

TECHNICAL MEMORANDUM

To: SWCA Environmental Consultants **Date:** January 19, 2012
Attn: Emily Creel **Project:** Beach Front Resort
From: Marty Inouye, Todd Tregenza Traffic Impact Analysis Report
Re: Analysis of Revised Site Plan and **Job No.:** 25-6236-06
Consistency with EIR Evaluation **File No.:** C1466MEM003.DOC
CC:

INTRODUCTION

SWCA Environmental Consultants (Client) has retained OMNI-MEANS to perform a Traffic Impact Analysis Report (TIAR) for the proposed Beach Front Resort in the City of Grover Beach, California. A Draft TIAR was completed in October 2010 for incorporation into a Draft EIR, circulated by SWCA in 2011. Since the circulation of the Draft EIR and preparation of a Final EIR in July 2011, a revised site plan has been released by the project applicant. This memorandum has been prepared to provide an analysis to determine whether the circulation patterns and trip characteristics in the new site plan result in impacts that are consistent with or less than the significant impacts identified in the Final EIR.

CHANGES TO SITE PLAN

The revised Site Plan received by OMNI-MEANS is presented in Figure 1. The primary change in the layout is the moving of the conference center from being inside the main hotel building to now being a standalone building in the northeastern corner of the site. The new standalone conference center is generally located on what was previously identified as a parking field with access to Le Sage Drive. Square footages changed slightly for individual buildings as well, but overall the project size is slightly smaller than the previous site plan.

EFFECT ON TRIP GENERATION

The changes in square footages from building to building, including the addition of the proposed standalone conference center, do not result in any changes to trip generation estimates. As discussed in the TIAR, the trip generation rates for the project are based on the number of hotel rooms, not building square footages. The trip generation rates per hotel room account for amenities such as conference centers in their trip rate estimates, and therefore while the presence of a conference center is accounted for in the trip rate, the square footage of it is not.

EFFECT ON ON-SITE CIRCULATION

The revised site plan will have an effect on on-site circulation patterns due to the reconfigured layout of the valet parking drop off and pick up area and parking fields. Under the original site plan, a parking field was accessible from the Le Sage Drive area, which has been replaced in the revised site plan by the Conference Center building. The original site plan forced vehicles to turn around and return to the main internal road from the valet area. The revised site plan will allow vehicles to keep going in either direction to enter or exit the site, having an impact on the directionality of entering and exiting vehicles depending on how the valet service operates.

In the original site plan, hotel guests that parked in the parking lot adjacent to Le Sage Drive did not need to travel through the valet parking area. The larger parking area adjacent to Grand Avenue on the original and the revised site plan has access from both Grand Avenue and from the on-site road near the valet parking area. On the revised site plan, hotel guests and conference center attendees arriving and departing using the Le Sage Drive entrance must drive through the valet drop off and pick up area from the parking field in order to get to and from the parking lot. This revised site plan may therefore create additional pedestrian-vehicular conflicts in the valet parking area between both hotel guests and conference center attendees.

EFFECT ON TRIP DISTRIBUTION

Trip distribution will not be affected by the new site plan. However, the new site plan will result in on-site circulation changes and a slight shift in trip assignment. While the previous site plan had a hotel patron parking lot close to the Le Sage Drive entrance, the new site plan does not (instead the parking lot has been replaced by the conference center). For this reason, the propensity for guests to depart or arrive from the Le Sage Drive entrance will be decreased since all hotel parking will be essentially oriented towards the Grand Avenue entrance.

The TIAR prepared for the previous site plan assumed a roughly 60/40 split between driveway uses (60% used Grand Avenue 40% used Le Sage Drive). This was based not only on the site plan but also on current traffic counts taken at both locations. Under the revised site plan, it is assumed that nearly all inbound and outbound traffic from Grand Avenue and from Highway 1 south of the project will use the Grand Avenue entrance. However, some traffic coming from Highway 1 north of the project would still likely use the Le Sage Drive entrance. Under the new site plan, it is assumed that this portion of the new project trips from north of the project would be split 75% on Grand Avenue and 25% on Le Sage Drive. Because of this change in trip assignment, the operations at the Le Sage Drive / Highway 1 and Grand Avenue / Highway 1 intersections have been reanalyzed under *Existing Plus Project* and *Cumulative Plus Project* scenarios to evaluate whether new impacts are created or whether the impacts are consistent with those identified in the Final EIR and TIAR.

REVISED EXISTING PLUS PROJECT ANALYSIS

The original *Existing Plus Project* intersection levels of service, as presented in the TIAR and Final EIR (refer to Table 4.8-3 in the Final EIR), are presented in Table 1A.

