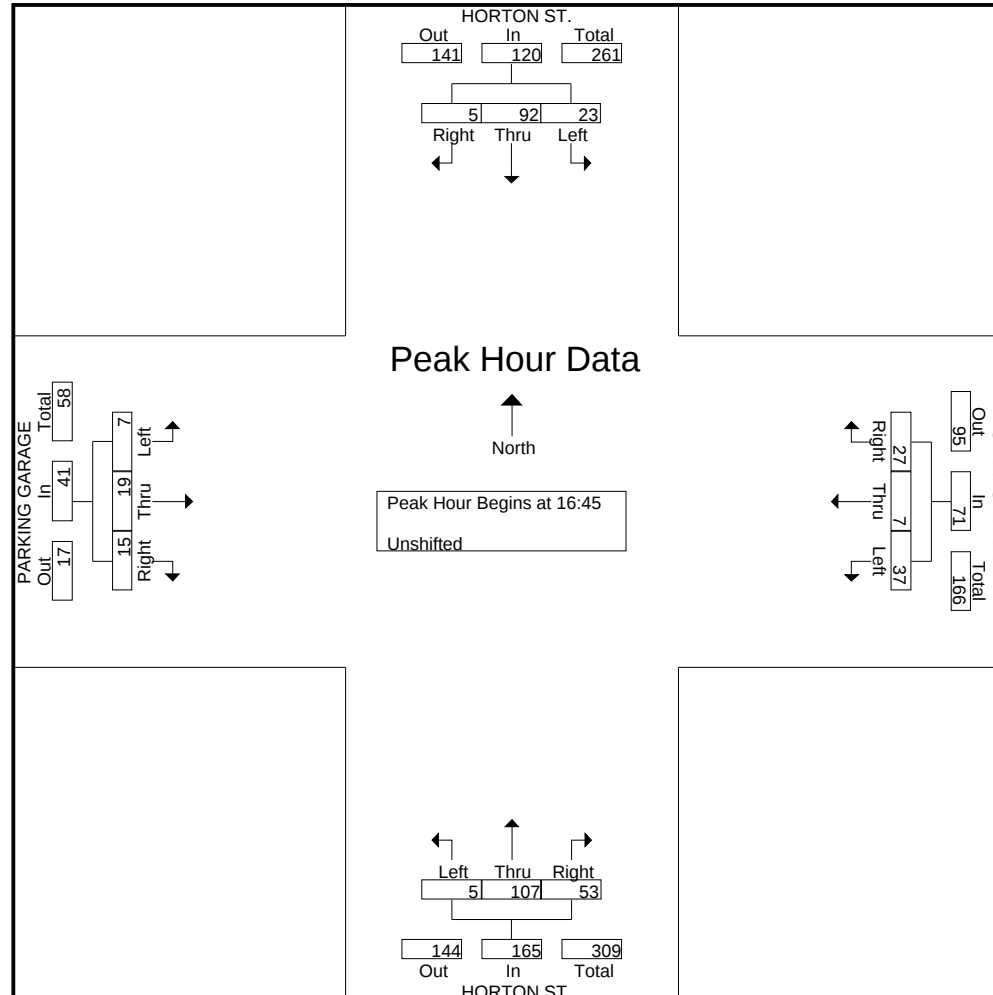
16:45	6	19	2	27	10	2	6	18	0	21	16	37	4	6	3	13	95
17:00	5	21	2	28	8	3	5	16	1	27	11	39	0	9	7	16	99
17:15	5	30	1	36	6	1	9	16	2	27	14	43	3	1	4	8	103
17:30	7	22	0	29	13	1	7	21	2	32	12	46	0	3	1	4	100
Total Volume	23	92	5	120	37	7	27	71	5	107	53	165	7	19	15	41	397
% App. Total	19.2	76.7	4.2		52.1	9.9	38		3	64.8	32.1		17.1	46.3	36.6		
PHF	.821	.767	.625	.833	.712	.583	.750	.845	.625	.836	.828	.897	.438	.528	.536	.641	.964

All Traffic Data

(916) 771-8700
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EMERYVILLE

File Name : 09-7261-005 HORTON-STANFORD-F
Site Code : 00000000
Start Date : 30/06/2009
Page No : 3



All Traffic Data

(916) 771-8700

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EMERYVILLE

File Name : 09-7261-006 DOYLE-59TH-F

Site Code : 00000000

Start Date : 30/06/2009

Page No : 1

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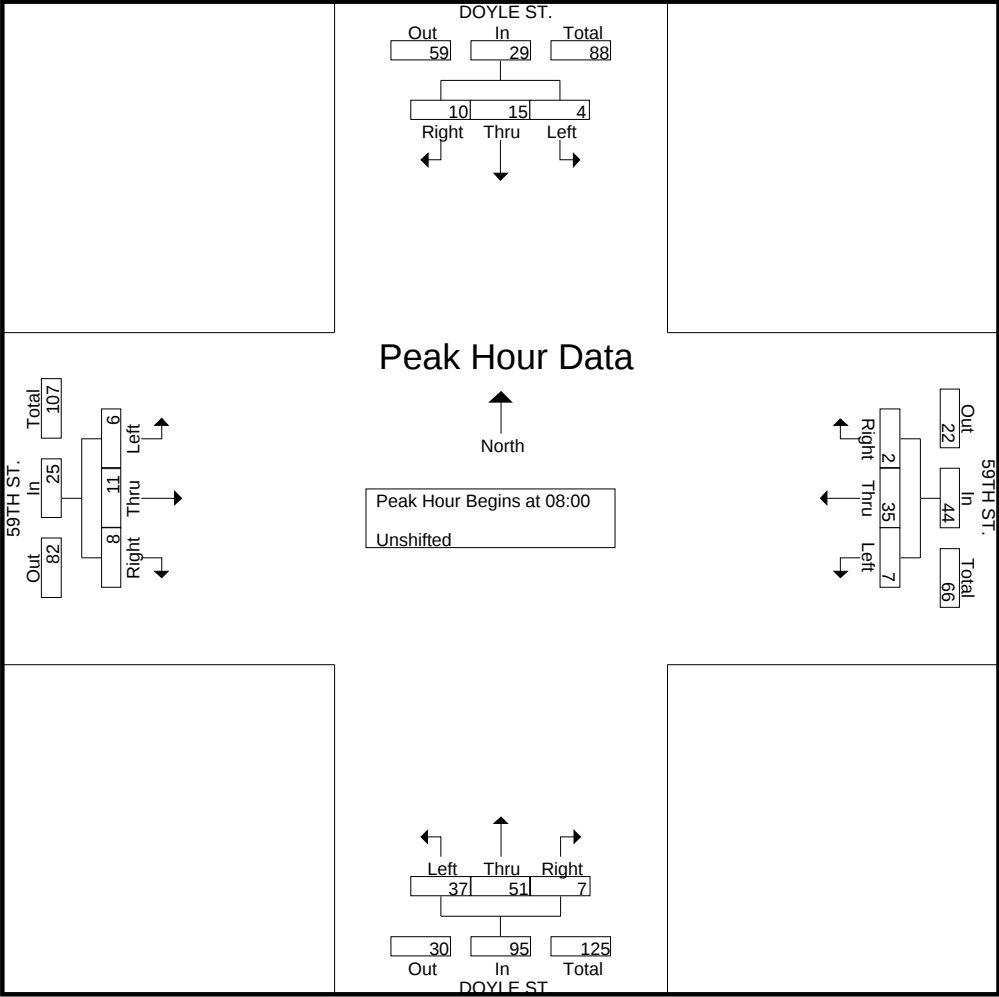
Groups Printed- Unshifted

	DOYLE ST. Southbound				59TH ST. Westbound				DOYLE ST. Northbound				59TH ST. Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
07:00	0	1	0	1	0	5	3	8	2	7	0	9	0	3	0	3	21
07:15	0	3	1	4	2	3	2	7	3	2	1	6	1	3	2	6	23
07:30	1	1	1	3	0	3	2	5	4	4	0	8	0	5	0	5	21
07:45	0	2	3	5	0	5	0	5	4	4	1	9	2	4	2	8	27
Total	1	7	5	13	2	16	7	25	13	17	2	32	3	15	4	22	92
08:00	1	2	2	5	1	6	0	7	8	13	1	22	1	3	1	5	39
08:15	1	4	3	8	4	9	0	13	6	13	0	19	0	4	1	5	45
08:30	1	4	2	7	1	9	1	11	10	11	2	23	2	3	0	5	46
08:45	1	5	3	9	1	11	1	13	13	14	4	31	3	1	6	10	63
Total	4	15	10	29	7	35	2	44	37	51	7	95	6	11	8	25	193

*** BREAK ***

16:00	6	4	3	13	0	9	2	11	0	4	2	6	1	8	5	14	44
16:15	2	4	0	6	1	8	1	10	2	3	1	6	2	11	2	15	37
16:30	3	12	2	17	4	4	1	9	4	1	0	5	2	13	0	15	46
16:45	1	5	4	10	1	9	0	10	5	5	1	11	1	11	1	13	44
Total	12	25	9	46	6	30	4	40	11	13	4	28	6	43	8	57	171
17:00	6	14	2	22	2	5	6	13	3	2	2	7	0	14	2	16	58
17:15	2	7	1	10	1	10	1	12	3	7	0	10	2	15	4	21	53
17:30	1	8	4	13	1	5	2	8	3	11	2	16	1	18	5	24	61
17:45	3	9	5	17	0	8	0	8	3	5	1	9	0	9	1	10	44
Total	12	38	12	62	4	28	9	41	12	25	5	42	3	56	12	71	216
Grand Total	29	85	36	150	19	109	22	150	73	106	18	197	18	125	32	175	672
Apprch %	19.3	56.7	24		12.7	72.7	14.7		37.1	53.8	9.1		10.3	71.4	18.3		
Total %	4.3	12.6	5.4	22.3	2.8	16.2	3.3	22.3	10.9	15.8	2.7	29.3	2.7	18.6	4.8	26	

	DOYLE ST. Southbound				59TH ST. Westbound				DOYLE ST. Northbound				59TH ST. Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 to 08:45 - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 08:00																	
08:00	1	2	2	5	1	6	0	7	8	13	1	22	1	3	1	5	39
08:15	1	4	3	8	4	9	0	13	6	13	0	19	0	4	1	5	45
08:30	1	4	2	7	1	9	1	11	10	11	2	23	2	3	0	5	46
08:45	1	5	3	9	1	11	1	13	13	14	4	31	3	1	6	10	63
Total Volume	4	15	10	29	7	35	2	44	37	51	7	95	6	11	8	25	193
% App. Total	13.8	51.7	34.5		15.9	79.5	4.5		38.9	53.7	7.4		24	44	32		
PHF	1.000	.750	.833	.806	.438	.795	.500	.846	.712	.911	.438	.766	.500	.688	.333	.625	.766



Peak Hour Analysis From 16:00 to 17:45 - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 16:45

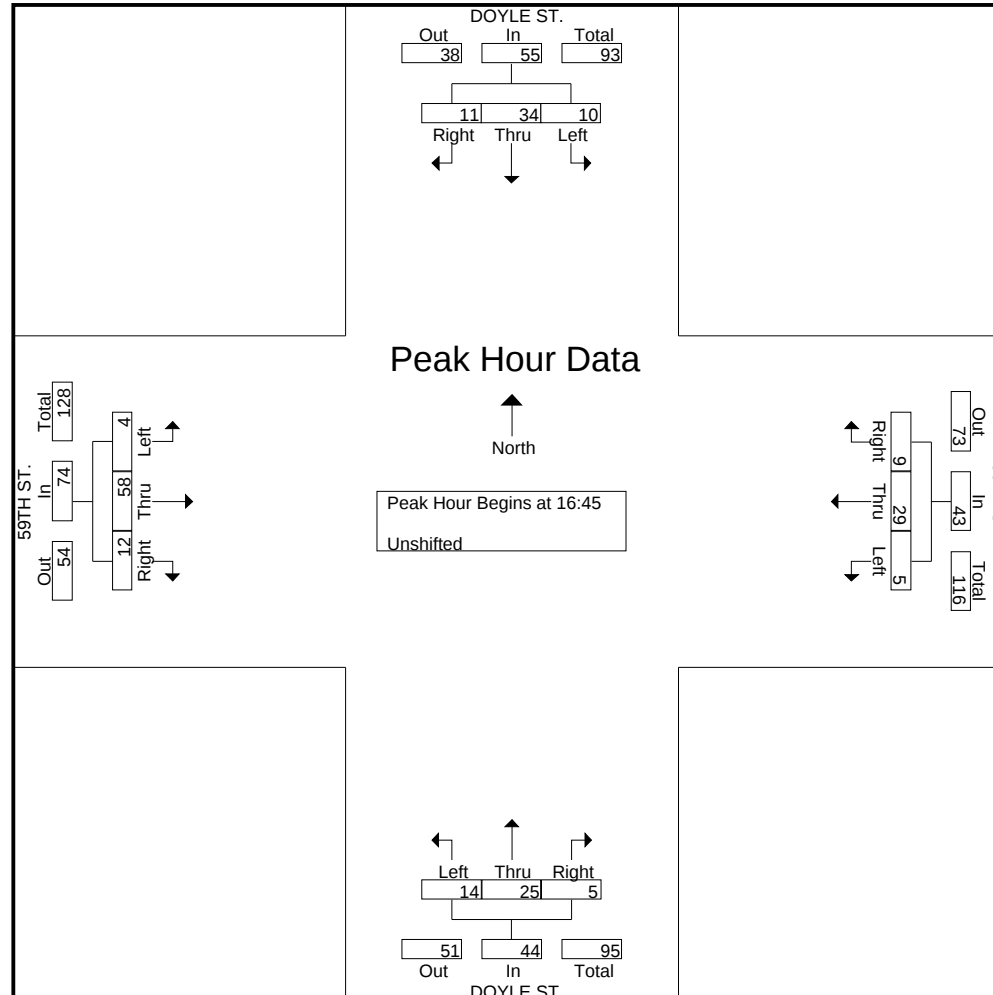
16:45	1	5	4	10	1	9	0	10	5	5	1	11	1	11	1	13	44
17:00	6	14	2	22	2	5	6	13	3	2	2	7	0	14	2	16	58
17:15	2	7	1	10	1	10	1	12	3	7	0	10	2	15	4	21	53
17:30	1	8	4	13	1	5	2	8	3	11	2	16	1	18	5	24	61
Total Volume	10	34	11	55	5	29	9	43	14	25	5	44	4	58	12	74	216
% App. Total	18.2	61.8	20		11.6	67.4	20.9		31.8	56.8	11.4		5.4	78.4	16.2		
PHF	.417	.607	.688	.625	.625	.725	.375	.827	.700	.568	.625	.688	.500	.806	.600	.771	.885

All Traffic Data

(916) 771-8700
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EMERYVILLE

File Name : 09-7261-006 DOYLE-59TH-F
Site Code : 00000000
Start Date : 30/06/2009
Page No : 3



All Traffic Data

(916) 771-8700

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EMERYVILLE

File Name : 09-7261-007 SAN PABLO-59TH-F

Site Code : 00000000

Start Date : 30/06/2009

Page No : 1

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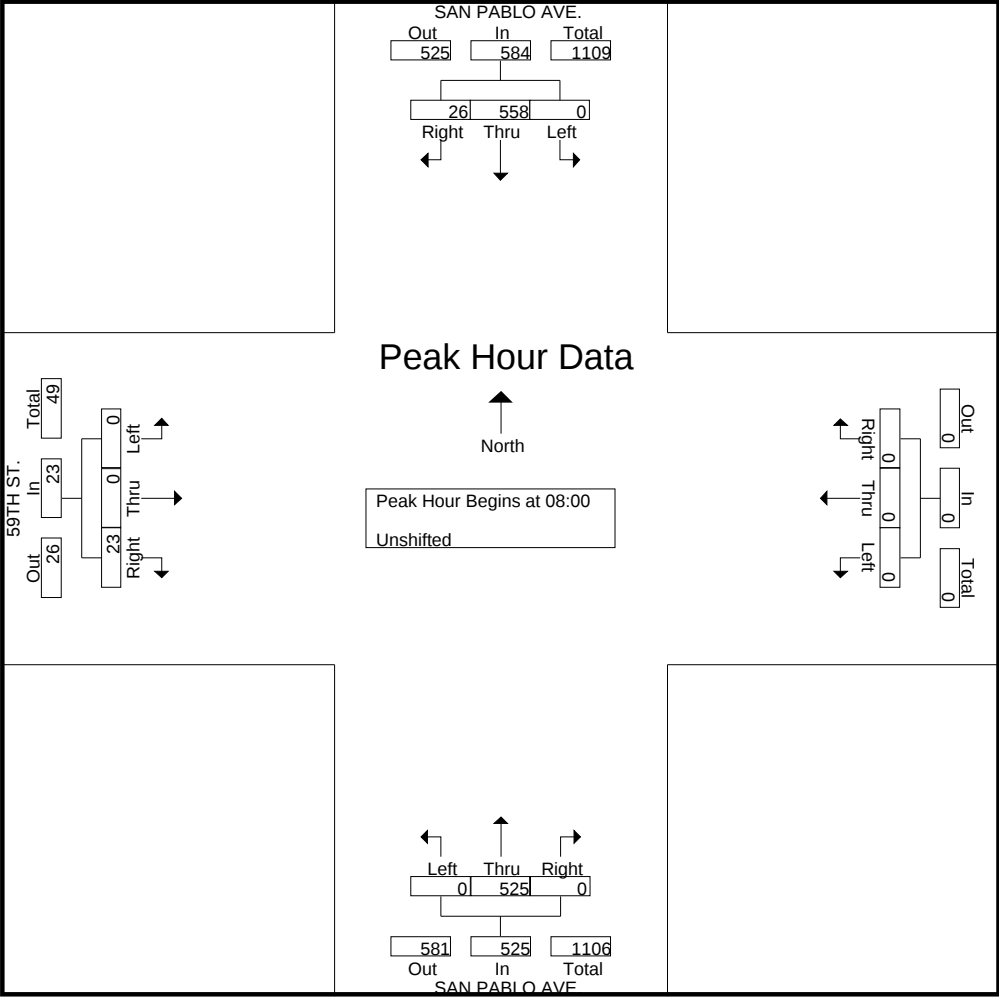
Groups Printed- Unshifted

	SAN PABLO AVE. Southbound				Westbound				SAN PABLO AVE. Northbound				59TH ST. Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
07:00	0	69	6	75	0	0	0	0	0	56	0	56	0	0	4	4	135
07:15	0	93	4	97	0	0	0	0	0	64	0	64	0	0	2	2	163
07:30	0	105	2	107	0	0	0	0	0	88	0	88	0	0	9	9	204
07:45	0	123	6	129	0	0	0	0	0	106	0	106	0	0	5	5	240
Total	0	390	18	408	0	0	0	0	0	314	0	314	0	0	20	20	742
08:00	0	122	5	127	0	0	0	0	0	111	0	111	0	0	6	6	244
08:15	0	142	7	149	0	0	0	0	0	150	0	150	0	0	6	6	305
08:30	0	144	8	152	0	0	0	0	0	116	0	116	0	0	7	7	275
08:45	0	150	6	156	0	0	0	0	0	148	0	148	0	0	4	4	308
Total	0	558	26	584	0	0	0	0	0	525	0	525	0	0	23	23	1132

*** BREAK ***

16:00	0	220	4	224	0	0	0	0	0	197	0	197	0	0	12	12	433
16:15	0	204	8	212	0	0	0	0	0	196	0	196	0	0	13	13	421
16:30	0	235	5	240	0	0	0	0	0	191	0	191	0	0	19	19	450
16:45	0	228	6	234	0	0	0	0	0	239	0	239	0	0	14	14	487
Total	0	887	23	910	0	0	0	0	0	823	0	823	0	0	58	58	1791
17:00	0	268	7	275	0	0	0	0	0	211	0	211	0	0	12	12	498
17:15	0	246	6	252	0	0	0	0	0	213	0	213	0	0	19	19	484
17:30	0	258	6	264	0	0	0	0	0	242	0	242	0	0	15	15	521
17:45	0	210	9	219	0	0	0	0	0	237	0	237	0	0	12	12	468
Total	0	982	28	1010	0	0	0	0	0	903	0	903	0	0	58	58	1971
Grand Total	0	2817	95	2912	0	0	0	0	0	2565	0	2565	0	0	159	159	5636
Apprch %	0	96.7	3.3		0	0	0		0	100	0		0	0	100		
Total %	0	50	1.7	51.7	0	0	0	0	0	45.5	0	45.5	0	0	2.8	2.8	

	SAN PABLO AVE. Southbound				Westbound				SAN PABLO AVE. Northbound				59TH ST. Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 to 08:45 - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 08:00																	
08:00	0	122	5	127	0	0	0	0	0	111	0	111	0	0	6	6	244
08:15	0	142	7	149	0	0	0	0	0	150	0	150	0	0	6	6	305
08:30	0	144	8	152	0	0	0	0	0	116	0	116	0	0	7	7	275
08:45	0	150	6	156	0	0	0	0	0	148	0	148	0	0	4	4	308
Total Volume	0	558	26	584	0	0	0	0	0	525	0	525	0	0	23	23	1132
% App. Total	0	95.5	4.5		0	0	0		0	100	0		0	0	100		
PHF	.000	.930	.813	.936	.000	.000	.000	.000	.000	.875	.000	.875	.000	.000	.821	.821	.919



Peak Hour Analysis From 16:00 to 17:45 - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 16:45

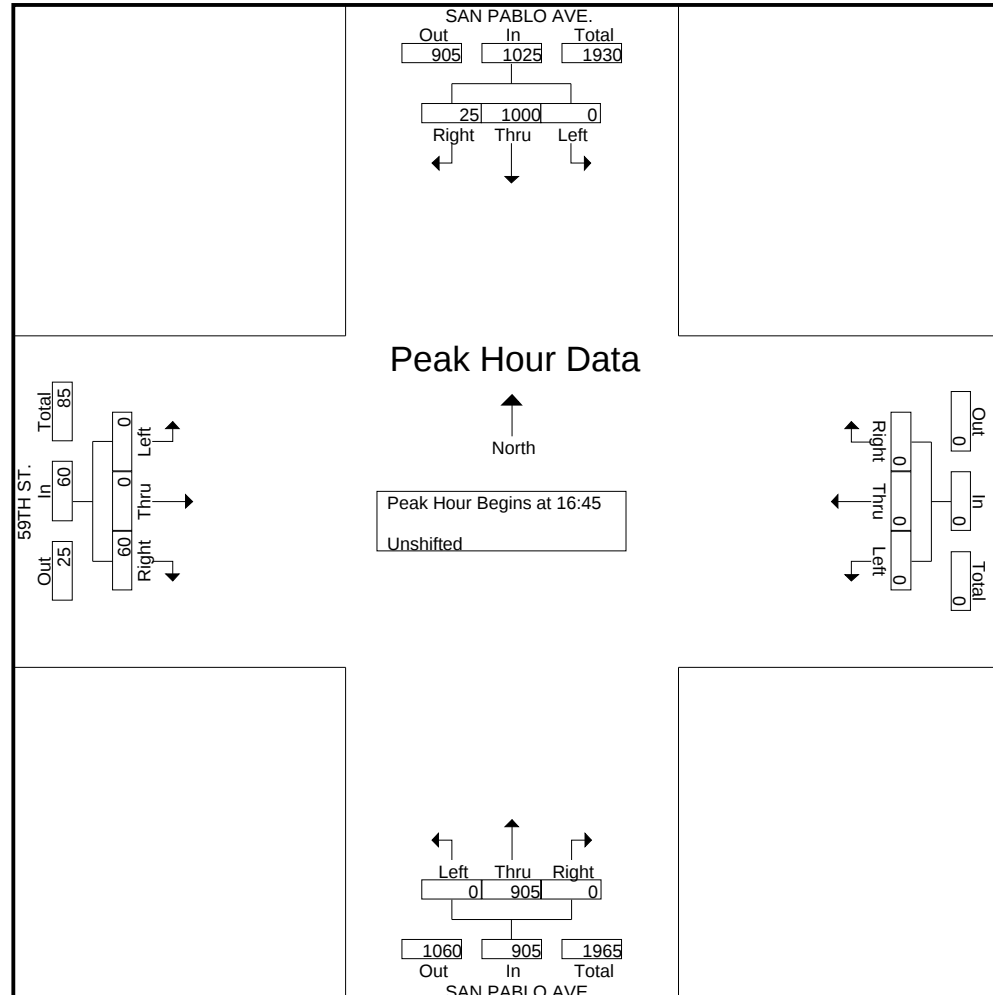
16:45	0	228	6	234	0	0	0	0	0	239	0	239	0	0	14	14	487
17:00	0	268	7	275	0	0	0	0	0	211	0	211	0	0	12	12	498
17:15	0	246	6	252	0	0	0	0	0	213	0	213	0	0	19	19	484
17:30	0	258	6	264	0	0	0	0	0	242	0	242	0	0	15	15	521
Total Volume	0	1000	25	1025	0	0	0	0	0	905	0	905	0	0	60	60	1990
% App. Total	0	97.6	2.4		0	0	0		0	100	0		0	0	100		
PHF	.000	.933	.893	.932	.000	.000	.000	.000	.000	.935	.000	.935	.000	.000	.789	.789	.955

All Traffic Data

(916) 771-8700
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EMERYVILLE

File Name : 09-7261-007 SAN PABLO-59TH-F
Site Code : 00000000
Start Date : 30/06/2009
Page No : 3



TECHNICAL APPENDIX B

LEVEL OF SERVICE CALCULATION WORKSHEETS

EXISTING AM PEAK HOUR CONDITIONS

Existing AM

1: Powell Street & Hollis Street

Emery Station

9/9/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	203	304	241	62	416	55	207	100	26	22	163	97
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.93		1.00	0.98		1.00	0.97		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	3304		1770	3477		1770	1805		1770	1863	1583
Flt Permitted	0.95	1.00		0.95	1.00		0.40	1.00		0.67	1.00	1.00
Satd. Flow (perm)	1770	3304		1770	3477		753	1805		1244	1863	1583
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	226	338	268	69	462	61	230	111	29	24	181	108
RTOR Reduction (vph)	0	177	0	0	17	0	0	19	0	0	0	74
Lane Group Flow (vph)	226	429	0	69	506	0	230	121	0	24	181	34
Turn Type	Prot			Prot			pm+pt			pm+pt		pm+ov
Protected Phases	7	4		3	8		5	2		1	6	7
Permitted Phases							2			6		6
Actuated Green, G (s)	4.6	16.2		2.2	13.8		12.7	12.7		10.5	10.5	15.1
Effective Green, g (s)	4.6	16.2		2.2	13.8		12.7	12.7		10.5	10.5	15.1
Actuated g/C Ratio	0.10	0.34		0.05	0.29		0.27	0.27		0.22	0.22	0.32
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	171	1122		82	1006		260	481		280	410	634
v/s Ratio Prot	c0.13	0.13		0.04	c0.15		c0.05	0.07		0.00	c0.10	0.01
v/s Ratio Perm							c0.18			0.02		0.02
v/c Ratio	1.32	0.38		0.84	0.50		0.88	0.25		0.09	0.44	0.05
Uniform Delay, d1	21.6	12.0		22.6	14.1		16.9	13.8		14.8	16.1	11.3
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	179.6	0.2		50.7	0.4		27.9	0.3		0.1	0.8	0.0
Delay (s)	201.1	12.2		73.3	14.5		44.8	14.0		14.9	16.8	11.4
Level of Service	F	B		E	B		D	B		B	B	B
Approach Delay (s)		63.5			21.3			33.1			14.8	
Approach LOS		E			C			C			B	

Intersection Summary

HCM Average Control Delay	39.1	HCM Level of Service	D
HCM Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	47.7	Sum of lost time (s)	12.0
Intersection Capacity Utilization	57.9%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Existing AM

2: Powell Street & Doyle Street

Emery Station

9/9/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	62	234	32	46	514	53	9	6	11	15	15	38
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.90	0.90	0.90	0.95	0.95	0.95	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	69	260	36	48	541	56	10	7	12	17	17	42
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)		525										
pX, platoon unblocked												
vC, conflicting volume	597			296			833	1109	148	949	1099	298
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	597			296			833	1109	148	949	1099	298
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	93			96			95	96	99	91	91	94
cM capacity (veh/h)	976			1263			210	186	872	190	189	698
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1						
Volume Total	199	166	319	326	29	76						
Volume Left	69	0	48	0	10	17						
Volume Right	0	36	0	56	12	42						
cSH	976	1700	1263	1700	297	319						
Volume to Capacity	0.07	0.10	0.04	0.19	0.10	0.24						
Queue Length 95th (ft)	6	0	3	0	8	23						
Control Delay (s)	3.6	0.0	1.5	0.0	18.4	19.7						
Lane LOS	A		A		C	C						
Approach Delay (s)	1.9		0.7		18.4	19.7						
Approach LOS					C	C						

Intersection Summary

Average Delay	2.9		
Intersection Capacity Utilization	41.1%	ICU Level of Service	A
Analysis Period (min)	15		

Existing AM

3: Stanford Ave & Hollis St.

Emery Station

9/9/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	26	12	20	15	24	13	70	273	21	20	387	46
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0			4.0			4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00			0.95			1.00	1.00
Flt	1.00	0.91		1.00	0.95			0.99			1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00			0.99			1.00	1.00
Satd. Flow (prot)	1770	1687		1770	1767			3475			1821	1552
Flt Permitted	0.87	1.00		0.87	1.00			0.84			0.98	1.00
Satd. Flow (perm)	1620	1687		1620	1767			2932			1783	1552
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	29	13	22	17	27	14	78	303	23	22	430	51
RTOR Reduction (vph)	0	19	0	0	12	0	0	5	0	0	0	16
Lane Group Flow (vph)	29	16	0	17	29	0	0	399	0	0	452	35
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	5	5
Turn Type	Perm			Perm			Perm			Perm		Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		6
Actuated Green, G (s)	4.6	4.6		4.6	4.6			26.9			26.9	26.9
Effective Green, g (s)	4.6	4.6		4.6	4.6			26.9			26.9	26.9
Actuated g/C Ratio	0.12	0.12		0.12	0.12			0.68			0.68	0.68
Clearance Time (s)	4.0	4.0		4.0	4.0			4.0			4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	3.0
Lane Grp Cap (vph)	189	196		189	206			1997			1214	1057
v/s Ratio Prot		0.01			0.02							
v/s Ratio Perm	c0.02			0.01			0.14			c0.25	0.02	
v/c Ratio	0.15	0.08		0.09	0.14		0.20			0.37	0.03	
Uniform Delay, d1	15.7	15.6		15.6	15.7		2.3			2.7	2.1	
Progression Factor	1.00	1.00		1.00	1.00		1.00			1.00	1.00	
Incremental Delay, d2	0.4	0.2		0.2	0.3		0.2			0.9	0.1	
Delay (s)	16.1	15.7		15.8	16.0		2.6			3.6	2.1	
Level of Service	B	B		B	B		A			A	A	
Approach Delay (s)		15.9			15.9		2.6			3.4		
Approach LOS		B			B		A			A		
Intersection Summary												
HCM Average Control Delay		4.6			HCM Level of Service		A					
HCM Volume to Capacity ratio		0.34										
Actuated Cycle Length (s)		39.5			Sum of lost time (s)		8.0					
Intersection Capacity Utilization		49.8%			ICU Level of Service		A					
Analysis Period (min)		15										

c Critical Lane Group

Existing AM

4: 59th Street & Hollis Street

Emery Station

9/9/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	33	17	38	25	23	16	49	308	73	25	194	19
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Flt	1.00	0.97			0.98		1.00	0.99		1.00	1.00	
Flt Protected	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Flt Permitted	0.95	1.00			0.98		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1618			1733		1770	1791		1770	1829	
Flt Permitted	0.95	1.00			0.98		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	1618			1733		1770	1791		1770	1829	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	37	19	42	28	26	18	54	342	81	28	216	21
RTOR Reduction (vph)	0	39	0	0	17	0	0	7	0	0	3	0
Lane Group Flow (vph)	37	22	0	0	55	0	54	416	0	28	234	0
Confl. Peds. (#/hr)	20		20	20		20	20		20	20		20
Confl. Bikes (#/hr)			5			5			5			5
Turn Type	Split			Split			Prot			Prot		
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	3.9	3.9			4.3		2.6	31.0		1.4	29.8	
Effective Green, g (s)	3.9	3.9			4.3		2.6	31.0		1.4	29.8	
Actuated g/C Ratio	0.07	0.07			0.08		0.05	0.55		0.02	0.53	
Clearance Time (s)	4.0	4.0			4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	122	111			132		81	981		44	963	
v/s Ratio Prot	c0.02	0.01			c0.03		c0.03	c0.23		0.02	0.13	
v/s Ratio Perm												
v/c Ratio	0.30	0.20			0.42		0.67	0.42		0.64	0.24	
Uniform Delay, d1	25.1	24.9			25.0		26.6	7.5		27.3	7.3	
Progression Factor	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.4	0.9			2.1		18.8	1.3		26.4	0.6	
Delay (s)	26.5	25.7			27.1		45.4	8.9		53.7	7.9	
Level of Service	C	C			C		D	A		D	A	
Approach Delay (s)		26.0			27.1			13.0			12.7	
Approach LOS		C			C			B			B	
Intersection Summary												
HCM Average Control Delay		15.4			HCM Level of Service		B					
HCM Volume to Capacity ratio		0.40										
Actuated Cycle Length (s)		56.6			Sum of lost time (s)		12.0					
Intersection Capacity Utilization		47.6%			ICU Level of Service		A					
Analysis Period (min)		15										

c Critical Lane Group

Existing AM

5: Powell Street & San Pablo Ave

Emery Station

9/9/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	47	174	58	95	417	23	135	579	58	56	699	67
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Flt	1.00	0.96		1.00	0.99		1.00	0.99		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3407		1770	3511		1770	3491		1770	3493	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	3407		1770	3511		1770	3491		1770	3493	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.91	0.91	0.91	0.96	0.96	0.96
Adj. Flow (vph)	52	193	64	106	463	26	148	636	64	58	728	70
RTOR Reduction (vph)	0	35	0	0	0	0	0	6	0	0	6	0
Lane Group Flow (vph)	52	222	0	106	489	0	148	694	0	58	792	0
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	7.2	17.5		10.3	20.6		12.4	48.6		7.6	43.8	
Effective Green, g (s)	7.2	17.5		10.3	20.6		12.4	48.6		7.6	43.8	
Actuated g/C Ratio	0.07	0.18		0.10	0.21		0.12	0.49		0.08	0.44	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	127	596		182	723		219	1697		135	1530	
v/s Ratio Prot	0.03	0.07		c0.06	c0.14		c0.08	0.20		0.03	c0.23	
v/s Ratio Perm												
v/c Ratio	0.41	0.37		0.58	0.68		0.68	0.41		0.43	0.52	
Uniform Delay, d1	44.4	36.4		42.8	36.6		41.9	16.5		44.1	20.4	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	2.1	0.4		4.7	2.5		8.0	0.7		2.2	1.3	
Delay (s)	46.5	36.8		47.5	39.1		49.9	17.2		46.3	21.7	
Level of Service	D	D		D	D		D	B		D	C	
Approach Delay (s)		38.4			40.6			22.9			23.3	
Approach LOS		D			D			C			C	
Intersection Summary												
HCM Average Control Delay		28.9			HCM Level of Service			C				
HCM Volume to Capacity ratio		0.60										
Actuated Cycle Length (s)		100.0			Sum of lost time (s)			16.0				
Intersection Capacity Utilization		57.9%			ICU Level of Service			B				
Analysis Period (min)		15										
c Critical Lane Group												