**TABLE 1A:
ORIGINAL EXISTING PLUS PROJECT INTERSECTION LOS**

#	Intersection	Control Type ^{1,2}	Target LOS	AM Peak Hour		PM Peak Hour		SAT Peak Hour	
				Delay	LOS	Delay	LOS	Delay	LOS
1	Highway 1 / Price Street	AWSC	C	9.1	A	15.9	C	35.6	E
2	Highway 1 / Pomeroy Avenue	Signal	C	5.4	A	8.5	A	11.6	B
3	Highway 1 / Hinds Avenue	Signal	C	6.4	A	10.0	A	10.9	B
4	Highway 1 / Ocean View Avenue	TWSC	C	14.6	B	74.2	F	115.4	F
5	Highway 1 / Le Sage Drive	TWSC	C	12.1	B	19.2	C	25.8	D
6	Highway 1 / Grand Avenue	Signal	C	13.9	B	20.4	C	19.9	B
7	4th Street / Grand Avenue	Signal	C	13.2	B	16.3	B	16.3	B
8	4th Street / 5 Cities Drive	Signal	C	22.2	C	25.9	C	25.9	C
9	4th Street / U.S. 101 NB Ramps	Signal	C	20.4	C	18.3	B	24.7	C

Notes:

1. TWSC = Two Way Stop Control, AWSC = All Way Stop Control

2. LOS = Delay based on worst minor street approach for TWSC intersections, average delay for AWSC and Signals

After reassigning the project traffic to reflect the parking orientation towards Grand Avenue in the revised site plan, the resulting levels of service for the *Existing Plus Project* scenario are presented in Table 1B.

**TABLE 1B:
REVISED EXISTING PLUS PROJECT INTERSECTION LOS**

#	Intersection	Control Type ^{1,2}	Target LOS	AM Peak Hour		PM Peak Hour		SAT Peak Hour	
				Delay	LOS	Delay	LOS	Delay	LOS
5	Highway 1 / Le Sage Drive	TWSC	C	11.9	B	18.2	C	22.4	C
6	Highway 1 / Grand Avenue	Signal	C	13.8	B	15.2	B	19.5	B

Notes:

1. TWSC = Two Way Stop Control

2. LOS = Delay based on worst minor street approach for TWSC intersections, average delay for Signals

As presented in Tables 1A and 1B, the reassigned traffic assumed under the revised site plan does not create new project impacts under the *Existing Plus Project* analysis scenario. In fact, the decreased outbound traffic at the Le Sage Drive improves the operations at the Le Sage Drive / Highway 1 intersection and eliminates the LOS D condition previously identified in the Saturday midday peak hour.

REVISED CUMULATIVE PLUS PROJECT ANALYSIS

The original *Cumulative Plus Project* intersection levels of service, as presented in the TIAR and Final EIR (refer to Table 4.8-5 in the Final EIR), are presented in Table 2A.

**TABLE 2A:
ORIGINAL CUMULATIVE PLUS PROJECT INTERSECTION LOS**

#	Intersection	Control Type ^{1,2}	Target LOS	AM Peak Hour		PM Peak Hour		SAT Peak Hour	
				Delay	LOS	Delay	LOS	Delay	LOS
1	Highway 1 / Price Street	AWSC	C	9.1	A	18.9	C	78.7	F
2	Highway 1 / Pomeroy Avenue	Signal	C	5.6	A	9.3	A	12.7	B
3	Highway 1 / Hinds Avenue	Signal	C	6.7	A	10.6	B	11.9	B
4	Highway 1 / Ocean View Avenue	TWSC	C	17.2	C	OVR	F	OVR	F
5	Highway 1 / Le Sage Drive	TWSC	C	12.1	B	29.7	D	53.9	F
6	Highway 1 / Grand Avenue	Signal	C	15.3	B	20.3	C	30.3	C
7	4th Street / Grand Avenue	Signal	C	16.7	B	27.5	C	30.5	C
8	4th Street / 5 Cities Drive	Signal	C	26.1	C	36.4	D	34.2	C
9	4th Street / U.S. 101 NB Ramps	Signal	C	21.3	C	21.1	C	30.3	C

Notes:

1. TWSC = Two Way Stop Control, AWSC = All Way Stop Control

2. LOS = Delay based on worst minor street approach for TWSC intersections, average delay for AWSC and Signals

After reassigning the project traffic to reflect the parking orientation towards Grand Avenue in the revised site plan, the resulting levels of service for the *Cumulative Plus Project* scenario are presented in Table 2B.