Existing AM

6: 40th Street & Hollis Street

Emery Station

9/9/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	27	140	23	68	298	145	47	104	48	45	107	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Flt	1.00	0.98		1.00	0.95		1.00	1.00		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3463		1770	3366		1770	1863		1583	1770	1839
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		1.00	0.95	1.00
Satd. Flow (perm)	1770	3463		1770	3366		1770	1863		1583	1770	1839
Peak-hour factor, PHF	0.90	0.90	0.90	0.94	0.94	0.94	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	30	156	26	72	317	154	52	116	53	50	119	11
RTOR Reduction (vph)	0	9	0	0	36	0	0	0	46	0	4	0
Lane Group Flow (vph)	30	173	0	72	435	0	52	116	7	50	126	0
Bus Blockages (#/hr)	0	0	0	0	0	5	0	0	0	0	0	0
Turn Type	Prot			Prot			Prot		Perm	Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases									2			
Actuated Green, G (s)	4.9	54.7		8.2	58.0		7.2	13.9	13.9	7.2	13.9	
Effective Green, g (s)	4.9	54.7		8.2	58.0		7.2	13.9	13.9	7.2	13.9	
Actuated g/C Ratio	0.05	0.55		0.08	0.58		0.07	0.14	0.14	0.07	0.14	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	87	1894		145	1952		127	259	220	127	256	
v/s Ratio Prot	0.02	0.05		c0.04	c0.13		c0.03	0.06		0.03	c0.07	
v/s Ratio Perm									0.00			
v/c Ratio	0.34	0.09		0.50	0.22		0.41	0.45	0.03	0.39	0.49	
Uniform Delay, d1	46.0	10.8		43.9	10.1		44.4	39.5	37.2	44.3	39.8	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	2.4	0.1		2.7	0.3		2.1	1.2	0.1	2.0	1.5	
Delay (s)	48.4	10.9		46.6	10.4		46.5	40.8	37.3	46.3	41.3	
Level of Service	D	B		D	B		D	D	D	D	D	
Approach Delay (s)		16.2			15.2			41.3			42.7	
Approach LOS		B			B			D			D	
Intersection Summary												
HCM Average Control Delay		24.6			HCM Level of Service			C				
HCM Volume to Capacity ratio		0.31										
Actuated Cycle Length (s)		100.0			Sum of lost time (s)			16.0				
Intersection Capacity Utilization		35.5%			ICU Level of Service			A				
Analysis Period (min)		15										
c Critical Lane Group												

Existing AM

7: Ashby Ave & Seventh Street

Emery Station

9/9/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations						34			59			
Volume (vph)	570	959	335	92	612	1900	130	146	1900	64	217	217
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	1.00	1.00
Frt	1.00	0.96		1.00	0.99		1.00	0.96		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	3402		1770	3511		1770	3386		1770	1863	1583
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1770	3402		1770	3511		1770	3386		1770	1863	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.94	0.94	0.94	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	600	1009	353	98	651	36	144	162	66	71	241	241
RTOR Reduction (vph)	0	25	0	0	4	0	0	46	0	0	0	101
Lane Group Flow (vph)	600	1337	0	98	683	0	144	182	0	71	241	140
Turn Type	Prot			Prot			Split			Split		pm+ov
Protected Phases	7	4		3	8		2	2		6	6	7
Permitted Phases												6
Actuated Green, G (s)	30.1	41.9		9.2	21.0		13.3	13.3		15.0	15.0	45.1
Effective Green, g (s)	30.1	41.9		9.2	21.0		13.3	13.3		15.0	15.0	45.1
Actuated g/C Ratio	0.32	0.44		0.10	0.22		0.14	0.14		0.16	0.16	0.47
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	558	1494		171	773		247	472		278	293	815
v/s Ratio Prot	c0.34	c0.39		0.06	0.19		c0.08	0.05		0.04	c0.13	0.05
v/s Ratio Perm												0.03
v/c Ratio	1.08	0.90		0.57	0.88		0.58	0.38		0.26	0.82	0.17
Uniform Delay, d1	32.6	24.7		41.2	36.0		38.5	37.3		35.3	38.9	14.4
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	59.9	7.3		4.6	11.7		3.5	0.5		0.5	16.8	0.1
Delay (s)	92.6	32.1		45.8	47.7		41.9	37.9		35.8	55.7	14.5
Level of Service	F	C		D	D		D	D		D	E	B
Approach Delay (s)		50.6			47.5			39.4			35.2	
Approach LOS		D			D			D			D	

Intersection Summary

HCM Average Control Delay	46.5	HCM Level of Service	D
HCM Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	95.4	Sum of lost time (s)	12.0
Intersection Capacity Utilization	81.5%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

AECOM

Synchro 7 - Report

Existing AM

8: Powell Street & Christie Ave

Emery Station

9/9/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	380	582	236	60	592	139	79	15	47	103	56	394
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0
Lane Util. Factor	0.97	0.91	0.91	1.00	0.95	1.00	0.95	0.95	1.00		1.00	0.88
Frt	1.00	0.99	0.85	1.00	1.00	0.85	1.00	1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.97	1.00		0.97	1.00
Satd. Flow (prot)	3433	3371	1441	1770	3539	1583	1681	1711	1583		1804	2787
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.97	1.00		0.97	1.00
Satd. Flow (perm)	3433	3371	1441	1770	3539	1583	1681	1711	1583		1804	2787
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.95	0.95	0.95
Adj. Flow (vph)	422	647	262	67	658	154	88	17	52	108	59	415
RTOR Reduction (vph)	0	2	119	0	0	92	0	0	47	0	0	264
Lane Group Flow (vph)	422	671	117	67	658	62	52	53	5	0	167	151
Turn Type	Prot		pm+ov	Prot		Perm		Split		Perm		Split
Protected Phases	7	4	2	3	8		2	2		6	6	7
Permitted Phases			4			8			2			6
Actuated Green, G (s)	18.8	40.9	49.6	16.8	38.9	38.9	8.7	8.7	8.7		17.6	36.4
Effective Green, g (s)	18.8	40.9	49.6	16.8	38.9	38.9	8.7	8.7	8.7		17.6	36.4
Actuated g/C Ratio	0.19	0.41	0.50	0.17	0.39	0.39	0.09	0.09	0.09		0.18	0.36
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	645	1379	715	297	1377	616	146	149	138		318	1126
v/s Ratio Prot	c0.12	c0.20	0.01	0.04	c0.19		0.03	c0.03			c0.09	0.03
v/s Ratio Perm			0.07			0.04			0.00			0.03
v/c Ratio	0.65	0.49	0.16	0.23	0.48	0.10	0.36	0.36	0.03		0.53	0.13
Uniform Delay, d1	37.6	21.8	13.8	36.0	22.9	19.4	43.0	43.0	41.8		37.4	21.3
Progression Factor	0.95	0.46	1.21	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	2.2	1.1	0.1	0.4	1.2	0.3	1.5	1.5	0.1		1.6	0.1
Delay (s)	38.0	11.0	16.8	36.4	24.1	19.8	44.5	44.5	41.9		39.0	21.3
Level of Service	D	B	B	D	C	B	D	D	D		D	C
Approach Delay (s)		20.6			24.3			43.6			26.4	
Approach LOS		C			C			D			C	

Intersection Summary

HCM Average Control Delay	24.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	52.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

AECOM

Synchro 7 - Report

Existing AM

9: Powell St & I-80E on-ramp

Emery Station

9/9/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↰↰↰		↰	↰↰↰	↰	↰	↰	↰			
Volume (vph)	71	561	0	0	747	283	553	17	656	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0	4.0	4.0	4.0	4.0			
Lane Util. Factor	1.00	0.91			0.91	1.00	0.95	0.91	0.95			
Frt	1.00	1.00			1.00	0.85	1.00	0.90	0.85			
Flt Protected	0.95	1.00			1.00	1.00	0.95	0.98	1.00			
Satd. Flow (prot)	1770	5085			5085	1583	1681	1507	1504			
Flt Permitted	0.95	1.00			1.00	1.00	0.95	0.98	1.00			
Satd. Flow (perm)	1770	5085			5085	1583	1681	1507	1504			
Peak-hour factor, PHF	0.90	0.90	0.90	0.92	0.92	0.92	0.90	0.90	0.90	0.92	0.92	0.92
Adj. Flow (vph)	79	623	0	0	812	308	614	19	729	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	159	0	69	171	0	0	0
Lane Group Flow (vph)	79	623	0	0	812	149	473	383	266	0	0	0
Turn Type	Prot				Perm	Split		Perm				
Protected Phases	7	4			8	2	2					
Permitted Phases					8			2				
Actuated Green, G (s)	6.3	58.8			48.5	48.5	33.2	33.2	33.2			
Effective Green, g (s)	6.3	58.8			48.5	48.5	33.2	33.2	33.2			
Actuated g/C Ratio	0.06	0.59			0.48	0.48	0.33	0.33	0.33			
Clearance Time (s)	4.0	4.0			4.0	4.0	4.0	4.0	4.0			
Vehicle Extension (s)	3.0	3.0			3.0	3.0	3.0	3.0	3.0			
Lane Grp Cap (vph)	112	2990			2466	768	558	500	499			
v/s Ratio Prot	c0.04	0.12			c0.16		c0.28	0.25				
v/s Ratio Perm						0.09		0.18				
v/c Ratio	0.71	0.21			0.33	0.19	0.85	0.77	0.53			
Uniform Delay, d1	45.9	9.7			15.8	14.6	31.0	29.9	27.1			
Progression Factor	0.73	3.00			0.62	0.39	1.00	1.00	1.00			
Incremental Delay, d2	17.1	0.1			0.3	0.5	11.4	6.9	1.1			
Delay (s)	50.6	29.1			10.1	6.3	42.5	36.8	28.2			
Level of Service	D	C			B	A	D	D	C			
Approach Delay (s)		31.6			9.1		36.0			0.0		
Approach LOS		C			A		D			A		
Intersection Summary												
HCM Average Control Delay		25.6			HCM Level of Service			C				
HCM Volume to Capacity ratio		0.55										
Actuated Cycle Length (s)		100.0			Sum of lost time (s)			12.0				
Intersection Capacity Utilization		53.9%			ICU Level of Service			A				
Analysis Period (min)		15										
c Critical Lane Group												

Existing AM

10: Powell St & Frontage Rd

Emery Station

9/9/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↰↰		↰	↰↰	↰				↰↰		↰
Volume (vph)	97	127	110	0	714	587	0	0	0	531	0	89
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0	4.0				4.0		4.0
Lane Util. Factor	1.00	0.95			0.91	0.91				0.97		1.00
Frt	1.00	0.93			0.97	0.85				1.00		0.85
Flt Protected	0.95	1.00			1.00	1.00				0.95		1.00
Satd. Flow (prot)	1770	3292			3284	1441				3433		1583
Flt Permitted	0.95	1.00			1.00	1.00				0.95		1.00
Satd. Flow (perm)	1770	3292			3284	1441				3433		1583
Peak-hour factor, PHF	0.96	0.96	0.96	0.90	0.90	0.90	0.92	0.92	0.92	0.90	0.90	0.90
Adj. Flow (vph)	101	132	115	0	793	652	0	0	0	590	0	99
RTOR Reduction (vph)	0	36	0	0	16	0	0	0	0	0	0	76
Lane Group Flow (vph)	101	211	0	0	986	443	0	0	0	590	0	23
Turn Type	Prot				Free					custom		custom
Protected Phases	7	4			8					6		6
Permitted Phases					Free					6		6
Actuated Green, G (s)	12.8	68.7			51.9	100.0				23.3		23.3
Effective Green, g (s)	12.8	68.7			51.9	100.0				23.3		23.3
Actuated g/C Ratio	0.13	0.69			0.52	1.00				0.23		0.23
Clearance Time (s)	4.0	4.0			4.0					4.0		4.0
Vehicle Extension (s)	3.0	3.0			3.0					3.0		3.0
Lane Grp Cap (vph)	227	2262			1704	1441				800		369
v/s Ratio Prot	c0.06	0.06			c0.30					c0.17		0.01
v/s Ratio Perm						0.31						
v/c Ratio	0.44	0.09			0.58	0.31				0.74		0.06
Uniform Delay, d1	40.3	5.2			16.5	0.0				35.5		29.8
Progression Factor	1.00	1.00			0.93	1.00				1.00		1.00
Incremental Delay, d2	1.4	0.1			1.3	0.5				3.6		0.1
Delay (s)	41.7	5.3			16.6	0.5				39.1		29.9
Level of Service	D	A			B	A				D		C
Approach Delay (s)		15.9			11.7			0.0			37.8	
Approach LOS		B			B			A			D	
Intersection Summary												
HCM Average Control Delay		19.5			HCM Level of Service			B				
HCM Volume to Capacity ratio		0.60										
Actuated Cycle Length (s)		100.0			Sum of lost time (s)			12.0				
Intersection Capacity Utilization		56.5%			ICU Level of Service			B				
Analysis Period (min)		15										
c Critical Lane Group												

Existing AM

Emery Station

11: I-80 off-ramp & Frontage Rd

9/9/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	5	16	15	474	80	0	72	96	545	75	220	87
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95		1.00	0.95	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85	1.00	0.96	
Flt Protected	0.95	1.00	1.00	0.95	0.97		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	1863	1583	1681	1709		1770	3539	1583	1770	1783	
Flt Permitted	0.95	1.00	1.00	0.95	0.97		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1770	1863	1583	1681	1709		1770	3539	1583	1770	1783	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.93	0.93	0.93	0.91	0.91	0.91
Adj. Flow (vph)	6	18	17	527	89	0	77	103	586	82	242	96
RTOR Reduction (vph)	0	0	16	0	0	0	0	0	0	0	13	0
Lane Group Flow (vph)	6	18	1	306	310	0	77	103	586	82	325	0
Turn Type	Split		Perm	Split		Prot		Free		Prot		
Protected Phases	4	4		8	8	5	2			1	6	
Permitted Phases			4					Free				
Actuated Green, G (s)	3.2	3.2	3.2	18.1	18.1		6.6	18.1	62.2	6.8	18.3	
Effective Green, g (s)	3.2	3.2	3.2	18.1	18.1		6.6	18.1	62.2	6.8	18.3	
Actuated g/C Ratio	0.05	0.05	0.05	0.29	0.29		0.11	0.29	1.00	0.11	0.29	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	91	96	81	489	497		188	1030	1583	194	525	
v/s Ratio Prot	0.00	0.01		c0.18	0.18		0.04	0.03		0.05	c0.18	
v/s Ratio Perm			0.00						c0.37			
v/c Ratio	0.07	0.19	0.01	0.63	0.62		0.41	0.10	0.37	0.42	0.62	
Uniform Delay, d1	28.1	28.3	28.0	19.1	19.1		26.0	16.1	0.0	25.9	18.9	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.3	0.9	0.1	2.5	2.4		1.5	0.0	0.7	1.5	2.2	
Delay (s)	28.4	29.2	28.1	21.6	21.5		27.4	16.1	0.7	27.4	21.1	
Level of Service	C	C	C	C	C		C	B	A	C	C	
Approach Delay (s)		28.6			21.6			5.4			22.3	
Approach LOS		C			C			A			C	

Intersection Summary

HCM Average Control Delay	15.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	62.2	Sum of lost time (s)	4.0
Intersection Capacity Utilization	52.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Existing AM

Emery Station

12: 59th St & Horton St

9/9/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control	Stop				Stop			Stop			Stop	
Volume (vph)	0	0	0	46	6	35	17	95	111	28	52	3
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	50	7	38	18	103	121	30	57	3
Direction, Lane #	WB 1	WB 2	NB 1	SB 1								
Volume Total (vph)	50	45	242	90								
Volume Left (vph)	50	0	18	30								
Volume Right (vph)	0	38	121	3								
Hadj (s)	0.53	-0.56	-0.25	0.08								
Departure Headway (s)	5.8	4.6	4.0	4.5								
Degree Utilization, x	0.08	0.06	0.27	0.11								
Capacity (veh/h)	586	722	875	770								
Control Delay (s)	8.0	6.7	8.5	8.0								
Approach Delay (s)	7.4		8.5	8.0								
Approach LOS	A		A	A								

Intersection Summary

Delay	8.1		
HCM Level of Service	A		
Intersection Capacity Utilization	23.2%	ICU Level of Service	A
Analysis Period (min)	15		

Existing AM
13: 59th St &

Emery Station
9/9/2009

	→	↗	↖	←	↙	↘
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↗			↖	↙	↘
Sign Control	Stop			Stop	Stop	
Volume (vph)	53	86	29	76	29	22
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	58	93	32	83	32	24
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total (vph)	151	114	55			
Volume Left (vph)	0	32	32			
Volume Right (vph)	93	0	24			
Hadj (s)	-0.34	0.09	-0.11			
Departure Headway (s)	3.8	4.3	4.3			
Degree Utilization, x	0.16	0.13	0.07			
Capacity (veh/h)	924	827	777			
Control Delay (s)	7.5	7.9	7.7			
Approach Delay (s)	7.5	7.9	7.7			
Approach LOS	A	A	A			
Intersection Summary						
Delay			7.7			
HCM Level of Service			A			
Intersection Capacity Utilization		27.0%		ICU Level of Service	A	
Analysis Period (min)		15				

Existing AM
14: 62nd St & Horton St

Emery Station
9/9/2009

	→	↗	↖	←	↙	↘
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↗			↖	↙	↘
Volume (veh/h)	9	55	27	48	46	30
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	10	60	29	52	50	33
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			70		151	40
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			70		151	40
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		94	97
cM capacity (veh/h)			1531		825	1032
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	70	82	83			
Volume Left	0	29	50			
Volume Right	60	0	33			
cSH	1700	1531	896			
Volume to Capacity	0.04	0.02	0.09			
Queue Length 95th (ft)	0	1	8			
Control Delay (s)	0.0	2.8	9.4			
Lane LOS		A	A			
Approach Delay (s)	0.0	2.8	9.4			
Approach LOS			A			
Intersection Summary						
Average Delay			4.3			
Intersection Capacity Utilization		21.7%		ICU Level of Service	A	
Analysis Period (min)		15				

Existing AM
15: 62nd St & Hollis St

Emery Station
9/9/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	13	6	15	1	15	15	28	204	10	9	251	34
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	14	7	16	1	16	16	30	222	11	10	273	37
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)								498				
pX, platoon unblocked												
vC, conflicting volume	623	604	291	618	617	227	310			233		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	623	604	291	618	617	227	310			233		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	96	98	98	100	96	98	98			99		
cM capacity (veh/h)	369	399	748	378	393	812	1251			1335		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	37	34	263	320								
Volume Left	14	1	30	10								
Volume Right	16	16	11	37								
cSH	483	523	1251	1335								
Volume to Capacity	0.08	0.06	0.02	0.01								
Queue Length 95th (ft)	6	5	2	1								
Control Delay (s)	13.1	12.4	1.1	0.3								
Lane LOS	B	B	A	A								
Approach Delay (s)	13.1	12.4	1.1	0.3								
Approach LOS	B	B										
Intersection Summary												
Average Delay			2.0									
Intersection Capacity Utilization			39.5%			ICU Level of Service		A				
Analysis Period (min)			15									

Existing AM
16: Stanford Ave & Horton St

Emery Station
9/9/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	2	1	85	28	24	16	72	32	17	65	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	2	1	92	30	26	17	78	35	18	71	0
Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	SB 1						
Volume Total (vph)	3	108	41	17	113	89						
Volume Left (vph)	0	92	0	17	0	18						
Volume Right (vph)	1	0	26	0	35	0						
Hadj (s)	-0.17	0.46	-0.41	0.53	-0.18	0.08						
Departure Headway (s)	5.1	5.5	4.6	5.5	4.8	5.1						
Degree Utilization, x	0.00	0.17	0.05	0.03	0.15	0.13						
Capacity (veh/h)	660	623	737	627	720	671						
Control Delay (s)	8.1	8.4	6.7	7.5	7.5	8.9						
Approach Delay (s)	8.1	7.9		7.5		8.9						
Approach LOS	A	A		A		A						
Intersection Summary												
Delay			8.0									
HCM Level of Service			A									
Intersection Capacity Utilization			29.1%		ICU Level of Service			A				
Analysis Period (min)			15									

Existing AM
17: Doyle Street &

Emery Station
9/9/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	6	11	8	7	35	2	37	51	7	4	15	10
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	7	12	9	8	38	2	40	55	8	4	16	11
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	27	48	103	32								
Volume Left (vph)	7	8	40	4								
Volume Right (vph)	9	2	8	11								
Hadj (s)	-0.11	0.04	0.07	-0.15								
Departure Headway (s)	4.1	4.3	4.2	4.0								
Degree Utilization, x	0.03	0.06	0.12	0.04								
Capacity (veh/h)	836	815	839	870								
Control Delay (s)	7.3	7.5	7.7	7.2								
Approach Delay (s)	7.3	7.5	7.7	7.2								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay				7.5								
HCM Level of Service				A								
Intersection Capacity Utilization				21.5%	ICU Level of Service			A				
Analysis Period (min)				15								

Existing AM
18: San Pablo Ave &

Emery Station
9/9/2009

								
Movement	EBL	EBR	NBL	NBT	SBT	SBR		
Lane Configurations								
Volume (veh/h)	0	23	0	525	558	26		
Sign Control	Stop			Free	Free			
Grade	0%			0%	0%			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92		
Hourly flow rate (vph)	0	25	0	571	607	28		
Pedestrians								
Lane Width (ft)								
Walking Speed (ft/s)								
Percent Blockage								
Right turn flare (veh)								
Median type				None	None			
Median storage (veh)								
Upstream signal (ft)				455				
pX, platoon unblocked	0.92							
vC, conflicting volume	906	317	635					
vC1, stage 1 conf vol								
vC2, stage 2 conf vol								
vCu, unblocked vol	728	317	635					
tC, single (s)	6.8	6.9	4.1					
tC, 2 stage (s)								
tF (s)	3.5	3.3	2.2					
p0 queue free %	100	96	100					
cM capacity (veh/h)	330	678	944					
Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2			
Volume Total	25	285	285	404	230			
Volume Left	0	0	0	0	0			
Volume Right	25	0	0	0	28			
cSH	678	1700	1700	1700	1700			
Volume to Capacity	0.04	0.17	0.17	0.24	0.14			
Queue Length 95th (ft)	3	0	0	0	0			
Control Delay (s)	10.5	0.0	0.0	0.0	0.0			
Lane LOS	B							
Approach Delay (s)	10.5	0.0	0.0					
Approach LOS	B							
Intersection Summary								
Average Delay				0.2				
Intersection Capacity Utilization				26.3%	ICU Level of Service			
Analysis Period (min)				15	A			

TECHNICAL APPENDIX B (CONTINUED)

LEVEL OF SERVICE CALCULATION WORKSHEETS

EXISTING PM PEAK HOUR CONDITIONS

Existing PM

1: Powell Street & Hollis Street

Emery Station

9/9/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↰↱		↰	↰↱		↰	↰		↰	↰	↰
Volume (vph)	111	588	141	48	520	30	354	212	46	77	242	237
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.97		1.00	0.99		1.00	0.97		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	3436		1770	3511		1770	1813		1770	1863	1583
Flt Permitted	0.95	1.00		0.95	1.00		0.34	1.00		0.58	1.00	1.00
Satd. Flow (perm)	1770	3436		1770	3511		626	1813		1088	1863	1583
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	123	653	157	53	578	33	393	236	51	86	269	263
RTOR Reduction (vph)	0	33	0	0	7	0	0	15	0	0	0	23
Lane Group Flow (vph)	123	777	0	53	604	0	393	272	0	86	269	240
Turn Type	Prot			Prot			pm+pt			pm+pt		pm+ov
Protected Phases	7	4		3	8		5	2		1	6	7
Permitted Phases							2			6		6
Actuated Green, G (s)	4.0	16.7		1.5	14.2		15.9	15.9		14.2	14.2	18.2
Effective Green, g (s)	4.0	16.7		1.5	14.2		15.9	15.9		14.2	14.2	18.2
Actuated g/C Ratio	0.08	0.32		0.03	0.27		0.30	0.30		0.27	0.27	0.35
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	135	1095		51	951		277	550		325	505	671
v/s Ratio Prot	0.07	c0.23		0.03	c0.17		c0.11	0.15		0.01	c0.14	0.03
v/s Ratio Perm							c0.32			0.06		0.12
v/c Ratio	0.91	0.71		1.04	0.63		1.42	0.49		0.26	0.53	0.36
Uniform Delay, d1	24.0	15.7		25.4	16.8		18.1	15.0		15.1	16.3	12.7
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	51.3	2.1		137.6	1.4		208.4	0.7		0.4	1.1	0.3
Delay (s)	75.3	17.8		163.0	18.2		226.4	15.7		15.6	17.4	13.1
Level of Service	E	B		F	B		F	B		B	B	B
Approach Delay (s)		25.4			29.8			137.5			15.3	
Approach LOS		C			C			F			B	
Intersection Summary												
HCM Average Control Delay		50.6			HCM Level of Service			D				
HCM Volume to Capacity ratio		0.86										
Actuated Cycle Length (s)		52.4			Sum of lost time (s)			8.0				
Intersection Capacity Utilization		69.8%			ICU Level of Service			C				
Analysis Period (min)		15										
c Critical Lane Group												

Existing PM

2: Powell Street & Doyle Street

Emery Station

9/9/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰↱			↰↱			↰			↰	↰
Volume (veh/h)	36	659	8	17	538	16	11	6	26	31	19	47
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.90	0.90	0.90	0.95	0.95	0.95	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	40	732	9	18	566	17	12	7	29	34	21	52
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)		525										
pX, platoon unblocked				0.87			0.87	0.87	0.87	0.87	0.87	
vC, conflicting volume	583			741			1198	1436	371	1089	1432	292
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	583			416			939	1210	0	813	1206	292
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	96			98			92	96	97	84	86	93
cM capacity (veh/h)	987			996			151	149	948	211	150	705
Direction, Lane #												
Volume Total	406	375	301	300	48	108						
Volume Left	40	0	18	0	12	34						
Volume Right	0	9	0	17	29	52						
cSH	987	1700	996	1700	306	285						
Volume to Capacity	0.04	0.22	0.02	0.18	0.16	0.38						
Queue Length 95th (ft)	3	0	1	0	14	42						
Control Delay (s)	1.3	0.0	0.7	0.0	18.9	25.1						
Lane LOS	A		A		C	D						
Approach Delay (s)	0.7		0.3		18.9	25.1						
Approach LOS					C	D						
Intersection Summary												
Average Delay		2.8										
Intersection Capacity Utilization		53.5%			ICU Level of Service			A				
Analysis Period (min)		15										

Existing PM

3: Stanford Ave & Hollis St.

Emery Station

9/9/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	118	53	48	26	15	23	15	528	30	7	410	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0			4.0			4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00			0.95			1.00	1.00
Flt	1.00	0.93		1.00	0.91			0.99			1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00			1.00			1.00	1.00
Satd. Flow (prot)	1770	1731		1770	1694			3507			1824	1552
Flt Permitted	0.73	1.00		0.68	1.00			0.94			0.99	1.00
Satd. Flow (perm)	1358	1731		1276	1694			3309			1807	1552
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	131	59	53	29	17	26	17	587	33	8	456	17
RTOR Reduction (vph)	0	41	0	0	20	0	0	6	0	0	0	7
Lane Group Flow (vph)	131	71	0	29	23	0	0	631	0	0	464	10
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	5	5
Turn Type	Perm			Perm			Perm			Perm		Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		6
Actuated Green, G (s)	8.7	8.7		8.7	8.7			22.0			22.0	22.0
Effective Green, g (s)	8.7	8.7		8.7	8.7			22.0			22.0	22.0
Actuated g/C Ratio	0.22	0.22		0.22	0.22			0.57			0.57	0.57
Clearance Time (s)	4.0	4.0		4.0	4.0			4.0			4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	3.0
Lane Grp Cap (vph)	305	389		287	381			1881			1027	882
v/s Ratio Prot		0.04			0.01							
v/s Ratio Perm	c0.10			0.02				0.19			c0.26	0.01
v/c Ratio	0.43	0.18		0.10	0.06			0.34			0.45	0.01
Uniform Delay, d1	12.9	12.1		11.9	11.8			4.5			4.8	3.6
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	1.00
Incremental Delay, d2	1.0	0.2		0.2	0.1			0.5			1.4	0.0
Delay (s)	13.8	12.4		12.1	11.9			4.9			6.3	3.6
Level of Service	B	B		B	B			A			A	A
Approach Delay (s)		13.2			11.9			4.9			6.2	
Approach LOS		B			B			A			A	
Intersection Summary												
HCM Average Control Delay		7.1			HCM Level of Service			A				
HCM Volume to Capacity ratio		0.45										
Actuated Cycle Length (s)		38.7			Sum of lost time (s)			8.0				
Intersection Capacity Utilization		47.1%			ICU Level of Service			A				
Analysis Period (min)		15										

c Critical Lane Group

Existing PM

4: 59th Street & Hollis Street

Emery Station

9/9/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	71	32	64	58	13	26	15	417	34	16	476	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0		4.0	4.0			4.0	4.0
Lane Util. Factor	1.00	1.00			1.00		1.00	1.00			1.00	1.00
Flt	1.00	0.97			0.98		1.00	1.00			1.00	1.00
Flt Protected	1.00	1.00			1.00		0.99	1.00			0.99	1.00
Flt Permitted	1.00	0.90			0.96		1.00	0.99			1.00	1.00
Satd. Flow (prot)	1770	1634			1712		1746	1834			1745	1854
Flt Permitted	0.95	1.00			0.97		0.95	1.00			0.95	1.00
Satd. Flow (perm)	1770	1634			1712		1746	1834			1745	1854
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	79	36	71	64	14	29	17	463	38	18	529	12
RTOR Reduction (vph)	0	63	0	0	19	0	0	3	0	0	1	0
Lane Group Flow (vph)	79	44	0	0	88	0	17	498	0	18	540	0
Confl. Peds. (#/hr)	20		20	20		20	20		20	20		20
Confl. Bikes (#/hr)			5			5			5			5
Turn Type	Split				Split		Prot			Prot		
Protected Phases	4	4			8	8	5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	6.5	6.5			6.8		0.8	26.3		0.6	26.1	
Effective Green, g (s)	6.5	6.5			6.8		0.8	26.3		0.6	26.1	
Actuated g/C Ratio	0.12	0.12			0.12		0.01	0.47		0.01	0.46	
Clearance Time (s)	4.0	4.0			4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	205	189			207		25	858		19	861	
v/s Ratio Prot	c0.04	0.03			c0.05		0.01	0.27		c0.01	c0.29	
v/s Ratio Perm												
v/c Ratio	0.39	0.23			0.42		0.68	0.58		0.95	0.63	
Uniform Delay, d1	23.0	22.6			22.9		27.6	10.9		27.8	11.4	
Progression Factor	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.2	0.6			1.4		56.0	2.9		179.6	3.5	
Delay (s)	24.2	23.2			24.3		83.5	13.8		207.4	14.8	
Level of Service	C	C			C		F	B		F	B	
Approach Delay (s)		23.6			24.3			16.1			21.0	
Approach LOS		C			C			B			C	
Intersection Summary												
HCM Average Control Delay		19.8			HCM Level of Service			B				
HCM Volume to Capacity ratio		0.56										
Actuated Cycle Length (s)		56.2			Sum of lost time (s)			16.0				
Intersection Capacity Utilization		46.6%			ICU Level of Service			A				
Analysis Period (min)		15										

c Critical Lane Group

Existing PM

5: Powell Street & San Pablo Ave

Emery Station

9/9/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	107	523	99	78	335	54	140	1015	108	137	917	79
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Flt	1.00	0.98		1.00	0.98		1.00	0.99		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3455		1770	3465		1770	3488		1770	3497	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	3455		1770	3465		1770	3488		1770	3497	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.91	0.91	0.91	0.96	0.96	0.96
Adj. Flow (vph)	119	581	110	87	372	60	154	1115	119	143	955	82
RTOR Reduction (vph)	0	16	0	0	0	0	0	8	0	0	6	0
Lane Group Flow (vph)	119	675	0	87	432	0	154	1226	0	143	1031	0
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	10.7	24.3		8.5	22.1		11.6	39.9		11.3	39.6	
Effective Green, g (s)	10.7	24.3		8.5	22.1		11.6	39.9		11.3	39.6	
Actuated g/C Ratio	0.11	0.24		0.08	0.22		0.12	0.40		0.11	0.40	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	189	840		150	766		205	1392		200	1385	
v/s Ratio Prot	c0.07	c0.20		0.05	0.12		c0.09	c0.35		0.08	0.29	
v/s Ratio Perm												
v/c Ratio	0.63	0.80		0.58	0.56		0.75	0.88		0.72	0.74	
Uniform Delay, d1	42.8	35.6		44.0	34.7		42.8	27.8		42.8	25.9	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	6.4	5.6		5.4	1.0		14.3	8.3		11.5	3.7	
Delay (s)	49.2	41.2		49.4	35.6		57.1	36.1		54.3	29.5	
Level of Service	D	D		D	D		E	D		D	C	
Approach Delay (s)		42.4			37.9			38.5			32.5	
Approach LOS		D			D			D			C	
Intersection Summary												
HCM Average Control Delay		37.4			HCM Level of Service			D				
HCM Volume to Capacity ratio		0.76										
Actuated Cycle Length (s)		100.0			Sum of lost time (s)			8.0				
Intersection Capacity Utilization		74.4%			ICU Level of Service			D				
Analysis Period (min)		15										
c Critical Lane Group												

Existing PM

6: 40th Street & Hollis Street

Emery Station

9/9/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	38	601	85	125	508	150	84	163	104	121	289	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Flt	1.00	0.98		1.00	0.97		1.00	1.00		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		1.00	0.95	
Satd. Flow (prot)	1770	3474		1770	3418		1770	1863		1583	1770	1837
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		1.00	0.95	1.00
Satd. Flow (perm)	1770	3474		1770	3418		1770	1863		1583	1770	1837
Peak-hour factor, PHF	0.90	0.90	0.90	0.94	0.94	0.94	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	42	668	94	133	540	160	93	181	116	134	321	33
RTOR Reduction (vph)	0	10	0	0	22	0	0	0	0	90	0	4
Lane Group Flow (vph)	42	752	0	133	678	0	93	181	26	134	350	0
Bus Blockages (#/hr)	0	0	0	0	0	5	0	0	0	0	0	0
Turn Type	Prot			Prot			Prot		Perm	Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases									2			
Actuated Green, G (s)	5.4	39.2		11.5	45.3		8.7	22.3		22.3	11.0	24.6
Effective Green, g (s)	5.4	39.2		11.5	45.3		8.7	22.3		22.3	11.0	24.6
Actuated g/C Ratio	0.05	0.39		0.12	0.45		0.09	0.22		0.22	0.11	0.25
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	96	1362		204	1548		154	415		353	195	452
v/s Ratio Prot	0.02	c0.22		c0.08	0.20		0.05	0.10		c0.08	c0.19	
v/s Ratio Perm									0.02			
v/c Ratio	0.44	0.55		0.65	0.44		0.60	0.44		0.07	0.69	0.77
Uniform Delay, d1	45.8	23.6		42.3	18.7		44.0	33.4		30.7	42.8	35.1
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	3.2	1.6		7.3	0.9		6.5	0.7		0.1	9.6	8.1
Delay (s)	49.0	25.2		49.6	19.6		50.5	34.2		30.8	52.5	43.2
Level of Service	D	C		D	B		D	C		C	D	D
Approach Delay (s)		26.5			24.4			37.1			45.8	
Approach LOS		C			C			D			D	
Intersection Summary												
HCM Average Control Delay		31.2			HCM Level of Service			C				
HCM Volume to Capacity ratio		0.63										
Actuated Cycle Length (s)		100.0			Sum of lost time (s)			12.0				
Intersection Capacity Utilization		61.3%			ICU Level of Service			B				
Analysis Period (min)		15										
c Critical Lane Group												