**TABLE 2B:
REVISED CUMULATIVE PLUS PROJECT INTERSECTION LOS**

#	Intersection	Control Type ^{1,2}	Target LOS	AM Peak Hour		PM Peak Hour		SAT Peak Hour	
				Delay	LOS	Delay	LOS	Delay	LOS
5	Highway 1 / Le Sage Drive	TWSC	C	11.9	B	27.0	D	40.4	E
6	Highway 1 / Grand Avenue	Signal	C	14.6	B	20.4	C	31.0	C

Notes:

1. TWSC = Two Way Stop Control

2. LOS = Delay based on worst minor street approach for TWSC intersections, average delay for Signals

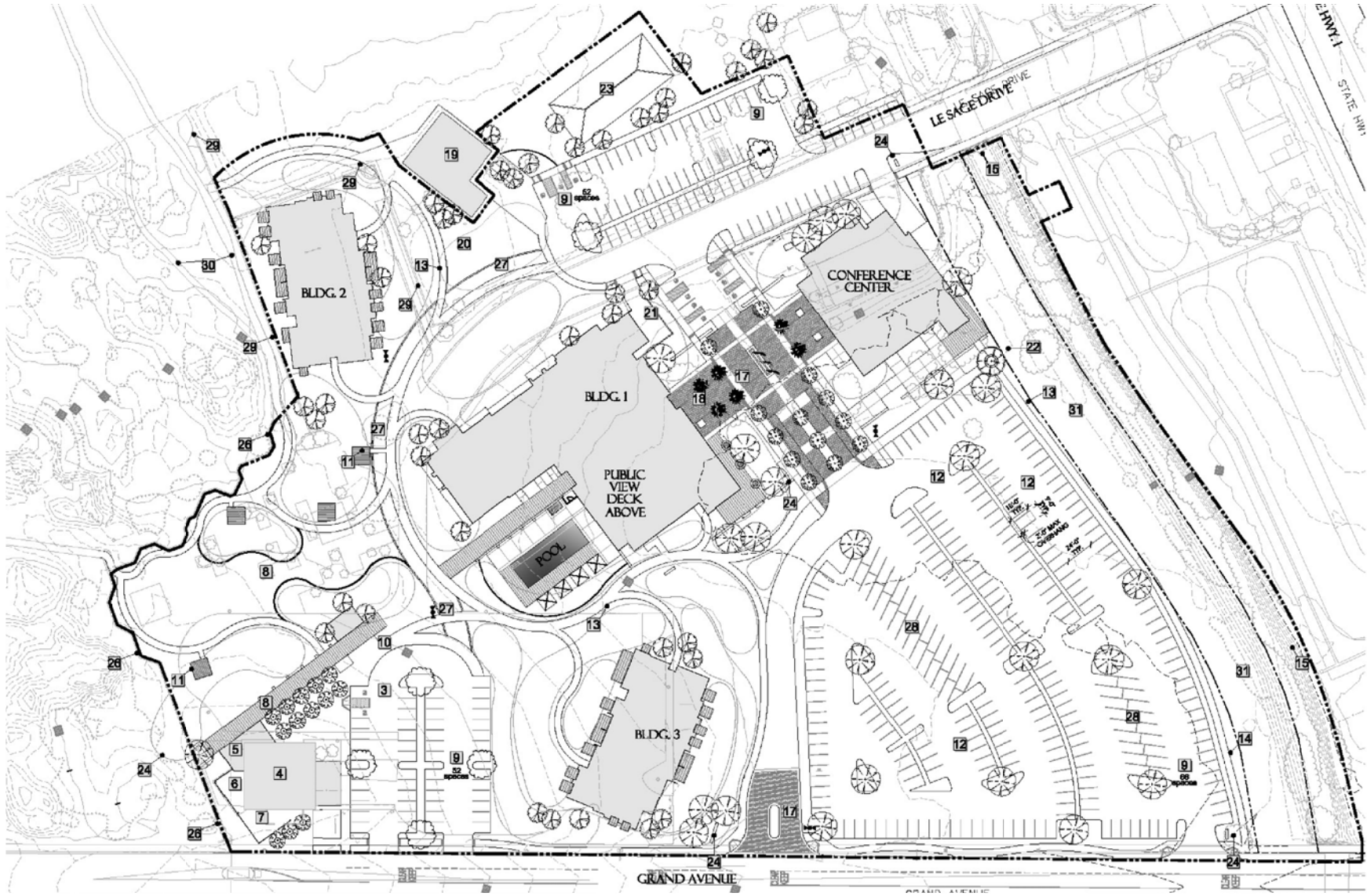
As was the case with the revised *Existing Plus Project* analysis, no new impacts are identified under the revised site plan for the *Cumulative Plus Project* scenario. The LOS F condition previously identified during the Saturday midday peak hour at the Highway 1 / Le Sage Drive intersection is projected to

improve to LOS E. This would not be a significant project impact as the intersection is forecasted to operate at LOS E in the *Cumulative No Project* condition, and the project would not increase delay by more than 5 seconds.