Existing PM

7: Ashby Ave & Seventh Street

Emery Station

9/9/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	231	600	153	85	811	32	215	433	101	133	277	526
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	1.00	1.00
Frt	1.00	0.97		1.00	0.99		1.00	0.97		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	3431		1770	3519		1770	3439		1770	1863	1583
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1770	3431		1770	3519		1770	3439		1770	1863	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.94	0.94	0.94	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	243	632	161	90	863	34	239	481	112	148	308	584
RTOR Reduction (vph)	0	18	0	0	2	0	0	20	0	0	0	56
Lane Group Flow (vph)	243	775	0	90	895	0	239	573	0	148	308	528
Turn Type	Prot			Prot			Split			Split		pm+ov
Protected Phases	7	4		3	8		2	2		6	6	7
Permitted Phases												6
Actuated Green, G (s)	19.7	32.2		8.6	21.1		17.6	17.6		16.1	16.1	35.8
Effective Green, g (s)	19.7	32.2		8.6	21.1		17.6	17.6		16.1	16.1	35.8
Actuated g/C Ratio	0.22	0.36		0.10	0.23		0.19	0.19		0.18	0.18	0.40
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	385	1221		168	820		344	669		315	331	696
v/s Ratio Prot	0.14	0.23		0.05	0.25		0.14	0.17		0.08	0.17	0.17
v/s Ratio Perm												0.17
v/c Ratio	0.63	0.63		0.54	1.09		0.69	0.86		0.47	0.93	0.76
Uniform Delay, d1	32.1	24.3		39.0	34.7		33.9	35.2		33.4	36.6	23.6
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	3.4	1.1		3.3	59.2		6.0	10.5		1.1	32.0	4.8
Delay (s)	35.5	25.3		42.3	93.9		39.9	45.7		34.5	68.6	28.4
Level of Service	D	C		D	F		D	D		C	E	C
Approach Delay (s)		27.7			89.2			44.1			41.2	
Approach LOS		C			F			D			D	

Intersection Summary

HCM Average Control Delay	50.4	HCM Level of Service	D
HCM Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	90.5	Sum of lost time (s)	12.0
Intersection Capacity Utilization	77.9%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Existing PM

8: Powell Street & Christie Ave

Emery Station

9/9/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	364	531	728	249	748	144	193	45	126	180	251	814
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0
Lane Util. Factor	0.97	0.91	0.91	1.00	0.95	1.00	0.95	0.95	1.00		1.00	0.88
Frt	1.00	0.94	0.85	1.00	1.00	0.85	1.00	1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.97	1.00		0.98	1.00
Satd. Flow (prot)	3433	3194	1441	1770	3539	1583	1681	1716	1583		1825	2787
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.97	1.00		0.98	1.00
Satd. Flow (perm)	3433	3194	1441	1770	3539	1583	1681	1716	1583		1825	2787
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.95	0.95	0.95
Adj. Flow (vph)	404	590	809	277	831	160	214	50	140	189	264	857
RTOR Reduction (vph)	0	83	158	0	0	92	0	0	121	0	0	80
Lane Group Flow (vph)	404	879	279	277	831	68	131	133	19	0	453	777
Turn Type	Prot		pm+ov	Prot		Perm	Split		Perm	Split		pm+ov
Protected Phases	7	4	2	3	8		2	2		6	6	7
Permitted Phases			4			8			2			6
Actuated Green, G (s)	18.9	22.8	36.1	21.0	24.9	24.9	13.3	13.3	13.3		26.9	45.8
Effective Green, g (s)	18.9	22.8	36.1	21.0	24.9	24.9	13.3	13.3	13.3		26.9	45.8
Actuated g/C Ratio	0.19	0.23	0.36	0.21	0.25	0.25	0.13	0.13	0.13		0.27	0.46
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	649	728	520	372	881	394	224	228	211		491	1388
v/s Ratio Prot	0.12	0.28	0.07	0.16	0.23		0.08	0.08			0.25	0.11
v/s Ratio Perm			0.12			0.04			0.01			0.17
v/c Ratio	0.62	1.21	0.54	0.74	0.94	0.17	0.58	0.58	0.09		0.92	0.56
Uniform Delay, d1	37.3	38.6	25.3	37.0	36.9	29.5	40.8	40.7	38.0		35.5	19.8
Progression Factor	0.80	0.60	1.27	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	1.5	103.6	0.9	7.9	19.3	0.9	3.9	3.8	0.2		23.0	0.5
Delay (s)	31.3	126.8	33.1	44.9	56.2	30.4	44.6	44.5	38.2		58.5	20.2
Level of Service	C	F	C	D	E	C	D	D	D		E	C
Approach Delay (s)		82.7			50.5			42.4			33.5	
Approach LOS		F			D			D			C	

Intersection Summary

HCM Average Control Delay	57.3	HCM Level of Service	E
HCM Volume to Capacity ratio	0.96		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	79.3%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Existing PM

9: Powell St & I-80E on-ramp

Emery Station

9/9/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↰↰↰		↰	↰↰↰	↰	↰	↰	↰			
Volume (vph)	135	918	0	0	1287	400	543	160	757	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0	4.0	4.0	4.0	4.0			
Lane Util. Factor	1.00	0.91			0.91	1.00	0.95	0.91	0.95			
Flt	1.00	1.00			1.00	0.85	1.00	0.91	0.85			
Flt Protected	0.95	1.00			1.00	1.00	0.95	0.99	1.00			
Satd. Flow (prot)	1770	5085			5085	1583	1681	1541	1504			
Flt Permitted	0.95	1.00			1.00	1.00	0.95	0.99	1.00			
Satd. Flow (perm)	1770	5085			5085	1583	1681	1541	1504			
Peak-hour factor, PHF	0.90	0.90	0.90	0.92	0.92	0.92	0.90	0.90	0.90	0.92	0.92	0.92
Adj. Flow (vph)	150	1020	0	0	1399	435	603	178	841	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	226	0	49	63	0	0	0
Lane Group Flow (vph)	150	1020	0	0	1399	209	543	509	458	0	0	0
Turn Type	Prot				Perm	Split		Perm				
Protected Phases	7	4			8	2	2					
Permitted Phases					8			2				
Actuated Green, G (s)	4.8	56.8			48.0	48.0	35.2	35.2	35.2			
Effective Green, g (s)	4.8	56.8			48.0	48.0	35.2	35.2	35.2			
Actuated g/C Ratio	0.05	0.57			0.48	0.48	0.35	0.35	0.35			
Clearance Time (s)	4.0	4.0			4.0	4.0	4.0	4.0	4.0			
Vehicle Extension (s)	3.0	3.0			3.0	3.0	3.0	3.0	3.0			
Lane Grp Cap (vph)	85	2888			2441	760	592	542	529			
v/s Ratio Prot	c0.08	0.20			c0.28		0.32	c0.33				
v/s Ratio Perm						0.13		0.30				
v/c Ratio	1.76	0.35			0.57	0.27	0.92	0.94	0.87			
Uniform Delay, d1	47.6	11.7			18.7	15.6	31.0	31.4	30.2			
Progression Factor	0.81	2.18			0.83	0.98	1.00	1.00	1.00			
Incremental Delay, d2	384.4	0.3			0.7	0.6	19.1	24.1	13.9			
Delay (s)	423.2	25.8			16.2	15.9	50.1	55.4	44.1			
Level of Service	F	C			B	B	D	E	D			
Approach Delay (s)		76.7			16.1			50.0		0.0		
Approach LOS		E			B			D		A		
Intersection Summary												
HCM Average Control Delay		43.3			HCM Level of Service			D				
HCM Volume to Capacity ratio		0.78										
Actuated Cycle Length (s)		100.0			Sum of lost time (s)			12.0				
Intersection Capacity Utilization		69.3%			ICU Level of Service			C				
Analysis Period (min)		15										
c Critical Lane Group												

Existing PM

10: Powell St & Frontage Rd

Emery Station

9/9/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↰↰		↰	↰↰	↰				↰↰		↰
Volume (vph)	133	406	440	0	429	1419	0	0	0	581	0	205
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0	4.0				4.0		4.0
Lane Util. Factor	1.00	0.95			0.91	0.91				0.97		1.00
Flt	1.00	0.92			0.91	0.85				1.00		0.85
Flt Protected	0.95	1.00			1.00	1.00				0.95		1.00
Satd. Flow (prot)	1770	3263			3073	1441				3433		1583
Flt Permitted	0.95	1.00			1.00	1.00				0.95		1.00
Satd. Flow (perm)	1770	3263			3073	1441				3433		1583
Peak-hour factor, PHF	0.96	0.96	0.96	0.90	0.90	0.90	0.92	0.92	0.92	0.90	0.90	0.90
Adj. Flow (vph)	139	423	458	0	477	1577	0	0	0	646	0	228
RTOR Reduction (vph)	0	150	0	0	250	0	0	0	0	0	0	170
Lane Group Flow (vph)	139	731	0	0	1016	788	0	0	0	646	0	58
Turn Type	Prot				Free					custom		custom
Protected Phases	7	4			8					6		6
Permitted Phases					Free					6		6
Actuated Green, G (s)	16.0	66.4			46.4	100.0				25.6		25.6
Effective Green, g (s)	16.0	66.4			46.4	100.0				25.6		25.6
Actuated g/C Ratio	0.16	0.66			0.46	1.00				0.26		0.26
Clearance Time (s)	4.0	4.0			4.0					4.0		4.0
Vehicle Extension (s)	3.0	3.0			3.0					3.0		3.0
Lane Grp Cap (vph)	283	2167			1426	1441				879		405
v/s Ratio Prot	0.08	0.22			c0.33					c0.19		0.04
v/s Ratio Perm						c0.55						
v/c Ratio	0.49	0.34			0.71	0.55				0.73		0.14
Uniform Delay, d1	38.3	7.3			21.5	0.0				34.1		28.7
Progression Factor	1.00	1.00			0.97	1.00				1.00		1.00
Incremental Delay, d2	1.3	0.4			2.3	1.1				3.2		0.2
Delay (s)	39.6	7.7			23.1	1.1				37.3		28.9
Level of Service	D	A			C	A				D		C
Approach Delay (s)		12.0			14.7			0.0			35.1	
Approach LOS		B			B			A			D	
Intersection Summary												
HCM Average Control Delay		18.5			HCM Level of Service			B				
HCM Volume to Capacity ratio		0.68										
Actuated Cycle Length (s)		100.0			Sum of lost time (s)			8.0				
Intersection Capacity Utilization		61.0%			ICU Level of Service			B				
Analysis Period (min)		15										
c Critical Lane Group												

Existing PM

11: I-80 off-ramp & Frontage Rd

Emery Station

9/9/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	78	229	74	368	13	0	19	403	1230	254	404	39
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95		1.00	0.95	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00	1.00	0.95	0.96		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	1863	1583	1681	1691		1770	3539	1583	1770	1838	
Flt Permitted	0.95	1.00	1.00	0.95	0.96		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1770	1863	1583	1681	1691		1770	3539	1583	1770	1838	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.93	0.93	0.93	0.91	0.91	0.91
Adj. Flow (vph)	87	254	82	409	14	0	20	433	1323	279	444	43
RTOR Reduction (vph)	0	0	65	0	0	0	0	0	0	0	3	0
Lane Group Flow (vph)	87	254	17	213	210	0	20	433	1323	279	484	0
Turn Type	Split		Perm	Split			Prot		Free	Prot		
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases			4						Free			
Actuated Green, G (s)	15.9	15.9	15.9	15.4	15.4		2.6	17.7	77.5	12.5	27.6	
Effective Green, g (s)	15.9	15.9	15.9	15.4	15.4		2.6	17.7	77.5	12.5	27.6	
Actuated g/C Ratio	0.21	0.21	0.21	0.20	0.20		0.03	0.23	1.00	0.16	0.36	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	363	382	325	334	336		59	808	1583	285	655	
v/s Ratio Prot	0.05	0.14		0.13	0.12		0.01	0.12		0.16	0.26	
v/s Ratio Perm			0.01						c0.84			
v/c Ratio	0.24	0.66	0.05	0.64	0.62		0.34	0.54	0.84	0.98	0.74	
Uniform Delay, d1	25.7	28.3	24.7	28.5	28.4		36.6	26.3	0.0	32.4	21.8	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.3	4.3	0.1	4.0	3.6		3.4	0.7	5.4	46.9	4.4	
Delay (s)	26.1	32.7	24.8	32.5	32.0		40.0	27.0	5.4	79.3	26.2	
Level of Service	C	C	C	C	C		D	C	A	E	C	
Approach Delay (s)		29.8			32.2			11.0			45.5	
Approach LOS		C			C			B			D	

Intersection Summary

HCM Average Control Delay	23.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	77.5	Sum of lost time (s)	0.0
Intersection Capacity Utilization	62.9%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Existing PM

12: 59th St & Horton St

Emery Station

9/9/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	0	0	35	10	22	18	107	186	106	57	2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	38	11	24	20	116	202	115	62	2
Direction, Lane #	WB 1	WB 2	NB 1	SB 1								
Volume Total (vph)	38	35	338	179								
Volume Left (vph)	38	0	20	115								
Volume Right (vph)	0	24	202	2								
Hadj (s)	0.53	-0.45	-0.31	0.16								
Departure Headway (s)	6.1	5.2	4.0	4.6								
Degree Utilization, x	0.06	0.05	0.38	0.23								
Capacity (veh/h)	538	635	879	754								
Control Delay (s)	8.4	7.2	9.4	9.0								
Approach Delay (s)	7.8		9.4	9.0								
Approach LOS	A		A	A								

Intersection Summary

Delay	9.1		
HCM Level of Service	A		
Intersection Capacity Utilization	40.4%	ICU Level of Service	A
Analysis Period (min)	15		

Existing PM
13: 59th St &

Emery Station
9/9/2009

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↗			↖	↗	↖
Sign Control	Stop			Stop	Stop	
Volume (vph)	111	184	9	46	20	45
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	121	200	10	50	22	49
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total (vph)	321	60	71			
Volume Left (vph)	0	10	22			
Volume Right (vph)	200	0	49			
Hadj (s)	-0.34	0.07	-0.32			
Departure Headway (s)	3.8	4.4	4.4			
Degree Utilization, x	0.34	0.07	0.09			
Capacity (veh/h)	931	778	760			
Control Delay (s)	8.7	7.8	7.8			
Approach Delay (s)	8.7	7.8	7.8			
Approach LOS	A	A	A			
Intersection Summary						
Delay			8.4			
HCM Level of Service			A			
Intersection Capacity Utilization			27.7%	ICU Level of Service	A	
Analysis Period (min)			15			

Existing PM
14: 62nd St & Horton St

Emery Station
9/9/2009

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↗			↖	↗	↖
Volume (veh/h)	20	43	22	91	95	65
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	22	47	24	99	103	71
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			68		192	45
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			68		192	45
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		87	93
cM capacity (veh/h)			1533		785	1025
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	68	123	174			
Volume Left	0	24	103			
Volume Right	47	0	71			
cSH	1700	1533	867			
Volume to Capacity	0.04	0.02	0.20			
Queue Length 95th (ft)	0	1	19			
Control Delay (s)	0.0	1.5	10.2			
Lane LOS		A	B			
Approach Delay (s)	0.0	1.5	10.2			
Approach LOS			B			
Intersection Summary						
Average Delay			5.4			
Intersection Capacity Utilization			28.6%	ICU Level of Service	A	
Analysis Period (min)			15			

Existing PM

15: 62nd St & Hollis St

Emery Station

9/9/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	43	17	31	11	13	17	36	407	5	5	373	46
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	47	18	34	12	14	18	39	442	5	5	405	50
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)								498				
pX, platoon unblocked	0.86	0.86		0.86	0.86	0.86				0.86		
vC, conflicting volume	990	967	430	1008	990	445	455			448		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	907	881	430	928	907	274	455			277		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	76	92	95	94	94	97	96			100		
cM capacity (veh/h)	198	236	625	184	228	658	1105			1106		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	99	45	487	461								
Volume Left	47	12	39	5								
Volume Right	34	18	5	50								
cSH	269	288	1105	1106								
Volume to Capacity	0.37	0.16	0.04	0.00								
Queue Length 95th (ft)	41	14	3	0								
Control Delay (s)	26.0	19.8	1.0	0.2								
Lane LOS	D	C	A	A								
Approach Delay (s)	26.0	19.8	1.0	0.2								
Approach LOS	D	C										
Intersection Summary												
Average Delay			3.7									
Intersection Capacity Utilization			59.9%			ICU Level of Service			B			
Analysis Period (min)			15									

Existing PM

16: Stanford Ave & Horton St

Emery Station

9/9/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	7	19	15	37	7	27	5	107	53	23	92	5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	8	21	16	40	8	29	5	116	58	25	100	5
Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	SB 1						
Volume Total (vph)	45	44	33	5	174	130						
Volume Left (vph)	8	40	0	5	0	25						
Volume Right (vph)	16	0	29	0	58	5						
Hadj (s)	-0.15	0.49	-0.59	0.53	-0.20	0.05						
Departure Headway (s)	5.2	5.8	4.7	5.5	4.8	5.1						
Degree Utilization, x	0.06	0.07	0.04	0.01	0.23	0.18						
Capacity (veh/h)	638	581	709	634	732	681						
Control Delay (s)	8.6	8.1	6.7	7.3	8.0	9.2						
Approach Delay (s)	8.6	7.5		7.9		9.2						
Approach LOS	A	A		A		A						
Intersection Summary												
Delay			8.3									
HCM Level of Service			A									
Intersection Capacity Utilization			34.0%		ICU Level of Service				A			
Analysis Period (min)			15									

Existing PM
17: Doyle Street &

Emery Station
9/9/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	4	58	12	5	29	9	14	25	5	10	34	11
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	4	63	13	5	32	10	15	27	5	11	37	12
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	80	47	48	60								
Volume Left (vph)	4	5	15	11								
Volume Right (vph)	13	10	5	12								
Hadj (s)	-0.05	-0.07	0.03	-0.05								
Departure Headway (s)	4.1	4.1	4.3	4.2								
Degree Utilization, x	0.09	0.05	0.06	0.07								
Capacity (veh/h)	844	839	808	832								
Control Delay (s)	7.6	7.4	7.5	7.5								
Approach Delay (s)	7.6	7.4	7.5	7.5								
Approach LOS	A	A	A	A								

Intersection Summary

Delay	7.5			
HCM Level of Service	A			
Intersection Capacity Utilization	15.3%	ICU Level of Service	A	
Analysis Period (min)	15			

Existing PM
18: San Pablo Ave &

Emery Station
9/9/2009

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↕		↕	↕	↕
Volume (veh/h)	0	60	0	905	1000	25
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	65	0	984	1087	27
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)				455		
pX, platoon unblocked	0.73					
vC, conflicting volume	1592	557	1114			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1072	557	1114			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	86	100			
cM capacity (veh/h)	157	474	623			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	65	492	492	725	389
Volume Left	0	0	0	0	0
Volume Right	65	0	0	0	27
cSH	474	1700	1700	1700	1700
Volume to Capacity	0.14	0.29	0.29	0.43	0.23
Queue Length 95th (ft)	12	0	0	0	0
Control Delay (s)	13.8	0.0	0.0	0.0	0.0
Lane LOS	B				
Approach Delay (s)	13.8	0.0		0.0	
Approach LOS	B				

Intersection Summary

Average Delay	0.4			
Intersection Capacity Utilization	38.8%	ICU Level of Service	A	
Analysis Period (min)	15			

TECHNICAL APPENDIX B (CONTINUED)

LEVEL OF SERVICE CALCULATION WORKSHEETS

CUMULATIVE (YEAR 2030) PM PEAK HOUR CONDITIONS

2: Powell Street & Doyle Street

Emery Station
11/3/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔↔			↔↔			↔↔			↔	
Volume (veh/h)	46	866	10	37	697	21	0	9	32	45	28	77
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.90	0.90	0.90	0.95	0.95	0.95	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	51	962	11	39	734	22	0	10	36	50	31	86
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)		525										
pX, platoon unblocked				0.79			0.79	0.79	0.79	0.79	0.79	
vC, conflicting volume	756			973			1616	1904	487	1447	1898	378
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	756			425			1241	1607	0	1026	1600	378
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	94			96			100	86	96	58	58	86
cM capacity (veh/h)	851			890			56	74	853	118	74	620
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1						
Volume Total	532	492	406	389	46	167						
Volume Left	51	0	39	0	0	50						
Volume Right	0	11	0	22	36	86						
cSH	851	1700	890	1700	257	170						
Volume to Capacity	0.06	0.29	0.04	0.23	0.18	0.98						
Queue Length 95th (ft)	5	0	3	0	16	193						
Control Delay (s)	1.6	0.0	1.4	0.0	22.0	118.5						
Lane LOS	A		A		C	F						
Approach Delay (s)	0.8		0.7		22.0	118.5						
Approach LOS					C	F						
Intersection Summary												
Average Delay			10.9									
Intersection Capacity Utilization			72.0%		ICU Level of Service				C			
Analysis Period (min)			15									

3: Stanford Ave & Hollis St.

Emery Station
11/3/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔		↔	↔			↔↔			↔↔	↔
Volume (vph)	152	68	62	30	19	30	22	778	47	10	607	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0			4.0			4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00			0.95			1.00	1.00
Frt	1.00	0.93		1.00	0.91			0.99			1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00			1.00			1.00	1.00
Satd. Flow (prot)	1770	1730		1770	1692			3505			1824	1552
Flt Permitted	0.72	1.00		0.66	1.00			0.93			0.98	1.00
Satd. Flow (perm)	1345	1730		1238	1692			3280			1796	1552
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	169	76	69	33	21	33	24	864	52	11	674	24
RTOR Reduction (vph)	0	52	0	0	25	0	0	7	0	0	0	11
Lane Group Flow (vph)	169	93	0	33	29	0	0	933	0	0	685	13
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	5	5
Turn Type	Perm			Perm			Perm			Perm		Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		6
Actuated Green, G (s)	9.3	9.3		9.3	9.3			21.2			21.2	21.2
Effective Green, g (s)	9.3	9.3		9.3	9.3			21.2			21.2	21.2
Actuated g/C Ratio	0.24	0.24		0.24	0.24			0.55			0.55	0.55
Clearance Time (s)	4.0	4.0		4.0	4.0			4.0			4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	3.0
Lane Grp Cap (vph)	325	418		299	409			1806			989	855
v/s Ratio Prot		0.05			0.02							
v/s Ratio Perm	c0.13			0.03				0.28			c0.38	0.01
v/c Ratio	0.52	0.22		0.11	0.07			0.52			0.69	0.02
Uniform Delay, d1	12.7	11.7		11.4	11.3			5.4			6.3	3.9
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	1.00
Incremental Delay, d2	1.5	0.3		0.2	0.1			1.1			4.0	0.0
Delay (s)	14.2	12.0		11.5	11.3			6.5			10.3	4.0
Level of Service	B	B		B	B			A			B	A
Approach Delay (s)		13.2			11.4			6.5			10.1	
Approach LOS		B			B			A			B	
Intersection Summary												
HCM Average Control Delay			9.0		HCM Level of Service			A				
HCM Volume to Capacity ratio			0.64									
Actuated Cycle Length (s)			38.5		Sum of lost time (s)			8.0				
Intersection Capacity Utilization			61.7%		ICU Level of Service			B				
Analysis Period (min)			15									

c Critical Lane Group

12: 59th St & Horton St

Emery Station
11/3/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	0	0	45	13	28	26	157	273	155	84	3
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	49	14	30	28	171	297	168	91	3
Direction, Lane #	WB 1	WB 2	NB 1	SB 1								
Volume Total (vph)	49	45	496	263								
Volume Left (vph)	49	0	28	168								
Volume Right (vph)	0	30	297	3								
Hadj (s)	0.53	-0.44	-0.31	0.15								
Departure Headway (s)	6.7	5.7	4.2	4.9								
Degree Utilization, x	0.09	0.07	0.58	0.36								
Capacity (veh/h)	484	561	840	712								
Control Delay (s)	9.2	7.9	12.8	10.5								
Approach Delay (s)	8.6		12.8	10.5								
Approach LOS	A		B	B								
Intersection Summary												
Delay			11.6									
HCM Level of Service			B									
Intersection Capacity Utilization			53.0%		ICU Level of Service		A					
Analysis Period (min)			15									

13: 59th St &

Emery Station
11/3/2009

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (vph)	143	237	12	59	29	66
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	155	258	13	64	32	72
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total (vph)	413	77	103			
Volume Left (vph)	0	13	32			
Volume Right (vph)	258	0	72			
Hadj (s)	-0.34	0.07	-0.32			
Departure Headway (s)	3.9	4.6	4.6			
Degree Utilization, x	0.45	0.10	0.13			
Capacity (veh/h)	903	739	713			
Control Delay (s)	10.0	8.1	8.3			
Approach Delay (s)	10.0	8.1	8.3			
Approach LOS	B	A	A			
Intersection Summary						
Delay			9.5			
HCM Level of Service			A			
Intersection Capacity Utilization			34.4%	ICU Level of Service	A	
Analysis Period (min)			15			

14: 62nd St & Horton St

Emery Station
11/3/2009

									
Movement	EBT	EBR	WBL	WBT	NBL	NBR			
Lane Configurations									
Volume (veh/h)	26	55	28	117	139	95			
Sign Control	Free			Free	Stop				
Grade	0%			0%	0%				
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92			
Hourly flow rate (vph)	28	60	30	127	151	103			
Pedestrians									
Lane Width (ft)									
Walking Speed (ft/s)									
Percent Blockage									
Right turn flare (veh)									
Median type	None			None					
Median storage (veh)									
Upstream signal (ft)									
pX, platoon unblocked									
vC, conflicting volume			88		246	58			
vC1, stage 1 conf vol									
vC2, stage 2 conf vol									
vCu, unblocked vol			88		246	58			
tC, single (s)			4.1		6.4	6.2			
tC, 2 stage (s)									
tF (s)			2.2		3.5	3.3			
p0 queue free %			98		79	90			
cM capacity (veh/h)			1508		727	1008			
Direction, Lane #	EB 1	WB 1	NB 1						
Volume Total	88	158	254						
Volume Left	0	30	151						
Volume Right	60	0	103						
cSH	1700	1508	820						
Volume to Capacity	0.05	0.02	0.31						
Queue Length 95th (ft)	0	2	33						
Control Delay (s)	0.0	1.6	11.4						
Lane LOS		A	B						
Approach Delay (s)	0.0	1.6	11.4						
Approach LOS			B						
Intersection Summary									
Average Delay		6.3							
Intersection Capacity Utilization		34.6%	ICU Level of Service	A					
Analysis Period (min)		15							

15: 62nd St & Hollis St

Emery Station
11/3/2009

																				
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR								
Lane Configurations																				
Volume (veh/h)	55	22	40	14	17	22	53	603	7	7	552	67								
Sign Control		Stop			Stop			Free			Free									
Grade		0%			0%			0%			0%									
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92								
Hourly flow rate (vph)	60	24	43	15	18	24	58	655	8	8	600	73								
Pedestrians																				
Lane Width (ft)																				
Walking Speed (ft/s)																				
Percent Blockage																				
Right turn flare (veh)																				
Median type								None			None									
Median storage (veh)																				
Upstream signal (ft)								498												
pX, platoon unblocked	0.65	0.65		0.65	0.65	0.65				0.65										
vC, conflicting volume	1459	1430	636	1482	1462	659	673			663										
vC1, stage 1 conf vol																				
vC2, stage 2 conf vol																				
vCu, unblocked vol	1438	1393	636	1472	1443	216	673			222										
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1										
tC, 2 stage (s)																				
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2										
p0 queue free %	0	72	91	67	77	96	94			99										
cM capacity (veh/h)	54	86	478	47	80	539	918			882										
Direction, Lane #	EB 1	WB 1	NB 1	SB 1																
Volume Total	127	58	721	680																
Volume Left	60	15	58	8																
Volume Right	43	24	8	73																
cSH	86	96	918	882																
Volume to Capacity	1.47	0.60	0.06	0.01																
Queue Length 95th (ft)	248	71	5	1																
Control Delay (s)	350.1	87.6	1.6	0.2																
Lane LOS	F	F	A	A																
Approach Delay (s)	350.1	87.6	1.6	0.2																
Approach LOS	F	F																		
Intersection Summary																				
Average Delay			32.1																	
Intersection Capacity Utilization			84.0%	ICU Level of Service					E											
Analysis Period (min)			15																	

16: Stanford Ave & Horton St

Emery Station
11/3/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	9	24	19	48	9	35	7	157	78	34	135	7
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	10	26	21	52	10	38	8	171	85	37	147	8
Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	SB 1						
Volume Total (vph)	57	57	43	8	255	191						
Volume Left (vph)	10	52	0	8	0	37						
Volume Right (vph)	21	0	38	0	85	8						
Hadj (s)	-0.15	0.49	-0.59	0.53	-0.20	0.05						
Departure Headway (s)	5.7	6.2	5.1	5.7	4.9	5.3						
Degree Utilization, x	0.09	0.10	0.06	0.01	0.35	0.28						
Capacity (veh/h)	576	532	638	609	702	649						
Control Delay (s)	9.2	8.7	7.3	7.6	9.4	10.4						
Approach Delay (s)	9.2	8.1		9.4		10.4						
Approach LOS	A	A		A		B						
Intersection Summary												
Delay			9.5									
HCM Level of Service			A									
Intersection Capacity Utilization			42.0%		ICU Level of Service		A					
Analysis Period (min)			15									

17: Doyle Street &

Emery Station
11/3/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	5	83	15	6	37	12	21	37	7	15	50	16
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	90	16	7	40	13	23	40	8	16	54	17
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	112	60	71	88								
Volume Left (vph)	5	7	23	16								
Volume Right (vph)	16	13	8	17								
Hadj (s)	-0.04	-0.08	0.03	-0.05								
Departure Headway (s)	4.3	4.3	4.4	4.3								
Degree Utilization, x	0.13	0.07	0.09	0.11								
Capacity (veh/h)	806	787	773	787								
Control Delay (s)	7.9	7.6	7.8	7.8								
Approach Delay (s)	7.9	7.6	7.8	7.8								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay				7.8								
HCM Level of Service				A								
Intersection Capacity Utilization				19.0%	ICU Level of Service			A				
Analysis Period (min)				15								

18: San Pablo Ave &

Emery Station
11/3/2009

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	85	0	1562	1741	43
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	92	0	1698	1892	47
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None	None		
Median storage (veh)						
Upstream signal (ft)			455			
pX, platoon unblocked	0.65					
vC, conflicting volume	2765	970	1939			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2639	970	1939			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	63	100			
cM capacity (veh/h)	12	253	299			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	
Volume Total	92	849	849	1262	678	
Volume Left	0	0	0	0	0	
Volume Right	92	0	0	0	47	
cSH	253	1700	1700	1700	1700	
Volume to Capacity	0.37	0.50	0.50	0.74	0.40	
Queue Length 95th (ft)	40	0	0	0	0	
Control Delay (s)	27.2	0.0	0.0	0.0	0.0	
Lane LOS	D					
Approach Delay (s)	27.2	0.0		0.0		
Approach LOS	D					
Intersection Summary						
Average Delay		0.7				
Intersection Capacity Utilization		61.4%		ICU Level of Service		B
Analysis Period (min)		15				

TECHNICAL APPENDIX B (CONTINUED)

LEVEL OF SERVICE CALCULATION WORKSHEETS

EXISTING PLUS PROJECT (ACCESS OPTION 1)
AM PEAK HOUR CONDITIONS

Existing AM

1: Powell Street & Hollis Street

Emery Station

9/9/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	221	304	241	62	430	69	207	104	26	24	164	111
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.93		1.00	0.98		1.00	0.97		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	3304		1770	3466		1770	1807		1770	1863	1583
Flt Permitted	0.95	1.00		0.95	1.00		0.40	1.00		0.66	1.00	1.00
Satd. Flow (perm)	1770	3304		1770	3466		753	1807		1238	1863	1583
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	246	338	268	69	478	77	230	116	29	27	182	123
RTOR Reduction (vph)	0	177	0	0	21	0	0	18	0	0	0	77
Lane Group Flow (vph)	246	429	0	69	534	0	230	127	0	27	182	46
Turn Type	Prot			Prot			pm+pt			pm+pt		pm+ov
Protected Phases	7	4		3	8		5	2		1	6	7
Permitted Phases							2			6		6
Actuated Green, G (s)	4.6	16.3		2.2	13.9		12.7	12.7		10.5	10.5	15.1
Effective Green, g (s)	4.6	16.3		2.2	13.9		12.7	12.7		10.5	10.5	15.1
Actuated g/C Ratio	0.10	0.34		0.05	0.29		0.27	0.27		0.22	0.22	0.32
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	170	1127		81	1008		260	480		279	409	633
v/s Ratio Prot	c0.14	0.13		0.04	c0.15		c0.05	0.07		0.00	c0.10	0.01
v/s Ratio Perm							c0.18			0.02		0.02
v/c Ratio	1.45	0.38		0.85	0.53		0.88	0.26		0.10	0.44	0.07
Uniform Delay, d1	21.6	11.9		22.6	14.2		17.0	13.9		14.9	16.1	11.4
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	231.0	0.2		53.8	0.5		27.9	0.3		0.2	0.8	0.0
Delay (s)	252.6	12.1		76.4	14.7		44.9	14.2		15.0	16.9	11.5
Level of Service	F	B		E	B		D	B		B	B	B
Approach Delay (s)		81.6			21.5			33.0			14.7	
Approach LOS		F			C			C			B	
Intersection Summary												
HCM Average Control Delay		45.9			HCM Level of Service			D				
HCM Volume to Capacity ratio		0.72										
Actuated Cycle Length (s)		47.8			Sum of lost time (s)			12.0				
Intersection Capacity Utilization		59.8%			ICU Level of Service			B				
Analysis Period (min)		15										
c Critical Lane Group												

Existing AM

2: Powell Street & Doyle Street

Emery Station

9/9/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	62	236	32	46	542	53	9	6	11	15	15	38
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.90	0.90	0.90	0.95	0.95	0.95	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	69	262	36	48	571	56	10	7	12	17	17	42
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)		525										
pX, platoon unblocked												
vC, conflicting volume	626			298			850	1141	149	980	1131	313
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	626			298			850	1141	149	980	1131	313
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	93			96			95	96	99	91	91	94
cM capacity (veh/h)	951			1260			203	178	871	180	180	683
Direction, Lane #												
Volume Total	200	167	334	341	29	76						
Volume Left	69	0	48	0	10	17						
Volume Right	0	36	0	56	12	42						
cSH	951	1700	1260	1700	287	306						
Volume to Capacity	0.07	0.10	0.04	0.20	0.10	0.25						
Queue Length 95th (ft)	6	0	3	0	8	24						
Control Delay (s)	3.6	0.0	1.5	0.0	19.0	20.6						
Lane LOS	A		A		C	C						
Approach Delay (s)	2.0		0.7		19.0	20.6						
Approach LOS					C	C						
Intersection Summary												
Average Delay		2.9										
Intersection Capacity Utilization		41.9%			ICU Level of Service			A				
Analysis Period (min)		15										

Existing AM

3: Stanford Ave & Hollis St.