CONCLUSIONS

The revised site plan will now require drivers using the Le Sage Drive entrance to travel through the valet parking area between the main hotel building and the conference center. This increased vehicular and pedestrian activity may create conflicts that would be less prominent under the original site plan, due to the parking fields being separated from the drop off and pick up area. The revised site plan will also have an effect on the directionality of the traffic flow, as it does not require vehicles to turn around at the valet drop off and pick up area as was the case in the original site plan.

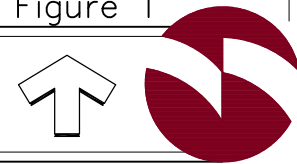
Under the revised site plan, that emphasizes use of the Grand Avenue entrance over the Le Sage Drive entrance by moving parking fields to be oriented on the southern end of the site, no new impacts are created during *Existing Plus Project* and *Cumulative Plus Project* conditions. The reduced use of the Le Sage Drive entrance in fact eliminates the Saturday midday peak hour project impact at Highway 1 / Le Sage Drive during both analysis scenarios (TC Impacts 3 and 7) without creating any new significant impacts along Grand Avenue and its project entrance. The previously identified project mitigation measures to widen the Le Sage Drive approach (TC/mm-5 and TC/mm-9) are no longer required under the revised site plan. All other previously identified mitigation measures are still required and remain unchanged from those identified in the Final EIR.



Grover Beach Lodge TIAR

Figure 1

Revised Project Site Plan



HCM Unsignalized Intersection Capacity Analysis
5: LE SAGE & HIGHWAY 1

Existing AM Plus Project
1/16/2012


























Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	26	31	76	238	209	27
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.75	0.75	0.75	0.75	0.75	0.75
Hourly flow rate (vph)	35	41	101	317	279	36
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	TWLTL	
Median storage (veh)					2	
Upstream signal (ft)				863		
pX, platoon unblocked						
vC, conflicting volume	817	297	315			
vC1, stage 1 conf vol	297					
vC2, stage 2 conf vol	520					
vCu, unblocked vol	817	297	315			
tC, single (s)	6.5	6.3	4.2			
tC, 2 stage (s)	5.5					
tF (s)	3.6	3.4	2.3			
p0 queue free %	93	94	92			
cM capacity (veh/h)	491	731	1218			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	76	101	317	315
Volume Left	35	101	0	0
Volume Right	41	0	0	36
cSH	598	1218	1700	1700
Volume to Capacity	0.13	0.08	0.19	0.19
Queue Length 95th (ft)	11	7	0	0
Control Delay (s)	11.9	8.2	0.0	0.0
Lane LOS	B	A		
Approach Delay (s)	11.9	2.0		0.0
Approach LOS	B			

Intersection Summary			
Average Delay		2.1	
Intersection Capacity Utilization		30.2%	ICU Level of Service A
Analysis Period (min)		15	

HCM Signalized Intersection Capacity Analysis
6: GRAND & HIGHWAY 1

Existing AM Plus Project
1/16/2012

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	14	69	22	75	99	146	21	154	100	116	97	27
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	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		0.97	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.94		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1719	1810	1538	1719	1810	1538	1719	1703		3335	1810	1538
Flt Permitted	0.68	1.00	1.00	0.70	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1228	1810	1538	1270	1810	1538	1719	1703		3335	1810	1538
Peak-hour factor, PHF	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
Adj. Flow (vph)	17	85	27	93	122	180	26	190	123	143	120	33
RTOR Reduction (vph)	0	0	21	0	0	143	0	32	0	0	0	17
Lane Group Flow (vph)	17	85	6	93	122	37	26	281	0	143	120	16
Heavy Vehicles (%)	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%
Turn Type	Perm		Perm	Perm		Perm	Prot			Prot		Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8						6
Actuated Green, G (s)	9.2	9.2	9.2	9.2	9.2	9.2	1.0	17.2		5.9	22.1	22.1
Effective Green, g (s)	9.2	9.2	9.2	9.2	9.2	9.2	1.0	17.2		5.9	22.1	22.1
Actuated g/C Ratio	0.21	0.21	0.21	0.21	0.21	0.21	0.02	0.39		0.13	0.50	0.50
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)	255	376	319	264	376	319	39	661		444	903	767
v/s Ratio Prot		0.05			0.07		0.02	c0.17		c0.04	0.07	
v/s Ratio Perm	0.01		0.00	c0.07		0.02						0.01
v/c Ratio	0.07	0.23	0.02	0.35	0.32	0.12	0.67	0.43		0.32	0.13	0.02
Uniform Delay, d1	14.1	14.6	14.0	15.0	14.9	14.3	21.5	9.9		17.4	6.0	5.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.1	0.3	0.0	0.8	0.5	0.2	35.5	0.4		0.4	0.1	0.0
Delay (s)	14.2	14.9	14.0	15.8	15.4	14.4	57.0	10.4		17.8	6.0	5.6
Level of Service	B	B	B	B	B	B	E	B		B	A	A
Approach Delay (s)		14.6			15.1			13.9			11.7	
Approach LOS		B			B			B			B	
Intersection Summary												
HCM Average Control Delay			13.8				HCM Level of Service				B	
HCM Volume to Capacity ratio			0.39									
Actuated Cycle Length (s)			44.3				Sum of lost time (s)			12.0		
Intersection Capacity Utilization			38.4%				ICU Level of Service			A		
Analysis Period (min)			15									

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
5: LE SAGE & HIGHWAY 1



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	83	73	130	281	524	35
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	89	78	140	302	563	38
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	TWLTL	
Median storage (veh)					2	
Upstream signal (ft)				863		
pX, platoon unblocked						
vC, conflicting volume	1164	582	601			
vC1, stage 1 conf vol	582					
vC2, stage 2 conf vol	582					
vCu, unblocked vol	1164	582	601			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)	5.4					
tF (s)	3.5	3.3	2.2			
p0 queue free %	77	85	86			
cM capacity (veh/h)	390	509	966			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	168	140	302	601
Volume Left	89	140	0	0
Volume Right	78	0	0	38
cSH	438	966	1700	1700
Volume to Capacity	0.38	0.14	0.18	0.35
Queue Length 95th (ft)	44	13	0	0
Control Delay (s)	18.2	9.4	0.0	0.0
Lane LOS	C	A		
Approach Delay (s)	18.2	3.0		0.0
Approach LOS	C			

Intersection Summary			
Average Delay		3.6	
Intersection Capacity Utilization		56.0%	ICU Level of Service B
Analysis Period (min)		15	

HCM Signalized Intersection Capacity Analysis

6: GRAND & HIGHWAY 1

Existing PM Plus Project

1/16/2012



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	33	124	29	167	144	196	24	182	140	248	297	52
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	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		0.97	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.93		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1736	1827	1553	1736	1827	1553	1736	1708		3367	1827	1553
Flt Permitted	0.66	1.00	1.00	0.67	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1211	1827	1553	1233	1827	1553	1736	1708		3367	1827	1553
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	34	128	30	172	148	202	25	188	144	256	306	54
RTOR Reduction (vph)	0	0	22	0	0	150	0	37	0	0	0	23
Lane Group Flow (vph)	34	128	8	172	148	52	25	295	0	256	306	31
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
Turn Type	Perm		Perm	Perm		Perm	Prot			Prot		Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8						6
Actuated Green, G (s)	13.8	13.8	13.8	13.8	13.8	13.8	1.6	17.6		9.7	25.7	25.7
Effective Green, g (s)	13.8	13.8	13.8	13.8	13.8	13.8	1.6	17.6		9.7	25.7	25.7
Actuated g/C Ratio	0.26	0.26	0.26	0.26	0.26	0.26	0.03	0.33		0.18	0.48	0.48
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)	315	475	404	320	475	404	52	566		615	884	752
v/s Ratio Prot		0.07			0.08		0.01	c0.17		c0.08	0.17	
v/s Ratio Perm	0.03		0.01	c0.14		0.03						0.02
v/c Ratio	0.11	0.27	0.02	0.54	0.31	0.13	0.48	0.52		0.42	0.35	0.04
Uniform Delay, d1	15.0	15.6	14.6	16.9	15.8	15.1	25.3	14.3		19.2	8.5	7.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.2	0.3	0.0	1.7	0.4	0.1	6.9	0.9		0.5	0.2	0.0
Delay (s)	15.1	15.9	14.6	18.6	16.2	15.2	32.2	15.2		19.7	8.7	7.2
Level of Service	B	B	B	B	B	B	C	B		B	A	A
Approach Delay (s)		15.6			16.6			16.4			13.1	
Approach LOS		B			B			B			B	

Intersection Summary

HCM Average Control Delay	15.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	53.1	Sum of lost time (s)	12.0
Intersection Capacity Utilization	54.3%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
5: LE SAGE & HIGHWAY 1