Emery Station

9/9/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	26	12	20	15	24	13	70	277	21	20	388	46
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0			4.0			4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00			0.95			1.00	1.00
Flt	1.00	0.91		1.00	0.95			0.99			1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00			0.99			1.00	1.00
Satd. Flow (prot)	1770	1687		1770	1767			3476			1821	1552
Flt Permitted	0.87	1.00		0.87	1.00			0.84			0.98	1.00
Satd. Flow (perm)	1620	1687		1620	1767			2935			1783	1552
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	29	13	22	17	27	14	78	308	23	22	431	51
RTOR Reduction (vph)	0	19	0	0	12	0	0	5	0	0	0	16
Lane Group Flow (vph)	29	16	0	17	29	0	0	404	0	0	453	35
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	5	5
Turn Type	Perm			Perm			Perm			Perm		Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		6
Actuated Green, G (s)	4.6	4.6		4.6	4.6			26.9			26.9	26.9
Effective Green, g (s)	4.6	4.6		4.6	4.6			26.9			26.9	26.9
Actuated g/C Ratio	0.12	0.12		0.12	0.12			0.68			0.68	0.68
Clearance Time (s)	4.0	4.0		4.0	4.0			4.0			4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	3.0
Lane Grp Cap (vph)	189	196		189	206			1999			1214	1057
v/s Ratio Prot		0.01			0.02							
v/s Ratio Perm	c0.02			0.01			0.14			c0.25	0.02	
v/c Ratio	0.15	0.08		0.09	0.14		0.20			0.37	0.03	
Uniform Delay, d1	15.7	15.6		15.6	15.7		2.3			2.7	2.1	
Progression Factor	1.00	1.00		1.00	1.00		1.00			1.00	1.00	
Incremental Delay, d2	0.4	0.2		0.2	0.3		0.2			0.9	0.1	
Delay (s)	16.1	15.7		15.8	16.0		2.6			3.6	2.1	
Level of Service	B	B		B	B		A			A	A	
Approach Delay (s)		15.9			15.9		2.6			3.4		
Approach LOS		B			B		A			A		
Intersection Summary												
HCM Average Control Delay		4.6			HCM Level of Service		A					
HCM Volume to Capacity ratio		0.34										
Actuated Cycle Length (s)		39.5			Sum of lost time (s)		8.0					
Intersection Capacity Utilization		50.0%			ICU Level of Service		A					
Analysis Period (min)		15										

c Critical Lane Group

Existing AM

4: 59th Street & Hollis Street

Emery Station

9/9/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	33	18	39	25	45	16	86	308	73	25	210	21
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Flt	1.00	0.97			0.99		1.00	0.99		1.00	1.00	
Flt Protected	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Flt Permitted	0.95	1.00			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1624			1767		1770	1790		1770	1829	
Flt Permitted	0.95	1.00			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	1624			1767		1770	1790		1770	1829	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	37	20	43	28	50	18	96	342	81	28	233	23
RTOR Reduction (vph)	0	39	0	0	12	0	0	7	0	0	3	0
Lane Group Flow (vph)	37	24	0	0	84	0	96	416	0	28	253	0
Confl. Peds. (#/hr)	20		20	20		20	20		20	20		20
Confl. Bikes (#/hr)			5			5			5			5
Turn Type	Split			Split			Prot			Prot		
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	5.5	5.5			6.8		5.0	30.6		1.5	27.1	
Effective Green, g (s)	5.5	5.5			6.8		5.0	30.6		1.5	27.1	
Actuated g/C Ratio	0.09	0.09			0.11		0.08	0.51		0.02	0.45	
Clearance Time (s)	4.0	4.0			4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	161	148			199		147	907		44	821	
v/s Ratio Prot	c0.02	0.01			c0.05		c0.05	c0.23		0.02	0.14	
v/s Ratio Perm												
v/c Ratio	0.23	0.16			0.42		0.65	0.46		0.64	0.31	
Uniform Delay, d1	25.5	25.3			25.0		26.9	9.6		29.2	10.7	
Progression Factor	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.7	0.5			1.4		10.0	1.7		26.4	1.0	
Delay (s)	26.2	25.8			26.4		36.8	11.2		55.6	11.6	
Level of Service	C	C			C		D	B		E	B	
Approach Delay (s)		26.0			26.4			16.0			16.0	
Approach LOS		C			C			B			B	
Intersection Summary												
HCM Average Control Delay		18.0			HCM Level of Service		B					
HCM Volume to Capacity ratio		0.45										
Actuated Cycle Length (s)		60.4			Sum of lost time (s)		16.0					
Intersection Capacity Utilization		48.1%			ICU Level of Service		A					
Analysis Period (min)		15										

c Critical Lane Group

Existing AM

5: Powell Street & San Pablo Ave

Emery Station

9/9/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	47	176	58	95	433	23	147	584	58	56	701	67
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Flt	1.00	0.96		1.00	0.99		1.00	0.99		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3409		1770	3512		1770	3491		1770	3493	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	3409		1770	3512		1770	3491		1770	3493	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.91	0.91	0.91	0.96	0.96	0.96
Adj. Flow (vph)	52	196	64	106	481	26	162	642	64	58	730	70
RTOR Reduction (vph)	0	35	0	0	0	0	0	6	0	0	6	0
Lane Group Flow (vph)	52	225	0	106	507	0	162	700	0	58	794	0
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	7.2	17.7		10.3	20.8		12.9	48.4		7.6	43.1	
Effective Green, g (s)	7.2	17.7		10.3	20.8		12.9	48.4		7.6	43.1	
Actuated g/C Ratio	0.07	0.18		0.10	0.21		0.13	0.48		0.08	0.43	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	127	603		182	730		228	1690		135	1505	
v/s Ratio Prot	0.03	0.07		c0.06	c0.14		c0.09	0.20		0.03	c0.23	
v/s Ratio Perm												
v/c Ratio	0.41	0.37		0.58	0.69		0.71	0.41		0.43	0.53	
Uniform Delay, d1	44.4	36.3		42.8	36.7		41.8	16.6		44.1	21.0	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	2.1	0.4		4.7	2.9		10.0	0.8		2.2	1.3	
Delay (s)	46.5	36.7		47.5	39.5		51.7	17.4		46.3	22.3	
Level of Service	D	D		D	D		D	B		D	C	
Approach Delay (s)		38.3			40.9			23.8			23.9	
Approach LOS		D			D			C			C	
Intersection Summary												
HCM Average Control Delay		29.5			HCM Level of Service			C				
HCM Volume to Capacity ratio		0.61										
Actuated Cycle Length (s)		100.0			Sum of lost time (s)			16.0				
Intersection Capacity Utilization		59.0%			ICU Level of Service			B				
Analysis Period (min)		15										
c Critical Lane Group												

AECOM

Synchro 7 - Report

Existing AM

6: 40th Street & Hollis Street

Emery Station

9/9/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	27	140	24	68	298	145	51	108	48	45	108	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Flt	1.00	0.98		1.00	0.95		1.00	1.00		1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		1.00	0.95	
Satd. Flow (prot)	1770	3461		1770	3366		1770	1863		1583	1770	1839
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		1.00	0.95	
Satd. Flow (perm)	1770	3461		1770	3366		1770	1863		1583	1770	1839
Peak-hour factor, PHF	0.90	0.90	0.90	0.94	0.94	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	30	156	27	72	317	154	57	120	53	50	120	11
RTOR Reduction (vph)	0	9	0	0	36	0	0	0	45	0	4	0
Lane Group Flow (vph)	30	174	0	72	435	0	57	120	8	50	127	0
Bus Blockages (#/hr)	0	0	0	0	0	5	0	0	0	0	0	0
Turn Type	Prot			Prot			Prot		Perm	Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases									2			
Actuated Green, G (s)	4.9	54.4		8.2	57.7		7.5	14.2	14.2	7.2	13.9	
Effective Green, g (s)	4.9	54.4		8.2	57.7		7.5	14.2	14.2	7.2	13.9	
Actuated g/C Ratio	0.05	0.54		0.08	0.58		0.08	0.14	0.14	0.07	0.14	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	87	1883		145	1942		133	265	225	127	256	
v/s Ratio Prot	0.02	0.05		c0.04	c0.13		c0.03	0.06		0.03	c0.07	
v/s Ratio Perm									0.00			
v/c Ratio	0.34	0.09		0.50	0.22		0.43	0.45	0.03	0.39	0.49	
Uniform Delay, d1	46.0	10.9		43.9	10.3		44.2	39.3	37.0	44.3	39.8	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	2.4	0.1		2.7	0.3		2.2	1.2	0.1	2.0	1.5	
Delay (s)	48.4	11.0		46.6	10.5		46.4	40.6	37.0	46.3	41.3	
Level of Service	D	B		D	B		D	D	D	D	D	
Approach Delay (s)		16.3			15.3			41.2			42.7	
Approach LOS		B			B			D			D	
Intersection Summary												
HCM Average Control Delay		24.8			HCM Level of Service			C				
HCM Volume to Capacity ratio		0.31										
Actuated Cycle Length (s)		100.0			Sum of lost time (s)			16.0				
Intersection Capacity Utilization		35.7%			ICU Level of Service			A				
Analysis Period (min)		15										
c Critical Lane Group												

AECOM

Synchro 7 - Report

Existing AM

7: Ashby Ave & Seventh Street

Emery Station

9/9/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	570	959	335	94	612	34	130	148	60	64	230	217
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	1.00	1.00
Frt	1.00	0.96		1.00	0.99		1.00	0.96		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	3402		1770	3511		1770	3385		1770	1863	1583
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1770	3402		1770	3511		1770	3385		1770	1863	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.94	0.94	0.94	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	600	1009	353	100	651	36	144	164	67	71	256	241
RTOR Reduction (vph)	0	25	0	0	4	0	0	46	0	0	0	100
Lane Group Flow (vph)	600	1337	0	100	683	0	144	185	0	71	256	141
Turn Type	Prot			Prot			Split			Split	pm+ov	
Protected Phases	7	4		3	8		2	2		6	6	7
Permitted Phases												6
Actuated Green, G (s)	30.1	41.7		9.3	20.9		13.3	13.3		15.4	15.4	45.5
Effective Green, g (s)	30.1	41.7		9.3	20.9		13.3	13.3		15.4	15.4	45.5
Actuated g/C Ratio	0.31	0.44		0.10	0.22		0.14	0.14		0.16	0.16	0.48
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	557	1482		172	767		246	470		285	300	819
v/s Ratio Prot	c0.34	c0.39		0.06	0.19		c0.08	0.05		0.04	c0.14	0.05
v/s Ratio Perm												0.03
v/c Ratio	1.08	0.90		0.58	0.89		0.59	0.39		0.25	0.85	0.17
Uniform Delay, d1	32.8	25.1		41.3	36.3		38.6	37.5		35.1	39.1	14.3
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	60.6	8.0		4.9	12.5		3.5	0.5		0.5	20.3	0.1
Delay (s)	93.4	33.1		46.3	48.8		42.1	38.1		35.6	59.3	14.4
Level of Service	F	C		D	D		D	D		D	E	B
Approach Delay (s)		51.5			48.5			39.6			37.3	
Approach LOS		D			D			D			D	

Intersection Summary

HCM Average Control Delay	47.5	HCM Level of Service	D
HCM Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	95.7	Sum of lost time (s)	12.0
Intersection Capacity Utilization	82.2%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

AECOM

Synchro 7 - Report

Existing AM

8: Powell Street & Christie Ave

Emery Station

9/9/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	380	767	236	60	618	139	79	15	47	103	56	394
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0
Lane Util. Factor	0.97	0.91	0.91	1.00	0.95	1.00	0.95	0.95	1.00		1.00	0.88
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.97	1.00		0.97	1.00
Satd. Flow (prot)	3433	3375	1441	1770	3539	1583	1681	1711	1583		1804	2787
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.97	1.00		0.97	1.00
Satd. Flow (perm)	3433	3375	1441	1770	3539	1583	1681	1711	1583		1804	2787
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.95	0.95	0.95
Adj. Flow (vph)	422	852	262	67	687	154	88	17	52	108	59	415
RTOR Reduction (vph)	0	2	119	0	0	87	0	0	47	0	0	264
Lane Group Flow (vph)	422	876	117	67	687	67	52	53	5	0	167	151
Turn Type	Prot		pm+ov	Prot		Perm	Split		Perm	Split		pm+ov
Protected Phases	7	4	2	3	8		2	2		6	6	7
Permitted Phases			4			8			2			6
Actuated Green, G (s)	18.8	40.9	49.6	16.8	38.9	38.9	8.7	8.7	8.7		17.6	36.4
Effective Green, g (s)	18.8	40.9	49.6	16.8	38.9	38.9	8.7	8.7	8.7		17.6	36.4
Actuated g/C Ratio	0.19	0.41	0.50	0.17	0.39	0.39	0.09	0.09	0.09		0.18	0.36
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	645	1380	715	297	1377	616	146	149	138		318	1126
v/s Ratio Prot	0.12	c0.26	0.01	0.04	c0.19		0.03	c0.03			c0.09	0.03
v/s Ratio Perm			0.07			0.04			0.00			0.03
v/c Ratio	0.65	0.63	0.16	0.23	0.50	0.11	0.36	0.36	0.03		0.53	0.13
Uniform Delay, d1	37.6	23.6	13.8	36.0	23.2	19.5	43.0	43.0	41.8		37.4	21.3
Progression Factor	0.96	0.49	1.25	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	2.1	2.0	0.1	0.4	1.3	0.4	1.5	1.5	0.1		1.6	0.1
Delay (s)	38.2	13.6	17.4	36.4	24.5	19.8	44.5	44.5	41.9		39.0	21.3
Level of Service	D	B	B	D	C	B	D	D	D		D	C
Approach Delay (s)		20.9			24.6			43.6			26.4	
Approach LOS		C			C			D			C	

Intersection Summary

HCM Average Control Delay	24.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	53.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

AECOM

Synchro 7 - Report

Existing AM

9: Powell St & I-80E on-ramp

Emery Station

9/9/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↰↰↰			↰↰↰	↰	↰	↰	↰			
Volume (vph)	71	636	0	0	765	291	553	17	766	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0	4.0	4.0	4.0	4.0			
Lane Util. Factor	1.00	0.91			0.91	1.00	0.95	0.91	0.95			
Flt	1.00	1.00			1.00	0.85	1.00	0.89	0.85			
Flt Protected	0.95	1.00			1.00	1.00	0.95	0.99	1.00			
Satd. Flow (prot)	1770	5085			5085	1583	1681	1487	1504			
Flt Permitted	0.95	1.00			1.00	1.00	0.95	0.99	1.00			
Satd. Flow (perm)	1770	5085			5085	1583	1681	1487	1504			
Peak-hour factor, PHF	0.90	0.90	0.90	0.92	0.92	0.92	0.90	0.90	0.90	0.92	0.92	0.92
Adj. Flow (vph)	79	707	0	0	832	316	614	19	851	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	164	0	118	137	0	0	0
Lane Group Flow (vph)	79	707	0	0	832	152	516	373	340	0	0	0
Turn Type	Prot					Perm	Split		Perm			
Protected Phases	7	4			8		2	2				
Permitted Phases						8			2			
Actuated Green, G (s)	5.6	57.6			48.0	48.0	34.4	34.4	34.4			
Effective Green, g (s)	5.6	57.6			48.0	48.0	34.4	34.4	34.4			
Actuated g/C Ratio	0.06	0.58			0.48	0.48	0.34	0.34	0.34			
Clearance Time (s)	4.0	4.0			4.0	4.0	4.0	4.0	4.0			
Vehicle Extension (s)	3.0	3.0			3.0	3.0	3.0	3.0	3.0			
Lane Grp Cap (vph)	99	2929			2441	760	578	512	517			
v/s Ratio Prot	c0.04	0.14			c0.16		c0.31	0.25				
v/s Ratio Perm						0.10			0.23			
v/c Ratio	0.80	0.24			0.34	0.20	0.89	0.73	0.66			
Uniform Delay, d1	46.6	10.4			16.2	15.0	31.1	28.7	27.8			
Progression Factor	0.72	2.87			0.61	0.39	1.00	1.00	1.00			
Incremental Delay, d2	32.1	0.2			0.4	0.5	16.0	5.1	3.0			
Delay (s)	65.5	30.2			10.2	6.4	47.1	33.8	30.8			
Level of Service	E	C			B	A	D	C	C			
Approach Delay (s)		33.7			9.2			37.5			0.0	
Approach LOS		C			A			D			A	
Intersection Summary												
HCM Average Control Delay			27.1			HCM Level of Service				C		
HCM Volume to Capacity ratio			0.59									
Actuated Cycle Length (s)			100.0			Sum of lost time (s)				12.0		
Intersection Capacity Utilization			55.5%			ICU Level of Service				B		
Analysis Period (min)			15									
c Critical Lane Group												

Existing AM

10: Powell St & Frontage Rd

Emery Station

9/9/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	97	144	110	0	716	602	0	0	0	589	0	89
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0	4.0				4.0		4.0
Lane Util. Factor	1.00	0.95			0.91	0.91				0.97		1.00
Flt	1.00	0.93			0.97	0.85				1.00		0.85
Flt Protected	0.95	1.00			1.00	1.00				0.95		1.00
Satd. Flow (prot)	1770	3309			3280	1441				3433		1583
Flt Permitted	0.95	1.00			1.00	1.00				0.95		1.00
Satd. Flow (perm)	1770	3309			3280	1441				3433		1583
Peak-hour factor, PHF	0.96	0.96	0.96	0.90	0.90	0.90	0.92	0.92	0.92	0.90	0.90	0.90
Adj. Flow (vph)	101	150	115	0	796	669	0	0	0	654	0	99
RTOR Reduction (vph)	0	39	0	0	19	0	0	0	0	0	0	74
Lane Group Flow (vph)	101	226	0	0	998	448	0	0	0	654	0	25
Turn Type	Prot					Free				custom		custom
Protected Phases	7	4			8					6		6
Permitted Phases						Free				6		6
Actuated Green, G (s)	12.8	66.4			49.6	100.0				25.6		25.6
Effective Green, g (s)	12.8	66.4			49.6	100.0				25.6		25.6
Actuated g/C Ratio	0.13	0.66			0.50	1.00				0.26		0.26
Clearance Time (s)	4.0	4.0			4.0					4.0		4.0
Vehicle Extension (s)	3.0	3.0			3.0					3.0		3.0
Lane Grp Cap (vph)	227	2197			1627	1441				879		405
v/s Ratio Prot	c0.06	0.07			c0.30					c0.19		0.02
v/s Ratio Perm						0.31						
v/c Ratio	0.44	0.10			0.61	0.31				0.74		0.06
Uniform Delay, d1	40.3	6.1			18.3	0.0				34.2		28.1
Progression Factor	1.00	1.00			0.93	1.00				1.00		1.00
Incremental Delay, d2	1.4	0.1			1.5	0.5				3.4		0.1
Delay (s)	41.7	6.2			18.5	0.5				37.6		28.2
Level of Service	D	A			B	A				D		C
Approach Delay (s)		16.0			13.0			0.0			36.4	
Approach LOS		B			B			A			D	
Intersection Summary												
HCM Average Control Delay			20.2		HCM Level of Service					C		
HCM Volume to Capacity ratio			0.63									
Actuated Cycle Length (s)			100.0		Sum of lost time (s)					12.0		
Intersection Capacity Utilization			58.4%		ICU Level of Service					B		
Analysis Period (min)			15									
c Critical Lane Group												

Existing AM

11: I-80 off-ramp & Frontage Rd

Emery Station

9/9/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	5	16	15	532	80	0	72	96	560	75	220	87
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95		1.00	0.95	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85	1.00	0.96	
Flt Protected	0.95	1.00	1.00	0.95	0.96		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	1863	1583	1681	1706		1770	3539	1583	1770	1783	
Flt Permitted	0.95	1.00	1.00	0.95	0.96		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1770	1863	1583	1681	1706		1770	3539	1583	1770	1783	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.93	0.93	0.93	0.91	0.91	0.91
Adj. Flow (vph)	6	18	17	591	89	0	77	103	602	82	242	96
RTOR Reduction (vph)	0	0	16	0	0	0	0	0	0	0	13	0
Lane Group Flow (vph)	6	18	1	337	343	0	77	103	602	82	325	0
Turn Type	Split	Perm		Split		Prot		Free		Prot		
Protected Phases	4	4		8	8	5	2			1	6	
Permitted Phases			4					Free				
Actuated Green, G (s)	3.3	3.3	3.3	19.7	19.7		6.7	18.3	64.1	6.8	18.4	
Effective Green, g (s)	3.3	3.3	3.3	19.7	19.7		6.7	18.3	64.1	6.8	18.4	
Actuated g/C Ratio	0.05	0.05	0.05	0.31	0.31		0.10	0.29	1.00	0.11	0.29	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	91	96	81	517	524		185	1010	1583	188	512	
v/s Ratio Prot	0.00	0.01		0.20	c0.20		0.04	0.03		0.05	c0.18	
v/s Ratio Perm			0.00					c0.38				
v/c Ratio	0.07	0.19	0.01	0.65	0.65		0.42	0.10	0.38	0.44	0.64	
Uniform Delay, d1	28.9	29.1	28.9	19.2	19.2		26.9	16.9	0.0	26.9	19.9	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.3	0.9	0.1	2.9	2.9		1.5	0.0	0.7	1.6	2.6	
Delay (s)	29.2	30.1	28.9	22.2	22.2		28.4	16.9	0.7	28.5	22.5	
Level of Service	C	C	C	C	C		C	B	A	C	C	
Approach Delay (s)		29.5			22.2			5.6			23.7	
Approach LOS		C			C			A			C	

Intersection Summary

HCM Average Control Delay	15.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	64.1	Sum of lost time (s)	4.0
Intersection Capacity Utilization	54.4%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Existing AM

12: 59th St & Horton St

Emery Station

9/9/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	1	7	0	46	22	94	51	232	111	34	52	11
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1	8	0	50	24	102	55	252	121	37	57	12
Direction, Lane #	EB 1	WB 1	WB 2	NB 1	SB 1							
Volume Total (vph)	9	50	126	428	105							
Volume Left (vph)	1	50	0	55	37							
Volume Right (vph)	0	0	102	121	12							
Hadj (s)	0.06	0.53	-0.53	-0.11	0.04							
Departure Headway (s)	5.6	6.3	5.2	4.4	4.9							
Degree Utilization, x	0.01	0.09	0.18	0.53	0.14							
Capacity (veh/h)	563	529	634	792	686							
Control Delay (s)	8.7	8.7	8.2	12.2	8.8							
Approach Delay (s)	8.7	8.3		12.2	8.8							
Approach LOS	A	A		B	A							

Intersection Summary

Delay	10.7		
HCM Level of Service	B		
Intersection Capacity Utilization	39.2%	ICU Level of Service	A
Analysis Period (min)	15		

Existing AM
13: 59th St &

Emery Station
9/9/2009

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↗			↖	↗	↖
Sign Control	Stop			Stop	Stop	
Volume (vph)	54	97	29	137	43	22
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	59	105	32	149	47	24
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total (vph)	164	180	71			
Volume Left (vph)	0	32	47			
Volume Right (vph)	105	0	24			
Hadj (s)	-0.35	0.07	-0.04			
Departure Headway (s)	3.9	4.3	4.6			
Degree Utilization, x	0.18	0.22	0.09			
Capacity (veh/h)	895	818	727			
Control Delay (s)	7.8	8.5	8.0			
Approach Delay (s)	7.8	8.5	8.0			
Approach LOS	A	A	A			
Intersection Summary						
Delay			8.1			
HCM Level of Service			A			
Intersection Capacity Utilization			31.3%		ICU Level of Service	A
Analysis Period (min)			15			

Existing AM
14: 62nd St & Horton St

Emery Station
9/9/2009

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↗			↖	↗	↖
Volume (veh/h)	9	55	77	48	46	31
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	10	60	84	52	50	34
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			70		259	40
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			70		259	40
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			95		93	97
cM capacity (veh/h)			1531		690	1032
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	70	136	84			
Volume Left	0	84	50			
Volume Right	60	0	34			
cSH	1700	1531	796			
Volume to Capacity	0.04	0.05	0.11			
Queue Length 95th (ft)	0	4	9			
Control Delay (s)	0.0	4.8	10.1			
Lane LOS		A	B			
Approach Delay (s)	0.0	4.8	10.1			
Approach LOS			B			
Intersection Summary						
Average Delay			5.2			
Intersection Capacity Utilization			24.6%		ICU Level of Service	A
Analysis Period (min)			15			

Existing AM

15: 62nd St & Hollis St

Emery Station

9/9/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Volume (veh/h)	15	14	31	1	45	15	28	204	10	9	253	48
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	16	15	34	1	49	16	30	222	11	10	275	52
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)								498				
pX, platoon unblocked												
vC, conflicting volume	649	614	301	650	635	227	327			233		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	649	614	301	650	635	227	327			233		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	95	96	95	100	87	98	98			99		
cM capacity (veh/h)	330	394	739	346	383	812	1232			1335		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	65	66	263	337								
Volume Left	16	1	30	10								
Volume Right	34	16	11	52								
cSH	488	440	1232	1335								
Volume to Capacity	0.13	0.15	0.02	0.01								
Queue Length 95th (ft)	11	13	2	1								
Control Delay (s)	13.5	14.6	1.1	0.3								
Lane LOS	B	B	A	A								
Approach Delay (s)	13.5	14.6	1.1	0.3								
Approach LOS	B	B										
Intersection Summary												
Average Delay			3.1									
Intersection Capacity Utilization			41.5%			ICU Level of Service			A			
Analysis Period (min)			15									

Existing AM

16: Stanford Ave & Horton St

Emery Station

9/9/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	2	1	85	28	24	16	76	32	17	66	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	2	1	92	30	26	17	83	35	18	72	0
Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	SB 1						
Volume Total (vph)	3	108	41	17	117	90						
Volume Left (vph)	0	92	0	17	0	18						
Volume Right (vph)	1	0	26	0	35	0						
Hadj (s)	-0.17	0.46	-0.41	0.53	-0.17	0.07						
Departure Headway (s)	5.1	5.5	4.7	5.5	4.8	5.1						
Degree Utilization, x	0.00	0.17	0.05	0.03	0.16	0.13						
Capacity (veh/h)	658	621	735	627	718	670						
Control Delay (s)	8.1	8.4	6.7	7.5	7.5	8.9						
Approach Delay (s)	8.1	8.0		7.5		8.9						
Approach LOS	A	A		A		A						
Intersection Summary												
Delay			8.0									
HCM Level of Service			A									
Intersection Capacity Utilization			29.1%		ICU Level of Service				A			
Analysis Period (min)			15									

Existing AM
17: Doyle Street &

Emery Station
9/9/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	6	12	8	7	57	2	37	51	7	4	15	10
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	7	13	9	8	62	2	40	55	8	4	16	11
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	28	72	103	32								
Volume Left (vph)	7	8	40	4								
Volume Right (vph)	9	2	8	11								
Hadj (s)	-0.10	0.04	0.07	-0.15								
Departure Headway (s)	4.2	4.3	4.2	4.1								
Degree Utilization, x	0.03	0.08	0.12	0.04								
Capacity (veh/h)	828	815	824	851								
Control Delay (s)	7.3	7.7	7.8	7.2								
Approach Delay (s)	7.3	7.7	7.8	7.2								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay				7.6								
HCM Level of Service				A								
Intersection Capacity Utilization	22.1%			ICU Level of Service					A			
Analysis Period (min)	15											

Existing AM
18: San Pablo Ave &

Emery Station
9/9/2009

								
Movement	EBL	EBR	NBL	NBT	SBT	SBR		
Lane Configurations								
Volume (veh/h)	0	24	0	536	561	48		
Sign Control	Stop			Free	Free			
Grade	0%			0%	0%			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92		
Hourly flow rate (vph)	0	26	0	583	610	52		
Pedestrians								
Lane Width (ft)								
Walking Speed (ft/s)								
Percent Blockage								
Right turn flare (veh)								
Median type				None	None			
Median storage (veh)				455				
Upstream signal (ft)								
pX, platoon unblocked	0.92							
vC, conflicting volume	927	331	662					
vC1, stage 1 conf vol								
vC2, stage 2 conf vol								
vCu, unblocked vol	740	331	662					
tC, single (s)	6.8	6.9	4.1					
tC, 2 stage (s)								
tF (s)	3.5	3.3	2.2					
p0 queue free %	100	96	100					
cM capacity (veh/h)	323	665	923					
Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2			
Volume Total	26	291	291	407	255			
Volume Left	0	0	0	0	0			
Volume Right	26	0	0	0	52			
cSH	665	1700	1700	1700	1700			
Volume to Capacity	0.04	0.17	0.17	0.24	0.15			
Queue Length 95th (ft)	3	0	0	0	0			
Control Delay (s)	10.6	0.0	0.0	0.0	0.0			
Lane LOS	B							
Approach Delay (s)	10.6	0.0		0.0				
Approach LOS	B							
Intersection Summary								
Average Delay			0.2					
Intersection Capacity Utilization			27.0%	ICU Level of Service		A		
Analysis Period (min)			15					

TECHNICAL APPENDIX B (CONTINUED)

LEVEL OF SERVICE CALCULATION WORKSHEETS

EXISTING PLUS PROJECT (ACCESS OPTION 1)
PM PEAK HOUR CONDITIONS

Emery Station

9/9/2009

1: Powell Street & Hollis Street

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	161	800	181	65	656	45	519	313	70	146	362	494
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.97		1.00	0.99		1.00	0.97		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	3441		1770	3505		1770	1812		1770	1863	1583
Flt Permitted	0.95	1.00		0.95	1.00		0.30	1.00		0.51	1.00	1.00
Satd. Flow (perm)	1770	3441		1770	3505		560	1812		958	1863	1583
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	179	889	201	72	729	50	577	348	78	162	402	549
RTOR Reduction (vph)	0	32	0	0	9	0	0	15	0	0	0	6
Lane Group Flow (vph)	179	1058	0	72	770	0	577	411	0	162	402	543
Turn Type	Prot			Prot			pm+pt			pm+pt		pm+ov
Protected Phases	7	4		3	8		5	2		1	6	7
Permitted Phases							2			6		6
Actuated Green, G (s)	4.0	15.5		2.3	13.8		17.3	17.3		16.4	16.4	20.4
Effective Green, g (s)	4.0	15.5		2.3	13.8		17.3	17.3		16.4	16.4	20.4
Actuated g/C Ratio	0.07	0.29		0.04	0.25		0.32	0.32		0.30	0.30	0.38
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	131	984		75	892		268	578		336	564	713
v/s Ratio Prot	0.10	c0.31		0.04	c0.22		c0.16	0.23		0.03	0.22	c0.06
v/s Ratio Perm							c0.53			0.12		0.29
v/c Ratio	1.37	1.08		0.96	0.86		2.15	0.71		0.48	0.71	0.76
Uniform Delay, d1	25.1	19.4		25.9	19.3		18.6	16.2		15.9	16.8	14.8
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	205.9	51.1		89.9	8.7		531.1	4.1		1.1	4.2	4.8
Delay (s)	231.0	70.4		115.8	28.0		549.7	20.4		17.0	21.1	19.6
Level of Service	F	E		F	C		F	C		B	C	B
Approach Delay (s)		93.1			35.4			324.9			19.7	
Approach LOS		F			D			F			B	
Intersection Summary												
HCM Average Control Delay		117.1			HCM Level of Service			F				
HCM Volume to Capacity ratio		1.33										
Actuated Cycle Length (s)		54.2			Sum of lost time (s)			8.0				
Intersection Capacity Utilization		92.6%			ICU Level of Service			F				
Analysis Period (min)		15										
c Critical Lane Group												

Emery Station

9/9/2009

2: Powell Street & Doyle Street

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	46	877	10	37	702	21	0	9	32	45	28	77
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.90	0.90	0.90	0.95	0.95	0.95	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	51	974	11	39	739	22	0	10	36	50	31	86
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)		525										
pX, platoon unblocked				0.79			0.79	0.79	0.79	0.79	0.79	
vC, conflicting volume	761			986			1631	1921	493	1458	1916	381
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	761			439			1259	1628	0	1039	1621	381
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	94			96			100	86	96	56	57	86
cM capacity (veh/h)	847			879			53	71	853	115	72	617
Direction, Lane #												
Volume Total	538	498	408	392	46	167						
Volume Left	51	0	39	0	0	50						
Volume Right	0	11	0	22	36	86						
cSH	847	1700	879	1700	250	166						
Volume to Capacity	0.06	0.29	0.04	0.23	0.18	1.01						
Queue Length 95th (ft)	5	0	3	0	16	199						
Control Delay (s)	1.6	0.0	1.4	0.0	22.6	127.4						
Lane LOS	A		A		C	F						
Approach Delay (s)	0.8		0.7		22.6	127.4						
Approach LOS					C	F						
Intersection Summary												
Average Delay		11.6										
Intersection Capacity Utilization		72.4%			ICU Level of Service			C				
Analysis Period (min)		15										

3: Stanford Ave & Hollis St.