Existing Saturday Plus Project
1/16/2012



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	59	140	226	357	406	111
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	65	154	248	392	446	122
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	TWLTL	
Median storage (veh)					2	
Upstream signal (ft)				863		
pX, platoon unblocked						
vC, conflicting volume	1396	507	568			
vC1, stage 1 conf vol	507					
vC2, stage 2 conf vol	889					
vCu, unblocked vol	1396	507	568			
tC, single (s)	6.5	6.3	4.2			
tC, 2 stage (s)	5.5					
tF (s)	3.6	3.4	2.3			
p0 queue free %	76	72	75			
cM capacity (veh/h)	269	554	975			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	219	248	392	568
Volume Left	65	248	0	0
Volume Right	154	0	0	122
cSH	421	975	1700	1700
Volume to Capacity	0.52	0.25	0.23	0.33
Queue Length 95th (ft)	73	25	0	0
Control Delay (s)	22.4	10.0	0.0	0.0
Lane LOS	C	A		
Approach Delay (s)	22.4	3.9		0.0
Approach LOS	C			

Intersection Summary			
Average Delay		5.2	
Intersection Capacity Utilization		62.5%	ICU Level of Service B
Analysis Period (min)		15	

HCM Signalized Intersection Capacity Analysis

6: GRAND & HIGHWAY 1

Existing Saturday Plus Project

1/16/2012



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	73	147	47	206	254	245	36	265	207	242	212	92
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	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		0.97	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.93		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1736	1827	1553	1736	1827	1553	1736	1707		3367	1827	1553
Flt Permitted	0.47	1.00	1.00	0.65	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	852	1827	1553	1191	1827	1553	1736	1707		3367	1827	1553
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	75	152	48	212	262	253	37	273	213	249	219	95
RTOR Reduction (vph)	0	0	35	0	0	184	0	37	0	0	0	47
Lane Group Flow (vph)	75	152	13	212	262	69	37	449	0	249	219	48
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
Turn Type	Perm		Perm	Perm		Perm	Prot			Prot		Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8						6
Actuated Green, G (s)	17.3	17.3	17.3	17.3	17.3	17.3	1.9	24.5		9.3	31.9	31.9
Effective Green, g (s)	17.3	17.3	17.3	17.3	17.3	17.3	1.9	24.5		9.3	31.9	31.9
Actuated g/C Ratio	0.27	0.27	0.27	0.27	0.27	0.27	0.03	0.39		0.15	0.51	0.51
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)	234	501	426	327	501	426	52	663		496	924	785
v/s Ratio Prot		0.08			0.14		0.02	c0.26		c0.07	0.12	
v/s Ratio Perm	0.09		0.01	c0.18		0.04						0.03
v/c Ratio	0.32	0.30	0.03	0.65	0.52	0.16	0.71	0.68		0.50	0.24	0.06
Uniform Delay, d1	18.2	18.1	16.8	20.2	19.4	17.4	30.3	16.0		24.8	8.8	8.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.8	0.3	0.0	4.4	1.0	0.2	36.8	2.8		0.8	0.1	0.0
Delay (s)	19.0	18.5	16.8	24.6	20.4	17.6	67.2	18.8		25.6	8.9	8.0
Level of Service	B	B	B	C	C	B	E	B		C	A	A
Approach Delay (s)		18.3			20.6			22.2			16.1	
Approach LOS		B			C			C			B	

Intersection Summary

HCM Average Control Delay	19.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	63.1	Sum of lost time (s)	12.0
Intersection Capacity Utilization	66.0%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
5: LE SAGE & HIGHWAY 1



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	32	40	90	320	244	34
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)	35	43	98	348	265	37
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	TWLTL	
Median storage (veh)					2	
Upstream signal (ft)				863		
pX, platoon unblocked						
vC, conflicting volume	827	284	302			
vC1, stage 1 conf vol	284					
vC2, stage 2 conf vol	543					
vCu, unblocked vol	827	284	302			
tC, single (s)	6.5	6.3	4.2			
tC, 2 stage (s)	5.5					
tF (s)	3.6	3.4	2.3			
p0 queue free %	93	94	92			
cM capacity (veh/h)	484	743	1231			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	78	98	348	302
Volume Left	35	98	0	0
Volume Right	43	0	0	37
cSH	601	1231	1700	1700
Volume to Capacity	0.13	0.08	0.20	0.18
Queue Length 95th (ft)	11	6	0	0
Control Delay (s)	11.9	8.2	0.0	0.0
Lane LOS	B	A		
Approach Delay (s)	11.9	1.8		0.0
Approach LOS	B			

Intersection Summary			
Average Delay		2.1	
Intersection Capacity Utilization		34.1%	ICU Level of Service A
Analysis Period (min)		15	