Emery Station

9/9/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	152	68	62	30	19	30	22	779	47	10	611	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0			4.0			4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00			0.95			1.00	1.00
Flt	1.00	0.93		1.00	0.91			0.99			1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00			1.00			1.00	1.00
Satd. Flow (prot)	1770	1730		1770	1692			3505			1824	1552
Flt Permitted	0.72	1.00		0.66	1.00			0.93			0.98	1.00
Satd. Flow (perm)	1345	1730		1238	1692			3280			1796	1552
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	169	76	69	33	21	33	24	866	52	11	679	24
RTOR Reduction (vph)	0	52	0	0	25	0	0	7	0	0	0	11
Lane Group Flow (vph)	169	93	0	33	29	0	0	935	0	0	690	13
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	5	5
Turn Type	Perm			Perm			Perm			Perm		Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		6
Actuated Green, G (s)	9.3	9.3		9.3	9.3			21.2			21.2	21.2
Effective Green, g (s)	9.3	9.3		9.3	9.3			21.2			21.2	21.2
Actuated g/C Ratio	0.24	0.24		0.24	0.24			0.55			0.55	0.55
Clearance Time (s)	4.0	4.0		4.0	4.0			4.0			4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	3.0
Lane Grp Cap (vph)	325	418		299	409			1806			989	855
v/s Ratio Prot		0.05			0.02							
v/s Ratio Perm	c0.13			0.03				0.29			c0.38	0.01
v/c Ratio	0.52	0.22		0.11	0.07			0.52			0.70	0.02
Uniform Delay, d1	12.7	11.7		11.4	11.3			5.4			6.3	3.9
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	1.00
Incremental Delay, d2	1.5	0.3		0.2	0.1			1.1			4.1	0.0
Delay (s)	14.2	12.0		11.5	11.3			6.5			10.4	4.0
Level of Service	B	B		B	B			A			B	A
Approach Delay (s)		13.2			11.4			6.5			10.2	
Approach LOS		B			B			A			B	
Intersection Summary												
HCM Average Control Delay		9.0			HCM Level of Service			A				
HCM Volume to Capacity ratio		0.64										
Actuated Cycle Length (s)		38.5			Sum of lost time (s)			8.0				
Intersection Capacity Utilization		61.9%			ICU Level of Service			B				
Analysis Period (min)		15										

c Critical Lane Group

4: 59th Street & Hollis Street

Emery Station

9/9/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	92	46	86	75	21	33	29	617	58	23	803	16
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0			4.0			4.0	4.0
Lane Util. Factor	1.00	1.00			1.00			1.00			1.00	1.00
Flt	1.00	0.98			0.98			1.00			1.00	1.00
Flt Protected	1.00	1.00			1.00			1.00			1.00	1.00
Flt	1.00	0.90			0.97			1.00			1.00	1.00
Flt Protected	0.95	1.00			0.97			0.95			0.95	1.00
Satd. Flow (prot)	1770	1639			1718			1770			1770	1855
Flt Permitted	0.95	1.00			0.97			0.95			0.95	1.00
Satd. Flow (perm)	1770	1639			1718			1770			1770	1855
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	102	51	96	83	23	37	32	686	64	26	892	18
RTOR Reduction (vph)	0	82	0	0	18	0	0	3	0	0	1	0
Lane Group Flow (vph)	102	65	0	0	125	0	32	747	0	26	909	0
Confl. Peds. (#/hr)	20		20	20		20	20		20	20		20
Confl. Bikes (#/hr)			5			5			5			5
Turn Type	Split			Split			Prot			Prot		
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	8.7	8.7			8.1		1.7	25.7		1.4	25.4	
Effective Green, g (s)	8.7	8.7			8.1		1.7	25.7		1.4	25.4	
Actuated g/C Ratio	0.15	0.15			0.14		0.03	0.43		0.02	0.42	
Clearance Time (s)	4.0	4.0			4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	257	238			232		50	785		41	787	
v/s Ratio Prot	c0.06	0.04			c0.07		c0.02	0.41		0.01	c0.49	
v/s Ratio Perm												
v/c Ratio	0.40	0.27			0.54		0.64	0.95		0.63	1.16	
Uniform Delay, d1	23.2	22.8			24.2		28.8	16.5		29.0	17.2	
Progression Factor	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.0	0.6			2.4		24.7	22.2		27.9	84.1	
Delay (s)	24.2	23.4			26.6		53.5	38.7		56.9	101.4	
Level of Service	C	C			C		D	D		E	F	
Approach Delay (s)		23.7			26.6			39.3			100.1	
Approach LOS		C			C			D			F	
Intersection Summary												
HCM Average Control Delay		63.6			HCM Level of Service			E				
HCM Volume to Capacity ratio		0.87										
Actuated Cycle Length (s)		59.9			Sum of lost time (s)			16.0				
Intersection Capacity Utilization		77.3%			ICU Level of Service			D				
Analysis Period (min)		15										

c Critical Lane Group

Emery Station

5: Powell Street & San Pablo Ave

9/9/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	137	694	131	100	443	69	245	1759	187	237	1603	147
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frt	1.00	0.98		1.00	0.98		1.00	0.99		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3455		1770	3467		1770	3488		1770	3495	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	3455		1770	3467		1770	3488		1770	3495	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.91	0.91	0.91	0.96	0.96	0.96
Adj. Flow (vph)	152	771	146	111	492	77	269	1933	205	247	1670	153
RTOR Reduction (vph)	0	16	0	0	0	0	0	8	0	0	7	0
Lane Group Flow (vph)	152	901	0	111	569	0	269	2130	0	247	1816	0
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	11.4	25.5		10.5	24.6		12.0	36.0		12.0	36.0	
Effective Green, g (s)	11.4	25.5		10.5	24.6		12.0	36.0		12.0	36.0	
Actuated g/C Ratio	0.11	0.26		0.10	0.25		0.12	0.36		0.12	0.36	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	202	881		186	853		212	1256		212	1258	
v/s Ratio Prot	c0.09	c0.26		0.06	0.16		c0.15	c0.61		0.14	0.52	
v/s Ratio Perm												
v/c Ratio	0.75	1.02		0.60	0.67		1.27	1.70		1.17	1.44	
Uniform Delay, d1	42.9	37.2		42.7	34.0		44.0	32.0		44.0	32.0	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	14.6	36.3		5.1	2.0		152.7	316.5		113.5	204.1	
Delay (s)	57.5	73.6		47.8	36.0		196.7	348.5		157.5	236.1	
Level of Service	E	E		D	D		F	F		F	F	
Approach Delay (s)		71.3			37.9			331.5			226.8	
Approach LOS		E			D			F			F	
Intersection Summary												
HCM Average Control Delay		219.9			HCM Level of Service			F				
HCM Volume to Capacity ratio		1.26										
Actuated Cycle Length (s)		100.0			Sum of lost time (s)			12.0				
Intersection Capacity Utilization		109.9%			ICU Level of Service			H				
Analysis Period (min)		15										
c Critical Lane Group												

Emery Station

6: 40th Street & Hollis Street

9/9/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	56	881	129	183	745	221	124	247	152	180	428	44
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frt	1.00	0.98		1.00	0.97		1.00	1.00		1.00	0.95	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		1.00	0.95	
Satd. Flow (prot)	1770	3472		1770	3418		1770	1863		1583	1770	1837
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		1.00	0.95	1.00
Satd. Flow (perm)	1770	3472		1770	3418		1770	1863		1583	1770	1837
Peak-hour factor, PHF	0.90	0.90	0.90	0.94	0.94	0.94	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	62	979	143	195	793	235	138	274	169	200	476	49
RTOR Reduction (vph)	0	12	0	0	26	0	0	0	0	121	0	4
Lane Group Flow (vph)	62	1110	0	195	1002	0	138	274	48	200	521	0
Bus Blockages (#/hr)	0	0	0	0	0	5	0	0	0	0	0	0
Turn Type	Prot			Prot			Prot		Perm	Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases									2			
Actuated Green, G (s)	7.7	31.2		12.2	35.7		11.1	28.6		28.6	12.0	29.5
Effective Green, g (s)	7.7	31.2		12.2	35.7		11.1	28.6		28.6	12.0	29.5
Actuated g/C Ratio	0.08	0.31		0.12	0.36		0.11	0.29		0.29	0.12	0.30
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	136	1083		216	1220		196	533		453	212	542
v/s Ratio Prot	0.04	c0.32		c0.11	0.29		0.08	0.15		c0.11	c0.28	
v/s Ratio Perm									0.03			
v/c Ratio	0.46	1.03		0.90	0.82		0.70	0.51		0.11	0.94	0.96
Uniform Delay, d1	44.1	34.4		43.3	29.3		42.9	29.9		26.3	43.7	34.7
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	2.4	33.9		35.8	6.3		10.9	0.8		0.1	45.8	29.1
Delay (s)	46.6	68.3		79.1	35.5		53.8	30.7		26.4	89.4	63.8
Level of Service	D	E		E	D		D	C		C	F	E
Approach Delay (s)		67.2			42.5			34.9			70.9	
Approach LOS		E			D			C			E	
Intersection Summary												
HCM Average Control Delay		54.7			HCM Level of Service			D				
HCM Volume to Capacity ratio		0.94										
Actuated Cycle Length (s)		100.0			Sum of lost time (s)			12.0				
Intersection Capacity Utilization		84.0%			ICU Level of Service			E				
Analysis Period (min)		15										
c Critical Lane Group												

Emery Station

9/9/2009

7: Ashby Ave & Seventh Street

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	297	772	197	110	1044	39	315	649	157	198	412	771
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	1.00	1.00
Flt	1.00	0.97		1.00	0.99		1.00	0.97		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	3431		1770	3520		1770	3436		1770	1863	1583
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1770	3431		1770	3520		1770	3436		1770	1863	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.94	0.94	0.94	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	313	813	207	117	1111	41	350	721	174	220	458	857
RTOR Reduction (vph)	0	17	0	0	2	0	0	21	0	0	0	21
Lane Group Flow (vph)	313	1003	0	117	1150	0	350	874	0	220	458	836
Turn Type	Prot			Prot			Split			Split		pm+ov
Protected Phases	7	4		3	8		2	2		6	6	7
Permitted Phases												6
Actuated Green, G (s)	30.0	38.0		12.0	20.0		18.0	18.0		16.0	16.0	46.0
Effective Green, g (s)	30.0	38.0		12.0	20.0		18.0	18.0		16.0	16.0	46.0
Actuated g/C Ratio	0.30	0.38		0.12	0.20		0.18	0.18		0.16	0.16	0.46
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	531	1304		212	704		319	618		283	298	792
v/s Ratio Prot	0.18	0.29		0.07	0.33		0.20	0.25		0.12	0.25	0.32
v/s Ratio Perm												0.21
v/c Ratio	0.59	0.77		0.55	1.63		1.10	1.41		0.78	1.54	1.06
Uniform Delay, d1	29.8	27.2		41.5	40.0		41.0	41.0		40.3	42.0	27.0
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	1.7	2.8		3.1	291.3		79.0	195.6		12.6	257.8	47.6
Delay (s)	31.4	29.9		44.6	331.3		120.0	236.6		52.9	299.8	74.6
Level of Service	C	C		D	F		F	F		D	F	E
Approach Delay (s)		30.3			304.8			203.9			138.7	
Approach LOS		C			F			F			F	
Intersection Summary												
HCM Average Control Delay		166.1			HCM Level of Service			F				
HCM Volume to Capacity ratio		1.33										
Actuated Cycle Length (s)		100.0			Sum of lost time (s)			12.0				
Intersection Capacity Utilization		105.3%			ICU Level of Service			G				
Analysis Period (min)		15										
c Critical Lane Group												

Emery Station

9/9/2009

8: Powell Street & Christie Ave

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	468	774	937	320	1165	185	334	78	218	312	435	1410
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.91	0.91	0.97	0.95	1.00	0.95	0.95	1.00	0.95	0.95	0.88
Flt	1.00	0.95	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.97	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	3216	1441	3433	3539	1583	1681	1716	1583	1681	1764	2787
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.97	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	3216	1441	3433	3539	1583	1681	1716	1583	1681	1764	2787
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.95	0.95	0.95
Adj. Flow (vph)	520	860	1041	356	1294	206	371	87	242	328	458	1484
RTOR Reduction (vph)	0	59	70	0	0	81	0	0	203	0	0	20
Lane Group Flow (vph)	520	1249	523	356	1294	125	226	232	39	295	491	1464
Turn Type	Prot		pm+ov	Prot		Perm	Split		Perm	Split		pm+ov
Protected Phases	7	4	2	3	8		2	2		6	6	7
Permitted Phases			4			8			2			6
Actuated Green, G (s)	21.0	21.0	37.0	21.0	21.0	21.0	16.0	16.0	16.0	26.0	26.0	47.0
Effective Green, g (s)	21.0	21.0	37.0	21.0	21.0	21.0	16.0	16.0	16.0	26.0	26.0	47.0
Actuated g/C Ratio	0.21	0.21	0.37	0.21	0.21	0.21	0.16	0.16	0.16	0.26	0.26	0.47
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	721	675	533	721	743	332	269	275	253	437	459	1421
v/s Ratio Prot	0.15	0.39	0.16	0.10	0.37		0.13	0.14		0.18	0.28	0.22
v/s Ratio Perm			0.21			0.08			0.02			0.31
v/c Ratio	0.72	1.85	0.98	0.49	1.74	0.38	0.84	0.84	0.15	0.68	1.07	1.03
Uniform Delay, d1	36.8	39.5	31.2	34.8	39.5	33.9	40.8	40.8	36.2	33.2	37.0	26.5
Progression Factor	0.80	0.76	1.69	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.3	384.6	18.9	0.5	339.3	3.3	20.4	20.4	0.3	4.1	61.9	32.1
Delay (s)	30.6	414.6	71.7	35.3	378.8	37.1	61.1	61.2	36.4	37.3	98.9	58.6
Level of Service	C	F	E	D	F	D	E	E	D	D	F	E
Approach Delay (s)		248.1			275.0			52.6			64.5	
Approach LOS		F			F			D			E	
Intersection Summary												
HCM Average Control Delay		178.6			HCM Level of Service			F				
HCM Volume to Capacity ratio		1.42										
Actuated Cycle Length (s)		100.0			Sum of lost time (s)			16.0				
Intersection Capacity Utilization		102.8%			ICU Level of Service			G				
Analysis Period (min)		15										
c Critical Lane Group												

Emery Station

9: Powell St & I-80E on-ramp

9/9/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↰↰↰		↰	↰↰↰	↰	↰	↰↰	↰			
Volume (vph)	174	1215	0	0	1799	578	940	277	1368	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0	4.0	4.0	4.0	4.0			
Lane Util. Factor	1.00	0.91			0.91	1.00	0.91	0.86	0.91			
Flt	1.00	1.00			1.00	0.85	1.00	0.92	0.85			
Flt Protected	0.95	1.00			1.00	1.00	0.95	0.99	1.00			
Satd. Flow (prot)	1770	5085			5085	1583	1610	2907	1441			
Flt Permitted	0.95	1.00			1.00	1.00	0.95	0.99	1.00			
Satd. Flow (perm)	1770	5085			5085	1583	1610	2907	1441			
Peak-hour factor, PHF	0.90	0.90	0.90	0.92	0.92	0.90	0.90	0.90	0.92	0.92	0.92	0.92
Adj. Flow (vph)	193	1350	0	0	1955	628	1044	308	1520	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	169	0	28	28	0	0	0
Lane Group Flow (vph)	193	1350	0	0	1955	459	731	1353	732	0	0	0
Turn Type	Prot				Perm		Split		Perm			
Protected Phases	7	4			8		2	2				
Permitted Phases						8			2			
Actuated Green, G (s)	4.0	56.0			48.0	48.0	36.0	36.0	36.0			
Effective Green, g (s)	4.0	56.0			48.0	48.0	36.0	36.0	36.0			
Actuated g/C Ratio	0.04	0.56			0.48	0.48	0.36	0.36	0.36			
Clearance Time (s)	4.0	4.0			4.0	4.0	4.0	4.0	4.0			
Vehicle Extension (s)	3.0	3.0			3.0	3.0	3.0	3.0	3.0			
Lane Grp Cap (vph)	71	2848			2441	760	580	1047	519			
v/s Ratio Prot	c0.11	0.27			c0.38		0.45	0.47				
v/s Ratio Perm						0.29			c0.51			
v/c Ratio	2.72	0.47			0.80	0.60	1.26	1.39dr	1.41			
Uniform Delay, d1	48.0	13.2			22.0	19.0	32.0	32.0	32.0			
Progression Factor	0.76	2.03			0.66	0.43	1.00	1.00	1.00			
Incremental Delay, d2	795.1	0.3			0.3	0.3	130.6	138.9	196.3			
Delay (s)	831.3	27.1			14.8	8.4	162.6	170.9	228.3			
Level of Service	F	C			B	A	F	F	F			
Approach Delay (s)		127.7			13.3		184.0			0.0		
Approach LOS		F			B		F			A		

Intersection Summary

HCM Average Control Delay	108.6	HCM Level of Service	F
HCM Volume to Capacity ratio	1.14		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	88.5%	ICU Level of Service	E
Analysis Period (min)	15		
dr Defacto Right Lane. Recode with 1 though lane as a right lane.			
c Critical Lane Group			

Emery Station

10: Powell St & Frontage Rd

9/9/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↰↰		↰	↰↰	↰				↰↰		↰
Volume (vph)	171	531	566	0	572	1950	0	0	0	1032	0	355
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0	4.0				4.0		4.0
Lane Util. Factor	1.00	0.95			0.91	0.91				0.97		1.00
Flt	1.00	0.92			0.91	0.85				1.00		0.85
Flt Protected	0.95	1.00			1.00	1.00				0.95		1.00
Satd. Flow (prot)	1770	3265			3070	1441				3433		1583
Flt Permitted	0.95	1.00			1.00	1.00				0.95		1.00
Satd. Flow (perm)	1770	3265			3070	1441				3433		1583
Peak-hour factor, PHF	0.96	0.96	0.96	0.90	0.90	0.90	0.92	0.92	0.92	0.90	0.90	0.90
Adj. Flow (vph)	178	553	590	0	636	2167	0	0	0	1147	0	394
RTOR Reduction (vph)	0	192	0	0	306	0	0	0	0	0	0	253
Lane Group Flow (vph)	178	951	0	0	1414	1083	0	0	0	1147	0	141
Turn Type	Prot				Free					custom		custom
Protected Phases	7	4			8					6		6
Permitted Phases						Free				6		6
Actuated Green, G (s)	16.0	56.3			36.3	100.0				35.7		35.7
Effective Green, g (s)	16.0	56.3			36.3	100.0				35.7		35.7
Actuated g/C Ratio	0.16	0.56			0.36	1.00				0.36		0.36
Clearance Time (s)	4.0	4.0			4.0					4.0		4.0
Vehicle Extension (s)	3.0	3.0			3.0					3.0		3.0
Lane Grp Cap (vph)	283	1838			1114	1441				1226		565
v/s Ratio Prot	0.10	0.29			c0.46					c0.33		0.09
v/s Ratio Perm						c0.75						
v/c Ratio	0.63	0.52			1.27dr	0.75				0.94		0.25
Uniform Delay, d1	39.2	13.5			31.8	0.0				31.0		22.7
Progression Factor	1.00	1.00			1.10	1.00				1.00		1.00
Incremental Delay, d2	4.3	1.0			123.5	1.1				13.1		0.2
Delay (s)	43.6	14.5			158.6	1.1				44.1		22.9
Level of Service	D	B			F	A				D		C
Approach Delay (s)		18.4			97.8			0.0			38.7	
Approach LOS		B			F			A			D	

Intersection Summary

HCM Average Control Delay	63.2	HCM Level of Service	E
HCM Volume to Capacity ratio	1.03		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	85.6%	ICU Level of Service	E
Analysis Period (min)	15		
dr Defacto Right Lane. Recode with 1 though lane as a right lane.			
c Critical Lane Group			

11: I-80 off-ramp & Frontage Rd

Emery Station

9/9/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	100	295	95	500	17	0	33	698	2254	440	700	68
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95		1.00	0.95	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00	1.00	0.95	0.96		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	1863	1583	1681	1691		1770	3539	1583	1770	1838	
Flt Permitted	0.95	1.00	1.00	0.95	0.96		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1770	1863	1583	1681	1691		1770	3539	1583	1770	1838	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.93	0.93	0.93	0.91	0.91	0.91
Adj. Flow (vph)	111	328	106	556	19	0	35	751	2424	484	769	75
RTOR Reduction (vph)	0	0	83	0	0	0	0	0	0	0	3	0
Lane Group Flow (vph)	111	328	23	289	286	0	35	751	2424	484	841	0
Turn Type	Split	Perm		Split			Prot		Free	Prot		
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases			4						Free			
Actuated Green, G (s)	20.1	20.1	20.1	19.7	19.7		4.7	23.5	91.5	12.2	31.0	
Effective Green, g (s)	20.1	20.1	20.1	19.7	19.7		4.7	23.5	91.5	12.2	31.0	
Actuated g/C Ratio	0.22	0.22	0.22	0.22	0.22		0.05	0.26	1.00	0.13	0.34	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	389	409	348	362	364		91	909	1583	236	623	
v/s Ratio Prot	0.06	0.18		0.17	0.17		0.02	0.21		0.27	0.46	
v/s Ratio Perm			0.01						0.153			
v/c Ratio	0.29	0.80	0.07	0.80	0.79		0.38	0.83	1.53	2.05	1.35	
Uniform Delay, d1	29.7	33.8	28.3	34.0	33.9		42.0	32.1	45.8	39.6	30.2	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.4	10.8	0.1	11.6	10.6		2.7	6.2	242.3	487.3	167.7	
Delay (s)	30.1	44.6	28.4	45.6	44.6		44.7	38.3	288.1	527.0	198.0	
Level of Service	C	D	C	D	D		D	D	F	F	F	
Approach Delay (s)		38.5			45.1			227.0			317.9	
Approach LOS		D			D			F			F	

Intersection Summary												
HCM Average Control Delay		211.7		HCM Level of Service				F				
HCM Volume to Capacity ratio		1.54										
Actuated Cycle Length (s)		91.5		Sum of lost time (s)				0.0				
Intersection Capacity Utilization		87.5%		ICU Level of Service				E				
Analysis Period (min)		15										
c Critical Lane Group												

12: 59th St & Horton St

Emery Station

9/9/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	9	44	1	45	16	39	33	183	273	195	87	5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	10	48	1	49	17	42	36	199	297	212	95	5
Direction, Lane #	EB 1	WB 1	WB 2	NB 1	SB 1							
Volume Total (vph)	59	49	60	532	312							
Volume Left (vph)	10	49	0	36	212							
Volume Right (vph)	1	0	42	297	5							
Hadj (s)	0.06	0.53	-0.46	-0.29	0.16							
Departure Headway (s)	6.4	7.2	6.2	4.6	5.3							
Degree Utilization, x	0.10	0.10	0.10	0.68	0.46							
Capacity (veh/h)	491	443	509	760	656							
Control Delay (s)	10.1	9.8	8.7	16.7	12.6							
Approach Delay (s)	10.1	9.2		16.7	12.6							
Approach LOS	B	A		C	B							

Intersection Summary			
Delay	14.2		
HCM Level of Service	B		
Intersection Capacity Utilization	63.4%	ICU Level of Service	B
Analysis Period (min)	15		

13: 59th St &

Emery Station
9/9/2009

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↗			↖	↗	↖
Sign Control	Stop			Stop	Stop	
Volume (vph)	153	311	12	71	32	66
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	166	338	13	77	35	72
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total (vph)	504	90	107			
Volume Left (vph)	0	13	35			
Volume Right (vph)	338	0	72			
Hadj (s)	-0.37	0.06	-0.30			
Departure Headway (s)	3.9	4.7	4.8			
Degree Utilization, x	0.55	0.12	0.14			
Capacity (veh/h)	903	721	660			
Control Delay (s)	11.6	8.4	8.6			
Approach Delay (s)	11.6	8.4	8.6			
Approach LOS	B	A	A			
Intersection Summary						
Delay			10.7			
HCM Level of Service			B			
Intersection Capacity Utilization			39.7%		ICU Level of Service	A
Analysis Period (min)			15			

14: 62nd St & Horton St

Emery Station
9/9/2009

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↗			↖	↗	↖
Volume (veh/h)	26	55	80	117	139	104
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	28	60	87	127	151	113
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			88		359	58
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			88		359	58
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			94		75	89
cM capacity (veh/h)			1508		603	1008
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	88	214	264			
Volume Left	0	87	151			
Volume Right	60	0	113			
cSH	1700	1508	728			
Volume to Capacity	0.05	0.06	0.36			
Queue Length 95th (ft)	0	5	42			
Control Delay (s)	0.0	3.3	12.7			
Lane LOS		A	B			
Approach Delay (s)	0.0	3.3	12.7			
Approach LOS			B			
Intersection Summary						
Average Delay			7.2			
Intersection Capacity Utilization			38.0%		ICU Level of Service	A
Analysis Period (min)			15			

15: 62nd St & Hollis St

Emery Station

9/9/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Volume (veh/h)	70	76	146	14	23	22	53	604	7	7	552	70
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	76	83	159	15	25	24	58	657	8	8	600	76
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)								498				
pX, platoon unblocked	0.65	0.65		0.65	0.65	0.65				0.65		
vC, conflicting volume	1465	1433	638	1629	1467	660	676			664		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1446	1396	638	1699	1449	200	676			206		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	2	67	0	68	96	94			99		
cM capacity (veh/h)	48	85	477	3	79	543	915			882		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	317	64	722	684								
Volume Left	76	15	58	8								
Volume Right	159	24	8	76								
cSH	110	12	915	882								
Volume to Capacity	2.88	5.32	0.06	0.01								
Queue Length 95th (ft)	747	Err	5	1								
Control Delay (s)	932.6	Err	1.6	0.2								
Lane LOS	F	F	A	A								
Approach Delay (s)	932.6	Err	1.6	0.2								
Approach LOS	F	F										
Intersection Summary												
Average Delay			525.2									
Intersection Capacity Utilization			95.0%		ICU Level of Service			F				
Analysis Period (min)			15									

16: Stanford Ave & Horton St

Emery Station

9/9/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	9	24	19	48	9	35	7	158	78	34	139	7
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	10	26	21	52	10	38	8	172	85	37	151	8
Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	SB 1						
Volume Total (vph)	57	57	43	8	257	196						
Volume Left (vph)	10	52	0	8	0	37						
Volume Right (vph)	21	0	38	0	85	8						
Hadj (s)	-0.15	0.49	-0.59	0.53	-0.20	0.05						
Departure Headway (s)	5.7	6.2	5.2	5.7	5.0	5.3						
Degree Utilization, x	0.09	0.10	0.06	0.01	0.35	0.29						
Capacity (veh/h)	574	531	636	609	701	649						
Control Delay (s)	9.2	8.7	7.3	7.6	9.4	10.5						
Approach Delay (s)	9.2	8.1		9.4		10.5						
Approach LOS	A	A		A		B						
Intersection Summary												
Delay			9.5									
HCM Level of Service			A									
Intersection Capacity Utilization			42.3%		ICU Level of Service			A				
Analysis Period (min)			15									

17: Doyle Street &

Emery Station
9/9/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	5	88	15	6	41	12	21	37	7	15	50	16
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	96	16	7	45	13	23	40	8	16	54	17
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	117	64	71	88								
Volume Left (vph)	5	7	23	16								
Volume Right (vph)	16	13	8	17								
Hadj (s)	-0.04	-0.07	0.03	-0.05								
Departure Headway (s)	4.3	4.3	4.4	4.3								
Degree Utilization, x	0.14	0.08	0.09	0.11								
Capacity (veh/h)	804	785	768	781								
Control Delay (s)	8.0	7.7	7.9	7.9								
Approach Delay (s)	8.0	7.7	7.9	7.9								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay			7.9									
HCM Level of Service			A									
Intersection Capacity Utilization			19.3%		ICU Level of Service				A			
Analysis Period (min)			15									

18: San Pablo Ave &

Emery Station
9/9/2009

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↕		↕	↕	↕
Volume (veh/h)	0	90	0	1564	1762	47
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	98	0	1700	1915	51
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)				455		
pX, platoon unblocked	0.65					
vC, conflicting volume	2791	983	1966			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2679	983	1966			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	61	100			
cM capacity (veh/h)	12	248	292			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	
Volume Total	98	850	850	1277	689	
Volume Left	0	0	0	0	0	
Volume Right	98	0	0	0	51	
cSH	248	1700	1700	1700	1700	
Volume to Capacity	0.39	0.50	0.50	0.75	0.41	
Queue Length 95th (ft)	45	0	0	0	0	
Control Delay (s)	28.7	0.0	0.0	0.0	0.0	
Lane LOS	D					
Approach Delay (s)	28.7	0.0		0.0		
Approach LOS	D					
Intersection Summary						
Average Delay			0.7			
Intersection Capacity Utilization			62.4%		ICU Level of Service	B
Analysis Period (min)			15			

TECHNICAL APPENDIX B (CONTINUED)

LEVEL OF SERVICE CALCULATION WORKSHEETS

EXISTING PLUS PROJECT (ACCESS OPTION 2)
AM PEAK HOUR CONDITIONS

Existing AM

1: Powell Street & Hollis Street

Emery Station

9/9/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	221	304	241	62	431	70	207	104	26	24	164	111
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.93		1.00	0.98		1.00	0.97		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	3304		1770	3465		1770	1807		1770	1863	1583
Flt Permitted	0.95	1.00		0.95	1.00		0.40	1.00		0.66	1.00	1.00
Satd. Flow (perm)	1770	3304		1770	3465		753	1807		1238	1863	1583
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	246	338	268	69	479	78	230	116	29	27	182	123
RTOR Reduction (vph)	0	177	0	0	21	0	0	18	0	0	0	77
Lane Group Flow (vph)	246	429	0	69	536	0	230	127	0	27	182	46
Turn Type	Prot			Prot			pm+pt			pm+pt		pm+ov
Protected Phases	7	4		3	8		5	2		1	6	7
Permitted Phases							2			6		6
Actuated Green, G (s)	4.6	16.3		2.2	13.9		12.7	12.7		10.5	10.5	15.1
Effective Green, g (s)	4.6	16.3		2.2	13.9		12.7	12.7		10.5	10.5	15.1
Actuated g/C Ratio	0.10	0.34		0.05	0.29		0.27	0.27		0.22	0.22	0.32
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	170	1127		81	1008		260	480		279	409	633
v/s Ratio Prot	c0.14	0.13		0.04	c0.15		c0.05	0.07		0.00	c0.10	0.01
v/s Ratio Perm							c0.18			0.02		0.02
v/c Ratio	1.45	0.38		0.85	0.53		0.88	0.26		0.10	0.44	0.07
Uniform Delay, d1	21.6	11.9		22.6	14.2		17.0	13.9		14.9	16.1	11.4
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	231.0	0.2		53.8	0.5		27.9	0.3		0.2	0.8	0.0
Delay (s)	252.6	12.1		76.4	14.8		44.9	14.2		15.0	16.9	11.5
Level of Service	F	B		E	B		D	B		B	B	B
Approach Delay (s)		81.6			21.6			33.0			14.7	
Approach LOS		F			C			C			B	

Intersection Summary

HCM Average Control Delay	45.9	HCM Level of Service	D
HCM Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	47.8	Sum of lost time (s)	12.0
Intersection Capacity Utilization	59.8%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Existing AM

2: Powell Street & Doyle Street

Emery Station

9/9/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	62	236	32	46	545	53	9	6	11	15	15	38
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.90	0.90	0.90	0.95	0.95	0.95	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	69	262	36	48	574	56	10	7	12	17	17	42
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)		525										
pX, platoon unblocked												
vC, conflicting volume	629			298			852	1144	149	983	1134	315
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	629			298			852	1144	149	983	1134	315
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	93			96			95	96	99	91	91	94
cM capacity (veh/h)	949			1260			202	177	871	179	179	681

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	200	167	335	343	29	76
Volume Left	69	0	48	0	10	17
Volume Right	0	36	0	56	12	42
cSH	949	1700	1260	1700	286	304
Volume to Capacity	0.07	0.10	0.04	0.20	0.10	0.25
Queue Length 95th (ft)	6	0	3	0	8	24
Control Delay (s)	3.6	0.0	1.5	0.0	19.0	20.7
Lane LOS	A		A		C	C
Approach Delay (s)	2.0		0.7		19.0	20.7
Approach LOS					C	C

Intersection Summary

Average Delay	2.9		
Intersection Capacity Utilization	42.0%	ICU Level of Service	A
Analysis Period (min)	15		

Existing AM

3: Stanford Ave & Hollis St.

Emery Station

9/9/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	26	12	20	15	24	13	70	277	21	20	388	46
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0			4.0			4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00			0.95			1.00	1.00
Frt	1.00	0.91		1.00	0.95			0.99			1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00			0.99			1.00	1.00
Satd. Flow (prot)	1770	1687		1770	1767			3476			1821	1552
Flt Permitted	0.87	1.00		0.87	1.00			0.84			0.98	1.00
Satd. Flow (perm)	1620	1687		1620	1767			2935			1783	1552
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	29	13	22	17	27	14	78	308	23	22	431	51
RTOR Reduction (vph)	0	19	0	0	12	0	0	5	0	0	0	16
Lane Group Flow (vph)	29	16	0	17	29	0	0	404	0	0	453	35
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	5	5
Turn Type	Perm			Perm			Perm			Perm		Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		6
Actuated Green, G (s)	4.6	4.6		4.6	4.6			26.9			26.9	26.9
Effective Green, g (s)	4.6	4.6		4.6	4.6			26.9			26.9	26.9
Actuated g/C Ratio	0.12	0.12		0.12	0.12			0.68			0.68	0.68
Clearance Time (s)	4.0	4.0		4.0	4.0			4.0			4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	3.0
Lane Grp Cap (vph)	189	196		189	206			1999			1214	1057
v/s Ratio Prot		0.01			0.02							
v/s Ratio Perm	c0.02			0.01			0.14			c0.25	0.02	
v/c Ratio	0.15	0.08		0.09	0.14		0.20			0.37	0.03	
Uniform Delay, d1	15.7	15.6		15.6	15.7		2.3			2.7	2.1	
Progression Factor	1.00	1.00		1.00	1.00		1.00			1.00	1.00	
Incremental Delay, d2	0.4	0.2		0.2	0.3		0.2			0.9	0.1	
Delay (s)	16.1	15.7		15.8	16.0		2.6			3.6	2.1	
Level of Service	B	B		B	B		A			A	A	
Approach Delay (s)		15.9			15.9		2.6			3.4		
Approach LOS		B			B		A			A		
Intersection Summary												
HCM Average Control Delay		4.6			HCM Level of Service		A					
HCM Volume to Capacity ratio		0.34										
Actuated Cycle Length (s)		39.5			Sum of lost time (s)		8.0					
Intersection Capacity Utilization		50.0%			ICU Level of Service		A					
Analysis Period (min)		15										

c Critical Lane Group

Existing AM

4: 59th Street & Hollis Street

Emery Station

9/9/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	33	18	39	25	63	16	87	308	73	25	210	42
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Frbp, ped/bikes	1.00	0.97			0.99		1.00	0.99		1.00	0.99	
Flpb, ped/bikes	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.90			0.98		1.00	0.97		1.00	0.97	
Flt Protected	0.95	1.00			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1623			1783		1770	1790		1770	1799	
Flt Permitted	0.95	1.00			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	1623			1783		1770	1790		1770	1799	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	37	20	43	28	70	18	97	342	81	28	233	47
RTOR Reduction (vph)	0	39	0	0	10	0	0	7	0	0	7	0
Lane Group Flow (vph)	37	24	0	0	106	0	97	416	0	28	273	0
Confl. Peds. (#/hr)	20		20	20		20	20		20	20		20
Confl. Bikes (#/hr)			5			5			5			5
Turn Type	Split			Split			Prot			Prot		
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	5.5	5.5			7.4		5.0	30.7		1.5	27.2	
Effective Green, g (s)	5.5	5.5			7.4		5.0	30.7		1.5	27.2	
Actuated g/C Ratio	0.09	0.09			0.12		0.08	0.50		0.02	0.45	
Clearance Time (s)	4.0	4.0			4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	159	146			216		145	899		43	801	
v/s Ratio Prot	c0.02	0.01			c0.06		c0.05	c0.23		0.02	0.15	
v/s Ratio Perm												
v/c Ratio	0.23	0.16			0.49		0.67	0.46		0.65	0.34	
Uniform Delay, d1	25.8	25.7			25.1		27.2	9.9		29.5	11.1	
Progression Factor	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.8	0.5			1.8		11.1	1.7		30.2	1.2	
Delay (s)	26.6	26.2			26.9		38.4	11.6		59.7	12.2	
Level of Service	C	C			C		D	B		E	B	
Approach Delay (s)		26.3			26.9			16.6			16.6	
Approach LOS		C			C			B			B	
Intersection Summary												
HCM Average Control Delay		18.6			HCM Level of Service		B					
HCM Volume to Capacity ratio		0.47										
Actuated Cycle Length (s)		61.1			Sum of lost time (s)		16.0					
Intersection Capacity Utilization		48.5%			ICU Level of Service		A					
Analysis Period (min)		15										

c Critical Lane Group

Existing AM

5: Powell Street & San Pablo Ave

Emery Station

9/9/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	47	176	58	95	433	23	150	581	58	56	701	67
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Flt	1.00	0.96		1.00	0.99		1.00	0.99		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3409		1770	3512		1770	3491		1770	3493	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	3409		1770	3512		1770	3491		1770	3493	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.91	0.91	0.91	0.96	0.96	0.96
Adj. Flow (vph)	52	196	64	106	481	26	165	638	64	58	730	70
RTOR Reduction (vph)	0	35	0	0	0	0	0	6	0	0	6	0
Lane Group Flow (vph)	52	225	0	106	507	0	165	696	0	58	794	0
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	7.2	17.7		10.3	20.8		13.1	48.4		7.6	42.9	
Effective Green, g (s)	7.2	17.7		10.3	20.8		13.1	48.4		7.6	42.9	
Actuated g/C Ratio	0.07	0.18		0.10	0.21		0.13	0.48		0.08	0.43	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	127	603		182	730		232	1690		135	1498	
v/s Ratio Prot	0.03	0.07		c0.06	c0.14		c0.09	0.20		0.03	c0.23	
v/s Ratio Perm												
v/c Ratio	0.41	0.37		0.58	0.69		0.71	0.41		0.43	0.53	
Uniform Delay, d1	44.4	36.3		42.8	36.7		41.6	16.6		44.1	21.1	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	2.1	0.4		4.7	2.9		9.8	0.7		2.2	1.3	
Delay (s)	46.5	36.7		47.5	39.5		51.5	17.4		46.3	22.4	
Level of Service	D	D		D	D		D	B		D	C	
Approach Delay (s)		38.3			40.9			23.9			24.1	
Approach LOS		D			D			C			C	
Intersection Summary												
HCM Average Control Delay		29.6			HCM Level of Service			C				
HCM Volume to Capacity ratio		0.61										
Actuated Cycle Length (s)		100.0			Sum of lost time (s)			16.0				
Intersection Capacity Utilization		59.2%			ICU Level of Service			B				
Analysis Period (min)		15										
c Critical Lane Group												