HCM Signalized Intersection Capacity Analysis

6: GRAND & HIGHWAY 1

Cumulative AM Plus Project
1/16/2012



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	20	108	33	110	128	210	25	180	140	140	110	34
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	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		0.97	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.93		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1719	1810	1538	1719	1810	1538	1719	1691		3335	1810	1538
Flt Permitted	0.67	1.00	1.00	0.68	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1209	1810	1538	1234	1810	1538	1719	1691		3335	1810	1538
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)	22	117	36	120	139	228	27	196	152	152	120	37
RTOR Reduction (vph)	0	0	27	0	0	174	0	39	0	0	0	19
Lane Group Flow (vph)	22	117	9	120	139	54	27	309	0	152	120	18
Heavy Vehicles (%)	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%
Turn Type	Perm		Perm	Perm		Perm	Prot			Prot		Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8						6
Actuated Green, G (s)	10.9	10.9	10.9	10.9	10.9	10.9	1.0	17.2		5.8	22.0	22.0
Effective Green, g (s)	10.9	10.9	10.9	10.9	10.9	10.9	1.0	17.2		5.8	22.0	22.0
Actuated g/C Ratio	0.24	0.24	0.24	0.24	0.24	0.24	0.02	0.37		0.13	0.48	0.48
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)	287	430	365	293	430	365	37	634		421	868	737
v/s Ratio Prot		0.06			0.08		0.02	c0.18		c0.05	0.07	
v/s Ratio Perm	0.02		0.01	c0.10		0.04						0.01
v/c Ratio	0.08	0.27	0.02	0.41	0.32	0.15	0.73	0.49		0.36	0.14	0.02
Uniform Delay, d1	13.6	14.3	13.4	14.8	14.5	13.8	22.3	11.0		18.4	6.7	6.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.1	0.3	0.0	0.9	0.4	0.2	52.2	0.6		0.5	0.1	0.0
Delay (s)	13.7	14.6	13.4	15.7	14.9	14.0	74.5	11.6		18.9	6.7	6.3
Level of Service	B	B	B	B	B	B	E	B		B	A	A
Approach Delay (s)		14.3			14.7			16.1			12.7	
Approach LOS		B			B			B			B	

Intersection Summary

HCM Average Control Delay	14.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.44		
Actuated Cycle Length (s)	45.9	Sum of lost time (s)	12.0
Intersection Capacity Utilization	47.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
5: LE SAGE & HIGHWAY 1



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	97	90	155	386	613	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)	105	98	168	420	666	47
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	TWLTL	
Median storage (veh)					2	
Upstream signal (ft)				863		
pX, platoon unblocked						
vC, conflicting volume	1446	690	713			
vC1, stage 1 conf vol	690					
vC2, stage 2 conf vol	757					
vCu, unblocked vol	1446	690	713			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)	5.4					
tF (s)	3.5	3.3	2.2			
p0 queue free %	66	78	81			
cM capacity (veh/h)	309	442	878			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	203	168	420	713
Volume Left	105	168	0	0
Volume Right	98	0	0	47
cSH	362	878	1700	1700
Volume to Capacity	0.56	0.19	0.25	0.42
Queue Length 95th (ft)	83	18	0	0
Control Delay (s)	27.0	10.1	0.0	0.0
Lane LOS	D	B		
Approach Delay (s)	27.0	2.9		0.0
Approach LOS	D			

Intersection Summary			
Average Delay		4.8	
Intersection Capacity Utilization	64.3%		ICU Level of Service C
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis

6: GRAND & HIGHWAY 1

Cumulative PM Plus Project
1/16/2012



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	46	159	39	235	195	280	30	215	185	300	345	58
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	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		0.97	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.93		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1736	1827	1553	1736	1827	1553	1736	1700		3367	1827	1553
Flt Permitted	0.56	1.00	1.00	0.62	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1026	1827	1553	1136	1827	1553	1736	1700		3367	1827	1553
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)	50	173	42	255	212	304	33	234	201	326	375	63
RTOR Reduction (vph)	0	0	29	0	0	211	0	40	0	0	0	21
Lane Group Flow (vph)	50	173	13	255	212	93	33	395	0	326	375	42
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
Turn Type	Perm		Perm	Perm		Perm	Prot			Prot		Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8						6
Actuated Green, G (s)	19.9	19.9	19.9	19.9	19.9	19.9	1.6	22.7		10.4	31.5	31.5
Effective Green, g (s)	19.9	19.9	19.9	19.9	19.9	19.9	1.6	22.7		10.4	31.5	31.5
Actuated g/C Ratio	0.31	0.31	0.31	0.31	0.31	0.31	0.02	0.35		0.16	0.48	0.48
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)	314	559	475	348	559	475	43	594		539	885	753
v/s Ratio Prot		0.09			0.12		0.02	c0.23		c0.10	0.21	
v/s Ratio Perm	0.05		0.01	c0.22		0.06						0.03
v/c Ratio	0.16	0.31	0.03	0.73	0.38	0.20	0.77	0.67		0.60	0.42	0.06
Uniform Delay, d1	16.4	17.3	15.8	20.2	17.7	16.6	31.5	17.9		25.4	10.9	8.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.2	0.3	0.0	7.8	0.4	0.2	56.1	2.8		1.9	0.3	0.0
Delay (s)	16.7	17.6	15.8	27.9	18.1	16.8	87.6	20.7		27.3	11.2	8.9
Level of Service	B	B	B	C	B	B	F	C		C	B	A
Approach Delay (s)		17.1			20.9			25.5			17.9	
Approach LOS		B			C			C			B	