Existing AM

6: 40th Street & Hollis Street

Emery Station

9/9/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	27	140	23	68	298	145	51	108	48	45	108	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Flt	1.00	0.98		1.00	0.95		1.00	1.00		1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		1.00	0.95	
Satd. Flow (prot)	1770	3463		1770	3366		1770	1863		1583	1770	1839
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		1.00	0.95	1.00
Satd. Flow (perm)	1770	3463		1770	3366		1770	1863		1583	1770	1839
Peak-hour factor, PHF	0.90	0.90	0.90	0.94	0.94	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	30	156	26	72	317	154	57	120	53	50	120	11
RTOR Reduction (vph)	0	9	0	0	36	0	0	0	45	0	4	0
Lane Group Flow (vph)	30	173	0	72	435	0	57	120	8	50	127	0
Bus Blockages (#/hr)	0	0	0	0	0	5	0	0	0	0	0	0
Turn Type	Prot			Prot			Prot		Perm	Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases									2			
Actuated Green, G (s)	4.9	54.4		8.2	57.7		7.5	14.2	14.2	7.2	13.9	
Effective Green, g (s)	4.9	54.4		8.2	57.7		7.5	14.2	14.2	7.2	13.9	
Actuated g/C Ratio	0.05	0.54		0.08	0.58		0.08	0.14	0.14	0.07	0.14	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	87	1884		145	1942		133	265	225	127	256	
v/s Ratio Prot	0.02	0.05		c0.04	c0.13		c0.03	0.06		0.03	c0.07	
v/s Ratio Perm									0.00			
v/c Ratio	0.34	0.09		0.50	0.22		0.43	0.45	0.03	0.39	0.49	
Uniform Delay, d1	46.0	10.9		43.9	10.3		44.2	39.3	37.0	44.3	39.8	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	2.4	0.1		2.7	0.3		2.2	1.2	0.1	2.0	1.5	
Delay (s)	48.4	11.0		46.6	10.5		46.4	40.6	37.0	46.3	41.3	
Level of Service	D	B		D	B		D	D	D	D	D	
Approach Delay (s)		16.3			15.3			41.2			42.7	
Approach LOS		B			B			D			D	
Intersection Summary												
HCM Average Control Delay		24.9			HCM Level of Service			C				
HCM Volume to Capacity ratio		0.31										
Actuated Cycle Length (s)		100.0			Sum of lost time (s)			16.0				
Intersection Capacity Utilization		35.7%			ICU Level of Service			A				
Analysis Period (min)		15										
c Critical Lane Group												

Existing AM

7: Ashby Ave & Seventh Street

Emery Station

9/9/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	570	959	335	95	612	34	130	148	60	64	230	217
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	1.00	1.00
Frt	1.00	0.96		1.00	0.99		1.00	0.96		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	3402		1770	3511		1770	3385		1770	1863	1583
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1770	3402		1770	3511		1770	3385		1770	1863	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.94	0.94	0.94	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	600	1009	353	101	651	36	144	164	67	71	256	241
RTOR Reduction (vph)	0	25	0	0	4	0	0	46	0	0	0	100
Lane Group Flow (vph)	600	1337	0	101	683	0	144	185	0	71	256	141
Turn Type	Prot			Prot			Split			Split	pm+ov	
Protected Phases	7	4		3	8		2	2		6	6	7
Permitted Phases												6
Actuated Green, G (s)	30.1	41.6		9.4	20.9		13.3	13.3		15.4	15.4	45.5
Effective Green, g (s)	30.1	41.6		9.4	20.9		13.3	13.3		15.4	15.4	45.5
Actuated g/C Ratio	0.31	0.43		0.10	0.22		0.14	0.14		0.16	0.16	0.48
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	557	1479		174	767		246	470		285	300	819
v/s Ratio Prot	c0.34	c0.39		0.06	0.19		c0.08	0.05		0.04	c0.14	0.05
v/s Ratio Perm												0.03
v/c Ratio	1.08	0.90		0.58	0.89		0.59	0.39		0.25	0.85	0.17
Uniform Delay, d1	32.8	25.2		41.3	36.3		38.6	37.5		35.1	39.1	14.3
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	60.6	8.1		4.9	12.5		3.5	0.5		0.5	20.3	0.1
Delay (s)	93.4	33.3		46.1	48.8		42.1	38.1		35.6	59.3	14.4
Level of Service	F	C		D	D		D	D		D	E	B
Approach Delay (s)		51.7			48.5			39.6			37.3	
Approach LOS		D			D			D			D	

Intersection Summary

HCM Average Control Delay	47.6	HCM Level of Service	D
HCM Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	95.7	Sum of lost time (s)	12.0
Intersection Capacity Utilization	82.2%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Existing AM

8: Powell Street & Christie Ave

Emery Station

9/9/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	380	767	236	60	618	139	79	15	47	103	56	394
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0
Lane Util. Factor	0.97	0.91	0.91	1.00	0.95	1.00	0.95	0.95	1.00		1.00	0.88
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.97	1.00		0.97	1.00
Satd. Flow (prot)	3433	3375	1441	1770	3539	1583	1681	1711	1583		1804	2787
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.97	1.00		0.97	1.00
Satd. Flow (perm)	3433	3375	1441	1770	3539	1583	1681	1711	1583		1804	2787
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.95	0.95	0.95
Adj. Flow (vph)	422	852	262	67	687	154	88	17	52	108	59	415
RTOR Reduction (vph)	0	2	119	0	0	87	0	0	47	0	0	264
Lane Group Flow (vph)	422	876	117	67	687	67	52	53	5	0	167	151
Turn Type	Prot		pm+ov	Prot		Perm	Split		Perm	Split		pm+ov
Protected Phases	7	4	2	3	8		2	2		6	6	7
Permitted Phases			4			8			2			6
Actuated Green, G (s)	18.8	40.9	49.6	16.8	38.9	38.9	8.7	8.7	8.7		17.6	36.4
Effective Green, g (s)	18.8	40.9	49.6	16.8	38.9	38.9	8.7	8.7	8.7		17.6	36.4
Actuated g/C Ratio	0.19	0.41	0.50	0.17	0.39	0.39	0.09	0.09	0.09		0.18	0.36
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	645	1380	715	297	1377	616	146	149	138		318	1126
v/s Ratio Prot	0.12	c0.26	0.01	0.04	c0.19		0.03	c0.03			c0.09	0.03
v/s Ratio Perm			0.07			0.04			0.00			0.03
v/c Ratio	0.65	0.63	0.16	0.23	0.50	0.11	0.36	0.36	0.03		0.53	0.13
Uniform Delay, d1	37.6	23.6	13.8	36.0	23.2	19.5	43.0	43.0	41.8		37.4	21.3
Progression Factor	0.96	0.49	1.25	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	2.1	2.0	0.1	0.4	1.3	0.4	1.5	1.5	0.1		1.6	0.1
Delay (s)	38.2	13.6	17.4	36.4	24.5	19.8	44.5	44.5	41.9		39.0	21.3
Level of Service	D	B	B	D	C	B	D	D	D		D	C
Approach Delay (s)		20.9			24.6			43.6			26.4	
Approach LOS		C			C			D			C	

Intersection Summary

HCM Average Control Delay	24.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	53.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Existing AM

9: Powell St & I-80E on-ramp

Emery Station

9/9/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↰↰↰			↰↰↰	↰	↰	↰	↰			
Volume (vph)	71	636	0	0	765	291	553	17	766	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0	4.0	4.0	4.0	4.0			
Lane Util. Factor	1.00	0.91			0.91	1.00	0.95	0.91	0.95			
Flt	1.00	1.00			1.00	0.85	1.00	0.89	0.85			
Flt Protected	0.95	1.00			1.00	1.00	0.95	0.99	1.00			
Satd. Flow (prot)	1770	5085			5085	1583	1681	1487	1504			
Flt Permitted	0.95	1.00			1.00	1.00	0.95	0.99	1.00			
Satd. Flow (perm)	1770	5085			5085	1583	1681	1487	1504			
Peak-hour factor, PHF	0.90	0.90	0.90	0.92	0.92	0.92	0.90	0.90	0.90	0.92	0.92	0.92
Adj. Flow (vph)	79	707	0	0	832	316	614	19	851	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	164	0	118	137	0	0	0
Lane Group Flow (vph)	79	707	0	0	832	152	516	373	340	0	0	0
Turn Type	Prot					Perm	Split		Perm			
Protected Phases	7	4			8		2	2				
Permitted Phases						8			2			
Actuated Green, G (s)	5.6	57.6			48.0	48.0	34.4	34.4	34.4			
Effective Green, g (s)	5.6	57.6			48.0	48.0	34.4	34.4	34.4			
Actuated g/C Ratio	0.06	0.58			0.48	0.48	0.34	0.34	0.34			
Clearance Time (s)	4.0	4.0			4.0	4.0	4.0	4.0	4.0			
Vehicle Extension (s)	3.0	3.0			3.0	3.0	3.0	3.0	3.0			
Lane Grp Cap (vph)	99	2929			2441	760	578	512	517			
v/s Ratio Prot	c0.04	0.14			c0.16		c0.31	0.25				
v/s Ratio Perm						0.10			0.23			
v/c Ratio	0.80	0.24			0.34	0.20	0.89	0.73	0.66			
Uniform Delay, d1	46.6	10.4			16.2	15.0	31.1	28.7	27.8			
Progression Factor	0.72	2.87			0.61	0.39	1.00	1.00	1.00			
Incremental Delay, d2	32.1	0.2			0.4	0.5	16.0	5.1	3.0			
Delay (s)	65.5	30.2			10.2	6.4	47.1	33.8	30.8			
Level of Service	E	C			B	A	D	C	C			
Approach Delay (s)		33.7			9.2			37.5			0.0	
Approach LOS		C			A			D			A	
Intersection Summary												
HCM Average Control Delay			27.1			HCM Level of Service				C		
HCM Volume to Capacity ratio			0.59									
Actuated Cycle Length (s)			100.0			Sum of lost time (s)				12.0		
Intersection Capacity Utilization			55.5%			ICU Level of Service				B		
Analysis Period (min)			15									
c Critical Lane Group												

Existing AM

10: Powell St & Frontage Rd

Emery Station

9/9/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	97	144	110	0	716	602	0	0	0	589	0	89
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0	4.0				4.0		4.0
Lane Util. Factor	1.00	0.95			0.91	0.91				0.97		1.00
Flt	1.00	0.93			0.97	0.85				1.00		0.85
Flt Protected	0.95	1.00			1.00	1.00				0.95		1.00
Satd. Flow (prot)	1770	3309			3280	1441				3433		1583
Flt Permitted	0.95	1.00			1.00	1.00				0.95		1.00
Satd. Flow (perm)	1770	3309			3280	1441				3433		1583
Peak-hour factor, PHF	0.96	0.96	0.96	0.90	0.90	0.90	0.92	0.92	0.92	0.90	0.90	0.90
Adj. Flow (vph)	101	150	115	0	796	669	0	0	0	654	0	99
RTOR Reduction (vph)	0	39	0	0	19	0	0	0	0	0	0	74
Lane Group Flow (vph)	101	226	0	0	998	448	0	0	0	654	0	25
Turn Type	Prot					Free				custom		custom
Protected Phases	7	4			8					6		6
Permitted Phases						Free				6		6
Actuated Green, G (s)	12.8	66.4			49.6	100.0				25.6		25.6
Effective Green, g (s)	12.8	66.4			49.6	100.0				25.6		25.6
Actuated g/C Ratio	0.13	0.66			0.50	1.00				0.26		0.26
Clearance Time (s)	4.0	4.0			4.0					4.0		4.0
Vehicle Extension (s)	3.0	3.0			3.0					3.0		3.0
Lane Grp Cap (vph)	227	2197			1627	1441				879		405
v/s Ratio Prot	c0.06	0.07			c0.30					c0.19		0.02
v/s Ratio Perm						0.31						
v/c Ratio	0.44	0.10			0.61	0.31				0.74		0.06
Uniform Delay, d1	40.3	6.1			18.3	0.0				34.2		28.1
Progression Factor	1.00	1.00			0.93	1.00				1.00		1.00
Incremental Delay, d2	1.4	0.1			1.5	0.5				3.4		0.1
Delay (s)	41.7	6.2			18.5	0.5				37.6		28.2
Level of Service	D	A			B	A				D		C
Approach Delay (s)		16.0			13.0			0.0			36.4	
Approach LOS		B			B			A			D	
Intersection Summary												
HCM Average Control Delay			20.2		HCM Level of Service					C		
HCM Volume to Capacity ratio			0.63									
Actuated Cycle Length (s)			100.0		Sum of lost time (s)					12.0		
Intersection Capacity Utilization			58.4%		ICU Level of Service					B		
Analysis Period (min)			15									
c Critical Lane Group												

Existing AM

Emery Station

11: I-80 off-ramp & Frontage Rd

9/9/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	5	16	15	532	80	0	72	96	560	75	220	87
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95		1.00	0.95	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85	1.00	0.96	
Flt Protected	0.95	1.00	1.00	0.95	0.96		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	1863	1583	1681	1706		1770	3539	1583	1770	1783	
Flt Permitted	0.95	1.00	1.00	0.95	0.96		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1770	1863	1583	1681	1706		1770	3539	1583	1770	1783	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.93	0.93	0.93	0.91	0.91	0.91
Adj. Flow (vph)	6	18	17	591	89	0	77	103	602	82	242	96
RTOR Reduction (vph)	0	0	16	0	0	0	0	0	0	0	13	0
Lane Group Flow (vph)	6	18	1	337	343	0	77	103	602	82	325	0
Turn Type	Split	Perm		Split			Prot		Free	Prot		
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases			4						Free			
Actuated Green, G (s)	3.3	3.3	3.3	19.7	19.7		6.7	18.3	64.1	6.8	18.4	
Effective Green, g (s)	3.3	3.3	3.3	19.7	19.7		6.7	18.3	64.1	6.8	18.4	
Actuated g/C Ratio	0.05	0.05	0.05	0.31	0.31		0.10	0.29	1.00	0.11	0.29	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	91	96	81	517	524		185	1010	1583	188	512	
v/s Ratio Prot	0.00	0.01		0.20	c0.20		0.04	0.03		0.05	c0.18	
v/s Ratio Perm			0.00						c0.38			
v/c Ratio	0.07	0.19	0.01	0.65	0.65		0.42	0.10	0.38	0.44	0.64	
Uniform Delay, d1	28.9	29.1	28.9	19.2	19.2		26.9	16.9	0.0	26.9	19.9	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.3	0.9	0.1	2.9	2.9		1.5	0.0	0.7	1.6	2.6	
Delay (s)	29.2	30.1	28.9	22.2	22.2		28.4	16.9	0.7	28.5	22.5	
Level of Service	C	C	C	C	C		C	B	A	C	C	
Approach Delay (s)		29.5			22.2			5.6			23.7	
Approach LOS		C			C			A			C	
Intersection Summary												
HCM Average Control Delay		15.9										
HCM Volume to Capacity ratio		0.52										
Actuated Cycle Length (s)		64.1							4.0			
Intersection Capacity Utilization		54.4%										
Analysis Period (min)		15										
c Critical Lane Group												

Existing AM

Emery Station

12: 59th St & Horton St

9/9/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	1	7	0	46	22	129	51	232	111	28	52	11
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1	8	0	50	24	140	55	252	121	30	57	12
Direction, Lane #												
Volume Total (vph)	9	50	164	428	99							
Volume Left (vph)	1	50	0	55	30							
Volume Right (vph)	0	0	140	121	12							
Hadj (s)	0.06	0.53	-0.56	-0.11	0.02							
Departure Headway (s)	5.7	6.3	5.2	4.5	5.0							
Degree Utilization, x	0.01	0.09	0.24	0.54	0.14							
Capacity (veh/h)	556	530	641	775	667							
Control Delay (s)	8.8	8.7	8.6	12.6	8.8							
Approach Delay (s)	8.8	8.6		12.6	8.8							
Approach LOS	A	A		B	A							
Intersection Summary												
Delay				10.9								
HCM Level of Service				B								
Intersection Capacity Utilization				39.7%								
Analysis Period (min)				15								

Existing AM
13: 59th St &

Emery Station
9/9/2009

	→	↗	↖	←	↙	↘
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↗			↖	↙	↘
Sign Control	Stop			Stop	Stop	
Volume (vph)	54	91	35	171	44	22
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	59	99	38	186	48	24
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total (vph)	158	224	72			
Volume Left (vph)	0	38	48			
Volume Right (vph)	99	0	24			
Hadj (s)	-0.34	0.07	-0.03			
Departure Headway (s)	4.0	4.3	4.7			
Degree Utilization, x	0.17	0.27	0.09			
Capacity (veh/h)	880	810	710			
Control Delay (s)	7.8	8.9	8.2			
Approach Delay (s)	7.8	8.9	8.2			
Approach LOS	A	A	A			
Intersection Summary						
Delay			8.4			
HCM Level of Service			A			
Intersection Capacity Utilization		33.1%		ICU Level of Service	A	
Analysis Period (min)		15				

Existing AM
14: 62nd St & Horton St

Emery Station
9/9/2009

	→	↗	↖	←	↙	↘
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↗			↖	↙	↘
Volume (veh/h)	9	55	35	48	46	262
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	10	60	38	52	50	285
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			70		168	40
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			70		168	40
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		94	72
cM capacity (veh/h)			1531		802	1032
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	70	90	335			
Volume Left	0	38	50			
Volume Right	60	0	285			
cSH	1700	1531	989			
Volume to Capacity	0.04	0.02	0.34			
Queue Length 95th (ft)	0	2	38			
Control Delay (s)	0.0	3.2	10.5			
Lane LOS		A	B			
Approach Delay (s)	0.0	3.2	10.5			
Approach LOS			B			
Intersection Summary						
Average Delay			7.7			
Intersection Capacity Utilization		36.5%		ICU Level of Service	A	
Analysis Period (min)		15				

Existing AM
15: 62nd St & Hollis St

Emery Station
9/9/2009

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Movement												
Lane Configurations		↔			↔			↔			↔	
Volume (veh/h)	15	14	38	2	22	15	28	204	10	9	266	35
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	16	15	41	2	24	16	30	222	11	10	289	38
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)								498				
pX, platoon unblocked												
vC, conflicting volume	644	621	308	665	635	227	327			233		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	644	621	308	665	635	227	327			233		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	95	96	94	99	94	98	98			99		
cM capacity (veh/h)	351	390	732	334	383	812	1232			1335		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	73	42	263	337								
Volume Left	16	2	30	10								
Volume Right	41	16	11	38								
cSH	514	477	1232	1335								
Volume to Capacity	0.14	0.09	0.02	0.01								
Queue Length 95th (ft)	12	7	2	1								
Control Delay (s)	13.2	13.3	1.1	0.3								
Lane LOS	B	B	A	A								
Approach Delay (s)	13.2	13.3	1.1	0.3								
Approach LOS	B	B										
Intersection Summary												
Average Delay			2.7									
Intersection Capacity Utilization			40.6%			ICU Level of Service			A			
Analysis Period (min)			15									

Existing AM
16: Stanford Ave & Horton St

Emery Station
9/9/2009

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Movement												
Lane Configurations		↔			↔			↔			↔	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	2	1	85	28	24	16	76	32	17	65	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	2	1	92	30	26	17	83	35	18	71	0
Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	SB 1						
Volume Total (vph)	3	108	41	17	117	89						
Volume Left (vph)	0	92	0	17	0	18						
Volume Right (vph)	1	0	26	0	35	0						
Hadj (s)	-0.17	0.46	-0.41	0.53	-0.17	0.08						
Departure Headway (s)	5.1	5.5	4.7	5.5	4.8	5.1						
Degree Utilization, x	0.00	0.17	0.05	0.03	0.16	0.13						
Capacity (veh/h)	658	621	735	627	719	670						
Control Delay (s)	8.1	8.4	6.7	7.5	7.5	8.9						
Approach Delay (s)	8.1	8.0		7.5		8.9						
Approach LOS	A	A		A		A						
Intersection Summary												
Delay			8.0									
HCM Level of Service			A									
Intersection Capacity Utilization			29.1%		ICU Level of Service				A			
Analysis Period (min)			15									

Existing AM
17: Doyle Street &

Emery Station
9/9/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	6	12	8	7	75	2	37	51	7	4	15	10
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	7	13	9	8	82	2	40	55	8	4	16	11
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	28	91	103	32								
Volume Left (vph)	7	8	40	4								
Volume Right (vph)	9	2	8	11								
Hadj (s)	-0.10	0.04	0.07	-0.15								
Departure Headway (s)	4.2	4.3	4.3	4.1								
Degree Utilization, x	0.03	0.11	0.12	0.04								
Capacity (veh/h)	822	816	813	838								
Control Delay (s)	7.3	7.8	7.9	7.3								
Approach Delay (s)	7.3	7.8	7.9	7.3								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay			7.7									
HCM Level of Service			A									
Intersection Capacity Utilization		23.0%		ICU Level of Service				A				
Analysis Period (min)		15										

Existing AM
18: San Pablo Ave &

Emery Station
9/9/2009

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↕		↕	↕	↕
Volume (veh/h)	0	24	0	527	561	66
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	26	0	573	610	72
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)				455		
pX, platoon unblocked	0.92					
vC, conflicting volume	932	341	682			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	753	341	682			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	96	100			
cM capacity (veh/h)	318	655	907			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	
Volume Total	26	286	286	407	275	
Volume Left	0	0	0	0	0	
Volume Right	26	0	0	0	72	
cSH	655	1700	1700	1700	1700	
Volume to Capacity	0.04	0.17	0.17	0.24	0.16	
Queue Length 95th (ft)	3	0	0	0	0	
Control Delay (s)	10.7	0.0	0.0	0.0	0.0	
Lane LOS	B					
Approach Delay (s)	10.7	0.0		0.0		
Approach LOS	B					
Intersection Summary						
Average Delay			0.2			
Intersection Capacity Utilization		27.6%		ICU Level of Service		A
Analysis Period (min)		15				

TECHNICAL APPENDIX B (CONTINUED)

LEVEL OF SERVICE CALCULATION WORKSHEETS

EXISTING PLUS PROJECT (ACCESS OPTION 2)
PM PEAK HOUR CONDITIONS

Existing PM

1: Powell Street & Hollis Street

Emery Station

9/9/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↩	↩↪		↩	↩↪		↩	↩↪		↩	↩↪	↩↪
Volume (vph)	115	588	141	48	523	33	354	213	46	88	248	331
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.97		1.00	0.99		1.00	0.97		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	3436		1770	3507		1770	1813		1770	1863	1583
Flt Permitted	0.95	1.00		0.95	1.00		0.33	1.00		0.58	1.00	1.00
Satd. Flow (perm)	1770	3436		1770	3507		621	1813		1087	1863	1583
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	128	653	157	53	581	37	393	237	51	98	276	368
RTOR Reduction (vph)	0	33	0	0	8	0	0	15	0	0	0	23
Lane Group Flow (vph)	128	777	0	53	610	0	393	273	0	98	276	345
Turn Type	Prot			Prot			pm+pt			pm+pt		pm+ov
Protected Phases	7	4		3	8		5	2		1	6	7
Permitted Phases							2			6		6
Actuated Green, G (s)	4.0	16.7		1.5	14.2		16.0	16.0		14.3	14.3	18.3
Effective Green, g (s)	4.0	16.7		1.5	14.2		16.0	16.0		14.3	14.3	18.3
Actuated g/C Ratio	0.08	0.32		0.03	0.27		0.30	0.30		0.27	0.27	0.35
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	135	1093		51	949		277	553		326	507	672
v/s Ratio Prot	0.07	c0.23		0.03	c0.17		c0.11	0.15		0.01	0.15	c0.04
v/s Ratio Perm							c0.32			0.07		0.18
v/c Ratio	0.95	0.71		1.04	0.64		1.42	0.49		0.30	0.54	0.51
Uniform Delay, d1	24.1	15.8		25.5	16.9		18.1	14.9		15.3	16.3	13.6
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	61.0	2.2		137.6	1.5		208.4	0.7		0.5	1.2	0.7
Delay (s)	85.1	18.0		163.1	18.4		226.5	15.6		15.8	17.5	14.2
Level of Service	F	B		F	B		F	B		B	B	B
Approach Delay (s)		27.1			29.8			137.3			15.7	
Approach LOS		C			C			F			B	

Intersection Summary

HCM Average Control Delay	49.7	HCM Level of Service	D
HCM Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	52.5	Sum of lost time (s)	8.0
Intersection Capacity Utilization	70.1%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Existing PM

2: Powell Street & Doyle Street

Emery Station

9/9/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↩↪			↩↪			↩↪			↩↪	↩↪
Volume (veh/h)	36	670	8	17	544	16	11	6	26	31	19	47
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.90	0.90	0.90	0.95	0.95	0.95	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	40	744	9	18	573	17	12	7	29	34	21	52
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)		525										
pX, platoon unblocked				0.87			0.87	0.87	0.87	0.87	0.87	
vC, conflicting volume	589			753			1214	1454	377	1101	1450	295
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	589			428			955	1230	0	826	1226	295
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	96			98			92	95	97	83	86	93
cM capacity (veh/h)	982			985			146	145	947	206	146	702

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	412	381	304	303	48	108
Volume Left	40	0	18	0	12	34
Volume Right	0	9	0	17	29	52
cSH	982	1700	985	1700	299	279
Volume to Capacity	0.04	0.22	0.02	0.18	0.16	0.39
Queue Length 95th (ft)	3	0	1	0	14	44
Control Delay (s)	1.3	0.0	0.7	0.0	19.3	25.8
Lane LOS	A		A		C	D
Approach Delay (s)	0.7		0.3		19.3	25.8
Approach LOS					C	D

Intersection Summary

Average Delay	2.9					
Intersection Capacity Utilization	54.0%		ICU Level of Service	A		
Analysis Period (min)	15					

Existing PM

3: Stanford Ave & Hollis St.

Emery Station

9/9/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	118	53	48	26	15	23	15	529	30	7	416	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0			4.0			4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00			0.95			1.00	1.00
Flt	1.00	0.93		1.00	0.91			0.99			1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00			1.00			1.00	1.00
Satd. Flow (prot)	1770	1731		1770	1694			3507			1824	1552
Flt Permitted	0.73	1.00		0.68	1.00			0.94			0.99	1.00
Satd. Flow (perm)	1358	1731		1276	1694			3308			1807	1552
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	131	59	53	29	17	26	17	588	33	8	462	17
RTOR Reduction (vph)	0	41	0	0	20	0	0	6	0	0	0	7
Lane Group Flow (vph)	131	71	0	29	23	0	0	632	0	0	470	10
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	5	5
Turn Type	Perm			Perm			Perm			Perm		Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		6
Actuated Green, G (s)	8.7	8.7		8.7	8.7			22.0			22.0	22.0
Effective Green, g (s)	8.7	8.7		8.7	8.7			22.0			22.0	22.0
Actuated g/C Ratio	0.22	0.22		0.22	0.22			0.57			0.57	0.57
Clearance Time (s)	4.0	4.0		4.0	4.0			4.0			4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	3.0
Lane Grp Cap (vph)	305	389		287	381			1881			1027	882
v/s Ratio Prot		0.04			0.01							
v/s Ratio Perm	c0.10			0.02				0.19			c0.26	0.01
v/c Ratio	0.43	0.18		0.10	0.06			0.34			0.46	0.01
Uniform Delay, d1	12.9	12.1		11.9	11.8			4.5			4.9	3.6
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	1.00
Incremental Delay, d2	1.0	0.2		0.2	0.1			0.5			1.5	0.0
Delay (s)	13.8	12.4		12.1	11.9			4.9			6.3	3.6
Level of Service	B	B		B	B			A			A	A
Approach Delay (s)		13.2			11.9			4.9			6.2	
Approach LOS		B			B			A			A	
Intersection Summary												
HCM Average Control Delay		7.1			HCM Level of Service			A				
HCM Volume to Capacity ratio		0.45										
Actuated Cycle Length (s)		38.7			Sum of lost time (s)			8.0				
Intersection Capacity Utilization		47.4%			ICU Level of Service			A				
Analysis Period (min)		15										

c Critical Lane Group

Existing PM

4: 59th Street & Hollis Street

Emery Station

9/9/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	72	37	68	58	21	26	22	417	34	16	583	56
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Flt	1.00	0.97			0.98		1.00	1.00		1.00	1.00	
Flt Protected	1.00	1.00			1.00		0.99	1.00		0.99	1.00	
Satd. Flow (prot)	1770	1639			1724		1751	1834		1745	1830	
Flt Permitted	0.95	1.00			0.97		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	1639			1724		1751	1834		1745	1830	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	80	41	76	64	23	29	24	463	38	18	648	62
RTOR Reduction (vph)	0	67	0	0	17	0	0	3	0	0	3	0
Lane Group Flow (vph)	80	50	0	0	99	0	24	498	0	18	707	0
Confl. Peds. (#/hr)	20		20	20		20	20		20	20		20
Confl. Bikes (#/hr)			5			5			5			5
Turn Type	Split			Split			Prot			Prot		
Protected Phases	4	4		8			5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	6.5	6.5			7.1		0.8	26.3		0.6	26.1	
Effective Green, g (s)	6.5	6.5			7.1		0.8	26.3		0.6	26.1	
Actuated g/C Ratio	0.12	0.12			0.13		0.01	0.47		0.01	0.46	
Clearance Time (s)	4.0	4.0			4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	204	189			217		25	854		19	845	
v/s Ratio Prot	c0.05	0.03			c0.06		c0.01	0.27		0.01	c0.39	
v/s Ratio Perm												
v/c Ratio	0.39	0.26			0.45		0.96	0.58		0.95	0.84	
Uniform Delay, d1	23.2	22.8			22.9		27.8	11.1		27.9	13.3	
Progression Factor	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.2	0.7			1.5		160.4	2.9		179.6	9.6	
Delay (s)	24.4	23.6			24.4		188.2	14.0		207.5	23.0	
Level of Service	C	C			C		F	B		F	C	
Approach Delay (s)		23.9			24.4			22.0			27.5	
Approach LOS		C			C			C			C	
Intersection Summary												
HCM Average Control Delay		25.0			HCM Level of Service			C				
HCM Volume to Capacity ratio		0.70										
Actuated Cycle Length (s)		56.5			Sum of lost time (s)			16.0				
Intersection Capacity Utilization		55.3%			ICU Level of Service			B				
Analysis Period (min)		15										

c Critical Lane Group

Existing PM

5: Powell Street & San Pablo Ave

Emery Station

9/9/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	107	534	100	78	338	54	143	1015	108	137	932	79
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Flt	1.00	0.98		1.00	0.98		1.00	0.99		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3456		1770	3466		1770	3488		1770	3498	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	3456		1770	3466		1770	3488		1770	3498	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.91	0.91	0.91	0.96	0.96	0.96
Adj. Flow (vph)	119	593	111	87	376	60	157	1115	119	143	971	82
RTOR Reduction (vph)	0	15	0	0	0	0	0	8	0	0	6	0
Lane Group Flow (vph)	119	689	0	87	436	0	157	1226	0	143	1047	0
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	10.7	24.5		8.5	22.3		11.6	39.8		11.2	39.4	
Effective Green, g (s)	10.7	24.5		8.5	22.3		11.6	39.8		11.2	39.4	
Actuated g/C Ratio	0.11	0.24		0.08	0.22		0.12	0.40		0.11	0.39	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	189	847		150	773		205	1388		198	1378	
v/s Ratio Prot	c0.07	c0.20		0.05	0.13		c0.09	c0.35		0.08	0.30	
v/s Ratio Perm												
v/c Ratio	0.63	0.81		0.58	0.56		0.77	0.88		0.72	0.76	
Uniform Delay, d1	42.8	35.6		44.0	34.5		42.9	27.9		42.9	26.2	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	6.4	6.0		5.4	0.9		15.6	8.5		12.2	4.0	
Delay (s)	49.2	41.6		49.4	35.5		58.5	36.4		55.1	30.2	
Level of Service	D	D		D	D		E	D		E	C	
Approach Delay (s)		42.7			37.8			38.9			33.2	
Approach LOS		D			D			D			C	
Intersection Summary												
HCM Average Control Delay		37.8			HCM Level of Service			D				
HCM Volume to Capacity ratio		0.76										
Actuated Cycle Length (s)		100.0			Sum of lost time (s)			8.0				
Intersection Capacity Utilization		74.7%			ICU Level of Service			D				
Analysis Period (min)		15										
c Critical Lane Group												

Existing PM

6: 40th Street & Hollis Street

Emery Station

9/9/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	38	601	87	125	508	150	85	164	104	121	295	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Flt	1.00	0.98		1.00	0.97		1.00	1.00		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		1.00	0.95	
Satd. Flow (prot)	1770	3472		1770	3418		1770	1863		1583	1770	1837
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		1.00	0.95	1.00
Satd. Flow (perm)	1770	3472		1770	3418		1770	1863		1583	1770	1837
Peak-hour factor, PHF	0.90	0.90	0.90	0.94	0.94	0.94	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	42	668	97	133	540	160	94	182	116	134	328	33
RTOR Reduction (vph)	0	10	0	0	22	0	0	0	90	0	4	0
Lane Group Flow (vph)	42	755	0	133	678	0	94	182	26	134	357	0
Bus Blockages (#/hr)	0	0	0	0	0	5	0	0	0	0	0	0
Turn Type	Prot			Prot			Prot		Perm	Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases									2			
Actuated Green, G (s)	5.4	39.1		11.4	45.1		8.7	22.5	22.5	11.0	24.8	
Effective Green, g (s)	5.4	39.1		11.4	45.1		8.7	22.5	22.5	11.0	24.8	
Actuated g/C Ratio	0.05	0.39		0.11	0.45		0.09	0.22	0.22	0.11	0.25	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	96	1358		202	1542		154	419	356	195	456	
v/s Ratio Prot	0.02	c0.22		c0.08	0.20		0.05	0.10		c0.08	c0.19	
v/s Ratio Perm									0.02			
v/c Ratio	0.44	0.56		0.66	0.44		0.61	0.43	0.07	0.69	0.78	
Uniform Delay, d1	45.8	23.7		42.4	18.8		44.0	33.3	30.5	42.8	35.1	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	3.2	1.6		7.5	0.9		7.0	0.7	0.1	9.6	8.6	
Delay (s)	49.0	25.3		50.0	19.7		51.0	34.0	30.6	52.5	43.7	
Level of Service	D	C		D	B		D	C	C	D	D	
Approach Delay (s)		26.6			24.5			37.1			46.0	
Approach LOS		C			C			D			D	
Intersection Summary												
HCM Average Control Delay		31.3			HCM Level of Service			C				
HCM Volume to Capacity ratio		0.63										
Actuated Cycle Length (s)		100.0			Sum of lost time (s)			12.0				
Intersection Capacity Utilization		61.7%			ICU Level of Service			B				
Analysis Period (min)		15										
c Critical Lane Group												