Intersection Summary

HCM Average Control Delay	20.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	65.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	65.9%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
5: LE SAGE & HIGHWAY 1



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	69	165	265	487	474	131
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)	75	179	288	529	515	142
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	TWLTL	
Median storage (veh)					2	
Upstream signal (ft)				863		
pX, platoon unblocked						
vC, conflicting volume	1692	586	658			
vC1, stage 1 conf vol	586					
vC2, stage 2 conf vol	1105					
vCu, unblocked vol	1692	586	658			
tC, single (s)	6.5	6.3	4.2			
tC, 2 stage (s)	5.5					
tF (s)	3.6	3.4	2.3			
p0 queue free %	62	64	68			
cM capacity (veh/h)	196	499	902			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	254	288	529	658
Volume Left	75	288	0	0
Volume Right	179	0	0	142
cSH	343	902	1700	1700
Volume to Capacity	0.74	0.32	0.31	0.39
Queue Length 95th (ft)	142	35	0	0
Control Delay (s)	40.4	10.9	0.0	0.0
Lane LOS	E	B		
Approach Delay (s)	40.4	3.8		0.0
Approach LOS	E			

Intersection Summary			
Average Delay		7.7	
Intersection Capacity Utilization		71.6%	ICU Level of Service C
Analysis Period (min)		15	

HCM Signalized Intersection Capacity Analysis
6: GRAND & HIGHWAY 1

Cumulative Saturday Plus Project

1/16/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	97	201	63	290	337	345	43	310	265	300	235	104
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	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		0.97	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.93		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1736	1827	1553	1736	1827	1553	1736	1701		3367	1827	1553
Flt Permitted	0.36	1.00	1.00	0.55	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	654	1827	1553	1007	1827	1553	1736	1701		3367	1827	1553
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)	105	218	68	315	366	375	47	337	288	326	255	113
RTOR Reduction (vph)	0	0	45	0	0	247	0	39	0	0	0	56
Lane Group Flow (vph)	105	218	23	315	366	128	47	586	0	326	255	57
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
Turn Type	Perm		Perm	Perm		Perm	Prot			Prot		Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8						6
Actuated Green, G (s)	26.3	26.3	26.3	26.3	26.3	26.3	3.4	30.7		8.1	35.4	35.4
Effective Green, g (s)	26.3	26.3	26.3	26.3	26.3	26.3	3.4	30.7		8.1	35.4	35.4
Actuated g/C Ratio	0.34	0.34	0.34	0.34	0.34	0.34	0.04	0.40		0.11	0.46	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)	223	623	530	344	623	530	77	677		354	839	713
v/s Ratio Prot		0.12			0.20		0.03	c0.34		c0.10	0.14	
v/s Ratio Perm	0.16		0.01	c0.31		0.08						0.04
v/c Ratio	0.47	0.35	0.04	0.92	0.59	0.24	0.61	0.87		0.92	0.30	0.08
Uniform Delay, d1	19.9	19.0	17.0	24.3	20.9	18.2	36.2	21.3		34.2	13.1	11.7
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	1.6	0.3	0.0	28.0	1.4	0.2	13.5	11.3		28.6	0.2	0.0
Delay (s)	21.5	19.3	17.0	52.3	22.4	18.5	49.7	32.6		62.8	13.3	11.8
Level of Service	C	B	B	D	C	B	D	C		E	B	B
Approach Delay (s)		19.5			29.9			33.8			36.3	
Approach LOS		B			C			C			D	
Intersection Summary												
HCM Average Control Delay			31.0				HCM Level of Service				C	
HCM Volume to Capacity ratio			0.89									
Actuated Cycle Length (s)			77.1				Sum of lost time (s)				12.0	
Intersection Capacity Utilization			81.0%				ICU Level of Service				D	
Analysis Period (min)			15									

c Critical Lane Group