Existing PM

7: Ashby Ave & Seventh Street

Emery Station

9/9/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	231	600	153	86	811	32	215	445	106	133	279	526
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	1.00	1.00
Frt	1.00	0.97		1.00	0.99		1.00	0.97		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	3431		1770	3519		1770	3437		1770	1863	1583
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1770	3431		1770	3519		1770	3437		1770	1863	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.94	0.94	0.94	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	243	632	161	91	863	34	239	494	118	148	310	584
RTOR Reduction (vph)	0	18	0	0	2	0	0	20	0	0	0	56
Lane Group Flow (vph)	243	775	0	91	895	0	239	592	0	148	310	528
Turn Type	Prot			Prot			Split			Split		pm+ov
Protected Phases	7	4		3	8		2	2		6	6	7
Permitted Phases												6
Actuated Green, G (s)	19.7	32.1		8.6	21.0		17.9	17.9		16.1	16.1	35.8
Effective Green, g (s)	19.7	32.1		8.6	21.0		17.9	17.9		16.1	16.1	35.8
Actuated g/C Ratio	0.22	0.35		0.09	0.23		0.20	0.20		0.18	0.18	0.39
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	384	1214		168	815		349	678		314	331	695
v/s Ratio Prot	0.14	0.23		0.05	0.25		0.14	0.17		0.08	0.17	0.17
v/s Ratio Perm												0.17
v/c Ratio	0.63	0.64		0.54	1.10		0.68	0.87		0.47	0.94	0.76
Uniform Delay, d1	32.2	24.5		39.2	34.9		33.8	35.3		33.5	36.8	23.7
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	3.4	1.1		3.5	61.7		5.5	12.0		1.1	33.0	4.9
Delay (s)	35.6	25.6		42.7	96.5		39.3	47.3		34.6	69.8	28.6
Level of Service	D	C		D	F		D	D		C	E	C
Approach Delay (s)		27.9			91.6			45.0			41.7	
Approach LOS		C			F			D			D	

Intersection Summary

HCM Average Control Delay	51.4	HCM Level of Service	D
HCM Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	90.7	Sum of lost time (s)	12.0
Intersection Capacity Utilization	77.9%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Existing PM

8: Powell Street & Christie Ave

Emery Station

9/9/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	364	566	728	249	916	144	193	45	126	180	251	814
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0
Lane Util. Factor	0.97	0.91	0.91	1.00	0.95	1.00	0.95	0.95	1.00		1.00	0.88
Frt	1.00	0.95	0.85	1.00	1.00	0.85	1.00	1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.97	1.00		0.98	1.00
Satd. Flow (prot)	3433	3204	1441	1770	3539	1583	1681	1716	1583		1825	2787
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.97	1.00		0.98	1.00
Satd. Flow (perm)	3433	3204	1441	1770	3539	1583	1681	1716	1583		1825	2787
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.95	0.95	0.95
Adj. Flow (vph)	404	629	809	277	1018	160	214	50	140	189	264	857
RTOR Reduction (vph)	0	70	158	0	0	76	0	0	121	0	0	79
Lane Group Flow (vph)	404	923	287	277	1018	84	131	133	19	0	453	778
Turn Type	Prot		pm+ov	Prot		Perm	Split		Perm	Split		pm+ov
Protected Phases	7	4	2	3	8		2	2		6	6	7
Permitted Phases			4			8			2			6
Actuated Green, G (s)	18.9	22.8	36.1	21.0	24.9	24.9	13.3	13.3	13.3		26.9	45.8
Effective Green, g (s)	18.9	22.8	36.1	21.0	24.9	24.9	13.3	13.3	13.3		26.9	45.8
Actuated g/C Ratio	0.19	0.23	0.36	0.21	0.25	0.25	0.13	0.13	0.13		0.27	0.46
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	649	731	520	372	881	394	224	228	211		491	1388
v/s Ratio Prot	0.12	0.29	0.07	0.16	0.29		0.08	0.08			0.25	0.11
v/s Ratio Perm			0.13			0.05			0.01			0.17
v/c Ratio	0.62	1.26	0.55	0.74	1.16	0.21	0.58	0.58	0.09		0.92	0.56
Uniform Delay, d1	37.3	38.6	25.5	37.0	37.5	29.8	40.8	40.7	38.0		35.5	19.8
Progression Factor	0.82	0.61	1.29	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	1.5	126.8	1.0	7.9	82.8	1.2	3.9	3.8	0.2		23.0	0.5
Delay (s)	31.9	150.5	33.9	44.9	120.4	31.0	44.6	44.5	38.2		58.5	20.3
Level of Service	C	F	C	D	F	C	D	D	D		E	C
Approach Delay (s)		96.3			96.2			42.4			33.5	
Approach LOS		F			F			D			C	

Intersection Summary

HCM Average Control Delay	75.5	HCM Level of Service	E
HCM Volume to Capacity ratio	1.04		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	80.2%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Existing PM

9: Powell St & I-80E on-ramp

Emery Station

9/9/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	135	932	0	0	1403	453	543	160	778	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0	4.0	4.0	4.0	4.0			
Lane Util. Factor	1.00	0.91			0.91	1.00	0.95	0.91	0.95			
Flt	1.00	1.00			1.00	0.85	1.00	0.91	0.85			
Flt Protected	0.95	1.00			1.00	1.00	0.95	0.99	1.00			
Satd. Flow (prot)	1770	5085			5085	1583	1681	1540	1504			
Flt Permitted	0.95	1.00			1.00	1.00	0.95	0.99	1.00			
Satd. Flow (perm)	1770	5085			5085	1583	1681	1540	1504			
Peak-hour factor, PHF	0.90	0.90	0.90	0.92	0.92	0.92	0.90	0.90	0.90	0.92	0.92	0.92
Adj. Flow (vph)	150	1036	0	0	1525	492	603	178	864	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	256	0	50	61	0	0	0
Lane Group Flow (vph)	150	1036	0	0	1525	236	543	516	475	0	0	0
Turn Type	Prot				Perm	Split		Perm				
Protected Phases	7	4			8		2	2				
Permitted Phases						8			2			
Actuated Green, G (s)	4.6	56.6			48.0	48.0	35.4	35.4	35.4			
Effective Green, g (s)	4.6	56.6			48.0	48.0	35.4	35.4	35.4			
Actuated g/C Ratio	0.05	0.57			0.48	0.48	0.35	0.35	0.35			
Clearance Time (s)	4.0	4.0			4.0	4.0	4.0	4.0	4.0			
Vehicle Extension (s)	3.0	3.0			3.0	3.0	3.0	3.0	3.0			
Lane Grp Cap (vph)	81	2878			2441	760	595	545	532			
v/s Ratio Prot	c0.08	0.20			c0.30		0.32	c0.33				
v/s Ratio Perm						0.15			0.32			
v/c Ratio	1.85	0.36			0.62	0.31	0.91	0.95	0.89			
Uniform Delay, d1	47.7	11.8			19.3	15.9	30.8	31.4	30.5			
Progression Factor	0.81	2.17			0.76	0.71	1.00	1.00	1.00			
Incremental Delay, d2	423.5	0.3			0.6	0.5	18.4	25.5	17.2			
Delay (s)	462.3	26.0			15.3	11.8	49.2	56.9	47.7			
Level of Service	F	C			B	B	D	E	D			
Approach Delay (s)		81.2			14.5			51.4			0.0	
Approach LOS		F			B			D			A	
Intersection Summary												
HCM Average Control Delay			43.3		HCM Level of Service				D			
HCM Volume to Capacity ratio			0.82									
Actuated Cycle Length (s)			100.0		Sum of lost time (s)				12.0			
Intersection Capacity Utilization			72.7%		ICU Level of Service				C			
Analysis Period (min)			15									
c Critical Lane Group												

Existing PM

10: Powell St & Frontage Rd

Emery Station

9/9/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	133	409	440	0	445	1519	0	0	0	592	0	205
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0	4.0				4.0		4.0
Lane Util. Factor	1.00	0.95			0.91	0.91				0.97		1.00
Flt	1.00	0.92			0.91	0.85				1.00		0.85
Flt Protected	0.95	1.00			1.00	1.00				0.95		1.00
Satd. Flow (prot)	1770	3264			3069	1441				3433		1583
Flt Permitted	0.95	1.00			1.00	1.00				0.95		1.00
Satd. Flow (perm)	1770	3264			3069	1441				3433		1583
Peak-hour factor, PHF	0.96	0.96	0.96	0.90	0.90	0.90	0.92	0.92	0.92	0.90	0.90	0.90
Adj. Flow (vph)	139	426	458	0	494	1688	0	0	0	658	0	228
RTOR Reduction (vph)	0	150	0	0	261	0	0	0	0	0	0	169
Lane Group Flow (vph)	139	734	0	0	1077	844	0	0	0	658	0	59
Turn Type	Prot					Free				custom		custom
Protected Phases	7	4			8					6		6
Permitted Phases						Free				6		6
Actuated Green, G (s)	16.0	66.0			46.0	100.0				26.0		26.0
Effective Green, g (s)	16.0	66.0			46.0	100.0				26.0		26.0
Actuated g/C Ratio	0.16	0.66			0.46	1.00				0.26		0.26
Clearance Time (s)	4.0	4.0			4.0					4.0		4.0
Vehicle Extension (s)	3.0	3.0			3.0					3.0		3.0
Lane Grp Cap (vph)	283	2154			1412	1441				893		412
v/s Ratio Prot	0.08	0.22			c0.35					c0.19		0.04
v/s Ratio Perm						c0.59						
v/c Ratio	0.49	0.34			0.88dr	0.59				0.74		0.14
Uniform Delay, d1	38.3	7.5			22.5	0.0				33.9		28.4
Progression Factor	1.00	1.00			1.04	1.00				1.00		1.00
Incremental Delay, d2	1.3	0.4			2.9	1.3				3.2		0.2
Delay (s)	39.6	7.9			26.2	1.3				37.1		28.6
Level of Service	D	A			C	A				D		C
Approach Delay (s)		12.2			16.5			0.0			34.9	
Approach LOS		B			B			A			C	
Intersection Summary												
HCM Average Control Delay			19.4			HCM Level of Service			B			
HCM Volume to Capacity ratio			0.72									
Actuated Cycle Length (s)			100.0			Sum of lost time (s)			8.0			
Intersection Capacity Utilization			62.8%			ICU Level of Service			B			
Analysis Period (min)			15									
dr Defacto Right Lane. Recode with 1 though lane as a right lane.												
c Critical Lane Group												

Existing PM

11: I-80 off-ramp & Frontage Rd

Emery Station

9/9/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	78	229	74	379	13	0	19	403	1330	254	404	39
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95		1.00	0.95	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00	1.00	0.95	0.96		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	1863	1583	1681	1691		1770	3539	1583	1770	1838	
Flt Permitted	0.95	1.00	1.00	0.95	0.96		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1770	1863	1583	1681	1691		1770	3539	1583	1770	1838	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.93	0.93	0.93	0.91	0.91	0.91
Adj. Flow (vph)	87	254	82	421	14	0	20	433	1430	279	444	43
RTOR Reduction (vph)	0	0	65	0	0	0	0	0	0	0	3	0
Lane Group Flow (vph)	87	254	17	219	216	0	20	433	1430	279	484	0
Turn Type	Split	Perm		Split			Prot		Free	Prot		
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases			4						Free			
Actuated Green, G (s)	15.9	15.9	15.9	15.6	15.6		2.6	17.7	77.7	12.5	27.6	
Effective Green, g (s)	15.9	15.9	15.9	15.6	15.6		2.6	17.7	77.7	12.5	27.6	
Actuated g/C Ratio	0.20	0.20	0.20	0.20	0.20		0.03	0.23	1.00	0.16	0.36	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	362	381	324	337	340		59	806	1583	285	653	
v/s Ratio Prot	0.05	0.14		0.13	0.13		0.01	0.12		0.16	0.26	
v/s Ratio Perm			0.01						c0.90			
v/c Ratio	0.24	0.67	0.05	0.65	0.64		0.34	0.54	0.90	0.98	0.74	
Uniform Delay, d1	25.8	28.5	24.8	28.5	28.4		36.7	26.4	0.0	32.5	21.9	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.3	4.4	0.1	4.3	3.9		3.4	0.7	8.8	46.9	4.5	
Delay (s)	26.2	32.8	24.9	32.8	32.3		40.1	27.1	8.8	79.4	26.5	
Level of Service	C	C	C	C	C		D	C	A	E	C	
Approach Delay (s)		29.9			32.6			13.4			45.8	
Approach LOS		C			C			B			D	

Intersection Summary

HCM Average Control Delay	24.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	77.7	Sum of lost time (s)	0.0
Intersection Capacity Utilization	63.2%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Existing PM

12: 59th St & Horton St

Emery Station

9/9/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	9	44	1	37	13	40	25	133	186	106	57	4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	10	48	1	40	14	43	27	145	202	115	62	4
Direction, Lane #	EB 1	WB 1	WB 2	NB 1	SB 1							
Volume Total (vph)	59	40	58	374	182							
Volume Left (vph)	10	40	0	27	115							
Volume Right (vph)	1	0	43	202	4							
Hadj (s)	0.06	0.53	-0.49	-0.28	0.15							
Departure Headway (s)	5.5	6.4	5.4	4.3	4.9							
Degree Utilization, x	0.09	0.07	0.09	0.45	0.25							
Capacity (veh/h)	580	511	604	810	696							
Control Delay (s)	9.1	8.7	7.7	10.7	9.5							
Approach Delay (s)	9.1	8.1		10.7	9.5							
Approach LOS	A	A		B	A							
Intersection Summary												
Delay				9.9								
HCM Level of Service				A								
Intersection Capacity Utilization			48.4%		ICU Level of Service					A		
Analysis Period (min)			15									

Existing PM
13: 59th St &

Emery Station
9/9/2009

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↗			↖	↗	↖
Sign Control	Stop			Stop	Stop	
Volume (vph)	121	218	49	66	23	45
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	132	237	53	72	25	49
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total (vph)	368	125	74			
Volume Left (vph)	0	53	25			
Volume Right (vph)	237	0	49			
Hadj (s)	-0.35	0.12	-0.30			
Departure Headway (s)	3.9	4.5	4.6			
Degree Utilization, x	0.40	0.16	0.09			
Capacity (veh/h)	912	758	705			
Control Delay (s)	9.4	8.4	8.1			
Approach Delay (s)	9.4	8.4	8.1			
Approach LOS	A	A	A			
Intersection Summary						
Delay			9.0			
HCM Level of Service			A			
Intersection Capacity Utilization			40.0%	ICU Level of Service		A
Analysis Period (min)			15			

Existing PM
14: 62nd St & Horton St

Emery Station
9/9/2009

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↗			↖	↗	↖
Volume (veh/h)	20	43	24	91	95	118
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	22	47	26	99	103	128
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			68		196	45
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			68		196	45
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		87	87
cM capacity (veh/h)			1533		779	1025
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	68	125	232			
Volume Left	0	26	103			
Volume Right	47	0	128			
cSH	1700	1533	898			
Volume to Capacity	0.04	0.02	0.26			
Queue Length 95th (ft)	0	1	26			
Control Delay (s)	0.0	1.6	10.4			
Lane LOS		A	B			
Approach Delay (s)	0.0	1.6	10.4			
Approach LOS			B			
Intersection Summary						
Average Delay			6.1			
Intersection Capacity Utilization			32.0%	ICU Level of Service		A
Analysis Period (min)			15			

Existing PM

15: 62nd St & Hollis St

Emery Station

9/9/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Volume (veh/h)	58	71	180	11	14	17	36	408	5	5	376	46
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	63	77	196	12	15	18	39	443	5	5	409	50
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)								498				
pX, platoon unblocked	0.86	0.86		0.86	0.86	0.86				0.86		
vC, conflicting volume	995	972	434	1203	994	446	459			449		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	912	885	434	1154	911	273	459			276		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	68	67	69	84	93	97	96			100		
cM capacity (veh/h)	195	234	622	74	226	658	1102			1105		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	336	46	488	464								
Volume Left	63	12	39	5								
Volume Right	196	18	5	50								
cSH	347	178	1102	1105								
Volume to Capacity	0.97	0.26	0.04	0.00								
Queue Length 95th (ft)	263	24	3	0								
Control Delay (s)	75.5	32.1	1.0	0.2								
Lane LOS	F	D	A	A								
Approach Delay (s)	75.5	32.1	1.0	0.2								
Approach LOS	F	D										
Intersection Summary												
Average Delay			20.5									
Intersection Capacity Utilization			72.8%			ICU Level of Service			C			
Analysis Period (min)			15									

Existing PM

16: Stanford Ave & Horton St

Emery Station

9/9/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	7	19	15	37	7	27	5	108	53	23	94	5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	8	21	16	40	8	29	5	117	58	25	102	5
Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	SB 1						
Volume Total (vph)	45	44	33	5	175	133						
Volume Left (vph)	8	40	0	5	0	25						
Volume Right (vph)	16	0	29	0	58	5						
Hadj (s)	-0.15	0.49	-0.59	0.53	-0.20	0.05						
Departure Headway (s)	5.2	5.8	4.7	5.5	4.8	5.1						
Degree Utilization, x	0.06	0.07	0.04	0.01	0.23	0.19						
Capacity (veh/h)	637	580	707	634	732	681						
Control Delay (s)	8.6	8.1	6.8	7.3	8.0	9.3						
Approach Delay (s)	8.6	7.5		8.0		9.3						
Approach LOS	A	A		A		A						
Intersection Summary												
Delay			8.3									
HCM Level of Service			A									
Intersection Capacity Utilization			34.2%		ICU Level of Service				A			
Analysis Period (min)			15									

Existing PM
17: Doyle Street &

Emery Station
9/9/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	4	63	12	5	37	9	14	25	5	10	34	11
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	4	68	13	5	40	10	15	27	5	11	37	12
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	86	55	48	60								
Volume Left (vph)	4	5	15	11								
Volume Right (vph)	13	10	5	12								
Hadj (s)	-0.05	-0.05	0.03	-0.05								
Departure Headway (s)	4.1	4.2	4.3	4.2								
Degree Utilization, x	0.10	0.06	0.06	0.07								
Capacity (veh/h)	840	834	799	822								
Control Delay (s)	7.6	7.5	7.6	7.5								
Approach Delay (s)	7.6	7.5	7.6	7.5								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay	7.5											
HCM Level of Service	A											
Intersection Capacity Utilization	15.7%			ICU Level of Service			A					
Analysis Period (min)	15											

Existing PM
18: San Pablo Ave &

Emery Station
9/9/2009

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	65	0	905	1021	33
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	71	0	984	1110	36
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)				455		
pX, platoon unblocked	0.73					
vC, conflicting volume	1620	573	1146			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1107	573	1146			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	85	100			
cM capacity (veh/h)	149	463	606			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	
Volume Total	71	492	492	740	406	
Volume Left	0	0	0	0	0	
Volume Right	71	0	0	0	36	
cSH	463	1700	1700	1700	1700	
Volume to Capacity	0.15	0.29	0.29	0.44	0.24	
Queue Length 95th (ft)	13	0	0	0	0	
Control Delay (s)	14.2	0.0	0.0	0.0	0.0	
Lane LOS	B					
Approach Delay (s)	14.2	0.0		0.0		
Approach LOS	B					
Intersection Summary						
Average Delay			0.5			
Intersection Capacity Utilization			40.0%	ICU Level of Service		A
Analysis Period (min)			15			

TECHNICAL APPENDIX B (CONTINUED)

LEVEL OF SERVICE CALCULATION WORKSHEETS

EXISTING PLUS PROJECT PLUS MITIGATIONS
PM PEAK HOUR CONDITIONS

8: Powell Street & Christie Ave

Emery Station

9/9/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	364	566	728	249	916	144	193	45	126	180	251	814
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.91	0.91	1.00	0.95	1.00	0.95	0.95	1.00	1.00	0.88	0.88
Frt	1.00	0.95	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.85	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.97	1.00	0.98	1.00	1.00
Satd. Flow (prot)	3433	3204	1441	1770	3539	1583	1681	1716	1583	1825	2787	2787
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.97	1.00	0.98	1.00	1.00
Satd. Flow (perm)	3433	3204	1441	1770	3539	1583	1681	1716	1583	1825	2787	2787
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.95	0.95	0.95
Adj. Flow (vph)	404	629	809	277	1018	160	214	50	140	189	264	857
RTOR Reduction (vph)	0	70	151	0	0	79	0	0	129	0	0	13
Lane Group Flow (vph)	404	923	294	277	1018	81	131	133	11	0	453	844
Turn Type	Prot	pm+ov		Prot	Perm		Split	Perm		Split	pm+ov	
Protected Phases	7	4	2	3	8		2	2		6	6	7
Permitted Phases			4			8			2			6
Actuated Green, G (s)	21.0	31.0	39.0	19.1	29.1	29.1	8.0	8.0	8.0	25.9	46.9	46.9
Effective Green, g (s)	21.0	31.0	39.0	19.1	29.1	29.1	8.0	8.0	8.0	25.9	46.9	46.9
Actuated g/C Ratio	0.21	0.31	0.39	0.19	0.29	0.29	0.08	0.08	0.08	0.26	0.47	0.47
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	721	993	620	338	1030	461	134	137	127	473	1307	1307
v/s Ratio Prot	0.12	c0.29	0.04	0.16	c0.29		c0.08	0.08		c0.25	0.14	0.14
v/s Ratio Perm			0.17			0.05			0.01		0.17	0.17
v/c Ratio	0.56	0.93	0.47	0.82	0.99	0.17	0.98	0.97	0.09	0.96	0.65	0.65
Uniform Delay, d1	35.4	33.4	22.8	38.8	35.3	26.5	45.9	45.9	42.6	36.5	20.2	20.2
Progression Factor	0.58	0.50	0.55	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.8	13.7	0.5	14.3	25.4	0.8	70.1	67.6	0.3	30.5	1.1	1.1
Delay (s)	21.3	30.3	13.1	53.1	60.7	27.3	116.0	113.5	42.9	67.0	21.3	21.3
Level of Service	C	C	B	D	E	C	F	F	D	E	C	C
Approach Delay (s)		24.2			55.6			89.9		37.1		
Approach LOS		C			E			F		D		
Intersection Summary												
HCM Average Control Delay			42.0		HCM Level of Service					D		
HCM Volume to Capacity ratio			0.95									
Actuated Cycle Length (s)			100.0		Sum of lost time (s)				12.0			
Intersection Capacity Utilization			80.2%		ICU Level of Service				D			
Analysis Period (min)			15									
c Critical Lane Group												

15: 62nd St & Hollis St

Emery Station

9/9/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	58	71	137	11	19	17	36	408	1900	5	5	373
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0				4.0
Lane Util. Factor		1.00			1.00			1.00				1.00
Frt		0.93			0.95			1.00				0.98
Flt Protected		0.99			0.99			1.00				1.00
Satd. Flow (prot)		1714			1753			1853				1833
Flt Permitted		0.91			0.92			0.95				1.00
Satd. Flow (perm)		1578			1637			1761				1825
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	63	77	149	12	21	18	39	443	5	5	405	53
RTOR Reduction (vph)	0	115	0	0	14	0	0	1	0	0	9	0
Lane Group Flow (vph)	0	174	0	0	37	0	0	486	0	0	454	0
Turn Type	Perm		Perm		Perm		Perm		Perm		Perm	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		7.3			7.3			16.3			16.3	
Effective Green, g (s)		7.3			7.3			16.3			16.3	
Actuated g/C Ratio		0.23			0.23			0.52			0.52	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		365			378			908			941	
v/s Ratio Prot												
v/s Ratio Perm		c0.11			0.02			c0.28			0.25	
v/c Ratio		0.48			0.10			0.54			0.48	
Uniform Delay, d1		10.5			9.6			5.1			4.9	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		1.0			0.1			0.6			0.4	
Delay (s)		11.5			9.7			5.7			5.3	
Level of Service		B			A			A			A	
Approach Delay (s)		11.5			9.7			5.7			5.3	
Approach LOS		B			A			A			A	
Intersection Summary												
HCM Average Control Delay			7.0		HCM Level of Service					A		
HCM Volume to Capacity ratio			0.52									
Actuated Cycle Length (s)			31.6		Sum of lost time (s)				8.0			
Intersection Capacity Utilization			71.0%		ICU Level of Service				C			
Analysis Period (min)			15									
c Critical Lane Group												

TECHNICAL APPENDIX B (CONTINUED)

LEVEL OF SERVICE CALCULATION WORKSHEETS

CUMULATIVE PLUS PROJECT (ACCESS OPTION 1)
PM PEAK HOUR CONDITIONS

2: Powell Street & Doyle Street

Emery Station

11/3/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔↔			↔↔			↔↔			↔	
Volume (veh/h)	46	877	10	37	702	21	0	9	32	45	28	77
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.90	0.90	0.90	0.95	0.95	0.95	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	51	974	11	39	739	22	0	10	36	50	31	86
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)		525										
pX, platoon unblocked				0.79			0.79	0.79	0.79	0.79	0.79	
vC, conflicting volume	761			986			1631	1921	493	1458	1916	381
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	761			439			1259	1628	0	1039	1621	381
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	94			96			100	86	96	56	57	86
cM capacity (veh/h)	847			879			53	71	853	115	72	617
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1						
Volume Total	538	498	408	392	46	167						
Volume Left	51	0	39	0	0	50						
Volume Right	0	11	0	22	36	86						
cSH	847	1700	879	1700	250	166						
Volume to Capacity	0.06	0.29	0.04	0.23	0.18	1.01						
Queue Length 95th (ft)	5	0	3	0	16	199						
Control Delay (s)	1.6	0.0	1.4	0.0	22.6	127.4						
Lane LOS	A		A		C	F						
Approach Delay (s)	0.8		0.7		22.6	127.4						
Approach LOS					C	F						
Intersection Summary												
Average Delay			11.6									
Intersection Capacity Utilization			72.4%		ICU Level of Service				C			
Analysis Period (min)			15									

3: Stanford Ave & Hollis St.

Emery Station

11/3/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔		↔	↔			↔↔			↔↔	↔
Volume (vph)	152	68	62	30	19	30	22	779	47	10	611	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0			4.0			4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00			0.95			1.00	1.00
Frt	1.00	0.93		1.00	0.91			0.99			1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00			1.00			1.00	1.00
Satd. Flow (prot)	1770	1730		1770	1692			3505			1824	1552
Flt Permitted	0.72	1.00		0.66	1.00			0.93			0.98	1.00
Satd. Flow (perm)	1345	1730		1238	1692			3280			1796	1552
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	169	76	69	33	21	33	24	866	52	11	679	24
RTOR Reduction (vph)	0	52	0	0	25	0	0	7	0	0	0	11
Lane Group Flow (vph)	169	93	0	33	29	0	0	935	0	0	690	13
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	5	5
Turn Type	Perm			Perm			Perm			Perm		Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		6
Actuated Green, G (s)	9.3	9.3		9.3	9.3			21.2			21.2	21.2
Effective Green, g (s)	9.3	9.3		9.3	9.3			21.2			21.2	21.2
Actuated g/C Ratio	0.24	0.24		0.24	0.24			0.55			0.55	0.55
Clearance Time (s)	4.0	4.0		4.0	4.0			4.0			4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	3.0
Lane Grp Cap (vph)	325	418		299	409			1806			989	855
v/s Ratio Prot		0.05			0.02							
v/s Ratio Perm	c0.13			0.03				0.29			c0.38	0.01
v/c Ratio	0.52	0.22		0.11	0.07			0.52			0.70	0.02
Uniform Delay, d1	12.7	11.7		11.4	11.3			5.4			6.3	3.9
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	1.00
Incremental Delay, d2	1.5	0.3		0.2	0.1			1.1			4.1	0.0
Delay (s)	14.2	12.0		11.5	11.3			6.5			10.4	4.0
Level of Service	B	B		B	B			A			B	A
Approach Delay (s)		13.2			11.4			6.5			10.2	
Approach LOS		B			B			A			B	
Intersection Summary												
HCM Average Control Delay			9.0		HCM Level of Service			A				
HCM Volume to Capacity ratio			0.64									
Actuated Cycle Length (s)			38.5		Sum of lost time (s)			8.0				
Intersection Capacity Utilization			61.9%		ICU Level of Service			B				
Analysis Period (min)			15									

c Critical Lane Group

12: 59th St & Horton St

Emery Station
11/3/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	9	44	1	45	16	39	33	183	273	195	87	5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	10	48	1	49	17	42	36	199	297	212	95	5
Direction, Lane #	EB 1	WB 1	WB 2	NB 1	SB 1							
Volume Total (vph)	59	49	60	532	312							
Volume Left (vph)	10	49	0	36	212							
Volume Right (vph)	1	0	42	297	5							
Hadj (s)	0.06	0.53	-0.46	-0.29	0.16							
Departure Headway (s)	6.4	7.2	6.2	4.6	5.3							
Degree Utilization, x	0.10	0.10	0.10	0.68	0.46							
Capacity (veh/h)	491	443	509	760	656							
Control Delay (s)	10.1	9.8	8.7	16.7	12.6							
Approach Delay (s)	10.1	9.2		16.7	12.6							
Approach LOS	B	A		C	B							
Intersection Summary												
Delay				14.2								
HCM Level of Service				B								
Intersection Capacity Utilization	63.4%			ICU Level of Service					B			
Analysis Period (min)	15											

13: 59th St &

Emery Station
11/3/2009

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (vph)	153	311	12	71	32	66
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	166	338	13	77	35	72
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total (vph)	504	90	107			
Volume Left (vph)	0	13	35			
Volume Right (vph)	338	0	72			
Hadj (s)	-0.37	0.06	-0.30			
Departure Headway (s)	3.9	4.7	4.8			
Degree Utilization, x	0.55	0.12	0.14			
Capacity (veh/h)	903	721	660			
Control Delay (s)	11.6	8.4	8.6			
Approach Delay (s)	11.6	8.4	8.6			
Approach LOS	B	A	A			
Intersection Summary						
Delay			10.7			
HCM Level of Service			B			
Intersection Capacity Utilization			39.7%	ICU Level of Service	A	
Analysis Period (min)			15			

14: 62nd St & Horton St

Emery Station
11/3/2009

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔			↔	↔	
Volume (veh/h)	26	55	80	117	139	104
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	28	60	87	127	151	113
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			88		359	58
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			88		359	58
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			94		75	89
cM capacity (veh/h)			1508		603	1008
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	88	214	264			
Volume Left	0	87	151			
Volume Right	60	0	113			
cSH	1700	1508	728			
Volume to Capacity	0.05	0.06	0.36			
Queue Length 95th (ft)	0	5	42			
Control Delay (s)	0.0	3.3	12.7			
Lane LOS		A	B			
Approach Delay (s)	0.0	3.3	12.7			
Approach LOS			B			
Intersection Summary						
Average Delay		7.2				
Intersection Capacity Utilization		38.0%		ICU Level of Service	A	
Analysis Period (min)		15				

15: 62nd St & Hollis St

Emery Station
11/3/2009

	↖	→	↘	↙	←	↖	↗	↘	↙	↖	↗	↘	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations		↕			↕			↕			↕		
Volume (veh/h)	70	76	146	14	23	22	53	604	7	7	552	70	
Sign Control		Stop			Stop			Free			Free		
Grade		0%			0%			0%			0%		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	
Hourly flow rate (vph)	76	83	159	15	25	24	58	657	8	8	600	76	
Pedestrians													
Lane Width (ft)													
Walking Speed (ft/s)													
Percent Blockage													
Right turn flare (veh)													
Median type								None			None		
Median storage (veh)													
Upstream signal (ft)								498					
pX, platoon unblocked	0.65	0.65		0.65	0.65	0.65				0.65			
vC, conflicting volume	1465	1433	638	1629	1467	660	676			664			
vC1, stage 1 conf vol													
vC2, stage 2 conf vol													
vCu, unblocked vol	1446	1396	638	1699	1449	200	676			206			
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1			
tC, 2 stage (s)													
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2			
p0 queue free %	0	2	67	0	68	96	94			99			
cM capacity (veh/h)	48	85	477	3	79	543	915			882			
Direction, Lane #	EB 1	WB 1	NB 1	SB 1									
Volume Total	317	64	722	684									
Volume Left	76	15	58	8									
Volume Right	159	24	8	76									
cSH	110	12	915	882									
Volume to Capacity	2.88	5.28	0.06	0.01									
Queue Length 95th (ft)	747	Err	5	1									
Control Delay (s)	932.1	Err	1.6	0.2									
Lane LOS	F	F	A	A									
Approach Delay (s)	932.1	Err	1.6	0.2									
Approach LOS	F	F											
Intersection Summary													
Average Delay			525.1										
Intersection Capacity Utilization			95.0%		ICU Level of Service				F				
Analysis Period (min)			15										

16: Stanford Ave & Horton St

Emery Station
11/3/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	9	24	19	48	9	35	7	158	78	34	139	7
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	10	26	21	52	10	38	8	172	85	37	151	8
Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	SB 1						
Volume Total (vph)	57	57	43	8	257	196						
Volume Left (vph)	10	52	0	8	0	37						
Volume Right (vph)	21	0	38	0	85	8						
Hadj (s)	-0.15	0.49	-0.59	0.53	-0.20	0.05						
Departure Headway (s)	5.7	6.2	5.2	5.7	5.0	5.3						
Degree Utilization, x	0.09	0.10	0.06	0.01	0.35	0.29						
Capacity (veh/h)	574	531	636	609	701	649						
Control Delay (s)	9.2	8.7	7.3	7.6	9.4	10.5						
Approach Delay (s)	9.2	8.1		9.4		10.5						
Approach LOS	A	A		A		B						
Intersection Summary												
Delay			9.5									
HCM Level of Service			A									
Intersection Capacity Utilization			42.3%		ICU Level of Service		A					
Analysis Period (min)			15									

17: Doyle Street &

Emery Station
11/3/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	5	88	15	6	41	12	21	37	7	15	50	16
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	96	16	7	45	13	23	40	8	16	54	17
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	117	64	71	88								
Volume Left (vph)	5	7	23	16								
Volume Right (vph)	16	13	8	17								
Hadj (s)	-0.04	-0.07	0.03	-0.05								
Departure Headway (s)	4.3	4.3	4.4	4.3								
Degree Utilization, x	0.14	0.08	0.09	0.11								
Capacity (veh/h)	804	785	768	781								
Control Delay (s)	8.0	7.7	7.9	7.9								
Approach Delay (s)	8.0	7.7	7.9	7.9								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay			7.9									
HCM Level of Service			A									
Intersection Capacity Utilization			19.3%		ICU Level of Service		A					
Analysis Period (min)			15									

18: San Pablo Ave &

Emery Station
11/3/2009

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	90	0	1564	1762	47
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	98	0	1700	1915	51
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None	None		
Median storage (veh)						
Upstream signal (ft)			455			
pX, platoon unblocked	0.65					
vC, conflicting volume	2791	983	1966			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2679	983	1966			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	61	100			
cM capacity (veh/h)	12	248	292			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	
Volume Total	98	850	850	1277	689	
Volume Left	0	0	0	0	0	
Volume Right	98	0	0	0	51	
cSH	248	1700	1700	1700	1700	
Volume to Capacity	0.39	0.50	0.50	0.75	0.41	
Queue Length 95th (ft)	45	0	0	0	0	
Control Delay (s)	28.7	0.0	0.0	0.0	0.0	
Lane LOS	D					
Approach Delay (s)	28.7	0.0		0.0		
Approach LOS	D					
Intersection Summary						
Average Delay		0.7				
Intersection Capacity Utilization		62.4%		ICU Level of Service		B
Analysis Period (min)		15				

TECHNICAL APPENDIX B (CONTINUED)

LEVEL OF SERVICE CALCULATION WORKSHEETS

CUMULATIVE PLUS PROJECT (ACCESS OPTION 2)
PM PEAK HOUR CONDITIONS

2: Powell Street & Doyle Street

Emery Station

11/3/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔↔			↔↔			↔↔			↔	
Volume (veh/h)	46	877	10	37	703	21	0	9	32	45	28	77
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.90	0.90	0.90	0.95	0.95	0.95	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	51	974	11	39	740	22	0	10	36	50	31	86
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)		525										
pX, platoon unblocked				0.79			0.79	0.79	0.79	0.79	0.79	
vC, conflicting volume	762			986			1631	1922	493	1459	1917	381
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	762			439			1260	1630	0	1041	1623	381
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	94			96			100	86	96	56	57	86
cM capacity (veh/h)	846			879			53	71	853	114	72	617
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1						
Volume Total	538	498	409	392	46	167						
Volume Left	51	0	39	0	0	50						
Volume Right	0	11	0	22	36	86						
cSH	846	1700	879	1700	250	165						
Volume to Capacity	0.06	0.29	0.04	0.23	0.18	1.01						
Queue Length 95th (ft)	5	0	3	0	16	200						
Control Delay (s)	1.6	0.0	1.4	0.0	22.6	128.2						
Lane LOS	A		A		C	F						
Approach Delay (s)	0.8		0.7		22.6	128.2						
Approach LOS					C	F						
Intersection Summary												
Average Delay			11.6									
Intersection Capacity Utilization			72.4%		ICU Level of Service				C			
Analysis Period (min)			15									

3: Stanford Ave & Hollis St.

Emery Station

11/3/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔		↔	↔			↔↔			↔↔	↔
Volume (vph)	152	68	62	30	19	30	22	779	47	10	613	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0			4.0			4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00			0.95			1.00	1.00
Frt	1.00	0.93		1.00	0.91			0.99			1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00			1.00			1.00	1.00
Satd. Flow (prot)	1770	1730		1770	1692			3505			1824	1552
Flt Permitted	0.72	1.00		0.66	1.00			0.93			0.98	1.00
Satd. Flow (perm)	1345	1730		1238	1692			3280			1796	1552
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	169	76	69	33	21	33	24	866	52	11	681	24
RTOR Reduction (vph)	0	52	0	0	25	0	0	7	0	0	0	11
Lane Group Flow (vph)	169	93	0	33	29	0	0	935	0	0	692	13
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	5	5
Turn Type	Perm			Perm			Perm			Perm		Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		6
Actuated Green, G (s)	9.3	9.3		9.3	9.3			21.2			21.2	21.2
Effective Green, g (s)	9.3	9.3		9.3	9.3			21.2			21.2	21.2
Actuated g/C Ratio	0.24	0.24		0.24	0.24			0.55			0.55	0.55
Clearance Time (s)	4.0	4.0		4.0	4.0			4.0			4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	3.0
Lane Grp Cap (vph)	325	418		299	409			1806			989	855
v/s Ratio Prot		0.05			0.02							
v/s Ratio Perm	c0.13			0.03				0.29			c0.39	0.01
v/c Ratio	0.52	0.22		0.11	0.07			0.52			0.70	0.02
Uniform Delay, d1	12.7	11.7		11.4	11.3			5.4			6.3	3.9
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	1.00
Incremental Delay, d2	1.5	0.3		0.2	0.1			1.1			4.1	0.0
Delay (s)	14.2	12.0		11.5	11.3			6.5			10.4	4.0
Level of Service	B	B		B	B			A			B	A
Approach Delay (s)		13.2			11.4			6.5			10.2	
Approach LOS		B			B			A			B	
Intersection Summary												
HCM Average Control Delay			9.0		HCM Level of Service			A				
HCM Volume to Capacity ratio			0.64									
Actuated Cycle Length (s)			38.5		Sum of lost time (s)			8.0				
Intersection Capacity Utilization			62.0%		ICU Level of Service			B				
Analysis Period (min)			15									
c Critical Lane Group												

12: 59th St & Horton St

Emery Station
11/3/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	9	44	1	47	16	46	33	183	273	155	84	5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	10	48	1	51	17	50	36	199	297	168	91	5
Direction, Lane #	EB 1	WB 1	WB 2	NB 1	SB 1							
Volume Total (vph)	59	51	67	532	265							
Volume Left (vph)	10	51	0	36	168							
Volume Right (vph)	1	0	50	297	5							
Hadj (s)	0.06	0.53	-0.49	-0.29	0.15							
Departure Headway (s)	6.3	7.1	6.0	4.5	5.3							
Degree Utilization, x	0.10	0.10	0.11	0.67	0.39							
Capacity (veh/h)	492	454	525	767	651							
Control Delay (s)	10.0	9.6	8.6	16.3	11.6							
Approach Delay (s)	10.0	9.0		16.3	11.6							
Approach LOS	A	A		C	B							
Intersection Summary												
Delay				13.8								
HCM Level of Service				B								
Intersection Capacity Utilization	61.0%			ICU Level of Service					B			
Analysis Period (min)	15											

13: 59th St &

Emery Station
11/3/2009

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (vph)	153	271	52	79	32	66
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	166	295	57	86	35	72
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total (vph)	461	142	107			
Volume Left (vph)	0	57	35			
Volume Right (vph)	295	0	72			
Hadj (s)	-0.35	0.11	-0.30			
Departure Headway (s)	4.0	4.7	4.9			
Degree Utilization, x	0.51	0.19	0.14			
Capacity (veh/h)	883	721	654			
Control Delay (s)	11.1	8.8	8.7			
Approach Delay (s)	11.1	8.8	8.7			
Approach LOS	B	A	A			
Intersection Summary						
Delay	10.3					
HCM Level of Service	B					
Intersection Capacity Utilization	47.5%			ICU Level of Service	A	
Analysis Period (min)	15					

14: 62nd St & Horton St

Emery Station
11/3/2009

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	26	55	30	117	139	148
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	28	60	33	127	151	161
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			88		251	58
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			88		251	58
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		79	84
cM capacity (veh/h)			1508		722	1008
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	88	160	312			
Volume Left	0	33	151			
Volume Right	60	0	161			
cSH	1700	1508	846			
Volume to Capacity	0.05	0.02	0.37			
Queue Length 95th (ft)	0	2	43			
Control Delay (s)	0.0	1.7	11.7			
Lane LOS		A	B			
Approach Delay (s)	0.0	1.7	11.7			
Approach LOS			B			
Intersection Summary						
Average Delay		7.0				
Intersection Capacity Utilization		37.9%		ICU Level of Service	A	
Analysis Period (min)		15				

15: 62nd St & Hollis St

Emery Station
11/3/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	70	76	189	14	18	22	53	604	7	7	555	67
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	76	83	205	15	20	24	58	657	8	8	603	73
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)								498				
pX, platoon unblocked	0.65	0.65		0.65	0.65	0.65				0.65		
vC, conflicting volume	1464	1434	640	1677	1467	660	676			664		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1444	1398	640	1774	1449	201	676			207		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	2	57	0	75	96	94			99		
cM capacity (veh/h)	52	84	476	2	79	543	915			882		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	364	59	722	684								
Volume Left	76	15	58	8								
Volume Right	205	24	8	73								
cSH	127	8	915	882								
Volume to Capacity	2.87	7.29	0.06	0.01								
Queue Length 95th (ft)	843	Err	5	1								
Control Delay (s)	918.7	Err	1.6	0.2								
Lane LOS	F	F	A	A								
Approach Delay (s)	918.7	Err	1.6	0.2								
Approach LOS	F	F										
Intersection Summary												
Average Delay			504.7									
Intersection Capacity Utilization			96.7%		ICU Level of Service	F						
Analysis Period (min)			15									

16: Stanford Ave & Horton St

Emery Station
11/3/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	9	24	19	48	9	35	7	158	78	34	137	7
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	10	26	21	52	10	38	8	172	85	37	149	8
Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	SB 1						
Volume Total (vph)	57	57	43	8	257	193						
Volume Left (vph)	10	52	0	8	0	37						
Volume Right (vph)	21	0	38	0	85	8						
Hadj (s)	-0.15	0.49	-0.59	0.53	-0.20	0.05						
Departure Headway (s)	5.7	6.2	5.2	5.7	5.0	5.3						
Degree Utilization, x	0.09	0.10	0.06	0.01	0.35	0.29						
Capacity (veh/h)	575	531	637	609	702	649						
Control Delay (s)	9.2	8.7	7.3	7.6	9.4	10.4						
Approach Delay (s)	9.2	8.1		9.4		10.4						
Approach LOS	A	A		A		B						
Intersection Summary												
Delay			9.5									
HCM Level of Service			A									
Intersection Capacity Utilization			42.2%		ICU Level of Service		A					
Analysis Period (min)			15									

17: Doyle Street &

Emery Station
11/3/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	5	88	15	6	45	12	21	37	7	15	50	16
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	96	16	7	49	13	23	40	8	16	54	17
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	117	68	71	88								
Volume Left (vph)	5	7	23	16								
Volume Right (vph)	16	13	8	17								
Hadj (s)	-0.04	-0.06	0.03	-0.05								
Departure Headway (s)	4.3	4.3	4.5	4.4								
Degree Utilization, x	0.14	0.08	0.09	0.11								
Capacity (veh/h)	803	784	765	779								
Control Delay (s)	8.0	7.7	7.9	7.9								
Approach Delay (s)	8.0	7.7	7.9	7.9								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay				7.9								
HCM Level of Service				A								
Intersection Capacity Utilization	19.3%			ICU Level of Service					A			
Analysis Period (min)	15											

18: San Pablo Ave &

Emery Station
11/3/2009

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	90	0	1562	1762	51
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	98	0	1698	1915	55
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None	None		
Median storage (veh)						
Upstream signal (ft)			455			
pX, platoon unblocked	0.65					
vC, conflicting volume	2792	985	1971			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2681	985	1971			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	60	100			
cM capacity (veh/h)	12	247	291			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	
Volume Total	98	849	849	1277	694	
Volume Left	0	0	0	0	0	
Volume Right	98	0	0	0	55	
cSH	247	1700	1700	1700	1700	
Volume to Capacity	0.40	0.50	0.50	0.75	0.41	
Queue Length 95th (ft)	45	0	0	0	0	
Control Delay (s)	28.8	0.0	0.0	0.0	0.0	
Lane LOS	D					
Approach Delay (s)	28.8	0.0		0.0		
Approach LOS	D					
Intersection Summary						
Average Delay		0.7				
Intersection Capacity Utilization		62.6%		ICU Level of Service		B
Analysis Period (min)		15				

TECHNICAL APPENDIX B (CONTINUED)

LEVEL OF SERVICE CALCULATION WORKSHEETS

CUMULATIVE PLUS PROJECT WITH MITIGATIONS
PM PEAK HOUR CONDITIONS

2: Powell Street & Doyle Street

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	46	877	10	37	703	21	0	9	32	45	28	77
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		0.95			0.95			1.00			1.00	
Frt		1.00			1.00			0.89			0.93	
Flt Protected		1.00			1.00			1.00			0.99	
Satd. Flow (prot)		3525			3516			1666			1708	
Flt Permitted		0.89			0.88			1.00			0.89	
Satd. Flow (perm)		3154			3108			1666			1541	
Peak-hour factor, PHF	0.90	0.90	0.90	0.95	0.95	0.95	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	51	974	11	39	740	22	0	10	36	50	31	86
RTOR Reduction (vph)	0	2	0	0	4	0	0	27	0	0	65	0
Lane Group Flow (vph)	0	1034	0	0	797	0	0	19	0	0	102	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		15.2			15.2			7.3			7.3	
Effective Green, g (s)		15.2			15.2			7.3			7.3	
Actuated g/C Ratio		0.50			0.50			0.24			0.24	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		1572			1549			399			369	
v/s Ratio Prot								0.01				
v/s Ratio Perm		c0.33			0.26						c0.07	
v/c Ratio		0.66			0.51			0.05			0.28	
Uniform Delay, d1		5.7			5.2			8.9			9.4	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		1.0			0.3			0.0			0.4	
Delay (s)		6.7			5.5			9.0			9.9	
Level of Service		A			A			A			A	
Approach Delay (s)		6.7			5.5			9.0			9.9	
Approach LOS		A			A			A			A	
Intersection Summary												
HCM Average Control Delay			6.5			HCM Level of Service				A		
HCM Volume to Capacity ratio			0.53									
Actuated Cycle Length (s)			30.5			Sum of lost time (s)			8.0			
Intersection Capacity Utilization			72.4%			ICU Level of Service			C			
Analysis Period (min)			15									
c Critical Lane Group												

TECHNICAL APPENDIX C
SIGNAL WARRANT SHEETS

Traffic Signal Warrants Worksheet
Warrant 3: Peak Hour
(from the MUTCD 2003 California Supplement)

Scenario: Existing – PM Peak Hour

Intersection # 15: 62nd Street / Hollis Street

PART A or PART B SATISFIED

YES ☐

NO ☒

PART A

(All parts 1, 2, and 3 below must be satisfied)

PART A SATISFIED

YES ☒

NO ☐

1. The total delay experienced for traffic on one minor street approach controlled by a STOP sign equals or exceeds four vehicle-hours for a one-lane approach and five vehicle-hours for a two-lane approach; AND

0.75 hours

Yes ☐

No ☒

2. The volume on the same minor street approach equals or exceeds 100 vph for one moving lane of traffic or 150 vph for two moving lanes; AND

91 vph

Yes ☐

No ☒

3. The total entering volume serviced during the hour equals or exceeds 800 vph for intersections with four or more approaches or 650 vph for intersections with three approaches.

1,004 vph

Yes ☒

No ☐

PART B

SATISFIED

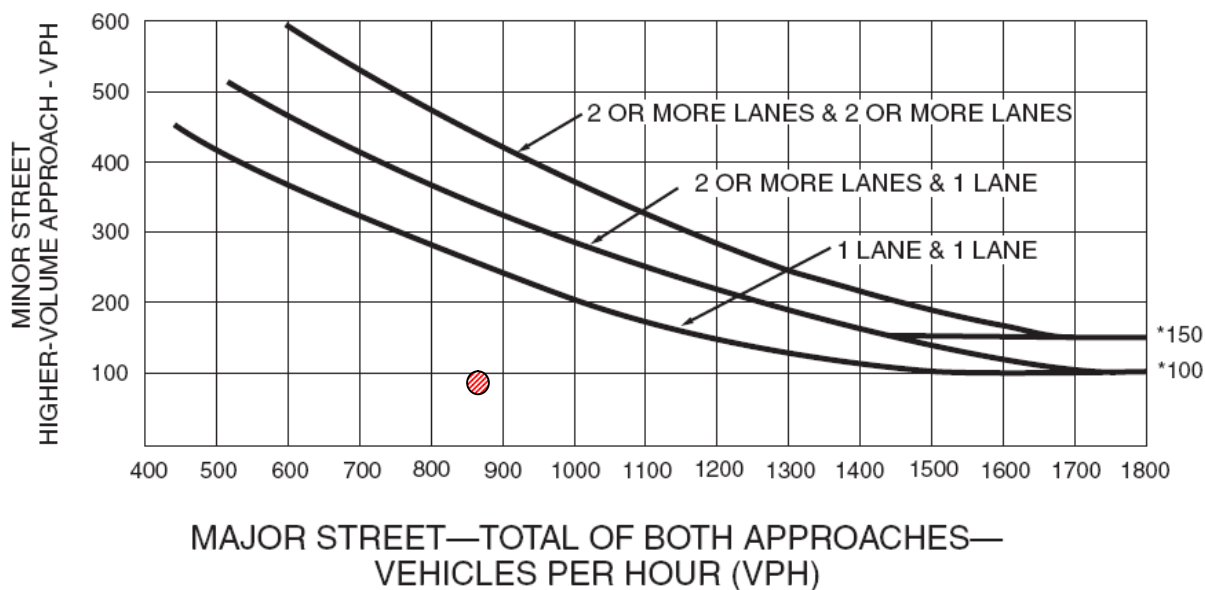
YES ☐

NO ☒

APPROACH LANES	One	2 or More				
Both Approaches – Major Street		872				
Highest Approaches – Minor Street	91					

The plotted points for vehicles per hour on major streets (both approaches) and the corresponding per hour higher volume minor street approach (one direction only) for one hour (any consecutive 15 minute period) fall above the applicable curves in MUTCD Figure 4C-3.

Figure 4C-3.Warrant 3, Peak Hour



*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Traffic Signal Warrants Worksheet
Warrant 3: Peak Hour
(from the MUTCD 2003 California Supplement)

Scenario: Existing Plus Project – PM Peak Hour
Intersection # 15: 62nd Street / Hollis Street

PART A or PART B SATISFIED

YES ☒ NO ☐

PART A

(All parts 1, 2, and 3 below must be satisfied)

PART A SATISFIED

YES ☒ NO ☐

1. The total delay experienced for traffic on one minor street approach controlled by a STOP sign equals or exceeds four vehicle-hours for a one-lane approach and five vehicle-hours for a two-lane approach; AND
2. The volume on the same minor street approach equals or exceeds 100 vph for one moving lane of traffic or 150 vph for two moving lanes; AND
3. The total entering volume serviced during the hour equals or exceeds 800 vph for intersections with four or more approaches or 650 vph for intersections with three approaches.

5.14 hours – Access Option 1
7.05 hours – Access Option 2

Yes ☒ No ☐

266 vph – Access Option 1
309 vph – Access Option 2

Yes ☒ No ☐

1,189 vph – Access Option 1
1,227 vph – Access Option 2

Yes ☒ No ☐

PART B

SATISFIED

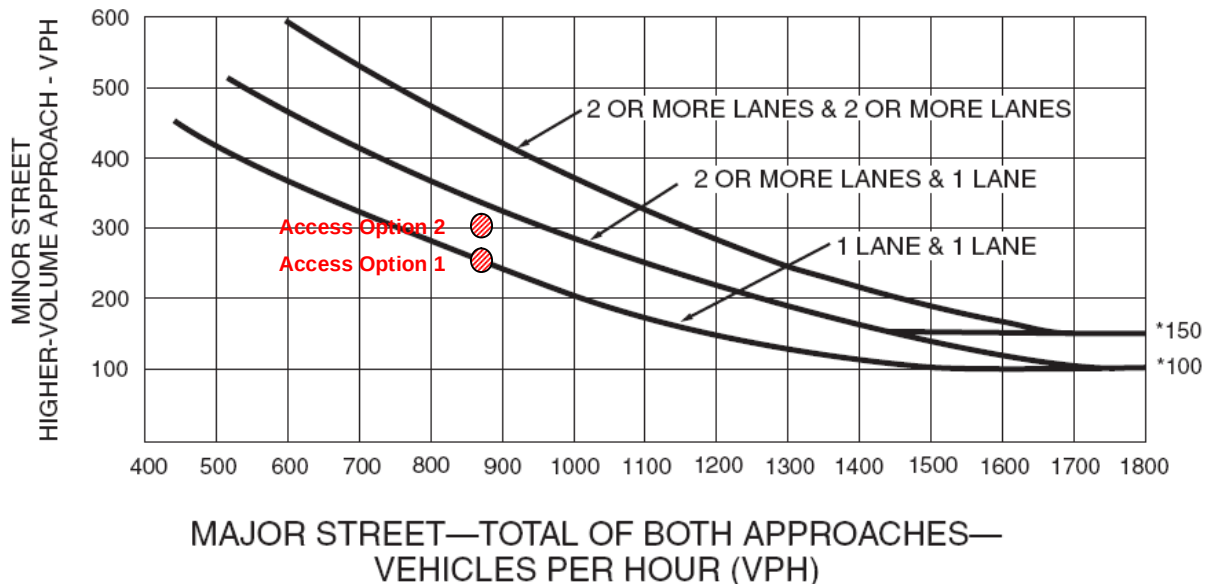
YES ☒ NO ☐

Borderline for Access Option 1
Yes for Access Option 2

APPROACH LANES	One	2 or More				
Both Approaches – Major Street		876 or 876				
Highest Approaches – Minor Street	266 or 309					

The plotted points for vehicles per hour on major streets (both approaches) and the corresponding per hour higher volume minor street approach (one direction only) for one hour (any consecutive 15 minute period) fall above the applicable curves in MUTCD Figure 4C-3.

Figure 4C-3.Warrant 3, Peak Hour



*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Traffic Signal Warrants Worksheet
Warrant 3: Peak Hour
(from the MUTCD 2003 California Supplement)

Scenario: Cumulative Conditions – PM Peak Hour
Intersection # 2: Powell Street / Doyle Street

PART A or PART B SATISFIED

YES ☒ NO ☐

PART A

(All parts 1, 2, and 3 below must be satisfied)

PART A SATISFIED

YES ☒ NO ☐

1. The total delay experienced for traffic on one minor street approach controlled by a STOP sign equals or exceeds four vehicle-hours for a one-lane approach and five vehicle-hours for a two-lane approach; AND
2. The volume on the same minor street approach equals or exceeds 100 vph for one moving lane of traffic or 150 vph for two moving lanes; AND
3. The total entering volume serviced during the hour equals or exceeds 800 vph for intersections with four or more approaches or 650 vph for intersections with three approaches.

5.5 hours
Yes ☒ No ☐

150 vph
Yes ☒ No ☐

1868 vph
Yes ☒ No ☐

PART B

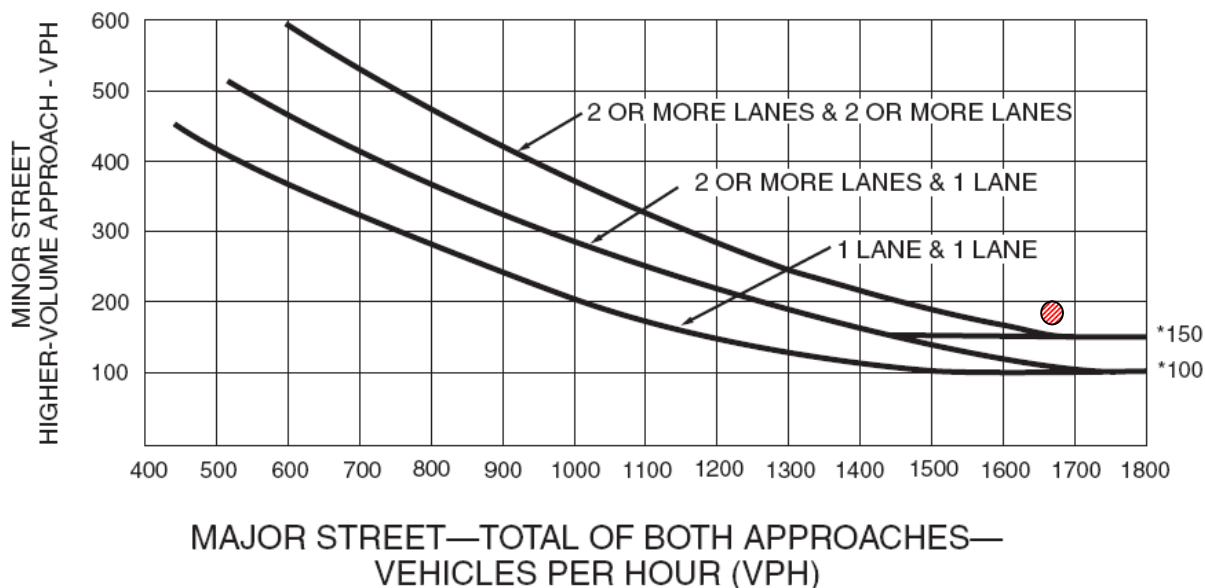
SATISFIED

YES ☒ NO ☐

APPROACH LANES	One	2 or More				
Both Approaches – Major Street		1,677				
Highest Approaches – Minor Street	191					

The plotted points for vehicles per hour on major streets (both approaches) and the corresponding per hour higher volume minor street approach (one direction only) for one hour (any consecutive 15 minute period) fall above the applicable curves in MUTCD Figure 4C-3.

Figure 4C-3.Warrant 3, Peak Hour

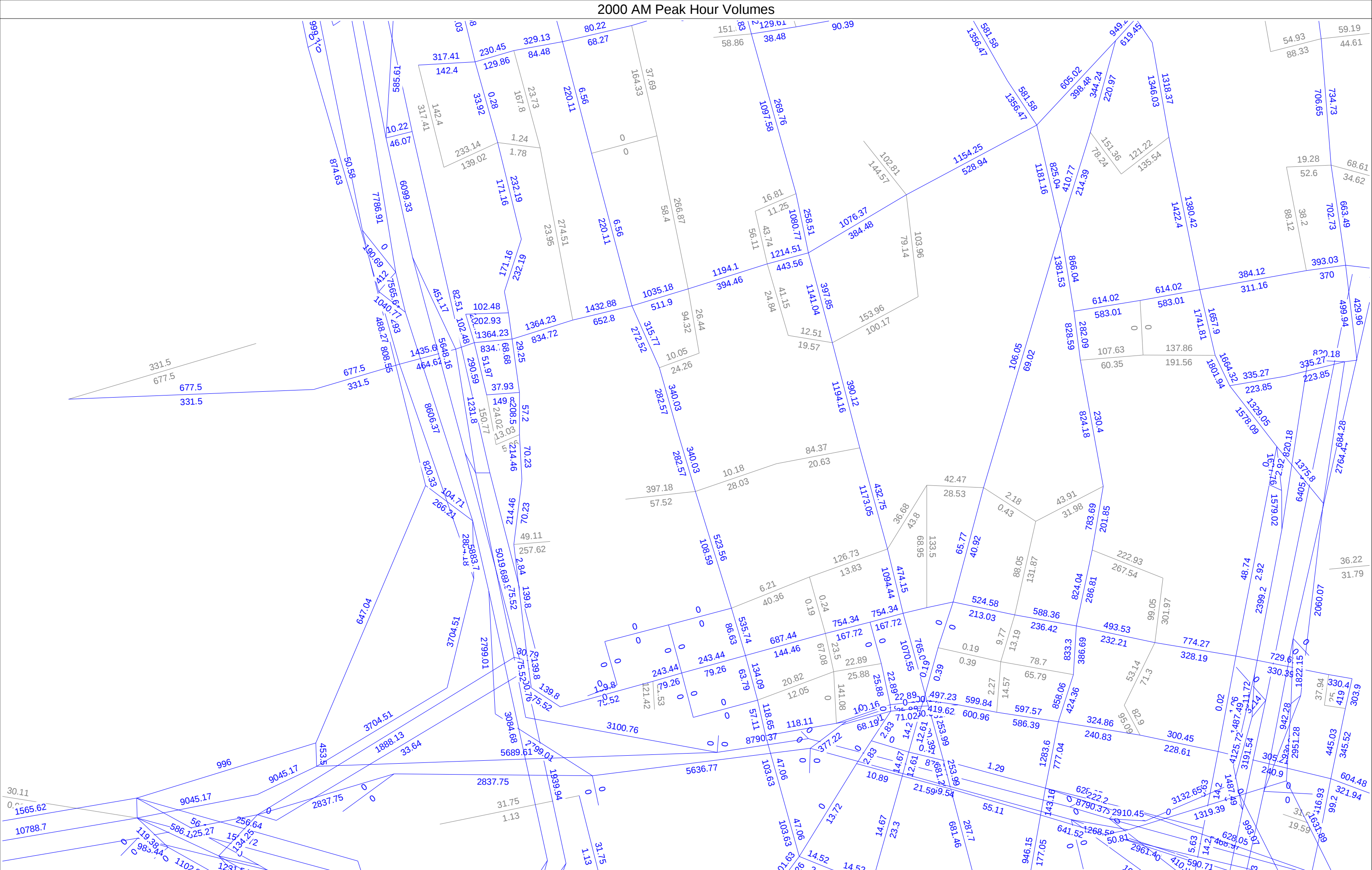


*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

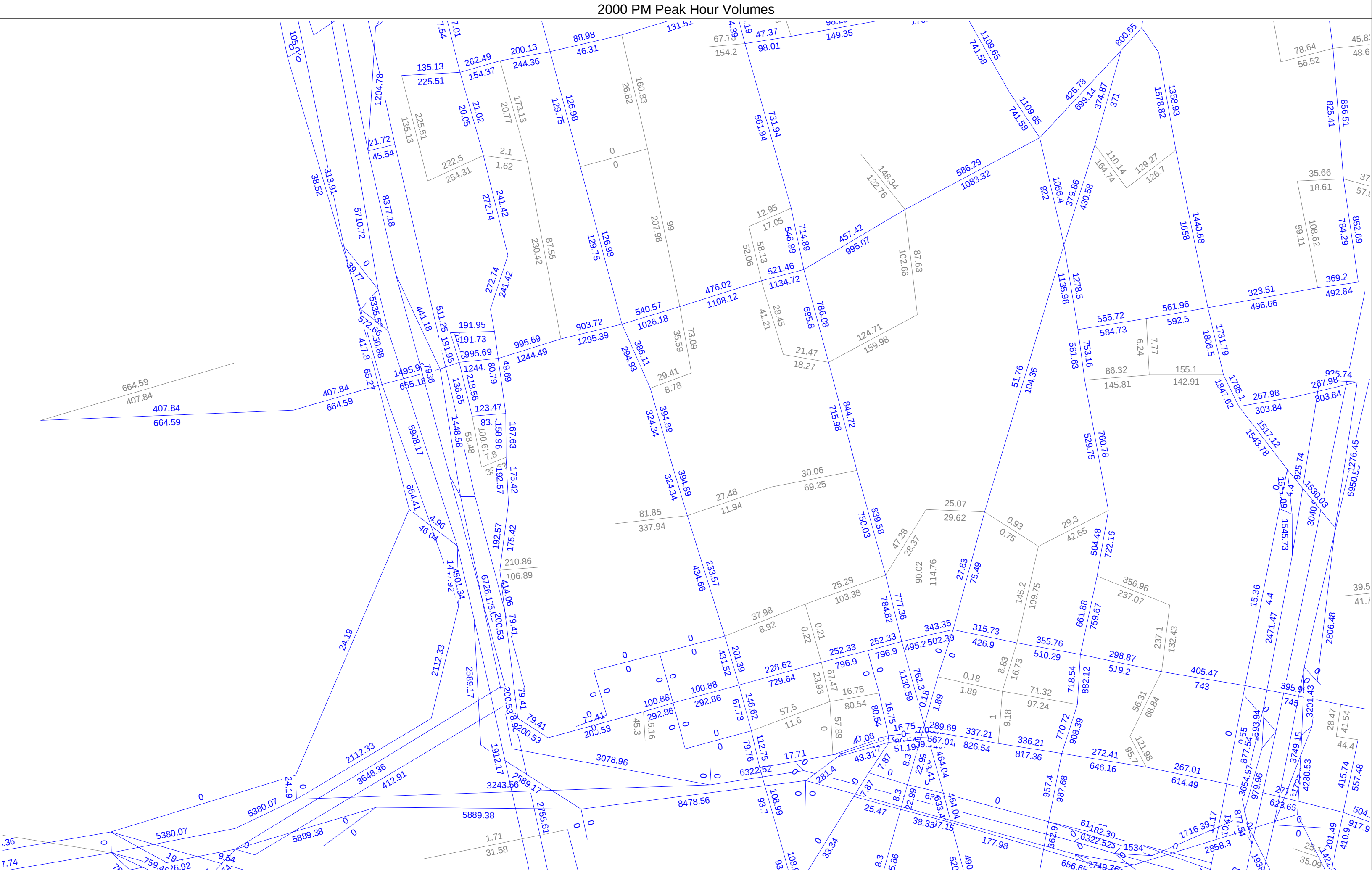
TECHNICAL APPENDIX D

ACCMA MODEL OUTPUTS

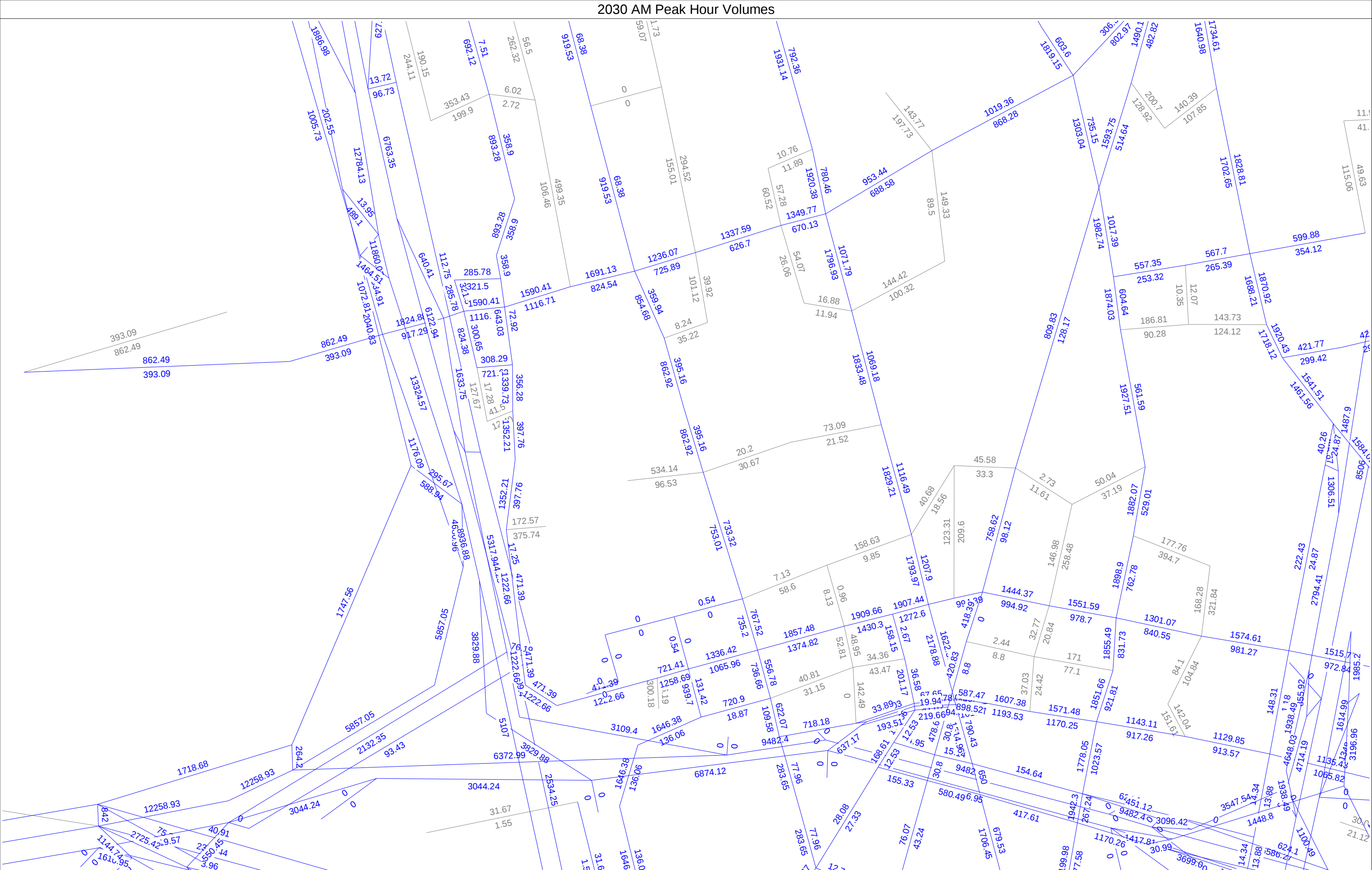
2000 AM Peak Hour Volumes



2000 PM Peak Hour Volumes



2030 AM Peak Hour Volumes



2030 PM Peak Hour Volumes

